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*This manual has been prepared by DERBI Nacional Motor, S.A. Sociedad Unipersonal for use by concessionaires and DERBI sub-agency workshops. It is assumed that persons using this work for the maintenance and repair of DERBI vehicles will have a basic grounding in the principles of mechanics and the necessary technical methods used in the repair of such vehicles. Major variations in the technical specifications of the vehicles or in specific repair operations will be communicated by means of updates to this manual.*

*Nevertheless, completely satisfactory work cannot be performed without the necessary installations and tools: for this reason we strongly recommend that you consult the pages in this manual which refer to specific tools and equipment.*

*Information in this manual which is of particular importance is indicated by the following notes:*

**N.B.** *This indicates a note which gives key information for performing the procedure more easily and clearly.*

**Caution!** *This indicates specific procedures which should be followed to avoid causing damage to the vehicle.*

**Warning !!!** *This indicates procedures which should be followed to avoid possible injury to the person carrying out the repairs to the vehicle.*

*All data may be changed without prior notice.*

*Derbi declines all responsibility for the use of non-original parts and accessories which have not been tested and approved.*

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### Predator-LC / O2 Atlantis-LC / O2 / 100 Models

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## TECHNICAL SPECIFICATIONS OF THE ENGINE

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### Engine

Number of cylinders .....1  
Cycle .....2-stroke  
Stroke and Bore .....41 x 37.4 mm  
Cubic capacity.....49cc  
Fuel admission.....reed valve direct to crankcase  
Compression ratio.....11.5 : 1  
Starter system .....electric start  
Engine cooling system .....fan-driven pressurised air  
LC: liquid cooling  
Fuel .....Unleaded fuel  
Lubrication system .....petrol-oil mixture, using constant flow pump driven lubrication

### Atlantis 100:

Stroke and Bore .....50 x 43 mm  
Cubic capacity.....85cc  
Compression ratio.....9.5 : 1

### Carburettor

Type .....DELL'ORTO PHVA 10.GD / PHVA12 DD / PHVA 14 DD / PHVA 17.5  
WEBER 14 OM 1 AA / WEBER 14 OM 1 BA / WEBER 12 OM 1 QA  
WEBER 12 OM 1 SA / WEBER 14 OM 1 FA

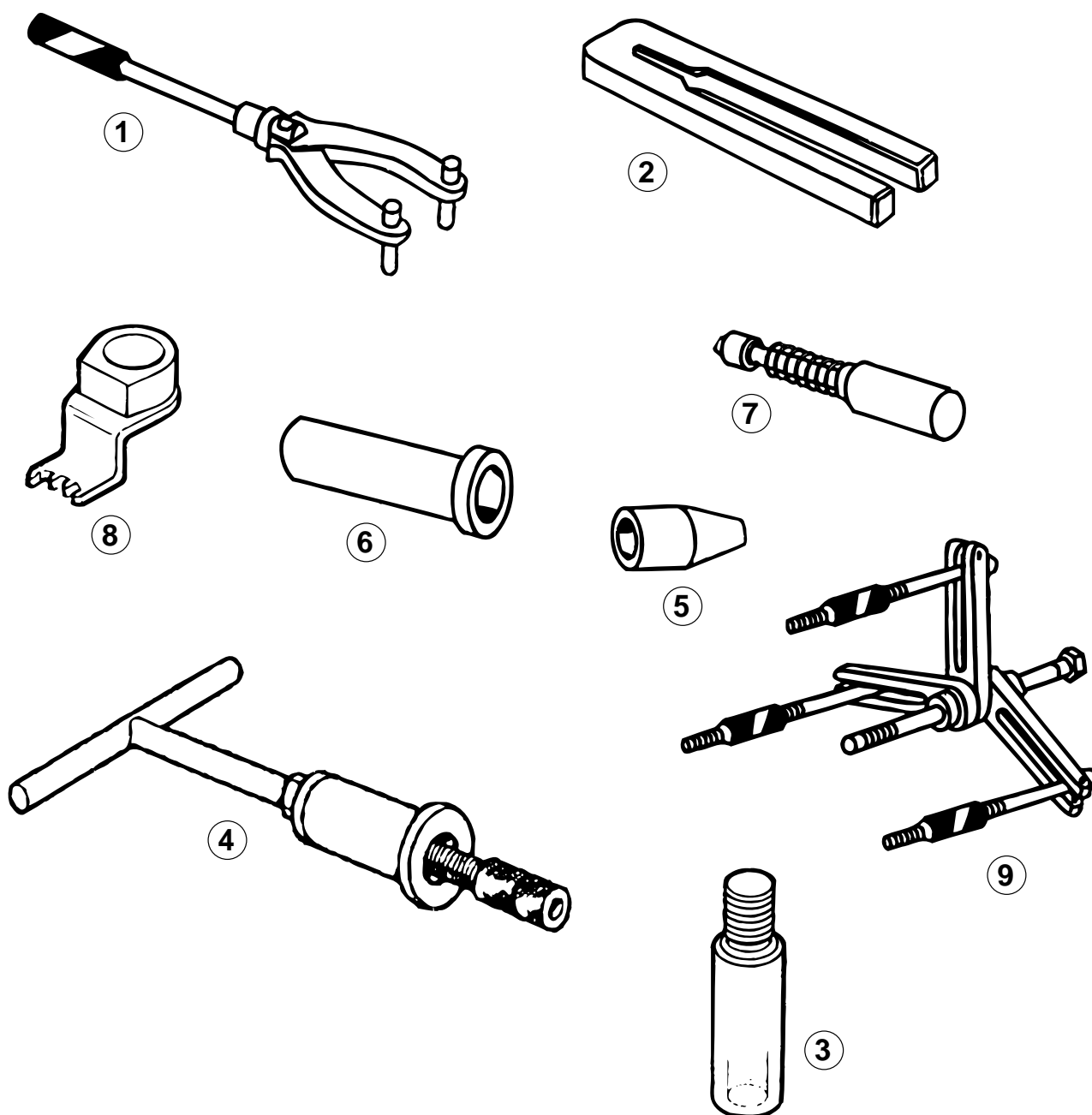
**Primary drive**.....automatic variable speed unit through trapezoidal belt drive

**Clutch** .....automatic centrifugal dry clutch

### Ignition

System .....magneto 12V 80W.  
Ignition advance.....18° before T.D.C.  
Spark plug.....NGK B8 HS / CHAMPION L.78 C.  
NGK B9 ES / CHAMPION N.2.C / NGK B8 ES / CHAMPION N3C  
Battery.....12V 4Ah

## SPECIAL TOOLS



Part Name	Reference Number
1.- Magneto disassembly tool unit.....	0.0G.053.0.001.1
2.- Connecting rod blocking tool.....	0.0G.056.0.037.1
3.- Water pump shaft extractor tool .....	0.0G.056.0.042.1
4.- Crankshaft assembly tool (use for water pump shaft).....	0.0G.056.0.036.1
5.- Crankshaft seal guide bush.....	0.0F .053.0.084.1
6.- Crankshaft seal assembly punch .....	0.0F .054.0.045.1
7.- Gudgeon pin circlip assembly tool .....	0.0G.056.0.041.1
8.- Water pump pinion blocking tool .....	0.0G.053.0.098.1
9.- Engine splitting tool.....	0.0G.053.0.015.1

## REGULAR MAINTENANCE TABLE

Period: the period may be calculated by kilometres run or by time in months	Km	1000	2500	5000	10000	15000	20000	25000
	Months	2	6	12	24	36		
Reduction gear or crankcase oil		Replace	Check	Check	Replace	Check	Replace	Check
Suspensions				Check	Check	Check	Check	Check
Tighten all fastenings		Check	Check	Check	Check	Check	Check	Check
Electrical connections		Check	Check	Check	Check	Check	Check	Check
Spark plug		Clean	Adjust	Replace	Replace	Replace	Replace	Replace
Carburettor		Adjust Clean		Adjust Clean	Adjust Clean	Adjust Clean	Adjust Clean	Adjust Clean
Water pump drive belt							Replace	
Variable speed drive rollers drive belt transmission						Check Replace		
Oil filter				Check	Replace	Check	Replace	Check
Air filter				Clean	Clean	Clean	Clean	Clean
Brakes / hose / pads				Check	Check	Check	Check	Check
Brake equipment					Check		Check	
Brake fluid		EVERY 2 YEARS			EVERY 2 YEARS			
Tyres				Check	Check	Check	Check	Check
Tyres pressures		Check	Check	Check	Check	Check	Check	Check
Fuel or oil hoses		Check			Replace	Check	Replace	Check
Transmission				Lubricate	Lubricate	Lubricate	Lubricate	Lubricate
Cylinder head nuts		Tighten up	Tighten up					
Inlet valve reeds					Check		Check	

## TORQUE SETTINGS

PART NAME			TORQUE SETTING (Nw x m.)	
BRAKE SHOE ROTATION SHAFT	8M125		17 - 19	LOCTITE
CYLINDER STUD	6M100	STUD	10 - 12	
CRANKCASE HALVES	6M100	SCREW	9 - 10	LOCTITE
CYLINDER HEAD	6M100	NUT	10 - 12	
INLET MANIFOLD VALVE BRACKET	4M70	SCREW	1 - 2	LOCTITE
CRANKCASE INLET MANIFOLD	6M100	SCREW	9 - 10	LOCTITE
OIL PUMP	5M80	SCREW	4 - 5	LOCTITE
COIL TO BASE PLATE	6M100	SCREW	8 - 10	LOCTITE
BASE PLATE TO CRANKCASE	6M100	SCREW	8 - 10	LOCTITE
MAGNETO	10M100	NUT	35 - 40	LOCTITE
STARTER MOTOR	6M100	SCREW	9 - 10	LOCTITE
FAN TO MAGNETO	6M100	SCREW	8 - 10	LOCTITE
ENGINE BRACKET PLATE A.E.	6M100	SCREW	9 - 10	LOCTITE
LEFT HAND SIDE CRANKSHAFT	10M100	NUT	35 - 40	LOCTITE
REDUCTION GEAR COVER	6M100	SCREW	9 - 10	LOCTITE
PULLEY SHAFT	10M100	NUT	35 - 40	LOCTITE
PLASTIC OIL FILLER CAP	14M150	CAP	HAND TIGHT	
LEFT HAND CRANKCASE COVER	6M100	SCREW	9 - 10	LOCTITE
OIL DRAIN PLUG	8M125	SCREW	17 - 19	
CYLINDER SLEEVE	6M100	SCREW	9 - 10	
FRONT WHEEL	12M150	NUT	50 - 60	
REAR WHEEL	16M150	NUT	100 - 105	
SWINGING ARM	10M150	NUT	40 - 45	
SHOCK ABSORBER UPPER/LOWER	10M150	NUT	40 - 45	
HANDLEBAR	8M125	SCREW	20 - 25	
EXHAUST PIPE TO CYLINDER	6M100	SCREW	8 - 12	
EXHAUST PIPE - INTERMEDIATE	6M100	NUT	8 - 12	
EXHAUST PIPE TO CRANKCASE	10M150	SCREW	40 - 45	
FORK LEG CLOSURE	6M100	NUT	8 - 12	
STEERING	25M100	NUT	70 - 90	
FRONT BRAKE	8M125	SCREW	20 - 25	
KICK START PEDAL	6M100	SCREW	08 - 12	LOCTITE
SILENCER PROTECTOR	4M70	SCREW	1 - 2	LOCTITE

## FRONT FORKS

### HUNTER MODELS

#### Stripping the fork legs

- Withdraw the two screws from the brake caliper.
- Withdraw the front wheel axle nut and slacken the lock screw.
- Withdraw the front wheel axle, the wheel DISTANCE PIECE, and leave the transfer box and the separator hanging free.
- Withdraw the fork protection plate screw so as to be able to extract the external fork leg cap.
- Loosen the 10 x 25 screw from the fork plate and while pushing upwards on the fork leg, release the fork bar securing clip.
- Withdraw the fork leg from the vehicle.

**Both fork legs are the same.**

#### Stripping the left or right hand fork bar

- Withdraw the safety circlip.
- Undo the fork leg tube cap and seal.
- Drain the hydraulic fluid from the bar.
- Extract the fork leg spring.
- Loosen and extract the fork leg screw.
- Withdraw the hydraulic tube and the bar from the fork leg.
- Extract the dustguard, the seal securing circlip, and finally the seal.

**Note: Clean thoroughly all the parts which are to be re-fitted; it is mandatory under all circumstances to replace the O-rings and seals.**

#### Re-assembly of the fork leg

- Fit the seal into the fork leg size 30-40-7/9. Using special tool **0.0H.054.0.045.1** and insert the seal securing circlip.
- Insert the hydraulic tube inside the fork bar.
- Insert the bar inside the fork leg, fit the fork spring and tighten the 10 x 25 screw using a copper washer and **Loctite** to a torque of **35 - 40** Nw x m.
- Re-fill using 80 cc of AGIP FORK SAE10W hydraulic oil.



- Insert the fork leg tube cap with the O-ring seal, the safety circlip and the dust-guard.
- Assemble the fork leg into the vehicle.
- Insert the complete fork leg assembly into the fork plate.
- Fit the safety circlip and the exterior fork leg cap.
- Tighten the fork plate securing screw.
- Tighten the mudguard/fork plate protector securing screw.
- Locate the wheel axle, the transfer box, the transfer box bushing, the wheel, and fit the brake caliper onto the brake disc; then the distance piece, the washer, the spring washer and nut, tightening to a torque of **50 - 60** Nw x m.
- Tighten the fork leg closure screw to a torque of **8 - 12** Nw x m.
- Locate the two brake caliper securing screws (8 x 60) to a torque of **20 - 25** Nw x m. using **Loctite**. Finally turn the wheel and operate the brake lever.



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## PADDOCK MODELS

### Stripping the fork legs

- Withdraw the four mudguard screws and remove the mudguard.
- Slacken off the wheel axle nut, withdraw the washer, loosen the 2 front brake caliper screws, loosen the locking screw, extract the wheel axle, the axle distance piece and leave the transfer box and the separator hanging free.

### Stripping the left hand fork bar

- To disassemble the left hand fork bar without stripping the fork the following procedure should be followed:
- Remove the dustguard and extract the safety circlip.
- Withdraw the two screws securing the bag carrier hook.
- Withdraw the seven screws securing the inner shield and remove the inner shield.
- Drill a hole using a 15 mm drill through the fork plate protector so as to be able to insert a tube spanner and loosen the 6 x 100 nut and washer; this way it is possible to withdraw the left hand fork leg, with the hydraulic cartridge with bushing and silentbloc, the boss, the rubber stop spring and the guide washer.

**If the hydraulic cartridge loses oil it must be replaced, since it cannot be repaired.**

### Right hand fork bar

- Remove the dustguard and the safety circlip.
- Withdraw the right hand fork leg, the lower spring washer, the rubber stop and the spring.

**This fork leg should be filled with AGIP GR MU 3 type grease only.**

**Re-fitting the two fork legs is carried out in the reverse order from stripping.**



## VAMOS MODELS

### Stripping the fork legs

- Withdraw the 2 front brake caliper screws ("separate the caliper").
- Remove the wheel axle nut, the spring washer and the washer.
- Withdraw the wheel axle, the transfer box bushing and the whole transfer box assembly.
- Loosen the end piece screws, and withdraw the end pieces.
- Extract the fork leg dustguard and the safety circlip.
- Withdraw the fork leg, the stop and the spring.

When re-assembling, carry out the same procedures in reverse order.

The fork legs should be filled with **AGIP GR MU 3** type grease.

## WITHDRAWING THE ENGINE FROM THE FRAME

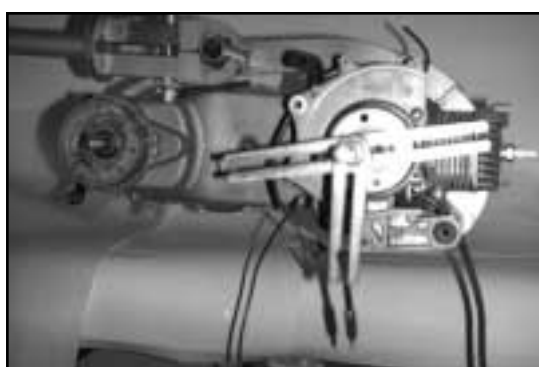
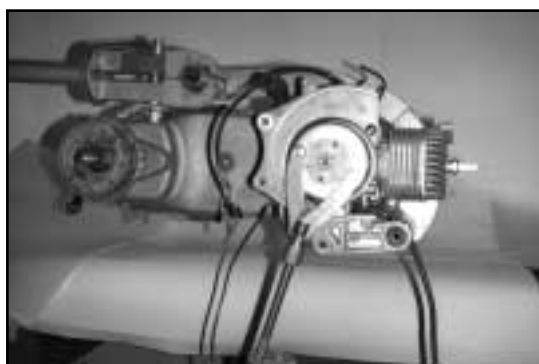
### STRIPPING

- Remove the luggage carrier ( 4 screws).
- In PADDOCK models separate the electrical connectors on the turn indicators.
- The left hand footrest cover (1 screw).
- The left hand side panel (2 screws).
- The right hand footrest cover (1 screw).
- The right hand side panel (2 screws).
- Raise the saddle.
- Remove the side panels (5 screws).
- Remove the oil reservoir cap.
- Remove the fuel tank filler cap.
- Remove the anti-freeze reservoir cap on PADDOCK-LC models.
- Remove the helmet carrier box (6 screws).
- Remove the rear brake cable nut.
- Remove the rear brake guide stop (1 screw).
- Remove the engine earth screw.
- Remove the throttle cable union.
- Disconnect the electrical connectors for the magneto, the stop light, the choke, the starter, the high tension coil and the coil earth cable.
- On the LC models, also disconnect the thermo-contact spade connector.
- Disconnect the two pipes from the connector on the carburettor: the fuel pipe and the vacuum line.
- Disconnect the oil hose at the reservoir outlet.
- In PADDOCK-LC models extract the antifreeze drain plug.
- Remove the cooling hoses where they connect to the antifreeze reservoir.
- Remove the 2 fixing screws which secure the engine to the frame.
- Remove the 1 shock absorber screw.
- Separate the engine from the frame.

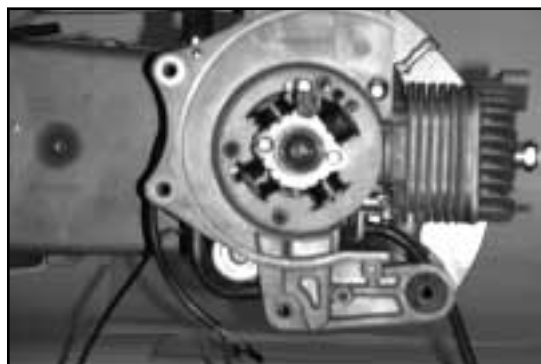


## STRIPPING THE ENGINE

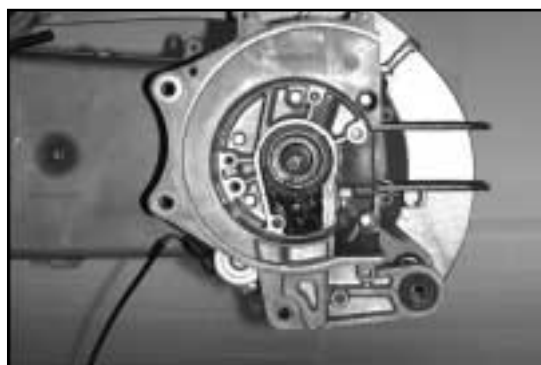
- Remove the exhaust pipe.
- Remove the filter box together with the inlet pipe and the rear mudguard.
- Withdraw the rear wheel nut and remove the rear wheel.
- Withdraw the centre stand spring, the pin, the central shaft, and the stand.
- On PADDOCK-LC models, remove all hose clips, radiator hoses, and the radiator.
- Remove the fan (2 screws).
- Remove the sleeve cover.
- On PADDOCK-LC models, first withdraw the anti-freeze outlet connector on the cylinder head (2 screws and gasket).
- Remove the carburettor together with the reed valve (4 screws).
- Remove the magneto nut using the special tool **0.0G.0.530.001.1**.
- Remove the magneto using the special magneto extractor tool **0.0G.053.0.015.1**.



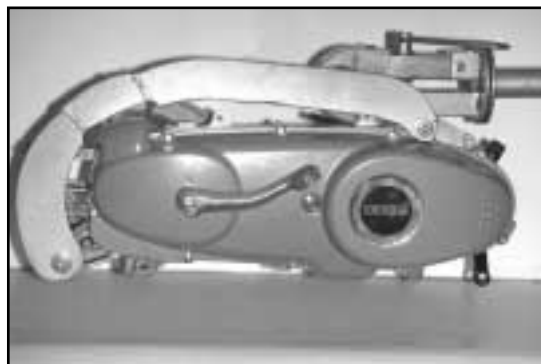
- Remove the stator (2 screws): in order to be able to extract the stator completely, the base plate should be withdrawn (3 countersunk Allen head screws) using an impact screwdriver; withdraw the grommet and the magneto key.
- Withdraw the spark plug NGK 8 HS or CHAMPION L-78-C.
- On LC models, NGK B9 ES or CHAMPION N-2-C.
- Withdraw the cylinder head (4 screws) and the cylinder head gaskets.
- Withdraw the cylinder, the cylinder gasket, the piston, and the cylinder studs.



- Remove the oil pump (2 screws).
- Remove the pump drive gear wheel, the safety ring, the washer, the gear wheel, the key and the safety circlip "replace the gear wheel with a new one".
- Withdraw the cooling hose from the pump to the radiator (2 screws) and the O-ring.



- Remove the left hand side crankcase cover or clutch cover (10 screws).



- Loosen the variable speed drive nut, blocking the connecting rod using special tool **0.0G.056.0.037.1.**
- Extract the nut, the washer, the starter boss, the drive washer, the drive pulley, the washer, the bush, the sliding weight hub, with the plate, and the 6 rollers.
- Extract the washer, the starter gear wheel, the washer and the bush.
- **On L.C: models ("only withdraw the starter gear wheel, there are no washers or bushes".**
- Remove the clutch belt.



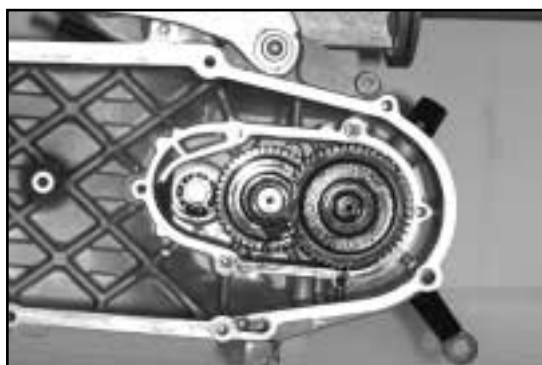
- Loosen the clutch hub nut using the special tool **0.0G.053.0.001.1** and remove the nut, the washer, the hub, and the clutch club.



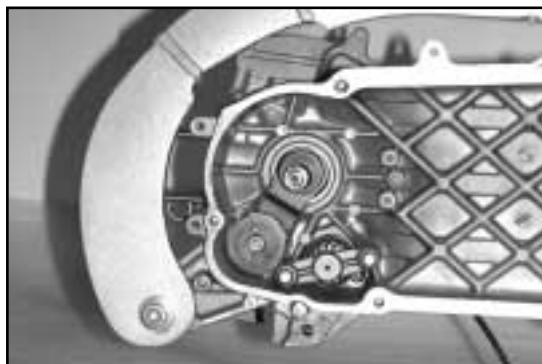
- Loosen the reduction gear oil drain plug with the washer and remove.
- Loosen and remove the 6 screws to the reduction gear box cover, and immediately remove the reduction gear cover complete with the clutch pulley shaft and the gasket.



- Withdraw the washer, the gear wheel shaft and the intermediate shaft.



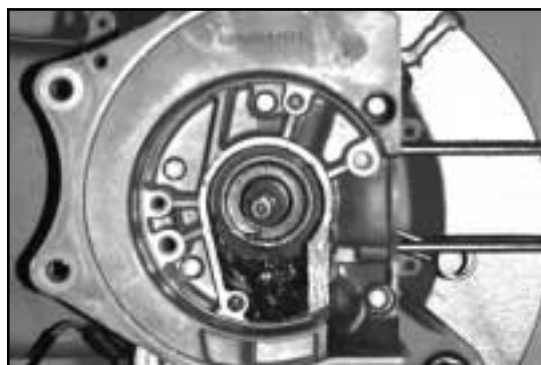
- Withdraw the water pump drive gear nut using special tool **0.0G.053.0.098.1**.
- Withdraw the pump drive gear and the pump drive pinion together with the toothed belt.
- Withdraw the water pump body locking piece (2 countersunk Allen head screws).



- In order to extract the water pump body, the following special tools are required: **0.0G.056.0.042.1** and **0.0G.056.0.036.1**.



- Loosen and remove the bendix starter pinion bracket (2 screws).
- Loosen and withdraw the 6 securing screws for the right hand crankcase half.



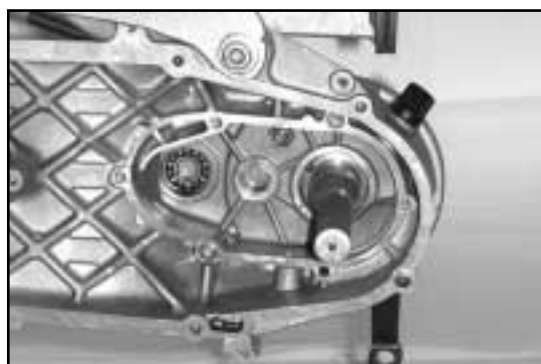
- In order to split the crankcase halves, it is necessary to make use of the special tool **0.0G.053.0.015.1**.
- Next separate the crankcase halves.



- Loosen the 2 screws to extract the starter motor, the gasket and the O-ring.
- Withdraw the rear brake shoes.



- Loosen and remove the rear wheel bearing locking piece "Use an impact hammer to loosen these screws".
- Withdraw the wheel axle seal, and using special tool **0.0H.054.0.045.1** and heating the part to a temperature of 80°C by means of a hot air paint stripper, extract the rear wheel axle bearing.



- Remove the crankshaft seal in the left hand side crankcase using special tool **0.0H.054.0.058.1**.

- Extract the rear brake lever and the brake operating arm.

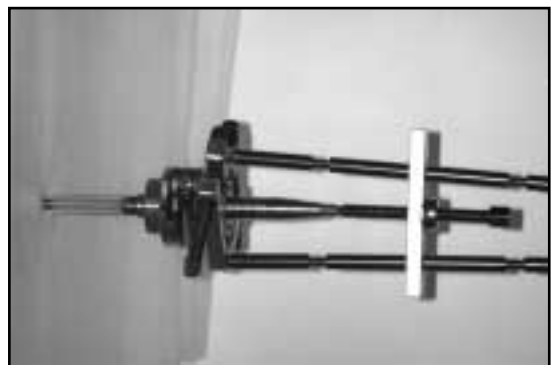
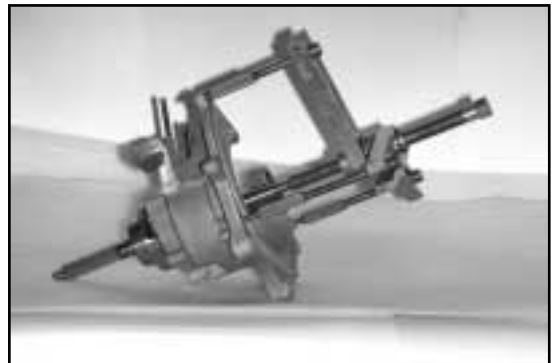
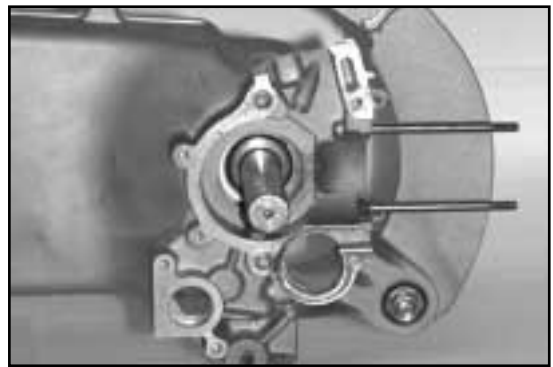
- Extract the crankshaft from the crankcase half or right hand crankcase half using special tool **0.0G.053.0.015.1**.

- Extract the crankshaft seal in the right hand side crankcase.

- Extract the crankshaft bearing from the crankcase half using special tool **0.0H.054.0.058.1**, after heating the part to a temperature of 80° C with a hot air gun.

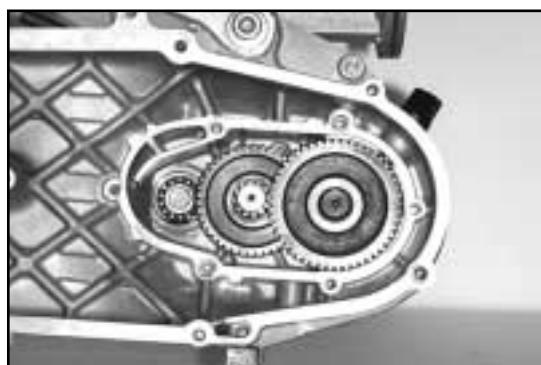
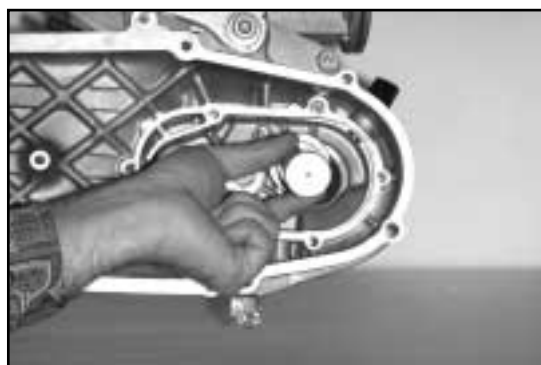
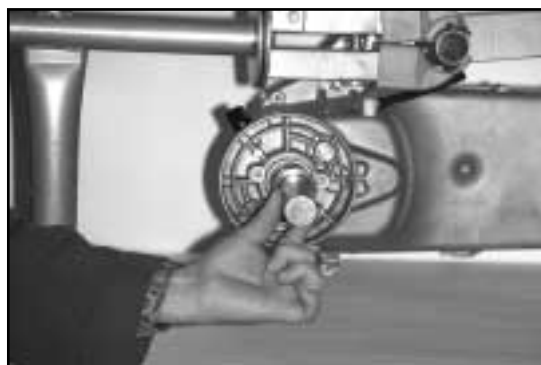
- If the bearings remain on the crankshaft they should be removed using a tool similar to the Kawasaki tool reference number **57001-158**, thus withdrawing the bearings from the crankshaft.

- Withdraw the pulley shaft from the reduction gear cover, and extract the 2 bearings from the reduction gear cover by applying heat.



## ASSEMBLY OF THE ENGINE

- Assembly of the wheel shaft bearing: heat up the housing by means of a hot air gun to approximately 80° C and use special tool number **0.0F. 054.0.045.1** to insert the bearing number **6204-2RS1**.
- Fit the wheel shaft bearing locking piece with the 2 screws using a thread sealer (such as **Loctite 243**) and tighten to a torque of **9 - 10 Nw x m**.
- Assembly of the pulley shaft bearing: Heat up the left hand side crankcase half to approximately 80° C, insert the bearing, number **6201-C3**, and push fully home.
- Fit the rear wheel seal using special tool number **0.0F.054.0.045.1**.
- The seal should be fitted with the lip facing inwards, or alternatively while it is being fitted the retaining spring should be visible and when it is home it should be just at the same level as the crankcase.
- Fit the washer and intermediate shaft.
- Fit the wheel shaft “**taking great care not to damage the seal spring**”.
- Offer up the reduction gear cover gasket and check the locating pins for the reduction gear cover.
- Reduction gear cover: fit the bearings in the reduction gear cover using special tool **0.0F.054.0.045.1**, after heating it up to approximately 80° C. First insert the bearing number **6203-C4**, then the bearing number **6204-C3**. Finally, heat up the core of this bearing so as to be able to fit the pulleyshaft.





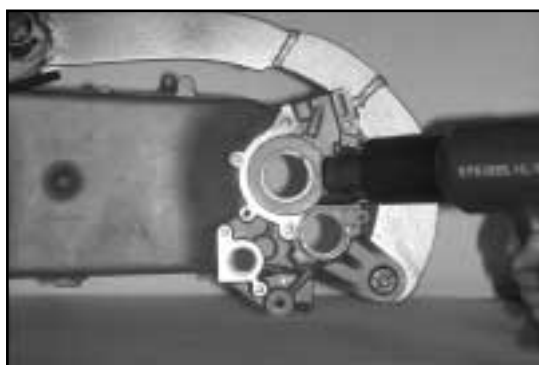
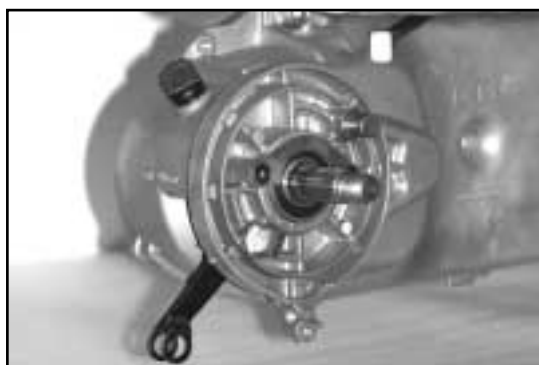
- Using special tool number **0.0F.054.0.045.1** insert the pulley cover shaft seal.



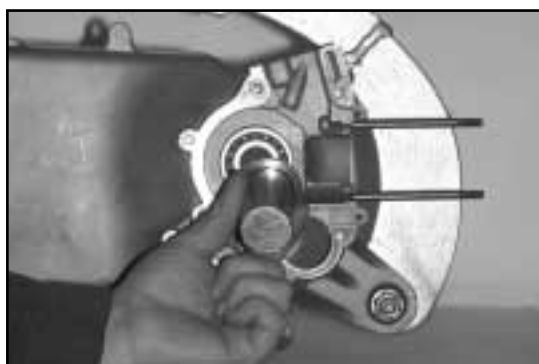
- Fit the washer onto the intermediate shaft and locate the reduction gear cover using 4 screws size 6 x 25 and 2 screws size 6 x 30. Use thread seal (such as **Loctite 243**) and tighten to a torque of **9 - 10** Nw x m.



- Fit the oil drain plug using a new washer and tighten to a torque of **17 - 19** Nw x m.
- Fill the crankcase with 110 cc of **AGIP GEAR SYNTH SAE 75w/90** oil. Fit the oil filler cap screw with an O-ring and **tighten manually**.
- Fit the rear brake operating arm using grease, followed by the foam, the brake shoe wear turn indicator cover, the brake lever, the screws and nut.



- Heat up the crankshaft seating in the right hand crankcase half using a hot air gun to approximately 80° C, and insert the crankshaft bearing **6204-px2 v4** using special tool **0.0F.054.0.045.1**.

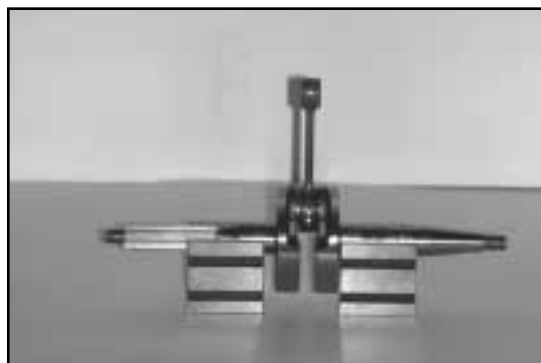


## CRANKSHAFT INSPECTION

- Measure the lateral play at the connecting rod big end using feeler gauges: the maximum permissible play is 0.35 to 0.60 mm.

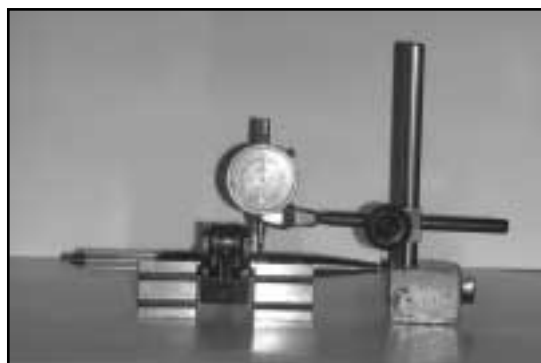
- Verification of the crankshaft counterweights.

39. - 03mm  
- 04 mm



- Place the crankshaft on blocks and check the radial play at the bearing seating.

**Service limit 0.04 mm. Both sides**

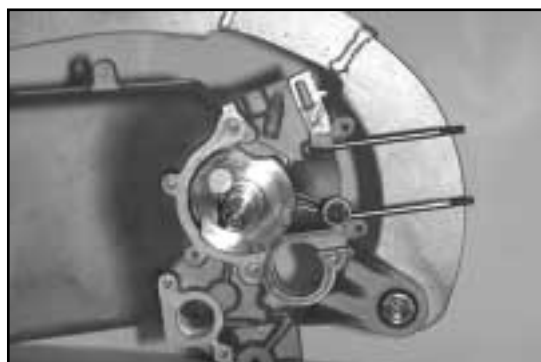


- Heat up the bearing core using a hot air gun.



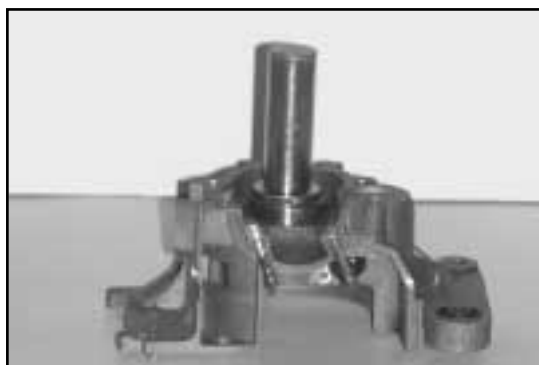
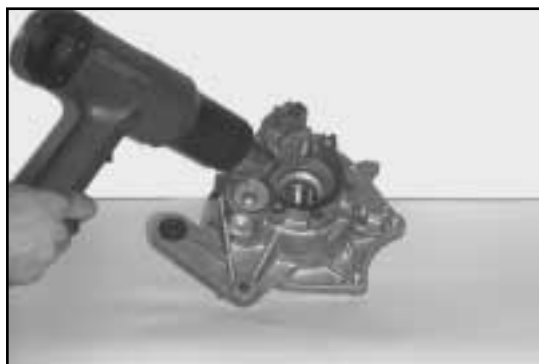
- Fit the crankshaft into the left hand crankcase half.

- Check the 2 crankcase half centring guide pins, and locate the crankcase gasket using **AGIP GR MU 3** type grease.



## ASSEMBLY OF RIGHT HAND CRANKCASE BEARING

- After heating up the seating in the right hand side crankcase half to 80° C, fit the crankshaft bearing using special tool **0.0F.054.0.045.1**. The bearing is number **6204 px2 v4**.



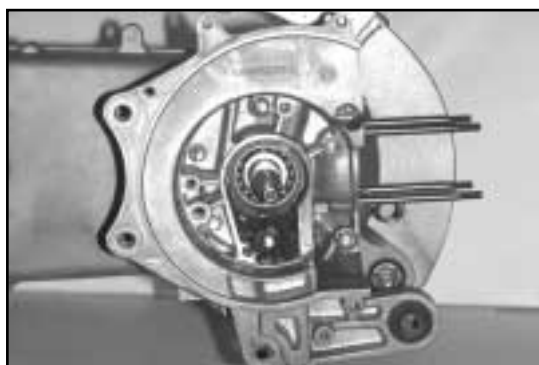
- Heat the bearing core in the right hand crankcase half with a hot air gun so as to be able to close the crankcase with 6 screws:

4 6 x 35

1 6 x 40

1 6 x 50

**Use thread seal Loctite 240 type and tighten to a torque of 9 - 10 Nw x m.**



- Fit a wedge in between the crankshaft counterweights in order to centre the crankshaft.

**The crankshaft should be centred to the following tolerances:**

**Minimum 0.30**

**Maximum 0.84**

- Fit the new crankshaft seal in the left hand crankcase half with guide bush **0.0F.053.0.084.1**. and special tool **0.0F.054.0.045.1**.



## WATER PUMP

### Stripping

- Unscrew the water pump “the water pump has a left-handed screw”
- Withdraw the two rubber O-rings
- Using special tool **0.0H.056.0.025.1** and a rubber mallet, strike the pump drive shaft in order to extract it complete with its two bearings.
- Extract the pump drive body seal
- Withdraw the 10 mm shim washer.

Using special tool **0.0F.054.0.045.1**, place the bearing on top and using special tool **0.0H.056.0.025.1** strike the shaft with a rubber mallet to extract.

- Withdraw the bearing, the **10 mm** shim washer and the shaft, and finally withdraw the circlip from the shaft.



### Assembly

- Fit the circlip to the pump drive shaft.
- Using special tool **0.0F.054.0.045.1**, place the first bearing on the tool, then the washer, the second bearing, the washer and then assemble the shaft using a rubber mallet.
- Fit the pump drive body on the special tool **0.0F.054.0.045.1**.
- Next apply heat to the pump drive body and fit the pump drive shaft with the bearings.

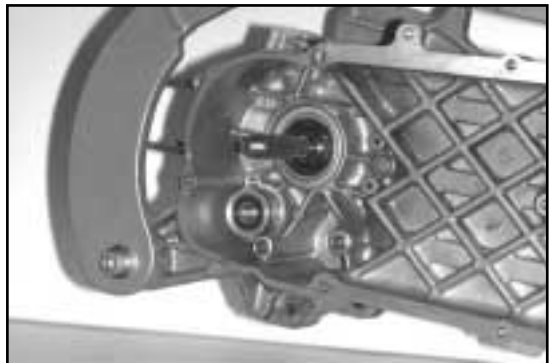


- With the aid of special tool **0.0H.056.0.025.1**, insert the shaft in the pump drive body.



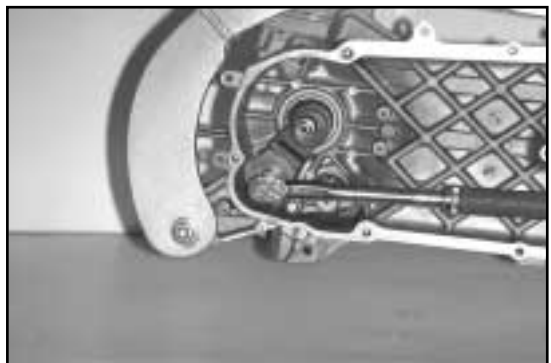
- Next fit the seal using special tool **0.0H.056.0.025.1**. The spring of this seal faces outwards.

- Fit the fan.
- Fit the two O-rings.
- Fit the water pump drive unit with great care into the left hand crankcase.

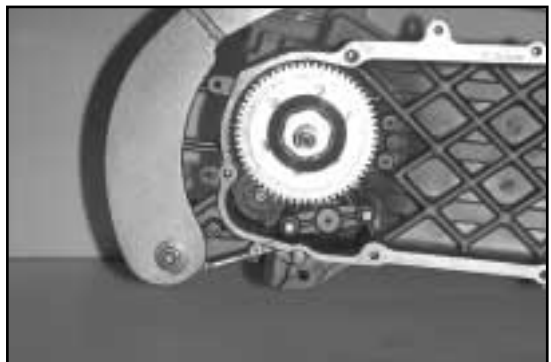


- Fit the water pump unit locking piece with 2 screws 5 x 12.
- Fit the bendix pinion.
- Fit the starter motor support bracket.
- **(2 screws 6 x 30 tightened to a torque of 9 - 10 Nw x m. using Loctite type 240).**

- Fit the pump pinion assembly with the toothed belt and the pump drive pinion and tighten down the nut for this assembly.
- To fit the pump pinion, use should be made of the special tool **0.0G.053.0.098.1** and tightened to a torque of **10 Nw x m.**

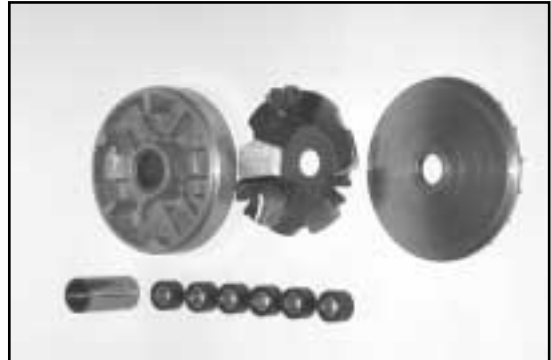


- Fit the starter motor gear wheel "with the concave side facing outwards".

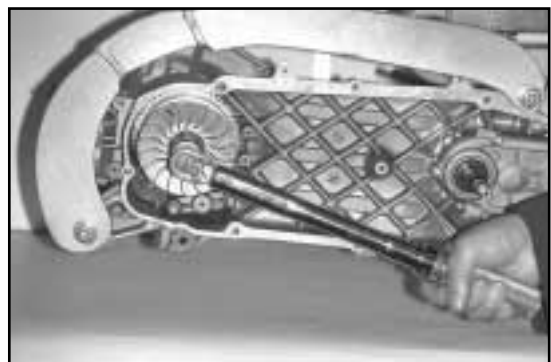


## ASSEMBLY OF SLIDING WEIGHT HUB

- The working surfaces of the pulleys should be carefully inspected where the drive belt runs: if these faces are deformed or show signs of wear, the useful life of the drive belt is extremely seriously affected.
- Disassemble the variable speed unit withdrawing the sliding weight plate.
- Confirm that the 6 rollers maintain their original profile and show no signs of wear or abrasion which might affect the correct operation of the variable speed unit.
- Check that the guides mounted on the sliding weight plate show no signs of wear, which would cause excessive noise and problems in the correct operation of the unit.
- Check the bronze bush in the sliding weight hub and that the bush is tightened to the correct torque.
- The transmission is by trapezoidal belt, the maximum width of which under working conditions must equal **16 mm**, in the HUNTER, PADDOCK, PADDOCK-LC engines, and **15 mm** in the VAMOS MONOBLOC engines.
- The belt must be replaced every 6,000 kms.



- Fit the variable speed unit with 6 rollers the sliding weight plate with the guides, and then fit the hub boss bushing, placing the variable speed unit onto the left hand side of the crankshaft.
- Fit the **20 x 16 x 1 mm** friction washer.
- Next fit the drive pulley, the drive washer, the starter boss, the washer, and the nut.
- Use special tool **0.0G.056.0.037.1** to tighten down the variable speed unit nut, blocking the connecting rod; tighten to a torque of **35 - 40 Nw x m.** using **Loctite** thread seal.



## CLUTCH ASSEMBLY

### Stripping:

- In order to disassemble the clutch assembly, the special locking tool **0.00.052.5.324.0** should be used, and the clutch nut is released using a 36 mm socket spanner.



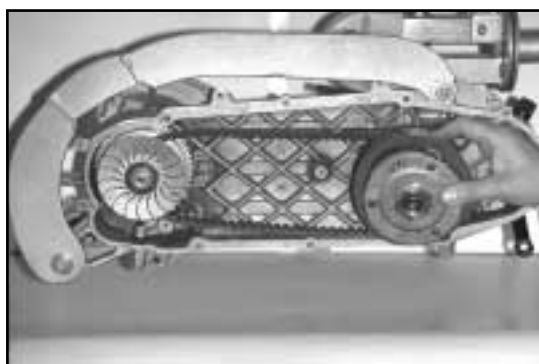
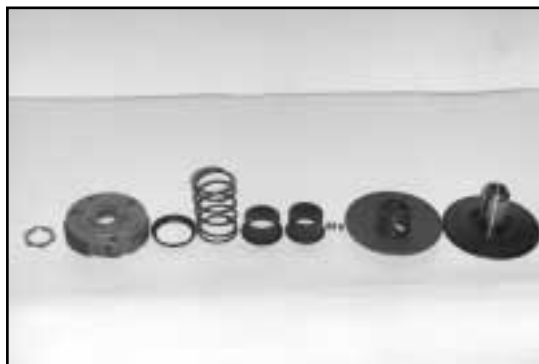
- Disassembly of the clutch shoe plate:
- The clutch shoe plate does not usually require to be disassembled since the wear on the shoes is minimal. But if it should prove necessary to disassemble the clutch shoe plate, the position of the shoes as they are originally placed should be marked, because they are balanced: the three locking clips should also be placed from the inside towards the outside, so that the clutch continues to operate normally. Check the three springs.



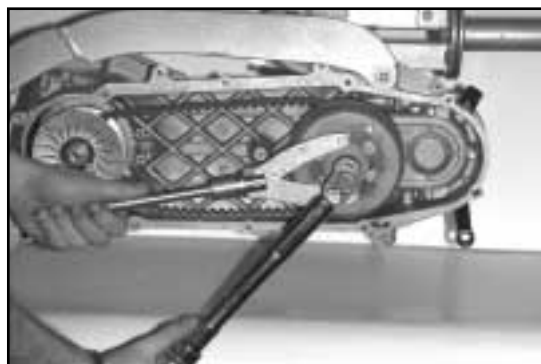
**The service limit on the shoes is 2 mm.**

### Assembly:

- Take the moving pulley and insert the 2 seals (33 x 39 x 4).
- Using the special tool **0.0F.054.0.045.1**, the two grease retaining rings, fit the moving pulley into the fixed pulley, checking that the lip of the seal is not damaged when the pulley is inserted.
- Insert the three guide pins in the slot on the moving pulley.
- Fill the spring guide bush with **AGIP GR MU 3** grease and fit, then the spring slider bushing, the spring, the spring guide boss, the clutch shoe plate and the nut.
- Using special tool **0.00.052.5.324.0** and a 36 mm socket spanner tighten up to a torque of **65 - 70** Nw x m.
- Fit the clutch assembly onto the pulley shaft together with the toothed belt.



- Fit the clutch hub onto the pulley shaft, the washer, and the nut.
- Using special tool **0.0G.053.0.001.1** lock the clutch hub and tighten up the nut to a torque of **35 - 40** Nw x m. sealing the thread with **Loctite 243**.



- **The service limit** for the clutch hub is: **112.5 mm.**

## REDUCTION GEAR

MODEL	BELT Length mm.	ROLLERS Grams	Ø CLUTCH mm.	SHOES Grams	SPRIN	REDUCTION GEAR	TYRE
DREBI VAMOS	716	6,583X6= 39,5	107	400	24 Kg 42 mm.	12/55X13/37	100/80X10"
VAMOS CHINA	716	6,583X6= 39,5	112	570	26 Kg 39 mm.	12/43X14/45	100/80X10"
HUNTER	836	6,583X6= 39,5	112	570	26 Kg 39 mm.	12/43X12/49	130/90X10"
PADDOCK	836	6,583X6= 39,5	112	570	26 Kg 39 mm.	12/43X13/49	130/60X13"
PADDOCK-LC	836	6,333X6= 38,0	112	570	24,5 Kg 41 mm.	12/43X14/48	130/60X13"

## LEFT HAND CRANKCASE COVER

- Disassembly of the starter sector:
- Withdraw the starter protector plate (three screws 6 x 12).
- By operating the starter pedal it is possible to extract the starter sliding pinion complete with the spring.
- Withdraw the starter pedal, the circlip, and the washer, so as to be able to extract the starter shaft, the stop boss, the spring retainer ring, and the spring.





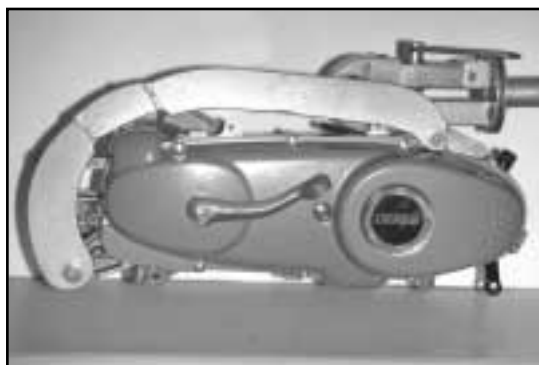
## Assembly of the left hand side crankcase cover

- Insert the spring.
- The spring retainer washer.
- Starter sector stop bush.
- Starter shaft “**with O-ring and corium 55 type grease**”.
- Washer and circlip.
- Starter pedal.
- Bendix pinion and spring, applying grease to the sliding pinion.
- Fit the starter protection plate (3 screws 6 x 12 using **Loctite** thread seal).



- Fit the left hand crankcase centring pins.
- Fit the left hand crankcase cover gasket.
- Fit the left hand crankcase cover.

**(10 screws : 8 of 6 x 25 and 2 of 6 x 30, apply Loctite and tighten to a torque of 9 - 10 Nw x m.)**



- Using special tool **0.0F.054.0.045.1**, fit the seal **20 x 38 x 7** on the right hand side of the crankshaft.

- Fit the circlip, the pump drive guide pin in the seating on the crankshaft, fit the pump drive, the washer, and the circlip.



- Fit the oil pump with 2 screws 5 x 15 and tighten to a torque of **4 - 5** Nw x m. "fill this part with **AGIP GR MU 3** type grease".
- Replace the 18.9 x 30 x 5 seal in the pump drive closure cover, using a new part.
- Pass the stator cable through the closure cover, and fit the grommet.
- Fit the cover using 3 screws 6 x 16 and tighten to a torque of **9 - 10** Nw x m.



- **When locating the closure cover, it should be positioned with the exit slot for the cables from the base plate, at the top.**



- Fit the stator with 2 screws 6 x 25 and tighten to a torque of **8 - 10** Nw x m.
- Fit the magneto key, the magneto, the washer, and the nut. Using special tool **0.0G.056.0.037.1**, to block the connecting rod, tighten the nut to a torque of **35 - 40** Nw x m. sealing the thread with **Loctite**.



## CYLINDER HEAD, CYLINDER, AND PISTON

- Fit a new cylinder gasket.
- Fit the cage bearing to the connecting rod little end.

### PISTON RINGS

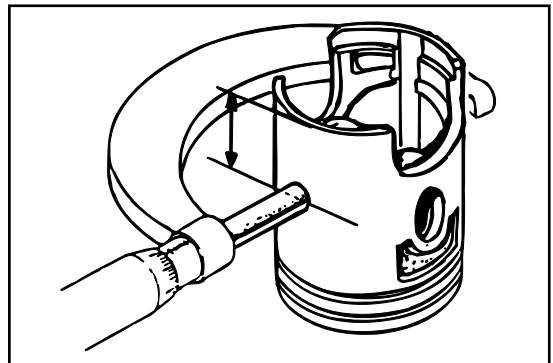
- Fit the piston rings into the cylinder and use the piston to push them a little way in, until they are perpendicular to the longitudinal axis of the cylinder.
- Measure the gap between the ends of the piston rings using feeler gauges.

The maximum permissible value is **0.5 mm**.

### PISTON

- Measure the exterior diameter of the piston at a point situated **15 mm** from the base of the piston.
- Calculate the play between the cylinder and the piston.

The service limit is **0.06 mm**.



Fit the piston rings onto the piston.

- “**First fit the expansion ring, and then the lower ring**”. It is **rectangular in section**, and finally, fit the upper piston ring “which has a trapezoidal section”.

- Fit the piston and keep the arrow on the upper surface of the piston facing towards the exhaust port.
- The piston is assembled onto the connecting rod by first inserting the little end cage bearing into the little end of the connecting rod, then the gudgeon pin and securing it by means of the circlips, using special tool **0.0G.056.0.041.1**.
- When fitting the cylinder it is recommended to apply a little oil to the part, and to the piston rings and to the piston so as to make assembling the cylinder over the piston easier. The recommended oil is that used for the fuel mixture.



- The cylinders of the monobloc models cannot be rectified, and there are no oversizes. There are only families of cylinders and pistons, which go in steps of 0.005 mm.
- When replacing the piston, the family identification stamped on the cylinder should be identified, and a piston of the same letter as on the cylinder should be used.

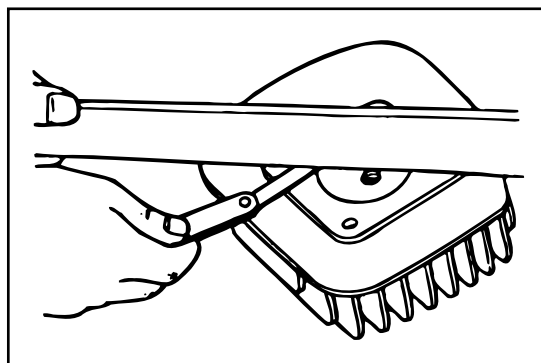
### Table of tolerances for cylinder and piston

TABLE OF FAMILIES

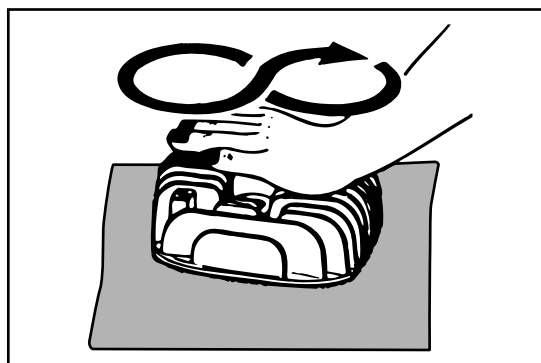
FAMILY	PISTON ASSO SP348	CYLINDER	PLAY
A	40,95 $\begin{smallmatrix} +0.004 \\ -0 \end{smallmatrix}$	40,975 $\begin{smallmatrix} +0.005 \\ -0 \end{smallmatrix}$	From
B	40,955 $\begin{smallmatrix} +0.004 \\ -0 \end{smallmatrix}$	40,980 $\begin{smallmatrix} +0.005 \\ -0 \end{smallmatrix}$	0,021
C	40,960 $\begin{smallmatrix} +0.004 \\ -0 \end{smallmatrix}$	40,985 $\begin{smallmatrix} +0.005 \\ -0 \end{smallmatrix}$	to
D	40,965 $\begin{smallmatrix} +0.004 \\ -0 \end{smallmatrix}$	40,990 $\begin{smallmatrix} +0.005 \\ -0 \end{smallmatrix}$	0,030

### CYLINDER HEAD

- Check the contact surface (the sealing surface) of the cylinder head by resting it on a surface plate; using a feeler gauge check that there is no greater gap than **0.05 mm**.



- For the engine to run properly it is very important that the cylinder head-cylinder joint, and the sheathing should be perfectly gas-tight.
- If the gap between the two parts is higher than the value quoted above, then it will be necessary to grind down the surface on abrasive paper resting on a surface plate, moving it in figures of eight as shown in the diagram.
- Models HUNTER, PADDOCK, and VAMOS: in these models the cylinder head gasket should be fitted with the convex exterior border facing upwards.



- In the case of the PADDOCK-LC model the gaskets must be changed every time the cylinder head is removed.



- Fit the cylinder head gaskets.
- Fit the cylinder head and tighten up the four 6 mm nuts to a torque of **10 - 12** Nw x m. using a torque spanner.
- Fit the copper gasket and the thermocontact to a torque of **18 - 20** Nw x m.
- Fit the spark plug and tighten to a torque of **18 - 20** Nw x m.



SPARK PLUG	NGK B 8HS	CHAMPION L 78C	MODELS: VAMOS - HUNTER - PADDOCK
SPARK PLUG	NGK B 9HS	CHAMPION N 2C	MODELS: PADDOCK-LC

## CARBURETTOR MANIFOLD

- Check that there are no cracks in the manifold.
- Check that the reeds are not broken and that they open correctly.
- Check that the **4 x 20** securing screws for the reed valve support are tightened **to a torque of 1 - 2** Nw x m.
- Fit the reed valve in the crankcase and then the new carburettor manifold gasket.
- Fit the carburettor manifold to the crankcase: four 6 x 20 screws tightened to a torque of **9 - 10** Nw x m. using **Loctite** thread seal.



## CARBURETTOR

### Stripping the carburettor

- Remove the choke cap.
- Remove the 2 choke screws.
- Remove the choke.
- Withdraw the throttle valve cover screw.
- Remove the cable from the throttle valve.
- Extract the spring and the spring guide.
- Extract the throttle valve.
- Extract the spray needle.
- Loosen and withdraw the 2 carburettor float chamber screws.
- Extract the main jet.
- Extract the idle jet.
- Remove the cold start jet.
- Remove the float pin.
- Remove the float needle.
- Remove the spray.



### Inspection and maintenance of the carburettor

- It is important to check the float needle to ensure correct operation of the vehicle. Wear in the float needle may even produce flooding of fuel directly into the crankcase which may cause damage to the crankshaft seals as well as problems with the piston, the connecting rod, and cause flooding in the exhaust pipe.



### CARBURETTOR FLOAT LEVEL

<b>Model:WEBER</b>	<b>16.5</b>	<b>+1.0</b>
		<b>-1.0 mm</b>
<b>Model:DELL'ORTO</b>	<b>14.3</b>	<b>+0.5</b>
		<b>-0.5 mm</b>

### Carburettor float chamber

- When disassembling and reassembling the carburettor to carry out inspection and cleaning, attention should be paid to ensure that the gasket is correctly located in its place, and that it is not deformed or torn: if it is not perfect it should be replaced, otherwise fuel will leak out.

### Cleaning the jets

- It is advisable to clean the main jet, the idle jet, and the cold start jet, as well as the airways, with a compressed air pistol.

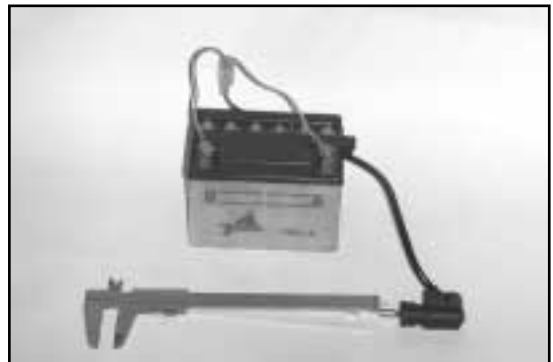
### Checking the electric choke

- Use a vernier caliper to check the choke: the length of the choke piston should be measured when cold.
- It should measure approximately **11 mm**.
- To test it a battery must be used. After connecting the two terminals, wait 3 minutes, and the piston should have extended by about 4 mm, and the total measurement should be around **15 mm**.
- Models like the MANHATTAN are fitted with a manual choke.



### Assembly of the Carburettor

- Fit the spray
- Fit the float needle.
- Fit the float and float pin.
- Fit the cold start jet.
- Fit the idle jet.
- Fit the main jet.
- Fit the float chamber using the 2 securing screws.
- Fit the throttle cable into the carburettor cap.
- Pass the throttle cable through the centre of the spring.
- Fit the throttle cable into the throttle valve.
- Insert the carburettor needle into the throttle valve.
- Fit the spring guide bushing.
- Insert the complete valve assembly into the body of the carburettor.
- Insert the carburettor cap screw and close the carburettor cap.
- Insert the automatic choke into the carburettor.
- Fit the locking piece, the two screws, and tighten up the automatic choke.
- Adjust the air screw (it should be opened approximately 2.5 turns).
- Install the carburettor into the engine.



## Carburettors

	VAMOS	HUNTER ITALIA	PADDOCK HUNTER HUNTER DG MANHATTAN	HUNTER 50 Germany Austria Holland	MXR	HUNTER 25 Germany Holland Finland	PADDOCK-LC
Make	Dell'orto	Dell'orto	Dell'orto	Dell'orto	Dell'orto	Dell'orto	Weber
Type	PHVA-12DD	PHVA-12DD	PHVA-14DD	PHVA-14DD	PHVA-14DD	PHVA-10GD	14 OM 1AA
Diffusor	12 mm.	12 mm.	14 mm.	14 mm.	14 mm.	10 mm.	14 mm.
Main jet	58	54	55	50	56	44	63
Idle jet	34	34	36	34	36	34	34
Needle type number	A 8- 3	A 11-3	A 11-3	A 11-4	A 11-3	A 11-5	AA-3
Spray	210 FA	209 GA	208 GA	211 GA	208 GA	210 GA	G 1
Throttle valve	40	30	30	40	30	30	5
Float	3,5 gr.	3,5 gr.	3,5 gr.	3,5 gr.	3,5 gr	3,5 gr.	4,5 gr.
Air screw openin	2,5 turns	3.0 turns	2,5 turns	2.0 turns	2,5 turns	2 3/4 turns	2 turns
Cold start jet	45	45	45	45	45	45	45
Float level	14,3 <sup>+0,5</sup> -0,5	14,3 <sup>+0,5</sup> -0,5	14,3 <sup>+0,5</sup> -0,5	14,3 <sup>+0,5</sup> -0,5	14,3 <sup>+0,5</sup> -0,5	14,3 <sup>+0,5</sup> -0,5	16,3 <sup>+1.0</sup> -1,0



## CYLINDER SLEEVE COVER, RADIATOR AND FILTER BOX

- Fit the oil tube from the oil pump to the carburetor.
- Fit the cylinder sleeve cover with the two securing screws (6 x 16), and tighten up to a torque setting of **9 -10** Nw x m.
- Check the oil pump bleed screw.



- **It is extremely important** when fitting the fan cover **to check the rubber protector profile** of the fan cover, since if it is broken, there will be leakage from the cooling circuit, and noise will be produced by the vibrations of the vehicle.



- Fit the fan using two 6 x 16 securing screws and tighten to a torque of **9 - 10** Nw x m. applying **Loctite** thread seal.
- Fit the fan cover using 2 screws (6 x 16) and 3 cross-head screws (6.3 x 19) and tighten to a torque of **9 - 10** Nw x m.



- Fit the radiator using 2 screws (6 x 60) and tighten to a torque of **9 - 10** Nw x m. and the 2 distance pieces of 35.5 mm.
- Fit the gasket and the cylinder head water outlet connector using 2 screws (6 x 20), and tighten up to a torque of **9 - 10** Nw x m. applying **Loctite** thread seal.
- Next fit the water hose from the connector to the radiator using 2 hose clips.
- Fit the starter motor with the supporting plate gasket, the 24 mm exterior diameter and 2.2 mm thick O-ring, using 2 screws (6 x 25) and tighten to a torque of **9 - 10** Nw x m. applying **Loctite**.



- Fit the cooling hose from the water pump to the radiator with an O-ring (using 1 screw 6 x 16) and tighten to a torque of **9 - 10** Nw x m. applying **Loctite**.
- Then also fit 1 screw (6 x 10) to a torque of **9 - 10** Nw x m. which is secured to the crankcase, applying **Loctite**.
- At the lowest part of the cooling hose the cooling liquid drain screw and washer are to be found. The washer must be replaced every time the screw is touched.
- Fit the oil drain plug (8 x 16 screw) with a new washer and tighten to a torque of **17 - 19** Nw x m.
- Fill the reduction gearbox with **110 cc** of **AGIP GEAR SYNTH SAE 75w/90** oil.
- Next fit the filler cap and tighten to hand tight only.
- Fit the rear brake shoes, where the assembled position of the shoes must be with the bevelled edges facing outwards.
- Fit the centre stand inserting the shaft from left to right, complete with washer, pin and stand spring.
- Fit the rear wheel on its shaft, with washer and nut and tighten to a torque of **100 - 105** Nw x m.
- Fit the filter box using 2 screws (6 x 35) and tighten to a torque of **9 - 10** Nw x m.
- Tighten up the drainage tank securing screw.
- Fit the inlet tube "with the spring to the carburettor".
- Fit the rear mudguard using 2 screws (5.1 x 18).
- Fit the exhaust pipe and silencer, using a new exhaust pipe gasket, with 2 screws (6 x 20); fit the silencer bracket using 2 screws (10 x 65) to a torque of **40 - 45** Nw x m. and the screw securing it to the rear mudguard (5 x 15).

### Checking the filter box

- It is important to maintain and clean the filter properly, to ensure the proper operation of the vehicle.
- It is also very important that none of the hoses from the filter box to the carburettor or to the drainage box is disconnected, and that no holes are made in the filter box, since this would alter the carburation and thus adversely affect the life and duration of the engine.



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## FITTING THE ENGINE IN THE FRAME

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- Fit the engine in the frame.
- Insert the two screws securing the engine to the frame (10 X 45), and tighten to a torque of **35 - 40** Nw x m.
- Insert the lower shock absorber screw (10 x 35) and tighten to a torque of **35 - 40** Nw x m.
- Fit the cooling hoses at the radiator water reservoir (LC models).
- Fit the fuel tubes to the fuel cock outlet, and fit them to the carburettor.
- Fit the oil hose to the carburettor and secure with a pressure clamp.
- In LC models connect the thermocontact electrical spade-connector.
- Make the connections for the magneto, the stop light, the choke, the starter, and the 2 connections to the high tension coil, and tighten up the earthing connection cable screw (6 x 25) to a torque of **9 - 10** Nw x m.
- Join the rear end of the throttle cable to the inspection cover.
- Fit the rear brake guide and the engine earth cable with 1 screw (6 x 16).
- Fit the rear brake guide stop screw (6 x 16) with the spring washer and tighten to a torque of **9 - 10** Nw x m.
- Locate the helmet carrier with the lower shield using four screws (6 x 16) and 2 screws (5 x 15).
- Fit the side panels (five crosshead screws).
- In the PADDOCK and PADDOCK-LC models pass the turn indicator cables through the hole in the left hand side panel.
- Assemble the right hand side panel to the lower shield (2 screws).
- Fit the right hand side footrest cover (1 screw).
- Assemble the left hand side panel to the lower shield (2 screws).
- Fit the left hand side footrest cover (1 screw).
- Fit the luggage carrier with four screws.
- In the PADDOCK and PADDOCK-LC models, connect up the turn indicator cables.
- Secure the luggage carrier using 5 screws (3.6 x 14), and 4 screws (2 of 8 x 35 and 2 of 8 x 60).
- Fit the fuel tank and oil reservoir filler caps, and check the oil level.
- Fill the cooling reservoir with 400 cc of antifreeze **AGIP CLOSED SYSTEM PLUS 30%** and screw on the filler cap.

## ELECTRICAL SYSTEM

### GENERAL CHARACTERISTICS

Component	Standard values
<b>Battery:</b> Type Electrolyte - specific gravity	12V 4 Ah 1,28 a 20° C.
<b>System:</b> Type Charging voltage Coil resistance	alternator and regulator $13,5 \pm 0,5$ V a 4.000 r.p.m. and lights on $1,1 \pm 0,2 \Omega$ a 20° C.
<b>Lighting system:</b> Type Regulation voltage Coil resistance	Alternator and regulator $13,5 \pm 0,5$ V a 4.000 r.p.m. and lights on $0,9 \pm 0,2 \Omega$ a 20° C.
<b>Ignition system:</b> Type <b>Magneto</b> Resistance of stator between Black/Red cables and earth <b>High Tension coil</b> Secondary winding resistance Suppressor cap resistance	Electronic  $238 \pm 30 \Omega$ a 20° C.  $5 \pm 1$ K $\Omega$ $10 \pm 1$ K $\Omega$
<b>Switches and sensors:</b> Brake switches Fuel sensor Oil sensor	The stop light comes on after 12 mm travel of the brake levers Full: $\infty \Omega$ / Reserve: 33 $\Omega$ Full: $\infty \Omega$ / Reserve: 0 $\Omega$

## BATTERY

### Warnings:

- Never reverse the polarity of the battery. This could cause damage to certain electronic components.
- The battery produces explosive gases. Do not make sparks or flames near the battery, and particularly when the battery is charging.
- The electrolyte in the battery contains sulphuric acid. If this acid comes into contact with the skin it causes burns. Wash the affected area with plentiful water and consult a doctor.
- In order to avoid mechanical failures do not disconnect the battery terminals or other connections unless the ignition switch is in the "OFF" position.
- Always use a slow charge whenever possible. A rapid charge should only be used in cases of emergency and then only for a short time, since it may damage the battery.
- It is advisable to remove the battery from the vehicle in order to charge it.
- Keep the breather tube clear of obstructions, particularly during charging.

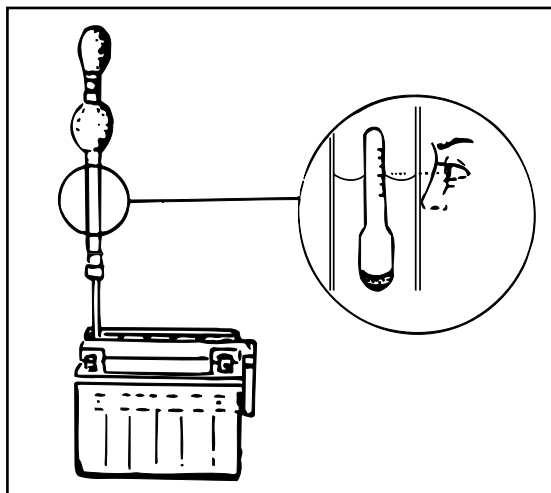
### IMPORTANT

Batteries lose charge when they are not used. Do not leave the battery for more than a month without recharging, and reduce the recharging interval to a fortnight after the first month.

Battery	Standard values
Type	12V 4 Ah
Electrolyte - specific gravity	1,28 a 20° C.
Charging amperage	0.4 Amps maximum.
Charging coil resistance	1,1 $\Omega \pm 0,2$ a 20° C.

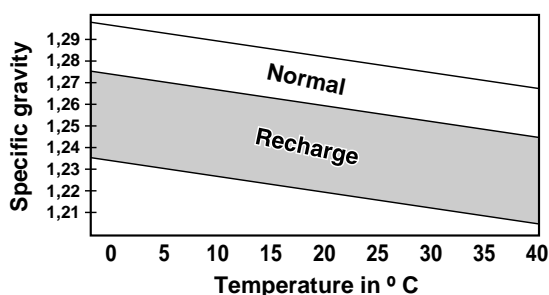
### Inspecting the battery

- Check periodically the level of the electrolyte, and if the level is low, add distilled water.
- Check that the density of the electrolyte in each cell is between 1.26 and 1.28. If it is below 1.26 charge the battery according to the attached table.



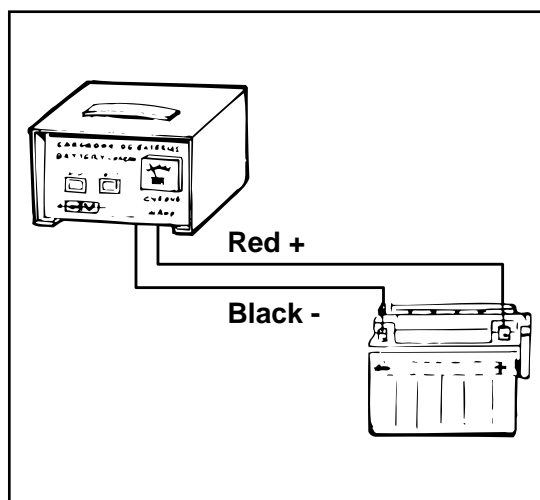
- If the density is low after charging the battery, or that there are variations between the different cells, the battery should be replaced.

- The density of the electrolyte varies with the temperature. Please refer to the table below.



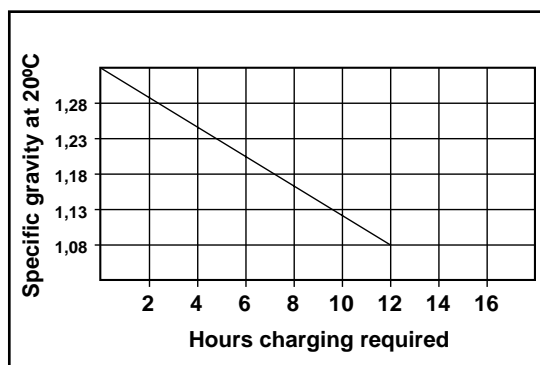
### Charging the battery for the first time

- Cut or extract the breather tube seal and fit the tube.
- Remove the plugs and fill the battery with electrolyte with a density of 1.28 at 20° C.
- It is extremely important to check the density of the electrolyte before charging the battery.
- Leave the battery to rest for about one hour after filling. Then adjust the level of electrolyte by **adding electrolyte**.
- Then connect the charger for **10 hours at 0.4 Ah.**, matching the polarities (connecting the + and the - of the charger to the + and the - of the battery).

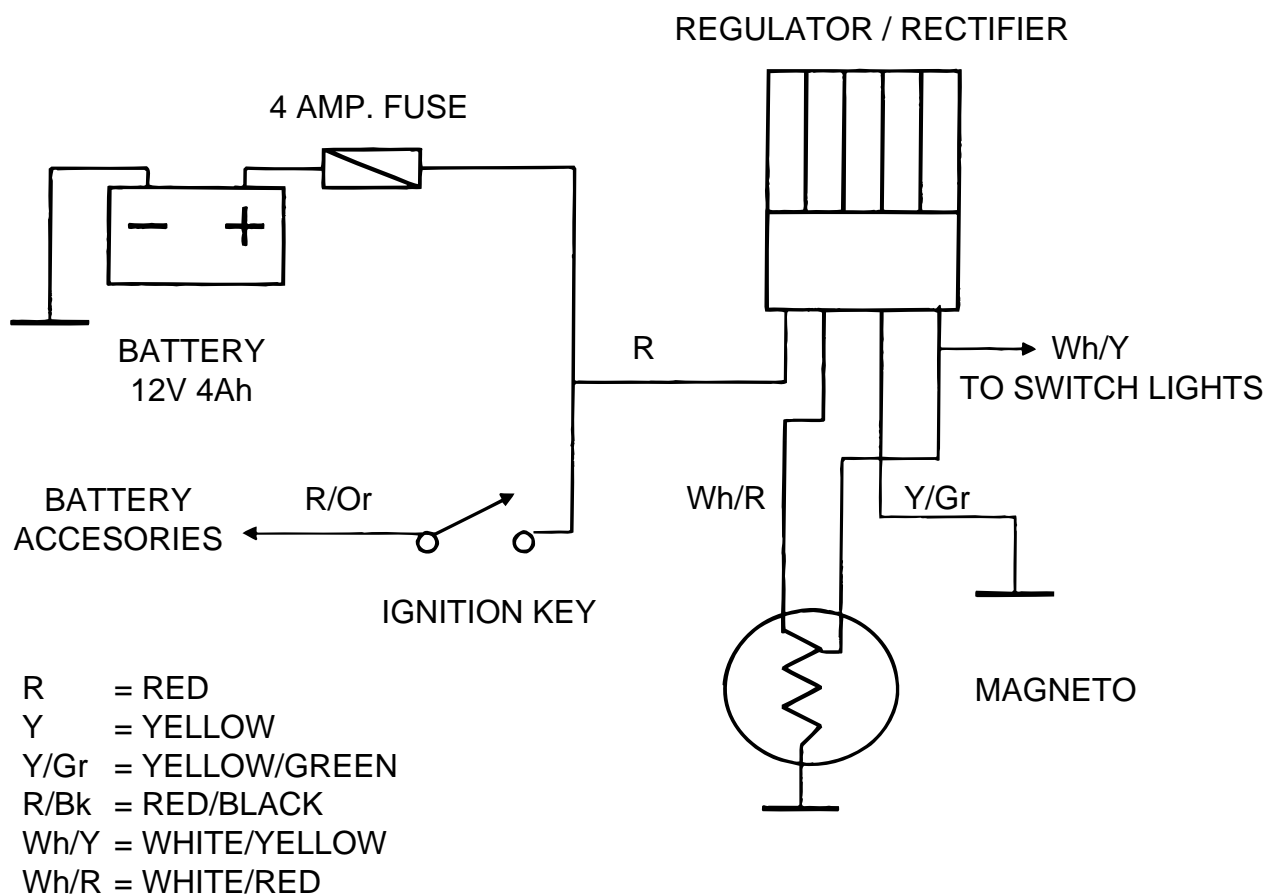


### Normal charging

- Remove the battery from the scooter.  
Clean the battery with plentiful water, but making sure that water does not enter the cells.
- Inspect the cells, and add distilled water to the level indicated on the battery.
- Connect the charger, taking care to match the polarities.
- **Charging current: 0.4 maximum.**
- Decide the charging time according to the attached table.



## Schematic and battery charging control



### Alternator voltage test at medium revs

Tester Connections	White / Yellow Cable	White / Red Cable
Earth	Minimum voltage 25V AC	Minimum voltage 30V AC

### Alternator resistance Test

Tester Connections	White / Yellow Cable	White / Red Cable
Earth	0,9 $\Omega \pm 0,2$	1,1 $\Omega \pm 0,2$

### Regulator Test at medium revs

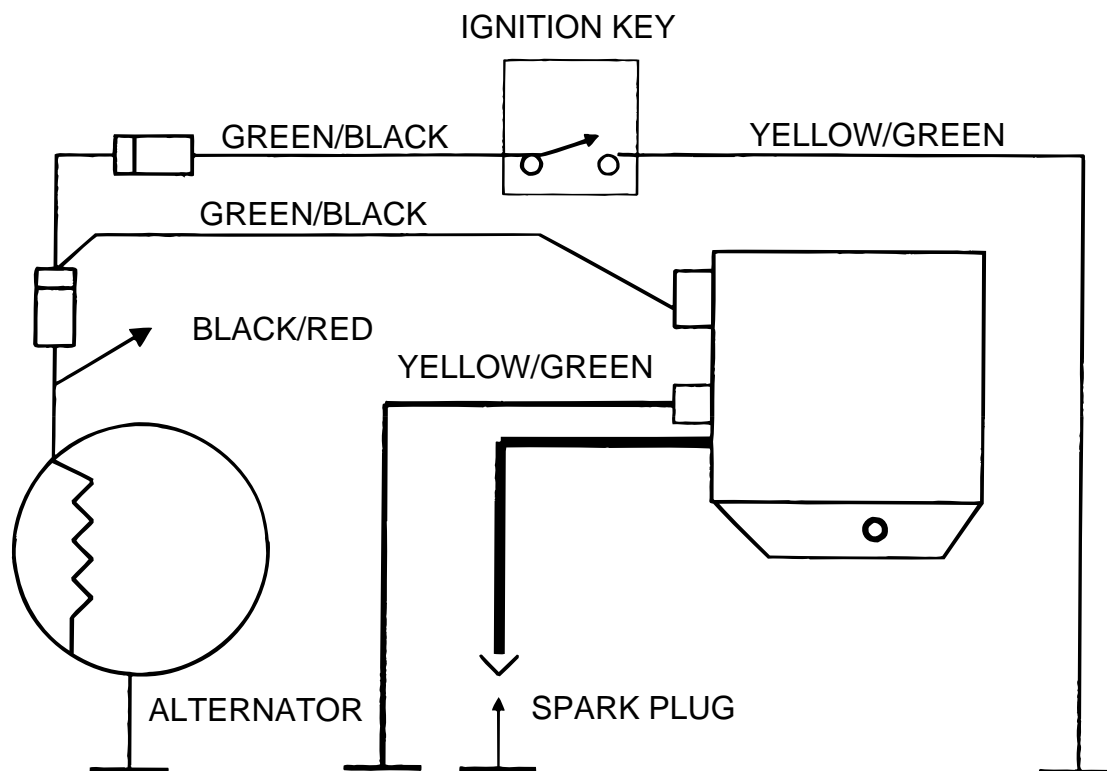
Tester Connections	Alternating current Yellow cable	Positive cable Red cable
Earth	13,5 V $\pm 0,5$	13,5 V $\pm 1$

## SCHEMATIC AND IGNITION CIRCUIT CONTROL

### Service information

- The ignition timing does not need any maintenance.
- The spark is distributed at 20 ° before TDC at 4,000 rpm.

### Schematic wiring diagram



Function of the colours	
Colour	Function
Green / Black	stopping the engine and feeding the ignition
Yellow / Green	Earth
Green	Coil feed
Black / Red	Spark lead



## CHECKING THE IGNITION

### Inspecting the magneto

- Remove the inspection cover, so as to be able to reach the magneto connectors.
- Disconnect the Black /Red feed cable from the coil and the 2-way connector in the White/Red and the White/Yellow cables.
- Check that the resistance values are in line with the following tables:

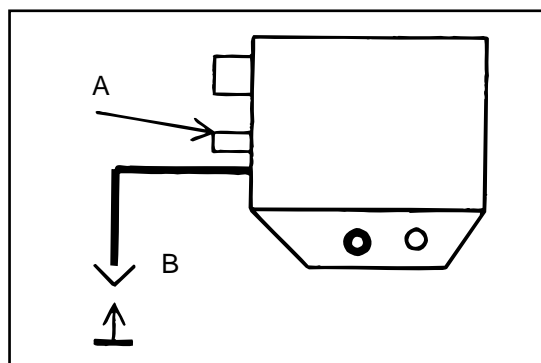
	Black/Red	White/Red	White/Yellow
Earth	238 $\Omega$ $\pm 10\%$	1,1 $\Omega$ $\pm 15\%$	0,9 $\Omega$ $\pm 15\%$

**The values for consulting the table should be read between 20° and 30° C.**

- If the actual values are not the same as those on the table, check the wiring before replacing the mageto.

### Inspecting the coil

- Withdraw the spark plug cap.
- Check the resistance of the secondary winding of the coil between points **A** and **B**.
- **The correct value between A and B: 5 - 6 k $\Omega$ .**
- If the value of the resistance of the secondary winding and the magneto are correct, the coil assembly should be replaced.



### Checking the spark plug cap

- Check the value of the resistance between the terminals of the spark plug cap.
- **The correct value of the resistance: 9 - 11 k $\Omega$ .**

## SWITCHES AND SENSORS

### Ignition switch

- Remove the panels so as to be able to reach the ignition lock connectors.
- Remove the ignition lock to carry out the continuity check as in the attached diagram.

### Code and function of the colours

BL - Blue .....Earth input

Wh/R - White/Red....Engine stop

Or - Orange .....Output and for battery accessories

Gr - Green .....Input and Battery

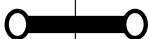

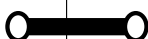

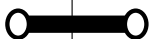
- If the continuity test is not satisfactory, replace the ignition lock.
- If the test is satisfactory, check the general condition of the cables in the wiring.






	Bl	R/Wh	Or	Vi
ON				
OFF				
LOCK				

## Connection of lighting switch, turn indicators and horn

- Remove the panel so as to be able to disconnect the switch connectors.
- If the continuity test is not satisfactory, replace the switch.
- If the test is satisfactory, check the general condition of the cables in the wiring.

Horn								
Left Turn indicator								
Right Turn indicator								
High Beam								
Dipped Beam								
Colours	Y/Gr	Bk	Vi	Or	P	Br	Wh/Y	Bl

### PADDOCK-LC Switch

Horn					
Left Turn indicator					
Right Turn indicator					
Colours	Y/Gr	Bk	Vi	Or	P

### Codes and Functions of the colours

Y/Gr - Yellow/Green..Earth

Bk - Black .....Horn

P - Pink .....Rear right hand turn indicator

Or - Orange .....Turn indicator common line



Vi - Violet .....Rear Left hand indicator

Bl - Blue .....Headlight - High beam

Wh/Y - White/Yellow..Headlight - Dipped beam

Br - Brown .....Lighting switch supply

## Lighting Switch and Electric Start

Starter				
Lights				
Colours	Y/Gr	Wh/Bk	Y	Br

### Codes and functions of the colours

Y/Gr - Yellow/Green .....Earth

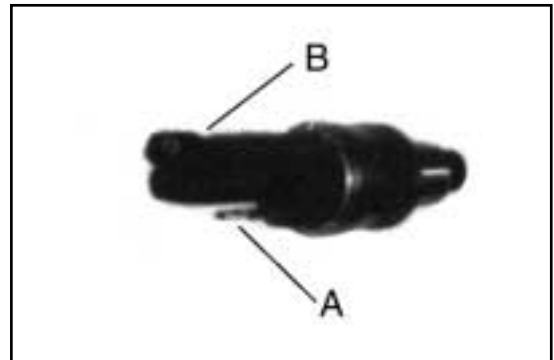
Wh/Bk - White/Black .....Relay Operation

Y - Yellow ....Supply

Br - Brown ....Rear light and lighting dip switch

### Front and rear brake switch

- Disconnect the terminals of the press switch and check continuity between contacts A and B.
- With the press button closed, the resistance is infinite, and with the press button at rest, the value of the resistance is 0  $\Omega$ .



### Side Stand switch

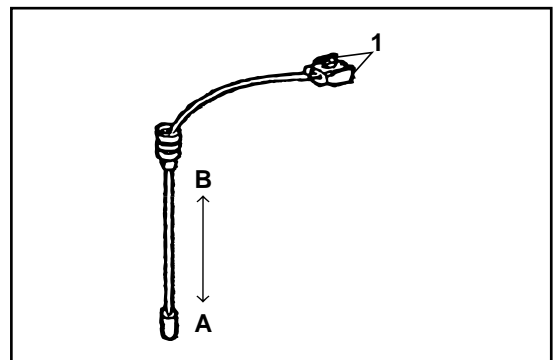
- Disconnect the 2-way connector situated below the saddle.
- Check continuity between the Yellow/Green and Green/Black cables.

### Values of the resistance

Stand deployed	0 $\Omega$
Stand closed	$\infty \Omega$

### Oil reserve sensor

- Remove the plastic caps from the reservoirs, and extract the tank sensor.
- Disconnect the terminals from the sensor and check continuity between terminals (1) Yellow/Green cable and Blue/Black cable.

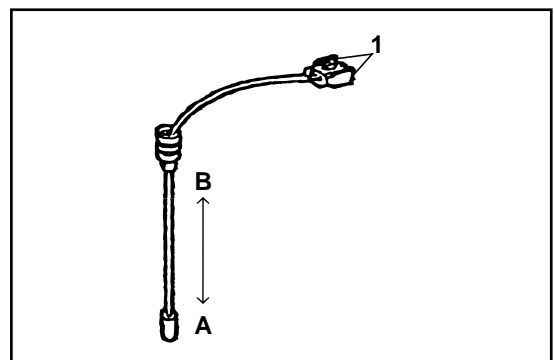


### Values of the resistance

Position A	0 $\Omega$
Position B	$\infty \Omega$

### Fuel tank reserve sensor

- Remove the plastic caps from the tanks, and remove the sensor from the tank.
- Disconnect the sensor terminals and check continuity between terminals (1) Yellow/Green cable and White/Blue cable

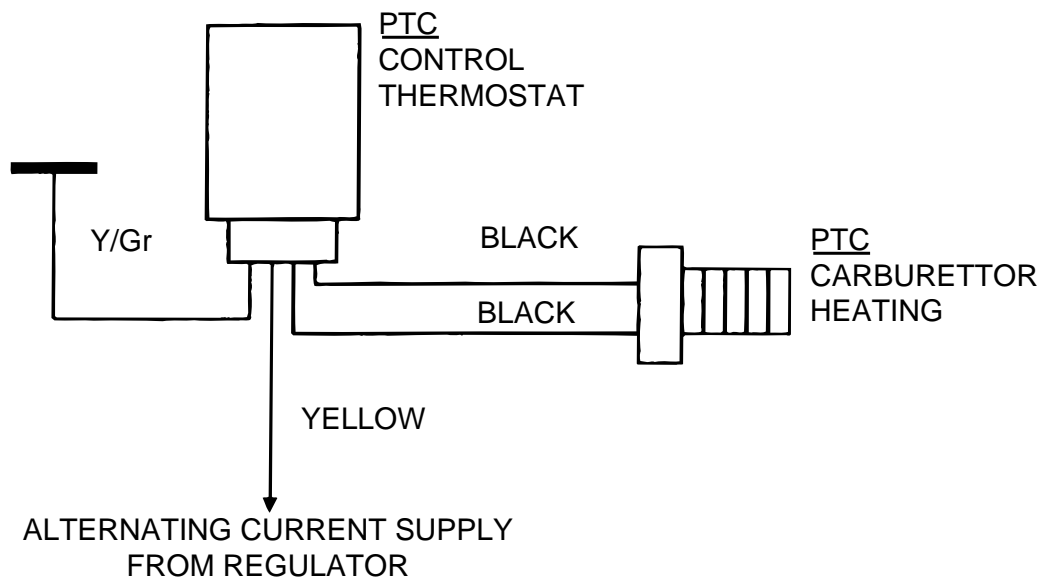


### Values of the resistance

Position A	33 $\Omega$
Position B	$\infty \Omega$

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## SCHEMATIC AND CARBURETTOR HEATING CONTROL



### Checking the thermostat

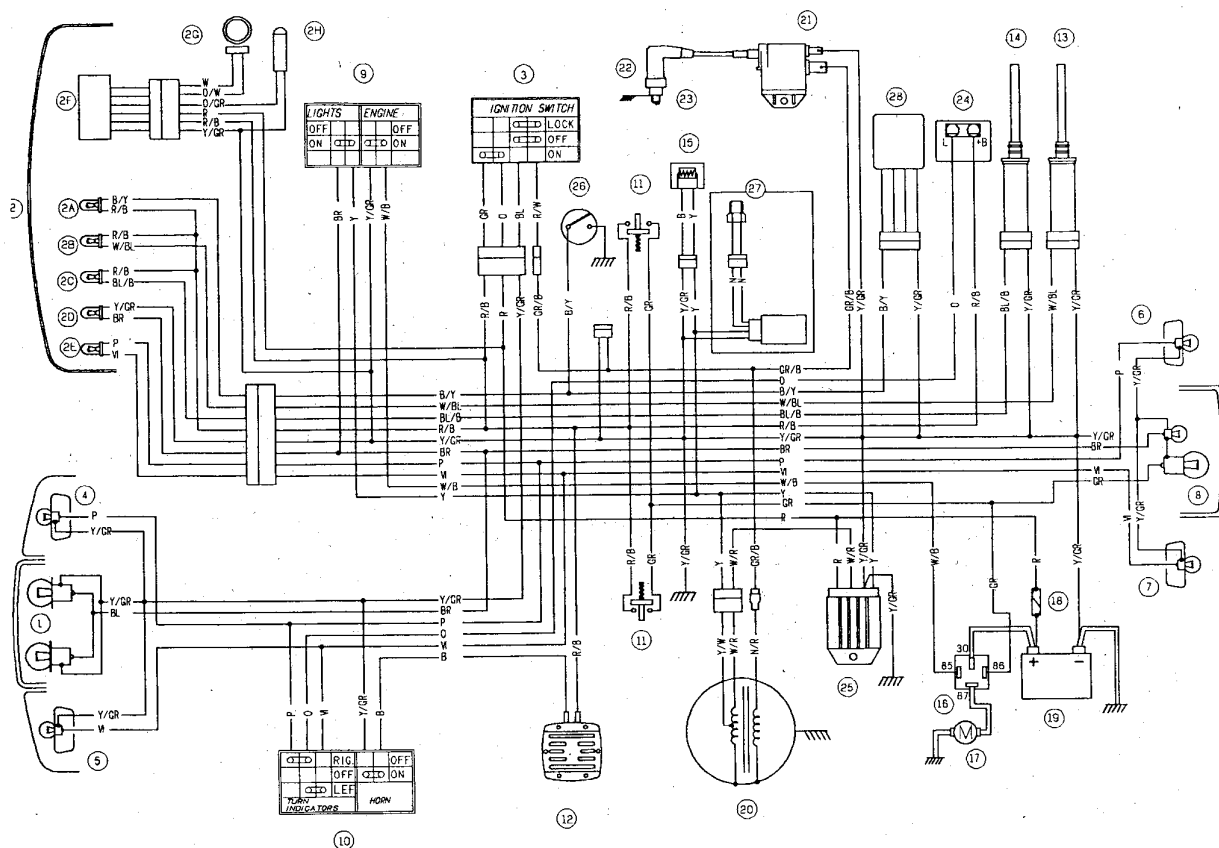
- Check that power reaches the thermostat by connecting a lamp between the Yellow/Green and Yellow cables.
- In order to check the output of the black cables, it is necessary to lower the temperature of the thermostat to 5° C and then check the output between the black cables with a 12V lamp.

### Checking the thermoresistance of the carburettor

- Check the resistance of the PTC at a temperature of between 15° and 20° C.

Values of the resistance =  $8 \Omega \pm 3$

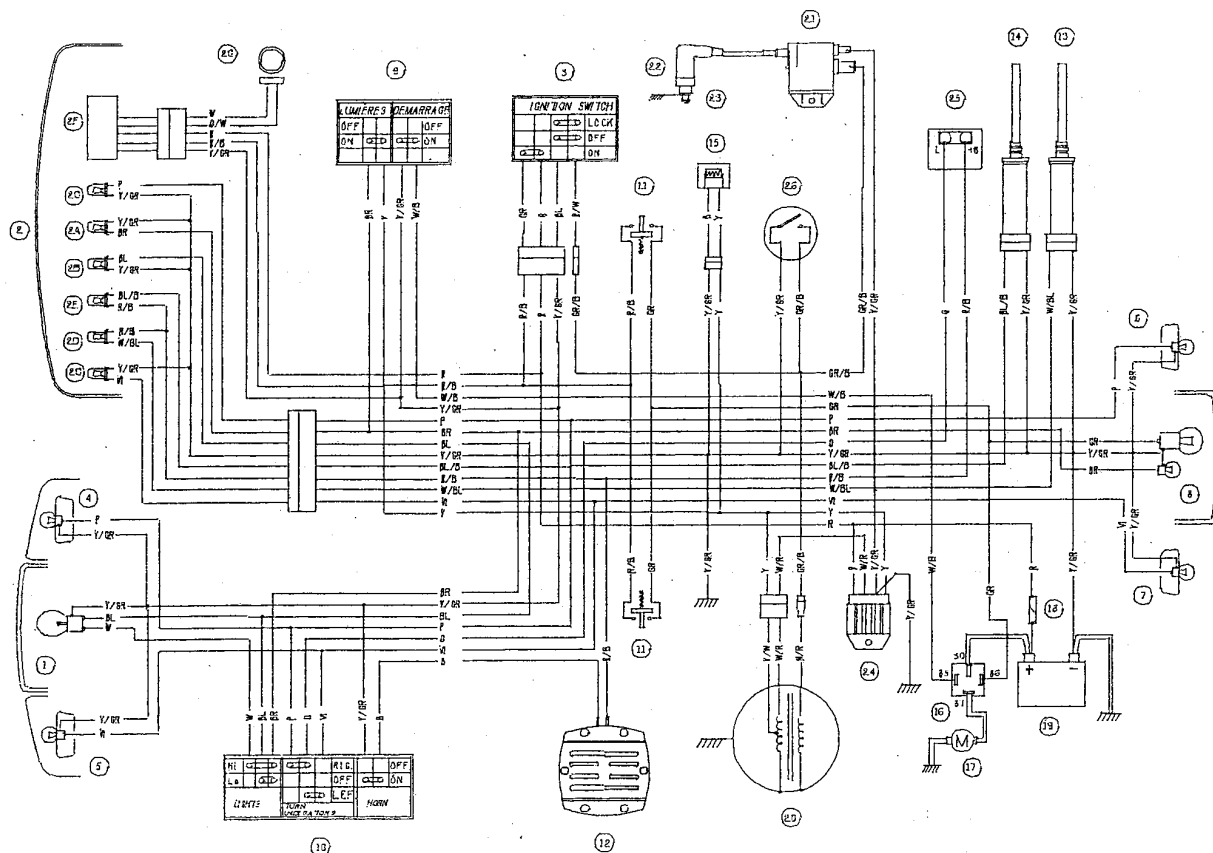
# ECHEMA ELECTRIQUE PADDOCK-LC



- |   |  |
|---|--|
| 1 Headlight 12V 15/15 W                       | 11 Brake Light Switch                      |
| 2 Dashboard                                   | 12 Horn 12V DC                             |
| 2D High Beam indicator light 12V 1.2w         | 13 Fuel Sensor                             |
| 2A Water temperature indicator light 12V 1.2w | 14 Oil Sensor                              |
| 2E Turn Signal Indicator Light 12V 2W         | 15 Electric Choke                          |
| 2B Fuel Indicator Light 12V 2W                | 16 Starter Relay                           |
| 2C Oil Indicator Light 12V 2W                 | 17 Starter Motor                           |
| 2F Display                                    | 18 Fuse 4A                                 |
| 2G Speedometer sensor                         | 19 Battery 12V 4A                          |
| 2H Temperature sensor                         | 20 Flywheel Magneto 12V 70W                |
| 3 Ignition Switch                             | 21 Electronic Converter A.T.               |
| 4 Front Right Turn Signal Light 12V 10W       | 22 Spark Plug Cap Anti-Radio Interferences |
| 5 Front Left Turn Signal Light 12V 10W        | 23 Spark Plug                              |
| 6 Rear Right Turn Signal Light 12V 10W        | 24 Turn signal box 12V 10/10W              |
| 7 Rear Left Turn Signal Light 12V 10W         | 25 Regulator AC-DC                         |
| 8 Tail/Brake Light 12V 5W / 12V 10W           | 26 Water temperature Thermostat            |
| 9 Headlight / Engine Stop Switch              | 27 Carburetor Heater KIT                   |
| 10 Dimmer / Turn Signal / Horn Switch         | 28 Check control                           |

D	F	UK	I	E	
Orange	Orange	Orange	Arancio	Naranja	O
Grün	Vert	Green	Verde	Verde	GR
Schwarz	Noir	Black	Nero	Negro	B
Braun	Marron	Brown	Marrone	Marron	BR
WeiB	Blanc	White	Bianco	Blanco	W
Grau	Gris	Gray	Grigio	Gris	G
Gelb	Jaune	Yellow	Giallo	Amarillo	Y
Blau	Blau	Blue	Azzurro	Azul	BL
Rot	Rouge	Red	Rosso	Rojo	R
Rosa	Rosa	Pink	Rosa	Rosa	P
Violett	Violet	Violet	Viola	Violeta	VI

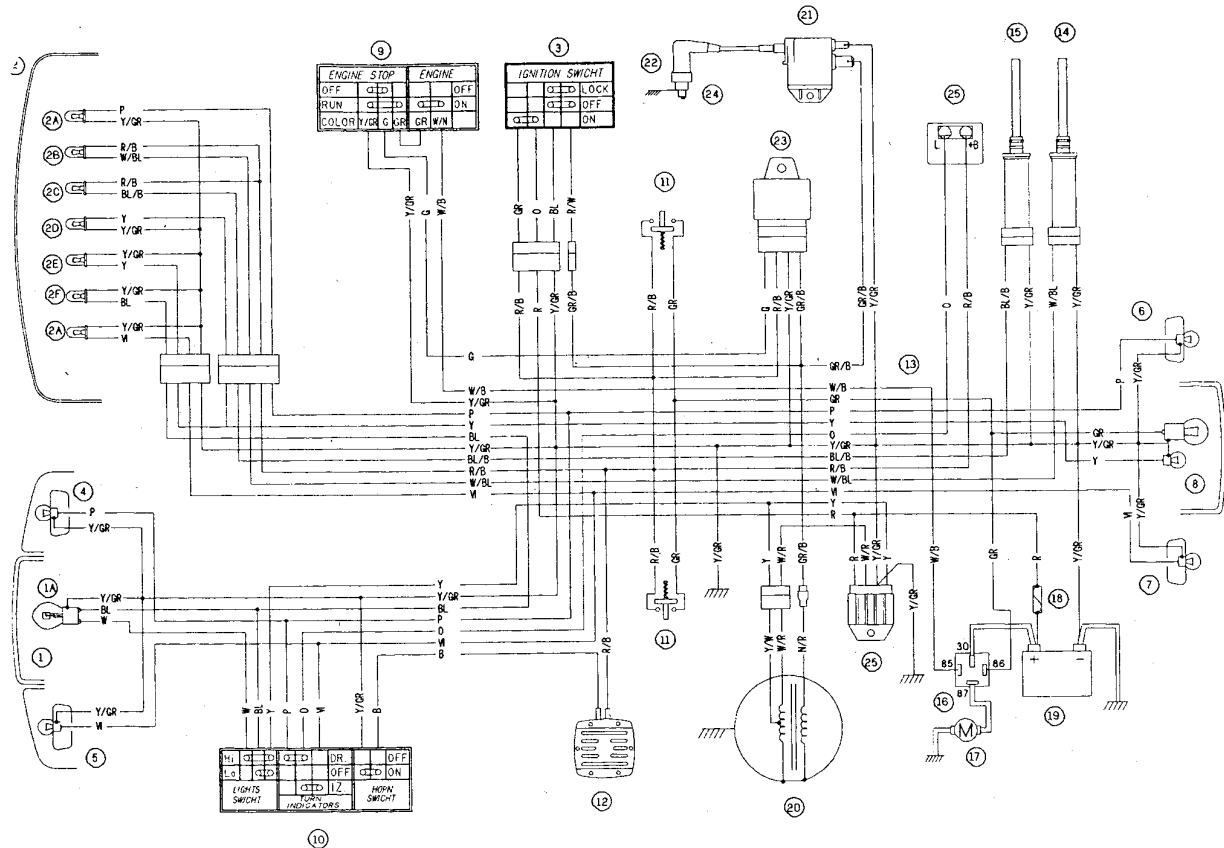
# ECHEMA ELECTRIQUE HUNTER



- |   |  |
|---|--|
| 1 Headlight 12V 25/25 W                 | 11 Brake Light Switch                      |
| 2 Dashboard                             | 12 Horn 12V DC                             |
| 2A Dashboard Light 12V 1.2W             | 13 Fuel Sensor                             |
| 2B High Beam Indicator Light 12V 1.2W   | 14 Oil Sensor                              |
| 2C Turn Signal Indicator Light 12V 2W   | 15 Electric Choke                          |
| 2D Fuel Indicator Light 12V 2W          | 16 Starter Relay                           |
| 2E Oil Indicator Light 12V 2W           | 17 Starter Motor                           |
| 2F Display                              | 18 Fuse 4A                                 |
| 2G Speedometer sensor                   | 19 Battery 12V 4A                          |
| 3 Ignition Switch                       | 20 Flywheel Magneto 12V 70W                |
| 4 Front Right Turn Signal Light 12V 10W | 21 Electronic Converter A.T.               |
| 5 Front Left Turn Signal Light 12V 10W  | 22 Spark Plug Cap Anti-Radio Interferences |
| 6 Rear Right Turn Signal Light 12V 10W  | 23 Spark Plug                              |
| 7 Rear Left Turn Signal Light 12V 10W   | 24 Regulator AC-DC                         |
| 8 Tail/Brake Light 12V 5W / 12V 10W     | 25 Turn signal box 12V 10/10W              |
| 9 Headlight / Engine Stop Switch        | 26 Stand switch assy                       |
| 10 Dimmer / Turn Signal / Horn Switch   |  |

D	F	UK	I	E	
Orange	Orange	Orange	Arancio	Naranja	O
Grün	Vert	Green	Verde	Verde	GR
Schwarz	Noir	Black	Nero	Negro	B
Braun	Marron	Brown	Marrone	Marron	BR
WeiB	Blanc	White	Bianco	Blanco	W
Grau	Gris	Gray	Grigio	Gris	G
Gelb	Jaune	Yellow	Giallo	Amarillo	Y
Blau	Blau	Blue	Azzurro	Azul	BL
Rot	Rouge	Red	Rosso	Rojo	R
Rosa	Rosa	Pink	Rosa	Rosa	P
Violett	Violet	Violet	Viola	Violeta	VI

# ECHEMA ELECTRIQUE MANHATTAN USA



- |   |  |
|---|--|
| 1 HEADLIGHT 12V 35/35W                    | 10 LIGHTS / TURN INDICATORS / HORN SWICHT  |
| 2 DASHBOARD                               | 11 BRAKE LIGHT SWICHT                      |
| 2A TURN SIGNAL INDICATOR LIGHT 12V 2W     | 12 HORN 12V                                |
| 2B FUEL INDICATOR LIGHT 12V 1.2W          | 13 ELECTRICAL ASSEMBLY                     |
| 2C OIL INDICATOR LIGHT 12V 2W             | 14 FUEL LEVEL SENSOR                       |
| 2D DASHBOARD LIGHT 12V 1.2W               | 15 OIL LEVEL SENSOR                        |
| 2E CONTROL PILOT LIGHT 12V 1.2W           | 16 STARTER RELAY                           |
| 2F HIGH BEAM CONTROL PILOT LIGHT 12V 1.2W | 17 STARTER MOTOR                           |
| 3 IGNITION SWICHT                         | 18 FUSE 4Amp                               |
| 4 FRONT RIGHT TURN SIGNAL 12V 10W         | 19 BATTERY 12V 4AH                         |
| 5 FRONT LEFT TURN SIGNAL 12V 10W          | 20 FLYWHEEL MAGNETO 12V 80W                |
| 6 REAR RIGHT TURN SIGNAL 12V 10W          | 21 ELECTRONIC CONVERTER A.T.               |
| 7 REAR LEFT TURN SIGNAL 12V 10W           | 22 SPARK PLUG CAP ANTI-RADIO INTERFERENCES |
| 8 TAIL/BRAKE LIGHT 12V 5W / 12V 10W       | 23 ENGINE STOP RELAY                       |
| 9 ENGINE STOP / ENGINE SWICHT             | 24 SPARK PLUG                              |

D	F	UK	I	E	
Orange	Orange	Orange	Arancio	Naranja	O
Grün	Vert	Green	Verde	Verde	GR
Schwarz	Noir	Black	Nero	Negro	B
Braun	Marron	Brown	Marrone	Marron	BR
WeiB	Blanc	White	Bianco	Blanco	W
Grau	Gris	Gray	Grigio	Gris	G
Gelb	Jaune	Yellow	Giallo	Amarillo	Y
Blau	Blau	Blue	Azzurro	Azul	BL
Rot	Rouge	Red	Rosso	Rojo	R
Rosa	Rosa	Pink	Rosa	Rosa	P
Violett	Violet	Violet	Viola	Violeta	VI

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# **ANNEXE**

**PREDATOR-LC - CAT - WVTA Models**  
**PREDATOR O<sub>2</sub> - CAT - WVTA Models**  
**ATLANTIS - CAT - WVTA Models**  
**ATLANTIS-LC - CAT - WVTA Models**  
**ATLANTIS 100 Models**

**2**



## REGULAR MAINTENANCE TABLE

Period: the period may be calculated by kilometres run or by time in months	Km	1000	2500	5000	10000	15000	20000	25000
	Months	2	6	12	24	36		
Reduction gear or crankcase oil		Replace	Check	Check	Replace	Check	Replace	Check
Suspensions				Check	Check	Check	Check	Check
Tighten all fastenings		Check	Check	Check	Check	Check	Check	Check
Electrical connections		Check	Check	Check	Check	Check	Check	Check
Spark plug		Clean	Adjust	Replace	Replace	Replace	Replace	Replace
Battery (with maintenance)			Check	Check	Check	Check	Check	Check
Carburettor		Adjust Clean		Adjust Clean	Adjust Clean	Adjust Clean	Adjust Clean	Adjust Clean
Water pump drive belt							Replace	
Variable speed drive rollers						Check Replace		
Drive belt transmission								
Oil filter				Check	Replace	Check	Replace	Check
Air filter				Clean	Clean	Clean	Clean	Clean
Brakes / hose / pads				Check	Check	Check	Check	Check
Brake equipment					Check		Check	
Brake fluid		EVERY 2 YEARS			EVERY 2 YEARS			
Coolant		Check	Check	Check	Check	Check	Check	Check
Tyres				Check	Check	Check	Check	Check
Tyres pressures		Check	Check	Check	Check	Check	Check	Check
Fuel or oil hoses		Check			Replace	Check	Replace	Check
Transmission				Lubricate and greasing	Lubricate and greasing	Lubricate and greasing	Lubricate and greasing	Lubricate and greasing
Cylinder head, cylinder, piston				Clean				
Segments piston				Replace	Check		Check	
Cylinder head nuts			Tighten up	Tighten up				
Inlet valve reeds					Check		Check	
Rear suspension links					Clean Greasing		Clean Greasing	
Speedometer transfer box					Clean Greasing		Clean Greasing	

## TORQUE SETTINGS

PART NAME			TORQUE SETTINGS (Nw x m)	
SHOE ROTATION SHAFT	8M125		17 - 19	LOCTITE
CYLINDER STUD	6M100	STUD	10 - 12	
CRANKCASE SECURING SCREWS	6M100	SCREW	9 - 10	LOCTITE
CYLINDER HEAD	6M100	NUT	10 - 12	
INLET VALVE MANIFOLD BRACKET	4M70	SCREW	1 - 2	LOCTITE
CRANKCASE INLET MANIFOLD	6M100	SCREW	9 - 10	LOCTITE
OIL PUMP	5M80	SCREW	4 - 5	LOCTITE
COIL TO BASE PLATE	6M100	SCREW	8 - 10	LOCTITE
BASE PLATE TO CRANKCASE	6M100	SCREW	8 - 10	LOCTITE
MAGNETO	10M100	NUT	35 - 40	LOCTITE
STARTER MOTOR	6M100	SCREW	9 - 10	LOCTITE
FAN TO MAGNETO	6M100	SCREW	8 - 10	LOCTITE
ENGINE A.E. PLATE SUPPORT BRACKET	6M100	SCREW	9 - 10	LOCTITE
LEFT HAND CRANKSHAFT	10M100	NUT	35 - 40	LOCTITE
REDUCTION GEAR COVER	6M100	SCREW	9 - 10	LOCTITE
PULLEY SHAFT	10M100	NUT	35 - 40	LOCTITE
PLASTIC OIL FILLER CAP	14M150	CAP	HAND TIGHT	
LEFT HAND CRANKSCASE HALF COVER	6M100	SCREW	9 - 10	LOCTITE
OIL DRAIN PLUG	8M125	SCREW	17 - 19	
CYLINDER CASING COVER	6M100	SCREW	9 - 10	
FRONT WHEEL	12M150	NUT	40 - 45	
REAR WHEEL	16M150	NUT	100 - 105	
SWINGING ARM	10M150	NUT	40 - 45	
UPPER / LOWER SHOCK ABSORBER	10M150	NUT	38 - 40	
CLIP-ON HANDLEBARS	8M125	SCREW	20 - 25	
EXHAUST PIPE TO CYLINDER	6M100	SCREW	8 - 12	
EXHAUST PIPE TO INTERMEDIATE SUPPORT	6M100	NUT	8 - 12	
EXHAUST PIPE TO CRANKCASE	10M150	SCREW	30 - 35	
FORK LEG SECURING	6M100	NUT	8 - 12	
STEERING	25M100	NUT	70 - 90	
FRONT/REAR BRAKES	8M125	SCREW	20 - 25	
STARTER PEDAL	6M100	SCREW	8 - 12	LOCTITE
SILENCER PROTECTOR	4M70	SCREW	1 - 2	LOCTITE
HANDLEBAR COUNTERWEIGHT		SCREW	4 - 5	LOCTITE
ENGINE	10M150	SCREW	35 - 40	
FRONT / REAR DISC BRAKES	8M125	SCREW	17 - 19	LOCTITE
SUSPENSION LINK / SWINGING ARM LINKAGE		SCREW	38 - 40	
ENGINE / BANANA ARM	10M150	SCREW	20 - 25	LOCTITE

## FRONT FORKS

### Disassemble fork legs

- Withdraw 4 mudguard screws and remove the mudguard.
- Slacken off the wheel shaft, withdraw the washer, loosen the 2 front brake caliper screws, loosen the locking nut, withdraw the wheel shaft, the wheel spacer piece and leave the transfer box hanging loose.



### Left hand fork leg

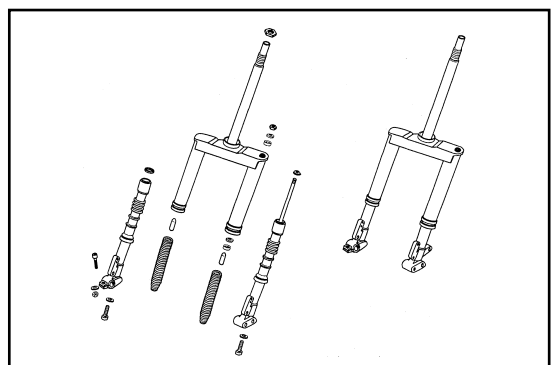
- In order to be able to disassemble the left hand fork leg without removing the forks, the following steps should be followed:
- Remove the mudguard and withdraw the locking ring.
- Withdraw the 2 bag carrier screws.
- Withdraw the 7 inner front shield screws and remove the inner front shield.
- Slacken off the 6 x 100 nut and washer, and then we can withdraw the left hand fork leg, which is a hydraulic cartridge complete with the bushing and silentbloc, the boss, rubber stop spring and guide washer.

**If the cartridge is losing oil, it must be replaced because it cannot be repaired.**

### Right hand fork leg

- Extract the dustguard and the locking ring.
- Withdraw the right hand fork leg, the lower spring washer, the rubber stop and the spring.

**This fork leg is filled only with AGIP GR MU 3 type grease.**



**Re-assembly of the fork legs is carried out in the reverse order to disassembly.**

## KAYABA FRONT FORKS

For all ATLANTIS models, hydraulic Kayaba is incorporated.

### Disassemble fork legs

- Withdraw 4 mudguard screws and remove the mudguard.
- Slacken off the wheel shaft, withdraw the washer, loosen the 2 front brake caliper screws, loosen the locking nut, withdraw the wheel shaft, the wheel spacer piece and leave the transfer box hanging loose.
- Slacken off the plate lock screw and withdraw the hand fork leg assembly.
- Do the same with the other hand fork leg.
- Now, we can substitute any front fork element, or we simply can change the hydraulic oil of it.



Front fork route .....65 mm.

Hand fork leg diameter .....26 mm.

Oil capacity for each hand fork leg .....47 cc

Oil type .....Agip FORK  
SAE 7,5 W

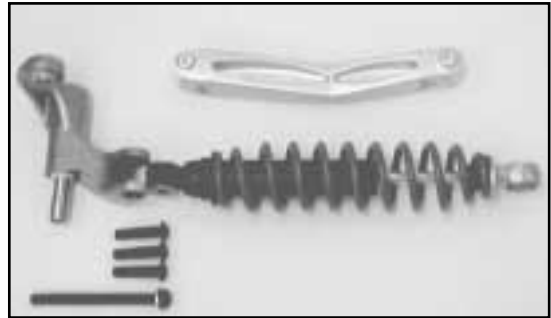
**Re-assembly of the fork legs is carried out in the reverse order to disassembly.**

## REAR SUSPENSION

### PREDATOR LC:

Progressive hydraulic shock absorber with linkage

Length of shock absorber.....300 mm  
Shock absorber travel .....80 mm  
Length of spring .....228 mm  
Spring compression .....kc = 1.8 kgf / mm  
Stud.....10 mm



### Maintenance of the shock absorber swinging arm

- The part should be kept cleaned and well-greased.
- If the swinging arm seizes up, check the bushing and the swinging arm linkage seals.
- When fitting the bushing and the swinging arm seals, they should be well-greased using lithium grease.
- The torque setting for tightening up the shock absorber swinging arm and main linkage assembly screws and nuts is **38 - 40 Nw x m**



### PREDATOR O2:

Hydraulic shock absorber

Length of shock absorber.....297 mm  
Shock absorber travel .....65 mm  
Length of spring .....237 mm  
Spring compression force to 20.5 mm.....43 kg.m.  
Spring compression force to 65 mm.....259 kg.m.  
Stud.....10 mm

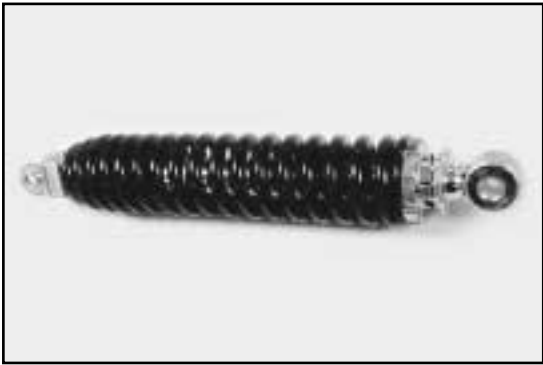


**If the shock absorber is losing hydraulic fluid, it should be replaced.**

**ATLANTIS LC:**

- Hydraulic shock absorber / with spring regulation.

Length of shock absorber.....	245 mm
Shock absorber travel .....	60 mm
Length of spring .....	191 mm
Length of spring LC.....	171 mm
Spring compression force to 30 mm.....	142 kg.m.
Spring compression force to 60 mm.....	282 kg.m.
Stud.....	10 mm



**ATLANTIS 100:**

- Hydraulic shock absorber with spring regulation  
for one or two passengers.

Length of shock absorber.....	290 mm
Shock absorber travel .....	60 mm
Length of spring .....	218 mm
Spring compression force to 30 mm.....	142 kg.m.
Spring compression force to 60 mm.....	282 kg.m.
Stud.....	10 mm

## REMOVING THE ENGINE FROM THE FRAME

### PREDATOR LC

- Remove the antifreeze liquid drain plug.
- Withdraw the engine inspection cover securing screw.
- Disconnect the thermo-contact.
- Withdraw the cylinder-head water outlet hose connector and clip.
- Disconnect the throttle cable at the connector.
- Disconnect the crankcase coolant hose and clip at the connection to the crankcase.
- Withdraw the high tension coil securing screw and coil earth.
- Disconnect the oil hose at the connector.
- Withdraw the 2 (fuel and vacuum) hoses from the fuel cock.
- Extract the 2 rear brake caliper screws and leave the caliper lying on the engine.
- Remove the engine earth cable screw.
- Disconnect the electrical connectors to the magneto, cut-off, starter and automatic choke.
- Withdraw the 2 engine frame anchorage securing screws.
- Withdraw the suspension link screw.
- Remove the engine from the frame.

### PREDATOR O<sub>2</sub> / ATLANTIS O<sub>2</sub> ATLANTIS LC / ATLANTIS 100

- Remove the throttle cable from the connector.
- Withdraw the screw and the low seat body (Atlantis).
- Withdraw the screw and the engine record cover (Predator).
- Withdraw the high tension coil securing screw and coil earth.
- Disconnect the oil hose at the connector.
- Withdraw the 2 (fuel and vacuum) hoses from the fuel cock.
- Withdraw the rear brake cable guide screw.
- Withdraw the rear brake nut.
- Remove the engine earth cable screw.
- Remove the carburettor access cover and withdraw the manual choke cable.
- Disconnect the electrical connectors to the magneto, cut-off, and starter.
- Withdraw the 2 engine frame anchorage securing screws.
- Withdraw the lower rear shock absorber screw.
- Remove the engine from the frame.
- Remove the antifreeze liquid drain plug (Atlantis LC).
- Disconnect the thermo-contact (Atlantis LC).
- Withdraw the cylinder-head water outlet hose connector and clip (Atlantis LC).
- Withdraw the coolant hose at the connection to the radiator (Atlantis LC).

## MAGNETO

### CHECKING THE IGNITION

#### Inspecting the magneto

- Pull out the connector block which is located at the rear left hand side of the frame.

- Disconnect the magneto cables.



The red/black high tension coil feeder cable and the 2-way connector with red/white and white/yellow cables.

- Check the resistance readings as per the following table:

#### KOKUSAN DENKI

	Black / red	White / red	White / yellow
Earth	224 $\Omega$ $\pm 20\%$	0.70 $\Omega$ $\pm 20\%$	0.55 $\Omega$ $\pm 20\%$

#### LEONELLI

	Green	Red / White	White / yellow
Earth	540 $\Omega$ $\pm 15\%$	1,8 $\Omega$ $\pm 15\%$	2 $\Omega$ $\pm 15\%$

#### IDM

	Black / red	White / red	White / yellow
Earth	298 $\Omega$ $\pm 20\%$	1.7 $\Omega$ $\pm 20\%$	1.5 $\Omega$ $\pm 20\%$

- The readings for this table should be taken between 20° and 30°C. If the values prescribed in the tables are not met, check the wiring before replacing the magneto.

#### High Tension Coil

- The resistance of the secondary winding of the high tension coil should read from 5 to 6 K $\Omega$ .

#### Spark plug cap

- The resistance between the terminals for the spark plug cap should read from 4 to 5 K $\Omega$ .



## CYLINDER HEAD, CYLINDER AND PISTON

### PISTON RINGS

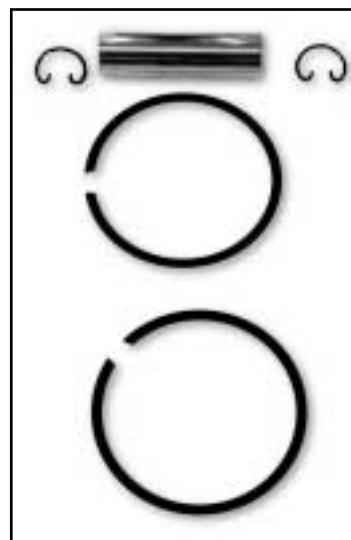
#### Checking:

- Fit the rings into the cylinder.
- Using feeler gauges, measure the play at the ends of the rings.

**The maximum value should be 0.5 mm**

#### Fitting the piston rings onto the piston

- Fit the expansion ring.
- Then fit the lower ring - "this has a rectangular section", and finally the upper piston ring - "this has a trapezoidal section".



Atlantis 100 with  
semitrapezoidal rings  
**and without  
expander ring.**

### PISTON

#### Checking:

- Measure the outside diameter of the piston at a point situated 15 mm from the base of the piston.
- Calculate the play between the cylinder and the piston.
- The service limit is **0.06 mm**
- When replacing the piston with a new one, take care to use one with the same family identification letter. This letter may be found marked on the upper surfaces of the piston and of the cylinder.

**C = FAMILY**

**09 = MONTH WHEN MANUFACTURED**

**98 = YEAR WHEN MANUFACTURED**

**3 = OPERATIVE**



### Table of Cylinder and Piston tolerances

#### PREDATOR - ATLANTIS LC – O2 – CAT – WVTA

FAMILY	PISTON ASSO SP348	CYLINDER	PLAY
A	40,95 $\begin{smallmatrix} +0,004 \\ -0 \end{smallmatrix}$	40,975 $\begin{smallmatrix} +0,005 \\ -0 \end{smallmatrix}$	From
B	40,955 $\begin{smallmatrix} +0,004 \\ -0 \end{smallmatrix}$	40,980 $\begin{smallmatrix} +0,005 \\ -0 \end{smallmatrix}$	0,021
C	40,960 $\begin{smallmatrix} +0,004 \\ -0 \end{smallmatrix}$	40,985 $\begin{smallmatrix} +0,005 \\ -0 \end{smallmatrix}$	to
D	40,965 $\begin{smallmatrix} +0,004 \\ -0 \end{smallmatrix}$	40,990 $\begin{smallmatrix} +0,005 \\ -0 \end{smallmatrix}$	0,030

#### ATLANTIS 100 O2 – WVTA

FAMILY	PISTON ASSO	CYLINDER	PLAY
A	49,966 $\pm 0,0025$	50,0075 $\pm 0,0025$	From
B	49,971 $\pm 0,0025$	50,0125 $\pm 0,0025$	0,0365
C	49,976 $\pm 0,0025$	50,0175 $\pm 0,0025$	to
D	49,981 $\pm 0,0025$	50,0225 $\pm 0,0025$	0,0455

## CYLINDER HEAD

**Compression Ratio: 11.5:1**

**Compression Ratio ATLANTIS 100: 9.5:1**

### PREDATOR LC / O2

- The gaskets should be replaced every time the cylinder head is removed.- Check that the cylinder head is gas-tight. There should be no more than **0.05 mm** gap.

**Cylinder head torque settings: 10 - 12 Nw x m.**

**Cylinder head torque settings  
ATLANTIS 100: 18 - 20 Nw x m.**

### PREDATOR LC

#### Thermostat

Starts to open at	55°	± 2 °C
Length of travel 3.5 mm	60°	± 2 °C

#### Thermoresistance

For temperature gauges with needle

Temperature ° C	Resistance ± 10 % Ω
25	788
80	98

#### Thermocontact

For models with electrical fan

Make contact at	97 ± 3 °C
Break contact at	85 ± 3 °C

#### Cooling system

Coolant antifreeze:

AGIP CLOSED SYSTEM PLUS 30%

Cooling system capacity Predator LC.....825 c.c.

Cooling system capacity Atlantis LC.....400 c.c.

Pressure in cooling system.....1.2 ± 1°

#### Spark plugs

PREDATOR O2	NGK B 8 HS / CHAMPION L 78 C
ATLANTIS	NGK B 8 HS / CHAMPION L 78 C
PREDATOR L.C.	NGK B 9 ES / CHAMPION N 2 C
ATLANTIS L.C.	NGK B 9 ES / CHAMPION N 2 C
ATLANTIS 100	NGK B 9 ES / CHAMPION N 2 C
PREDATOR L.C. (CAT)	NGK B 8 ES / CHAMPION N 3 C



## CRANKSHAFT

	PREDATOR / ATLANTIS	ATLANTIS 100
Lateral play at connecting rod big end	Maximum axial play 0.700 mm. Minimum axial play 0.330 mm.	Maximum axial play 0.630 mm. Minimum axial play 0.250 mm
Crankshaft counterweight inspection and verification	39 - 0.3 mm. - 0.4 mm.	43 - 0.2 mm. - 0.3 mm.
Inspection of radial play at bearing surfaces	0.04 mm. (both sides)	0.04 mm. (both sides)
Lateral play in crankshaft	0.84 mm. (max. Axial)	Maximum axial play 0.74 mm. Minimum axial play 0.20 mm.
Crankshaft bearings	Koyo: 83299 - 9RTCS31 NTN: 6204 px2v4 Nachi: 20BC05S16	Koyo: 83299 - 9RTCS31 NTN: 6204 px2v4 Nachi: 20BC05S16

## VARIADOR REDUCTOR

MODEL	BELT	ROLLERS	ROLLERS CAT - WVTA	CLUTCH	SHOES	SPRING	REDUCTION
PREDATOR	836 (mm)	6,15x6=37 (gr)	8,33x6= 50 (gr)	112 (mm)	543 (mm)	29,5 Kg a 41 mm.	12/43X14/48
ATLANTIS	836 (mm)	5,90X6=35,5 (gr)	7,66X6= 46 (gr)	110 (mm)	525 (mm)	30,6 Kg a 45,5 mm.	12/43X14/48
ATLANTIS 100	850 (mm)	10,66X6=64 (gr)	10,66X6= 64 (gr)	112 (mm)	543 (mm)	29,5 Kg a 43,5 mm.	12/43X15/40

### DRIVE:

#### Trapezoidal belt

The width of the belt in optimum condition should be **16.5 mm**

The limit for wear in the trapezoidal belt is either **0.5 mm or 10,000 km.**

#### Clutch shoes

The service limit of the shoes is **2 mm.**

#### Clutch hub

The service limit on the clutch hub is **112.5 mm.**

The service limit on the clutch hub is **110,5 mm. (ATLANTIS O2 / LC)**

#### Inspection of the clutch pulley:

In the event that the fixed pulley of the clutch is disassembled, it should be cleaned and greased using **lithium grease** of the following specification: **250 °C ASTM D 217**

Working temperature +160° C / -25° C using a quantity of 3 to 3.5 grams.

Torque setting - clutch nut: **65-70 Nw x m**

Torque setting - pulley shaft nut: **35-40 Nw x m (using loctite)**

Torque setting - variable speed unit nut: **35-40 Nw x m (using loctite)**

## CARBURETTORS

**Adjustment Table**

BRAND	CARBURETOR	MODELS	JET	MAIN NEEDLE	JET POSITION	IDLE EMULSIFIER	AIR SCREW	STARTER JET	FLOAT LEVEL
WEBER	14 OM 1BA	PREDATOR LC (E)	66	AB – 3 <sup>a</sup>	38/35	G8	2 Turns	55	16,5 ± 1
WEBER	14 OM 1FA	PREDATOR O <sub>2</sub> (E)	66	AB – 3 <sup>a</sup>	38/35	G8	2 Turns	55	16,5 ± 1
WEBER	12 OM 1QA	PREDATOR LC (I)	66	G – 2 <sup>aa</sup>	35/35	G8	2 Turns	55	16,5 ± 1
WEBER	12 OM 1SA	PREDATOR O <sub>2</sub> (I)	66	G – 2 <sup>aa</sup>	35/35	G8	2 Turns	55	16,5 ± 1
DELL ' ORTO	PHVA 14 DD	PREDATOR LC (E)	57	A 11 – 3 <sup>o</sup>	34	210 GA	1 3/4 Turns	45	14,3 ± 0,5
DELL ' ORTO	PHVA 14 DD	PREDATOR O <sub>2</sub> (E)	57	A 11 – 3 <sup>o</sup>	34	210 GA	1 3/4 Turns	45	14,3 ± 0,5
DELL ' ORTO	PHVA 12 DD	PREDATOR LC (I)	57	A 11 – 3 <sup>o</sup>	34	212 GA	1 3/4 Turns	45	14,3 ± 0,5
DELL ' ORTO	PHVA 12 DD	PREDATOR O <sub>2</sub> (I)	57	A 11 – 3 <sup>o</sup>	34	212 GA	1 3/4 Turns	45	14,3 ± 0,5
DELL ' ORTO	PHVA 12 DD	PREDATOR LC (I) CAT	49	A 11 – 3 <sup>o</sup>	32	212 GA	1 3/4 Turns	45	14,3 ± 0,5
DELL ' ORTO	PHVA 12 DD	PREDATOR O <sub>2</sub> (I) CAT	49	A 11 – 3 <sup>o</sup>	32	212 GA	1 3/4 Turns	50	14,3 ± 0,5
DELL ' ORTO	PHVA 14 DD	PREDATOR LC (A)	50	A 11 – 4 <sup>o</sup>	34	211 GA	2 Turns	45	14,3 ± 0,5
DELL ' ORTO	PHVA 14 DD	PREDATOR O <sub>2</sub> (A)	50	A 11 – 4 <sup>o</sup>	34	211 GA	2 Turns	45	14,3 ± 0,5
DELL ' ORTO	PHVA 14 DD	PREDATOR LC WVTa	50	A 14 – 4 <sup>o</sup>	34	211 GA	2 Turns	45	14,3 ± 0,5
DELL ' ORTO	PHVA 14 DD	PREDATOR O <sub>2</sub> WVTa	50	A 14 – 4 <sup>o</sup>	34	211 GA	2 Turns	45	14,3 ± 0,5
WEBER	12 OM 1SA	ATLANTIS (I)	66	G – 2 <sup>aa</sup>	35/35	G8	2 Turns	55	16,5 ± 1
DELL ' ORTO	PHVA 14 DD	ATLANTIS (E)	57	A 11 – 3 <sup>o</sup>	34	210 GA	1 3/4 Turns	50	14,3 ± 0,5
DELL ' ORTO	PHVA 14 DD	ATLANTIS (F)	57	A 11 – 3 <sup>o</sup>	34	210 GA	1 3/4 Turns	50	14,3 ± 0,5
DELL ' ORTO	PHVA 14 DD	ATLANTIS WVTa	50	A 14 – 4 <sup>o</sup>	34	211 GA	2 Turns	45	14,3 ± 0,5
DELL ' ORTO	PHVA 14 DD	ATLANTIS LC (E)	57	A 11 – 3 <sup>o</sup>	34	210 GA	1 3/4 Turns	50	14,3 ± 0,5
DELL ' ORTO	PHVA 14 DD	ATLANTIS LC (I) CAT	50	A 14 – 4 <sup>o</sup>	34	211 GA	2 Turns	45	14,3 ± 0,5
DELL ' ORTO	PHVA 14 DD	ATLANTIS LC (F)	57	A 11 – 3 <sup>o</sup>	34	210 GA	1 3/4 Turns	50	14,3 ± 0,5
DELL ' ORTO	PHVA 14 DD	ATLANTIS LC WVTa	50	A 14 – 4 <sup>o</sup>	34	211 GA	2 Turns	45	14,3 ± 0,5
DELL ' ORTO	PHVA 17,5 DD	ATLANTIS 100 WVTa	69	A 21 – 3 <sup>o</sup>	36	210 GA	2 Turns	50	14,3 ± 0,5
DELL ' ORTO	PHVA 14 DD	ATLANTIS 30 Km H.	50	A 14 – 4 <sup>o</sup>	34	211 GA	2 Turns	45	14,3 ± 0,5

- In PREDATOR LC models there is an automatic choke.
- In PREDATOR O<sub>2</sub>, ATLANTIS and ATLANTIS LC models the choke is manually operated.
- Maintenance and cleaning of the carburettor are extremely important for the correct performance of the scooter.
- Cleaning and maintenance of the filter box are also vital to keep fuel consumption within normal limits.
- Inspection of the float needle: inspect the float needle for wear: a worn needle may cause damage to the engine.



## ELECTRICAL SYSTEM

### GENERAL CHARACTERISTICS

Component	Standard values
<b>Battery:</b> Type Special electrolyte. Maintenance free	12V 4 Ah Specific gravity 1,32 at 20° C.
<b>Battery charging system:</b> Type Voltage under load Coil resistance	Alternator and regulator 13,5 ± 0,5 V at 4.000 r.p.m. with lights on 1,1 ± 0,2 Ω at 20° C.
<b>Lighting system:</b> Type Regulation voltage Coil resistance	Alternator and regulator 13,5 ± 0,5 V at 4.000 r.p.m. with lights on 0,9 ± 0,2 Ω at 20° C.
<b>Ignition system:</b> Type <b>Magneto:</b> Resistance of stator between Black/Red cables and earth <b>High Tension Coil:</b> Resistance of secondary winding Resistance of anti-interference cap	Electronic  224 Ω ± 20% a 20° C.  5 ± 1 KΩ 4 ± 1 KΩ
<b>Switches and Sensors:</b> Brake light switches Fuel sensor Oil sensor Temperature thermo-resistance Cooling fan thermo-contact	Light operates after 12 mm. travel at brake levers Full: ∞ Ω / Reserve: 33 Ω Full: ∞ Ω / Reserve: 0 Ω 25 °C 788 Ω ± 10% 80 °C 98 Ω ± 10% OFF-ON 97 ± 3 °C ON-OFF 85 ± 3 °C

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## CHECKING THE ELECTRICAL SYSTEM IN THE SCOOTER

### BATTERY

- When the battery is used for the first time, it is necessary to fill with the acid which comes together with the battery.
- First remove the sealing strip.
- Next place the container of electrolyte upside down with the six sealed parts aligned with the six filler holes on the battery. Push the container firmly down to break the seals.
- Check that all the electrolyte has gone into the battery.

#### Sealing up the battery:

- Push the sealing strip firmly into each of the filler holes.
- Never remove the sealing strip, and never add water to the electrolyte.
- The battery is a 12V 4 Ah type. When installing the battery it is important not to reverse the polarity of the terminals, since this could cause damage to some sensitive electronic components.

#### Using the battery for the first time:

- **This battery is a sealed type and the cell covers should never be removed, and water must never be added.**
- After 30 minutes test the voltage at the terminals.

<b>Standard voltage 12.5 volts minimum</b>
--

Under normal circumstances it is not necessary to charge the battery. Once charged it is normally at 75% capacity.

#### Special conditions under which the battery should be charged:

- When the temperature falls below 0 °C.
- After a long period in storage.
- When the original seal has been broken.
- In general the battery should be charged whenever the voltage after charging remains below the standard reading of 12.5 V.

## CHARGING SYSTEM:

- It is necessary to use a charger with constant voltage and current.

**Standard charge: 0.3 Ah for 10 hours if the voltage is below 12.5 volts.**

- Carry out battery charging in accordance with the accompanying table.

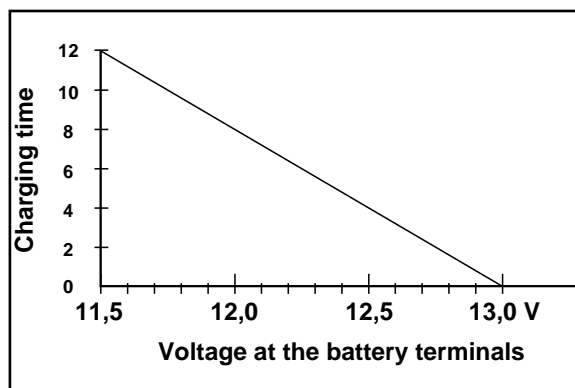
### Standard values for determining the condition of the battery

Voltage is 12.5 or higher	Correct
Voltage between 12.0 - 12.4	Insufficient charge (recharge battery)
Voltage at 11.9 or less	Unserviceable (replace battery)

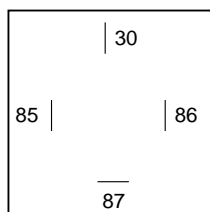
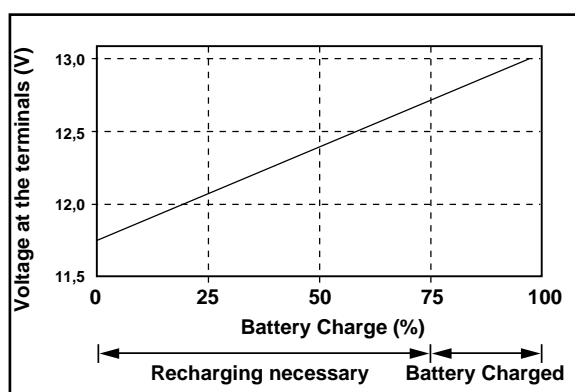
## STARTER RELAY

- Check the resistance between each of the terminals.
- Resistance between 85 and 86 =  $55 \Omega \pm 15\%$ .
- In order to measure continuity between the contacts, connect poles 85 and 86 to the battery and pole 30 and 87 to the tester: the result of this test should be a reading of 0 ohms (closed circuit). When poles 85 and 86 are disconnected from the battery, the tester should read infinity, or open circuit.
- If there is any variation from these readings, the relay should be replaced.

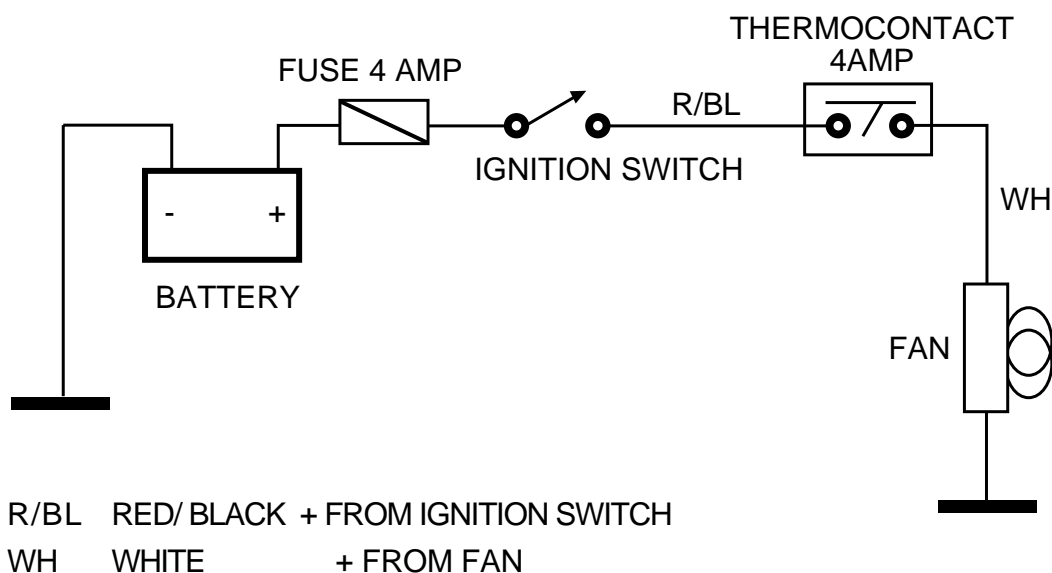
## Standard battery charging times



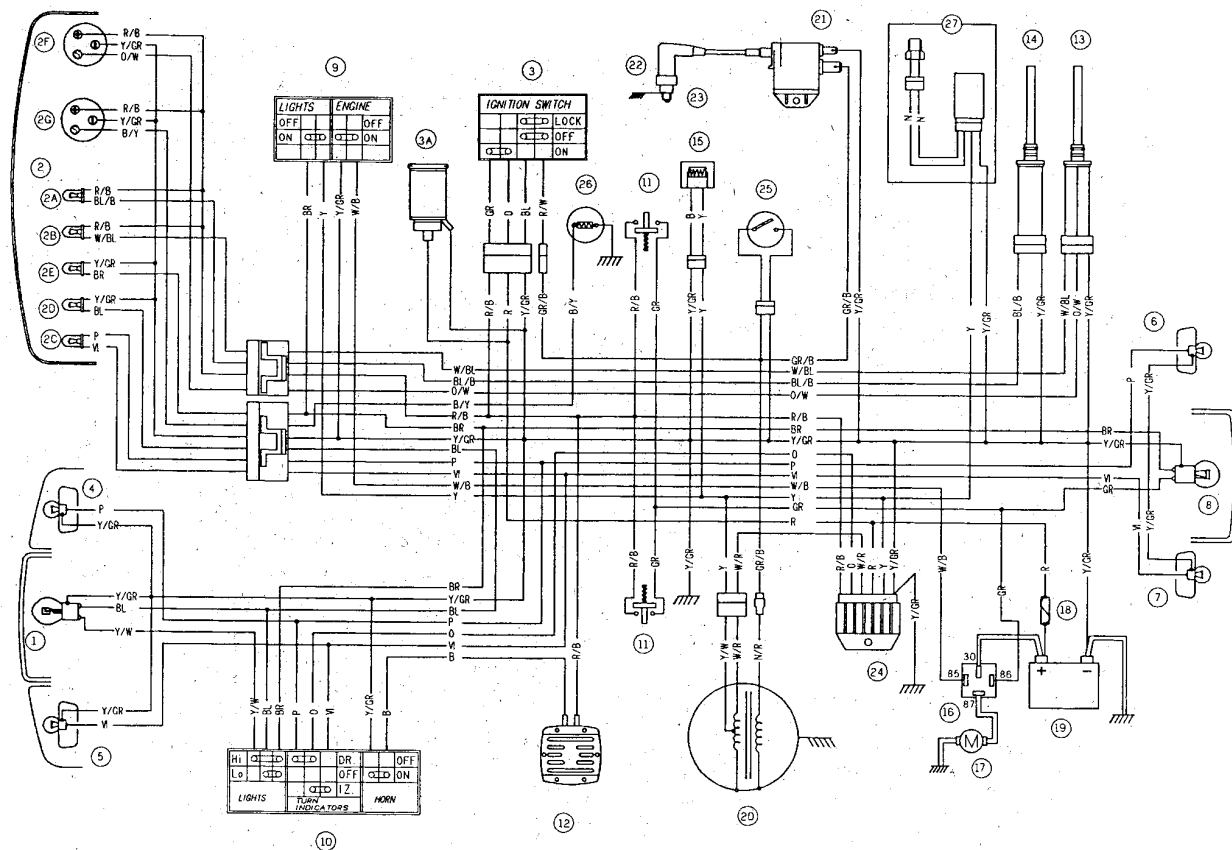
## Control diagram to determine battery state



## WIRING DIAGRAM AND CONTROL OF THE FAN CIRCUIT



# ECHEMA ELECTRIQUE PREDATOR

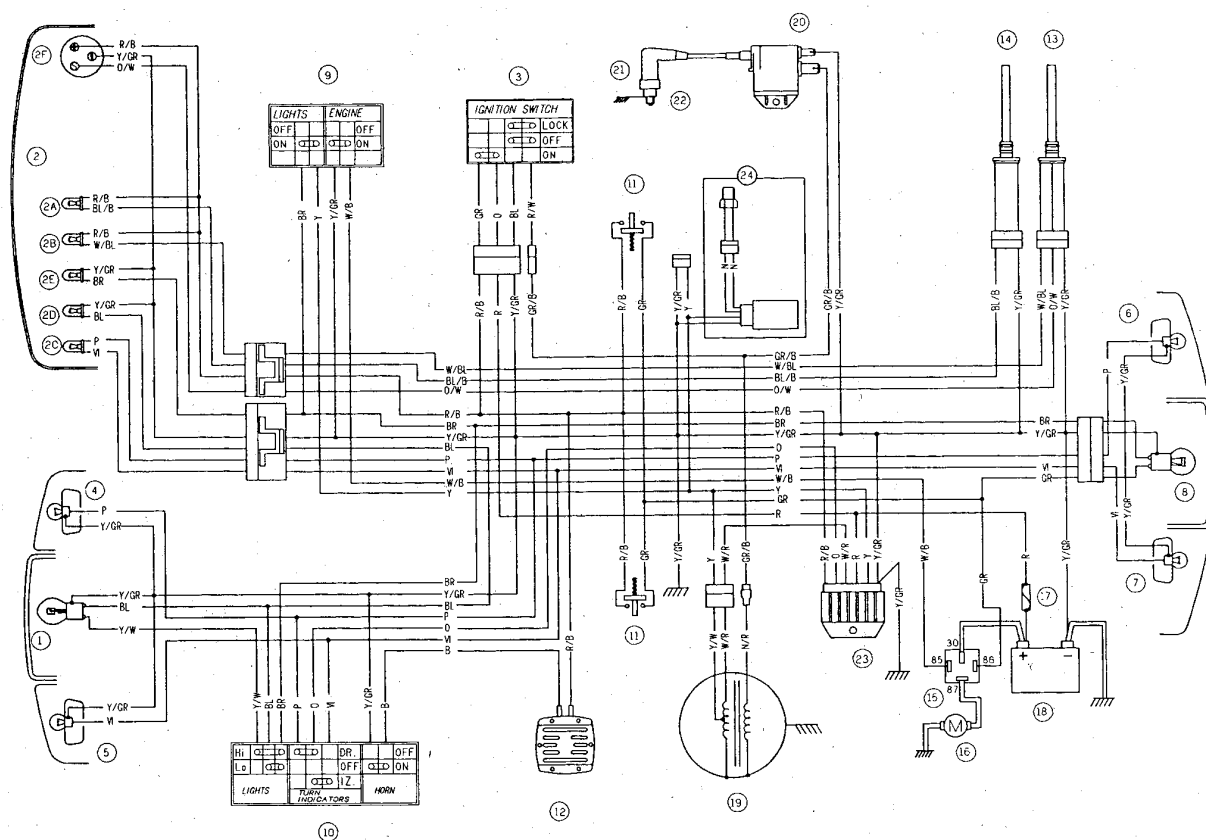


- |   |  |
|---|--|
| 1 Headlight 12V 35/35 W                 | 11 Brake Light Switch                      |
| 2 Dashboard                             | 12 Horn 12V DC                             |
| 2A Oil Indicator Light 12V 2W           | 13 Fuel Sensor                             |
| 2B Fuel Indicator Light 12V 2W          | 14 Oil Sensor                              |
| 2C Turn Signal Indicator Light 12V 2W   | 15 Electric Choke                          |
| 2D High Beam Indicator Light 12V 1.2W   | 16 Starter Relay                           |
| 2E Dashboard Light 12V 1.2W             | 17 Starter Motor                           |
| 2F Fuel Level Gauge                     | 18 Fuse 4A                                 |
| 2G Water Temperature Gauge              | 19 Battery 12V 4A                          |
| 3 Ignition Switch                       | 20 Flywheel Magneto 12V 70W                |
| 3A Mobil phone connector                | 21 Electronic Converter A.T.               |
| 4 Front Right Turn Signal Light 12V 10W | 22 Spark Plug Cap Anti-Radio Interferences |
| 5 Front Left Turn Signal Light 12V 10W  | 23 Spark Plug                              |
| 6 Rear Right Turn Signal Light 12V 10W  | 24 Regulator AC-DC/Turn Signal System      |
| 7 Rear Left Turn Signal Light 12V 10W   | 25 Stand switch                            |
| 8 Tail/Brake Light 12V 21W / 5W         | 26 Temperature thermoresistance            |
| 9 Headlight / Engine Stop Switch        | 27 Carburetor Heater KIT ( OPTIONAL )      |
| 10 Dimmer / Turn Signal / Horn Switch   |  |

D	F	UK	I	E	
Orange	Orange	Orange	Arancio	Naranja	O
Grün	Vert	Green	Verde	Verde	GR
Schwarz	Noir	Black	Nero	Negro	B
Braun	Marron	Brown	Marrone	Marron	BR
WeiB	Blanc	White	Bianco	Blanco	W
Grau	Gris	Gray	Grigio	Gris	G
Gelb	Jaune	Yellow	Giallo	Amarillo	Y
Blau	Blau	Blue	Azzurro	Azul	BL
Rot	Rouge	Red	Rosso	Rojo	R
Rosa	Rosa	Pink	Rosa	Rosa	P
Violett	Violet	Violet	Viola	Violeta	VI



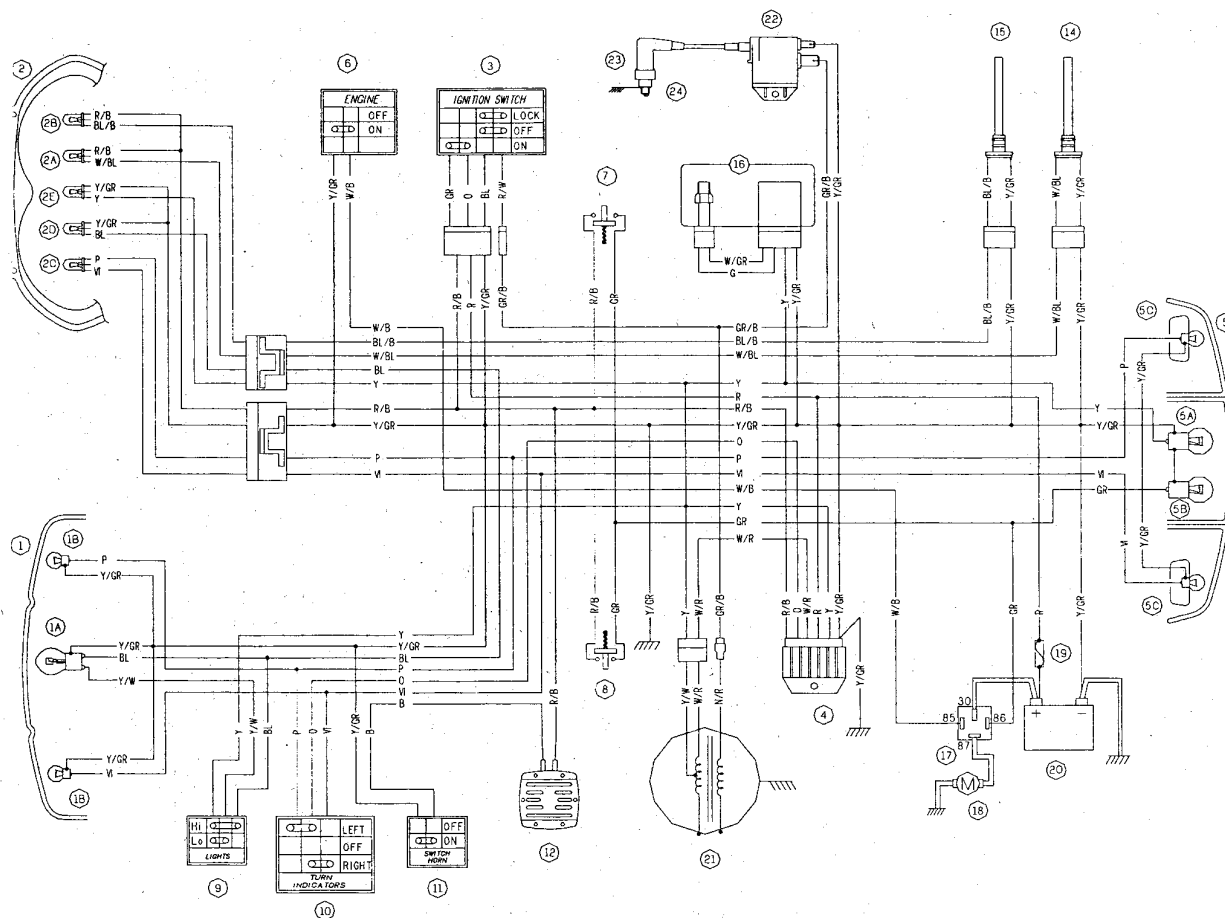
## ECHEMA ELECTRIQUE PREDATOR O2



- |   |  |
|---|--|
| 1 Headlight 12V 35/35 W                 | 11 Brake Light Switch                      |
| 2 Dashboard                             | 12 Horn 12V DC                             |
| 2A Oil Indicator Light 12V 2W           | 13 Fuel Sensor                             |
| 2B Fuel Indicator Light 12V 2W          | 14 Oil Sensor                              |
| 2C Turn Signal Indicator Light 12V 2W   | 15 Starter Relay                           |
| 2D High Beam Indicator Light 12V 1.2W   | 16 Starter Motor                           |
| 2E Dashboard Light 12V 1.2W             | 17 Fuse 4A                                 |
| 2F Fuel Level Gauge                     | 18 Battery 12V 4A                          |
| 3 Ignition Switch                       | 19 Flywheel Magneto 12V 70W                |
| 4 Front Right Turn Signal Light 12V 10W | 20 Electronic Converter A.T.               |
| 5 Front Left Turn Signal Light 12V 10W  | 21 Spark Plug Cap Anti-Radio Interferences |
| 6 Rear Right Turn Signal Light 12V 10W  | 22 Spark Plug                              |
| 7 Rear Left Turn Signal Light 12V 10W   | 23 Regulator AC-DC/Turn Signal System      |
| 8 Tail/Brake Light 12V 21W / 5W         | 24 Carburetor Heater KIT ( OPTIONAL )      |
| 9 Headlight / Engine Stop Switch        |  |
| 10 Dimmer / Turn Signal / Horn Switch   |  |

D	F	UK	I	E	
Orange	Orange	Orange	Arancio	Naranja	O
Grün	Vert	Green	Verde	Verde	GR
Schwarz	Noir	Black	Nero	Negro	B
Braun	Marron	Brown	Marrone	Marron	BR
WeiB	Blanc	White	Bianco	Blanco	W
Grau	Gris	Gray	Grigio	Gris	G
Gelb	Jaune	Yellow	Giallo	Amarillo	Y
Blau	Blau	Blue	Azzurro	Azul	BL
Rot	Rouge	Red	Rosso	Rojo	R
Rosa	Rosa	Pink	Rosa	Rosa	P
Violett	Violet	Violet	Viola	Violeta	VI

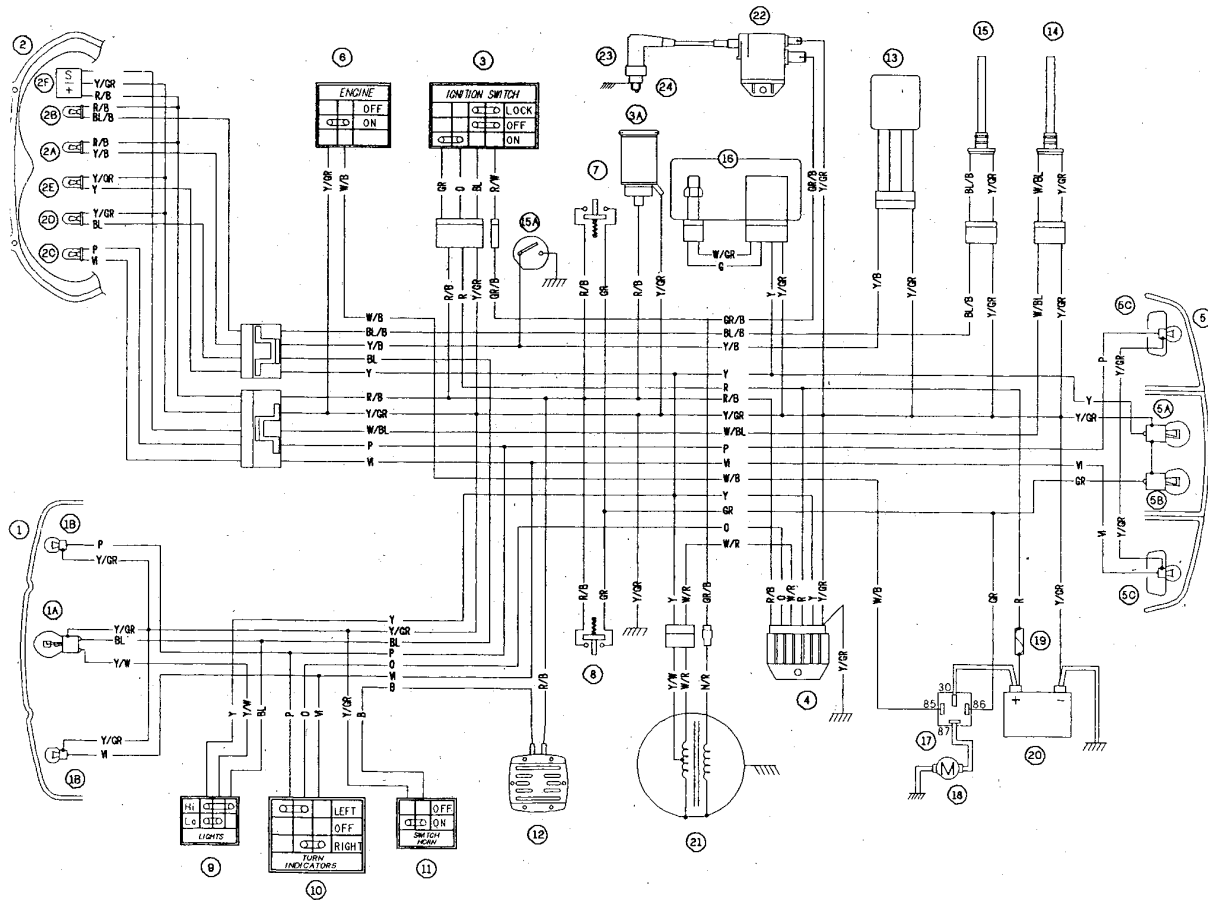
# ECHEMA ELECTRIQUE ATLANTIS



- 1 HEADLIGHT ASSEMBLY  
1A BULB 12V 25/25W  
1B INDICATOR BULB 12V 10W
- 2 DASHBOARD  
2A OIL RESERVE CONTROL PILOT LIGHT 12V 2W  
2B FUEL RESERVE CONTROL PILOT LIGHT 12V 2W  
2C TURN INDICATOR CONTROL PILOT LIGHT 12V 2W  
2D HIGH BEAM CONTROL PILOT LIGHT 12V 1.2W  
2E DASHBOARD LIGHT 12V 1.2W
- 3 IGNITION SWITCH
- 4 TURN INDICATOR CENTRAL CONTROL 12V 10/10W + REGULATOR 12V 80W
- 5 TAIL LIGHT ASSEMBLY  
5A BRAKE BULB 12V 10W  
5B TAIL BULB 12V 5W  
5C INDICATOR BULB 12V 10W
- 6 ENGINE SWITCH
- 7 BRAKE LIGHT SWITCH
- 8 BRAKE LIGHT SWITCH
- 9 LIGHTS SWITCH
- 10 TURN INDICATORS SWITCH
- 11 HORN SWITCH
- 12 HORN
- 13 ---
- 14 FUEL LEVEL SENSOR
- 15 OIL LEVEL SENSOR
- 16 CARBURATOR HEATER KIT (OPTIONAL)
- 17 STARTER RELAY
- 18 STARTER MOTOR
- 19 FUSE 4A
- 20 BATTERY 12V 4AH
- 21 FLYWHEEL MAGNETO 12V 80W
- 22 ELECTRONIC CONVERTER A.T.
- 23 SPARK PLUG CAP ANTI-RADIO INTERFERENCES
- 24 SPARK PLUG

D	F	UK	I	E	
Orange	Orange	Orange	Arancio	Naranja	O
Grün	Vert	Green	Verde	Verde	GR
Schwarz	Noir	Black	Nero	Negro	B
Braun	Marron	Brown	Marrone	Marron	BR
WeiB	Blanc	White	Bianco	Blanco	W
Grau	Gris	Gray	Grigio	Gris	G
Gelb	Jaune	Yellow	Giallo	Amarillo	Y
Blau	Blau	Blue	Azzurro	Azul	BL
Rot	Rouge	Red	Rosso	Rojo	R
Rosa	Rosa	Pink	Rosa	Rosa	P
Violett	Violet	Violet	Viola	Violeta	VI

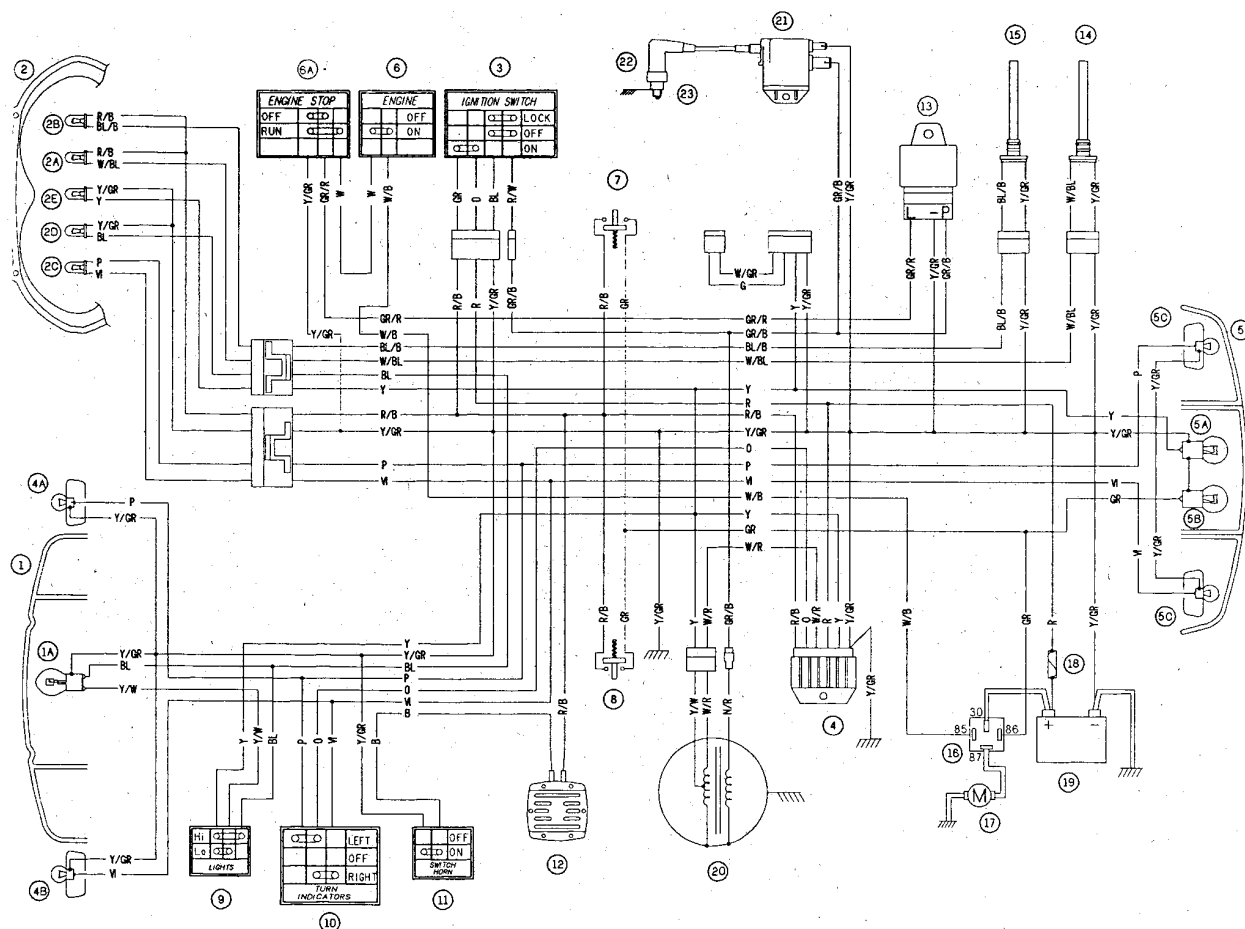
# ECHEMA ELECTRIQUE ATLANTIS LC



- |   |  |
|---|--|
| 1 HEADLIGHT ASSEMBLY  | 8 BRAKE LIGHT SWITCH                       |
| 1A BULB 12V 25/25W  | 9 LIGHTS SWITCH                            |
| 1B INDICATOR BULB 12V 10W                                       | 10 TURN INDICATORS SWITCH                  |
| 2 DASHBOARD   | 11 HORN SWITCH                             |
| 2A WATER TEMPERATURE CONTROL PILOT LIGHT 12V 2W                 | 12 HORN                                    |
| 2B OIL RESERVE CONTROL PILOT LIGHT 12V 2W                       | 13 CHECK CONTROL                           |
| 2C TURN INDICATOR CONTROL PILOT LIGHT 12V 2W                    | 14 FUEL LEVEL SENSOR                       |
| 2D HIGH BEAM CONTROL PILOT LIGHT 12V 1.2W                       | 15 OIL LEVEL SENSOR                        |
| 2E DASHBOARD LIGHT 12V 1.2W                                     | 15A WATER TEMPERATURE THERMOSTAT           |
| 2F FUEL-LEVEL GAUGE   | 16 CARBURATOR HEATER KIT (OPTIONAL)        |
| 3 IGNITION SWITCH   | 17 STARTER RELAY                           |
| 3A MOVIOL PHONE CONNECTOR                                       | 18 STARTER MOTOR                           |
| 4 TURN INDICATOR CENTRAL CONTROL 12V 10/10W + REGULATOR 12V 80W | 19 FUSE 4A                                 |
| 5 TAIL LIGHT ASSEMBLY   | 20 BATTERY 12V 4AH                         |
| 5A BRAKE BULB 12V 10W   | 21 FLYWHEEL MAGNETO 12V 80W                |
| 5B TAIL BULB 12V 5W   | 22 ELECTRONIC CONVERTER A.T.               |
| 5C INDICATOR BULB 12V 10W                                       | 23 SPARK PLUG CAP ANTI-RADIO INTERFERENCES |
| 6 ENGINE SWITCH   | 24 SPARK PLUG                              |
| 7 BRAKE LIGHT SWITCH  |  |

D	F	UK	I	E	
Orange	Orange	Orange	Arancio	Naranja	O
Grün	Vert	Green	Verde	Verde	GR
Schwarz	Noir	Black	Nero	Negro	B
Braun	Marron	Brown	Marrone	Marron	BR
Weiß	Blanc	White	Bianco	Blanco	W
Grau	Gris	Gray	Grigio	Gris	G
Gelb	Jaune	Yellow	Giallo	Amarillo	Y
Blau	Blau	Blue	Azzurro	Azul	BL
Rot	Rouge	Red	Rosso	Rojo	R
Rosa	Rosa	Pink	Rosa	Rosa	P
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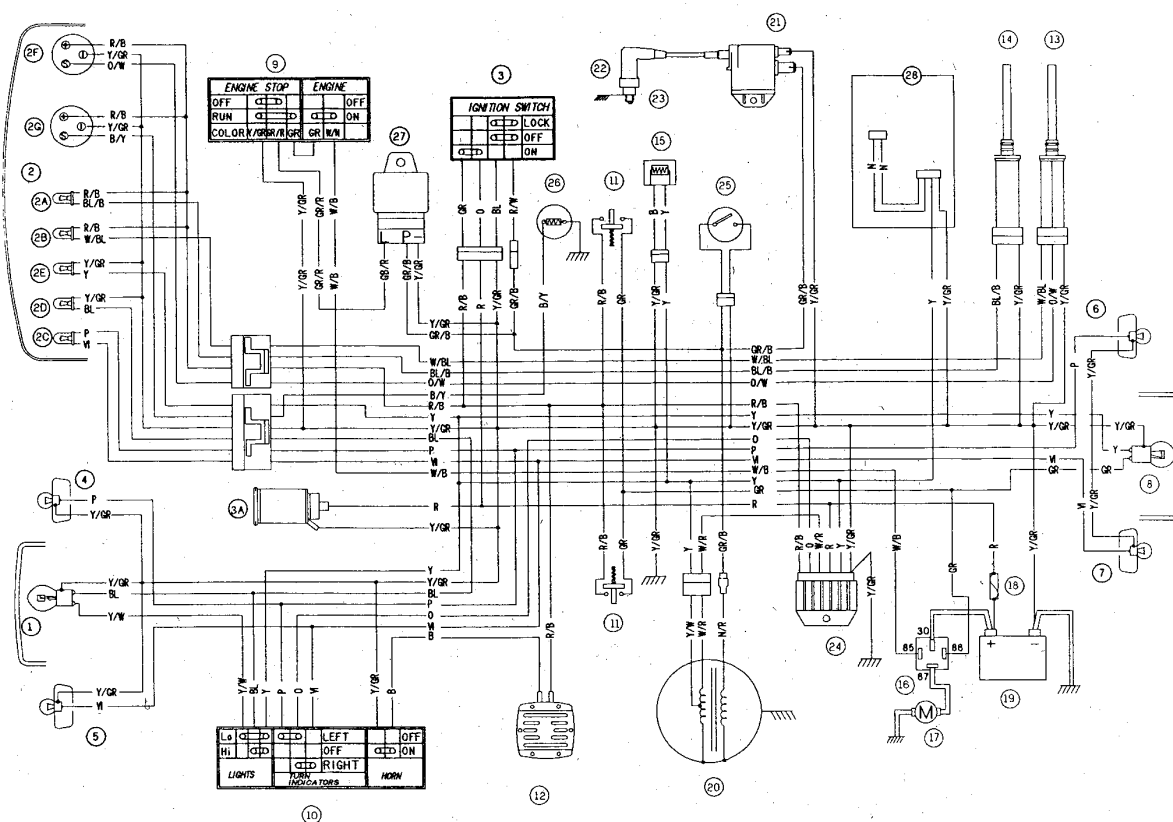
# ECHEMA ELECTRIQUE ATLANTIS (USA)



- |  |  |
|--|--|
| 1 HEADLIGHT ASSEMBLY<br>1A BULB 12V 35/35W   | 6A ENGINE STOP                             |
| 2 DASHBOARD<br>2A FUEL RESERVE CONTROL PILOT LIGHT 12V 2W<br>2B OIL RESERVE CONTROL PILOT LIGHT 12V 2W<br>2C TURN INDICATOR CONTROL PILOT LIGHT 12V 2W<br>2D HIGH BEAM CONTROL PILOT LIGHT 12V 1.2W<br>2E DASHBOARD LIGHT 12V 1.2W | 7 BRAKE LIGHT SWITCH                       |
| 3 IGNITION SWITCH  | 8 BRAKE LIGHT SWITCH                       |
| 4 TURN INDICATOR CENTRAL CONTROL 12V 10/10W + REGULATOR 12V 80W  | 9 LIGHTS SWITCH                            |
| 4A FRONT RIGHT TURN SIGNAL LIGHT 12V 10W   | 10 TURN INDICATORS SWITCH                  |
| 4B FRONT LEFT TURN SIGNAL LIGHT 12V 10W  | 11 HORN SWITCH                             |
| 5 TAIL LIGHT ASSEMBLY<br>5A TAIL BULB 12V 5W<br>5B BRAKE BULB 12V 10W<br>5C INDICATOR BULB 12V 10W   | 12 HORN                                    |
| 6 ENGINE SWITCH  | 13 ENGINE STOP RELAY                       |
|  | 14 FUEL LEVEL SENSOR                       |
|  | 15 OIL LEVEL SENSOR                        |
|  | 16 STARTER RELAY                           |
|  | 17 STARTER MOTOR                           |
|  | 18 FUSE 4A                                 |
|  | 19 BATTERY 12V 4AH                         |
|  | 20 FLYWHEEL MAGNETO 12V 80W                |
|  | 21 ELECTRONIC CONVERTER A.T.               |
|  | 22 SPARK PLUG CAP ANTI-RADIO INTERFERENCES |
|  | 23 SPARK PLUG                              |

D	F	UK	I	E	
Orange	Orange	Orange	Arancio	Naranja	O
Grün	Vert	Green	Verde	Verde	GR
Schwarz	Noir	Black	Nero	Negro	B
Braun	Marron	Brown	Marrone	Marron	BR
WeiB	Blanc	White	Bianco	Blanco	W
Grau	Gris	Gray	Grigio	Gris	G
Gelb	Jaune	Yellow	Giallo	Amarillo	Y
Blau	Blau	Blue	Azzurro	Azul	BL
Rot	Rouge	Red	Rosso	Rojo	R
Rosa	Rosa	Pink	Rosa	Rosa	P
Violett	Violet	Violet	Viola	Violeta	VI

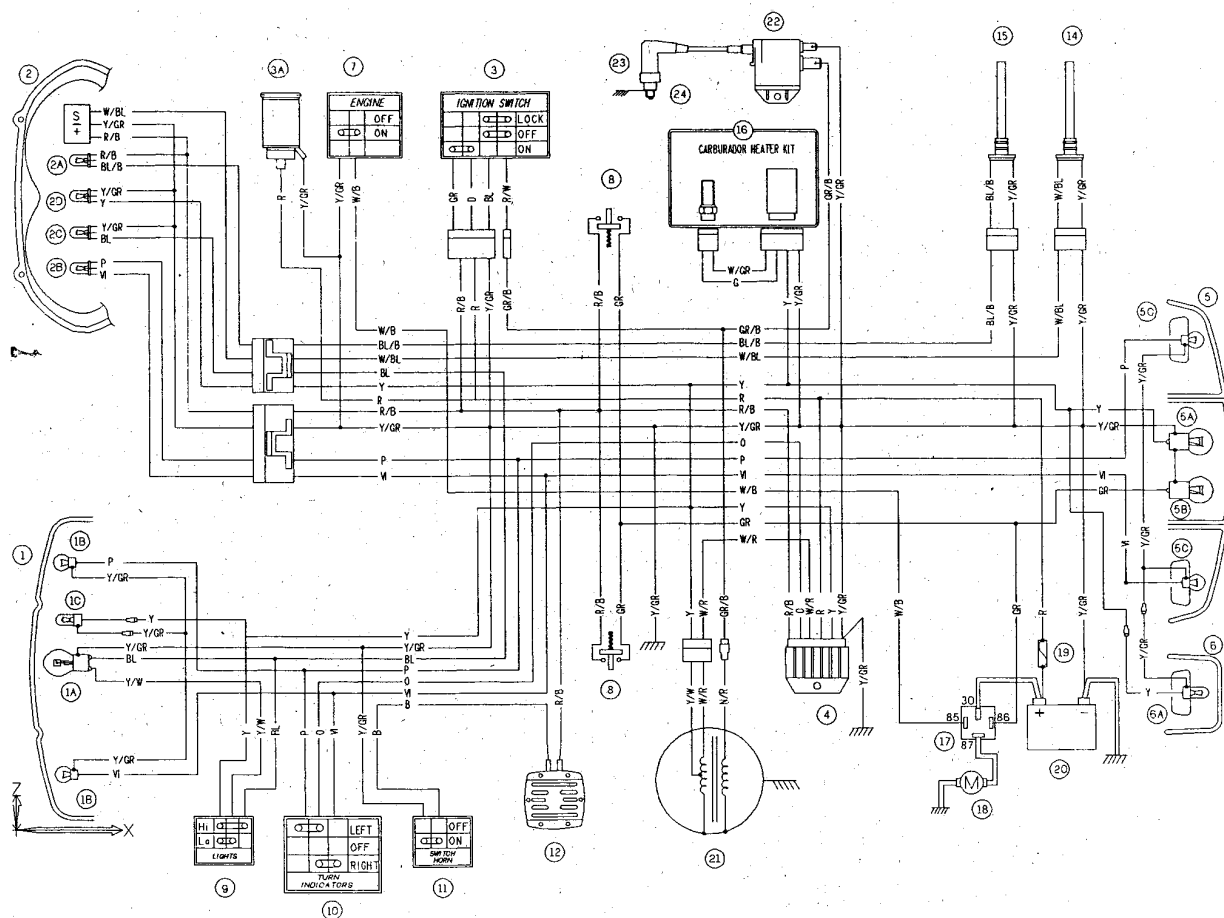
# ECHEMA ELECTRIQUE PREDATOR (USA)



- |  |  |
|--|--|
| 1 Headlight 12V 35/35 W                | 11 Brake Light Switch                            |
| 2 Dashboard                            | 12 Horn 12V DC                                   |
| 2A Oil Indicator Light 12V 2W          | 13 Fuel Sensor                                   |
| 2B Fuel Indicator Light 12V 2W         | 14 Oil Sensor                                    |
| 2D High Beam Indicator Light 12V 1.2W  | 15 Electric Choke                                |
| 2E Dashboard Light 12V 1.2W            | 16 Starter Relay                                 |
| 2F Fuel Level Gauge                    | 17 Starter Motor                                 |
| 2G Water Temperature Gauge             | 18 Fuse 4A                                       |
| 3 Ignition Switch                      | 19 Battery 12V 4A                                |
| 3A Mobil phone connector               | 20 Flywheel Magneto 12V 70W                      |
| 4 Front Right Turn Signal Ligh 12V 10W | 21 Electronic Converter A.T.                     |
| 5 Front Left Turn Signal Ligh 12V 10W  | 22 Spark Plug Cap Anti-Radio Interferences       |
| 6 Rear Right Turn Signal Ligh 12V 10W  | 23 Spark Plug                                    |
| 7 Rear Left Turn Signal Ligh 12V 10W   | 24 Regulator AC-DC + Turn signal central control |
| 8 Tail/Brake Light 12V 21W / 5W        | 25 Stand switch                                  |
| 9 Engine Stop /Engine Switch           | 26 Temperature thermoresistance                  |
| 10 Lights/Horn/Turn Indicators/Switch  | 27 Engine Stop Relay                             |
|  | 28 Carburetor Heater KIT (OPTIONAL)              |

D	F	UK	I	E	
Orange	Orange	Orange	Arancio	Naranja	O
Grün	Vert	Green	Verde	Verde	GR
Schwarz	Noir	Black	Nero	Negro	B
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Gelb	Jaune	Yellow	Giallo	Amarillo	Y
Blau	Blau	Blue	Azzurro	Azul	BL
Rot	Rouge	Red	Rosso	Rojo	R
Rosa	Rosa	Pink	Rosa	Rosa	P
Violett	Violet	Violet	Viola	Violeta	VI

# ECHEMA ELECTRIQUE ATLANTIS 100



- 1 HEADLIGHT ASSEMBLY
  - 1A BULB 12V 25/25W
  - 1B INDICATOR BULB 12V 10W
  - 1C POSITION BULB 12V 5W
- 2 DASHBOARD
  - 2A OIL RESERVE CONTROL PILOT LIGHT 12V 2W
  - 2B FUEL RESERVE CONTROL PILOT LIGHT 12V 2W
  - 2C TURN INDICATOR CONTROL PILOT LIGHT 12V 2W
  - 2D HIGH BEAM CONTROL PILOT LIGHT 12V 1.2W
  - 2E DASHBOARD LIGHT 12V 1.2W
- 3 IGNITION SWITCH
- 4 TURN INDICATOR CENTRAL CONTROL 12V 10/10W + REGULATOR 12V 80W
- 5 TAIL LIGHT ASSEMBLY
  - 5A BRAKE BULB 12V 10W
  - 5B TAIL BULB 12V 5W
  - 5C INDICATOR BULB 12V 10W
- 6 LICENCE PLATE LIGHT ASSEMBLY WITH REFLECTOR
  - 6A LICENCE PLATE BULB 12V 5W
- 7 ENGINE SWITCH
- 8 BRAKE LIGHT SWITCH
- 9 LIGHTS SWITCH
- 10 TURN INDICATORS SWITCH
- 11 HORN SWITCH
- 12 HORN
- 13 ---
- 14 FUEL LEVEL SENSOR
- 15 OIL LEVEL SENSOR
- 16 CARBURADOR HEATER KIT
- 17 STARTER RELAY
- 18 STARTER MOTOR
- 19 FUSE 4A
- 20 BATTERY 12V 4AH
- 21 FLYWHEEL MAGNETO 12V 80W
- 22 ELECTRONIC CONVERTER A.T.
- 23 SPARK PLUG CAP ANTI-RADIO INTERFERENCES
- 24 SPARK PLUG

D	F	UK	I	E	
Orange	Orange	Orange	Arancio	Naranja	O
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Grau	Gris	Gray	Grigio	Gris	G
Gelb	Jaune	Yellow	Giallo	Amarillo	Y
Blau	Blau	Blue	Azzurro	Azul	BL
Rot	Rouge	Red	Rosso	Rojo	R
Rosa	Rosa	Pink	Rosa	Rosa	P
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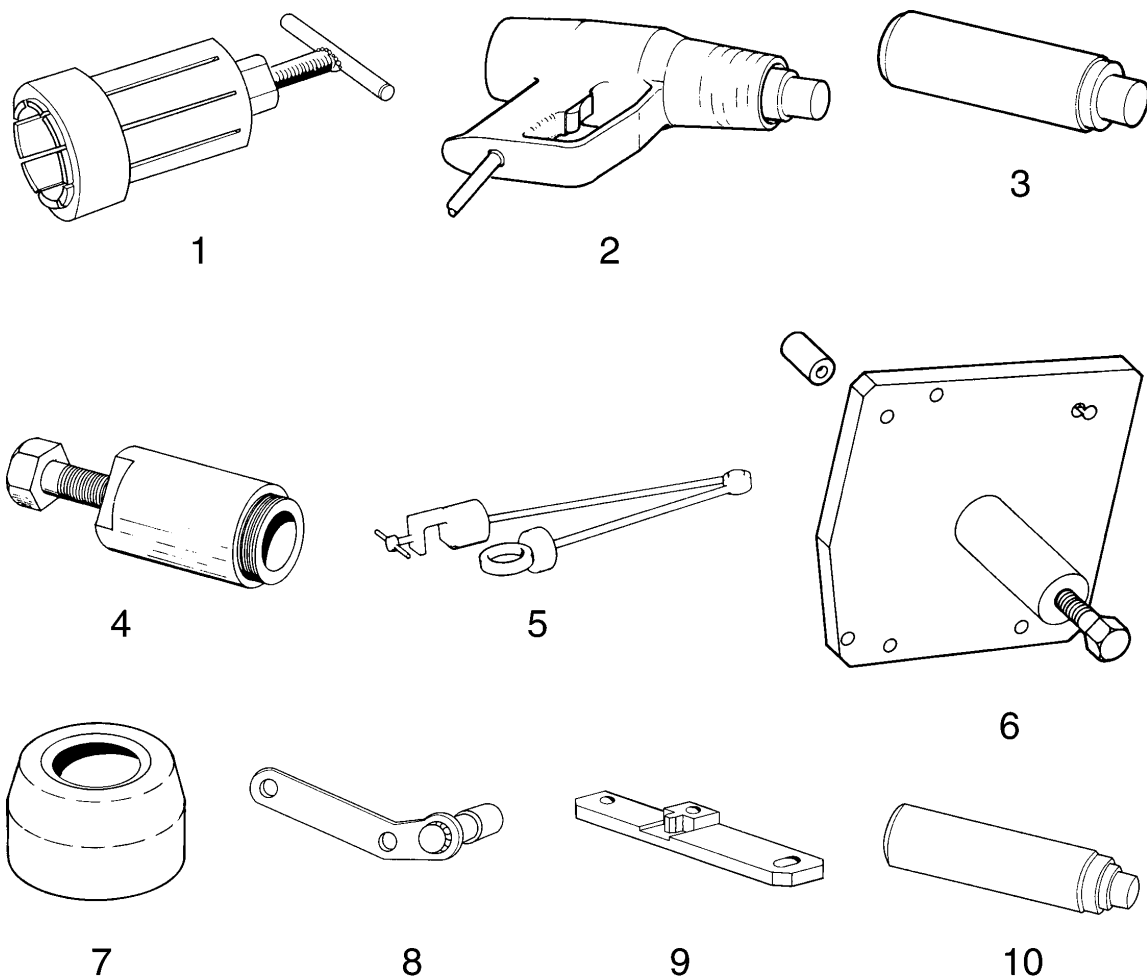
# **WORKSHOP MANUAL**

## **GP 1 GP SERIES ATLANTIS**

\* 50 C.C. ENGINE PIAGGIO

**3**

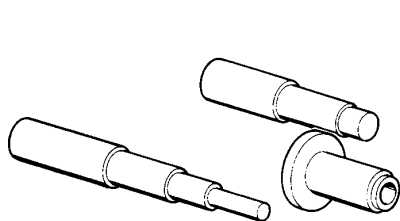
## SPECIAL TOOLS



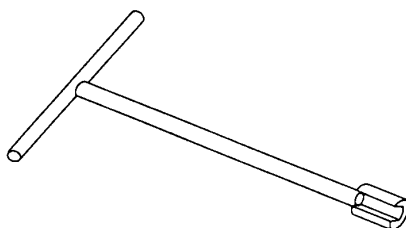
Description	Reference
1 - Bearing extractor.....	004499Y
2 - Heat gun.....	020151Y
3 - Needle bearing punch.....	020080Y
4 - Magneto extractor.....	020162Y
5 - Heat gun holder.....	020150Y
6 - Crankcase separator.....	020163Y
7 - Semi-pulley assembly sleeve.....	020164Y
8 - Water-pump impeller retaining tool.....	020167Y
9 - Starter crown wheel retaining tool.....	020165Y
10 - Crankcase-half water-seal assembly punch.....	020168Y



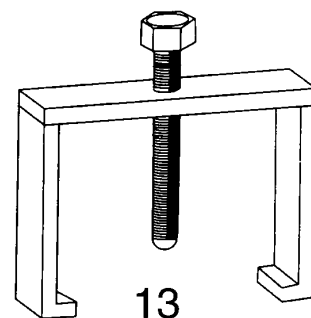
## SPECIAL TOOLS



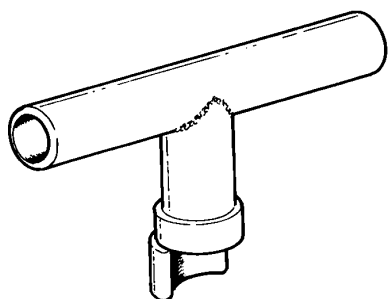
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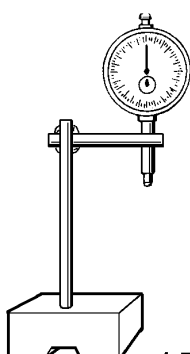
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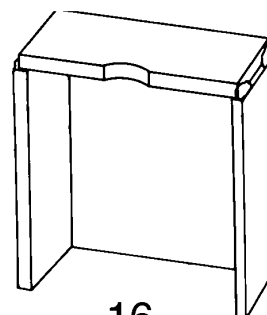
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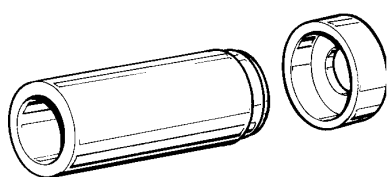
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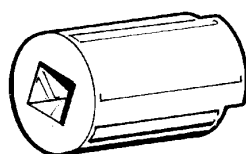
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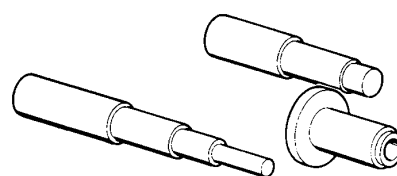
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17



18



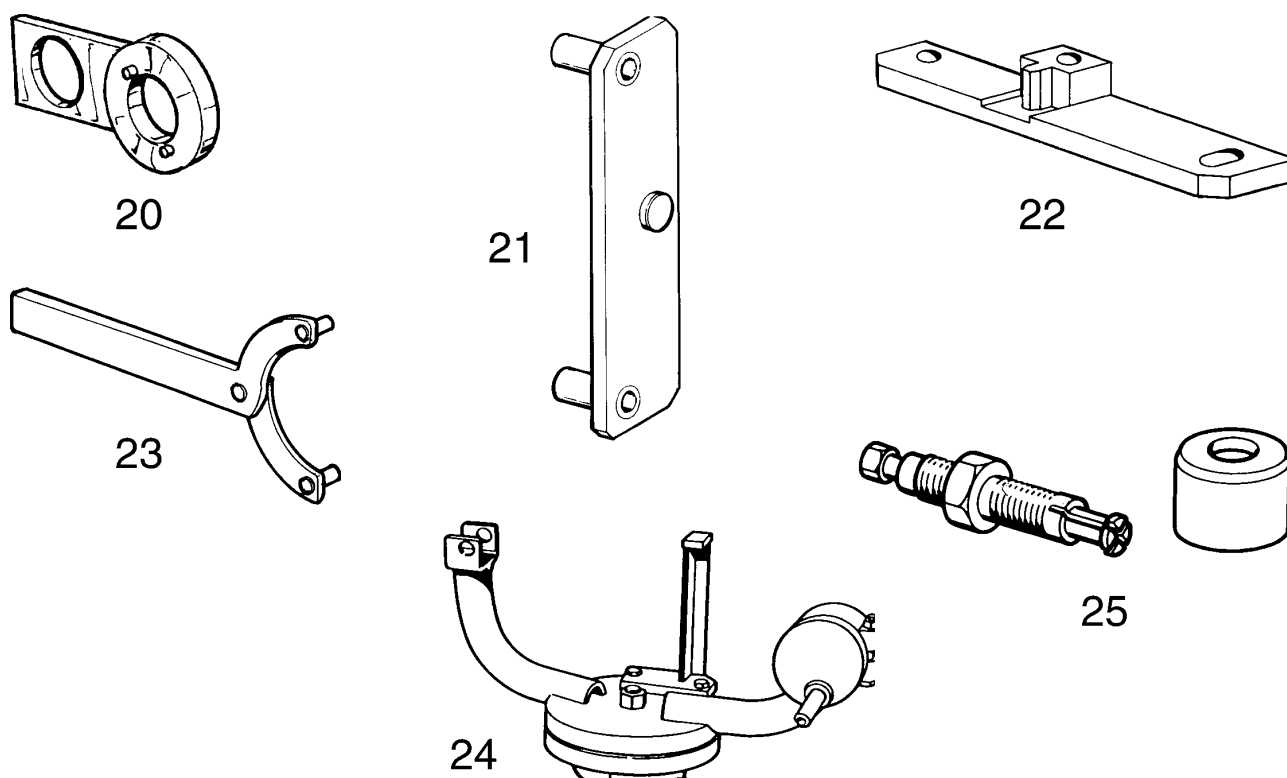
19

### Description

### Reference

11 - Spring clip assembly tool .....	020166Y
12 - Water-pump drive shaft (dis)assembly wrench .....	020169Y
13 - Mixer drive gear extractor tool.....	020361Y
14 - Starter spring assembly tool.....	020261Y
15 - Comparator and holder .....	020335Y
16 - Crankshaft support.....	020163Y
17 - Crankshaft seal punch .....	020340Y
18 - Valve separation tool.....	020341Y
19 - Piston ring assembly tool .....	020344Y

## SPECIAL TOOLS



### Description

### Reference

20 - Compressor crankshaft pulley retaining tool .....	020342Y
21 - Magneto retaining tool.....	020346Y
22 - Starter crown wheel retainer .....	020343Y
23 - Crown wheel retainer .....	020565Y
24 - Engine support.....	005095Y
25 - Extractor tool .....	001467Y

## REGULAR MAINTENANCE CHART

### GP1 - GP Series O2 - ATLANTIS

Period: this period can be calculated by kilometres run or by time in months	Km	1000	2500	5000	10000	15000	20000	25000
	Months	2	6	12	24	36		
Reduction gear or crankcase oil		Replace	Check	Check	Replace	Check	Replace	Check
Check cylinder air							Clean	
Suspensions				Check	Check	Check	Check	Check
Tighten fastenings		Check	Check	Check	Check	Check	Check	Check
Electrical Connections		Check	Check	Check	Check	Check	Check	Check
Spark plug		Clean	Adjust	Replace	Replace	Replace	Replace	Replace
Battery			Check	Check	Check	Check	Check	Check
Carburettor		Adjust / Clean	Adjust / Clean	Adjust / Clean	Adjust / Clean	Adjust / Clean	Adjust / Clean	Adjust / Clean
Oil pump / Fuel valve Variable speed rollers /		Adjust	Adjust	Adjust	Adjust	Adjust	Adjust	Adjust
Transmission belt						Check Replace		
Oil Filter				Check	Replace	Check	Replace	Check
Air Filter				Clean	Clean	Clean	Clean	Clean
Secondary Air Filter				Clean	Clean	Clean	Clean	Clean
Brakes / Pads				Check	Check	Check	Check	Check
Brake equipment					Check		Check	
Brake fluid		EVERY 2 YEARS				EVERY 2 YEARS		
Tyres				Check	Check	Check	Check	Check
Tyre pressures		Check	Check	Check	Check	Check	Check	Check
Fuel or oil hoses		Check			Replace	Check	Replace	Check
Transmission				Lubricate	Lubricate	Lubricate	Lubricate	Lubricate
Starter gears to pedal				Clean and grease	Clean and grease	Clean and grease	Clean and grease	Clean and grease

## TORQUE SETTINGS

DESCRIPTION			TORQUE SETTING Nw x m	
CALIPER ROTATION SHAFT	8M125		17 - 19	LOCTITE
CYLINDER STUD	6M100	STUD	10 - 12	
CRANKCASE HALVES JOINT	6M100	SCREW	12 - 13	
CYLINDER HEAD	6M100	NUT	10 - 11	
INLET MANIFOLD VALVE SUPPORT		SCREW	1 - 2	LOCTITE
CRANKCASE INLET MANIFOLD		SCREW	9 - 10	LOCTITE
OIL PUMP	5M80	SCREW	3 - 4	
COIL TO BASE PLATE		SCREW	8 - 10	
BASE PLATE TO CRANKCASE		SCREW	8 - 10	
MAGNETO		NUT	40 - 44	LOCTITE
PICK-UP SCREW		SCREW	4 - 5	
STARTER MOTOR	6M100	SCREW	12 - 13	
FAN TO MAGNETO		SCREW	3 - 4	
LEFT-HAND CRANKCASE HALF		NUT	40 - 44	
REDUCTION GEAR COVER	6M100	SCREW	12 - 13	
PULLEY SHAFT		NUT	40 - 44	LOCTITE
CLUTCH		NUT	50 - 60	
PLASTIC OIL FILLER CAP		CAP	3 - 5	
LEFT-HAND CRANKCASE COVER	6M100	SCREW	12 - 13	
OIL DRAIN PLUG	8M125	SCREW	17 - 19	
CYLINDER SLEEVE COVER	6M100	SCREW	4 - 5	
FRONT WHEEL	12M150	NUT	35 - 50	
REAR RIM SECURING NUT		NUT	17 - 19	
HUB TO REAR WHEEL AXLE	16M150	NUT	115 - 125	
ENGINE SUPPORT TO FRAME	10M150	NUT	30 - 40	
SHOCK ABSORBER UP/ DOWN	10M150	NUT	30 - 40	
HANDLEBAR	8M125	SCREW	15 - 19	
EXHAUST PIPE TO CYLINDER	6M100	SCREW	9 - 12	
EXHAUST PIPE TO CRANKCASE	10M150	SCREW	15 - 19	
FORK LEG SECURING NUT	6M100	NUT	8 - 10	
STEERING	25M100	NUT	90 - 130	
FRONT BRAKE CALIPER	8M125	SCREW	17 - 19	
BRAKE CALIPER TO CRANKCASE	8M125	SCREW	17 - 19	
STARTER PEDAL	6M100	SCREW	8 - 12	
SILENCER PROTECTOR	4M70	SCREW	1 - 2	LOCTITE
HANDLEBAR COUNTERWEIGHT		SCREW	4 - 5	LOCTITE
ENGINE TO SUPPORT	10M150	SCREW	30 - 40	
BRAKE DISC FRONT / REAR	8M125	SCREW	17 - 19	LOCTITE
CENTRE STAND TO CRANKCASE		SCREW	17 - 19	

## PAIOLI FRONT FORKS

**FOR PROPER MAINTENANCE AND REPAIR OF THE PAIOLI FORKS, IT IS RECOMMENDED THAT THEY SHOULD BE REMOVED FROM THE FRAME.**

### **TO REMOVE THE FORKS FROM THE FRAME:**

- Remove the fairing.
- Loosen off the screws in the upper casing.
- Disconnect the connections in the instrument panel, Speedometer sleeve, instrument connectors, grip lighting switch connectors, stop light, indicators, and cut the rear brake clip,
- Remove upper casing.
- Remove the shield backing plate.
- Loosen and remove the 2 handlebar screws.
- Loosen the front forks nut.
- Loosen and remove the 4 mudguard screws.
- Loosen the wheel shaft nut, remove the washer,
- Loosen the 2 front brake caliper screws.
- Loosen the locking screw, remove the wheel shaft, the wheel spacer, and leave the speedometer cable hanging free.
- Remove the forks.

### **STRIPPING THE LEFT / RIGHT FORK LEG**



Suspension stroke ..... 80 mm.  
Diameter of fork bars ..... 32 mm.  
Oil capacity in each bar ..... 100 C.C.  
Type of oil ..... Agip FORK  
SAE 7,5 W



## REAR SUSPENSION:

### GP 1 - GP SERIES

Hydraulic shock absorber

Length of shock absorber ..... 297 mm.  
Shock absorber stroke ..... 64 mm.  
Length of spring ..... 235 mm.  
Spring compression at 36 mm ..... 127 kg.m  
Spring compression at 64 mm ..... 254 kg.m  
Stud ..... 10 mm.



## ENGINE

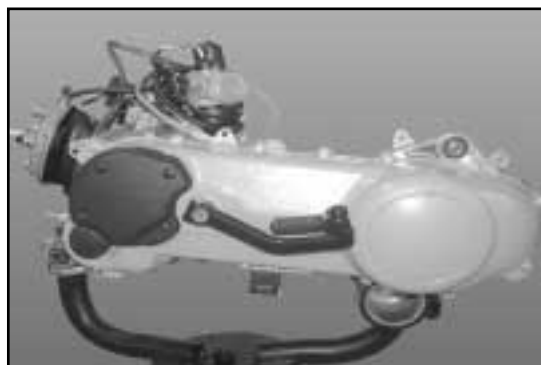
- Place the complete engine on the special stand.

**Warning !!!** take extreme care when working with petrol

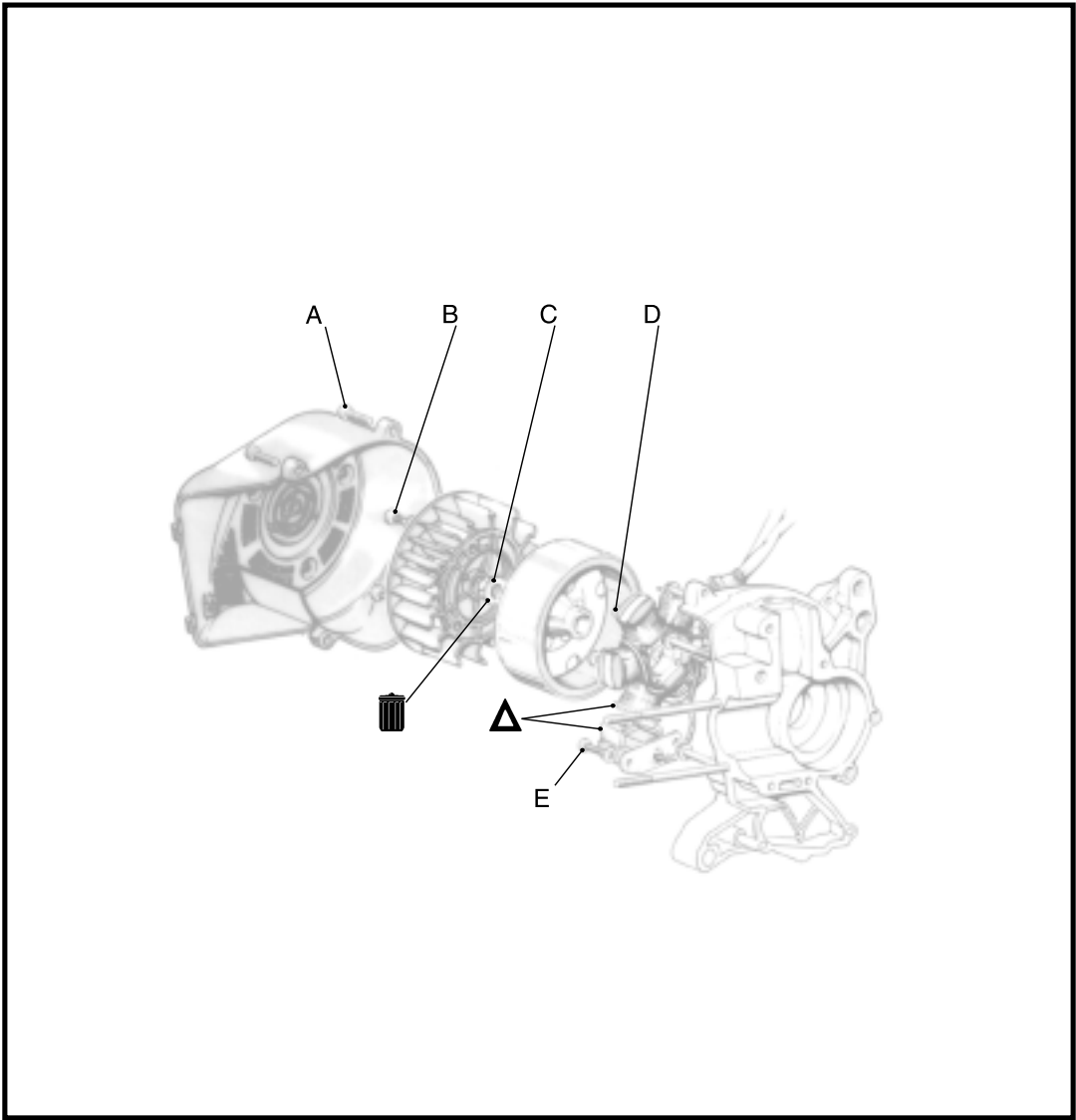
**Caution!** when installing the battery, connect the positive cable first, and then the negative cable.

**Caution!** The use of protective glasses is recommended when using percussion tools.

Tool: 19.1.25095



MAGNETO



LUBRICATE



APPLY THE PRODUCT



CAUTION HANDLE WITH CARE



GREASE



CLEAN WITH CARE

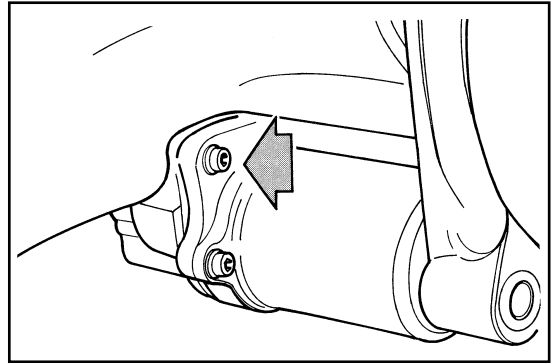


ALWAYS REPLACE

SYMBOL	A	B	C	D	E	F	G	H	I	L	M	N	O	P	Q
QUANTITY	4	3	1	3	2										
TORQUE N.M.	1÷2	3÷4	40÷44	3÷4	3÷4										

### Starter motor

- The securing nuts are the one indicated in the drawing and the one diametrically opposite.



### Flying cover

- Remove the four screws covers steering wheel.
- Models cooled by liquid.



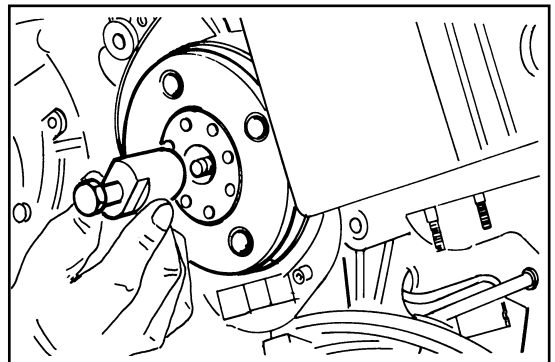
### Fan Cover

- Remove the four screws and disengage the two lugs inserted in the cylinder cooling jacket.
- If the vehicle is used for off-road duty, it is advisable to remove the outer part of the cover and clean the silencer element with compressed air and/or water.



### Magneto

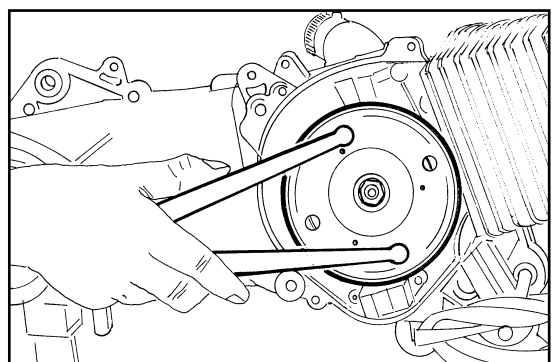
Extractor: 19.1.20162



### Magneto securing nut

- During this operation, secure the magneto using the special tool for this purpose.

Special tool: 19.1.20565



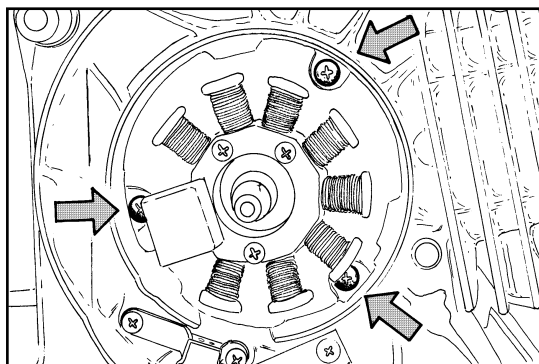


## Stator pick-up

**N.B.** Assemble the parts by following the stripping procedure in reverse.

- Use a new nut to ensure proper adjustment.

**N.B.** It is good practice after assembling the magneto to protect the extractor tool screw with Agip GR MU 3 grease.



Magneto nut torque setting  $40 \pm 4 \text{ N x m}$ .

## ELECTRONIC IGNITION

All operations to check the wiring which involve disconnecting cables (checking connections and devices which form part of the ignition circuit) must **be performed with the engine switched off**: otherwise the central unit may suffer irreparable damage.

**These checks should be performed if the ignition is irregular, or if there is no spark at the spark plug.**

- 1) Check the spark plug (clean with wire brush, remove soot, blow clean with compressed air, if necessary replace).
- 2) Without stripping the stator, perform the following check:

After visual examination of the electrical connections, measure the characteristics of the coil and the pick-up (see table).

If any anomalies appear when checking the coil and the pick-up, replace the stator and the damaged parts.

Remember that in order to replace the central unit, cables must only be disconnected with the engine switched off.

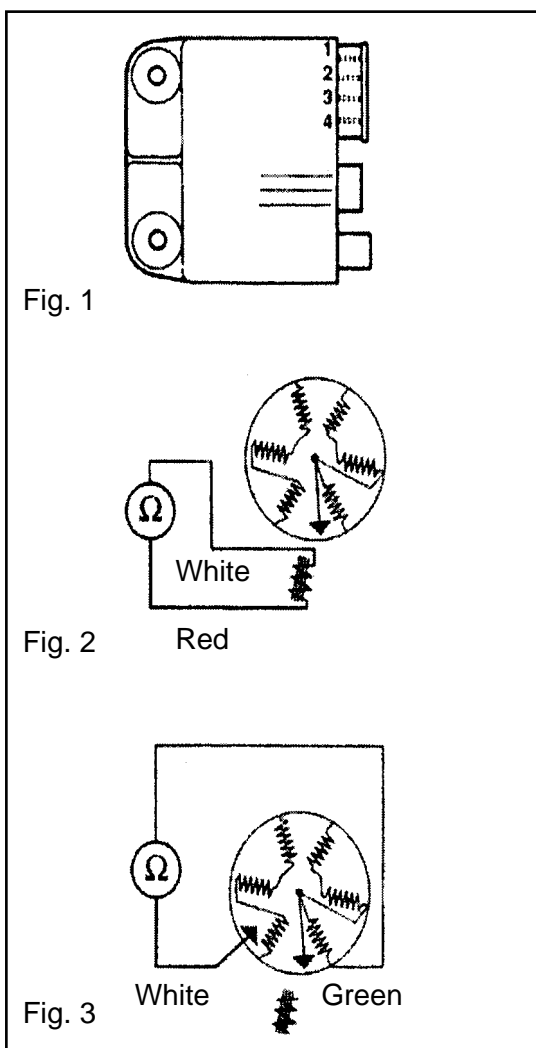


Fig. 1

Fig. 2

Fig. 3

### CHECKING THE PICK-UP (Fig. 2)

Instrument connected between:	Value ( $\Omega$ )
1) Red and White Cables	$90 \pm 140 \Omega$

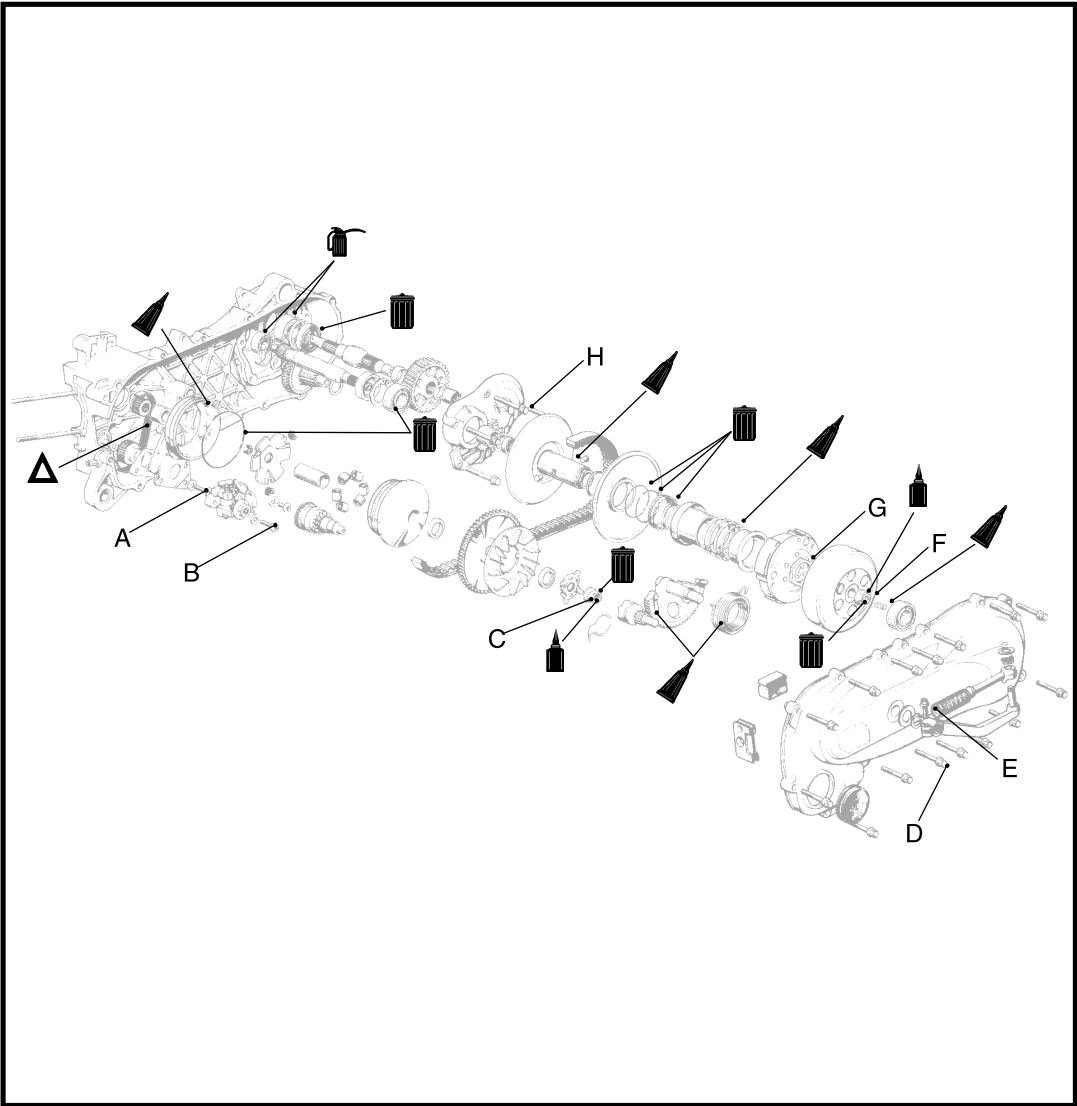
### CHECKING THE Coil (Fig. 3)

Instrument connected between:	Value ( $\Omega$ )
1) White and Green Cables	$800 \pm 1100 \Omega$

### CHECKING for Continuity

Instrument connected between:	Value ( $\Omega$ )
1) White Cable and Frame	Continuity
2) White Cable and Engine	Continuity

TRANSMISSION - MIXER



LUBRICATE



APPLY THE PRODUCT



CAUTION HANDLE WITH CARE



GREASE



CLEAN WITH CARE



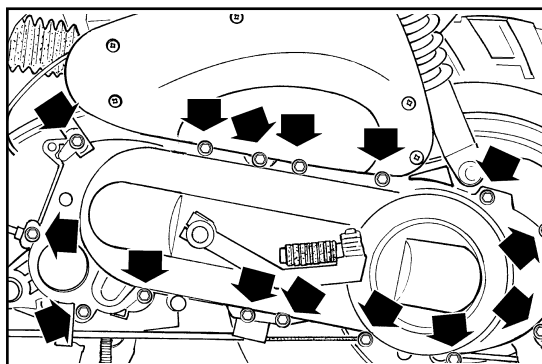
ALWAYS REPLACE

SYMBOL	A	B	C	D	E	F	G	H	I	L	M	N	O	P	Q
QUANTITY	1	2	1	15	1	1	1	5							
TORQUE N.M.	3÷4	3÷4	40÷44	12÷13	12÷13	40÷44	50÷60	12÷13							

## Transmission Cover

- Unscrew the 15 screws, and remove the transmission cover using a raw-hide hammer.

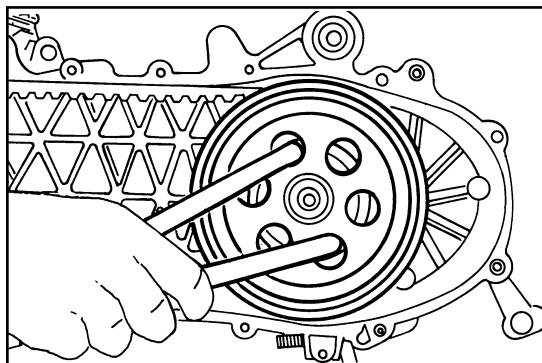
**N.B.** the crankcase remains lightly secured by the driven semi-pulley shaft in the bushing fitted into the crankcase itself.



## Follower Pulley

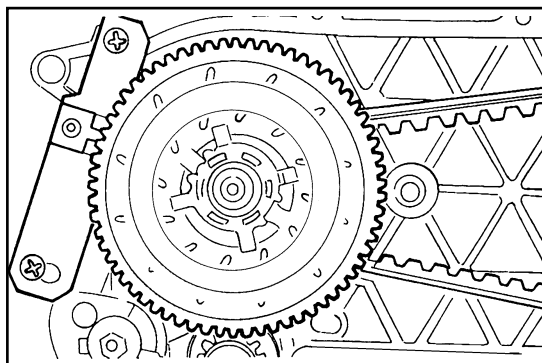
- Remove the nut.
- Withdraw the complete unit.

Special tool: 19.1.20165



## Starter gearing – Drive pulley

Special tool: 19.1.20165



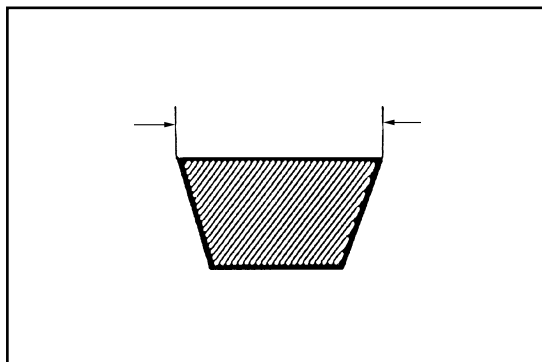
## Controls

### Drive belt

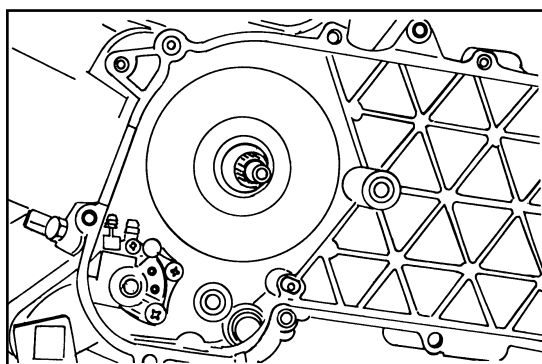
- Verify that the drive belt is not deteriorated
- Control the width of the drive belt

Minimum permissible 17,5 mm.

**N.B.** to control the drive belt and the container of rollers each 20,000 km

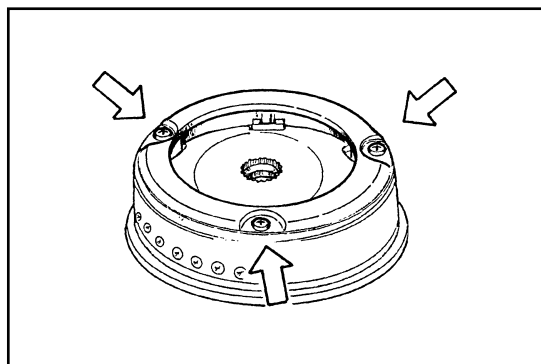


**Belt - Starter cable - Variable speed unit Mixer**



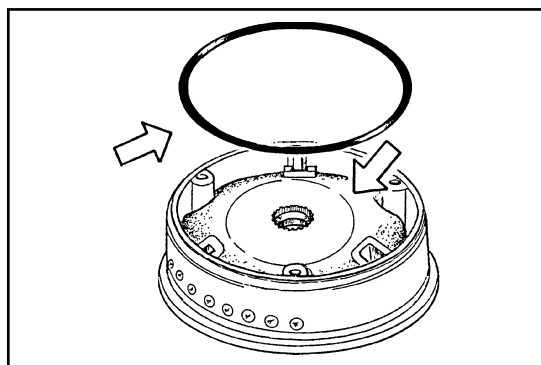
### Movil semi pulley

- Remove the three screws and the cover.



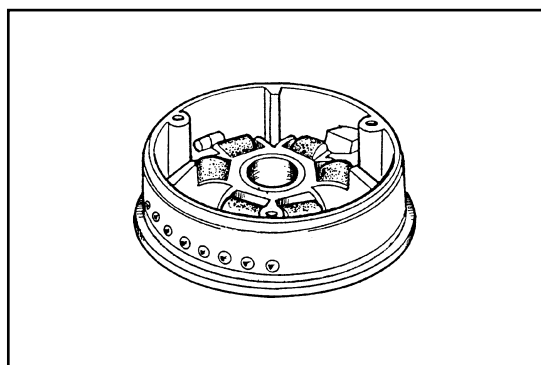
### Variable speed plate

- Remove the O-ring and the variable speed plate.



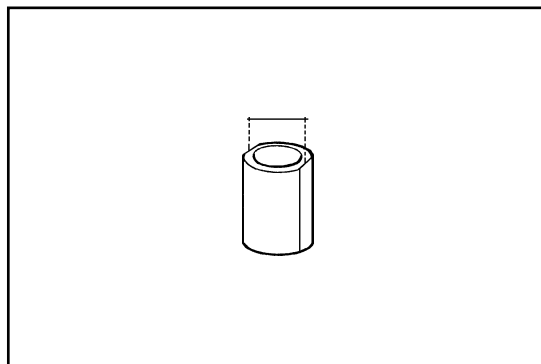
### Rollers

- Withdraw the rollers. Lift out the rollers, marking them with a felt pen to ensure correct re-assembly.



### Rollers

- Check that the rollers are not damaged or worn.  
Limit of wear 18.5 mm minimum diameter.

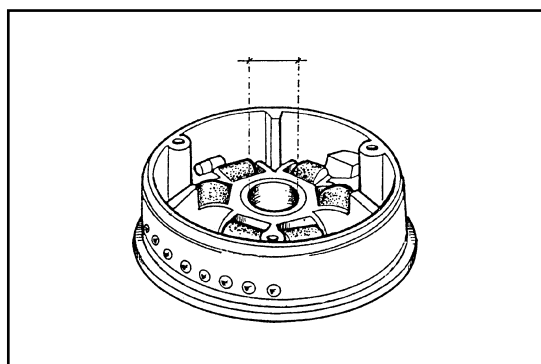


### Transmission - mixer variable speed unit

- Check that the interior bushing shows no sign of unusual wear and measure the interior diameter.

Maximum permitted diameter 20.12 mm max.

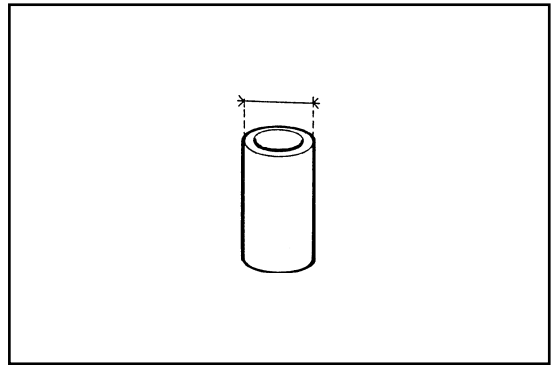
**N.B.** Do not lubricate or clean the anti-friction bushing.



### Pulley displacement bush

- Measure the external diameter of the sliding pulley bush.

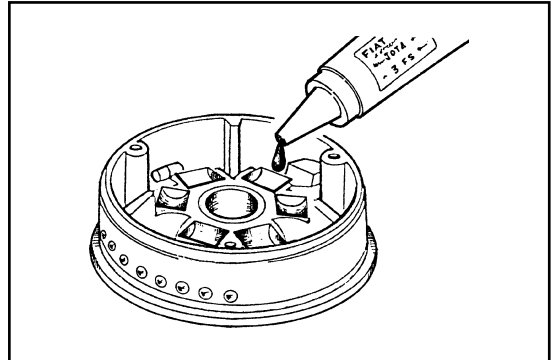
Minimum permissible diameter 19.95 mm



### Variable Speed unit roller ramps

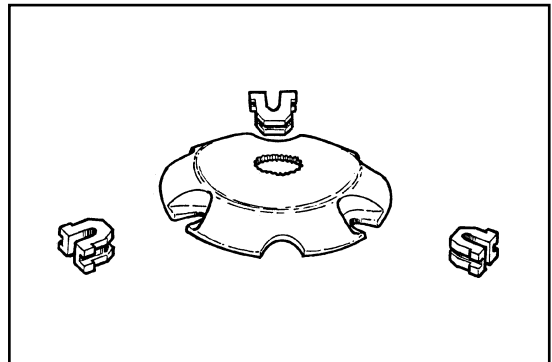
- Grease the working surfaces of the rollers using Agip GR MU 3 grease, and re-assemble the rollers.

**N.B.** For correct assembly, if the rollers are not being replaced, re-fit them into their original seatings.

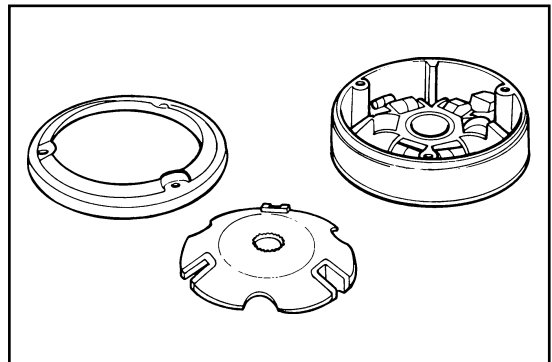


### Variador guide

- Assemble the roller cover, the oil plate, and the cover, securing with the three screws.



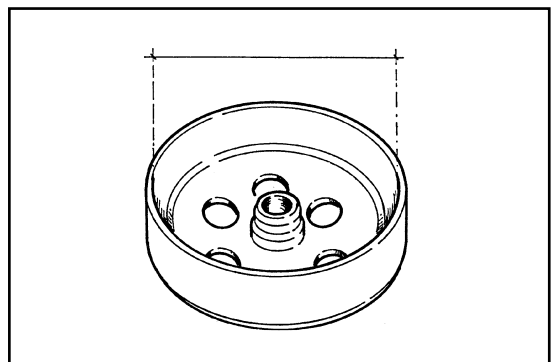
- Assemble the roller backing plate, the oil seal, and the cover, securing with the three screws.



### Follower Pulley

- Check that the clutch casing is not worn or damaged.
- Measure the internal diameter of the clutch casing. Maximum diameter value 107.5 mm.

**N.B.** Mount it on the appropriate shaft and check for eccentricity: maximum value 0.20 mm.

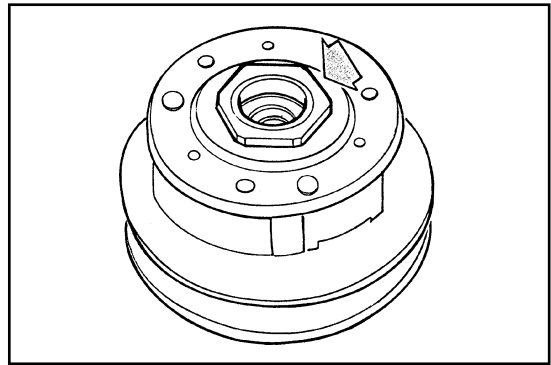


## Clutch

- Remove the central nut while holding the pulley rigid using the special tool.

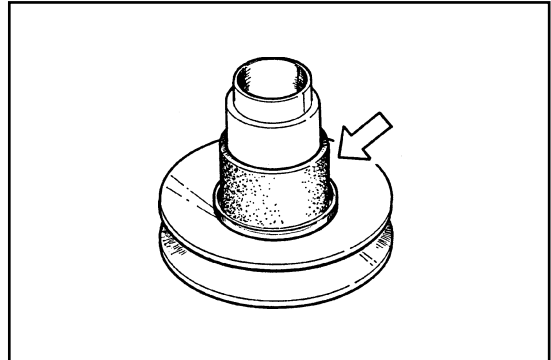
**Caution!** During the stripping operation on the clutch unit securing nut, take care to keep the unit itself in its housing; it may be ejected by the force of the clutch spring.

Special tool: 19.1.20565



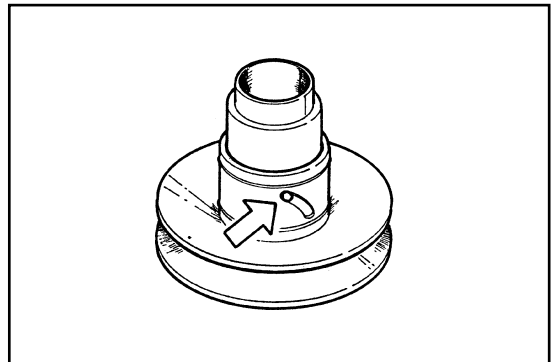
## Stud retaining collar

- Withdraw the retaining collar.



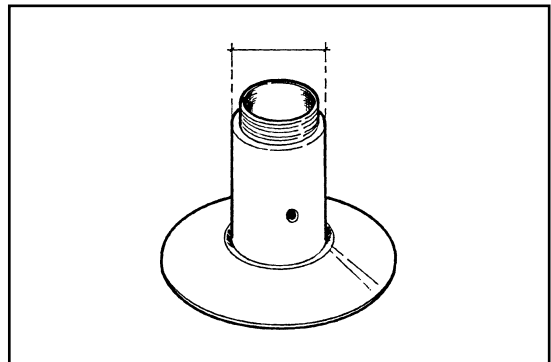
## Guide roller studs

- Extract the guide roller studs, and withdraw the mobile follower semi-pulley from the fixed follower semi-pulley.



## Fixed follower semi-pulley

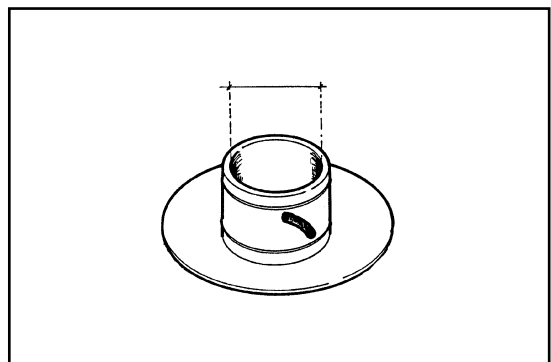
- Measure the external diameter of the pulley bush.
- Minimum permissible diameter 33.96 mm.



## Mobile follower semi-pulley

- Measure the internal diameter of the moving semi-pulley bush.

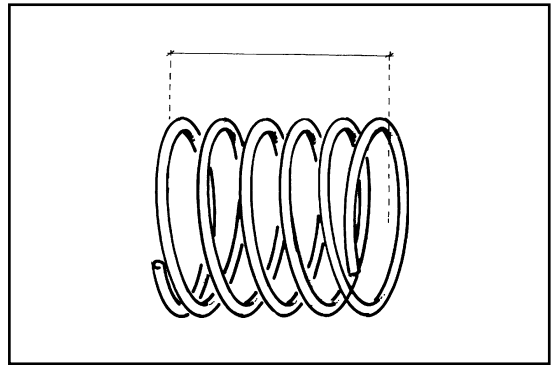
Maximum wear limit 34.08 mm.



### Spring

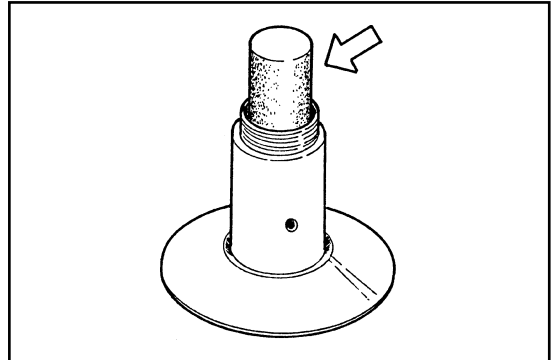
- Measure the length of the moving follower semi-pulley spring.

Minimum permissible length limit 110 mm.



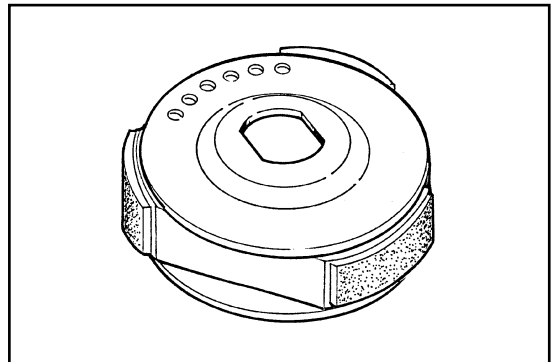
### Fixed follower semi-pulley bushing

- Extract the old bushings and insert new replacements, using a piece of tubing of the right diameter as a punch.



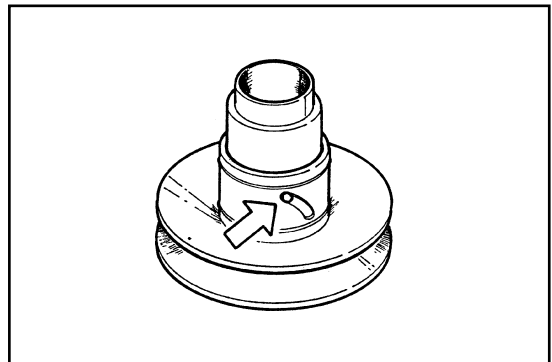
### Checking the Clutch

- The clutch assembly should be replaced when the joint is less than 1 mm at its thinnest part.
- This assembly should be replaced as a complete unit, because it is balanced after assembly of the clutch weights.



### Re-assembly of the semi-pulley

- Insert the mobile semi-pulley into the fixed semi-pulley using the protective sleeve, after replacing the sealing rings and the O-rings, fit the studs with their respective rollers using a small quantity of Agip GR MU 3 grease.
- After completing this operation it is necessary to apply, using a curved point syringe, a sufficient quantity of grease such that when it is injected through one of the holes situated in the interior of the bushing, it squeezes out of the opposite hole.



Special tool: 19.1.20164

### Re-assembly of the clutch

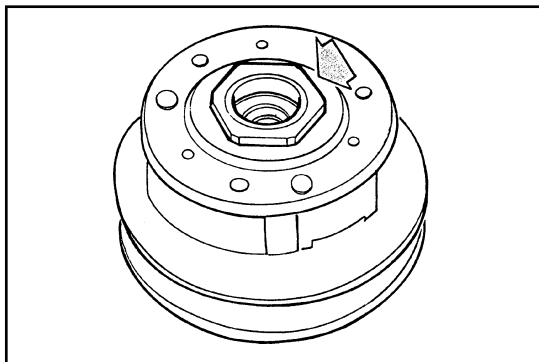
- Refit the stud retaining collar, the spring, the clutch assembly, and lock the clutch nut.

**Caution!** During the stripping operation on the clutch unit securing nut, take care to keep the unit itself in its housing; it may be ejected by the force of the clutch spring.

Special tool: 19.1.20565

Torque setting:  $40 \div 44 \text{ N x m}$

Loctite 242 Nut sealing paste



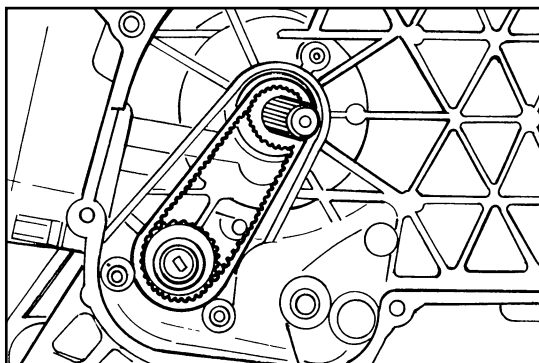
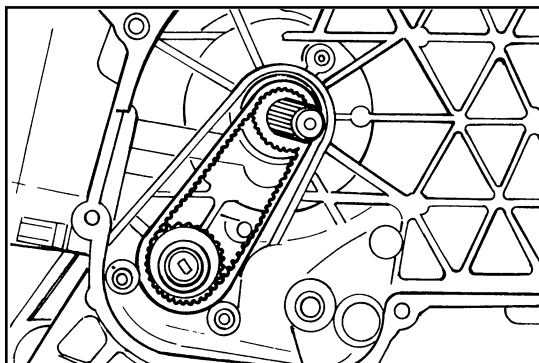
### Mixer drive gear and belt

- Withdraw the gear and the belt.

**Caution!** Do not twist or fold the belt during assembly.

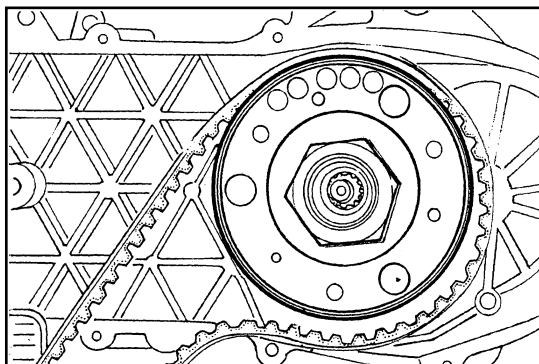
**Caution!** During assembly, carefully lubricate the mixer drive stud and bush, using only CONSTANT GLY 21000 oil, and make sure that it is free to move.

**N.B.** Replace the belt every 20,000 kilometres.



### Follower pulley, clutch, belt

- Assemble the follower pulley - clutch - belt assembly.



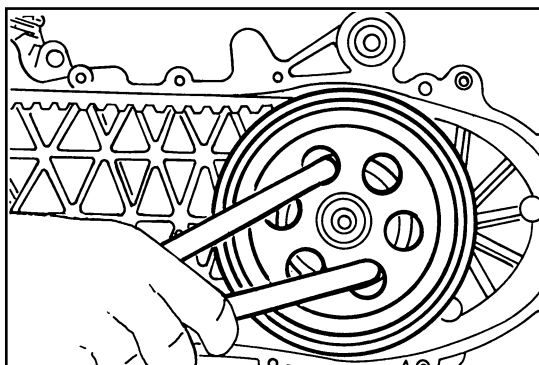
### Clutch hub

- Assemble the clutch hub and tighten the nut while holding the hub itself rigid by means of the special tool.

**N.B.** On assembly, use new nuts and apply Loctite "Super Fast" type 242 E.

Special tool 19.1.20565

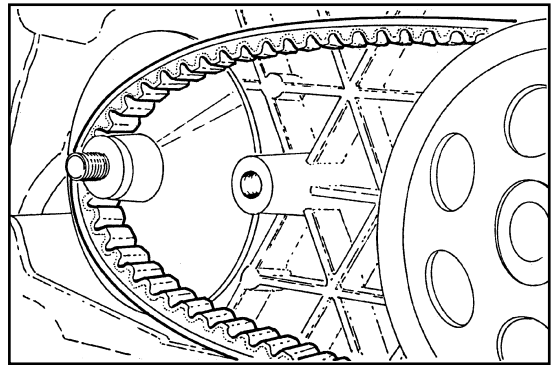
Torque setting  $40 \div 44 \text{ N x m}$





### Bushing and mobile semi-pulley

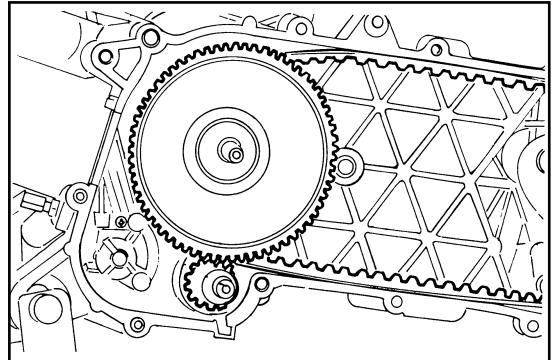
- Fit the assembly while taking care not to damage the transmission belt.
- It is essential to open out the rear pulley in order to fit the belt. It is vitally important when tightening the front pulley assembly to ensure that the belt is free to move inside it, otherwise the semi-pulley may not be tightened correctly.



### Mixer - Starter cable - Belt

#### Fixed semi-pulley

- Handle with care so as to avoid twisting the belt.



### Fan - Fan securing disc - Washer - Nut

- Apply recommended thread sealer

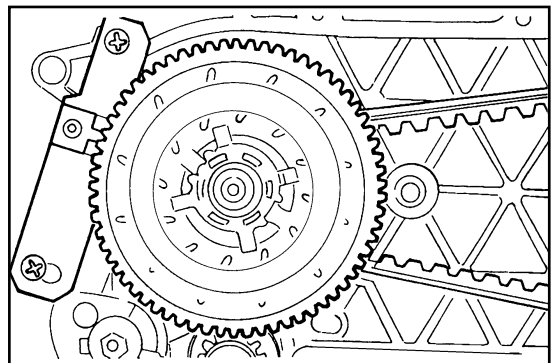
**Caution!** use only nuts supplied as original spare parts.

**N.B.** When assembling use new nuts in order to ensure correct engagement.

Torque setting:  $40 \div 44 \text{ N x m}$

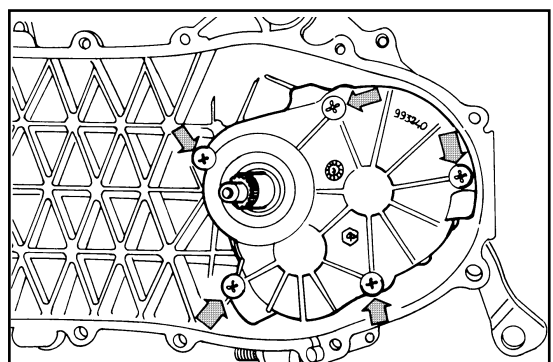
Special tool: 19.1.20165

Loctite 242 E



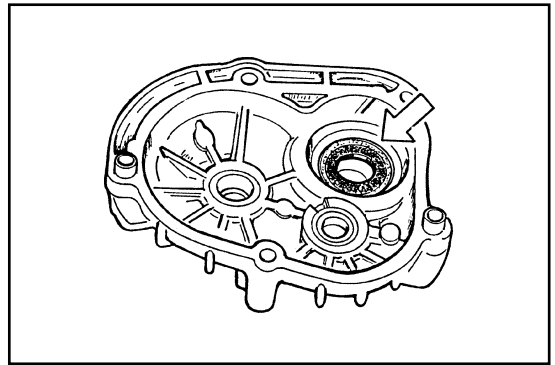
### Reduction gear cover

- Before carrying out this operation, drain the oil from the reduction gear by means of the drain plug.



### **Follower pulley shaft oil seal**

- Strip the oil seal.

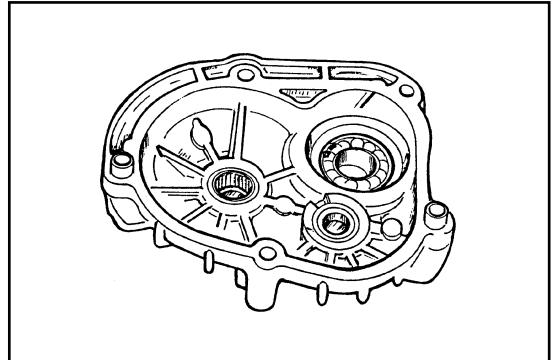


### **Reduction gear cover bearings**

- After removing the Seeger ring, withdraw the bearing.
- When stripping the wheel shaft bearing, use the special tool.

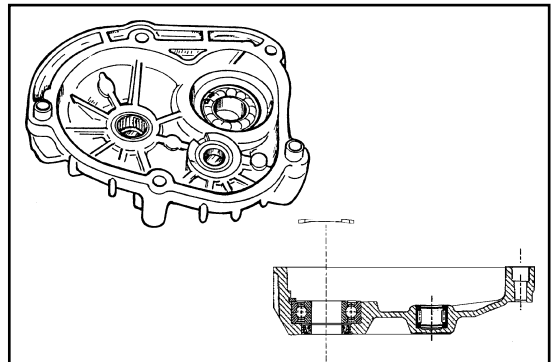
Special tool: 12.1.21467

13/17 for wheel shaft



### **Reduction gear housing bearing**

- Heat the cover using the heat gun on its stand, and fit the bearing, let the cover cool down, and then fit the oil seal and the needle bearing using the appropriate punch. Fit the follower pulley shaft bearing Seeger ring ensuring that it is positioned correctly.
- The concave side of the Seeger ring must face the bearing.



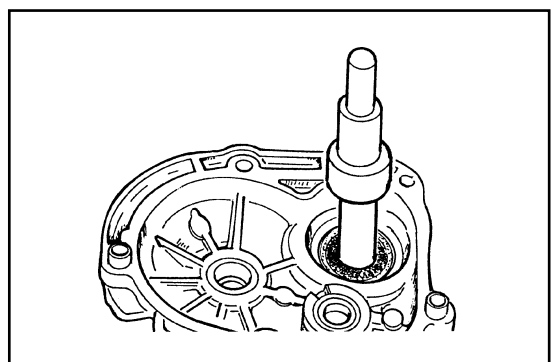
Special tool: 19.1.20151 (heat gun)

Special tool: 19.1.20150 (holder)

Special tool: 19.1.20080

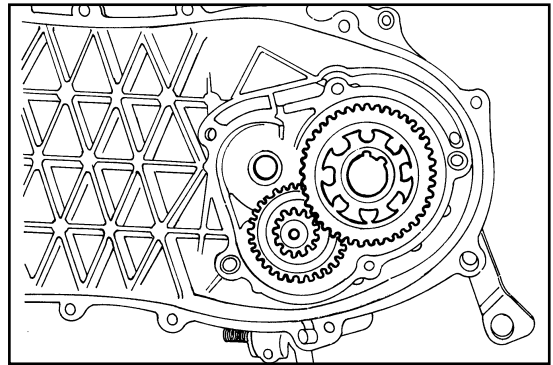
### **Assembly of follower pulley shaft**

- Assemble the pulley shaft onto the bush cover by tapping lightly with a rawhide hammer.



## Reduction gearing

**N.B.** If necessary when withdrawing the reduction gearing, use a plastic hammer, tapping lightly on the opposite side to that shown in the figure.

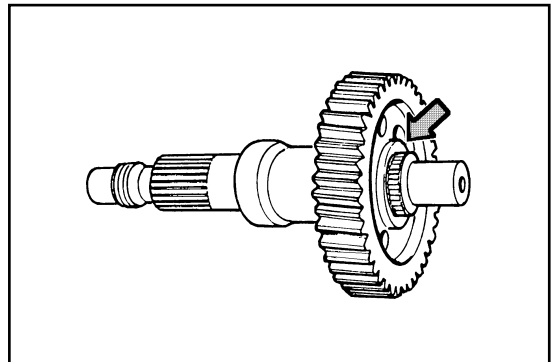
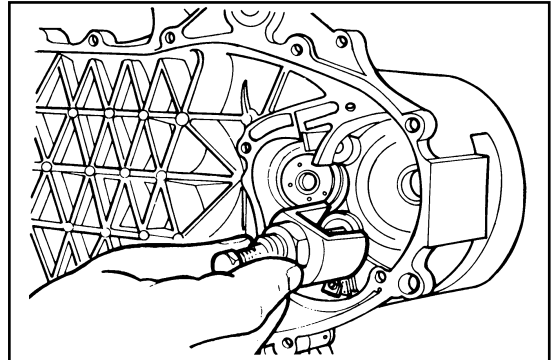


## Crankcase bearings

- Wheel shaft bushing:
- Withdraw the oil seal and the Seeger ring, extract the bushing.
- Follower pulley shaft bushing.
- Use the special tool.

**N.B.** Perform the same operations on the bearings in the crankcase cover.

Extractor tool 19.1.21467/21/17

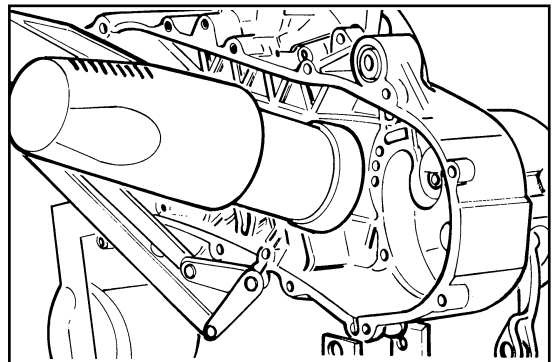


## Crankcase bearings

- Heat up the crankcase halves to approximately 80°C, and then assemble the bearings.

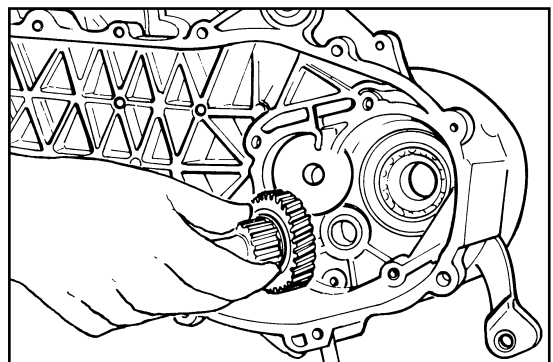
Support 19.1.20150

Heat gun 19.1.20151



## Crankcase bearings

**Caution!** place the stop washers correctly on the intermediate shaft.

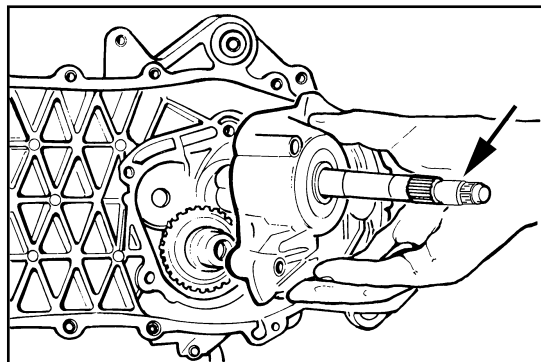


### Mating the crankcase halves

- Apply Loctite 510 to the mating surfaces.
- Tighten the screws to the prescribed torque setting.

**N.B.** Always check that the compensator ring is correctly in place and well-greased.

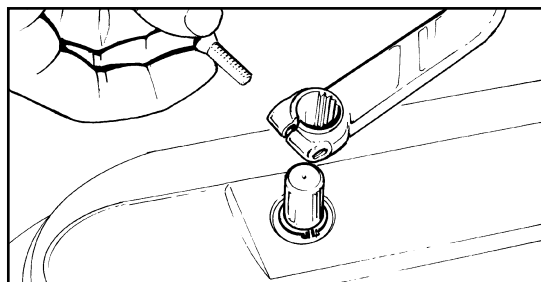
Torque settings 12 ÷ 13 N x m



### Replacing the starter pedal

- Remove the screw as shown in the figure and withdraw the starter pedal.
- For re-assembly follow the same operation in reverse, and tighten to the specified torque setting.

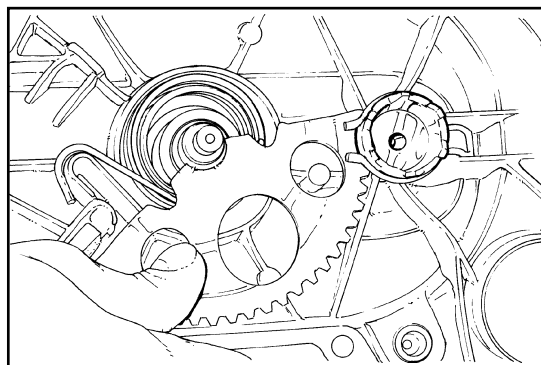
Torque setting: 12-13 N·m



### Replacement of the toothed segment and starter-crankshaft gearing

- Remove the Seeger ring situated on the outside of the crankcase.
- Strip the starter gearing from its housing, relaxing the pressure exerted by the toothed segment through the spring; in order to do this, it is necessary to rotate the toothed segment slightly (see figure).

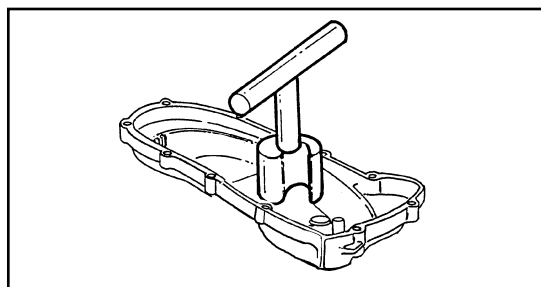
**Caution!** During the stripping operation on the toothed segment, take extreme care over the tension exerted by the spring: this could injure the operator.



### Assembling the toothed segment and starter gearing into the crankcase

- When assembling, apply Agip GR MU to the bush, to the spring, and along the toothed segment.
- To load the spring, use the special tool as shown in the figure.
- Fit the Seeger ring after checking that it is in perfect condition.

Special tool: 19.1.20261

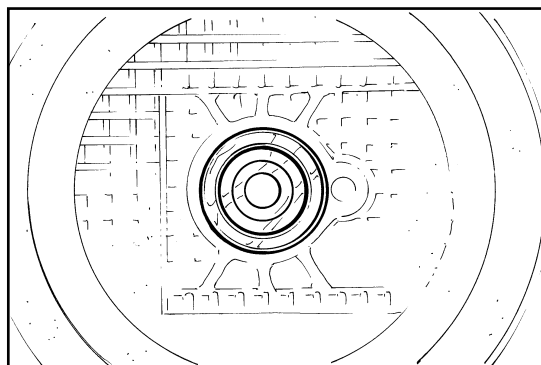


### Replacing the reduction gear cover bearing

- In order to replace the bearing in the reduction gear cover, heat up the crankcase and extract the bearing by tapping with gentle blows from a rawhide hammer.

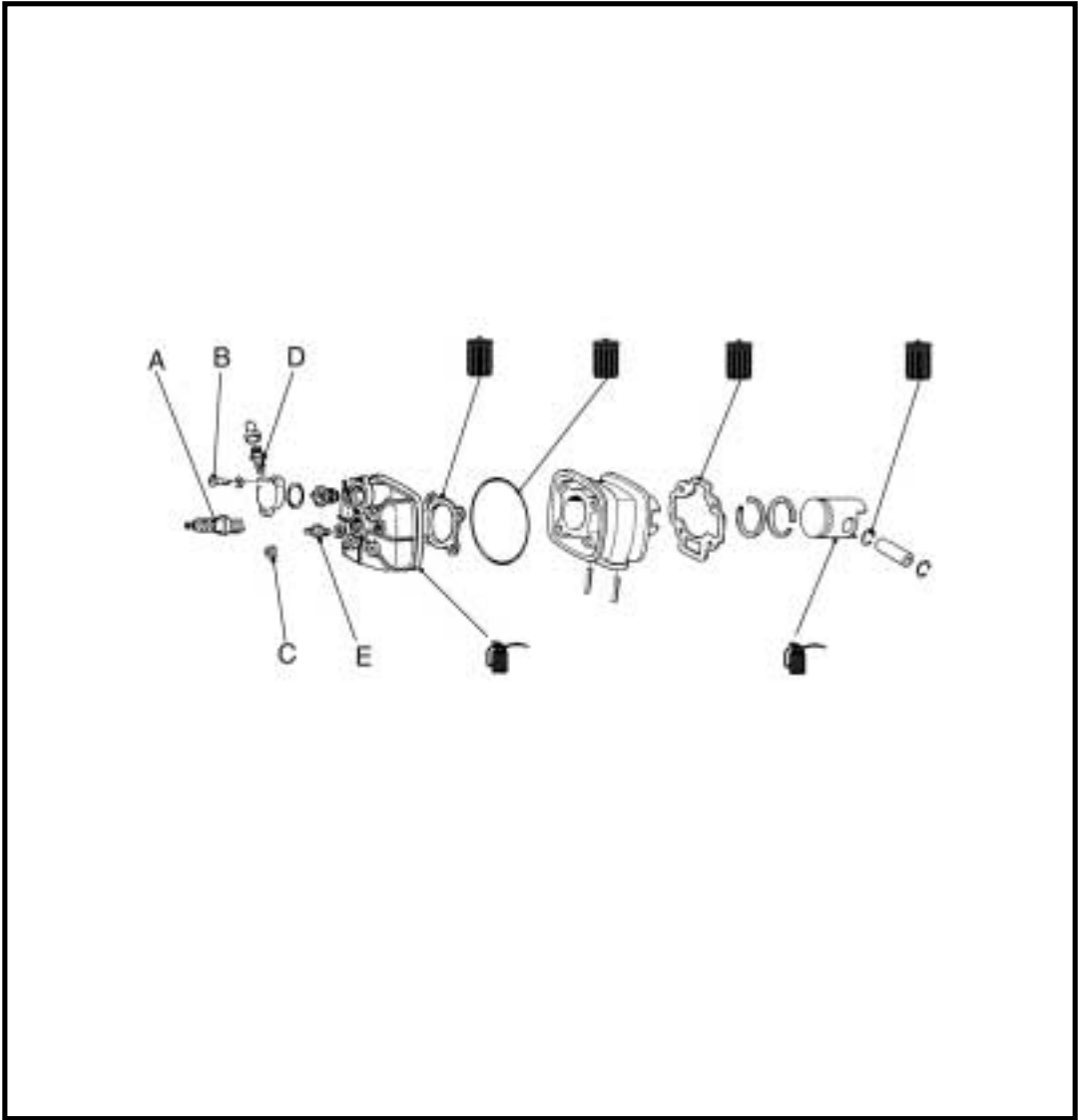
Special tool: 19.1.20150

Special tool: 19.1.20151



CYLINDER HEAD - CYLINDER - PISTON

Liquid cooled models



LUBRICATE



APPLY THE PRODUCT



CAUTION HANDLE WITH CARE



GREASE



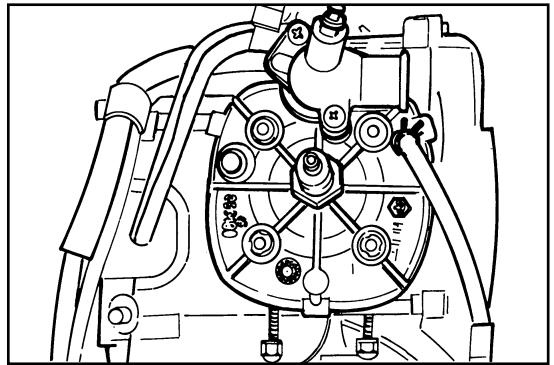
CLEAN WITH CARE



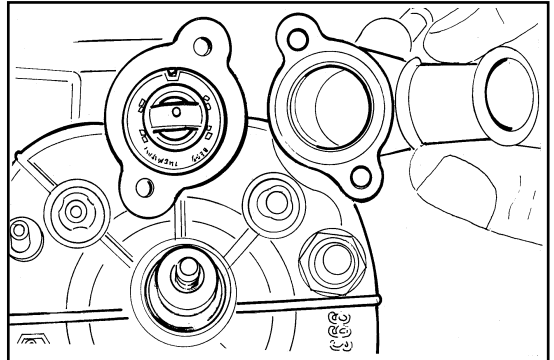
ALWAYS REPLACE

SYMBOL	A	B	C	D	E	F	G	H	I	L	M	N	O	P	Q
QUANTITY	1	2	4	1	1										
TORQUE N.M.	25÷30	3÷4	10÷11	6÷7	6÷8										

## Thermostat - cylinder head - by-pass tube

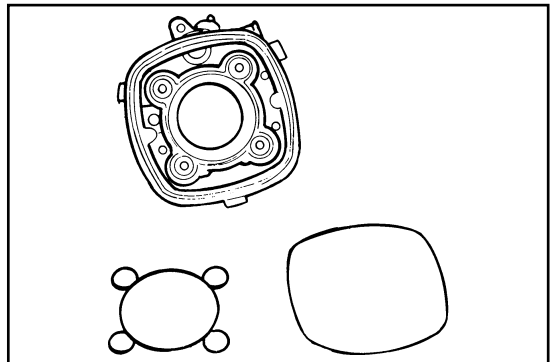


## Detail of the thermostat

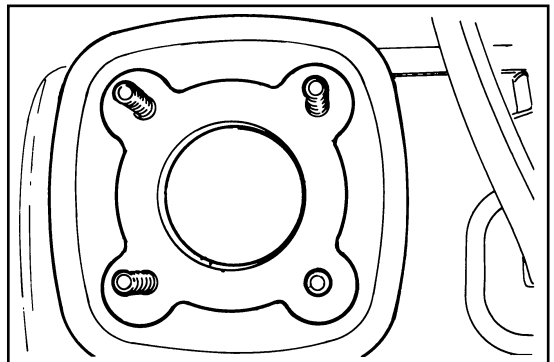


## Cylinder head - Cylinder

**Caution!** Every time the cylinder head is stripped down, replace the two seals and the cylinder head gasket.



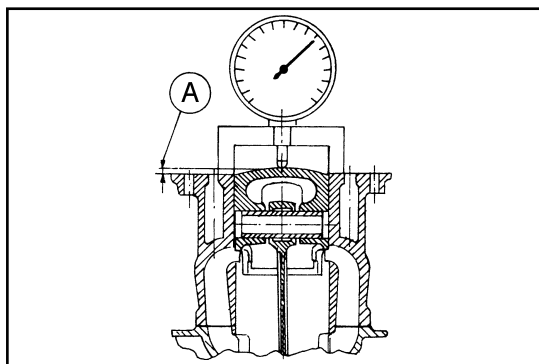
## Cylinder



## Cylinder

### Checking the thickness of the cylinder base gasket

- Assemble the cylinder without using the cylinder base gasket.
- Fit a hundredths comparator on special tool 19.1.20268 and bring the needle to zero on a rectified surface.
- Fit the tool to the upper part of the cylinder and secure it with two nuts to the studs, observing the torque setting of 10-11 N·m, and bring the piston to TDC.
- The thickness of the gasket which is required will vary according to the value observed.
- For this reason 3 gaskets are supplied in the following thicknesses:  
0.75 mm. – 0.5 mm. – 0.4 mm.

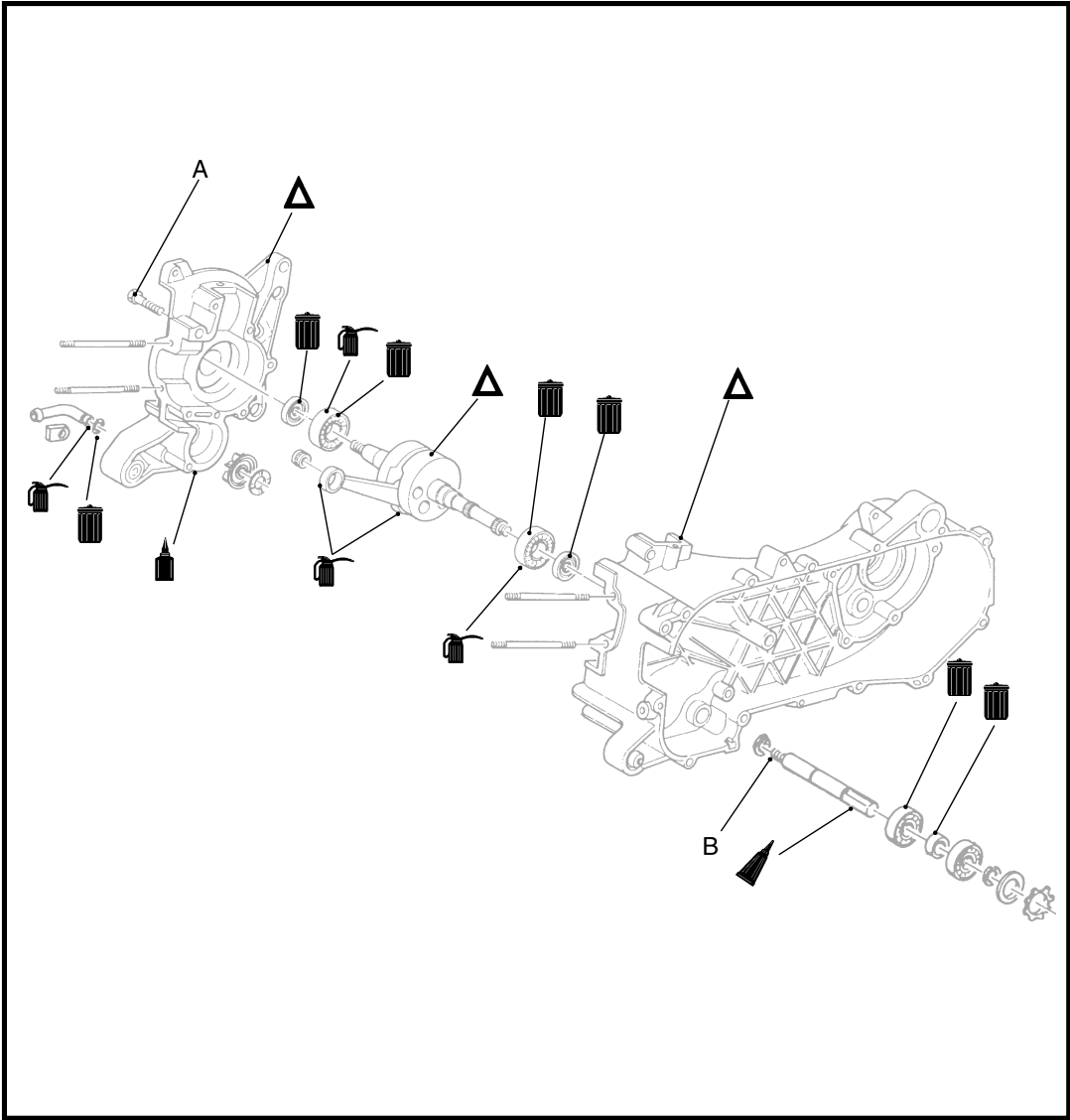


Cylinder head torque setting: 10 ÷ 11 N x m

Special tool: 19.1 20268

VALUE OF "A" (mm)	Thickness of gasket	Reference No.
2,85 ÷ 3,10	0,4	435602
3,10 ÷ 3,25	0,5	289499
3,25 ÷ 3,45	0,75	435603

CRANKCASE HALVES - CRANKSHAFT



LUBRICATE



APPLY THE PRODUCT



CAUTION HANDLE WITH CARE



GREASE



CLEAN WITH CARE



ALWAYS REPLACE

SYMBOL	A	B	C	D	E	F	G	H	I	L	M	N	O	P	Q
QUANTITY	8	1													
TORQUE N.M.	12÷13	4÷5													

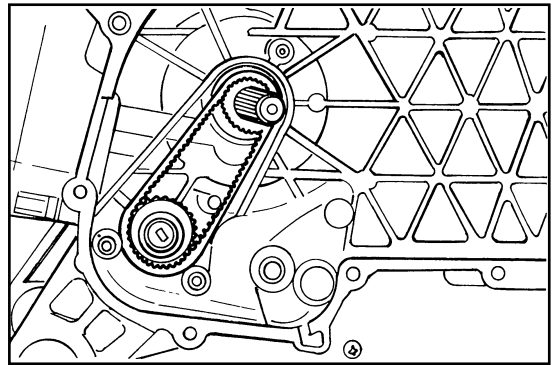


### Automatic mixer drive gearing and belt

- Strip the gearing and belt.
- If it is difficult to remove the mixer gearing use the special tool.

**Caution!** Do not twist the belt

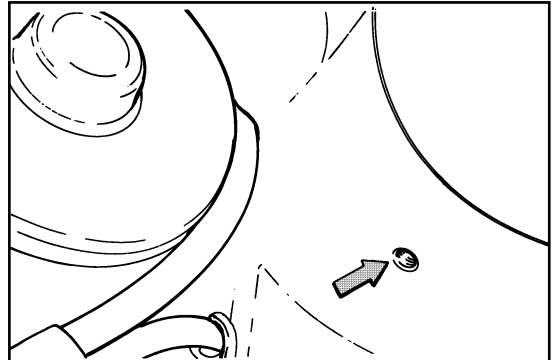
Special tool: 19.1.20170



### Drain hole

(Transmission side crankcase half)

**N.B.** In the event of loss of fluid through the drain hole, carry out a revision of the pump as shown below.

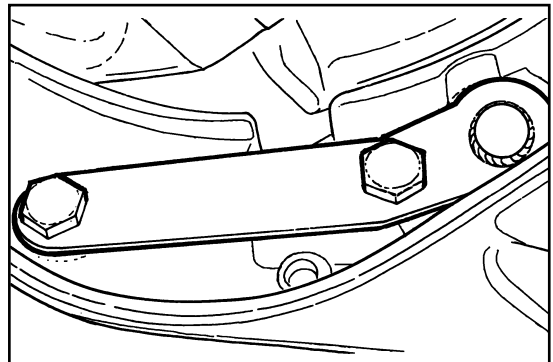


### Replacing the water pump seal in the clutch side crankcase half

- Strip the pick-up and remove the water feed hose to the pump.
- Fit the special tool in the pick-up securing holes.

**Caution!** when re-assembling the pump feed water hose, use a new seal.

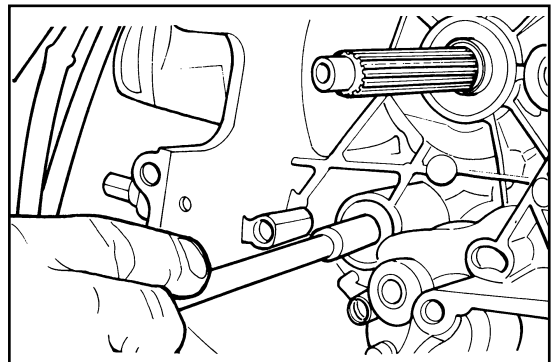
Special tool 19.1.20167



### Unscrew the pump drive shaft and withdraw the unit.

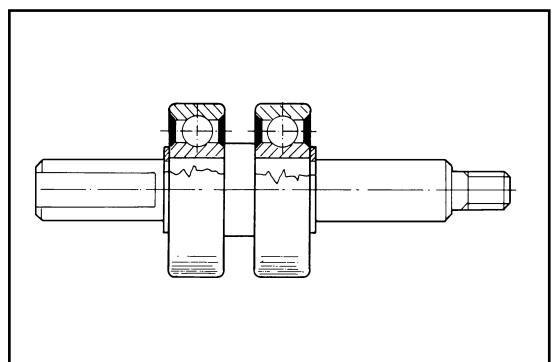
**Caution!** The water pump drive shaft has a left-hand thread.

Special tool: 19.1.20169



### Water pump drive shaft

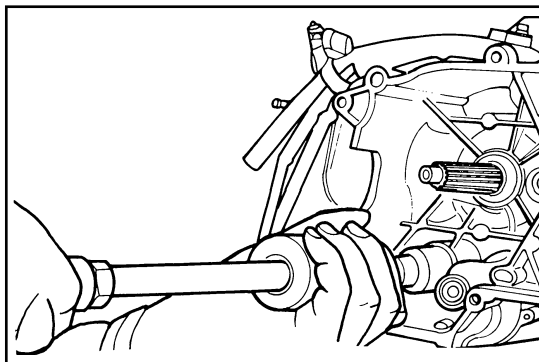
- **Note on spare parts:** The shaft is supplied complete as shown in the figure.



## Disassembling the seal

Common tools

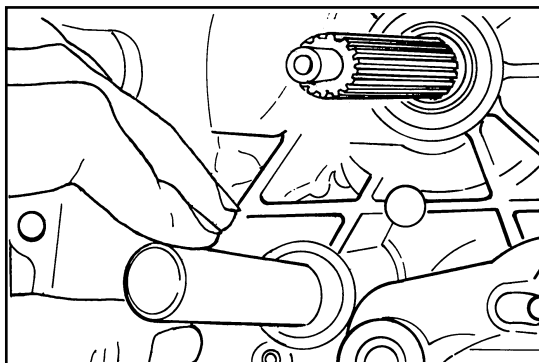
- Frame type ABC 3065 / 8
- Extractor type USAG A / 17 -10



## When assembling, clean the surface scrupulously

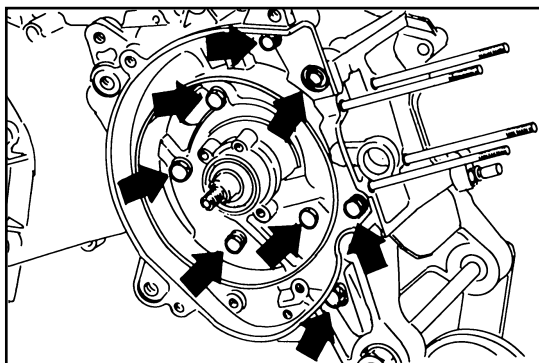
- Lubricate the surface and the seal, and check that the seal is correctly inserted and that the drain hole is not blocked.

Special tool: 19.1.20168



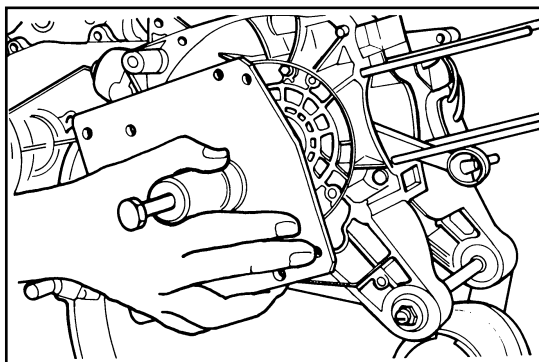
## Remove the joint screws

- Remove the eight crankcase half joint securing screws.



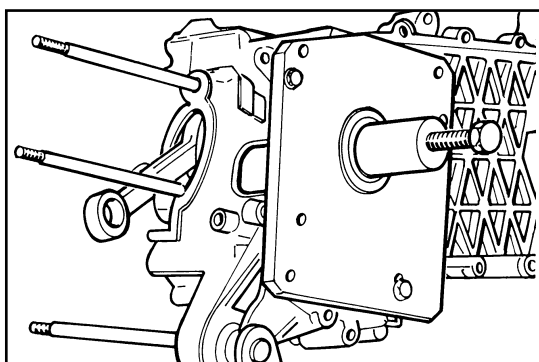
## Separating the crankcase halves

Special tool: 19.1.20163



## Extracting the Crankshaft

Special tool: 19.1.20163



## Crankcase bushings

**N.B.** The same procedure is used to remove the magneto-side main bushing.

**Caution!** In the event that the main bushings were to remain fitted to the crankshaft, use special tool 19.1.14499/7.

Special tool 19.1.21467/6/7

## Main bushings on the crankshaft

- Heat up the bushings to approximately 100°C in an oil bath, and fit them onto the crankshaft; if necessary use a piece of tube to exert pressure on the internal track of the bushing.
- In the event that it is necessary to replace the connecting rod, when assembling, it must be fitted with the lubrication hole (situated on the head of the connecting rod) towards the transmission side.

Base 19.1.20265

## Joining the crankcase halves

- Heat up the transmission side crankcase half around the area where the main bushing is to be fitted.
- Fit the crankshaft.
- Allow the crankcase half to cool.
- Fit the special tool to the transmission side crankcase half and push the crankshaft gently to recover axial play.
- Apply joint sealer Loctite 510 to the mating surfaces.
- As before, heat up the magneto side crankcase half.
- Join the crankcase halves.

Support 19.1.20150

Heat gun 19.1.20151

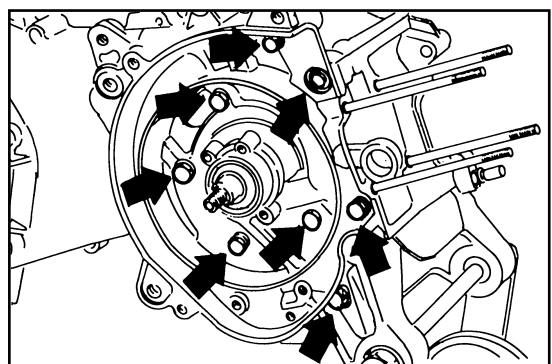
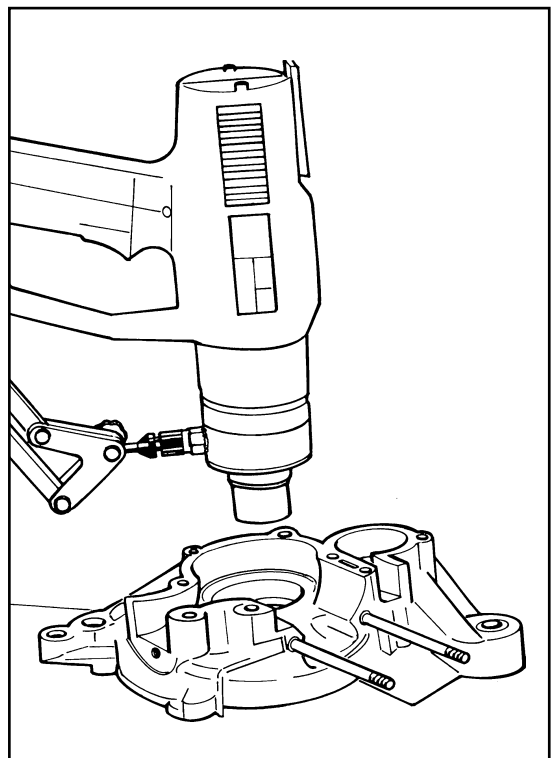
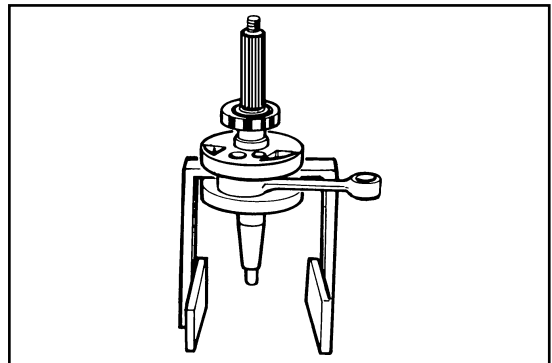
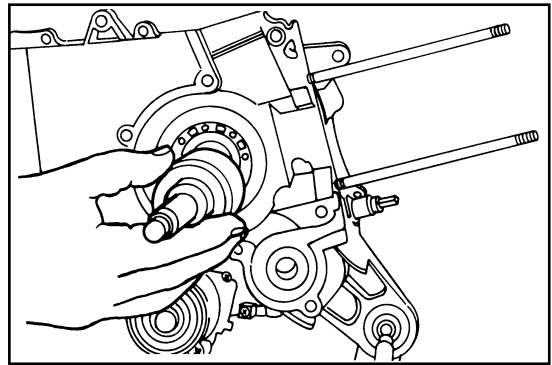
Special tool 19.1.20163

## Closing the crankcase half - Magneto side oil seal

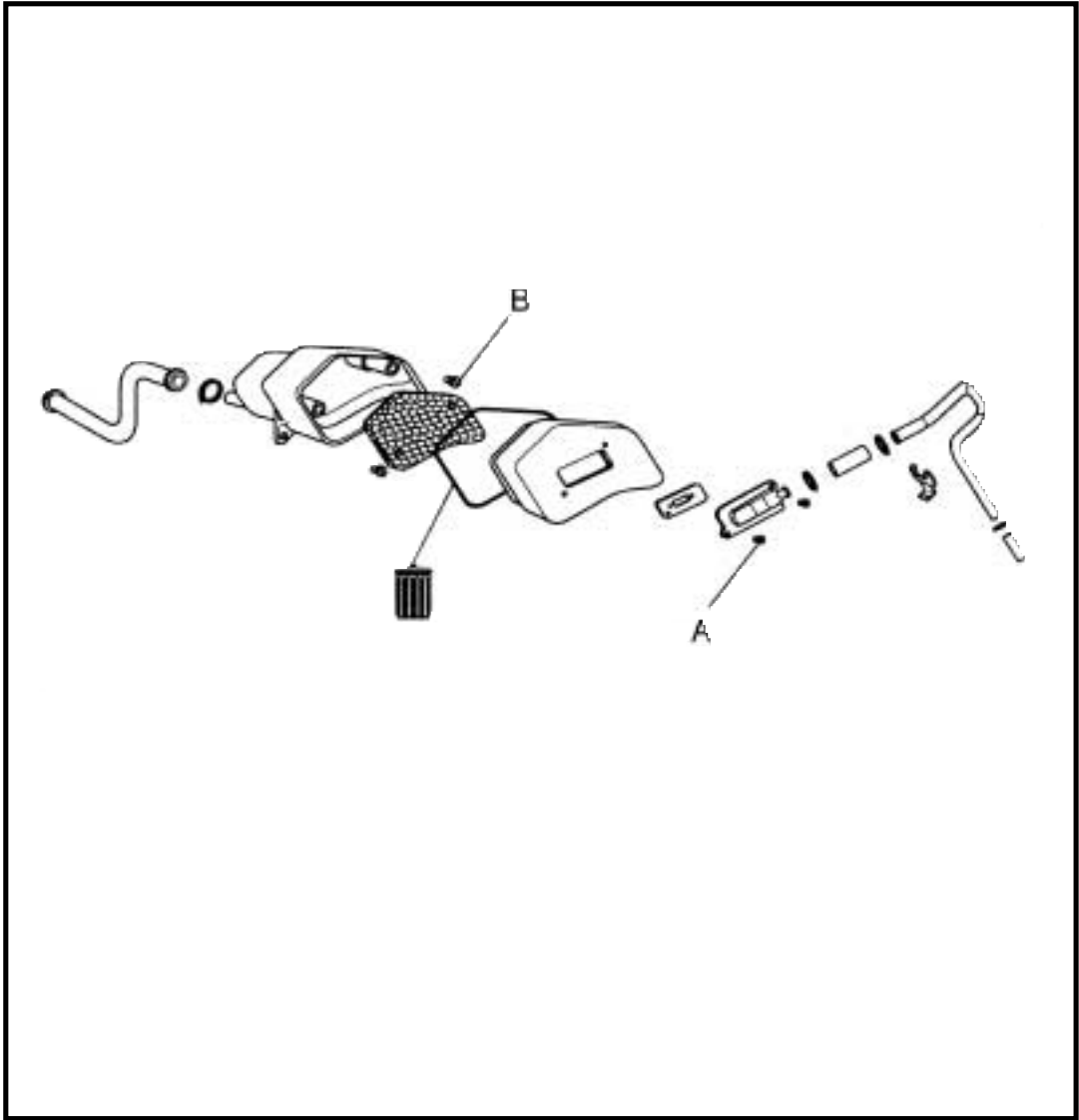
- 8 off securing nuts
- Remove special tool 19.1.20163
- Allow the crankcase to cool, and check that the axial play of the crankshaft is  $0.03 \div 0.09$  mm.
- Use tool 19.1.20340 when fitting the magneto side seal, and tool 19.1.20340 part 2 for the transmission side seal.

Torque setting  $12 \div 13$  N x m

Comparator and comparator holder base 19.1.20335



SECONDARY AIR SYSTEM



LUBRICATE



APPLY THE PRODUCT



CAUTION HANDLE WITH CARE



GREASE



CLEAN WITH CARE



ALWAYS REPLACE

SYMBOL	A	B	C	D	E	F	G	H	I	L	M	N	O	P	Q
QUANTITY	2	2													
TORQUE N.M.															

### Disassembly of Secondary Air System Cover

- To disconnect the metallic tube, indicated in the figure, of the rubber seat on the cover, without unplugging the same tube of the cover.
- Remove screws of cover "SAS" in aluminum.
- Remove the plastic cover, the lamina and the foam.

**Atención** To each assembly to replace the O-Ring lodged in its own lodging in the cover.

### Disassembling the Secondary Air System (SAS) housing

- Remove the two screws securing the SAS housing to the crankcase, loosen the clip from the hose and withdraw the hose without cracking it.

### Checking the SAS reed

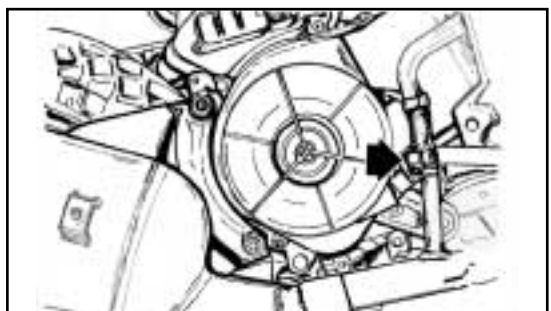
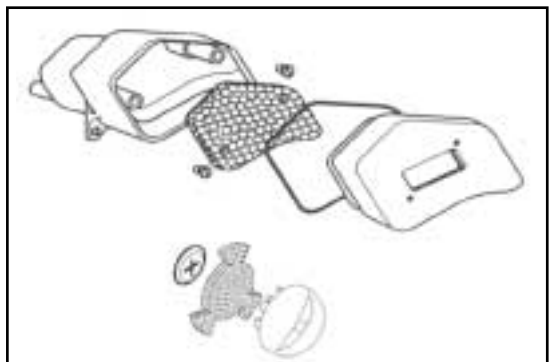
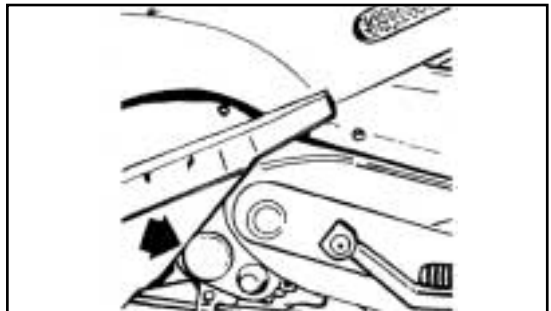
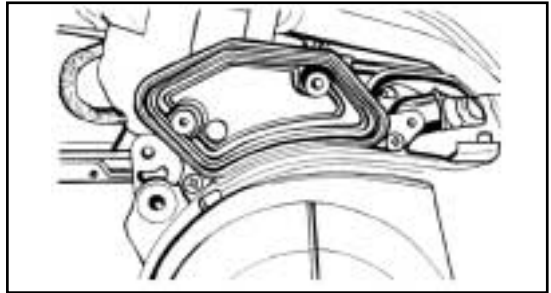
**Caution!** Verify that the steel reed seals hermetically. If it does not seal correctly, it must be replaced.

- In order to check the oil pump, withdraw the rubber cover, levering off by means of a screwdriver.

### Cleaning the filter

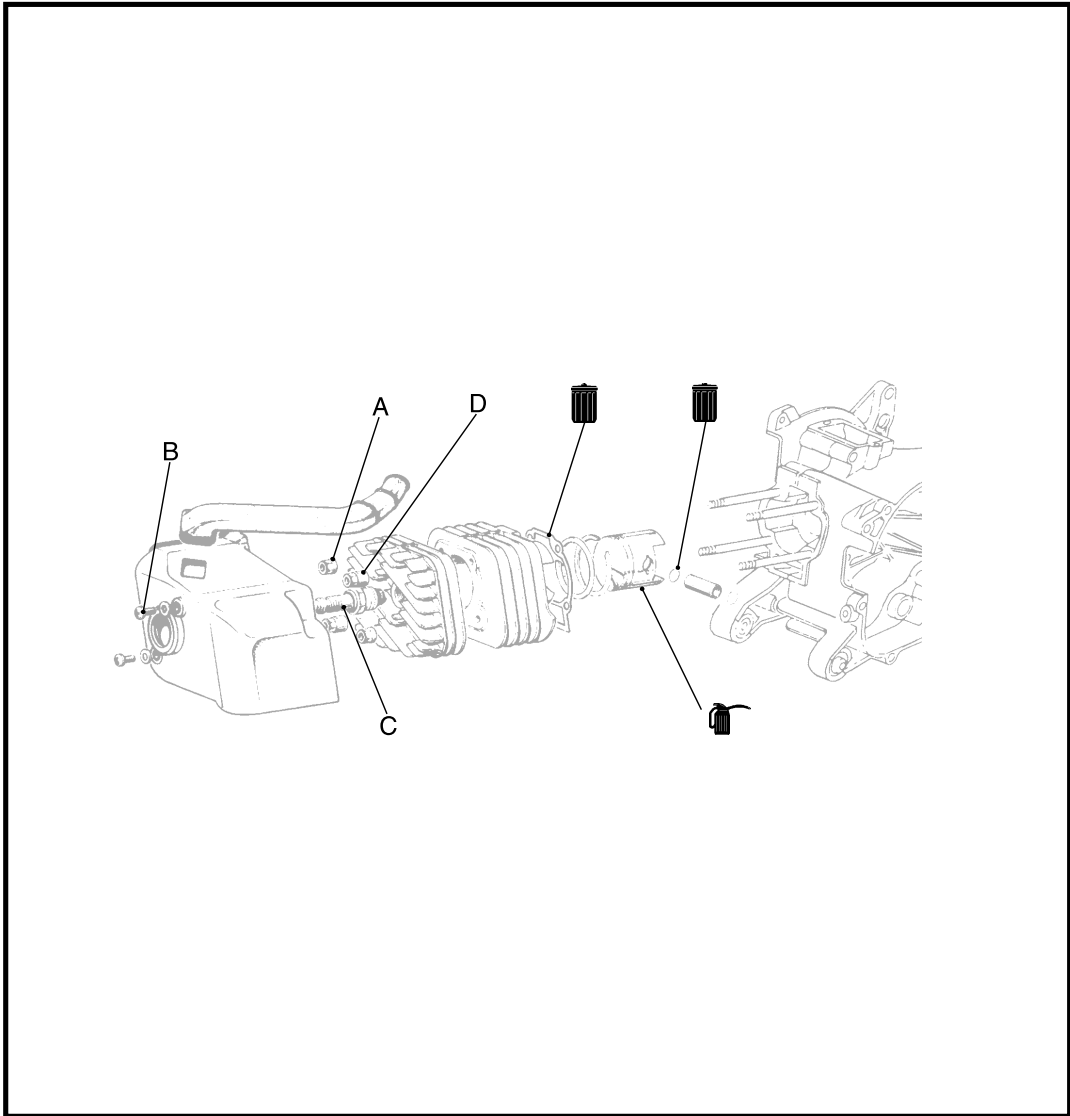
- Wash both filters with soap and water.
- Dry using compressed air before re-installing.

- Remove the securing clamp, and then withdraw the hose from the secondary air filter to the exhaust pipe.



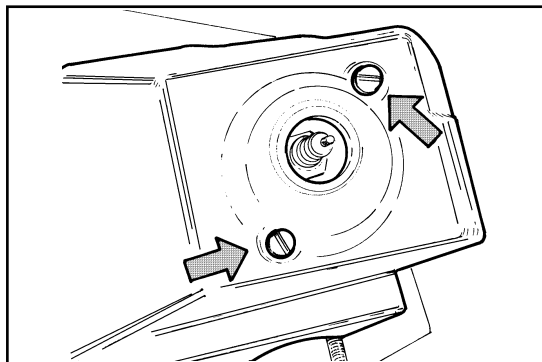
CYLINDER HEAD - CYLINDER - PISTON
-----------------------------------

Models air cooled

[illegible]

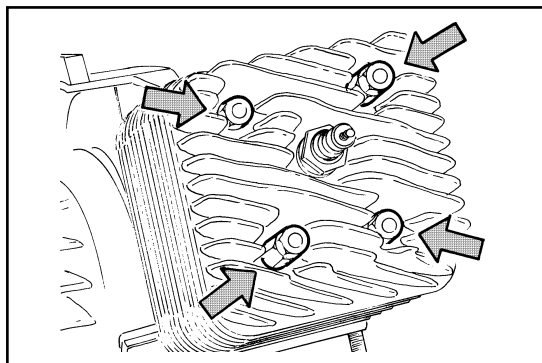
### Cylinder cooling cover

- Withdraw the screws shown in the figure.



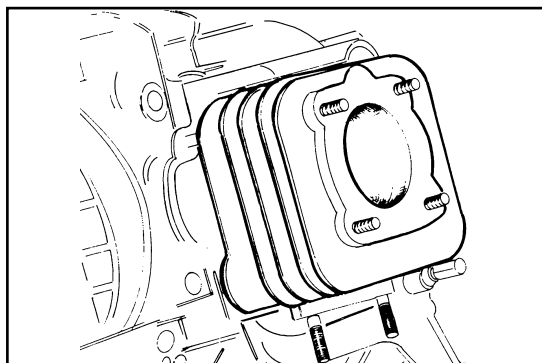
### Cylinder Head

- Remove the 4 nuts indicated in the figure.



### Cylinder

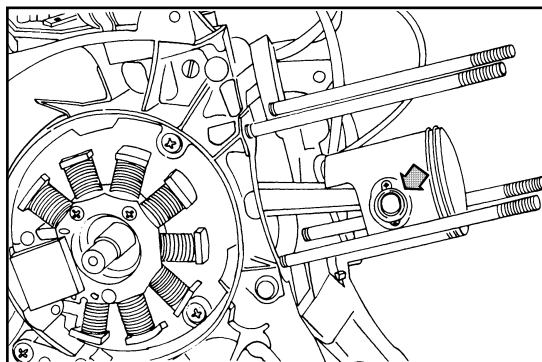
- Exercise great care when withdrawing the cylinder.



### Piston

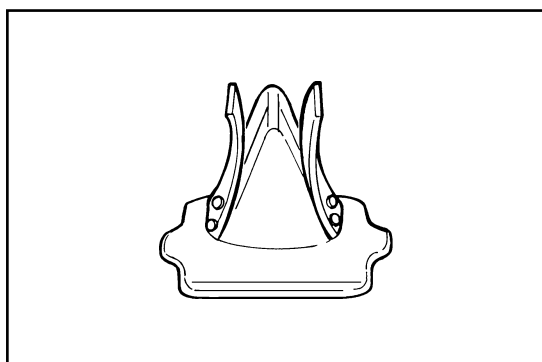
- Remove the spring clips and withdraw the gudgeon pin.

**Caution!** Replace the spring clips securing the gudgeon pin every time the assembly is stripped.



### Reed Valve

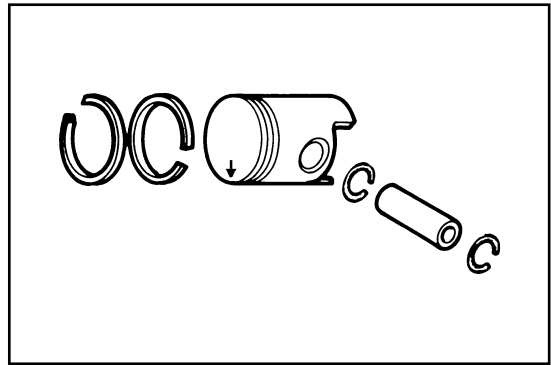
**Caution!** Check that the reed assembly closes correctly; no light should be seen between the reeds and the valve body.



## Piston

**Caution!** Position the arrow stamped on the crown of the piston so that it faces towards the exhaust port.

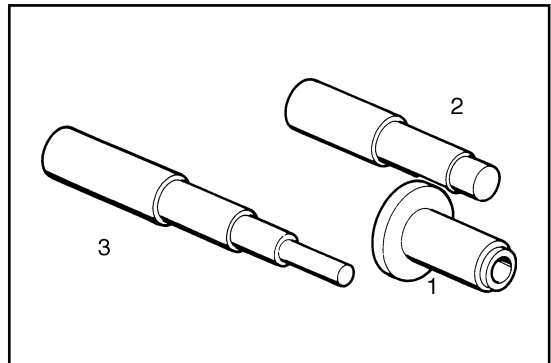
**Caution!** The gudgeon pin spring clips should be fitted into the piston using the special tool.



### Gudgeon Pin spring clips in the piston

- Place the spring clip in part 1, fitting it over the arrow stamped on the tool.
- Push part 2 into part 1 fully and withdraw part 2.
- Fit part 3 into part 1, place the assembly over the spring clip seating area in the piston and push part 3 fully home.

Special tool 19.1.20166



**N.B.** Re-assemble all remaining parts following the stripping procedures in reverse order.

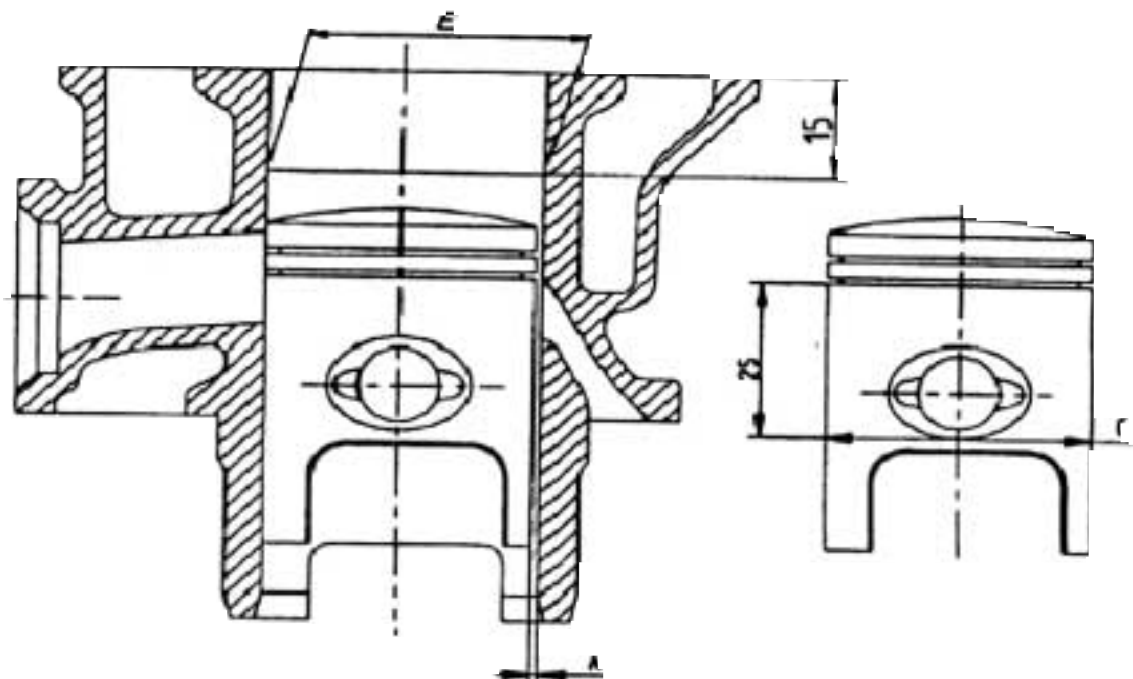
- Use new gudgeon pin spring clips.
- Use a new cylinder base gasket.
- Before re-assembly clean all surfaces scrupulously.
- Use mixing oil Agip City 2T when re-assembling the cylinder and the piston.

Cylinder head nuts 10 ÷ 11 N x m



## VEHICLE SERVICE DATA

### Assembly tolerances



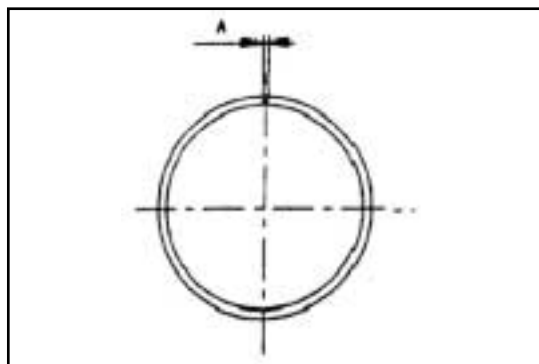
**N.B.** The cylinder diameter should be checked at a level 15mm below the cylinder head mating surface.

**Table of cylinder and piston tolerances**

DESCRIPTION	Dimension	Letter	Fitting tolerances		Assembly tolerance "A"
			Cylinder "E"	Piston "C"	
Cylinder	$\varnothing 40 \begin{matrix} -0,01 \\ +0,018 \end{matrix}$	M	39,990 ÷ 39,997	39,943 ÷ 39,950	0,040
		N	39,997 ÷ 40,004	39,950 ÷ 39,957	
Piston	$\varnothing 40 \begin{matrix} -0,029 \\ +0,057 \end{matrix}$	O	40,004 ÷ 40,011	39,957 ÷ 39,964	
		P	40,011 ÷ 40,018	39,964 ÷ 39,971	
Cylinder 1st Oversize	$\varnothing 40,2 \begin{matrix} -0,01 \\ +0,018 \end{matrix}$	M 1	40,19 ÷ 40,197	40,143 ÷ 40,15	0,054
		N 1	40,197 ÷ 40,204	40,15 ÷ 40,157	
Pistón 1st Oversize	$\varnothing 40,2 \begin{matrix} -0,029 \\ +0,057 \end{matrix}$	O 1	40,204 ÷ 40,211	40,157 ÷ 40,164	
		P 1	40,211 ÷ 40,218	40,164 ÷ 40,171	
Cylinder 2nd Oversize	$\varnothing 40,4 \begin{matrix} -0,01 \\ +0,018 \end{matrix}$	M 2	40,39 ÷ 40,397	40,343 ÷ 40,35	
		N 2	40,397 ÷ 40,404	40,35 ÷ 40,357	
Pistón 2nd Oversize	$\varnothing 40,4 \begin{matrix} -0,029 \\ +0,057 \end{matrix}$	O 2	40,404 ÷ 40,411	40,357 ÷ 40,364	
		P 2	40,411 ÷ 40,418	40,364 ÷ 40,371	

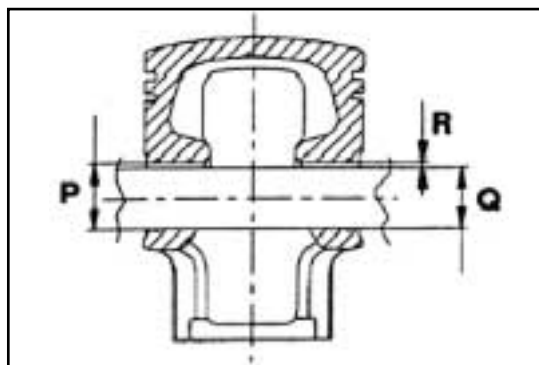
## Piston Rings

- The verification of assembly tolerance should be carried out by inserting the piston ring into the cylinder at 15 ÷ 20 mm from the cylinder head mating surface, and measuring the gap between the opposite ends of the ring using a set of feeler gauges.



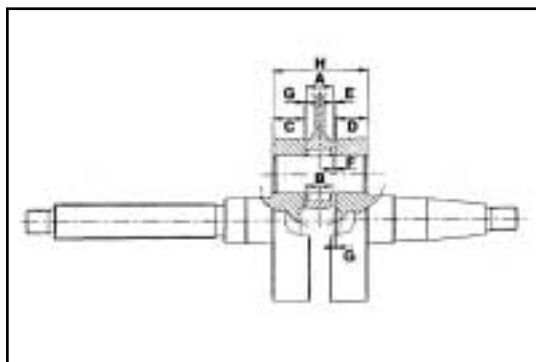
DESCRIPTION	DIAMETER	PLAY	ASSEMBLY TOLERANCE
Piston Ring Std	Ø 40	A	0.10 ÷ 0.25
Piston Ring 1st Oversize	Ø 40.2		
Piston Ring 2nd Oversize	Ø 40.4		

## Checking the Gudgeon Pin



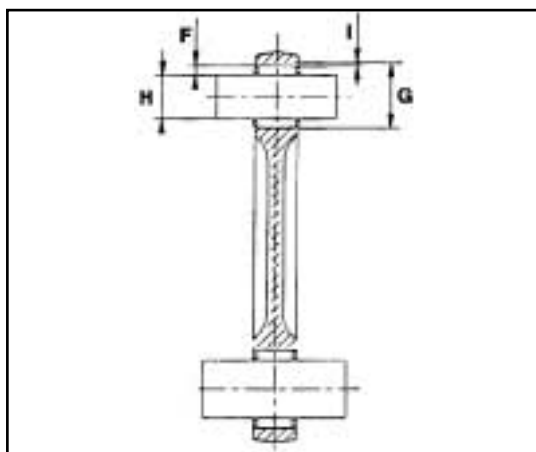
DESCRIPTION	DIAMETER	PLAY	ASSEMBLY TOLERANCE
Piston	$P = \text{Ø } 12 \begin{smallmatrix} + 0,007 \\ - 0,012 \end{smallmatrix}$	R	0,002 ÷ 0,011
Gudgeon Pin	$Q = \text{Ø } 12 \begin{smallmatrix} + 0,005 \\ - 0,001 \end{smallmatrix}$		

## Axial tolerance between crankshaft and connecting rod



DESCRIPTION	DIMENSION	PLAY	ASSEMBLY TOLERANCE
Connecting rod	$A = 11.75^{+0}_{-0.05}$	<b>E</b>	$0.25 \div 0.50$
Stop washer	$G = 0.5^{+0.03}_0$		
Half-shaft transmission side	$C = 13.75^{+0.04}_0$		
Half-shaft magneto side	$D = 13.75^{+0.04}_0$		
Distance tool	$H = 40.64$		
Bearing cage	$B = 11.8^{+0}_{-0.35}$	<b>F</b>	$0.20 \div 0.75$
Stop washer	$G = 0.5^{+0.03}_0$		
Half-shaft transmission side	$C = 13.75^{+0.04}_0$		
Half-shaft magneto side	$D = 13.75^{+0.04}_0$		
Distance tool	$H = 40.64$		

## Connecting rod big end - bearing cage gudgeon pin



CONNECTING ROD BIG END - BEARING CAGE - GUDGEON PIN									
DESCRIPTION	DIMENSIONS	PLAY	ASSEMBLY TOLERANCE	Fitting Categories (in thousandths of mm)					Gudgeon pin
				Con. Rod. big end	Cage				
					CAT	Ø 17 mm	CAT	Ø 2.5 mm	
Connecting Rod	G = Ø 17 + 0,011	I	0.002 ÷ 0.012	1	+11 +7	1 Roja	0 -2	-1 -3	+5
Cage	F = Ø 2.5 0			2	+7 +3	2 Azul	-2 -4	-3 -5	+1
Gidgeon pin	H = Ø 12 + 0,005			3	+3 -1	3 Gris	-4 -6	-5 -7	

## Crankshaft alignment check

- Using the special tool indicated, check the surface of diameters "A" "B" "C" for eccentricity: they should fall within 0.03 mm (maximum limit of reading on comparator dial). Also check eccentricity of diameter "D" for which the maximum permitted reading is 0.02 mm. Where the eccentricity is slightly greater than specifications, true the crankshaft between the counterweights by shim bushing, or by pressing in a screw press fitted with aluminium bushes, as required. In the event that it is impossible to true the shaft, or where eccentricity is excessive, replace the crankshaft.

## Axial assembly tolerance:

- Measure the axial tolerance of the crankshaft in the crankcase, with the engine cold.
- Push and pull the crankshaft from one side, and measure the value using a comparator on the other side.

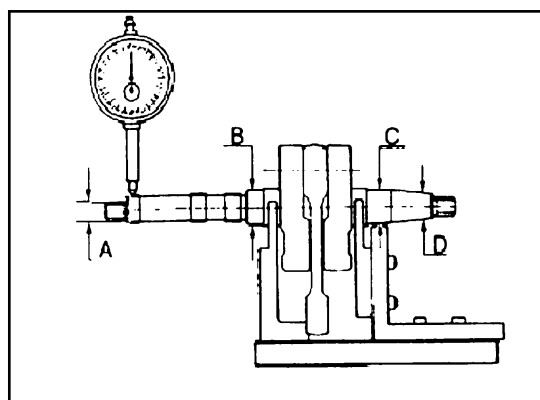
Assembly tolerance under load  $\pm 3$  kg:

0.03 ÷ 0.12 mm

Special tools:

Comparator with magnetic support: 020335Y

Crankshaft alignment tool: 020074Y



## CARBURETTOR

### Adjustment Table

MAKE	CARBURETTOR	MODEL	JET MAXIM	NEEDLE POSITION	JET MINIMUM	EMULSIFIER	IDLE JET	CHOKE JET	FLOAT LEVEL
DELL'ORTO	PHVA 17, 5 ID	GP 1 (E) GP SERIES (E) Atlantis 2002 (E) Atlantis 2002 LC(E)	62	A 22 – 1°	32	209 HA	1 ¾ Turns	50	14,3 ± 0,5
DELL'ORTO	PHVA 17, 5 ID	GP 1 (WVTA) GP SERIE (WVTA) Atlantis 2002 (WVTA) Atlantis 2002 L.C(WVTA)	56	A 22 – 1°	32	209 HA	1 ¾ Turns	50	14,3 ± 0,5

## ELECTRICAL SYSTEM

### Checking the fuel indicator

- The fuel indicator needle operates on the moving magnet principle.
- Check carried out with voltage at 13 V DC.

Marking	1/1	1/2	0
Tolerances	+ 4,5 - 3	-	+ 3 - 4,5
Resistance	10	38	90

### Checking the temperature indicator

- The temperature indicator needle operates on the moving magnet principle.

Value in at the probe	Index Position	Tolerance
82	120° C	+5°C - 0°C
190	80° C	
511	40° C	+5°C - 0°C

### Checking the thermistor

Temperature	Resistance
60° c	600 ÷ 470 Ω
90° c	215 ÷ 175 Ω
120° c	93 ÷ 73 Ω

### Checking the fuel sensor

FUEL SENSOR		
Reserve Indicator	FULL	$A/V - BL/AZ = \infty \pm 10\%$
	EMPTY	$A/V - BL/AZ = 33 \pm 10\%$
Analogue level indicator	FULL	$A/V - BL/RO = 2,7 \Omega \pm 10\%$
	EMPTY	$A/V - BL/RO = 96 \Omega \pm 10\%$

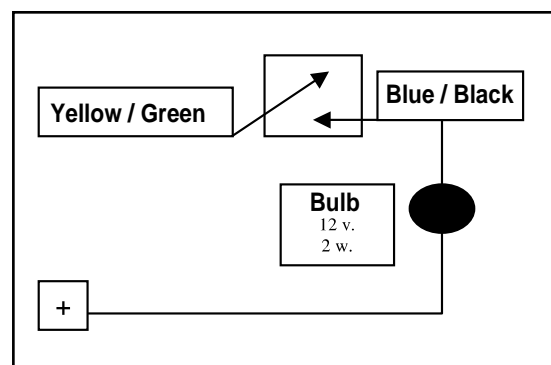
### Checking the oil sensor

#### Check

- Check that the oil sensor pilot light lights up for about 10 seconds and then switches off.

#### Sensor

- After carrying out the check function, the light goes out for approximately 1 minute. Then it should light up again.
- Once the device is active, it should not deactivate until power is shut off.



## Checking the voltage regulator

- Breakdown of the voltage regulator may lead, depending on the type of breakdown, to the following types of failure:

- 1) Burnt-out bulbs in the lighting circuit.
- 2) Lighting circuit fails to operate.
- 3) Excessive battery charging.
- 4) Battery fails to charge.
- 5) Direction indicators fail to operate.

### FAILURE 1

- Replace the regulator as it is certainly ineffective.

### FAILURE 2

- a) Check for proper distribution of current from the stator: disconnect from the regulator terminal and insert alternating current tester 020331Y between the blue/green terminal and the black cable, and check that the voltage distributed at 3,000 rpm falls between 25 ÷ 30 VAC (Fig. 1)
- b) If there is no abnormality, replace the regulator.
- c) If correct operation is impossible even with a new regulator, carry out a check of the connections in the wiring circuit.

### FAILURE 3

- After checking that there are no short-circuits from the wiring circuit to ground with the engine stopped and with the regulator terminal disconnected, replace the regulator, because it is certainly ineffective; also replace the protection fuse.
- After replacement, measure charging current and voltage at the battery terminals (Fig. 2).

### FAILURE 4

- a) Connect an ammeter between the stator (blue cable) and the battery and check using tester 020331Y that the current distributed at 3,000 rpm and with the battery at 13 V is approximately 1.5 ÷ 2 Amps (Fig. 3).

If measured values are lower than specified, replace the regulator.

- b) If replacing the regulator does not re-establish correct operation, set the tester 020031Y for alternating current voltage, connect between the regulator yellow cable terminal and the black cable (Fig.4) and check that the voltage distributed by the generator at 3,000 rpm falls between 26-30V (this test should be carried out with the battery disconnected).

**N.B.** Before carrying out any checks on the regulator and the related wiring, it is recommended that a continuity check is run between the black cable and ground.

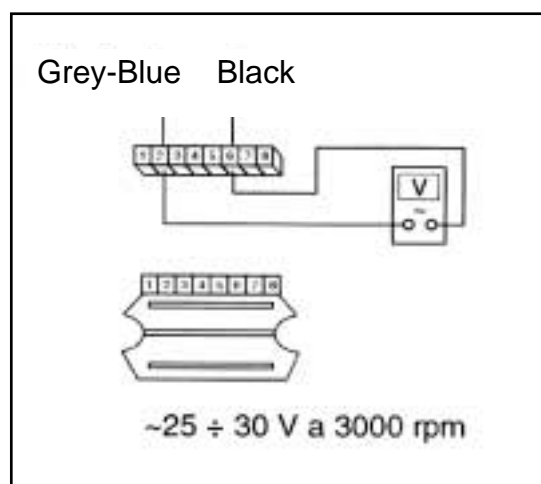


Fig. 1

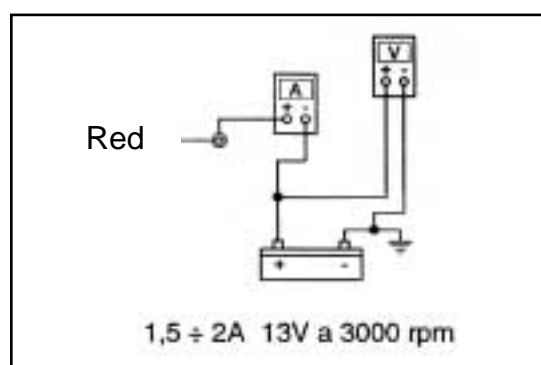


Fig. 2

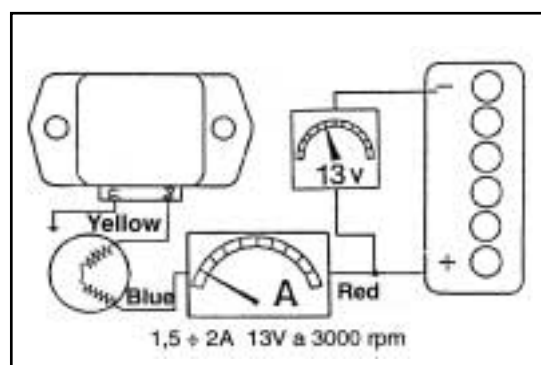


Fig. 3

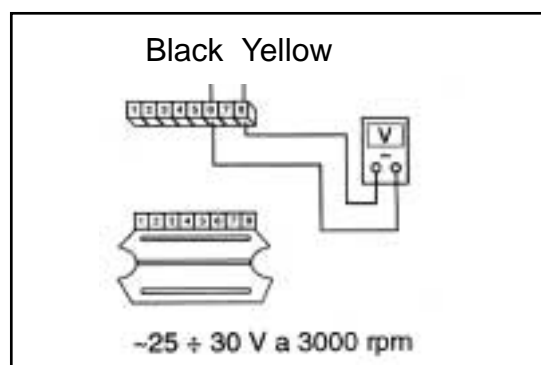


Fig. 4

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## ECHEMA ELECTRIQUE ATLANTIS

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D	F	UK	I	E	
Orange	Orange	Orange	Arancio	Naranja	O
Grün	Vert	Green	Verde	Verde	GR
Schwarz	Noir	Black	Nero	Negro	B
Braun	Marron	Brown	Marrone	Marron	BR
WeiB	Blanc	White	Bianco	Blanco	W
Grau	Gris	Gray	Grigio	Gris	G
Gelb	Jaune	Yellow	Giallo	Amarillo	Y
Blau	Blau	Blue	Azzurro	Azul	BL
Rot	Rouge	Red	Rosso	Rojo	R
Rosa	Rosa	Pink	Rosa	Rosa	P
Violett	Violet	Violet	Viola	Violeta	VI

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## EHEMA ELECTRIQUE GP1

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D	F	UK	I	E	
Orange	Orange	Orange	Arancio	Naranja	O
Grün	Vert	Green	Verde	Verde	GR
Schwarz	Noir	Black	Nero	Negro	B
Braun	Marron	Brown	Marrone	Marron	BR
WeiB	Blanc	White	Bianco	Blanco	W
Grau	Gris	Gray	Grigio	Gris	G
Gelb	Jaune	Yellow	Giallo	Amarillo	Y
Blau	Blau	Blue	Azzurro	Azul	BL
Rot	Rouge	Red	Rosso	Rojo	R
Rosa	Rosa	Pink	Rosa	Rosa	P
Violett	Violet	Violet	Viola	Violeta	VI



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<b>ECHEMA ELECTRIQUE GP1 (USA)</b>
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D	F	UK	I	E	
Orange	Orange	Orange	Arancio	Naranja	O
Grün	Vert	Green	Verde	Verde	GR
Schwarz	Noir	Black	Nero	Negro	B
Braun	Marron	Brown	Marrone	Marron	BR
WeiB	Blanc	White	Bianco	Blanco	W
Grau	Gris	Gray	Grigio	Gris	G
Gelb	Jaune	Yellow	Giallo	Amarillo	Y
Blau	Blau	Blue	Azzurro	Azul	BL
Rot	Rouge	Red	Rosso	Rojo	R
Rosa	Rosa	Pink	Rosa	Rosa	P
Violett	Violet	Violet	Viola	Violeta	VI

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## ECHEMA ELECTRIQUE GP Series

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D	F	UK	I	E	
Orange	Orange	Orange	Arancio	Naranja	O
Grün	Vert	Green	Verde	Verde	GR
Schwarz	Noir	Black	Nero	Negro	B
Braun	Marron	Brown	Marrone	Marron	BR
WeiB	Blanc	White	Bianco	Blanco	W
Grau	Gris	Gray	Grigio	Gris	G
Gelb	Jaune	Yellow	Giallo	Amarillo	Y
Blau	Blau	Blue	Azzurro	Azul	BL
Rot	Rouge	Red	Rosso	Rojo	R
Rosa	Rosa	Pink	Rosa	Rosa	P
Violett	Violet	Violet	Viola	Violeta	VI