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## **1. Introduction**

The "basic engine 4140" is used to drive a number of power tools: FS 45, 46, 55; FC 55; BG 45, 55, 65, 85; SH 55, 85; HS 45; HL 45.

Servicing procedures for specific machine components are described in the handbook "Machine components 4140".

There are separate handbooks for servicing procedures for standardized parts and assemblies that are installed in several STIHL power tool models ("Standard Repairs, Troubleshooting", "Carburetors"). Reference is made to these handbooks in the appropriate chapters in 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.

Refer to the latest edition of the relevant parts list to check the part numbers of any replacement parts needed. Parts lists on microfiche and CD-ROM are always more up to date than printed lists.

A fault in the machine may have several causes. To help locate the fault, 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.

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:

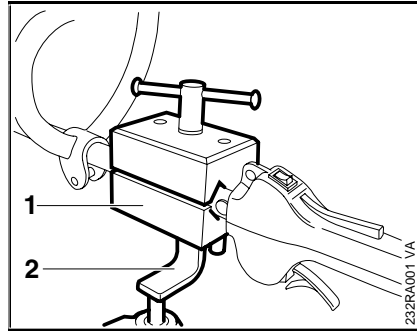
In the descriptions:

- = 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 on to third parties.



Servicing and repairs of power tools with shaft (FS, FC, HL) are made considerably easier if the machine is mounted on assembly stand (2) 5910 890 3100 with the aid of clamp (1) 5910 890 8800.

Secure the clamp to the assembly stand with two washers and two M8 nuts. The complete unit can then be swivelled to the best position for the ongoing repair, thus leaving 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.

If the machine is started up in the course of repairs or maintenance work, observe all local and specific national safety regulations, as well as the safety precautions and warnings in the owner's manual.

Petrol is a highly inflammable fuel and can be explosive in certain conditions.

Improper handling may result in burns or other serious injuries.

**Warning!** Do not smoke or bring any fire or flame near the fuel. All work with fuel must be performed outdoors only. Spilled fuel must be wiped away immediately.

### 3. Specifications

3.1	Engine	STIHL single-cylinder two-stroke engine with special impregnated cylinder bore	
		Displacement:	27.2 cm <sup>3</sup>
		Bore:	34 mm
		Stroke:	30 mm
		Engine power to ISO 8893 at 7000 rpm:	0.75 kW (1 HP)
		Max. permissible engine speed without cutting tool (cut-off speed):	9500 ± 800 rpm
		Idle speed:	2800 ± 300 rpm
		Bearings:	Crankshaft supported in heavy-duty deep-groove ball bearings, needle cages on small and big ends
		Piston pin diameter:	8 mm
		Clutch:	Centrifugal clutch without linings
		Clutch engages at:	3800 rpm
		Crankcase leakage test at gauge pressure:	p <sub>ü</sub> = 0.5 bar (5 kPa)
		under vacuum:	p <sub>u</sub> = 0.5 bar (5 kPa)
<hr/>			
3.2	Ignition system	Type:	Electronic magneto ignition (breakerless) with integral trigger unit
		Air gap:	0.15 ... 0.45 mm
		Spark plug (suppressed):	Bosch WSR 6F NGK BPMR 7 A Champion RCJ 6Y
		Electrode gap:	0.5 mm

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### 3.3 Tightening torques

DG and P (Plastoform) screws are used in polymer and lightmetal 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 impairing the strength of the screwed assembly, provided the specified tightening torque is observed. For this reason it is **essential to use a torque wrench**.

Fastener	Thread size	For component	Tightening torque (Nm)	Remarks
Spline screw	IS-DG5x60	Engine pan / crankcase / cylinder	9,0	2)
Spline screw	IS-DG5x60	Muffler / cylinder	9,0	2)
	M8	Starter cup	17,0	
	M14x1,25	Spark plug	20,0	
Spline screw	IS-DG4x20	Ignition module / cylinder	4,5	2)

Proceed as follows to fit a DG or P screw in an existing thread:

- Place the DG or P screw in the hole and turn 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 assembly.

**Note:** Power screwdriver speed settings for polymer: Plastoform screws max. 600 rpm  
DG screws max. 500 rpm

**Important!** Do not confuse screws with and without underhead locking teeth.

- 1) **With** locking teeth
- 2) **Without** locking teeth

## 4. Cylinder and piston Removal

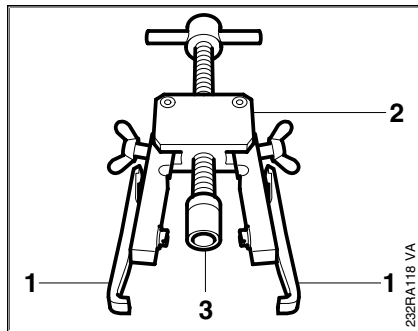
### 4.1 Removal

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

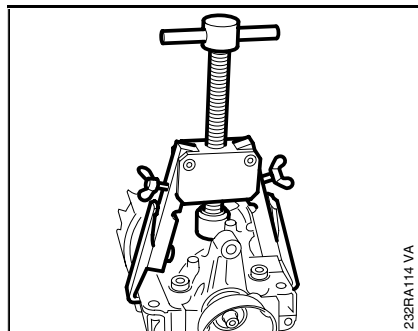
Troubleshooting chart – see "Standard Repairs, Troubleshooting" handbook.

- Remove housing parts, muffler, ignition module and spacer flange – see handbook "Components, Basic Engine 4140".

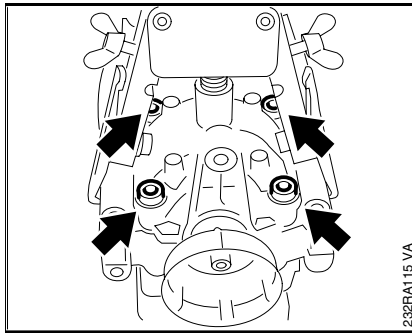
- Unscrew the spark plug.



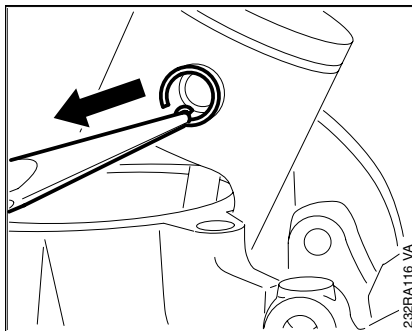
- Fit jaws (1) 0000 893 3700 with No. 2 profile on puller (2) 5910 890 4400.
- Fit screw bush (3) 1108 893 4500 on spindle.



- To ensure that the crankcase and engine pan do not come apart when the cylinder is removed, hold both parts together with the puller.

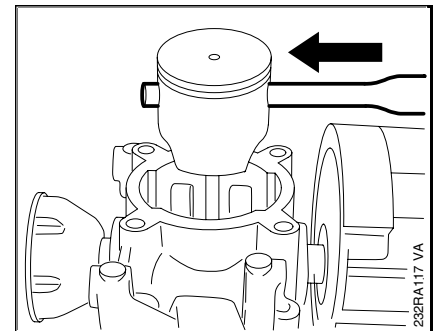


- Unscrew cylinder base screws.
- Clamp puller in a vice.
- Pull cylinder off piston.
- Inspect cylinder and replace it if necessary.
- If a new cylinder has to be installed, always fit the matching piston as well. New cylinders are only available with piston.
- Remove cylinder gasket.



- Take snap ring (B8x0.7) out of groove on starter cup side.

**Note:** The hookless snap ring on the flywheel side **remains** in the groove.



- Drive piston pin out of piston with a 7 mm drift.

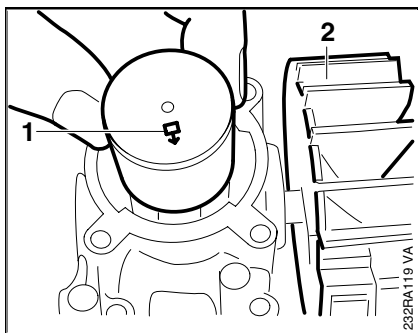
**Note:** If the piston pin is stuck, tap the end of the drift **lightly** with a hammer if necessary. **Hold the piston steady** during this process, so that jolts are not transmitted to the connecting rod.

- Remove piston from connecting rod.
- Inspect needle cage and replace crankshaft if necessary, [see 5.1](#).

**Note:** One (FS 45) or two (FS 45, 55) piston ring(s) is/are used depending on the model in question.

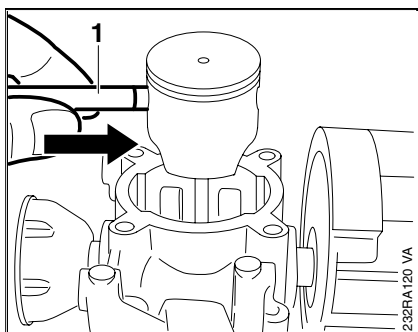
- Inspect piston rings and replace if necessary, [see 4.3](#).

## 4.2 Installation



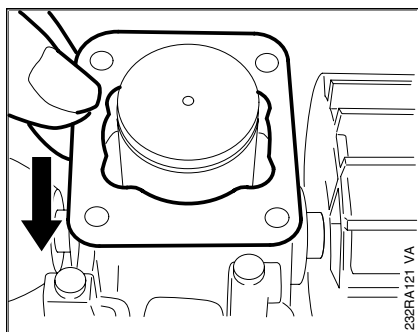
Thoroughly clean gasket seating surface.

- Lubricate needle cage in connecting rod with oil.
- To simplify assembly, heat the piston and slip it over the connecting rod.
- Installed position of piston:  
1 = Marking = exhaust side  
2 = Flywheel

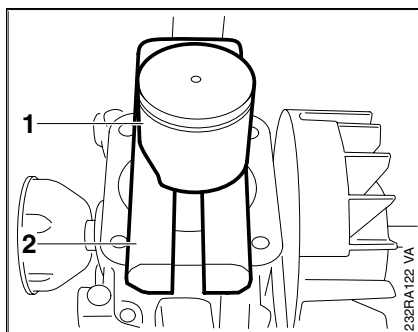


- Fit the piston pin in position and use assembly drift (1) 1114 893 4700 to push it as far as possible against the hookless snap ring (the pin slides home easily if the piston is hot).

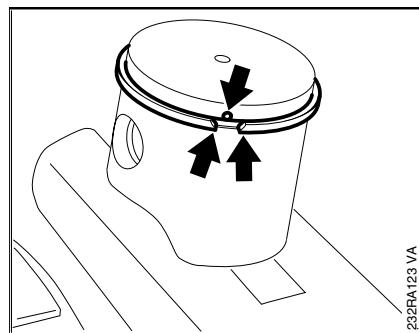
- Fit snap ring (B8x0.7) so that its gap is on the vertical axis of the piston (pointing up or down).



- Fit new cylinder gasket.

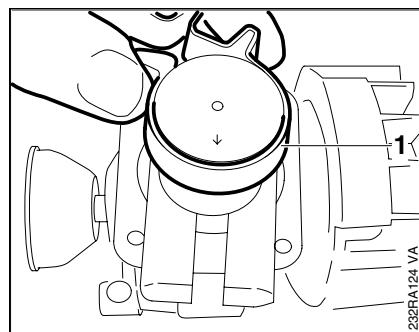


- Lubricate piston and piston rings with oil. Rest piston (1) on wooden assembly block (2) 1108 893 4800.



**Note:** One (FS 45) or two (FS 45, 55) piston ring(s) is/are used depending on the model in question.

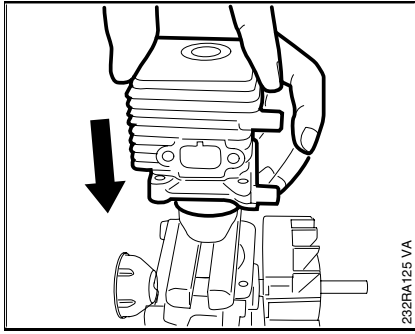
- Position the piston rings so that the radii at the ring gap meet at the fixing pin in the piston groove when the rings are compressed.



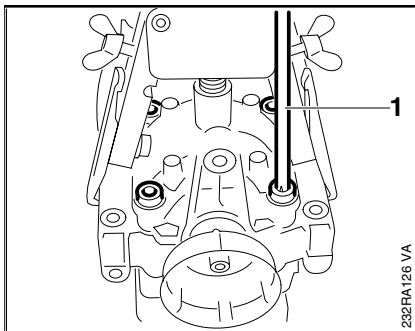
- Use clamping strap (1) 0000 893 2600 to compress piston ring around piston.

- Check that piston rings are correctly positioned.
- Lubricate inside of cylinder with oil and line it up in its subsequent position when installed. The piston rings may break if this point is disregarded.

### 4.3 Piston rings



- Slide cylinder over piston – the clamping strap is pushed downward as the piston rings slip into the cylinder.
- Remove clamping strap and wooden assembly block.
- Line up cylinder and cylinder gasket.



- Use socket (1) 0812 542 2104 to tighten down cylinder base screws to 9.0 Nm.

Assemble all other parts in the reverse sequence.

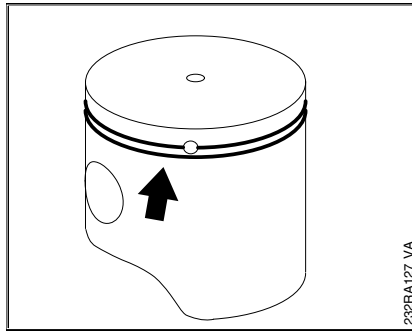
**Basic engine 4140**

- Remove piston, [see 4.1.](#)

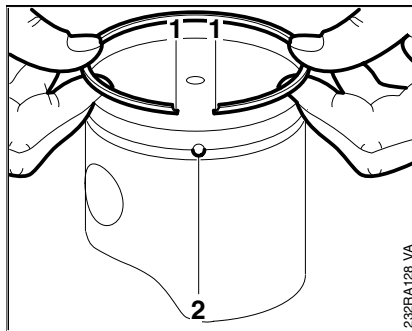
**Note:** One (FS 45) or two (FS 45, 55) piston ring(s) is/are used depending on the model in question.

**Note:** The piston must be removed to ensure that residues cannot fall into the crankcase when installing the piston rings and cleaning their grooves.

- Remove rings from piston.

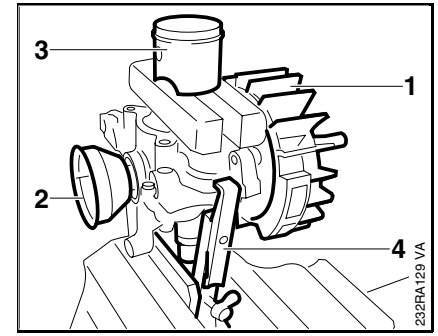


- Use a piece of old piston ring to scrape the grooves clean.

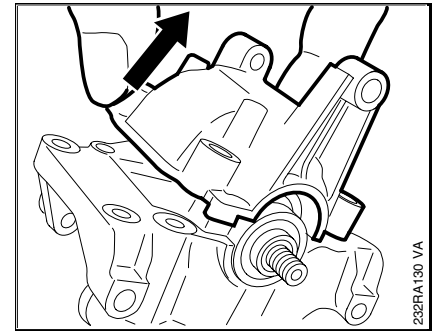


- Install the new piston rings in the grooves so that the radii (1) face the fixing pin (2).
- Install the piston, [see 4.2.](#)

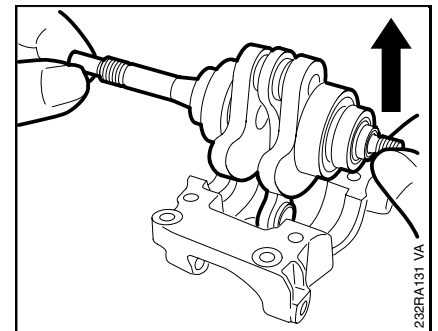
### 5. Crankshaft / ball bearings



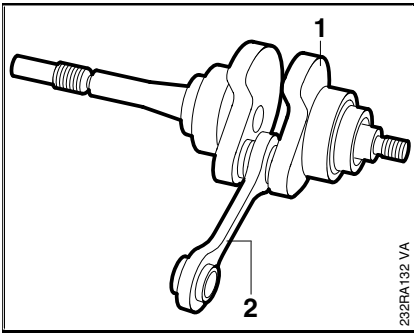
- Remove cylinder, [see 4.1.](#)
- Remove flywheel (1), starter cup (2) and piston (3).
- Remove puller (4).



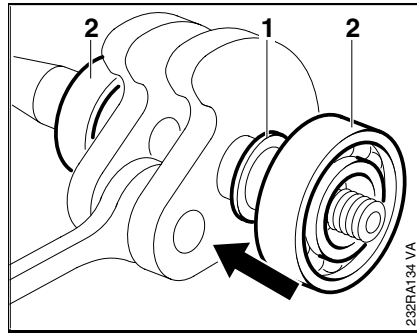
- Pull engine pan off crankcase.



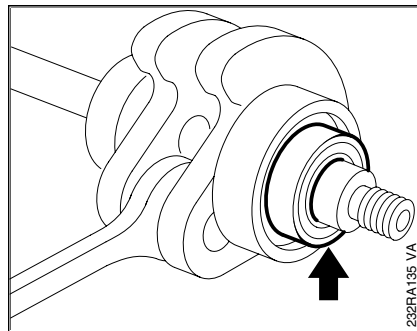
- Lift crankshaft out of crankcase.
- Inspect ball bearings and oil seals and replace if necessary.



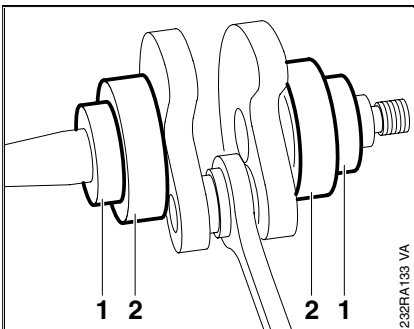
- Crankshaft (1), connecting rod (2) and needle bearing form an inseparable unit and must always be replaced as a complete unit.
- New oil seals and ball bearings must always be installed when fitting a replacement crankshaft.



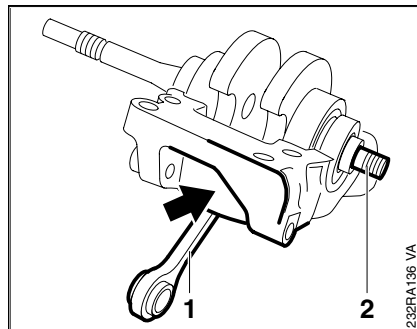
- Slip washers (1) onto right and left crankshaft stubs.
- Heat ball bearings (2) to approx. 50 °C and push them home as far as possible.



- Grease sealing lips of oil seals, [see 10](#).
- Slide the oil seals over the ends of the crankshaft, open side facing the ball bearings.

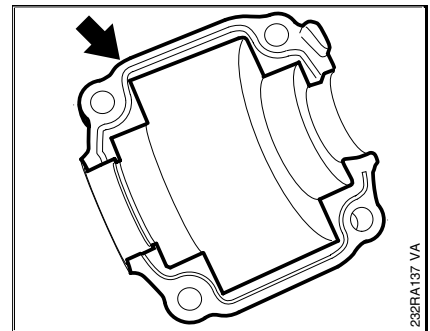


- Pull off the oil seals (1) and ball bearings (2).
- Remove washers.



- Thoroughly clean sealing faces on crankcase and engine pan to remove all traces of sealant.

- Place crankshaft in crankcase so that connecting rod (1) points to cylinder side and the short crankshaft stub (2) is on the wide side (arrow) of the crankcase.



- Apply a thin bead of sealant to mating face of engine pan, [see 10](#).

**Important!** Follow the manufacturer's instructions.

- Fit engine pan and clamp it to crankcase with puller, [see 4.1](#).

Assemble all other parts in the reverse sequence.

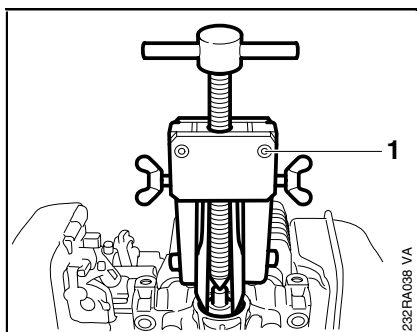


## 5.1 Oil seals

It is not necessary to disassemble the complete engine in order to replace the oil seals.

### Starter side:

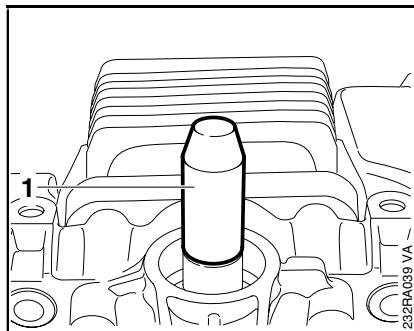
- Remove starter cup, [see 8.2](#).
- Remove housing parts, see handbook "Components, Basic Engine 4140".



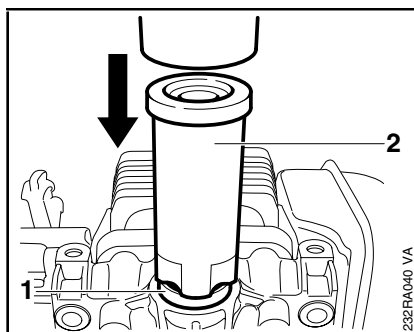
- Apply puller (1) 5910 890 4400 (with No. 3.1 jaws 0000 893 3706).
- Tension the arms.
- Pull out oil seal.

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

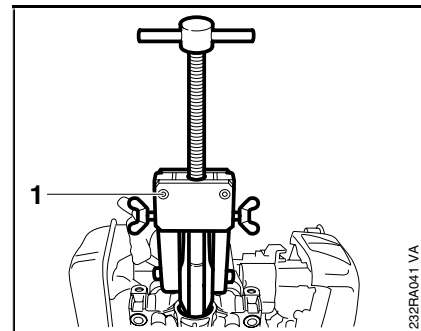
- Clean sealing surface with a standard solvent-based degreasant containing neither chlorinated nor halogenated hydrocarbons, [see 10](#).
- Grease sealing lips of oil seal, [see 10](#).



- Slip assembly sleeve (1) 1129 893 4600 over the crankshaft stub.



- Slide oil seal (1) over the crankshaft stub, open side facing the crankcase.
- Press fully home with press sleeve (2) 1114 893 4601.
- Fit housing parts.
- Install starter cup.

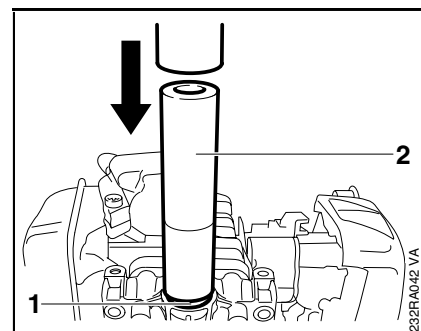


### Clutch side:

- Remove flywheel, [see 7.2](#).
- Apply puller (1) 5910 890 4400 (with No. 3.1 jaws 0000 893 3706).
- Tension the arms.
- Pull out oil seal.

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

- Clean sealing surface with a standard solvent-based degreasant containing neither chlorinated nor halogenated hydrocarbons, [see 10](#).
- Grease sealing lips of oil seal, [see 10](#).



- Slide oil seal (1) over assembly sleeve with open side facing crankcase.

## 6. Leakage test

- Press fully home with press sleeve (2) 1120 893 2400.
- Fit flywheel.

Leaks are usually caused by defective oil seals or gaskets and cracks in castings of the spacer flange. Such faults allow supplementary air to enter the engine and thus upset the fuel-air mixture.

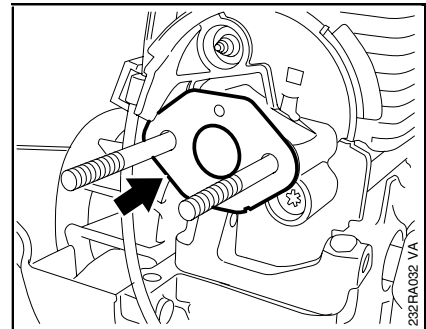
This makes adjustment of the prescribed idle speed difficult, if not impossible.

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

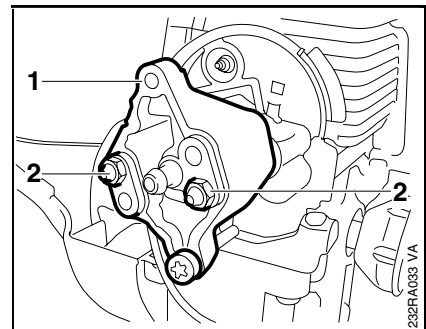
The crankcase can be checked thoroughly for leaks with the carburetor and crankcase tester and the vacuum pump.

## 6.1 Preparations

- Remove shroud, carburetor and starter cover, see handbook "Machine components, 4140".
- Set piston to top dead centre (T.D.C.). This can be checked through the inlet port.
- Check that the spark plug is properly tightened down.



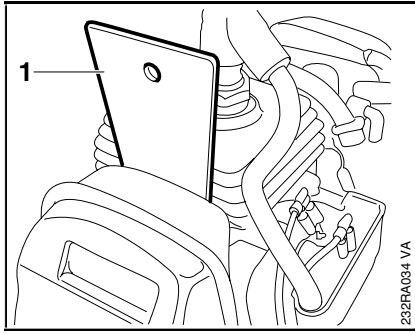
- Fit a new gasket on spacer flange.



- Fit test flange (1) 1128 850 4200.

Fit nuts (2) and tighten down to 3.5 Nm.

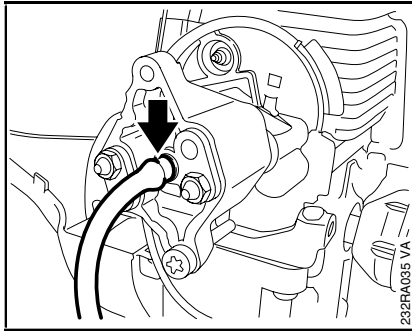
## 6.2 Pressure test



- Slacken muffler mounting screws half-way.

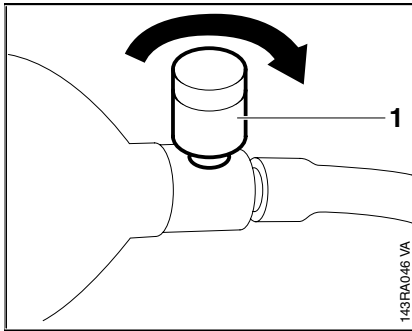
- Slide sealing plate (1) 0000 855 8106 between gasket and cylinder exhaust port. Retighten screws moderately.

**Note:** The sealing plate must completely fill the space between the screws.

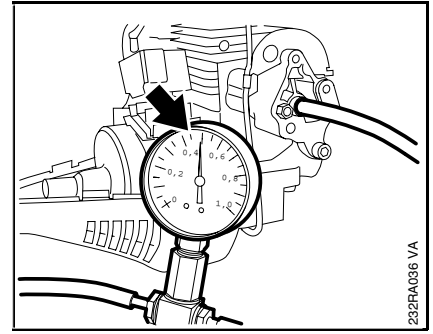


- Carry out preparations, [see 6.1](#).

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



- Close vent screw (1) on rubber bulb.
- Use rubber bulb to pump air into the engine until the gauge indicates a pressure of 0.5 bar (5 kPa). If this pressure remains constant for at least 20 seconds, the crankcase is airtight.



- 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.

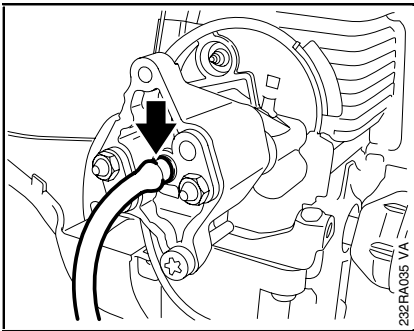
- Repeat the pressure test.
- Carry out vacuum test, [see 6.3](#).
- After testing, open vent screw and disconnect hose.
- Remove test flange.
- Slacken muffler mounting screws.
- Pull out sealing plate and tighten down the screws to 9.0 Nm.
- Refit starter cover, carburetor and shroud, see handbook "Machine components 4140".

### 6.3 Vacuum test

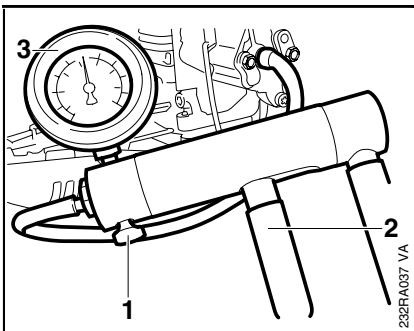
Oil seals tend to fail when subjected to a vacuum, i.e. the sealing lip lifts away from the crankshaft during the piston's induction stroke because there is no internal counterpressure.

An additional test can be carried out with the vacuum pump to detect this kind of fault.

- Carry out preparations, see 6.1.



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

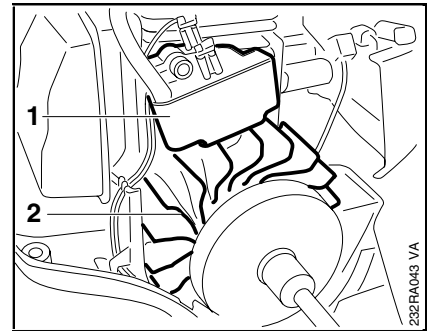


- Close vent screw (1) on pump cylinder.
- Operate lever (2) until the gauge (3) shows a vacuum of 0.5 bar (5 kPa).

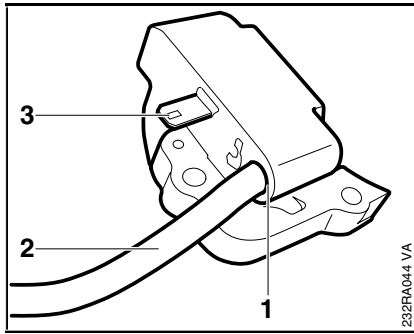
### 7. Ignition system

**Warning!** Exercise extreme caution when carrying out maintenance and repair work or troubleshooting on the ignition system. The high voltages which occur can cause serious or even fatal accidents!

Troubleshooting on the ignition system should always begin with the spark plug. See "Standard Repairs, Troubleshooting" handbook.



**Note:** The electronic (breakerless) ignition system basically consists of an ignition module (1) and flywheel (2).



The ignition module accommodates all the components required to control ignition timing.

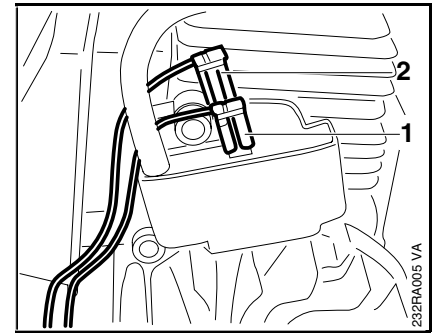
There are two electrical connections on the coil body:

- A. The high-voltage output (1) with ignition lead (2)
- B. The connector tag (3) for the short-circuit wire

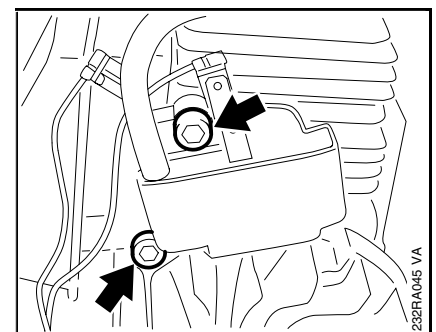
Accurate testing of the ignition module is only possible with sophisticated test equipment. For this reason, it is only necessary to carry out a spark test in the workshop. A new ignition module must be installed if an ignition spark is not obtained (after checking that wiring and stop switch are in good condition).

Ignition timing is **not** adjustable.

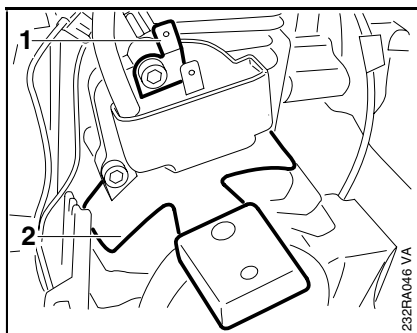
Since there is no mechanical wear in these systems, ignition timing cannot get out of adjustment. However, an internal fault in the circuit can alter the switching point in such a way that a spark test will still show the system to be in order although timing is outside the permissible tolerance. This will impair engine starting and running behaviour.



- Remove shroud or relevant housing part, see handbook "Machine components 4140".
- Disconnect short-circuit wire (1) and ground wire (2) from ignition module.
- Pull boot off spark plug.



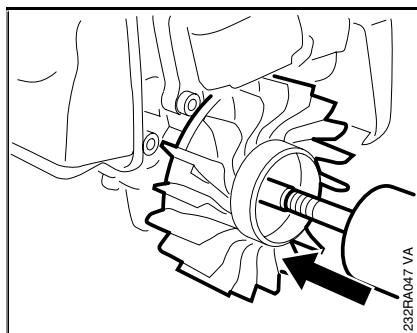
- Undo screws.
- Remove ignition module.



**Note:** The ignition lead is moulded to the ignition module.

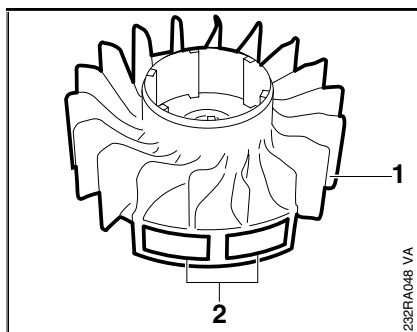
- Place ignition module in position and insert screws, but do not tighten them down yet.
- Secure connector tag (1) for ground wire with upper screw.
- Slide setting gauge (2) 1127 890 6400 between arms of ignition module and flywheel magnet poles.
- Press ignition module against setting gauge and tighten down the mounting screws to a torque of 4.5 Nm.

Assemble all other parts in the reverse sequence.



Removing the flywheel:

- Remove clutch, see handbook "Components, Basic Engine 4140".
- Lightly tap the end of the crankshaft stub with a rubber mallet to free the flywheel.
- Pull off the flywheel.



**Note:** There must not be any cracks or other signs of damage visible in the flywheel (1) and magnet poles (2), otherwise the flywheel must be replaced.

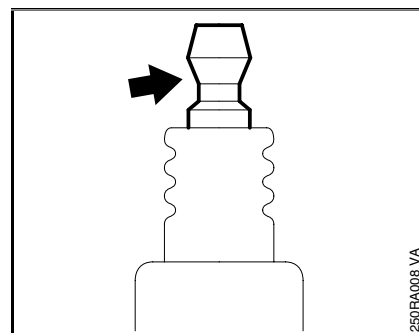
**Installing the flywheel:**

Important: Degrease the stub of the crankshaft and bore of the flywheel hub with a standard commercial solvent-based degreasant containing neither chlorinated nor halogenated hydrocarbons, [see 10](#).

- Fit flywheel.

**Note:** Check position of slot.

- Install clutch, see handbook "Components, Basic engine 4140".



- Pull locking strip out of cylinder.
- Fit spark plug and torque down to 20 Nm.
- If the spark plug comes with a separate terminal nut, always check that the nut is securely tightened down on the thread and retighten if necessary.
- Fit boot on spark plug.

## 8. Rewind starter

### 8.1 General

If the action of the starter rope becomes very stiff and the rope rewinds very slowly or incompletely, it may be assumed that the starter mechanism is in order but plugged with dirt. At very low outside temperatures, the lubricating oil on the rewind spring may thicken and cause the spring windings to stick together. This has a detrimental effect on the function of the starter mechanism. In such a case, it is sufficient to apply a few drops of paraffin (kerosine) to the rewind spring.

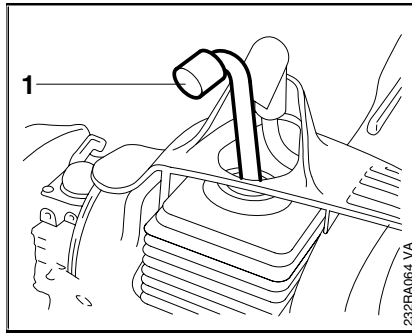
Then carefully pull out the starter rope several times and allow it to rewind until its normal smooth action is restored.

If clogged with dirt or pitch, the entire starter mechanism, including the rewind spring, must be removed and disassembled. Take particular care when removing the spring.

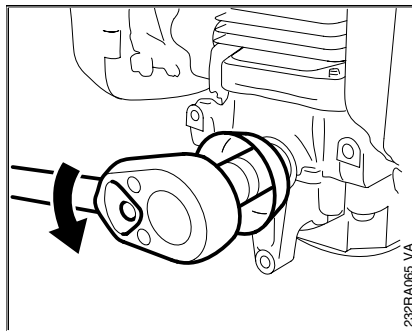
Wash all parts in paraffin or white spirit.

Lubricate the rewind spring and starter post with STIHL special lubricant, [see 10](#), before installing.

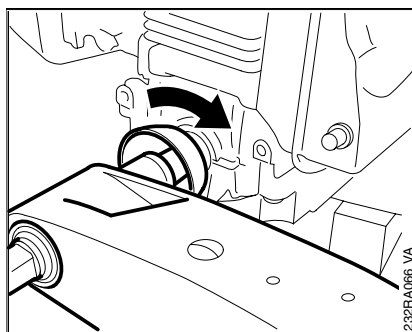
### 8.2 Starter cup



- Remove starter cover, see handbook "Components, Basic Engine 4140".
- Unscrew spark plug.
- Fit locking strip (1)  
4221 893 5900.



- Unscrew starter cup.



- Fit starter cup and torque down to 17.0 Nm.

Install all other parts in the reverse sequence.

## 9. Special servicing tools

No.	Part name	Part No.	Application	Remarks
1	Locking strip for piston	4221 893 5900	Blocking crankshaft	
2	Puller	5910 890 4400	Removing oil seals	1)
3	- Jaws (profile No. 3.1 + 4)	0000 893 3706		
4	- Jaws (profile No. 2)	0000 893 3700	Clamping engine pan and crankcase	
5	- Screw bush	1108 893 4500		
6	Carburetor and crankcase tester	1106 850 2905	Testing carburetor and crankcase for leaks	
7	Vacuum pump	0000 850 3501	Testing crankcase for leaks	
8	Sealing plate	0000 855 8106	Sealing exhaust port for leakage test	
9	Test flange	1128 850 4200	Leakage test	
10	Assembly sleeve	1129 893 4600	Protecting oil seal (starter side)	
11	Press sleeve	1114 893 4601	Installing oil seal (starter side)	
12	Press sleeve	1120 893 2400	Installing oil seal (clutch side)	
13	Setting gauge	1127 890 6400	Setting air gap between ignition module and flywheel	2)
14	Crimping tool	5910 890 8210	Attaching connectors to electrical wires	
15	Torque wrench	5910 890 0301	Screw connections (0.5 to 18 Nm)	3)
		5910 890 0302		4)
16	Torque wrench	5910 890 0311	Screw connections (6 to 80 Nm)	3)
		5910 890 0312		4)
17	Spline screw socket T27x125	0812 542 2104	Tightening hexagonal socket-head screws	
18	Screwdriver Q-T27x150	5910 890 2400	For all hexagonal socket-head screws	5)
19	Assembly stand	5910 890 3100	Holding FS units	
20	- Clamp	5910 890 8800	Holding FS units by drive tube for servicing (in conjunction with assembly stand)	
21	Assembly drift	1114 893 4700	Installing piston pin	
22	Wooden assembly block	1108 893 4800	Fitting piston	
23	Clamping strap	0000 893 2600	Compressing piston ring	

### Remarks:

- 1) Equivalent to puller 0000 890 4400, but with longer spindle 5910 890 8400.
- 2) Setting gauge 1111 890 6400 can be used instead.
- 3) Always use torque wrench to tighten DG/P screws.
- 4) Wrench includes visual/acoustic signal.
- 5) May only be used on GD/P screws for releasing.



## 10. Service aids

No.	Part name	Part No.	Application
1	Lubricating grease (370 g tube)	0781 120 1111	Oil seals
2	Standard commercial solvent-based degreasant containing neither chlorinated nor halogenated hydrocarbons		Cleaning crankshaft stub
3	STIHL special lubricant	0781 417 1315	Bearing bore in rope rotor, rewind spring in rope rotor
4	Electrical repair kit	5910 007 1050	Electrical system
5	Dirko sealant	0783 830 2120	Sealing engine pan / cylinder

## 11. Special accessories for the user

Part name	Part No.
Safety glasses	
STIHL ElastoStart (starter rope with grip)	0000 190 3400
STIHL gear lubricant for brushcutters	
- tube 80 g	0781 120 1117
- tube 225 g	0781 120 1118
STIHL gear lubricant for hedge trimmers	
- tube 80 g	0781 120 1109
- tube 225 g	0781 120 1110