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**STIHL**<sup>®</sup>

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## 1 INTRODUCTION

This service manual contains detailed descriptions of all the repair and servicing procedures specific to this series of chainsaws. There are separate handbooks for servicing procedures on standardized parts and assemblies that are installed in several STIHL power tool models. Reference is made to these handbooks in the appropriate chapters of this manual.

You should make use of the illustrated parts lists while carrying out repair work. They show the installed positions of the individual components and assemblies.

Always use the latest edition of the parts list to determine the part numbers of any replacement parts required. Microfilmed parts list are always more up to date than printed lists.

A fault on the machine may have several causes. Consult the troubleshooting charts for all assemblies in the "Standard Repairs, Troubleshooting" handbook.

Refer to the "Technical Information" bulletins for engineering changes which have been introduced since publication of this service manual. Technical information bulletins also supplement the parts list until a revised edition is issued.

The special servicing tools mentioned in the descriptions are listed in the last chapter of this manual. Use the part numbers to identify the tools in the "STIHL Special Tools" manual. The manual lists all special servicing tools currently available from STIHL.

Symbols are included in the text and pictures for greater clarity. The meanings are as follows:

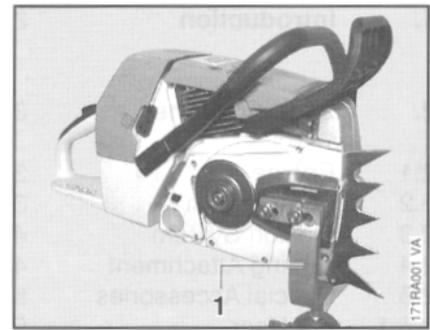
In the descriptions:

- = Action to be taken as shown in the illustration (above the text)
- = Action to be taken that is not shown in the illustration (above the text)

In the illustrations:

- ➔ = Pointer
- ➔ = Direction of movement

Service manuals and all technical information bulletins describing engineering changes are intended exclusively for the use of STIHL servicing dealers. They must not be passed to third parties.



Servicing and repairs are made considerably easier if the powerhead is mounted to the assembly stand (1) 5910 890 3100.

This enables the powerhead to be swivelled to the best position for the ongoing repair and leaves both hands free.

**Always use original STIHL replacement parts.** They can be identified by the STIHL part number, the **STIHL** logo and the STIHL parts symbol . The symbol may appear alone on small parts.

## 2. SPECIFICATIONS

### 2.1 Engine

STIHL single cylinder two-stroke engine with special impregnated cylinder bore

Displacement:	121.6 cm <sup>3</sup> (7.42 cu.in)
Bore:	60 mm (2.35 in)
Stroke:	43 mm (1.69 in)
Engine power:	6.3 kW (8.6 bhp)
Max. torque:	8.0 Nm (5.9 lb.ft) at 6,000 rpm
Max. engine speed:	12,000 rpm
Main bearings:	Two deep-groove ball bearings
Big-end bearing:	Needle cage
Small-end bearing:	Needle cage
Piston pin diameter:	13 mm (0.51 in)
Connecting rod length:	75 mm (2.95 in)
Rewind starter:	ElastoStart
Pawls:	Two-pawl system
Reserve pull on rope rotor:	min. 2 turns
Starter rope:	4.5 mm (0.18 in) dia., 1000 mm (39.4 in) long
Clutch:	Centrifugal clutch without linings
Diameter:	87 mm (3.4 in)
Clutch engages at:	3.200 rpm
Crankcase leakage test at gauge pressure:	0.6 bar (8.7 psi)
under vacuum:	0.4 bar (5.8 psi)

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### 2.2 Fuel System

Carburetor:	Diaphragm carburetor
Standard setting	
High speed screw H:	Open approx. 1 turn
Low speed screw L:	Open approx. 1 turn
Carburetor leakage test at gauge pressure:	0.8 bar (11.6 psi)
Function of tank vent at gauge pressure:	≤ 0.5 bar (7.25 psi)
under vacuum:	≤ 0.1 bar (1.45 psi)
Fuel tank capacity:	1.3 l (2.75 US pt)
Octane number:	min. 90 RON (US/CAN: pump octane min. 87 unleaded)
Fuel mixture:	Regular brand-name gasoline and two-stroke engine oil
Mix ratio:	<b>50:1</b> with STIHL 50:1 two-stroke engine oil <b>25:1</b> with other brand-name two-stroke, air cooled engine oils
Air filter:	<b>Standard filter</b> (green) with wire mesh element for normal operating conditions and winter operation or HD filter (special accessory)

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<b>2.3. Ignition System</b>	Type:  Air gap: Ignition timing:  Spark plug (suppressed):  Electrode gap: Spark plug thread: Length of thread: Heat range:	Electronic magneto ignition (breakerless) with integral trigger unit 0.2 - 0.3 mm (0.008-0.012 in) 2.3 - 3.3 mm (0.091-0.130 in) B.T.D.C. at 8,000 rpm Bosch WSR 6F or NGK BPMR 7 A 0.5 mm (0.02 in) M14x1.25 9.5 mm (0.37 in) 200
<b>2.4 Cutting Attachment</b>	Guide bars   Bar tail: Bar lengths:   Oilomatic chain:   Chain sprockets:  Chain speed: Chain lubrication:  Oil delivery rate: Oil tank capacity:	STIHL Rollomatic with nose sprocket STIHL Duromatic with Stellite-tipped nose. Both types with corrosion- resistant finish and induction hardened rails. 3002 Rollomatic: 53, 63, 75, 90 and 105 cm (21, 25, 30, 35 and 41 in) Duromatic: 53, 63, 75, 90, 105, 120 and 150 cm (21, 25, 30, 35, 47, 59 in) 10.26 mm (0.404") Rapid-Micro and Rapid-Super (standard equipment) 9.32 mm (3/8") Rapid-Micro and Rapid-Super as well as 12.7 mm (1/2") Rapid-Standard available as options 7-tooth 0.404" rim or spur sprocket (standard equipment) 8-tooth 3/8" rim and spur sprockets 23.9 m/s (78.4 ft/sec) at 8,500 rpm (with 7-tooth 0.404" sprocket) Fully automatic speed-controlled reciprocating oil pump, no oil feed at idle speed. Additional manual oil flow control (with <b>E</b> -matic mark) Adjustable 17 - 38 cm <sup>3</sup> /min (0.6 - 1.3 fl.oz/min) at 10,000 rpm 0.70 l (1.48 US pt)

## 2.5 Special Accessories

2.5.1	For User	STIHL repair kit 084/088	1124 900 5001
		HD air filter kit	0000 120 1650
		Intake air preheating kit	1124 007 1005
2.5.2	For Service	Carburetor parts kit	1124 007 1061
		Gasket kit 088	1124 007 1051

## 2.6 Tightening Torques

Plastoform screws are used for polymer components. These screws form a permanent thread when they are installed for the first time. They can be removed and installed as often as necessary without detrimentally affecting the strength of the screwed assembly, providing the specified tightening torque is observed. For this reason it is **essential to use a torque wrench**.

Fastener	Thread size	For component	Torque		Remarks
			Nm	lbf.ft	
Spline screw	IS-B3.9x13	Cover plate/sprocket cover	1.5	1.1	
Spline screw	IS-B3.9x19	Tank housing/handle molding	1.0	0.75	
Spline screw	IS-B3.9x19	Switch shaft pivot/tank housing	1.0	0.75	
Spline screw	IS-M4x8	Cover plate/chain tensioner	3.0	2.2	
Spline screw	IS-M4x8	Inner side plate/crankcase	3.0	2.2	
Spline screw	IS-M4x12	Segment/fan housing	2.5	1.8	
Spline screw	IS-M4x12	Oil pump/crankcase front, bottom, rear	3.5	2.6	
Spline screw	IS-M4x12	Chain brake cover/crankcase	3.0	2.2	
Spline screw	IS-M4x12	Oil pump/crankcase front top	3.5	2.6	1)
Spline screw	IS-M4x12	Brake band/crankcase	3.0	2.2	2)
Spline screw	IS-M4x12	Oil pump cover/crankcase	3.0	2.2	
Spline screw	IS-M4x12	Exhaust cover/muffler	4.0	3.0	
Spline screw	IS-M4x12	Spur gear cover/crankcase	3.0	2.2	
Collar nut	M5	Shroud/cylinder	7.0	5.2	
Collar nut	M5	Tank housing/carburetor/flange	5.0	3.7	
Spline screw	IS-M5x12	Top left annular buffer plate/ crankcase	9.0	6.6	2)
Spline screw	IS-M5x16	Support/muffler	10.0	7.5	
Spline screw	IS-M5x20	Shroud/crankcase	7.0	5.2	

Fastener	Thread size	For component	Torque		Remarks
			Nm	lbf.ft	
Spline screw	IS-M5x20	Fan housing/crankcase	7.0	5.2	
Screw assembly	IS-M5x35	Hand guard/fan housing/ crankcase	7.0	5.2	2 )
Spline screw	IS-M5x25	Ignition module/crankcase	9.0	6.6	2 )
Spline screw	IS-M5x25	Crankcase	11.5	8.5	
Nut	M6	Spiked bumper/chain sprocket cover	7.5	5.5	
Spline screw	IS-M6x18	Spiked bumper/crankcase, bottom	7.5	5.5	2)
Spline screw	IS-M6x18	Spiked bumper/crankcase, top	7.5	5.5	
Spline screw	IS-M5x16	Support/crankcase	10.0	7.5	
Spline screw	IS-M6x40	Annular buffer, top left/tank housing	7.0	5.2	2)
Spline screw	IS-M6x30	Cylinder/crankcase	15.0	3.7	
Nut	M10x1	Flywheel/crankshaft	45.0	33.0	
	M10x1	Decompression valve	14.0	10.3	
	M 10x27	Bar mounting stud	30.0	22.0	2)
	M14x1	Clutch carrier/crankshaft	80.0	59.0	
	M 14x1.25	Spark plug	25.0	18.5	
Plastoform screw	IS-P6x19	Annular buffer, bottom/tank housing	5.5	4.0	
Plastoform screw	IS-P6x21.5	Front handle, bottom/tank housing	8.0	5.9	3)
Plastoform screw	IS-P6x32.5 1.8	Front handle, right, stiffener/ tank housing	8.0	5.9	3 )
Nut	M5	Chain catcher/spiked bumper	6.0	4.4	4 )

Use the following procedure when refitting a Plastoform screw in an existing thread:

- Place the screw in the hole and rotate it counterclockwise until it drops down slightly.
- Tighten the screw clockwise to the specified torque.

This procedure ensures that the screw engages properly in the existing thread and does not form a new thread and weaken the joint.

- 1) Sealant (Hylomar)
- 2) Screw secured with Loctite 242
- 3) Screw secured with Loctite 648
- 4) R version only

**Note:** Use hot air blower (hair dryer) to release screws secured with adhesive.

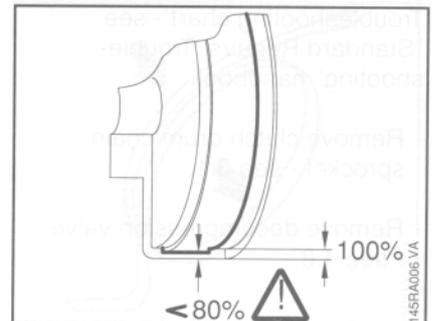
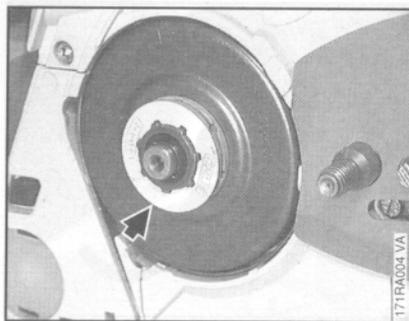
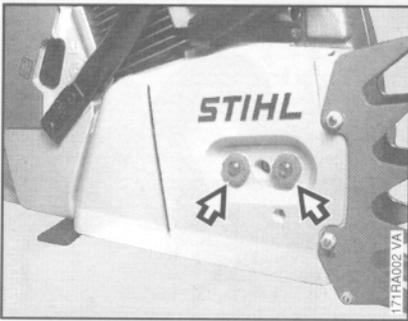
**Take special care with polymer components.**

Power screwdriver speed for use in polymer:

Plastoform screws max. 600 rpm,

DG screws max. 500 rpm.

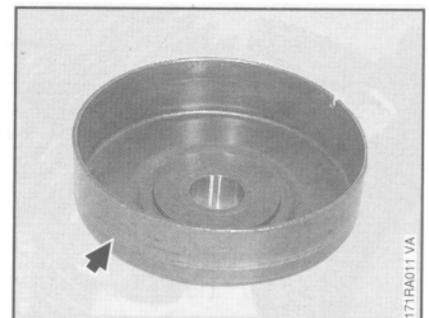
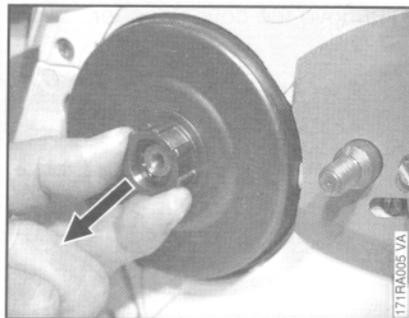
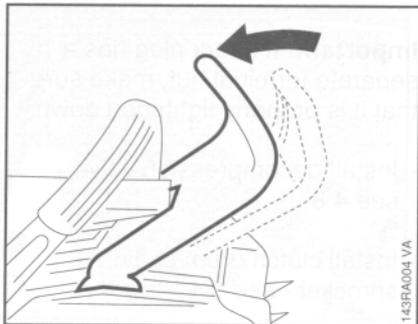
**3. CLUTCH, CHAIN DRIVE, CHAIN BRAKE AND CHAIN TENSIONER**  
**3.1 Clutch Drum/Chain Sprocket**



- Unscrew nuts.
- Remove the chain sprocket cover.

- If a rim sprocket is fitted, pull it off.

**Important:** If there are noticeable wear marks on the inside diameter of the clutch drum, check its wall thickness. If it is less than 80% of the original wall thickness, fit a new clutch drum.

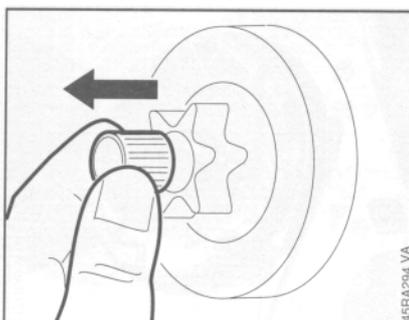
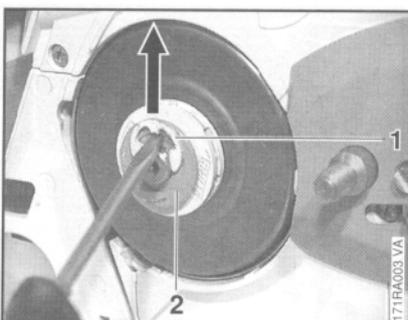


- Disengage the chain brake by pulling the hand guard toward the front handle.

- Pull off the clutch drum/chain sprocket.

**Note:** If the clutch drum has to be replaced, also check the brake band - see 3.3.

- If the clutch drum is still serviceable, use No. 120 emery paper or emery cloth (grain size approx. 120µm) to clean and roughen its friction surface.



Reassemble in the reverse sequence.

- Clean stub of crankshaft. Wash needle cage in clean white spirit and lubricate with grease - see 11.2.
- Replace damaged needle cage.
- Rotate clutch drum/chain sprocket and apply slight pressure at the same same until oil pump drive spring engages properly.

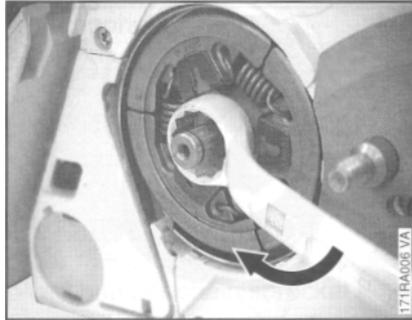
- Remove the E-clip (1).
- Remove the washer (2).

- Take the needle cage out of the sprocket.
- Clean and inspect the clutch drum/chain sprocket.

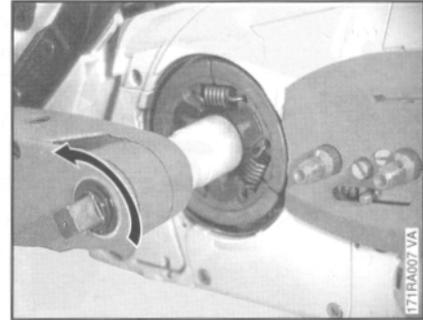
### 3.2 Clutch

Troubleshooting chart - see "Standard Repairs, Troubleshooting" handbook.

- Remove clutch drum/chain sprocket - see 3.1.
- Remove decompression valve - see 4.8.



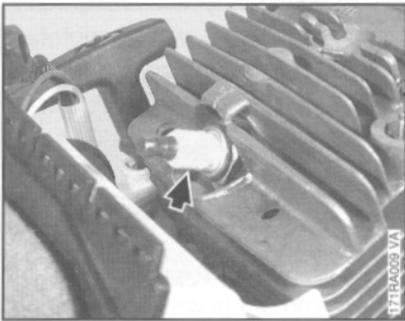
- Unscrew the clutch from the crankshaft in the direction of the arrow (left-hand thread).
- Disassemble and reassemble the clutch - see "Standard Repairs, Troubleshooting" handbook.
- Remove the cover washer.



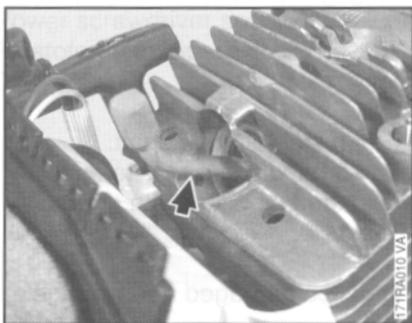
- Screw clutch onto crankshaft and torque down to 80 Nm (59 lbf.ft).
- Remove locking strip from cylinder.
- Install spark plug and torque down to 25 Nm (18.5 lbf.ft).

**Important:** If spark plug has a separate terminal nut, make sure that it is properly tightened down.

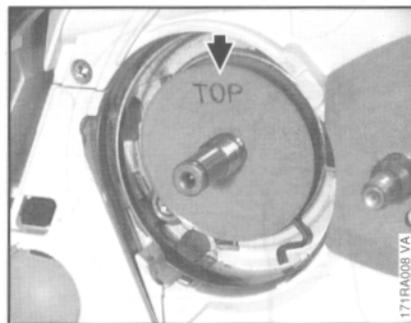
- Install decompression valve - see 4.8.
- Install clutch drum/chain sprocket - see 3.1.



- Unscrew the spark plug.

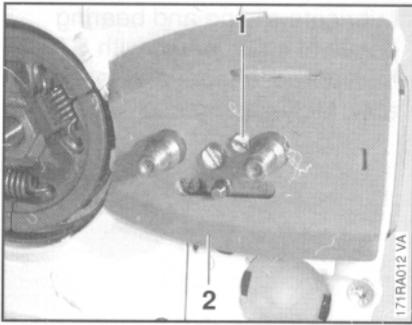


- Push the locking strip 0000 893 5903 into the cylinder.

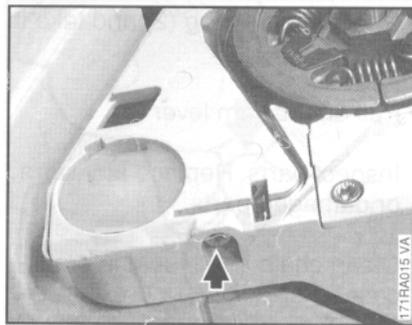


- Fit cover washer so that "TOP" faces outward.

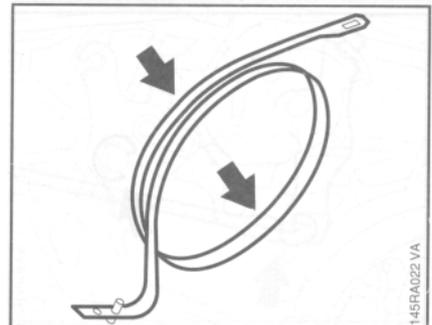
**3.3 Chain Brake**  
**3.3.1 Disassembly**



- Remove clutch drum/chain sprocket - see 3.1.
- Take out the screw (1).
- Remove the side plate (2).

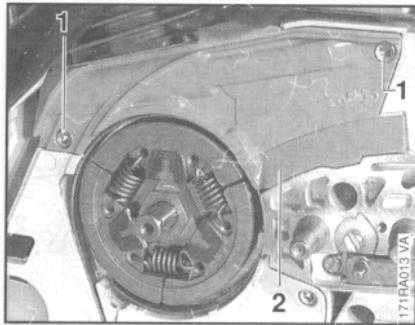


- Take out the brake band fastening screw.

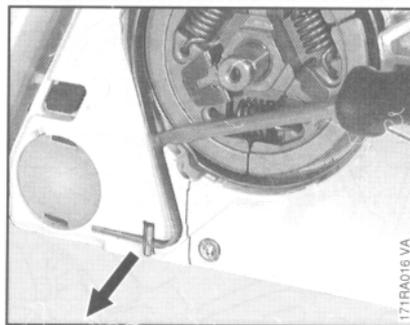


Replace the brake band if:

- there are noticeable signs of wear (large areas on inside diameter and/or parts of outside diameter) and
- its remaining thickness is  $< 0.6 \text{ mm}$  (0.024").



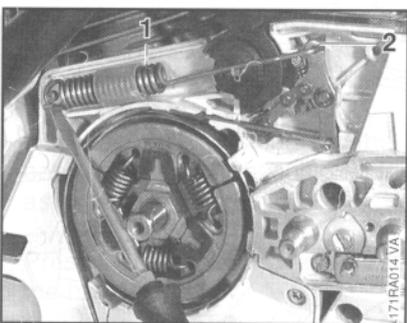
- Relieve tension of brake spring by pushing the hand guard forward.
- Take out the screws (1).
- Lift away the cover (2).



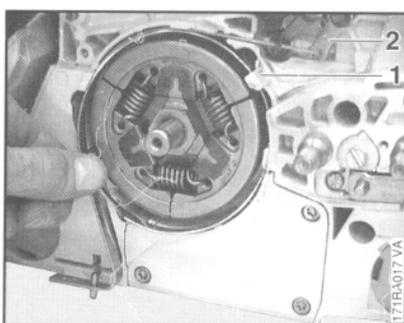
- Lever the brake band out of the crankcase.

**Important!** Thickness of brake band must not be less at any point.

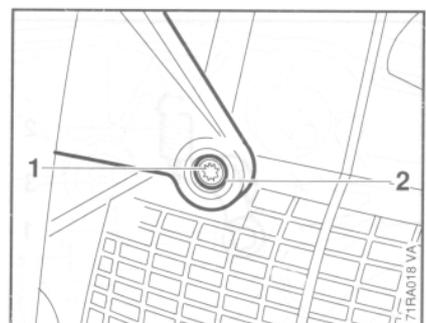
- If the brake band is still serviceable, use No. 120 emery paper or emery cloth (grain size approx.  $120\mu\text{m}$ ) to clean and roughen its entire friction surface (inside diameter).



- Carefully pry the brake spring (1) off the anchor pin and unhook it from the bell crank (2).

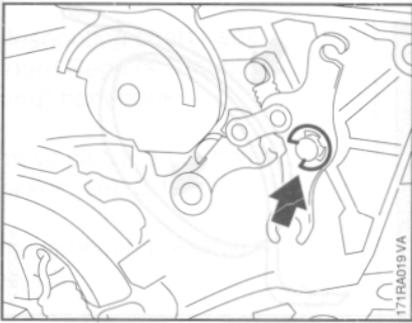


- Remove the brake band from the lugs (1) on the crankcase.
- Unhook the brake band from the bell crank (2).



- Take out the screw (1).
- Remove the rubber bushing (2).
- Inspect parts and replace if damaged.

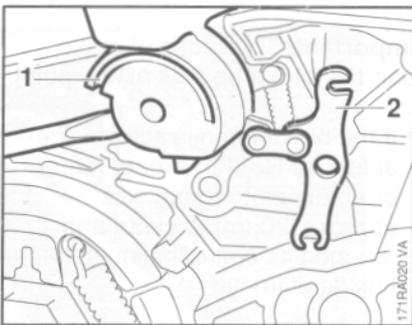
### 3.3.2 Assembly



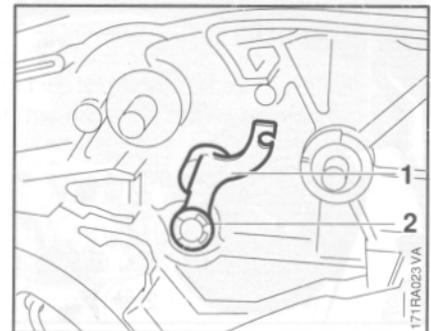
- Ease the E-clip off the bell crank pivot pin.

- Unhook the spring (2) and take it away.
- Pull off the cam lever (3).
- Inspect parts. Replace any worn or damaged parts.
- Clean chain brake seat in crankcase.
- If the groove of the brake spring anchor pin is worn, the anchor pin must be replaced - see 3.3.4.

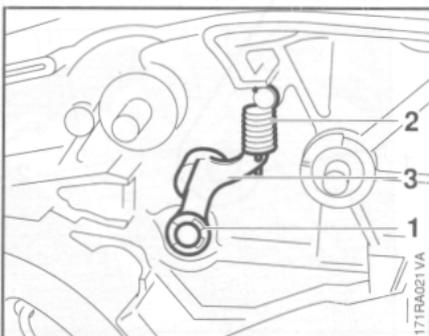
- Lubricate sliding and bearing points of chain brake with STIHL multipurpose grease or, preferably, Molykote grease - see 11.2.



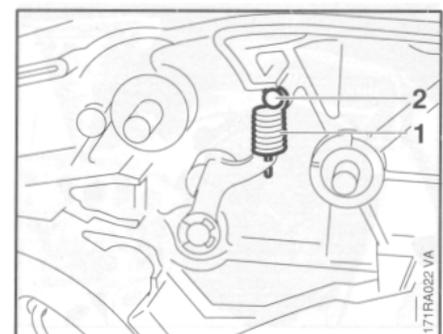
- Carefully ease the hand guard (1) and bell crank (2) off the pivot pins and lift them away together.
- Pull the bell crank out of the hand guard.



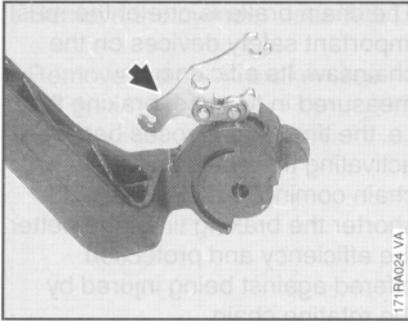
- Push the cam lever (1) onto the pivot pin.
- Fit the E-clip (2).



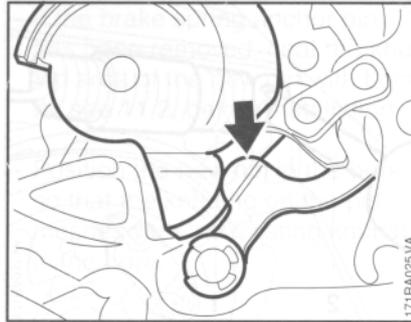
- Remove the E-clip (1).



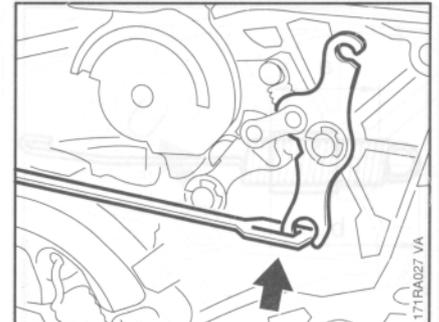
- Attach the spring (1) to the pivot pin (2) and cam lever.



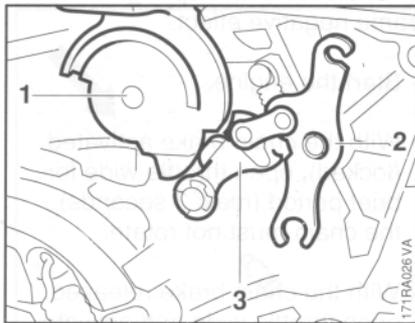
- Insert the bell crank in the side of the hand guard so that the short arm of the bell crank points up.



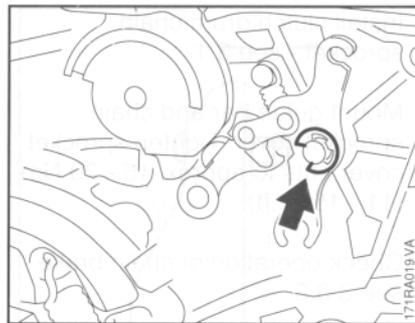
- Check that cam lever is properly located on face of hand guard bearing boss.



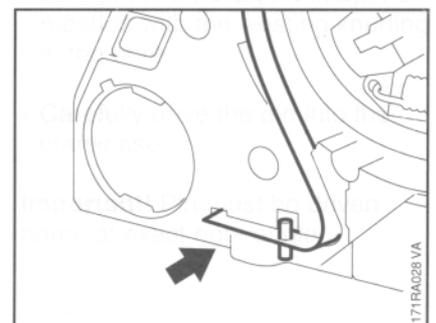
- Hook the brake spring onto the bell crank.
- Position the brake band behind the lugs on the crankcase.



- Position the hand guard (1) against the pivot pin and fit the other side of the hand guard over, the housing.
- Position the bell crank (2) against the pivot pin.
- Press the cam lever (3) slightly downward and push the hand guard and bell crank onto their pivot pins.
- Push the metal bushing into the back of the rubber bushing as far as shoulder.
- Press the rubber bushing into the hand guard.
- Fit hand guard mounting screw and tighten to 7.0 Nm (5.2 lbf.ft).

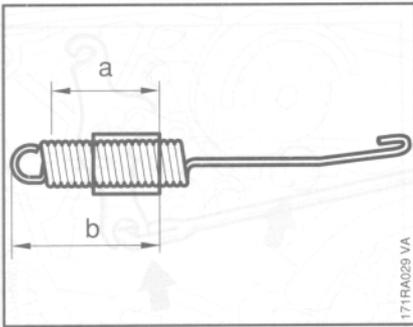


- Secure bell crank with E-clip.
- Coat brake band with chain oil (STIHL Bioplus), see 11.2, to protect it from corrosion and cushion "snatching" during the first few brake applications.

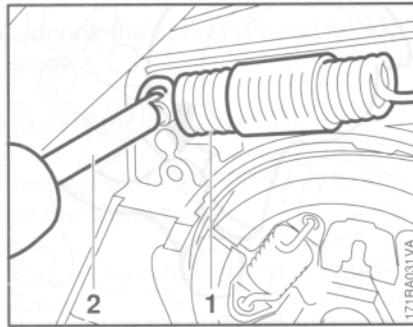


- Press brake band into slot.
- Coat the mounting screw with Loctite, see 11.2. and torque down to 3.0 Nm (2.2 lbf.ft).

### 3.3.3 Checking Function



- Coils of brake spring must locate tight against one another in relaxed condition. Install a new brake spring if necessary.
- Check that protective tube is correctly positioned:  
a = 20 mm (3/4")  
b = 42 mm (1 5/8")



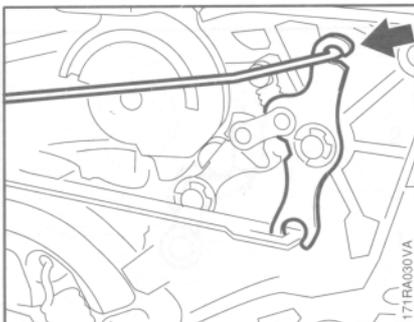
- Use the assembly tool (2) 1117 890 0900 to attach the brake spring (1) to the anchor pin.
- Fit cover over the chain brake.
- Fit the side plate.
- Install clutch drum/chain sprocket - see 3.1.
- Mount guide bar and chain sprocket cover. Tighten sprocket cover nuts to approx. 15 - 20 Nm (11 - 15 lbf.ft).
- Check operation of chain brake - see 3.3.3.

The chain brake is one of the most important safety devices on the chainsaw. Its efficiency is measured in terms of braking time, i.e. the time that elapses between activating the brake and the saw chain coming to a standstill. The shorter the braking time, the better the efficiency and protection offered against being injured by the rotating chain.

Contamination (with chain oil, chips, fine particles of abrasion, etc.) and smoothing of the friction surfaces of the brake band and clutch drum impair the coefficient of friction. This, in turn, reduces the frictional forces and thus prolongs the braking time. A fatigued or stretched brake spring has the same negative effect.

- Start the engine.
- With the chain brake activated (locked), open throttle wide for brief period (max. 3 seconds) the chain must not rotate.
- With the chain brake released,
  - open throttle wide and activate the brake manually - the chain must come to an abrupt stop.

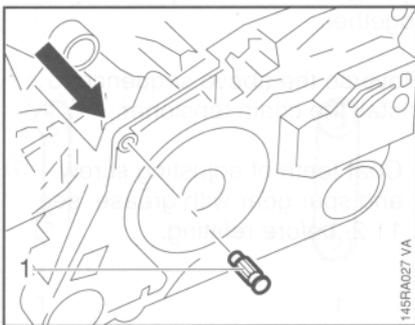
**Note:** The braking time is in order if deceleration of the saw chain is imperceptible to the eye.



- Attach the brake spring to the bell crank.

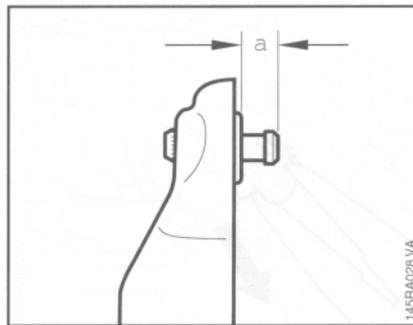
### 3.3.4 Brake Spring Anchor Pin

- Remove the cylinder - see 4.5.1.
- Remove the chain brake – see 3.3.1.
- If the brake spring anchor pin has been removed, coat the knurled area of the new pin with Loctite, see 11.2, before installation.
- Position the new pin in the bore so that the knurling on the pin meshes with the existing knurling in the bore.



- Use a suitable punch to drive the anchor pin out of the crankcase in the direction of the arrow.

**Important!** Do not drive out the pin in the other direction as this would damage the annular bead which was formed in the crankcase bore when the pin was originally installed. In such a case neither the new anchor pin nor the brake spring would locate properly. Furthermore, the crankcase could be damaged in this way and possibly impair correct operation of the chain brake.

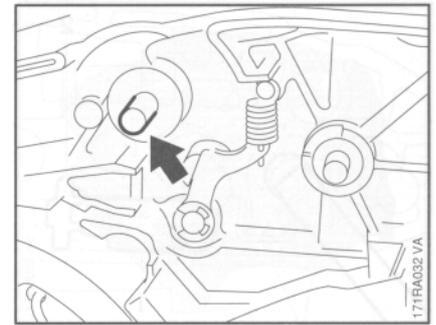


- Carefully tap home the pin squarely to obtain dimension "a" = 4.3 - 4.7 mm (11/64").

**Important!** Pin must be driven home at exact right angle.

- Install the cylinder - see 4.5.2.
- Install the chain brake - see 3.3.2.

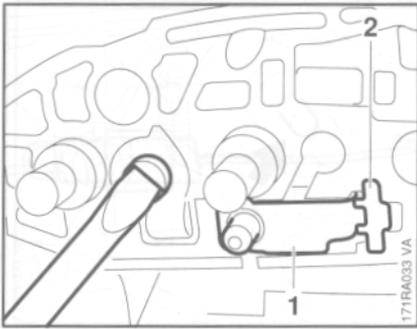
### 3.3.5 Hand Guard Pivot



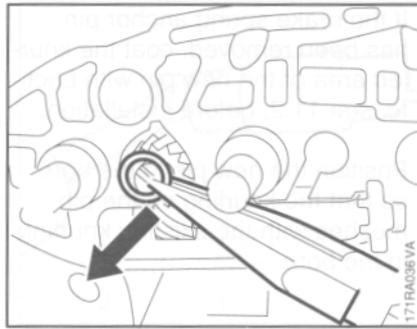
- Use pliers to grip the pivot pin and pull it out of the crankcase.
- Coat the knurled area of the new pin with Loctite, see 11.2, before installation.
- Position the new pin in the bore so that the knurling on the pin meshes with the existing knurling in the bore.
- Carefully drive the pin into the crankcase.

**Important!** Pin must be driven home at exact right angle.

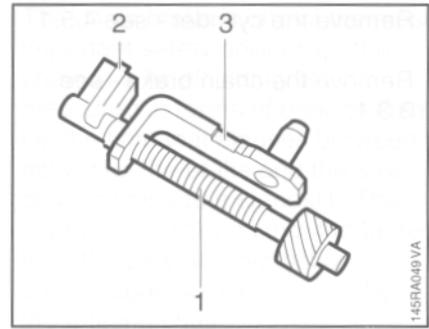
### 3.4 Chain Tensioner



- Remove inner side plate - see 3.3.1.
- Rotate the spur gear clockwise until the tensioner slide (1) butts against the thrust pad (2).

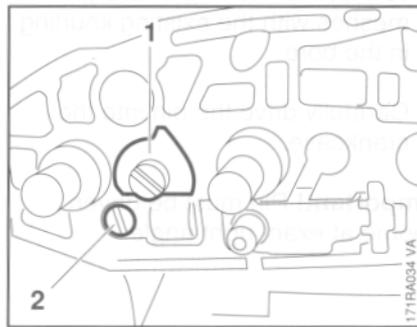


- Take out the brake washer.

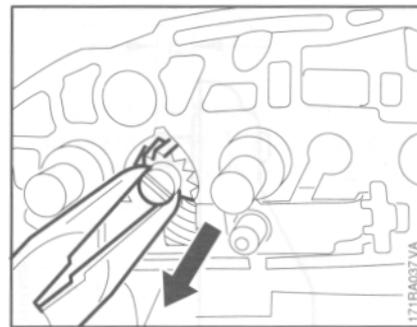


- Inspect the teeth on the spur gear and adjusting screw (1). If the teeth are damaged, pull off the thrust pad (2), take the adjusting screw out of the tensioner slide (3) and replace both parts.

**Note:** The adjusting screw and spur gear must be replaced together.



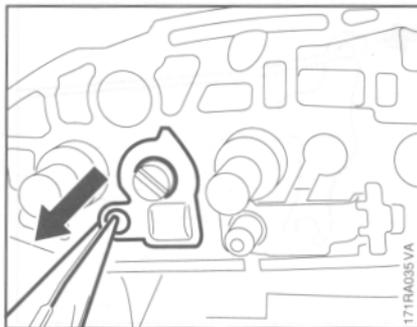
- Take out the retainer (1).
- Take out the screw (2).



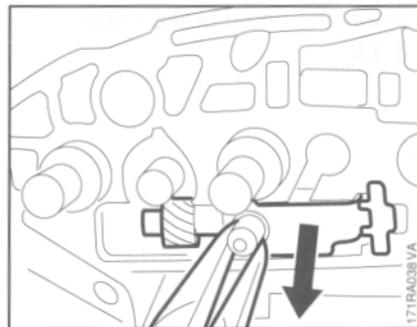
- Pull out the spur gear.

Reverse the above sequence to install the chain tensioner.

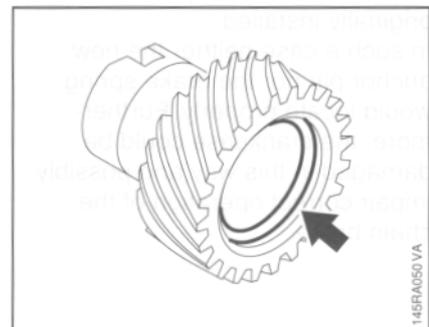
- Coat teeth of adjusting screw and spur gear with grease, see 11.2, before refitting.



- Remove the cover plate.



- Take out the tensioner slide with adjusting screw and thrust pad.

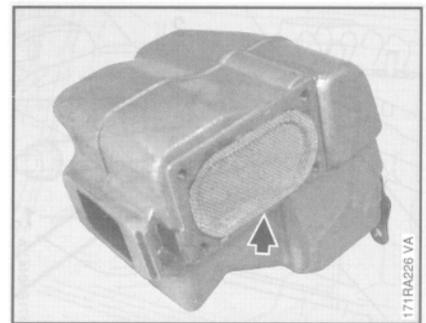
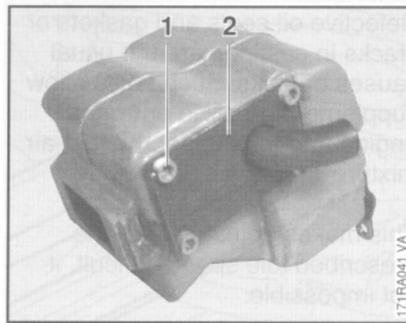


- Check that O-ring is fitted in spur gear and lubricate it with a little oil before installing.

**4. ENGINE**  
**4.1 Exhaust Muffler/Spark Arresting Screen**

Troubleshooting chart - see "Standard Repairs, Troubleshooting" handbook.

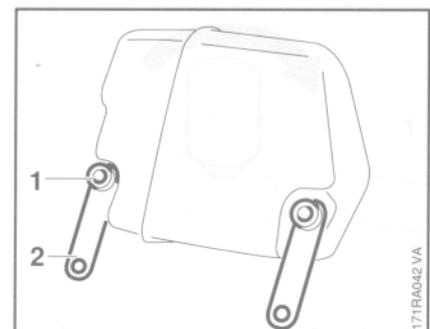
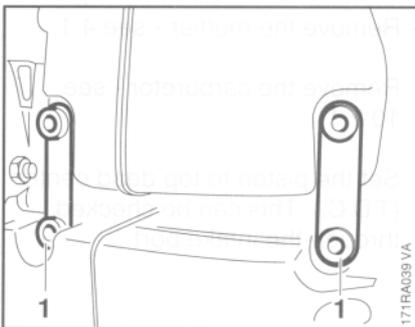
- Remove the shroud - see 4.8.



**Muffer without spark arresting screen**

- Take out the screws (1).
- Remove the cover (2).
- Fit the cover so that the stub points away from the exhaust port.

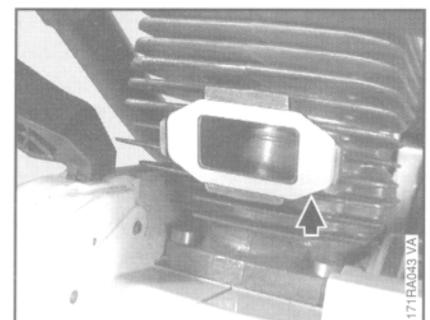
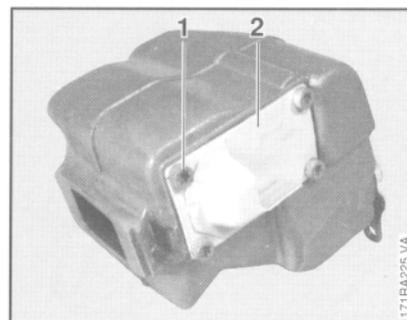
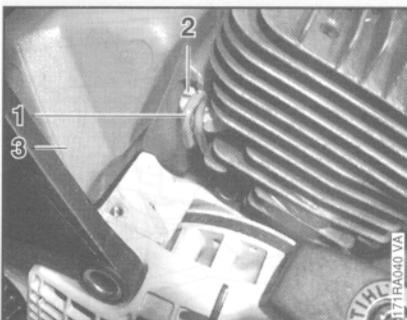
- Remove the spark arresting screen.
- Clean the spark arresting screen or fit a new one.



- Take out the screws.

- Take out the screws (1)
- Remove the strap (2)

**Muffer with spark arresting screen**



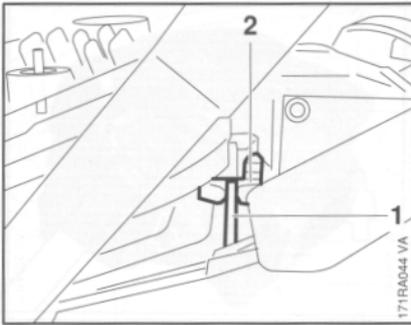
- Ease away the clips (1).
- Remove the retainers (2).
- Remove the muffer (3).

- Take out the screws (1).
- Remove the cover (2).

- Remove the exhaust gasket.

Reassemble in the reverse sequence.

## 4.2 Leakage Test



- Install a new exhaust gasket.
- Attach clip (1) to retainer (2).
- Tightening torques - see 2.6.

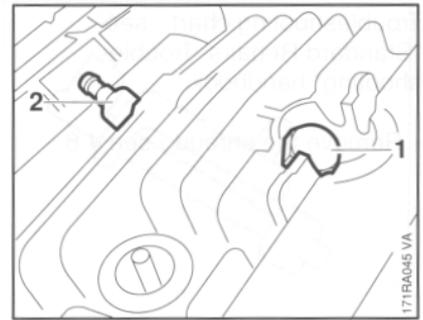
Defective oil seals and gaskets or cracks in castings are the usual causes of leaks. Such faults allow supplementary air to enter the engine and thus upset the fuel-air mixture.

This makes adjustment of the prescribed idle speed difficult, if not impossible.

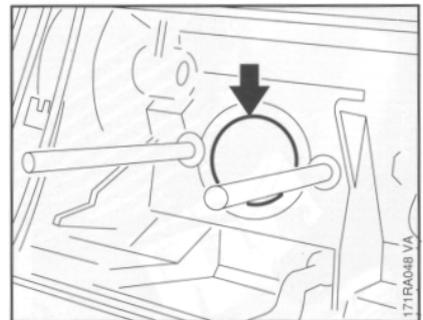
Moreover, the transition from idle speed to part or full throttle is not smooth.

The crankcase can be checked thoroughly for leaks with the carburetor and crankcase tester and the vacuum pump.

## 4.2.1 Preparations

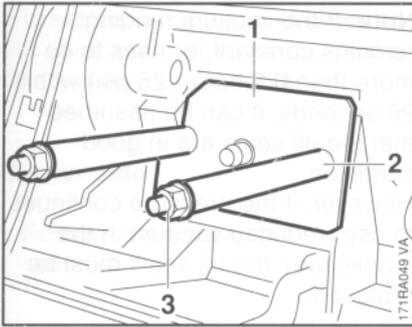


- Remove decompression valve - see 4.8.
- Install plug (1) 1122 025 2200 and tighten to 14 Nm (10.3 lbf.ft).
- Check that spark plug (2) is properly tightened down.
- Remove the muffler - see 4.1.
- Remove the carburetor - see 10.2.1.
- Set the piston to top dead center (T.D.C.). This can be checked through the intake port.

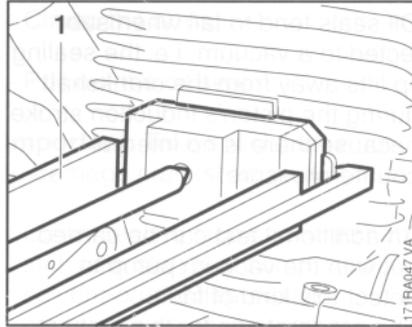


- Check that sleeve is in position.

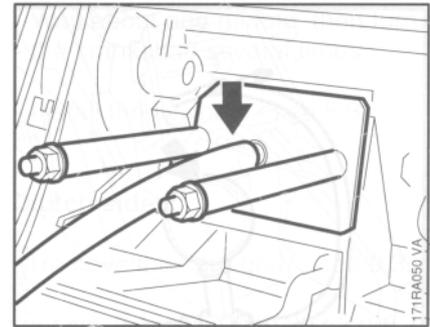
#### 4.2.2 Pressure Test



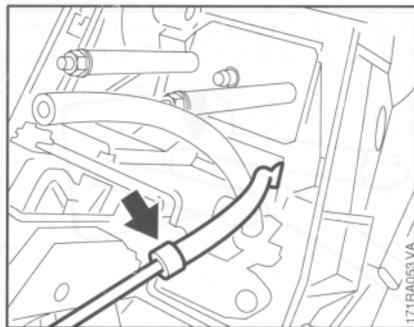
- Push the test flange (1) 1106 850 4201 into position.
- Fit sleeves (2) 1127 851 8300.
- Fit nuts (3) and tighten down firmly.



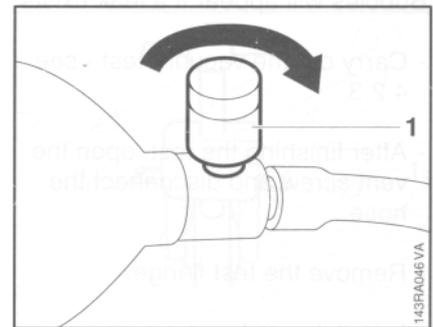
- Mount the clamp (1) 0000 890 4400.



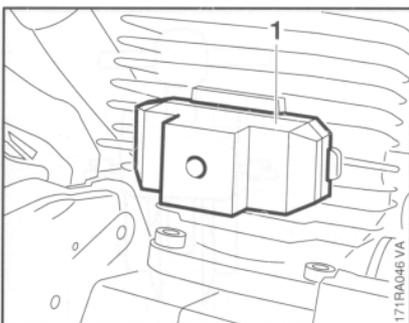
- Connect pressure hose of tester 1106 850 2905 to nipple on test flange.



- Seal the end of the impulse hose with a pointed piece of round stock (3 mm dia.) or a scriber.

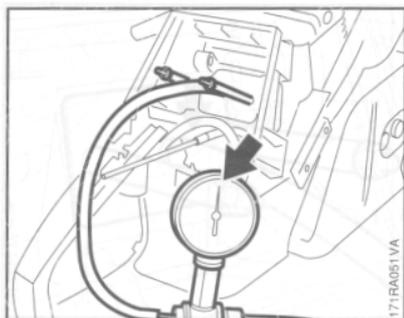


- Close the vent screw (1) on the rubber bulb.
- Pump air into the crankcase with rubber bulb until the gauge indicates a pressure of 0.6 bar (8.7 psi). If this pressure remains constant for at least 20 seconds, the crankcase is airtight.



- Fit the flange (1) 1124 850 4205 in position.

### 4.2.3 Vacuum Test



- However, if the indicated pressure drops, the leak must be located and the faulty part replaced.

**Note:** To find the leak, coat the suspect area with oil and pressurize the crankcase again. Bubbles will appear if a leak exists.

- Carry out the vacuum test - see 4.2.3.
- After finishing the test, open the vent screw and disconnect the hose.
- Remove the test flange.
- Install the carburetor - see 10.2.1.
- Remove the test flange with clamp.
- Install the muffler - see 4.1.
- Unscrew the plug from the cylinder.
- Install decompression valve see 4.8.

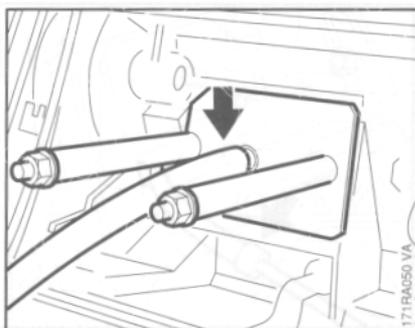
Oil seals tend to fail when subjected to a vacuum, i.e. the sealing lip lifts away from the crankshaft during the piston's induction stroke because there is no internal counterpressure.

An additional test can be carried out with the vacuum pump to detect this kind of fault. The preparations for this test are the same as for the pressure test see 4.2.2.

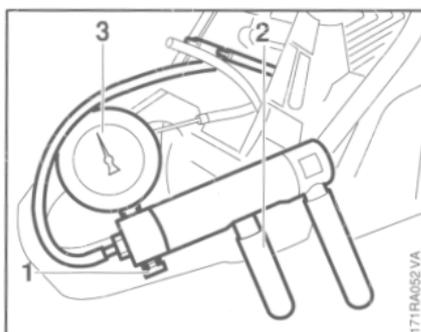
**Note:** ! If the vacuum reading remains constant, or rises to no more than 0.3 bar (4.25 psi) within 20 seconds, it can be assumed that the oil seals are in good condition.

However, if the pressure continues to rise (reduced vacuum in the crankcase), the oil seals must be replaced.

- After finishing the test, open the vent screw and disconnect the hose.
- Remove the test flange.
- Install the carburetor  
- see 10.2.1.
- Remove the test flange with clamp.
- Install the muffler - see 4.1.
- Unscrew the plug from the cylinder.
- Install decompression valve  
- see 4.8.



- Connect suction hose of vacuum pump 0000 850 3501 to test flange nipple.



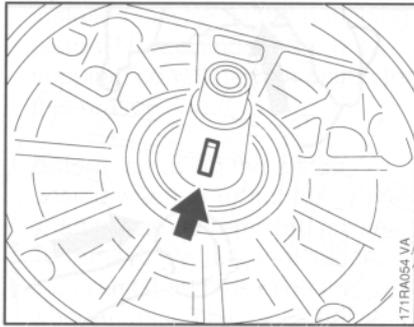
- Close the vent screw (1) on the pump.
- Operate lever (2) until pressure gauge (3) indicates a vacuum of 0.4 bar (5.8 psi).

### 4.3 Oil Seals

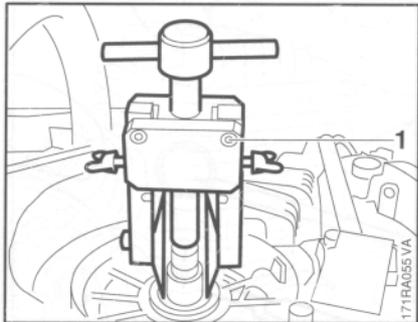
It is not necessary to disassemble the complete crankcase if only the oil seals have to be replaced.

#### Starter side:

- Remove the flywheel - see 5.3.



- Remove key from crankshaft.
- Use a suitable pipe or punch to carefully tap the oil seal and free it off.

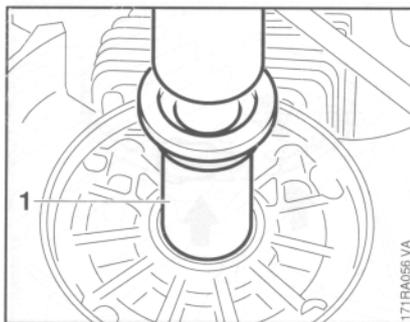


- Apply puller (1) 5910 890 4400 (with No. 3.1 jaws 0000 893 3706).

- Clamp the arms.
- Pull out the oil seal.

**Important:** Take special care not to damage crankshaft stub.

- Clean sealing face on crankshaft stub with standard commercial solvent-based degreasant containing no chlorinated or halogenated hydrocarbons – see 11.2.
- Lubricate sealing lips of oil seal with grease - see 11.2.
- Thinly coat the outside diameter of the oil seal with sealant - see 11.2.
- Push the oil seal over the crankshaft stub - the open side must face the crankcase.

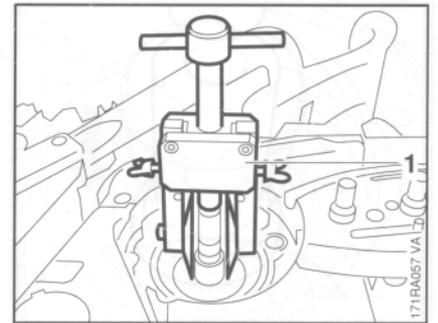


- Use the press sleeve (1) 1127 893 2400 to install the oil seal.

- Wait about one minute, then turn the crankshaft several times.
- Install the flywheel - see 5.3.

#### Clutch side:

- Remove the spur gear - see 9.3.
- Fit No. 3.1 jaws 0000 893 3706 to the puller.

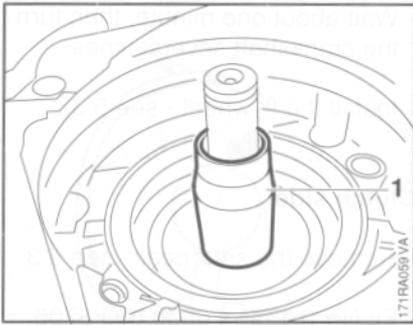


- Apply puller (1) 5910 890 4400.
- Clamp the arms.
- Pull out the oil seal.

**Important:** Take special care not to damage crankshaft stub.

- Clean sealing face on crankshaft stub with standard commercial solvent-based degreasant containing no chlorinated or halogenated hydrocarbons - see 11.2.
- Lubricate sealing lips of oil seal with grease - see 11.2.
- Apply thin coat of sealant (see 11.2) to outside diameter of oil seal.

#### 4.4 Exposing the Cylinder

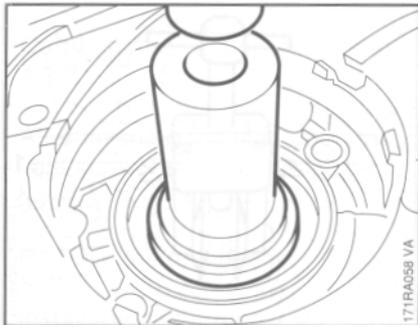


- Slip assembly sleeve (1) 1124 893 4600 over the crankshaft stub.

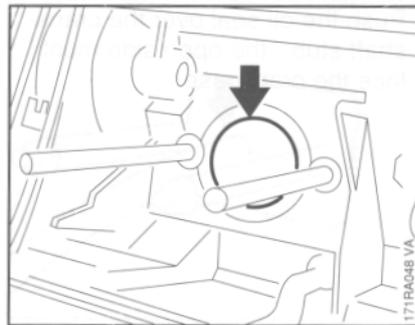
Always check and, if necessary, repair the fuel system, carburetor, air filter and ignition system before looking for faults on the engine.

Troubleshooting chart - see "Standard Repairs, Troubleshooting" handbook.

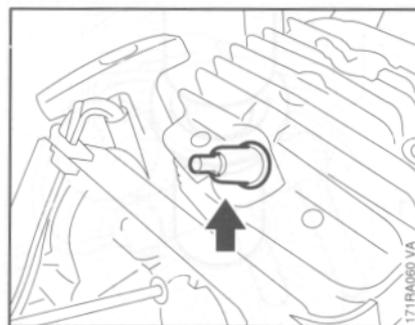
- Remove the muffler - see 4.1
- Remove the carburetor - see 10.2.1.
- Remove decompression valve - see 4.8.



- Push the oil seal, open side facing the crankcase, over the assembly sleeve.
- Press oil seal home with press sleeve (1) 1127 893 2400.
- Remove the assembly sleeve.
- Wait about one minute, then turn the crankshaft several times.
- Install the spur gear - see 9.3.



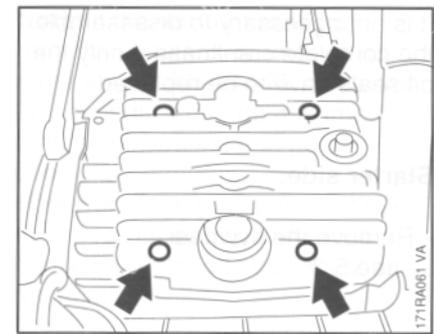
- Take the sleeve out of the manifold.



- Unscrew the spark plug.

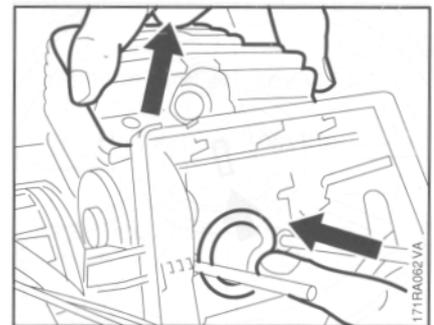
Reassemble in the reverse sequence.

#### 4.5 Cylinder and Piston Removal



Preparations - see 4.4.

- Unscrew the four cylinder base screws through the holes in the cylinder.



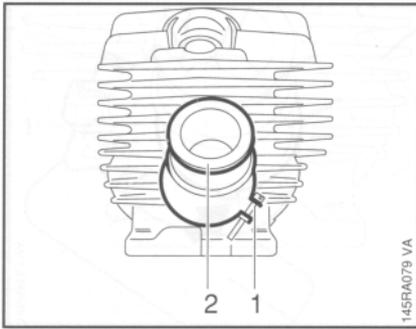
- Carefully lift the cylinder up and, at the same time, push the manifold through the tank housing opening.

**Caution:** Do not use pointed or sharp-edged tools.

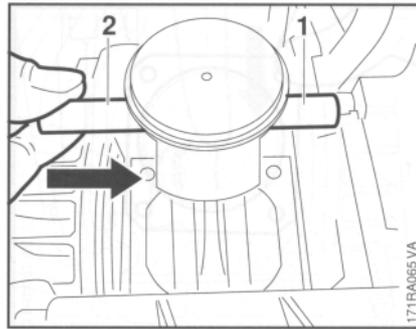


- Carefully separate the cylinder gasket from the cylinder base.
- Pull the cylinder off the piston.

## 4.5.2 Installation



- Release the hose clamp (1).
- Pull the manifold (2) off the intake port.
- Inspect the cylinder and replace it if necessary.
- If a new cylinder has to be installed, always fit the matching piston. New cylinders are only supplied complete with piston for this reason.
- Before removing the piston, decide whether or not the crankshaft has to be removed as well. To remove the flywheel, block the crankshaft by sliding the wooden assembly block between the piston and crankcase.
- Remove the cylinder gasket.

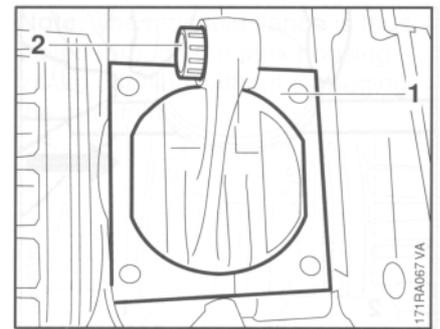


- Use the assembly drift (2) 1111 893 4700 to push the piston pin (1) out of the piston.

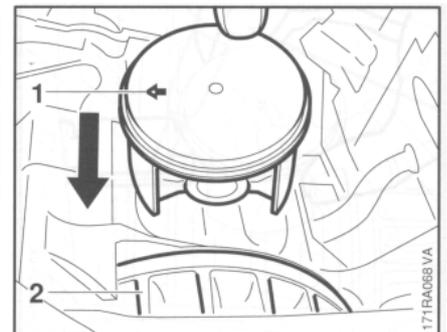
**Note:** If the piston pin is stuck, tap the end of the drift **lightly** with a hammer if necessary.

**Important:** Hold the piston steady during this process to ensure that no jolts are transmitted to the connecting rod.

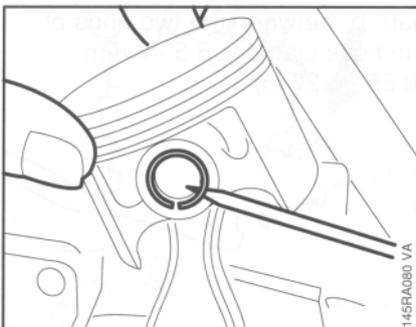
- Remove piston and take the needle cage out of the connecting rod.



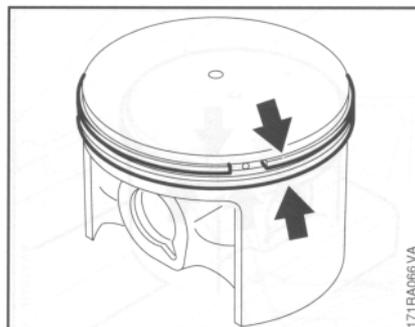
- Thoroughly clean the gasket seating surface (1).
- Lubricate the needle cage (2) with oil and fit it in the small end.



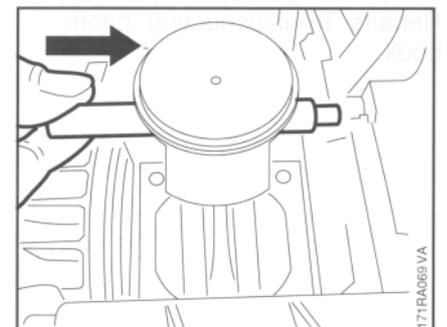
- To ease assembly, heat the piston slightly and slip it over the connecting rod.
- Check installed position of piston:
  - 1 = Mark
  - 2 = Flywheel



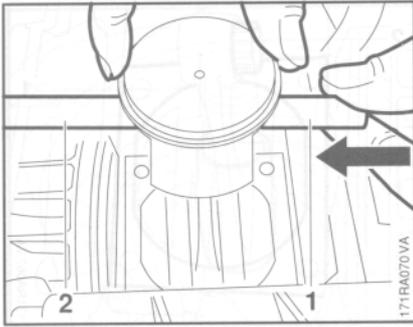
- Ease the hookless snap rings out of the grooves in the pistons.



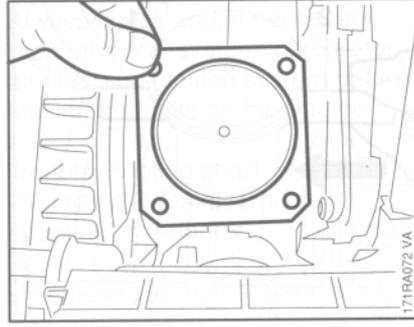
- Inspect piston rings and replace if necessary - see 4.6.



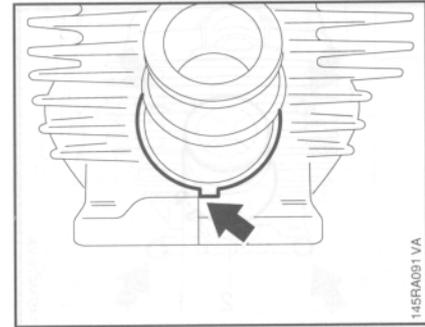
- Push the assembly drift, small diameter first, through the piston and small end (needle cage) and line up the piston.



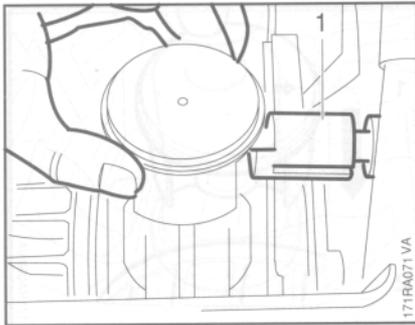
- Fit the piston pin (1) on the assembly drift (2) and slide it into the piston (the pin slides home easily if the piston is heated).



- Place new cylinder gasket in position.

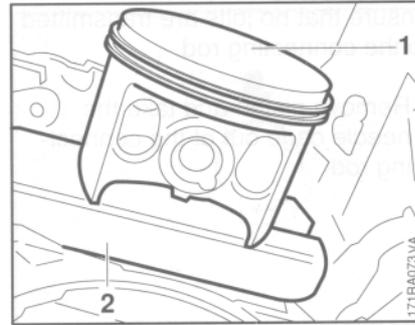


- Push the manifold onto the intake port.
- Note installed position of manifold.

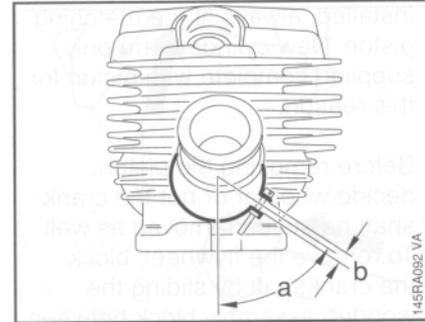


- Apply the installing tool (1) 5910 890 2212 to the piston boss, hold the piston steady, center the tool shank exactly and press home until the snap ring slips into the groove.

**Note:** For instructions on how to use installing tool, see "Standard Repairs, Troubleshooting" handbook.

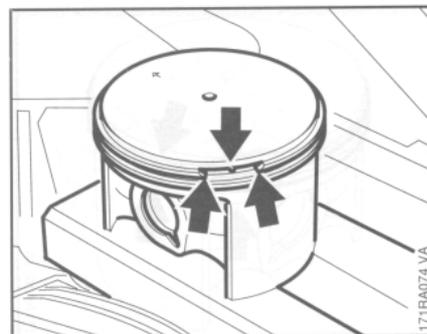


- Lubricate the piston and piston rings with oil and place the piston (1) on the wooden assembly block (2) 1108 893 4800.

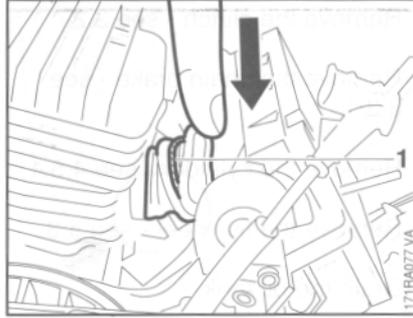
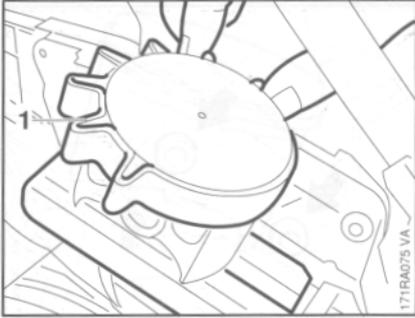


- Push the hose clamp over the manifold. The screw head must point to the right.
- Tighten the hose clamp. Ends of clamp must point down to the right at angle "a" of 45 degrees.

**Note:** Tighten the screw until the gap "b" between the two ends of the hose clamp is 6.5 - 7 mm (0.25 - 0.27 in).

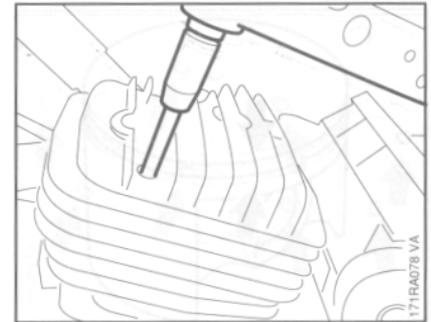


- Install the new piston rings in the grooves so that the radii at the ring gap face upward and meet at the fixing pin.



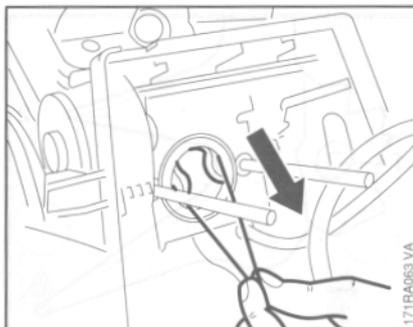
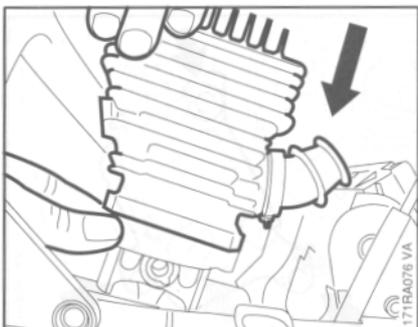
**Note:** The manifold flange is thus pulled through the tank housing intake opening without damaging the manifold.

- Use the clamping strap (1) 0000 893 2600 to compress the piston rings around the piston.
- Check that the piston rings are correctly positioned.
- Lubricate the inside of the cylinder with oil and line it up so that it is positioned as it will be in the installed condition. It is important to observe this point as the piston rings might otherwise break.
- Remove the clamping strap and wooden assembly block.
- To fit the manifold in the tank housing intake opening, wind a piece of string (1) (about 15 cm / 6" long) around the back of the manifold flange and pass the ends of the string through the intake opening.
- Push the manifold down.



- Carefully line up the cylinder and gasket.
- Fit cylinder base screws and torque down to 15.0 Nm (11.0 lbf.ft) in diagonal pattern.

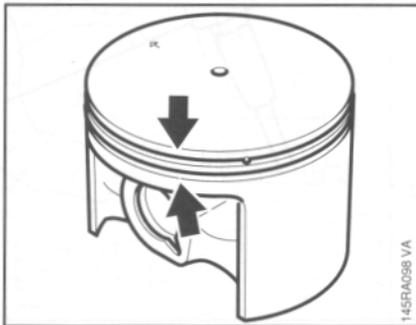
Assembly is now a reversal of the disassembly sequence



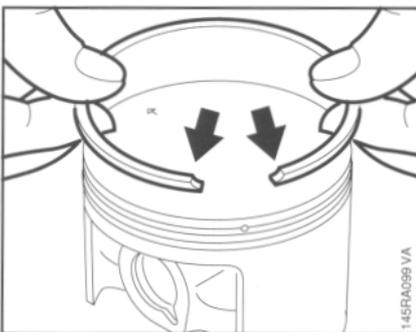
- Slide the cylinder over the piston - the clamping strap is pushed downward as the piston rings slip into the cylinder.
- Pull the ends of the string outward.

## 4.6 Piston Rings

- Remove the piston - see 4.5.1.
- Remove rings from piston.



- Use a piece of old piston to scrape the grooves clean.



- Install the new piston rings in the grooves so that the radii face upward.
- Install the piston - see 4.5.2.

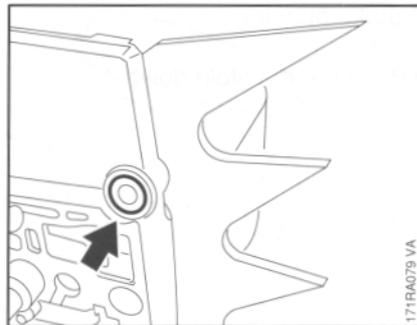
## 4.7 Crankcase

### 4.7.1 Removing the Crankshaft

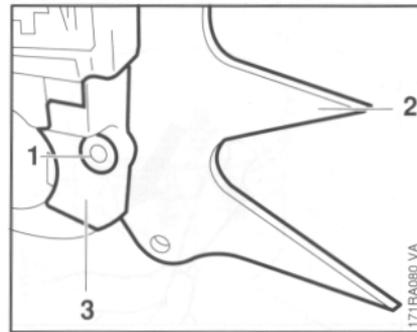
- Remove the clutch - see 3.2.
- Remove the chain brake - see 3.3.1.
- Remove the cylinder - see 4.5.1.
- Remove the flywheel - see 5.3.
- Drain the oil tank.
- Drain the fuel tank.

**Note:** Dispose of fuel at approved disposal site.

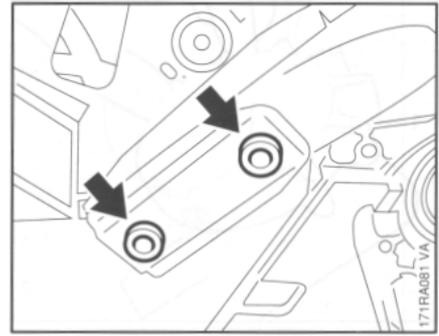
- Remove the oil pump - see 9.4.1.



- Hold the self-locking nut steady and take out the screws.

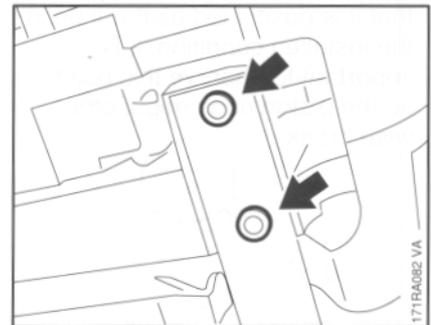


- Take out the screw (1).
- Remove the spiked bumper (2) with deflector (3).



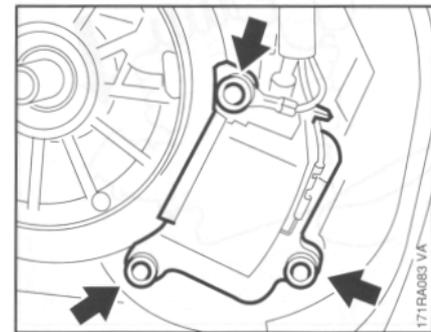
**Important:** Heat the screws. Take care not to overheat plastics.

- Remove front handle mounting screws from side of machine.

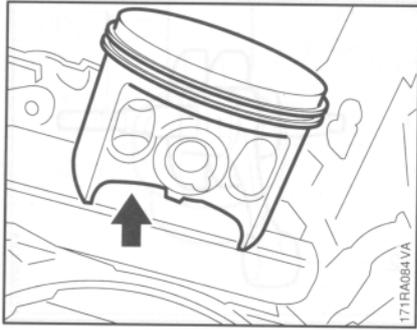


- Remove front handle mounting screws from underside of machine.

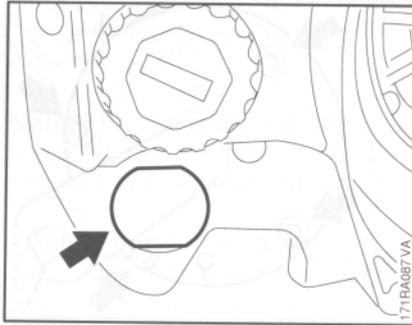
- Lift away the front handle.



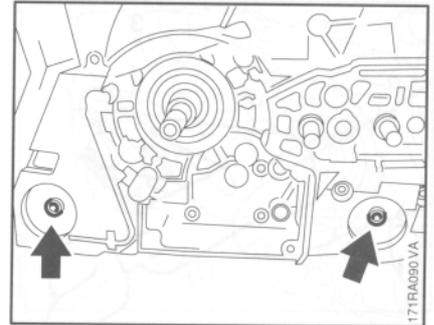
- Take out the screws.
- Remove the ignition module.



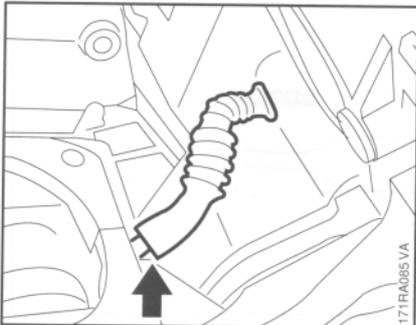
- Remove the piston - see 4.5.1.



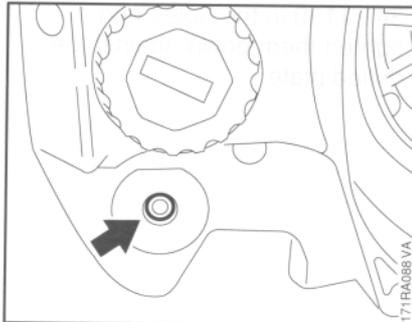
- Pry the plug out of the annular buffer at the starter side.



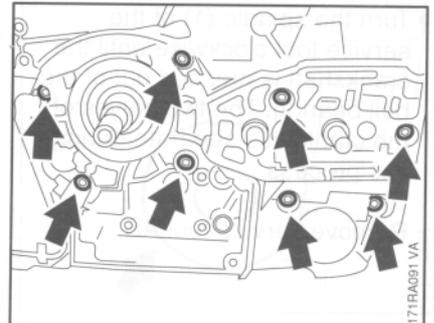
- Take the screws out of the annular buffers.
- Lift the crankcase away from the tank housing.



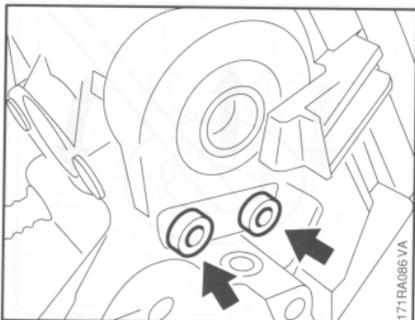
- Pull impulse hose off the nipple.



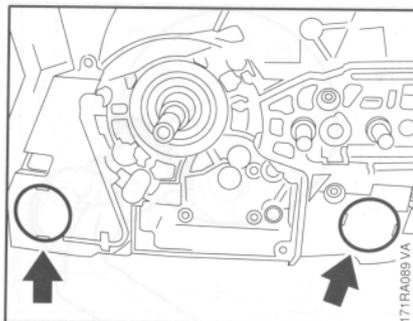
- Take the screw out of the annular buffer.



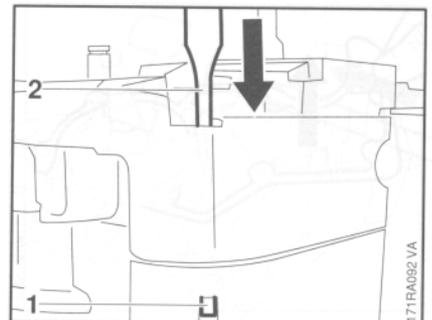
- Unscrew the mounting screws which join the two halves of the crankcase.



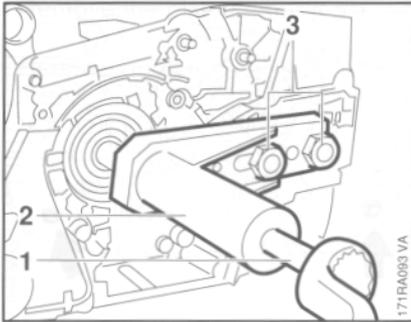
- Take out the screws.



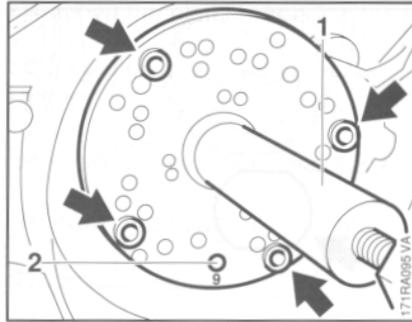
- Pry the plugs out of the annular buffers at the clutch side.



- At chain tensioner side of crankcase, use a 5 mm (3/16") drift (2) to drive the dowel pin (1) out of the two halves of the crankcase.



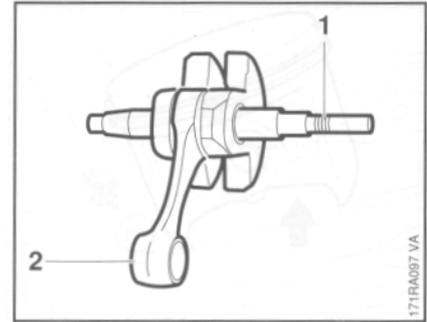
- Back off spindle (1) of service tool AS 5910 007 2205 all the way.
- Slip service tool AS (2) over the collar studs, fit the hexagon nuts (3) (for sprocket cover) and tighten them down by hand.
- Turn the spindle (1) of the service tool clockwise until the crankshaft is pressed out of the ball bearing. The two halves of the crankcase separate during this process.
- Remove service tool AS.



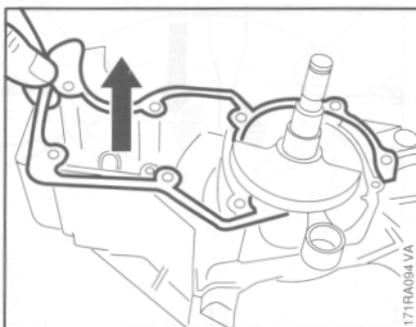
- Fit service tool ZS (1) 5910 007 2220 against starter side of crankcase so that number "9" (2) on the plate is at the bottom.

**Note:** Cylinder flange upright.

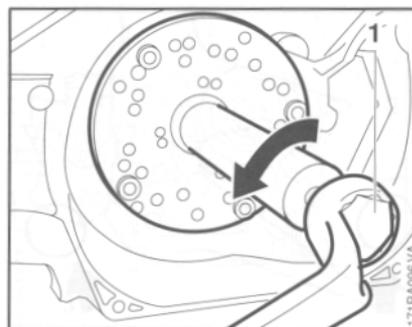
Insert four M5x72 screws 9022 341 1190 in the holes and tighten them down against the drilled plate.



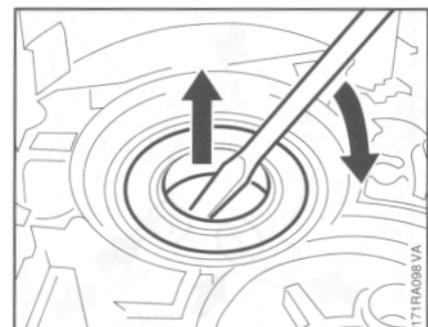
- The crankshaft (1), connecting rod (2) and needle bearing form an inseparable unit. This means that the crankshaft must always be replaced as a complete unit.
- When fitting a replacement crankshaft, always install new oil seals and ball bearings.



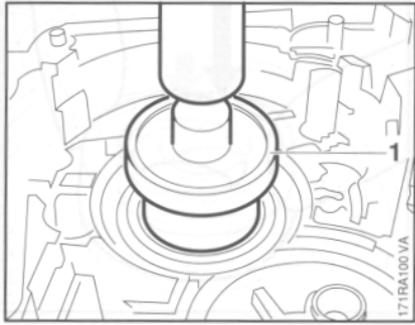
- Remove crankcase gasket.
- Unscrew spindle of service tool ZS a little (left-hand thread).



- Turn spindle (1) counterclockwise until the crankshaft is pushed out of the ball bearing.



- Pry the oil seal out of the ball bearing at the clutch side.



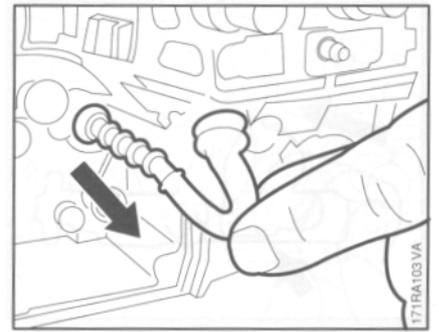
- Use press arbor (1) 1124 893 7200 to press the ball bearing out of its seat.
- If necessary, remove snap ring from bearing seat.

- Inspect both halves of the crankcase for cracks and replace if necessary.

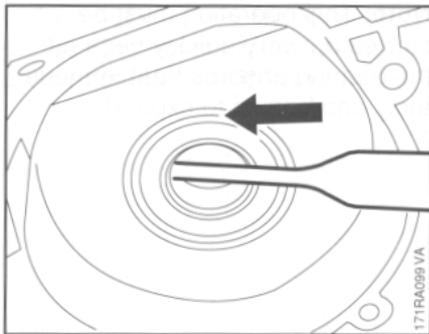
**Note:** The crankcase must be replaced as a complete unit even if only one half is damaged.

All other parts which are still serviceable can then be transferred to the new crankcase.

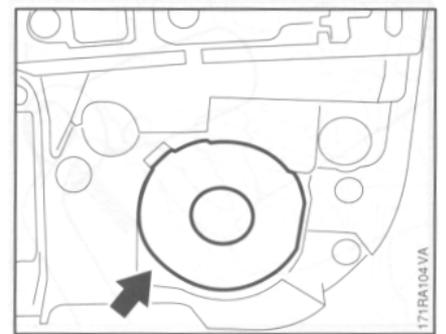
If only the ball bearings have to be replaced, remove all rubber and plastic components first, i.e. oil suction hose, stop buffer and annular buffers. Carry out the following operations for this purpose.



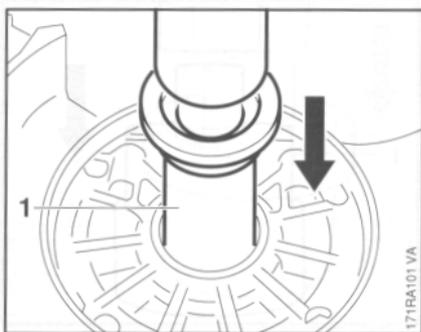
- Pull out the oil suction hose with pickup body.



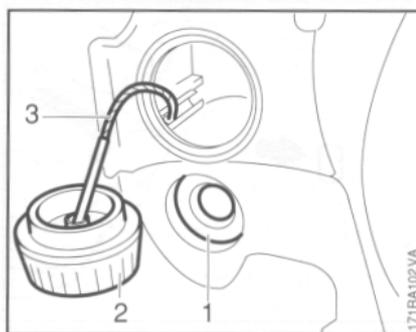
- Carefully knock the oil seal out of the starter side of the crankcase.



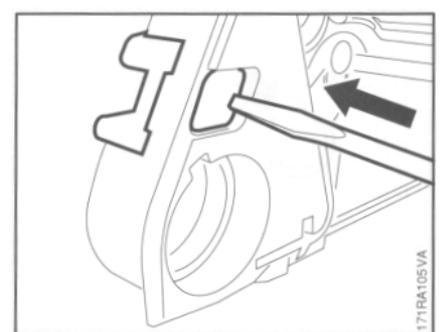
- Push the annular buffer out of the clutch side of the crankcase.



- Use press arbor (1) 1119 893 2401 to remove the ball bearing.



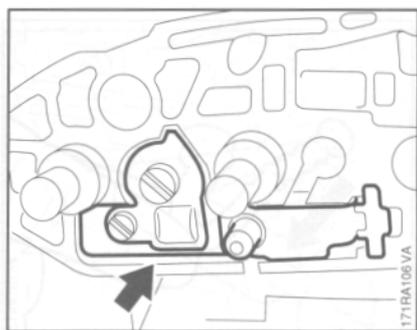
- Push the annular buffer (1) out of the starter side of the crankcase.
- Unscrew the oil tank filler cap (2).
- Remove cord (3) from the groove.



- Push the stop buffer out of its seat.

**Note:** To replace the crankcase, carry out the following operations.

#### 4.7.2 Installing the Crankshaft

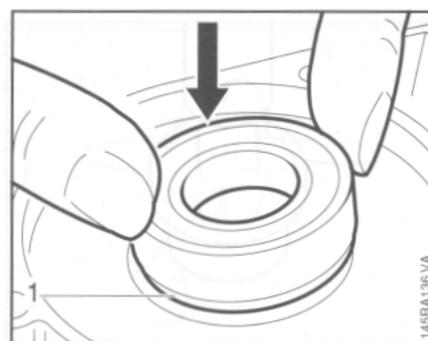


**New** crankcases come with preassembled ball bearings.

Stamp the machine number on the crankcase with 2.5 mm (0.1 ") figure stamps.

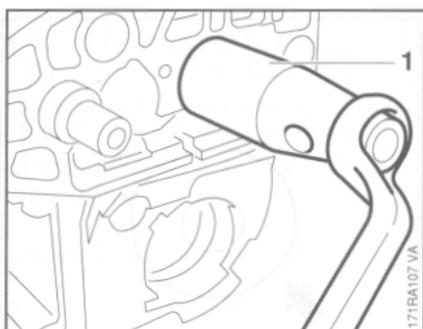
If the original crankcase is used again, remove the gasket residue and clean the mating surfaces they must be cleaned very thoroughly to ensure a perfect joint.

- Remove the complete chain tensioner - see 3.4.

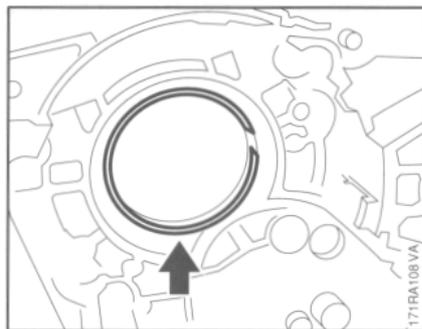


- Heat area of bearing seat on clutch side of crankcase to approx. 150 C (300 F).
- Place ball bearing in position, with stepped edge (1) down, and push it home by hand as far as stop.

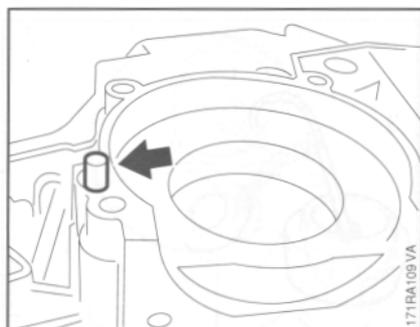
**Note:** This operation must be carried out very quickly because the bearing absorbs heat immediately and begins to expand.



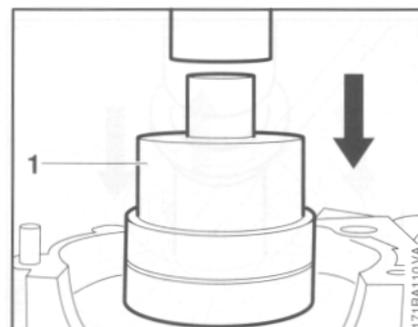
- If necessary, use stud puller (1) 5910 893 0506 to unscrew the collar studs.



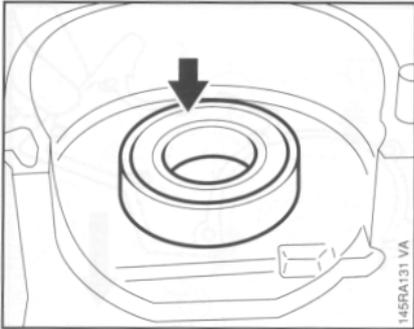
- Check that snap ring is fitted in the clutch side of the crankcase.



- Check that dowel pin is in position. If necessary, drive dowel pin into new crankcase.

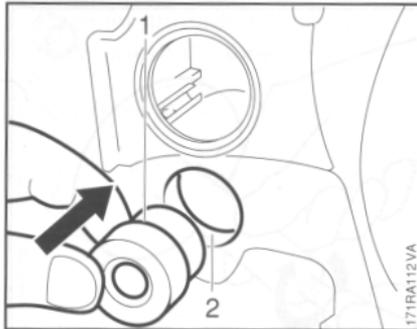


- If it is not possible to heat the crankcase, use the press arbor (1) 1124 893 7200 to press in the ball bearing as far as stop.

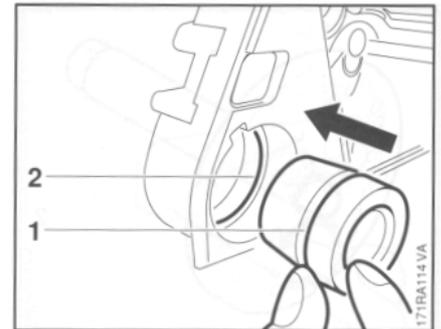


- Heat area of bearing seat on starter side of crankcase to approx. 150° C (300°F).
- Place ball bearing in position (closed side up) and push it home by hand as far as stop.

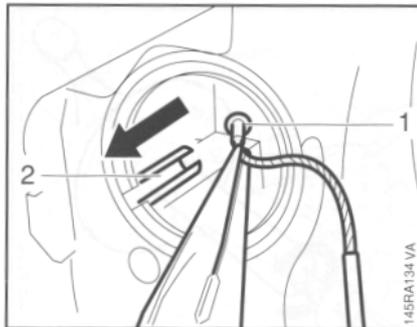
**Note:** This operation must be carried out very quickly because the bearing absorbs heat immediately and begins to expand.



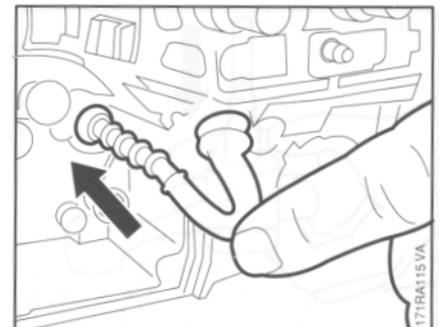
- After the crankcase has cooled down, push the annular buffer into position until its annular groove (1) engages the edge of the housing (2).



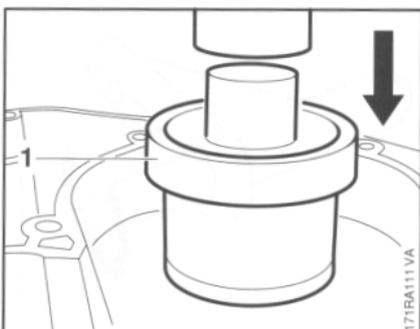
- Push the two annular buffers, tapered end first, into position until their annular grooves (1) engage the edge of the housing (2).



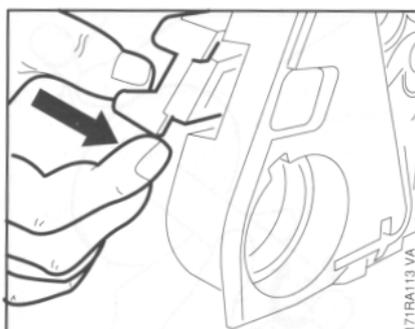
- Place filler cap's cord (1) in the groove (2) and pull it forward.



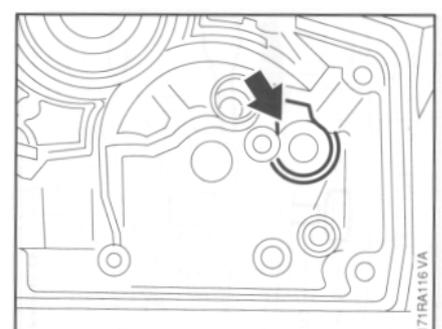
- Push the oil suction hose into the crankcase bore.



- If it is not possible to heat the crankcase, use the press arbor (1) 1124 893 7200 to press in the ball bearing as far as stop.



- After the crankcase has cooled down, push the stop buffer into guide until its lugs are behind the edge of the housing.



- Use a blunt tool to push the oil suction hose into the bore so that its tab locates in the recess at the top left.