Repair manual - Type 348



Okt 91

Engine removal

Clean machine and drain off engine oil, disconnect battery. Dismount exhaust manifold, remove chain cover and chain, disconnect clutch and decompressor control cable, remove carburetor, disconnect oil suction pipe at frame, disconnect oil return line and venting hose from engine, disconnect generator cables, remove engine mounting on cylinder head and engine housing, and lift engine out of frame.

Disassembly of engine

- Remove electric Starter.
- Set up the cleaned engine on trestle (277917) and secure with two fixing bolts (1).
- Remove gearshift and kickstart levers.



Timing belt drive



Remove timing belt cover (4 Allen screws M6). Remove plug screw M8 for crankshaft locking, then set piston to top dead centre so that the locking bolt groove can be seen through the crankcase aperture.

Fit crankshaft locking screw (2) (241965) by hand until it engages firmly in the crankshaft recess (move the crankshaft gently to and fro by means of a wrench 24).

Unscrew fixing screw M8 of timing pulley with socket wrench 13.

Unscrew nut M8 of tensioning pulley with socket wrench 13 and take off tension roller (1) with spacer. Mark sense of rotation of timing belt and take it off. Screw off guide pulley (2).





Remove timing pulley from camshaft with puller and remove thrust washer. Unscrew spacer nut M6 with socket wrench 10 and take off washer. Remove the 2 Allenhead screws M6 with wrench 5. Remove timing belt housing with guide roller.



Cylinder and cylinder head

Unscrew the 2 collar-nuts M8 (1) with ring wrench 13 and remove from below.

Unscrew the 3 collar-nuts M10 (2) and one cap nut M10 with ring wrench 15.







Take off complete cylinder head, levering it off the dowel pins with 2 screwdrivers.

Attention: Don't place levers between the joint faces.

Remove cylinder head gasket and O-ring with O-ring support. Remove the cylinder, taking care to prevent piston falling against crankcase.



Cover crankcase opening with a cloth and prise out the 2 piston pin circlips using a narrow-blade screwdriver. Press out piston pin with guide bolt, tapping the guide bolt carefully if necessary.

Caution:

Support piston by hand to avoid bending the connecting rod.

Remove cylinder base gasket.



Ignition system

Turn engine on trestle magneto side upwards. Unscrew 4 Allen screws M6 with wrench 5 and take off cable clamp and ignition cover.

Unscrew hex. nut M18 with wrench 27 and remove lockwasher.

Screw tool (277807) fully onto the flywheel thread by screwing in the extractor bolt with wrench 22. Remove Woodruff key from crankshaft.





Unscrew 2 Taptite screws M6 with socket wrench 10, lift trigger cable off the cable clamp. Take off trigger coil (1) and the rubber plug.

Attention: The cable clamp (2) need not be removed unless it is also necessary to remove the crankshaft.



Sprocket

Engage 1st gear, bend back tab-washer and unscrew hex. nut M20 with wrench 30. Remove tab-washer and sprocket.



Clutch and primary drive

Turn engine on trestle so that clutch side faces upwards. Unscrew hex. nut M16 of timing pulley with wrench 24 and take off lock washer.

Use puller (276445) to remove timing pulley.





Remove circlip (1) from kickstart shaft and O-ring (2) from shift shaft.

Remove the 4 Allen screws M5 and the electric starter drive cover. Lift thrust washer (3) and idler wheel (4) and thrust washer beneath.





Unscrew 12 Allen screws M6 of clutch cover using wrench 5.

Lift off clutch cover using 2 large screwdrivers applied at the lugs (1) provided. Don't lever between sealing surfaces.

Caution:

When taking off the clutch cover, check that the thrust washers of the helical gear (2) for revolution counter drive are not stuck to the clutch cover.

Remove 6 Allen screws M5 of clutch thrust plate with wrench 8 crosswise.

Remove hexagon screws lock washers, clutch thrust plate and clutch springs



Bend back tab washer on clutch shaft.

Place clutch hub locking tool (1) (277887) on clutch hub and unscrew hex. nut M18 with wrench 27. Remove tab washer and locking tool.

Lift off clutch drum complete with hub and all plates.







Remove 2 needle cages, bearing sleeve and thrust washer. Remove oil pump gear, extract drive peg (1) and remove thrust washer (2) if fitted.

Remove idler gear (3), helical gear (4) with thrust washers and starter gear (5) and thrust washer underneath. Remove Woodruff key and O-ring from crankshaft.

Unscrew hex. nut M14 with wrench 22 from balance shaft, take off spring washer and freewheel gear, withdraw the 2 needle bearings.



Remove snapring (1) and sprag clutch (2)





Extract balancer gear with puller (1) (277085). Use the snap-ring previously removed to retain the puller.

Pull drive gear and balancer drive gear from crankshaft. Remove Woodruff keys from crankshaft and balance shaft.

Unscrew 4 counter-sunk screws M5 with screwdriver and remove retaining plate (2) for transmission bearings and the shims underneath for mainshaft and clutch shaft.





Oil sump cover

Remove crankshaft locking screw (1).

Remove 6 Allen head screws M6 of oil sump cover with wrench 5 and take off oil sump cover (2), with magnetic plug (3), oil screen, gasket and 2 O-rings.

[Trestle fixing screws (4)]



Separating crankcase halves

Turn engine on trestle so that ignition side faces upwards.

Unscrew the 10 Allen-head screws M6 and spring washers with wrench 5.

Turn engine on trestle again so that clutch side faces upwards. Screw puller plate (276435) with 6 screws M6x25 onto the clutchside half of the crankcase. Remove both fixing screws (4) from trestle. Screw the 4 screws into puller plate by hand.

With wrench 22 tighten the 4 screws uniformly until left crankcase half can be raised. Take it off and remove puller plate. Take care of the shims on crankshaft and balance shaft. Take oil separater foam blocks out of right and left crankcase halves



Transmission

Mount right crankcase half on trestle with 2 fixing screws and spacers.

Remove the 2 shift fork spindles (6) and the 3 shift forks (8).

Hook index lever with screwdriver into projecting lug in crankcase half. Disengage gearshift pawl (9) from the shift drum (5) and remove shift drum.

Attention

On model without neutral gear indicator, there is a steel plate in the crankcase under the shift drum which might remain in position. Remove this plate.

Pull out shift shaft assy (7) with roller index lever, index spring and the shim placed below.





Extract balance shaft from the ball bearing. Turn crankcase half on trestle into vertical position. Hold mainshaft and clutch shaft by hand and with a mallet knock gently from outside onto main shaft. Then you can withdraw the two shafts with gears out of their bearings.

- 1. balance shaft
- 2. crankshaft
- 3. clutch shaft
- 4. main shaft
- 5. shift drum
- 6. shift fork spindle
- 7. shift shaft
- 8. shift fork
- 9. pawl

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Extract balance shaft from the ball bearing. Turn crankcase half on trestle into vertical position. Hold mainshaft and clutch shaft by hand and with a mallet knock gently from outside onto main shaft. Then you can withdraw the two shafts with gears out of their bearings.



Crankshaft

Turn right crankcase half on trestle ignition side upwards. Insert puller ring (2) into puller plate assy (3) and screw pull-in spindle (1) into puller ring.

Fix puller plate with 4 screws M6x25 on magneto side crankcase surface. Screw pull-in spindle into puller ring, screw pull-in spindle onto crankshaft and screw out the pull-in ring anticlockwise until bolt (4) can be inserted in the holes of the pull-in ring.

Hold pull-in spindle by hand in this position and turn pull-in ring anticlockwise by means of the bolt until crankshaft is pressed out of the crankcase half.

It is advisable to warm the crankcase half evenly to 60-80° C (if possible in oven).

When the crankshaft has been pressed out of the bearing seat, hold the crankshaft by hand and screw pull-in spindle off the crankshaft.

Attention

When pulling out crankshaft, take care not to damage the oil seal!

Remove puller plate from crankcase and unscrew pull-in spindle from pull-in ring.



Oil pump and oil filter cover

Unscrew the 3 Allen-head screws M6 with wrench 5 and take off oil filter cover together with O-ring.

Lift oil filter element (1) with screwdriver and unscrew pressure retaining valve (2).





Turn right crankcase half on trestle so that inside faces upwards, unscrew the 3 Allenhead screws M6, remove lock washers and take off oil pump assy.



Individual component maintenance

Crankcase

All ball-bearings must be cleaned with gasoline or kerosene only, not with degreasing or cold cleaning agent. Heat crankcase to 60—80° C, place crankcase half on a flat surface (having removed dowel pins) to avoid damage to the sealing surfaces.

Right crankcase half

To remove the clutch shaft ballbearing, extract it with puller (1) (276360). For the balance shaft bearing (2) use the split dowel 276375. Crankshaft bearing and mainshaft bearing are tapped from outside towards the inside with an appropriate punch, after removal of the oil seals.

Clean crankcase half.

Attention:

Check all bearing seats and sealing surfaces. Clean oil bores (for lubrication of crankshaft bearing, gearbox (3)) with compressed air and check for free passage.





Left crankcase half

Disassembly of kick start shaft is only necessary if the kickstart shaft, ratchet gear or spring has to be replaced.

Mount the lever on the kickstarter shaft, hold it firmly and unscrew the stop screw (1) from crankcase, bottom side. Relieve spring. Remove kickstart lever, ratchet gear and kickstart spring. Remove snap ring from kickstart shaft and washer from crankcase inside, pull kickstart shaft and washer out. Pull out dowel pin with pliers, place crankcase half on flat wooden board and knock out ball bearing from outside towards inside, tapping on the outer ring with an appropriate tool.

Clean crankcase half with gasoline or kerosene.





Measuring crankshaft axial play

If crankcase or crankshaft are to be replaced, crankshaft axial play must be measured. Both crankcase halves are placed with the inside facing upwards, and a depth gauge is used to measure the distance from the crankcase joint surfaces to the base of the bearing seats.

Add both measurements.

Push distance ring onto crankshaft magneto side, then measure the width over crankblades (including distance ring) and add the width of the 2 crankshaft bearings.



The axial play should be 0,1—0,3 mm. If it is more, place shims as required, but only on the clutch side.

Measuring balance shaft axial play

If crankcase or balance shaft has to be replaced, measure the axial play of the balance shaft.

With a depth gauge measure the distance between the sealing surface on both crankcase halves and the bottom of the bearing seat.

Add the 2 dimensions.

Add the dimensions measured on balance shaft and the width of the 2 balance shaft bearings.

The axial play should be 0,1—0,2 mm and is achieved by adding shims on the clutch side.



Crankshaft

Check the following points on the crankshaft:

- Check crankshaft between centres for eccentricity (1) max. 0,03 mm
- Radial play in con rod bearing (2) max. 0,05 mm
- Con rod axial play 0,62—0,83 mm
- Piston pin bore in con rod (3) max. play 0,08 mm
- Grooves (4) for Woodruff keys.
- Clean oil slinger (5) inside from deposits.
- Check taper surface (6).
- Check bearing seats and surface for oil seals



When pressing out the crankshaft, the ball bearing may remain on the crankshaft. If this happens, pull it off with bearing puller 876296, ring halves 977472 and ring 977492.



Balance shaft

Check the 2 bearing seats (1) for wear and concentricity. Also check the Woodruff key groove. Check balance shaft between centres of a lathe or similar device for truth (0,03 mm).

Attention:

Bearing seats (1) are a sliding fit.



Transmission

Fix mainshaft/clutch shaft in a vice (use protective jaws). Remove gears, and observe the following points:

- a. Check needle bearings for wear.
- b. Check bearing seats on main and clutch shaft.
- c. Check gear dogs for wear.
- d. Check tooth flanks of all gears for wear.
- e. Check tooth profile of clutch shaft and mainshaft as well as their matching gears for wear.
- f. Check all gears for easy movement along their splines.

Carefully clean all components, replacing any damaged items. Gears should always be replaced in pairs. Check clutch shaft and mainshaft for truth between centers.



Main shaft assembly

Fix mainshaft in vice with threaded end downwards and lubricate the split bearing (10 mm wide), fit it on shaft, slide 2nd gear freewheel, collar downwards, over the bearing, and fix with thrust-washer and snap-ring (sharp edge facing upwards).

Push on 5th gear with dogs downwards. Mount snap-ring with sharp edge downwards, slide on thrust-washer, fit and lubricate the split bearing (13 mm wide), slide on 3rd gear free wheel with dogs upwards, and fix with thrust-washer and snap-ring (sharp edge upwards).

Mount 4th gear wheel with fivedog side upwards, mount thrust-



washer and lubricated needle-cage, slide over 1st gear free wheel with collar upwards and mount thrustwasher.



Clutch shaft assembly

Fix clutch shaft with threaded end downwards in vice, fit and lubricate the 12 mm split bearing, then slide on 4th gear free wheel with dogs upwards, and fix with thrust-washer and snap-ring (sharp edge upwards).

Mount 3rd gear wheel with five dogs upwards, fit thrust-washer, slide on lubricated needle bearing, and slide on 5th gear free wheel with dogs downwards. Finally fit 2nd gear fixed-wheel.

Gear shift mechanism

- a. Check shift forks for wear on their blades and engagement pins
- b. Check tracks on shift drum for wear and make sure that index profile disk is securely fastened to the shift drum body.
- c. The index lever roller must turn freely.
- d. Check pawl for wear.
- e. Check index, pawl and hairpin Springs carefully for cracks and tension.
- f. Check shiftshaft for eccentricity.
- g. O-ring should always be replaced.





Gear shift drum

- 1. Peg for neutral gear indication
- 2. Isolating shim (only for engines with neutral gear indicator) has to be checked.
- 3. Neutral position of index disk (between 1st and 2nd gear).

Oil pump Disassembly of the oil pump

By gently tapping the pump shaft with a maltet, separate pump cover and suction pump housing.

Remove oil pump cover, take out inner and outer pressure rotor, withdraw pin, take out pump shaft with inner suction rotor and pin, take

out outer suction rotor.

Clean parts and check for wear.

Axial clearance between outer suction and pressure rotors and the pump housing surfaces should be max. 0,1 mm.

All surfaces of the oilpump housings must be checked for perfect flatness.

Max. wear: 0,2 mm.

Clean suction pump housing and pressure pump housing with compressed air and check oil bores for free passage.

For oil pump assembly, see page 49



Clutch

Check clutch drum, needle bearing, all clutch plates, thrust bearing and clutch hub for wear.

Check threads M5 in inner pressure plate.

All clutch plates must be completely flat.

The clutch springs must have a free length of $34,1 \pm 0,4$ mm.

Never change individual springs, always replace complete sets of 6.

Check the clutch hub splines (1) and corresponding slots in the clutch drum (2) for wear.

Check teeth and tooth flanks of primary drive gears (3) for wear.

Attention:

The primary drive gears are a matched pair, and must not be replaced individually.



Clutch assembly

Place clutch disks on clutch hub (E), starting with steel disk (A) (1,5 mm thick) and then alternately 7 friction disks (B) (3 mm thick) and 6 steel disks (A) (1,5 mm). Then fit the inner pressure plate (C).

The disk package (7 friction plates + 7 steel plates) is 31,5 mm thick. The wear limit is 30 mm. The clutch springs have a free length of $34,1\pm0,4$ mm. If necessary, exchange the springs (D) but only as complete set.



Clutch release

Remove screw M5 (1) with screwdriver, remove leaf-spring (2) and tension-spring (3), and check release plate (4) at ball races for wear, replacing if necessary. Reassemble.



Revolution counter drive

Unscrew banjo bolt, pull the cable drive shaft (1) out of the worm gear (2) until the pin (3) can be seen. Hold the worm gear down.

Check disassembled parts for wear and replace if necessary.

Reassemble in reverse sequence.

Replace the cable drive shaft oil seal.



Kick start drive

Check the teeth (A) of Starter gear (4) and ratchet gear (5) and the tooth flanks (B) of the Starter gear, as well as the bronze bushing.

If replacement is necessary, exchange the 2 gears only in pairs



Electric starter drive

Check tooth flanks of balance drive (= balance gear (1) and counter-gear (2)), of the free-wheel gear and of the idle wheel.

Check sprag clutch (3) and the 2 needle bearings.

Exchange balance gear (1) and counter-gear (2) only in pairs



Piston

Remove combustion residues from piston crown, and check carefully for cracks and signs of seizure. Replace if necessary.

Clean piston ring grooves and oil drain bores and blast with compressed air.

The piston ring groove / ring clearance must not exceed 0,2 mm max.

Piston/cylinder clearance:

types 348—506:	0,04—0,06 mm
type 560:	0,05—0,07 mm

To determine piston/cylinder clearance, take piston diameter as stamped on piston top (A).

Wear limit of piston:

Difference between maximum skirt dimension and cylinder diameter must not be greater than 0,17 mm.

Wear limit of piston pin bore clearance: 0,08 mm.





Piston rings

Check piston rings for clean working surfaces. Ring end gap (B) 0,3—0,5 mm, max. permissible ring end gap 1,0 mm.

Replace piston rings if necessary.

The chrome plated compression ring (1) must be placed in top ring groove, the tapered ring (2) in the middle, and the double oil control ring (3) in the bottom groove.

All rings must be fitted with the marked side upwards — this is particularly important in case of the middle (tapered) ring (2)



Piston ring end gap

Insert piston ring squarely into cylinder, using the bare piston. The end gap **B** should not exceed 1,0 mm and can be checked with a feeler gauge. If the end gap is greater, check piston and cylinder for wear. If piston and cylinder wear are within tolerance limits, replace the piston rings only.

Cylinder

Check cylinder working surfaces for wear. If cylinder diameter exceeds nominal diameter by more than max. 0,15 mm it must be rebored. Ensure that sealing surfaces are clean.

Ovality and taper max. talerance 0,03 mm.

Cylinder diameter for 1st oversize

Type 348	Туре 506	Type 560	for
79,76—79,77	89,25—89,26	94,25—94,26	'red' piston
79,77—79,78	89,26—89,27	94,26—94,27	'green' piston

The sealing surface of cylinder, cylinder head side, must be plane. 1f necessary, the sealing surface can be reworked up to max. 0,3 mm

Dismantling of cylinder head

Carefully remove combustion residues with blunt tool. Clamp cylinder head at the 2 studs M8 in the vice with protective jaws.



Remove the 2 valve covers (1) and slacken the 4 valve adjusting screws (2).



Unscrew the 2 plug screws (3) with wrench 8.
Remove both rocker spindles (A) with a screw M10 (B). Take out both rocker arms with one thrust-washer and one spring-washer each. To remove the camshaft, take off lock ring (1) and remove spacer (2).





After screwing in camshaft extractor (3) (276400), hold hex. schrew M8 (4) and take out camshaft by carefully turning hexagon nut (5) clockwise.

Caution:

When the camshaft is extracted, the shim behind the oil seal sometimes drops into the lock-ring groove thus hindering complete removal of camshaft.

Remedy:

Take off extractor, remove oil seal and take out shim. Now the camshaft can be taken out with the extractor easily.



Remove cylinder head from vice, take out studs and remove dowel pins.

With valve spring push tool (A) (276470) and valve spring pliers or similar, compress the valve spring and remove the split cotters (B). Relieve valve spring, take out valve spring compression jig, valve spring and valve.



Caution:

Before valves are removed, they should be numbered. This Operation must be carried out on all 4 valves. Clean cylinder head and components with gasoline or kerosene.

Clean oil duct (C) carefully with compressed air and check for free passage.

Check cylinder head sealing surface. If necessary, dress on appropriate plate. Rework must not exceed 0,2 mm.



The following components must be checked:

Valve guides (1): max. internal diameter 7,25 mm, valve guide with larger internal diameter must be replaced.

Valve seats: Ensure clean sealing seat, grind if necessary.

Sealing seat width:

intake valve (2) max. 1,5 mm

exhaust valve (3) max. 2,0 mm

Valve: Check valve head for wear and eccentricity, grind or replace if necessary (max. admissible eccentricity 0,03 mm at valve head).

Camshaft (4): Check both lobes and bearing seats for wear, fit new camshaft if necessary.

Rocker arm (5): Check rocker arm roller (6) for easy movement, and if there is noticeable radial play, the rocker arm must be replaced. Check flat surface of adjusting screw (7) for wear.

Needle cage (8): Check needles and cage for damage, replace if necessary.

Check ballbearing and joint surfaces of cylinder head. It is advisable to fit new valve stem seals and to replace the camshaft oil seal.





Replacing of valve guides

The part of the valve guide projecting into the camshaft chamber must be knocked off. The valve guide breaks easily at the groove (A) and the guide can be driven out with a suitable punch towards combustion chamber without damaging the valve guide bore.

When pressing in the new valve guides, use slide paste Molycote GN. After installation, the guides must be reamed to 7,06—7,13 mm dia.

Then check valve seats. If necessary, re-cut them.

Removal and replacement of valve guides should only be done when the cylinder head ist cold.

Replacement of needle bearing

Warm cylinder head to approx. 60—80° C. Drive needle bearing (1) with suitable punch from outside inwards. Coat the bottom of new needle bearing with R. T. V. sealing compound and press with a suitable punch into cylinder head pre-heated to 60—80° C.

Attention:

Don't press on bottom but only against shoulder of needle bearing.



Assembly of cylinder head

Fit spring seat washers over valve guides, press new valve stem seals onto the 4 valve guides. Insert lubricated valve, fit valve spring and valve spring retainer, press together with valve spring pliers and valve spring compressing jig and fit both split cotters. Check valves for tightness (leak tester). Heat cylinder head to 60-80° C, lubricate needle bearing, insert camshaft and install cold ballbearing with appropriate punch (1). Slide Oring onto camshaft, fit shim, press in new greased oil seal with assembly punch (276310) and fix with locking ring. Fit spacer and check camshaft for easy movement and axial play.





Install rocker arm, bevel washer, shim and rocker arm pin (with screw M10 (2)).

Caution:

Spring washers on screw plug side. Turn and tighten both screw plugs with wrench 8.

M8x119 stud with long thread on exhaust side, M8x94 stud with long thread on intake side, screwed into cylinder head.

- **A**. = camshaft
- B. = rocker arm roller
- C. = valve
- **D**. = adjustment screw
- E. = oil tray
- **F**. = valve seal

Adjustment of valve clearance

The cam position to adjust the valves for one pair of valves (2 intake, 2 exhaust) is shown on the illustration. The valve clearance is measured between the valve stem and the adjusting screw.

Valve clearance cold: Intake: 0,05 mm, exhaust: 0,05 mm.

Check O-rings in valve covers, replace if necessary.

For engines with valve lifter: Mount valve cover with decompressor shaft on exhaust side.

Attention:

After fitting the valve cover, check for free movement of decompressor lever.



Check upper and lower timing pulleys, timing belt, tooth profiles, mating surface for oil seal, and timing belt. Replace if necessary. Ensure that the belt guide washers of the lower pulley (3) are tigthly fastened to the pulley body.

punch mark by factory
 groove for type 348
 groove for type 504, 506, 550 and 560



Ignition system and generator

The ROTAX-4-stroke engine is equipped with a breakerless C. D. ignition system (Nippondenso) with electronic ignition timing and 12V 190W 3-phase A. C. generator.

The main advantages compared with breaker units are: Greater reliability, because there are no wearing parts such as breaker or lubricating felt. The ignition system with external trigger is unaffected by moisture and dust and is completely maintenance-free.

The ignition system must not be tested with conventional test equipment, because this will cause serious damage. The individual coils should be tested with an ohmmeter.

Ignition timing can only be checked with a stroboscope while engine is running.

Caution: Never disconnect the spark plug cable when the engine is running — serious damage to the ignition system will result. To test the spark, the H. T. cable must always have free passage to earth, with the air gap not exceeding 7 mm.



- Stator
 Magneto flywheel
 External trigger
 Ignition coil
 Amplifier Box

Table of measuring values for testing ignition system and generator

Designation	Wire colours	Resistance Ohm
Trigger coil for low speed (external transmitted)	black-blue	120—180
Trigger coil for high speed (internal transmitter)	black-pink	12—20
Generator — charging coil for low speed	black-brown	230—350
Charging coil for high speed	brown-red	4—6
Lighting coils	white-orange white-green green-orange	0,6—0,9 0,54—0,8 0,8—1,6
Ignition coil Primary winding	black-orange (earth)	0,85
Ignition coil Secondary winding	ignition cable-black (earth)	8—16 kOhm
Ignition key/short-circuit switch Ignition 'on'	black/white -blue	no passage
Ignition key/short-circuit switch Ignition 'off'	black/white -blue	0

Checking regulator-rectifier

Measuring instrument: DC voltmeter, measuring range ~ 20 V Battery voltage between + and — should be measured at 3000 rpm engine speed.

- a. With headlight switched on, the voltage should be between 12,5 and 14,5 V.
- b. With lights switched off, the voltage should be bet ween 13 and 14,5 V.

If the measured voltages are less than this, the regulator-rectifier is defective.

Table of measuring values for testing amplifier box

		— Measuring instrument					$\Delta \Box_{\chi}$ Measuring range 1		
		red	black- white	brown	blue	pink	orange	black	= Passage (positive reading
	red		×	×	×	×	×	×	but value unimportant)
+ Measuring instrument	black- white			×	×	×	×	×	= No passage (no reading)
	brown	Δ	×						= ohm-meter may show
	blue	X	X	X		×	×	X	
	pink	×	×	×	×		×	Δ	
	orange	Δ	X	X	×	X		×	
	black	Δ	X	×					

Measuring procedure

Remove amplifier box. Resistance is measured between two cables. Carefully note polarity on the measuring instrument!

e.g.:

Connect brown cable from the amplifier box with + cable of the ohm-meter. Connect blue cable from the amplifier box with — cable of the ohm-meter. As shown on the table, the ohm-meter must show a reading (indicator moves).

Altogether 42 possible measuring points must be checked

Electric starter

After dismantling check the following parts:

1. Armature

Check for out of round, inspect visually, if necessary rework finely and separate the commutator segments by cutting (see ill. <u>A</u>). The insulation should be 0,5 mm deeper than the segments. Check armature at 220 Volt with test lamp between commutator and iron core for connection to earth. If the lamp lights up, the armature has to be replaced. Check armature windings at 2 to 4 Volts and Ammeter (measuring range 60 A) for open circuit (see ill. <u>B</u>).

If the Ammeter indicates big differences between the single segments, the armature has to be replaced. Check the splines.

- 2. Ball bearing: Replace if necessary.
- 3. Bearing bushing:

If worn, replace rotor support assy.

- 4. Carbon brushes: Must be able to move freely. Replace any which are too short.
- 5. Starter housing

Check starter coil at 220 Volts with test lamp between connection of windings and housing for mass connection. If test lamp lights up, the windings are burned out, so replace starter housing.

- 6. Needle bearing: Replace if necessary.
- 7. O-rings and oil seals should be replaced.







Engine assembly

Heat right crankcase half to 80—100° C and fix on trestle with screws and spacers. Install new crankshaft and mainshaft oil seals using assembly jigs 276310 and 277861 respectively. Sealing lips must face inwards. Fit cold ballbearings on crankshaft, balance shaft, clutch shaft and mainshaft with appropriate assembly jigs

Installing the crankshaft

If the crankcase half is still sufficiently warm, the crankshaft can be inserted by hand. Otherwise the crankshaft must be pulled in with the crankshaft pull-in tool as follows:

Turn right crankcase half on trestle so that ignition side faces upwards. Mount puller bell (1) on crankcase half. Screw puller ring (2) onto pullin spindle (3) until the crankshaft inserted from underneath can be screwed into the pull-in spindle.

Caution:

Don't forget spacer 35,2x50x4 on crankshaft and take care not to damage oil seal. Hold crankshaft in this position and turn pull-in ring by hand clockwise until the crankshaft is drawn into position. Hold pull-in spindle by hand, insert handle (4) into pull-in ring and turn handle clockwise until the crankshaft is fully seated in the bearing.



Caution:

Take care not to trap the connection rod against the crankcase faces as the crankshaft is drawn into position, otherwise it may be bent.

Unscrew pull-in spindle from crankshaft and remove pull-in bell. Turn crankcase half so that joint surface faces upwards again.

Assembly of oil pump

When replacing the oil seals make sure that they are fitted with lips inwards on pressure-pump housing and on pump cover. Seal mating surfaces of the oilpump using a thin film of 'Loctite 574'. Caution:

Do not use excess sealant, particles could block oil passages. <u>Recommended procedure:</u>

Put clean cardboard on a flat surface, coat with thin film of sealing compound and spread out using a straightedge. This gives a sealing film. Press suction pump and pressure pump housings onto cardboard (see drawing) and thus transfer the sealing film.

Place paper gasket between suction pump housing and crankcase. Don't use Loctite 574 at this point.

- Suction pump housing
 Pump shaft
 Suction inner rotor

- 4. Suction outer rotor
- 5. Pressure pump housing
- 6. Pressure inner rotor
- 7. Pressure outer rotor
- 8. Pump cover
- 9. Gasket



Install suction pump housing in right crankcase half, fit suction outer rotor, pump shaft with pin and suction inner rotor in suction pump housing. Fit guide sleeve (1) on pump shaft and fit pressure pump housing. Insert both dowel pins 4x28,5 in pump housing. Fit pin in pump shaft, mount pressure outer rotor and pressure inner rotor in pressure pump housing, and fit pump cover.

Caution:

Always use guide sleeve (1).

Fit pump assy with Allen head screws M6 with spring-washers and test by turning several times by hand.





Gear-box assembly

Mount guide sleeve (2) on mainshaft, insert mainshaft and clutch shaft together in crankcase half, by light taps with a mallet. Apply slide paste (e. g. Loctite Antiseize) on bearing seats to prevent fretting corrosion.

Assembly of gear shift mechanism

Place index spring in crankcase half, togetherwith gear shift shaft, index lever with bend facing downwards and thrust-washer. Suspend index spring in index lever and fix in crankcase nose (A). Press pawl (1) outwards and insert shift drum (2). Tap gently on gear shift shaft so that index lever (3) engages in operating position.



On models without neutral indicator, insert a washer 12,5x21,5x2 under the shift drum.

Place distance sleeve and washer on shift shaft, hook hairpin spring (4), place O-ring (5) in groove of shift shaft and grease shift shaft.

Engage shift fork for 2nd gear and shift fork for 1st/3rd gear in gears of mainshaft and shift drum. Engage shift fork for 4th/5th gear in gear of clutch shaft and shift drum. Slide in both guide pins.



Checking of gear shift mechanism

Clutch shaft, mainshaft, gear shift shaft, guide pins and shift drum must all be pressed fully into position. Fit gear shift lever on shift shaft and shift all 5 gears. When this is done, select, none of the 3 gear shift forks must be under pressure (see ill. <u>A</u>).

Turn shift shaft to left and right until stop. In this position, the shift pawl (1) must have some play which should be equal in both directions.

If not, check shift shaft, shift pawl and shift drum and replace defective parts.





Balance shaft

Fit balance shaft (1) in right crankcase half and fit shims (2) as required on balancing shaft. Apply slide paste (e. g. Loctite Antiseize) on bearing seat to prevent fretting corrosion.



Crankcase assembly

Fit starter shaft in left crankcase half. Install large and small dowel pins in right crankcase half. Fit shims on crankshaft if necessary. Apply 'Loctite Antiseize' on bearing seats. Unscrew 2 fixing screws with spacers from trestle. Heat left crankcase half to 60—80° C, fit crankshaft and balance shaft ballbearings



in crankcase with appropriate jig. Coat sealing surfaces of right crankcase half with 'Loctite 574' flange sealing compound. Place large oil separator (3) in right crankcase half, and small oil separator in left crankcase half, according to shape, avoid trapping between the sealing surfaces. Fit left crankcase half, if necessary tapping gently with a mallet on engine mounting points (do not tap on sealing surfaces!).

Fit crankcase with fixing screws on assembly trestle. Turn crankcase so that ignition side faces upwards. Connect crankcase naives with 10 Allen screws and spring-washers (see



Turn crankcase on trestle again to clutch side. Fit ball-bearings for mainshaft and clutch shaft in crankcase using an appropriate punch. The crankcase should still be warm.

Check that all shafts turn easily, tapping gently on bearing inner races if necessary.



3. = M6x70



Knock ballbearings of clutch shaft and mainshaft firmly into position using an appropriate punch. Use shims (A) as required for clearance between clutch shaft and mainshaft (clearance 0,1—0,2 mm). Fit retaining plate, coat 4 countersunk screws M5 with 'Loctite 221', screw in and tighten.

Caution:

Shims must not be displaced. If necessary keep them in position with grease.



Kickstarter

Turn release screw (1) into crankcase by about 4 turns. Slide kickstarter spring over starter shaft and hook into hole of crankcase. Slide ratchet gear (2) onto starter shaft with ratchet teeth outwards, and hook in kickstarter spring. Engage ratchet gear over starter shaft splines (3) so that points A + B (see drawing) are aligned.

Hold ratchet gear in this position, and with kickstarter lever fitted turn the starter shaft clockwise until the stop screw can be fully installed, thus locking the ratchet gear (see illustration).

Tighten stop screw (75 Nm).





A. = recess in spline of Starter shaftB. = stop-edge of ratchet gear



Ratchet gear stop

Electric starter drive, Primary drive

Place Woodruff keys in crankshaft and balance shaft. Lock crankshaft with crankshaft locking screw (1). This screw has to engage firmly in the groove in crankshaft. Screw in only by hand.

Fit balancer drive (= counter-gear (2) with balancer gear (3)) so that marks (4) of the two gears correspond.

Insert sprag clutch (5) with the rounded shoulder towards outside (wide L-shaped guide surface towards inside).

Put a drop of Loctite 648 into the keyway of balancer gear (3), insert lubricated bushing, then the two needle bearings, and lubricate.





Secure sprag clutch with snap-ring.

Push free-wheel gear by turning movement onto balance shaft. Place spring washer and secure hex. nut M14x1,5 (wrench 22) of balance shaft with Loctite 221 and tighten to 75 Nm.

Attention:

When turning the free-wheel gear clockwise, it has to be locked by the sprag clutch but must be completely free to turn anticlockwise.

The free-wheel gear must have an axial play of 0,2 mm. Install drive gear (6) on crankshaft, intermediate gear (7) on mainshaft, thrust washer on starter shaft and starter gear (8)



with tooth section inwards. Check the two gears for easy

movement. Fit helical gear (9) and thrust washers (10) on starter shaft.

Axial play of helical gear 0,2 mm. If the free-play of kickstart lever is too much. check this axial play. Slide thrust washer on pump shaft, place pin (11) in shaft and fit pump gear with shoulder inwards.

Clutch

Slide thrust-washer 20,2x35x3 over clutch shaft, coat shaft with 'Loctite Antiseize', install bushing and lubricated needle-cages. Slide on clutch drum and thrustwasher 20,2x35x3, fit preassembled set of clutch plates in clutch drum. To facilitate assembly screw 2 hex. screws M5 into pressure plate. Shift gear so that by turning the mainshaft the clutch hub and clutch shaft splines engage.

Caution:

Clutch shaft splines must project by about 1 mm from clutch hub.



Using clutch hub locking tool (277887), place tab-washer, secure hex. nut M18x1,5 with 'Loctite 648' and tighten to 120 Nm. Slacken crankshaft locking screw, turn crankshaft and check all gears for easy movement. Lock crankshaft again. Bend uptab-washer and remove clutch hub locking tool. Install the 6 clutch springs, fit thrust-plate with thrust-bearing outwards and tighten crosswise with 6 hex. screws M5x25 and spring washers. Insert 2 dowel pins in crankcase.



Fitting the clutch cover

Check oil seals of crankshaft and Starter shaft, fitting new seals if necessary with assembly jigs (276322, 276330 resp.) (sealing lips towards inside). Mount revolution counter drive (see page **32** illustration. Fit circlip on starter shaft and O-ring on shift shaft.

- 1. sealing ring 6,2 x 8,9 x 1
- **2**. M6 x 35
- **3**. M6 x 40
- **4**. M6 x 30

Clutch adjustment

Unscrew the 2 plastic plugs (5), loosen lock-nut 11 (6) with wrench (7). Turn adjustment screw M 8 (8) fully inwards, then slacken by 1/2 turn, finaliy tighten lock-nut (6) again.

The lever (9) for clutch cable must have approx. 6 mm free-play.

Tighten plugs again.

From engine no. 194.203 the plugs (5) are fitted with O-ring 18-1,5.







Assembly of idler gear

Place thrust washer over journal and coat with 'Loctite Antiseize', fit idler gear (1) and check backlash. Fit thrust washer (2).

Lubricate gear.

The idler gear must turn freely clockwise, but must lock when turned counter-clockwise.

Check axial play of idler gear (should be 0,2 mm).

Place O-ring in starter drive cover and fix with 4 Allen head screws M5x16.

On engines without electric starter, the starter aperture has a plain cover (3)

plain cover (3) Fitting the oil sump cover







Fitting the oil filter

Turn engine so that ignition side faces upwards. Check sealing surface of pressure retaining valve (6), replace if necessary. Install assembled pressure-retaining valve. Lubricate O-ring of oil filter element and fit it with O-ring side inwards. Fit oil filter cover together with O-ring with 3 Allen-head screws. (7) = connection for oil pressure gauge.

Fitting of sprocket

Degrease splines of mainshaft and sprocket, coat with 'Loctite 221' and fit sprocket with shoulder facing inwards. Mainshaft splines (8) must project by about 1 mm. Fit tab washer, and install the hex. nut M20x1,5 (recessed side inwards) using 'Loctite 221'. Tightening torque 100 Nrn. Bend up tab-washer.



Installation of ignition system

Fix cable of external trigger coil (1) with cable clamp and Taptite screw M4. Fit Woodruff key 4x5 in crankshaft. Degrease tapers of crankshaft and flywheel, coat with 'Loctite 221'. Install flywheel on crankshaft, fit spring-washer, secure hex. nut M18x1,5 with 'Loctite 221' and tighten to 100 Nm. Slacken crankshaft locking screw so that crankshaft can be turned.

Place feeler gauge (3) between external trigger coil (1) and trigger pin (2).

Fit external trigger coil with 2 Taptite screws M6. Set transmitter gap to 0,35 mm.



If the stator has been unscrewed from the magneto cover, secure the 2 Allen screws M6 with 'Loctite 221' when refitting. Mount 2 dowel pins. Coat sealing surface with Silicon RTV sealing compound, fit magneto cover and tighten with Allen-head screws M6. Close ignition inspection opening with PVC-plug.

Fitting cylinder components

Insert 2 dowel pins in cylinder flange of crankcase, and install cylinder base gasket. Lock crankshaft at top dead centre.

Caution:

Keep oil bore at right-hand rear stud bolt (4) clean.

Lubricate piston pin bore, fit piston on connecting rod, and install piston pin (1) with guide tool (2). The arrow on the piston crown must point forwards. (Note that the (arger valve pocket is on the intake



side). Cover crankcase opening with a cloth. Fix piston pin with new circlips (see illustration).





Remove cloth covering crankcase. Lubricate piston, turn piston ring gap 120° to each other, put piston ring clamp (3) over piston and slide lubricated cylinder over piston until piston ring clamp can be removed.

Remove piston ring clamp and fit cylinder on dowel pins. Insert 2 dowels (1) on cylinder top, fit cylinder head gasket (2), place O-ring (3) with O-ring retainer (4) in recess of cylinder head gasket and mount complete cylinder head. Fasten cylinder head with 3 collar-nuts M10 (5), 1 cap-nut M10 (6) at 35 Nm and 2 collarnuts M8 (7) at 20 Nm. Position of cap-nut, in direction of travel, rear, right hand side.



Attention:

Only when the engine is cold, tighten cylinder head nuts crosswise. Re-torque after first 500 km/300 miles.





Valve train

Fit O-ring, timing pulley (1) and spring-washer on crankshaft, secure hex. nut M16x1,5 with 'Loctite 221' and tighten to 100 Nm. Coat timing gear cover (2) over whole clutch cover area with RTV Silicon compound, and fit it. Fix timing belt cover with 2 Allen-head screws M6 (3) and spring washers, washer 6,4x30x3 and spacer nut M6 (4). Fix guide pulley (5) with hex. screw M8. Slide distance-sleeve 8,4x22x11 and tensioner pulley on stud M8, and tighten gently with hex. nut and spring washer.

Attention:

For type 348, place timing pulley on crankshaft using keyway (B) which is displaced by 90° (see illustration next page). For types 504-560, use keyway (A) marked by factory







Slide thrust-washer 20,2x25x3 and timing pulley on to camshaft. Mark (1) on timing pulley must align with mark on camshaft. Colour mark (2) means ideal crankshaft position for kickstarting. Visible through timing belt cover.

Caution:

Never knock timing pulley onto camshaft, because this can damage the needle bearing.

if necessary, draw the pulley over the splines using hex. srew M8x30.

(3) = eccentric for belt tensioning.

Fitting of tooth belt

When fitting the tooth belt, the crankshaft must be fixed with crankshaft locking screw (6) at T. D. C. position. Rotate pulley to align timing marks (as shown on drawing) and mount tooth belt so that the lettering on the belt can be read.

Fix timing pulley (1) with shim (2), spring washer (3) and hex. screw M8x30 (4) (with 'Loctite 221').

Attention:

Fit spring washer (3) in correct position (see illustration)



Tensioning of tooth belt (only on cold engine)

Turn tensioner eccenter as far to the left as to obtain a gap of 6 mm between tooth belt and guide pulley when applying a pressure of 20 N.

Tighten hex. nut M8 of tensioner eccenter in this position. Tighten hex. screw M8x30 for timing pulley at 35 Nm.

Remove crankshaft fixation screw, insert Allen screw M8 with gasket. Fix timing belt cover with 4 Allen screws M6.

The centre line (7) must align, if valve timing ist correct, with camshaft centre and the 2 marks (5)



(5) marks(7) thought centre line, with crankshaft in top dead centre position(8) tensioning direction

Fitting kickstart and gearshift levers

The kickstarter lever should be as dose as possible to the clutch cover but must not touch it. Tighten with Allenhead screw M8. Fit gearshift lever on gearshift shaft and fix with Allenhead screw.

Remove engine from trestle. Grease O-ring of electric starter, insert electric starter with a turning movement from the right side into the clutch cover, place distance block and secure electric starter with 2 Allen screws

Engine installation

Before installing the engine, clean oil screen of the oil tank. After engine installation, vent the oil system before fitting the chain cover

Venting the oil system

Whenever the engine is removed, or the oil lines are disconnected, it is necessary to vent the oil system.

Connect oil lines to engine and oil tank. Fill the oil tank with about 1,5 litre engine oil.

Remove oil filter cover and oil filter. Unscrew and remove pressure retaining valve in oil filter chamber.

With spark plug removed and short-circuited ignition, crank engine with kickstarter until oil flows out of the pressure retaining valve orifice.

Refit pressure retaining valve, fit oil filter and oil filter cover with O-ring.

Checking the ignition timin

There is no provision for ignition timing adjustment, timing control is electronic.

To check whether the ignition system is working correctly, take 2 ignition readings with stroboscope. To do so, remove the inspection plug on the magneto cover. In this opening (1) the two marks on the magneto flywheel are visible.

- a. Idle ignition timing: Engine speed 1500 rpm ± 100 Ignition timing 3° before top dead centre = mark (2) stamped on front of magneto flywheel
- b. Full load ignition timing: Engine speed 6000 - 7000 rpm Ignition timing 29° before top dead centre = second mark.

Ignition timing advances steadily from 2000 - 6000 rpm, but remains constant above this speed.



TIGHTENING TORQUES

TIGHTENING TORQUES	Sealing/locking Compound	
Hexagon nut, timing pulley M16x1,5	100 Nm	Loctite 221 violet
Hexagon nut, flywheel M18x1,5	100 Nm	Loctite 221 violet
Hexagon nut, balancer shaft M14x1,5	75 Nm	Loctite 221 violet
Hexagon nut, sprocket M20 x 1,5	100 Nm	Loctite 221 violet
Hexagon nut, clutch hub, M18x1,5	120 Nm	Loctite 648 green
Hexagon screw, timing gear M8	35 Nm	Loctite 221 violet
Collar nuts, cylinder head M10	35 Nm	Molykote GN
Collar nuts, cylinder head M8	20 Nm	Molykote GN
Hexagon screw M8, guide pulley		Loctite 221 violet
Countersunk screws M5, transmission bearing retaining plate	-	Loctite 221 violet
Stud for belt tensioner pulley	-	Loctite 221 violet
Oil pipe connections	-	Loctite 648 green
Screw plug in oil filter cover	-	Loctite 221 violet
Screw M5, clutch release cam leaf spring	-	Loctite 221 violet
Kickstarter stop screw M12	75 Nm	Loctite 221 violet
Timing belt cover fixing stud M6	-	Loctite 221 violet
Sealing surfaces on crankcase, clutch cover and oil pump	-	Loctite 574 orange
Camshaft needle bearing seal Sealing of timing belt housing - clutch cover	-	Silicon rubber RTV

Special tools

	Description	Qty.	Part-No.
1	insertion jig for oil seal 850055	1	876660
2	insertion jig for oil seal 230395	1	277861
3	insertion jig for oil seal 930715	1	276322
4	insertion jig for oil seal 831260	1	276330

5	insertion jig for oil seal 230690	1	276250
6	insertion jig for oil seal 230870	1	276340
7	insertion jig for oil seal 930500	1	277090
8	insertion jig for oil seal 850055	1	276310
9	guide sleeve for mainshaft	1	277970
10	guide sleeve for oil pump shaft	1	276450
11	guide for piston pin	1	276300
12	piston ring clamp 79,5 mm	1	276720
13	puller assy.	1	276445
14	puller assy. M35x1,5	1	277807
15	spark plug wrench 18	1	276280
16-21	puller assy.	1	276360
17	bolt M10	1	276380
18	extractor sleeve for bearing 6303	1	276370
19	extractor sleeve for bearing 6304	1	276375
20	support bar	1	276390
21	hex. nut M10	2	242090
22	ring	1	977492
23	ring half	2	977472
24-25	puller assy.	1	876296
25	hex. screw M16x1,5x145	1	940755
26	cyl. screw M8x40	2	840681
27	puller plate assy.	1	276535
28	puller bell	1	276560
29	puller ring	1	276550
30	bolt 12x250	1	276155
31	pull-in spindle M18x1,5 assy.	1	276127
32	locating bolt M8x30	1	241965

33	valve clearance feeler gauge 0,05	1	276295
34	valve spring push tool	1	276470
35	puller assy.	1	276400
36	wrench 11 mm	1	276040
37	clutch locking tool for 133 mm	1	277887
38	trestle assy.	1	277917
39	puller plate assy.	1	276435
40	ring wrench 13/15	1	277070
41-42	puller assy. for balancer gear 14 mm	1	277085
41-42	puller assy. for balancer gear 18 mm	1	277087
42	hex. screw M10x60	1	841700
43	pressure nipple assy.	1	276855
44	valve spring spanner assy.	1	276880
45	lever for valve spring spanner	1	276990
46	pin 5x25	1	243360
47	Molykote G-N 100 g, slide paste	1	297433
48	Silastic 732 RTV / 100 g	1	297386
49	Loctite 221 violet 10 cc. locking comp.	1	899785
50	Loctite 648 green 6 cc. locking comp.	1	899788
51	Loctite Anti-Seize 10 g	1	297431
52	Locite 574 orange 50 cc. sealing comp.	1	899784
53	gasket set for type 348	1	292746

Technical Data

Engine type	348 Enduro		
Engine design	Single cylinder, air-cooled 4-stroke		
Displacement	348 cc		
Bore/stroke	79,5 / 70,4		

Power	24,25 kW (33 HP DIN)	
Nominal speed	7000 rpm	
Torque	28 Nm / 5600 rpm	
Compression	9,6:1	
Fuel	Premium	
Valve train	SOHC, tooth belt drive	
Valve timing measured with 1 mm valve clearance	IO 2,5° BTDC IC 42,5° ABDC EO 42,5° BBDC EC 2,5° ATDC	
Camshaft overlap	225°	
Intake valve	2x30 ø	
Exhaust valve	2x27 ø	
Valve clearance cold	Intake valve 0,05 mm Exhaust valve 0,05 mm	
Crankshaft bearing	2 ballbearings	
Connecting rod bearing	needleroller-bearing	
Piston	light-alloy, solid-skirt	
Piston rings	1 compression ring, chrome-plated 1 tapered ring, 1 oil control ring	
Oil pump	double trochoid pump	
Engine lubrication	dry sump lubrication system	
Transmission lubrication	pump splash lubrication	
Primary drive	straight-tooth gears 32/76	
Clutch	multi-plate, in oil-bath	
Transmission	5-speed, constant-mesh, dog engagement	
Ignition	electronic C.D.I.	
Generator output	12 V/190 WAC	
Ignition timing Automatic advance	3° BTDC at 1500 rpm 29° BTDC at 6000 rpm Continuous between 2000 - 6000 rpm	
Spark plug	NGK D 8 EA	
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Electrode gap	0,7 mm	
Starting aid	valve-lifter	

GEAR RATIOS

Primary Ratio	Transmission
32:76	1st gear 32:11=2,909 2nd gear 24:12=2,000 3rd gear 21:15=1,400 4th gear 19:17=1,118 5th gear 21:23=0,913
Option	5th gear 21:22=0,955

Service table

Service table	After 500 km / 300 miles	As required	Every 6000 km / 4000 miles	Every 12.000 km / 8000 miles	At least once a year
Change engine oil and oil filter element	Х		X		Х
Clean oil screen in oil sump cover			X		
Adjust valve clearances	Х		Х		
Check condition and adjust tension of timing belt	Х		X		
Replace timing belt				Х	
Check play of clutch release		X	X		
Check oil lines	Х	Х	Х		
Clean carburetor and adjust idling		Х	X		
Check electronic ignition variation		Х	X		
Clean spark plug, adjust electrode gap			X		
Replace spark plug		Х		Х	
Re-torque cylinder head nuts	Х				

WIRING DAGRAM



Trouble-shooting Engine fails to start

CAUSE	REMEDY
Incorrect handling	Ensure full fuel supply, fuel cock open, and ignition switch on.
Fuel line blocked	Clean fuel cock, fuel tank and fuel line
Spark plug sooty, wet or bridged	Clean or replace spark plug
Electrode gap too large	Adjust electrode gap
Ignition cable or spark plug protector damaged	Fit new ignition coil or spark plug protector

Wire chafed in cable harness (short circuit). Ignition switch or kill button faulty	Disconnect plug with black-white/ black cable and test for spark. If there is a spark (i. e. ignition unit is in order), check for possible cable damage (short-circuit), check ignition switch and kill-button.	
Insufficient ignition voltage	Check ignition system	
Water in carburetor or jets obstructed	Dismantle and clean carburetor	

Engine will not idle

CAUSE	REMEDY
Idling jet blocked	Clean idle jet
Idle mixture screw incorrect adjustment	Adjust idle mixture screw.
Ignition system damaged	Check ignition system

Lack of engine performance

CAUSE	REMEDY
Fuel supply intermittent or water/dirt in carburetor	Clean fuel system and carburetor
Air filter dirty	Clean or replace air filter
Loss of compression due to loose spark plug, loose cylinder head, defective gasket,	Check for leaks and replace faulty parts
no valve clearance, no clearance at decompressor lever	Adjust valve clearances, adjust decompressor cable
Electronic ignition Urning faulty	Check electronic ignition timing advance
Exhaust leaking or blocked	Tighten exhaust flange, replace faulty parts.

Engine will not reach full speed

CAUSE	REMEDY
Carburetor flooding, level set too high, float needle seat dirty or damaged, loose carburetor jets, float punctured, defective electronic ignition timing	Clean carburetor, replace float if necessary and adjust float level. Tighten jets Check ignition timing

Engine knocks under full load

CAUSE	REMEDY
Carburetor setting too lean	Adjust carburetor
Engine overheating due to excess dirt in cylinder / cylinder head cooling fins	Clean engine
Ignition timing too advanced	Check ignition timing at max. rpm
Fuel octane rating too low	Use fuel with higher octane rating

Engine splutters in carburetor

CAUSE	REMEDY
insufficient fuel	Check and clean fuel system and carburetor
Intake valves leaking	Check valve clearance and / or replace valves.
Valve timing faulty (incorrect belt fitment, or belt loose)	Check valve timing, adjust belt or replace if necessary.
Engine air intake faulty	Check or replace seals and flanges on intake side