
Workshop Manual

Brushcutter, Trimmer

McCulloch modell T22LCS, T22LS

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General recommendations

The workshop used to carry out repairs must be equipped with safety devices in accordance with local directives.

No one may carry out repairs without first having read and understood the contents of this Workshop Manual.

The boxes below can be found in appropriate parts of this manual.



WARNING!

The warning box warns of the risk for personal injury if the instructions are not followed.

NOTE!

This box warns of damage to material if the instructions are not followed.

The machine is type approved for safety in accordance with applicable legislative demands with the equipment specified in the Operator's Manual. The assembly of other equipment or accessories or spare parts not approved by Husqvarna can result in the failure to meet these safety demands and that the person carrying out assembly bears responsibility for this.

Bear in mind:



Do not start the machine without making sure the cutting attachment and all the safety features are fitted and working properly.



To avoid burns, do not touch hot components, e.g. the muffler before they have cooled sufficiently.



Avoid getting fuel or oil on your skin or in your mouth.

Use a barrier cream on your hands. This reduces the risk of infection and makes dirt easier to wash away.

Long term contact with engine oil can represent a health hazard.



Never start the engine indoors. Exhaust fumes are poisonous! They contain carbon monoxide, an odourless, poisonous and highly dangerous gas.



Wipe up oil spills from the floor immediately to avoid slipping.



Do not use tools that are worn or fit badly, for example on nuts and bolts.



Always work on a clean bench.



Always work logically to ensure all parts are fitted correctly and that nuts and bolts are tightened.



Use the special tools where recommended to be able to carry out the work correctly and efficiently.

Fire risk

Handle fuel with respect as it is extremely inflammable.

Never refuel while the engine is running.

Do not smoke and ensure there are no open flames or sparks in the vicinity.

Never start the engine if the machine is leaking fuel or if there has been a spillage when refuelling. Allow the remaining fuel to evaporate first.

Make sure there is a working fire extinguisher close at hand.

Do not try to extinguish a petrol fire with water.

Poisonous fumes

When using cleaning agents read the instructions carefully.

Ensure there is good ventilation when handling petrol and other volatile fluids.

The engine's exhaust fumes are poisonous. Test run the engine outdoors.

Special tools

Some of the work described in this workshop manual requires special tools. In each section where this is necessary there is a picture of the tool and an order number.

We recommend the use of special tools in order to avoid expensive damage to parts in question and personal injury and to provide an efficient repair procedure.

Contact faces and gaskets

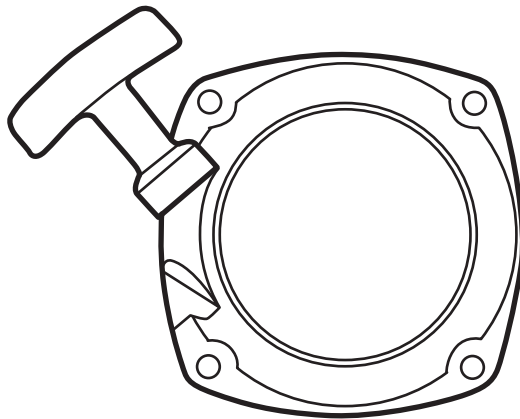
Ensure all surfaces are clean and free from gasket residue, etc. When cleaning use a tool that will not damage the contact face. Any scratches or unevenness should be removed using a flat fine cut file.

Sealing rings

Always replace a sealing ring that has been dismantled. The sensitive sealing lip can easily be damaged resulting in inferior sealing capacity. Surfaces which the seal shall seal against must also be completely undamaged. Lubricate the sealing lip with grease before it is fitted and ensure that it is not damaged e.g. by shoulders and splines on a shaft. Use tape or a conical sleeve as protection. It is important that the sealing ring faces in the right direction for it to act as it is intended.

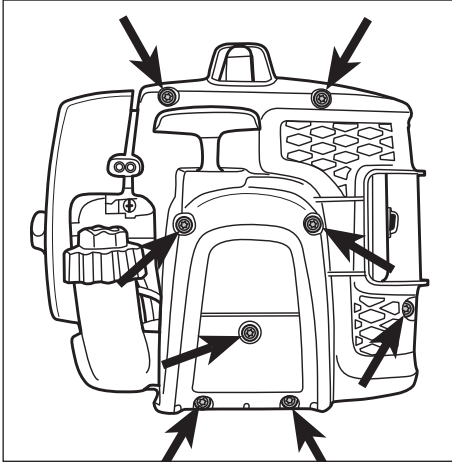
Starter

1



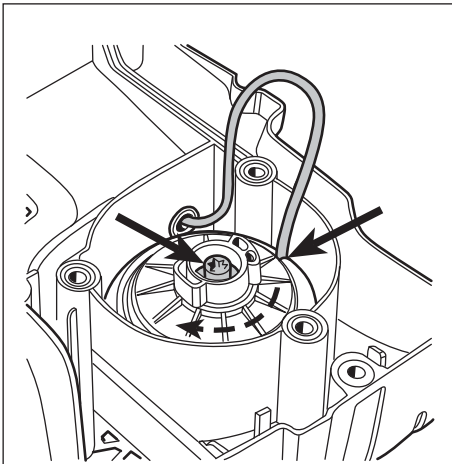
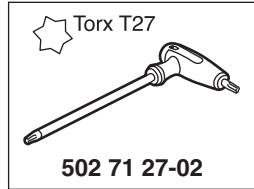
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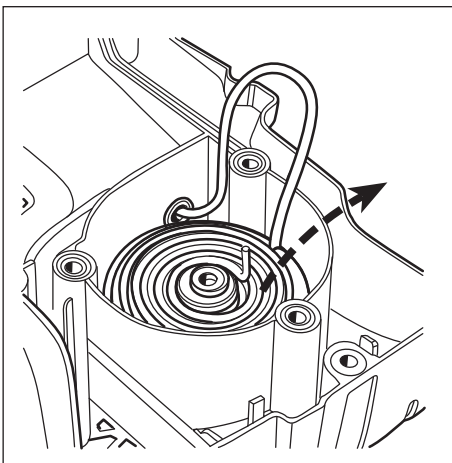
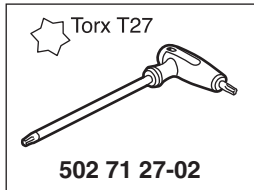


Dismantling

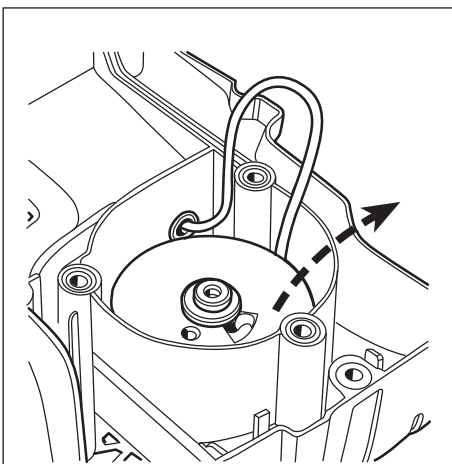
Remove the 8 screws and lift off the starter from the engine body.



Offload the spring tension.
Remove the screw and the washer.
Carefully remove the drive disc for the pressure equalisation spring.



Lift off the pressure equalisation spring.



Carefully lift off the starter pulley so that the recoil spring does not fly off its position in the starter pulley.

Dismantling

The starter, the cylinder cover and the cover over the muffler is one unit. Remove all the 8 screws.

Offload the spring tension.
Lift up the starter cord on the starter pulley and allow it to rotate clockwise. Slow the rotation with your thumb.
Remove the screw and the washer.
Carefully remove the drive disc for the pressure equalisation spring.

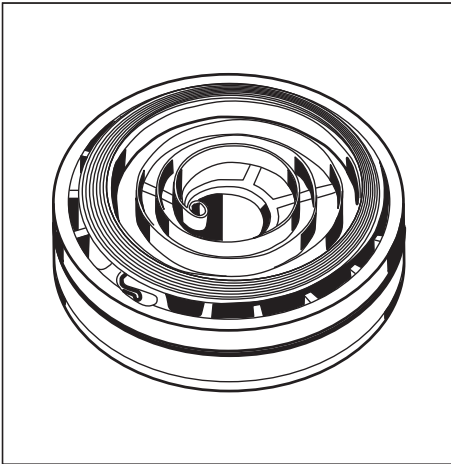
Lift off the pressure equalisation spring.

Carefully lift off the starter pulley so that the recoil spring does not fly off its position in the starter pulley.



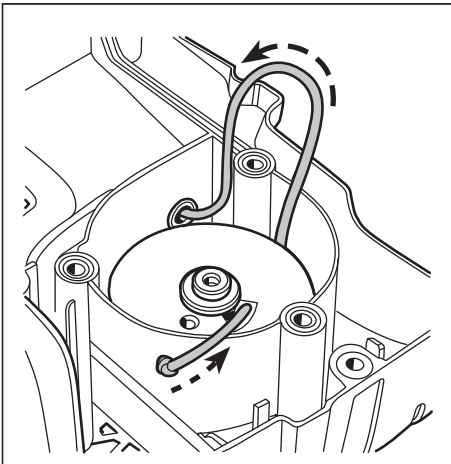
WARNING!
Wear protective glasses.

The return spring lies tensioned in the starter and can fly out and cause personal injury with careless handling.

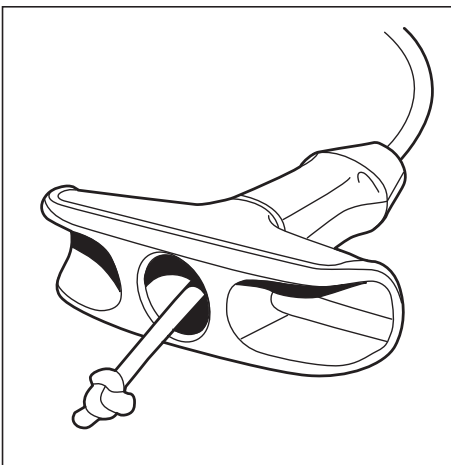


Assembly

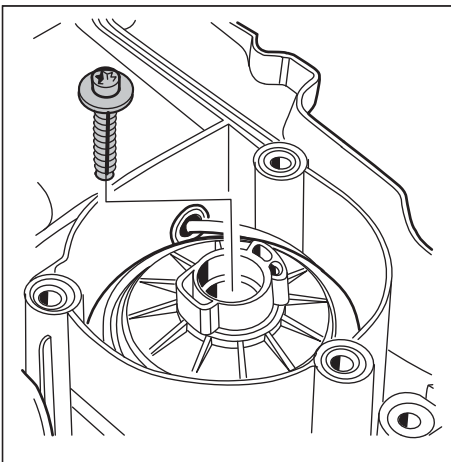
Clean the component parts and assemble in the reverse order as set out for dismantling.



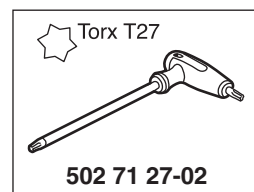
Wind the new starter cord 3 turns **anticlockwise** around the starter pulley.
Insert the starter pulley in position.



Assemble the starter handle.



Fit the pressure equalisation spring, the drive disc, the screw and the washer.



Assembly

Clean component parts before assembling.
Replace the return spring/starter pulley and starter cord, if necessary.

NOTE!

The return spring and starter pulley are supplied pre-assembled and are fitted in the starter housing as a single unit.

Exercise care when opening the packaging so that the spring does not fly out.

Wind the new starter cord 3 turns **anticlockwise** around the starter pulley. Push it in to the starter pulley's track as illustrated and then out through the cord guide in the starter cover.

Make sure that the knot at the end of the cord is as small as possible.

Lubricate the bearing pin with some grease and place the starter in position in the starter cover.

Assemble the starter handle.

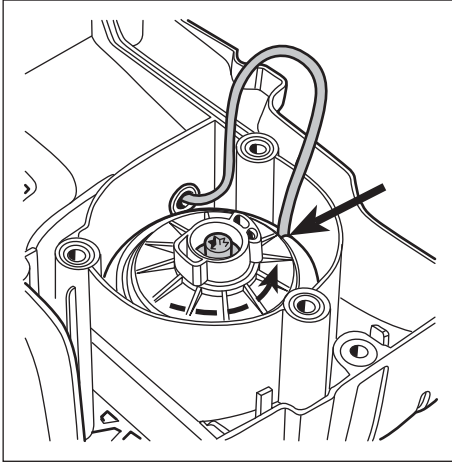
Tie a double knot and fold under the free end.

Pull the knot fully into the handle.

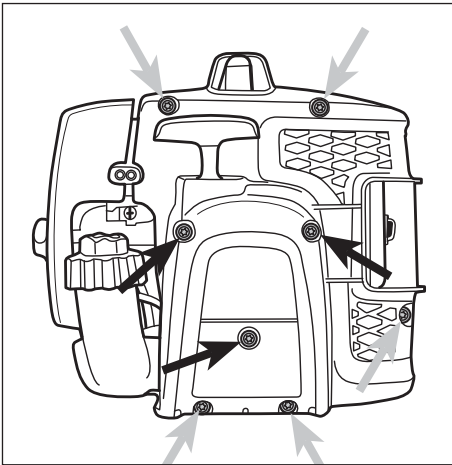
The pressure equalisation spring must be placed in position so that the **short** spring end is inserted into the starter pulley.

Place the drive disc over the pressure equalisation spring.

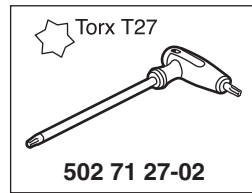
Fit the screw and the washer.



Tension the return spring.
Check the spring tension.
Fit the starter on the engine body.

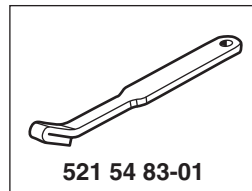


Mount the starter on the engine body.

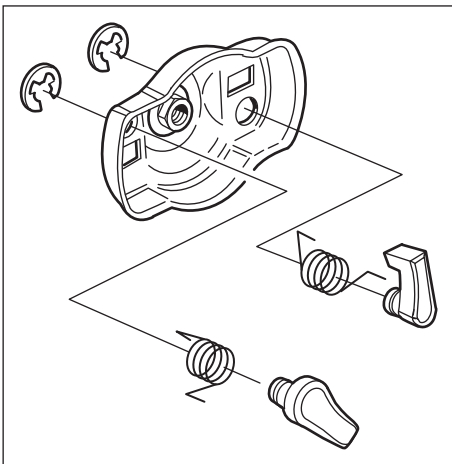
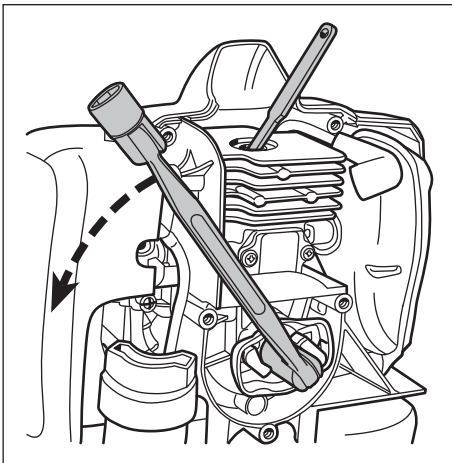


Replacing the drive dogs

Dismantle the drive body.



NOTE!
Position the piston stop so it is clamped between the piston crown and the combustion chamber. Not so it sticks out into the exhaust port.



Remove the circlip and replace any damaged drive dogs or springs, if necessary.

Tension the return spring.
Pull the starter cord out completely and slow the starter pulley with your thumb.
Lift the cord into the notch on the starter pulley.
Now turn the starter pulley **anticlockwise**, 4 turns.
Check the spring tension. With the starter cord fully extended it should still be possible to turn the starter pulley further, **at least a half turn**.
Fit the starter on the engine body and check that the drive dog engages.

Fit the starter on the engine body and check that the drive dogs engage.

NOTE!
Screw in place the 3 screws with the metric threads as shown in the illustration.

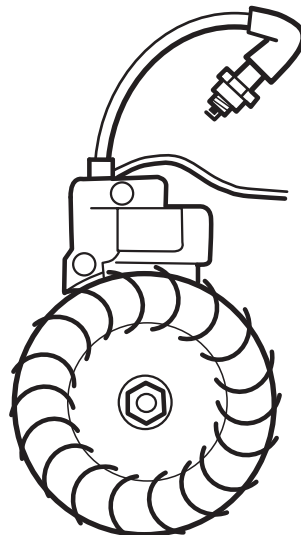
Replacing the drive dogs

Fit the piston stop, no. 521 54 83-01 in the spark plug hole and loosen the drive disc cup. (The nut is soldered onto the disc drive.)

Remove the circlip holding the drive dog.
Lift out the drive dog and spring for replacement.
Assemble in the reverse order as set out for dismantling.

Electrical system

2

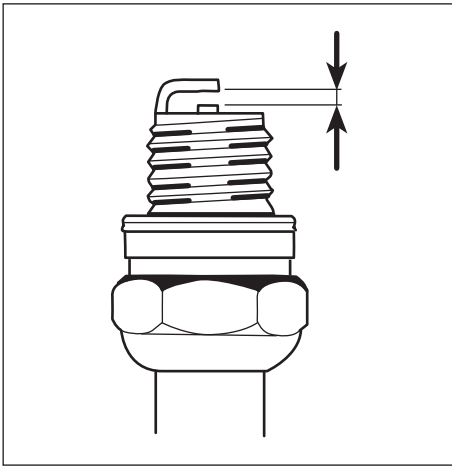


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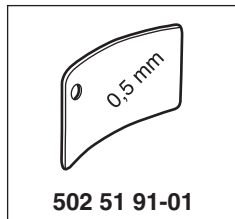
The engine is equipped with an electronic ignition system completely without moving parts. Consequently, a faulty component cannot be repaired, but must be replaced by a new component.

The spark in an electronic ignition system has a very short burn time and can therefore be interpreted as weak and can be difficult to see while troubleshooting.



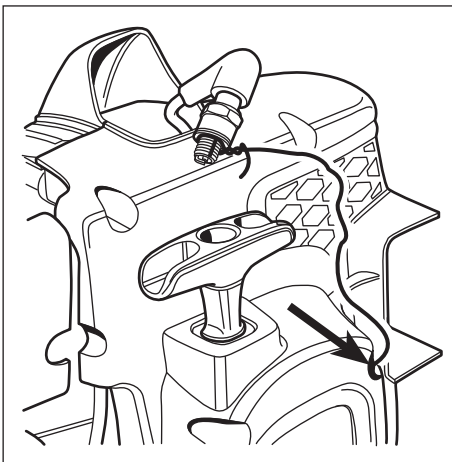
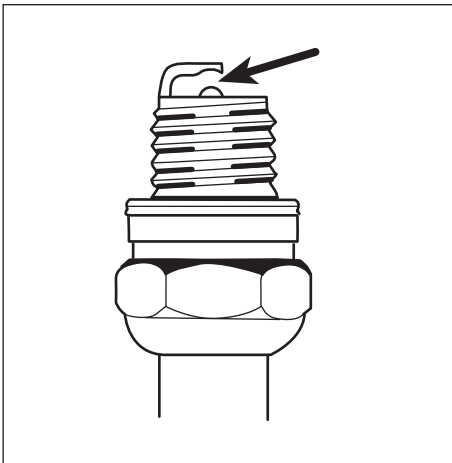
Checking the ignition spark

Clean the electrodes and check the electrode gap.



502 51 91-01

If the electrodes are worn more than 50% the spark plug should be changed.



Check if a spark occurs when attempting to start.

Test with test spark plug no. 502 71 13-01 if no spark is seen.



502 71 13-01

Checking the ignition spark

Remove the spark plug and clean it from soot deposits with the help of a steel brush.

Check the electrode gap. It should be 0.5 mm.

Adjust the gap as needed to the correct value with the side electrode.

If the electrodes are worn more than 50% the spark plug should be changed.

Too large a spark gap entails a great deal of stress on the ignition module and risk for short-circuiting.

Check if a spark occurs when attempting to start.

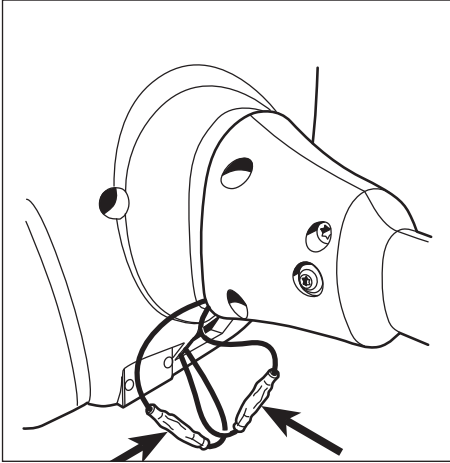
Earth the spark plug by attaching it to the starter screw with a steel wire as shown in the illustration. Give a sharp pull on the starter handle.

A spark should be seen between the electrodes.

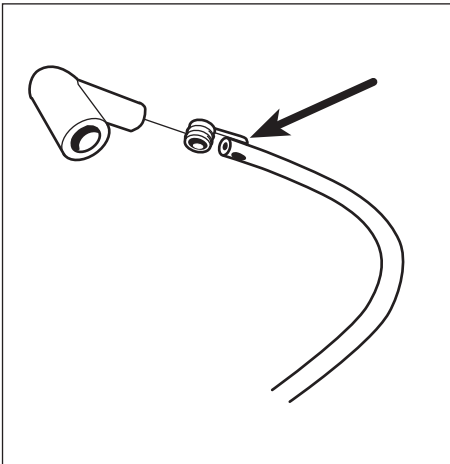
If no spark is seen test with test spark plug no. 502 71 13-01.

If a spark then occurs, the spark plug is faulty.

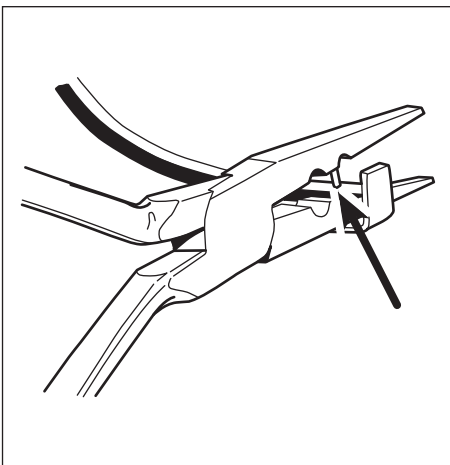
Try a new spark plug.



When no spark is obtained, dismantle the short-circuit cable from the ignition switch.
Still no spark?
Check that the short-circuit cable is not broken by using an Ohmmeter.



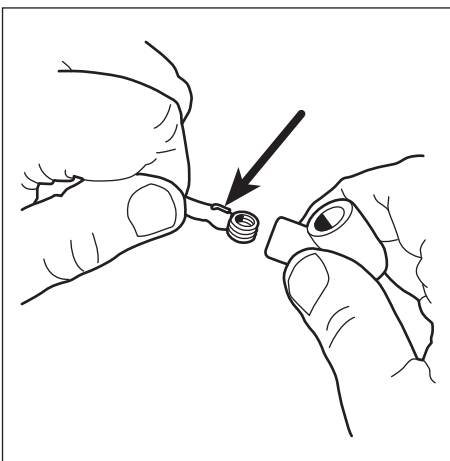
Still no spark?
Check the ignition cable's connection to the spark plug cover.



Use pliers no 502 50 06-01 to make a hole in the ignition cable.



502 50 06-01



Attach the ignition coil to the ignition cable.

If there is still no spark even now, then separate the short-circuit cables.
If the plug now sparks, the fault is either in the ignition switch or the short-circuit cable.
Change the switch as needed and check to see if the cable insulation is damaged.
See also the "Throttle handle" section in chapter 2, Fuel system.

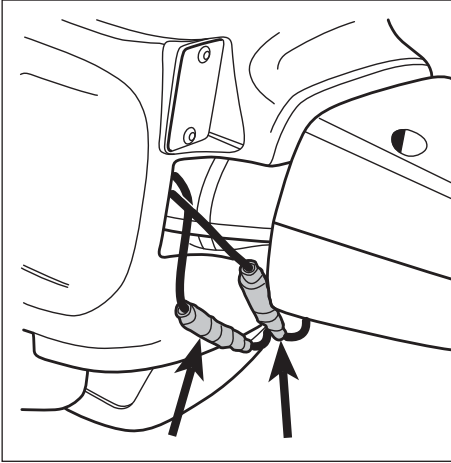
Still no spark?
Check the spark plug connection.
Remove the spark plug cover and make sure the ignition cable is not damaged.
Remove a section of cable if required to make proper contact with the connection coil.

When a section of the ignition lead has been cut off, it helps to use the pliers no. 502 50 06-01 to make a hole in the ignition cable to fit the ignition coil.

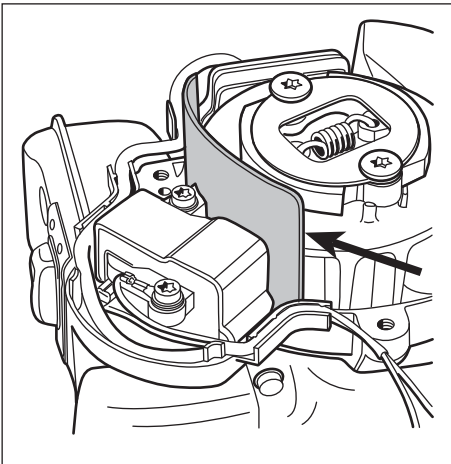
NOTE!
It is important that the tip of the contact coil hits the centre of the ignition cable to prevent sparking.

Attach the ignition coil to the ignition cable and ensure that the wire is folded along the cable.
Slide the ignition coil into the spark plug cover.

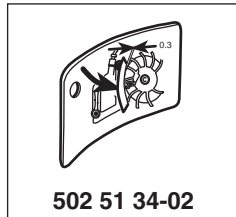
TIP!
Lubricate the hole in the spark plug cover so that it is easier to slide in the ignition coil.



Still no spark?
Check other cables and connections.

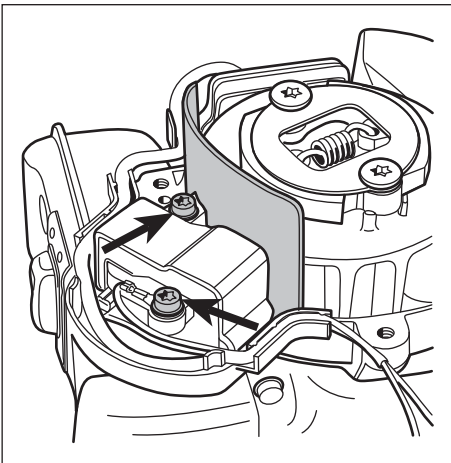


Still no spark?
Check the air gap.



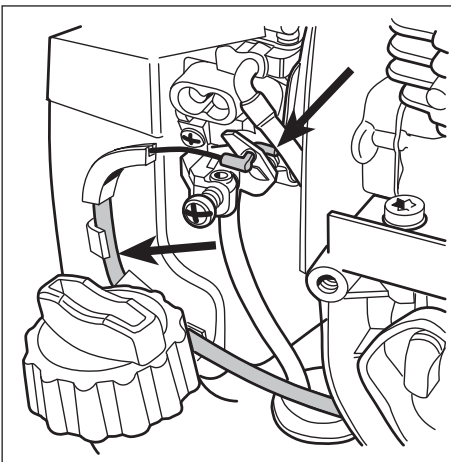
502 51 34-02

Adjust the air gap.



Dismantling

Dismantle the starter cover, the spark plug and the throttle cable.



Still no spark?

Check other cables and connections for poor contacts (dirt, corrosion, cable breakage and damaged insulation).

Make sure that the cables are correctly drawn and lie in the cable grooves.

Do not forget to check the cables in the throttle too.

See chapter 3 "Throttle".

TIP!

Use an Ohmmeter in order to easily check if cable breakage has occurred, due to pinching, for example.

Still no spark?

Check the air gap between the flywheel magnet and the ignition module. The gap should be 0.3 mm.

Use a 502 51 34-02 feeler gauge.

See also "Dismantling" below.

Adjust the air gap as needed to the correct value.

- Loosen the bolts.
- Insert the feeler gauge between the ignition modules and the magnets in the flywheel.
- Press the ignition module against the flywheel.
- Tighten the bolts and check the air gap again.

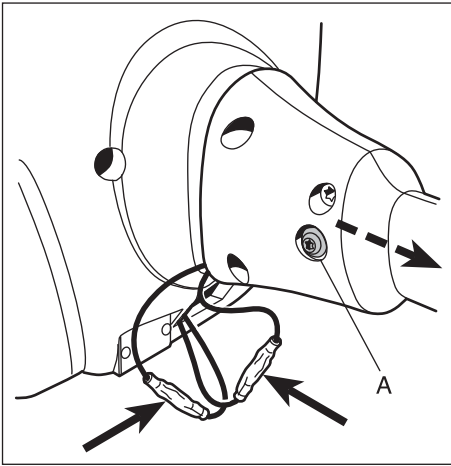
If the spark plug still does not fire, the ignition system should be replaced.

Dismantling

The following components must be dismantled for the ignition system to be accessible:

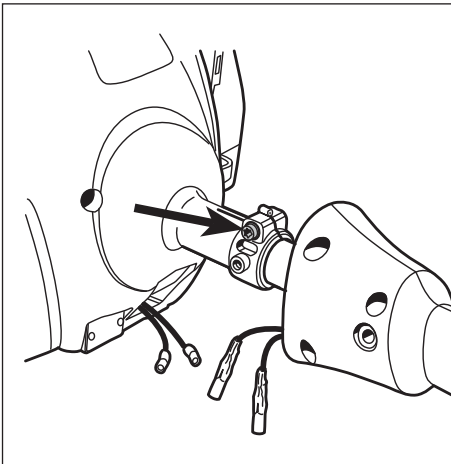
The starter cover, the air filter cover and the spark plug.

Unhook the throttle cable from the carburettor and remove it from the guides in the carburettor cover.



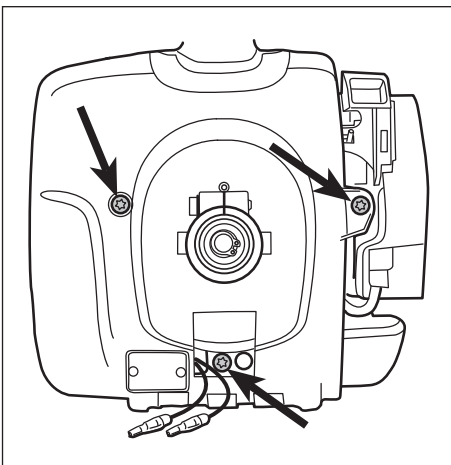
Separate the short-circuit cables.
Remove the screws (A) and slide the throttle forwards.

Separate both short-circuit cables.
Remove both screws (A), one on each side of the throttle handle.
Push the throttle forward onto the shaft.



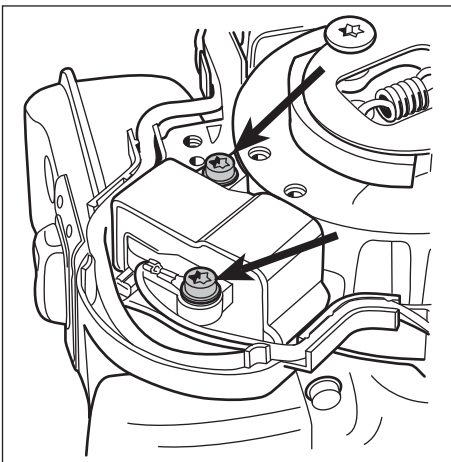
Loosen the screws and remove the shaft from the engine.

Loosen the screws and remove the shaft from the engine.



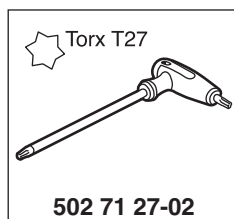
Remove the 3 screws and lift off the cover.

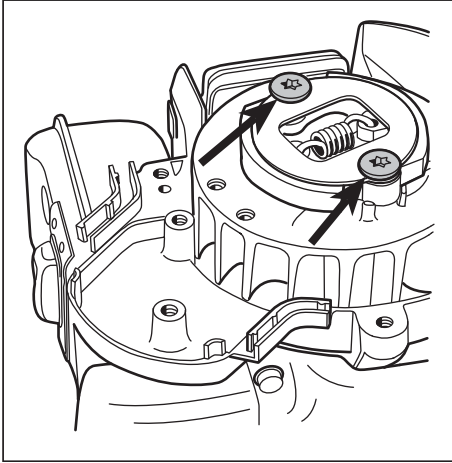
Remove the 3 screws shown in the illustration and lift off the cover over the clutch/flywheel.



Remove the screws and lift off the ignition module.

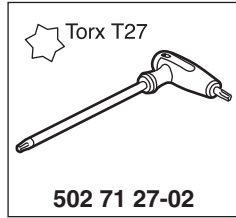
Remove the screws and lift off the ignition module.





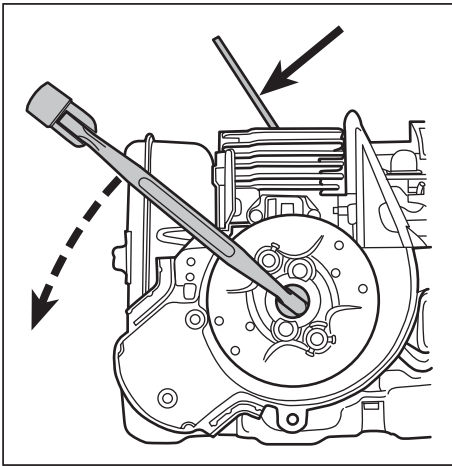
Dismantle the centrifugal clutch.

Remove the two screws holding the centrifugal clutch.
Lift off the clutch and both support washers.

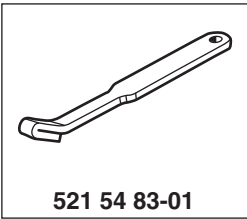


Fit the piston stop no. 502 54 15-01 and remove the nut holding the flywheel.

Fit piston stop no. 502 54 15-01 in the spark plug hole.
Remove the nut holding the flywheel.

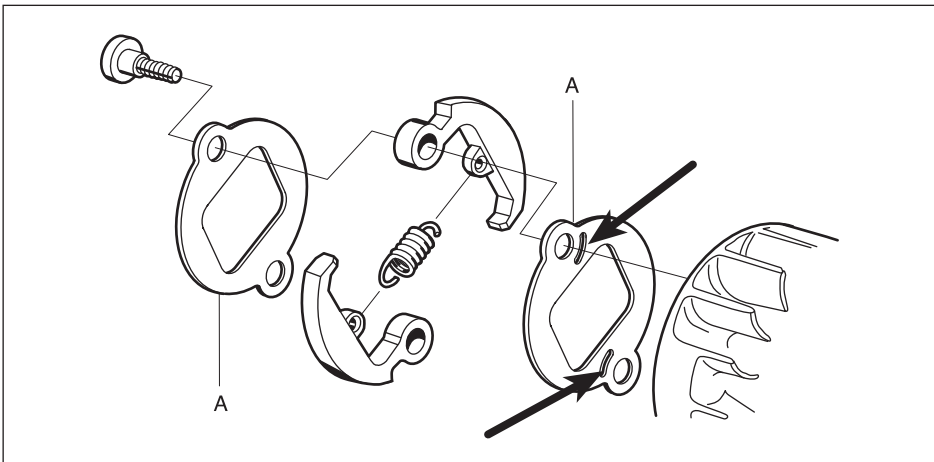
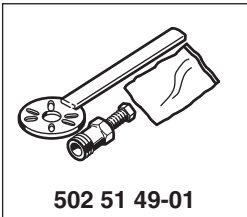
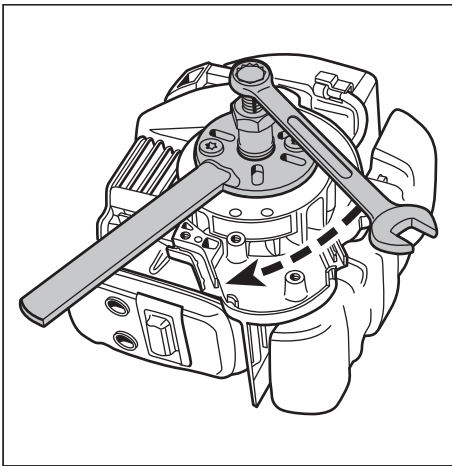


NOTE!
Position the piston stop so it is clamped between the piston crown and the combustion chamber. Not so it sticks out into the exhaust port.



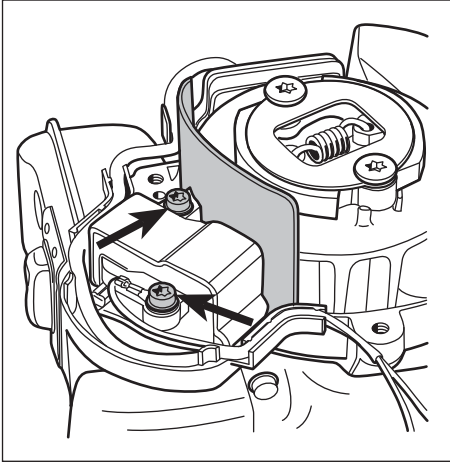
Remove the flywheel.

Dismantle the flywheel from the crankcase using the puller no. 502 51 49-01.
Gently knock the puller screw with a hammer, if the flywheel sits tightly on the crankshaft.

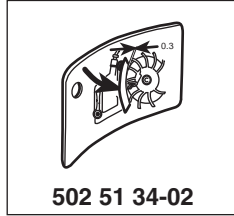


Assembly

Check that the cast key in the flywheel and key way in the crankshaft are undamaged.
Fit the flywheel and centrifugal clutch. Do not forget the washers (A).
Note the slots on the washer lie closest to the flywheel. Align with the equivalent pins on the flywheel.



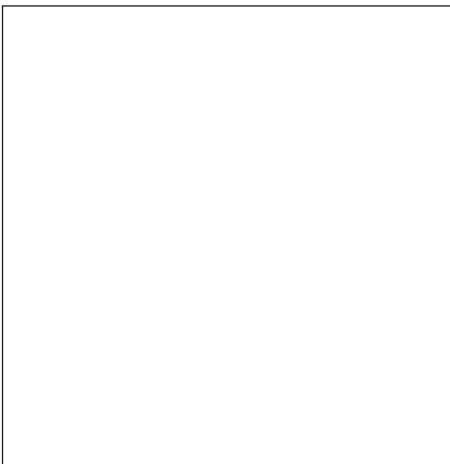
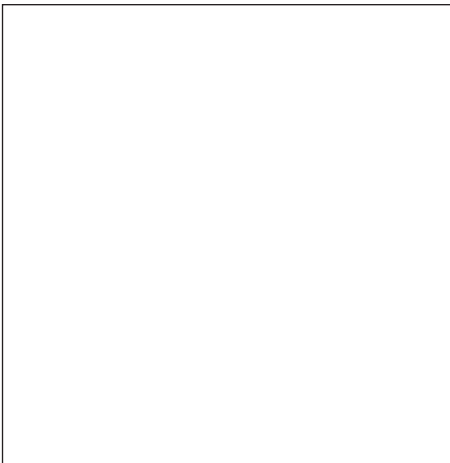
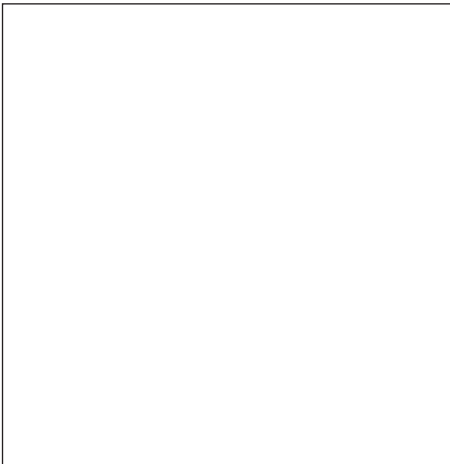
Assemble the ignition module and adjust the air gap to 0.3 mm.



Assemble the ignition module.

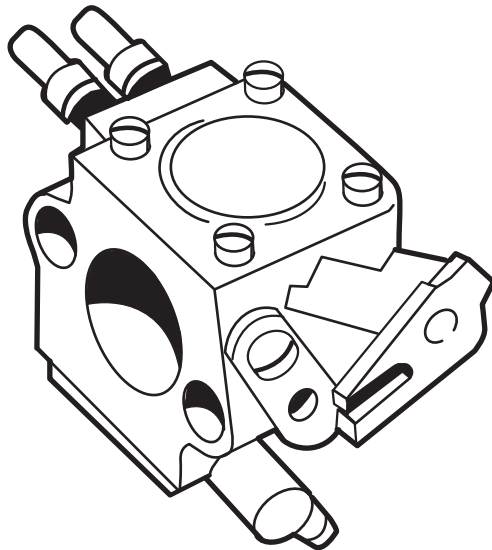
Adjust the air gap. It should be 0.3 mm between the permanent magnets in the flywheel and the ignition module.

Assemble other parts in the reverse order as set out for dismantling.



Fuel system

3



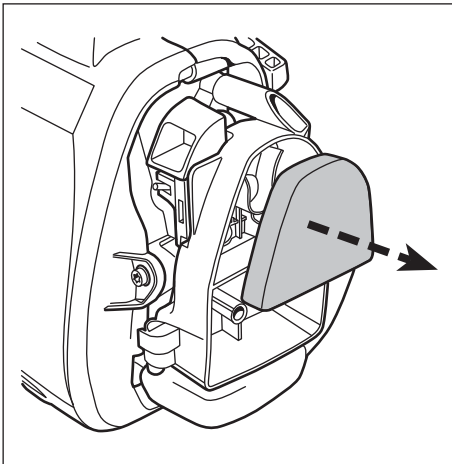
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In addition to the fuel tank and carburettor, the fuel system consists of the air filter, fuel filter and tank venting.

All these components interact so that the engine receives the optimal mixture of fuel and air to make it as efficient as possible. Very small deviations in the carburettor setting or a blocked air filter have a large effect on the running and efficiency of the engine.

The carburettor can come from several different manufacturers on our models, but the function and repair methods are essentially the same.



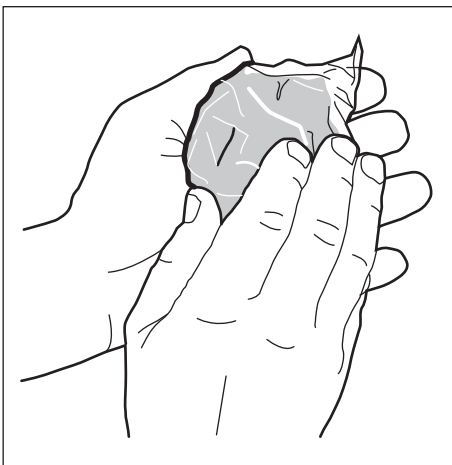
Air filter

Dismantle the air filter and clean it in warm soapy water.

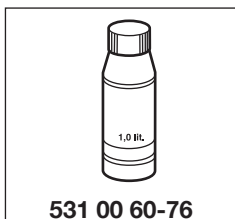
Replace the filter if it is damaged.



505 69 85-70



Impregnate the filter with air filter oil.



531 00 60-76

Tank venting

Check that the tank venting works correctly.



531 03 06-23

Air filter

Remove the cover over the carburettor and lift off the air filter.

The filter is manufactured of foamed plastic and should be cleaned in warm soapy water.

A damaged filter should be replaced with a new filter.



WARNING!

Do not clean not the filter with petrol. Hazardous!

NOTE!

Do not blow the filter clean with compressed air. It can be damaged. Ensure that the filter is dry before refitting it.

TIP!

Use cleaning agent Active Cleaning no. 505 69 85-70.

Impregnate the filter with air filter oil.

TIP!

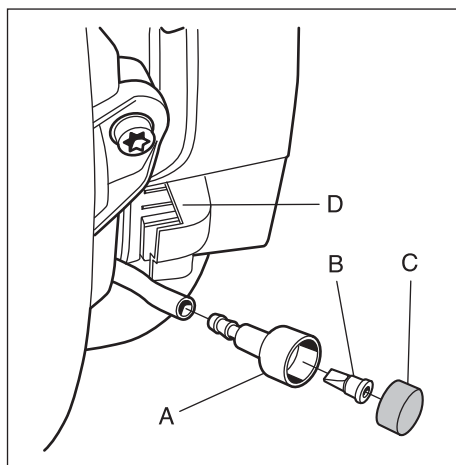
Place the filter in a plastic bag and pour about a tablespoon of air filter oil no. 531 00 60-76 into the bag.

Massage the oil into the air filter.

Tank venting

The tank venting valve is fitted in a separate hose from the fuel tank and it is important that the valve functions for engine operation, especially at low speeds, i.e. to allow air into the tank but prevent fuel from being forced out.

1. Empty the fuel from the tank and remove the fuel hose from the carburettor.
2. Connect the fuel hose to pressure tester no. 531 03 06-23.
3. Check that there is no vacuum build up in the tank.
4. Pump up the tank to generate excess pressure (about 20 kPa). The pressure should drop to atmospheric pressure within 30 seconds.

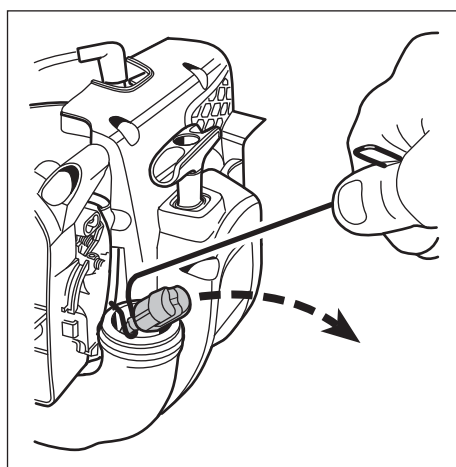


Check that the slot in the non-return valve (B) is not damaged.
Clean the foamed plastic filter (C).
Replace damaged components.

Remove the filter housing (A) from the bracket (D) on the carburettor cover using flat nose pliers.

Remove the filter (C) using a pointed object. Clean the filter in warm soapy water. A damaged filter should be replaced with a new filter.

Remove the non-return valve (B) using a pointed object. If the sealing slot in the flat end of the valve is damaged, the valve must be replaced.



Fuel filter

The fuel filter can be removed through the tank's fill hole.

Fuel filter

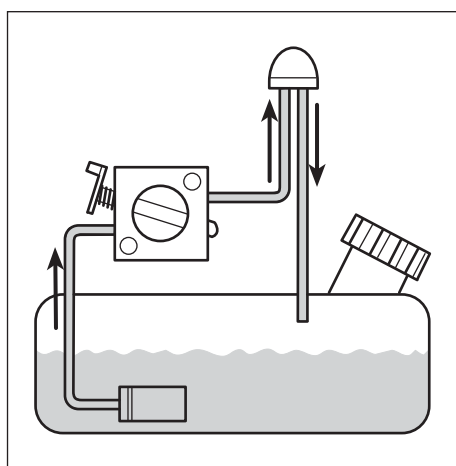
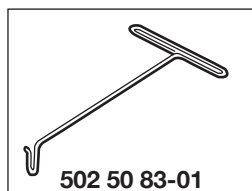
The fuel hose in the tank contains a fuel filter. It is accessible through the fill hole. Pull out the filter with your fingers or with help of tool 502 50 83-01.

If the filter is not too dirty, its surface can be cleaned with a brush.

Otherwise it must be replaced.

Check the fuel hose for cracks and leaks.

Make sure that the filter's connection neck is inserted as far as possible into the fuel hose.



Fuel pump

The fuel pump facilitates cold starts.

The pump cannot be repaired and must be replaced if it stops working.

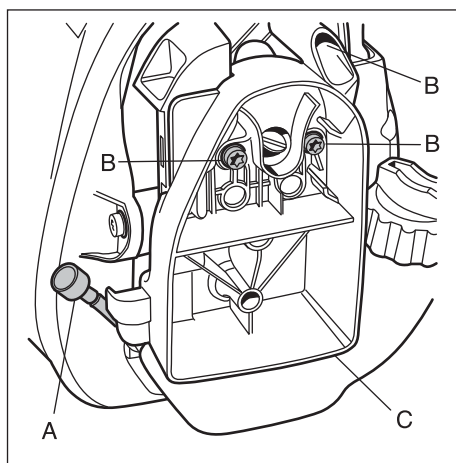
Note how the fuel hoses are connected to simplify assembly.

Fuel pump

The fuel pump has the task of facilitating the start of the engine when cold. The pump fills the carburettor with fuel before attempting to start the engine. This also prevents vapour bubbles from blocking the narrow fuel channels.

If the pump does not work it must be replaced.

Note how the fuel hoses are connected to simplify assembly.



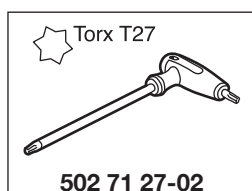
Carburettor Dismantling

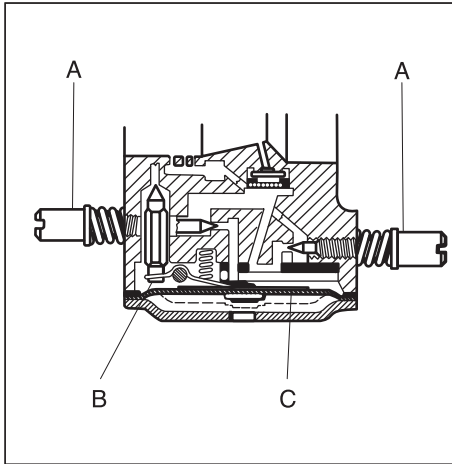
Blow clean the carburettor compartment and disconnect the throttle cable from the carburettor.

Remove the screws and fuel pipes and lift off the carburettor.

Carburettor Dismantling

1. Remove the carburettor cover and blow the carburettor compartment clean with compressed air. Remove the air filter.
2. Disconnect the throttle cable from the lever arm on the carburettor and from the guide in the air filter holder.
3. Remove the tank venting hose (A) from its bracket, the three carburettor screws (B) and the air filter holder (C).
4. Remove the fuel hoses and lift off the carburettor.





The carburettor's design

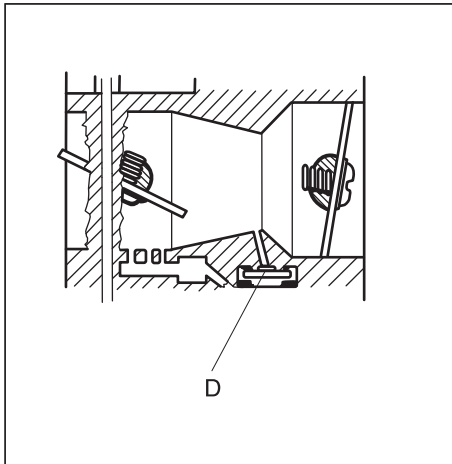
The carburettor can be divided into three different functional units: the metering unit, the blending unit, and the pump unit.

The metering unit

The needles and the fuel control functions are located here.

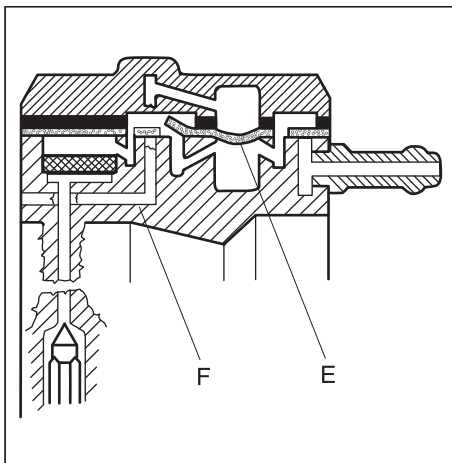
The blending unit

Fuel and air are mixed here.



The pump unit

Pumps fuel from the tank to the carburettor.



The carburettor's design

The carburettor can be divided into three different functional units: the metering unit, the blending unit, and the pump unit.

The metering unit

The needles (A) and the fuel control functions are located here.

The needle valve (B) and control diaphragm (C) are vital to the carburettor's function.

The blending unit

In this section of the carburettor fuel and air are mixed in the proper proportions.

The choke and throttle valves are placed here.

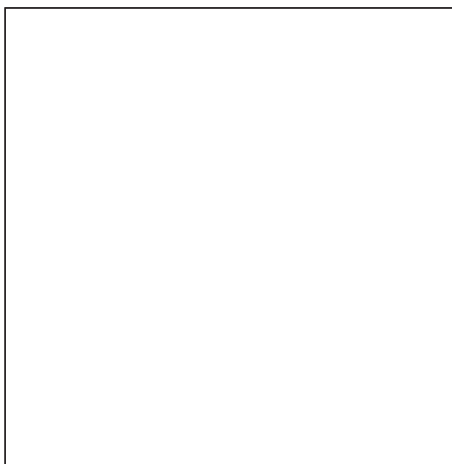
In the middle of the venturi (narrowest part of the throughput) the main jet (D) is found.

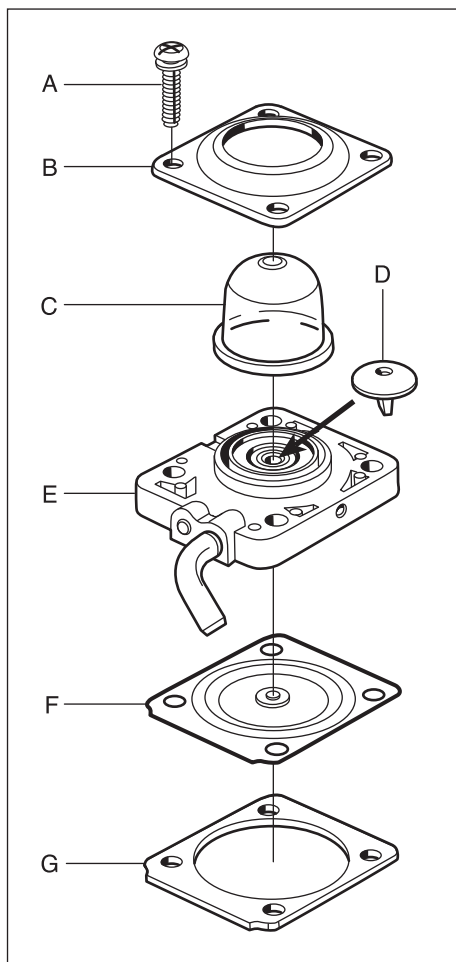
The pump unit

This is where the pump diaphragm (E) that pumps fuel from the tank to the carburettor's measuring unit is found.

The diaphragm is affected by pressure variations in the engine's crankcase via an impulse channel (F).

If the channel is blocked, by grease or a wrongly facing gasket, for example, the pump unit does not function and the engine cannot be started.



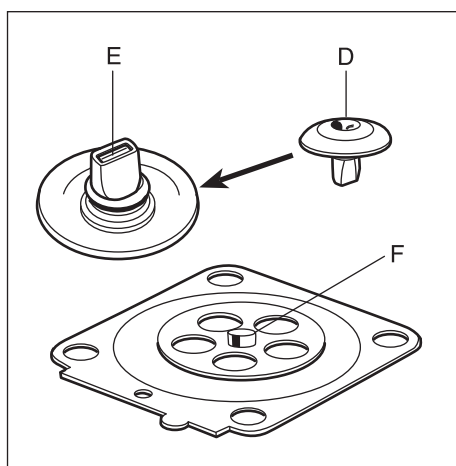


Dismantling the carburettor The metering unit

Remove the 4 screws (A) and pull apart the various parts for inspection and possible replacement.

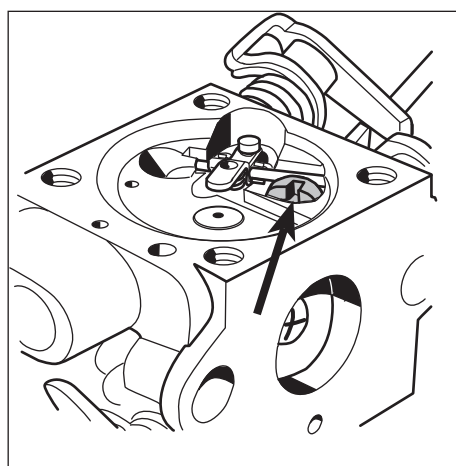
Dismantling the carburettor The metering unit

Remove the 4 screws (A) and lift off the cover (B) and the pump bellows (C).
Remove the non-return valve (D) using a small screwdriver.
Lift off the diaphragm cover (E).
Carefully remove the control diaphragm (F) and any gasket (G).



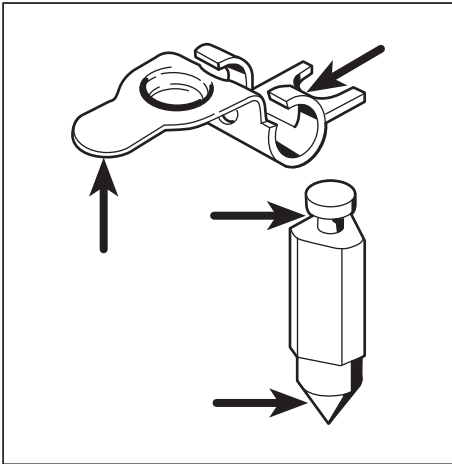
Check the non-return valve and the control diaphragm for damage.

Check the non-return valve (D) to make sure the gap (E) closes tightly.
If this is not the case the valve should be replaced with a new one.
Check that the pin (F) on the control diaphragm and contact surface on the needle valve is not worn.
Also check the diaphragm by holding it up to a light for instance to discover any holes in the material.
Replace damaged parts with new ones.



Remove the needle valve.

Remove the needle valve.
Loosen the bolt and remove the lever arm, axle, needle valve and spring.

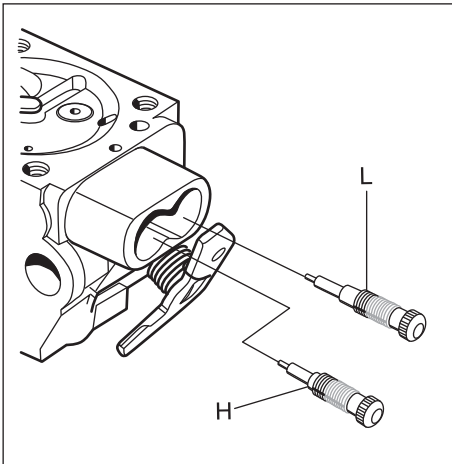


Check the needle valve and the lever arm for damage or wear.
Replace damaged components with new ones.

Check the needle valve for damage on the tip and in the lever arm groove.

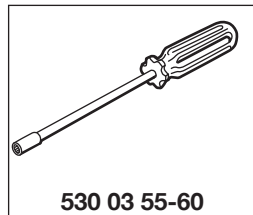
Check the lever arm for damage to the groove for the needle valve and wear on the mounting points towards the control diaphragm.

Replace damaged components with new ones.



Remove the jet needles and inspect them for damage.

Unscrew both jet needles H and L using the special tool 530 03 55-60.

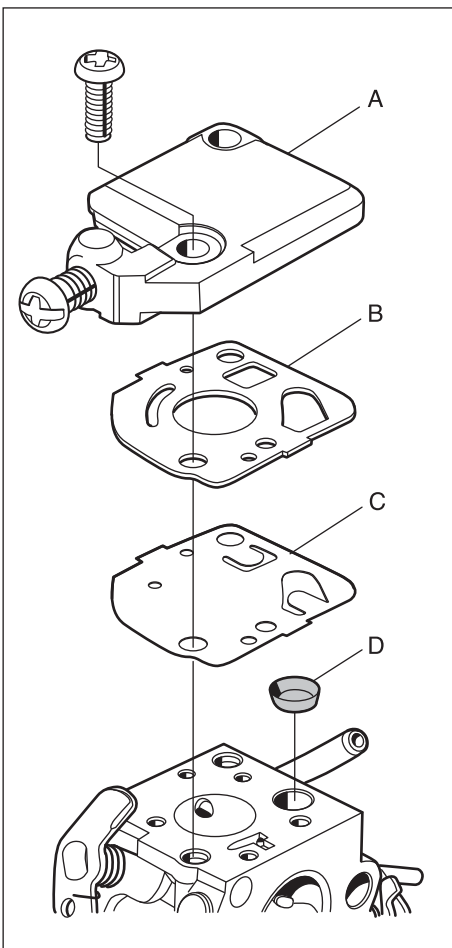


530 03 55-60

NOTE!

Note how the jets are positioned. (For example, the H-needle is a little shorter than the L-needle).

Inspect the needles for damage such as a broken tip. Replace in that case with a new needle.



The pump unit

Remove the pump diaphragm.
Check the diaphragm for damage.
Remove the fuel screen and clean it or attach a new one.

The pump unit

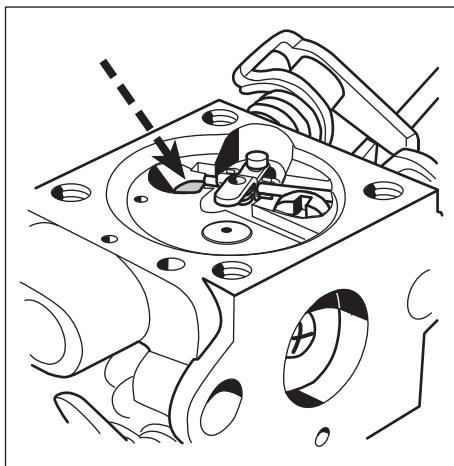
Remove the 2 screws holding the cover over the pump diaphragm.

Lift off the cover (A), the gasket (B) and the pump diaphragm (C).

Check the diaphragm for damage to the valve tongues. If the valve tongues are bent, the pump will not function in a satisfactory manner.

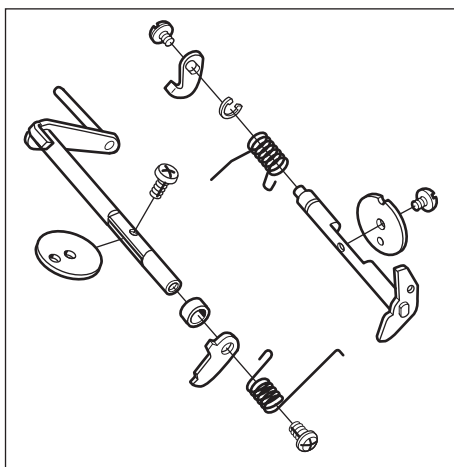
Hold it up to a light as well to discover any holes in the material.

Carefully remove the fuel screen (D), using a needle for example. Clean or replace the fuel screen.



The blending unit
Remove the main jet.

The blending unit
Press out the main jet (A) with a suitable punch.
Remember how far it is pressed into the carburettor housing.



Check valves and dampers for wear.
Replace if required.

Remove the valves and dampers. If these components are worn, idling is disrupted.
Always replace the valves and dampers at the same time.

Assembling the carburettor

Blow the carburettor housing clean.
Fit the new main jet, the valves and dampers.
Fit the needle valve and the lever arm.

Assembling the carburettor

- Blow all channels in the carburettor compartment clean
- Press in a new main jet. Use a suitable punch and hammer.
- Fit the valves and dampers.
- Fit the needle valve and the lever arm.

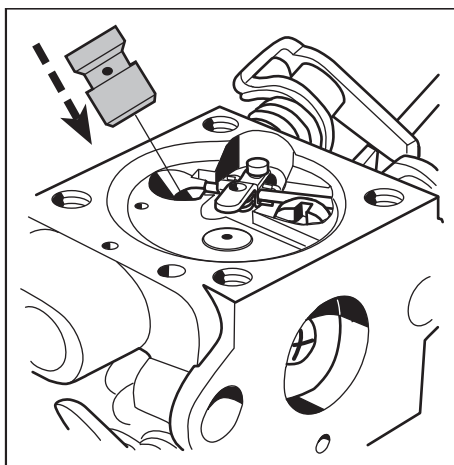
Tip!

Any numbers on the valves should be able to be read from the outside.

NOTE!

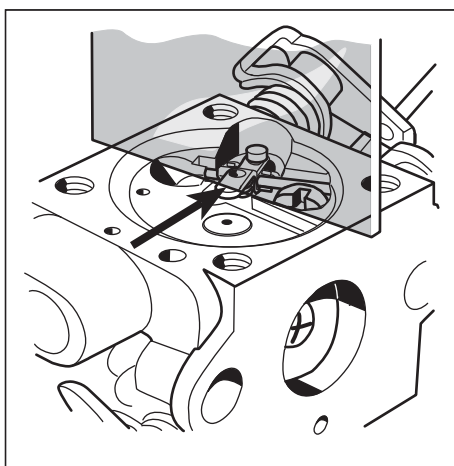
Check that the valves are turned correctly and that they close completely and tightly in the closed position.

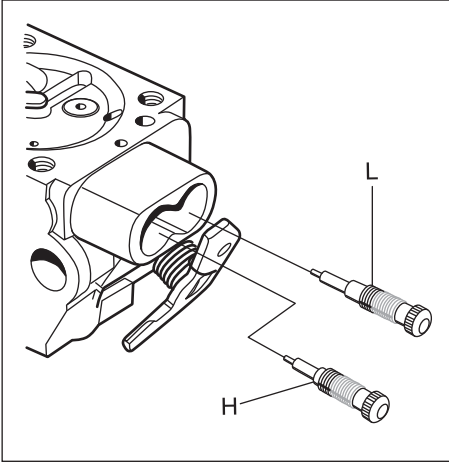
Use Loctite on the valve screws.



The lever arm should lie flush with the carburettor housing.

The lever arm should lie flush with the carburettor housing.
Too high setting = too much fuel.
Too low setting = too little fuel.

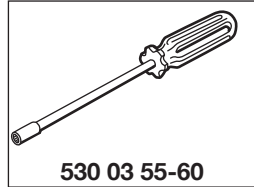




Fit the carburettor needles and adjust them to the basic setting:

H = 1.0 turn

L = 1.5 turns



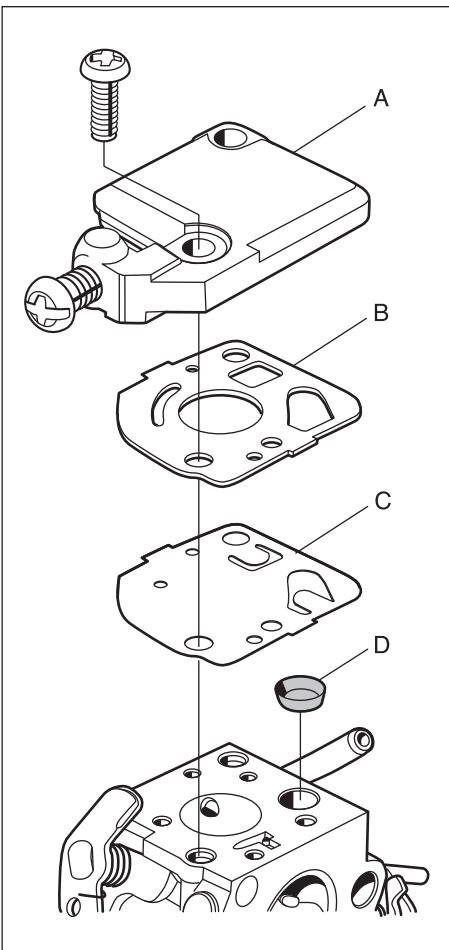
530 03 55-60

Pressure test the metering unit.



531 03 06-23

Assemble the various parts of the pump unit.



Fit the carburettor needles.

Screw them in so that they just reach the bottom of the needle seat.

Then screw them out according to the basic setting:

H = 1.0 turn

L = 1.5 turns

NOTE!

The H-needle is a little shorter than the L-needle.

Connect the pressure tester 531 03 06-23 to the fuel hose nipple (by the carburettor needles).

Lower the carburettor in a vessel with petrol in order to discover any leaks more easily.

Test the pressure at 50 kPa.

No leakage is permitted.

Assemble the various parts of the pump unit.

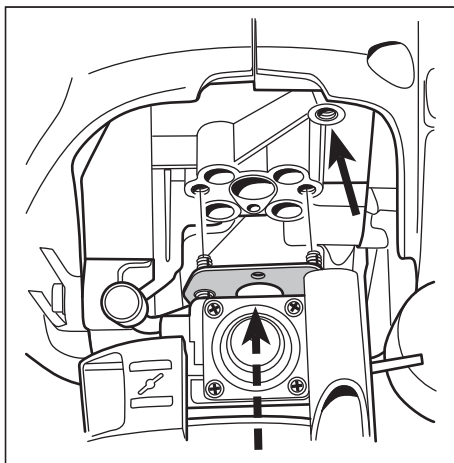
Check that there are no holes in the pump diaphragm (C) by holding it up to a light for instance.

Do not forget the fuel screen (D).

Make sure that it is not damaged or dirty.

NOTE!

During assembly the pump diaphragm must lie closest to the carburettor housing.



Assembly

Connect the fuel hoses to the carburettor and screw it on to the distance piece.

Do not forget the top screw!

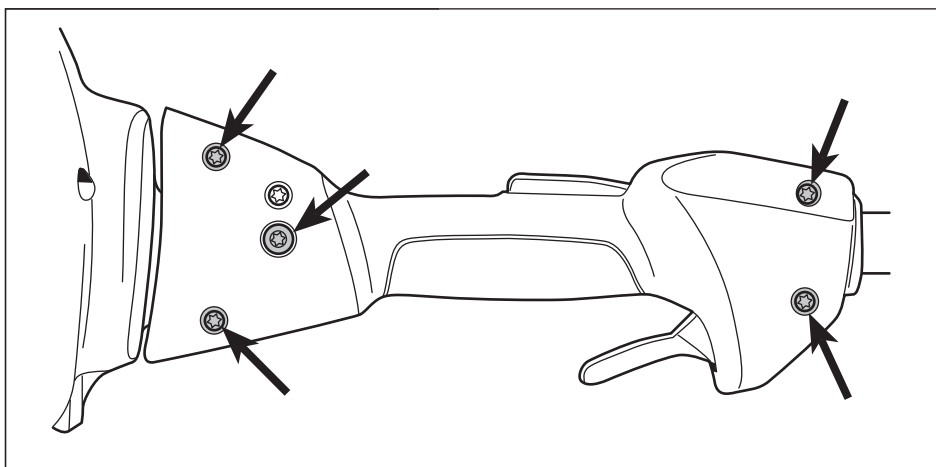
Assembly

1. Connect the fuel hoses to the carburettor.
2. Hold the carburettor against the air filter holder and push in the carburettor screws.
3. Place the gasket against the carburettor and over the screws.
4. Hold the carburettor against the distance piece and screw in position.
Do not forget the top screw!
5. Place the tank venting valve in its bracket.
6. Connect the throttle cable.

Throttle

Remove the screws holding the throttle handle against the shaft attachment and the 4 screws holding the handle halves together.

Lift off the right hand handle half and carefully note how the different parts are fitted.

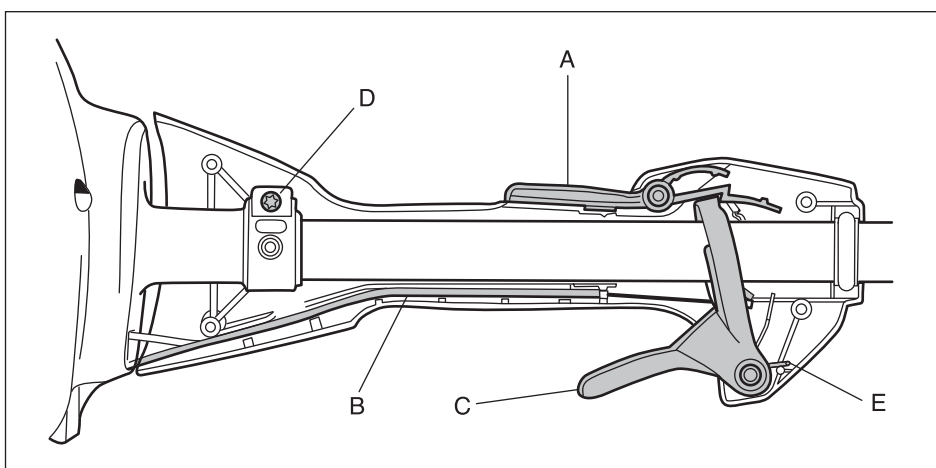


Lift off the catch for unintentional full throttle (A) and replace if needed.

Lift up the throttle cable (B) from the channel and unhook it from the throttle (C) and replace if needed.

To continue dismantling to access for instance the short-circuit switch or to replace the throttle (C), the screws (D) are loosened after which the shaft can be removed from the throttle handle half.

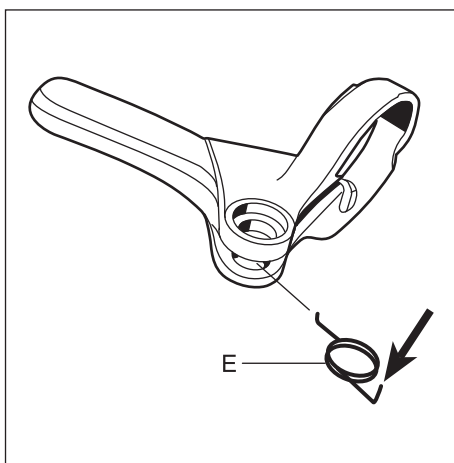
Take note of how the recoil spring (E) is fitted and that it does not fly out when dismantling the throttle lever.



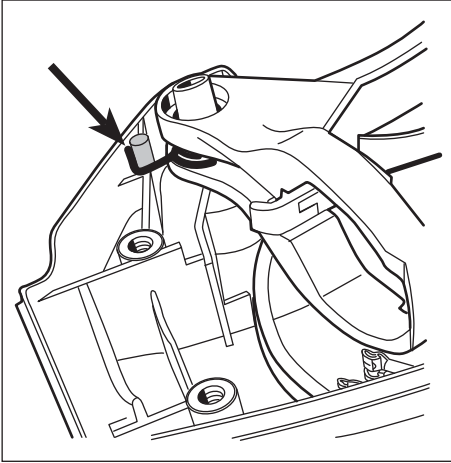
Assemble the throttle handle in the reverse order as set out for dismantling.

Assembling is made easier if the throttle cable is first fitted to the throttle handle.

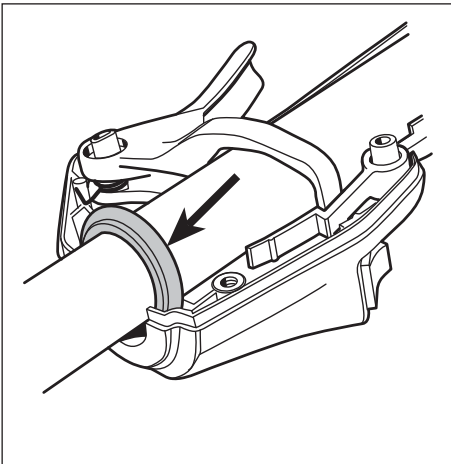
Insert the recoil spring (E) in the groove in the throttle handle and make sure the angled end is pointing upwards.



Insert the recoil spring (E) in the groove in the throttle handle and make sure the angled end is pointing upwards.

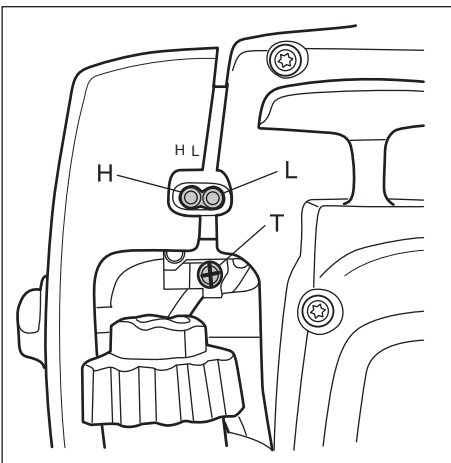


Place the catch for involuntary throttling and the throttle in position and make sure the recoil spring is tensioned and pressed against the pin in the throttle handle as shown in the illustration.



Put the O-ring/vibration damper in place and slide the throttle handle half over the shaft.

Screw the right-hand handle half in place and fit the shaft on the clutch cover.



Carburettor settings



WARNING!

When testing the engine in connection with carburettor adjustment, the clutch and clutch cover must be mounted together with the shaft and angle gear under all circumstances

Otherwise there is a risk of the clutch becoming loose resulting in serious personal injury.

Function

The carburettor has the task of supplying a combustible fuel/air mixture to the cylinder.

The amount of this mixture is controlled by the throttle.

The mixture's composition of fuel and air is controlled by means of the adjustable "H" and "L" needles.

The needles must be correctly adjusted in order for the engine to give maximum power at different speeds, run steadily while idling and to react quickly when accelerating.

The setting of the carburettor can vary a little depending on the humidity, temperature and air pressure.

- L = Low speed needle
- H = High speed needle
- T = Idle adjustment screw

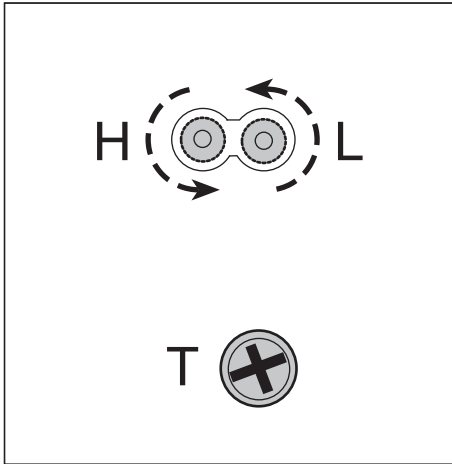
- The fuel quantity in relation to the air flow permitted by the throttle opening is adjusted by the L and H jets. Turning the needles clockwise gives a leaner fuel mixture (less fuel) and turning them anticlockwise gives a richer fuel mixture (more fuel). A *leaner* mixture gives *higher* revs while a *richer* mixture gives *less* revs.
- The T-screw regulates the position of the throttle while the engine is idling. Turning the screw clockwise gives a higher idling speed while turning it anticlockwise gives a lower idling speed.

Place the catch for involuntary throttling and the throttle in position and make sure the recoil spring is tensioned and pressed against the pin in the throttle handle as shown in the illustration.

Place the O-ring/vibration damper in the throttle handle half and slide it into position over the shaft.

Screw the right-hand handle half in place and make sure the holes for both shoulder bolts are aligned with the holes in the shaft.

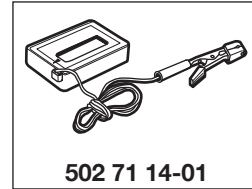
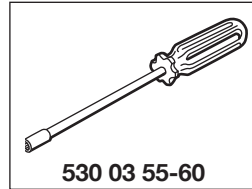
Fit the shaft to the clutch cover.



Basic setting

The carburettor is set to its basic setting when test run at the factory. The basic setting is "richer" than the optimal setting (fast idle speed is 600–800 rpm under the recommended max. speed) and should be kept during the engine's first working hours. Thereafter the carburettor should be fine tuned.

The basic setting is: H = 1 turn open, L = 1,5 turns open.



Both of the high and low speed jets in the carburettor can only be adjusted using the special tool 530 03 55-60.

To carry out adjustment when replacing needles or the entire carburettor the engine must be under load. This is achieved by fitting a standard trimmer with the specified length (defined by the blade on the trimmer guard) and diameter of the trimmer cord. Consequently, the stated speed will be much lower than with "normal" carburettor adjustment when the engine may run freely.

After replacing the needles or the entire carburettor on a CARB-EPA approved engine, adjustment must be carried out according to the instructions below.

The combiguard or trim guard must be fitted when adjusting the H-needle.

Fine adjustment

Fine adjustment of the carburettor should be carried out after the engine has been "run-in". It is important that the air filter is clean and that the carburettor cover is fitted when adjusting the carburettor.

The engine must be run warm at full throttle which is approx. 11,000 rpm (electronic speed limitation). Run the engine for 4 to 5 minutes to make sure it is warm.

Then adjust the carburettor needles in two steps as follows:

First adjustment

1. Turn the L needle clockwise until the top idle speed is reached. If the trimmer head then rotates, reduce the speed by turning the idle screw (T) anticlockwise until it stops rotating.
2. Turn the H needle at full throttle to the position where the engine starts running as a 4-stroke.
3. Stop the engine.

Second adjustment

1. Start the engine (still warm).
2. Turn the L needle anticlockwise so that the speed drops by 500 rpm.
3. Stop the engine.
4. Turn the H needle a 3/4 turn clockwise.
5. Then adjust the idling speed to 2,900 rpm by turning the idle screw (T).

NOTE!

If the cutting equipment rotates while idling, the T-screw must be turned anticlockwise until it stops rotating.

A tachometer should always be used to find the optimal setting.

Idling speed T-screw

Let the engine idle for about 30 seconds or until the speed has stabilised. Adjust the idling speed T-screw until the engine idles without stopping.

- Turn the screw clockwise if the engine stops.
- Turn the screw anticlockwise to lower the speed.

Correctly adjusted carburettor

A correctly adjusted carburettor means that the engine accelerates without hesitation and it four-strokes a little at full throttle.

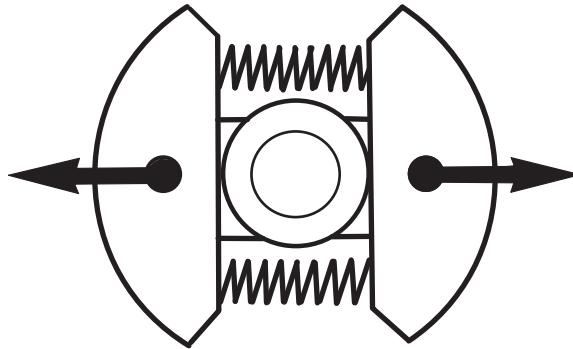
- The cutting equipment must not rotate while idling.
- A too lean adjusted L-needle can cause starting difficulties and poor acceleration.
- A too lean adjusted H-needle results in lower power, poor acceleration and/or damage to the engine.
- A too rich setting of the "L" and "H" needles give acceleration problems or a too low working speed.

Trouble Shooting Guide

Symptom	Starting			Low speed			Acceleration/ Deceleration			High speed
	Difficult to start	Flooding, fuel leakage	Difficult to prime when starting	Engine does not idle	Idles too slowly	Idling does not stabilise	Stops when idling	Engine does not accelerate	Engine stops when decelerating	
Probable causes										
Stop screw for the throttle not working	●			●		●	●			
Fuel tank/hose	Fuel filter blocked	●		●	●	●	●	●		●
	The fuel hose blocked	●		●	●	●	●	●		●
	Air in fuel ducts	●		●	●	●	●	●		●
	Incorrect/poor fuel	●				●				●
Pump diaphragm	Vacuum pulse leakage							●		●
	Vacuum pulse duct blocked							●		●
	Loose screw(s) on the pump cover		●					●		●
	Faulty pump diaphragm							●	●	●
Flow bellows	Flow bellows damaged			●						
	The needle valve faulty	●		●		●	●	●		●
Carburettor is not fitted correctly				●		●	●			●
Faulty heat insulation seal				●		●	●			●
Needle valve's lever	Lever arm damaged	●	●			●		●		●
	Lever arm too high		●			●	●		●	
	Lever arm too low							●		
	Lever arm does not work correctly	●	●	●	●	●	●	●	●	●
Needle valve's spring	The spring is deformed		●				●			●
	The spring is not fitted correctly					●	●	●		●
Control diaphragm	Diaphragm is damaged	●	●	●		●		●		●
	Faulty seal	●	●	●						●
Needle valve	Valve jams	●		●				●		
	Valve worn	●	●			●	●		●	●
	Foreign object in the valve guide	●	●			●	●		●	●

Centrifugal clutch

4



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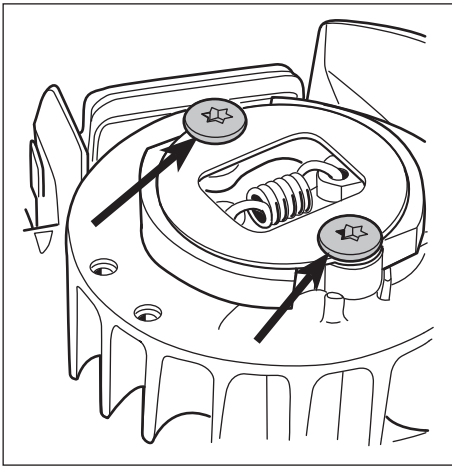
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Assembly	28
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The centrifugal clutch has the task of transferring the power from the engine to the cutting equipment's drive axle. As the name implies, it works according to a centrifugal principle.

This means the clutch's friction shoes are thrown outwards towards the clutch drum at a certain engine speed. When the friction against the drum is sufficiently great it drives the drive shaft at the same speed as the engine.

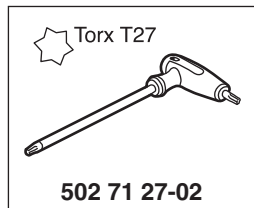
Some slipping occurs between the clutch and the clutch drum when accelerating as well as in the reversed situation when the cutting equipment jams. Thereby preventing abnormal load changes on the crankshaft.

The engagement speed has been carefully tested so that the engine can idle without the cutting equipment's drive shaft rotating.

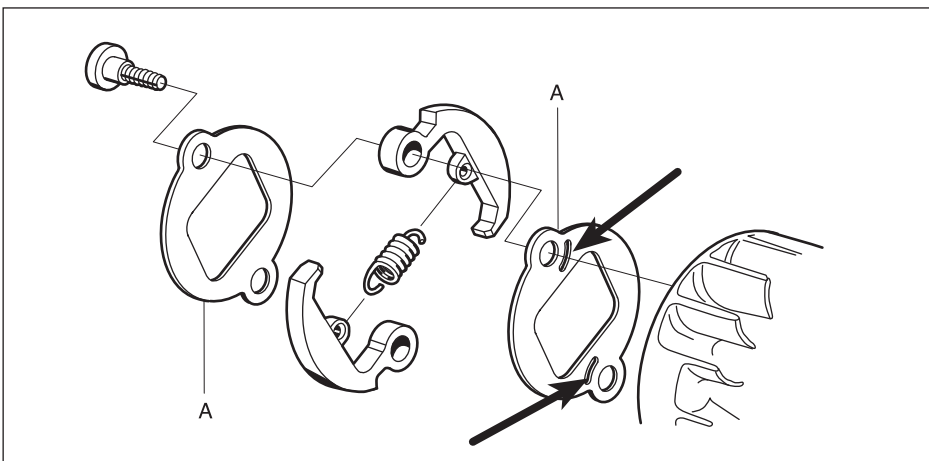
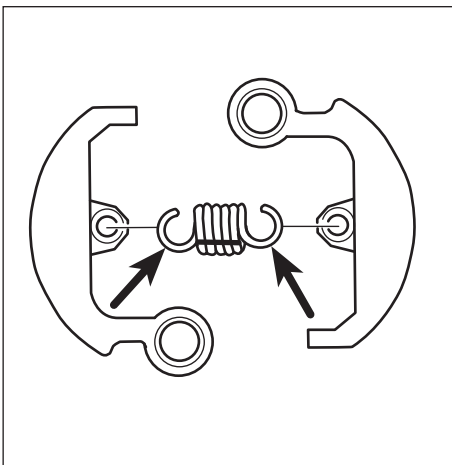


Dismantling

Dismantle the clutch by following the instructions in the chapter "Electrical system".



Twist apart the clutch and inspect the different parts with regard to wear or damage.



Dismantling

The centrifugal clutch is bolted to the flywheel.

Follow the detailed instructions in the chapter "Electrical system" when the clutch is to be dismantled.

Twist apart the clutch.

Inspect the different parts with regard to wear or damage.

Pay special attention to the ends of the springs, which in addition to wear, can also show signs of cracking.

Assembly

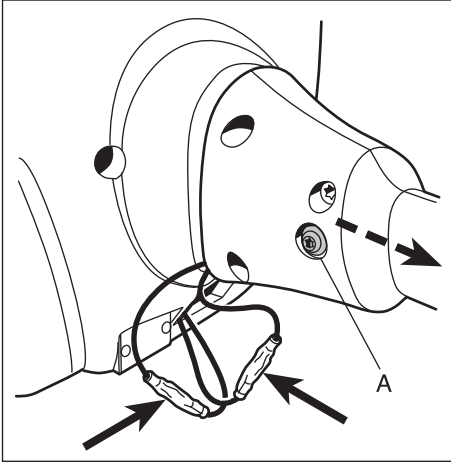
Connect the clutch shoes together with the spring.

NOTE!

Both clutch shoes should be replaced even if only one of them is showing signs of heavy wear. This is to avoid engine vibration caused by imbalance in the clutch.

Bolt the clutch on the flywheel. Do not forget the washers (A).

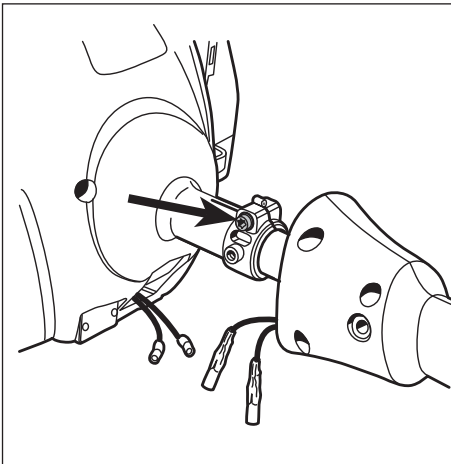
Note the slots on the washer lie closest to the flywheel. Align with the equivalent pins on the flywheel.



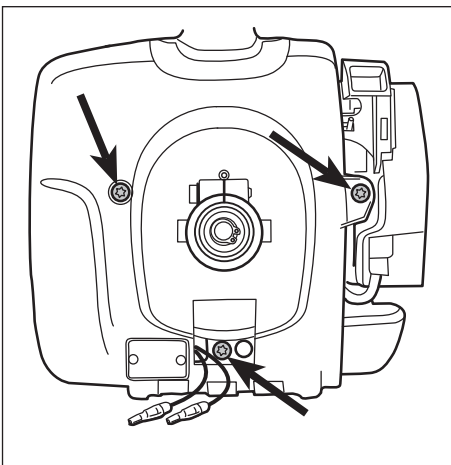
Replacing the clutch drum

Pull the short-circuit cables apart and disconnect the throttle cable from the carburettor.

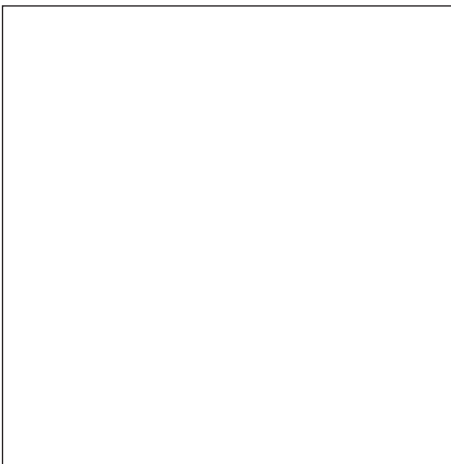
Remove the screws (A) and slide the throttle forwards.



Loosen the screws and remove the shaft from the engine.



Remove the 3 screws and lift off the cover. Inspect the parts for wear and damage. The inner diameter of the clutch drum must not exceed 64 mm.



Replacing the clutch drum

Pull both short-circuit cables apart and disconnect the throttle cable from the carburettor.

Remove both screws (A), one on each side of the throttle handle.

Push the throttle forward onto the shaft.

Loosen the screws and remove the shaft from the engine.

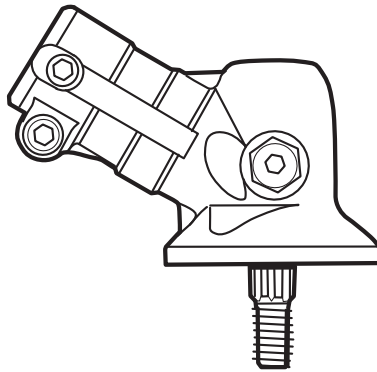
Remove the 3 screws shown in the illustration and lift off the cover over the clutch/flywheel.

Check for wear on the clutch drum and its internal diameter. If it exceeds $\text{Ø } 64 \text{ mm}$, it must be replaced together with the clutch cover.

Assemble in the reverse order as set out for dismantling.

Bevel gear

5



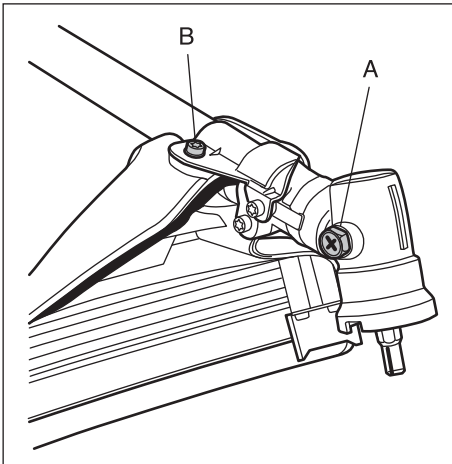
Contents

Dismantling	_____	32
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The angle gear has two purposes:

The first is to gear down the engine's high speed to better suit the lower speed a saw blade or trimmer requires to work efficiently.

Secondly, the angle gear contributes towards the operator's working stance so that it is comfortable and at the same time efficient. In other words, the power from the engine via the drive axle should be angled so that the cutting tool works parallel with the ground.

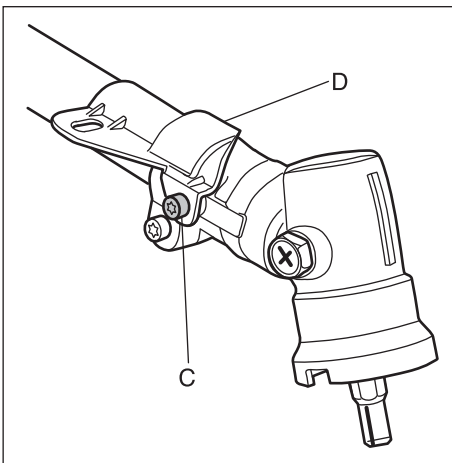
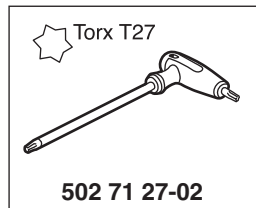


Dismantling

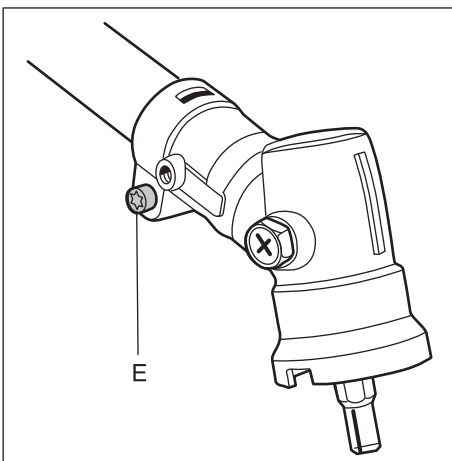
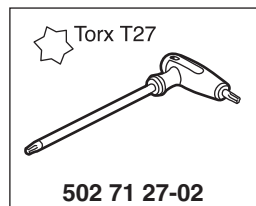
If a fault occurs in the bevel gear, it must be replaced as a single unit.

Remove the screws (B) and swing the trimmer guard to one side.

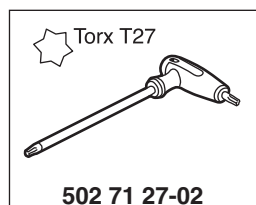
Check for and apply if required grease once the plug (A) has been removed.



Remove the mounting plate (D).



Loosen the screw (E) and remove the bevel gear from the shaft.



Dismantling

If a fault occurs in the bevel gear, it must be replaced as a single unit.

Dismantle the cutting attachment.

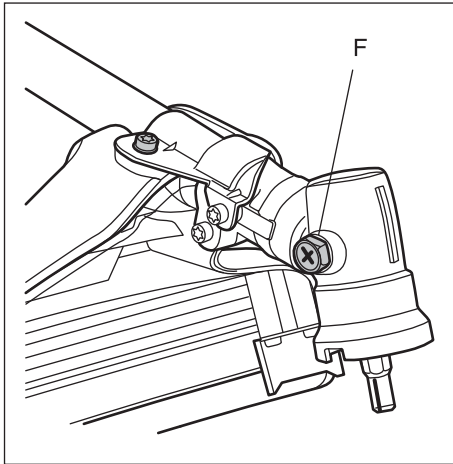
The shaft pin has left-hand threads!

The only service step required is inspection and possible refilling of grease in the gear box once the plug (A) has been removed.

Remove the screws (B) and swing the trimmer guard to one side.

Remove the screw (C) and lift off the mounting plate (D). Observe that there is a plastic washer between the plate and the bevel gear.

Loosen the screw (E) and remove the bevel gear from the shaft.



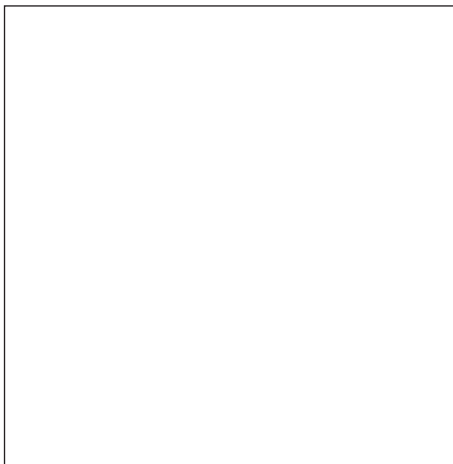
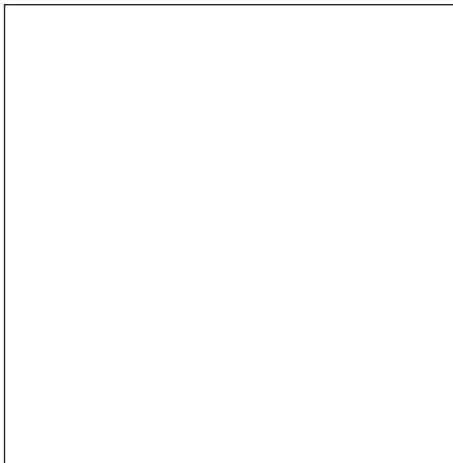
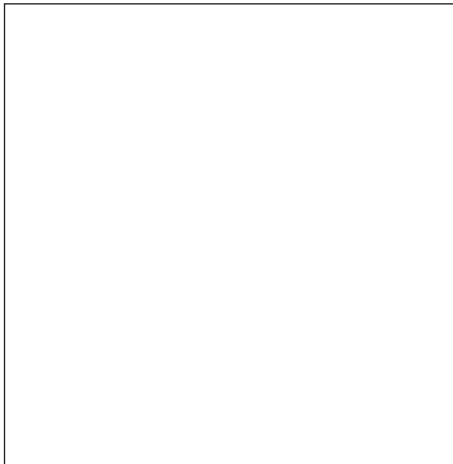
Assembly

Assemble the new bevel gear in the reverse order as set out for dismantling and check that the gear is filled with grease.



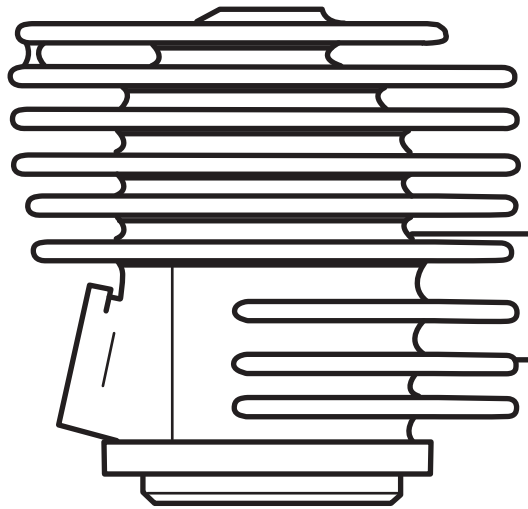
Assembly

Assemble the new bevel gear in the reverse order as set out for dismantling. Remove the plug (F) and check that the gear is filled with grease. If required, fill with grease no. 503 97 64-01.



Cylinder and piston

6

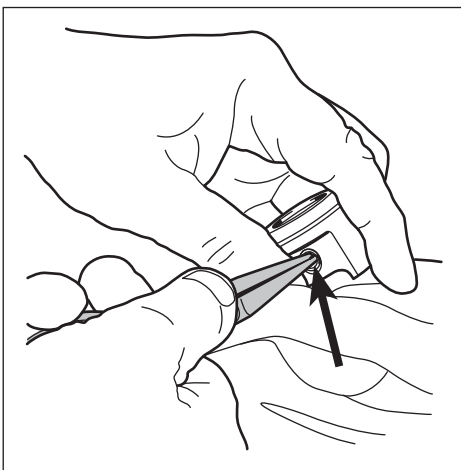
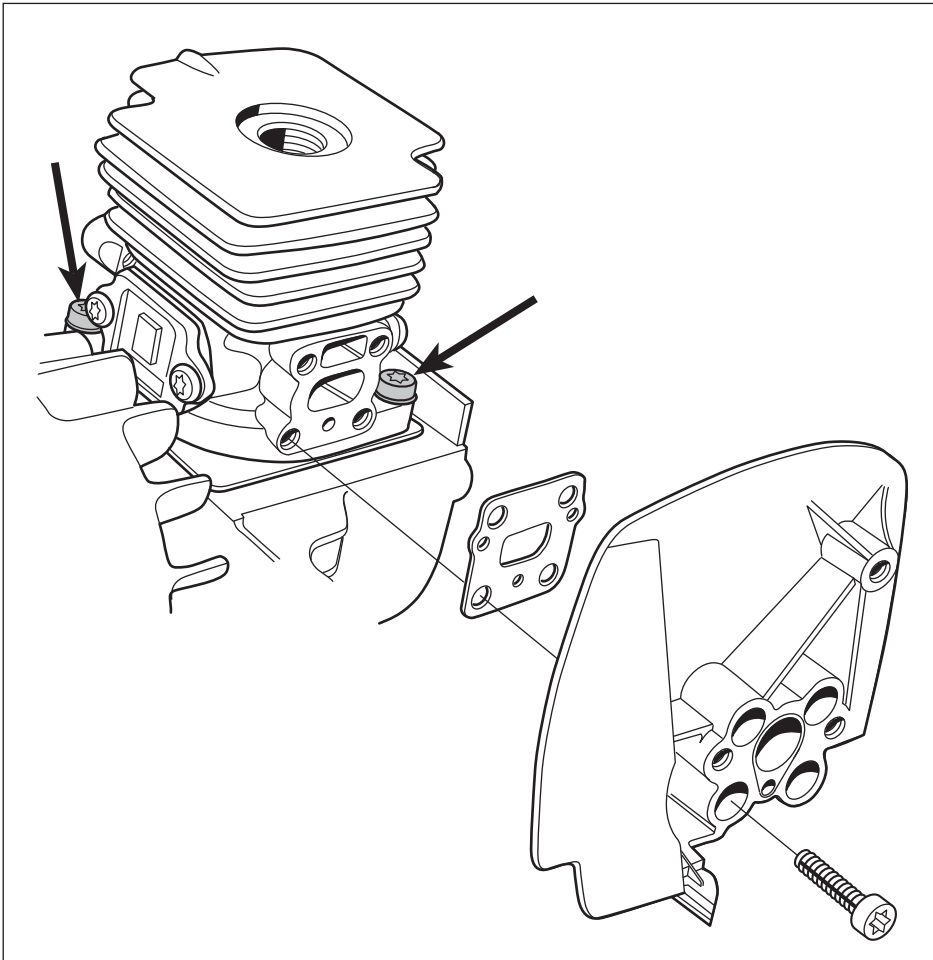


Contents

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The cylinder and the piston are two of the components exposed to most strain in the engine. They must withstand, for example, high speeds, large temperature swings and high pressure. Moreover, they must be resistant to wear. Despite these tough working conditions, major piston and cylinder failure is relatively uncommon. The reasons for this include new coatings in the cylinder bore, new types of oil and grease and refined manufacturing techniques.

When servicing these components, cleanliness is of the utmost importance. It is therefore recommended that the cylinder and the area around it be thoroughly cleaned before being dismantled from the crankcase.



Remove the circlips from the gudgeon pin.

Dismantling

Dismantle the following components to make the cylinder accessible:

Air filter, air filter holder and carburettor (see "Fuel system" chapter).

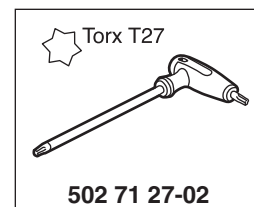
Starter, clutch cover, muffler with heat guard plate.

Dismantle the carburettor's distance piece/heat guard from the cylinder. The spark plug.

Remove both of the screws holding the cylinder.

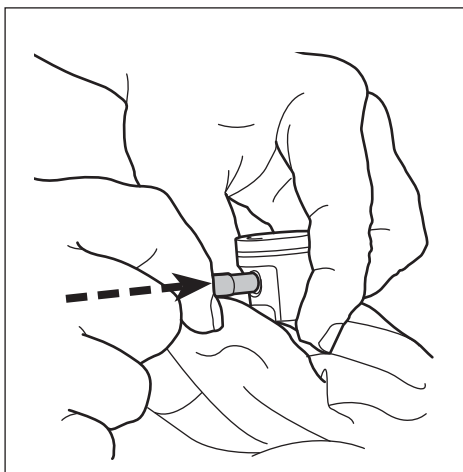
Carefully remove the cylinder straight up by rocking it backwards. Make sure that no dirt enters the crankcase.

Use a rag to cover the crankcase opening under the piston.



Using long-nose pliers remove the gudgeon pin circlips.

Keep your thumb over the circlip to prevent it from flying out.

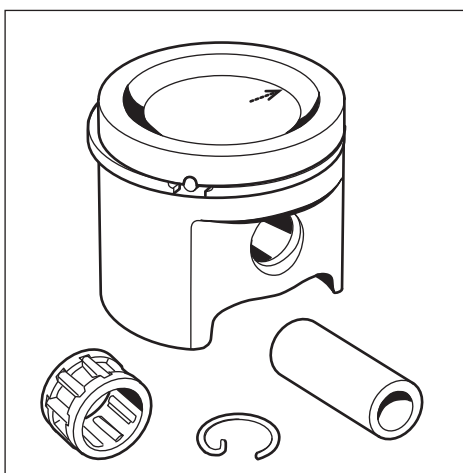
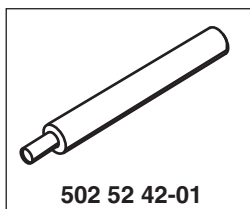


Dismantle the piston.

Push the gudgeon pin from the piston using punch 502 52 42-01. If the pin is too tight, carefully warm the piston.

NOTE!

Make sure the spacer washers on each side of the needle bearing are not misplaced.



Cleaning, inspection

After dismantling, clean the individual components:

1. Scrape carbon deposits from the top of the piston.
2. Scrape carbon deposits from the cylinder's combustion chamber.
3. Scrape carbon deposits from the cylinder's exhaust port.

NOTE!

Scrape carefully with not too sharp a tool so as not to damage the soft aluminium parts.

4. Wash all the components.
5. Inspect the different components for damage and wear.

Check the piston and cylinder for seizure damage and wear.

Also see the "Analysis and actions" section.

Check the piston ring for wear and damage.

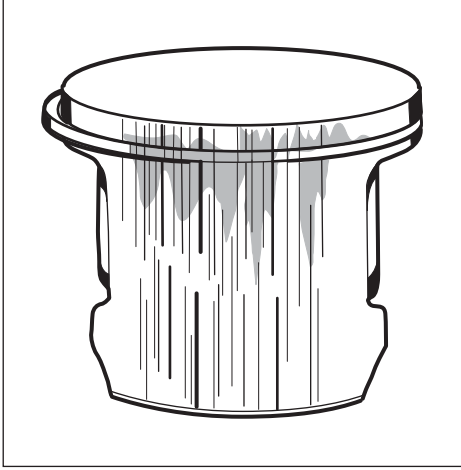
Also see the "Analysis and actions" section.

Check the gudgeon pin.

- If it has blued, it must be replaced.
- If the piston moves too easily both the piston and the gudgeon pin must be replaced.

Check the needle bearing. If it is discoloured or damaged, it must be replaced.

Check the circlips. If they exhibit cracks or are discoloured (caused by overheating), they must be replaced.



Small to medium size scores primarily in the middle of the exhaust port.

Analysis and actions

Experience tells us that piston or cylinder failure due to manufacturing errors are extremely rare.

The reason is usually due to other factors, which is evident from the following.

Note the reasons for the breakdown, repair the damage and take the actions required to prevent the same thing happening again.

Insufficient lubrication

The piston has small to medium size score marks usually in front of the exhaust port. In extreme cases heat development can be so great that material from the piston smears along the piston skirt and even in the cylinder bore.

Generally the piston ring is undamaged and moves freely in the ring groove

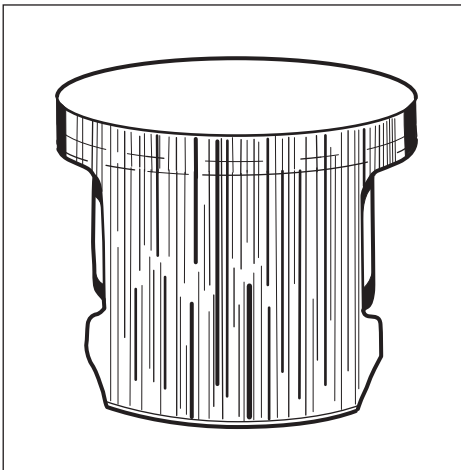
There can also be scores on the inlet side of the piston.

Cause:

- Incorrect carburettor setting.
Recommended max. speed exceeded.
- Incorrect oil mixture in the fuel.
- Too low octane fuel.

Action:

Check and change the carburettor setting.
Change the fuel.
Change the fuel.



Medium to deep scores along the entire piston skirt on the exhaust side.

The piston ring starts to stick or is completely stuck in its groove and has therefore not been able to seal against the cylinder wall, which has resulted in further, intensive temperature increases in the piston

Seizure scores along the entire piston skirt on the inlet and exhaust sides.

Cause:

- Incorrect oil mixture in the fuel.
- Too low octane fuel.
- Air leaks.
Cracked fuel hose.
Leaking inlet gaskets.
Cracked distance piece or inlet manifold.
- Air leakage in engine body.
Leaking crankshaft seals.
Leaking cylinder and crankcase gaskets.
- Poor maintenance.
Dirty cooling fins on the cylinder.
Blocked air intake on the starter.
Blocked spark arrestor mesh in the muffler.

Action:

Change to a fuel with the correct oil mixture.
Change to a higher octane petrol.
Replace damaged parts.

Replace leaking gaskets and shaft seals.

Clean the cooling fins and air intake.

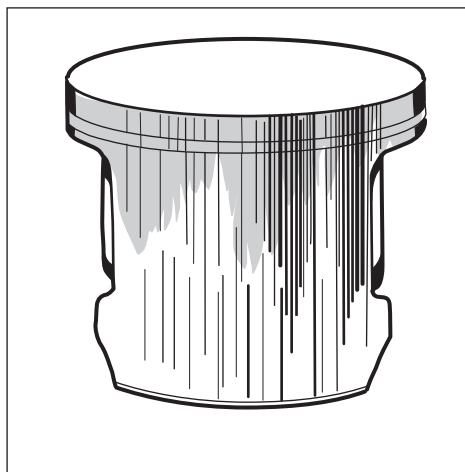
Clean or replace the spark arrestor mesh.

For the best results we recommend McCulloch two-stroke oil or ready-mixed fuel that is specially developed for air-cooled two-stroke engines.

Mixing ratio: 1:50 (2%).

If McCulloch two-stroke oil is not available another good quality two-stroke oil can be used.

Mixing ratio: 1:33 (3%) or 1:25 (4%).



Medium to deep scores on the exhaust side. The piston ring is stuck in the groove. Black discoloration under the piston ring due to blow-by.

Piston scoring caused by heavy carbon deposits

Too heavy carbon depositing can cause damage similar to that caused by insufficient lubrication. However, the piston skirt has a darker colour caused by the hot combustion gases that are blown past the piston.

This type of piston damage starts at the exhaust port where carbon deposits can become loose and get trapped between the piston and the cylinder wall.

Typical for this type of piston damage is brown or black discoloration of the piston skirt.

Cause:

- Wrong type of two-stroke oil or petrol.
- Incorrect oil mixture in the petrol.
- Incorrect carburettor setting.

Action:

- Change the fuel.
- Change to a fuel with the correct oil mixture.
- Correct the carburettor setting



Exhaust side damaged by a broken piston ring. The piston ring parts damage the top section and cause score marks.

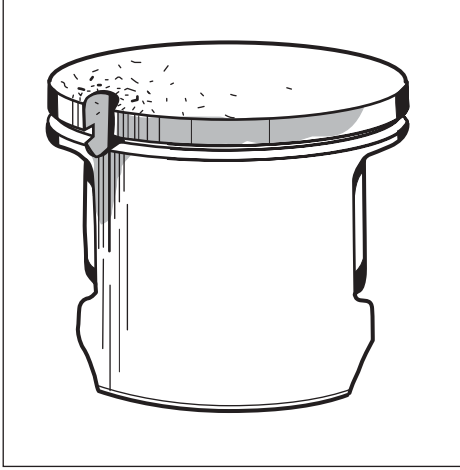
Piston damage caused by a too high engine speed.

Typical damage associated with a too high engine speed includes broken piston rings, broken circlip on the gudgeon pin, faulty bearings or that the guide pin for the piston ring has become loose.

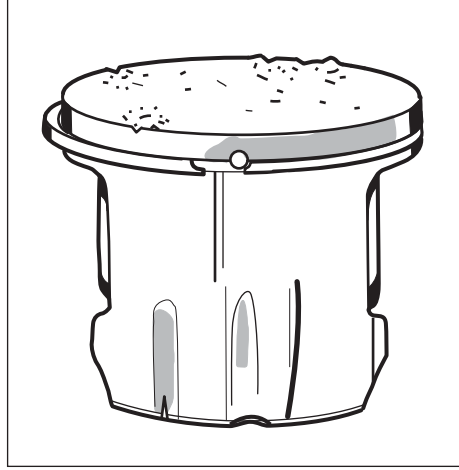
Piston ring breakage

A too "lean" carburettor setting results in a too high speed and a high piston temperature. If the piston temperature rises above the normal working temperature the piston ring can seize in its groove, consequently it will not sit deep enough in its groove. The edges of the piston ring can then hit the top edge of the exhaust port and be smashed and also cause piston damage.

A too high engine speed can also cause rapid wear to the piston ring and play in the piston ring groove primarily in front of the exhaust port. The ring is weakened by the wear and can be caught in the port causing serious piston damage.



The guide pin for the piston ring has been pushed up through the top of piston.



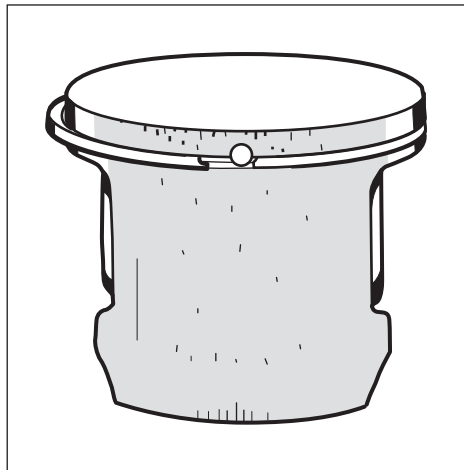
Deep, irregular grooves caused by a loose circlip. Shown here on the piston's inlet side.



Irregular grooves on the piston's inlet side caused by a broken roller retainer.

Piston ring guide pin vibrated loose

A too high engine speed can cause the ends of the piston ring to hammer against the guide pin when the piston ring moves in its groove. The intensive hammering can drive out the pin through the top of the piston causing serious damage also to the cylinder.



Small score marks and a matt, grey surface on the piston's inlet side caused by fine dust particles.

Damage caused by gudgeon pin circlips

A too high engine speed can cause the gudgeon pin circlips to vibrate. The circlips are drawn out of their grooves due to the vibrations, which in turn reduces the circlips' tensioning power. The rings can then become loose and damage the piston.

Bearing failure

Failure of the crankshaft bearing or on the connecting rod bearing is usually caused by a too high engine speed, resulting in the bearing being overloaded or overheating. This in turn can cause the bearing rollers or ball to glide instead of rotate, which can cause the roller or ball retainer to break.

The broken debris can be trapped between the piston and cylinder wall, damaging the piston skirt.

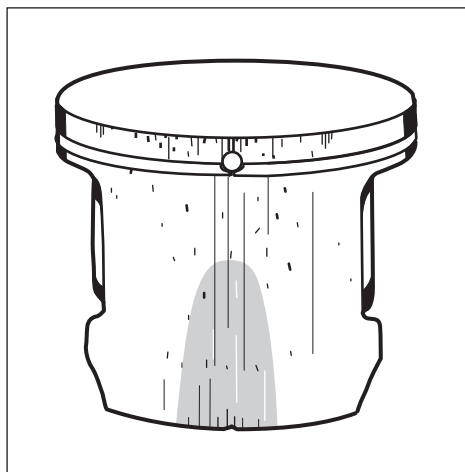
Debris can also pass up through the cylinder's transfer channels and cause damage to the top and sides of the piston as well as to the cylinder's combustion chamber.

Foreign objects

Everything other than clean air and pure fuel that enters the engine's inlet port causes some type of abnormal wear or damage to the cylinder and piston.

This type of increased wear shows on the piston's inlet side starting at the lower edge of the piston skirt.

The damage is caused by badly filtered air that passes through the carburettor and into the engine.



Inlet side.

Particles of dust and dirt from carbon-like deposits on the top of the piston and in the piston ring groove. The piston ring sits firmly in the groove. Piston material has been worn away.

The lower part of the piston skirt is thinner on the inlet side than on the exhaust side.

Cause:

- Faulty air filter. Small dust particles pass through the filter.
- The filter is worn out due to too much cleaning, whereby small holes have appeared in the material.
- Unsuitable filter maintenance, such as wrong method or wrong cleaning agent. Flock material becomes loose and holes appear.
- Air filter incorrectly fitted.
- Air filter damaged or missing.

Action:

Fit a finer grade filter.

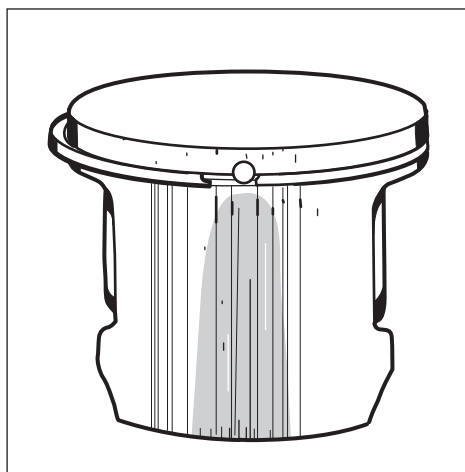
Check the filter carefully for holes and damage after cleaning. Replace the filter if necessary.

Clean more carefully and use the right cleaning agent (such as tepid soapy water).

Change the filter.

Fit the filter correctly.

Fit a new air filter.



The piston scored and worn from the piston ring down on the inlet side.

Larger, softer particles that penetrate into the engine cause damage to the piston skirt under the piston ring as the illustration shows.

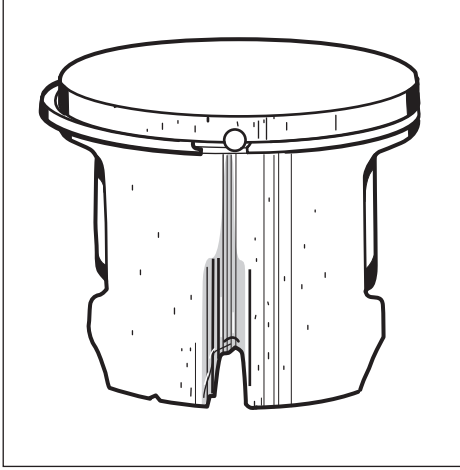
Cause:

- Air filter incorrectly fitted.
- Air filter damaged or missing.

Action:

Fit the air filter correctly.

Fit a new air filter.



Extensive damage to the lower part of the piston's inlet side.

Larger, harder particles that enter the engine cause serious damage to the underside of the piston skirt.

Cause:

- Air filter damaged or missing.
- Parts from the carburettor or intake system have come loose and entered the engine.

Action:

Fit a new air filter.
Regular service and inspection.

Service tips

Defect:

Broken cooling fins, damaged threads or sheared bolts by the exhaust port.

Seizure marks in the cylinder bore (especially by the exhaust port).

Surface coating in the cylinder bore worn out (primarily at the top of the cylinder).

The piston shows signs of seizure score marks.

Piston ring burnt in its groove.

Bolts much too tight in the aluminium material.

Action:

In severe cases – replace the cylinder.
Repair the threads using Heli-Coil.

Polish the damaged area using a fine grade emery cloth so that the coating of aluminium disappears.
With deep seizure score marks the piston and cylinder should be replaced.

Replace the cylinder and piston.

Carefully polish the damaged area using a fine file of fine grade emery cloth. Before the piston is refitted the cylinder should be polished as above. With deep score marks the piston and cylinder should be replaced.

Carefully loosen the piston rings and clean the groove well before refitting. Carbon deposits in the groove impair the important heat transfer between the piston and cylinder.

NOTE!

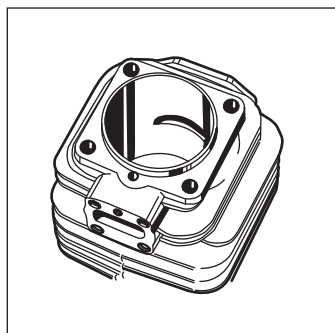
Be careful with the lower edge of the piston ring groove. If this is damaged, or if carbon deposits remain, the compression pressure can leak through.

Check the wear on the piston ring by placing it in the lower part of the cylinder.

Position a suitable punch on the bolt head and give a few sharp knocks with a hammer. If the bolt still does not loosen, repeat the procedure.

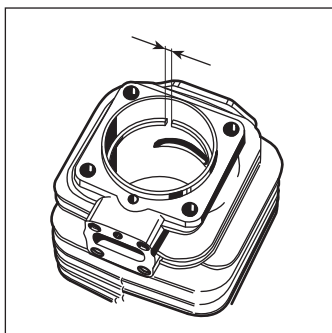
Wear tolerances

Cylinder bore



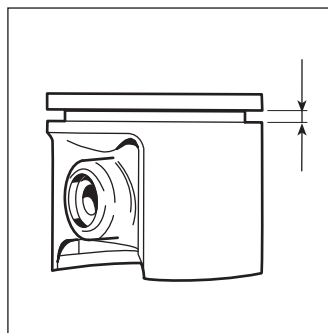
When the surface coating is worn and aluminium appears.

Piston ring gap



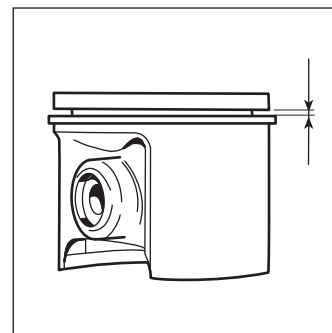
Max. 1.0 mm with the piston ring inserted in the lower part of the cylinder.

Piston ring groove



Max. 1.6 mm. Clean the groove before checking the measurement.

Piston ring play



Max. 0.15 mm. Clean the groove before checking the measurement.

Assembly

Lubricate the gudgeon pin's needle bearing with a few drops of engine oil and assemble the piston.

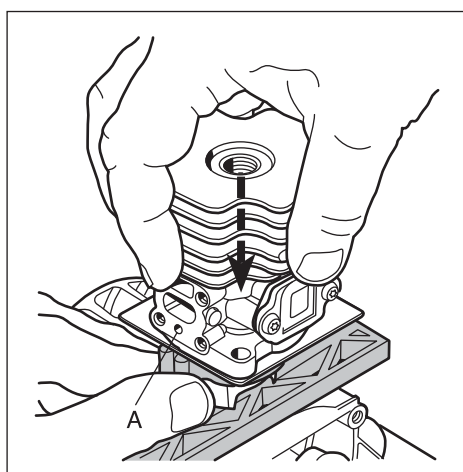
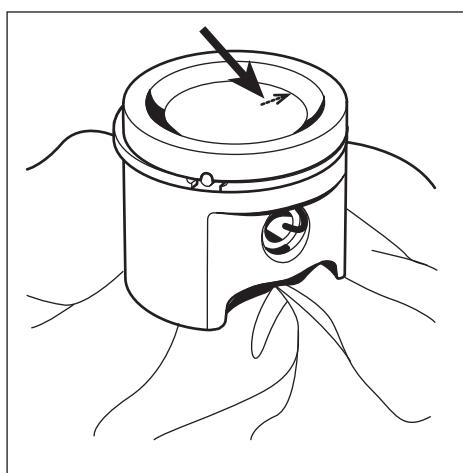
Assembly

Lubricate the gudgeon pin's needle bearing with a few drops of engine oil and assemble the piston.

Lubricate the gudgeon pin's needle bearing with a few drops of engine oil. Place a distance washer on each side of the needle bearing. Turn the countersunk end toward the needle bearing.

Direct the arrow on the top of the piston towards the exhaust port.

Press in the gudgeon pin and fit the circlips.



NOTE!

Place a rag in the crankcase opening to prevent the circlip from falling into the crankcase in case it should fly out.

Check that the circlip is correctly fitted into the groove by turning it with a flat nosed pliers.

Check that the pulse channel (A) in the cylinder is open.

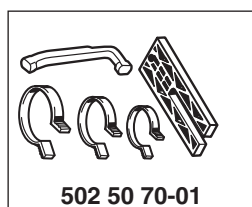
Assemble the cylinder with the help of assembly set 502 50 70-01.

Check that the pulse channel (A) in the cylinder is open.

Place a new cylinder base gasket on the cylinder or the crankcase. Lubricate the piston and the crank bearing with a few drops of engine oil.

Assemble the cylinder with the help of the piston ring compressor in the assembly set 502 50 70-01.

Tighten the cylinder against the crankcase.

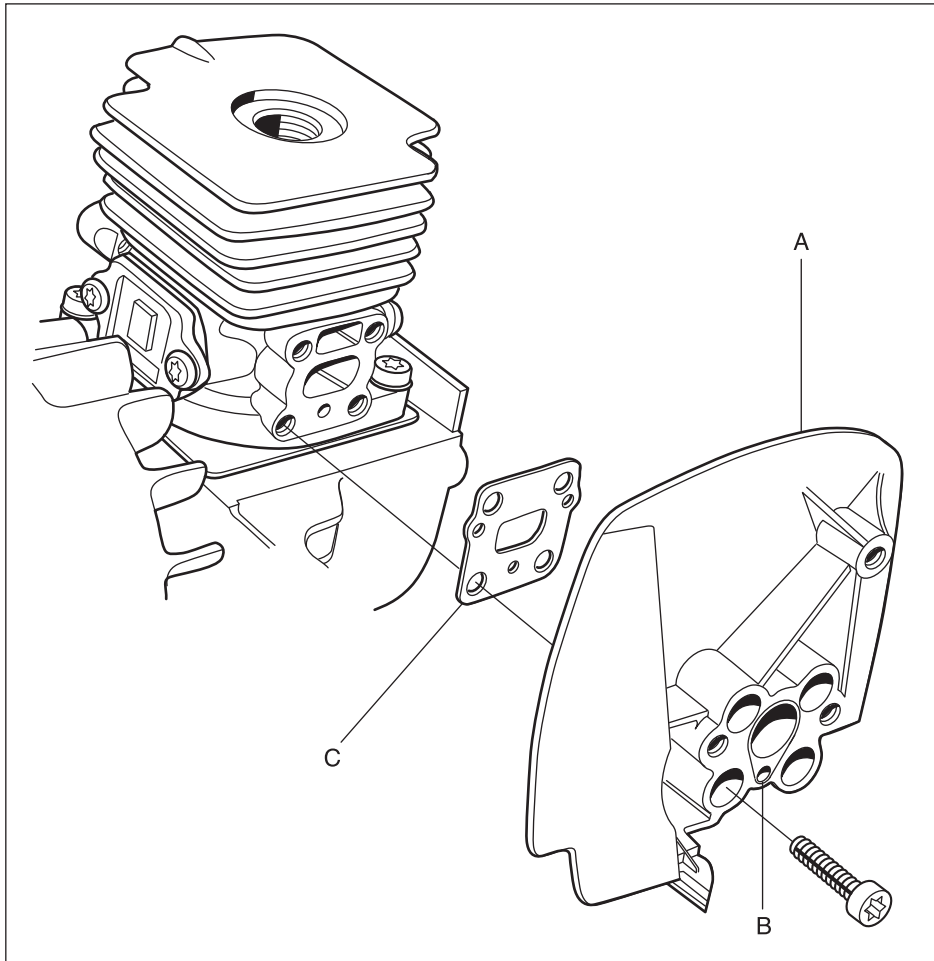


NOTE!

Do not twist the cylinder when sliding it down over the piston. There is a risk that the piston ring may break.

6

Cylinder and piston



Check the carburettor's distance piece/ heat shield (A) for cracks.

Make sure the impulse channel (B) is open and that the gasket (C) is not damaged.

Screw the distance piece to the cylinder and tighten the screws crosswise and diagonally.

Assemble the remaining parts in the reverse order as set out for dismantling. See respective sections in the manual.

