# RAKET 95

ENGLISH

# Owners Manual

# Owners Manual R 95

Congratulations, you have made a good choice when you picked our engine R 95.

Now we beg you to read through this User Manual before you start using the engine. The manual is an important part of our delivery and it is a proof of our endeavour to deliver a good and safe product that both you and we can be proud of.

R 95 is a brand new type of kart engine. It is a two stroke engine, but it is built on a completely new principle for scavenging, which is called Dual Charge. Thanks to this the R 95 engine has much less exhaust emissions than any other comparable kart engine. Dual Charge also means a number of other advantages, e.g. lower fuel consumption and improved oiling of all bearings in the crankcase.

**WARNING!**
Under no circumstance is it allowed to change the original design of the engine without a written acceptance from the manufacturer. You should always use original spare parts. Unauthorised changes or non original spare parts can lead to serious damages.

Should you one day sell your R 95 engine, you should pass on this User Manual to the new owner.

If the User Manual has got lost you can order a new one free of charge from Radne Motor AB.



Contents

IMPORTANT

## 1. Safety

1.
R 95 engines including accessories, as supplied by Radne Motor, are only intended to be assembled on a kart and for the purpose of driving the kart. Any other use is forbidden unless written approval has been received from Radne Motor. Radne Motor accepts no responsibility whatsoever for anything that may happen if a R 95 engine is used for any other purpose than that for which it is specifically intended.

2.
A kart that is equipped with a R 95 engine can attain speeds at which the driver is exposed to obvious danger to life and limb if the kart is handled in an irresponsible manner. Radne Motor accepts no responsibility whatsoever for injuries to people or damage to property that may arise if a kart that is equipped with a R 95 engine, either directly or indirectly is the cause of an accident or damage as a result of carelessness or negligence on behalf of the driver.

3.
During normal use, some parts in a R 95 engine become so warm that they can cause burns to people who come into contact with the warm parts. Examples of such parts are the silencer and cylinder. It is up to the driver to ensure that the kart is equipped with appropriate protection so that contact with warm and hot objects is avoided, and to act in an appropriate fashion so that such possible burn injuries do not occur. Radne Motor accepts no responsibility whatsoever for injuries that may occur as a result of a person coming into contact with the hot or warm parts of a R 95 engine.

4.
During the normal use of a R 95 engine installed on a kart, there is a risk for personal injuries that may occur as a result of body parts or objects being trapped between, or rubbing against, the engine's rotating parts. An example of this could be getting a finger stuck between the sprocket on the outbound axle and the chain that drives the rear axle. It is up to the driver to ensure that the kart is equipped with appropriate protection so that such incidences of contact are avoided, and to act in an appropriate fashion so that no injuries of this type occur. Radne Motor accepts no responsibility whatsoever for injuries to people that may occur as a result of something becoming trapped between the rotating parts of a R 95 engine.

5.
A R 95 engine is propelled using a flammable fuel – alkylate petrol or 95 octane petrol. Careless handling of the fuel can lead to fires that can cause injury to people or damage to property. Radne Motor accepts no responsibility whatsoever for accidents and injuries that may occur as a result of careless handling of fuel, for instance when filling the fuel tank, incorrect mounting of the fuel tank onto the kart, inappropriate construction of the fuel tank, a fuel tank made of inappropriate materials or the existence or use of inappropriate materials in, or with the drawing of, a fuel line.

6.
R 95 is equipped with an electric starter system consisting of a starter motor and a starter battery. The battery is of the NiMH type (Nickel-metal hydride). Please refer to the separate section in this manual regarding handling and care of the NiMH battery that is included with the delivery of a R 95 engine. Radne Motor accepts no responsibility whatsoever for accidents or injuries that may occur to people or property if any battery is used other than that which is supplied with the original delivery or as an original spare part battery.

7.
The driver is responsible for the mounting of the battery, battery box and cables between the battery box and the starter motor, in accordance with the instructions provided in this manual. Radne Motor accepts no responsibility whatsoever for accidents and injuries that may occur as a result of incorrect mounting of the battery, battery box and/or the cables between the battery and the starter motor.

8.
The charging and storage of the NiMH battery should occur in accordance with the instructions provided in this manual. Radne Motor accepts no responsibility whatsoever for injuries to people or damage to property that may occur as a result of incorrect handling, storage or charging of the R 95 NiMH battery.

## 2. Instructions for handling and charging a R 95 starter battery.

PLEASE NOTE: These instructions regarding the handling of a R 95 starter battery are an important part of Radne Motor's delivery of the R 95 kart engine. These instructions contain information about handling of the battery and the charging of the same. Before you may use the NiMH battery it is important that you read these instructions in their entirety. If in the future you sell your R 95 engine together with its starter battery, then you must ensure that the new owner receives these instructions.
IMPORTANT! Radne Motor accepts no responsibility whatsoever for damages to a R 95 engine that may occur if you use any other battery than a R 95 original battery.
If you have previous experience of lead-acid batteries then please be aware that NiMH batteries are radically different from these. As long as a NiMH battery is used correctly then it is a very good and environmentally-friendly source of power that is far superior to both lead-acid and nickel-cadmium batteries. However, if a NiMH battery is not handled correctly and in accordance with these instructions, such incorrect handling may drastically shorten the battery's lifespan, or else cause injury to people or damage to property.

**Technical Data Raket 95 Battery**

Battery type: NiMH
Voltage: 14,4 volt
Capacity: 3000 mAh
Charging power: 1 A, determined by the charger
Charge 5 hours, then maintenance charge
Minimum discharge voltage 11.0 volts
Maintenance charge only by Raket Original special charger
Fuse in the battery cartridge 40 A

Use in temperatures:
Storage 0-50 degrees ambient temperature
Use 0-50 degrees ambient temperature
Charge 0 - 30 degrees ambient temperature

Life expectancy 500 up and discharge cycles
Charger Raket Original special charger for NiMH





**Safety instructions for the use of the battery and the charging of the battery:**

1.
Read these instructions in their entirety before you begin to use the NiMH battery.
2.
The handling and care of the NiMH battery should never be entrusted to children unless there is a supervising adult in attendance.
3.
Always check that the NiMH battery is in good condition every time before using it. If you see that the battery is mechanically damaged, or if it appears to have expanded in volume or if electrolyte (a sticky gel-like substance) has penetrated the battery, then you should discard the battery immediately.
4.
A NiMH battery should not be thrown out with household garbage but should be taken for recycling in accordance with your local guidelines regarding the management of recyclable waste.
5.
A NiMH battery should never be shorted or exposed to high levels of heat.
6.
A NiMH battery should never be overcharged. That is why you should always use the Raket original battery charger that automatically stops charging when the battery has reached its full capacity.
7.
A NiMH battery should not be discharged so that the terminal voltage drops to below 11.0 volts. If you discharge the battery too deeply then one of the battery's cells may be damaged in which case you will no longer be able to recharge the battery to its full capacity.
8.
A NiMH battery should not be charged until most of its capacity has been used up. At that point the terminal voltage will have dropped to 12.0 volts. In practical terms this means that you can start your kart approx. 50 times before you need to charge the battery. Try to get into the habit of charging your battery after you have started the kart 35 – 45 times.
9.
You should always charge the battery using the original special charger that is supplied with the delivery of a R 95 engine. The charger is an intelligent-type charger which means that it initially charges with a high current until the battery reaches maximum capacity. After that the charger switches over to trickle charge mode. If you were to use a charger that does not have this automatic function then you would almost certainly "burn-out" your battery because of overcharging.

10.
Never charge a battery that is warm. Let the battery cool to normal room temperature before you start to charge it again.
11.
The time required to charge a battery that is typically discharged is 5 hours. When the charger notices that the battery is fully charged it switches to trickle charge mode.
12.
When charging the battery, the charger should be connected to the charger plug that is located on the battery box. If the battery is to be charged once it has been removed from the box then the charging process should occur on an inflammable surface. Connect the

charger's positive terminal to the battery's positive terminal and the battery's negative terminal to the charger's negative terminal. If the charger is connected incorrectly it is most likely that both the battery and the charger will immediately and irrepairably damaged.
13.
The battery does not need to be supervised during charging. The automatic functionality of the charger takes care of any need for supervision.
14.
The battery should not be altered in any way, for instance by taking it apart and putting it back together in a different configuration.
15.
It is not permitted to solder the battery. If one of the connection cables should come loose from the battery as a result of careless handling then it should be disposed of immediately.
16.
If a fire should start in a NiMH battery then the fire should be extinguished with sand or alternatively the battery should be cooled down by using a $CO_2$ fire extinguisher.
17.
If the battery's electrolyte should come into contact with a person's hands then the electrolyte should be immediately washed away to avoid any burns to the skin. If someone were to get electrolyte in their eyes then assistance from a specialist eye doctor should be sought immediately.

18.
Prior to winter, when you are no longer using your kart, it is important that you charge your battery before you put your kart into storage for the winter. If you store away your kart in the autumn with a discharged battery then the battery will almost certainly be inoperable when you take out your kart again in the spring. For this reason you should allow your battery to remain charging on trickle charge mode during the period that you will not be using it.
19.
If your kart is to be stored in cold storage, in other words a storage area where minus temperatures may occur, then you should remove the battery and store it somewhere at normal room temperature.
20.
For information regarding handling of the charger we refer you to the general instructions that can be found on Mascot's website. Please see: http://www.mascot.no/





## Installing the NiMH battery.

1.
The battery is delivered in a battery box made of extruded aluminium.

2.
The battery box is to be mounted onto a console that is in turn to be mounted onto the frame to the left of the driver's seat, using the supplied mounting components.


3.
The start button and the charger plug can be found on the battery box. In the box there is also a 40 A fuse that prevents the battery from being destroyed if a short should occur outside of the battery box. The fuse may only be changed for an identical fuse that can be purchased as a spare part from a Raket reseller.

4.
A cable leads from the battery box which should be connected to the starter motor. There is a plug on the cable that should be connected to the equivalent plug on the starter motor.

5.
The cables between the battery box and the starter motor should be carefully fastened to the frame by using suitable cable clips or ties. The cables should be fastened in such a manner that they cannot come into contact with any hot or warm parts of the engine that might melt the cable casing, nor with any moving parts that might render holes in the cable casing.

## 3. Instructions for mounting the R 95 engine onto the kart.

The process for mounting the R 95 engine onto your kart can of course vary somewhat depending on what type of kart you have. Below we provide some advice and guidelines that are normally applicable to most types of karts.

1.
The R 95 engine is designed to fit directly onto the engine support that already exists on your kart. You will need four M8 Allen (hexagonal) bolts in order to attach the engine to the engine support.

2.
Your engine has an engine sprocket with 11 teeth. It is normally a good idea to try an 80-tooth sprocket on the rear axle, but then it is of course up to you to test different settings for different tracks. A curvy track may require a larger sprocket = more teeth, while a straight and long track may require a smaller sprocket on the rear axle.

3.
The great majority of karts have a holder for the silencer as standard, and the accompanying silencer is suitable for use with such a standard holder. It comes with three springs that hold the silencer against the engine's exhaust pipe, and it will require two slightly longer springs to hold the silencer in the support, for which you can use the kart's standard springs.

4.
A holder for the throttle cable can be found between the carburettor and the carburettor flange, while a lever with a holder for the cable can be found on the throttle shaft.

5.
You need to have a CIK-approved inlet silencer to be able to drive and race your kart. There are several different models available and all are suitable for use with the flange on the inlet crown.

6.
How you will then fasten the inlet silencer to your kart depends on the type of inlet silencer that you have chosen. We recommend that you are careful when it comes to fastening the inlet silencer since this normally is required to absorb quite hard knocks. We can certainly recommend the use of Radne Motor's holder (article number 5208).

7.
When it comes to mounting the battery, battery box and the connection between the battery and the starter motor, a description of how to do this can be found in a separate section of this manual.





## 4. Starting and stopping the R 95 engine.

Thanks to the R 95 engine being equipped with an electric starter it is normally very easy to start. No longer does one need a strong mechanic who is able to lift the rear end of the kart in order to run-start the kart.

1.
Make sure that you have filled the tank with fuel.

2.
If the fuel line is empty of petrol then take away the inlet silencer if it is attached, hold your hand over the carburettor and give full throttle. Press the start button and hold it in until you can see that the fuel is being pumped to the carburettor. Release the start button.

3.
When you start the engine you should not apply the throttle, but hold the brake pedal down in order to avoid the kart from beginning to roll when the engine starts.

4.
Push the start button. Normally the engine will start directly. As soon as you hear the engine ignite you should take your hand away from the inlet silencer.

5.
If the engine happens to stop then press the start button again. However this time you should not hold your hand over the inlet holes on the inlet silencer. If the engine does not ignite and start directly, you can carefully try to give a little throttle. This may be required in particular if the engine is cold, but otherwise there is a risk that the engine will receive too rich of a fuel mixture.

6.
If you do not succeed in starting the engine through the method described then you should check the starter battery. The battery maintains its voltage as long as it is charged, but when it begins to approach the limits of its capacity the voltage can reduce quickly. Low voltage leads to less revolutions for the starter motor and thus can cause problems starting, especially when the engine is warm. A fully-charged battery will normally cope with 50 starts before it needs to be recharged.

7.
You stop the engine via the short circuit button that can be found on the battery box.

## 5. Setting up the R 95 engine.

Your new engine does not require a lot of setting up. It is essentially only the carburettor that has varying setup alternatives.

1.
Start with a default setting for the carburettor. Carefully turn both of the adjusting screws for High Speed (H) and Low Speed (L) the whole way so that they are fully closed. After that, open the High Speed screw (H) 0.75 turns and the Low Speed screw (L) 2.25 turns.

2.
Next you should screw out the idling adjustment screw so that it just misses making contact with the lever on the throttle shaft. After that, screw in the idling adjustment screw 1.5 turns. This is now the default setting for the carburettor that guarantees that you will be able to start your engine.

3.
Start the engine. If it stops as soon as you no longer press the start button, but continues to run if you carefully give throttle, then you can try screwing in the idling adjustment screw by half a turn. Don't overdo it however, because the engine should be able to idle without the centrifugal clutch engaging and thus beginning to pull the kart along with it.

4.
Now you can drive a lap or two of the track so that the engine warms up.

5.
Begin the fine tuning with the Low Speed screw (L). Allow someone to hold the brake to ensure that the kart cannot begin to roll, and press quickly on the throttle. The engine should answer directly and increase speed until the centrifugal clutch engages. If the engine hesitates or even stops then you should test the effect of slightly increasing the Low Speed screw. Start with half a turn. When you have found a setting at which you can apply the gas and the engine responds immediately then it is time to move onto the setting of the High Speed screw (H).

6.
Drive a few laps of the track so that the engine is really warm. Listen thereafter to

**Standard Jetting**

L: 2,25 turn
H: 0,75 turn


*These are the minimum settings that should not be lower*

how the engine sounds when you are driving on the track's longest straight. The High Speed screw is correctly adjusted when the engine begins to splutter at the very end of the straight. If it starts to splutter any earlier

then you should carefully screw in the High Speed screw one tenth of a turn. WARNING! Do not overdo it and screw in the High Speed screw too much, because then the engine will not receive enough fuel and as a result not enough oil, which can lead to piston and cylinder damage. The High Speed screw should always remain opened at least a 0,75 turn.

7.
When you have found exactly the right setting for the High Speed screw you should check the settings of the Low Speed screw and the idling adjustment screw again. You can feel satisfied when:

- the engine idles easily without pulling the kart, and you hear the occasional pinging sound from the clutch but not so often.
- the engine responds directly when you apply the gas, both when idling and when you are driving on the track and, for instance, have taken your foot off the gas going into a curve and then apply the gas again.
- the engine winds up properly on the track's straight sections, but begins to splutter at the very end of the longest straight.

8.
If you find after having driven for a while that you are no longer able to achieve a correct setup then it may be time to clean the carburettor. See the section about servicing the engine.

## 6. Technical data for R 95

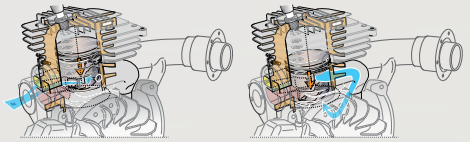
| | |
|---|---|
| Engine model | One-cylinder two-stroke engine of Dual Charge model |
| Cylinder volume | 94 cm3 |
| Cylinder diameter | 56 mm |
| Stroke | 38 mm |
| Connecting rod length | 74 mm |
| Carburettor | Tillotson HS 319 a, venturi 17,7 mm |
| Ignition system | Selettra analog |
| Flywheel | Selettra 113,9 mm |
| Starter system | Electric, integrated starter (or Magnapull cord starter) |
| Starter battery | Raket, 14.4 V Nickel-metal hydride (NiMH) 3.0 Ah |
| Spark plug | NGK BPM 8 Y |
| Clutch | Centrifugal clutch metal |
| Sprocket on clutch drum | 11 teeth, type 219 |
| Exhaust system | Tuned system with end silencer |
| Fuel | Alkylate or 95/98 octane lead free petrol |
| Petrol mix | 4% of synthetic two-stroke oil |
| Squisch | Min 0,8 mm |
| Combustion chamber volume | Min.11,0 ml |
| Bearings | Original SKF 6203 TN9C3 |
| Sealing rings | 17x28x7 sealing lip with Teflon coating and dust seal |
| Idling speed | 2500 rpm |
| Max rpm | 12500 rpm |
| Max power | 7,6 kW at 8600 rpm |
| Recyclable parts in the engine | 82 % |
| Emission values CO and HC | According to EPA2 standards |
| Weight | 12.1 kg complete engine (engine, starter battery and silencer) |





## 7. What do we mean by an engine of Dual Charge model?

If one looks at the inlet in the cylinder one can immediately see the big difference. The inlet is divided up into an upper section and a lower section. If one then follows the channels one will see that the upper channels go directly into the cylinder's upper section, while the lower section of the inlet leads via channels down into the crankcase, just like an ordinary two-stroke engine.
Insulating flange with two channels ensures that the two streams of air are not mixed together. As you can see from the picture of the cylinder, the two air streams continue each

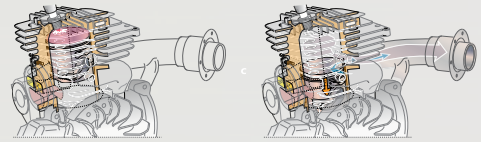


of them through their respective channel into the cylinder.

You may wonder why the air that travels on the top side of the throttle doesn't suddenly stop when it no longer has any depression to pull it. Well, when it comes to air it happens to be the case that when one part of an air mass moves, it pulls the surrounding air along with it.

When it comes to the operating strokes, when the piston moves downwards into the cylinder, a port is opened in the cylinder at which point the air stream that is not mixed with the fuel streams in and rinses clean on the top side of the piston. The result is that when the mixture of fuel and air flows up from the crankcase via the transfer channels it meets with a clean combustion chamber. Because of this the combustion is much purer, which in turn means purer exhaust fumes. R 95 has such good values concerning the content levels of carbon monoxide, carbon dioxide and hydrogen carbonates (HC) that it is able to meet the required emission demands without the use of catalytic exhaust emission control.

When the piston moves upwards in the cylinder, in other words during the inlet and compression stroke, a depression occurs in the crankcase. It is this depression that enables the engine to suck in air through the carburettor. The throttle in the carburettor divides up the inlet air into one part beneath the throttle and one part above it. It is only



the air that travels beneath the throttle that then sucks up fuel through the carburettor jet. A rubber inlet flange sits between the carburettor and the cylinder. The inlet flange also has a plate that divides the air and fuel mixture when the throttle is completely open.

However this is not the only advantage with Dual Charge. The purer combustion also means that the fuel consumption is reduced and that the exhaust fumes do not smell as bad as in the case of an ordinary two-stroke engine. Dual Charge engines are also much cleaner in the crankcase which has been shown to have a positive effect on bearings and seals.

## 8. Product description for homologation purposes

R 95 will be homologated in those countries where it receives approval from the local Automobile Sport Federations. This product description may not be used as a supporting document during technical control unless the appropriate Automobile Sport Federation's stamp of approval exists.

The main principle involved is that absolutely no changes or modifications may occur. The engines should be "out of the box", in other words exactly as they are delivered. Below follow some clarifications.

### 1. Crankcase

The crankcase should have the same design as shown in the picture.
The measurements that are of decisive importance are those relating to the part of the crankcase that exactly encloses the crankshaft. In this matter absolutely no modification whatsoever is allowed. The crankcase halves should both be labelled with RAKET.

The sealing rings are "open to choice", in other words they may be exchanged for any other factory make of your choosing under the condition that the model and the dimensions are kept the same. On both sides there should be 17x28x7 with sealing lip as well as dust sealing lip. Original sealing rings have a sealing lip that is Teflon coated.
The ball-bearings move on the crankshaft but are press fitted in the crankcase and are original 6203 TN 9C3. It is not permitted to change the bearings' fitting or placement.

### 2. Crankshaft

The crankshaft may not be altered in any way. For instance it is not permitted to balance the crankshaft by removing or adding material. The same applies to the connecting rod, in other words no alteration of any kind is allowed.
The needle roller bearings at either end of the connecting rod are open to choice with regards to factory make as long as the same

model is used. This should be needle roller bearings in a steel basket.

### 3. Cylinder

The cylinder should be completely original and absolutely no modification is allowed. For instance it is not permitted to smooth out the edges of the transfer ports.
The cylinder should be labelled MAHLE 56 ZK3 and display Radne Motor's logo and article number 35085. No other labels are permitted.
Exception:
If a thread in the cylinder were to be damaged, for instance the spark plug thread,

then it is permitted to make the repair with a thread kit of the Heli Coil variety. PLEASE NOTE! It must be the same thread as the original.

### 4. Spark plug

The original spark plug is NGK BPM8Y, but it may be exchanged for another equivalent factory make. The diameter of the thread and the thread length, 14x 9.5 mm, must always be the same as the original.

### 5. Piston

You may not change to another factory make of piston and it is very unlikely that you will come across any pirate versions of pistons. The piston should be labelled on the top with R 35087.
Piston pins, piston pin locks and piston rings must be original.
On the top of the piston there is an arrow indicating which side of the piston should be facing the exhaust port.

### 6. Carburettor

The carburettor is a Tillotson HS 319 A carburettor. Absolutely no modifications whatsoever are permitted. The venturi diameter should be 17.7 mm and the diameter at the

connection for transition to the cylinder connection should be 20.50 mm.
Parts subject to wear and tear such as the diaphragm, gaskets and needle valve must be original.
The throttle shaft should be an original Tillotson with a lever for connection of the throttle

cable.

### 7. Carburettor flange

The carburettor flange should always be assembled and labelled with article number 35061.

### 8. Inlet flange

The rubber inlet flange should be labelled with article number 35065 and may not be altered in any way. The dividing plate of treated Bakelite should be assembled.

### 9. Ignition system

The ignition system should be original Selettra and no modifications are allowed.
The ignition coil and flywheel should be labelled with Selettra. The minimum weight is 390g.
The flywheel wedge should be assembled and

may not be altered.
The picture illustrates the flywheel with flange hub for manual starting. The hub should not be removed.

### 10. Exhaust system

The exhaust system, consisting of cylinder connection and complete silencer, may not be altered or modified in any way. The attachment of the silencer onto the cart is open to choice, but it must be of such a nature that the original silencer can be used without any

alterations whatsoever.
The exhaust system for Micro has a restrictor washer assembled at the cylinder connection. The restrictor washer has a diameter of 14 mm.
One can divide the silencer by drilling out the rivets and replacing them with suitable screws. When the silencer is divided one is able to check on the amount of damping material. This should be done at least once every season, or when you notice a change to the sound of the exhaust.






### 11. Centrifugal clutch

The clutch is an one piece steel clutch with expandable arms.
The clutch is a security feature and absolutely no alterations or modifications are allowed. In

other words it is not permitted to change the clutch weights or the clutch springs in order to alter the number of rpm at which the slip clutch engages.
The clutch should be fully engaged at max 5,000 rpm.
The clutch drum has a sprocket with 11 teeth.

### 12. Covers

The covers are safety features designed to avoid contact with the rotating and warm parts of the engine, and absolutely no alterations or modifications are permitted. The kart may not be driven without the covers.

### 13. Starter system

The engine is equipped with an electric starter system as standard. The starter motor should be an original R 95.
The engine may even be equipped with a manual starter system also known as a Magnapull starter.
This means that a flange hub may be assembled onto the flywheel.

## 9. Service tips

Experiences from the previous engine model, Raket 85, have taught us that a Raket engine should normally not require any comprehensive levels of service during a racing season, since we believe that a R 95 engine will be used no more than 50 times per season. We do not believe that it should be necessary to change bearings, sealing rings and piston rings several times during a season, such as is required with more extreme kart engines. It is of course up to every driver and mechanic to make their own decisions about what they think is necessary or best.

The following simple service routines can however be said to fall into the category of normal maintenance work:

### 1. Lubricating the clutch parts.

We recommend that you lubricate the bearing of the clutch drum. The clutch it self shall be clean and not lubricated.

### 2. Silencer

As we mentioned previously, it is possible to drill out the rivets at the back edge of the silencer.
When you have done this you can remove the end of the barrel and thus even the damping material that is lying wrapped around the barrel. Assuming that the carburettor is setup normally and correctly it should not be necessary to change the damping material during a season. However we would recommend a change prior to the start of each new season.

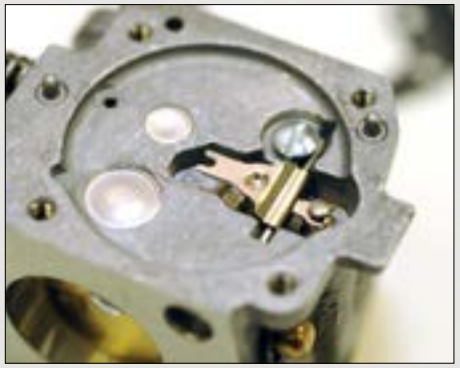
### 3. Servicing the carburettor

The only aspect of your R 95 engine that requires regular service is the carburettor.
A diaphragm carburettor is a quite amazing component that is capable of operating in chainsaws, cutters and other testing applications whilst working problem-free for several years at a time. As long as you are careful to only refuel using well-filtered fuel, and always drive with the inlet silencer attached, then you should also be able to get through a season without needing to disassemble the carburettor for cleaning and control. On the other hand you must possess the ability to clean and setup your carburettor. To that end there now follows a short tutorial in carburettor service.

The carburettor is a Tillotson 319 A. If we follow the passage of the petrol through the carburettor we will be able to quickly describe the carburettor's function.
The carburettor has two caps, one made of metal while the other is mould cast. Under the moulded cap lie a rubber diaphragm and a gasket. There is a small chamber on each side.

One of these chambers is connected to the engine's crankcase via a channel. When the pressure in the crankcase changes the pump diaphragm in the carburettor will begin to move. On the other side of the diaphragm there is fuel in the other chamber. When the diaphragm moves the fuel is pumped in and out of the chamber. Two small lip valves that are cut-out in the same piece of rubber ensure that suction from the tank occurs and that the fuel is pumped further towards the carburettor's inlet valve. The pump should sustain a pressure of approx.0.5 kp/cm2.

It is quite simple to check if the pump is working correctly. Take off the spark plug so that it will be easier to move around the engine. Ensure that the fuel line is correctly attached and that the carburettor is sitting correctly on



the engine. All gaskets should be OK. Ensure that the hose running from the crankcase to the carburettor is in place. Press carefully (we emphasise – CAREFULLY) down on the master diaphragm which you can reach through the small hole on the die-cut cover of the carburettor. When you press down on the diaphragm the inlet valve opens. Turn the engine around and check to see if there is any fuel coming from the tank.

If no fuel is coming then you should firstly loosen the fuel line from the tank and blow into the hose. You should still be pressing down on the carburettor diaphragm. You should feel that it is possible to blow air through the carburettor. If you are not able to blow air through the carburettor then you should take off the moulded cap, because there is obviously something wrong. Firstly check the small fuel strainer (this has article number 3043 in the spare parts list). It may be clogged.

After that it is time to focus on the pump diaphragm itself. It could be worn out, but that is actually difficult to determine with the naked

eye; however if it has been used for a while then you should change it! Remember that one should always change the gasket when one changes the diaphragm.
The rule is: The diaphragm should be facing the carburettor casing – otherwise the lip valves will not seal!
Now the pump should be working OK, which you can check by using the same method as we have previously described. If you still – despite everything – are not able to receive fuel then the needle valve must be stuck and in that case there is nothing else to do than to continue. The pump pushes the fuel forward towards the needle valve, but it cannot open it through its own force. The needle valve is held closed by a spring that operates over a lever. The master diaphragm works against the lever, which we know from the small rivet in the middle of the diaphragm. One side of the diaphragm is in contact with the carbu-

rettor's venturi. When the fuel is sucked out through the needle valves, the amount of fuel beneath the diaphragm is reduced. This in turn applies pressure to the lever and cancels the spring's force. Now the inlet valve can open and more and more fuel can flow in – the chamber beneath the diaphragm fills up and the diaphragm moves outwards. In this way the spring closes the needle valve and maintains a relatively constant amount of fuel in readiness for the needle valves.

Fuel can find its way out of the chamber to the carburettor's venturi via the H and L screws. The channels there are so thin that the fuel will not normally escape of its own accord but rather must be sucked out. The

shape and placement of the channels in the venturi decide the characteristics of the carburettor. That is however not something that we shall go into in any more detail here.

Now we can start with the needle valve. Take away the pressed metal cap and the master diaphragm together with its gasket. By loosening the small screw that can now be reached, the needle valve can be disassembled. Be careful that the spring does not come loose! Now you should check the needle valve itself (nr: 25) to ensure that its pin is totally even – change it if you are unsure. Check that the seating at the bottom of the valve appears to be even and undamaged. Unfortunately it can happen that the seating sustains damage in which case the valve will not be able to close properly.
When you have checked and cleaned everything it is time to reassemble the needle valve with its lever. The spring should not be deformed (you should always have a couple available to change when necessary) and the lever should not be bent. When you assemble the valve, the part of the lever that has a fork that fits onto the master diaphragm's rivet should lie exactly at the edge of the carburettor's rough surface.

Now you should attach a small air pump with a manometer (art nr: 5054) to the fuel nipple on the pump side. Drop a few drops of fuel down onto the needle valve and pump up the pressure on your pump. At approx. 1.0 kp/cm2 the inlet valve should open and after that it should release air through it down to a pressure of approx. 0.5 kp/cm2. Now the valve should be totally sealed! If this test does not appear to have worked properly then the question is, what should we do next? The most common problem is probably that the valve is not sealed, and in that case one must search for dirt or pores or else change the needle valve. PLEASE NOTE! Leaking gas-

kets on the pump side will exhibit the same symptoms. If the opening or sealing pressure is not correct then you will have to change the spring and lever until it does appear to be correct.





OK – now the valve is correctly adjusted. What other faults could exist? The master diaphragm – maybe?! It is most likely so that far too many master diaphragms are changed for no good reason. There are strong forces at work on the diaphragm. One should really be able to feel that it has become stiff before it is definitely time to change it. Check the gasket (that is lying closest to the carburettor casing on this side of the carburettor).

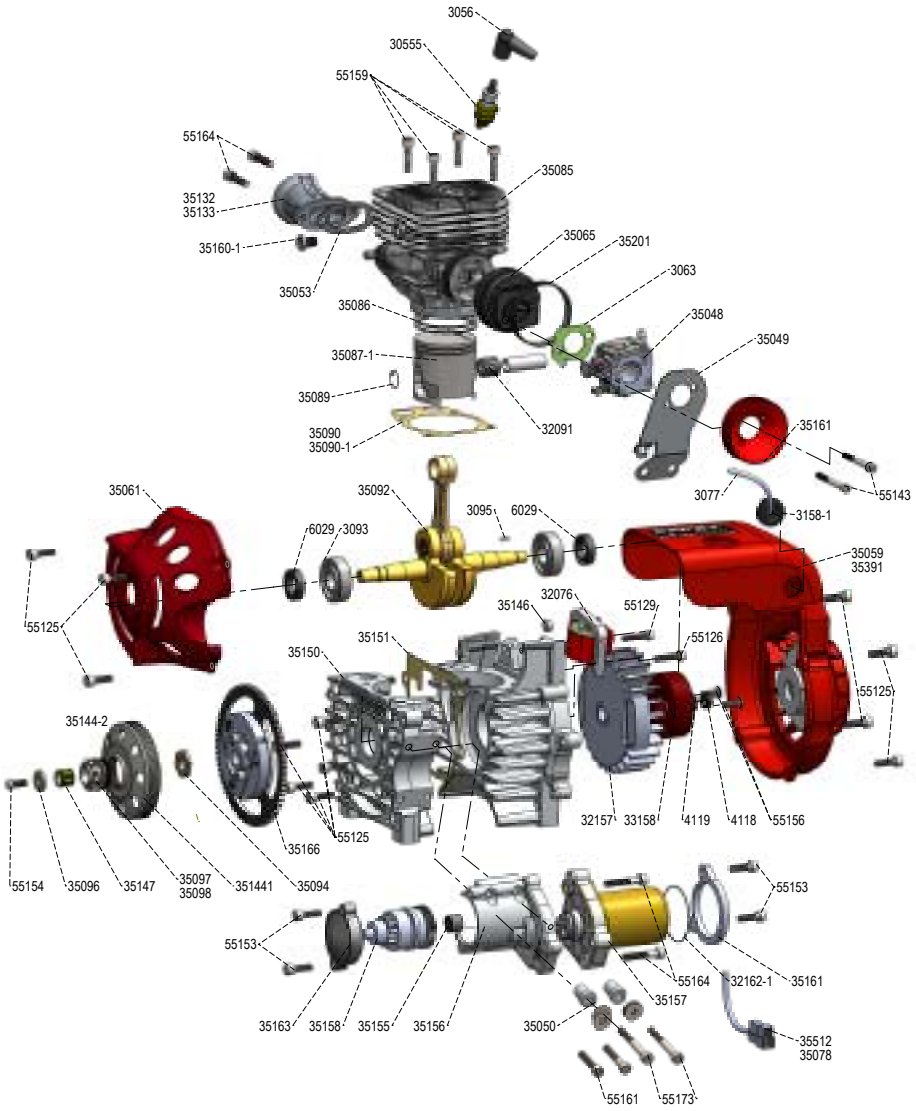
Assuming that you have cleaned the carburettor properly and that the High Speed and Low Speed screws are not damaged, then there is really not too much more that can be wrong.

The only thing that remains now is to check if the engine is difficult to start and if it refuses to react when the setting of the L-needle is changed. In that case there could be dirt under the expansion cap that is located beneath the master diaphragm. The fuel from the Low Speed needle passes through a small chamber on its way out to the venturi and on very rare occasions this chamber can become clogged. In such a case one should bore a 2 mm hole in the middle of the cap (nr 20) and then pry it away using a sharp object that one can stick into the hole. Thereafter you should carefully check all of the channels running to and from the chamber and seal those with a new expansion cap that you must carefully put in place using a mandrel 8 mm. Now there should not be any more faults with your carburettor.

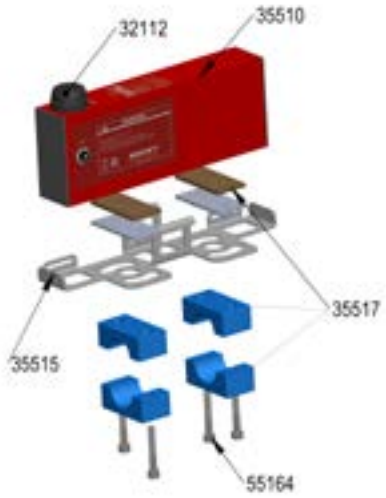
Normally these diaphragm carburettors are extremely reliable. They are developed for use with chainsaws and snowmobiles. On very rare occasions one may come across a carburettor that does not provide satisfactory performance. In that case you should borrow an identical one if possible. If you notice a large difference in the performance of the carburettor you have borrowed compared with your own then you should change your carburettor. It is more or less a practical impossibility to alter the fuel channels in a carburettor on one's own.

### 4. Starter equipment

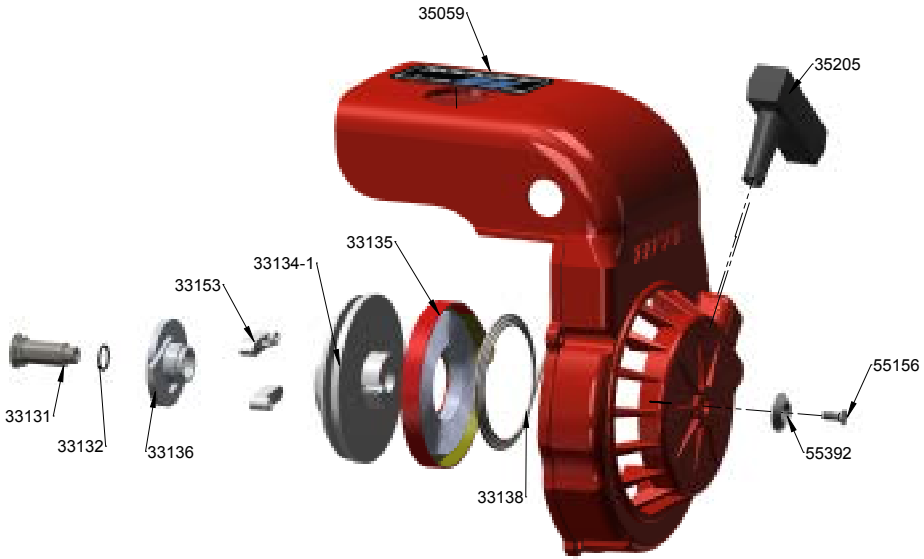
On engines that are equipped with a manual coil starter (or Magnapull starter), the coil or the return spring may need to be changed. The basic rule regarding an eventual change is that the return spring may never be drawn to such an extent that it causes a stoppage for the coil when it is fully drawn. A small amount of "give" should always exist in the spring when the coil is fully drawn.




30550 Sparkplug NKG BPM 7A
3056 Sparkplug cap
3093 Mainbearing 6203 TN9 C3
3095 Key
32076 Ignitioncoil 95, 120 Selettra
32157 Flywheel 95, 120 ES
35162 Support for starter engine
32162-1 Support for starter engine
33158 Flywheel hub 95, 120 ES
35048 Carburettor Tillotson HS-319A
35049 Throttle cable support
35053 Exhaustgasket
35059 Engine cover
35061 Sprocket cover
35065 Inletflange in rubber
35086 Piston ring
35087 Piston R 95
35090 Cylinder gasket 0,15
35090-1 Cylinder gasket 0,25
35091 Needlebearing
35092 Crankshaft complete
35096 Washer clutchdrum
35132 Exhaust flange R 95.
35144 Clutch drum
35147 Needlebearing for clutch 95
35150 Crankcase
35151 Crankcase gasket
35154 Cover for starter support
35155 Neeedlebearing bendix
35156 Support for start engine
35158 Bendix for startengine
35159 Startergear with clutch complete
35160 Plug for sensor
35161 Carburettor flange
4118 Flywheel nut 60, 95, 120
55153 Screw 6x20 10 pc
55154 Screw 6x14 10 pc
55159 Screw 6x25 10 pc
55161 Screw 6x30 10 pc
55164 Screw 6x35 10 pc
6029 Oilsealing sprocket side Teflon




32112 Startbutton for R 95, 120
35510 Batteri/start box complete Raket
35515 Batterysupport complete
35517 Clamp for battery support R 95
55164 Screw 6 X 35



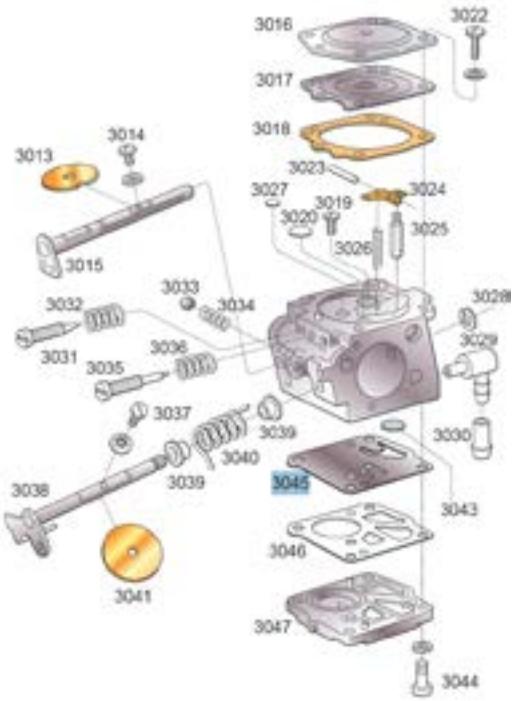

| | | |
|---|---|---|
| 35059 | Aircoat | ..... |
| 33134 | String disc 07- | ..... |
| 33153 | Start boss | ..... |
| 33131 | Axle for stringdisc 07- | ..... |
| 35205 | Starthandle | ..... |
| 33138 | Start string | ..... |
| 33136 | Frictionring Aluminium | ..... |
| 33132 | O-Ring för string disc axlee | ..... |
| 55156 | Screw countersunk 6x20 | ..... |
| 55392 | Countersunk aluminium washer 6X20 | ..... |





## Tillotson HS-319A

| | | |
|---|---|---|
| 3013 | Plate | ..... |
| 3014 | Screw | ..... |
| 3015 | Choke axle | ..... |
| 3016 | Cap | ..... |
| 3017 | Main diaphragm | ..... |
| 3018 | Gasket | ..... |
| 3019 | Screw | ..... |
| 3020 | Expansion cap | ..... |
| 3022 | Screw | ..... |
| 3023 | Axle | ..... |
| 3024 | Lever | ..... |
| 3025 | Valve | ..... |
| 3026 | Spring | ..... |
| 3027 | Expansion cap | ..... |
| 3028 | Circlip | ..... |
| 3029 | Fuel elbow | ..... |
| 3030 | Tube fitting | ..... |
| 3031 | High speed mixture screw | ..... |
| 3032 | Spring | ..... |
| 3033 | Ball | ..... |
| 3034 | Spring | ..... |
| 3035 | Low speed mixture screw | ..... |
| 3036 | Spring | ..... |
| 3037 | Screw | ..... |
| 3038 | Screw | ..... |
| 3039 | Bushing | ..... |
| 3040 | Spring | ..... |
| 3041 | Control plate | ..... |
| 3042 | Filter small | ..... |
| 3043 | Filter | ..... |
| 3044 | Screw | ..... |
| 3045 | Diaphragm Std | ..... |
| 3045-1 | Diaphragm plastic | ..... |
| 3045-2 | Diaphragm Teflon | ..... |
| 3046 | Gasket | ..... |
| 3047 | Pump cover | ..... |



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