SERVICE STATION MANUAL

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STELVIO 4V - 1200

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THE VALUE OF SERVICE

Only the mechanics of the Official Moto Guzzi Service Network know this vehicle well, thanks to constant technical professional development and Moto Guzzi specific training programmes, and have the tools needed to carry out maintenance and repair operations correctly.

The reliability of the vehicle also depends on its mechanical conditions. Checking the vehicle before setting off, carrying out routine maintenance and using only Moto Guzzi Original Spare parts is fundamental!

For information about the nearest Official Dealer and/or Service Centre, consult the Yellow Pages or search directly on the inset map in our Official Website:

www.motoguzzi.it

Only by purchasing Moto Guzzi Original Spare Parts will you get a product designed and tested during the bike designing phase. Moto Guzzi Original Spare Parts are subject to systematic quality control procedures so that their reliability and performance over time is guaranteed.

The descriptions and illustrations given in this publication are not binding; While the basic features as described and illustrated in this booklet remain unchanged, Moto Guzzi reserves the right, at any time and without being required to update this publication beforehand, to make any changes to components, parts or accessory supplies, which it deems necessary to improve the product or which are required for manufacturing or commercial reasons.

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

SERVICE STATION MANUAL
STELVIO 4V - 1200

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

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

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

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

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

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

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

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INDEX OF TOPICS

Rules

Safety rules

Carbon monoxide

If you need to keep the engine running in order to carry out any procedure, please ensure that you do so in an open or very well ventilated area. Never let the engine run in an enclosed area. If you do work in an enclosed area, make sure to use a smoke-extraction system.

CAUTION

EXHAUST EMISSIONS CONTAIN CARBON MONOXIDE, A POISONOUS GAS WHICH CAN CAUSE LOSS OF CONSCIOUSNESS AND EVEN DEATH.

Fuel

CAUTION

FUEL USED TO POWER INTERNAL COMBUSTION ENGINES IS HIGHLY FLAMMABLE AND CAN BECOME EXPLOSIVE UNDER SPECIFIC CONDITIONS. IT IS THEREFORE RECOMMENDED TO CARRY OUT REFUELLING AND MAINTENANCE PROCEDURES IN A VENTILATED AREA WITH THE ENGINE SWITCHED OFF. DO NOT SMOKE DURING REFUELLING AND NEAR FUEL VAPOURS, AVOIDING ANY CONTACT WITH NAKED FLAMES, SPARKS OR OTHER SOURCES WHICH MAY CAUSE THEM TO IGNITE OR EXPLODE.
DO NOT DISPERSE FUEL IN THE ENVIRONMENT.
KEEP OUT OF THE REACH OF CHILDREN

Hot components

The engine and the exhaust system components get very hot and remain in this condition for a certain time interval after the engine has been shut off. Before handling these components, make sure that you are wearing insulating gloves or wait until the engine and the exhaust system have cooled down.

Used engine oil and transmission oil

CAUTION

IT IS ADVISABLE TO WEAR LATEX GLOVES WHEN SERVICING THE VEHICLE.
ENGINE OR TRANSMISSION OIL MAY CAUSE SERIOUS INJURIES TO THE SKIN IF HANDLED FOR PROLONGED PERIODS OF TIME AND ON A REGULAR BASIS.
WASH YOUR HANDS CAREFULLY AFTER HANDLING OIL.
HAND THE OIL OVER TO OR HAVE IT COLLECTED BY THE NEAREST USED OIL RECYCLING COMPANY OR THE SUPPLIER.
DO NOT DISPOSE OF OIL IN THE ENVIRONMENT
KEEP OUT OF THE REACH OF CHILDREN

Brake and clutch fluid

THE BRAKE AND CLUTCH FLUIDS CAN DAMAGE THE PLASTIC OR RUBBER PAINTED SURFACES. WHEN SERVICING THE BRAKING SYSTEM OR THE CLUTCH SYSTEM PROTECT THESE COMPONENTS WITH A CLEAN CLOTH. ALWAYS WEAR PROTECTIVE GOGGLES WHEN SERVICING THE SYSTEMS. BRAKE AND CLUTCH FLUIDS ARE EXTREMELY HARMFUL FOR YOUR EYES. IN THE EVENT OF ACCIDENTAL CONTACT WITH THE EYES, RINSE THEM IMMEDIATELY WITH ABUNDANT COLD, CLEAN WATER AND SEEK MEDICAL ADVICE.
KEEP OUT OF THE REACH OF CHILDREN

Battery electrolyte and hydrogen gas

CAUTION

THE BATTERY ELECTROLYTE IS TOXIC, CORROSIVE AND AS IT CONTAINS SULPHURIC ACID, IT CAN CAUSE BURNS WHEN IN CONTACT WITH THE SKIN. WHEN HANDLING BATTERY ELECTROLYTE, WEAR TIGHT-FITTING GLOVES AND PROTECTIVE APPAREL. IF THE ELECTROLYTIC FLUID COMES INTO CONTACT WITH THE SKIN, RINSE WELL WITH ABUNDANT FRESH WATER. IT IS PARTICULARLY IMPORTANT TO PROTECT THE EYES BECAUSE EVEN TINY AMOUNTS OF BATTERY ACID MAY CAUSE BLINDNESS. IF THE FLUID GETS INTO CONTACT WITH YOUR EYES, WASH WITH ABUNDANT WATER FOR FIFTEEN MINUTES AND CONSULT AN EYE SPECIALIST IMMEDIATELY. IF THE FLUID IS ACCIDENTALLY SWALLOWED, DRINK LARGE QUANTITIES OF WATER OR MILK, FOLLOWED BY MILK OF MAGNESIA OR VEGETABLE OIL AND SEEK MEDICAL ADVICE IMMEDIATELY. THE BATTERY RELEASES EXPLOSIVE GASES; KEEP IT AWAY FROM FLAMES, SPARKS, CIGARETTES OR ANY OTHER HEAT SOURCES. ENSURE ADEQUATE VENTILATION WHEN SERVICING OR RECHARGING THE BATTERY.
KEEP OUT OF THE REACH OF CHILDREN
BATTERY LIQUID IS CORROSIVE. DO NOT POUR IT OR SPILL IT, PARTICULARLY ON PLASTIC COMPONENTS. ENSURE THAT THE ELECTROLYTIC ACID IS COMPATIBLE WITH THE BATTERY TO BE ACTIVATED.

Maintenance rules

GENERAL PRECAUTIONS AND INFORMATION

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

BEFORE DISASSEMBLING COMPONENTS

- Before dismantling components, remove dirt, mud, dust and foreign bodies from the vehicle. Use the special tools designed for this bike, as required.

COMPONENTS REMOVAL

- Do not loosen and/or tighten screws and nuts using pliers or other tools other than the especially designed wrench.
- Mark positions on all connection joints (pipes, cables, etc.) before separating them, and identify them with distinctive symbols.
- Each component needs to be clearly marked in order to be identified during assembly.
- Clean and wash the removed components carefully using a low-flammability detergent.

- Keep coupled parts together since they have "adjusted" to each other due to normal wear and tear.
- Some components must be used together or replaced altogether.
- Keep away from heat sources.

REASSEMBLING COMPONENTS

CAUTION

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

- Only use ORIGINAL Moto Guzzi SPARE PARTS.
- Comply with lubricant and consumables usage guidelines.
- Lubricate parts (whenever possible) before reassembling them.
- When tightening nuts and screws, start from the ones with the largest section or from the internal ones, moving diagonally. Tighten nuts and screws in successive steps before applying the tightening torque.
- Always replace self-locking nuts, washers, sealing rings, circlips, O-rings, split pins and screws with new ones if their tread is damaged.
- When fitting bearings, make sure to lubricate them well.
- Check that each component is fitted correctly.
- After a repair or routine maintenance procedure, carry out pre-ride checks and test the vehicle on private grounds or in an area with low traffic density.
- Clean all junction surfaces, oil guard rims and washers before refitting them. Smear a light layer of lithium-based grease on the oil guard rims. Reassemble the oil guard and the bearings with the brand or lot number facing outward (visible side).

ELECTRIC CONNECTORS

Electric connectors must be disconnected as described below as non-compliance with the procedure so described causes irreparable damage to both the connector and the cable harness:
Press the relevant safety hooks, if any.

- Grip the two connectors and disconnect them by pulling them in opposite directions.
- If there are signs of dirt, rust, humidity, etc., clean the connector internal parts carefully using a pressurised air jet.
- Make sure that the cables are correctly linked to the connector internal terminal ends.
- Then insert the two connectors making sure that they couple correctly (if the relevant hooks are provided, you will hear them "click" into place).

CAUTION

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

NOTE

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

TIGHTENING TORQUE

CAUTION

DO NOT FORGET THAT THE TIGHTENING TORQUE OF ALL FASTENING ELEMENTS ON WHEELS, BRAKES, WHEEL SPINDLES AND OTHER SUSPENSION COMPONENTS PLAY A KEY ROLE IN ENSURING THE VEHICLE'S SAFETY AND MUST COMPLY WITH SPECIFIED VALUES. CHECK THE TIGHTENING TORQUE OF FASTENING PARTS ON A REGULAR BASIS AND ALWAYS USE A TORQUE WRENCH TO REASSEMBLE THESE COMPONENTS. FAILURE TO COMPLY WITH THESE RECOMMENDATIONS MAY CAUSE ONE OF THESE COMPONENTS TO GET LOOSE AND EVEN DETACHED, THUS BLOCKING A WHEEL, OR OTHERWISE COMPROMISE VEHICLE HANDLING. THIS CAN LEAD TO FALLS, WITH THE RISK OF SERIOUS INJURY OR DEATH.

Running-in

Engine run-in is essential to ensure engine long life and correct operation. Twisty roads and gradients are ideal to run in engine, brakes and suspensions effectively. Vary your driving speed during run-in. In this way, you allow for the work of components to be "loaded" and then "unloaded", thus cooling engine parts.

CAUTION

THE CLUTCH MAY EMIT A SLIGHT BURNING SMELL WHEN FIRST USED. THIS PHENOMENON SHOULD BE CONSIDERED NORMAL AND WILL DISAPPEAR AS SOON AS THE CLUTCH PLATES GET ADAPTED.
IT IS IMPORTANT TO STRAIN ENGINE COMPONENTS DURING RUN-IN, HOWEVER, MAKE SURE NOT TO OVERDO THIS.

CAUTION

ONLY AFTER THE SERVICE AT THE END OF THE RUN-IN PERIOD CAN THE BEST PERFORMANCE OF YOUR VEHICLE BE OBTAINED.

Follow the guidelines detailed below:

- Do not twist the throttle grip abruptly and completely when the engine is working at a low revs, either during or after run-in.
- During the first 100 km (62 miles) operate the brakes with caution avoid rough and long braking. That is to permit the adequate adjustment of the pad friction material to the brake discs.

AFTER THE SPECIFIED MILEAGE, TAKE THE VEHICLE TO AN OFFICIAL Moto Guzzi DEALER FOR THE CHECKS INDICATED IN THE "AFTER RUN-IN" TABLE IN THE SCHEDULED MAINTENANCE SECTION TO AVOID INJURING YOURSELF, OTHERS AND /OR DAMAGING THE VEHICLE.

Transmission

TRANSMISSION

Specification	Desc./Quantity
Main transmission	With helical teeth, ratio 26/35 = 1:1.346
Gearbox	Mechanical, 6 speeds with foot lever on the left hand side of the engine
1st gear ratios	17/38 = 1 :2.2353
2nd gear ratios	20/34 = 1:1.7
3rd gear ratios	23/31 = 1:1.3478

Specification	Desc./Quantity
4th gear ratios	26/29 = 1:1.1154
5th gear ratios	31/30 = 1:0.9677
6th gear ratios	29/25 = 1:0.8621
Final drive	cardan shaft
Ratio	12/44 = 1:3.6667

Supply

FUEL SUPPLY

Specification	Desc./Quantity
FUEL SUPPLY	Electronic injection (Weber . Marelli) with Stepper engine
Diffuser	diameter: 50 mm (1.97 in)
Fuel	premium unleaded petrol, minimum octane rating of 95 (NORM) and 85 (NOMM)

Overhaul data

Assembly clearances

Cylinder - piston assy.

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

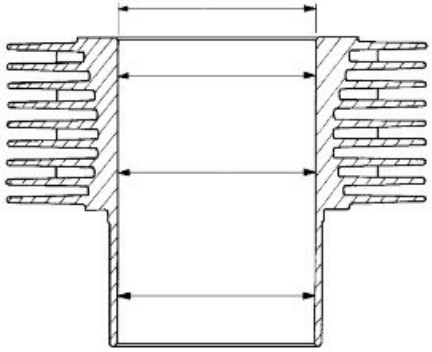
Check that cylinders and pistons are of the same selection types (D, E, F).

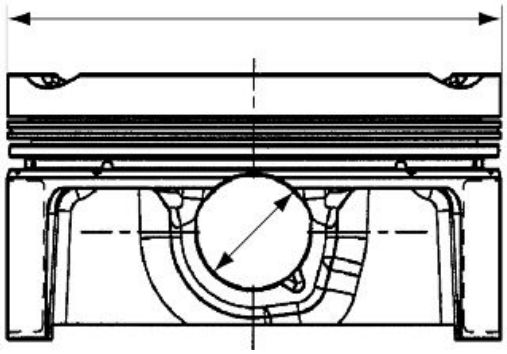
Check clearance between cylinders and pistons on the selected diameter; if it exceeds the value specified, it is necessary to replace cylinders and pistons.

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

PISTON - CYLINDER SELECTION TYPES

Specification	Desc./Quantity
Piston diameter - selection D	94.935 - 94.945 mm (3.73759 - 3.73798 in)
Cylinder diameter - selection D	95.000 - 95.010 mm (3.74015 - 3.74054 in)
Piston diameter - selection E	94.945 - 94.955 mm (3.73798 - 3.73837 in)
Cylinder diameter - selection E	95.010 - 95.020 mm (3.74054 - 3.74093 in)
Piston diameter - selection F	94.955 - 94.965 mm (3.73837 - 3.73877 in)
Cylinder diameter - selection F	95.020 - 95.030 mm (3.74093 - 3.74133 in)





PIN - PISTON COUPLING

Specification	Desc./Quantity
Pin diameter	21.998 - 21.994 mm (0.86606 - 0.86590 in)
Pin hole diameter on piston	22.016 - 22.011 mm (0.86677 - 0.86657 in)
Clearance between pin and holes on piston	0.013 - 0.022 mm (0.00051 - 0.00087 in)

Piston rings

On each piston there are:

- 1 top piston ring;
- 1 middle piston ring;
- 1 oil scraper piston ring.

Turn the rings so that the coupling ends are 120 degrees from each other.

CLEARANCE BETWEEN PISTON RINGS AND SEATS ON PISTON

Specification	Desc./Quantity
Top ring	0.030 - 0.065 mm (0.00118 - 0.00256 in)
Middle ring	0.020 - 0.055 mm (0.00079 - 0.00216 in)
Oil scraper ring	0.010 - 0.045 mm (0.00039 - 0.00177 in)

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

- Top and middle piston ring: 0.40 - 0.65 mm (0.00158 - 0.00255 in)
- Oil scraper piston ring: 0.30 - 0.60 mm (0.00118 - 0.00236 in).

Crankcase - crankshaft - connecting rod

CRANKSHAFT SEAT (TIMING SYSTEM SIDE)

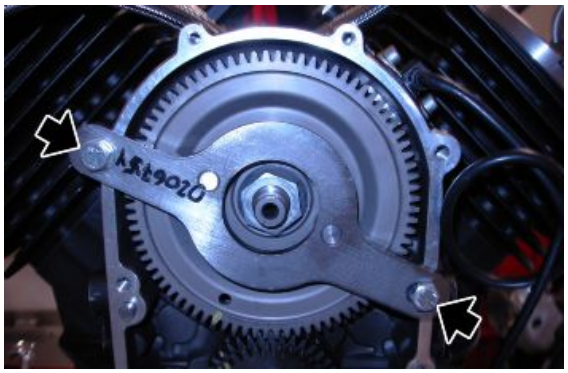
Specification	Desc./Quantity
Diameter of crankshaft main journal, timing system side	37.975 - 37.959 mm (1.49507 - 1.49444 in)
Inside diameter of crankshaft bushing, timing system side	38.016 - 38.0 mm (1.49669 - 1.49606 in)
Clearance between bushing and main journal (timing system side)	0.025 - 0.057 mm (0.00098 - 0.00224 in)

CRANKSHAFT SEAT (CLUTCH SIDE)

Specification	Desc./Quantity
Diameter of crankshaft main journal, clutch side	53.97 - 53.961 mm (2.12480 - 2.12444 in)
Inside diameter of crankshaft bushing on clutch-side flange	54.019 - 54.0 mm (2.12673 - 2.12598 in)
Clearance between bushing and main journal (clutch side)	0.030 - 0.058 mm (0.00118 - 0.00228 in)

Slot packing system

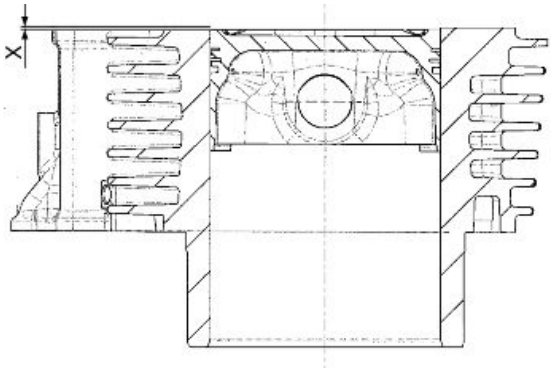
- Installare sulle bielle entrambi i pistoni.
- Operando da entrambi i lati, installare sul basamento la guarnizione tra basamento e cilindro.
- Installare entrambi i cilindri.
- Portare il pistone del cilindro sinistro al PMS e bloccare la rotazione dell'albero motore.



Specific tooling

020675Y Fermo ingranaggio albero di servizio

- Fit both pistons on the connecting rods.
- Working from both sides, fit the gasket between the crankcase and the cylinder on the crankcase.
- Fit both cylinders.
- Take the left cylinder piston to TDC and lock crankshaft rotation.
- Place the tool on the left cylinder stud bolts to determine the "squish" (X).



Specific tooling

020676Y Supporto comparatore controllo posizione pistone

- Tighten both nuts fixing the tool.
- Reset the micrometer on the cylinder rim.
- Move the micrometer up to the highest point of the piston crown.

- Take note of the measurement and, according to the values found, consult the chart at the bottom of the page to decide the thickness of the gasket to be fitted between the cylinder and the head.
- Unlock crankshaft rotation.
- Rotate the crankshaft by 90°until the right cylinder piston reaches the TDC.
- Lock crankshaft rotation.
- Place the tool on the right cylinder stud bolts to determine the "squish" (X).

Specific tooling

020676Y Supporto comparatore controllo posizione pistone

- Repeat the same operations to determine the thickness of the left cylinder gasket between the cylinder and the head also for the right cylinder .

CYLINDER GASKET THICKNESS - HEAD

Specification	Desc./Quantity
Value (X) -0.56 / -0.37 mm (-0.022 / -0.0146 in)	gasket thickness: 0.65 mm (0.0256 in)
Value (X) -0.37 / -0.19 mm (-0.0146 / -0.0075 in)	gasket thickness: 0.85 mm (0.0335 in)
Value (X) -0.19 / 0 mm (-0.0075 / 0 in)	gasket thickness: 1.05 mm (0.0413 in)

Recommended products chart

RECOMMENDED PRODUCTS

Product	Description	Specifications
AGIP RACING 4T 10W-60	Engine oil	SAE 10W - 60. As an alternative for recommended oils, use top branded oils that meet or exceed the requirements of CCMC G-4 API SG specifications.
AGIP GEAR SAE 80 W 90	Transmission oil	-
AGIP GEAR MG/S SAE 85 W 90	Gearbox oil	-
AGIP FORK 7.5W	Fork oil	SAE 5W / SAE 20W
AGIP GREASE SM2	Lithium grease with molybdenum for bearings and other points needing lubrication	NLGI 2
Neutral grease or petroleum jelly.	BATTERY POLES	
AGIP BRAKE 4 / BRAKE 5.1	Brake fluid	As an alternative for recommended fluids, use top branded fluids that meet or exceed the requirements of SAE J1703, NHTSA 116 DOT 4, ISO 4925 synthetic fluid specifications.
AGIP BRAKE 4 / BRAKE 5.1	Clutch fluid	As an alternative for recommended fluids, use top branded fluids that meet or exceed the requirements of SAE J1703, NHTSA 116 DOT 4, ISO 4925 synthetic fluid specifications.

INDEX OF TOPICS

Transmission fluid

Gearbox Oil

Checking the valve clearance

If the timing system is very noisy, check the clearance between the valves and the rocking levers.

NOTE

ADJUST WITH COLD ENGINE, WITH PISTON AT TOP DEAD CENTRE (TDC) IN COMPRESSION STROKE (VALVES CLOSED).

- Disconnect both spark plug tubes.

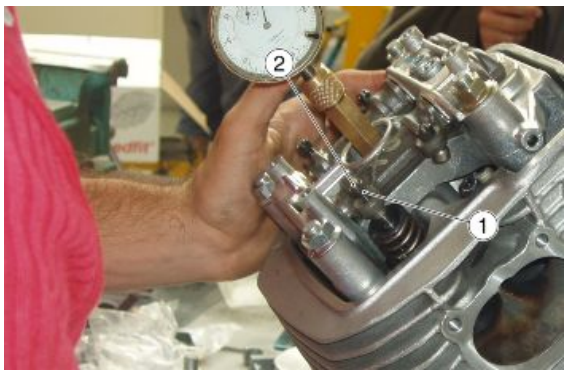
- Undo and remove the four head cover fixing screws and collect the sealing O-rings.
- Remove the head cover together with the gasket.

- Loosen the nut (1).
- Use a screwdriver to act on the set screw (2) until the following clearances are obtained:

Inlet valve: 0.10 mm (0.0039 in)

Outlet valve: 0.15 mm (0.0059 in)

- The measurement must be done using a special thickness gauge .



CAUTION

IF CLEARANCE IS LARGER THAN RECOMMENDED, THE TAPPET WILL BE NOISY. OTHERWISE, THE VALVES DO NOT CLOSE COR-

RECTLY, WHICH CAN LEAD TO PROBLEMS SUCH AS:

- PRESSURE DROP;
- ENGINE OVERHEAT;
- VALVE BURNOUT, ETC.

INDEX OF TOPICS

Checks and inspections

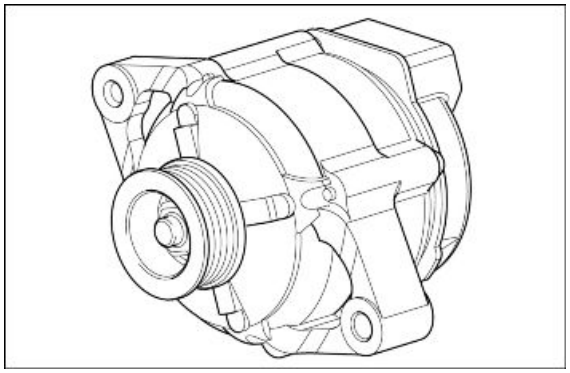
Battery recharge circuit

Checking the stator

Single-phase generator with regulated voltage

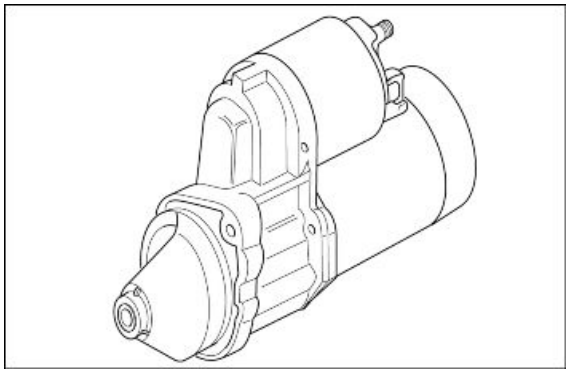
Maximum load 40A (550W)

Charging voltage 14.2 - 14.8 V (5000 rpm)



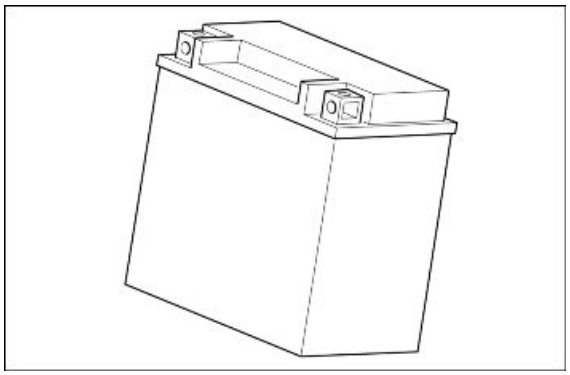
Start-up system check

pick-up input about 100 A



Battery

12 V - 18 Ampere/hour



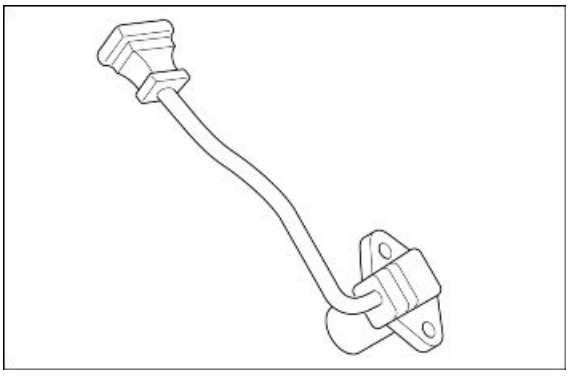
Engine rpm sensor

Measures the engine revolution speed and each cylinder timing in relation to the TDC

Inductive type sensor, with three-way connector:

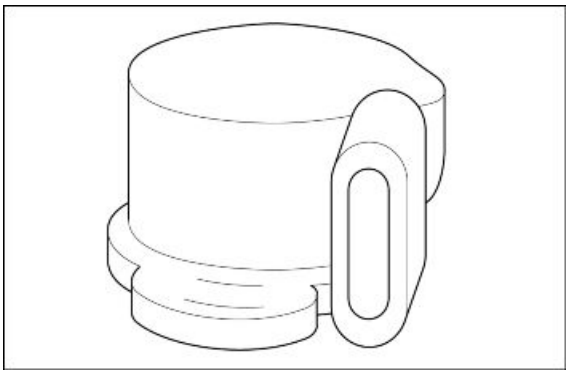
- positive voltage pin;
- negative voltage pin: resistance from 650 to 720 Ohm (to be measured between pins 1 and 2);
- shielding pin.

Air gap value: (measure sensor length with a depth gauge): 0.5 - 0.7 mm (0.0197 - 0.0276 in).



Throttle position sensor

Output voltage 0.55 - 4.4 V (variable depending on the position of the throttle valve, to be measured between pins C and A)



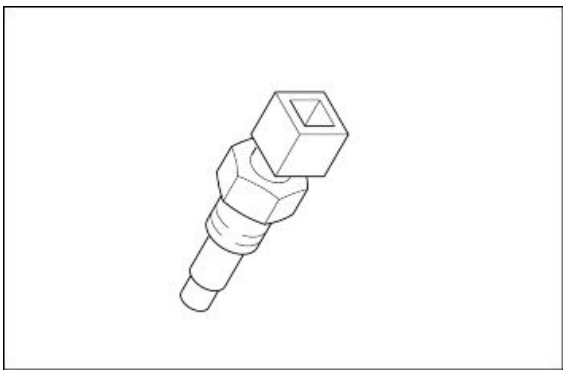
Engine temperature sensor

This sensor, 5V powered, features NTC specifications and sends the control unit a signal which varies depending on temperature to help manage the stoichiometric ratios during engine speed adjustment.

ENGINE TEMPERATURE SENSOR RESISTANCE

	Specification	Desc./Quantity
1	Resistance at -40 °C (-104 °F)	100.950 kOhm
2	Resistance at -30 °C (-22 °F)	53.100 kOhm
3	Resistance at -20 °C (-4 °F)	29.120 kOhm
4	Resistance at -10 °C (14 °F)	16.600 kOhm
5	Resistance at 0 °C (32 °F)	9.750 kOhm
6	Resistance at +10 °C (50 °F)	5.970 kOhm
7	Resistance at +20 °C (68 °F)	3.750 kOhm
8	Resistance at +30 °C (86 °F)	2.420 kOhm
9	Resistance at +40 °C (104 °F)	1.600 kOhm
10	Resistance at +50 °C (122 °F)	1.080 kOhm
11	Resistance at +60 °C (140 °F)	0.750 kOhm
12	Resistance at +70 °C (158 °F)	0.530 kOhm

	Specification	Desc./Quantity
13	Resistance at +80 °C (176 °F)	0.380 kOhm
14	Resistance at +90 °C (194 °F)	0.280 kOhm
15	Resistance at +100 °C (212 °F)	0.204 kOhm
16	Resistance at +110 °C (230 °F)	0.153 kOhm
17	Resistance at +120 °C (257 °F)	0.102 kOhm

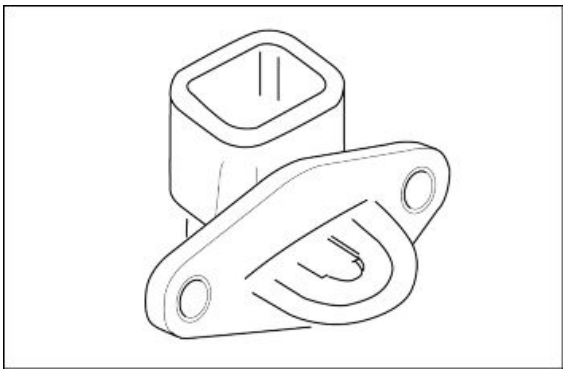


Air temperature sensor

NTC type sensor

AIR TEMPERATURE SENSOR RESISTANCE

	Specification	Desc./Quantity
1	Resistance at -40 °C (-104 °F)	100.950 kOhm
2	Resistance at 0 °C (32 °F)	9.750 kOhm
3	Resistance at 10 °C (50 °F)	5.970 kOhm
4	Resistance at 20 °C (68 °F)	3.750 kOhm
5	Resistance at 30 °C (86 °F)	2.420 kOhm
6	Resistance at 40 °C (104 °F)	1.600 kOhm
7	Resistance at 90 °C (194 °F)	0.280 kOhm

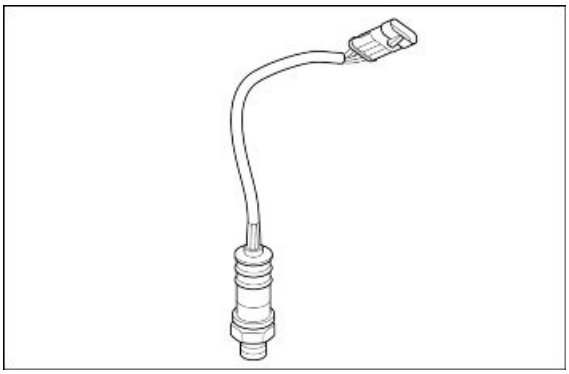


Lambda sensor

Oxygen sensor with heater.

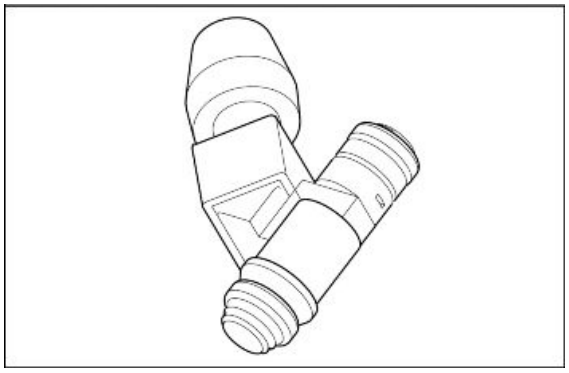
Sensor voltage between 0 and 0.9 V (to be measured between pins 1 and 2).

Heater resistance 12.8 Ohm (to be measured between pins 3 and 4 at 20°C - 68°F).



Injector

Resistance 14 Ohm ± 2 Ohm measured at 20 °C (68 °F)



Coil

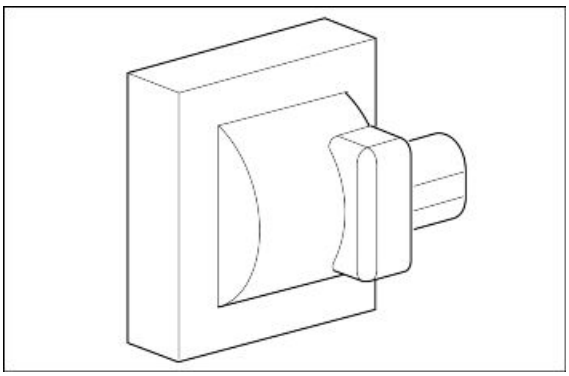
Characteristic

Primary resistance:

0.9 - 1.1 Ω (measured between pins 1 and 15)

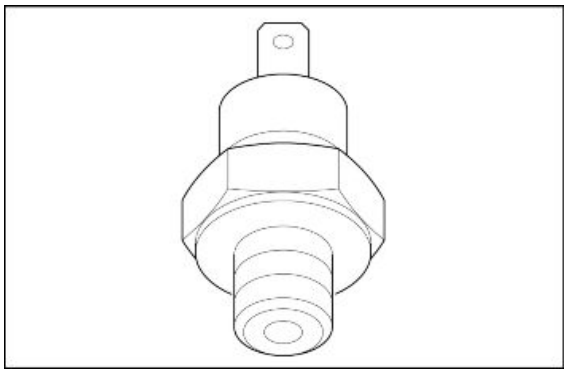
Secondary resistance:

6.5 - 7.2 KΩ.



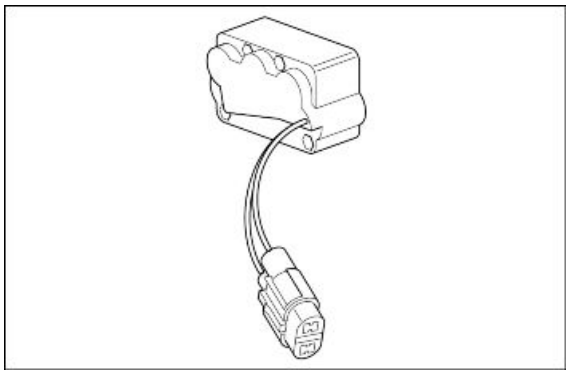
Engine oil pressure sensor

An oil pressure sensor anomaly is signalled by the lighting of the "bulb" icon which should remain lit even with the engine running.
There is an oil pressure anomaly when, with engine running at over 1500 rpm, the sensor is detected as conducting (closed) at least for one second.
At lower rpm, there is an anomaly when the sensor remains closed for at least 300 seconds. The opening of the sensor, and therefore the alarm triggering, is detected if the contact is open for at least one second.



Bank angle sensor

Normally open contact, 62 kOhm resistance, with vehicle upright (straight sensor); Closed contact, 0 Ohm resistance, when the sensor is turned by 90° with respect to its fitting position.



Air temperature sensor - instrument panel

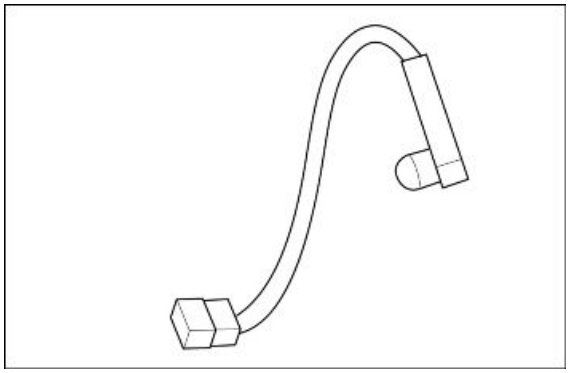
Characteristic

Resistance

10 kOhm (at 25°C - 77°F)

Resistance

32.5 kOhm (at 0°C - 32°F)

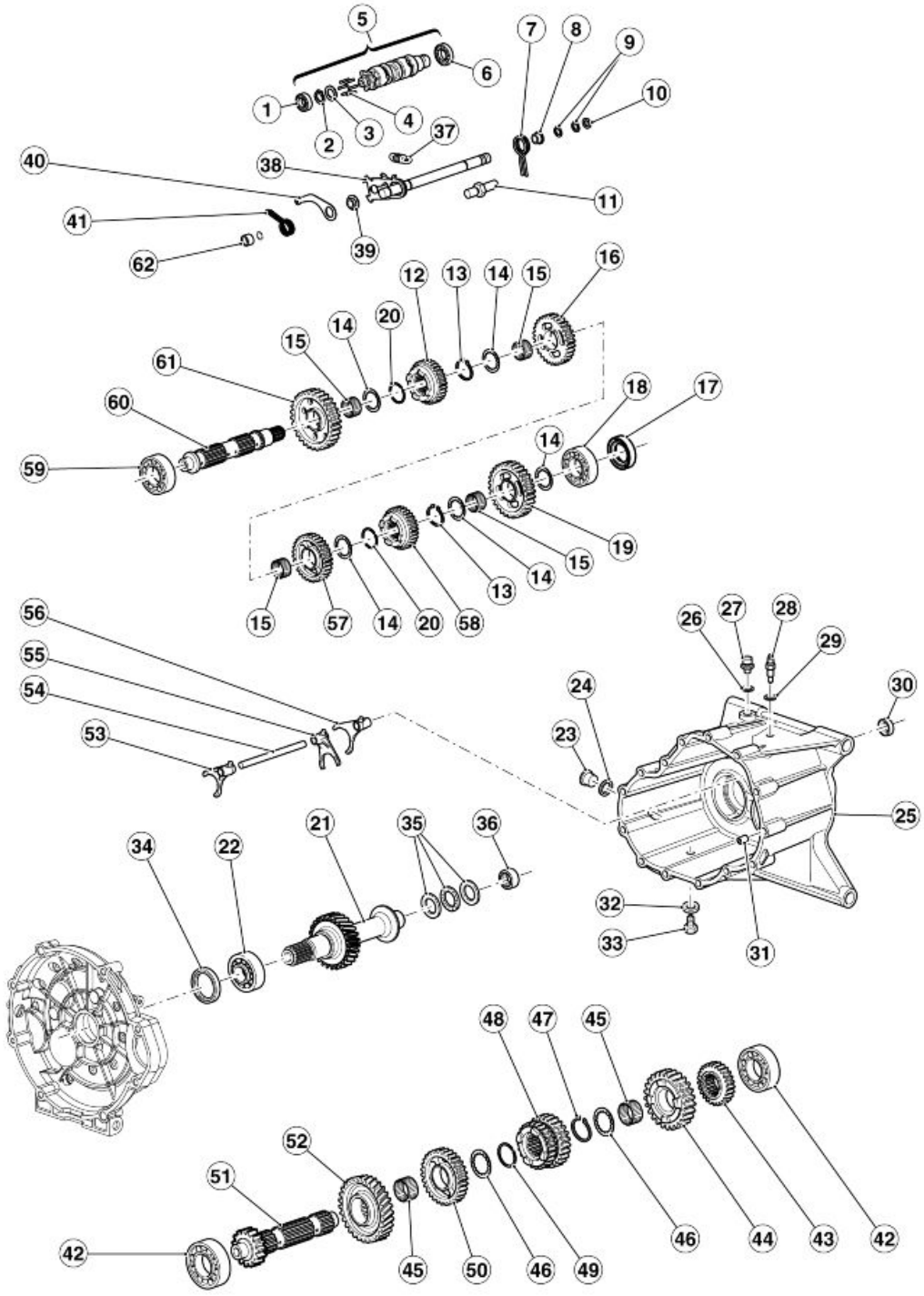


INDEX OF TOPICS

ENGINE	ENG

Gearbox

Diagram



Key:

1. Ball bearing

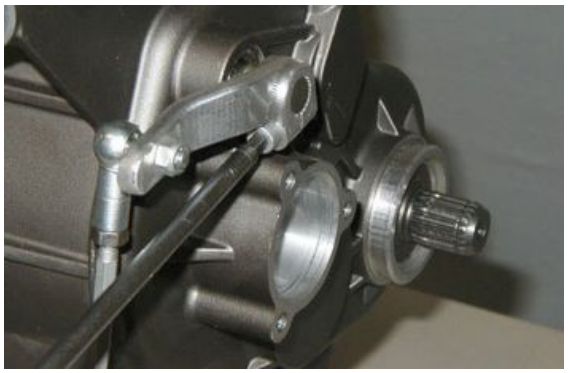
2. Circlip
3. Thickness
4. Pin
5. Complete desmodromic
6. Ball bearing
7. Spring
8. Spacer
9. Circlip
10. Fifth wheel
11. Linking pin
12. Gear
13. Circlip
14. Thrust washer
15. Ball bearing cage
16. Gear
17. Sealing ring
18. Ball bearing
19. Gear
20. Circlip
21. Clutch shaft
22. Ball bearing
23. Oil plug
24. Washer
25. Gearbox
26. Aluminium washer
27. Breather cap
28. Neutral sensor
29. Gasket
30. Sealing ring
31. Bushing
32. Gasket
33. Oil drainage plug
34. Sealing ring
35. Thrust bearing
36. Roller bearing
37. Spring
38. Complete pre-selector
39. Bushing

40.Index lever
41.Spring
42.Ball bearing
43.Gear
44.Gear
45.Ball bearing cage
46.Thrust washer
47.Circlip
48.Gear
49.Circlip
50.Gear
51.Main shaft
52.Transmission gear
53.Fork (5th - 1st)
54.Fork shaft
55.Fork (3rd - 4th)
56.Fork (2nd - 4th)
57.Gear
58.Gear
59.Ball bearing
60.Transmission shaft
61.Gear
62.Spacer

Gearbox

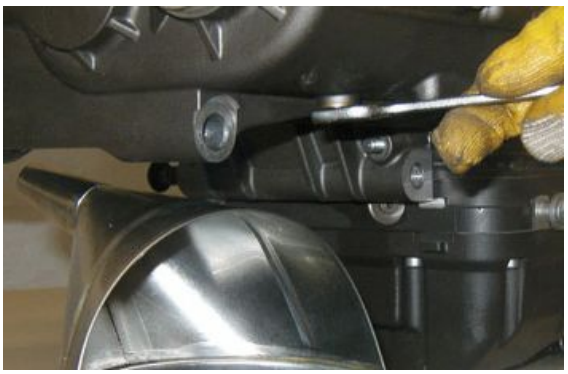
Removing the gearbox

- Remove the starter motor.
- Make sure the transmission is in idle.
- Undo and remove the screw and remove the gearbox lever.

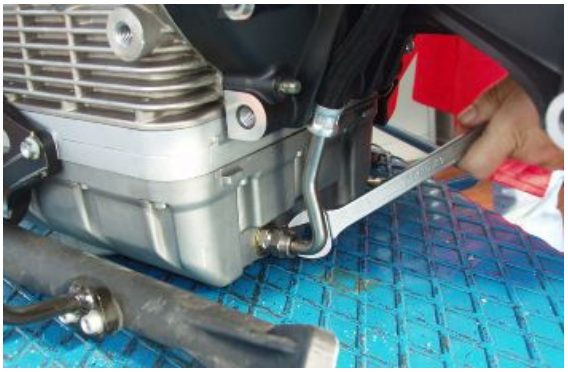


- Unscrew and remove the gearbox oil filler cap.

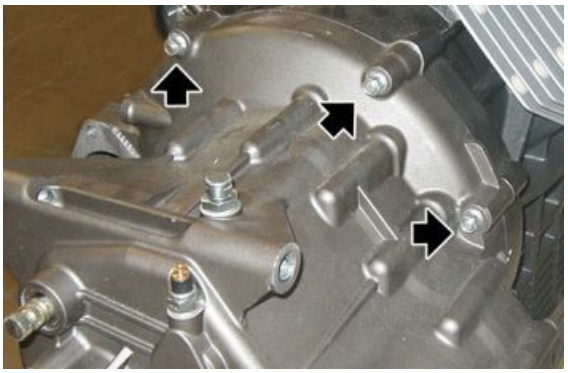
- Place a container of suitable capacity under it, unscrew and remove the cap and then bleed all gearbox oil.



- Loosen and turn the oil pipe fitting on the sump.



- Undo and remove the three screws.



- Undo and remove the two screws.

- Undo and remove the screw.

- Remove the gearbox.

See also

Removing the starter motor
Replacement

Gearbox shafts

Disassembling the gearbox

- Remove the gearbox.

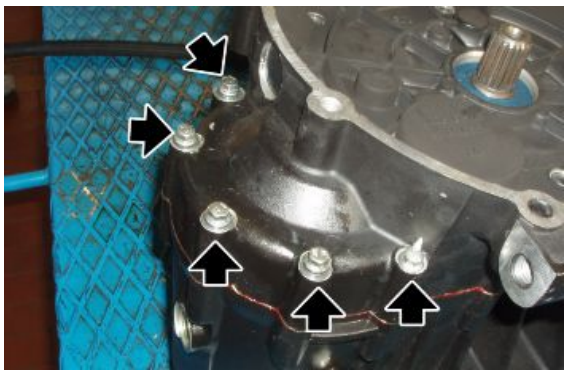
- Unscrew and slide off the odometer gear and collect the abutment washer that is inside the gearbox.

- From the outside, slide off the thrust cylinder and collect the O-Ring and the washer.

- Remove the thrust bearing and the washer.

- Slide off the rod with the two bushings.

- Undo and remove the five external screws.



- Place the gearbox on the specific gearbox support tool and on a vice.

Specific tooling

05.90.25.30 Gearbox support

- Undo and remove the nine internal screws.

- Aprire la scatola cambio.

- Remove the bearings from the gearbox if necessary.

- Release the spring.

- Pressing the selector, slide off the whole transmission lever.
- Use rubber bands to tie down the transmission shaft unit and extract it.

- Once the transmission shaft unit is in on a bench, remove the rubber bands, being careful with the group.
- Detach the shafts and label the forks before removal.

- Remove the forks and collect the shaft.

- Replace bearings if necessary and remove the clutch shaft.

See also

Removing the gearbox

Removing the primary shaft

- Remove the main shaft.
- Operate on the main shaft from the second gear side.

- Remove the gear of the second gear and collect the ball bearing cage.

- Remove the gear of the sixth gear and collect the shoulder washer.

- Remove the circlip.

- Remove the gear of the third and fourth gears.

- Remove the circlip and collect the shoulder washer.

- Remove the gear of the fifth gear and collect the ball bearing cage.

- Heat the shaft with a specific heater and remove the helical transmission gear.

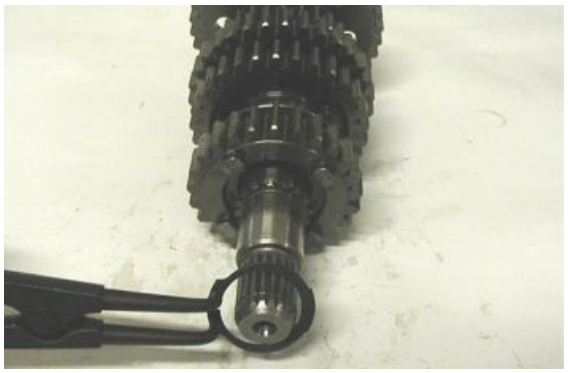
Removing the secondary shaft

- Remove the transmission shaft.
- Operate on the shaft from the grooved side.

- Remove the shoulder washer.

- Remove the gear of the second gear and collect the ball bearing cage and the shoulder washer.

- Remove the circlip.



- Remove the gear of the sixth gear.

- Remove the circlip and collect the shoulder washer.

- Remove the gear of the fourth gear and collect the ball bearing cage.

- Remove the gear of the third gear and collect the ball bearing cage and the shoulder washer.

- Remove the circlip.

- Remove the gear of the fifth gear.

- Remove the circlip, the shoulder washer and remove the gear of the first gear, collect the ball bearing cage.
- Remove the bearing if necessary.

See also

Disassembling the gearbox

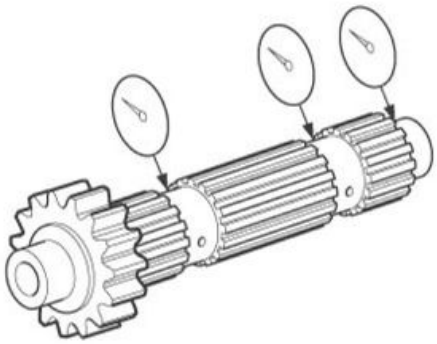
Checking the primary shaft

Measure coaxiality of the main shaft with a dial gauge and a centring device and replace it if not complying with specifications.

Characteristic

Shaft coaxiality limit

0.08 mm (0.0031 in)



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

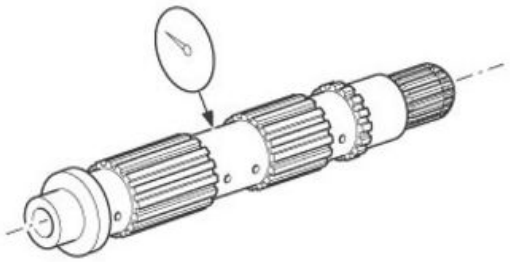
Checking the secondary shaft

Measure the coaxiality of the transmission shaft with a dial gauge and a centring device and replace it if not complying with specifications.

Characteristic

Shaft coaxiality limit

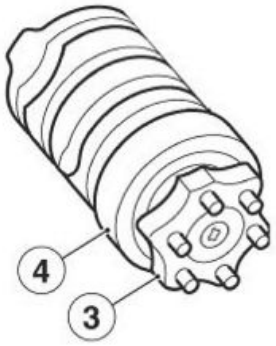
0.08 mm (0.0031 in)



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

Checking the desmodromic drum

Check gear drum for damage, scratches and wear and replace the desmodromic if necessary.
Check the desmodromic segment «**3**» for damage and wear and replace it if necessary.
Check the desmodromic bearing «**4**» for damage and cracks and replace it if necessary.

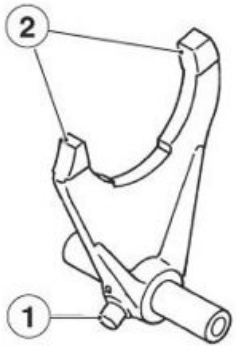


Checking the forks

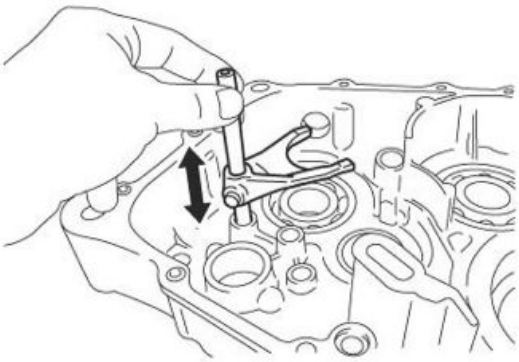
NOTE

THE FOLLOWING PROCEDURE IS VALID FOR ALL TRANSMISSION FORKS.

- Check the transmission fork cam roller «1» and the transmission fork tooth «2» for damage, deformation and wear.
- Replace the transmission fork if necessary.



- Check the transmission fork movement and if it is not regular, replace the transmission forks.



See also

Disassembling the gearbox

Fitting the primary shaft

NOTE

TO REFIT, FOLLOW THE SAME INSTRUCTIONS AS FOR REMOVAL BUT IN REVERSE ORDER. REMEMBER TO REPLACE ALL SEALING RINGS, CIRCLIPS AND SAFETY RINGS PREVIOUSLY REMOVED.

See also

Removing the primary shaft

Fitting the secondary shaft

NOTE

TO REFIT, FOLLOW THE SAME INSTRUCTIONS AS FOR REMOVAL BUT IN REVERSE ORDER. REMEMBER TO REPLACE ALL SEALING RINGS, CIRCLIPS AND SAFETY RINGS PREVIOUSLY REMOVED.

See also

Removing the secondary shaft

Assembling the gearbox

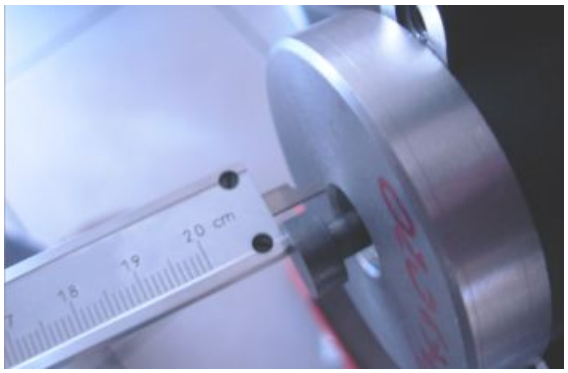
NOTE

TO REFIT, FOLLOW THE SAME INSTRUCTIONS AS FOR REMOVAL BUT IN REVERSE ORDER. REMEMBER TO REPLACE ALL SEALING RINGS, CIRCLIPS AND SAFETY RINGS PREVIOUSLY REMOVED.

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

- Fit the new clutch on the crankshaft.
- Fit the clutch control bowl in the gear-box.

- Fit the gearbox on the engine block.
- Fit the tool in the gearbox to determine the clutch control rod length.
- According to the value found, select the correct rod based on the following table:



Specific tooling

020678Y Attrezzo verifica asta frizione

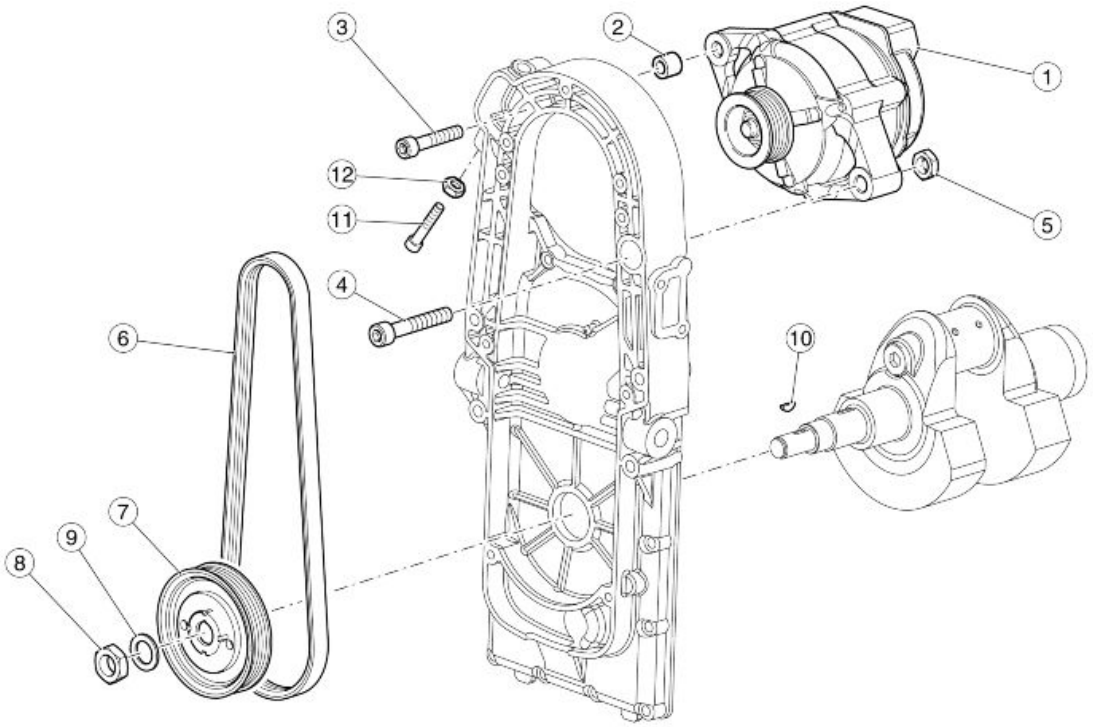
CLUTCH CONTROL ROD SELECTION

Specification	Desc./Quantity
Clutch control rod (code 976593)	183 mm (7.205 in)
Clutch control rod (code 976594)	184.5 mm (7.264 in)
Clutch control rod (code 976595)	186 mm (7.323 in)
Clutch control rod (code 976596)	187.5 mm (7.382 in)

See also

Disassembling the gearbox

Generator



Key:

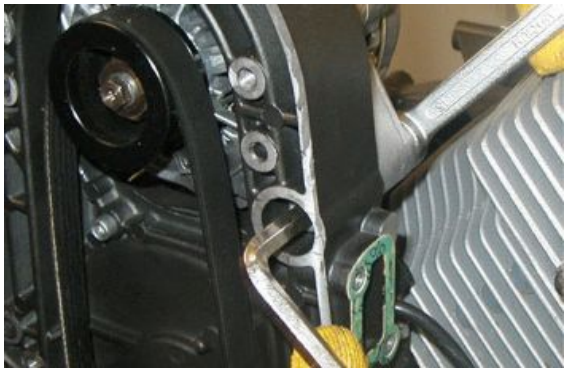
1. Alternator
2. Spacer
3. Screw
4. Screw
5. Nut
6. Belt
7. Generator control pulley
8. Nut
9. Washer
10. Magneto flywheel cotter
11. Screw
12. Nut

Removing the generator

- Remove the fuel tank.
- Remove the control unit from its seat.
- Disconnect the alternator connectors.
- Undo and remove the five screws and collect the bushings.

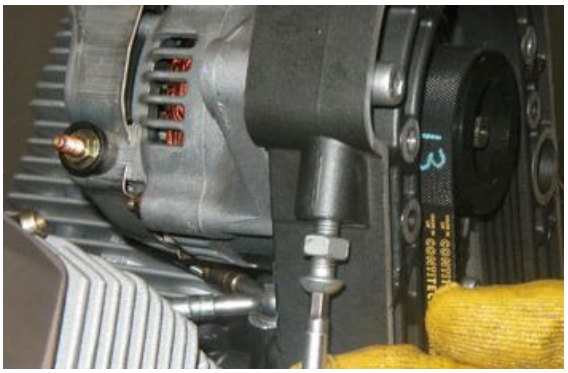
- Remove the cover.

- Unscrew the nut and collect the screw.



- Loosen the screw.

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

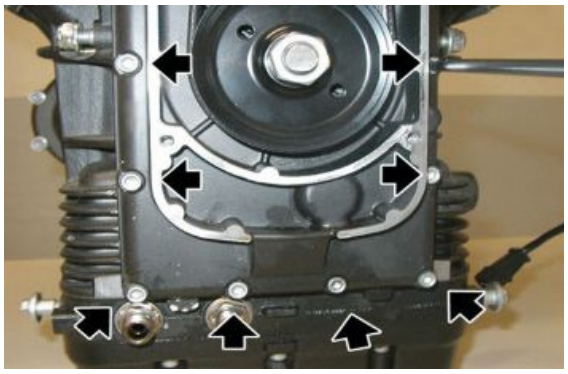


- Completely loosen and remove the screw.

- Remove the belt and the alternator with pulley.

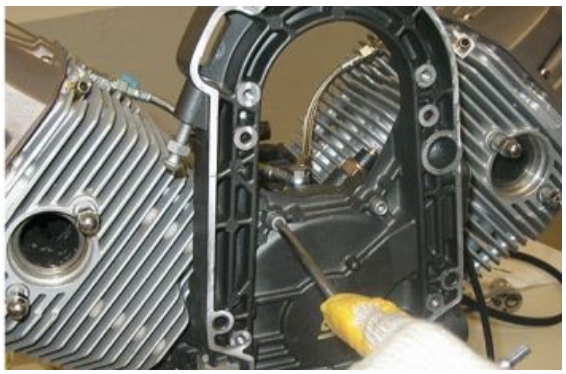
- Using a compressed air gun, unscrew and remove the nut and collect the spacer.
- Remove the lower pulley.

- Undo and remove the eight screws.



- Undo and remove the two screws.

- Undo and remove the two screws.



- Remove the alternator frame.
- Remove the sealing ring if necessary.

See also

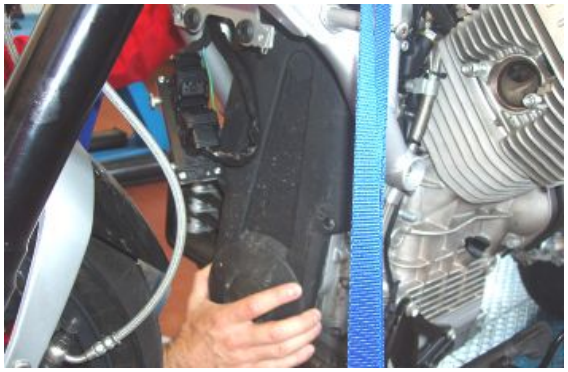
Fuel tank

Tensioning the belt

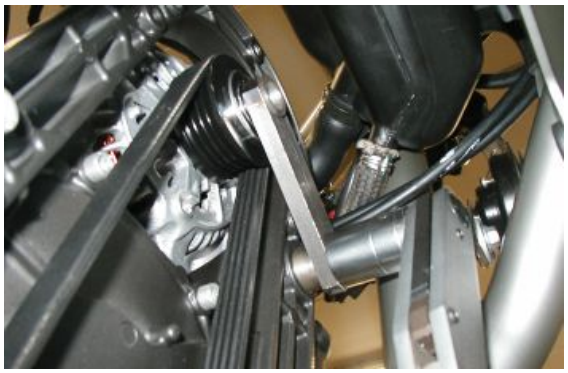
- Remove both fuel tank side fairings.
- Remove the right exhaust manifold.
- Remove the control unit.
- Undo and remove the fixing screw of the engine oil scavenge reservoir.

- Unscrew and remove the spacer.

- Undo and remove the five fixing screws of the timing system cover.
- Remove the timing system cover.
- Loosen the set screw lock nut.



- Utilizzando l'attrezzo di tensionamento della cinghia, tensionare la cinghia alla coppia prestabilita.
- Avvitare il registro.
- Serrare il controdado.



Specific tooling

020677Y Tenditore cinghia alternatore

Installing the generator

- If the sealing ring has been previously removed, replace it using the punch of the timing system cover sealing ring.

Specific tooling

05.92.72.30 Timing system cover sealing ring punch

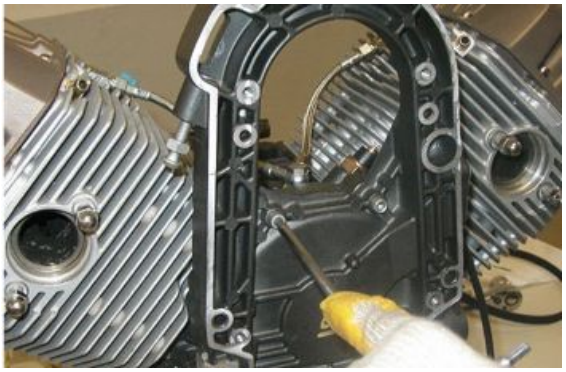
- Place the bolt and the pin in the generator cover.

- Replace the gasket and place the alternator frame using the front cover insertion cone.
- Remove the insertion cone afterwards.

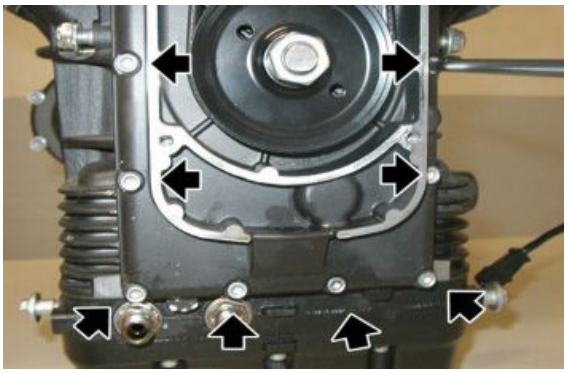
Specific tooling

05.91.17.30 Front cover insertion cone

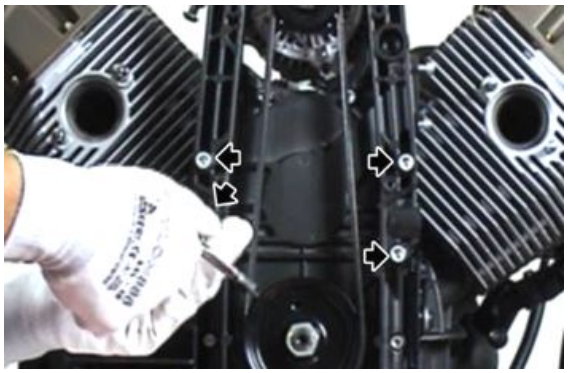
- Tighten the two screws.



- Tighten the eight lower screws.
- Operating diagonally and in stages, tighten the ten fixing screws on the alternator fitting.



- Tighten the four screws, operating diagonally and in stages.

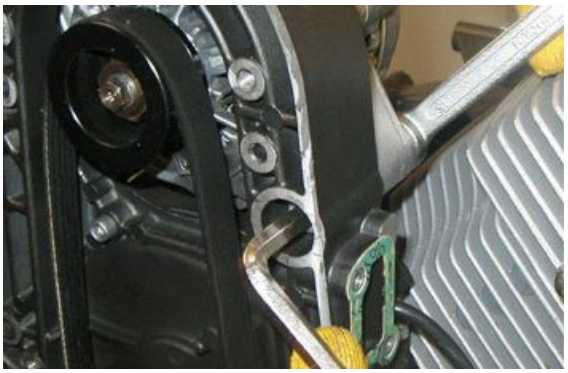


- Position the lower pulley and the spacer.
- Tighten the nut to the prescribed torque.

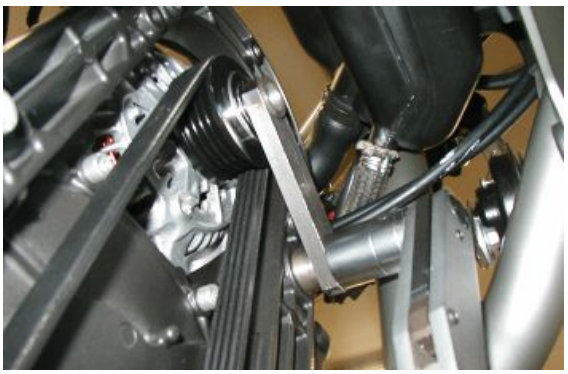
- Position the alternator and the timing system belt.

- Position the screw and pre-tighten it.

- Position the screw and tighten the nut.



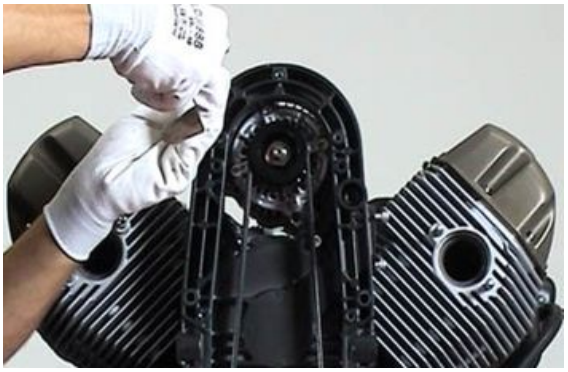
- Utilizzando l'attrezzo di tensionamento della cinghia, tensionare la cinghia alla coppia prestabilita e avvitare il registro.
- Rimuovere l'attrezzo di tensionamento della cinghia.
- Bloccare il registro in posizione serrando il controdado.



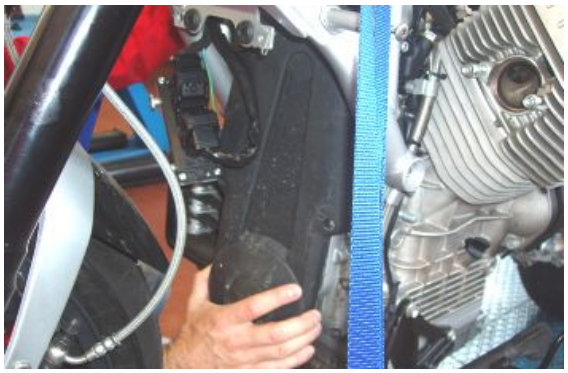
Specific tooling

020677Y Tenditore cinghia alternatore

- Tighten the alternator fixing screws.



- Position the timing system cover.
- Tighten the five screws, operating in oblique direction and in stages.



Starter motor

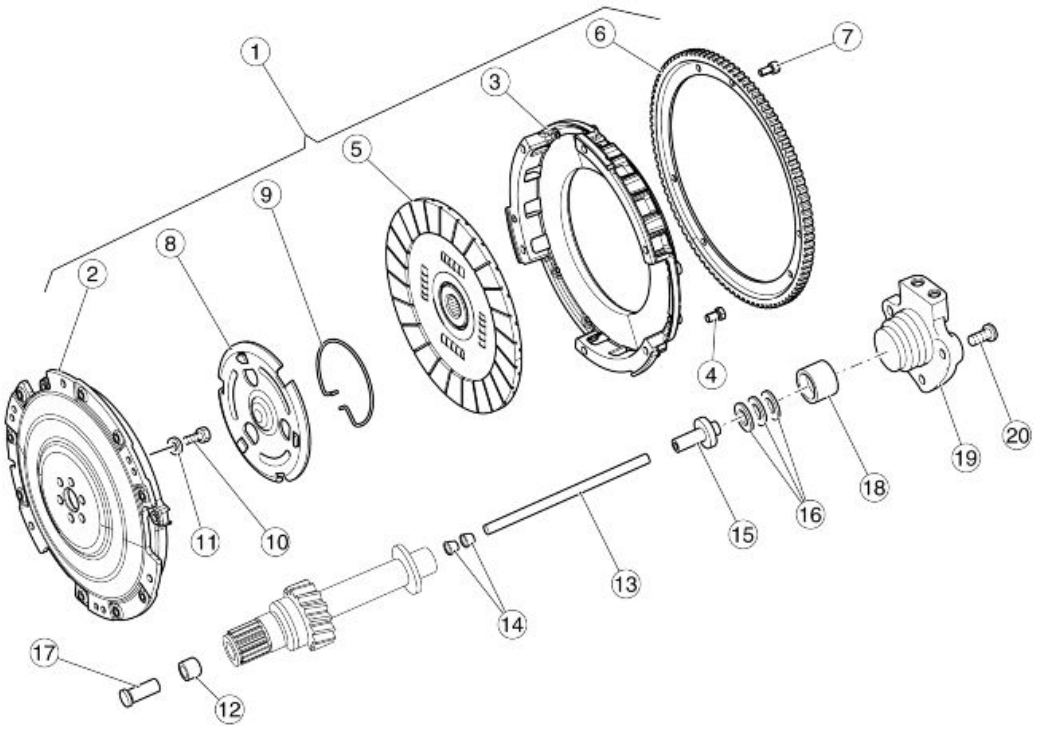
Removing the starter motor

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

- Slide off the starter motor.

Clutch side

Disassembling the clutch



Key:

1. Complete clutch
2. Clutch
3. Clutch bell
4. TCEI screw
5. Clutch disc
6. Crown
7. TCEI screw
8. Clutch pressure plate
9. Ring
10. TE flanged screw
11. Conical washer
12. Bushing
13. Rod
14. Bushing
15. Intermediate body
16. Thrust bearing
17. Clutch control bowl

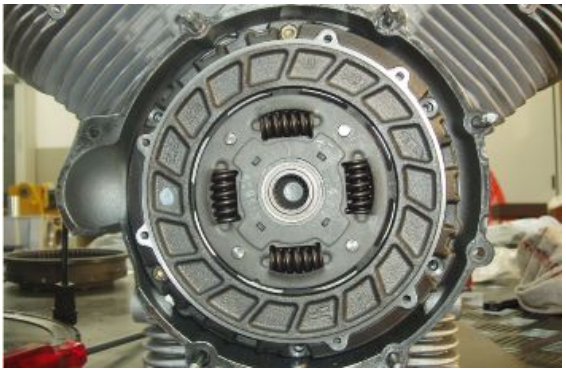
18.Thrust cylinder

19.Clutch control cylinder

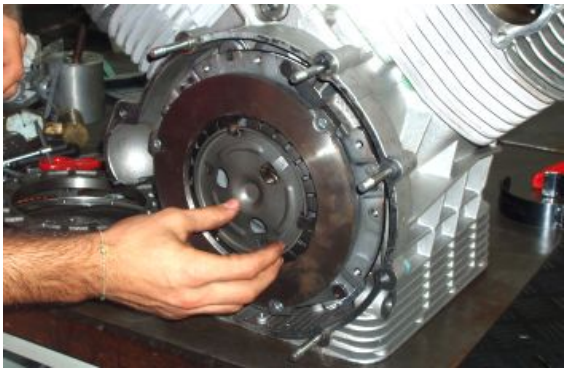
20.TE flanged screw

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

- Remove the clutch bell and the friction disc.



- Remove the Seeger ring.
- Remove the clutch pressure plate.



- Undo and remove the six screws and collect the belleville springs.
- Remove the clutch disc.

See also

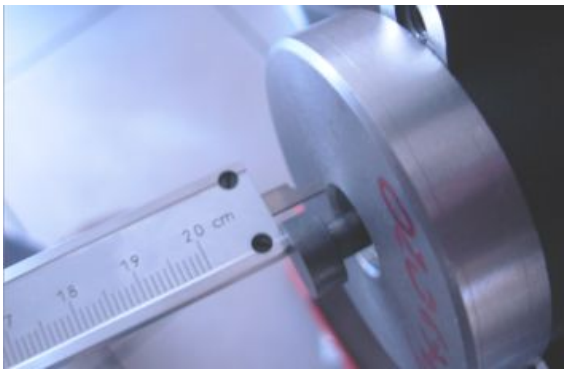
Removing the gearbox

Checking the clutch actuator

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

- Fit the new clutch on the crankshaft.
- Fit the clutch control bowl in the gear-box.

- Fit the gearbox on the engine block.
- Fit the tool in the gearbox to determine the clutch control rod length.
- According to the value found, select the correct rod based on the following table:



Specific tooling

020678Y Attrezzo verifica asta frizione

CLUTCH CONTROL ROD SELECTION

Specification	Desc./Quantity
Clutch control rod (code 976593)	183 mm (7.205 in)
Clutch control rod (code 976594)	184.5 mm (7.264 in)
Clutch control rod (code 976595)	186 mm (7.323 in)
Clutch control rod (code 976596)	187.5 mm (7.382 in)

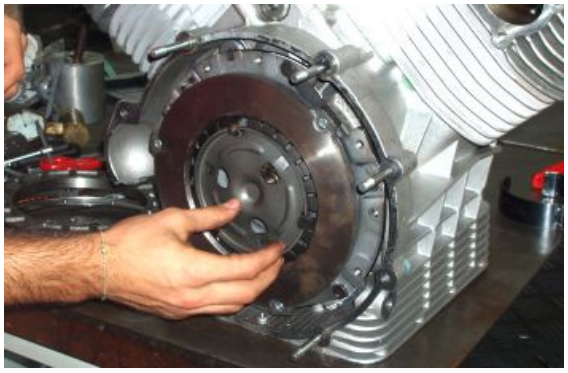
Assembling the clutch

- Lock crankshaft rotation with the crankpin facing upwards.
- Place the clutch disc with the reference facing upwards.
- Fasten the clutch disc on the crankshaft with the six screws, Loctite 243 and the belleville springs.

- Place the clutch pressure plate.

Specific tooling

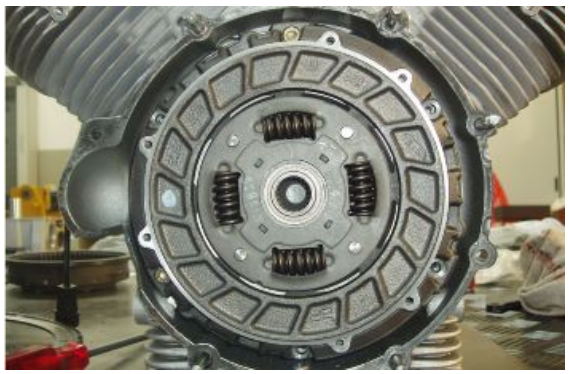
020672Y Centra e spingi molla frizione



- Lock the plate with a snap ring.
- Centre the plate.

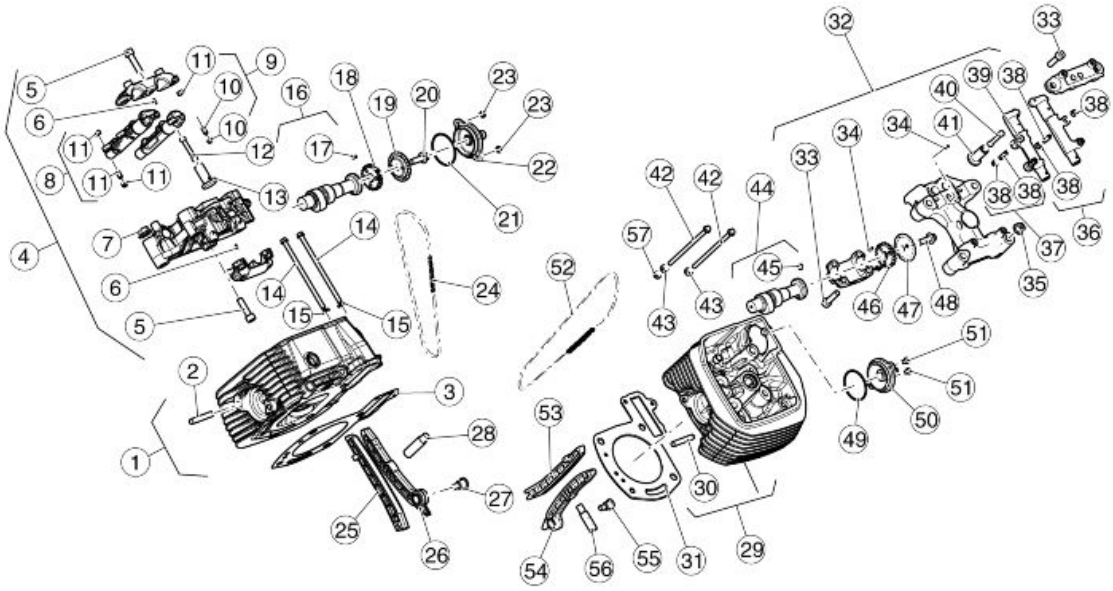
- Place the friction disc; centre it.

- Place the clutch bell with the reference facing upwards.



- Place the start-up crown gear with the reference facing upwards.
- Tighten the six screws to the prescribed torque operating diagonally and in stages.

Head and timing



Key:

1. Right cylinder head
2. Stud bolt
3. Cylinder head gasket
4. Right rocking lever support
5. Screw
6. Pin
7. Nut
8. Right exhaust, left intake rocking lever
9. Left exhaust, right intake rocking lever
10. Set screw
11. Nut
12. Rocking lever rod
13. Tappet bowl
14. Flanged screw
15. Spacer
16. Camshaft
17. Pin
18. Timing system gear
19. Breather plate

20. TE flanged screw
21. O-ring
22. Complete breather cover
23. TBEI screw
24. Timing system chain
25. Chain guide slider
26. Chain tensioner pad
27. Chain tensioner screw
28. Right chain tensioner
29. Left cylinder head
30. Stud bolt
31. Cylinder head gasket
32. Left rocking lever support
33. Screw
34. Pin
35. Nut
36. Right exhaust, left intake rocking lever
37. Left exhaust, right intake rocking lever
38. Set screw
39. Nut
40. Rocking lever rod
41. Tappet bowl
42. Flanged screw
43. Spacer
44. Camshaft
45. Pin
46. Timing system gear
47. Breather plate
48. TE flanged screw
49. O-ring
50. Complete breather cover
51. TBEI screw
52. Timing system chain
53. Chain guide slider
54. Chain tensioner pad
55. Chain tensioner screw
56. Left chain tensioner
57. Spacer

Removing the head cover

NOTE

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

- Disconnect the spark plug tube.

- Undo and remove the four head cover fixing screws and collect the sealing O-rings.
- Remove the head cover together with the gasket.

Removing the cylinder head

CAUTION

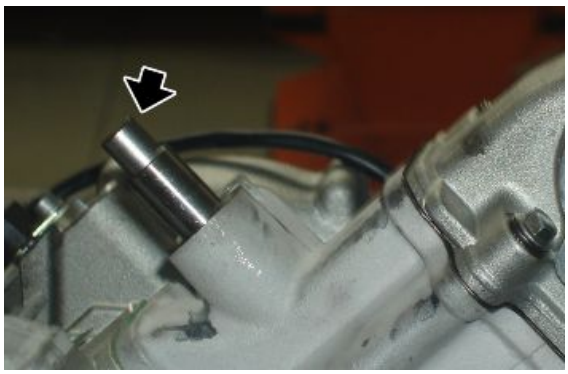
WHEN REMOVING THE COMPONENTS, MARK THE POSITION OF EACH PART VERY CAREFULLY IN ORDER TO PLACE THEM IN THEIR ORIGINAL POSITION UPON FITTING.

- Remove the head cover.
- Undo and remove the two screws
- Remove the cap.

- Undo and remove the screw.
- Remove the timing system upper gear bulkhead.

For the right head:

- Unscrew and remove the chain tensioner cap.
- Remove the right chain tensioner.

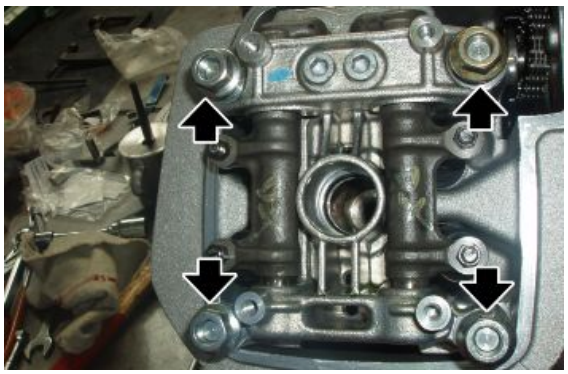


For the left head:

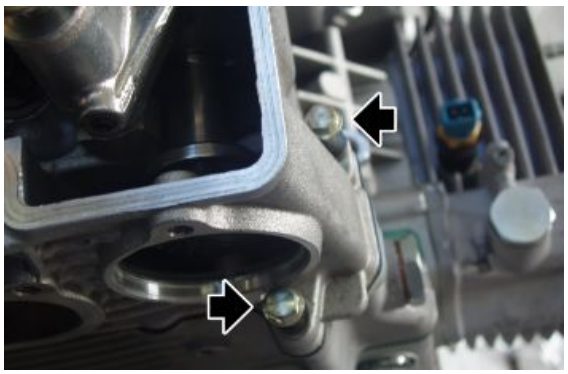
- Undo and remove the screw and the washer.
- Relief oil pressure from the left chain tensioner.

- Slide off the timing system gear from the chain to remove it from the camshaft.

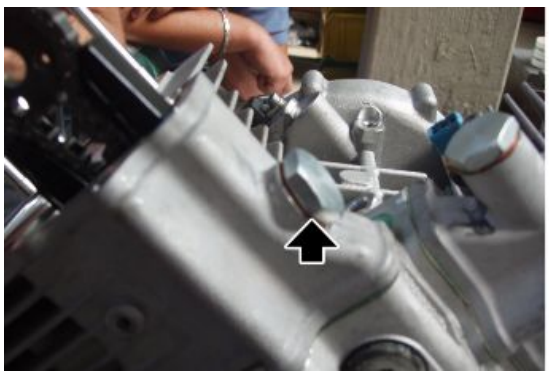
- Unscrew and remove the four nuts on the stud bolts.
- Remove the complete cam cap.



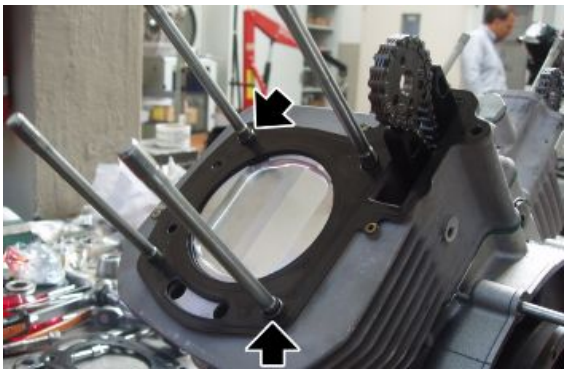
- Undo and remove the two screws.
- Remove the head.



- Fit the timing system upper gear back to the chain.
- Fit the chain tensioner cap temporarily and keep the chain taut on the service shaft.



- Collect the two head dowel pins.
- Collect the gasket between the head and the cylinder.



See also

Removing the head cover

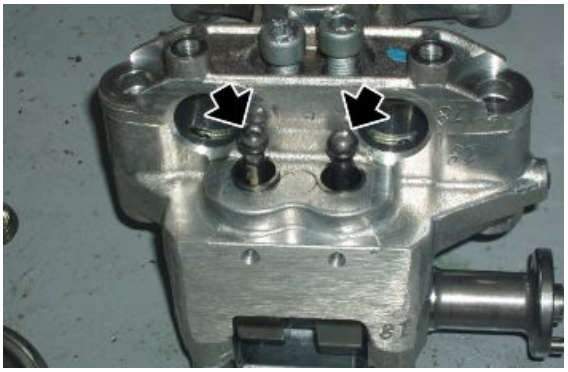
Cylinder head

Removing the overhead camshaft

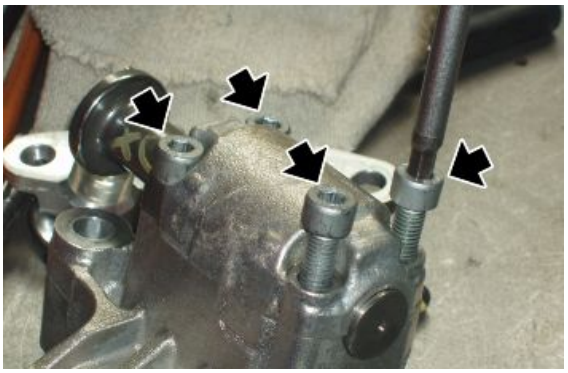
CAUTION

WHEN REMOVING THE COMPONENTS, MARK THE POSITION OF EACH PART VERY CAREFULLY IN ORDER TO PLACE THEM IN THEIR ORIGINAL POSITION UPON FITTING.

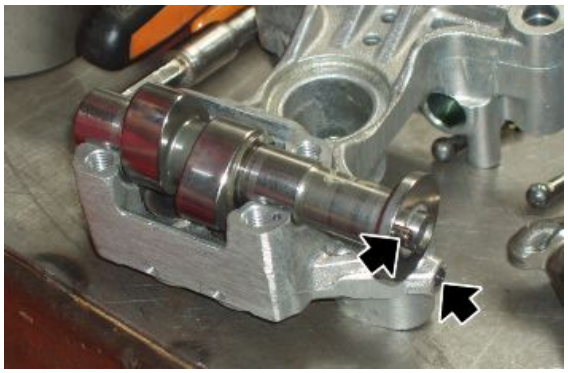
- Remove the two rocking levers from the cam cap.
- Remove the two rods.



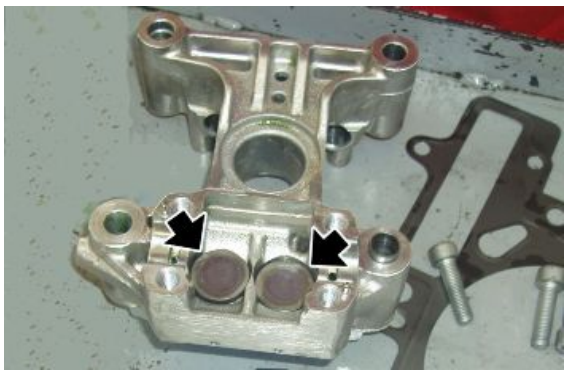
- Undo and remove the four screws.
- Remove the U-bolt.



- Remove the camshaft.



- Remove the bowls from the cam cap, and mark their position so as not inter-change them when refitting.



See also

Removing the rocker arms

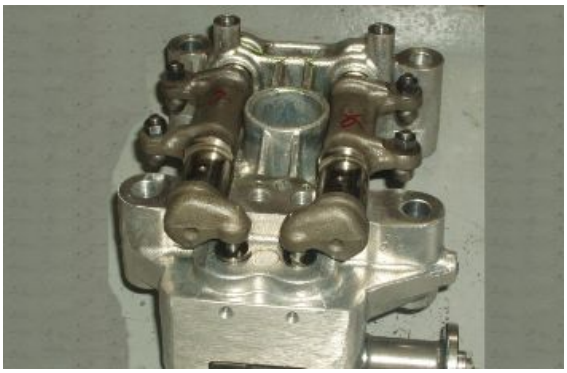
Removing the rocker arms

CAUTION

WHEN REMOVING THE COMPONENTS, MARK THE POSITION OF EACH PART VERY CARE-FULLY IN ORDER TO PLACE THEM IN THEIR ORIGINAL POSITION UPON FITTING.

- Remove the cam cap from the stud bolts.
- Undo and remove the two screws.
- Remove the U-bolt.

- Remove the two rocking levers from the cam cap.



See also

Removing the cylinder head

Removing the valves

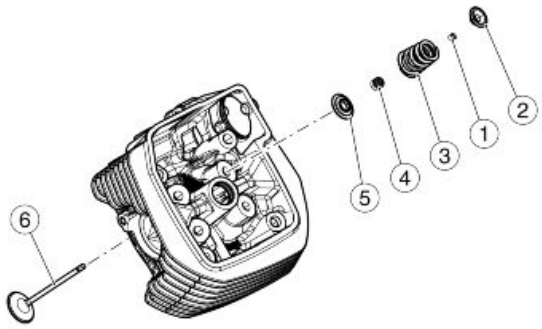
- Rimuovere la testa.
- Posizionare l'attrezzo speciale sul piattello superiore e al centro del fungo della valvola che si vuole rimuovere.

Specific tooling

10.90.72.00 Tool for valve removal and refitting

AP9100838 Tool for valve pressure plate

- Tighten the tool screw until fitted, and then hit the tool head (where the upper cap works) with a mallet so that the two cotters (1) get detached from the upper cap (2).
- Once the two cotters (1) are detached, screw these cotters until they can be slid off the valve seats; unscrew the tool and remove it from the head.
- Slide off the upper cap (2).
- Remove the spring (3).
- Remove the lower cap (5) and the valve guide oil seal (4), if necessary.
- Remove the valve (6) from inside the head.



Checking the valve guides

Use a punch to extract the valve guides from the heads.

The valve guides should be replaced only if the clearance between them and the stem cannot be eliminated by simply replacing the valves.

To refit the valve guides on the head, follow this procedure:

- Heat the head in an oven at about 60°C (140°F).
- Lubricate the valve guide.
- Fit the circlips.
- Press the valve guide with a punch.
- Use a reamer to bore the holes the valve stems slide through so that the inside diameter is at the prescribed value. The interference between the seat on the head and the valve guide must be 0.046 - 0.075 mm (0.0018 - 0.0030 in)

VALVE GUIDE COUPLING - VALVES (INLET)

Specification	Desc./Quantity
Valve guide inside diameter	5.0 ÷ 5.012 mm (0.19685 ÷ 0.19732 in)
Valve stem diameter	4.972 ÷ 4.987 mm (0.19574 ÷ 0.19633 in)
Fitting clearance	0.013 ÷ 0.040 mm (0.00051 ÷ 0.00157 in)

VALVE GUIDE COUPLING - VALVES (OUTLET)

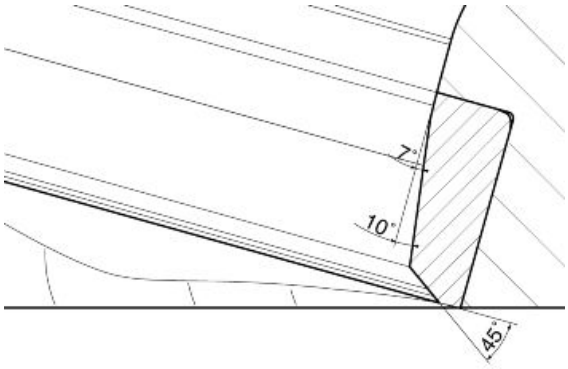
Specification	Desc./Quantity
Valve guide inside diameter	5.0 ÷ 5.012 mm (0.19685 ÷ 0.19732 in)
Valve stem diameter	4.960 ÷ 4.975 mm (0.19527 ÷ 0.19587 in)
Fitting clearance	0.025 ÷ 0.052 mm (0.00098 ÷ 0.00205 in)

Checking the cylinder head

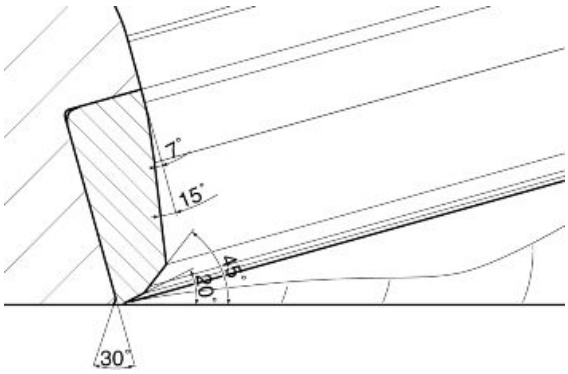
Check that:

- the faying surfaces with the cover and the cylinder are not scored or damaged, jeopardising a perfect sealing.
- Check that the tolerance between the valve guide holes and the valve stems is within the prescribed limits.
- Check the valve seats are in good conditions.

INLET VALVE SEAT DETAIL DRAWING



OUTLET VALVE SEAT DETAIL DRAWING



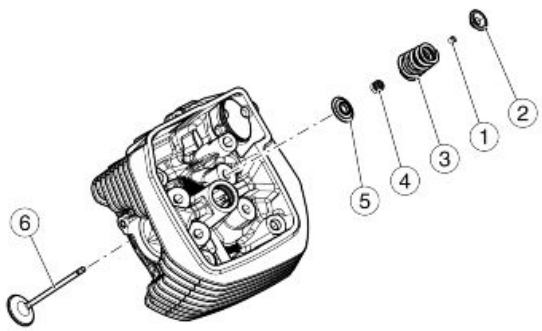
- If the width of the mark on the valve seat is larger than the prescribed limits, true the seats with a 45° mill and then grind.
- Replace the head in case of excessive wear or damage.

Installing the valves

NOTE

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

- Place the valve guide oil seal (4) in the head.
- Place the lower cap (5).
- Place the valve (6) inside the head.
- Place the spring (3).
- Fit the upper cap (2).
- Place the two cotters (1) on the seats in the valves.
- By compressing the spring (3) with the special tool, fit the valve cotters.



Specific tooling

10.90.72.00 Tool for valve removal and refitting

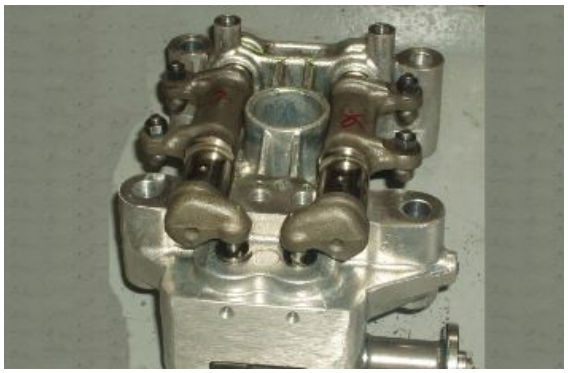
AP9100838 Tool for valve pressure plate

- Remove the special tool

Installing the rocker arms

- Fit the camshaft.
- Fit the two rods.

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



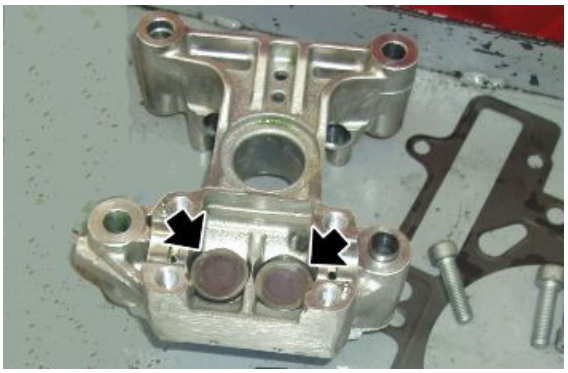
- Place the U-bolt on the rocking levers making sure the two reference pins match the seats on the cam cap.
- Tighten the two screws operating diagonally and in stages.

See also

Installing the overhead camshaft

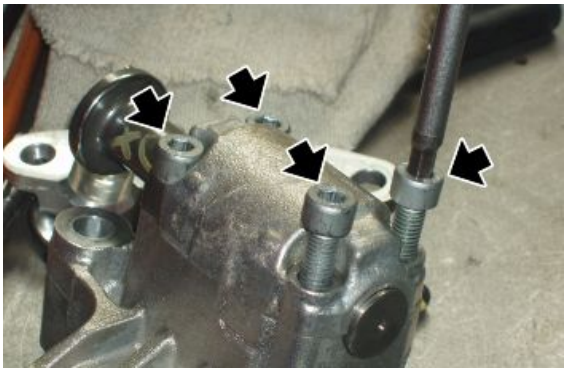
Installing the overhead camshaft

- Place the bowls in the cam cap, if those previously removed are refitted be careful not to interchange them.



- Place the camshaft with the gear seat on the dowel side.

- Place the U-bolt on the camshaft making sure the two reference pins match the seats on the cam cap.
- Tighten the four screws operating diagonally and in stages.



Timing

Removing the phonic wheel

- Remove the generator and the timing system cover.
- Unscrew and remove the nut and collect the washer.
- Remove the timing system gear on the service shaft.

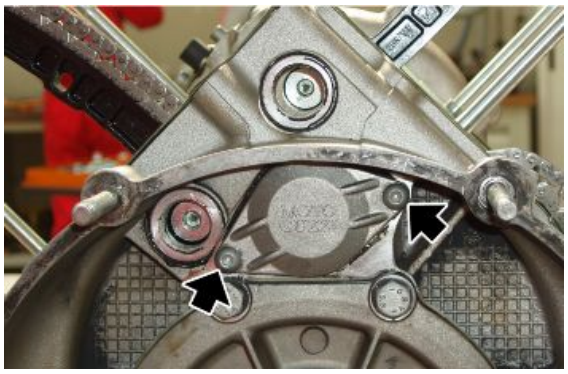
- Remove the timing sensor and any shim washers.
- Remove the tone wheel.
- Remove the cotter and shim washer from the service shaft.

See also

Removing the generator

Removing the service shaft

- Remove the tone wheel.
- Remove both cylinders.
- Undo and remove the two screws.
- Remove the service shaft closing cap.



- Mark the timing chains so as not to invert the direction of rotation upon fitting.
- Slide off the service shaft from the chains.
- Remove both chains.

See also

Removing the phonic wheel

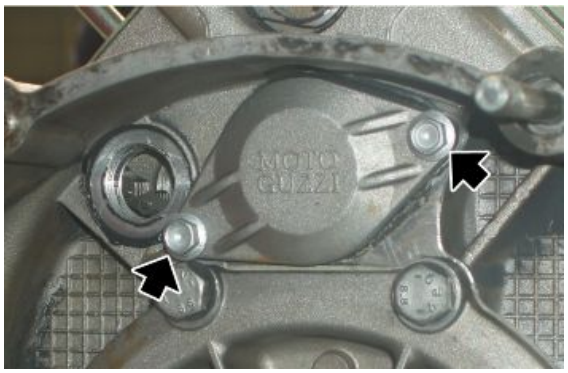
Installing the service shaft

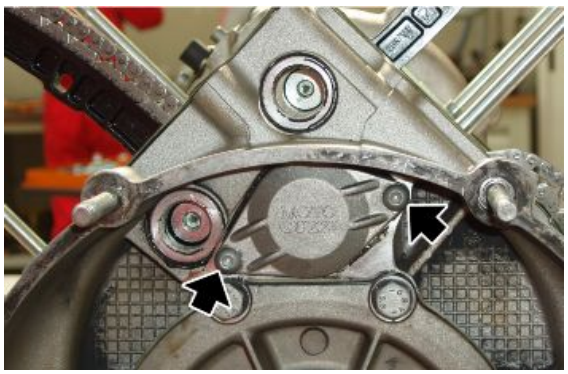
- Place the service shaft bearing (if previously removed) on the crankcase.
- Fix it to the seat with the lock washer and screw.

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

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

- Partially fit the service shaft closing cap.
- To screw the cap until it stops, use two M6 flanged screws larger than the original screws.
- Tighten the two M6 flanged screws operating in stages until the cap stops against the crankcase.
- Undo and remove the two M6 flanged screws.
- Tighten the cap with the two original TBEI screws.

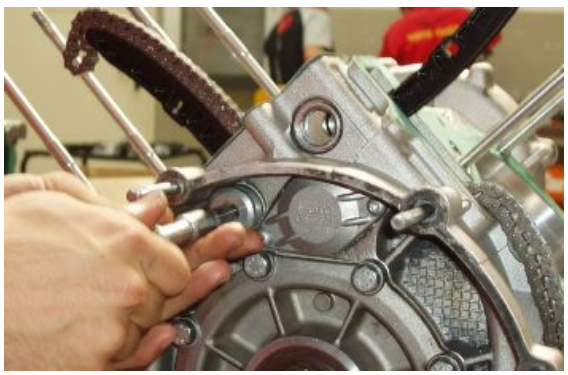




Installing sliders

- Fit the crankshaft and the service shaft on the crankcase.
- Fit the fixed chain sliders and tighten the fixing screws.

- Tighten the chain caps with O-rings.
- The operations related to the movable chain sliders are described in the cylinder fitting section.



See also

Installing the crankshaft
Installing the service shaft

Cam timing

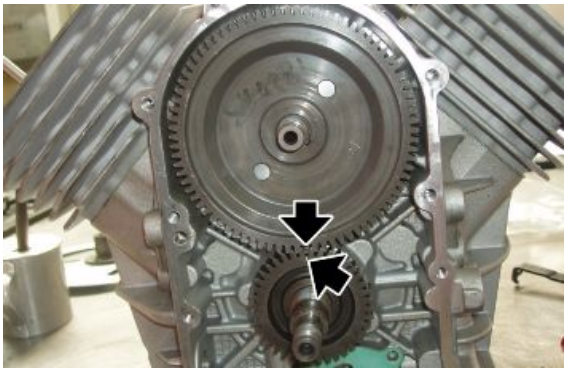
- Fit the crankshaft and the service shaft on the crankcase.
- Fit the cylinders.
- Turn the crankshaft until the left cylinder piston reaches the top dead centre (TDC).
- Fit the cotter and the shim washer on the service shaft.
- Fit the tone wheel with the chamfered side facing the crankcase on the service shaft.

- Lock crankshaft rotation.
- Unscrew and remove the nut fixing the crankshaft gear.
- Remove the oil pump control gear.

Specific tooling

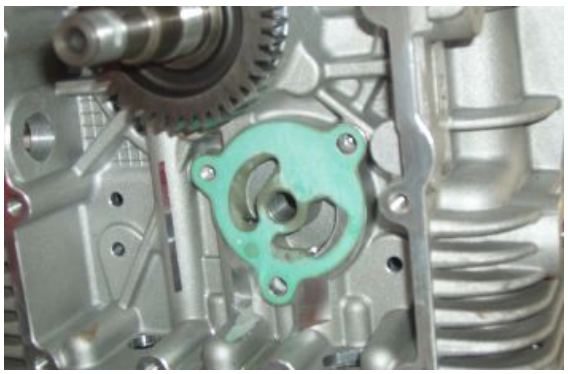
12.91.18.01 Tool to lock flywheel and start-up crown gear

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

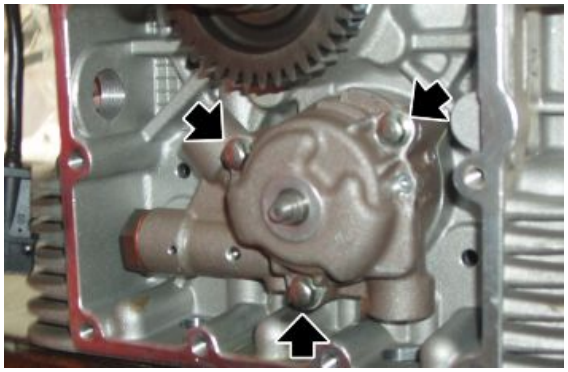


- After shimming the timing sensor properly, proceed to fit it.
- Fit the washer and tighten the timing system gear fixing nut of the service shaft.

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



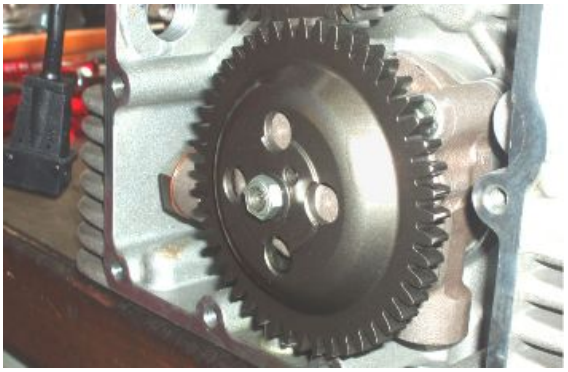
- Place the oil pump.
- Tighten the three screws fixing the oil pump.



- Place the driving pin on the oil pump shaft.

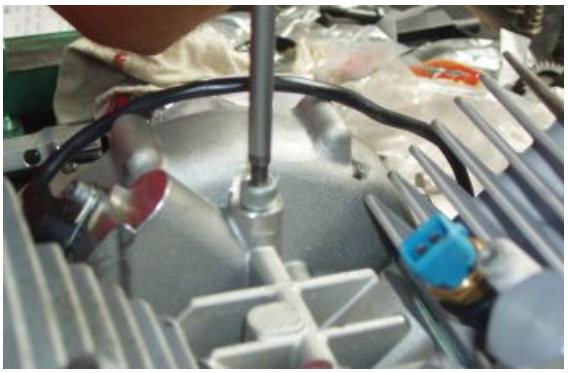
- Place the gear on the oil pump shaft.

- Place the washer on the oil pump shaft.
- Tighten the nut to the specified torque.



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

- Tighten the screw with the washer to the prescribed torque.

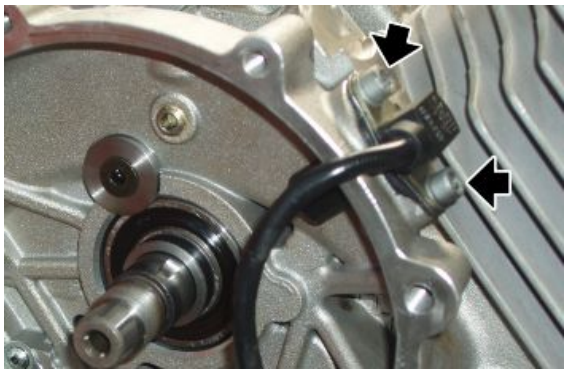


See also

Installing the crankshaft
Installing the service shaft
Measuring air gap

Measuring air gap

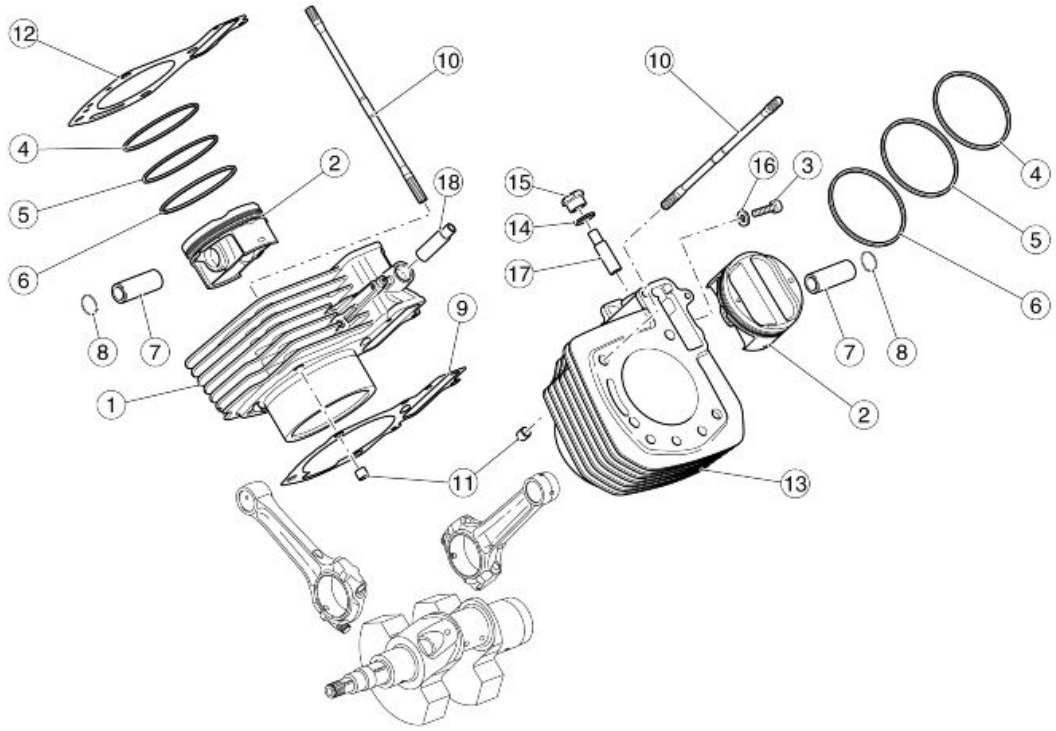
- Undo and remove the two screws and remove the sensor.



- Insert a suitable plain washer on the sensor and note its thickness.

- Place the sensor on the crankcase and move it until it makes contact with the tone wheel.
- Measure the clearance between the fixing plate and the crankcase with a thickness gauge. Subtract the plain washer value from this measurement to obtain the clearance between the sensor and the tone wheel.
- Remove the washer and fit the sensor after applying adequate sealing paste on the fixing plate, then tighten the screws to the prescribed torque.

Cylinder-piston assembly



Key:

1. Right cylinder
2. Piston
3. Screw
4. Top piston ring
5. Middle piston ring
6. Oil scraper piston ring
7. Pin
8. Snap ring
9. Cylinder base gasket
10. Stud bolt
11. Pin
12. Cylinder head gasket
13. Left cylinder
14. Washer
15. Chain tensioner cap
16. Washer
17. Left chain tensioner
18. Right chain tensioner

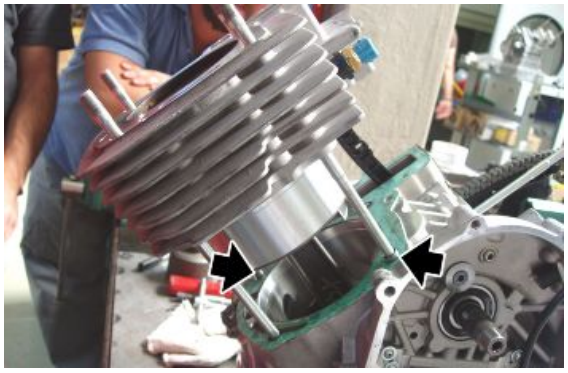
Removing the cylinder

NOTE

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

- Remove the head, the gasket between the head and the cylinder and the two dowel pins.
- Slide off the movable chain slider.
- Remove the cylinder from the stud bolts.

- Remove the two dowel pins on the stud bolts.
- Remove the two gaskets between the crankcase and the cylinder.
- Cover the crankcase opening with a clean cloth.



See also

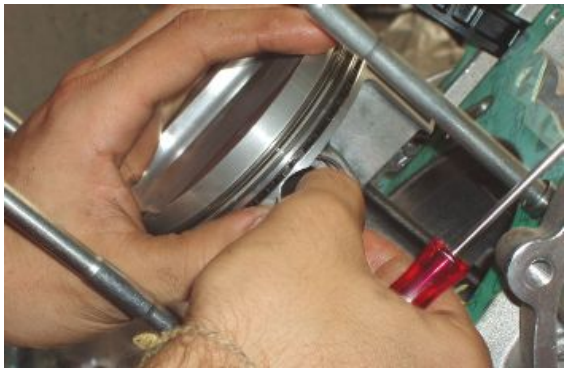
Removing the cylinder head

Disassembling the piston

NOTE

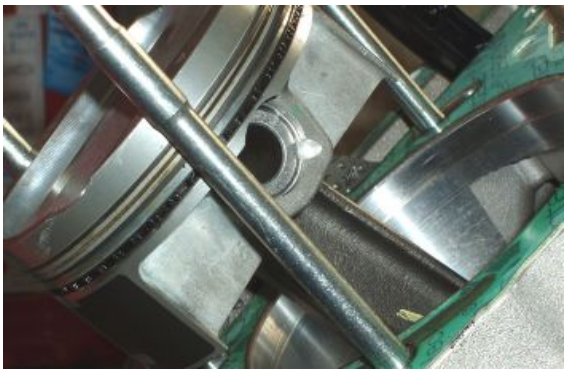
THE OPERATIONS DESCRIBED BELOW REFER TO REMOVING ONLY ONE HEAD BUT APPLY TO BOTH HEADS.

- Remove the cylinder.
- Cover the crankcase opening with a clean cloth.
- Disengage the pin clip.



- Remove the pin.

- Mark the piston crown on the outlet side to remember its position when re-fitting.
- Remove the piston.



Fitting the piston

NOTE

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

- The reference on the piston ring must be facing the piston crown.
- Fit the piston rings on the piston: - the oil scraper in the lower slot; - the thicker smooth ring in the intermediate slot; - the less thick smooth ring in the upper slot.
- The piston rings must be offset at 120° one from the other.
- Fit one of the two pin snap rings on the piston.
- Lock crankshaft rotation.

Specific tooling

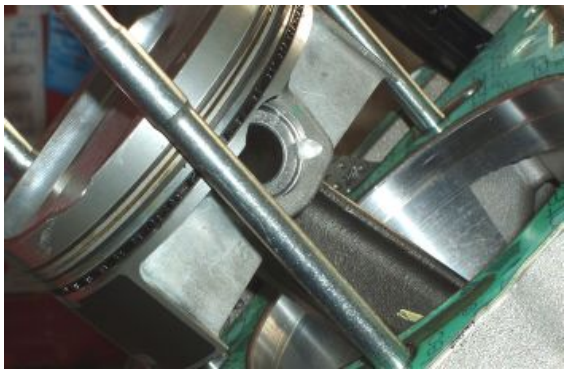
12.91.18.01 Tool to lock flywheel and start-up crown gear

- Fit the piston.

NOTE

CHECK THE PISTON DIRECTION ACCORDING TO THE REFERENCES MARKED ON THE PISTON CROWN. DO NOT ASSEMBLE PISTONS AND CYLINDERS OF DIFFERENT SELECTOR TYPES.

- Insert the pin.



- Inserire il fermo dello spinotto.

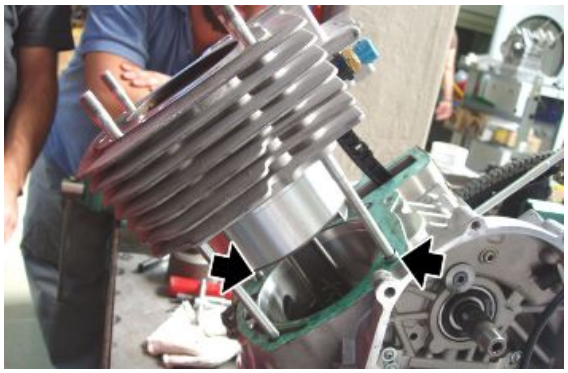
Specific tooling

020470Y Pin snap ring fitting tool

Installing the cylinder

RIGHT CYLINDER

- Fit the piston.
- Remove the cloth used to prevent foreign bodies from getting into the crankcase.
- Turn the rings so that the coupling ends are 120 degrees from each other.
- Place a new metal gasket between the crankcase and the cylinder. Place the two dowel pins on the stud bolts. Lubricate the piston and the cylinder. Lock connecting rod motion with the fork tool. Using the suitable piston ring clamp tool, place the cylinder and fit the chain in the timing system plate.



CAUTION

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

Specific tooling

020674Y Stringifasce

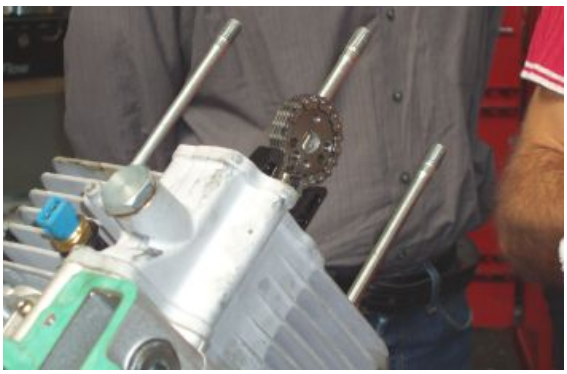
020716Y Connecting rod locking

- Rimuovere l'attrezzo stringifasce e completare il posizionamento del cilindro.

Specific tooling

020674Y Stringifasce

- Fit the movable chain slider.
- Fit the upper gear.
- Fit the chain tensioner and the chain tensioner cap temporarily and keep the chain taut on the service shaft.



LEFT CYLINDER

- Fit the piston.
- Remove the cloth used to prevent foreign bodies from getting into the crankcase.
- Turn the rings so that the coupling ends are 120 degrees from each other.
- Place a new metal gasket between the crankcase and the cylinder.
- Place the two dowel pins on the stud bolts.
- Undo the screw which will be used to time the upper gear.

- Check that the oil in the left cylinder chain tensioner has been drained off by compressing it. If the operation is difficult, use a pin drive to push the central hole so that the oil is drained off from the circuit.

- Fit the chain tensioner in the cylinder.
- Lubricate the piston and the cylinder.
- Lock connecting rod motion with the fork tool.
- Using the suitable piston ring clamp tool, place the cylinder and fit the chain in the timing system plate.

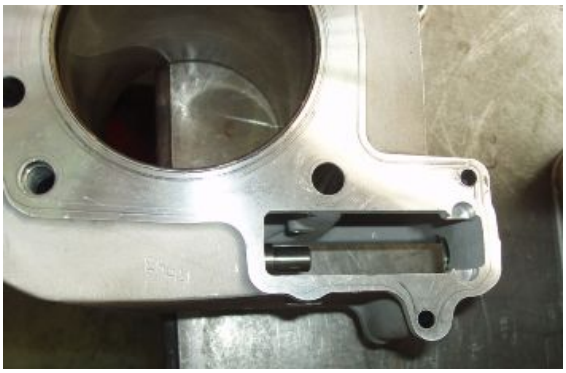
CAUTION

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

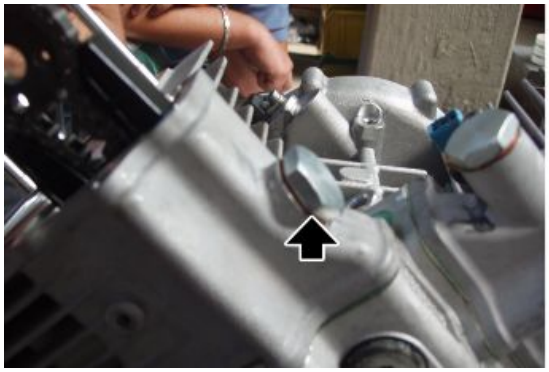
Specific tooling

020674Y Stringifasce

020716Y Connecting rod locking

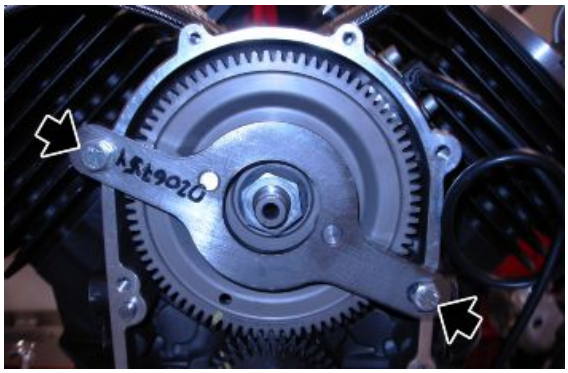


- Fit the movable chain slider.
- Fit the upper gear.
- Fit the chain tensioner cap temporarily and keep the chain taut on the service shaft.

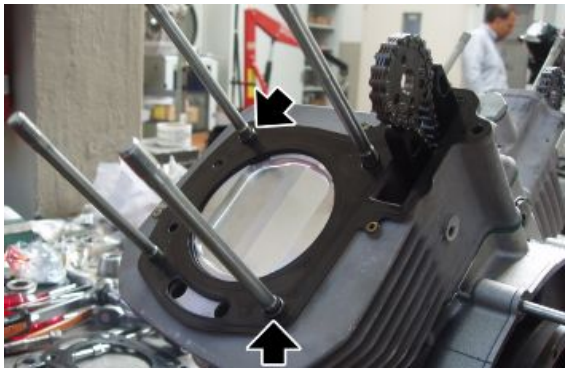


Installing the cylinder head

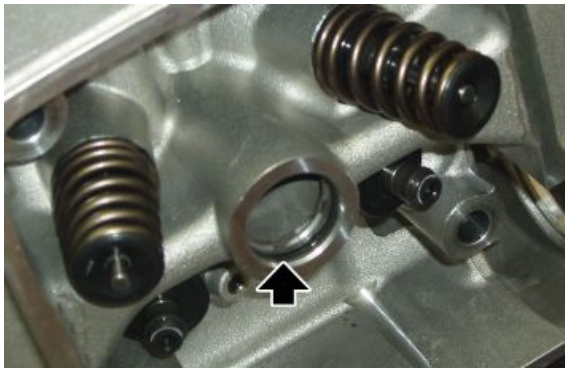
- Fit the valves in the head, if previously removed.
- Take the left cylinder piston to TDC and lock crankshaft rotation.
- Determine the thickness of the gasket to be fitted between the head and the cylinder as described in the section: Shimming system.



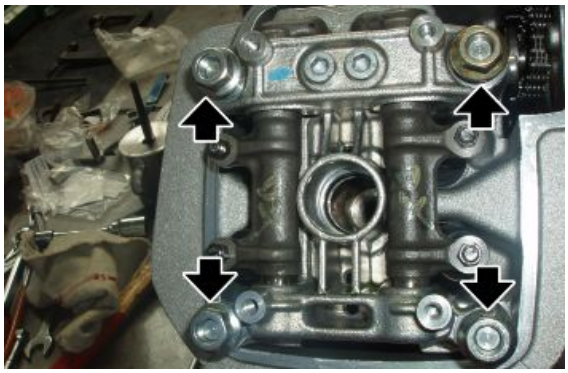
- Place the two dowel pins.
- Fit the gasket with the correct thickness between the head and the cylinder.
- Fit the left cylinder head.



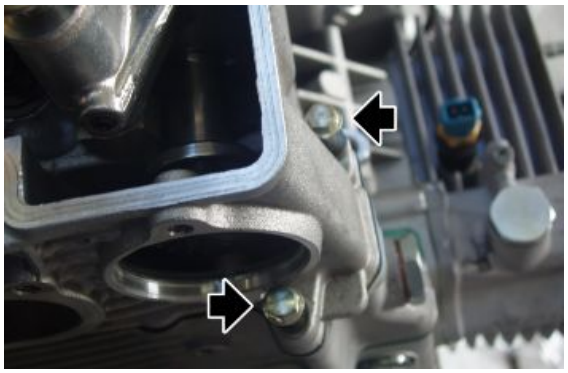
- Fit a new O-ring in the spark plug hole.
- Fit the complete cam cap.



- Fix the cam cap with the four nuts on the stud bolts.



- Fix the head with the two screws.
- Tighten nuts and screws to the prescribed torque operating diagonally and in stages.
- Loosen the valve set screws.



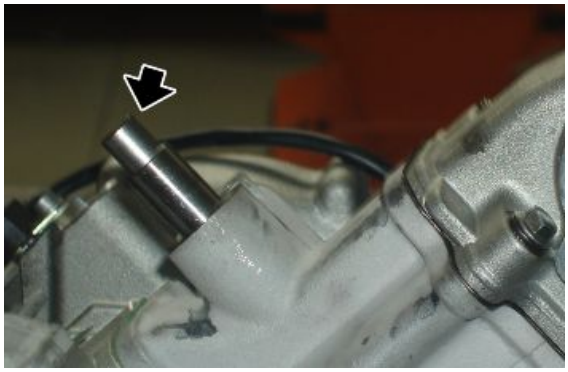
- Using a thin screwdriver relief oil pressure from the left cylinder chain tensioner.

- Screw two screws in the threaded holes of the timing system upper gear.
- Place the gear in the chain.
- On the left camshaft pin, fit the hole marked with the letter "L" of the timing system gear.

- Block the left chain tensioner hole with screw and washer.
- Rotate the crankshaft by 90°so that the right cylinder piston reaches the TDC; lock crankshaft rotation.
- Also determine the thickness of the gasket for the right cylinder, to be fitted between the head and the cylinder as described in the section: Shimming system.
- Place the two dowel pins.

- Fit the gasket with the correct thickness between the head and the cylinder.
- Fit the right cylinder head.

- Unscrew and remove the right chain tensioner cap.



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

- Screw the cap of the right chain tensioner.
- Undo and remove the screws used to place the gear on the camshaft.
- Place the bulkhead and align the holes with the timing system gear.
- Fix the bulkhead on the timing system gear using a screw with Loctite on the thread.
- Tighten the screw to the prescribed torque.
- Also place the bulkhead of the other head.

- Place the cap.
- Tighten the two screws to the prescribed torque.
- Also place the cap of the other head.
- Adjust valve clearance.

See also

Checking the valve clearance

Installing the head cover

- Replace the gasket and install the head cover.

- Place the plastic half-cover.
- Replace the four rubber rings.
- Tighten the four screws to the prescribed torque.

- Place the spark plug tube.

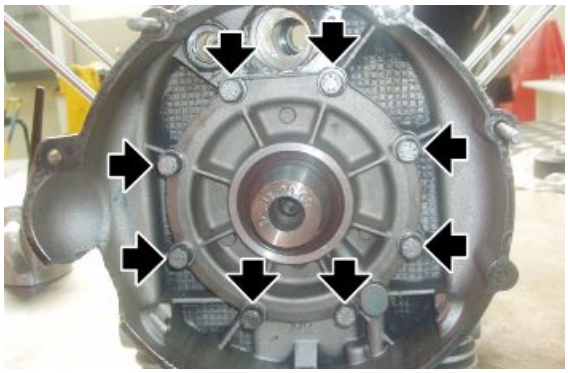
Crankcase - crankshaft

Removing the crankshaft

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

- Remove the connecting rods.

- Undo and remove the eight fixing screws and collect the washers.

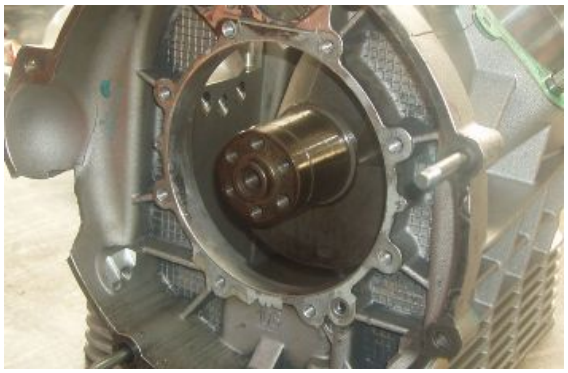


- Hold the crankshaft during flange removal.
- Using the suitable special tool, remove the crankshaft flange.
- Remove the sealing ring from the flange, if necessary.

Specific tooling

12.91.36.00 Tool to remove the flywheel-side flange

- Remove the crankshaft afterwards.



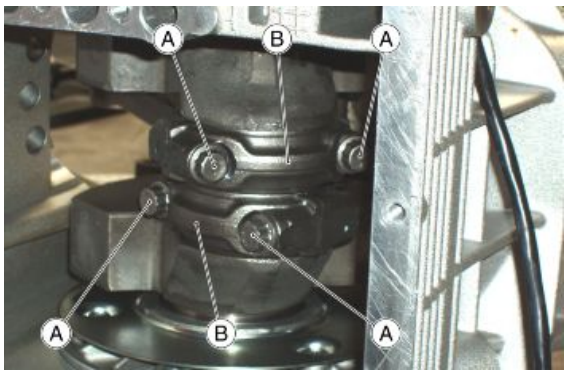
- Collect the shim washer from inside the crankcase.

See also

Disassembling the clutch
Removing the phonic wheel

Disassembling the connecting rod

- Remove both heads.
- Remove the cylinders and the pistons.
- Remove the oil sump.
- Undo the coupling screws (A) inside the crankcase and remove the connecting rods (B).



See also

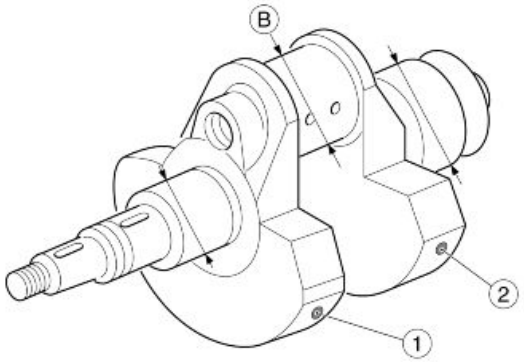
Removing the flywheel
Disassembling the piston
Removing the cylinder
Removing the cylinder head

Inspecting the crankshaft components

Check the surfaces of the main journals; if they are scored or oval-shaped, reface them (observing the undersize charts), and replace the main bushing/s.

Reference (1) indicates the position where the coloured reference is applied to select diameter (B).

Reference (2) indicates the position where the coloured reference is applied to select balancing.



CRANKSHAFT SEAT (TIMING SYSTEM SIDE)

Specification	Desc./Quantity
Diameter of crankshaft main journal, timing system side	37.975 - 37.959 mm (1.49507 - 1.49444 in)
Inside diameter of crankshaft bushing, timing system side	38.016 - 38.0 mm (1.49669 - 1.49606 in)
Clearance between bushing and main journal (timing system side)	0.025 - 0.057 mm (0.00098 - 0.00224 in)

CRANKSHAFT SEAT (CLUTCH SIDE)

Specification	Desc./Quantity
Diameter of crankshaft main journal, clutch side	53.97 - 53.961 mm (2.12480 - 2.12444 in)
Inside diameter of crankshaft bushing on clutch-side flange	54.019 - 54.0 mm (2.12673 - 2.12598 in)
Clearance between bushing and main journal (clutch side)	0.030 - 0.058 mm (0.00118 - 0.00228 in)

CRANKPIN DIAMETER (B)

Specification	Desc./Quantity
'Blue' bushing half-shell regular production	44.008 ÷ 44.014 mm (1.73259 ÷ 1.73283 in)
'Red' bushing half-shell regular production	44.014 ÷ 44.020 mm (1.73283 ÷ 1.73307 in)

BALANCING SELECTION COLOURS (2)

Specification	Desc./Quantity
Crankshaft selection colour (2) brown	Type 1 to be used with brown connecting rods. Balance with a **1558 g (54.96 oz) +/- 0.25%** weight fitted on the crankpin (B). Maximum imbalance allowed for each shoulder: **2 g (0.07 oz)**.
Crankshaft selection colour (2) green	Type 2 to be used with green connecting rods. Balance with a **1575 g (55.56 oz) +/- 0.25%** weight fitted on the crankpin (B). Maximum imbalance allowed for each shoulder: **2 g (0.07 oz)**.
Crankshaft selection colour (2) black	Type 2 to be used with black connecting rods. Balance with a **1592 g (56.16 oz) +/- 0.25%** weight fitted on the crankpin (B). Maximum imbalance allowed for each shoulder: **2 g (0.07 oz)**.

Checking the connecting rod

When examining the connecting rods, check that:

- Bushing conditions and bushings-pins clearance;
- Shaft parallelism;
- Connecting rod bearings.

These are thin shell bearings, anti-friction alloy that does not allow for any adaptation; replace them immediately if seizing or wear marks are found.

Upon replacing the bearings it may be necessary to ream the crankshaft pin.

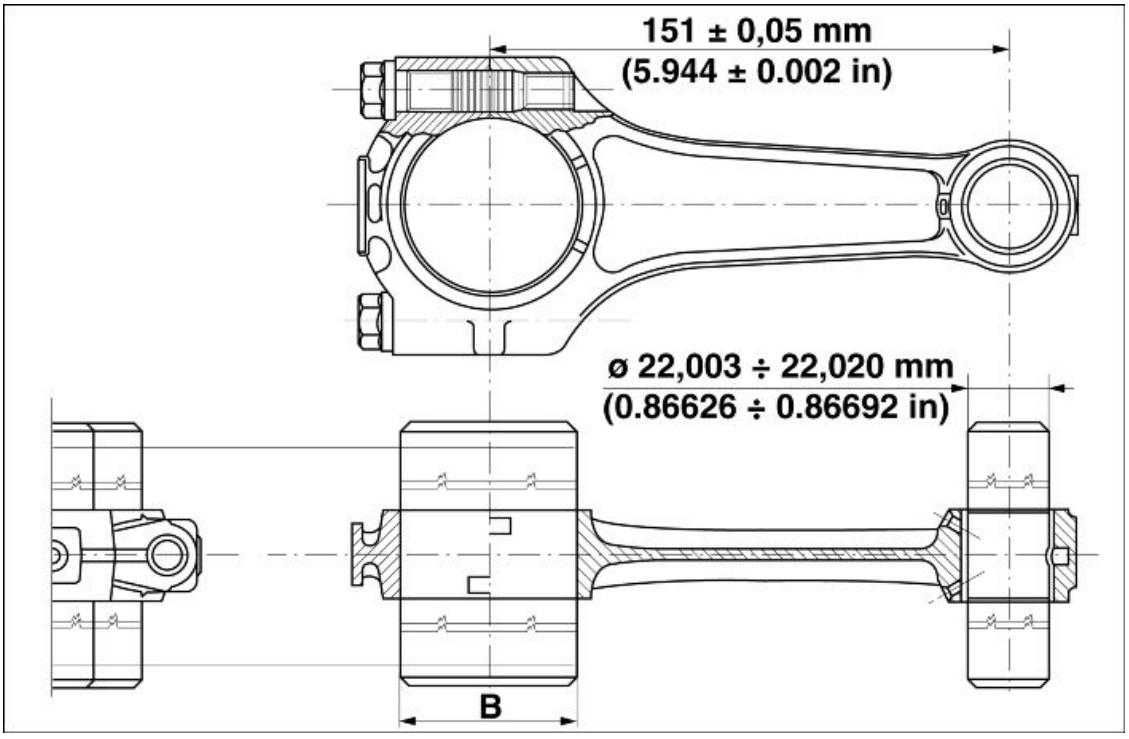
Before reaming the crankpin, measure the pin diameter (B) comparing it with the maximum wear allowed, as indicated in the figure; this defines what kind of undersizing the bearing should have and to which diameter the pin (B) should be reamed.

Checking shaft parallelism

Check shafts for squaring before fitting them.

It is therefore necessary to check that the head holes and the rod small end are parallel and on the same plane.

The maximum parallelism and plane error of the two head shafts and connecting rod small end should be +/- 0.10 mm (0.00393 inch).



CONNECTING ROD BEARING THICKNESS

Specification	Desc./Quantity
Regular 'Blue' connecting rod bearing (production)	1.539 - 1.544 mm (0.06059 - 0.06079 in)
Regular 'Red' connecting rod bearing (production)	1.535 - 1.540 mm (0.06043 - 0.06063 in)

CRANKPIN DIAMETER (B)

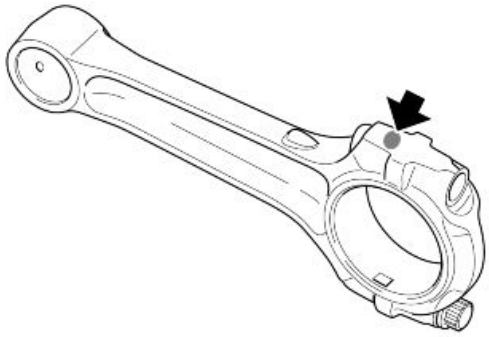
Specification	Desc./Quantity
'Blue' bushing half-shell regular production	44.008 ÷ 44.014 mm (1.73259 ÷ 1.73283 in)
'Red' bushing half-shell regular production	44.014 ÷ 44.020 mm (1.73283 ÷ 1.73307 in)

PIN-BUSHING COUPLING DATA

Specification	Desc./Quantity
Fitted and machined bushing - inside Ø	22.003 - 22.020 mm (0.86626 - 0.86692 in)
Pin diameter	21.998 - 21.994 mm (0.86606 - 0.86590 in)
Clearance between pin and bushing	0.005 - 0.026 mm (0.000197 - 0.001024 in)

The connecting rods have a marked area for weight selection.

The weight indicated in the chart includes screws, dowels and the bushing.



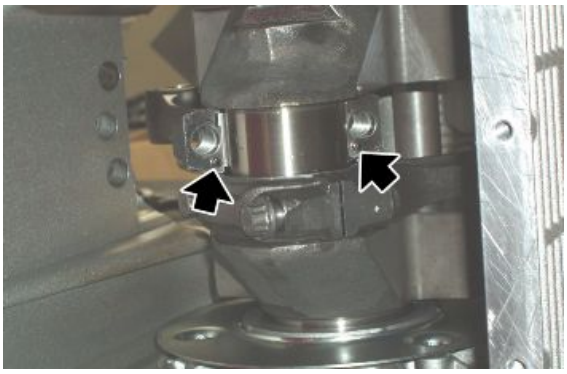
CONNECTING ROD WEIGHT SELECTION

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

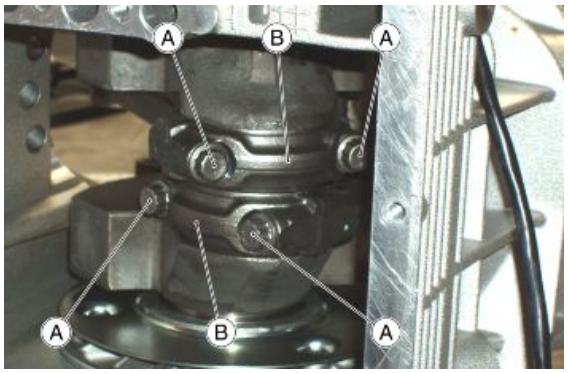
Assembling the connecting rod

- Lubricate the crankpin on which the connecting rods are to be fixed.
- If the connecting rods are not replaced, be careful not to interchange the right connecting rod with the left one and vice versa.

To place the connecting rods: the two pins must be facing the crankcase internal side.



- Place the connecting rods and the caps (B) on the crankshaft and fasten them with new screws (A).
- Remember these recommendations:



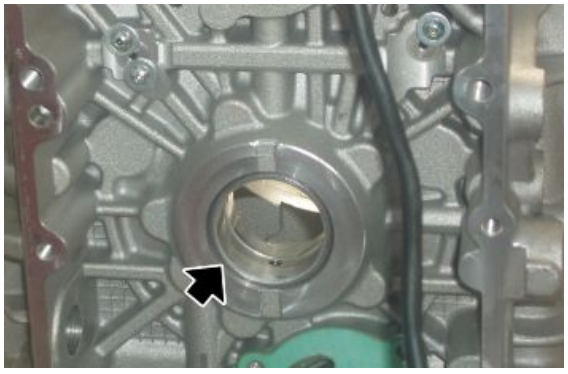
- The screws fixing the connecting rods to the crankshaft must be replaced with new ones at the following refitting as they are subject to high loads and stress;
- The fitting clearance between bearing and connecting rod pin is 0.028 mm (0.0011 inch) minimum and 0.052 mm (0.0020 inch) maximum;
- The clearance between the shim washers of the connecting rod and those of the crankshaft is comprised between 0.30 mm (0.01181 in) and 0.50 mm (0.01968 in);
- Lock the screws (A) on the caps (B) with a torque wrench at the prescribed torque.

PAY ATTENTION TO CRANKSHAFT ROTATION WHEN ONLY THE CONNECTING RODS ARE FITTED BECAUSE IT COULD HIT THE TWO LUBRICATION JETS INSIDE THE CRANKCASE.

Installing the crankshaft

- Fit the shim washer inside the crankcase with the chamfered side facing the generator side.

- Lubricate the crankshaft bushing on the crankcase, generator side.



- Use the sealing ring fitting tool on the flywheel-side flange to fit the sealing ring on the flange.

Specific tooling

19.92.71.00 Tool to fit the sealing ring on the flywheel-side flange

- Fit a new gasket between the crankcase and the crankshaft flange, flywheel side.

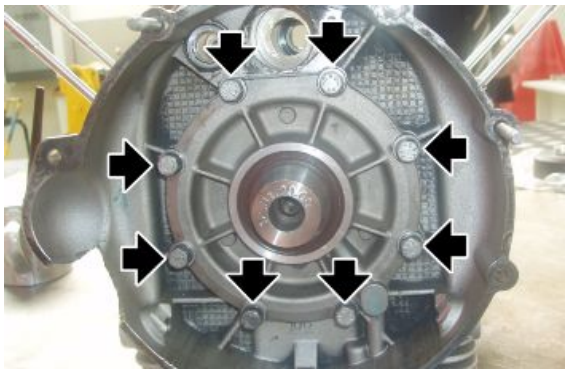
- Fit the crankshaft on the crankcase, flywheel side.
- Mark the crankshaft on the flywheel side with the crankpin facing upwards.
- Place the suitable sealing ring centring tool on the crankshaft.

Specific tooling

12.91.20.00 Tool to fit the flywheel-side flange together with sealing ring on the crankshaft

- Place the flywheel-side flange on the crankshaft and check if the dowel pin with the O-ring is correctly placed.
- When fitting the flange on the crankcase, make sure that the three dowel pins match the seats on the crankcase.

- Apply Teflon tape on the two lower fixing screws at the back in order to prevent oil leaks.
- Screw the eight flange screws on the flywheel side proceeding diagonally.

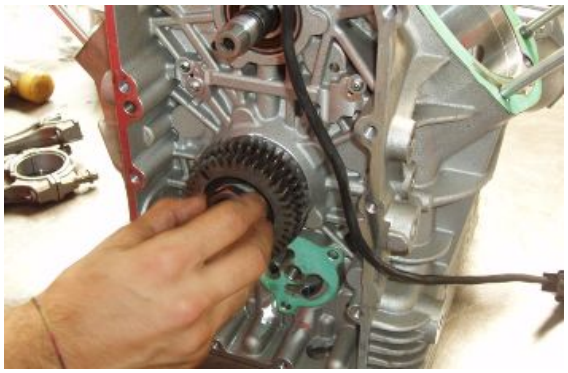


- Remove the sealing ring centring tool from the crankshaft.

Specific tooling

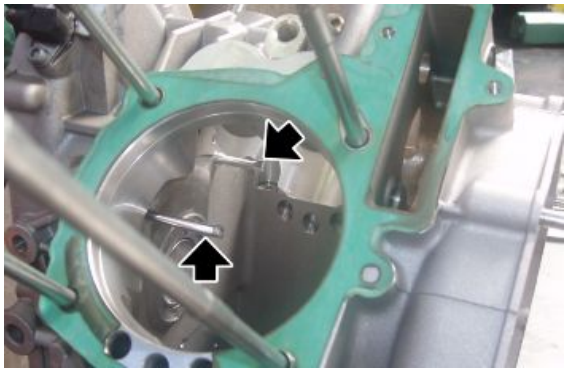
12.91.20.00 Tool to fit the flywheel-side flange together with sealing ring on the crankshaft

- To avoid that the shim washer inside the crankcase moves out of its seat, fit the two gears and the nut on the crankshaft on the generator side.



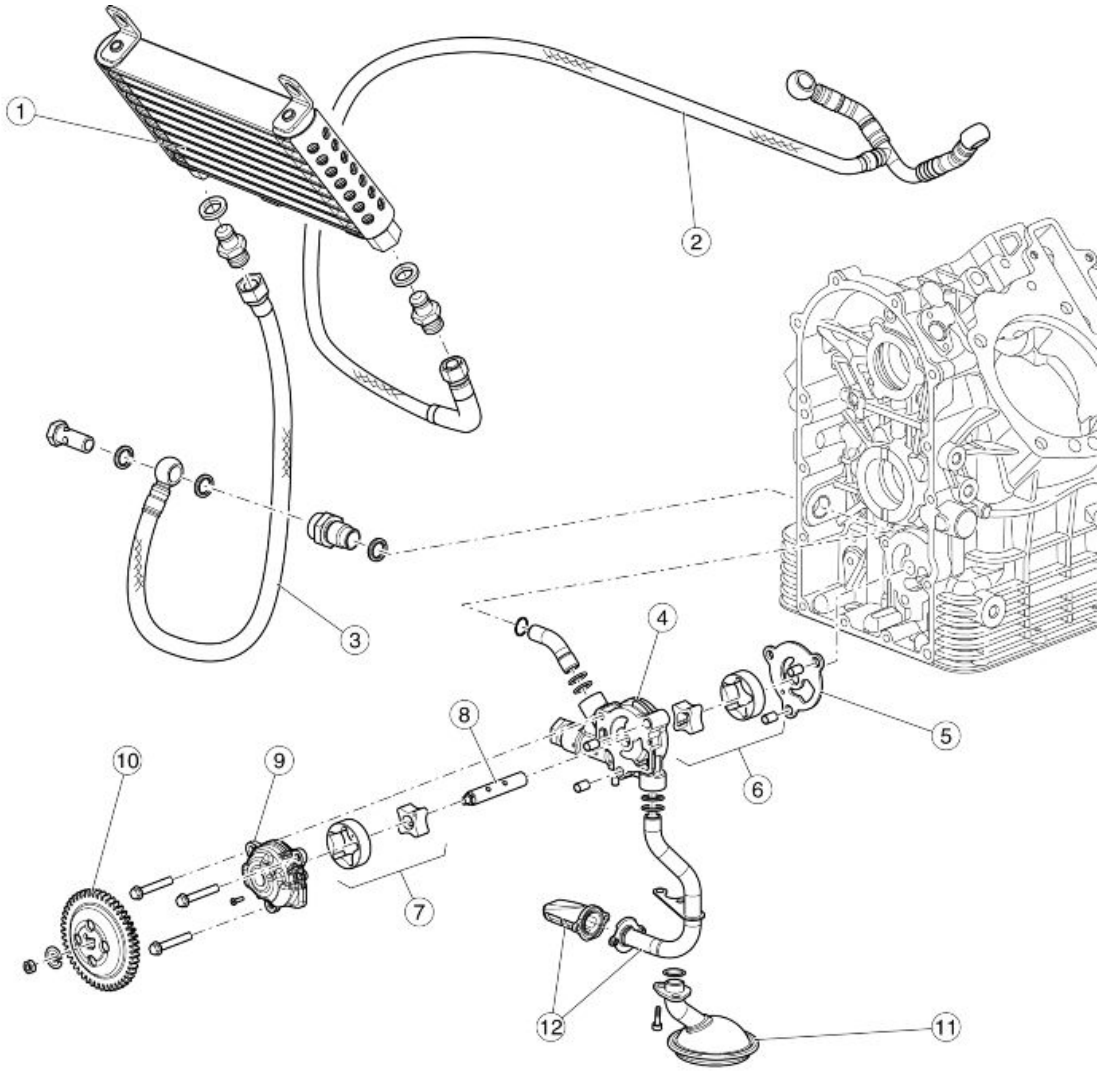
Refitting the crankcase halves

In case the lubrication jets are removed, replace them with two new of the same type. Check that the O-ring is fitted on the jets.
Do not interchange them upon refitting because they have a different length.



Lubrication

Conceptual diagrams



Key:

1. Oil radiator
2. Oil delivery pipe to heads
3. Oil delivery pipe to radiator
4. Oil pump body
5. Oil pump gasket
6. Rotor for lubrication
7. Rotor for cooling
8. Rotor control shaft
9. Oil pump cover
10. Oil pump control gear
11. Lubrication oil intake filter
12. Cooling oil intake filter

The oil pump is operated by the gear (10) which receives the motion directly from the crankshaft. The gear (10) is mounted on the shaft (8), on which two rotors are fitted: one for engine cooling (7) and another for lubrication (6).

Cooling:

The rotor (7) takes in oil from the sump through the filter (12); the oil is sent to the radiator (1) through the hoses (3). Oil passes through the radiator (1) dispersing part of the heat and reaches the heads through the hoses (2). Oil goes down to the sump again and joins the oil used for lubrication.

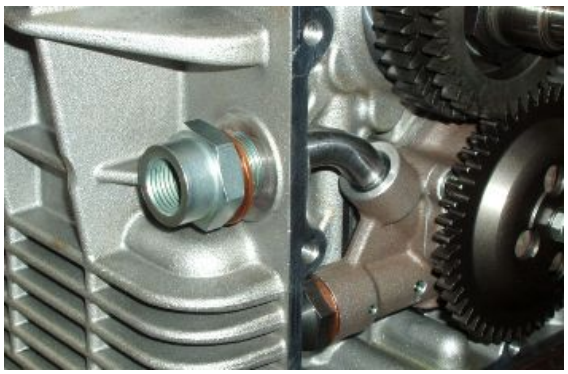
Lubrication:

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

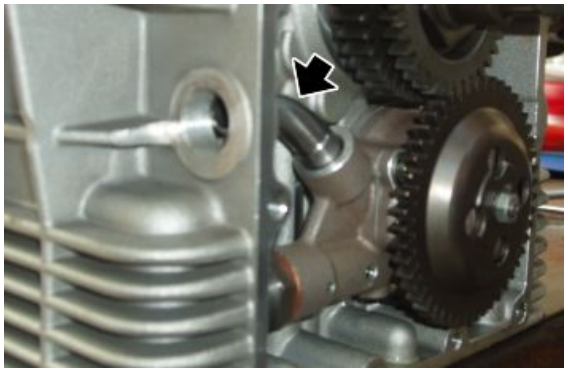
Oil pump

Removing

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

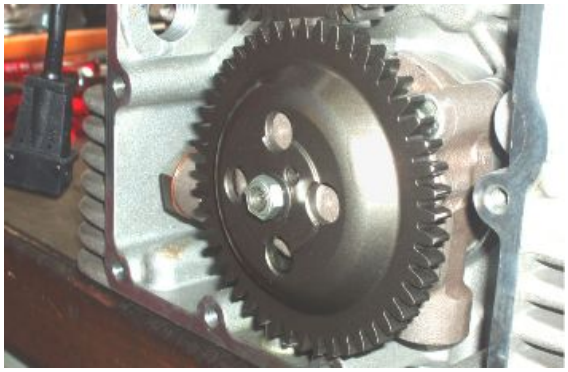


- Remove the nipple - oil pump fitting.



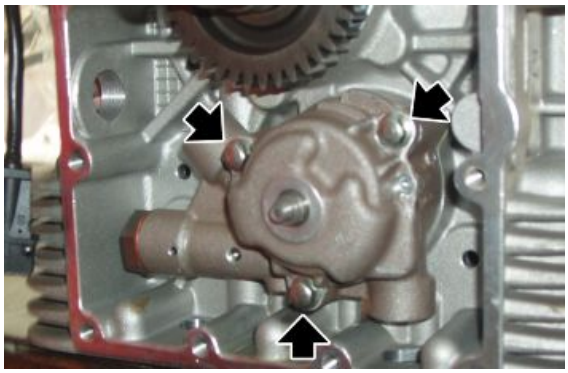
- Bring the left cylinder piston to the TDC in combustion phase.
- Mark a reference on the oil pump control gear and another on the driven gear so as to place them correctly again upon refitting.
- Unscrew and remove the nut on the crankshaft.
- Remove the oil pump control gear.
- Screw the nut again so that the internal shim washer does not fall in the crankshaft crankcase.

- Unscrew and remove the driven gear nut.
- Collect the washer.
- Remove the oil pump driven gear.

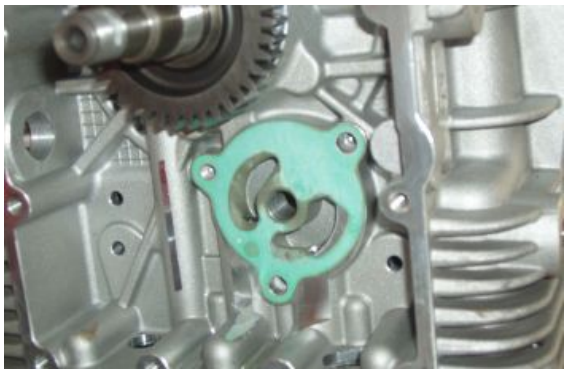


- Remove the driving pin.

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



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

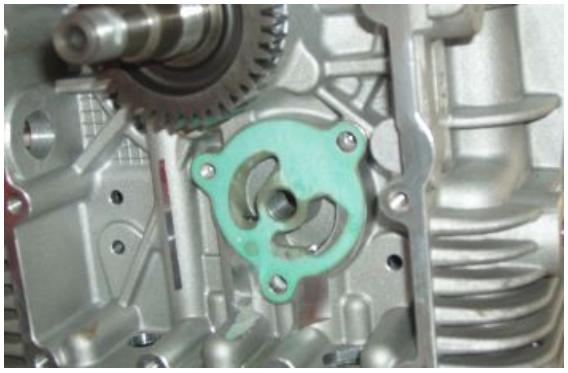


See also

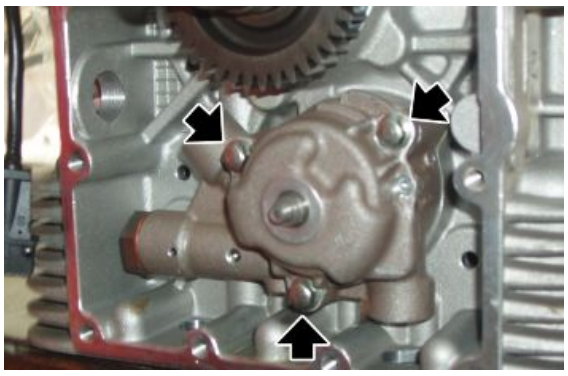
Replacement
Removing the generator

Installing

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



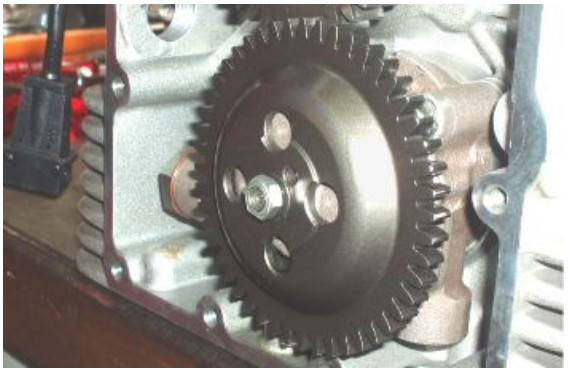
- Place the oil pump.
- Tighten the three screws fixing the oil pump.



- Place the driving pin on the oil pump shaft.

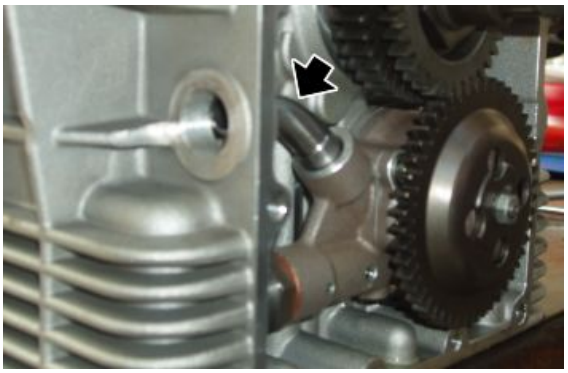
- Place the gear on the oil pump shaft.

- Place the washer on the oil pump shaft.
- Tighten the nut to the specified torque.

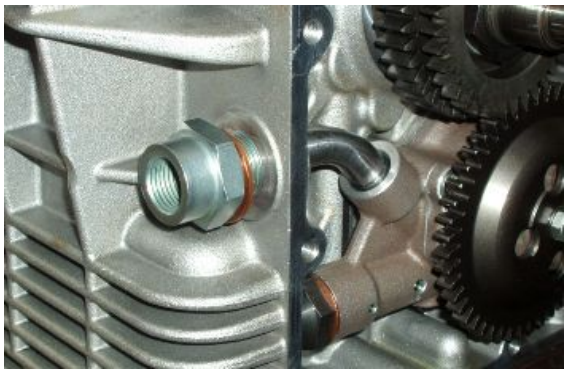


- Place the oil pump control gear on the crankshaft and align its reference with that marked during the removal phase on the oil pump driven gear.
- Tighten the nut to the specified torque.

- Insert the joint in the oil pump.



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



Removing the oil sump

NOTE

TO REMOVE THE OIL SUMP, PLACE A SUITABLE CONTAINER UNDER IT TO COLLECT THE USED OIL AND DRAIN OUT ALL OIL.

- If necessary, the filter can be removed with the suitable special tool.

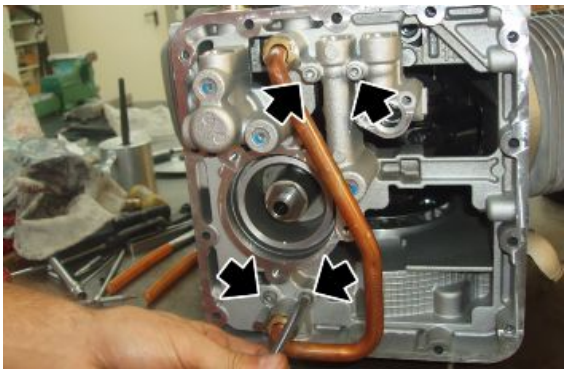
Specific tooling

01.92.91.00 Wrench for removing the cover on sump and filter

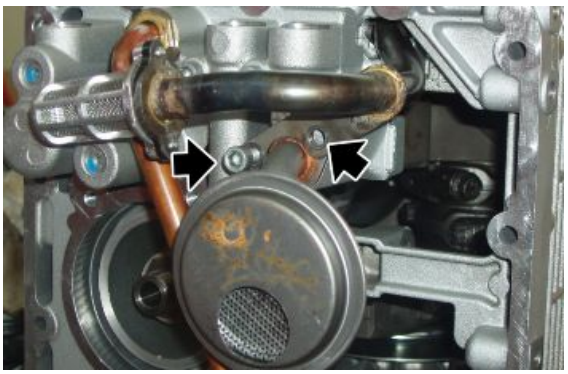
- Unscrew and remove the oil level plug and collect the O-Ring.

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

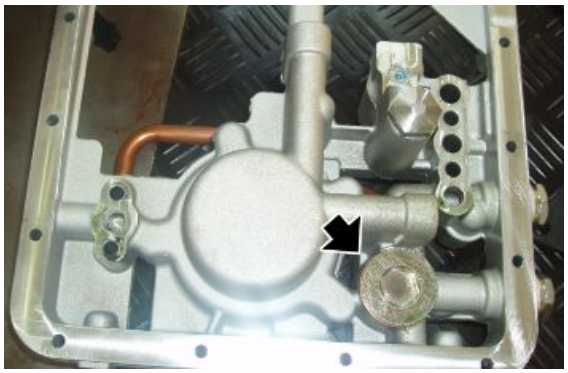
- Undo and remove the four screws.
- Remove the flange.



- Undo and remove the two screws.
- Remove both filters.

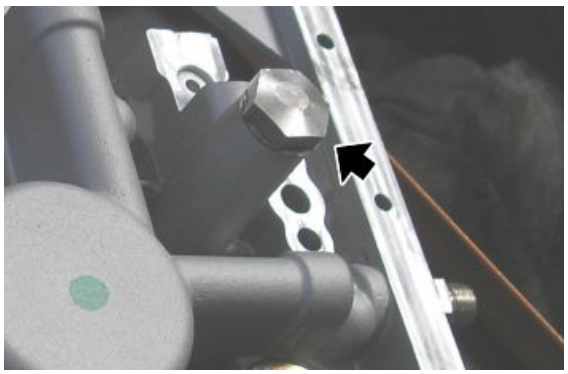


- Unscrew and remove the plug.



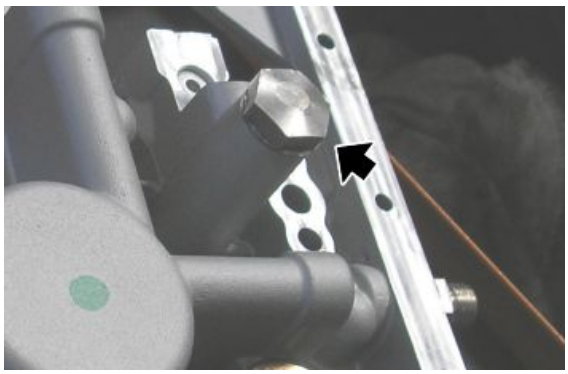
- Remove the thermostatic valve.

- Unscrew and remove the pressure relief valve plug.
- Remove the pressure relief valve components



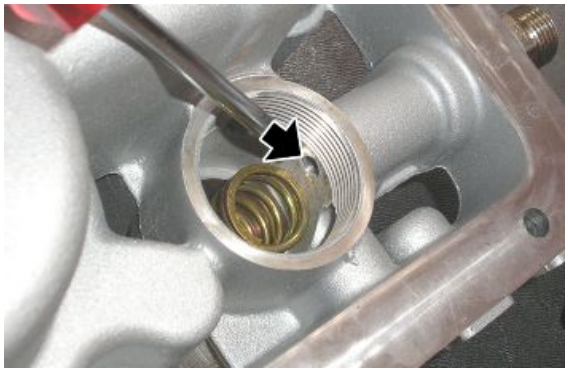
Refitting the oil sump

- Place the pressure relief valve components correctly.
- Screw the pressure relief valve plug.

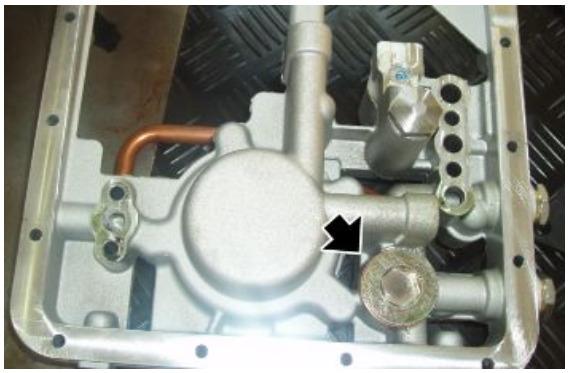


- Place the thermostatic valve.

CHECK THAT THE ENGINE OIL PASSAGE HOLE IS NOT CLOGGED.

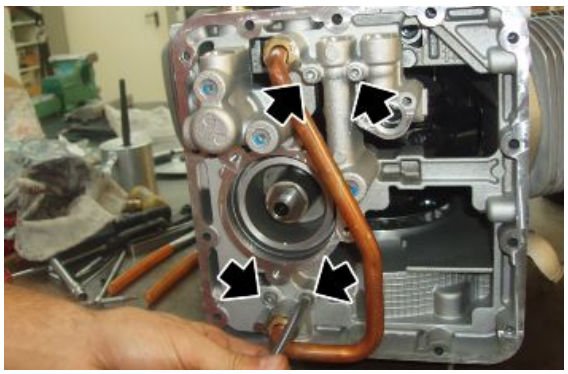


- Tighten the thermostatic valve plug.



- Place a new gasket between the crank-case and the flange.

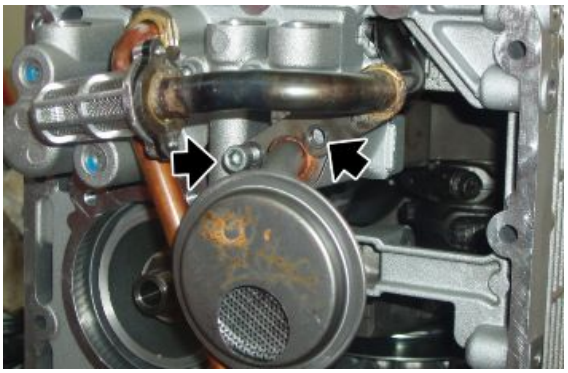
- Fit the flange.
- Fix the flange with the four screws.



- Fit the lubrication oil intake filter.

- Check that the O-rings are fitted on the oil pump.
- Fit the cooling oil intake filter.

- Fix both filters and tighten the two screws to the prescribed torque.



- Fit a new oil filter and tighten it to the prescribed torque.

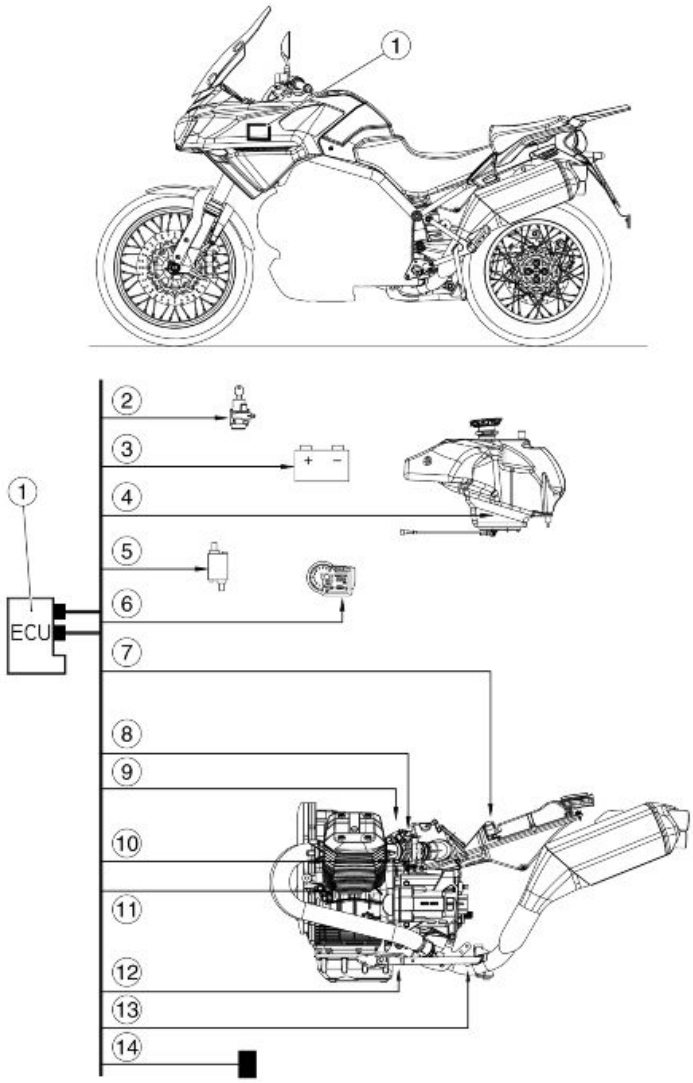
- Place a new gasket between the flange and the sump.

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

INDEX OF TOPICS

Injection

Diagram



Key:

1 Control unit

2 Ignition switch

3 Battery

4 Fuel pump

5 Coils

6 Instrument panel

7 Air temperature sensor

8. Throttle valve position sensor

9 Injectors

10 Engine temperature sensor

11 Crankshaft position sensor

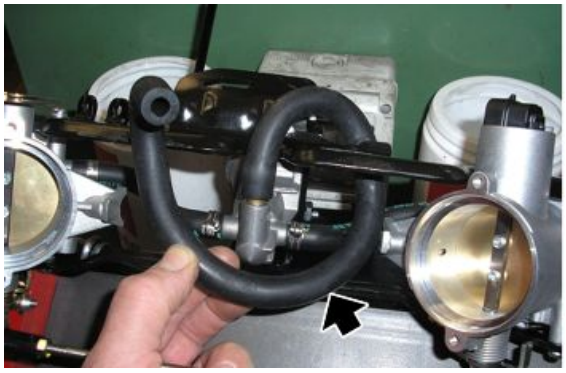
12. Side stand

13 Lambda probe

14 Fall sensor

PASSAGGIO TUBAZIONI CORPO FARFALLATO

La tubazione che và dal corpo farfallato al motorino del minimo deve essere installata in modo che la parte sagomata sia inserita nella cassa filtro aria.

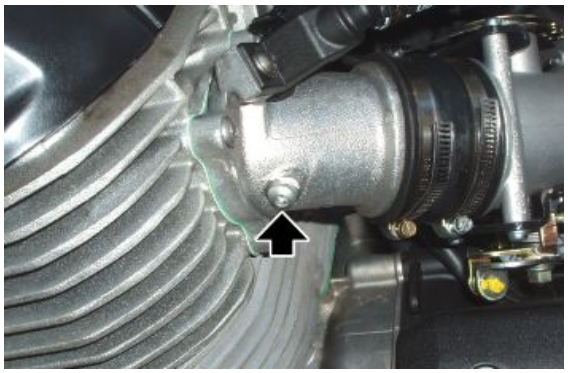


La parte più corta della tubazione carburante collegata ai corpi farfallati, deve essere posizionata a destra.

Cylinders synchronisation

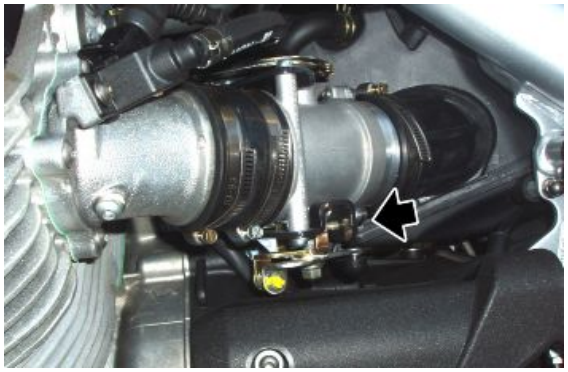
- With engine off, connect the Axone 2000 tool to the diagnosis connector and to the vehicle battery.

- Turn on the scanner.
- Screw the joints connecting the vacuometer pipes on the inlet pipe holes.
- Connect the vacuometer pipes to the relative joints.
- Set the key to ON.
- Make sure there are no errors in the control unit; otherwise, solve them and repeat the procedure.



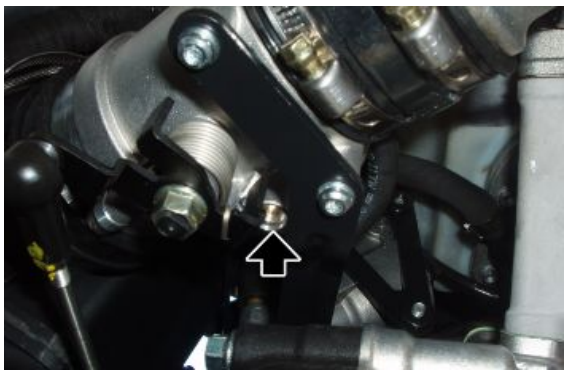
- Make sure the left throttle is fully in.

DO NOT TOUCH THE THROTTLE ABUTMENT SCREW OR THE THROTTLE BODY MUST BE REPLACED. CHECK THAT THE THROTTLE RETURN CABLE IS NOT TAUT.



- The Axone should display the adjustable parameters screen.
- Autodetect the throttle position.

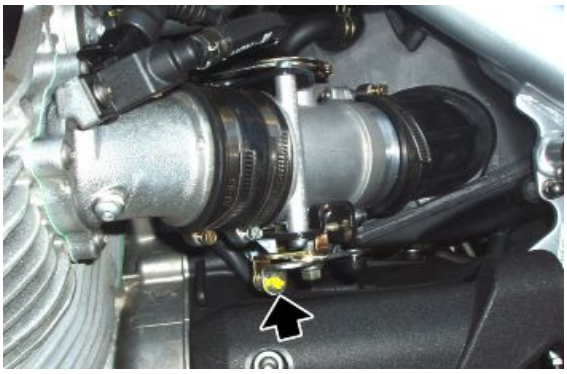
- Turn the key to "OFF" and leave it for at least 30 seconds.
- Turn the key back to "ON" and restore the Axone session.
- Check that the "Throttle" value reading is 4.7 +/- 0.2°. If the value is incorrect, replace the control unit and repeat the procedure from the start.
- Completely close the two by-pass screws on the throttle bodies.
- Start the engine.
- Take the engine to the prescribe temperature: 60 °C (140 °F).
- Make the engine rev at 2000/3000 rpm and with the vacuometer check that the difference between the two pressures is maximum 1 cm Hg (1.33 kPa).



If this condition is detected:

- take the engine back to idle and check the depression values so that they are aligned between the two cylinders. Otherwise, open only the screw with higher depression, using the by-pass screws, to compensate.

If there is a larger difference:



- work on the set screw of the throttle body connecting rod to reduce the pressure difference in the two pipes.
- Repeat the procedure "Throttle position autodetection" as explained above.
- Bring the engine back to idle and check the depression values so that they are aligned between the two cylinders.
- Otherwise, open only the screw with higher depression, using the by-pass screws, to compensate.

Recovery function

If the signal of the following sensors is interrupted, the control unit determines some values to keep the engine running or it uses a different parameter. The instrument panel and the Axone also signal the problem.

RECOVERY FUNCTION

Specification	Desc./Quantity
air temperature	25 °C (77 °F)
engine temperature	30 °C (86 °F) with linear increase from the air temperature at ignition
barometric pressure	1010 hPa
throttle valve potentiometer	2.9° at idle, otherwise variable.
idle motor	fixed value variable depending on the vehicle

Using axone for injection system

Injection

Iso screen page

ISO

This display shows general data regarding the control unit, for example software type, mapping, control unit programming date

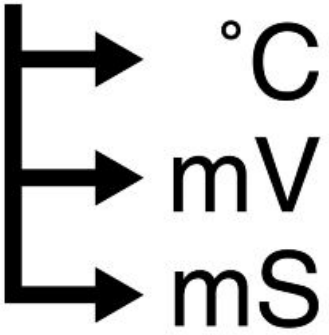
ISO DISPLAY

Specification	Desc./Quantity
Mapping	-

Engine parameter reading screen page

ENGINE PARAMETER READING

This display shows the parameters measured by the several sensors (engine revs, engine temperature, etc.) or values set by the control unit (injection time, ignition advance, etc.)



ENGINE PARAMETER READING SCREEN PAGE

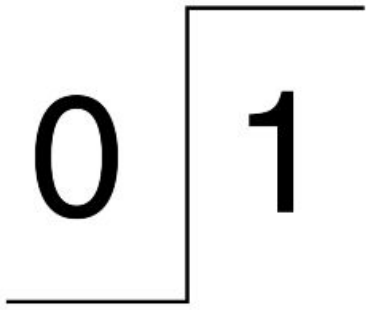
Specification	Desc./Quantity
Engine rpm	Engine revolutions per minute: the minimum value is set by the control unit cannot be adjusted
Injection time	- ms
Ignition advance	- °
Air temperature	°C Temperature of the air taken in by the engine, measured by the sensor in the filter casing. This is not the temperature indicated by the instrument panel
Engine temperature	°C
Battery voltage	V
Throttle	Value corresponding to the throttle when closed (approximate value between 4.5 and 4.9°) (left throttle supported by the end of stroke screw). If a different value is read, it is necessary to activate the parameter "Throttle positioner autodetection" and obtain this value.
Atmospheric pressure	1015 mPa (approximate values)

Specification	Desc./Quantity
	The sensor is inside the instrument panel
Lambda probe	100 - 900 mV (approximate values) Signal when energised that the control unit receives from the lambda probe: inversely proportional to the presence of oxygen
Lambda integrator	When the control unit uses the lambda probe signal (see the 'Lambda' parameter on the 'Device status' display) this value should be close to 0%
Vehicle speed	- km/h
Target engine revs	1150 rpm (approximate values) Parameter valid at idle, setting depends especially on the engine temperature: the control unit will try to keep the engine running at this revs, acting on the ignition advance and the Stepper motor
Stepper base	70 - 100 (approximate values) Steps corresponding to the Stepper motor reference position
CL Stepper	70 - 150 (approximate values) Steps set by the control unit for the Stepper motor. At idle, steps so that the engine keeps the target engine revs set by the control unit
Stepper regulator	Difference between current steps of motor at idle and those at the reference position
Virtual throttle angle from Stepper	0° With engine not at idle speed, this value indicates the throttle degrees corresponding to the Stepper motor air flow

Device status screen page

DEVICE STATUS

This screen page shows the status (ON/OFF only) of the vehicle devices or the operation condition of some vehicle systems (for example, lambda probe functioning status)



DEVICE STATUS

Specification	Desc./Quantity
Engine status	ON/run/power-latch/stopped operation conditions
Throttle position	Released / pressed indicates if the throttle potentiometer is open or closed
Stand	Retracted / expanded indicates the position of the side stand (only with gear engaged)
IGNITION	Enabled / disabled

Specification	Desc./Quantity
	indicates if the control unit consents engine start-up
RUN / STOP switch	Run / stop indicates the position of the safety switch
Clutch	No / Yes indicates the clutch sensor status
Gear engaged	No / Yes indicates the gear sensor status
Fall sensor	Normal / Tip over indicates the vehicle fall sensor status
Lambda	Open loop / Closed loop Indicates if the control unit is using (CLOSED) the lambda probe signal to keep the stoichiometric combustion. At idle CLOSED only if: Air T over 20° C (68°F) and engine T over 30°C (86°F) and engine on for at least 2-3 minutes
Synchronisation	Synchronised / Not synchronised Indicates if the control unit detects the revolution sensor signal correctly

Devices activation screen page

DEVICES ACTIVATION

This displays is used to delete errors in the control unit memory and activate some systems controlled by the control unit

DEVICES ACTIVATION

Specification	Desc./Quantity
Left coil	operation for 2.5 m, 5 times
Right coil	operation for 2.5 m, 5 times
Left injector	Operation for 4 m, 5 times
Right injector	Operation for 4 m, 5 times
Error clearing	By pressing the 'enter' button, the stored errors (MEM) become part of the historical data (STO). In the next connection between the Axone and the control unit, the historical errors (STO) are no longer shown
Fuel pump	Operation for 30''
Stepper control	For 4'', advancement control of 32 steps; for the next 4'', retrocession control of 32 steps and so on for 30''

Errors display screen page

ERRORS DISPLAY

This screen page shows potential errors detected in the vehicle (ATT) or stored in the control unit (MEM) and it is possible to check error deletion (STO)

ERRORS DISPLAY

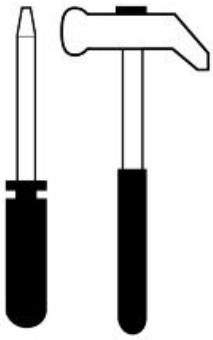
Specification	Desc./Quantity
Pressure sensor	Possible short circuit in the earth lead, battery or open circuit: recovery function noticeable for customer. Careful with the air pressure sensor in the instrument panel
Air temperature	Possible short circuit in the earth lead, battery or open circuit: recovery function hardly noticeable for customer.
Engine temperature	Possible short circuit in the earth lead, battery or open circuit: recovery function.
Throttle actuator position sensor	Possible short circuit in the earth lead, battery or open circuit: recovery function noticeable for customer.
Lambda probe	Possible short circuit on the earth lead, battery or open circuit or plausibility: recovery function hardly noticeable for customer.
Left injector	Possible short circuit in the earth lead, battery or open circuit. If both injectors do not work, the engine does not work
Right injector	Possible short circuit in the earth lead, battery or open circuit. If both injectors do not work, the engine does not work
Fuel pump relay	Possible short circuit in the earth lead, battery or open circuit: the engine does not start.
Left coil	Possible short circuit in the earth lead, battery or open circuit. If both coils do not work, the engine does not work.
Right coil	Possible short circuit in the earth lead, battery or open circuit. If both coils do not work, the engine does not work.
Idle regulator	Possible short circuit in the earth lead, battery or open circuit: recovery function noticeable for the customer due to no idle management
Battery voltage	Battery voltage detected is too low (7V) or too high (16V) for a certain period
Starter diagnosis	Possible short circuit in the earth lead, battery or open circuit.
Engine revolution sensor	Possible open circuit.

Specification	Desc./Quantity
Lambda heater	Possible short circuit in the earth lead, battery or lambda probe heating circuit open.
SPEED SENSOR	Possible short circuit in the earth lead, battery or speed sensor circuit open: also possible lack of supply from the control unit
CAN line diagnosis	Possible error on the CAN line: short circuit or line break or no signal or plausibility error detected.
RAM memory	Possible internal control unit error. Also check the control unit supply and earth connections
ROM memory	Possible internal control unit error. Also check the control unit supply and earth connections
Microprocessor	Possible internal control unit error. Also check the control unit supply and earth connections
Checksum EPROM	Possible internal control unit error. Also check the control unit supply and earth connections

Adjustable parameters screen page

ADJUSTABLE PARAMETERS

This screen page is used to adjust some control unit parameters



ADJUSTABLE PARAMETERS

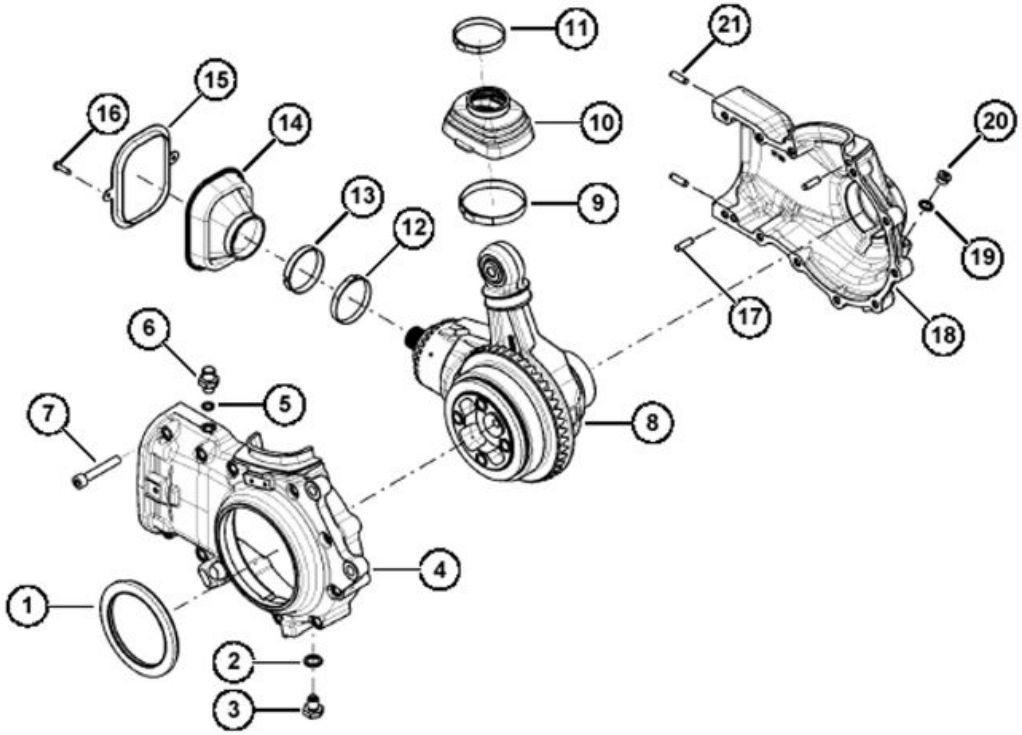
Specification	Desc./Quantity
Throttle positioner autodetection	Allows the control unit to detect the closed throttle position: just press the enter button

INDEX OF TOPICS

Bevel gears

Checking

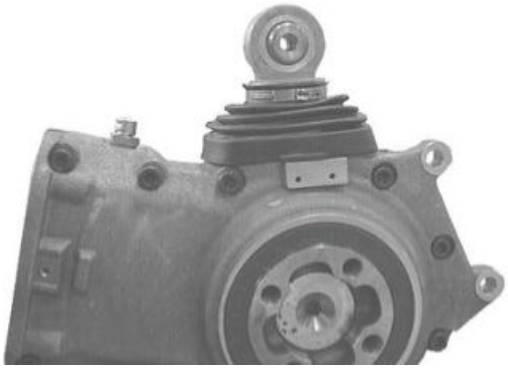
Smontaggio gruppo scatola



Remove the cover (20).

Remove the plug (3) to drain out the oil.

Lift the cap (10).



Remove the clamps (9) and (11).

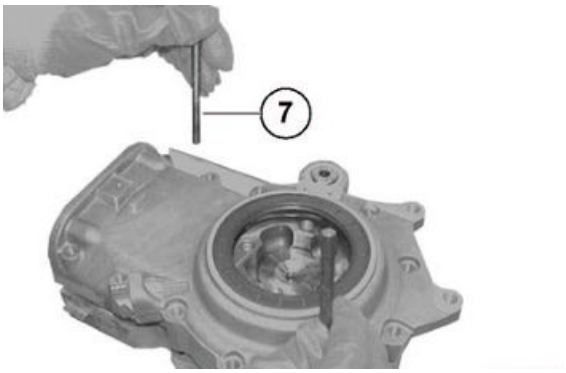
Remove the cap (14).

Remove the screws (16).

Collect the ring (15).

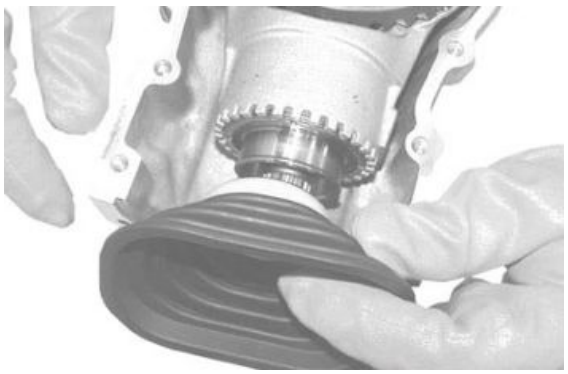
Remove the screws (7).

Remove the casing (4).

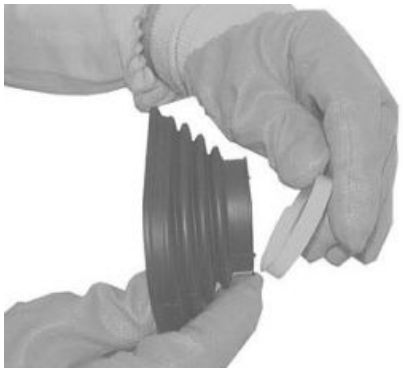


Remove the clamp (12).

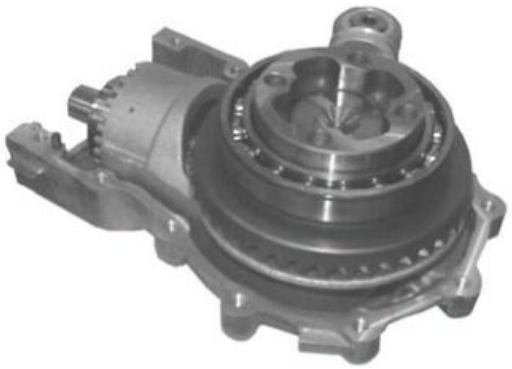
Remove the cap (14).



Collect the ring (13).

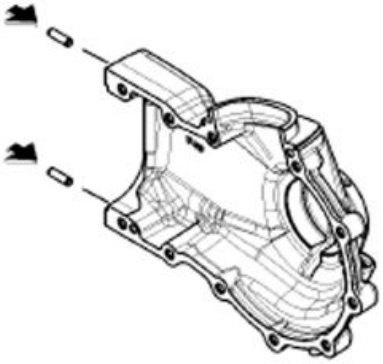


Remove the support unit (8).

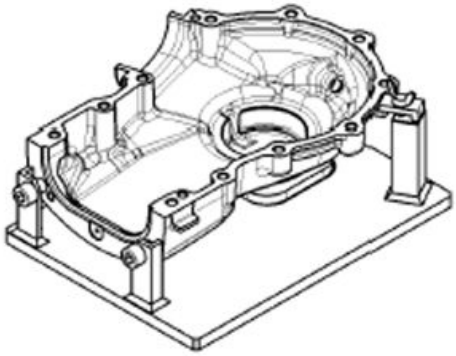


Montaggio gruppo scatola

Assemble the dowel pins to the casing with the buffer and a hammer.



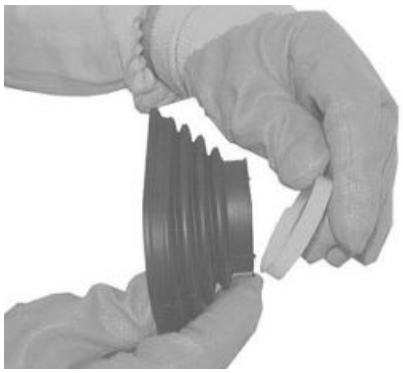
Assemble the casing to the special fastening tool.
Clean the casing faying surfaces carefully.



Heat the casing.

Insert the support group in the casing.

Assemble the cap and the ring.



Fit the cap on the support.

Fit the clamp.

Screw the clamp with the specific pliers.

Apply the prescribed sealant to the casing.

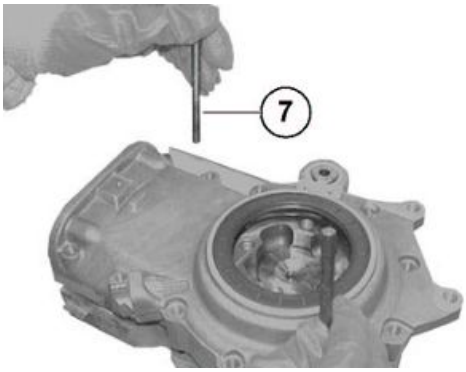
Fit a new sealing ring using the buffer.

Lubricate the sealing ring.

Assemble two centring stud bolts with M8 thread in the threaded holes of the casing as shown in the picture.

Fit the casing.

Remove the two dowel pins.

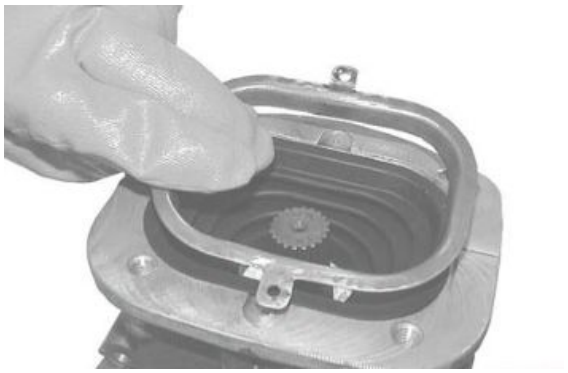


Assemble the fixing screws (7).

Tighten the screws (7) to the prescribed torque.

Remove excessive sealant.

Assemble the ring to the casing.



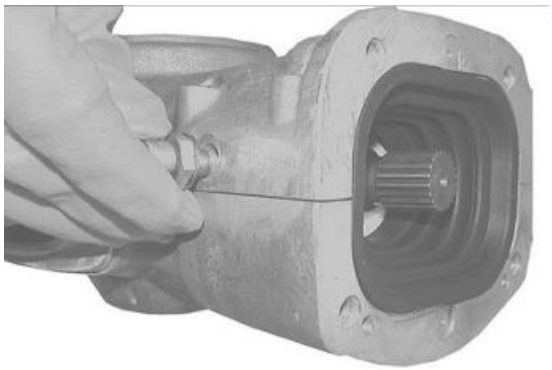
Tighten the fixing screws to the prescribed torque.

Fit the cap with the washer.

Screw the cap to the prescribed torque.

Fit the breather with the washer.

Screw the breather to the prescribed torque.

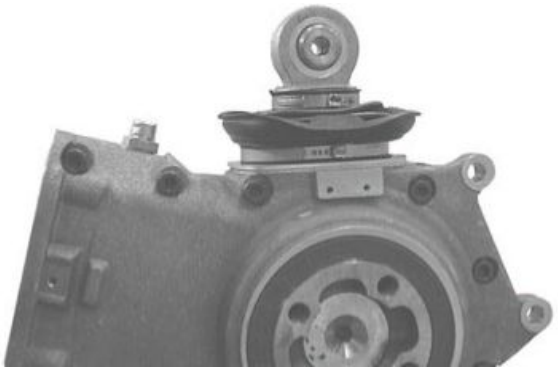


Fill the transmission with the prescribed oil.

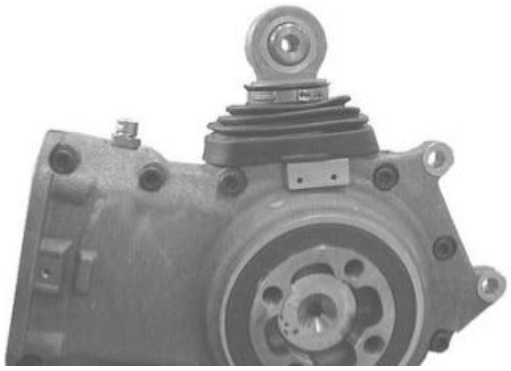
Fit the cap with the washer.

Screw the cap to the prescribed torque.

Assemble the cap with the clamps.



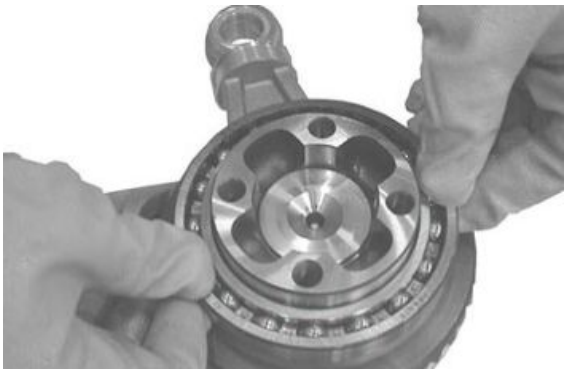
Fit the cap in its seat.



Gruppo asse ruota

REMOVAL

Remove the bearing from the wheel axle with a suitable extractor.



Turn the unit over.

Remove the bearing from the wheel axle with a suitable extractor.

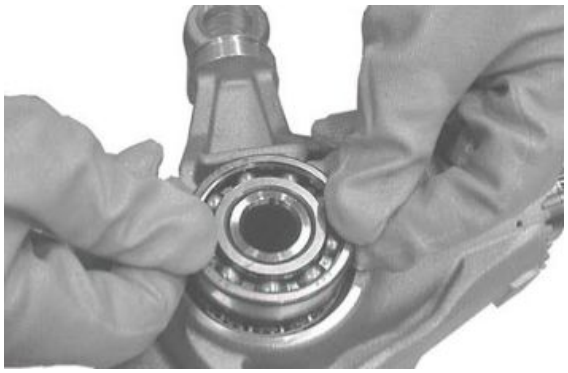
FITTING

Heat the bearings to 100°C (212 °F).

Assemble the bearings to the wheel axle.

Turn the unit over.

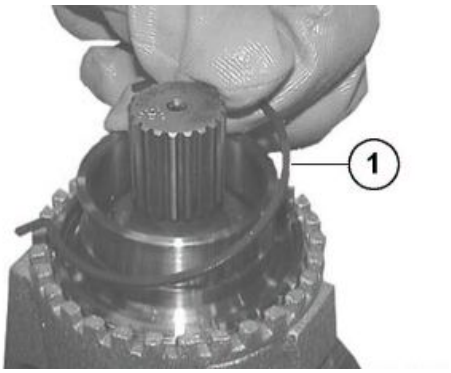
Assemble the bearings to the wheel axle.



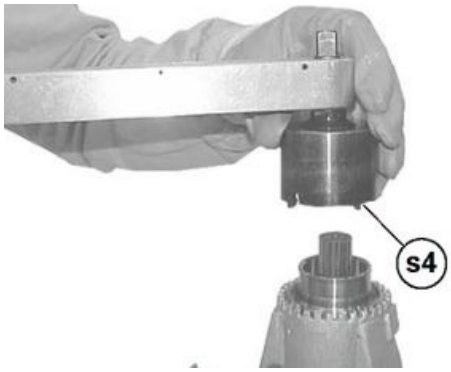
Gruppo pignone

REMOVAL

Remove the stop ring (1) from the ring nut.



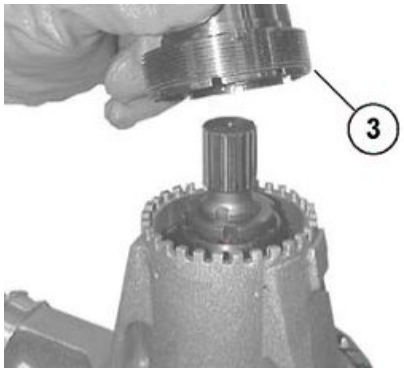
Unscrew the ring nut (2) with the special spanner (s4).



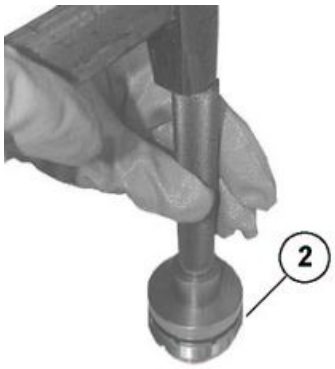
Remove the ring nut (2) and remove the sealing ring from the ring nut.

NOTE

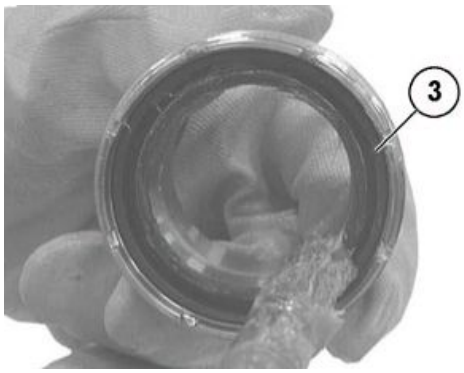
THIS OPERATION DESTROYS THE SEALING RING.



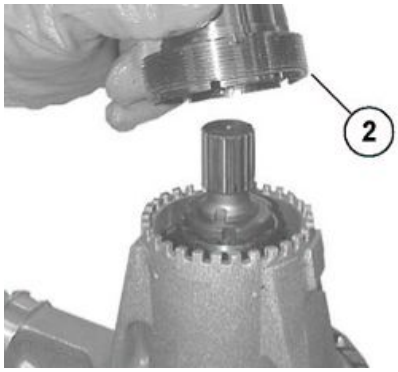
Assemble the sealing ring (3) to the ring nut (2) with the buffer CA715855 (see Fig.1) and a hammer.



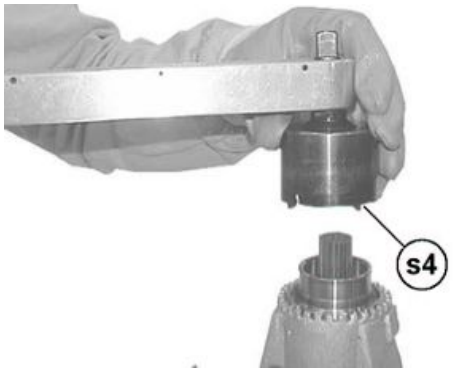
Lubricate the sealing ring (3).



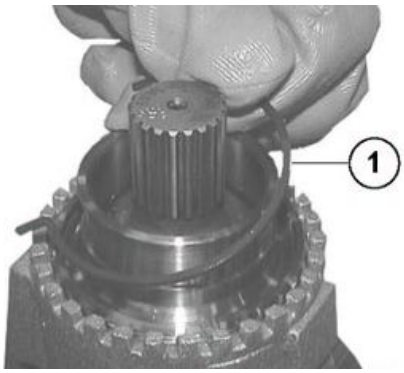
Assemble the ring nut (2).



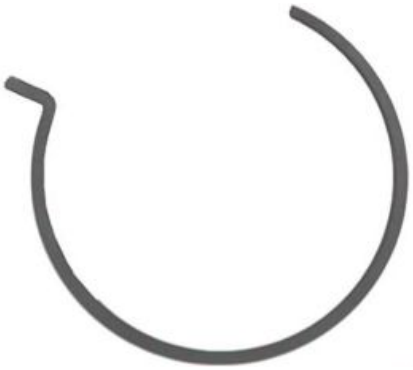
Tighten the ring nut (2) with the special spanner (s4) to the prescribe torque.



Insert the stop ring (1) in the ring nut (2) in the indicated direction.

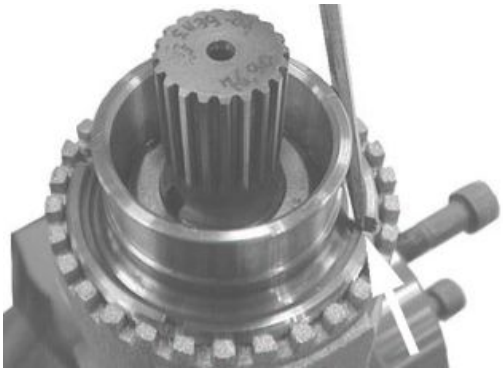


Assembly position of the stop ring (1).

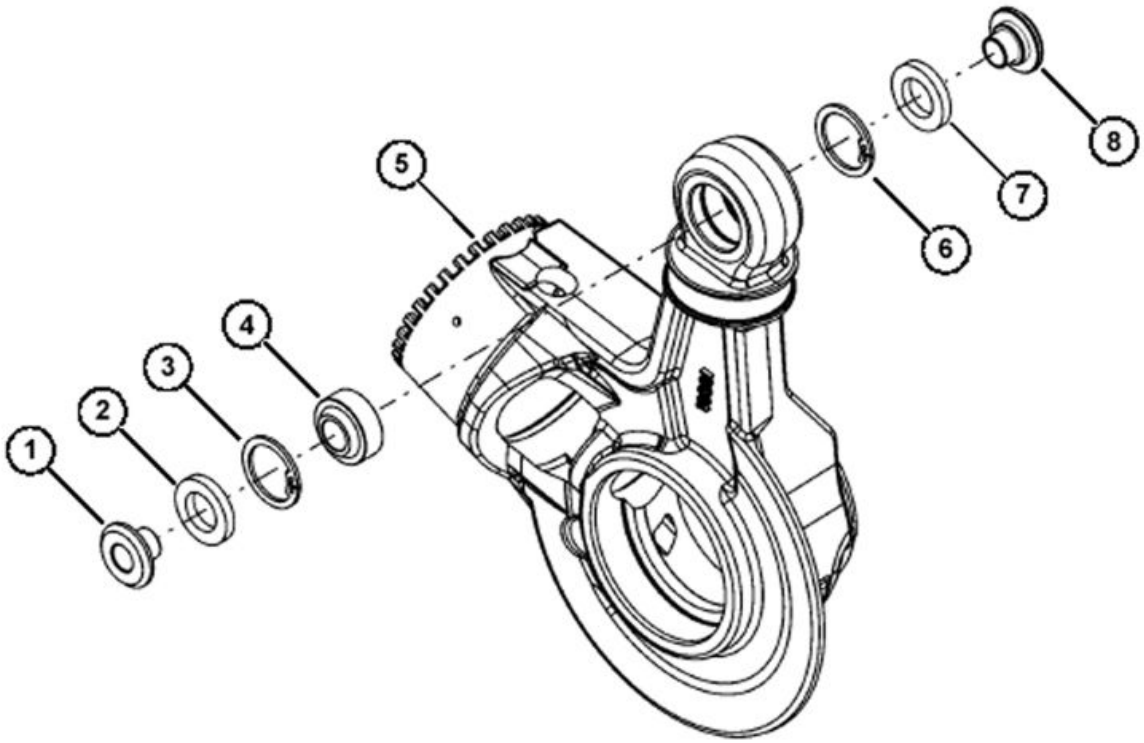


CAUTION

MAKE SURE THE STOP RING IS IN ITS SEAT.



Gruppo supporto



REMOVAL

Remove the bushing (1) with a punch.

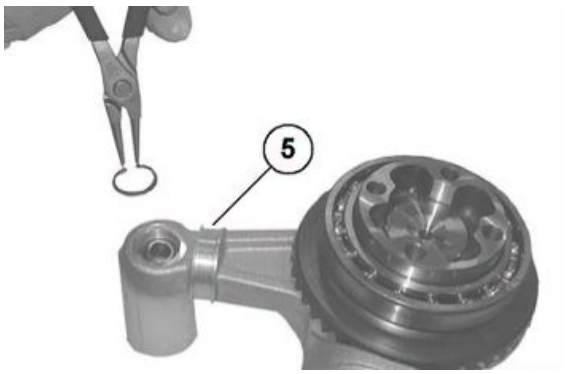
Turn the support (5) over and remove the other bushing (8).

Remove the sealing rings (2) and (7) with a screw-driver.

Remove the stop rings (3) and (6) from the support (5) with suitable pliers.

NOTE

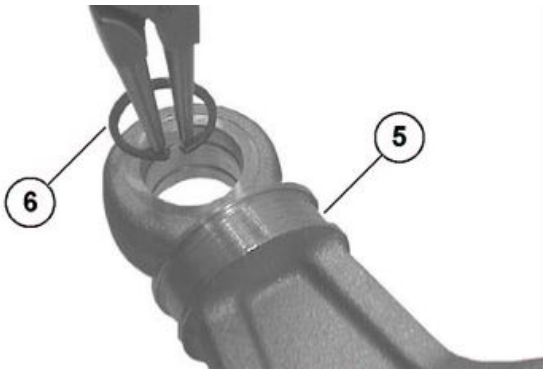
THIS OPERATION DESTROYS THE SEALING RING.



Remove the ball joint (4) with a suitable buffer and a rubber hammer.

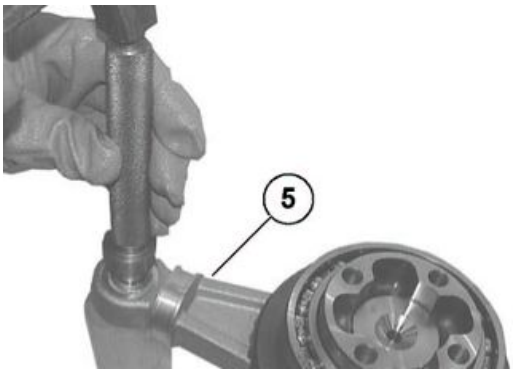
FITTING

Fit the stop ring (6) in the support (5) with suitable pliers.

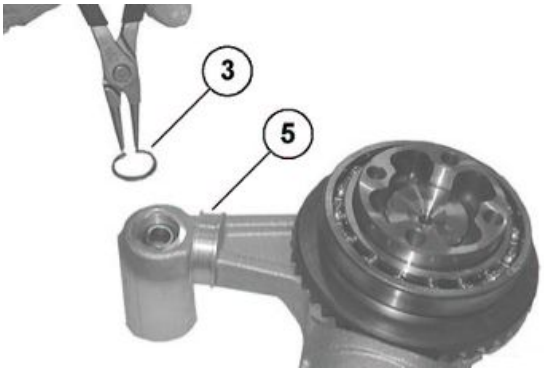


Turn the support (5) over.

Assemble the ball joint (4) with the buffer and a rubber hammer.



Fit the stop ring (3) in the support (5) with suitable pliers.



Manually assemble the new sealing rings (2) and (7).

Assemble the bushing (1).

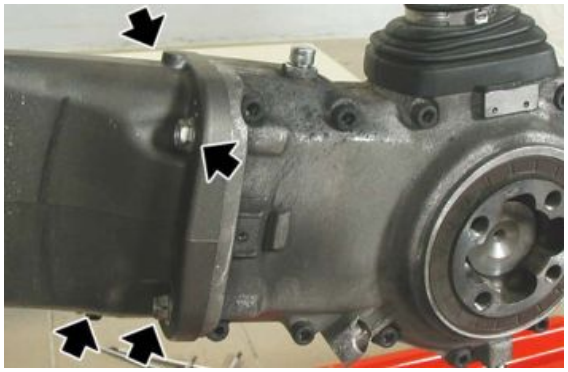
Drive the bushing (1) in with a plastic hammer.

Turn the support (5) over and assemble the other bushing (8).

Installing

- Insert the transmission casing on the fork making sure that the universal joint engages correctly.

- Tighten the four screws to the prescribed torque operating diagonally.



- Place the reaction rod into its seat.
- Insert the screw.
- Screw the nut fixing the reaction rod.

- Place the dust-protection ring between the rim and the cardan shaft taking care to mount it with the collar facing the transmission unit.

- Posizionare il sensore velocità e fermare il cablaggio tramite fascette.
- Posizionare sul forcellone la ruota posteriore.
- Serrare le quattro viti complete di distanziali e anello antipolvere.
- Posizionare sul disco la pinza freno posteriore e il tubo freno sul forcellone.