SERVICE STATION MANUAL

854331

GRISO 1100

SERVICE STATION MANUAL

GRISO 1100

SERVICE STATION MANUAL GRISO 1100

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.

INDEX OF TOPICS

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 switched 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 gear oil

CAUTION

IT IS ADVISABLE TO WEAR LATEX GLOVES WHEN SERVICING THE VEHICLE. THE ENGINE OR GEARBOX OIL MAY CAUSE SERIOUS DAMAGE TO THE SKIN IF HANDLED FOR PROLONGED PERIODS OF TIME AND ON A REGULAR BASIS. IT IS RECOMMENDED TO WASH YOUR HANDS CAREFULLY AFTER HANDLING IT. HAND THE OIL OVER TO OR HAVE IT COLLECTED BY THE NEAREST USED OIL RECYCLING COMPANY OR THE SUPPLIER. IT IS ADVISABLE TO WEAR LATEX GLOVES WHEN SERVICING THE VEHICLE.
DO NOT DISPERSE THE 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 THE BATTERY ELECTROLYTE, WEAR TIGHT-FITTING GLOVES AND PROTECTIVE APPAREL. IF THE FLUID GETS INTO CONTACT WITH THE SKIN, RINSE WELL WITH ABUNDANT FRESH WATER. IT IS EXTREMELY IMPORTANT TO PROTECT THE EYES BECAUSE EVEN A SMALL QUANTITY OF BATTERY ACID CAN CAUSE BLINDNESS. IF THE FLUID GETS INTO CONTACT WITH THE 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 DISMANTLING COMPONENTS

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

DISMANTLING COMPONENTS

- Do not loosen and/or tighten screws and nuts using pliers or other tools 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 dismantled 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

THE BEARINGS MUST BE ABLE TO ROTATE FREELY, WITHOUT BINDING 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 ap-

plying the tightening torque.

- Always replace self-locking nuts, washers, sealing rings, circlips, O-rings(OR), split pins and screws with new ones if their thread is damaged.
- When assembling the bearings, make sure to lubricate them well.
- Check that each component is assembled 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 planes, oil guard rims and washers before refitting them. Smear a light layer of lithium-based grease on the oil guard rims. Reassembly 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 as follows as non-compliance with the procedure described below causes irreparable damages 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.
- In presence of dirt, rust, humidity etc. clean the connector's internal parts carefully, using a pressurised air jet.
- Make sure that the cables are correctly linked to the connector's 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 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. IF THESE RECOMMENDATIONS ARE NOT COMPLIED WITH, ONE OF THE COMPONENTS MAY BECOME LOOSE AND EVEN DETACHED, THUS BLOCKING A WHEEL, OR OTHERWISE COMPROMISING THE

VEHICLE'S MANOEUVRABILITY. 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 the run-in. In this way, you allow for the work of components to be "loaded" and then "unloaded", thus cooling the 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 DISCS 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, IT IS POSSIBLE TO ATTAIN THE BEST PERFORMANCE OF YOUR VEHICLE.

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) brake carefully to 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" TABLE IN THE SCHEDULED MAINTENANCE SECTION TO AVOID INJURING YOURSELF, OTHERS AND /OR DAMAGING THE VEHICLE

- Between 1000 km (625 miles) and 2000 km (1250 miles) travelled, ride more vigourously, vary speeds and twist throttle fully for some short periods for best coupling of the components; do not exceed 6000 rpm.
- After 2000 km (1250 miles) a better engine performance may be expected, but without exceeding the engine maximum rpm allowed (7600 rpm).

Vehicle identification

SERIAL NUMBER POSITION

These numbers are necessary for vehicle registration.

NOTE

ALTERING IDENTIFICATION NUMBERS CAN BE SERIOUSLY PUNISHED BY LAW, PARTICULARLY MODIFYING THE CHASSIS NUMBER WILL IMMEDIATELY INVALIDATE THE WARRANTY.

This number is composed by numbers and letters, as in the example shown below.

ZGULS0000YMXXXXXX /

ZGULSA000YMXXXXXX

KEY:

ZGU: WMI (World manufacturer identifier) code;

LS: model;

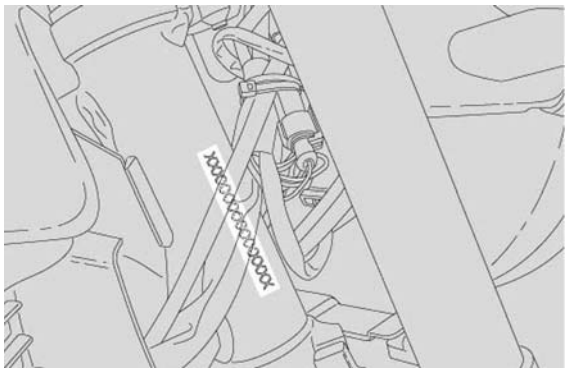
000 / A00: version variation;

0: digit free

Y year of manufacture

M: production plant (M= Mandello del Lario);

XXXXXX: progressive number (6 digits);

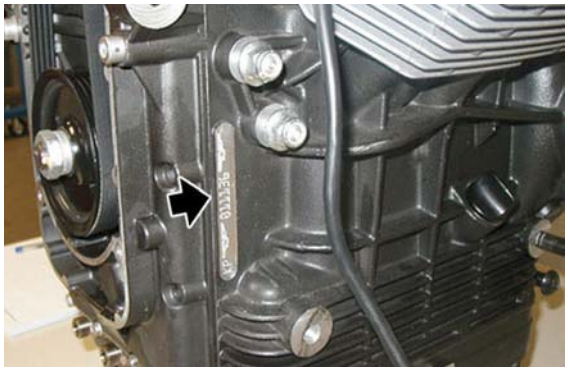


CHASSIS NUMBER

The chassis number is stamped on the right side of the headstock.

ENGINE NUMBER

The engine number is stamped on the left side, close to the engine oil level check cap.



Dimensions and mass

WEIGHT AND DIMENSIONS

Specification	Desc./Quantity
Length	2260 mm (89.0 in)
Width	880 mm (34.6 in)
Maximum height	1070 mm (42.1 in)
Saddle height	800 mm (31.5 in)
Minimum ground clearance	185 mm (7.3 in)
Wheelbase	1554 mm (61.2 in)
Kerb weight	240 kg (529 lb)

Engine

ENGINE

Specification	Desc./Quantity
Type	90° transversal V-twin, four stroke
Cylinder quantity	2
Cylinders layout	90° V
Total engine capacity	1064 cm³ (65 cu.in)
Bore / stroke	92 x 80 mm (3.6 x 3.1 in)
Compression ratio	9.8 :1
Ignition	electric
Engine revs at idle speed	1100 ± 100 rpm
Clutch	dry, twin disc
Lubrication system	Pressure-fed lubrication system adjusted through valves and a trochoidal pump
Air filter	cartridge, dry
Cooling	air
Supply	Electronic injection (Weber . Marelli) with Stepper motor
Diffuser	Ø 45 mm (1.77 in)
Fuel	Premium unleaded petrol, minimum octane rating of 95 (NORM) and 85 (NOMM)
Timing system diagram:	2 rod valves and rocking levers
Valid values with checking clearance between rocking levers and valve	inlet: 0.10 mm (0.0039 in) outlet: 0.15 mm (0.0059 in)

Transmission

TRANSMISSION

Specification	Desc./Quantity
Main transmission	with gears, ratio: 24/35 = 1 :1.4583
Transmission	Mechanical, 6 speeds with foot lever on the left hand side of the engine
Gear ratios:	1st gear : 17/38 = 1 :2.2353 2nd gear : 20/34 = 1:1.7 3rd gear : 23/31 = 1:1.3478 4th gear : 26/29 = 1:1.1154 5th gear : 31/30 = 1:0.9677 6th gear : 29/25 = 1:0.8621
Final transmission	cardan shaft
Ratio	12/44 = 1:3.6667

Capacities

CAPACITY

Specification	Desc./Quantity
Engine oil	Oil and oil filter change 3600 cm³ (219 cu.in)
Gearbox oil	500 cm³ (30.5 cu.in)
Transmission oil	380 cm³ (23.2 cu.in)
Fuel (reserve included)	17.2 l (4.6 gal)
Fuel reserve	3.3 l (0.87 gal)
Fork oil	520 ± 2.5 cm³ (31.7 ± 0.15 in) (for each stem)
Seats	2
Vehicle maximum load	210 kg (463 lb) (rider + passenger + luggage)

Electrical system

ELECTRICAL SYSTEM

Specification	Desc./Quantity
Candela interna (long life) (solo per versione 1100)	NGK PMR8B
Outer spark plug	NGK BPR6ES
Electrode gap	0.6 - 0.7 mm (0.024 - 0.028 in)
Battery	12 V - 18 Ampere/hour
(Permanent magnet) Generator	12V - 550W
Main fuses	30 A
Secondary fuses	3A - 15A - 20A
Tail light	12V - 5 W

Specification	Desc./Quantity
Low-/ High-beam light bulb (halogen)	12 V - 55 W/ 60 W H4
Turn indicators	12V - 10 W
Rear tail light / stop light	LED
Instrument panel lighting	LED
License plate light	12V - 5 W
Turn indicator warning light	LED
N gear warning light	LED
Alarm warning light - Gear shift	LED
Side stand down warning light	LED
Low fuel warning light	LED
High-beam warning light	LED
Oil pressure warning light	LED

Frame and suspensions

CHASSIS

Specification	Desc./Quantity
Type	double cradle, high strength steel tube chassis
Trail	108 mm (4.25 in)
Headstock angle	26° 30'
Front:	Upside-down hydraulic telescopic fork, Ø 43 mm (1.69 in), adjustable for spring preloading, compression and rebound damping.
Wheel travel	120 mm (4.72 in)
Rear	single sided arm suspension with progressive rising-rate linkage, single shock absorber with fully adjustable compression and rebound damping and spring preloading.
Wheel travel	110 mm (4.33 in)

Brakes

BRAKES

Specification	Desc./Quantity
Front:	twin Ø 320 mm (12.6 in) stainless steel floating disc, calliper with 4 different and counteracting plungers
Rear	Single stainless steel disc; Ø 282 mm (11.1 in)

Wheels and tyres

WHEELS AND TYRES

Specification	Desc./Quantity
Type	hollow 3-spoke rim in chilled cast aluminium alloy
Front wheel rim	3.50" x 17"
Rear wheel rim	5.50" x 17"
Tyres	METZELER Rennsport; MICHELIN Pilot Power; DUNLOP D208 RR PIRELLI Diablo Corsa;
Front:	120/70 - ZR 17" 58 W
Inflation pressure (front)	230 kPa (33.4 PSI)
Inflation pressure with passenger (front)	230 kPa (33.4 PSI)
Rear	180/55 - ZR 17" 73 W
Inflation pressure (rear)	250 kPa (36.3 PSI)
Inflation pressure with passenger (rear)	270 kPa (39.1 PSI)

Tightening Torques

HEAD UNIT

Name	Torque in Nm
Head conical cover	4 Nm
M8x42 Stud bolt	35 Nm
Set screw	- Nm
Nut	8 -11 Nm
M6x16 TE DA screw	6 -8 Nm
Stainless M6x25 TBEI screw	10 Nm
Stainless M5x16 TBEI flanged screw	6 -7 Nm
M12x1.5 head / oil temperature sensor	-
M10x1.5 head temperature sensor container	10 -12 Nm

TIMING SYSTEM UNIT

Name	Torque in Nm
M6x20 TE DA screw	8 -12 Nm
M18x1.5 Man. Nut	150 Nm
Belt tension	50 Nm

TORQUE

Name	Torque in Nm
M10x38 Stud bolt	40 Nm
Tie rod (valid up to engine No. KP12937)	42 Nm
Stud bolts (valid from engine No. KP12938)	15 Nm + 90° + 90°
M10x1.5 EA ZB Nut	40 -42 Nm
Head fixing screw (valid up to engine No. KP12937)	40 -42 Nm
Head fixing screw (valid from engine No. KP12938)	15 Nm + 90° + 90°
M8x75 stud bolt	35 Nm
M8x66 Stud bolt	35 Nm
M8x25 TE DA screw	25 Nm
M4x8 UNI 5933 TSPEI screw	5 Nm
M4x10 TCEI screw	25 Nm
M8x25 TE DA screw	25 Nm
M6x30 TCEI DA screw	8 -12 Nm
M8x55 TCEI DA screw compl.; 8.8 UNI 5931 Dacromet	23 Nm
M6x16 TCEI screw	8 -12 Nm
M6x30 TCEI DA screw	8 -12 Nm
M6x40 TCEI DA screw	8 -12 Nm
M6x60 TCEI DA screw	8 -12 Nm
M24x1.5 joint	40 Nm
M6x55 TCEI DA screw	8 -12 Nm
M6x20 TCEI DA screw	8 -12 Nm
M18x1.5 nipples fixing copper pipes	20 Nm
Cover with rod	- Nm
M10x1.5 Magnetic cover	20 Nm

LUBRICATION UNIT

Name	Torque in Nm
M8x30 TCEI DA Screw	25 Nm
M8x1.25 slot screw	15 -18 Nm
M18x1.5 Cover	40 Nm
M32x1.5 Cover	40 Nm

CRANK MECHANISM UNIT

Name	Torque in Nm
Connecting rod screw	60 ÷ 62 Nm
MF25x1.5 EBFM ZB Nut	120 Nm

CHASSIS ON ENGINE UNIT

Name	Torque in Nm
M6x40 TCEI DA screw	8 -12 Nm
Reduction	20 Nm

IGNITION UNIT

Name	Torque in Nm
M8x45 TCEI DA screw	22 Nm
M10x60 TCEI DA screw	see nut
M10x1.5 Flanged nut	30 Nm
M8x50 TBEI DA screw	- Nm
EBFM DA MF16x1.5 Nut	80 Nm
NGK BPR 6ES Spark plug	20 -30 Nm
NGK PMR8B Spark plug	13 -15 Nm
M6x16 TCEI screw	8 -12 Nm

FUEL SUPPLY CONTROL UNIT

Name	Torque in Nm
M5x12 TCEI screw	6 -7 Nm
Stainless steel M5x16 TBEI flanged screw	6 -7 Nm
M6x25 TCEI DA screw	8 -12 Nm

TRANSMISSION UNIT

Name	Torque in Nm
Clutch bell to gearbox tightening screws	13 Nm
Bearing on clutch bell retaining screws	10 Nm
Lock on clutch bell screws	24 Nm
Ring nut on clutch shaft	100 Nm
Idle sensor on gearbox housing	10 Nm
Magnetic cover	24 Nm
Oil filler cap	28 Nm
Joint for breather pipes	8 Nm

CHASSIS

Name	Torque in Nm
Front engine to chassis retainer	80 Nm
Transmission to chassis retainer (M12x250 + M12x230)	50 Nm
Right fixing plate - transmission retainer	25 Nm
Plate clamp - blow-by retainer	10 Nm
Coil plate retainer	10 Nm
Electronic control unit retainer	10 Nm
Bushings to electronic control unit retainer	10 Nm
Retainer for tank to chassis rear support rubber rings	Manual
Filter casing fixing bolts	10 Nm
Left and right footrest plate to chassis upper retainer	25 Nm
Left and right footrest plate to chassis lower retainer	18 Nm
Brake switch on plate retainer	Manual
Plate ring to plate retainer	6 Nm
Retainer for cable guide on right footrest plate	6 Nm

FOOTRESTS AND LEVERS

Name	Torque in Nm
Footrest rubber retainer	10 Nm
Rider footrest sliding pin M8	25 Nm
Passenger footrest support to lateral plates retainer	38 Nm
Rider heelrest to plates retainer	6 Nm
Passenger heelrest retainer	3 Nm
Rod retainer (nut)	10 Nm
Gear shift lever / brake pin retainer	10 Nm
Gear shift lever / pre-selector retainer	10 Nm
Gear shift lever - brake pin retainer	15 Nm

SIDE STAND

Name	Torque in Nm
Stand plate to engine upper retainer	50 Nm
Stand plate to engine lower retainer	25 Nm
Side stand retainer pin	10 Nm

Name	Torque in Nm
Switch fixing screw	10 Nm
Lock nut	30 Nm
Stand cable guide to engine retainer	50 Nm
Lateral lever arm retainer	10 Nm

FORK

Name	Torque in Nm
Fork on bushing clamp retainer	10 Nm
Fork on bevel gear pair retainer	50 Nm
Reaction rod to bevel gear pair retainer	50 Nm
Reaction rod to chassis retainer	50 Nm
Fork bolt to fork retainer	60 Nm
Preloading bushing to fork bolt retainer	10 Nm

FRONT SUSPENSION

Name	Torque in Nm
Tube lock plate to steering base retainer	6 Nm
Fork stem on upper plate retainer	18 Nm
Upper and lower screws fixing fork stem on lower plate	22 Nm
Central screw fixing fork stem on lower plate	20 Nm
Headstock ring nut	40 Nm
Headstock counter ring nut	manual + 90 degrees
Upper plate fixing cover	100 Nm
Fork hubs closing	25 Nm

REAR SUSPENSION

Name	Torque in Nm
Shock absorber to chassis retainer, 8.8	50 Nm
Double connecting rod/shock absorber retainer, 10.9	40 Nm
Single connecting rod/double connecting rod retainer, 10.9	50 Nm
Single connecting rod to chassis retainer, 8.8	50 Nm
Double connecting rod/fork retainer, 10.9	50 Nm

AIR FILTER CASING

Name	Torque in Nm
Exp. tank to engine spacer retainer	10 Nm
Blow by expansion tank to spacer retainer	10 Nm
Filter housing to chassis retainer	10 Nm

OUTLET

Name	Torque in Nm
Exhaust pipe to engine retainer	25 Nm
Silencer to chassis connecting pipe retainer	25 Nm
Silencer to footrest support retainer	25 Nm
Protection to connecting pipe retainer	10 Nm
Lambda probe retainer	38 Nm
Clamp retainer	10 Nm

FRONT WHEEL

Name	Torque in Nm
Wheel pin nut	80 Nm

REAR WHEEL

Name	Torque in Nm
Disc retainer	25 Nm
Rear wheel retainer, 10.9	110 Nm

FRONT BRAKING SYSTEM

Name	Torque in Nm
Front brake right and left calliper retainer	50 Nm

REAR BRAKING SYSTEM

Name	Torque in Nm
Rear brake calliper retainer	50 Nm
Rear brake fluid reservoir retainer	3 Nm
Rear brake fluid reservoir support to plate retainer	10 Nm
Rear brake rod lock nut	manual
Brake pump retainer	10 Nm

HANDLEBAR AND CONTROLS

Name	Torque in Nm
Retainer for handlebar lower U-bolts on steering upper plate	50 Nm
Retainer for handlebar upper U-bolts	25 Nm

Name	Torque in Nm
Anti-vibration weights retainer	10 Nm
Retainer for injection and brake pump U-bolts	10 Nm
Right and left light switch retainer	1.5 Nm
Clutch pump to transmission retainer	10 Nm
Rear-view mirror	Manual

ELECTRICAL SYSTEM

Name	Torque in Nm
Coil retainer	2 Nm
Horn retainer	15 Nm
Odometer sensor on bevel gear pair retainer	3 Nm

INSTRUMENT PANEL AND LIGHTS

Name	Torque in Nm
Instrument panel support to light support retainer	10 Nm
Instrument panel support to fork upper plate retainer	10 Nm
Instrument panel retainer	3 Nm
Light support to fork lower plate retainer	25 Nm
Retainer for front and rear arrows	10 Nm
Headlamp retainer	15 Nm
Rear light to tail clamp retainer	3 Nm

FUEL PUMP FLANGE

Name	Torque in Nm
Pump support to tank retainer	6 Nm
Tank breather joint	6 Nm

FUEL TANK

Name	Torque in Nm
Filler to tank retainer	5 Nm
Cap ring nut to tank retainer	5 Nm
Screws on cap ring nut (aesthetic)	5 Nm
Tank to chassis front retainer	10 Nm
Battery housing and tank to chassis rear retainer	6 Nm

CHASSIS/ FAIRINGS (FRONT)

Name	Torque in Nm
Front mudguard retainer	6 Nm

Name	Torque in Nm
Control unit protection retainer	6 Nm
Deflectors to chassis front upper retainer	Manual
Deflectors to chassis front lower retainer	Manual
Deflectors to chassis rear retainer	Manual
Retainer fixing the deflectors to deflector clamp	Manual

CHASSIS/ FAIRINGS (REAR)

Name	Torque in Nm
reflector to support retainer	4 Nm
reflector support to license plate holder retainer	4 Nm
License plate holder and light support retainer	4 Nm
License plate holder to lower clamp retainer	manual
Tail section to chassis lower clamp retainer	25 Nm
Fuse bracket and relay support retainer	4 Nm

FINISHINGS

Name	Torque in Nm
Ignition lock retainer - shear head screw	- Nm

Overhaul data

Assembly clearances

Cylinder - piston assy.

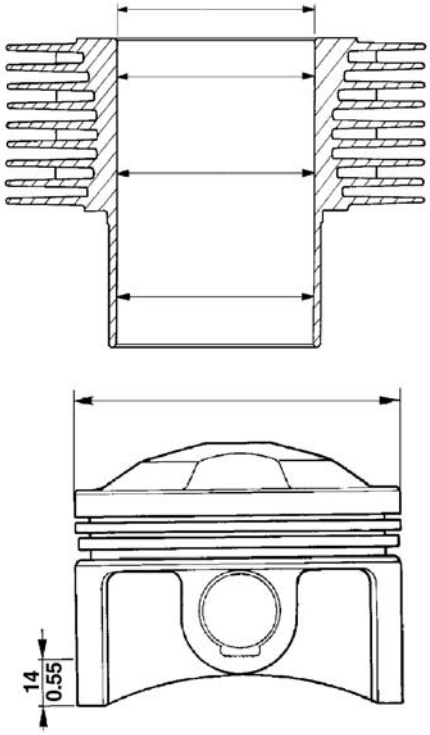
Measurement of the cylinder diameter must be done at three heights, turning the dial gauge 90°.

Check the clearance between the cylinders and pistons; if it is larger than indicated, it is necessary to replace cylinders and pistons.

The pistons of an engine must be balanced; a weight difference of up to 1.5 grams (0.0033 pounds) is admitted between them.

ADMITTED MEASUREMENTS

Specification	Desc./Quantity
cylinder diameter	92.000 - 92.020 mm (3.62204 - 3.62282 in)
piston diameter	91.947 - 91.967 mm (3.61995 - 3.62074 in)
fitting clearance	0.048 - 0.068 mm (0.00189 - 0.00268 in)



Piston rings

Check the sealing piston rings and the oil scraper.

On each piston there are:

1 upper piston ring;

1 middle stepped piston ring;

1 oil scraper piston ring.

The ends of the fitted piston rings are out of phase.

Fitting backlash detected between the ring thickness and seats on the piston:

Sealing rings and oil scraper 0.030 - 0.065 mm (0.00118 - 0.00256 in)

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

Upper sealing ring and stepped ring 0.40 - 0.65 mm (0.00158 - 0.00255 in)

Oil scraper ring 0.30 - 0.60 mm (0.00118 - 0.00236 in).

Turn the rings so that the junction ends are 120 degrees between them.

Crankcase - crankshaft - connecting rod

CAMSHAFT (CAM) SUPPORT DIAMETER AND THEIR SEATS ON THE BASE (TIMING SYSTEM SIDE)

Specification	Desc./Quantity
Shaft support diameter	47.000 - 46.984 mm (1.85039 ÷ 1.84976 inch)

Specification	Desc./Quantity
Seat diameter on base	47.025 - 47.050 mm (1.85137 ÷ 1.85236 inch)
fitting clearance	0.025 - 0.066 mm (0.00098 ÷ 0.00260 inch)

CAMSHAFT (CAM) SUPPORT DIAMETER AND THEIR SEATS ON THE BASE (FLYWHEEL SIDE)

Specification	Desc./Quantity
Shaft support diameter	32.000 - 31.984 mm (1.25984 ÷ 1.25921 inch)
Seat diameter on base	32.025 - 32.050 mm (1.26082 ÷ 1.26181 inch)
fitting clearance	0.025 - 0.066 mm (0.00098 ÷ 0.00260 inch)

TAPPET-SEAT COUPLING ON BASE DATA (PRODUCTION)

Specification	Desc./Quantity
Seats diameter	22.021 - 22.000 mm (0.86697 ÷ 0.86614 inch)
Tappet external diameter	21.996 - 21.978 mm (0.86598 ÷ 0.86527 inch)
Fitting clearances	0.004 - 0.043 mm (0.00016 ÷ 0.00169 in.)

Recommended products chart

RECOMMENDED PRODUCTS

Product	Description	Specifications
AGIP RACING 4T 10W-60	Engine oil	SAE 10W - 60. Top branded oils that meet or exceed the requirements of CCMC G-4 API SG specifications can be used as an alternative for recommended oils.
AGIP ROTRA MP 80 W 90	Transmission oil	-
AGIP ROTRA MP/S 85 W 90	Gearbox oil	-
AGIP FORK 5W or FORK 20W	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	Battery poles	

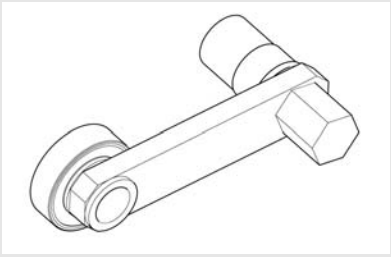
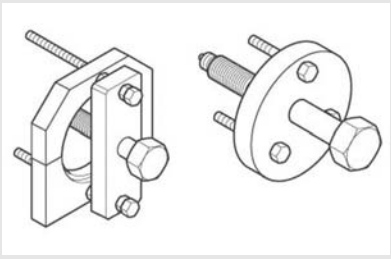
Product	Description	Specifications
jelly.		
AGIP BRAKE 5.1 DOT 4 (the braking system is also compatible with DOT 5)	Brake fluid	top branded fluids that meet or exceed the requirements of SAE J1703, NHTSA 116 DOT 4, ISO 4925 Synthetic fluid specifications can be used as an alternative for recommended fluids.

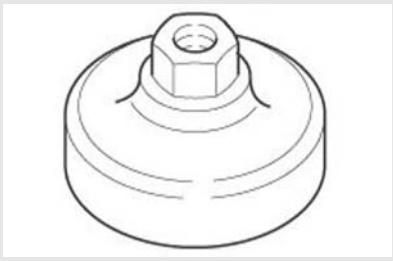
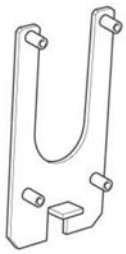
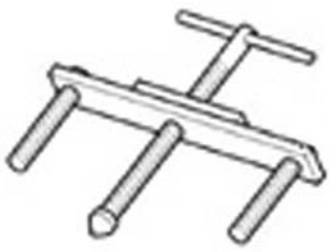
NOTE

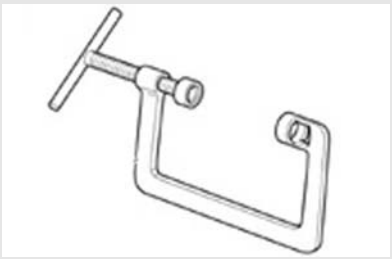
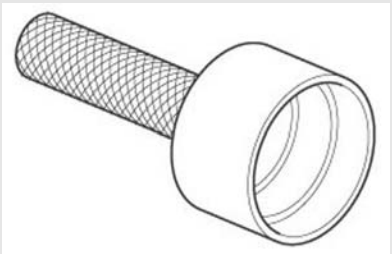
USE ONLY NEW BRAKE FLUID. DO NOT MIX DIFFERENT BRANDS OR TYPES OF OIL WITHOUT CHECKING THEIR BASE COMPATIBILITY.

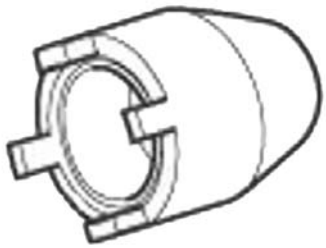
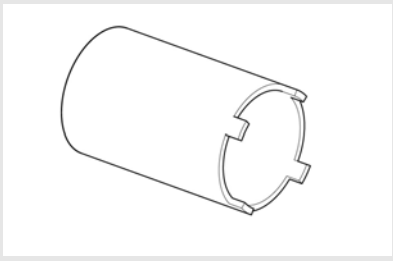
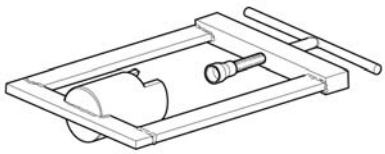
INDEX OF TOPICS

SPECIAL TOOLS

Stores code	Description	
06.94.86.00	belt tensioning tool	
05.91.17.30	Front cover insertion cone	
05.91.25.30	Gearbox opening	
05.90.19.30	Internal spark plug removal	
05.92.80.30	Piston ring clamp	
05.92.72.30	Timing system cover sealing ring punch	

Stores code	Description	
01.92.91.00	Wrench for removal of the cover on sump and filter	
14.92.96.00	Gearbox support	
19.92.96.00	Graduated dial to control ignition timing	
17.94.75.60	Arrow to control ignition timing	
12.91.18.01	Tool to lock the flywheel and start-up crown	
12.91.36.00	Tool to remove the flywheel side flange	

Stores code	Description	
10.90.72.00	Tool for valve removal and refitting	
30.90.65.10	Tool for clutch fitting	
14.92.71.00	Tool to fit the sealing ring on the flywheel side flange	
12.91.20.00	Tool to fit the flywheel side flange together with sealing ring on the crankshaft	
19.92.71.00	Tool to fit the sealing ring on the flywheel side flange	
14.92.73.00	Tool for camshaft gear sealing	

Stores code	Description	
65.92.84.00	Graduated dial hub	
05.91.26.30	Tool to tighten the fork pin ring nut	
AP8140190	Tool for steering tightening	
000019663300	Tool for clutch shaft removal	

INDEX OF TOPICS

Maintenance chart

NOTE

CARRY OUT THE MAINTENANCE OPERATIONS AT HALF THE INTERVALS SHOWN IF THE VEHICLE IS USED IN WET OR DUSTY AREAS, OFF ROAD OR FOR SPORTS APPLICATIONS.

AT EVERY START-UP

Action
Engine oil pressure warning light - check and clean, adjust, grease or replace if necessary

BEFORE EACH RIDE AND EVERY 2000 KM (1250 MILES)

Action
Brake pad wear - Check and clean, adjust, grease or replace if necessary

AFTER 1000 KM (625 MILES) RUN-IN

Action
Exhaust pipe flange bolts - Check and clean, adjust, grease or replace if necessary
Transmission cables and controls - Check and clean, adjust, grease or replace if necessary
Steering bearings and steering clearance - Check and clean, adjust, grease or replace if necessary
Brake discs - Check and clean, adjust, grease or replace if necessary
Engine oil filter - Replace
Fork - Check and clean, adjust, grease or replace if necessary
General vehicle operation - Check and clean, adjust, grease or replace if necessary
Braking systems - Check and clean, adjust, grease or replace if necessary
Light circuits - Check and clean, adjust, grease or replace if necessary
Safety switches - Check and clean, adjust, grease or replace if necessary
Gearbox oil - change
Engine oil - Replacement
Final transmission oil - Change
Tyres - Check and clean, adjust, grease or replace if necessary
Tyre pressure - Adjust
Engine revs at idle speed - Adjustment
Valve clearance adjustment - Adjust
Wheels - Check and clean, adjust, grease or replace if necessary
Bolt, nut and screw tightening - Check and clean, adjust, grease or replace if necessary
Battery terminal tightening - Check and clean, adjust, grease or replace if necessary
Cylinder synchronisation - Check and clean, adjust, grease or replace if necessary
Suspensions and trim - Check and clean, adjust, grease or replace if necessary

Action
Brake pad wear - Check and clean, adjust, grease or replace if necessary

EVERY 4 YEARS

Action
Fuel pipes - Replacement
Brake pipes - Replacement

EVERY 5000 KM (3125 MILES) - IF THE VEHICLE IS USED FOR RACING

Action
Outer spark plugs - Replace
Engine oil filter - Replace
Purge fluid present in oil drainage pipe from the filter housing - Clean
Clutch wear - Check and clean, adjust, grease or replace if necessary

EVERY 10000 KM (6250 MILES) OR 12 MONTHS

Action
Outer spark plugs - Replace
Gearbox oil - change
Idle mixture (CO) - Check and clean, adjust, grease or replace if necessary
Transmission cables and controls - Check and clean, adjust, grease or replace if necessary
Steering bearings and steering clearance - Check and clean, adjust, grease or replace if necessary
Wheel bearings - Check and clean, adjust, grease or replace if necessary
Brake discs - Check and clean, adjust, grease or replace if necessary
Air filter - Check and clean, adjust, grease or replace if necessary
Engine oil filter - Replace
General vehicle operation - Check and clean, adjust, grease or replace if necessary
Braking systems - Check and clean, adjust, grease or replace if necessary
Valve clearance adjustment - Adjust
Wheels - Check and clean, adjust, grease or replace if necessary
Bolt, nut and screw tightening - Check and clean, adjust, grease or replace if necessary
Cylinder synchronisation - Check and clean, adjust, grease or replace if necessary
Purge fluid present in oil drainage pipe from the filter housing - Clean
Final transmission oil - Change
Fuel pipes - Check and clean, adjust, grease or replace if necessary
Brake pipes - Check and clean, adjust, grease or replace if necessary
Clutch wear - Check and clean, adjust, grease or replace if necessary

AFTER THE FIRST 10,000 KM (6,250 MILES) AND THEN AFTER EVERY 20,000 KM (12,500 MILES)

Action
Fork oil - Change
Fork oil seals - Replace

EVERY 20,000 KM (12,500 MILES) OR 24 MONTHS

Action
Inner spark plugs - Replace
Alternator belt - Adjust; replace every 50,000 km
Air filter - Replace
Fork - Check and clean, adjust, grease or replace if necessary
Brake fluid - Change
Final transmission oil - Change
Gearbox oil - change
Suspensions and trim - Check and clean, adjust, grease or replace if necessary
Brake pad wear - Check and clean, adjust, grease or replace if necessary

Transmission fluid

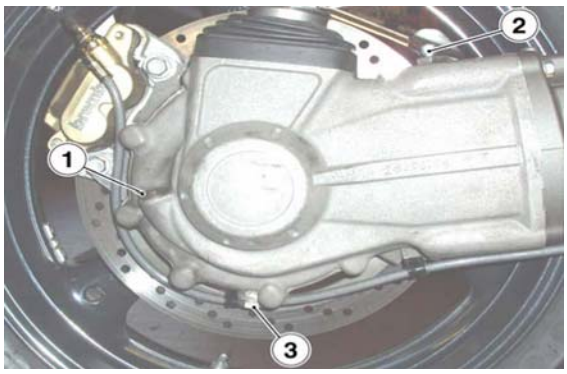
Check

• Keep the vehicle upright with both wheels on the ground.

• Unscrew and remove the level plug (1).

• The level is correct if the oil is close to the hole of the level plug (1).

• If the oil is lower than specified, top-up until it reaches the level plug hole (1).



CAUTION

DO NOT ADD ADDITIVES OR OTHER SUB-STANCES TO THE FLUID.WHEN USING A FUNNEL OR ANY OTHER ELEMENT, MAKE SURE IT IS PERFECTLY CLEAN.

Replacement

CAUTION

THE UNIT MUST BE HOT WHEN THE OIL IS CHANGED AS UNDER SUCH CONDITIONS OIL IS FLUID AND THEREFORE EASY TO DRAIN.

NOTE

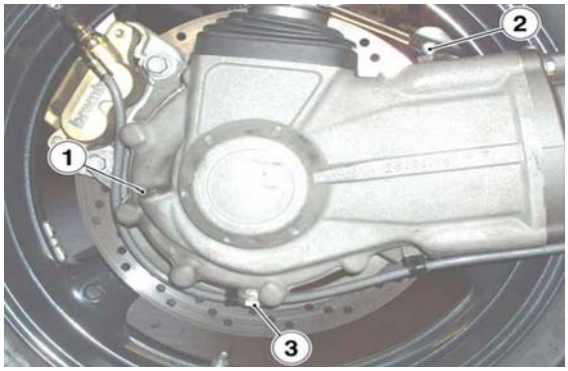
RIDE SOME km (miles) TO WARM UP ENGINE OIL

- Place a container with over 400 cm³ (25 in³) capacity under the drainage plug (3).
- Unscrew and remove the drainage plug (3).
- Unscrew and remove the breather cap (2).
- Drain the oil into the container; allow several minutes for oil to drain out completely.
- Check and replace, if necessary, the drainage plug sealing washer (3).
- Remove any metal scrap attached to the drainage plug magnet (3).
- Screw and tighten the drainage plug (3).
- Pour new oil through the filler (1) until it reaches the level plug hole (1).

CAUTION

DO NOT ADD ADDITIVES OR OTHER SUBSTANCES TO THE OIL. WHEN USING A FUNNEL OR ANY OTHER ELEMENT, MAKE SURE IT IS PERFECTLY CLEAN.

- Screw and tighten the caps (1 - 2).



Engine oil

Check

CAUTION

THE ENGINE MUST BE WARM TO CHECK ENGINE OIL LEVEL

NOTE

DO NOT LET THE ENGINE IDLE WITH THE VEHICLE AT STANDSTILL TO WARM UP THE ENGINE AND REACH THE OPERATING TEMPERATURE OF ENGINE OIL. OIL IS BEST CHECKED

AFTER RUNNING ABOUT 15 KM (10 MILES).

• Stop the engine.

• Keep the vehicle upright with both wheels on the ground.

• Unscrew and remove the dipstick (1).

• Clean the dipstick (1).

• Reinsert the dipstick (1) into its tube but do not screw it.

• Remove the dipstick (1).

• Check the oil level on the dipstick (1).

• Oil level is correct when it is close to the "**MAX**" mark.

MAX = maximum level

MIN = minimum level

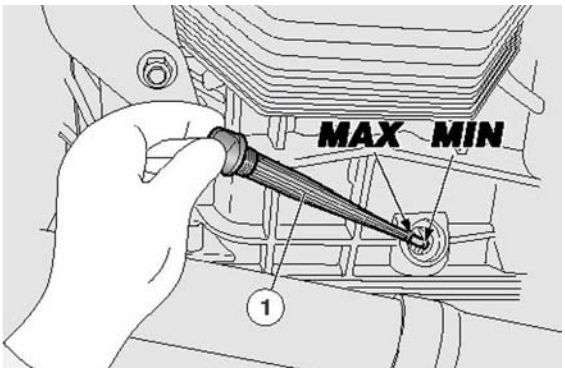
Add engine oil if required:

• Unscrew and remove the dipstick (1).

• Top-up with engine oil getting over the minimum level marked "**MIN**".

CAUTION

DO NOT ADD ADDITIVES OR OTHER SUBSTANCES TO THE OIL. WHEN USING A FUNNEL OR ANY OTHER ELEMENT, MAKE SURE IT IS PERFECTLY CLEAN.



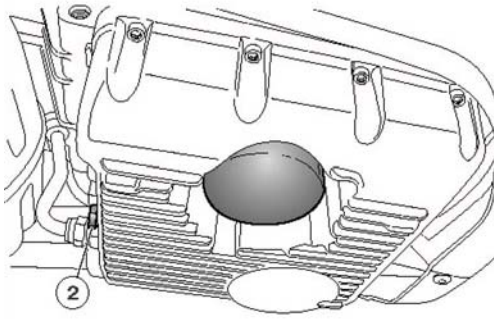
Replacement

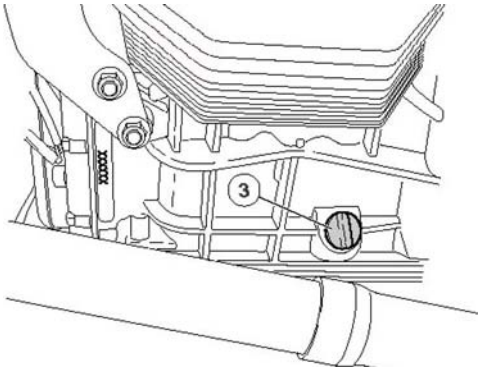
NOTE

HOT OIL IS MORE FLUID AND WILL DRAIN OUT MORE EASILY AND COMPLETELY.

• Place a container with +4000 cm³ capacity under the drainage plug (2).

• Unscrew and remove the drainage plug (2).





• Unscrew and remove the filler cap (3).

• Drain the oil into the container; allow several minutes for oil to drain out completely.

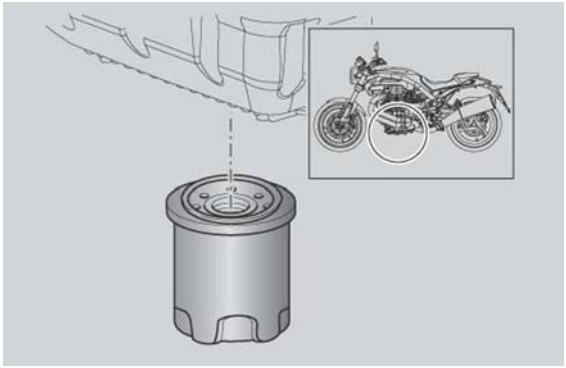
• Check and replace, if necessary, the drainage plug (2) sealing washers.

• Remove any metal scrap attached to the drainage plug (2) magnet.

• Screw and tighten the drainage plug (2).

• Pour new oil until getting over the minimum level marked "MIN".

Engine oil filter



• Unscrew and remove the engine oil filter from its seat.

NOTE

NEVER REUSE A FILTER.

• Spread a thin layer of oil on the sealing ring of the new engine oil filter.

• Fit and screw the new oil filter in its seat.

Gearbox Oil

Inspection

CHECKING AND TOPPING UP

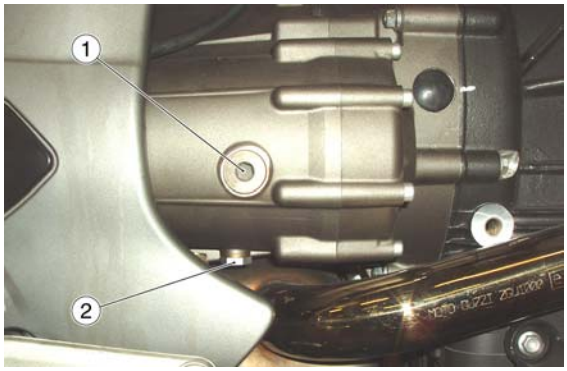
CAUTION

THE ENGINE MUST BE WARM TO CHECK GEARBOX OIL LEVEL.

NOTE

DO NOT LET THE ENGINE IDLE WITH THE VEHICLE AT STANDSTILL TO WARM UP THE ENGINE AND REACH THE OPERATING TEMPERATURE OF ENGINE OIL. OIL IS BEST CHECKED AFTER RUNNING FOR ABOUT 15 KM (10 MILES).

- Stop the engine.
- Keep the vehicle upright with both wheels on the ground.
- Unscrew and remove the cap/dipstick (1) placed on the gearbox right side.
- • The level is correct if the oil is on the rim of the hole of the level plug (1).



If necessary:

- Top-up with oil until it reaches the dip-stick opening (1).

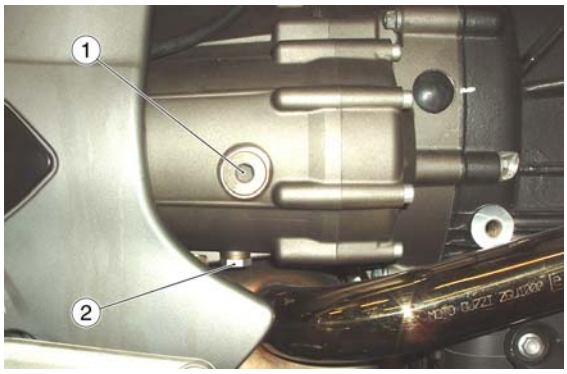
CAUTION

DO NOT ADD ADDITIVES OR OTHER SUB-STANCES TO THE OIL. WHEN USING A FUN-NEL OR ANY OTHER ELEMENT, MAKE SURE IT IS PERFECTLY CLEAN.

Replacement

NOTE

HOT OIL IS MORE FLUID AND WILL DRAIN OUT MORE EASILY AND COMPLETELY.



• Place a container with suitable capacity under the drainage plug (2).
• Unscrew and remove the drainage plug (2).
• Unscrew and remove the filler cap (1).
• Drain the oil into the container; allow several minutes for oil to drain out completely.
• Check and replace, if necessary, the drainage plug (2) sealing washers.
• Remove any metal scrap attached to the drain-age plug (2) magnet.
• Screw and tighten the drainage plug (2).
• Fill with new oil until it reaches the dipstick hole (1).
• Tighten the filler cap (1).

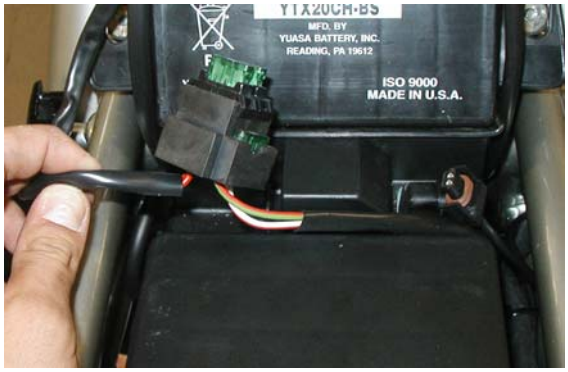
CAUTION

DO NOT ADD ADDITIVES OR OTHER SUBSTANCES TO THE OIL. WHEN USING A FUNNEL OR ANY OTHER ELEMENT, MAKE SURE IT IS PERFECTLY CLEAN.

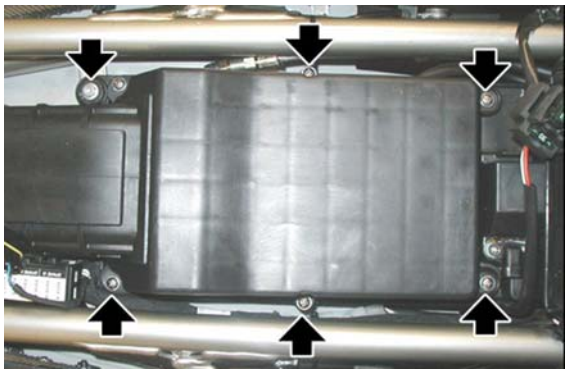
Air filter

- Disconnect the air temperature sensor connector.

- Slide off and remove the main fuse box from its holder.

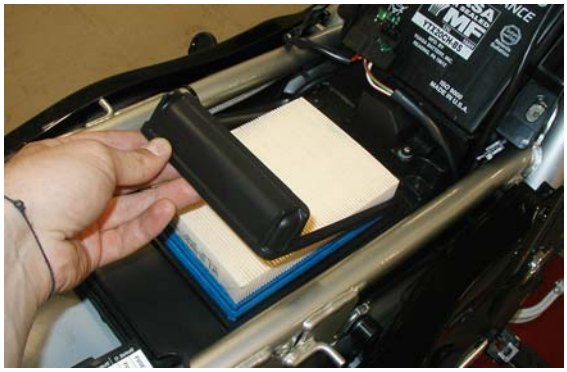


- Unscrew and remove the six screws.

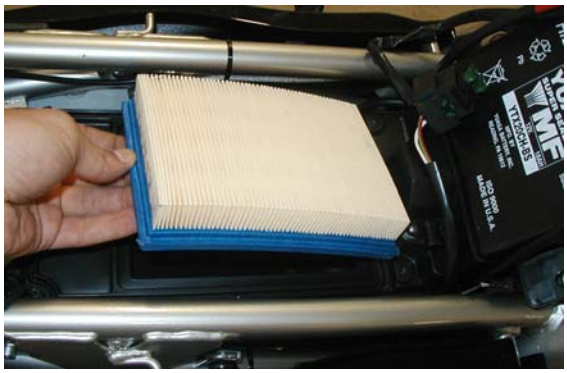


- Lift the filter housing cover.

- Remove the air filter frame.



- Remove the air filter.
- Cover the inlet duct with a clean cloth so that no foreign bodies get into the inlet ducts.



DO NOT START THE ENGINE WITHOUT THE AIR FILTER.
TO CLEAN THE FILTERING ELEMENT, USE A PRESSURE AIR JET FROM THE INSIDE TO THE OUTSIDE.

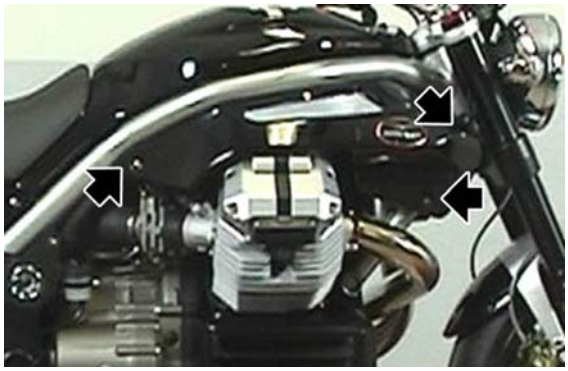
Checking the valve clearance

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

NOTE

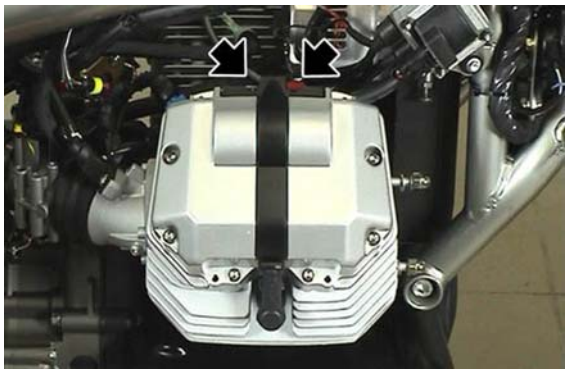
ADJUST WITH COLD ENGINE, WITH PISTON AT TOP DEAD CENTRE (TDC) IN COMPRESSION STROKE (VALVES CLOSED).

- Unscrew and remove the three screws and remove the fairing.



- Working on both sides, unscrew and remove the two external screws and remove the spark plug cap.

- Working from both sides, unscrew and remove the two internal screws and remove the insert.



- Disconnect both spark plug tubes.

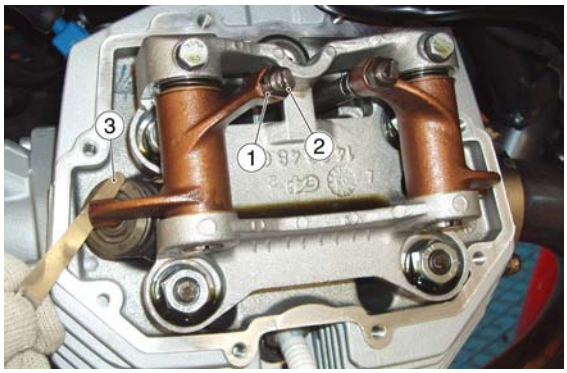
- Unscrew and remove the eight screws.
- Remove the head cover.

- Loosen the nut (1).
- Use a screwdriver 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 thickness gauge (3).



CAUTION

IF CLEARANCE IS LARGER THAN RECOMMENDED, THE TAPPET WILL BE NOISY. OTHERWISE, THE VALVES DO NOT CLOSE CORRECTLY, WHICH CAN LEAD TO PROBLEMS SUCH AS:

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

Braking system

Level check

Brake fluid check

- Rest the vehicle on its stand.
- For the front brake, turn the handlebar fully to the right.
- For the rear brake, keep the vehicle upright so that the fluid in the reservoir is at the same level with the plug.
- Make sure that the fluid in the reservoir is above the "
- MIN

" mark:

MIN = minimum level

MAX = maximum level

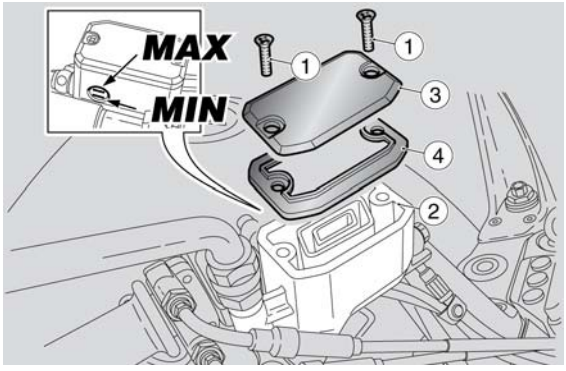
If the fluid does not reach at least the "**MIN**" reference mark:

- Check the break pads and disc for wear.
- If the pads and/or the disc do not need replacing, top-up the fluid.
- If the pads and/or the disc need replacing, check the brake fluid and top-up if necessary.

Top-up

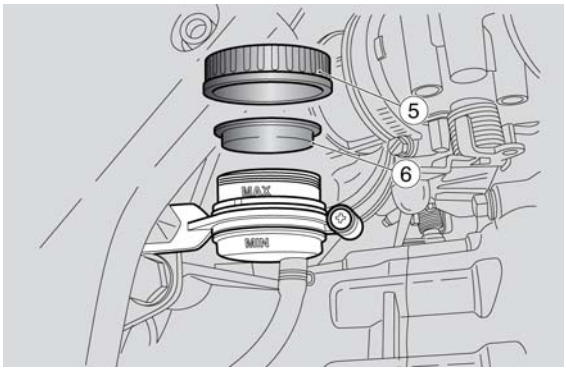
Front brake:

- Unscrew the two screws (1) of the brake fluid reservoir (2) using a Phillips screwdriver.
- Lift and remove the cover (3) and the screws (1) as well.
- Remove the gasket (4).



Rear brake:

- Unscrew and remove the cover (5).
- Remove the gasket (6).



Top-up the reservoir with brake fluid to the correct level, which is between the two "MIN" and "MAX" reference marks.

RISK OF BRAKE FLUID SPILLAGE. DO NOT OPERATE THE BRAKE LEVER WITH BRAKE FLUID RESERVOIR CAP LOOSENED OR REMOVED.

AVOID PROLONGED AIR EXPOSURE OF THE BRAKE FLUID. BRAKE FLUID IS HYGROSCOPIC AND ABSORBS MOISTURE WHEN IN CONTACT WITH AIR. LEAVE THE BRAKE FLUID RESERVOIR OPEN ONLY FOR THE TIME NEEDED TO COMPLETE THE TOPPING UP PROCEDURE.

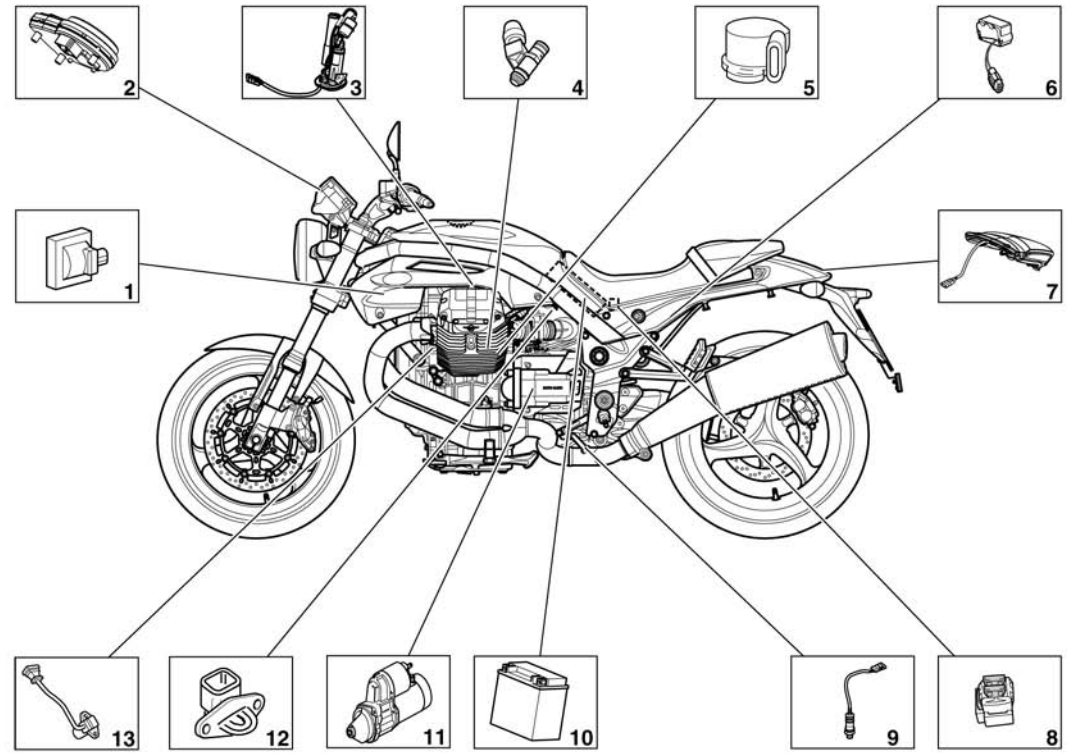
TO AVOID SPILLING FLUID WHILE TOPPING-UP, KEEP THE TANK PARALLEL TO THE RESERVOIR EDGE (IN HORIZONTAL POSITION).
DO NOT ADD ADDITIVES OR OTHER SUBSTANCES TO THE LIQUID.
WHEN USING A FUNNEL OR ANY OTHER ELEMENT, MAKE SURE IT IS PERFECTLY CLEAN.

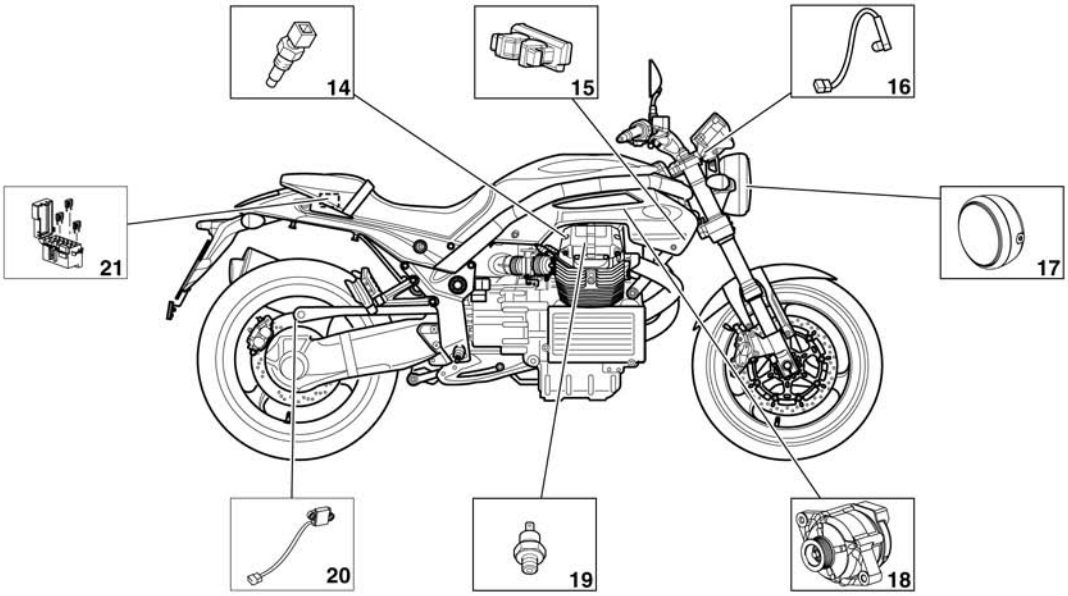
DO NOT EXCEED THE "MAX" LEVEL MARK WHEN TOPPING UP.
TOP-UP TO "MAX" LEVEL MARK ONLY WHEN BRAKE PADS ARE NEW. WHEN TOPPING UP DO NOT EXCEED THE "MAX" LEVEL MARK WHEN BRAKE PADS ARE WORN AS YOU RISK SPILLING FLUID WHEN CHANGING THE BRAKE PADS.
CHECK BRAKING EFFICIENCY. IN CASE OF EXCESSIVE TRAVEL OF THE BRAKE LEVER

OR POOR PERFORMANCE OF THE BRAKING CIRCUIT, TAKE YOUR VEHICLE TO AN OFFICIAL MOTO GUZZI DEALER, AS IT MAY BE NECESSARY TO PURGE THE AIR IN THE CIRCUIT.

INDEX OF TOPICS

Components arrangement





Key:

1 Coil

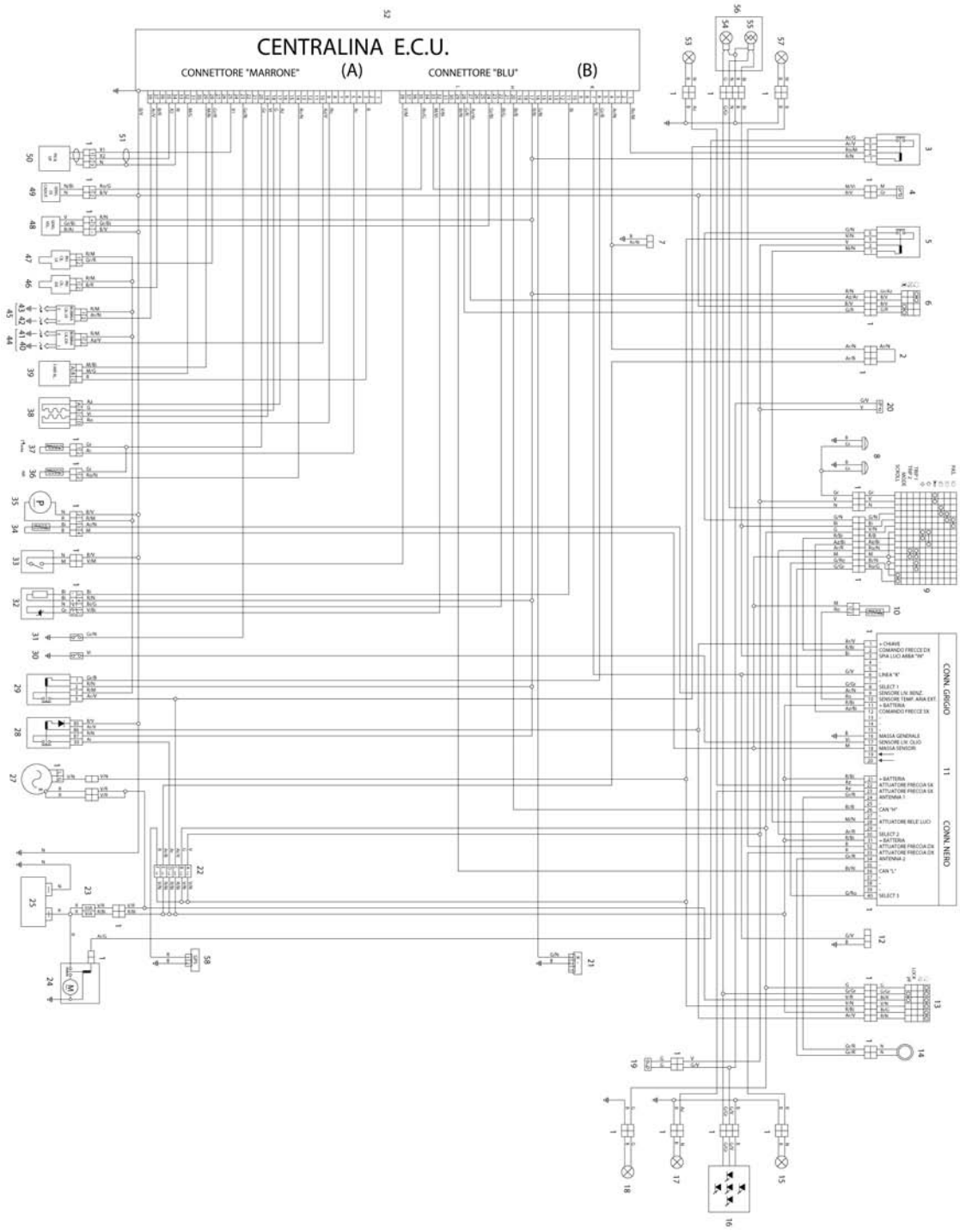
2 Instrument panel

3 Fuel pump

4 Injector
5 Throttle valve potentiometer
6 Fall sensor
7 Rear light
8 Main fuses
9 Lambda probe
10 Battery
11 Starter motor
12 Intake air temperature sensor
13 Engine revolution sensor
14 Head temperature sensor
15 Engine control unit
16 Instrument panel air temperature sensor
17 Front headlamp
18 Alternator
19 Oil pressure sensor
20 Speed sensor
21 Secondary fuses

Electrical system installation

General wiring diagram



Key:

1 Multiple connectors

2 Diode pre-installation

3 Start-up relay

4 Clutch switch

5 Lights relay

6 Right light switch

7 Condenser pre-installation

8 Horn

9 Left light switch

10 Instrument panel air temperature thermistor

11 Instrument panel

12 Instrument panel diagnosis

13 Key switch

14 Immobilizer aerial

15 Right rear turn indicator

16 Rear light (with LED)

17 Left rear turn indicator

18 License plate light

19 Rear stop switch

20 Front stop switch

21 (ECU) Diagnosis connector

22 Secondary fuses

23 Main fuses

24 Starter motor

25 Battery

26 -

27 Alternator

28 Main injection relay

29 Secondary injection relay

30 Oil pressure bulb

31 Gear in neutral switch

32 Lambda probe

33 Side stand switch

34 Fuel reserve sensor

35 Fuel pump

36 Intake air temperature thermistor

37 Head temperature thermistor

38 Automatic air

39 Throttle sensor

40 Right cylinder inner spark plug

41 Right cylinder outer spark plug

42 Left cylinder inner spark plug

43 Left cylinder outer spark plug

44 Right cylinder double coil

45 Left cylinder double coil

46 Right cylinder injector

47 Left cylinder injector

48 Speed sensor

49 Fall sensor

50 Flywheel pick up

51 Pick up cable shielding

52 ECU control unit

53 Left front turn indicator

54 Tail light bulb

55 Low-/high-beam light bulb

56 Front headlamp

57 Right front turn indicator

58 GPS attachment (if fitted)

Cable colour:

Ar orange

Az sky blue

B blue

Bi white

G yellow

Gr grey

M brown

N black

R red

Ro pink

V green

Vi violet

Checks and inspections

Dashboard

Diagnosis

Changing the CODE

If you know the code, just enter it and then a new code that will be automatically stored in the memory. If the vehicle is new, the user code is: 00000

Resetting the CODE

This function is used to set a new code when the old one is not available; in this case, at least two of the programmed keys have to be inserted in the ignition lock.

After the first key has been inserted, the second one is requested with the following message:

INSERT KEY II

If the second key is not inserted within 20 seconds, the operation is finished.

After recognising the second key, the new code is required with the message:

ENTER NEW CODE

Once the operation is finished, the instrument panel goes back to the SET-UP menu.

DIAGNOSIS

Access to this menu (diagnosis functions), for the technical service only, after requesting a service code.

It will read: ENTER SERVICE CODE. The code for Griso 1100 is: **12425**

The functions in this menu are

- Exit
- ECU Diagnosis
- Instrument panel errors
- Delete errors
- Reset Service
- Update
- Key change
- km / miles

ECU ERRORS

The instrument panel receives only the current errors from the control unit.

Description Error code

Throttle Valve Error DC V DC ECU 10

Throttle Valve Error DC Grnd ECU 11

Engine Temperature Error DC V DC ECU 14

Engine Temperature Error DC Grnd ECU 15

Air Temperature Error DC V DC ECU 16

Air Temperature Error DC Grnd ECU 17

Low Battery Error ECU 20

Lambda Probe Error ECU 21

Coil 1 Error DC V DC ECU 22

Coil 1 Error DC Grnd ECU 23

Coil 2 Error DC V DC ECU 24

Coil 2 Error DC Grnd ECU 25

Injector 1 Error DC V DC ECU 26

Injector 1 Error DC Grnd ECU 27

Injector 2 Error DC V DC ECU 30

Pump Relay Error ECU 36

Local Loop-back Error ECU 37

Start-up Remo. Error DC V DC ECU 44

Remo. Error Start-up DC Grnd ECU 45

Canister Error DC V DC ECU 46

Canister Error DC Grnd ECU 47

Battery Error Hig ECU 50

Generic ECU Error ECU 51

Rpm Sensor Error ECU 54

Self-adaptability Value Error ECU 55

Vehicle Speed Error ECU 56

Stepper Error AC ECU 60

Stepper Error DC V DC ECU 61

Stepper Error DC Grnd ECU 62

Not recognised error ECU 00

INSTRUMENT PANEL ERRORS

In this mode a chart is displayed showing potential errors in the immobilizer and its sensors.

This is the error decoding chart:

Description: Immobilizer failure: Key code read but not recognised. Error code: DSB 01

Description: Immobilizer failure: Key code not read (Key not inserted or transponder broken) Error code: DSB 02

Description: Immobilizer failure: Aerial not working (Open or short-circuited). Error code: DSB 03

Description: Immobilizer failure: Internal controller failure. Error code: DSB 04

Description: - Error code: DSB 05

Description: Air temperature sensor failure. Error code: DSB 06

Description: Oil sensor failure. Error code: DSB 07

Description: Oil pressure anomaly. Error code: DSB 08

The instrument panel keeps all previous errors stored in its **memory**.

DELETE ERRORS

This option deletes instrument panel errors only, a further confirmation is requested.

INSTRUMENT PANEL SOFTWARE UPGRADE

This function is used to program the instrument panel again with a new software through Axone. The Display reads: "Instrument panel disconnected. Now connect the diagnosis instrument"; the instrument panel will connect normally after the key is extracted-inserted.

The white connector is placed under the saddle, beside the fuse box, close to the diagnosis connector for the injection system.

Use the Ditech connector in the Axone 2000 **Aprilia-Moto Guzzi** package to connect to the Axone cable.

KEY CHANGE FUNCTION

This function can be used:

1) if one key is lost; the dealer can disable this key;

2) to activate up to 4 keys;

3) should a new key lock be necessary and thus program the new set of keys.

In the first phase the user code must be entered and, after confirming the inserted key (key I) has been programmed, the other keys must be entered too.

The procedure finishes once the 4 keys have been programmed or after 20 seconds.

Should a new key lock be necessary, the procedure is: once the key is set to ON but the instrument panel does not recognise it, the user code is requested: enter the user code.

Now enter MENU, DIAGNOSIS (entering the service code), KEY CHANGE and program the new keys.

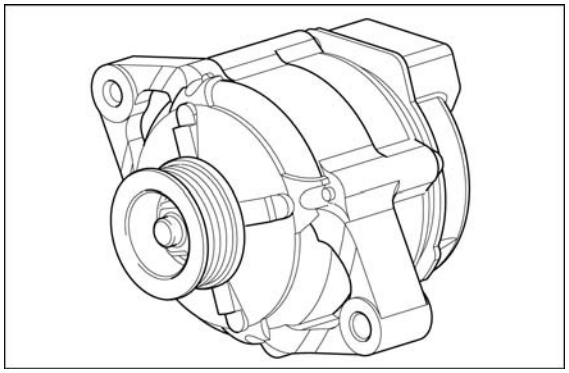
Battery recharge circuit

Checking the stator

Single-phase generator with regulated voltage

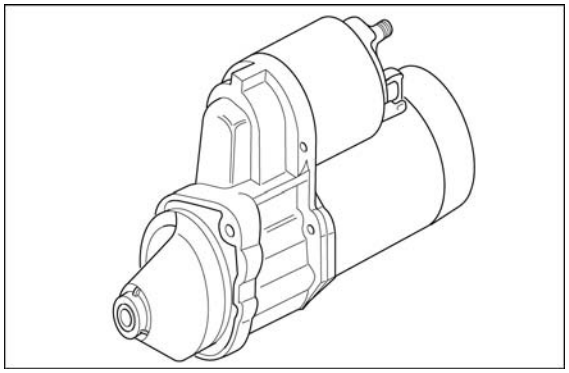
Maximum load 40A (550W)

Charging voltage 14.2 - 14.8 V (5000 rpm)



Starter motor

pick-up input about 100 A



level indicators

Petrol pump:

Input: 3.5 A (to be measured between pins 1 and 2 with 12V voltage

Fuel level sensor:

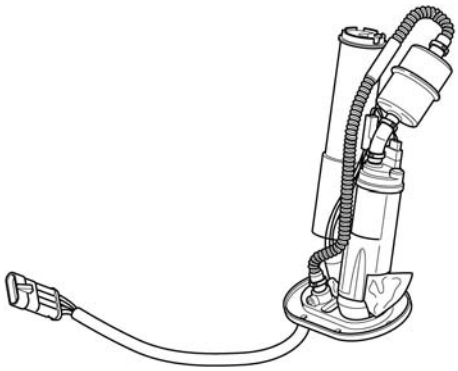
Resistance (to be measured between pins 3 and 4)

250-300 Ohm with fuel level equal to 0 litre

100 Ohm with fuel level equal to 11.25 litres (20.43 pt)

10-20 Ohm with fuel level equal to 22.5 litres (40.86 pt)

The low fuel warning light turns on with values over 230 Ohm.



In case there is anomaly on the fuel probe, the low fuel warning light flashes on the instrument panel. The alarm warning light on the instrument panel does not light up and the word Service is not displayed.

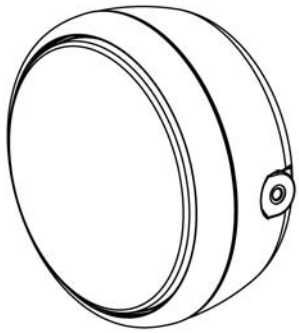
Lights list

FRONT HEADLAMP

Tail light: 12V - 5W

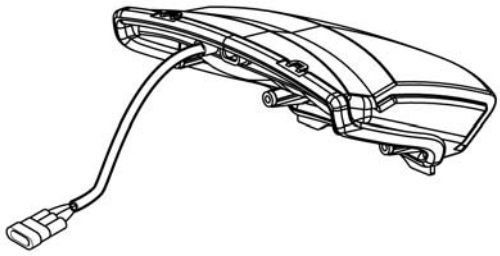
Low-beam light: 12V - 55W

High-beam light: 12 V - 60 W H4



REAR LIGHT

LED



Fuses

SECONDARY FUSES

A - Stop, horn, light relay coil (15 A).

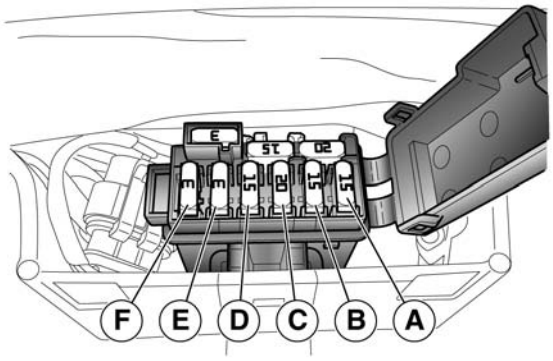
B - Tail lights, license plate light, passing (15 A).

C - Fuel pump, coils, injectors, start-up relay (20 A).

D - Lambda burner, secondary injection relay coil, start-up relay coil, speed sensor power supply, ECU control unit power supply, engine kill (15 A).

E - Permanent positive, ECU power supply (3A).

F - "Tom - Tom" (3A) (if fitted)



NOTE

THERE ARE THREE SPARE FUSES (3, 15, 20 A).

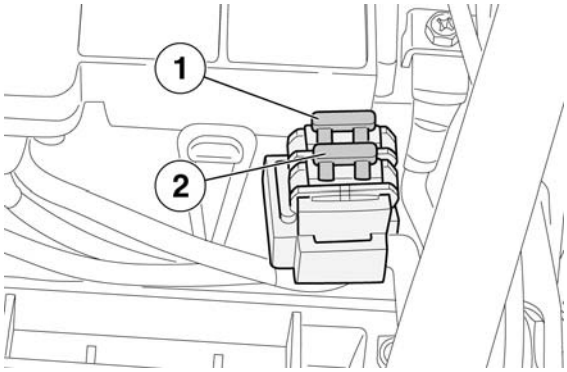
MAIN FUSES

1 - From battery to voltage regulator (30 A).

2 - From battery to key and secondary fuses C - D (30 A).

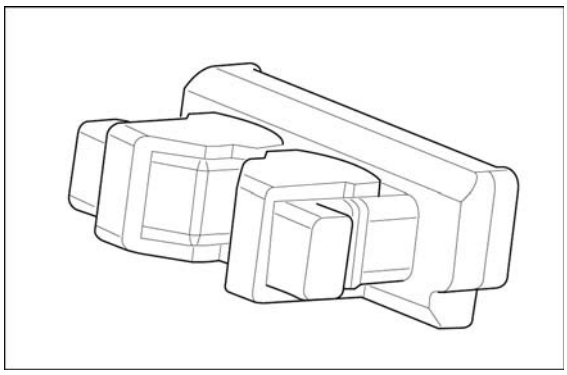
NOTE

THERE IS ONE SPARE FUSE.



Control unit

Model: Magneti Marelli IAW 5 AM2



Black connector pins

Pin Use

1 Not used

2 Not used

3 Ignition potentiometer signal

4 Not used

5 Engine temperature signal

6 Not used

7 Not used

8 Not used

9 Stepper motor (+)

10 Right cylinder coil control

11 Not used

12 Not used

13 Not used

14 Air temperature signal

15 Not used

16 Not used

17 Stepper motor (+)

18 Stepper motor (-)

19 Stepper motor (-)

20 5V power supply (NTC sensors)

21 Not used

22 Not used

23 Neutral sensor signal

24 Not used

25 Engine revolution sensor signal

26 Not used

27 Not used

28 Left cylinder injector control

29 Ignition potentiometer power supply

30 Not used

31 Not used

32 Ignition potentiometer negative

33 Not used

34 Revolution sensor anti-jamming cable

35 Engine revolution sensor signal

36 Not used

37 Right cylinder injector control

38 Left cylinder coil control

Grey connector pins

Pin Use

1 Pin 85 ignition relay control

2 Not used

3 Not used

4 Power supply protected from instrument panel

5 Not used

6 Pin 86 auxiliary relay control

7 Immobilizer line

8 Pin 85 ignition relay control

9 Not used

10 Not used

11 Oxygen probe negative control

12 Not used

13 Not used

14 Not used

15 Not used

16 K line (diagnosis)

17 Power supply from main relay

18 Not used

19 Not used

20 CAN - H line (ccm/instrument panel)

21 Not used

22 Oxygen probe signal

23 Not used

24 Vehicle speed signal input

25 Not used

26 Not used

27 "Engine stop" signal input

28 Ignition signal input

29 CAN - L line (ccm/instrument panel)

30 Not used

31 Not used

32 Oxygen probe power supply

33 Clutch sensor signal

34 Not used

35 Fall sensor signal

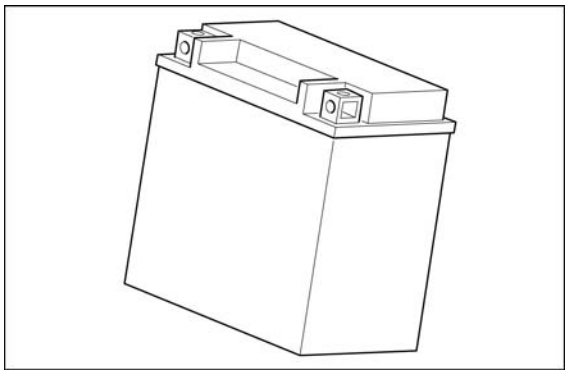
36 Not used

37 Not used

38 Side stand sensor signal

Battery

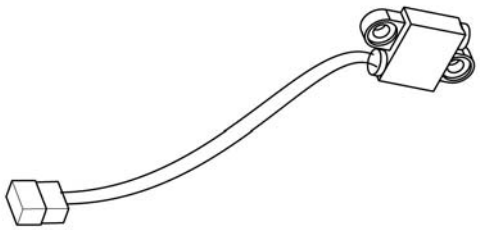
12 V - 18 Ampere/hour



Speed sensor

Active inductive sensor

3-pin connector (Power supply - Signal-Earth connection).



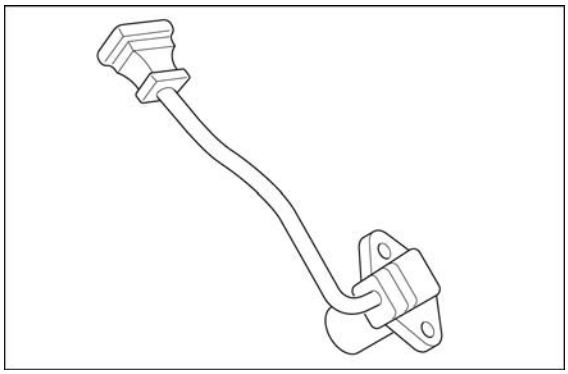
Engine rpm sensor

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

Inductive type sensor, with three-way connector:

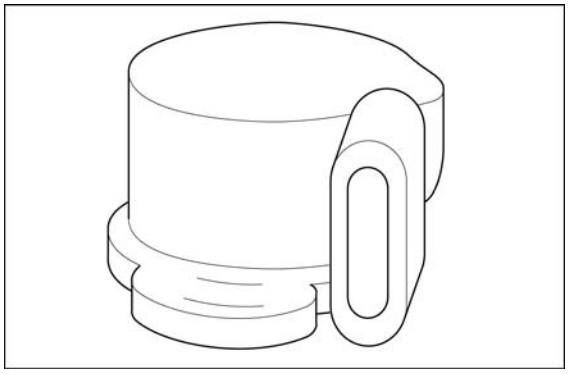
- positive voltage pin;
- negative voltage pin: resistance from 650 to 720 Ohm (to be measured between pins 1 and 2);
- shielding pin.

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)



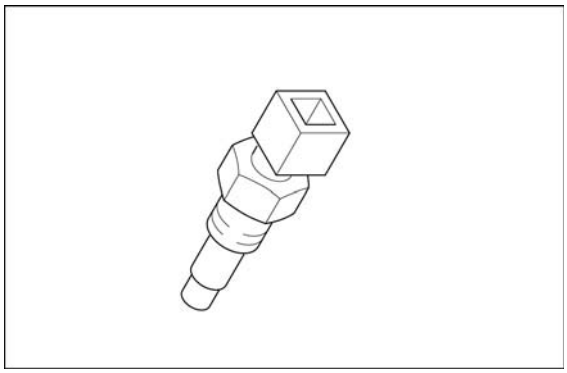
Engine temperature sensor

This sensor, 5V powered, features NTC specifications and sends the control unit a signal which var-

ies 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 (-40 °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
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



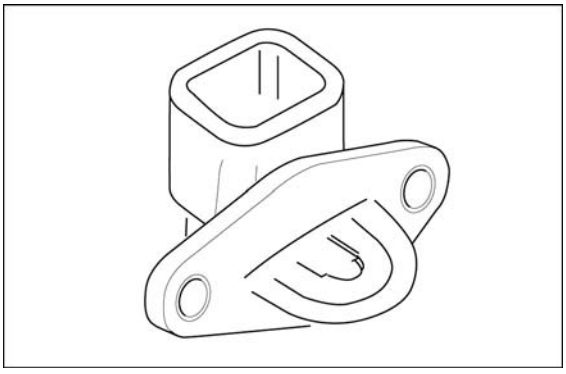
Air temperature sensor

NTC type sensor

AIR TEMPERATURE SENSOR RESISTANCE

	Specification	Desc./Quantity
1	Resistance at -40 °C (-40 °F)	100.950 kOhm

	Specification	Desc./Quantity
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

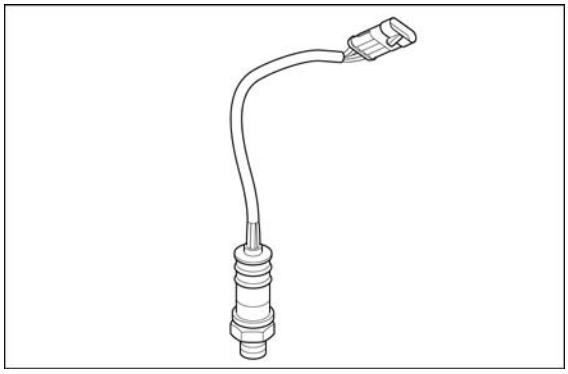


Lambda sensor

Oxygen sensor with heater.

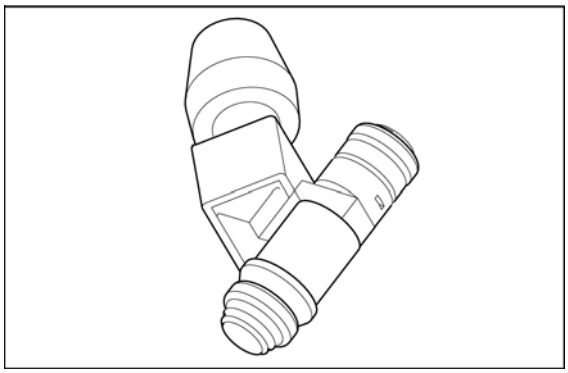
Sensor voltage between 0 and 0.9 V (to be measured between pins 1 and 2).

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

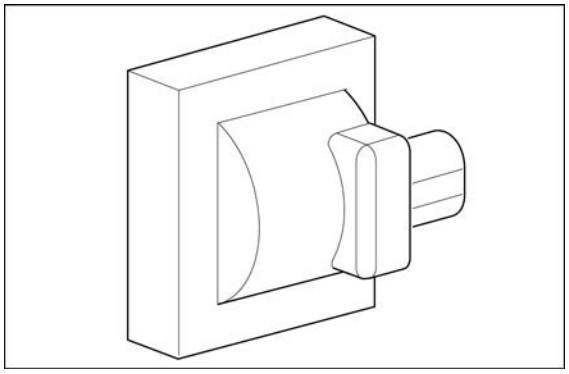
Characteristic

Primary resistance:

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

Secondary resistance:

6.5 - 7.2 KΩ.



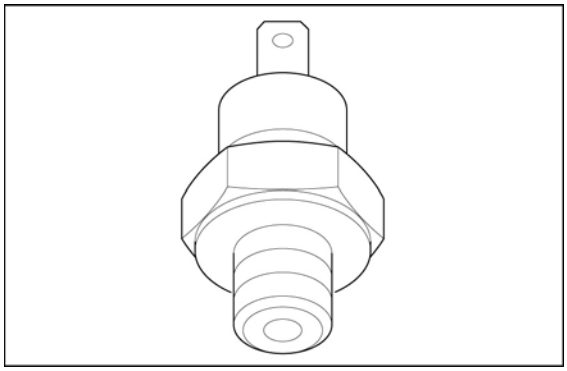
Engine oil pressure sensor

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.

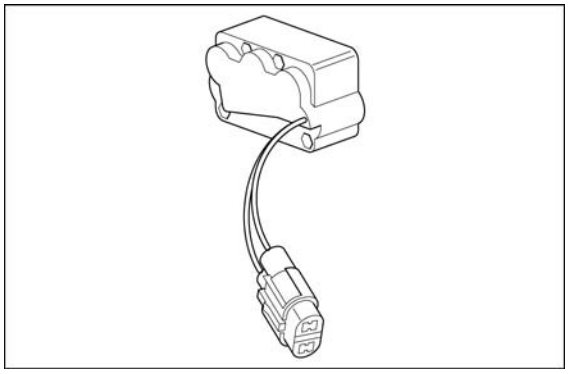
At lower rpm, there is an anomaly when the sensor remains closed for at least 300 seconds.

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

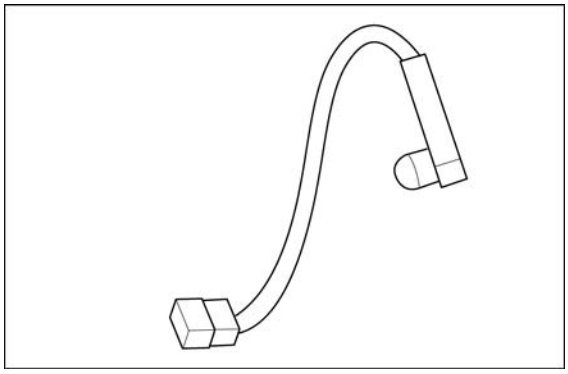
Characteristic

Resistance

10 kOhm (at 25°C - 77°F)

Resistance

32.5 kOhm (at 0°C - 32°F)



Connectors

Dashboard

The pin configuration of the grey-bodied connector is as follows:

PIN USE

1 + KEY

2 RIGHT TURN INDICATOR CONTROL

3 HIGH-BEAM LIGHT INPUT

4 -

5 -

6 K LINE

7 -

8 SELECT 1 - SET

9 FUEL LEVEL SENSOR

10 AIR TEMPERATURE SENSOR

11 + BATTERY

12 LEFT TURN INDICATOR CONTROL

13 -

14 -

15 -

16 GENERAL EARTH CONNECTION

17 OIL PRESSURE SENSOR INTAKE

18 SENSORS EARTH CONNECTION

19 GENERAL GROUND (OPTIONAL)

20 GENERAL GROUND (OPTIONAL)

The pin configuration of the black-bodied device is as follows:

PIN USE

21 + BATTERY

22 LEFT FRONT TURN INDICATOR ACTIVATION

23 LEFT REAR TURN INDICATOR ACTIVATION

24 AERIAL 1

25 -

26 CAN H

27 -

28 LIGHTS RELAY ACTIVATION

29 -

30 SELECT 2

31 + BATTERY

32 RIGHT FRONT TURN INDICATOR ACTIVATION

33 RIGHT REAR TURN INDICATOR ACTIVATION

34 AERIAL 2

35 -

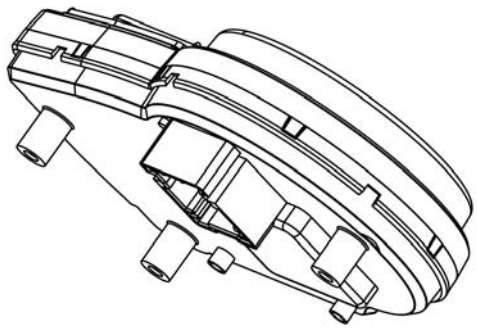
36 CAN L

37 -

38 -

39 -

40 SELECT 3



INDEX OF TOPICS

Vehicle preparation

Before removing the engine block, proceed as follows:

- Hold the vehicle steady with a stand from the front and belts fixed to a hoist from the rear.
- Place the engine service stand under the oil sump.
- Remove the whole exhaust, the air filter housing, the fork together with the cardan shaft, the fuel tank side fairings, the spark plug covers and disconnect the spark plug tubes.
- Empty the clutch control fluid through the bleed pipe located under the saddle.

Removing the engine from the vehicle

- Working on both sides disconnect the injector connectors

- Disconnect the throttle cables.

- Disconnect the idle motor connector.

- Disconnect the engine temperature sensor connector

- Disconnect the throttle valve position sensor connector

- Unscrew and remove the two screws and collect the washer.

- Disconnect the revolution sensor connector and collect the gasket.

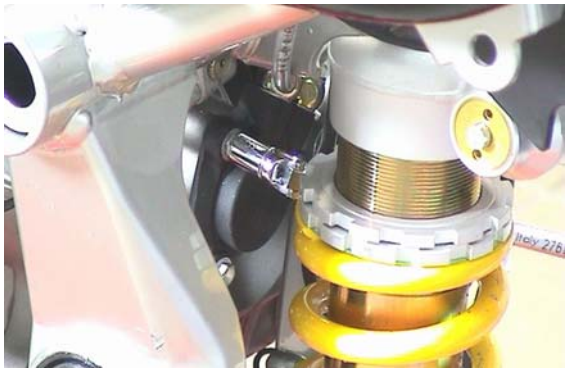
- Disconnect the alternator connectors.

- Disconnect the neutral sensor connector.

- Unscrew and remove the two screws and collect the washers.
- Remove the starter motor cover.
- Unscrew and remove the screw.
- Disconnect the ground leads.

- Disconnect the starter motor connectors.

- Unscrew and remove the three screws and remove the clutch control cylinder.



- Slide off the gearbox oil breather pipe.

- Working on both sides, release the clamp and slide off the engine oil breather pipe.

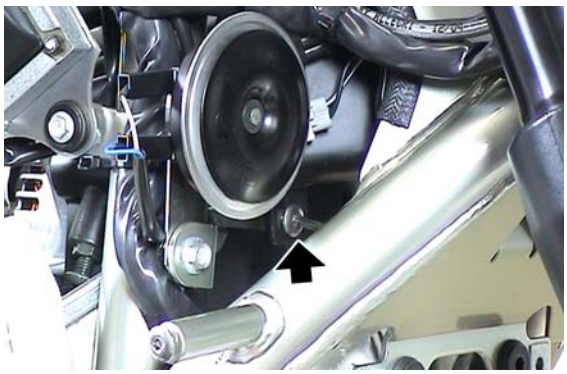
- Remove the oil vapour connecting pipe.

- Unscrew and remove the two screws fixing the oil vapour connecting pipe.

- Disconnect the stand sensor connector and release it from the clamps.

- Unscrew and remove the two screws and remove the control unit cover.
- Unscrew and remove the two screws and move the control unit downwards .

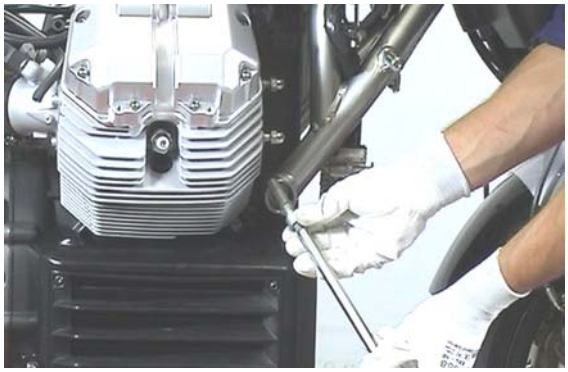
- Unscrew and remove the screws and move the oil vapour recovery reservoir.
- Unscrew and remove the stud bolt.



- Unscrew and remove the engine lower fixing nut and collect the washer.

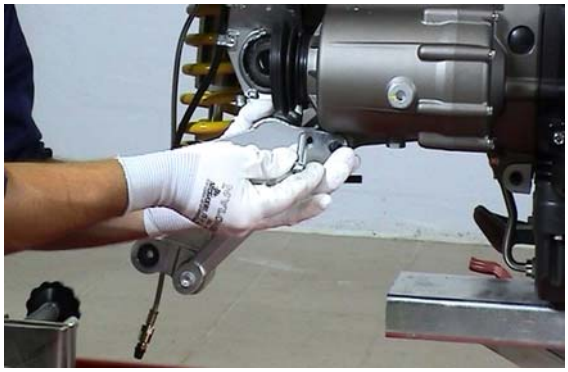
- Remove the lower bolt and collect the washer.

- Working on both sides, unscrew and remove the front screw and collect the washer.



- Unscrew and remove the engine upper fixing nut and collect the washer.
- Remove the upper bolt and collect the washer.

- Unscrew and remove the nut and collect the screw and the cable guide.
- Unscrew and remove the screw and then remove the plate.



CAUTION

PERFORM THE OPERATIONS BELOW HELPED BY A SECOND OPERATOR.

- Lower the engine partially.
- Disconnect the oil pressure sensor

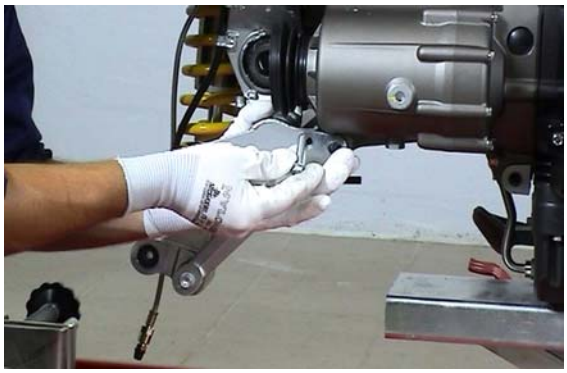
connector.

- Fully lower the engine.
- Lift the rear part of the vehicle.
- Remove the front stand.
- Unhook the belts from the hoist holding the rear part of the vehicle and remove the chassis from the engine.

Installing the engine to the vehicle

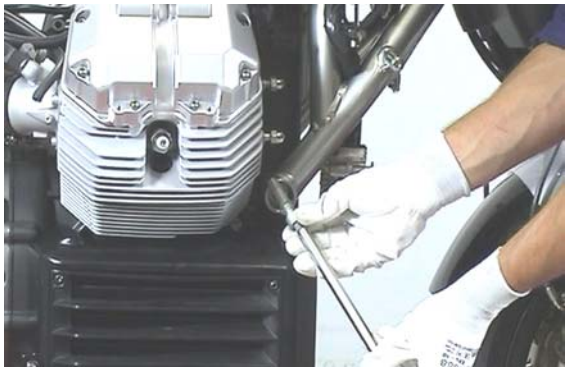
- Secure the vehicle chassis with a hoist and onto a front stand and lift the engine to place it in position.
- Connect the oil pressure sensor connector.

- Fit the plate and tighten the screw.
- Insert the screw, the cable guide and screw the nut.



- Working from the right side, insert the washer and the upper bolt.
- Fit the washer and insert the engine upper fixing nut.

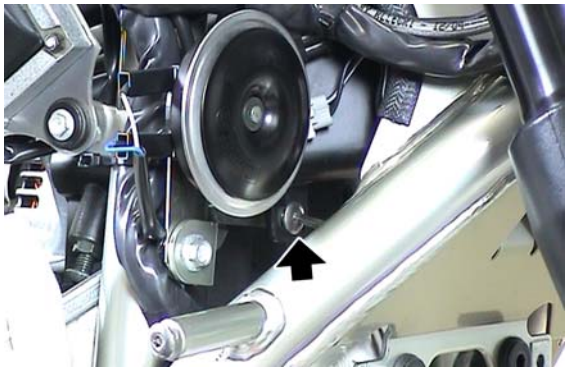
- Working on both sides, insert the washer and screw the screw without tighten it.



- Working from the right side, fit the washer and insert the lower bolt.
- Fit the washer and tighten the engine lower fixing nut.

- Working on both sides, tighten the front screw to the prescribed torque.
- Tighten the stud bolt.

- Place the oil vapour recovery reservoir and tighten the screw.



- Fit the control unit and tighten the two screws.
- Fit the control unit cover and tighten the two screws.

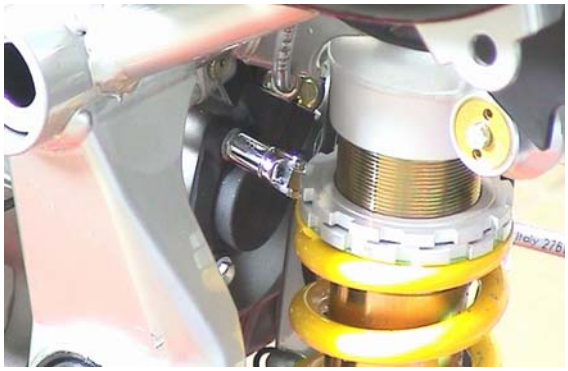
- Connect the stand sensor connector and fix it to the chassis with new clamps.

- Fit the oil vapour attachment pipe and tighten the two fixing screws.

- Insert the oil breather pipe and fasten it with a new clamp.

- Fit the gearbox oil breather pipe.

- Fit the clutch control cylinder.
- Tighten the three screws.



- Fit the clutch bleed pipe on the cable guide.
- Fill up the clutch system.

- Connect the starter motor connectors.

- Connect the ground cables and tighten the screw.
- Fit the starter motor cover.
- Insert the two washers and tighten the two screws.

- Connect the neutral sensor connector.

- Connect the alternator connectors.

- Fit the gasket and connect the revolution sensor connector.
- Fit the washer and tighten the two screws.

- Connect the throttle valve position sensor connector.

- Connect the engine temperature sensor connector.

- Connect the idle motor connector.
- Connect and adjust the throttle grip cable clearance.

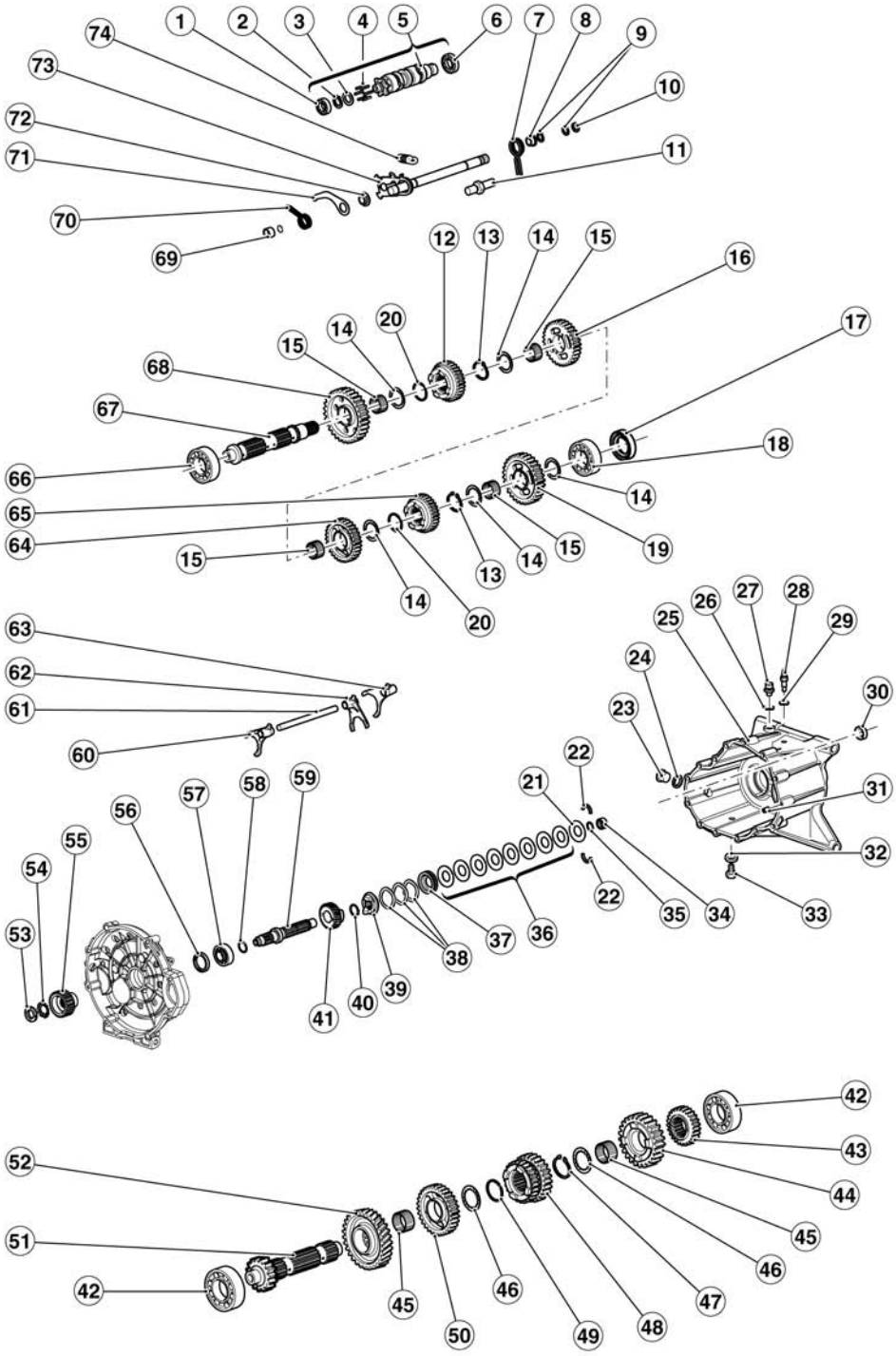
- Working on both sides, connect the injector connectors.
- Working on both sides, connect the spark plug tubes.
- Working from both sides, fit the insert and tighten the two internal screws.
- Working from both sides, fit the spark plug cover and tighten the two external screws.
- Fit the fuel tank.
- Fit the saddle.

- Working from both sides, fit the fairing and tighten the three screws.
- Fit the fork together with the cardan shaft.
- Install the whole exhaust, the air filter housing, the fuel tank and the saddle.

INDEX OF TOPICS

Gearbox

Diagram



KEY:

1. Ball bearing

2. Circlip
3. Shim washer
4. Pin
5. Desmodromic compl.
6. Ball bearing
7. Spring
8. Spacer
9. Circlip
10. Fifth wheel
11. Linking pin
12. Gear
13. Circlip
14. Shoulder washer
15. Ball bearing cage
16. Gear
17. Sealing ring
18. Ball bearing
19. Gear
20. Circlip
21. Washer
22. Half ring
23. Oil cap
24. Washer
25. Gearbox
26. Aluminium gasket
27. Bleed cap
28. Neutral sensor
29. Gasket
30. Sealing ring
31. Bushing
32. Gasket
33. Oil drainage cap
34. Roller bearing
35. Circlip
36. Belleville spring

37. Pressure plate

38. Shaped washers

39. Sleeve

40. Circlip

41. Transmission gear

42. Ball bearing

43. Gear

44. Gear

45. Ball bearing cage

46. Shoulder washer

47. Circlip

48. Gear

49. Circlip

50. Gear

51. Main shaft

52. Transmission gear

53. Ring nut

54. Washer

55. Clutch internal body

56. Sealing ring

57. Ball bearing

58. O-Ring

59. Clutch shaft

60. Fork

61. Fork shaft

62. Fork

63. Fork

64. Gear

65. Gear

66. Ball bearing

67. Secondary shaft

68. Gear

69. Spacer

70. Spring

71. Index lever

72. Bushing

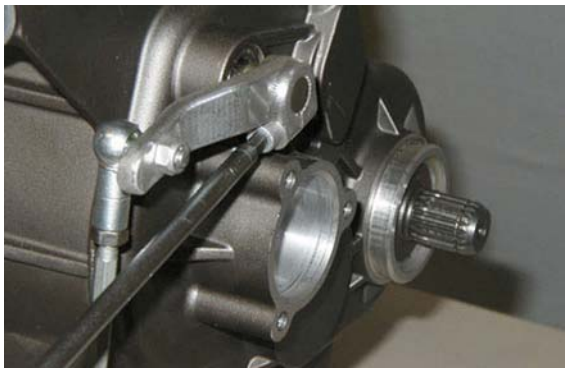
73. Pre-selector compl.

74. Spring

Gearbox

Removing the gearbox

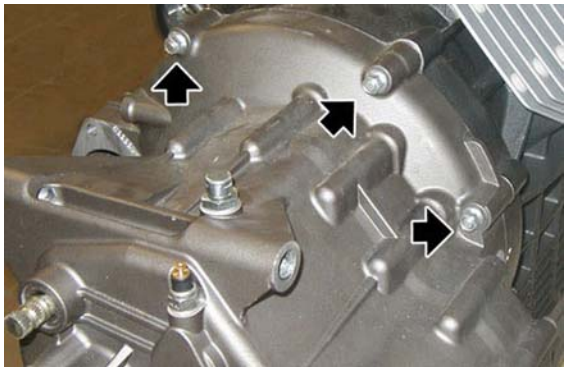
- Remove the starter motor.
- Make sure the transmission is in idle.
- Unscrew and remove the screw and remove the gearbox lever.



- Unscrew and remove the cap.

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

- Unscrew and remove the three screws.



- Unscrew and remove the two screws.

- Unscrew and remove the screw.

- Remove the gearbox.

Gearbox shafts

Disassembling the gearbox

- Remove the gearbox.

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

Specific tooling

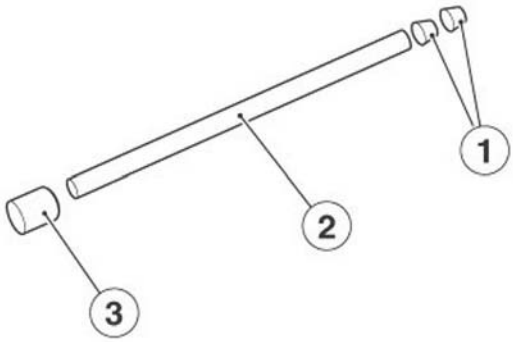
14.92.96.00 Gearbox support

- 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.

- Remove the two bushings «1» and remove the rod «2», collecting the bushing «3».



- Fold the washer fins.

- Using the adequate ring nut spanner and the clutch body locking tool, unscrew and remove the ring nut, collecting the clutch internal body.

Specific tooling

30.91.28.10 Clutch body locking

- Open the gearbox using the specific tool.

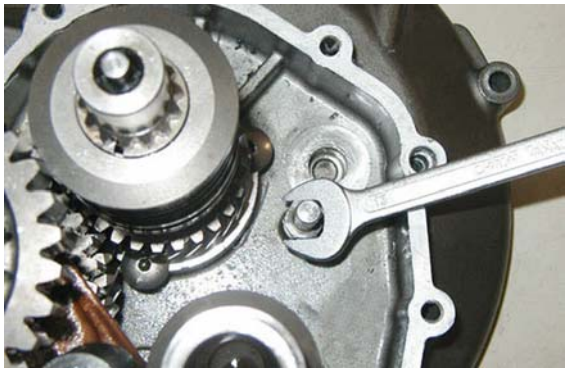
Specific tooling

05.91.25.30 Gearbox opening

- Release the spring.

- Pressing the selector, slide off the whole transmission lever.

- Unscrew and remove the threaded reference pin.



- Use rubber bands to tie down the transmission shaft unit and extract it.

- Remove the bearings from the gear-box if necessary.

- 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.

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 helicoidal transmission gear.

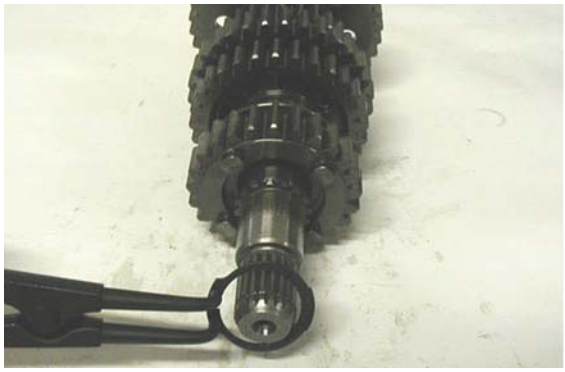
Removing the secondary shaft

- Remove the secondary 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.

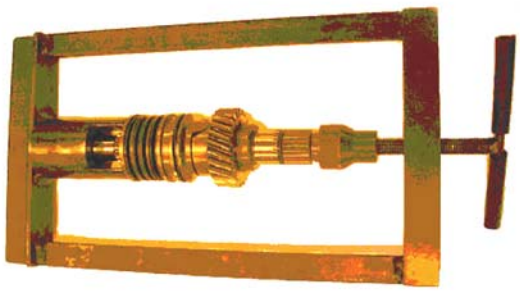
- Remove the circlip.

- Remove the gear of the fifth gear.

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

Disassembling the clutch shaft

- Remove the gearbox from the engine block.
- Remove the gearbox.
- Insert the clutch shaft in the special tool for removal.



Specific tooling

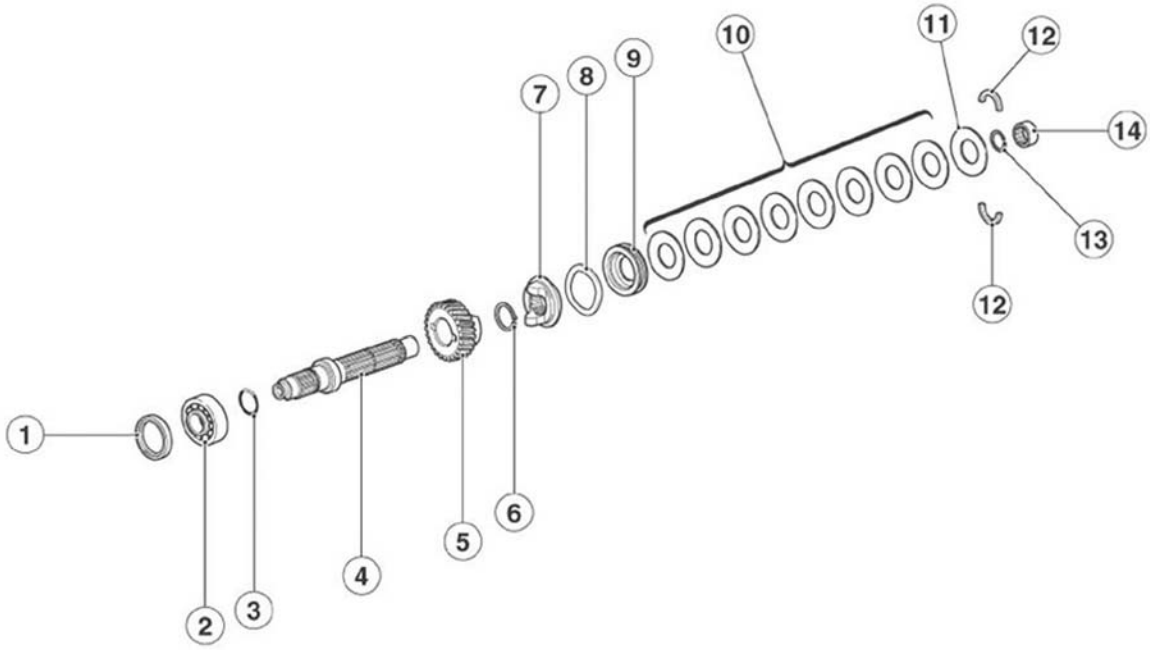
000019663300 Tool for clutch shaft removal

- Compress the Belleville springs (10) until releasing the two half-rings (12).
- Remove the Belleville springs (10).
- Remove the washer (11).
- Remove the shaped washers (8).
- Remove the sleeve (7).
- Remove the circlip (6).
- Remove the transmission gear (5).
- Collect the clutch shaft (4).

CAUTION

VEHICLES WITH CHASSIS NUMBER FROM ZGULS00096M112690 **TO** ZGULS00096M113440 **MAY PRESENT SOME NOISE PROBLEMS AT IDLE SPEED.**

TO REDUCE THIS NOISE, ON THE CLUTCH SHAFT, FIT TWO SHAPED WASHERS (8) BESIDES THE ONE ALREADY PRESENT IN THE ASSEMBLY



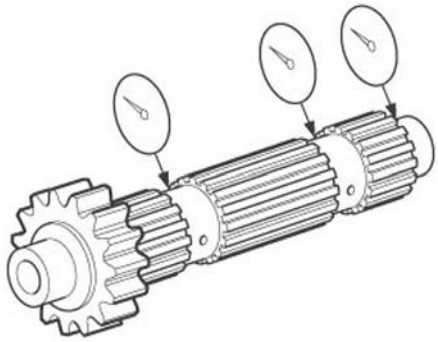
Checking the primary shaft

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

Characteristic

Secondary 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.

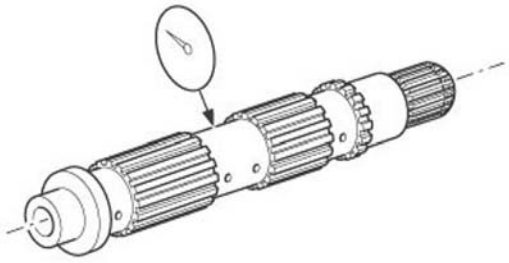
Checking the secondary shaft

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

Characteristic

Secondary 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.

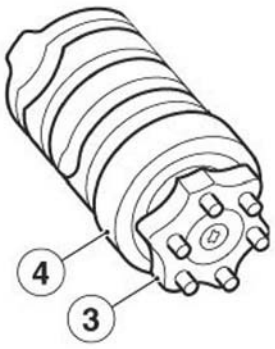
Check the transmission gears movement and, if it is not regular, replace the damaged part.

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.

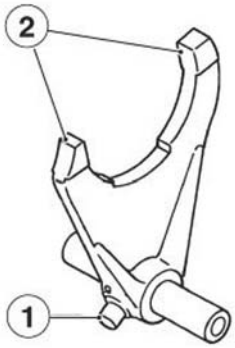


Checking the forks

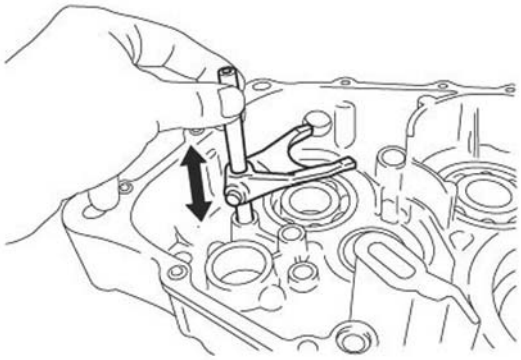
NOTE

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.



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.

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.

Assembling the clutch 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.

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.

Flywheel

Removing the flywheel

- Remove the clutch.
- Place the locking tool on the flywheel and unscrew the six sealing screws of the flywheel, operating diagonally and in stages.
- Remove the locking tool.

Specific tooling

12.91.18.01 Tool to lock the flywheel and start-up crown

- Remove the flywheel.

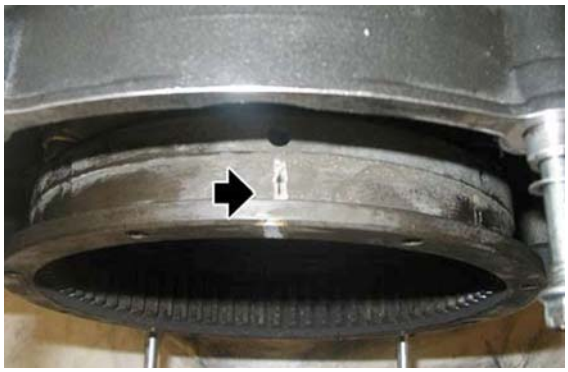
Checking

- Check that the flywheel shows no scorings on the disc faying surface.

- Check that the support surfaces on the crankshaft are not deformed; if they are, replace the flywheel.

Installing the flywheel

- Position the flywheel.



NOTE

RESPECT THE FLYWHEEL POSITIONING REFERENCES.

CAUTION

THE SCREWS MUST BE REPLACED WITH NEW ONES AT THE FOLLOWING REFITTING AS THEY ARE SUBJECT TO HIGH LOADS AND STRESS.

- Position the locking tool on the flywheel and tighten the six flywheel sealing screws operating diagonally and in stages.
- Fit the clutch.

Specific tooling

12.91.18.01 Tool to lock the flywheel and start-up crown

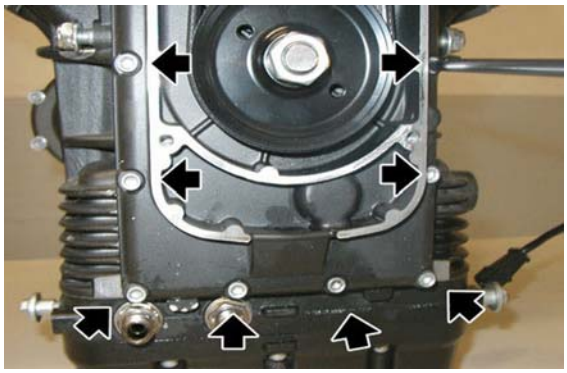
Generator

Removing the generator

- Unscrew and remove the six screws and collect the bushings.

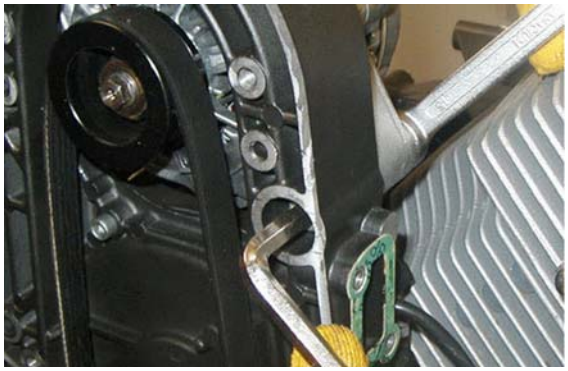
- Remove the cover.

- Unscrew and remove the eight screws.

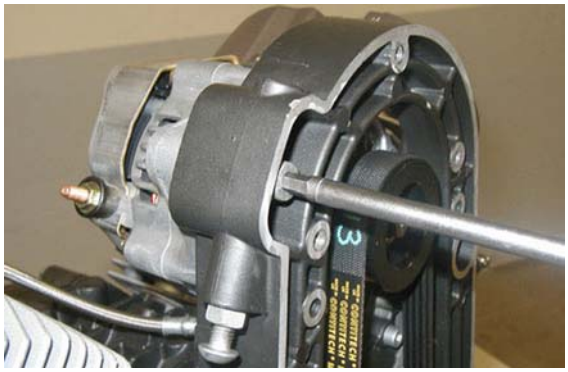


- Unscrew and remove the two screws.

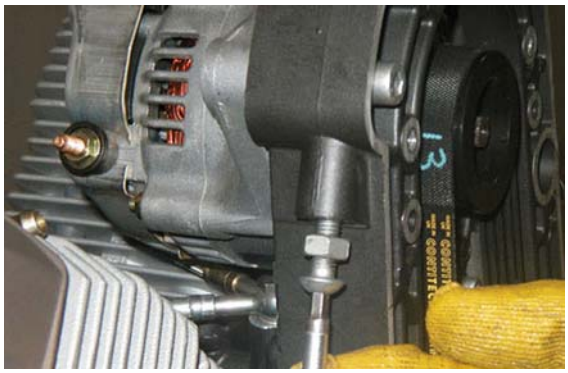
- Unscrew the nut collecting the screw.



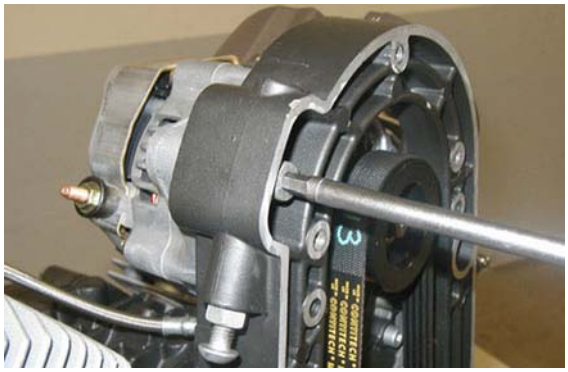
- Loosen the screw.



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



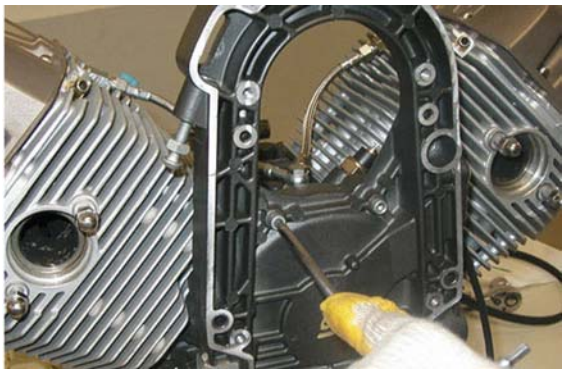
- Completely loosen and remove the screw.



- 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.

- Unscrew and remove the two screws.



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

Tensioning the belt

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

- Unscrew and remove the spacer.

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

- Using the belt tensioning tool (code 06.94.86.00), tension the belt to the prescribed torque.
- Screw the set screw.
- Tighten the lock nut.

Specific tooling

06.94.86.00 belt tensioning tool

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

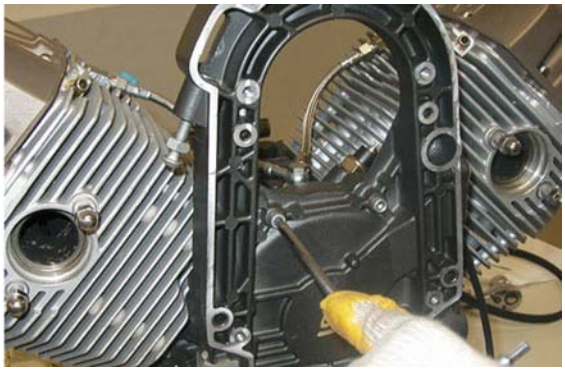
05.92.72.30 Timing system cover sealing ring punch

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

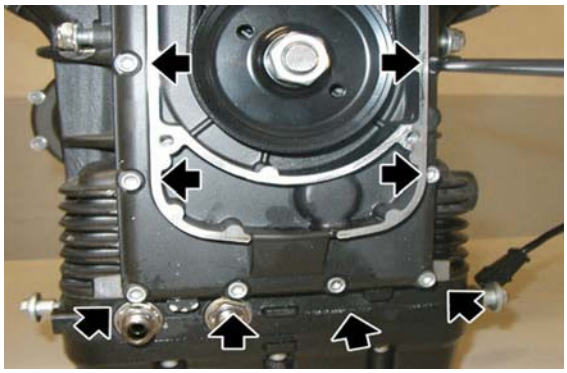
Specific tooling

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.

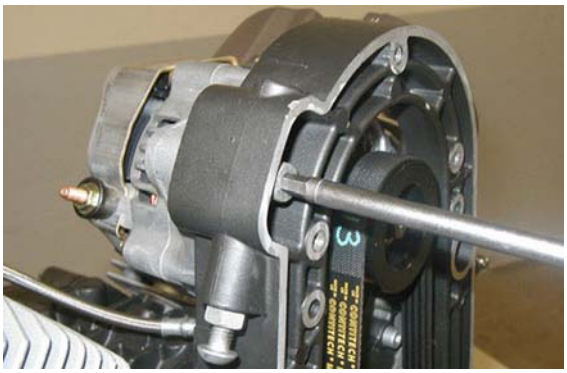


- Position the lower pulley and the spacer.

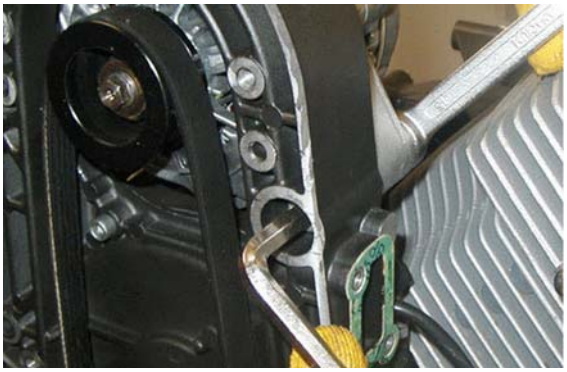
- Tighten the nut to the prescribed torque.

- Position the alternator and the timing system belt.

- Position the screw and pre-tighten it.



- Position the screw and tighten the nut.



- Using the belt tensioning tool (code 06.94.86.00), tension the belt to the

prescribed torque and screw the set screw.

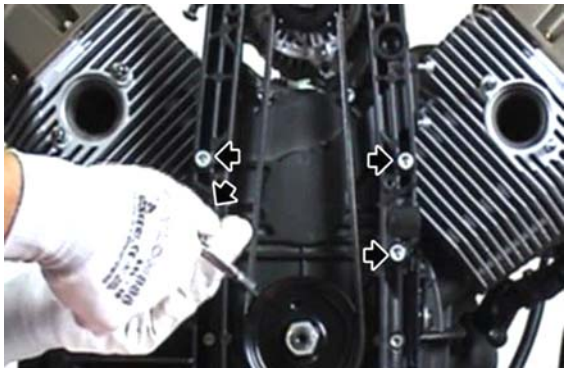
- Remove the belt tensioning tool.
- Lock the set screw in position by screwing the lock nut.

Specific tooling

06.94.86.00 belt tensioning tool

- Tighten the alternator fixing screws.

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



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

Starter motor

Removing the starter motor

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

- Slide off the starter motor.

Clutch side

Disassembling the clutch

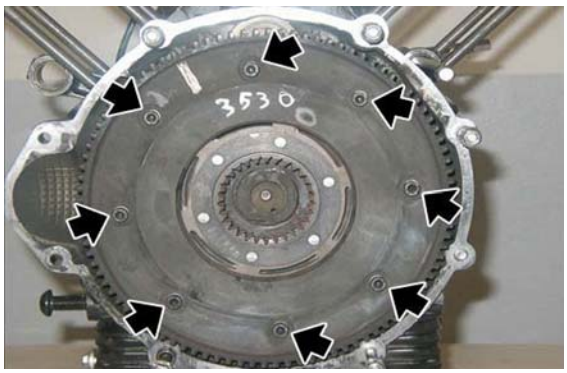
- Remove the gearbox from the engine.
- Use the locking tool and the clutch spring compression tool on the fly-wheel.

Specific tooling

30.90.65.10 Tool for clutch fitting

12.91.18.01 Tool to lock the flywheel and start-up crown

- Unscrew and remove the eight sealing screws from the crown gear on the engine flywheel.



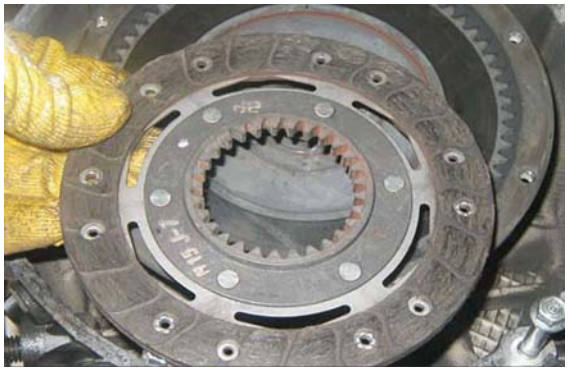
- Remove the start-up crown gear.

Extract from the inside of the engine flywheel:

- the clutch disc.

- The intermediate disc.

- The second clutch disc.



- The pressure plate disc cover.

- The pressure plate disc with springs.

Checking the clutch plates

Driven plates

Check that the supporting surfaces with the driven plates are perfectly smooth and even and that the external toothing that works inside the flywheel is not damaged, otherwise, replace the plate.

Crown gear for start-up

Check that the supporting surface with the driven plate is perfectly smooth and even.

Also check that the toothing where the starter motor pinion works is not chipped or scratched; otherwise, replace it.

Checking the clutch housing

Check that the teeth do not show any marks on the plate faying areas and that the toothing inside the clutch bell is in good conditions.

Checking the pusher plate

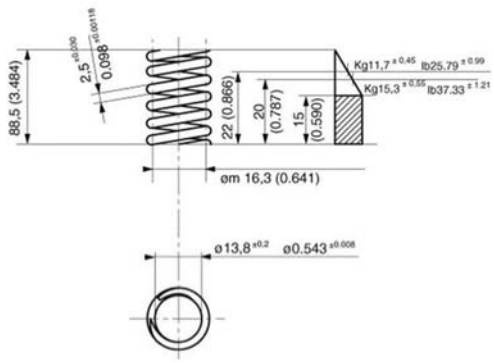
Pressure plate

Check that the plate does not show signs of wear on the opening where the control cap works, and that the supporting surfaces with the driven plate are perfectly even.

Checking the springs

Check that the springs are still flexible and are not deformed:

- Springs compressed at 22 mm (0.8661 in) must bear a load of 11.25 ÷ 11.70 kg (24.80 ÷ 25.79 pounds);
- Springs compressed at 20 mm (0.7874 in) must bear a load of 14.75 ÷ 15.30 kg (32.52 ÷ 33.73 pounds).

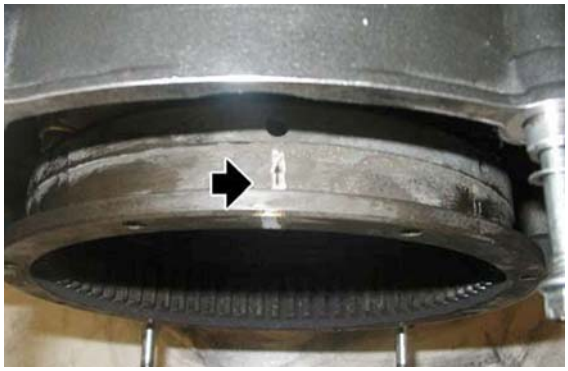


Assembling the clutch

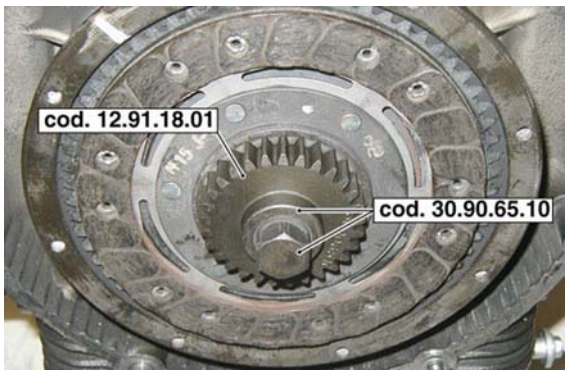
Insert the components in the clutch bell in the following order:

- the pressure plate with springs.

- Make sure that the reference marked on the pressure plate tooth is aligned with the reference on the flywheel.



- Use the locking tool and the clutch spring compression tool on the flywheel.



Specific tooling

30.90.65.10 Tool for clutch fitting

12.91.18.01 Tool to lock the flywheel and start-up crown

- Remove the locking tool.
- Fit the clutch disc.

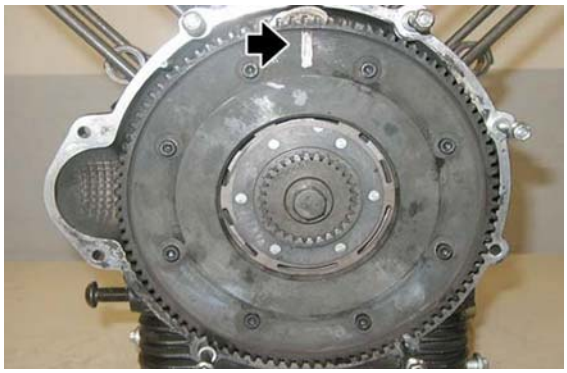
Specific tooling

12.91.18.01 Tool to lock the flywheel and start-up crown

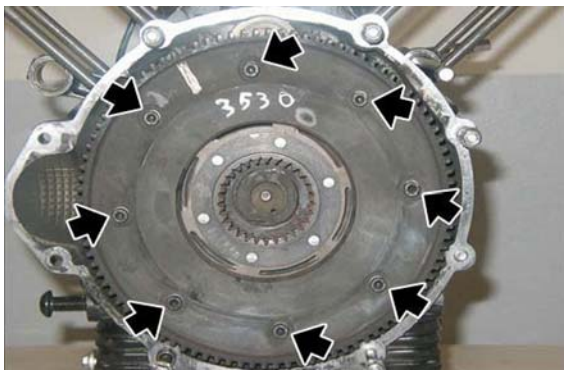
- The intermediate disc.

- The clutch disc.

- Place the crown gear aligning its reference with that on the flywheel.



- Tighten the eight screws sealing the crown gear to the flywheel to the prescribed torque
- Remove the special tool for clutch spring compression.



Specific tooling

30.90.65.10 Tool for clutch fitting

- Insert the pressure plate disc cover.
- Install the gearbox unit.

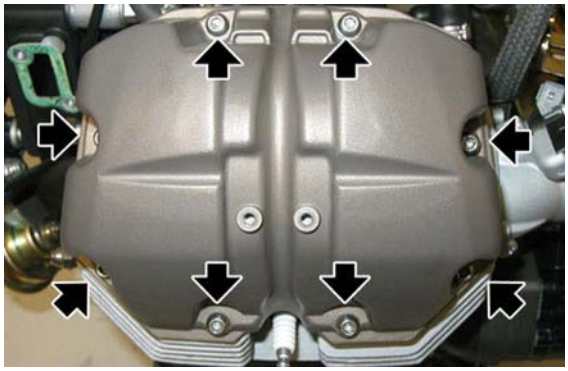
Head and timing

Removing the head cover

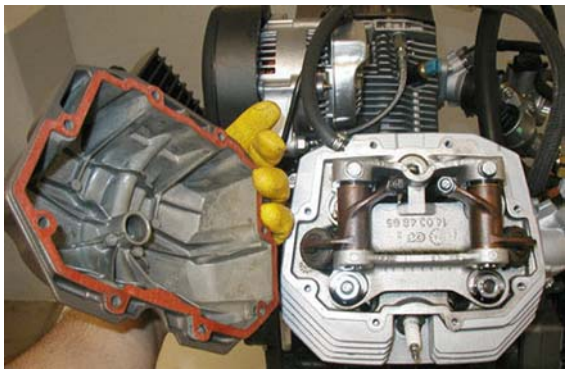
NOTE

THE FOLLOWING OPERATIONS REFER TO REMOVING ONLY ONE COVER BUT APPLY TO BOTH COVERS.

- Unscrew and remove the eight screws and collect the bushings.



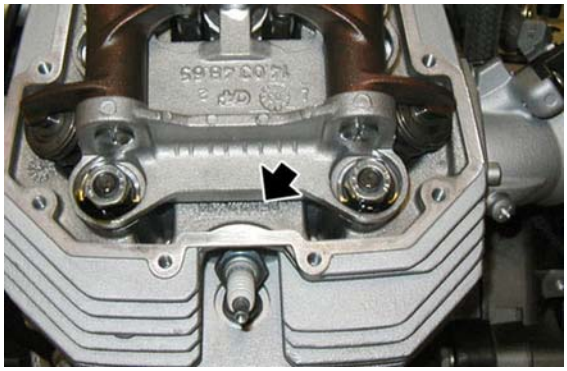
- Remove the head cover and collect the gasket.



Removing the cylinder head

- Remove the rockers rods.

- Unscrew and remove the outer spark plug.



- Loosen the nut and disconnect the pipes that deliver oil to the head.

- Unscrew and remove the threaded cap.

- Unscrew and remove the joint of the pipe that delivers oil to the head and collect the washer.

- Using the suitable special tool, unscrew and remove the inner spark

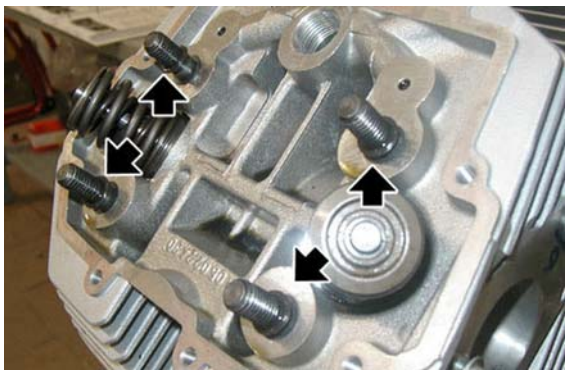
plug.

Specific tooling

05.90.19.30 Internal spark plug removal

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

- Slightly detach the cylinder head and remove the four O-rings.



- Remove the head and collect the gasket.

Cylinder head

Removing the rocker arms

NOTE

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

• Remove the head cover.

• Rotate the crankshaft to TDC position in combustion phase (closed valves) for the left cylinder.

• Unscrew and remove the two screws.

• Remove the rockers shafts.

• Remove the rockers and collect the three washers.

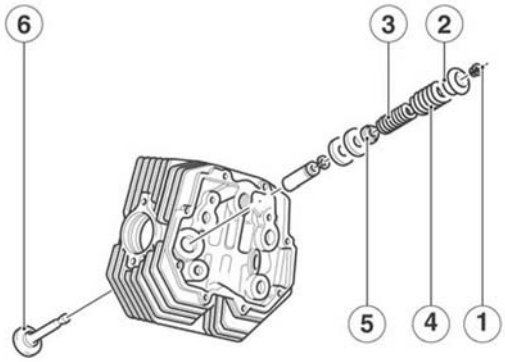
Removing the valves

- Remove the head.
- Place the special tool (code 10.90.72.00) on the upper retainer and at the centre of the head of the valve to be removed.

Specific tooling

10.90.72.00 Tool for valve removal and refitting

- Tighten the tool screw until fitted, and then hit the tool head (where the upper retainer works) with a mallet so that the two cotters (1) get detached from the upper retainer (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.
- Remove the upper retainer (2).
- Remove the internal spring (3).
- Remove the external spring (4).
- Remove the lower retainer (5) and the shimming washers if necessary.
- Remove the valve (6) from inside the



head.

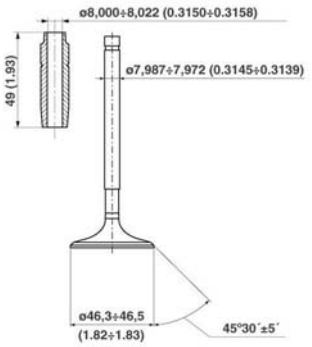
Checking the valve guides

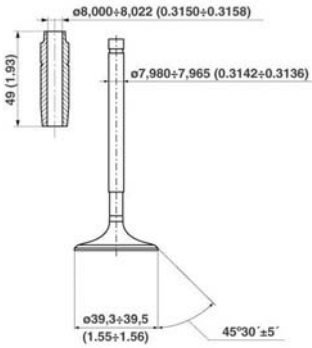
Use a punch to extract the valve guide from the heads.

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 AND GUIDES COUPLING DATA CHART (INLET)

Specification	Desc./Quantity
Valve guide inside diameter mm (in)	8.000 ÷ 8.022 (0.3150 ÷ 0.3158)
Valve stem diameter	7.972 ÷ 7.987 (0.3139 ÷ 0.3145)
Fitting clearance mm (in)	0.013 ÷ 0.050 (0.0005 ÷ 0.0020)

VALVE AND GUIDES COUPLING DATA CHART (OUTLET)

Specification	Desc./Quantity
Valve guide inside dia-	8.005 ÷ 8.022 (0.3152 ÷

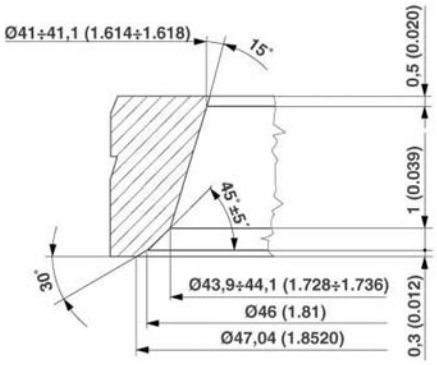
Specification	Desc./Quantity
meter mm (in)	0.3158)
Valve stem diameter mm (in)	7.965 ÷ 7.980 (0.3136 ÷ 0.3142)
Fitting clearance mm (in)	0.025 ÷ 0.057 (0.0010 ÷ 0.0022)

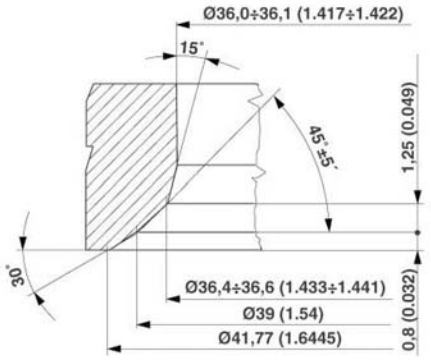
Checking the cylinder head

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.

The valve seats should be reamed with a mill. The seat inclination angle is 45° +/- 5. After milling, it is necessary to grind them to ensure a good coupling and a perfect sealing between the ring nuts and the valve heads.



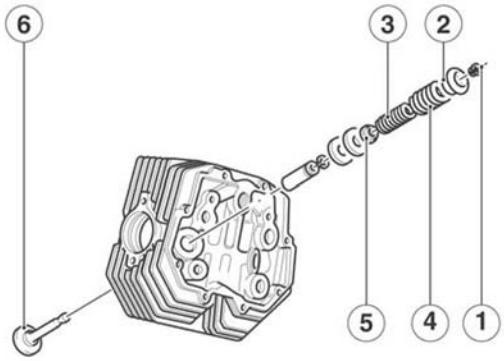


Installing the valves

NOTE

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

- Place the valve (6) inside the head.
- Place the lower retainer (5) and the shimming washers.
- Place the external spring (4).
- Place the internal spring (3).
- Insert the upper retainer (2).
- Place the two cotters (1) on the seats on the valves.
- Compressing the spring with the special valve tool, install the valve cotters.



Specific tooling

10.90.72.00 Tool for valve removal and refitting

NOTE

UPON REFITTING, PLACE THE O-RING CORRECTLY ON THE VALVE.

- Remove the special tool

Installing the rocker arms

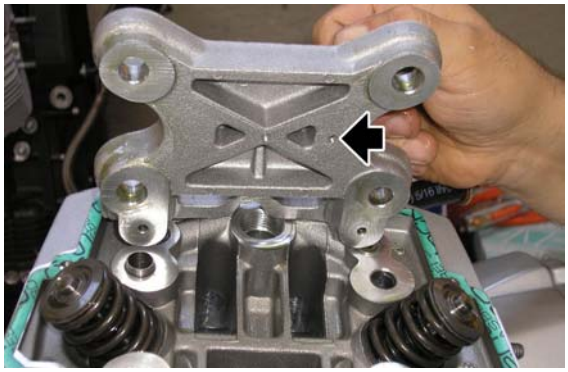
CAUTION

UPON REFITTING, ALWAYS REPLACE THE O-

RINGS

CAUTION

UPON REFITTING, DO NOT INVERT THE POSITION OF THE ROCKER SUPPORTS SO AS NOT TO COMPROMISE LUBRICATION.

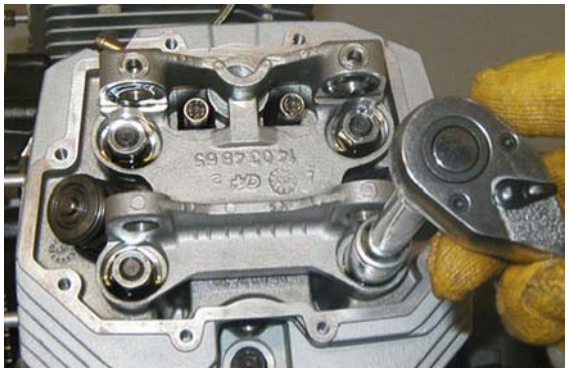


CAUTION

THE NEW LUBRICATION SYSTEM IS VALID FROM ENGINE NUMBER KS13770 ON.

- Install the rocker rods if they have been previously removed.
- Install the rocker support and replace the four O-rings.

- Place the four washers and screw the four nuts.



- Place the six washers and install the rockers.

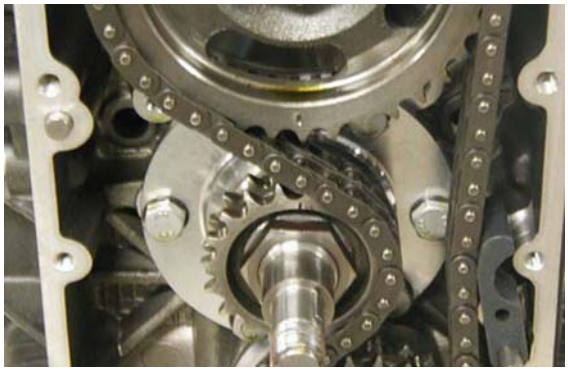
- Insert the rocker shafts.

- Rotate the crankshaft to TDC position in combustion phase (closed valves) for the left cylinder.
- Tighten the two screws.

Timing

Chain removal

- Remove the engine assembly.
- Remove the alternator.
- Clearly indicate the distribution timing marks that should be restored at the next refitting (left cylinder TDC).

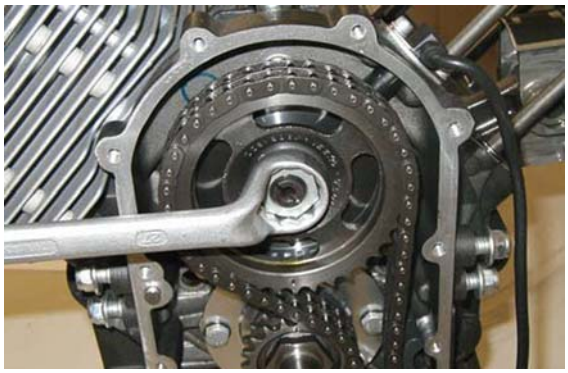


- Using the adequate tool, lock the ignition crown.

Specific tooling

12.91.18.01 Tool to lock the flywheel and start-up crown

- Unscrew the central sealing nut of the camshaft gear and collect the washer.



- Remove the cotter.

- Unscrew and remove the central sealing nut of the timing system control

gear on the crankshaft and collect the washer.

- Unscrew and remove the oil pump gear nut and collect the washer.

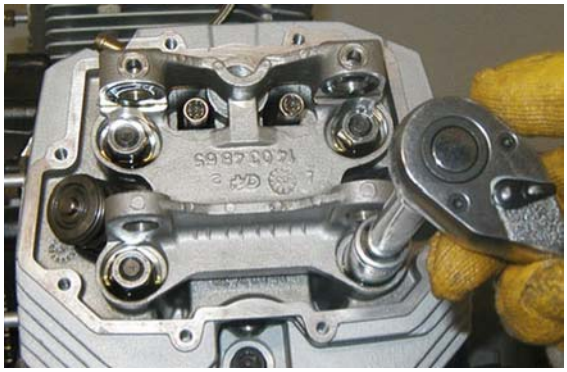
- Remove the chain tensioner and collect the spring.
- Slide off the three gears together with the chain.

CAUTION

BE CAREFUL WITH THE OIL PUMP PULLING COTTER.

Removing the rods

- Remove the rockers.
- Unscrew and remove the four nuts and collect their washers.



- Remove the rocker support.

- Remove the two rocker rods

Removing the tappets

- Remove the engine assembly.
- Remove both heads.
- Slide off and remove the tappets from their seat on both sides.

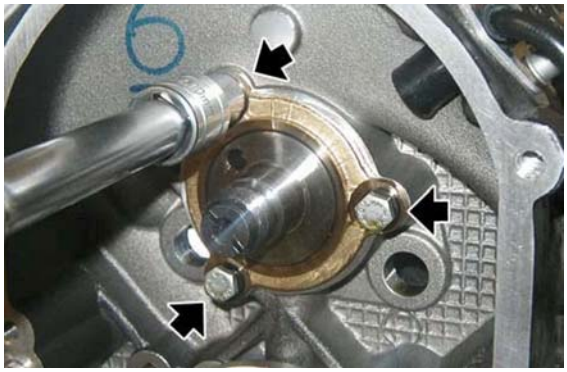
Removing the phonic wheel

- Remove the timing chain.
- Slide off and remove the tone wheel and collect the pin.

Removing the camshaft

- Remove the timing chain.
- Remove the tone wheel.
- Remove the tappets.
- Remove the rods.

- Unscrew and remove the three screws and collect the washers.



- Remove the flange.

- Remove the camshaft.

Installing the camshaft

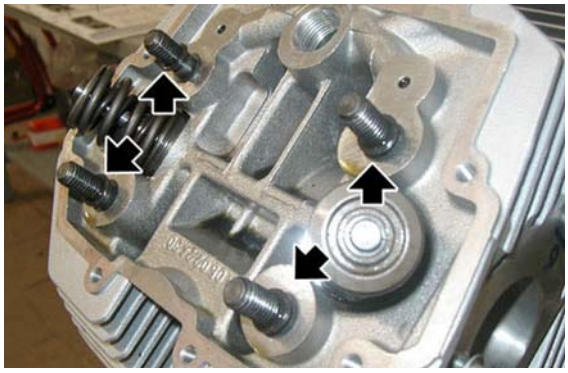
NOTE

FOR TIMING SYSTEM REFITTING, IT IS NECESSARY TO HEAT THE ENGINE WITH A SUITABLE HEATER IN ORDER TO INSERT THE CAMSHAFT CORRECTLY AND WITHOUT DAMAGING IT.

Follow the camshaft removal instructions but in reverse order.

Installing the rods

- Install the head if it has been previously removed.
- Replace the four O-rings.



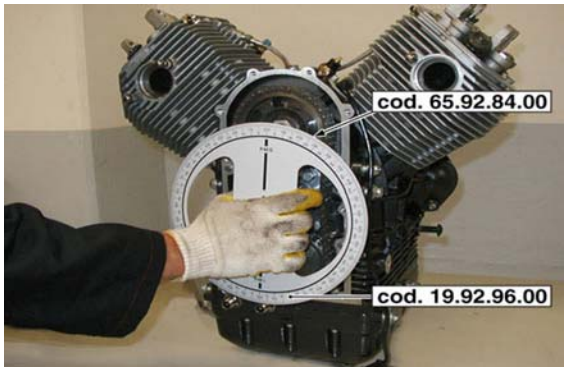
- Install the two rocker rods.

Cam timing

Timing

To check distribution timing, follow these instructions:

- Obtain a clearance between rockers and valves of 1.5 mm (0.059 in);
- Place the hub for graduated dial and the relative graduated dial on the crankshaft slot, inserting the spacer and fixing it to the shaft with the nut.



Specific tooling

65.92.84.00 Graduated dial hub

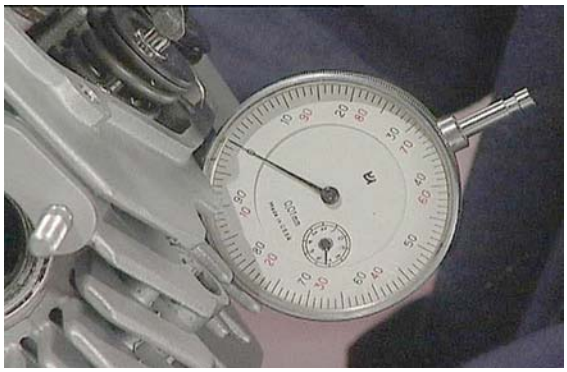
19.92.96.00 Graduated dial to control ignition timing

- With a screw, fasten the specific arrow to the threaded hole to the left of the base.

Specific tooling

17.94.75.60 Arrow to control ignition timing

- Fit the dial gauge support and then the gauge itself on the left outer spark plug hole.



- Rotate the crankshaft until the left cylinder piston is actually at the top dead

centre (with valves closed).

- Reset the dial gauge and make sure the references (on the timing system gears and the engine pinion) are perfectly aligned, so that looking through the checking hole on the gearbox, the reference line marked 'S' is perfectly aligned with the reference marked at the centre of the hole.
- Align the arrow point with the zero TDC. on the graduated dial.

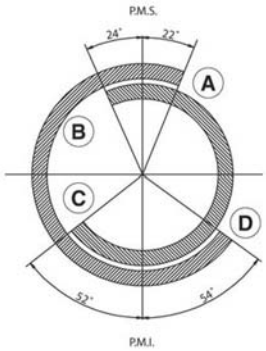
- Observing the timing system diagram, check timing considering that:

A - intake start opens 22° before TDC

B - outlet end closes 24° after TDC

C - outlet start opens 52° before BDC

D - intake end closes 54° after BDC



- Screw the dial gauge support and then the gauge itself on the right cylinder outer spark plug hole.
- With a screw, fix the arrow to the threaded hole to the right of the base.
- Turn the disc clockwise until the reference marked with letter 'D' is aligned with the reference at the centre of the checking hole on the gearbox (valves closed).
- Repeat the operations described above for the left cylinder.

- After the check and if everything is correct, operate as follows to restore the operation clearance between rocking levers and valves (intake 0.10 mm (0.0039 in), outlet 0.15 mm (0.0059 in).
- Remove the graduated dial hub, the graduated dial, the arrow, the dial gauge support and the gauge itself.
- Refit the spark plugs and finish the refit.

Specific tooling

65.92.84.00 Graduated dial hub

19.92.96.00 Graduated dial to control ignition timing

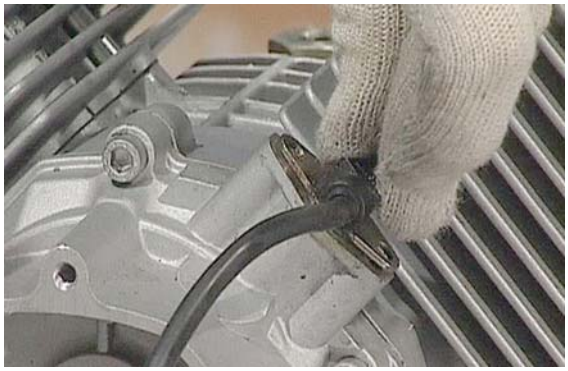
17.94.75.60 Arrow to control ignition timing

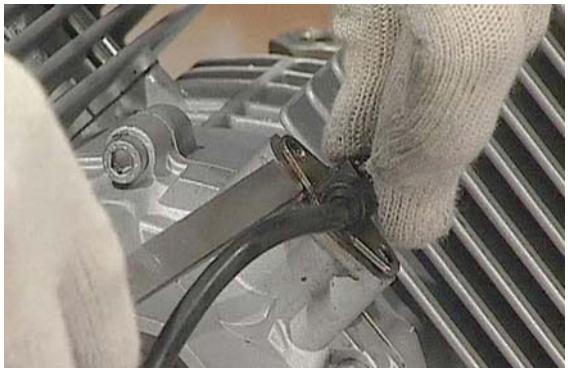
Measuring air gap

• Unscrew 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 timing system cover and cause it to make contact with the tone wheel.





• Measure the clearance between the fixing plate and the cover 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 insert the sensor after applying adequate sealing paste on the fixing plate, then tighten the screws to the torque.

Cylinder-piston assembly

Removing the cylinder

NOTE

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

- Remove the head.
- Remove the gasket.

- Slide off the cylinder from the stud

bolts, paying attention not to damage the piston.

Disassembling the piston

NOTE

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

- Remove the cylinder.
- Cover the base opening with a clean cloth.
- Disengage the pin lock.

- Remove the pin.

- Label 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.

- Place the piston.

NOTE

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

- Insert the pin.

- Insert the pin lock.

Installing the cylinder

- Fit the piston.
- Remove the cloth used to prevent foreign bodies coming into the crankcase.
- Turn the rings so that the junction ends are 120 degrees from each other.
- Lubricate piston and cylinder.
- Using a specific tool for piston ring clamps, place the cylinder.

CAUTION

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

Specific tooling

05.92.80.30 Piston ring clamp

- Remove the piston ring clamp tool and finish positioning the cylinder.

Specific tooling

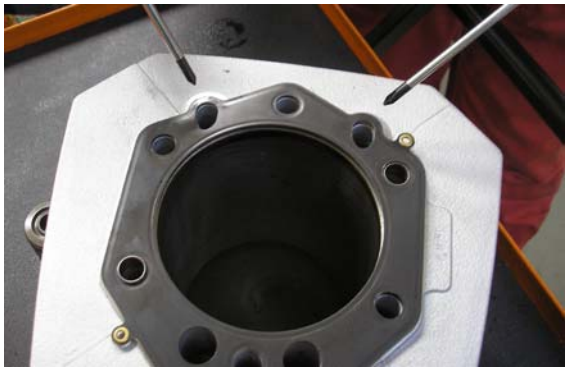
05.92.80.30 Piston ring clamp

CAUTION

UPON REFITTING DO NOT INVERT THE POSITION OF THE CYLINDER GASKET SO AS NOT TO COMPROMISE LUBRICATION.

CAUTION

THE NEW LUBRICATION SYSTEM IS VALID FROM ENGINE NUMBER KS13770 ON.

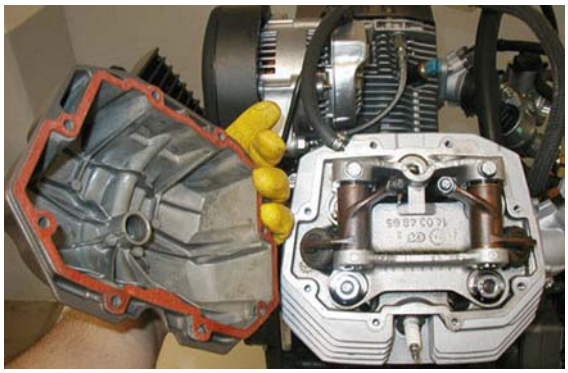


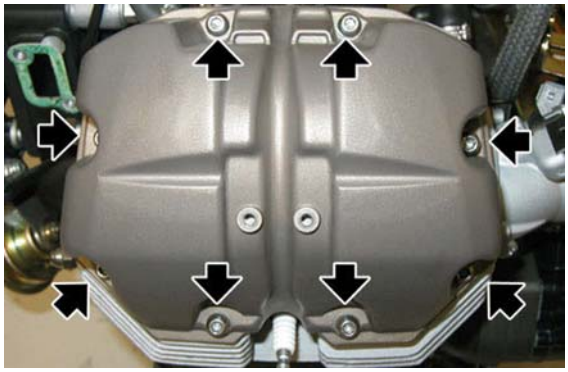
- Place the gasket on the cylinder base.

- Fit the head.

Installing the head cover

- Replace the gasket and fit the head cover.
- Place the bushings and cross tighten the eight screws.





Installing the cylinder head

- Fit the valves if they have been previously removed.
- Replace the gasket between head and cylinder.
- Fit the head.

- Place the two washers and tighten the two screws.

- Using the suitable special tool, screw the inner spark plug.

Specific tooling

05.90.19.30 Internal spark plug removal

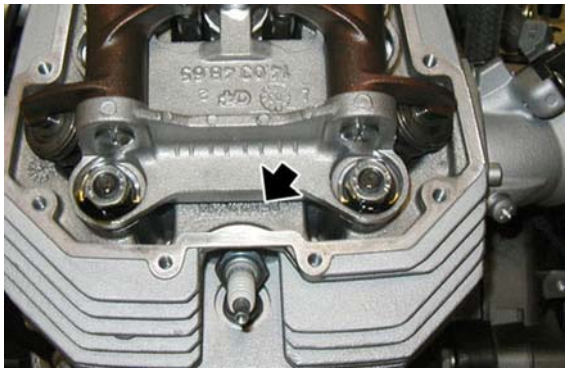
- Insert the washer and screw the joint

of the pipe that delivers oil to the head .

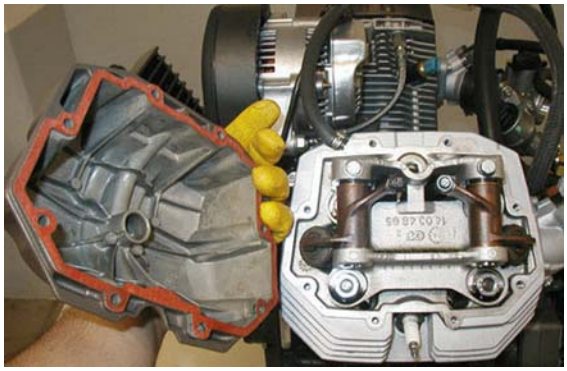
- Screw the threaded cap.

- Connect the pipes that deliver oil to the head and screw the nut.

- Install the outer spark plug.



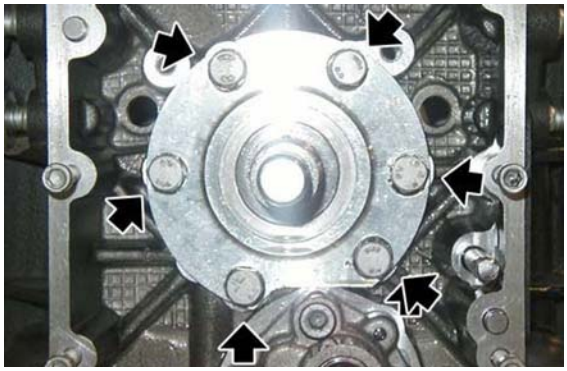
- Replace the gasket and install the head cover.



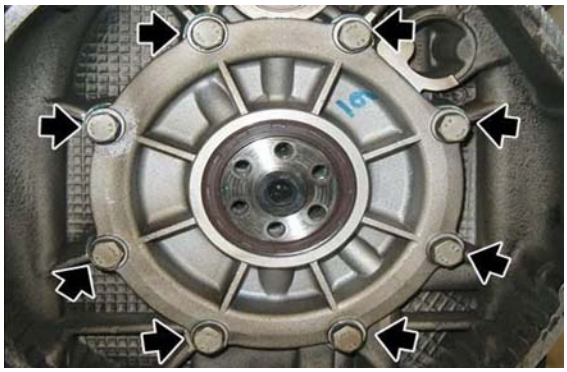
Crankcase - crankshaft

Removing the crankshaft

- Remove the connecting rods.
- Loosen and remove the six fixing screws and collect the washers.
- Remove the crankshaft flange on the alternator side.



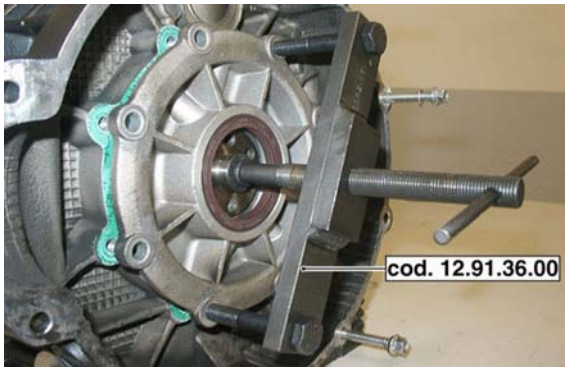
- Loosen and remove the eight fixing screws and collect the washers.



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

Specific tooling

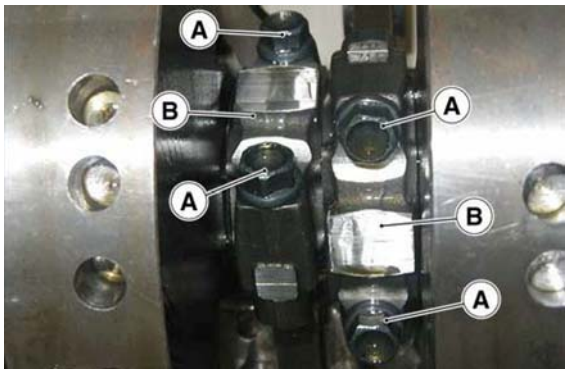
12.91.36.00 Tool to remove the flywheel side flange



- Remove the crankshaft afterwards.

Disassembling the connecting rod

- Remove the heads.
- Remove the cylinders and the pistons.
- Remove the clutch.
- Remove the flywheel.
- Remove the timing system.
- Remove the oil sump.
- Loosen the coupling screws 'A' from inside the base and remove the connecting rods 'B'.



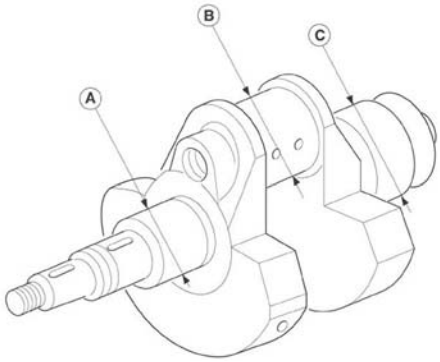
Inspecting the crankshaft components

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

FITTING CLEARANCES

Specification	Desc./Quantity
Between the bearing and the main journal on the	0.028 ÷ 0.060 mm (0.00110 ÷ 0.00236 in);

Specification	Desc./Quantity
timing system side	
Between the bearing and the main journal on the flywheel side	0.040 ÷ 0.075 mm (0.00157 ÷ 0.00295 in)
Between the bearing and the connecting rod pin	0.022 ÷ 0.064 mm (0.00087 ÷ 0.00252 in)



MAIN JOURNAL DIAMETER ON THE TIMING SYSTEM SIDE (A)

Specification	Desc./Quantity
Regular production	37.975 mm (1.49507 inch) 37.959 mm (1.49444 inch)

CRANKPIN DIAMETER (B)

Specification	Desc./Quantity
Regular production	44.008 ÷ 44.020 mm - (1.73259 ÷ 1.73307 in)
'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)

FLYWHEEL MAIN JOURNAL DIAMETER (C)

Specification	Desc./Quantity
Regular production	52.970 mm (2.08542 inch) 53.951 mm (2.12405 inch)

Checking the connecting rod

CAUTION

FLAMMABLE VAPOURS ARE PRODUCED AND METAL PARTICLES CAN BE EJECTED AT HIGH SPEED DURING THIS OPERATION, SO WORK IN A ROOM FREE OF NAKED FLAMES OR SPARKS AND MAKE SURE OPERATORS WEAR SAFETY GOGGLES.

CONNECTING RODS

When examining the connecting rods, check that:

- Bushings are in good conditions, their clearance and the pins;

- Shaft parallelism;
- Connecting rod bearings.

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

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

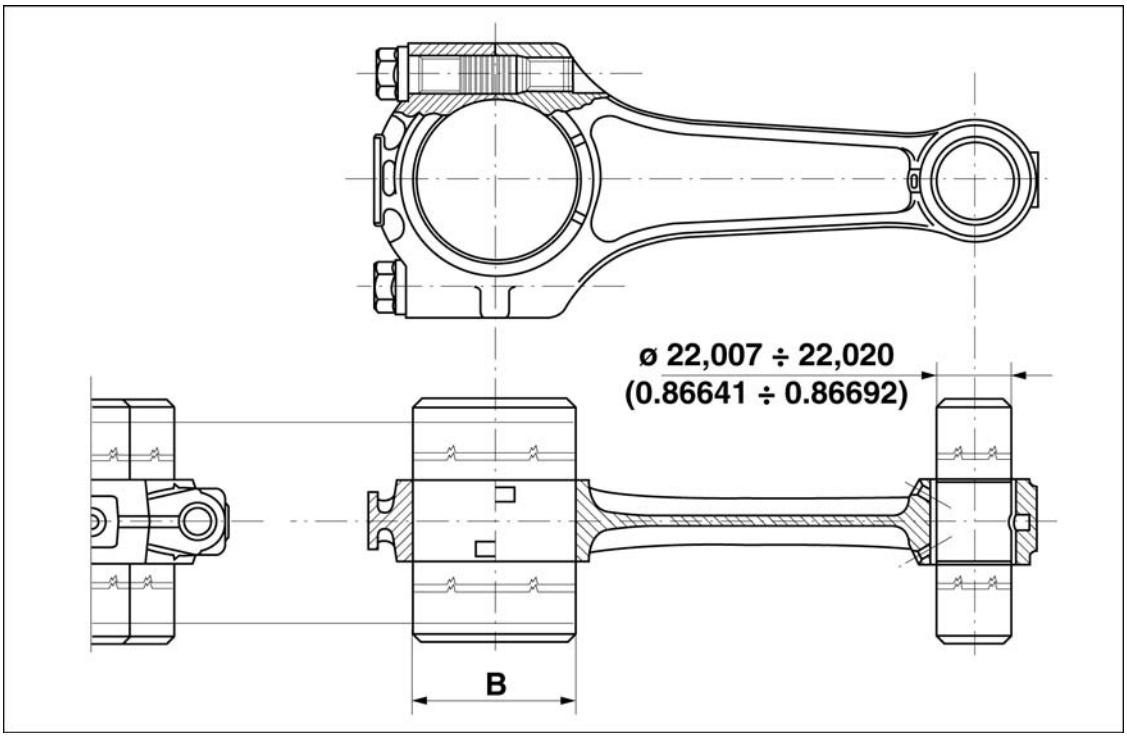
Before reaming the crankpin, measure the pin diameter comparing it with the maximum wear allowed, as indicated in the figure; this defines what kind of undersizing the bearing should have and to which diameter the pin should be reamed.

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 shafts of the head and rod small end, measured at 200 mm (7.873 inch) should be +/- 0.10 mm (0.00393 inch).



CONNECTING ROD BEARING THICKNESS

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

CRANKPIN DIAMETER (B)

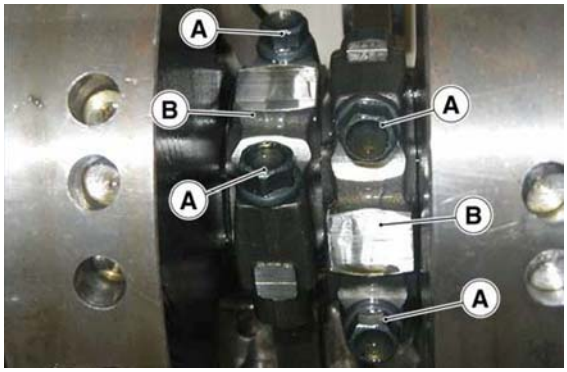
Specification	Desc./Quantity
Regular production	44.008 ÷ 44.020 mm - (1.73259 ÷ 1.73307 in)
'Blue' bushing half-shell regular production	44.008 ÷ 44.014 mm (1.73259 ÷ 1.73283 in)
'Red' bushing half-shell regular production	44.014 ÷ 44.020 mm (1.73283 ÷ 1.73307 in)

PIN AND BUSHING COUPLING DATA

Specification	Desc./Quantity
fitted and machined bushing inside Ø mm (inch)	22.007 mm (0.86641 inch) - 22.020 mm (0.86692 inch)
pin Ø mm (inch)	21.994 mm (0.86590 inch) - 21.998 mm (0.86606 inch)
Clearance between pin and bushing mm (inch)	0.009 ÷ 0.026 mm (0.000354 ÷ 0.001024 inch)

Assembling the connecting rod

- 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 on the caps with a torque wrench at the prescribed torque.

Installing the crankshaft

- Place the crankshaft supporting flanges correctly, observing their fitting directions indicated by the holes;
- Seal the two bottom rear fixing screws with Teflon tape to avoid oil leaks.
- 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

- Use the camshaft gear sealing tool to fit the flange with its sealing ring.
- To complete the refitting, follow the operations described for removal but in reverse order.

Specific tooling

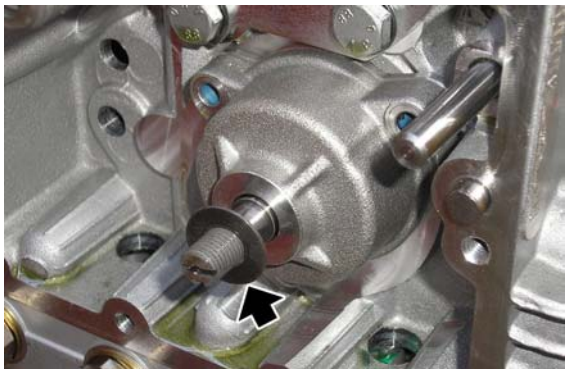
14.92.73.00 Tool for camshaft gear sealing

Lubrication

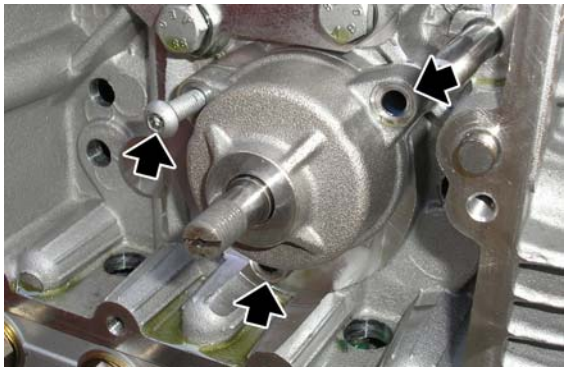
Oil pump

Removing

- Drain all the engine oil.
- Remove the alternator.
- Remove the timing system.
- Remove the shim washer.

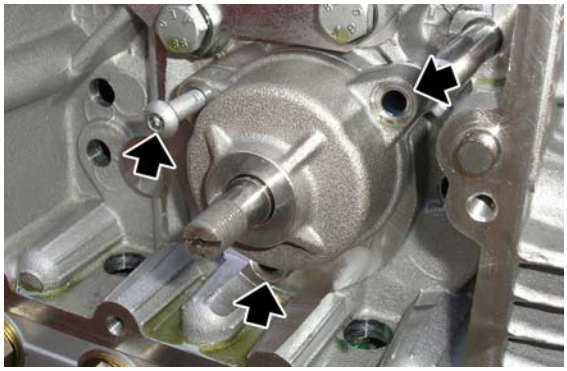


- Unscrew and remove the three screws fixing the oil pump.
- Remove the oil pump.

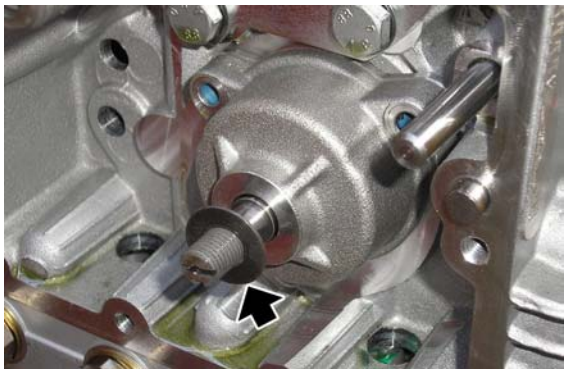


Installing

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



- Place the shim washer adequately so that the timing chain do not wear out the base.
- Fit the timing system.
- Fit the alternator.
- Top-up with engine oil.



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.

CAUTION

THE NEW LUBRICATION SYSTEM IS VALID FROM ENGINE NUMBER KS13770 ON.

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

Specific tooling

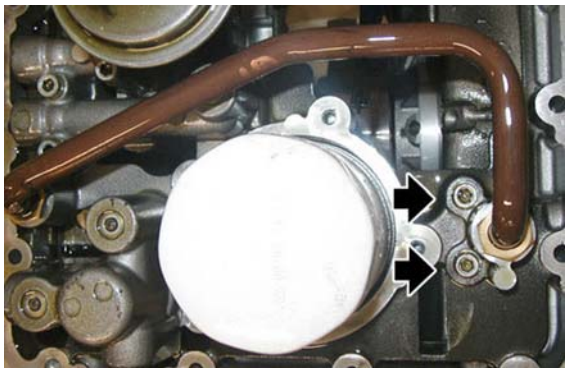
01.92.91.00 Wrench for removal of the cover on sump and filter

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

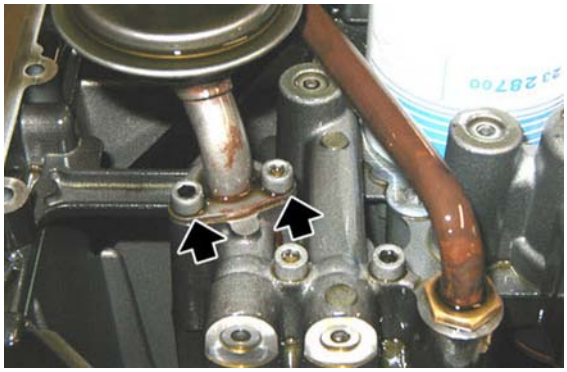
- Unscrew and remove the fourteen screws fixing the oil sump to the engine base.

- Unscrew and remove the four screws and remove the engine oil sump cover.

- Unscrew and remove the two screws.



- Unscrew and remove the two screws.
- Remove the mesh filter and collect the gasket.



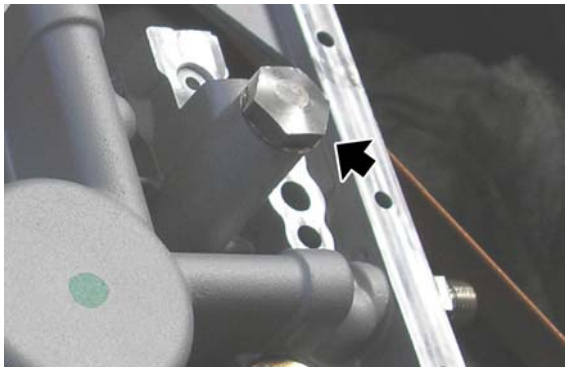
- Remove the black flange and collect the gasket.

- Unscrew and remove the plug.

- Remove the thermostatic valve.

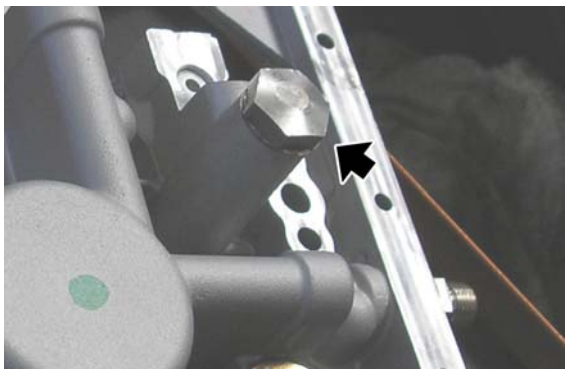
- Unscrew and remove the pressure relief valve plug.

- Remove the pressure relief valve components



Refitting the oil sump

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



- In case of overpressure, the engine oil goes back into the oil sump through

the hole indicated in the picture.

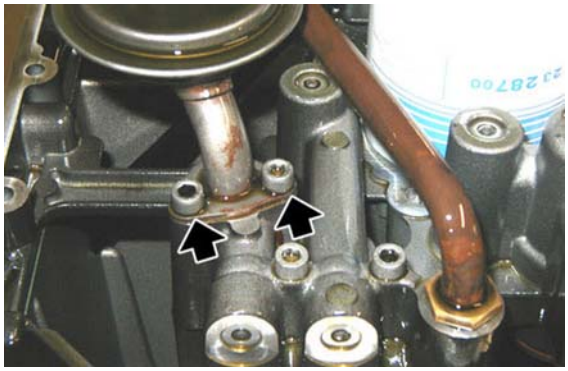
- Place the thermostatic valve.

CHECK THAT THE ENGINE OIL PASSAGE HOLE IS NOT CLOGGED.

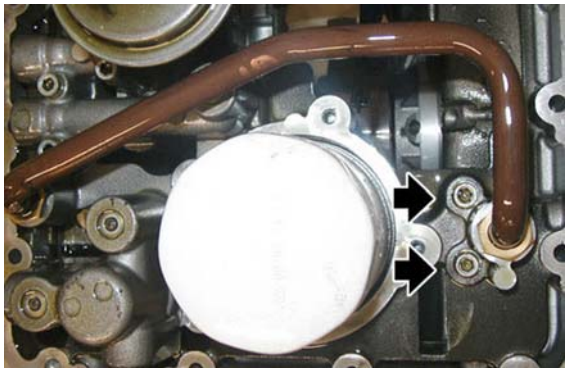
- Tighten the thermostatic valve plug.

- Place a new gasket and refit the black flange.

- Place a new gasket and refit the mesh filter tightening the two screws.



- Tighten the two screws.



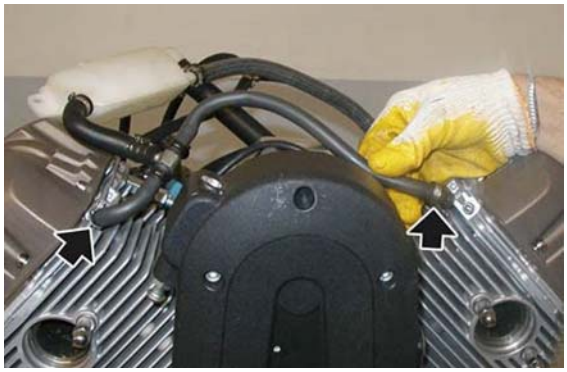
- Place the oil sump cover.
- Tighten the four screws.
- Refit the oil sump on the base.
- Fill engine oil up to the correct level.

Blow-by

- Loosen the oil return pipe sealing joint and remove the oil return pipe from the crankcase.

- Remove the clamp.

- Release the two straps retaining the oil breather pipe.



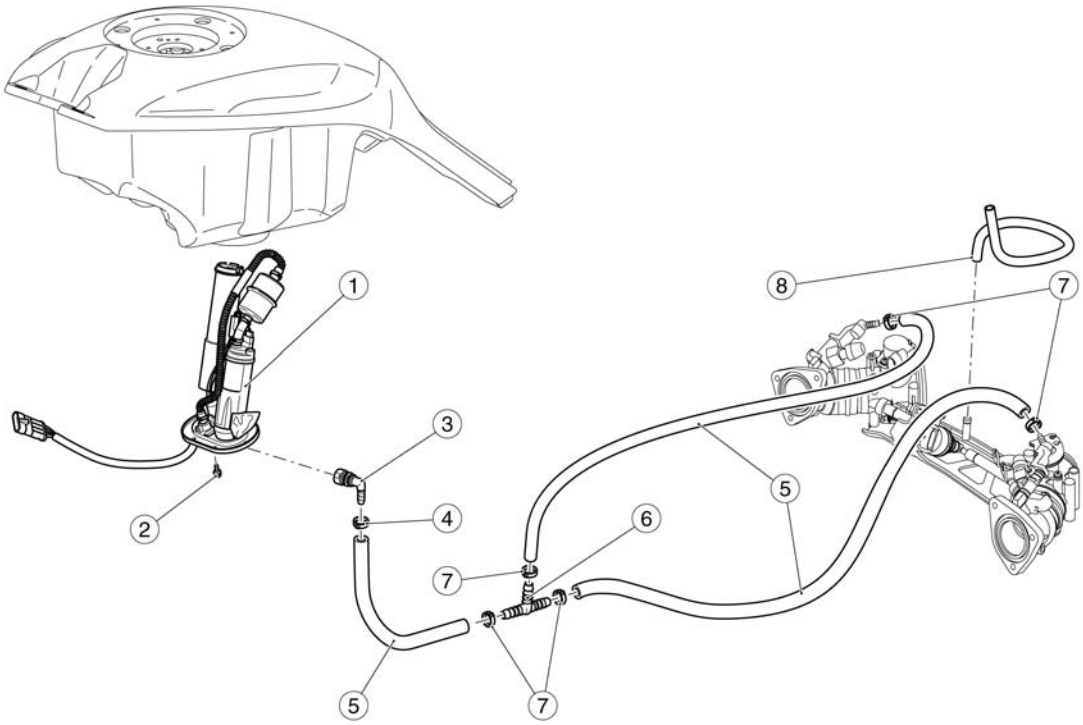
- Remove the two oil breather pipes.

- Unscrew and remove the oil return pipe positioning screw.
- Release the oil return pipe

- Remove the complete blow-by system.

INDEX OF TOPICS

Circuit diagram



Key:

1 Complete fuel pump assembly

2 Flange screw

3 Union

4 Clamp

5 Fuel pipe

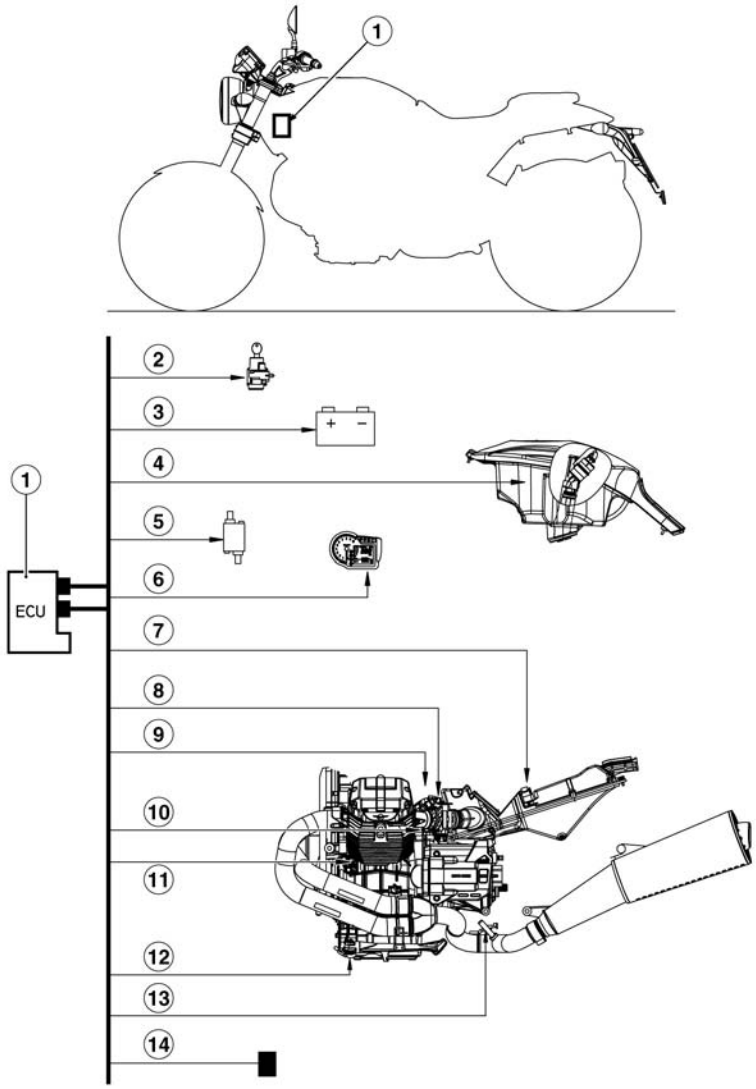
6. Three-way joint

7 Clamp

8 Pipe

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

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.

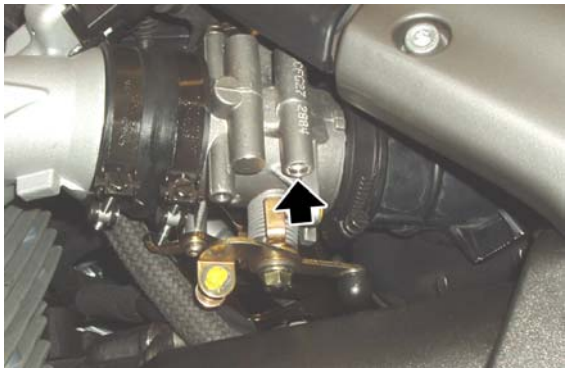
- Make sure the left throttle is fully in.

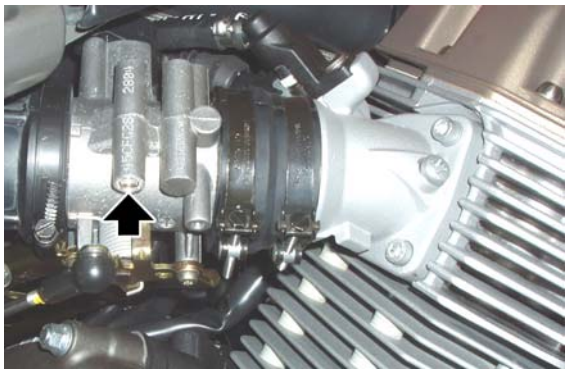
DO NOT TOUCH THE THROTTLE ABUTMENT SCREW OR THE THROTTLE BODY MUST BE REPLACED. CHECK THAT THE THROTTLE RETURN CABLE IS NOT TAUT.

- 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).



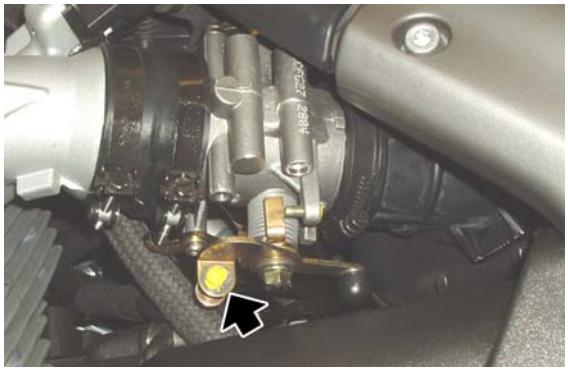


If this condition is detected:

- 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

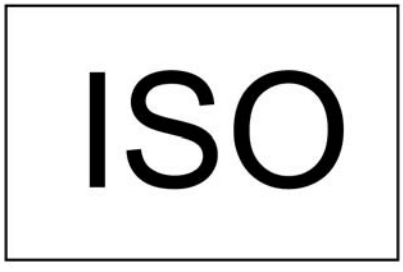
Using axone for injection system

Injection

Iso screen page

ISO

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



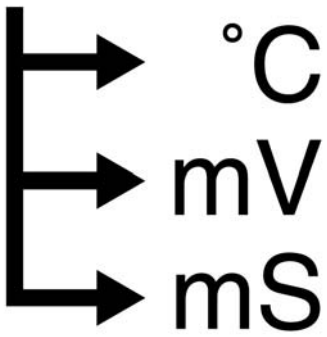
ISO DISPLAY

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, ...) or values set by the control unit (injection time, ignition advance, ...)



ENGINE PARAMETER READING DISPLAY

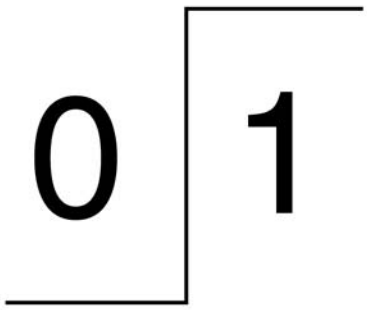
Specification	Desc./Quantity
Engine revs	Engine revolutions per minute: the minimum value is set by the control unit cannot be adjusted
Injection time	- ms
Ignition advance	- °
Air temperature	°C Temperature of the air taken in by the engine, measured by the sensor in the filter casing. This is not the 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) 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 sig-

Specification	Desc./Quantity
	nal (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 display show the status (ON/OFF only) of the vehicle devices or the operation condition of some vehicle systems (for example, lambda probe functioning)



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

Specification	Desc./Quantity
	indicates the position of the side stand (only with gear engaged)
Ignition	Enabled / disabled 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

DEVICE ACTIVATION

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

DEVICE 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
Deleting errors	By pressing the 'enter' button, the stored errors

Specification	Desc./Quantity
	(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

ERROR DISPLAY

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

ERROR DISPLAY

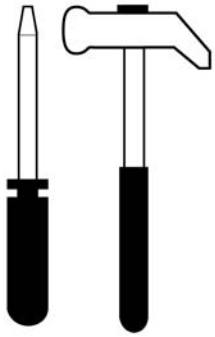
Specification	Desc./Quantity
Pressure sensor	Possible short circuit in the earth lead, battery or open circuit: recovery function noticeable for customer. Careful with the air pressure sensor in the instrument panel
Air temperature	Possible short circuit in the earth lead, battery or open circuit: recovery 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 en-

Specification	Desc./Quantity
	gine 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.
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 display 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

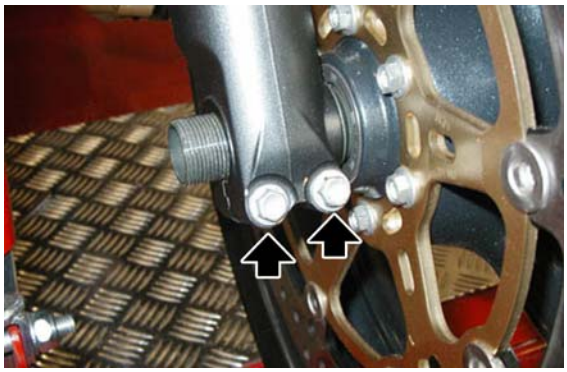
Front

Removing the front wheel

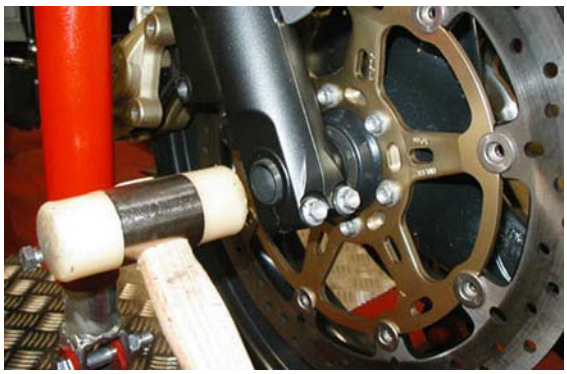
- Working from both sides, unscrew and remove the two fixing screws from the front brake callipers and remove them from their seats.

- Support the front part of the vehicle.
- Unscrew and remove the nut fixing the wheel bolt and collect the sealing ring.

- Working from both sides, loosen the screws on the wheel bolt clamps.



- Hit the wheel pin slightly with a rubber hammer so that the hole on the opposite side is exposed.



- Take out the wheel bolt by inserting a

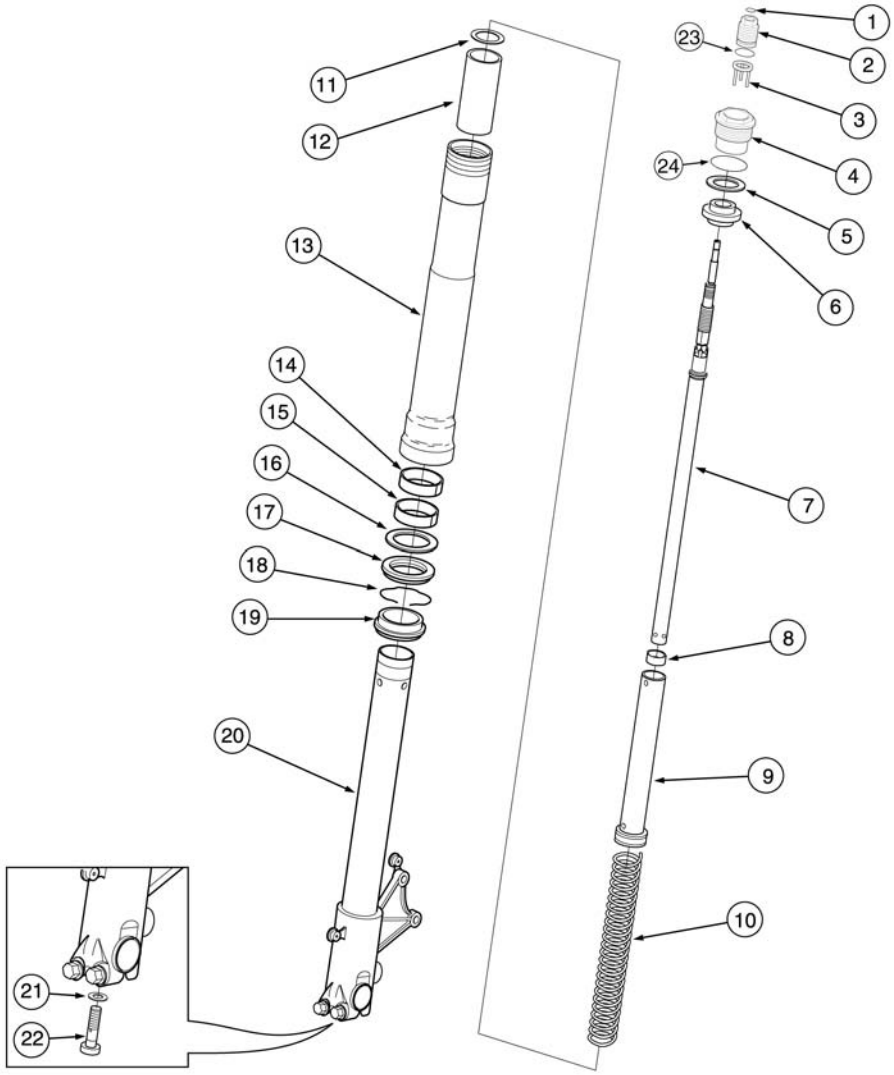
screwdriver in the bolt holes.

- Upon extracting the wheel, hold it and then remove it.

- Collect the spacer from the front wheel right side.

Front fork

Diagram



Key:

1 Locking ring

2 Spring preloading regulator

3 Spring preloading pusher

4 Sleeve upper cover

5 Washer

6 Slider

7 Complete pumping member

8 Centring bushing

9 Spring pressing pipe

10 Spring

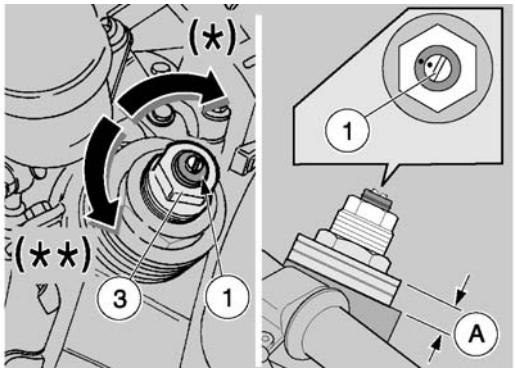
11 Spring support washer

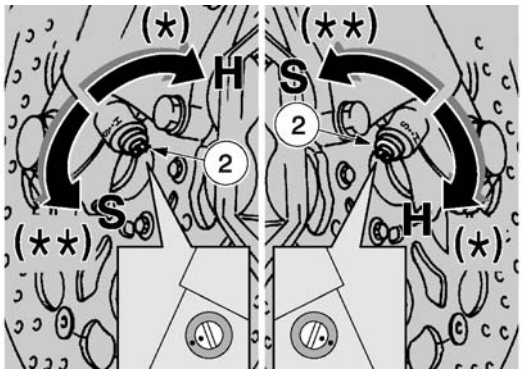
12 Lower collar

13 Sleeve
14 Sliding bushing
15 Guide bushing
16 Stop washer
17 Gasket
18 Snap ring
19 Dust guard gasket
20 Wheel holder stem
21 Copper washer
22 Central screw
23 O-ring
24 O-ring

Adjustment

The standard front fork setting is adjusted to suit most low and high speed riding conditions, whether the vehicle is partially or fully loaded. This setting can also be customised based on vehicle use.





CAUTION

SPORTS SETTING MAY BE USED ONLY FOR OFFICIAL COMPETITIONS TO BE CARRIED OUT ON TRACKS, AWAY FROM NORMAL ROAD TRAFFIC AND WITH THE AUTHORISATION OF THE RELEVANT AUTHORITIES.
IT IS STRICTLY FORBIDDEN TO USE SPORT SETTINGS AND RIDE THE VEHICLE SO SET ON ROADS AND MOTORWAYS.

FOR ADJUSTMENT, ALWAYS START FROM THE MOST RIGID SETTING (SET SCREWS (1 - 2) FULLY CLOCKWISE). USE THE NOTCHES ON SET SCREWS (1 - 2) AS REFERENCES TO ADJUST HYDRAULIC COMPRESSION AND

REBOUND DAMPING.

TURN THE SET SCREWS (1 - 2) GRADUALLY

BY 1/8 OF A TURN AT A TIME.

FRONT FORK ADJUSTMENT

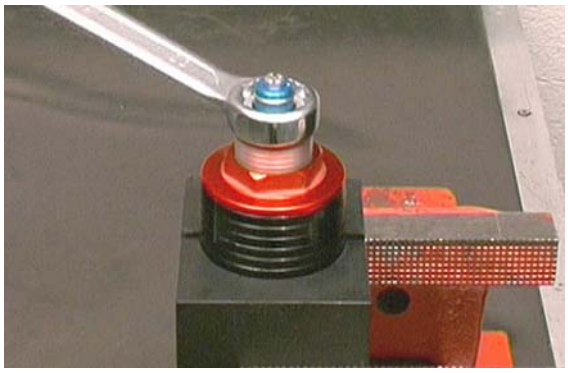
Specification	Desc./Quantity
Standard rebound damping adjustment, screw (1)	Open (**) 1.25 turn from fully closed (*)
Hydraulic rebound damping adjustment for sports use, screw (1)	Open (**) 0.5 - 1 turn from fully closed (*)
Standard compression damping adjustment, screw (2)	Open (**) (S) 1 turn from fully closed (*) (H)
Hydraulic compression damping adjustment for sports use, screw (2)	Open (**) (S) 0.5 - 1 turn from fully closed (*) (H)
Spring preloading, nut (3)	Open (**) 4 - 5 protrusion notches from fully closed (*)
Stems (A) protrusion from top plate (excluding cover) (standard adjustment)	4 protrusion notches Take your vehicle only to a **Moto Guzzi** Official Dealer for this type of adjustment.
Stems (A) protrusion from top plate (excluding cover) (sports use adjustment)	5 protrusion notches Take your vehicle only to a **Moto Guzzi** Official Dealer for this type of adjustment.

Removing the fork legs

- Remove the front mudguard.
- Support the fork stem and loosen the screws on the upper and lower plates.
- Slide off the fork stem.

Draining oil

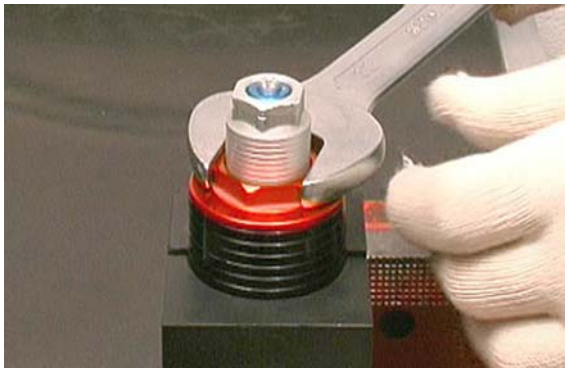
- Lock the sleeve in a vice with the specific tool (code AP8140149).
- Set the minimum spring preloading.



Specific tooling

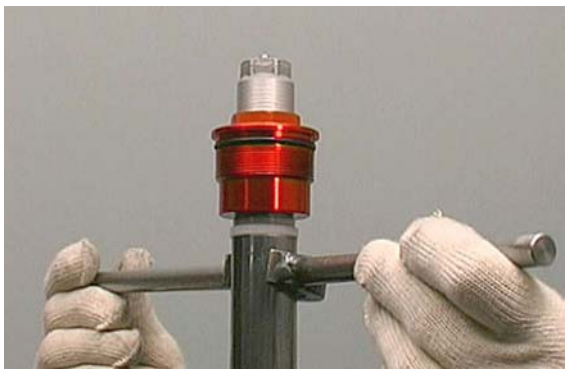
AP8140149 Protection for fitting operations

- Unscrew the sleeve upper cap.



- Lock the fork end in a vice paying attention not to damage it.

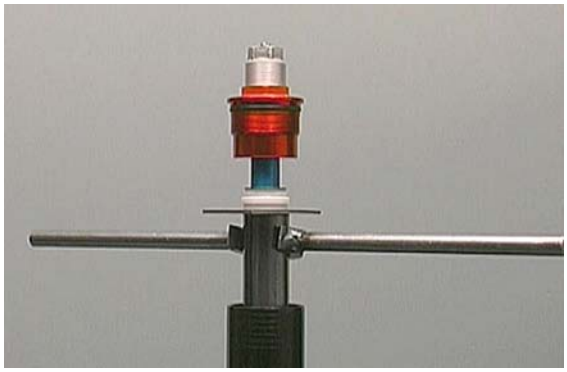
- Fit the tool on the spring joint.



Specific tooling

AP8140147 Spacer tool

- Push the tool against the spring and compress it. Fit the spacer of the tool under the cartridge lock nut.

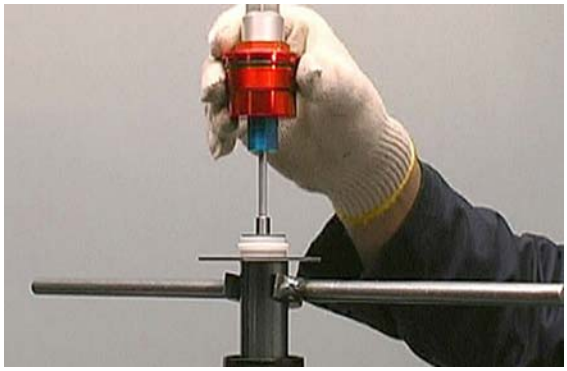


Specific tooling

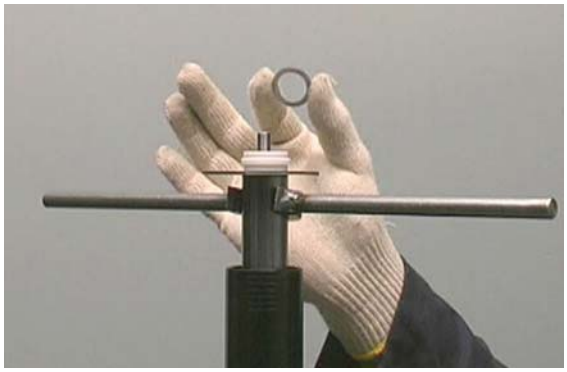
AP8140148 Spacer-pumping element separating strip

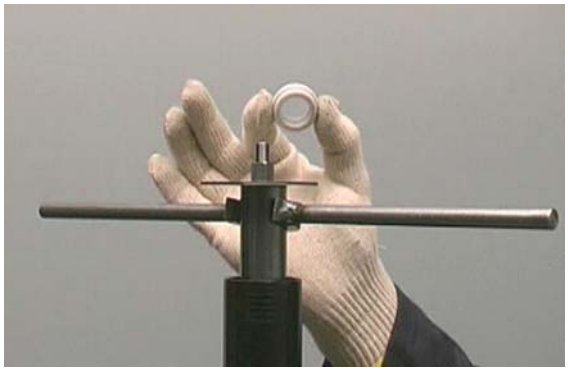
- Loosen the cap acting on the wrench slot and making the lock nut turn.

- Remove the whole cap.



- Detach the spacer and the washer.
- Press down the spring and slide off the spacer.



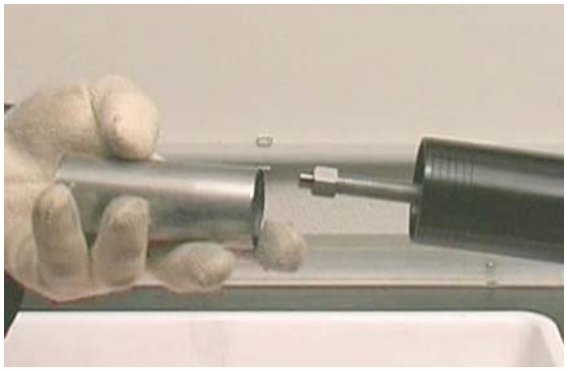


- Slide off the spring joint.

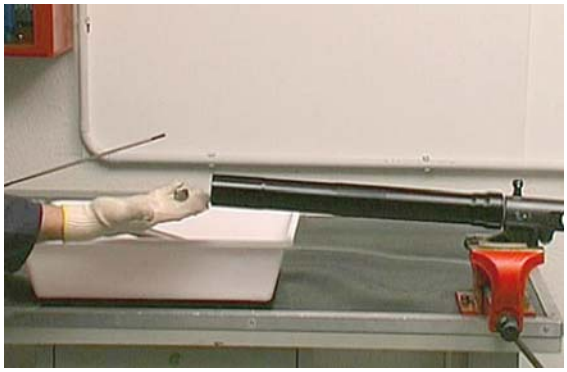
- Empty the oil into a container and remove the spring.

Disassembling the fork

- After emptying the oil, fasten the fork stem end in a vice.
- Take out the washer and the lower spacer.

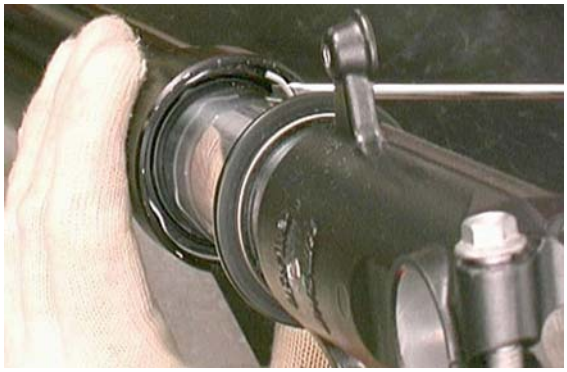


- Undo the screw fixing the cartridge on the fork end.
- Collect the centring bushing.



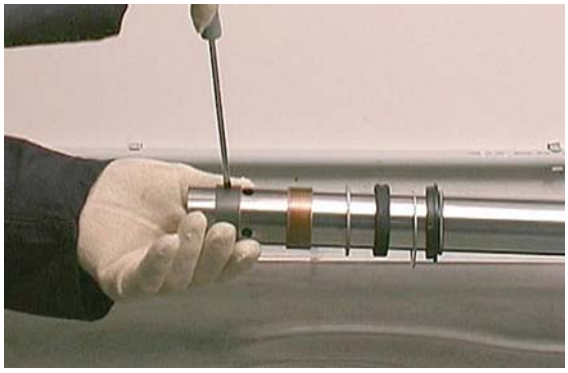
- Slide off the dust scraper from the sleeve using a screwdriver as a lever.
- Do not damage the sleeve edge while doing this.

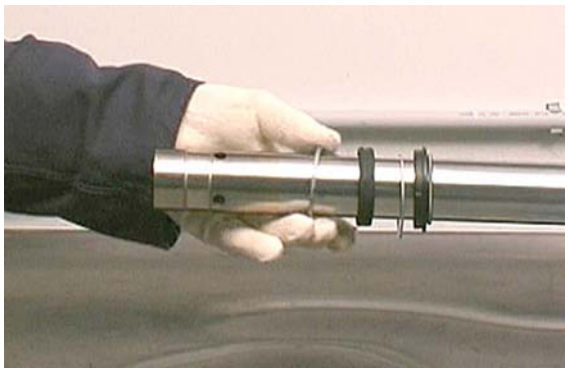
- Remove the snap ring.

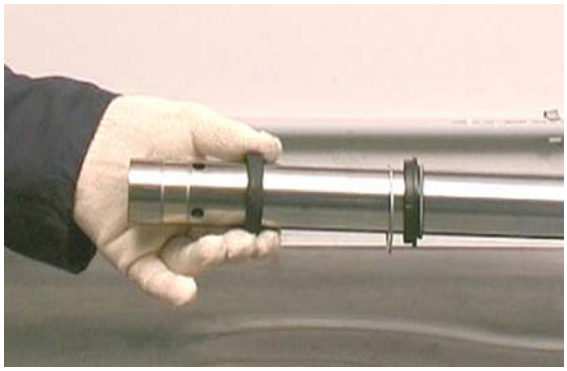


- Take out the sleeve from the stem using the stem as a hammer puller.

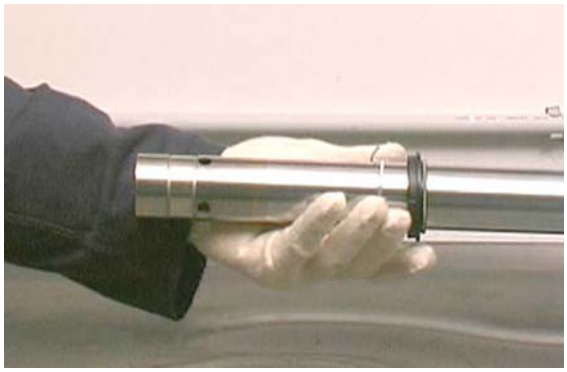
- From the stem remove the fixed fitted bushing, the movable bushing, the ring and the oil seal.







- Remove the ring and the dust guard.



Checking the components

Stem

Check the sliding surface for scorings and/or scratches.

These scorings can be eliminated rubbing with wet sandpaper (grain 1).

If the scorings are deep, replace the stem.

Use a dial gauge to check that the stem bending is below the limit value.

If over the value, replace the stem.

CAUTION

A BENT STEM SHOULD NEVER BE STRAIGHTENED BECAUSE ITS STRUCTURE WOULD BE WEAKENED AND USING THE VEHICLE MAY BECOME DANGEROUS.

Characteristic

Bending limit:

0.2 mm (0.00787 in)

Sleeve

Check that there are no damages and/or cracks; otherwise, replace it.

Spring

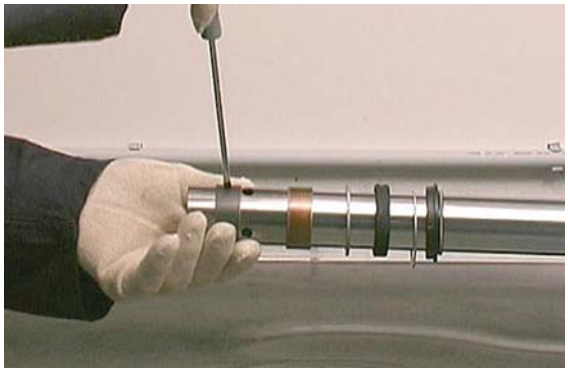
Check that the spring is in good conditions. Check that the spring length is within the limit value.

Replace the spring if its length does not fall within the limit values.

FREE SPRING MINIMUM LENGTH: 284 mm (11.2 in)

Check that the following components are in good conditions:

- sliding bushing;
- guide bushing;



- pumping member.

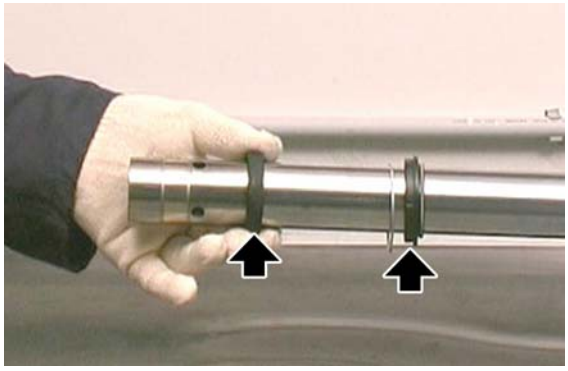
If there are signs of excessive wear or damage, replace the affected component.

CAUTION

REMOVE ANY IMPURITY IN THE BUSHINGS, TAKING CARE NOT TO SCRATCH THEIR SURFACE.

Replace the following components with new ones:

- gasket;
- dust guard gasket;
- the two O-rings on the regulator.

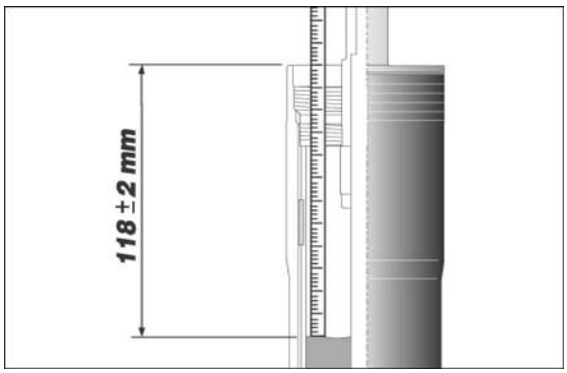


Oil quantity: 520 +/- 2.5 cm³ (31.7 +/- 0.15 cu.in).

Oil level: 118 +/- 2 cm³ (4.6 +/- 0.079 cu.in) (from the sleeve rim)

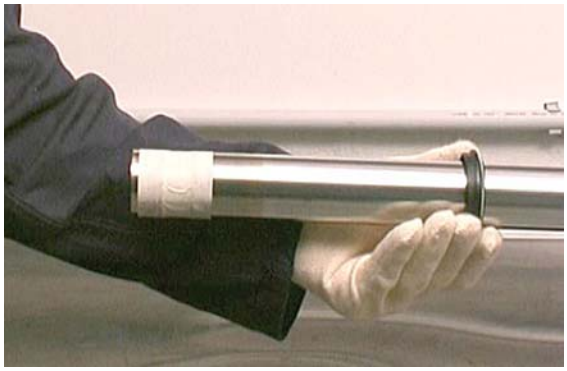
NOTE

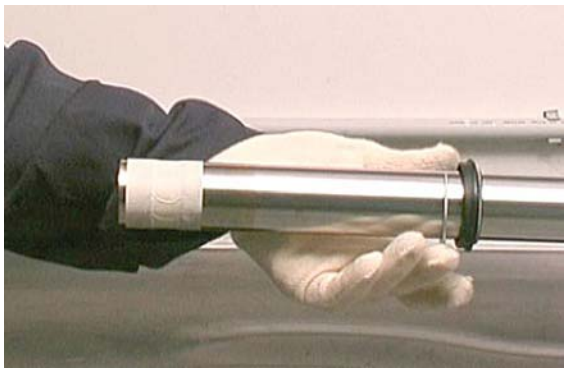
FOR A CORRECT OIL LEVEL MEASUREMENT THE SLEEVE MUST BE PERFECTLY VERTICAL. THE OIL LEVEL MUST BE THE SAME IN BOTH STEMS.

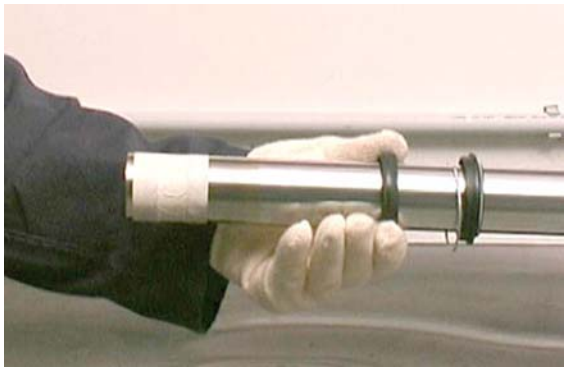


Reassembling the fork

- Lock the stem in a vice without damaging the surfaces.
- Protect the bearing tube end with adhesive tape.
- Lubricate the sliding edges with fork oil or with seal grease.
- Fit the dust scraper, the snap ring and the sealing ring on the slider.

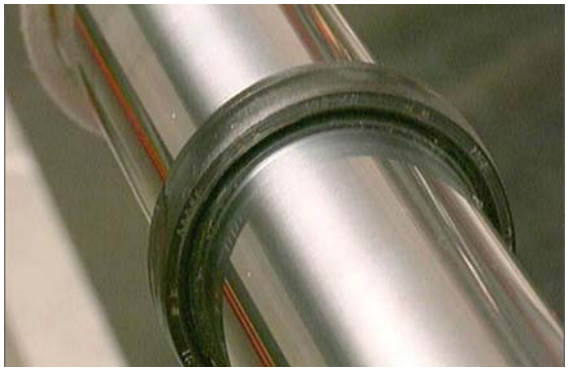




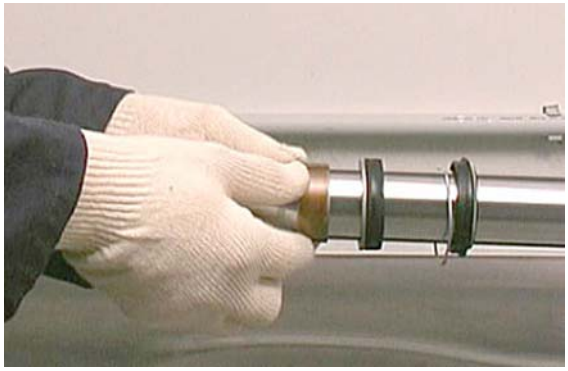


- The sealing ring must be placed with the stamped part facing the dust

guard.



- Fit the ring, the movable bushing and, after removing the tape, fit the fixed bushing.



- Fit the sleeve on the stem and set the oil seal into position with the aid of the specific tool.

Specific tooling

AP8140149 Protection for fitting operations

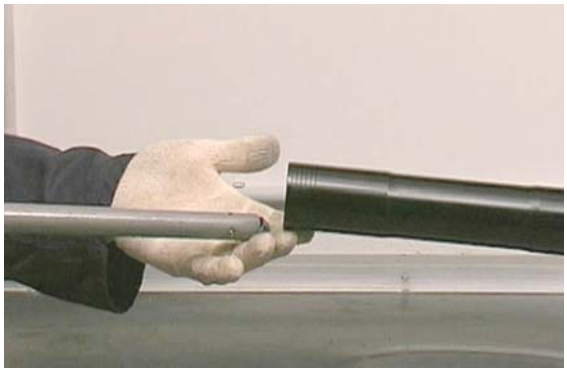
- Insert the snap ring in its position.

- Fit the oil seal with the specific tool.

Specific tooling

AP8140149 Protection for fitting operations

- Fit the centring bushing on the cartridge and insert the whole assembly in the fork.



- Tighten the screw fixing the pumping element on the fork end to the pre-

scribed torque.

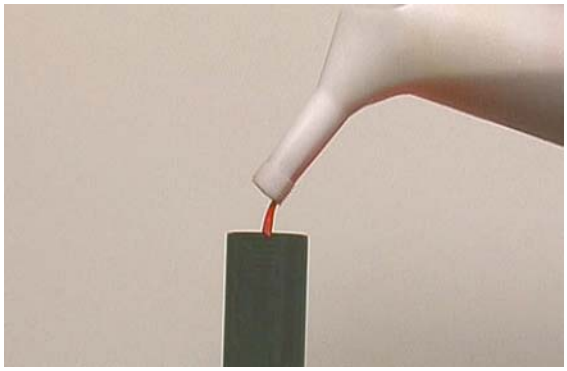
- Position the lower spacer and the washer.

- Insert the fork spring.
- Fill the fork with oil.

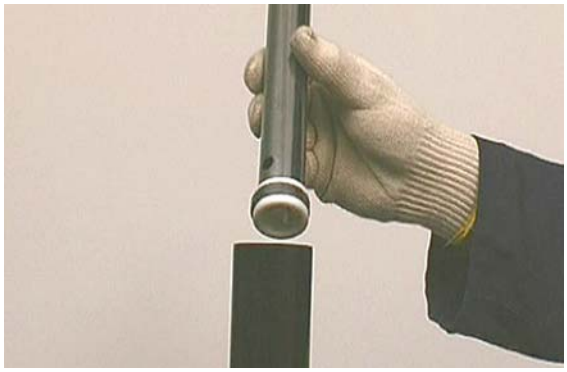
Filling oil

- Fill the fork freeing the air bubbles

trapped inside.



- Fit the spring joint.

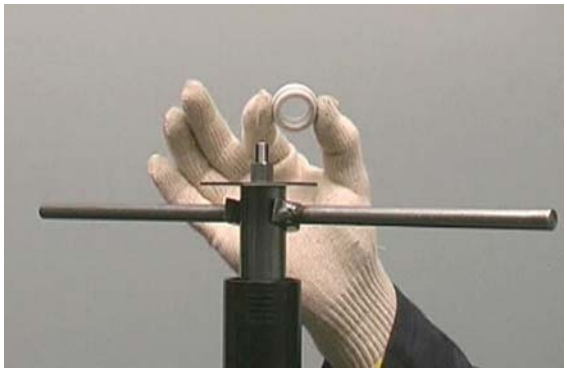


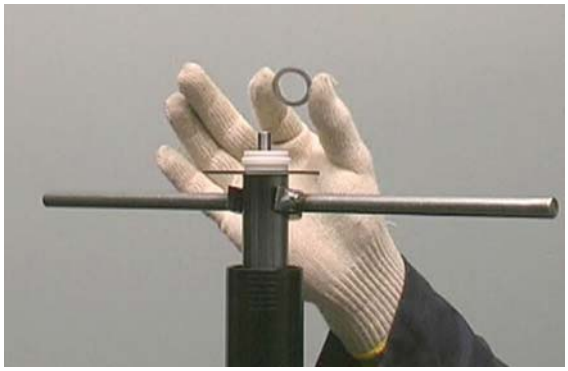
- Fit the specific tool on the spring joint so that the cartridge stem can be locked in position.

Specific tooling

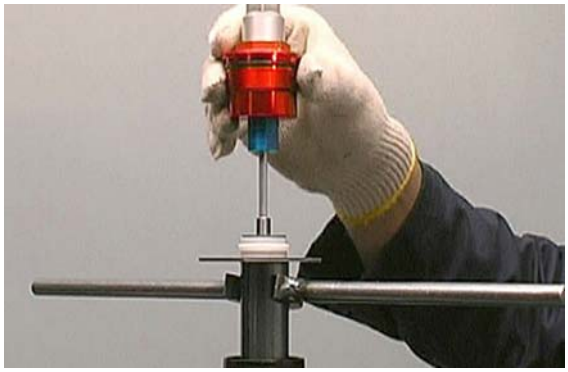
AP8140147 Spacer tool

- Position the spacer and the washer.





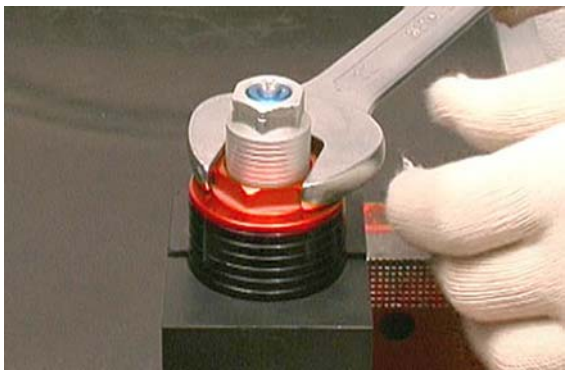
- Screw the upper cover on the cartridge stem.



- Lock the sleeve in a vice with the specific tool (code AP8140149).
- Screw the upper cover tightening it to the prescribed torque.

Specific tooling

AP8140149 Protection for fitting operations



Steering bearing

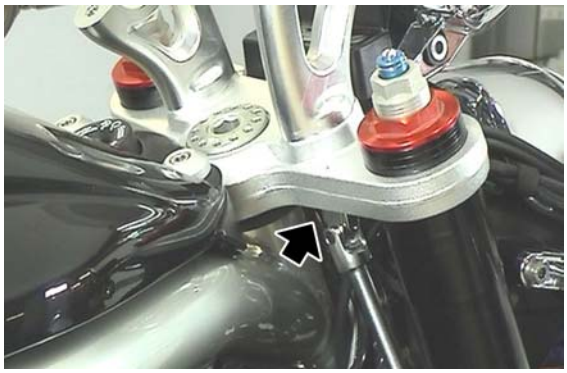
Adjusting play

- Unscrew and remove the two front screws.

- Unscrew and remove the two external screws and move the instrument panel forwards.

- Unscrew and remove the screws and collect the U-bolts, holding the handlebar.
- Move the handlebar forward without tilting the clutch and the front brake fluid reservoirs.

- Unscrew and remove the screw.
- Collect the right handlebar support.



- Unscrew and remove the fork upper plate cover; collect the shim.

- Working on both sides, unscrew and remove the upper plate fixing screw on the fork stems.

- Lift the fork upper plate sliding it off from the stems.

- Rivet the safety washer on the head-stock.

UPON REFITTING, REPLACE THE SAFETY WASHER WITH A NEW ONE.

- Using the suitable special tool, un-screw and remove the upper ring nut.

Specific tooling

AP8140190 Tool for steering tightening

- Remove the safety washer.

- Using the suitable special tool, set the preloading of the steering bearings.

Specific tooling

AP8140190 Tool for steering tightening

- Fit a new safety washer.

- Screw the upper ring nut manually and then slightly tighten the clamps on the

plate so as to align notches on the ring nut.

Specific tooling

AP8140190 Tool for steering tightening

- Rivet the tongues of the new safety washer.

- Fit the fork upper plate on the stems.

Rear

Removing the rear wheel

- Support the vehicle from the rear with an adequate stand.
- Remove the cover.

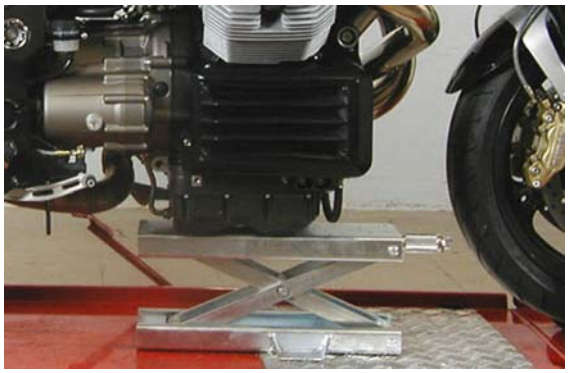
- Engage the first gear.
- Unscrew and remove the four screws, collect the spacers and the dust guard ring.
- Remove rear wheel.

Shock absorbers

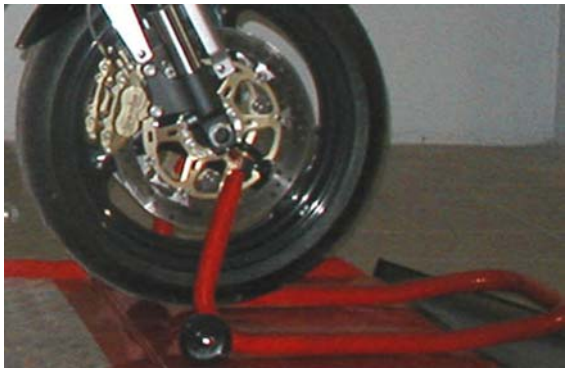
Removing

- Secure the vehicle handlebar from the front with a hoist.

- Support the vehicle from below with a suitable underpan jack.



- Support the vehicle from the front with a suitable stand.

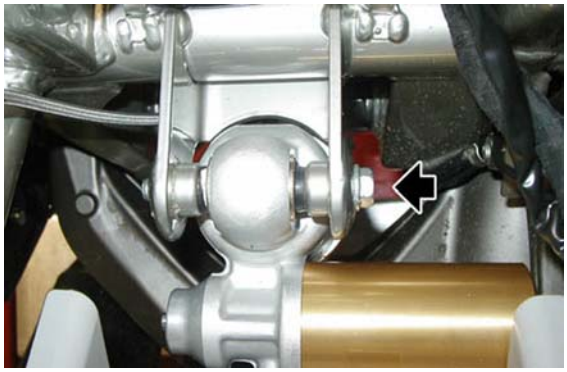


- Unscrew and remove the fixing nut.

- Take out the screw tapping lightly with a rubber hammer and follow as the assembly slides out of its position.

- Unscrew and remove the suspension lower screw.

- Unscrew and remove the suspension upper screw.



INDEX OF TOPICS

CHASSIS	CICL

Swinging arm

Removing

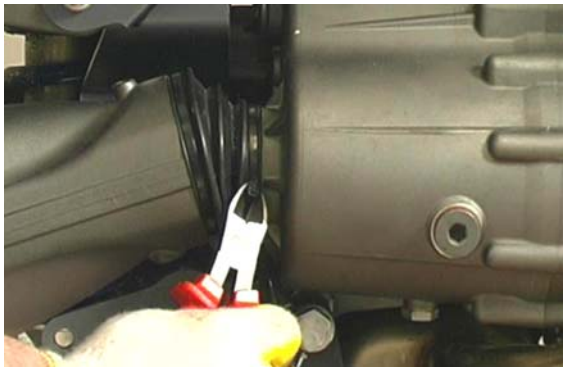
- To remove the fork, first remove both footrest supporting plates and the exhaust silencer.
- Slide off the rear brake calliper from the disc and release the brake pipe.
- Remove the cover.

- Engage first gear.
- Unscrew and remove the four screws, collecting the spacers and the anti-dust ring.

- Remove the rear wheel.

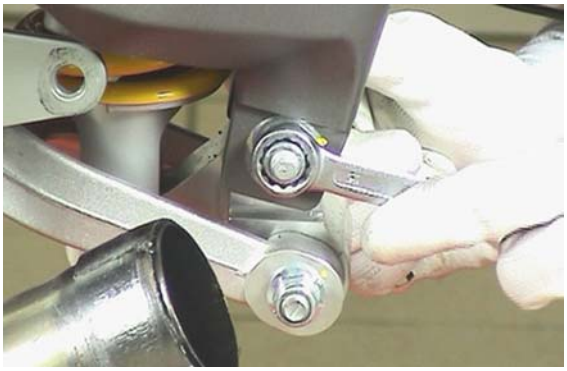
- Unscrew and remove the fixing nut of the reinforcing bar.
- Remove the screw.
- Fix the reinforcing bar to the chassis with a clamp.

- Remove the clamp from the dust guard cap.



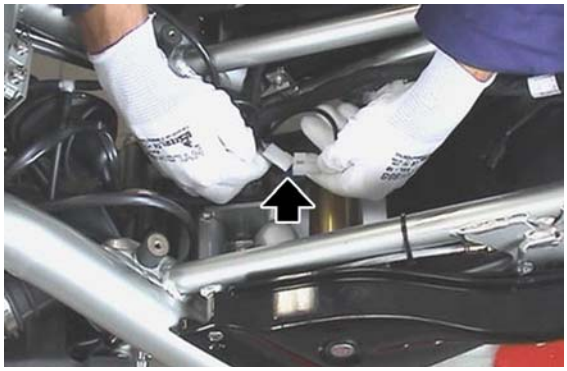
- Loosen the two fork terminal screws.

- Unscrew and remove the fixing nut of the connecting rod assembly and collect the screw.



- Disconnect the speed sensor connector and release the cable from the

clamp on the chassis.



- Loosen the ring nut.

Specific tooling

05.91.26.30 Tool to tighten the fork pin ring nut

- Helped by a second operator, remove the pin and remove the fork with cardan shaft.

Checking

- Check that the universal joint is not damaged, the gear teeth inserting in the sleeve grooves and the grooves on the joint are not deformed or damaged; otherwise, replace the joint.
- Check that the rubber bellows are not cut or pierced; otherwise, replace it.
- Check that the fork pin threads and the fork fixing nuts are not damaged,

deformed or flattened; otherwise, replace them.

- Check that the sleeve grooves are not damaged, deformed or deteriorated; otherwise, replace the sleeve.
- Check that the sleeve outer toothing and grooves are not damaged.

Installing

- Spread a thin layer of lubricating grease all along the fork pin.
- Fit the ring nut in the fork pin and screw it manually.

- Working on both sides, grease the cardan shaft cables with the recommended product from the recommended products table.
- Block the fork, insert the universal joint, align the holes and, at the same time, helped by a second operator, insert the pin completely.
- Tighten the fork pin.

- Use the suitable box-spanner to tighten the ring nut.

Specific tooling

05.91.26.30 Tool to tighten the fork pin ring nut

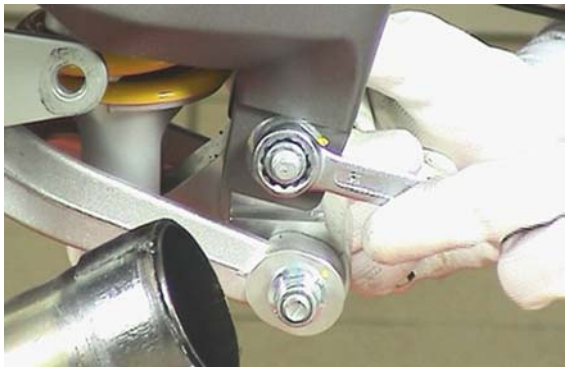
- Tighten the two fork terminal screws.

- Fit the dust guard cap in the gearbox.
- Lock the dust guard cap with a new clamp.

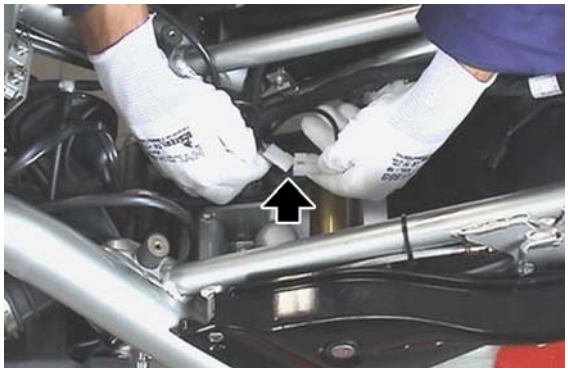
- Place the reinforcing bar in its seat.
- Insert the screw.
- Screw the fixing nut of the reinforcing.

- Place the connecting rod assembly on the fork.

- Insert the screw.
- Tighten the fixing nut of the connecting rod assembly.



- Connect the speed sensor connector and fix the cable to the chassis with clamps.



- Place the rear wheel on the fork.
- Tighten the four screws with their spacers and the anti-dust ring.
- Place the cover.
- Place the rear brake calliper on the disc and the brake pipe on the fork.

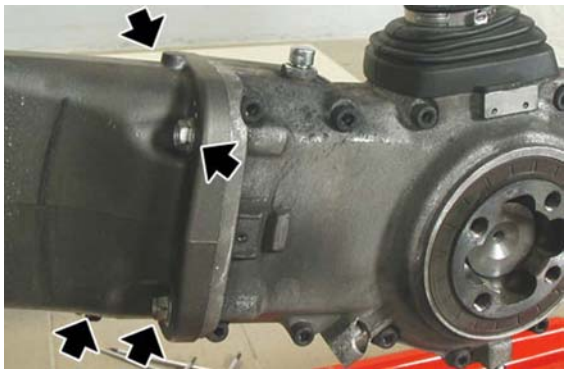
Bevel gears

Removing

- To remove the gearbox, first remove the exhaust silencer and the rear wheel.

- Unscrew and remove the fixing nut of the reinforcing bar.
- Remove the screw.
- Fix the reinforcing bar to the chassis with a clamp.

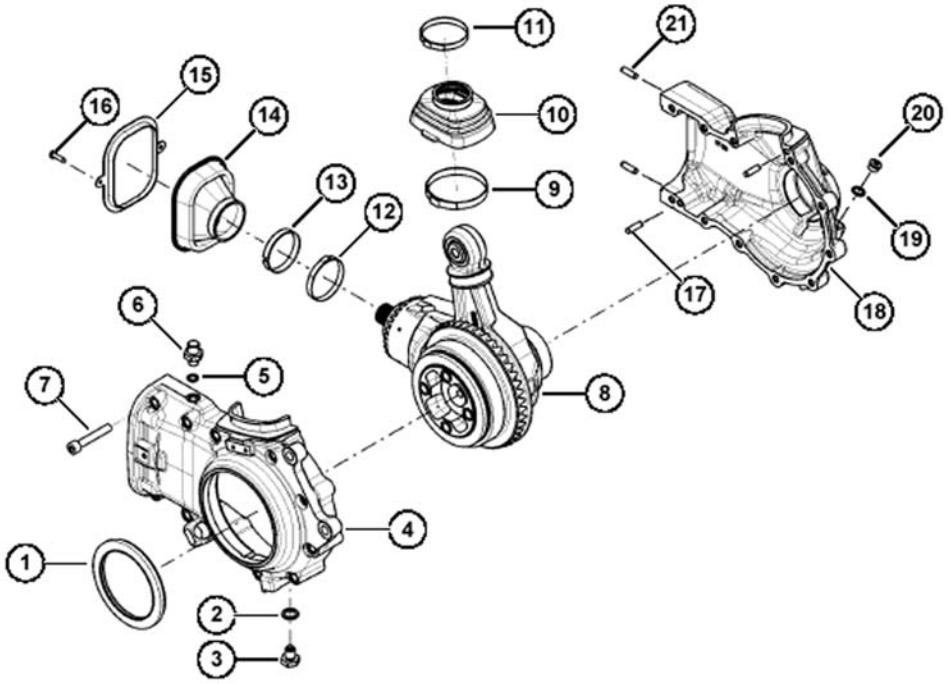
- Unscrew and remove the four screws.



- Remove the transmission casing sliding off the universal joint.

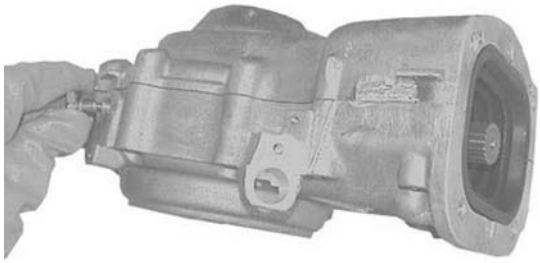
Checking

Casing unit removal

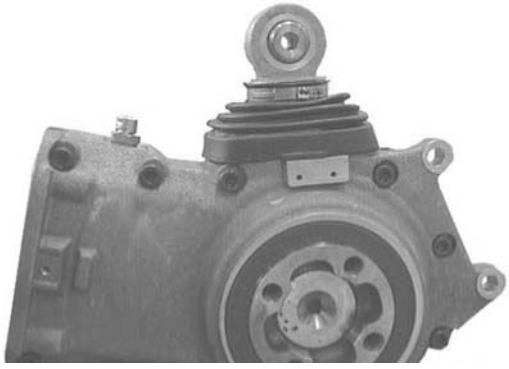


Remove the cover (20).

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



Lift the cap (10).



Remove the clamps (9) and (11).

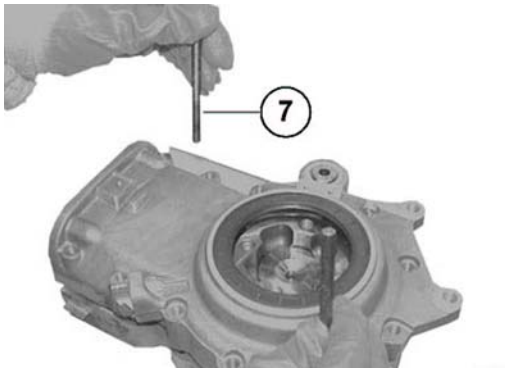
Remove the cap (14).

Remove the screws (16).

Collect the ring (15).

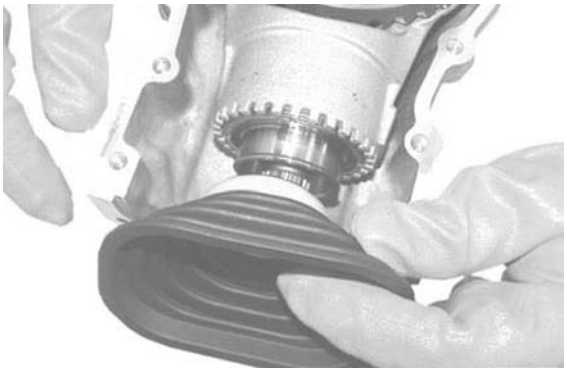
Remove the screws (7).

Remove the casing (4).

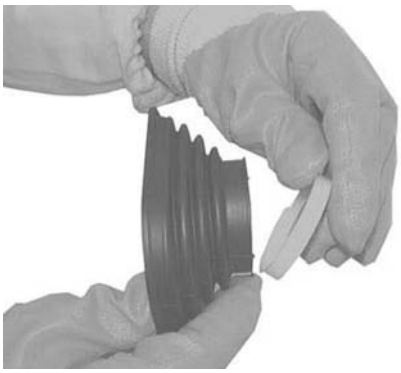


Remove the clamp (12).

Remove the cap (14).



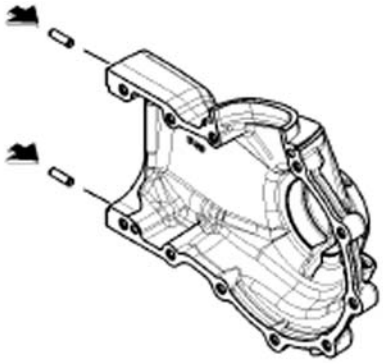
Collect the ring (13).



Remove the support unit (8).

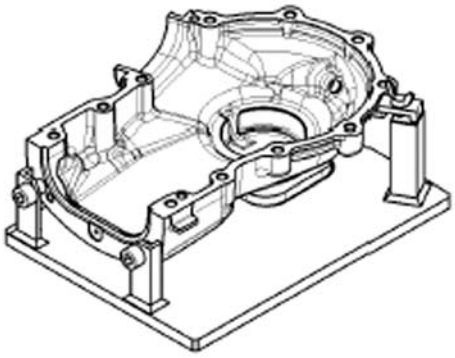
Casing unit fitting

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



Assemble the casing to the special fastening tool.

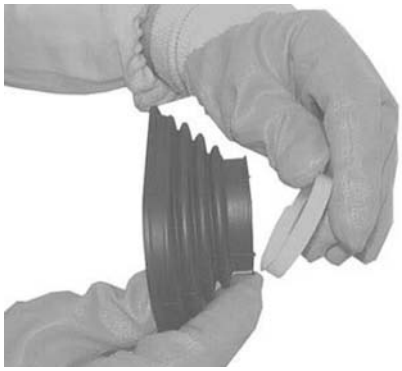
Clean the casing faying surfaces carefully.



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.

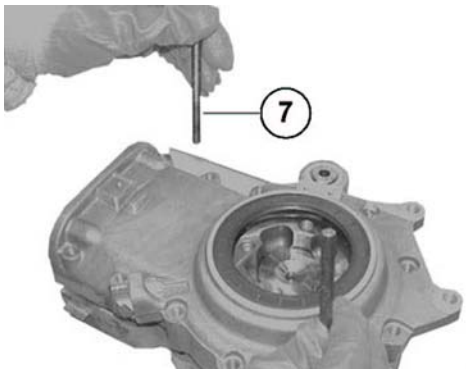
Fit a new sealing ring using the buffer.

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.

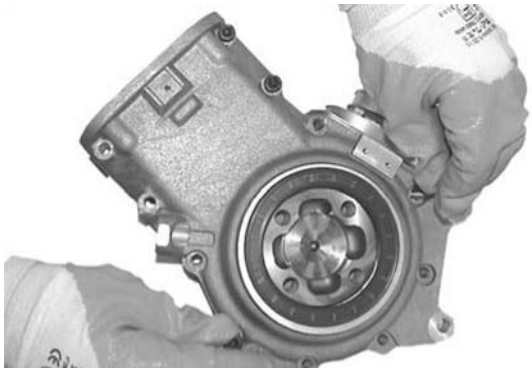
Remove the two dowel pins.



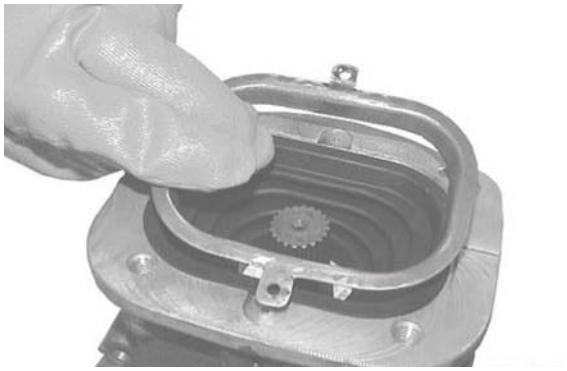
Assemble the fixing screws (7).

Tighten the screws (7) to the prescribed torque.

Remove excessive sealant.



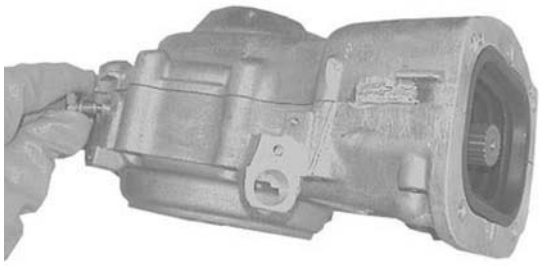
Assemble the ring to the casing.



Tighten the fixing screws to the prescribed torque.

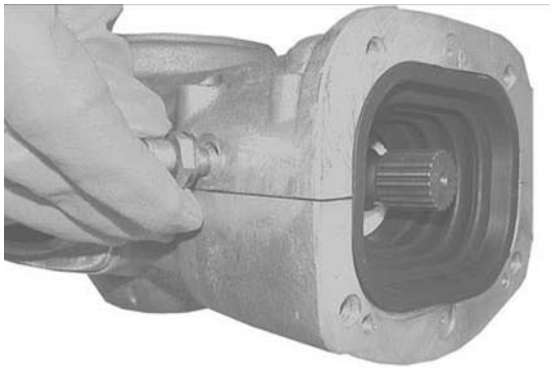
Fit the cap with the washer.

Screw the cap to the prescribed torque.



Fit the breather with the washer.

Screw the breather to the prescribed torque.

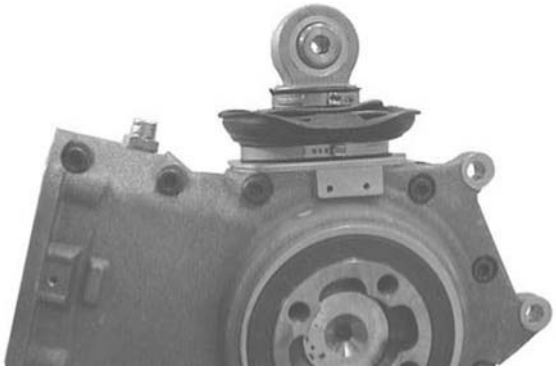


Fill the transmission with the prescribed oil.

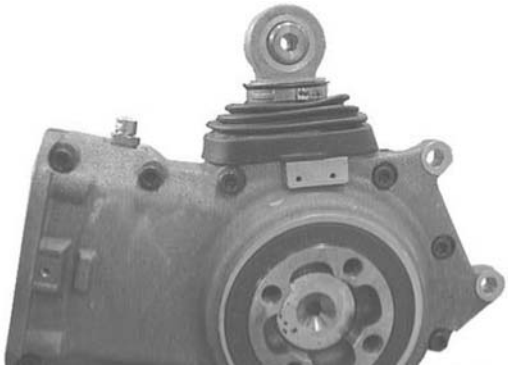
Fit the cap with the washer.

Screw the cap to the prescribed torque.

Assemble the cap with the clamps.



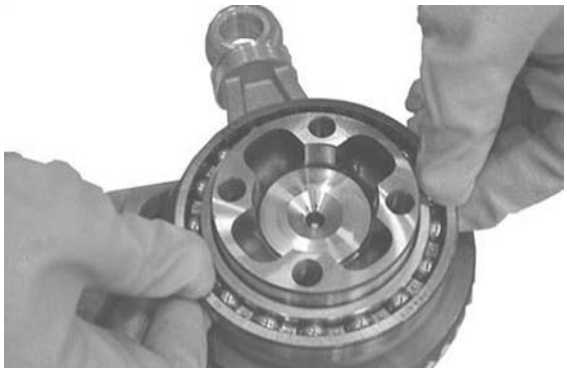
Fit the cap in its seat.



Wheel axle unit

REMOVAL

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



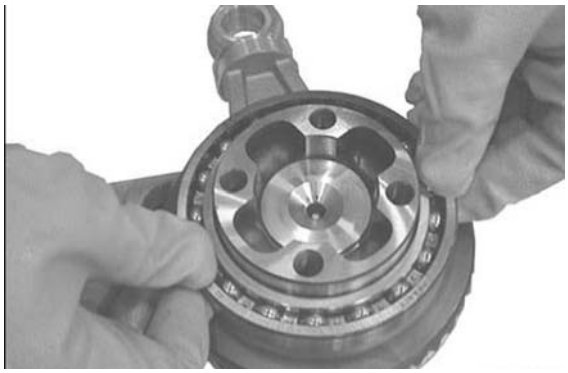
Turn the unit over.

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.



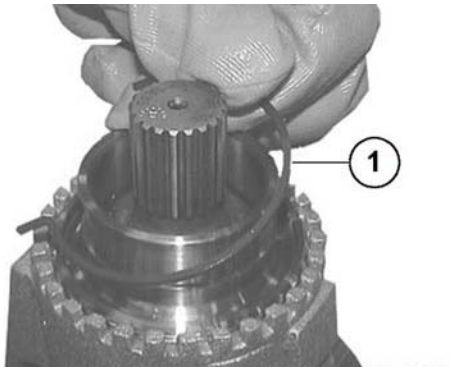
Turn the unit over.

Assemble the bearings to the wheel axle.

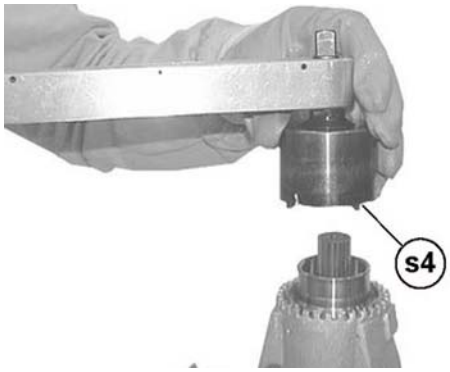
Pinion unit

REMOVAL

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



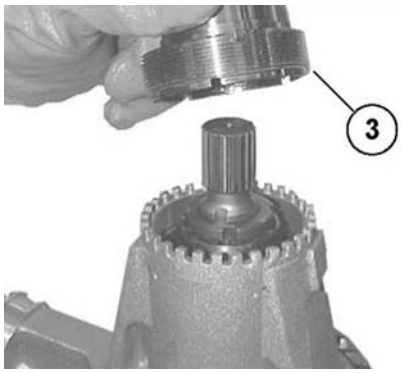
Unscrew the ring nut (2) with the special spanner (s4).



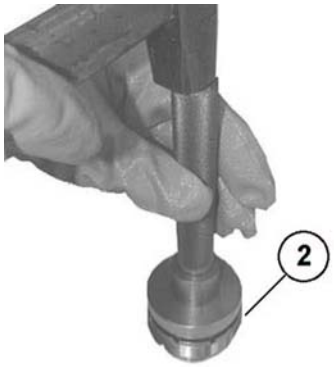
Remove the ring nut (2) and remove the sealing ring from the ring nut.

NOTE

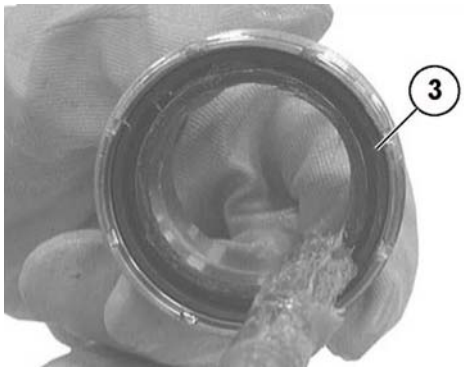
THIS OPERATION DESTROYS THE SEALING RING.



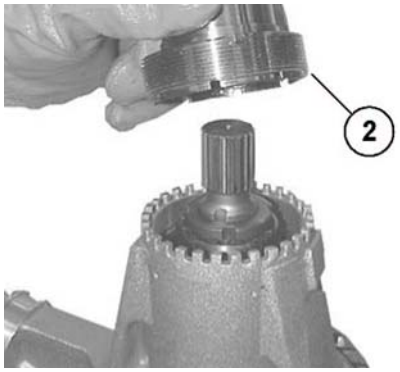
Assemble the sealing ring (3) to the ring nut (2) with the buffer CA715855 (see Fig.1) and a hammer.



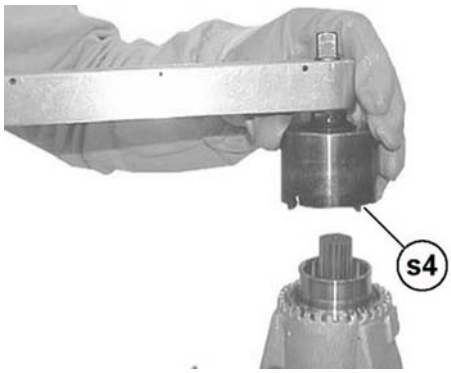
Lubricate the sealing ring (3).



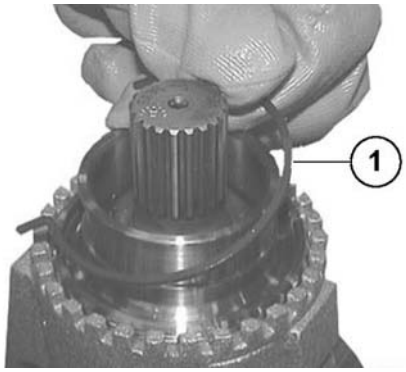
Assemble the ring nut (2).



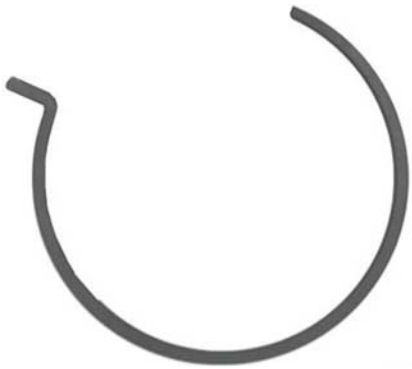
Tighten the ring nut (2) with the special spanner (s4) to the prescribe torque.



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

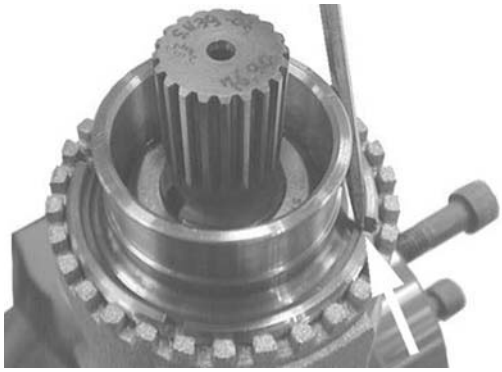


Assembly position of the stop ring (1).

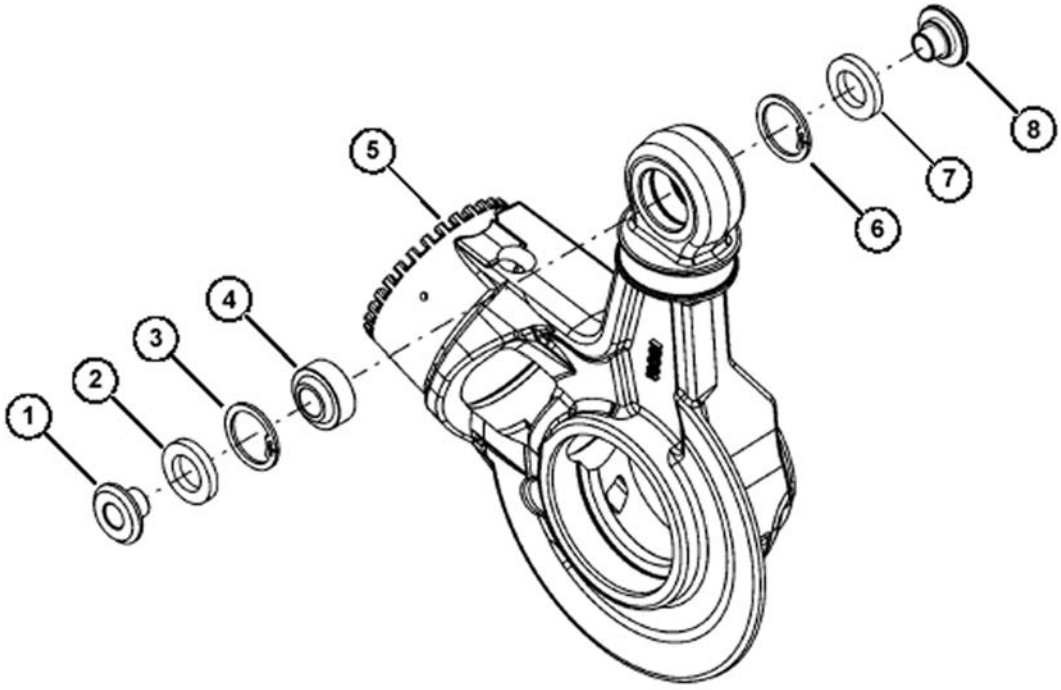


CAUTION

MAKE SURE THE STOP RING IS IN ITS SEAT.



Support unit



REMOVAL

Remove the bushing (1) with a punch.

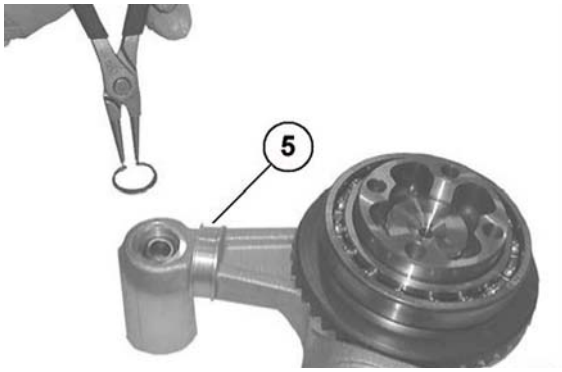
Turn the support (5) over and remove the other bushing (8).

Remove the sealing rings (2) and (7) with a screwdriver.

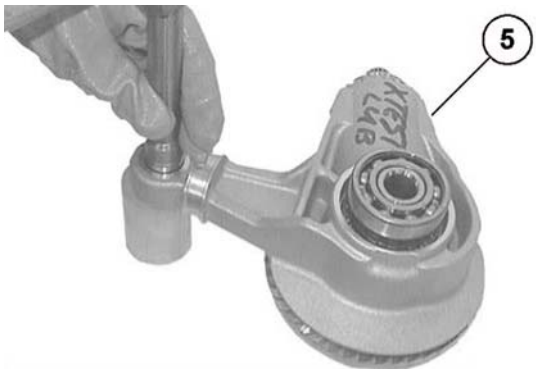
Remove the stop rings (3) and (6) from the support (5) with suitable pliers.

NOTE

THIS OPERATION DESTROYS THE SEALING RING.

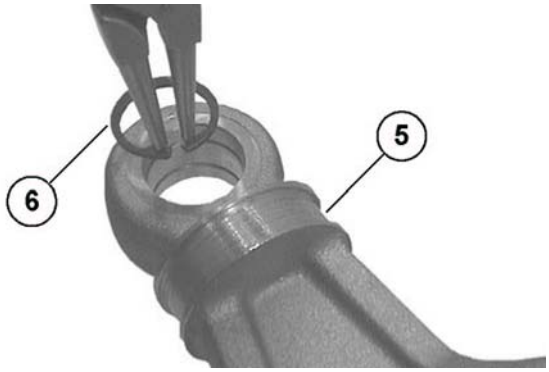


Remove the ball joint (4) with a suitable buffer and a rubber hammer.



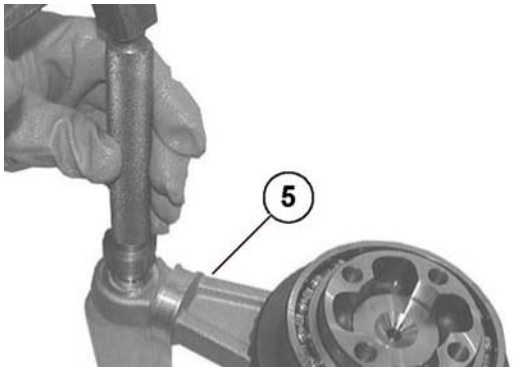
FITTING

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

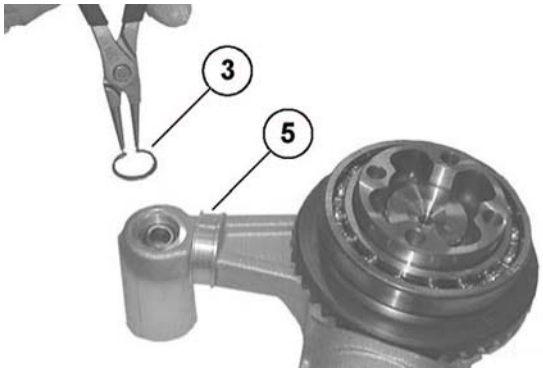


Turn the support (5) over.

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).

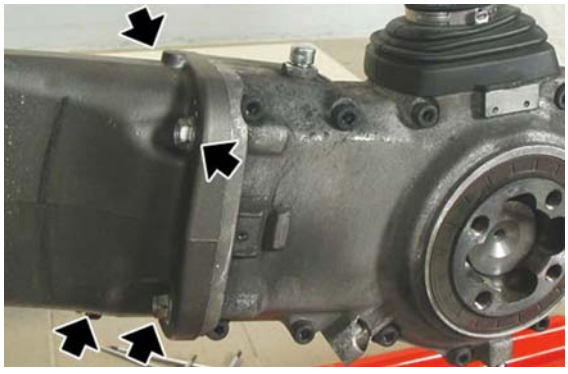
TROUBLESHOOTING

Possible Cause	Operation
1. Fitting error of the radial seal or seal damaged 2. Sliding surface of the wheel axle seal spoiled or damaged	1. Replace the sealing ring and fit it correctly with the suitable tool 2. Replace the wheel axle
1. Casing not sealed 2. Closing screws of the casing shells not tightened to the prescribed torque.	1. Open the casing shells, clean the surfaces, seal it and reassemble the casing 2. Tighten the closing screws to the correct torque
1. Dirt between sealing ring and casing 2. Worn sealing ring fitted 3. Plug not tightened to the prescribed torque	1. Clean and tighten to the correct torque 2. Replace the sealing ring 3. Tighten the plug to the correct torque
1. Damaged cap 2. Retaining clamps or closing cover slacken 3. Fitting error of the radial seal or seal damaged 4. Sliding surface of the wheel spacer seal spoiled or damaged	1. Replace the cap 2. Screw the clamp with suitable pliers 3. Replace the sealing ring and fit it correctly with the suitable tool 4. Replace the spacer
1. Cap damaged 2. Internal retaining clamp or external closing clamp loose	1. Replace the cap 2. Screw the internal or external clamp with suitable pliers
1. Bevel gear pair fitting error 2. Bevel gear pair toothing spoiled or damaged	1. Replace the bevel gear pair
1. Ball bearings on the wheel axle damaged	1. Replace the wheel bearings

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 reinforcing bar in its seat.
- Insert the screw.
- Tighten the reinforcing bar fixing nut.

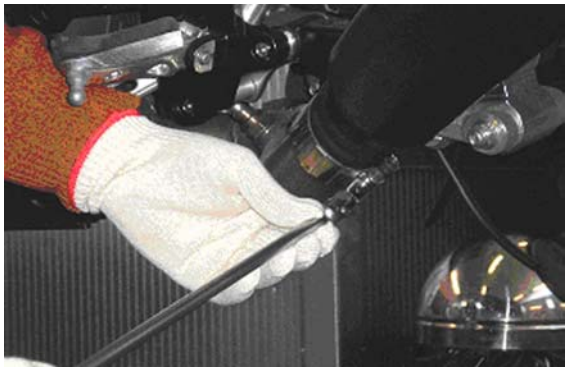
- Place the anti-dust ring between the rim and the cardan shaft taking care to mount it with the collar facing the transmission unit.

- Place the rear wheel on the fork.
- Tighten the four screws with their spacers and the anti-dust ring.
- Place the cover.
- Place the rear brake calliper on the disc and the brake pipe on the fork.

Exhaust

Removing the tail pipe

- Loosen the seal clamp between the exhaust and the central manifold.



- Unscrew and remove the two front attachment screws fixing the exhaust to the chassis; collect the lock nuts.

Locking torques (N*m)

Silencer to footrest support retainer 25 Nm

- Unscrew and remove the rear attachment screw fixing the exhaust to the chassis; collect the locking nut, the spacer and the washer.

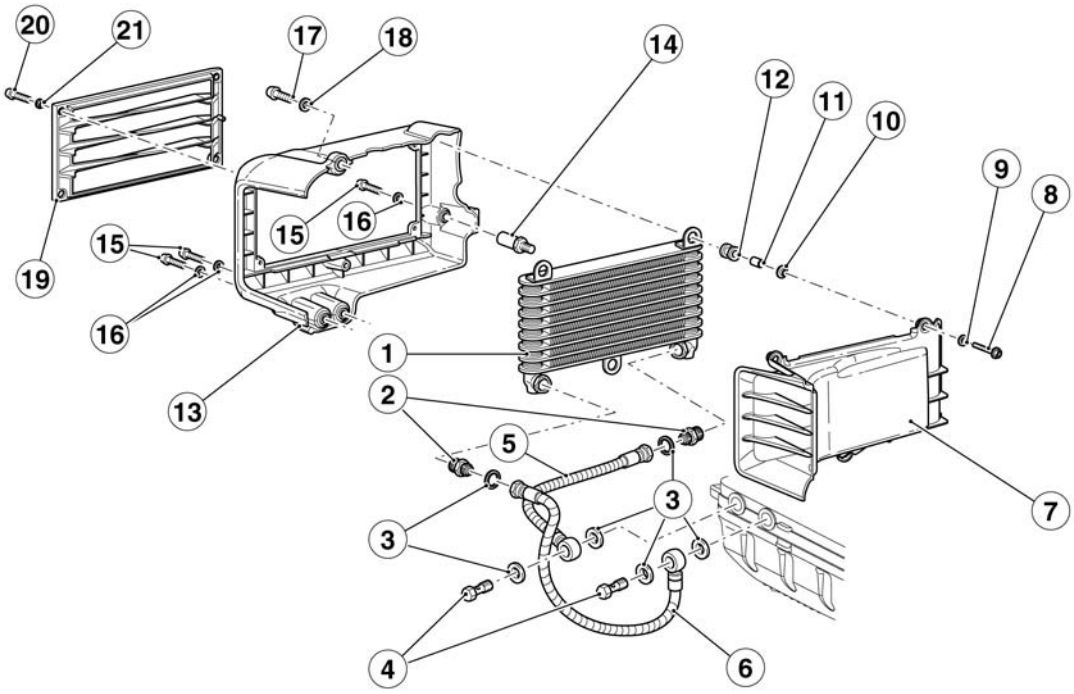
DURING THIS OPERATION SUPPORT THE EXHAUST SO THAT IT DOES NOT FALL.

Locking torques (N*m)

Silencer to chassis connecting pipe retainer 25 Nm

- Remove the terminal.

Engine oil cooler



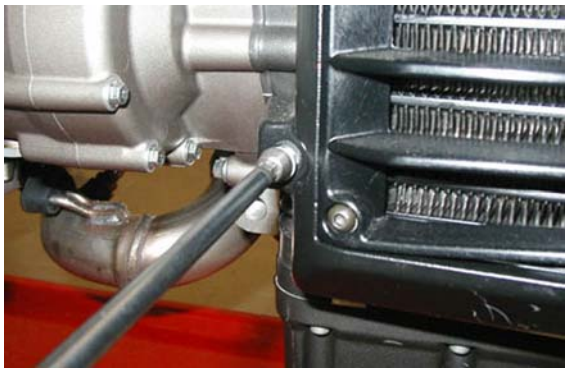
Key:

1. Complete oil radiator
2. Reduction
3. Aluminium gasket
4. Capstan screw
5. Right pipe
6. Left pipe
7. Deflector
8. M6x30 TE flanged screw
9. Washer
10. Bushing
11. Spacer
12. Rubber ring
13. Cap
14. Spacer
15. M8x30 TCC screw
16. Washer
17. M10x30 TCC screw

18. Washer
19. Radiator grille
20. M5x12 TBEI screw
21. T-shaped bushing

Removing

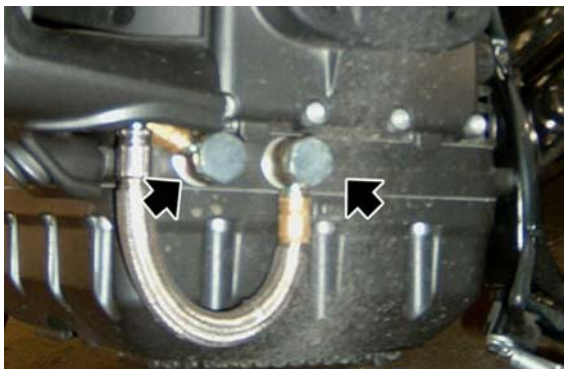
- Prepare a container and empty the lubrication system fluid in it.
- Unscrew and remove the screw and collect the washer.



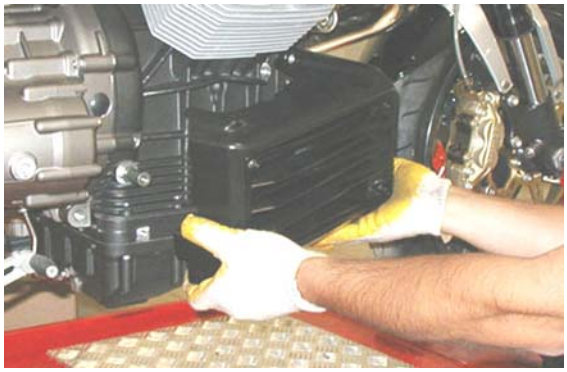
- Unscrew and remove the two screws and collect the washers.

- Unscrew and remove the screw and collect the washer.

- Unscrew and remove the two screws; collect the pipes and the four washers.



- Remove the oil radiator.

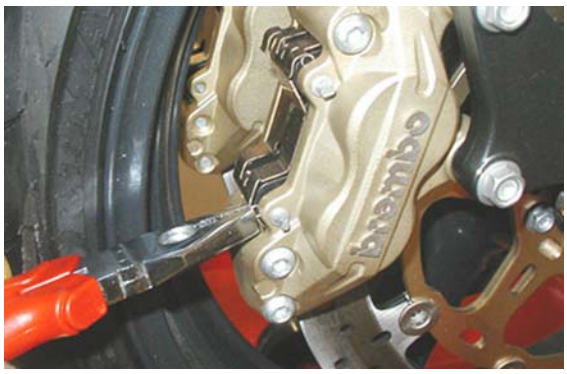


INDEX OF TOPICS

Front brake pads

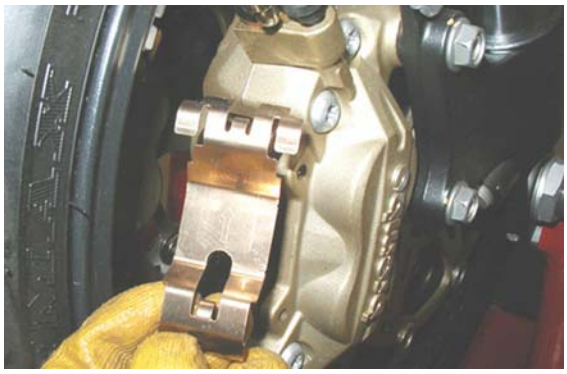
Removal

- Turn the pins and remove both split pins.



- Remove both pins.

- Remove the damping plate.



- Extract one pad at a time.

CAUTION

AFTER REMOVING THE PADS, DO NOT OPERATE THE BRAKE CONTROL LEVER OR THE CALLIPER PLUNGERS COULD GO OUT OF THEIR SEATS RESULTING IN BRAKE FLU-

ID LEAKAGE.

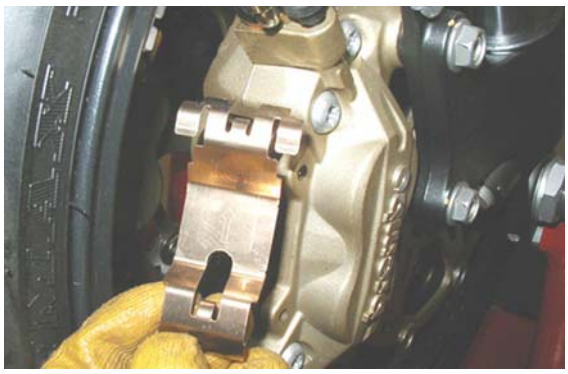
Installing

- Insert two new pads, placing them so that the holes are aligned with the calliper holes.

CAUTION

ALWAYS REPLACE BOTH PADS AND MAKE SURE THEY ARE CORRECTLY POSITIONED INSIDE THE CALLIPER.

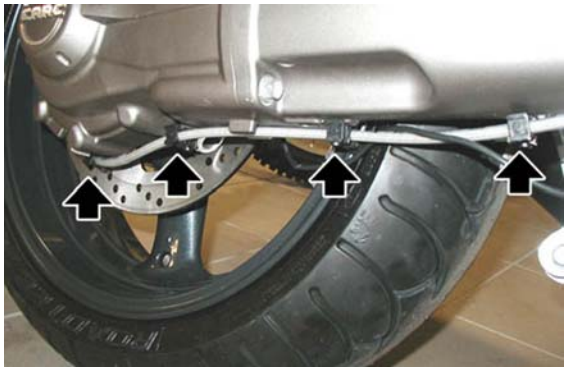
- Position the anti-vibration plate.
- Insert both pins.
- Position both split pins.
- Abut the plungers against the pads, acting on the brake pump lever several times.
- Check the brake fluid level in the reservoir.



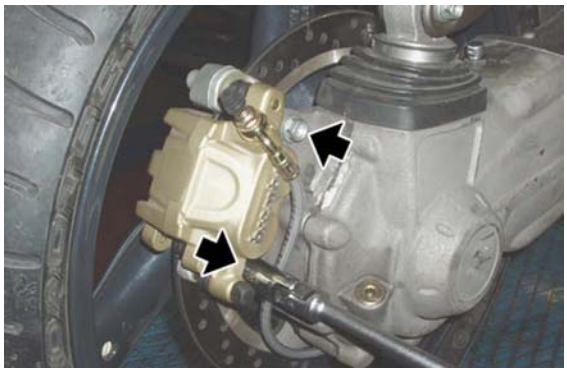
Rear brake pads

Removal

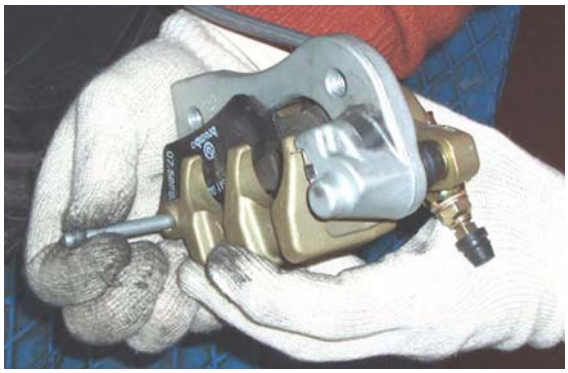
- Free the brake pipe and the throttle grip cable from the clamps.



- Unscrew and remove the two screws.
- Remove the brake calliper from the disc.
- Turn the pin and remove the split pin.
- Remove the split pin.



- Remove the pin.



- Extract one pad at a time.

CAUTION

AFTER REMOVING THE PADS, DO NOT OPERATE THE BRAKE CONTROL LEVER OR THE CALLIPER PLUNGERS COULD GO OUT OF THEIR SEATS RESULTING IN BRAKE FLUID LEAKAGE.

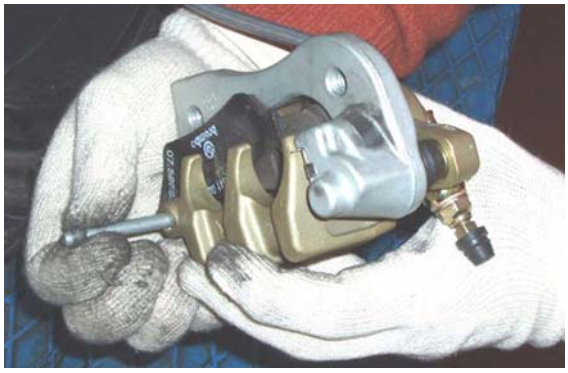
Installing

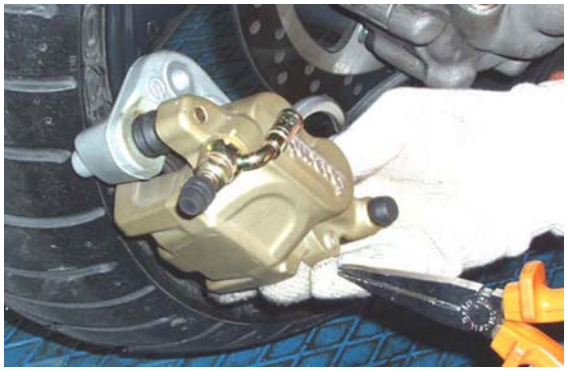
- Insert two new pads, placing them so that the holes are aligned with the caliper holes.

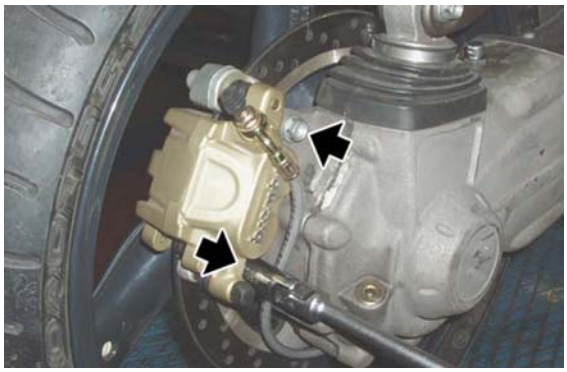
CAUTION

ALWAYS REPLACE BOTH PADS AND MAKE SURE THEY ARE CORRECTLY POSITIONED INSIDE THE CALLIPER.

- Insert the pin.
- Position the split pin.
- Abut the plungers against the pads, acting on the brake pump pedal several times.
- Check the brake fluid level in the reservoir.







Bleeding the braking system

Front

If there is air in the hydraulic system, it acts as a bearing, absorbing a large part of the pressure from the brake pump and minimising calliper efficiency during braking.

The presence of air is signalled by the "sponginess" of the brake control and poor braking efficiency.

CONSIDERING THE DANGER FOR VEHICLE AND RIDER, IT IS STRICTLY NECESSARY, AFTER REFITTING BRAKES AND RESTORING THE BREAKING SYSTEM TO THE REGULAR USE CONDITIONS, THAT THE HYDRAULIC CIRCUIT BE AIR PURGED.

NOTE

THE FOLLOWING OPERATIONS REFER TO ONLY ONE FRONT BRAKE CALLIPER BUT APPLY TO BOTH CALLIPERS. THE VEHICLE MUST BE ON LEVEL GROUND TO BE PURGED. WHILE PURGING THE HYDRAULIC SYSTEM, FILL THE RESERVOIR WITH THE NECESSARY QUANTITY OF BRAKE FLUID. CHECK THAT, DURING THE OPERATION, THERE IS ALWAYS BRAKE FLUID IN THE RESERVOIR.

- Remove the rubber protection cover

from the bleed valve.

- Insert the transparent plastic pipe in the front brake calliper bleed valve and slide the other end of this pipe in a container to collect the fluid.
- Remove the front brake oil reservoir cap.
- Quickly press and release the front brake lever several times and then keep it fully pressed.
- Loosen the bleed valve 1/4 of a turn so that the brake fluid flows into the container. This will release the tension on the brake lever and will make it reach the end of stroke.
- Close the bleed valve before the lever reaches its end of stroke.
- Repeat the operation until the fluid draining into the container is air-bubble free.

NOTE

WHILE PURGING THE HYDRAULIC SYSTEM, FILL THE RESERVOIR WITH THE NECES-SARY QUANTITY OF BRAKE FLUID. CHECK THAT, DURING THE OPERATION, THERE IS ALWAYS BRAKE FLUID IN THE RESERVOIR.

- Screw the bleed valve and remove the pipe.
- Top-up the reservoir until the right brake fluid level is obtained.
- Refit and block the front brake oil reservoir cap.
- Refit the rubber protection cover.

Rear - combined

If there is air in the hydraulic system, it acts as a bearing, absorbing a large part of the pressure from the brake pump and minimising calliper efficiency during braking.

The presence of air is signalled by the "sponginess" of the brake control and poor braking efficiency.

CAUTION

CONSIDERING THE DANGER FOR VEHICLE AND RIDER, IT IS STRICTLY NECESSARY, AFTER REFITTING BRAKES AND RESTORING THE BREAKING SYSTEM TO THE REGULAR USE CONDITIONS, THAT THE HYDRAULIC CIRCUIT BE AIR PURGED.

THE VEHICLE MUST BE ON LEVEL GROUND TO BE PURGED. WHILE PURGING THE HYDRAULIC SYSTEM, FILL THE RESERVOIR WITH THE NECESSARY QUANTITY OF BRAKE FLUID. CHECK THAT, DURING THE OPERATION, THERE IS ALWAYS BRAKE FLUID IN THE RESERVOIR.

- Remove the rubber protection cover from the bleed valve.
- Insert the transparent plastic pipe in the rear brake calliper bleed valve and insert the other end of this pipe into a container to collect the fluid.
- Remove the rear brake oil reservoir cap.
- Quickly press and release the rear brake lever several times and then keep it fully pressed.
- Loosen the bleed valve 1/4 of a turn so that the brake fluid flows into the container. This will release the tension on the brake lever and will make it reach the end of stroke.
- Close the bleed valve before the lever reaches its end of stroke.
- Repeat the operation until the fluid draining into the container is air-bubble free.

NOTE

WHILE PURGING THE HYDRAULIC SYSTEM, FILL THE RESERVOIR WITH THE NECESSARY QUANTITY OF BRAKE FLUID CHECK

THAT, DURING THE OPERATION, THERE IS

ALWAYS BRAKE FLUID IN THE RESERVOIR.

- Screw the bleed valve and remove the pipe.
- Top-up the reservoir until the right brake fluid level is obtained.
- Refit and lock the rear brake oil reservoir cap.
- Refit the rubber protection cover.

INDEX OF TOPICS

Rider footrest plate

RIGHT

- Unscrew and remove the two lower screws and collect the nuts and the spacers.
- Free the rear brake pipe from the clamps and from pipe guide.
- Remove the rear brake calliper from the disc.

- Unscrew and remove the rear upper screw and collect the nut.

- Unscrew and remove the front upper screw.

- Remove the air filter housing.
- Disconnect the connector of the rear brake lever switch and release it from the clamps.

- Remove the right footrest plate, keeping the brake fluid reservoir in vertical position.

LEFT

- Remove the exhaust silencer.
- Unscrew and remove the screw and collect the nut and the spacer.

- Unscrew and remove the rear upper screw and collect the nut.

- Unscrew and remove the front upper screw.

- Unscrew and remove the screw and remove the left footrest plate.

Air box

- Remove the fuel tank.
- Disconnect the connector from the air temperature sensor.

- Slide off and remove the main fuse box from its holder.

- Unscrew and remove the four screws.

- Slide off and remove the secondary fuse box from its holder.

- Unscrew and remove the two screws.

- Disconnect the low pressure pipe.
- Disconnect the blow-by tank breather pipe.
- Free the pipes from the clamps.

- Release the breather pipe from the clamp on the right side of the filter casing and the remove the pipe.

- Working on both sides, loosen the clamp.
- Remove the filter casing by sliding it backwards; collect the blow-by drain pipe.

Fuel tank

- Remove both side fairings and the saddle.
- Unscrew and remove the two front screws fixing the tank.

- Unscrew and remove the two rear screws fixing the tank and collect the two T spacers.
- Remove the battery.

- Lift the front and then the rear of the fuel tank, leaning its lower part onto the support rubber pad of the brackets welded to the chassis.
- Disconnect the quick-release coupling.

- Disconnect the connector.
- Remove the fuel tank.