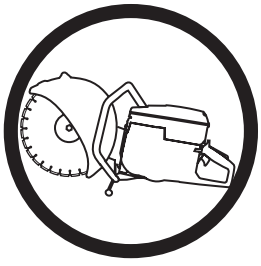
Husqvarna

Workshop manual

K 3600 Mk II, K 2500



HUSQVARNA CONSTRUCTION PRODUCTS

HUSQVARNA K3600 MkII K2500

CONTENTS

Workshop Manual

The Workshop Manual covers virtually all workshop procedures concerning the Husqvarna K3600 MkII and K2500. Some very simple and self-evident repair procedures have been omitted.

Outline

The Workshop Manual begins by addressing servicing and repair procedures for the K3600 MkII and K2500, in individual sections. These sections address all repair procedures except those relating to the hydraulic motor itself.

Both machines have identically designed hydraulic motors; only a few components separate the two models. Because of this similarity, servicing and repair procedures for the hydraulic motor are covered in a single chapter for the K3600 MkII and K2500, located at the end of the manual.

It is essential to know how pressure and flow work together in order to be able to understand how hydraulics work and, more importantly, to understand problems when things don't work. Because of this, we decided to start the manual with a section dedicated to the way in which hydraulics work, written specifically for those with little or no experience of hydraulics.

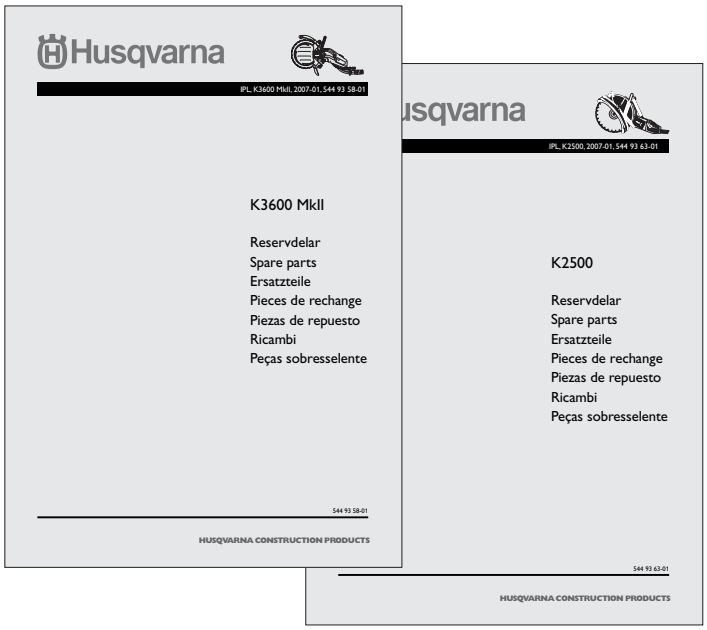
Layout – pictures and text

In addition to the diagrams and illustrations, there are generally two columns of text. The left-hand text column is concise and is suitable for experienced mechanics, whilst the right-hand column gives a more detailed description and is targeted at mechanics with less experience of power cutter repair work.

Contents

The manual is divided into numbered chapters together with chapter headings that are stated in bold at the top of each page.

The contents list also shows page references to the start of each chapter.



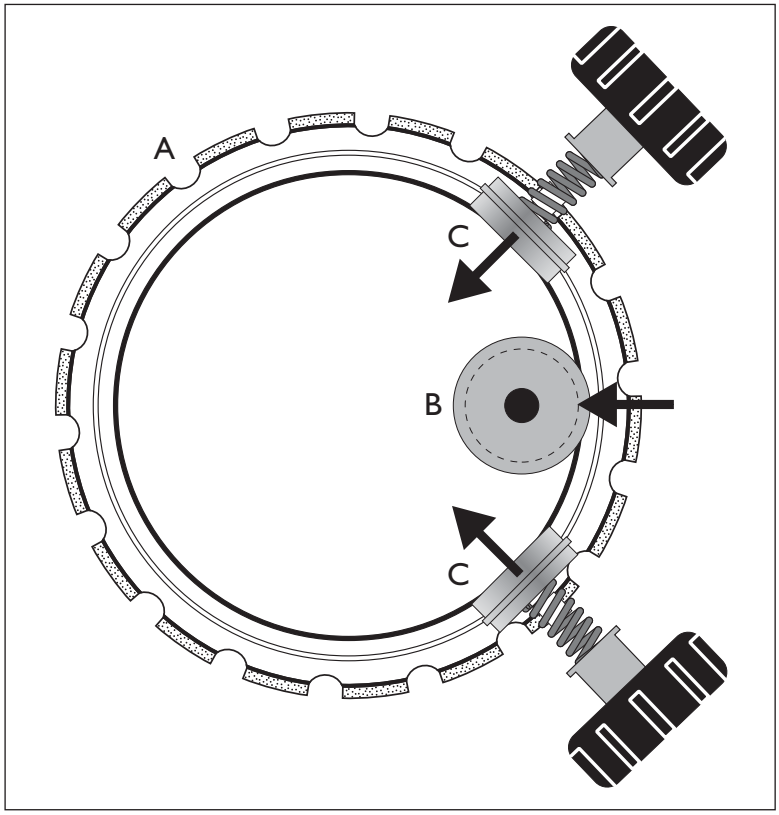
Spare parts

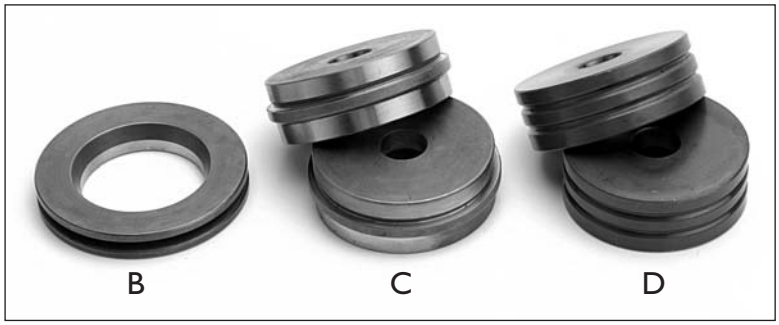
K3600 MkII and K2500

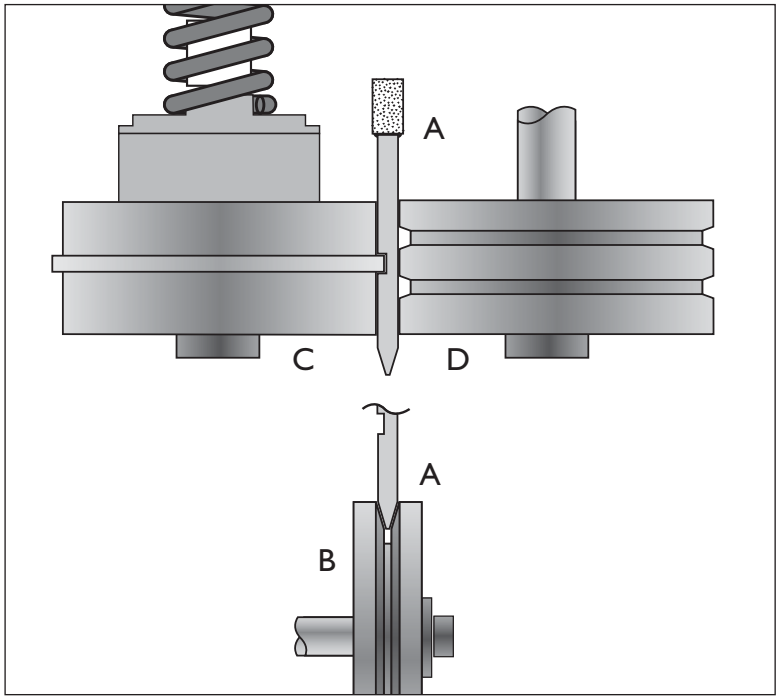
The folders cover all spare parts available for the power cutters.

The folders contain complete exploded views of the entire machine that allow each component's location, spare part number and appearance to be easily identified.

HUSQVARNA K3600 MkII







The blade's drive and control systems

Eccentric drive

The unique concept behind the K3600 MkII is its eccentric drive (outside the centre) and control of the cutter blade (A).

Function

The drive disc (B) which is powered by a belt driven off the engine, has a groove into which the blade slots.

The two engagement rollers (C) exert pressure against the blade (from the engagement roller springs, when the knob is tightened), causing the blade to press against the drive disc. The lower picture shows how the engagement roller flanges grip in the cutter blade's groove. The only function of the support roller (D) is to exert counter-pressure so that the blade is located properly against the rollers without any play or clearance.

With this design, the cutter blade can be controlled in both the radial and axial directions (rotating and lateral movements). Three points (at the two engagement and support rollers and at the drive disc) guide the blade at the same time as the pressure against the drive disc generates sufficient friction to drive the blade.

Important for good function

The description of the function indicates that it is particularly important that the engagement rollers can move axially without interference from the spring force (the direction of the arrows), so as to provide the correct pressure against the drive disc. Corrosion or dirt that blocks movement will cause the blade to slip against the drive disc. A properly greased bearing housing will reduce the risk of operational disruption.

There must be zero clearance in the adjustment of the engagement and support rollers against the sides of the blade. The adjustment is to be changed when the blade is replaced and must be checked at least once during the life of the blade. Because the adjustment is mechanically locked, there is no movement once the locknuts have been set and tightened.

Wear

In comparison with a traditional centre-driven machine, the blade's drive and engagement systems are subjected to harder wear since the mechanical parts work constantly in an environment of water and slurry.

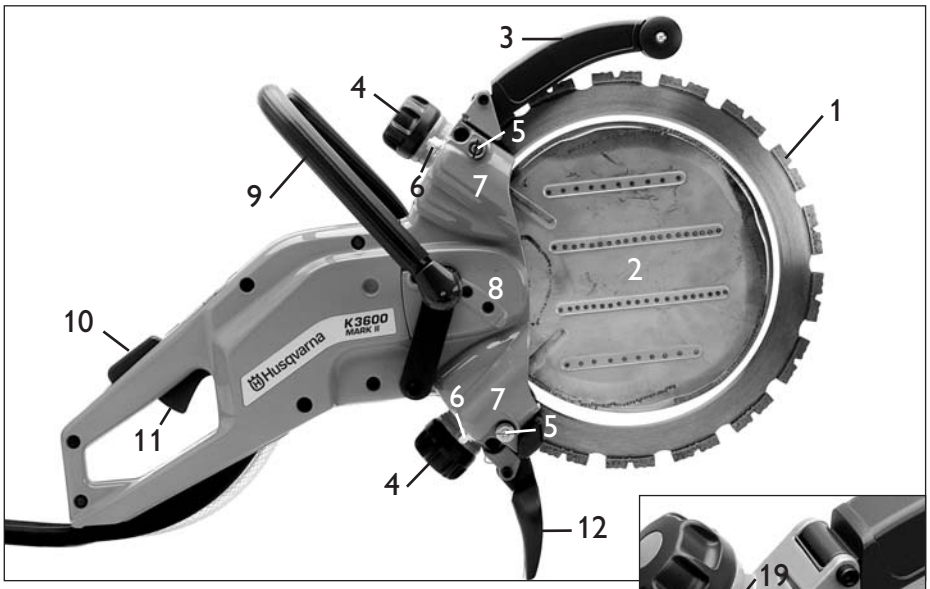
Parts subject to wear

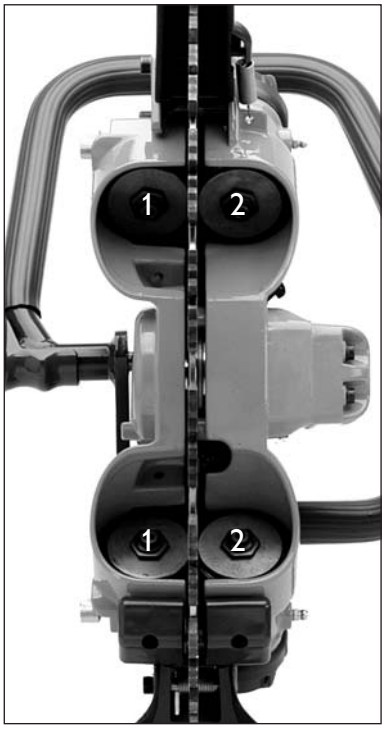
The wear-prone parts are the drive disc, engagement rollers and support rollers (B, C and D in the figure). These parts can be quickly and easily replaced and this job is normally carried out by the user.

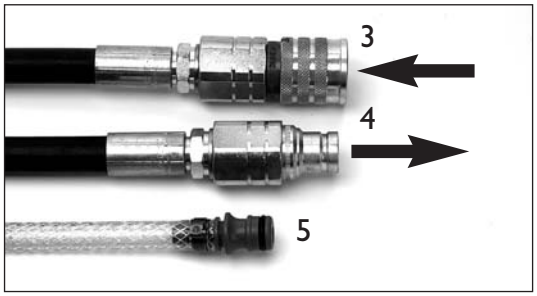
IMPORTANT

In all control and adjustment work on the engagement and support rollers, the knobs that tensions the blade against the drive disc must be unscrewed to its end position.

NB: The knobs must not be fully screwed to the end position as this restricts engagement roller rotation.







Hydraulic pressure, max	150 bar 2200 psi
Hydraulic flow, min–max	35–42 l/min 9–11 US gpm
Hydraulic oil	ISO VG 46

Components

1. Cutting blade – ring shaped cutting blade with diamond segment
2. Water disc
3. Blade guard
4. Knobs for tensioning the blade against the drive disc
5. Adjuster screws for support roller adjustment against blade
6. Locknuts for roller adjuster
7. Support rollers (behind guard)

8 Drive disc (behind guard)

9. Adjustable handle
10. Throttle trigger lockout
11. Throttle trigger
12. Splash guard
13. Engagement rollers (behind guard)
14. Lubrication nipples
15. Hydraulic motor
16. Lock to prevent rotation of the drive disc
17. Water adjustment valve
18. Type plate
19. Lubrication channel outlet

1. Support rollers
2. Engagement rollers
3. Pressure hose
4. Return hose
5. Water hose

NB
The position of the engagement and support rollers on the Husqvarna K950 Ring is reversed on the K3600 MkII.

The direction of blade rotation in relation to the machine is the same for both models (pulling blade), but the rotation of the cutting blade is reversed.

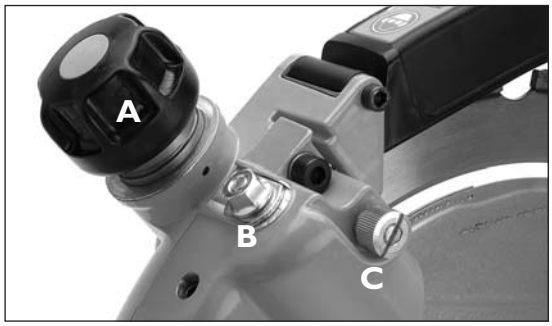
Therefore, the same cutting blade should not be used on both machines as this will result in the blade suffering increased wear.

Removal

Move the handle to the backward position.

Removal

Pull out the handle lock and move the handle to the rearmost position to secure the best possible accessibility.



Unscrew the knobs (A).

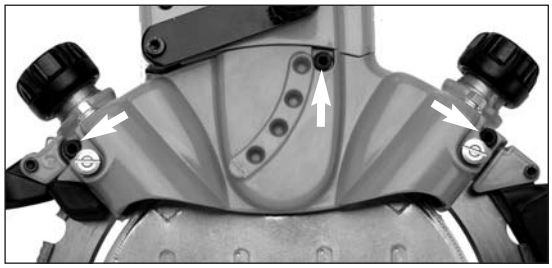
Undo the locknuts (B).

Unscrew the adjuster screws (C) at least two turns.

First unscrew both knobs (A); this ensures that the blade exerts no pressure against the drive disc.

Undo both locknuts (B) to the support rollers.

Unscrew the adjuster screws (C) at least two turns.



Remove the guard
Undo the three socket head cap screws.

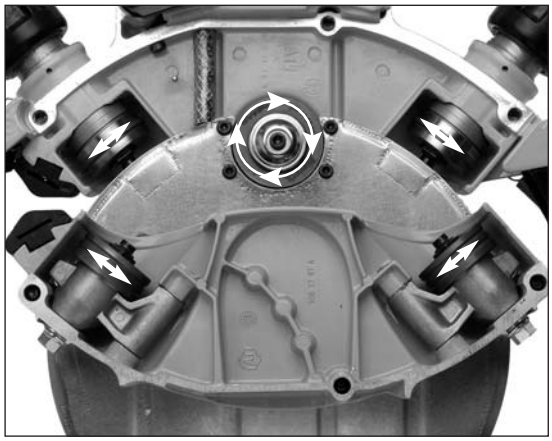
Lift off the guard.

Remove the blade.

Remove the support roller guard
The support roller guard is fixed in position by three socket head cap screws. Undo these.

Lift off the guard.

Remove the blade.



Quick inspection

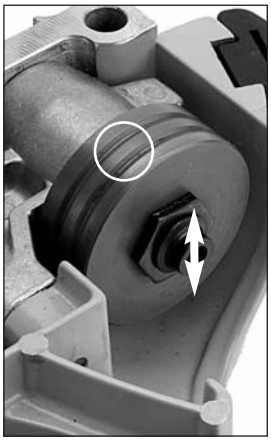
Roller bearings
Check that the engagement and support rollers rotate easily. For details of how to replace bearings, refer to Chapter 8.

Hydraulic motor
Rotate the drive disc a few turns by hand.

Quick inspection

Roller bearings
When replacing the blade, it is appropriate and easy to perform a quick inspection of the condition of the engagement and support rollers. Feel that the rollers rotate evenly and easily. Any bearing damage must be corrected; refer to Chapter 8.

Hydraulic motor
Rotate the drive disc a few turns by hand. There must be even resistance.



Flange and waist
Check roller flanges and grooves. Replace if necessary. Refer to Chapters 6 and 7.

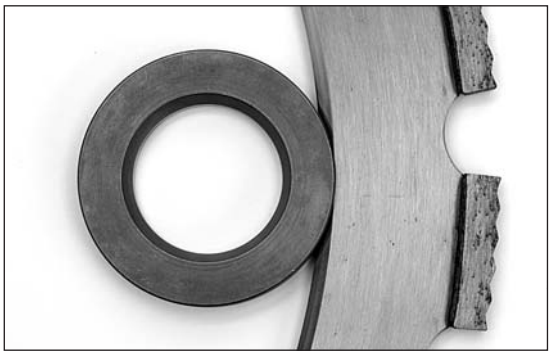
Bearing bracket – mobility
Check the mobility of the engagement and support rollers' bearing brackets.

Flange and waist
Also check that the engagement roller flange and the support roller groove (circled) is within permitted tolerances; refer to Chapter 6.

If necessary, replace engagement and support rollers in accordance with Chapter 7.

Bearing bracket – mobility
Mobility of engagement roller bearing brackets is checked by turning the knobs between end positions.

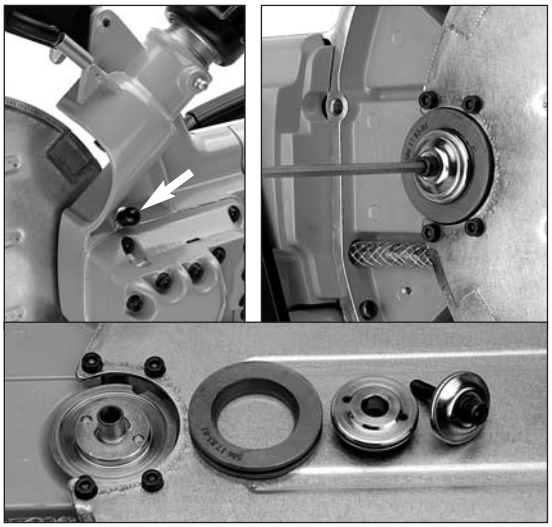
It must be possible to move support roller bearing brackets between end positions by hand.



Replacement of drive disc

Blade and drive disc replaced at the same time
A new blade must be installed along with a new drive disc. If replacing with a used blade, the drive disc associated with that blade must also be installed.

A used blade can be used with a new drive disc, never vice versa.



Remove the drive disc
Push in the rotation lock.

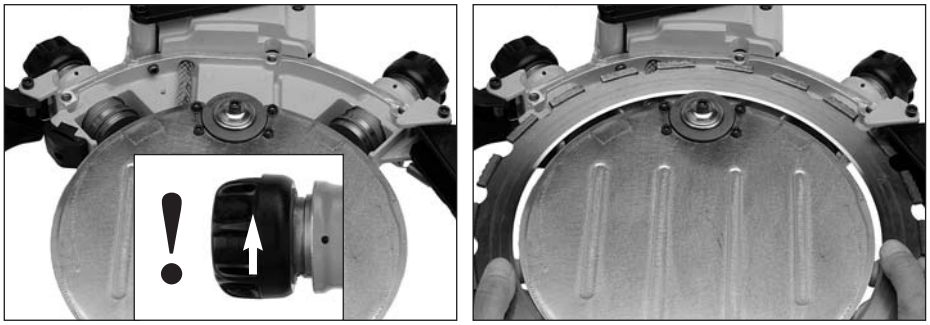
Remove the drive disc.

Install a new drive disc

Remove the drive disc
Press in the drive disc rotation lock on the opposite side above the hydraulic motor.

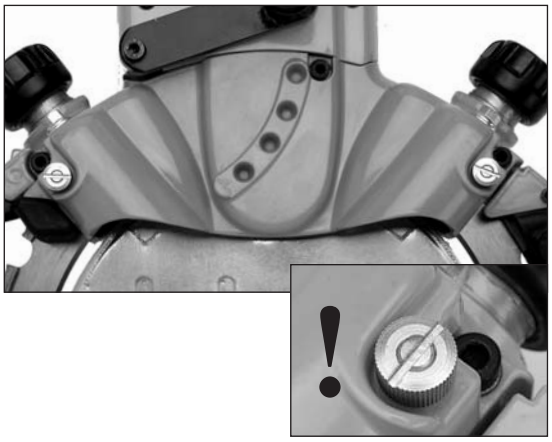
Remove the centre screw and lift off the washer and drive disc.

Install a new drive disc
Fit the new drive disc and the tappet. Fit the centre screw, press in the rotation lock and tighten the centre screw firmly.



Fit the blade
The knobs must be screwed out!

Fit the cutting blade in the drive disc and then in both engagement rollers. Fix the blade in position by turning both knobs one turn.



Fit the guard
Fit the guard and tighten the screws lightly. Screw the knobs back out.

Check the position of the adjuster screws
Check that the adjuster screws are sufficiently screwed out to create clearance between the blade and the rollers.

Firmly screw the guard in position

Adjust roller contact

Adjust in accordance with Chapter 5.

Fit the guard
Fit the guard and tighten the screws lightly. Screw the knobs back out.

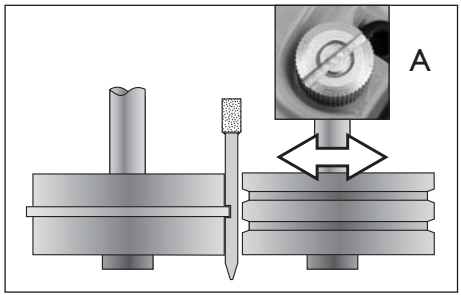
Check the position of the adjuster screws
Check that the adjuster screws are sufficiently screwed out to create clearance between the blade and the rollers as follows: Rotate the blade by hand. The rollers must now not rotate or be easy to slow down. Otherwise, unscrew the adjuster screws.

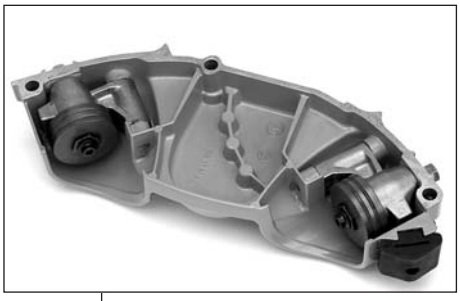
Tighten the guard
Screw the guard firmly in position.

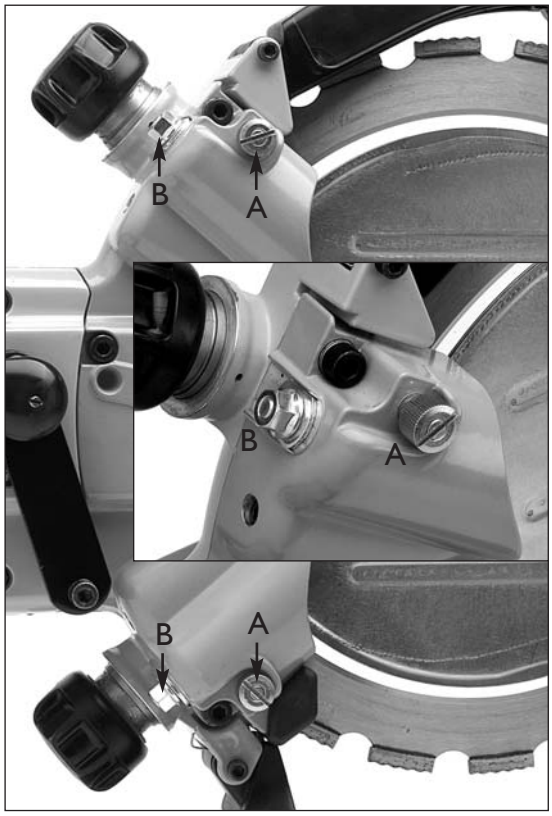
Adjust roller contact
Before the machine can be used, the rollers must be adjusted as set out in Chapter 5.

The rollers must always be adjusted following:
– changeover to a new blade
– changeover to another used blade
– replacement of guide or support roller
Always check the adjustment whenever the support roller guard has been removed and refitted.

IMPORTANT: When adjusting the rollers, the knobs must be screwed out – but not out fully to its end position as this will stop the engagement roller rotation.







Adjustment

Important – knobs screwed out
The knobs must be screwed out. Undo the locknuts (B).

Rough adjustment
Rotate the blade by hand and screw in the adjuster screws (A) until the rollers rotate.

Fine adjustment
Fine adjust until you reach a position where you can easily stop the rotation of the support rollers with your thumb (lower picture).

Tighten the locknuts – final inspection
Tighten the locknuts firmly and perform a final inspection of the adjustment.

Screw in the knobs

Inspection

At least once during the life of the blade
The inspection is conducted in the same way described above.

Correct adjustment
It is very important that the rollers are correctly adjusted in order to ensure machine function and to minimise wear.

To be correctly adjusted, the rollers must be set to the blade with no clearance.

Excessive contact increases roller wear and results in deformation on the blade that will, in a worst case scenario, lead to the blade breaking.

Insufficient contact will result in the blade being unstable. In extreme cases, this may lead to the blade leaving its track.

Function
The support rollers are fitted on levers in the support roller guard. The position of the lever is determined by the adjuster screws (A). The locknuts (B) lock the lever in position.

Adjustment

Important – knobs screwed out
Roller adjustment must always be performed with the knobs screwed out. Undo the locknuts (B).

The best way to inspect the adjustment is to tighten the locknuts slightly before starting the adjustment process.

Rough adjustment
Rotate the blade by hand and screw in the adjuster screws (A) until the rollers rotate.

Fine adjustment
Fine adjust until you reach a position where you can easily stop the rotation of the support rollers with your thumb (lower picture).

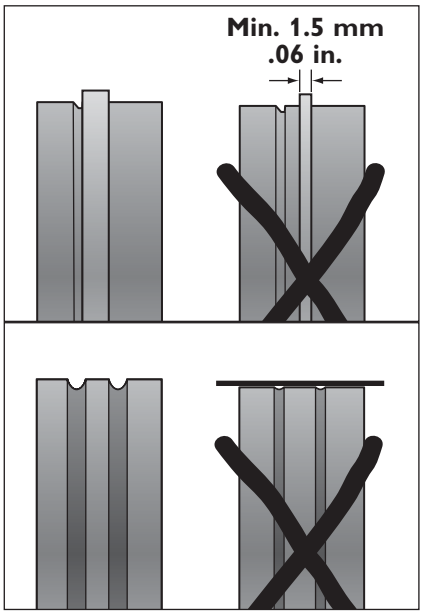
Tighten the locknuts – final inspection
Tighten the locknuts (B) firmly and perform a final inspection of the adjustment.

Screw in the knobs
Finish by screwing in the knobs to tension the blade against the drive disc.

Inspection

At least once during the life of the blade
The inspection is conducted in the same way described above.

Remember – the knobs must be unscrewed during the inspection!



Replaceable wear parts

The engagement and support rollers, as well as the drive disc, are exposed to extreme wear due to the dirty conditions in which they operate. As a result, wear parts have been made easy to replace. The lifespan of a set of engagement and support rollers can vary considerably depending on the material cut and the cutting technique employed. Using insufficient water during cutting increases wear. A set usually rolls approximately 2–6 blades.

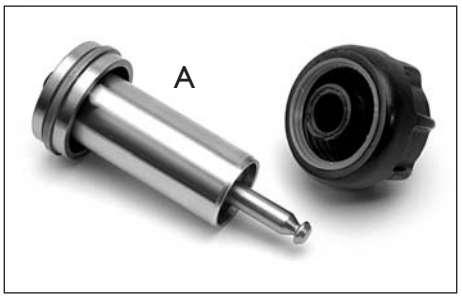
Same roller type replaced in pairs
In order for the blade to sit straight in the drive disc, the same roller type must be replaced in pairs.

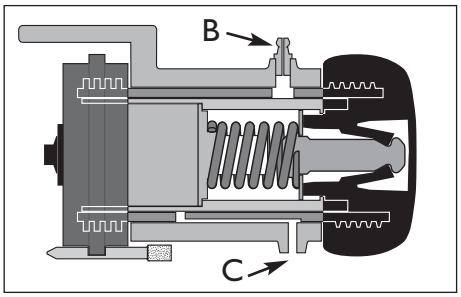
Upper and lower rollers may be swapped
It is common for the flange of the upper engagement roller to experience more wear due to the additional load exerted on it by the feed pressure. You can swap the upper and lower engagement rollers in order to get the full operational life out of both rollers.

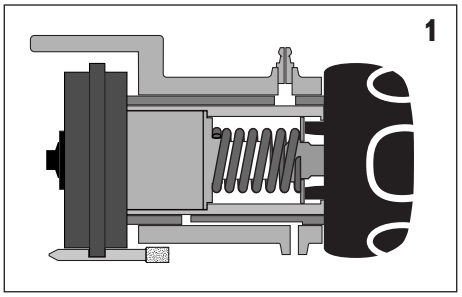
Wear limit

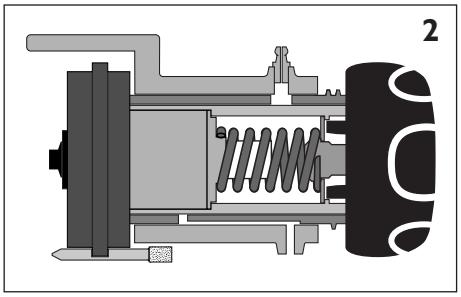
Engagement rollers
The engagement rollers must have a flange width of at least 1.5 mm/.06 in.

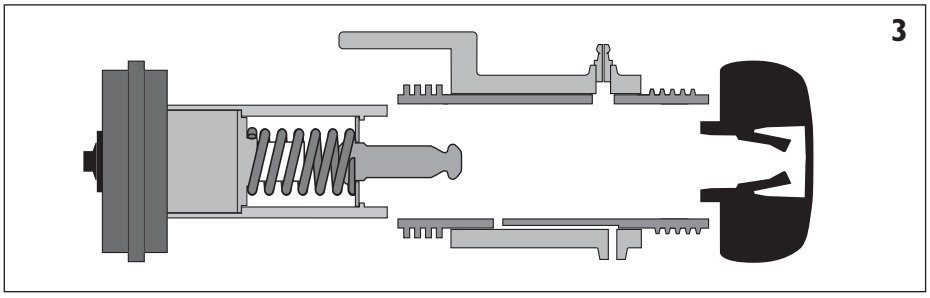
Support rollers
The support rollers must be replaced if they have no grooves.











Engagement rollers

The engagement roller unit assembly (A) comprises bearing brackets, which hold double roller bearings, and the engagement roller itself, which is fitted on the shaft. The spring, which provides pressure to the drive disc, is pre-tensioned and fixed in the bearing bracket. The plastic cylinder in the centre of the spring limits movement of the bearing bracket when the cutting blade is exposed to extreme loads.

The bearing bracket moves in the machine's bearing housing. Lubrication is applied via the grease nipple (B) and lubrication channels in the bearing housing carry grease to the outlet channel (C), which indicates when clean grease comes out.

NB: The bearing housing must be lubricated with the blade fitted and the knobs in operational position!

Knobs

Operational position (1)
The knobs must always be fully screwed in when the machine is put in operation.

Service position (2)
The knobs must be screwed out when changing the blade and adjusting the rollers.

Disassembled knob (3)
Screwing the knob past the service position releases the snap-on fastener from the cam, allowing the bearing bracket to be pressed out.

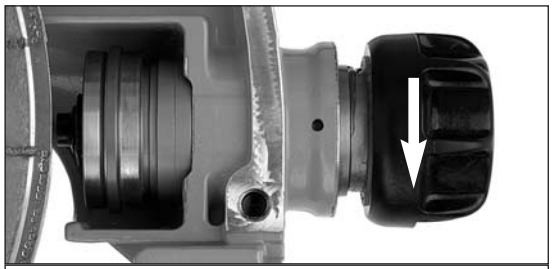
IMPORTANT!
Worn engagement and support rollers have a smaller diameter than new rollers. Unscrew the adjuster screws two turns if only one type of roller is to be replaced, and four turns if all rollers are to be replaced before the guard is fitted.

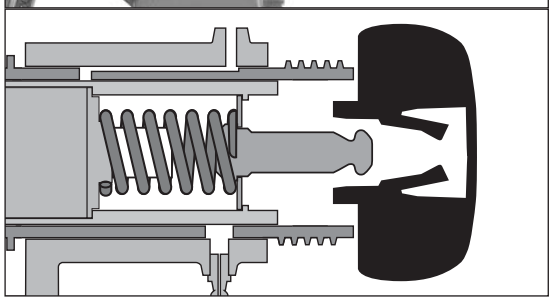
Grease – characteristics
The grease used in the service procedures set out below must be stiff and afford good resistance to water penetration.

The original grease used during assembly in the factory is Shell Alvania RL3 (lithium grease), where the figure '3' indicates the NLGI grade of the grease.

If you opt to use a different brand, the grease used must be of the same NLGI grade.

(The NLGI grade indicates the stiffness of the grease. The higher the NLGI grade, the stiffer the grease.)





Engagement rollers

Remove the support roller guard and the blade.

Unscrew the knob.

Engagement rollers

Remove the support roller guard and the blade.

When replacing the engagement roller, the bearing bracket assembly must be removed for inspection and service.

Force the knob from the snap-on fastener by screwing the knob past the end stop. Unscrew the knob.

Inspection, cleaning
Pull or press out the bearing bracket.

Inspection, cleaning
Pull or press out the bearing bracket.

If the bearing bracket is defective (wear/corrosion damage), the simplest thing to do is to replace the entire bearing bracket assembly with bearings.

Replace the bearings as described in Chapter 8.

Clean the bearing housing.

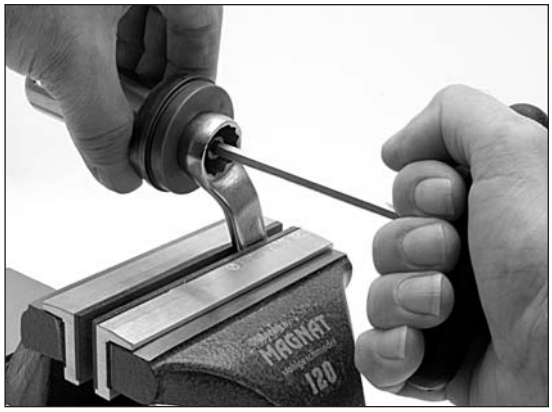
Wipe the bearing bracket and check that it is not damaged.

Inspect the engagement roller bearings.

Clean all traces of old grease from the bearing housing.

Wipe the bearing bracket and check that it is not damaged.

Check the integrity of the engagement roller bearings.



Replace engagement rollers

Secure the tool in a vice
Lock the nut using the box spanner and unscrew the socket head cap screw.

Replace engagement rollers

Secure the tool in a vice
The simplest way of removing the wear part is to place a box spanner in a vice. Lock the nut using the spanner and unscrew the socket head cap screw.

Never put the roller in the vice!

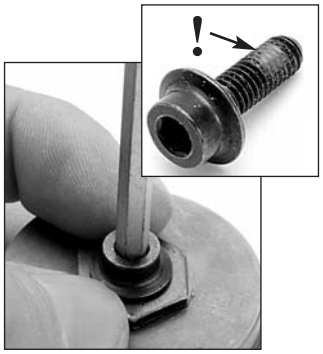
7 REPLACEMENT OF ENGAGEMENT AND SUPPORT ROLLERS

Remove the wear part
Lift off the engagement roller.

Clean and apply grease under the washer and on the engagement roller seat.

Remove the wear part
Once the socket head cap screw has been removed, the wear part can be lifted out.

Clean and apply grease under the washer and on the engagement roller seat. (The grease prevents penetration of concrete sludge.)



Fit the wear part
Fit a new socket head cap screw with thread lock.

Position the roller against the tool in the vice and tighten the socket head cap screw firmly.

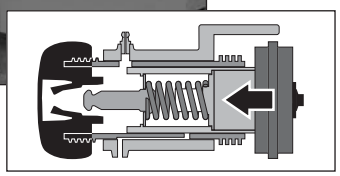
Fit the wear part
Put the new engagement roller in position, thread on the lock nut and fit a new socket head cap screw with thread lock. Press the lock nut down towards the roller so that it locks the shaft and tighten the screw to the nut.

Position the roller against the tool in the vice and tighten the socket head cap screw firmly.

Fit the bearing brackets
Grease the threads for the knobs and fit.

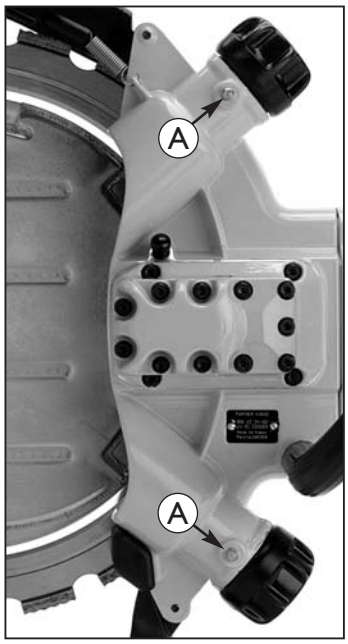
Fit the bearing brackets
Grease the knob threads.

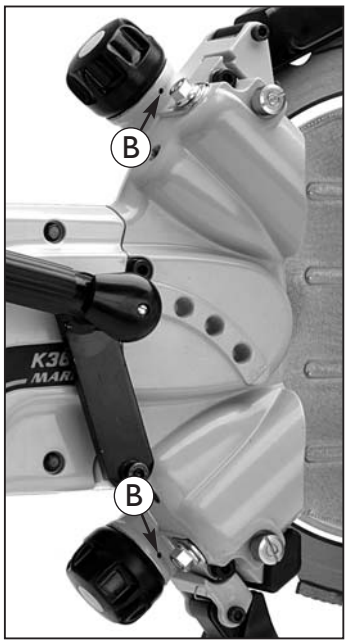
Fit the knobs and screw in until approximately 10 mm remains.



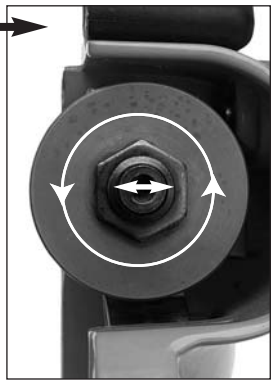
Insert the bearing brackets in the knob snap lock.
Fit the blade and adjust the rollers.

Insert the bearing brackets in the knob snap lock.
Then unscrew the knobs to the service position. Fit the blade and adjust the rollers as described in Chapters 4 and 5.





Grease the bearing housing
The cutting blade must be fitted and the knobs screwed in!
Put the grease gun against the nipples (A) and pump grease in until clean grease runs out through the outlet (B).



Support rollers

Inspection

Check the integrity of the support roller bearings. Check that the bearing arms can move and that they do not have excessive play.

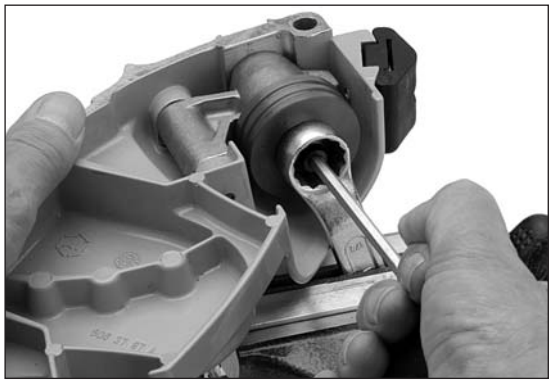
Support rollers

Inspection

Check the integrity of the support roller bearings – the rollers must be able to rotate freely, with even movement and zero play.

The support roller is fitted on an arm that changes position during roller adjustment. Check that the bearing arms can move and that they do not exhibit too much play in their mountings.

The simplest way of correcting a defective bearing arm is by replacing it with a new bearing arm assembly with pre-installed bearings. Replace defective bearings as described in Chapter 8.



Replace support rollers

Secure the tool in a vice

Lock the nut using the box spanner and unscrew the socket head cap screw.

Replace support rollers

Secure the tool in a vice

The simplest way of removing the wear part is to place a box spanner in a vice as shown in the picture.

Lock the nut using the spanner and unscrew the socket head cap screw.

Never put the roller in the vice!

Remove the wear part.

Once the socket head cap screw has been removed, the wear part can be pulled from the shaft.

Clean and grease

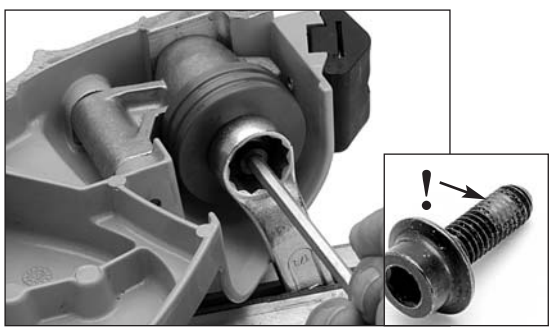
Clean the grooves in the sealing collar.

Clean and apply grease under the washer and on the support roller seat.

Clean and grease

Clean the grooves in the sealing collar. Use steel wire or twine. The grooves and the conical interior of the roller work to counteract the build-up of sludge in the centre.

Clean and apply grease under the washer and on the support roller seat.



Fit the wear part

Use a new socket head cap screw with thread lock during installation.

Tighten the socket head cap screw firmly.

Fit the wear part

Put the new support roller in position, thread on the lock nut and fit a new socket head cap screw with thread lock.

Position the roller against the tool in the vice and tighten the socket head cap screw firmly.

Tools

Tool 506 38 85-01
The bearing tool, with assembly punch and disassembly socket, is used to fit and remove engagement and support roller bearings.

The inner diameter of the twist grip is specifically adapted for the bearing bracket pin. The handle is used to remove and fit the pin.

Engagement rollers

Remove the pin
Use the handle as shown above.

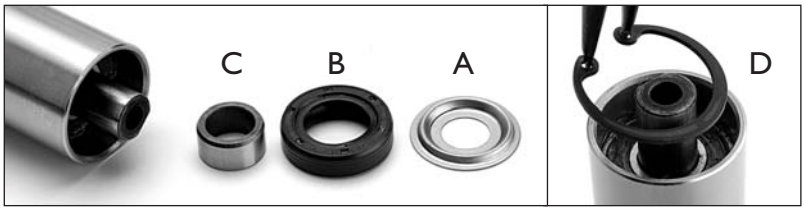
Press the pin down a little. Twist the handle and ease the pin out of the bearing socket.

Engagement rollers

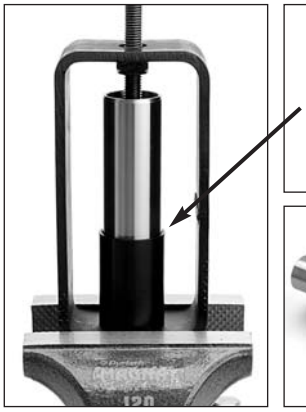
Remove the pin
Use the handle as shown above.

Press down the handle so that the spring below the pin is slightly compressed. Twist the handle so that one end of the pin washer can be moved past the interior flange of the bearing bracket.

Remove the pin and the spring below, together with the deflection limiter inside the spring.



Remove seals
Lift off the cap (A)
Push up the sealing ring (B) using an awl. (The sealing ring must be replaced.)
Remove the wear ring (C) from the shaft.
Remove the circlip (D).



Remove the bearing unit
Position the disassembly socket with the shoulder facing upwards.

Press the bearing unit out through the bearing bracket.

Remove the bearing unit
Secure the bearing tool in a vice.

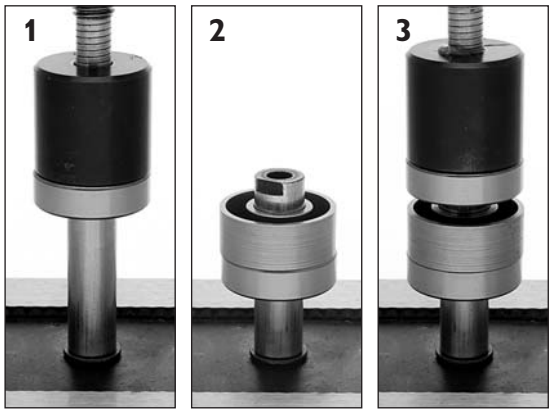
Position the disassembly socket on the bearing tool with the shoulder facing upwards and turn the bearing bracket with the protruding shaft downwards.

Press the bearing unit out through the bearing bracket.

Tap out the shaft
Use a plastic mallet and a punch.

Tap out the shaft
Tap out the shaft, first with a plastic mallet until it is level with the bearing and then using a punch.

NB: The screw in the shaft must not be removed. Later models use a flange instead of a screw.



Fit new bearings
1. Locate the shaft with the screw head in the hole on the bearing tool. Fit a roller bearing and position the assembly punch on the shaft. Press the bearing down until the punch touches the shaft.

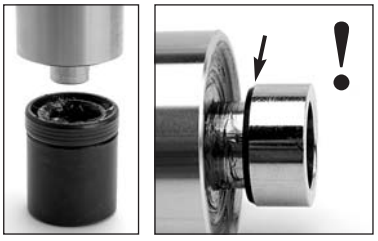
2. Fit the inner and outer spacer rings.

3. Fit the next roller bearing.

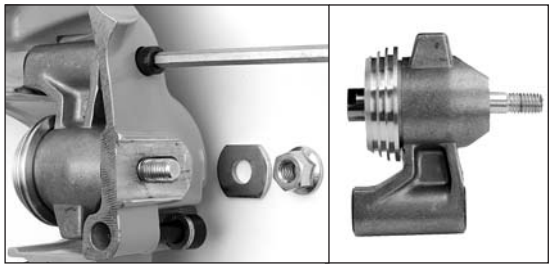
4. Press the entire bearing unit down so that it bottoms against the shaft screw.

5. Grease the sealing washer O-ring. Place the sealing washer on the assembly punch and run the bearing bracket over it. Press the sealing washer firmly in position in the bearing bracket by hand and remove the punch.

6. Turn the bearing bracket and place it in the bearing tool. Press in the bearing unit until it bottoms against the sealing washer.



7. Fit the circlip. Fill the inside of the new sealing ring with grease and fit using the assembly punch. Fit a wear ring (turn as shown in picture) and greased cap.
Fit the spring with deflection limiter and the pin for the snap lock.



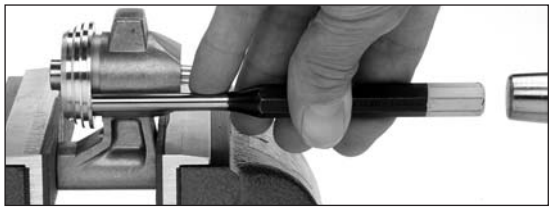
Support rollers

Remove the roller adjuster locknut and washer, as well as the bearing arm screw/shaft.

Support rollers

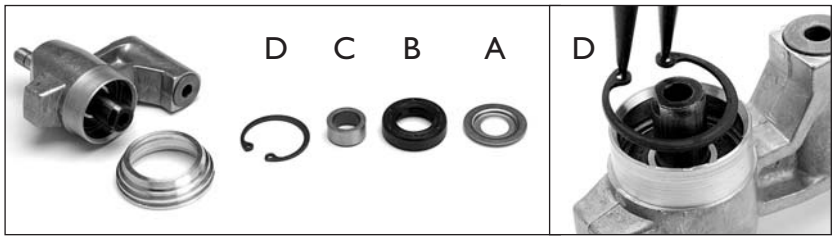
Remove the roller adjuster locknut and washer.

Remove the bearing arm screw/shaft and take out the bearing arm.



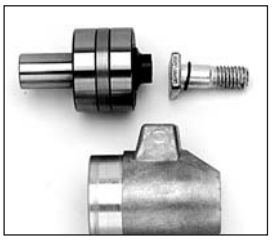
Sealing collar
Remove the sealing collar by carefully tapping round it.

Sealing collar
Remove the sealing collar by carefully tapping round it with a small hammer and a large pin punch.



Remove seals
Lift off the cap (A)
Push up the sealing ring (B) using an awl. (The sealing ring must be replaced.)
Remove the wear ring (C) from the shaft.
Remove the circlip (D).

8 REPLACEMENT OF ROLLER BEARINGS



Remove the bearing unit
Secure the bearing tool in a vice.

Position the disassembly socket with the shoulder facing upwards and turn the bearing arm so that the tool's screw meets the bearing arm screw.
Press the bearing unit out through the bearing arm.

Tap the shaft out of the bearing in the same way as shown on page 12.

Fit new bearings
1. Locate the shaft with the screw head in the hole on the bearing tool. Fit a roller bearing and position the assembly punch over it. Press the bearing down until the punch touches the shaft.

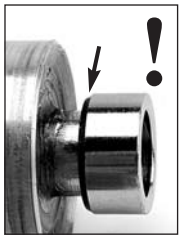
2. Fit the inner and outer spacer rings.

3. Fit the next roller bearing.

4. Press the entire bearing unit down so that it bottoms against the shaft screw.

5. Grease the O-ring on the screw and install in the bearing arm.

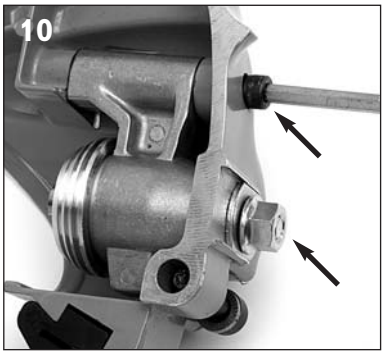
6. Turn the bearing arm with the screw through the hole in the tool. Press in the bearing unit until it bottoms in the bearing arm.



7. Fit the circlip. Fill the inside of the new sealing ring with grease and fit using the assembly punch. Fit the wear ring (turn as shown in picture).

8. Grease the cap and locate in position, noting how it must be turned!

9. The sealing collar is fitted using the bearing tool socket. Position the assembly punch on the shaft in order to centre the socket.
Fit a suitable shim on the socket and press on the sealing collar.

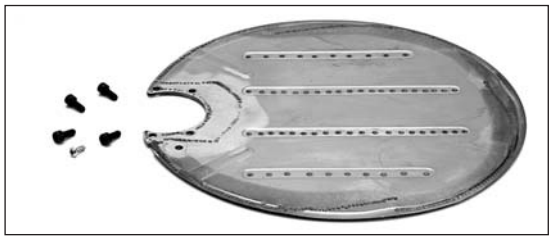


10. Install the bearing arm in the guard.

Removal

Tool

A special tool produced by Husqvarna is required in order to replace the bearing socket. Item no. 506 37 53-01.



Tip

Removing the water disc facilitates the procedure.

Remove the bearing socket

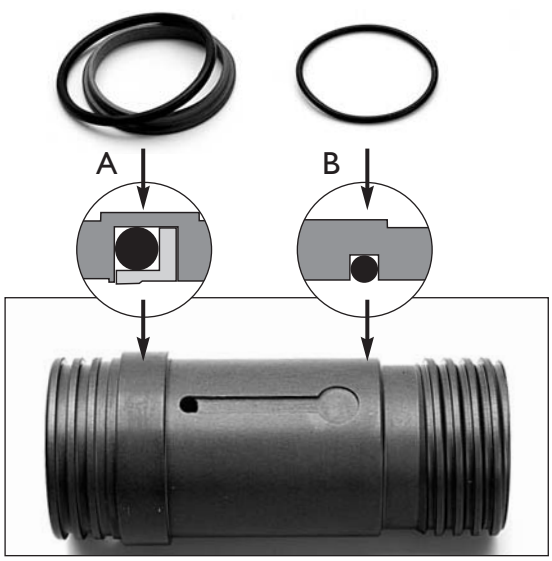
Removal is a two step process:

Step 1

Fit the puller as shown in the picture and press out the bearing socket about one centimetre/0.5 inch.

Step 2

Add the spacer ring and press out the bearing socket.



Tip

Removing the water disc facilitates the procedure. Remove the 4 screws holding the water disc in place and the screw holding the water connection.

Remove the bearing socket

Removal is a two step process:

Step 1

Fit the puller as shown in the picture. Only one ring should be used in the first step. Press out the bearing socket about one centimetre/0.5 inch.

Step 2

Remove the tool and fit the spacer ring as shown in the picture.

Screw in the screw until the bearing socket is fully out.

Replaceable seals

Remove the seals using a sharp-pointed awl.

The stripper plate (A) comprises two components; an O-ring and a plastic ring. The O-ring is fitted first and positioned outermost (against the roller).

The plastic ring is first shaped around a round object (1) and then fitted in the bearing socket (2). Use pliers that do not damage the seal surface; circlip pliers are ideal. Shape the plastic ring in the bearing socket using a finger. Grease in the stripper plate and press in the bearing bracket. After a few minutes, pull out the bearing bracket and check that the stripper plate has shaped itself correctly.

The seal (B) is a simple O-ring that is fitted by hand without tools. Grease the O-ring.

9 REPLACEMENT OF ENGAGEMENT ROLLER BEARING SOCKET

Fitting

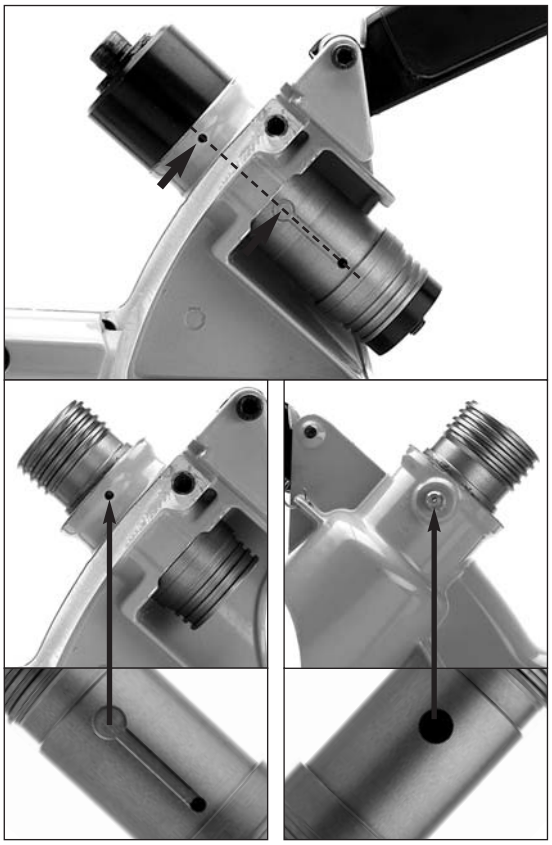
Grease the tool
When the bearing socket is screwed in there is a tendency for the socket to turn in the screwing direction.

You can minimise this by greasing the slide surfaces of the tool.

Fitting

Grease the tool
When the bearing socket is screwed in using the tool there is a tendency for the socket to turn in the screwing direction. (This problem is illustrated by the next picture.)

This tendency can be minimised by greasing the slide surfaces of the tool.



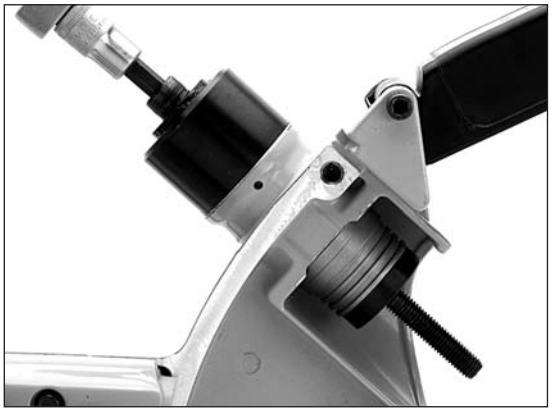
Line up the bearing socket
Fit the tool and lightly tighten the socket.

Turn the socket so that it correctly lines up:
- the outlet channel with the bearing socket distribution channel
- the lubrication nipple with the bearing socket hole.

Line up the bearing socket
When fitting the bearing socket one of the tool's sockets is used for pressing.

Fit the tool and lightly tighten the socket by hand.

Turn the socket so that it correctly lines up:
- the outlet channel with the bearing socket distribution channel
- the lubrication nipple with the bearing socket hole.

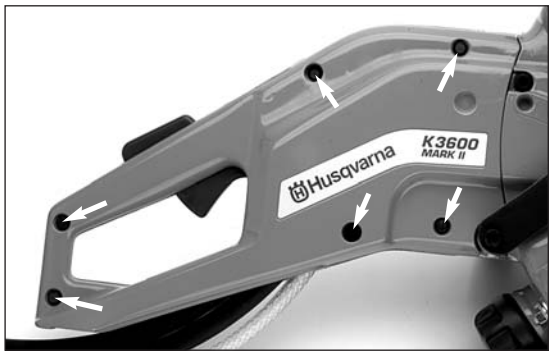


Press in the bearing socket

Press in the bearing socket
Press in the bearing socket until it bottoms in the chassis.

Check the fitting
Pump in a little grease at the lubrication nipple.

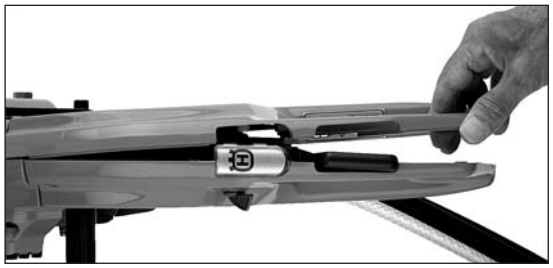
Check the fitting
A simple way of checking that the bearing socket is in the correct position in the chassis (i.e. that it has not rotated during fitting) is to pump a little grease at the lubrication nipple.

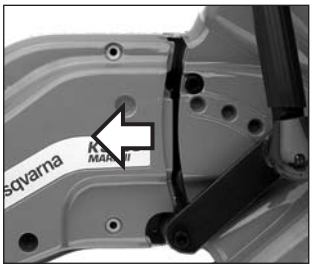


Remove the handle halve
Remove the screws.

Remove the handle halve
Move the handle to the forward position.

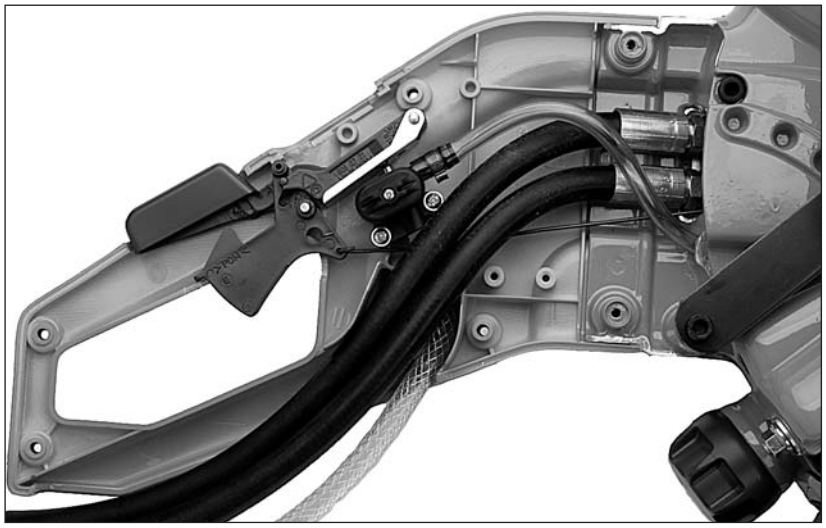
Remove the handle half screws.





First, separate the handle at the rear, by the controls, to release the control shafts from the handle half.

Then move the handle half back to release it from the front section of the machine.



Fitting components
The picture shows how the components in the handle half must be fitted.

Note that the start control link rod is located below the incoming water pipe.

Remove the controls
Fit a 5 mm Allen key, as shown in the picture, to hold the units together.

Remove the controls
The controls come in two parts that, when dismantled, are difficult to handle. In addition, there is also a spring on the underside.

The following arrangement facilitates removal and fitting of the controls: Fit a 5 mm Allen key, as shown in the picture, to hold the units together.

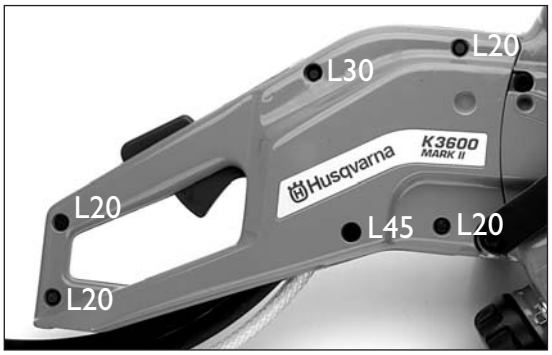
Remove the start control shaft with a pair of pliers.

Pull the start control link rod to operational position. Lift the controls out of the handle half and unhook the controls from the link rod.

Return spring
The picture shows a correctly fitted return spring.

Return spring
The return spring is fitted on the underside of the controls and usually comes loose when the controls is removed from the handle half.

The picture shows how the return spring should be fitted when the control unit is in position.

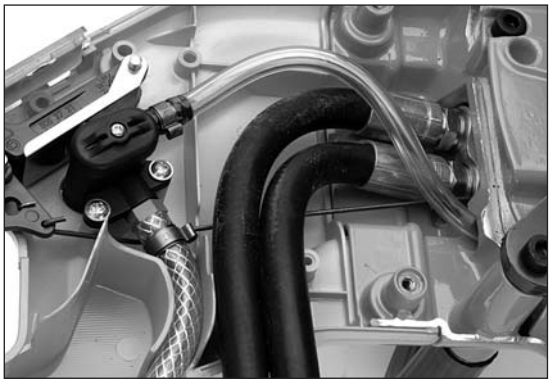


Fit the controls
Fit in reverse order to the removal procedure.

Note the screw lengths, in mm, as shown in the picture. Tightening torque 3 lbf·ft/4 Nm.

Fit the controls
The controls are fitted in reverse order to the removal procedure.

Note the screw lengths when the handle half is to be fitted. Screw lengths in mm as shown in the picture. Tightening torque 3 lbf·ft/4 Nm.



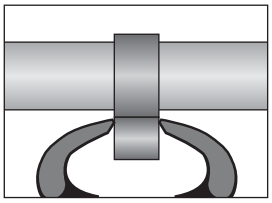
Water valve
The water valve is fitted in the handle half by two screws. After removal, the knob can be unscrewed and the valve cleaned.

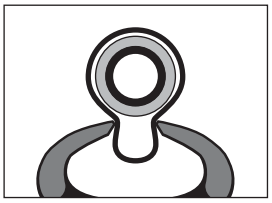
Note the water valve's hose routing. (Hydraulic hoses in the picture have been turned out of the way.)

Water valve
The water valve is fitted in the handle half by two screws. After removal, the knob can be unscrewed and the valve cleaned. The cover also has channels that can accrue dirt.

Note the water valve's hose routing. (Hydraulic hoses in the picture have been turned out of the way. Refer to the previous page to see their position in the handle half.)

Removal **Fitting**





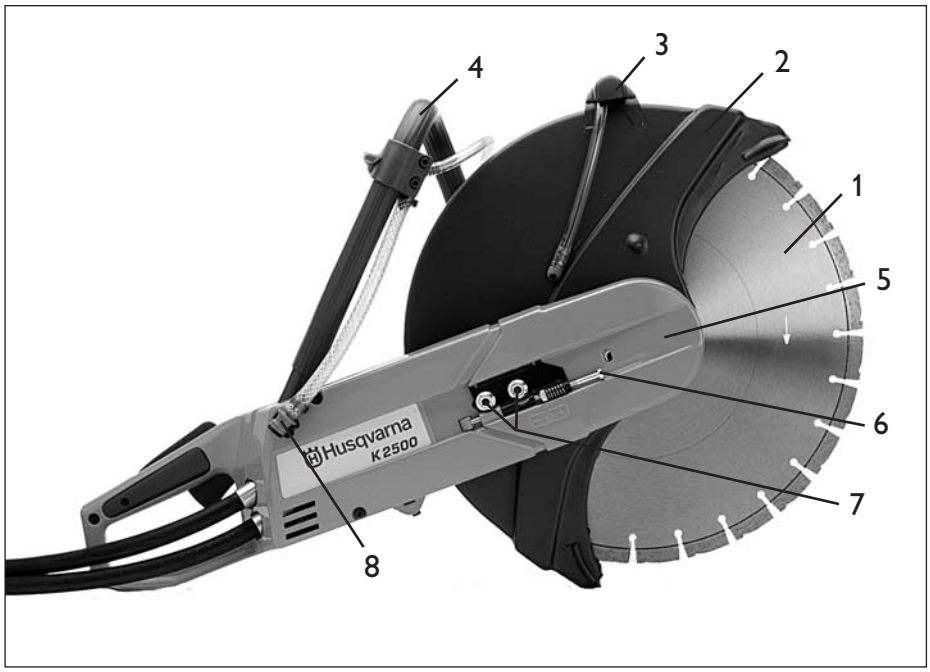
Hose clips
Use pliers to fit and remove clips as shown in the pictures.

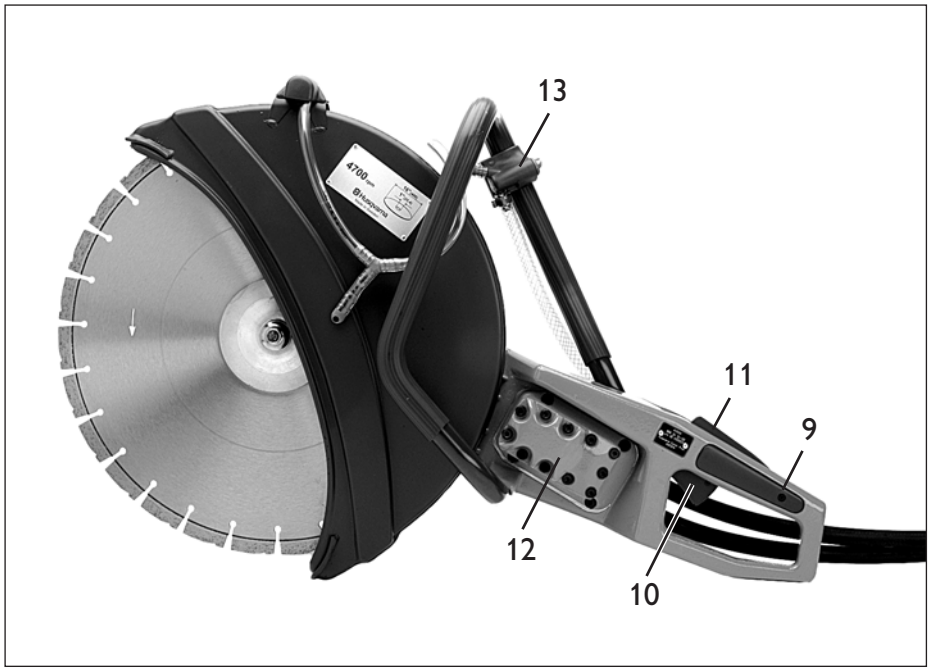
Hose clips
Remove the hose clips by cutting them with pliers as shown in the picture.

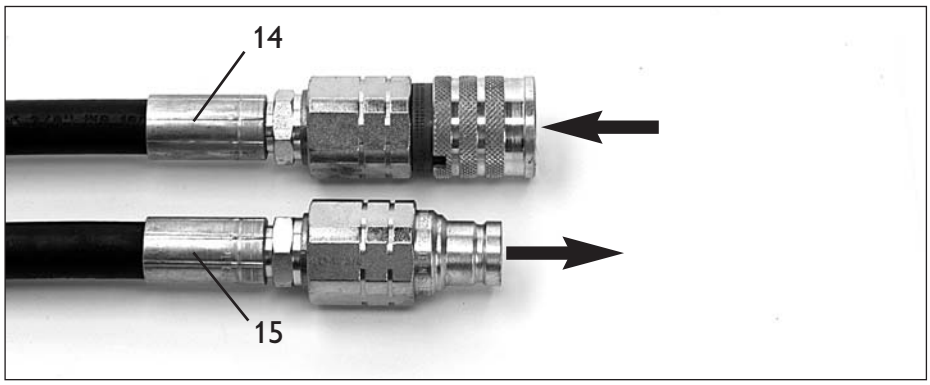
Fit new hose clips using pliers as shown in the picture on the right.

HUSQVARNA K2500

Hydraulic pressure, max	150 bar (2200 psi)
Hydraulic flow, min–max	35–42 l/min (9–11 US gpm)
Hydraulic oil	ISO VG 46







K2500 – components

1 Cutting blade

2. Blade guard

3. Adjustable handle for the blade guard

4. Front handle

5. Belt guard

6. Belt adjuster screw

7. Lock screws for belt adjustment

8. Water connector

9. Rear handle

10. Throttle trigger

11. Throttle trigger lockout

12. Hydraulic motor

13. Water valve

14. Pressure hose

15. Return hose

Belt guard

Removal
Undo the nuts (A) and release the belt tension using the adjuster screw (B).

Belt guard

Removal
Undo both nuts on the front belt guard (A).

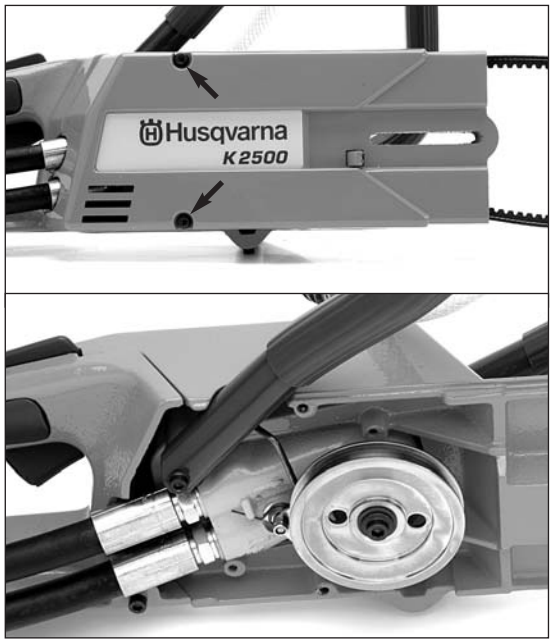
Slacken the belt tension by unscrewing the adjuster screw (B) until there is no spring tension.

Remove the belt guard.

Pull the water hose off the valve and remove the cutting head.

Then remove the nuts and take off the belt guard. Lift the belt off the belt pulley.

Pull the water hose off the valve. The cutting head can now be lifted out of the machine.



The rear belt guard must be removed in order to replace the drive belt and to enable certain types of servicing to be performed on the hydraulic motor.

The rear belt guard is held in position by two screws.

It must be removed in order to replace the drive belt and to enable certain types of servicing to be performed on the hydraulic motor.

Belt adjustment

Tighten the nuts by hand. Screw in the adjuster screw until the square nut is centred in the mark on the guard.

Tighten the nuts firmly, 22 lbf·ft/30 Nm.

Belt adjustment

Fit the front belt guard and tighten the nuts by hand. Adjust belt tension by screwing in the adjuster screw until the square nut (located to the left of the spring) is centred on the mark on the guard. Rotate the blade a few turns to get the belt in the right position. Screw in the adjuster screw more if necessary.

Then tighten both nuts firmly, 22 lbf·ft/30 Nm.

Dismantling

Dismantle the cutting head from the machine.

Dismantling

Dismantle the cutting head from the machine.

This chapter describes dismantling of the cutting head components and has instructions for replacing the blade shaft bearing at the end.

Lock the belt pulley with a pin punch and dismantle the centre screw.
Lift off the belt pulley. Remove the washer.

Lock the belt pulley with a pin punch and dismantle the centre screw.
Lift off the belt pulley. Remove the washer between the belt pulley and the bearing.
Tip: Tie on the belt pulley so that it is not lost or forgotten when reassembling.

Press up bushing with two open ended spanners. Now remove the inner flange washer.

The centre bush for the blade can be replaced and is available in different diameters.

Press up the centre bush with two open ended spanners. Now remove the inner flange washer.

Remove the spacer together with the bearing seal.
Check that the seal is intact.

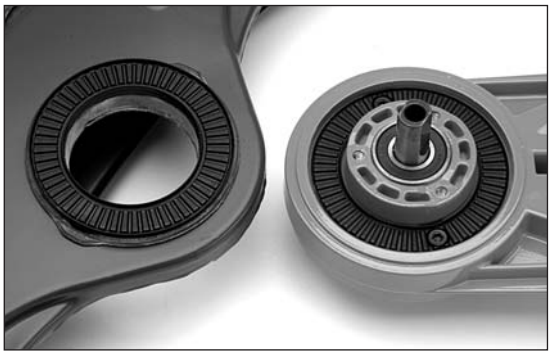
Remove the spacer together with the bearing seal.
Check that the seal is intact. Dirt under this indicates defective seals and these should be replaced.

Remove the washer.

The washer and the three screws hold the blade guard against the bearing housing. Remove the screws and the washer.

Lift the blade guard off the bearing housing.

Lift the blade guard off the bearing housing.



Check that the grooved rings are intact.

Also check that the rubber ring is in good condition.

Check that the grooved rings for the blade guard's locking mechanism are intact.

Also check that the rubber ring under the grooved ring is in good condition. The rubber ring acts as a spring to keep the gears engaged.

The bearing housing grooved ring is secured by two screws.

Bearing replacement

Tools

To replace the blade shaft bearing, tool kit 506 37 61-02 is required.

To replace the bearing, use the small bearing support plate, the milled washer and the screw with nut and washers. Grease the screw and the tool's slide surfaces.

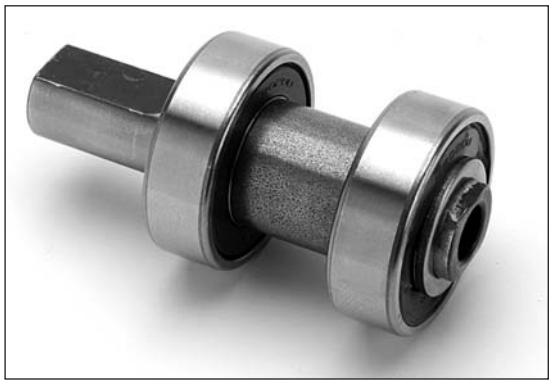
The triangle and the large bearing support plate are not used on the K2500.

Remove the bearing unit

Heat the bearing housing to approx. 150 °C using a heat gun.

Use a vice as a counterhold when removing the bearing unit. Make sure that the bearing runs free of the jaws.

Tap the bearing unit out using a suitable socket.



Bearing unit
The complete bearing unit consists of the axle, two ball bearings with spacer ring for the inner bearing races and a spacer washer against the belt pulley.

Split the bearing unit
Fit the screw on the special tool in the axle and knock the axle out of both bearings.

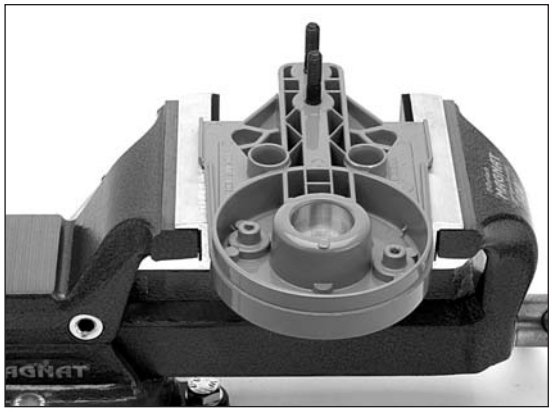
Split the bearing unit
Use the vice as a counterhold.

Fit the screw on the special tool in the axle and knock the axle out of both bearings.

Alternatively a brass punch can be used to drive out the axle.

Check
Check that the axle and the bearing seating in the cutting arm are not damaged.

Check
Check that the axle and the bearing seating in the cutting arm are not damaged. If the bearing is seriously damaged so that it has been scored, in all probability the axle or cutting arm must be replaced due to the damage a seized bearing causes to the bearing seating or the axle.



Prepare bearing replacement
The bearing is fitted vertically. The bearing housing must be accessible both from the upper and the underside.

Prepare bearing replacement
The bearing housing must be secured so that the bearing can be fitted vertically. The bearing housing must be accessible both from the upper and the underside.

Using a vice to hold it works well. Use soft jaws to prevent damage to the bearing housing.

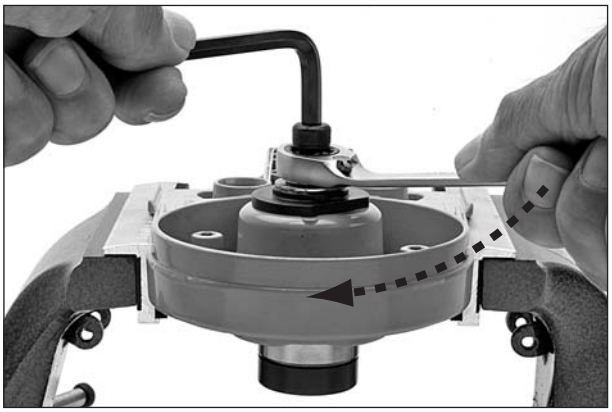
Tool use
Lubricate the slide surfaces and the screw.

Centre the washer on the top side of the bearing housing.

Place the bearing on the round support plate on the underside of the bearing housing. Screw the screw into plate for its entire thread length.

Fitting the inner bearing
Place the bearing on the support plate and hold it under the bearing housing. Insert the screw through the washer and fit the screw in the round support plate on the underside.

Lock the screw and turn the nut until the bearing reaches the stop in the chassis.

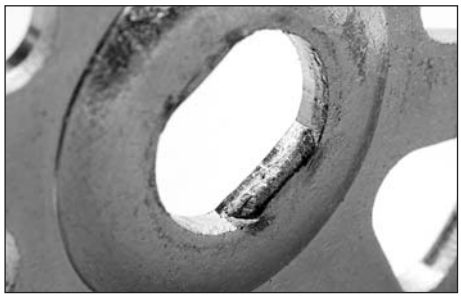


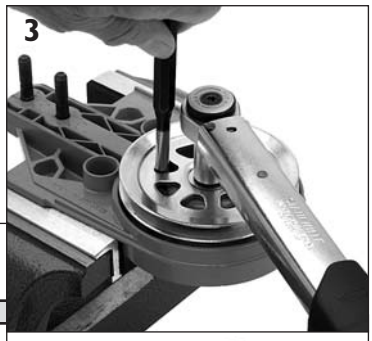
Fitting the outer bearing
Position the bearing **and spacer** on the support plate and hold it under the bearing housing.

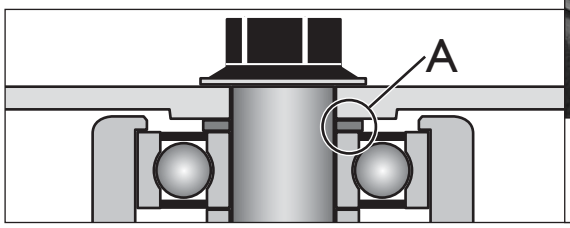
Press in the outer bearing until the spacer ring touches.

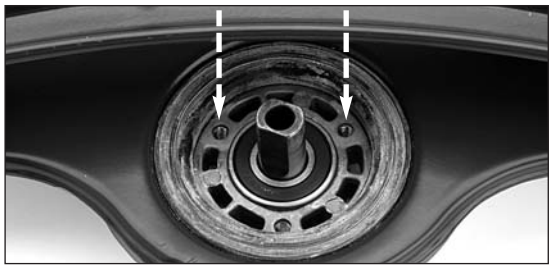
Fitting the shaft
Screw in the tool's screw until it bottoms in the shaft.

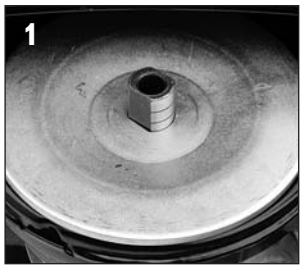
Press in the shaft until it bottoms against the washer. The shaft is now at the correct height for the next step.

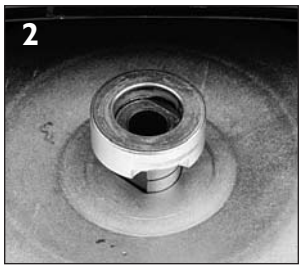


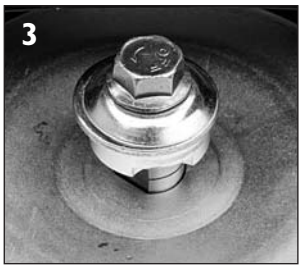


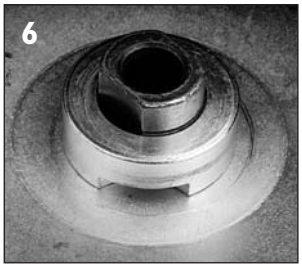












Fit the belt pulley
Note that the axle and the belt pulley have a profile that means that the belt pulley must be turned correctly when assembling.

Do not forget the washer between the bearing and the belt pulley!

1. Fit the washer.

2. Fit the belt pulley on the axle.

3. Tighten the centre screw so that the axle slides up towards the belt pulley and the washer (A) is pressed between the bearing and the belt pulley.
Tightening torque 28–31 lbf·ft/38–42 Nm.

Note: If the belt pulley is dismantled and reassembled, before assembly the axle must be driven down approx. .04 in./ 1 mm to obtain the position as per paragraph 3 above.

Bearing housing/blade guard
Check that the rubber seal is fitted properly against the bearing housing and blade guard.

Turn the bearing housing so that the screw hole becomes accessible from the top with the tool.

Tighten the three screws crosswise so that the washer is not unevenly loaded and risks being deformed. Tighten the screws fully.

Fit the seal with spacer ring.

Centre bush
Never hit the centre bush into position, the axle will then be offset!
Fit as follows:
1. Position the inner flange washer.
2. Position the centre bush.
3. Fit the screw for the blade's attachment.
4. Press down the bush until the screw bottoms.
5. Dismantle the screw and place it on the other flange washer “turned the wrong way”. Refit the screw and press down the bush against the inner flange washer.
6. The bush is fitted.

Separate the handle
First, remove the cutting head and the rear belt guard.

Remove the three screws as shown in the picture.

Separate the handle
In order to gain access to separate the handle, the cutting head and rear belt guard must first be removed; see previous chapters.

Remove the three screws as shown in the picture.

Throttle trigger fitting
Once the screw has been removed, the throttle trigger can be taken out.

Throttle trigger fitting
The picture shows the throttle trigger correctly installed.

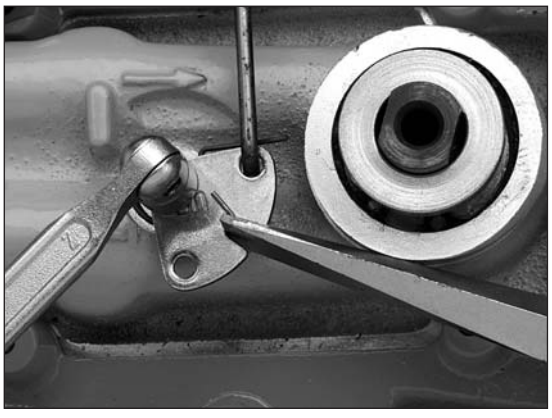
Once the link rod screw has been removed, the throttle trigger can be taken out.

Throttle trigger lockout fitting

Throttle trigger lockout fitting
The picture shows the throttle trigger lockout correctly installed.

Link rod fitting
Note the "UP" marking that is turned outwards from the motor.

Link rod fitting
The picture shows the link rod, torsion plate and return spring correctly fitted on the hydraulic motor.
The "UP" marking on the torsion disc must be turned outwards from the motor.



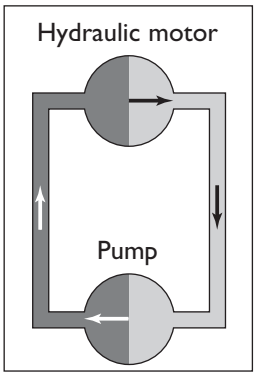
Removal of torsion plate
Relax the return spring at the motor housing support point.
Use a large screwdriver to prevent torsion plate movement during removal and fitting.

Removal of torsion plate
Lift the sprung end at the motor housing support point in order to eliminate spring force.
Use a large screwdriver to prevent torsion plate movement during removal and fitting of the nut.

Comments: The torsion plate has a symmetrical attachment to the control shaft that can be turned without end positions. Control function is the same for each half turn. This ensures that the plate cannot be incorrectly fitted on the shaft.

The target group for this chapter is mechanics who have no prior knowledge of hydraulic machines. An understanding of the basic principles of hydraulics will help resolve many of the problems and issues encountered during troubleshooting.

Hydraulic system

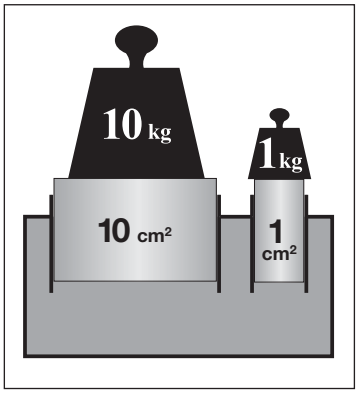


The term "hydraulic" refers to the transfer of power using some form of fluid. The fluid that is used in this context is oil, which apart from serving as the medium for transferring power, also lubricates and cools the system's components. Hydraulic power transfer normally operates in a sealed system, that is to say the fluid medium that is used is returned to a container from where it is reused. A hydraulic system consists of a power source, a pump of some sort and a recipient that performs some kind of work, for example a hydraulic motor. Often, transmission links of some kind are also required, for example hoses or pipes. A comparison with a mechanical system helps clarify this set-up, for example with a motor or engine, a chain and a wheel.

PRESSURE AND FLOW

Two terms are fundamental when it comes to hydraulics, namely pressure and flow. Proper understanding of how these work and interact will help solve most problems and answer most questions that may arise.

Pressure



In order to describe pressure, we use the example of a static hydraulic system. This example also shows how hydraulics can be used for motion and power gearing. The figure here shows a sealed container containing water. The container has two movable pistons, one with an area of 10 cm^2 and the other just 1 cm^2. We place a weight of 1 kg on the smaller piston and 10 kg on the large piston. The following will apply:

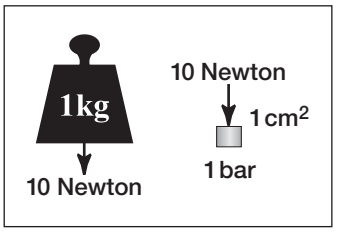
Weight balance. Since the weights are proportional to the areas on which they are placed (1 kg/cm^2), the system remains in balance, and the pistons will not move.

Movement gearing. The piston areas in contact with the fluid have a ratio of 1 to 10. If we press down the small piston 10 mm into the fluid, the large piston will rise 1 mm. The same fluid volume will now have exchanged places between the two pistons, and we have used hydraulics to create movements of different magnitudes.

Power gearing. Gearing of movement also promotes gearing of power – that which is lost in terms of movement is gained in terms of power. The load of the small piston gives a lifting power on the large piston that is 10 times greater.

These basic physical properties are used for functions in hydraulic and pneumatic systems and in such applications, very complex functions can often be carried out using surprisingly simple mechanical designs.

Dimensions for pressure



Pressure must always be measured over a given area in order for it to be meaningful as a dimension, usually per square centimetre. Pressure was previously often measured as kg/cm^2 (actually kp/cm^2), a method that is still widely used because it is so easy to grasp since we have a clearer understanding of weight as a dimension. Since engineers and physicists prefer the dimension of Newton for weight and power (10 N corresponds to 1 kp), the "bar" is often nowadays used as the unit for expressing pressure, for instance in hydraulic systems (1 bar corresponds to 1 kp/cm^2). A power of 10 Newton/cm^2 gives a pressure of 1 bar. Note that each square centimetre-sized surface unit of the container we described earlier is subjected to a pressure of 1 bar. We can thus measure pressure anywhere we like in the container.

Flow

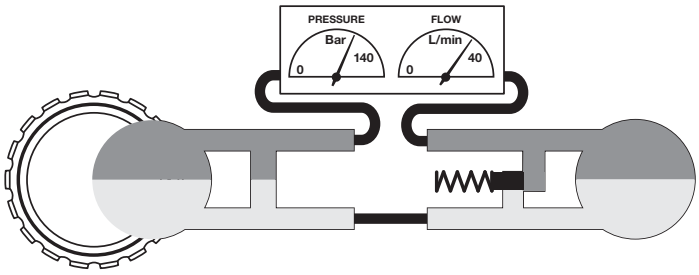
Flow in a hydraulic system is the fluid's speed of movement, often measured in litres per minute (l/min). In more or less static systems, such as a hydraulic jack, flow is unimportant. However, if we want to drive various devices hydraulically at set speeds, such as cranes, vehicles, power cutters and so on, flow is a vital parameter.

The hydraulic unit pumps a predetermined volume at a given rotational speed or pump stroke. If the pump's speed is altered, then flow too is changed. If we know the pump's capacity, we can calculate the movement at the other (receiving) end. If we know the hydraulic
piston's area, we can calculate the rotational speed, and if we know the hydraulic motor's flow-through volume per revolution, then we can calculate the speed.

Measurement of pressure and flow

In order to be able to check the function of hydraulic cutting machines, you must be able to measure pressure and flow. Of course, to do this you need a hydraulic unit with a capacity equivalent to that required for the cutting machine in question. In the case of Husqvarna hydraulic cutters, the hydraulic unit must provide a flow of 40 l/min (10 gpm) and a pressure of up to 150 bar (2000 psi), at which point an overpressure valve in the unit must trip.

As shown in the diagram below, the measurement equipment must be connected to the pressure side, which is represented by the upper half.



Measurement equipment

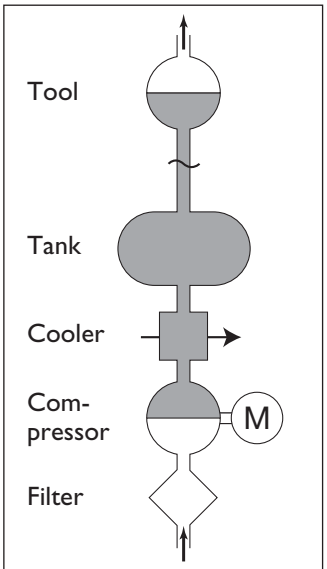
Measurement equipment for hydraulic applications is available in a number of configurations from specialist retailers. It is relatively easy to build a suitable measurement device, the procedure for which is described on page 31.

Comparison of hydraulics and pneumatics

For people used to compressed-air applications but not familiar with hydraulics, a comparison between the two is valuable since the operational principles are entirely different. One basic difference is the following: **A gas can be compressed whereas a fluid cannot.**

A compressed air system utilises this to build up the energy that is subsequently used: the compressor builds up pressure that is collected in a tank. When no air is being consumed, there is no flow. The pressure in the system is constant.

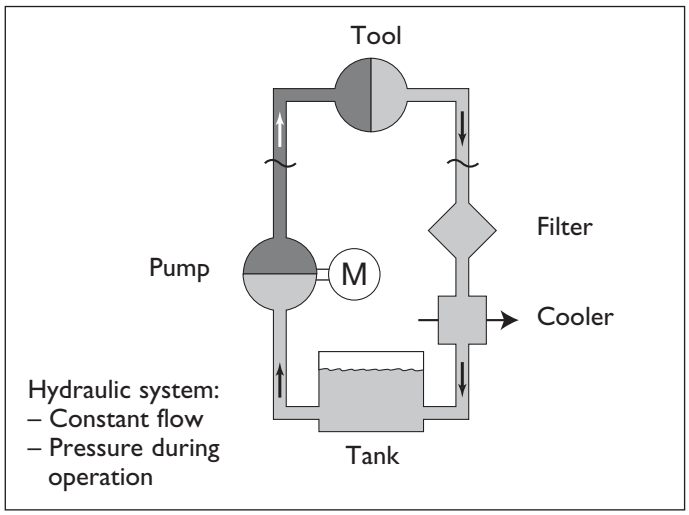
In practice, there is normally a slight variation in pressure. The compressor has an activation and deactivation pressure within a given interval, which however does not play any role in the operational principle.



Compressed air system:
– Constant pressure
– Flow during operation

Hydraulics – rigid power transmission

For practical reasons, hydraulic systems are always built in a closed loop. Hydraulic fluid is pumped in a circuit where in each cycle it passes through an operational phase and a return phase before being collected in a tank for reuse.



Hydraulic system:
– Constant flow
– Pressure during operation

As we said earlier, a fluid cannot be compressed, which means that as long as the pump runs at a constant speed, the flow in the system is also constant, which is exactly the opposite of the compressed-air system.

At what pressure does the hydraulic system operate? If we imagine for a moment that no resistance is offered by any part of the system, the fluid will be pumped without any pressure. If we connect a tool that performs heavy work (high resistance), pressure will naturally increase between the pump and the tool. Pressure is thus dependent on the work that is being carried out.

Practical differences - pneumatics/hydraulics

One important difference between pneumatics and hydraulics is that several tools can be connected to the same compressor in a pneumatic system since the pressure is constant and there is a state of flow during the work. Since the hydraulic system provides varying pressure during operation, it is impossible to add more power cutters to a single hydraulic unit.

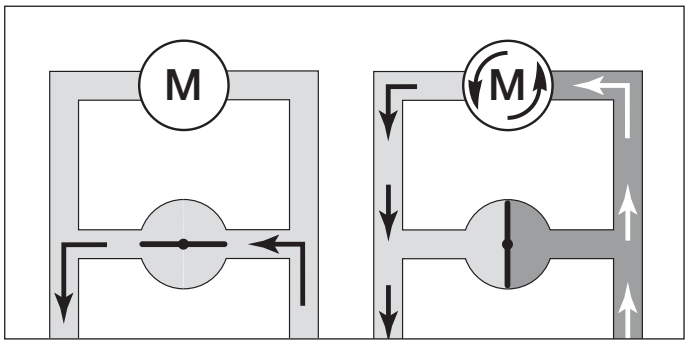
The benefit of the hydraulic system in driving a power cutter – and for many other applications – is the fact that a fluid cannot be compressed. Therefore, power transmission remains exactly the same as if there was a mechanical link. As a result, the cutting blade rotates at the same speed irrespective of load – as long as the power source maintains a steady pump capacity.

If instead we imagine a pneumatic system, the cutting blade's speed would vary with load. We have admittedly said that a pneumatic system operates with steady pressure, but as soon as the air has the opportunity to expand, it will do so. If we inject compressed air into a pneumatic motor that does not have any resistance, the volume of that air will expand upon entry and thus boost speed; under load, the air would once again shrink in volume. The disadvantage of compressed air for equipment that needs to operate at a steady speed under varying load conditions is thus obvious.

The hydraulic system's constant flow, which cannot be varied at will, naturally requires constructive solutions so as to be able to vary the tool's rotating speed. We will now see a few common solutions that are applied in hydraulic systems and for Husqvarna hydraulic power cutters.

Bypass

Since we cannot vary flow in a hydraulic system, an alternative solution must be employed. We must instead lead some or part of the fluid via a different path. This so-called bypass solution is used for many functions in various hydraulic tools. This basic principle is also termed "open centre". (A hydraulic jack operates according to the "closed centre" principle.)



Regulating flow

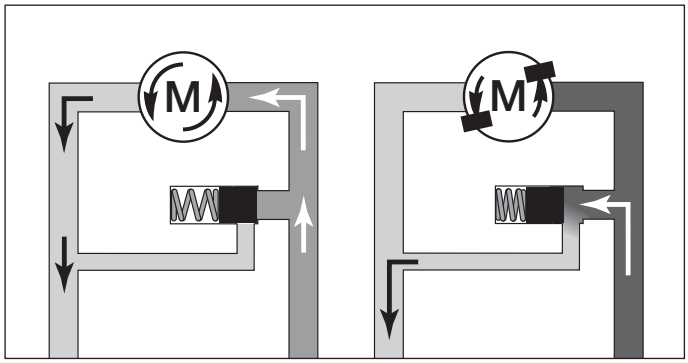
Assume that we want to vary flow to the tool (M) but that we cannot change either the pump's speed or displacement (volume).

By leading some of the fluid directly to the return side, the flow to the tool can be varied. This principle is used for throttle control in Husqvarna hydraulic cutters. When the machine is not operating, the entire flow passes virtually without pressure through the bypass valve. When the throttle control is pressed in, the bypass valve is closed and the hydraulic fluid is forced to pass through the motor.

Overload protector

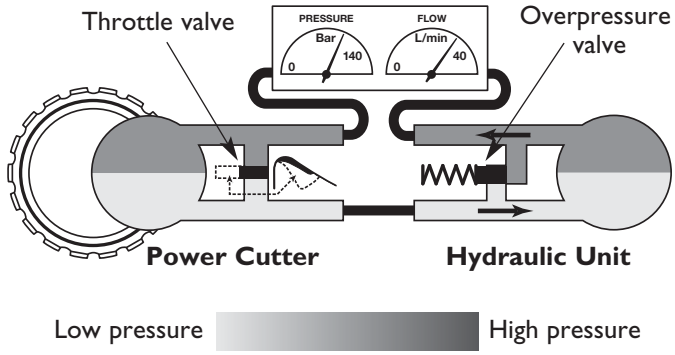
A bypass valve is also used in hydraulic systems to protect the equipment from overpressure. A spring-loaded valve keeps the duct closed up to the maximum permitted pressure. If the hydraulic motor is suddenly blocked during operation (the cutter blade gets stuck while spinning) the pressure rises abruptly to the level at which the pressure pushes the piston towards the return side and permits the fluid to pass through.

An overload protector of this type is normally found in all hydraulic units. Husqvarna hydraulic cutters therefore do not have this feature duplicated in the machines themselves.

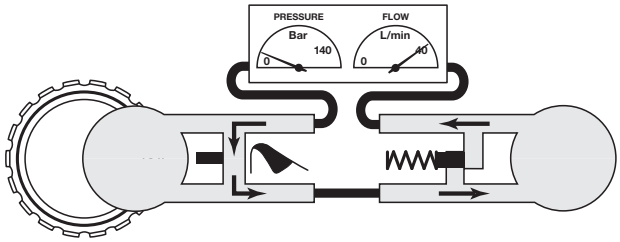


Power cutter and hydraulic unit

We will now see how pressure and flow interact in principle in a variety of situations with the Husqvarna K3600 MkII/ K2500 and the Husqvarna hydraulic unit. Measuring equipment for pressure and flow are connected to the pressure side. The cutter has a bypass valve that is regulated by throttle action and the hydraulic unit has an overpressure valve that activates if pressure exceeds the maximum permitted.

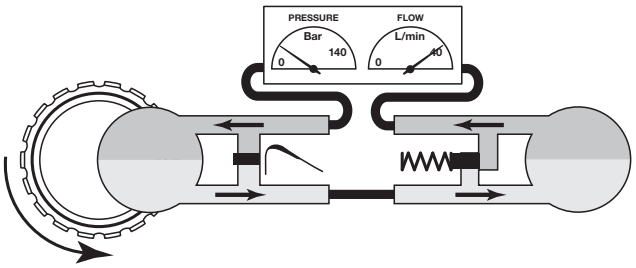


The pressure side of the hydraulic system is described by the upper half and the return by the lower half. As we shall see, there will be no change of pressure on the return side, only the flow path is changed under certain circumstances. That is why we only need to measure what happens on the pressure side, that is to say the side to which the hydraulic unit provides flow and pressure, and which drives the power cutter.



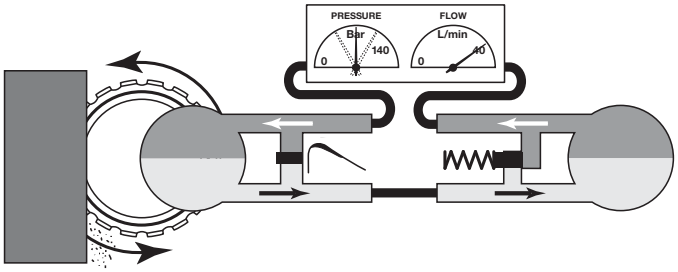
Idling

The hydraulic unit is operational and provides its preset 40 l/min (10 gpm). The throttle on the cutter is at the stop setting, so the throttle valve is open and allows all the fluid to pass freely through the bypass valve. The pressure and return sides are practically without pressure, and the blade is at a standstill.



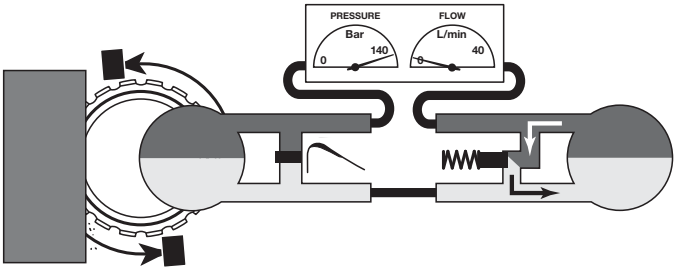
Start

Work is about to begin, the throttle is pressed in so the throttle valve closes. The fluid is now forced to pass through the hydraulic motor and the blade rotates. The pressure is somewhat higher now since some power is required to rotate the blade.



Cutting

When the blade rotates in the material to be cut, resistance naturally increases and pressure rises on the pressure side. Depending on how heavily the machine has to work, the pressure gauge will show readings close to the normal rating.

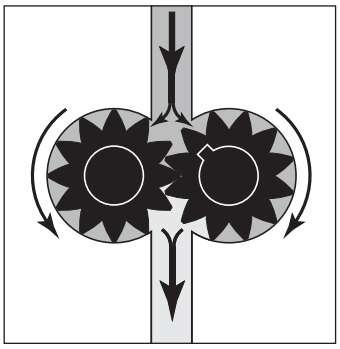


Blade gets stuck

The blade gets stuck. Flow to the power cutter is cut off and pressure rises to the level at which the overload protector valve in the unit opens and allows the fluid to enter the bypass duct. As soon as the operator releases the throttle, the overpressure valve will close and the fluid will pass through the power cutter's bypass valve, as in the picture entitled "Idling".

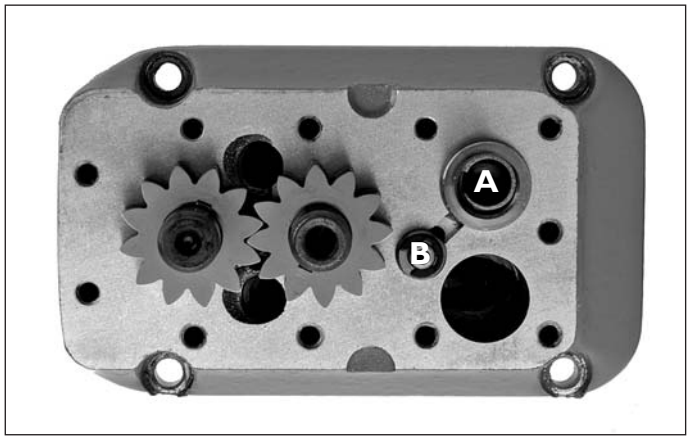
16 HYDRAULIC MOTOR – PRINCIPLES OF OPERATION

Hydraulic motor



The hydraulic motor is of the gear-driven type. The two gears form a seal where they grip one other and hydraulic fluid is forced into the space between the gears and the motor housing (the outsides) to reach the return side.

One gear has an output shaft linked to the cutter blade's driving wheel. Since the gears are mechanically linked to one another, power is transferred to the shaft by both gears.



The hydraulic motor and the structure of the servo system are identical for both the K3600 MkII and the K2500. However, because the two machines use completely different transmission systems, the hydraulic motor gear is set at different heights in order to ensure that the cutting blade is turned at the correct speed.

The pictures show the spring loaded main valve (A), the servo valve (B) and the brake valve (C). The function of these components is described later in this document.

Servo-controlled starter

The starter unit controls the flow of the hydraulic oil, either through the motor when the machine is in operation, or past the motor through a bypass channel whilst the blade is still.

The hydraulic cutters employ a servo function in their starters. Using this approach it has been possible to adjust the power required to keep the starter switch engaged down to a comfortably low level.

Servo valve

In order to understand the principle of operation, we must first look at a few salient details. There is a very small hole in the main valve (A) that allows a trickle of oil to pass straight through the piston that then passes the servo valve (B) when it is open. The servo valve is mechanically actuated by the starter. A weak spring, the purpose of which is to press the main valve down, is also in the system. This spring is necessary in order to be able to switch the machine between stop and start.

Brake valve

The brake valve appears in both machines, but is of greatest significance for the K2500. The transmission in the K2500 is practically friction-free and the slight pressure difference that exists between the pressure and return sides in the system when the starter is not activated would equally allow hydraulic oil to pass through the motor as the bypass valve. The blade would then rotate slowly. The solution is the spring-loaded valve by the motor that forces the oil to pass through the main valve.

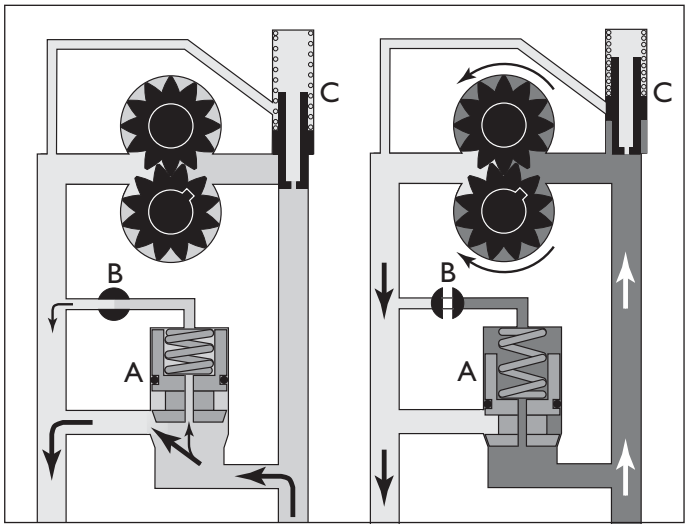
When the starter is activated, pressure increases, the valve opens and gives the oil a free path to the motor. The valve also acts as a brake, stopping the blade for a few seconds when the starter is released. (The narrow channel provides drainage for the valve.)

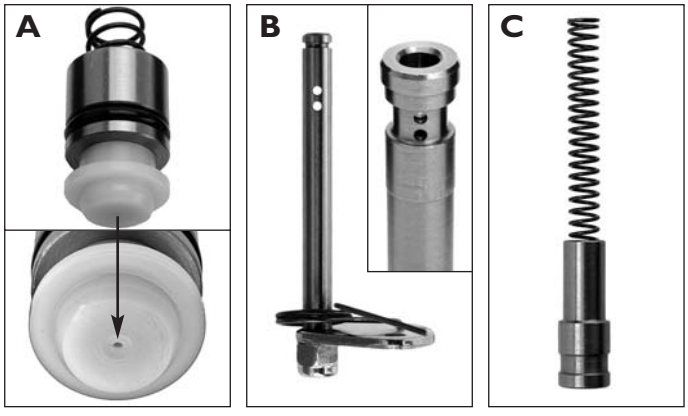
The circular cutter blade drive and control system applies sufficient braking that the brake valve only has a marginal effect.

FUNCTION

Engine at rest. The servo valve is open. The fluid can pass through both the bypass channel and the servo channel via the hole in the main valve. The cutter blade gives the motor a certain degree of resistance, sufficient to compress the weak spring above the main valve. Even when the motor is at a standstill, there is a slight pressure difference between the pressure and return sides. This pressure difference provides the flow through the hole in the main valve at the same time as the main valve is pressed upwards and allows the fluid to pass through the bypass channel.

To start the motor. The servo valve is closed. The same pressure is now built up on both sides of the main valve. The spring slowly pushes the main valve down at the same speed as the fluid fills the space above the cylinder. When the bypass channel is fully closed, the motor starts, the main valve is kept in the closed position because the area above the main valve is larger than the area below, at the bypass channel. In this position and with operating pressure, the spring has no locking function. The channel remains closed irrespective of how high the pressure is on the pressurised side.



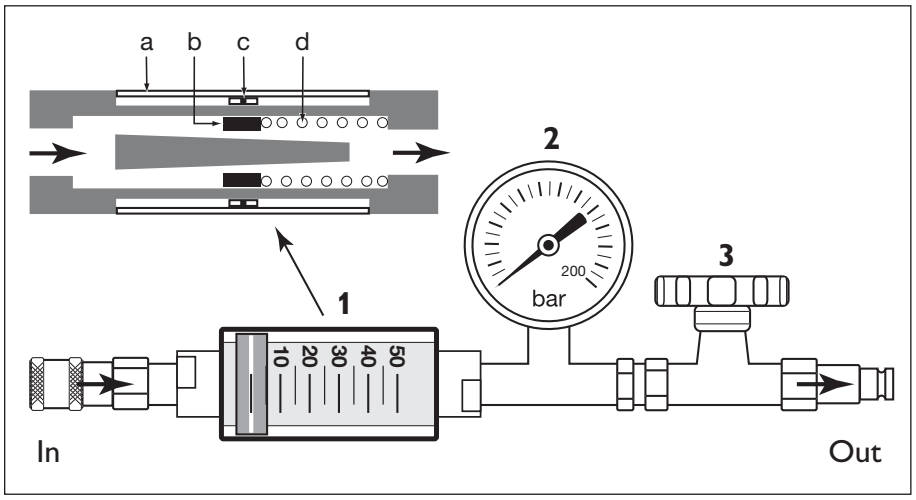


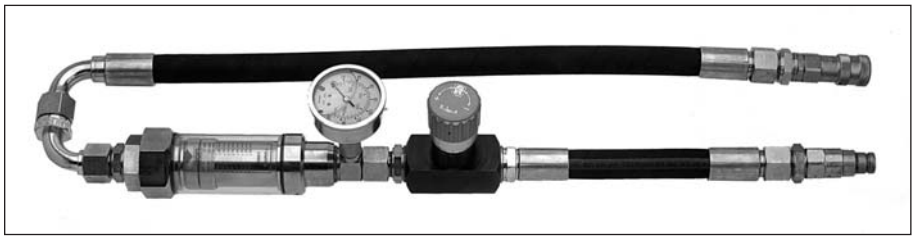
Build your own measurement equipment

Measurement equipment with the appropriate specification to test hydraulic cutters and hydraulic units is generally available for purchase as a finished product from specialist hydraulic equipment retailers.

It is also relatively easy to build measurement equipment, as shown in the picture opposite. To do this, you need:
1. A simple cylindrical flow meter in which the flow compresses a spring-loaded (d) hollow piston (b) to a variety of positions depending on the flow speed. The piston is magnetic. A cylindrical ring (c), located outside the flow meter pressure chamber, follows the magnetic piston and indicates the flow in the viewing glass (a). The meter must be able to show flows ranging from 5 l/min, or below, up to 40 l/min (1–10 gpm).
2. The gauge must be able to show pressures up to approx. 200 bar (3000 psi) .
3. Ideally, the valve should be a needle valve, allowing the flow to be fine adjusted at high pressures.

All components must be rated to handle pressures of at least 200 bar (300 psi) and flows of at least 40 l/min (10 gpm).





Important for the correct test result

Pressure and flow

Both machines are built to be powered with a hydraulic unit that delivers a flow of 35–42 l/min (9–11 gpm). The unit must be equipped with an overpressure valve that trips at pressures in excess of 150 bar (2200 psi).

In order to obtain accurate control values when workshop testing hydraulic motor condition, it is extremely important to ensure that the hydraulic unit is able to provide the pressure and flow that the machines are built to take. The hydraulic unit is tested using the same equipment described on this page and the test conducted in accordance with the description given on the next page.

Pressure	**max 150 bar (2200 psi)**
Flow	**35–42 l/min (9–11 gpm)**

Hydraulic oil

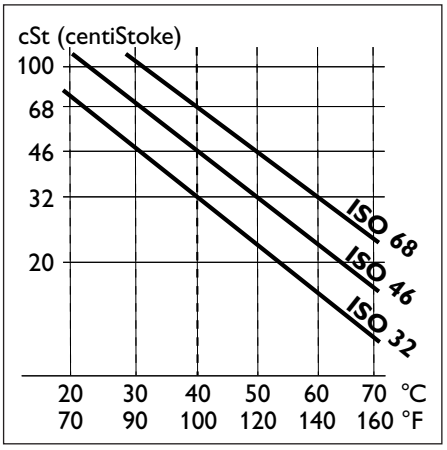
Low cutting machine or unit performance may not necessarily be the result of any mechanical failure on the part of the machines. Incorrect, contaminated (water, dirt) and worn out (aged) hydraulic oil is usually the cause. If the reason for the instance of low performance is unknown, the first port of call should be to examine the hydraulic unit's oil, filter and related elements.

Hydraulic oils – quality standards

ISO 6743 is a classification standard for hydraulic fluids. The grade is specified by a number in accordance with ISO VG (Viscosity Grade). Widely used viscosity grades are 22, 32, 46 and 68, specifying the viscosity of the liquid measured in cSt (centiStoke) at 40 °C/100 °F. Normally, the grade of fluid used in the cutting machines is ISO VG 46. Operation of the machine in extreme conditions may necessitate the selection of a different viscosity grade.

ISO-L-HV has a higher viscosity index, which means that it exhibits a lower change in viscosity at varying temperatures and is therefore more suited for use in cutting machines that work in environments with variable temperatures (ISO-L-HV, VG 46).

The graph illustrates how the viscosity of hydraulic oil typically changes at various temperatures. At operating temperature, a viscosity of between 20 and 50 cSt is recommended.

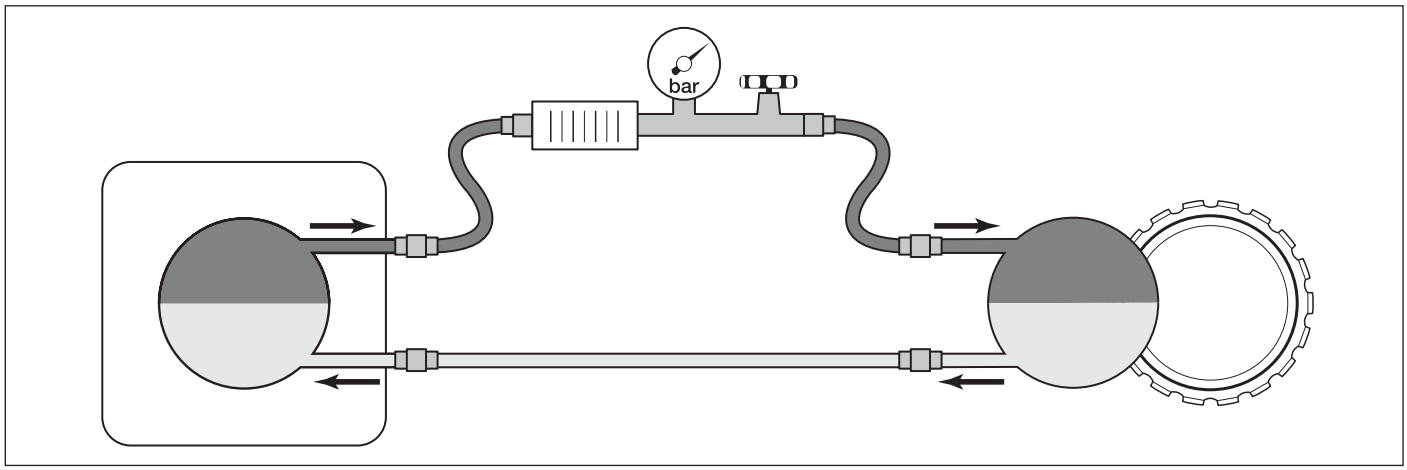


Typical example:
Shell Tellus T

Hydraulic hose and couplings

During hydraulic unit and cutting machine testing, hose lengths should be kept as short and as rough as possible. Long hoses and couplings result in pressure losses at high flow levels. At a flow of 38 l/min using ISO VG 46 oil at 50 °C/120 °F (cSt 30 at this temperature), the pressure losses are approximately as follows:

	Dimension	Pressure loss
Hydraulic hose	3/8″	2,0 bar/m (9 psi/ft)
	1/2″	0,5 bar/m (2 psi/ft)
	5/8″	0,16 bar/m (1 psi/ft)
Coupling (each)	3/8″	1,3 bar (19 psi)
	1/2″	0,4 bar (6 psi)



Testing hydraulic units

Connection

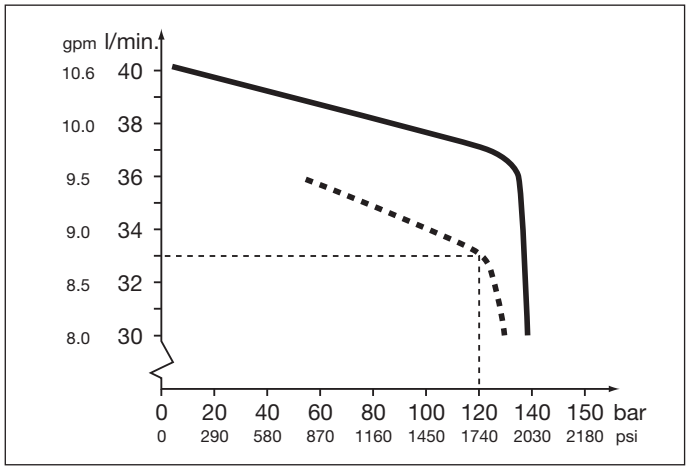
The function and output of both the hydraulic unit and the cutting machine can be tested using the connection circuit shown above. (Output is the product of pressure and flow.) If both the hydraulic unit and the cutting machine are available, the hydraulic unit should be tested first in order to rule this out as the source of any fault.

Testing

The test will show whether the hydraulic unit provides the correct pressure and flow and that the overpressure valve works.

The test is done as follows:

– Connect the measurement equipment as shown in the illustration above and fully open the needle valve.
– Start the hydraulic unit.
– Slowly tighten the needle valve and note how pressure and flow changes as the valve is tightened.
– Check that the overpressure valve trips at approximately 140 bar/2000 psi. This is important for testing the cutting machine hydraulic motor.



Diagram

The table above shows typical values for a hydraulic unit. The solid line shows the approximate performance of a new unit at an oil temperature of 45 °C/110 °F.

The dotted line represents what is acceptable for a worn unit before remedial measures must be implemented.

The important range for testing lies between 80 and 130 bar (1150–1900 psi), which is equivalent to normal cutting machine operation.

Testing cutting machine

Hydraulic motor

This test will show whether internal leakage in the hydraulic motor is the cause of reduced power.

The test is performed with the motor shaft locked as shown below.

K3600 MkII. Remove the cutting blade, the drive disc and the washer below. Lock the motor shaft using a fixed 12 mm open ended spanner and press this against the machine's lower handle attachment. Get an assistant to hold the tool in position during the test.

K2500. Remove the cutting head and the rear belt guard. Remove the belt pulley. Screw the belt pulley washer and screw back in position. The lock requires a fixed 12 mm combination open ended/box spanner. Fit the open ended spanner to the driveshaft and secure the box spanner using an M8 screw in the cutting head attachment.

WARNING!

The hydraulic motors have a high, in the case of the K2500 very high, torque. Don't use manual force as resistance during the test!

Testing

The test procedure is as follows:

– Connect the measurement equipment as shown in the illustration above and fully open the needle valve.
– Start the hydraulic unit.
– Press the start control on the machine and keep pressed for approximately 5 seconds, whilst at the same time taking a reading from the flow meter.

During the test, the hydraulic unit will reach 140 bar/2000 psi, causing the overpressure valve to trip out.

7 litres/minute (2 gpm)

If the test indicates an internal leak in excess of 7 litres/min (2 gpm), the hydraulic motor must be repaired. Assuming that the motor valves are working correctly, the oil leak is the result of a poor seal between the motor housing and the gears (wear).

Symptom: Low motor output

Cause:	Action:
Worn motor Internal leakage allows hydraulic oil to pass the top and bottom side of the gears due to wear. This sort of wear can be totally normal for a motor that has had a long operating life. Incorrect, old or contaminated hydraulic oil will increase wear dramatically.	Connect the machine to a hydraulic unit and test run the cutting machine with the motor shaft locked in accordance with the description on the previous page. If the internal leakage exceeds 7 litres per minute/2 gpm, the hydraulic motor must be repaired. Remove the hydraulic motor cover and inspect for signs of wear damage. If the gears have caused circular grooves and pitting in the sealing plane, the entire hydraulic motor must be removed and replaced with a new one. It is also likely that the gear shaft bearings are worn out.
Leaking main valve If the main valve does not fully close in operational position, some of the oil will pass directly to the return side.	Remove the hydraulic motor cover and examine the main valve: – Check that the main valve can move in its bore and does not jam due to contamination or corrosion and that the O-ring is intact. – Also check that the small hole in the main valve hat (white plastic) is open. Check that the O-ring holds the hat in position.

Symptom: Motor does not start

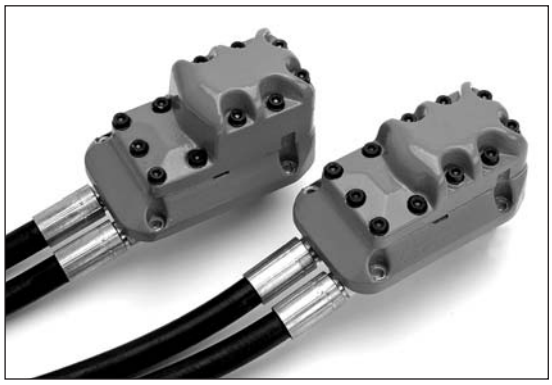
Cause:	Action:
Locked main valve Once the hydraulic unit is shut off, the main valve is compressed into operating position by the spring above. When the hydraulic unit is started, the main valve is forcibly compressed to the spring. The reason why the motor does not start may be that dirt or corrosion prevent the spring from compressing the main valve into operational position. If the machine has not been used for some time, this may be the main reason for the motor not starting.	Remove the hydraulic motor cover. Check that the main valve can move in its bore under spring power and does not jam due to contamination or corrosion.
Blocked valve hole If the valve hole (the main valve white plastic hat) is blocked, pressure will not be equalised on both sides of the main valve – the piston will stop in bypass position.	Check that the small hole in the main valve hat (white plastic) is open.
Locked gear It is very unlikely that this is the cause of the fault.	Test that the gears can rotate by hand.
Defective control or link rod	This can be checked simply by pressing the starter and noting whether the servo valve moves.
Locked brake valve The brake valve is locked in bypass position. It is very unlikely that this is the cause of the fault.	Disconnect the pressure pipe from the motor. Using a Philips screwdriver, check that the brake valve can move. Otherwise, remove the brake valve and spring and check for dirt and corrosion.

Symptom: Motor does not stop – control in stop position

Cause:	Action:
Deformed link rod **Dirt locking the torsion plate** The servo valve, on which the torsion plate is mounted, has a very definite position where the servo valve is open to the return side, which in turn allows the main valve to be open to the return side. The motor is inoperative in this position. This may be due to a bent link rod. Dirt or a defective return spring at the torsion plate may also prevent the servo valve reaching the stop position (open servo valve).	This test is to be done with the cutting machine connected to a hydraulic unit. For safety reasons, remove the cutting machine blade. **K3600 MkII:** Remove the handle half in order to make the starter link rod accessible. With the hydraulic unit in operation: Using a pair of pliers, press the link rod to the stop position. **K2500:** Remove the front and rear belt guards and the belt. With the hydraulic unit in operation: Using a pair of pliers, force the torsion plate to the stop position. If doing this does not produce results, the hydraulic motor must be examined. Disconnect the machine from the hydraulic unit.
Blocked servo valve When the main valve is in bypass position (stop position), a small amount of oil comes through the small hole in the main valve hat and into the servo valve channels to the return side. Blocked channels in the servo valve have the same effect as an activated starter, i.e. the motor runs.	Remove the servo valve and blow the channels (two holes on either side of the shaft) and the channels in the motor housing clean. See page 46.
Locked main valve Once the hydraulic unit is shut off, the main valve is compressed into operating position by the spring above. If the machine has not been used for some time, it is likely that the main valve has locked in this position.	Remove the hydraulic motor cover and check the movement of the main valve.
Leaking main valve The following faults may cause sufficient leakage to prevent the main valve opening to the return side: – Damaged gasket around the main valve – Bad seal between the main valve and the white plastic hat. Alternatively, the plastic hat may be deformed or leaking. .	Remove the main valve and examine the units for potential leaks.

Symptom: External leakage

Cause:	Action:
Motor housing/cover Leaks between the motor housing and the cover may occur without there being any other fault.	Remove the cover from the motor housing and examine the sealing surfaces. If there is no fault, carefully remove oil and sealant residues from the sealing surfaces. Spread on fresh sealing compound and re-fit. Tighten the screws alternately and to the correct tightening torque.
Driveshaft The sealing ring to the driveshaft is exposed to wear. If oil leakage occurs here, the sealing ring must be replaced. If the shaft is damaged by the sealing ring, it must be replaced. Whilst doing this, check the integrity of the driveshaft roller bearings. Bearing play causes damage to both the sealing ring and the slide bearings in the motor housing and the cover. Running the machine for extended periods of time with damaged drive disc bearings will lead to the hydraulic motor suffering irreparable damage.	Remove the driveshaft from the motor housing. First check whether the leak comes from the inner sealing ring (to the shaft), then check whether it comes from the outer sealing ring (to the motor housing). Check the integrity of the shaft roller bearings. Play in the roller bearings may be an indirect factor in the sealing ring to the driveshaft being damaged.

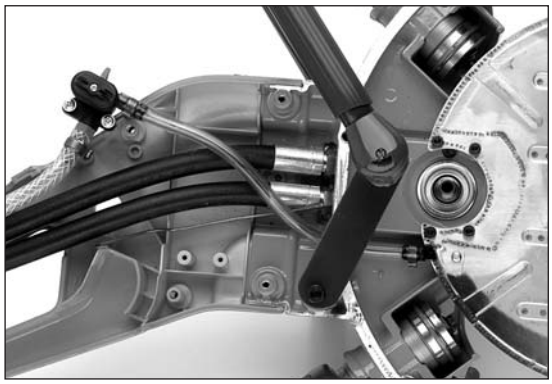


Removal of complete hydraulic motor

For inspection and standard servicing purposes, the hydraulic motor need not be removed from the machine. The motor must be removed in the following instances:

– Complete hydraulic motor replacement
If there is wear damage in the motor housing or cover, the entire hydraulic motor should be replaced with a new unit.

The following work is facilitated if the hydraulic motor is removed:
– Inspection and servicing of the brake valve
– Replacement of hydraulic hoses



K3600 MkII

Release link rod from control

Remove the drive disc and the washer below

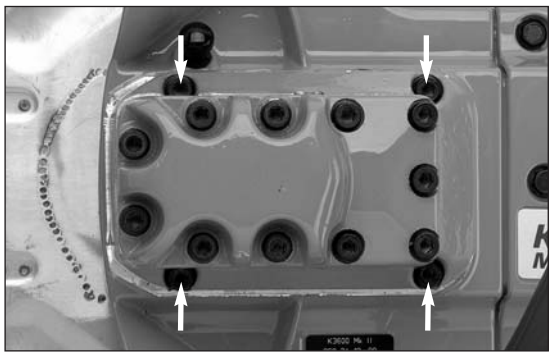
Loosen the water valve
Lift the valve to release the link rod.

K3600 MkII

Release link rod from control
The procedure to separate the handle is described in detail in Chapter 10.

Remove the drive disc and the washer below
The procedure for removing the drive disc is described in Chapter 4.

Loosen the water valve
Remove the water valve's two screws and lift the valve to release the link rod. See Chapter 10.

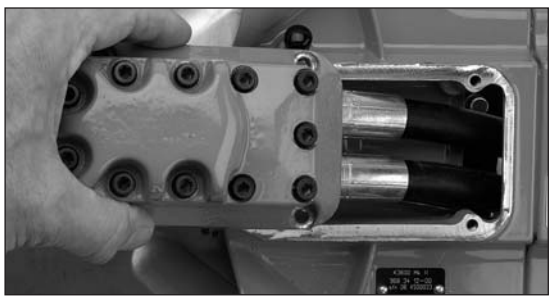


Remove the hydraulic motor
Remove the four screws.

Tightening torque for re-fitting:
10 Nm/7 lbf-ft.

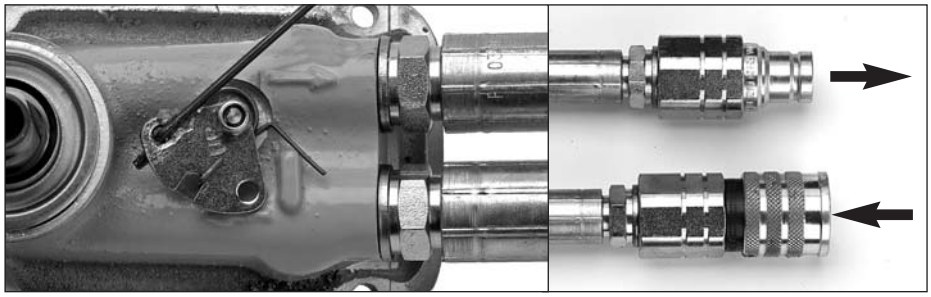
Remove the hydraulic motor
Remove the four screws holding the hydraulic motor to the machine body.

Tightening torque for re-fitting:
10 Nm/7 lbf-ft.



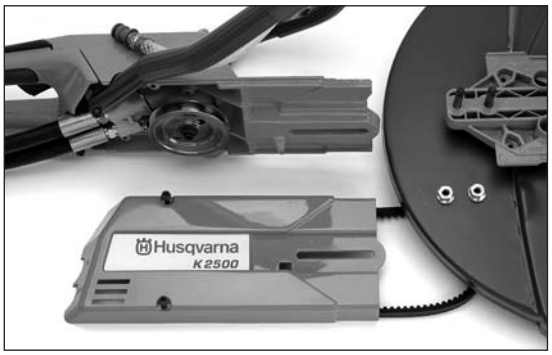
Pull out the motor unit along with the hoses and the link rod.
Take care to ensure that the link rod is not deformed.

Pull out the motor unit together with the hoses and the control link rod.
Take care to ensure that the link rod is not deformed. It is important to preserve the shape of the link rod in order to ensure starter function.



Important when re-fitting
Note the link rod attachment and position, as well as the position of the return spring.

If hoses/hose couplings have been removed – re-fit the male and female couplings correctly.



K2500

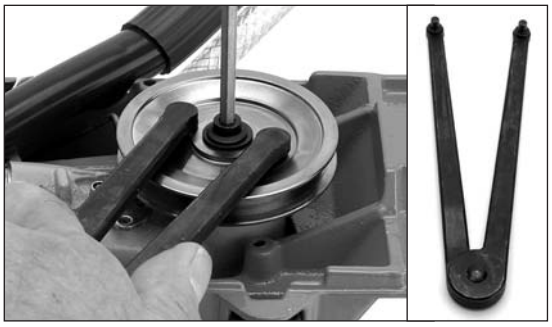
Remove the cutting head

Remove the rear belt guard

K2500

Remove the cutting head
See description in Chapter 12.

Remove the rear belt guard
See description in Chapter 12.



Remove the belt pulley
Prevent belt pulley rotation and remove the centre screw.

Remove the belt pulley and the washer below.

Remove the belt pulley
Prevent belt pulley rotation using a pin spanner. Alternatively, angled needle nose pliers may be used.

Unscrew the centre screw, remove the belt pulley and the washer below.

When re-fitting
Note how the parts must be turned during re-fitting.

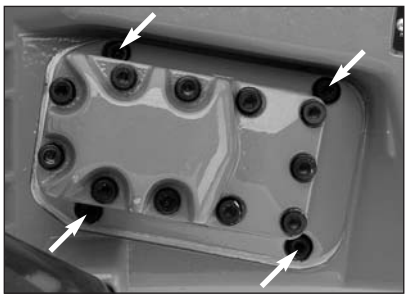
When re-fitting
Note that the washer to the left must be turned with the flat side up. The belt pulley must be turned with the raised centre section facing up. Do not forget the washer for the centre screw.

Remove the torsion plate
Lift the spring end at the motor housing support point.

Lock torsion plate movement when removing and re-fitting the nut.

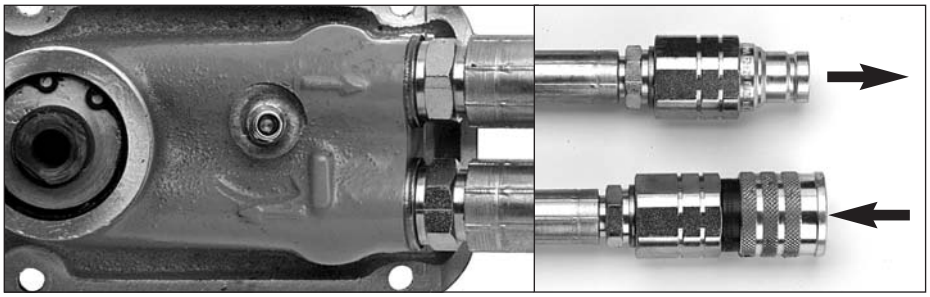
Remove the torsion plate
Lift the spring end at the motor housing support point in order to eliminate spring force.

Use a large screwdriver to prevent torsion plate movement during removal and fitting of the nut.



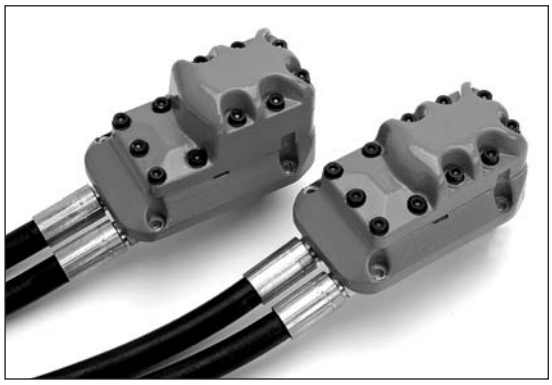
Remove the hydraulic motor
Remove the four screws holding the hydraulic motor to the machine body. Pull out the motor unit along with the hoses.

Screw tightening torque for re-fitting: 10 Nm/7 lbf·ft.



Important when re-fitting
If hoses/hose couplings have been removed – re-fit the male and female couplings correctly.

The attachment and position of the link rod, as well as the position of the return spring; see picture on page 26 “Link rod fitting”.



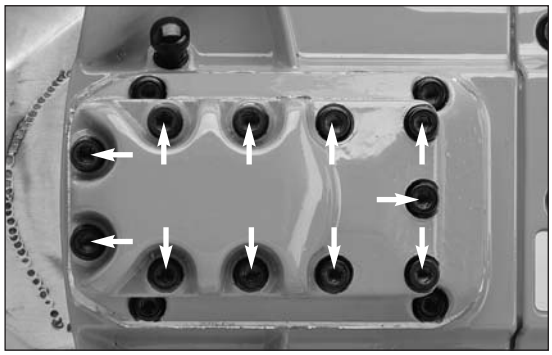
Identical design

The hydraulic motors used in the K3600 MkII and K2500 are identical in all but one respect.

That difference is in the gear height, which affects the speed of the output shaft at identical flows from the hydraulic unit. This is due to the totally different cutting blade transmission systems used.

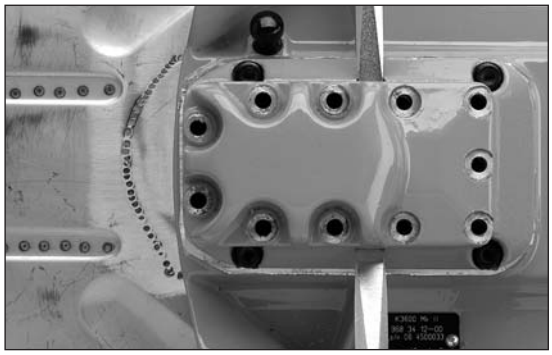
All servicing is identical for both motors and is therefore dealt with in the same chapter. The pictures in the following chapter show the motor for the K3600 MkII.

Note that the hydraulic motor does not need to be removed for the majority of the following servicing work.



Dismantling for inspection

Remove cover screws



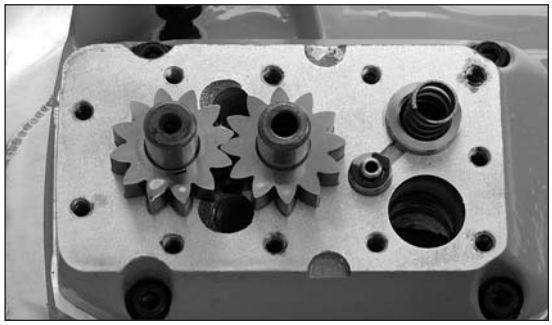
Remove the cover
Use a couple of suitable screwdrivers.

Dismantling for inspection

Remove cover screws

Remove the cover
The sealing compound between the motor housing and the cover can cause the two parts to stick together quite tightly.

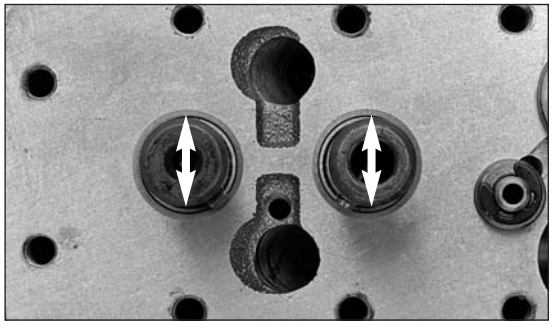
Use a couple of suitable screwdrivers in the housing outlet to carefully separate the units.



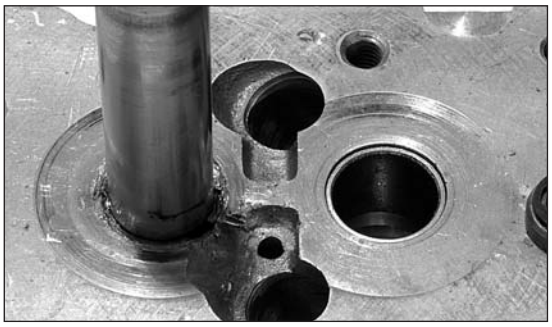
Gear motor

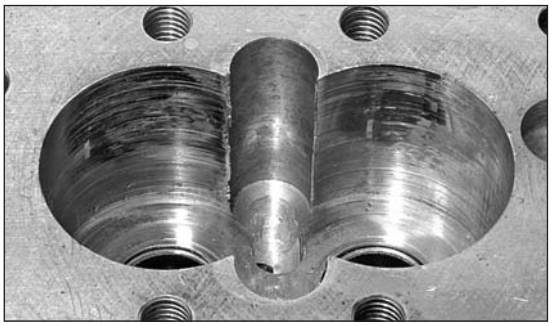
Symptom – low motor power
If the fault symptom is low motor power, the gear motor should first be examined for signs of wear.

Damaged slide bearings
Press the gear shafts in different directions in order to examine slide bearing conditions. The bearings receive the majority of load in the direction pressure side to return side (direction of arrows). This is also where bearing wear is greatest.



Damaged drive disc bearing
If the driveshaft (shaft on the left) exhibits play, it may be the result of the drive disc bearing being damaged, which in turn will damage the slide bearings in the motor housing and the cover.





Motor housing/cover

Damaged motor housing
Damaged bearings cause the gears to be positioned obliquely to the sealing surfaces of both the motor housing and the cover. Damage manifests as circular grooves following the movement of the gears and leads to reduced motor power due to internal leakage.

Damaged cover
If the slide bearings in the cover are damaged, wear marks usually appear on the flat surfaces of the cover facing the flat side of the gears and on the circular shaped surface that engages with the gears.

Cause

The gear motor used in the cutting machines is a precision product that is manufactured with very small dimensional tolerances in order to ensure minimal leakage and a high level of efficiency.

Motor damage
The wear damage described above is uncommon. Generally speaking, there are the following causes:
– The hydraulic motor has operated for many hours beyond that estimated to be the normal operating life of the machine.
– If wear occurs on a hydraulic motor with fewer operating hours, the first thing that must be checked is the hydraulic oil.

Hydraulic oil
The quality of the hydraulic oil has considerable bearing on the lifespan of the hydraulic motor. Contaminants in the hydraulic oil increases wear significantly. Old oil affords poorer lubrication characteristics. Incorrect oil quality can also increase wear.

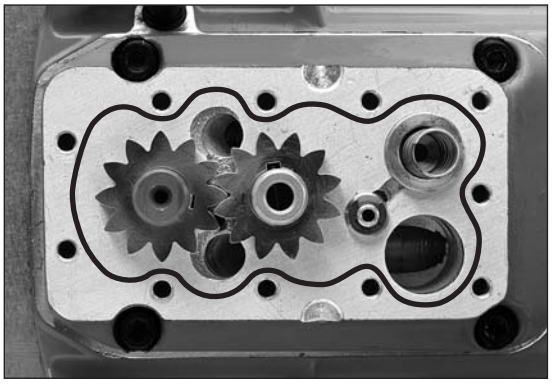
Repair or motor replacement

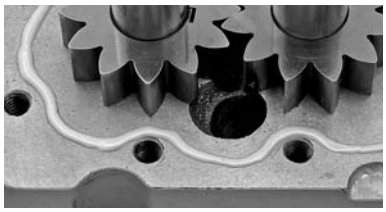
Damaged motor housing/cover – motor replacement
If there is wear damage caused by the gears in the motor housing or the cover, it is a sign of internal leakage. If motor power is reduced, the aforementioned damage is probably the cause.

Neither the motor housing nor the cover can be repaired. The solution is to replace with a new motor assembly.

Replacement of bearings
It is uncommon for loose motor bearings not to have damaged the motor housing and cover, primarily because the fault symptom manifests once the gears have damaged the sealing surfaces. Replacing the gear shaft slide bearings is a quite complicated and unusual procedure. See description below.

This procedure must not be confused with replacement of the driveshaft roller bearings.





Re-fitting
When re-fitting the cover to the motor housing, all old sealant residues must be removed and the surfaces degreased.

Sealant
The following types of sealant are tested and recommended:
Henkel Omnifit FD 1042 or Loctite 572. Both sealants are anaerobic, which means that they harden where there is no oxygen. Spread the sealant in a path approximately as shown in the picture. Only a very thin string of sealant is required, 1–2 mm (.04–.08) in diameter.

Fit the cover
Don't forget to fit the main valve spring!
Tighten all screws crosswise and alternately with increased tightening torque in order to provide even contact between motor housing and cover.

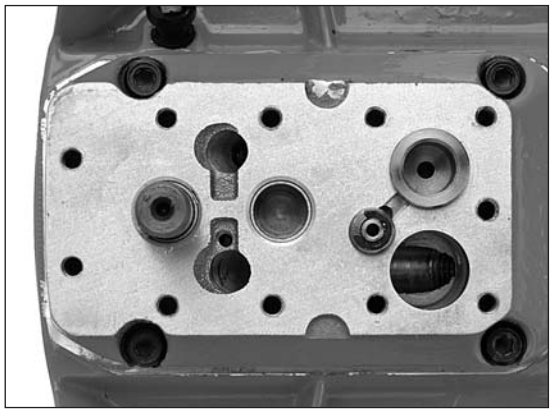
Final tightening torque: 10 Nm/7 lbf·ft
Use a torque wrench.

Driveshaft bearing/shaft seal

If external leakage comes from the drive shaft, it is a sign that the shaft seal is damaged. Worn roller bearings may be indirectly responsible for the leak.

Recommendation – replace bearing, shaft and seal
On machines that have many operational hours on the clock, the shaft seal may cause damage to the surface of the driveshaft, reducing the integrity of the seal. Play in the roller bearing causes major stress on the shaft slide bearing that, when worn, makes it difficult to engage gears in the motor housing and the cover, resulting in internal leakage and reduced motor power.

Therefore, it is recommended that the entire unit be replaced (as shown in picture). This is available as a complete spare part.

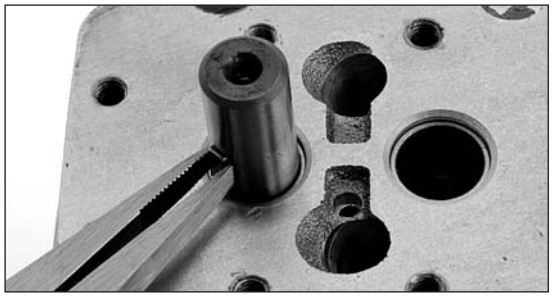


Removal

K 3600 MkII
1. Remove the drive disc, see page 6.
2. Remove water disc (this facilitates the procedure).

K 2500
Remove the belt pulley, see page 34.

K 3600 MkII and K 2500
Remove the motor cover, the gears, the non-driving shaft and the spring as shown in the picture.



Remove the wedge
Remove the key on the drive-shaft.

Remove the wedge
Remove the key on the driveshaft using a pair of pliers or tap it out of the groove using a small screwdriver and a hammer.

Turn the machine.

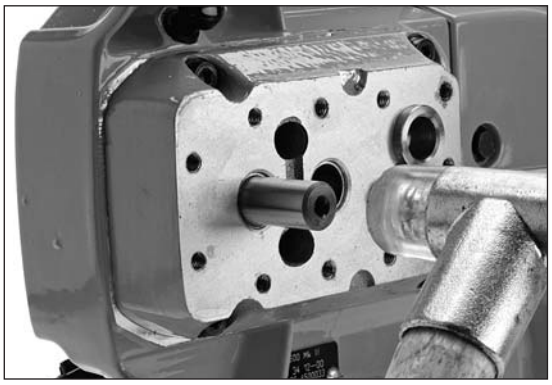
Remove the sealing collar
Use a knife or chisel.

Turn the machine.

Remove the sealing collar
Use a knife or chisel to carefully press up the sealing collar.

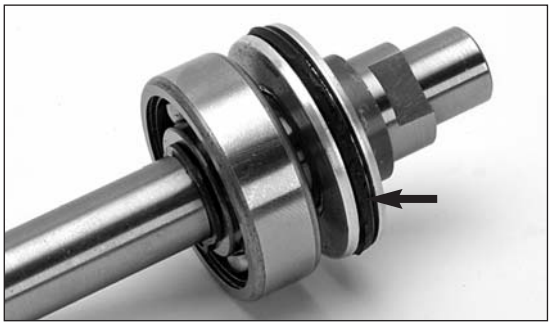
Remove the circlip

Remove the circlip
Using a pair of circlip pliers.



Remove the shaft unit
Tap out the complete shaft unit.

Remove the shaft unit
Tap out the complete shaft unit with bearings and seals.



Fitting

Fitting the complete shaft unit
Clean the bearing housing in the machine.

Grease the outer sealing ring (arrow).

Fitting

Fitting the complete shaft unit
Clean the bearing housing in the machine.

Grease the outer sealing ring (arrow).

Heat the bearing housing
Heat the bearing housing to approximately 200 °F/100 °C.
Ideally, the shaft unit should be cooled in a freezer before fitting.

Heat the bearing housing
Using a hot air gun, heat the bearing housing to approximately 200 °F/100 °C.
Ideally, the shaft unit should be cooled in a freezer before fitting.

Fit the shaft unit
Fitting can normally be carried out by hand.

Fit the shaft unit
Once the bearing housing is heated and the shaft unit is cooled, fitting can normally be done by hand. If necessary, make a few light taps with a plastic mallet.

Re-fit
Re-fit the circlip.

Fit the sealing collar.

Re-fit
Press the sealing washer to the bearing and fit the circlip.

Fit the sealing collar by lightly tapping around it with a hammer and a large pin punch.

Shaft seal

If the roller bearing and the shaft do not exhibit signs of damage, the shaft seal may be replaced separately in accordance with the description below.

Important
Remember that the shaft has two bearing surfaces to the gear motor slide bearing in addition to the roller bearing. Therefore, it is important that the shaft is handled in such a way that its surface is not damaged.

Remove roller bearing and sealing washer

Remove the circlip.

Tap the shaft out of the roller bearing.

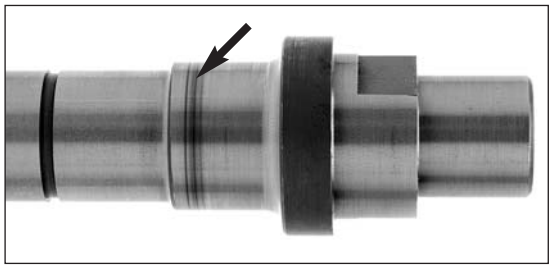
Check that the shaft has no mechanical damage.

Remove roller bearing and sealing washer

Remove the circlip using a pair of circlip pliers.

Use a vice with soft jaws as resistance. Tap the shaft out of the roller bearing using a rubber mallet.

Check that the shaft has no mechanical damage.



Check the sealing surface
Pay special attention to the surface where the seal meets the shaft. Clean off all residues. If there are signs of wear damage, replace the shaft.

Check the sealing surface
Pay special attention to the surface where the seal meets the shaft. Clean the shaft of all residues from the sealing ring. If this part of the shaft has wear damage it must be replaced.

Fit a new outer sealing ring

Fit a new outer sealing ring
Lift the old sealing ring using an awl or similar and fit a new sealing ring.

Grease the shaft
Grease the shaft thoroughly where it touches the roller bearing. Greasing protects the sealing ring during fitting.

Thread the sealing washer on the shaft.

Grease the shaft
Grease the shaft thoroughly where it touches the roller bearing. The main reason for doing this is to protect the inner sealing ring as it is fed over the sharp edges of the stop where the diameter of the shaft increases.

Fit a new inner sealing ring
Carefully press the sealing ring over the roller bearing stop edge down to its seat.

Fit a new inner sealing ring
Carefully press the new sealing ring over the sharp stop edges of the roller bearing. Press the sealing ring down into its seat.

Secondary adjustment
Press the sealing ring down fully into its seat using a blunt instrument

Secondary adjustment
Use a blunt instrument to press the sealing ring down into the bottom of its seat. Press around the sealing ring in short, sharp intervals.

Fit the roller bearing
Place the roller bearing on the shaft.

Tighten the vice jaws to the point at which they support the roller bearing ring.

Tap the shaft down.

Fit the roller bearing
Place the roller bearing on the shaft and push until it touches.

Place the shaft in a vice, which must have soft jaws to prevent damaging the shaft surface. Tighten the jaws to the point at which they support the roller bearing ring.

Tap the shaft down towards the roller bearing recess.

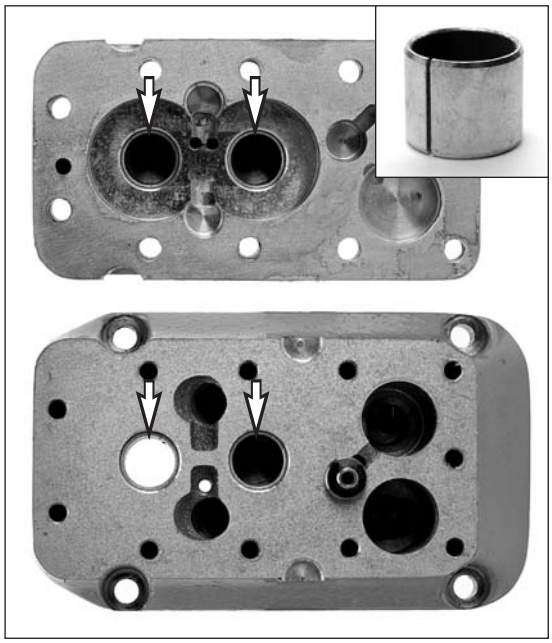
Fit the circlip

Fit the shaft unit in the bearing housing
Fit in accordance with the description on page 40.

Fit the circlip
Fit the circlip using a pair of circlip pliers.

Ensure that the circlip is sited correctly and is locked in the groove.

Fit the shaft unit in the bearing housing
Fit in accordance with the description on page 40.



Slide bearings

Gear shafts, the driveshaft and the non-driving shaft are all fitted with slide bearings. These four bearings are identical.

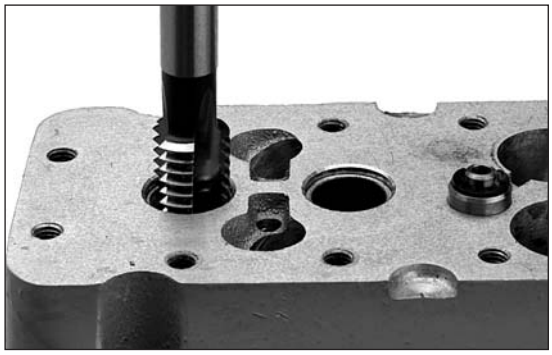
Replacement of slide bearings – rarely necessary
It is rarely necessary to replace slide bearings as damage to these parts is a very infrequent occurrence. If, in spite of everything, these bearings do suffer damage, the first sign will be a loss of motor power, which in turn means that the motor housing and/or the cover will have suffered damage as the result of deficient control on the part of the gears. In such instances, the motor must be replaced.

Inspection when changing driveshaft bearings
If the driveshaft bearings are changed, it is important to check the condition of the slide bearing nearest the roller bearing as a loose roller bearing transfers the load to the slide bearing, which is thereby exposed to significant wear. Check by placing the shaft in the non-driving shaft bearings and comparing. Replace slide bearing if necessary.

Tools
There are no special tools in production for replacing slide bearings. The following simple tool solution works well:

To remove slide bearings, use a ½ inch screw tap. A nut is used in the three sealed bearing houses to provide resistance in the bottom.

The driveshaft is used for fitting. In order to minimise the risk of surface damage to the driveshaft, use a shaft from a scrapped motor.



Removal

Driveshaft slide bearings in motor housing
Screw the screw tap into the bearing a few turns.

Turn the jaws in the vice with the soft side (fibre jaws) facing upward.

Turn the motor housing. Tap out the slide bearing using a pin punch.

Removal

Driveshaft slide bearings in motor housing
Screw the screw tap a few turns down into the bearing so that it becomes securely attached.

Turn the jaws in the vice with the soft side (fibre jaws) facing upward. Tighten the jaws so that the motor housing has a substantial support surface. Wooden blocks may be used instead of fibre jaws. Under no circumstances may metal jaws be used – this damages the sealing plane.

Turn the motor housing with the sealing plane towards the vice. Place a pin punch against the screw tap and tap out the slide bearing.

Removal

Closed bearing housing

Place a nut or washer as support in the bottom of the bearing housing.

Screw in the screw tap. The bearing should lift out.

IMPORTANT

Thoroughly remove any metallic debris using compressed air after removal!

Removal

Closed bearing housing

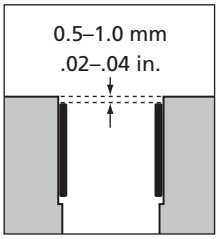
Removal of both non-driving shaft slide bearings and the driveshaft bearing in the cover is done in the following way:

Place a nut or washer as support in the bottom of the bearing housing.

Remove the bearing by screwing in the screw tap. This should lift the bearing when the pin reaches the bottom of the bearing housing.

IMPORTANT

Thoroughly remove any metallic debris using compressed air after removal!

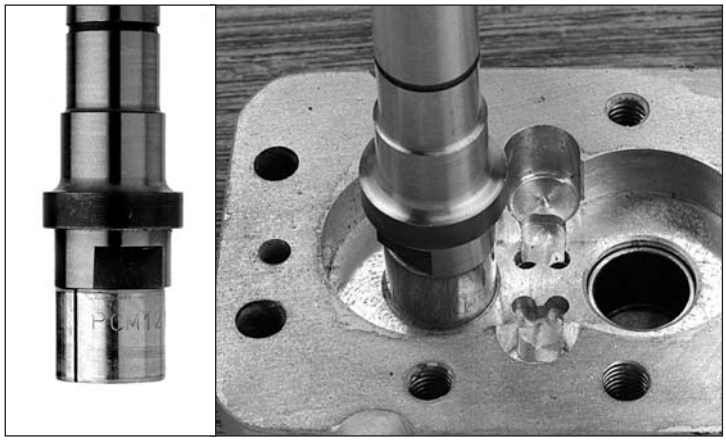


Fitting

Driveshaft slide bearings in motor housing

Fit the new bearing on the driveshaft as shown in the picture.

Tap down the bearing using a plastic mallet on the shaft until the bearing is 0.5–1.0 mm (.02–.04 in.) below the sealing plane.

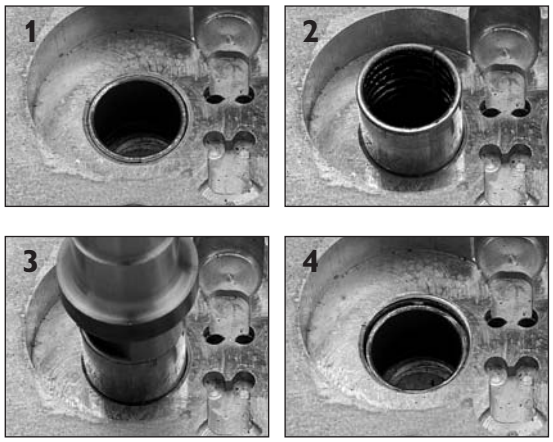


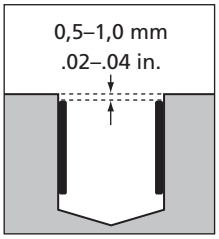
Sealed bearing housing

Fitting of both non-driving shaft slide bearings and the driveshaft bearing in the cover is done in the following way:

Fit the new bearing on the driveshaft as shown in the picture.

Tap down the bearing using a plastic mallet on the shaft until the bearing is level with the gear sealing plane.





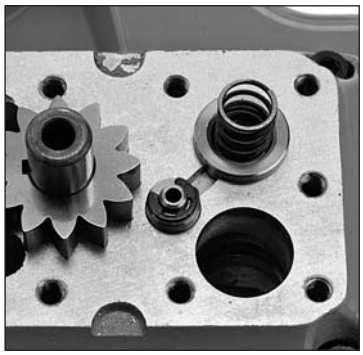
Use a scrapped bearing and tap down the fitted bearing a further 0.5–1.0 mm (.02–.04 in.) below the gear sealing plane.

1. Starting position.

2. Place a scrapped bearing on the fitted bearing.

3. Tap the bearing down 0.5–1.0 mm (.02–.04 in.) below the gear sealing plane.

4. Fitting is now complete.



Main valve

Function

The main valve manages the start and stop function of the hydraulic motor by guiding the oil flow to the gears or the return side. The position of the main valve is dictated by the servo valve, which is directly connected to the start control.

Important for the function

The main valve must be able to move without hindrance and the sealing rings must be intact. It is very important that the small hole in the centre of the plastic hat is open. If it is blocked, the motor will not start. It is also important that the plastic hat is kept in position relative to the main valve (by the O-ring) with a certain amount of resistance.

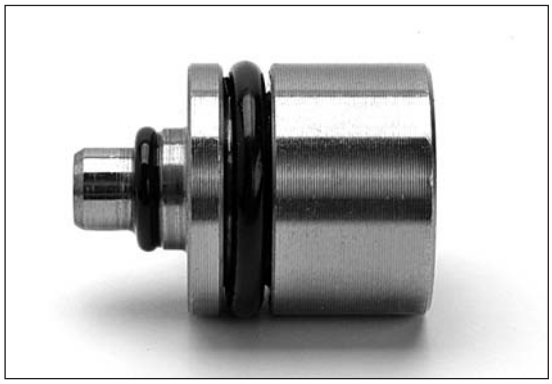
Removal

Remove the spring and lift the valve.

Removal

Remove the coiled spring from the main valve.

Lift the valve with a twisting motion using a pair of circlip pliers.



Inspection

Lift the plastic hat off and check that the piston is free from corrosion and dirt.

Check the O-rings.

The smaller O-ring must hold the plastic hat in position.

Inspection

Lift the plastic hat off and check that the piston is free from corrosion and dirt. Also check that the bore for the piston in the motor is free from damage and contaminants.

Check that the O-rings are intact.

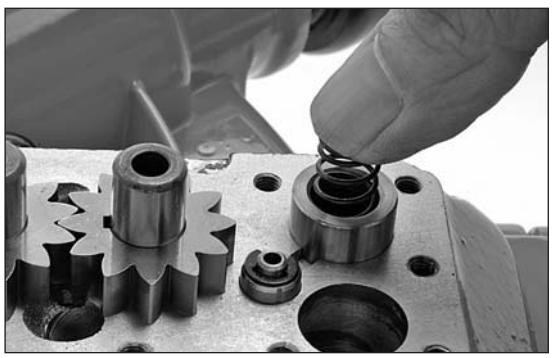
It is important that the smaller O-ring holds the plastic hat in position with a certain amount of resistance. Otherwise, replace the O-ring or plastic hat.

Check that the plastic hat is intact and that the hole in the centre is open.

Check the condition of the spring.

Check that the plastic hat is intact and that the hole in the centre is free from contamination.

Check that the spring is intact, i.e. free from corrosion and fatigue.

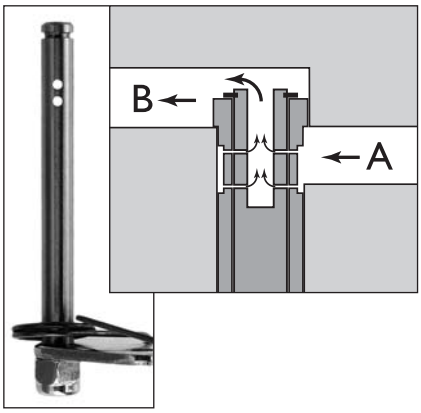


Check piston movement

Place the main valve in position and press it down into its bore so that approximately 5 mm/ .2 in. remain until it bottoms. Using the power of the spring, it should now be possible to move the piston to its bottom position.

Check piston movement

Place the main valve assembly in position and press it down into its bore so that approximately 5 mm/.2 in. remain until it bottoms. Using the power of the spring, it should now be possible to move the piston to its bottom position.



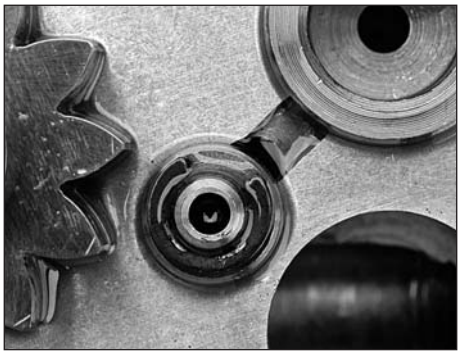
Servo valve

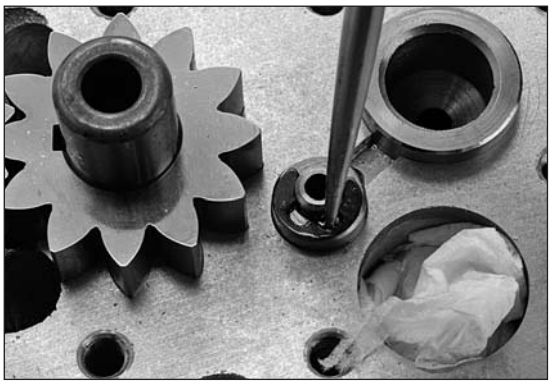
Function

The servo valve is mechanically connected to the start control. It hydraulically controls the start and stop function of the main valve. Its design ensures that the start control can be operated with minimal force.

The fixed and the movable part of the servo valve has two small holes through which hydraulic oil can pass whenever the holes are lined up. In this open position, the motor becomes inoperative. When the moving part (the servo shaft) is turned and the servo valve is closed, the motor starts.

A – milled channel in motor housing from main valve
B – milled channel in cover towards return pipe





Inspection

First check that the servo valve mechanically returns to the stop position when the start control is released. Remove any contaminants that prevent movement.

Check that the spring is intact and is in the correct position.

Then check that the servo valve channels are open. This can be done in the following way without removing the servo valve:

Spray oil in the servo shaft and at the inlet located on the side of the servo valve. Apply compressed air to the shaft and note whether any air bubbles come out through the inlet.

If the valve is blocked, remove the servo shaft for cleaning.

Removal

Remove the e-clip and pull out the servo shaft.

Cleaning

Blow the fixed section of the valve clean in the same way as during the inspection. Block off the underside.

Blow the servo shaft channel and hole clean.

Re-fitting

Fit the return spring on the opposite side in the correct position before fitting the e-clip; refer to the pictures above.

Removal

Cover the return channel with paper in order to prevent the e-clip falling in. Remove the lock washer using an awl or a small screwdriver. The servo shaft can then be pulled out.

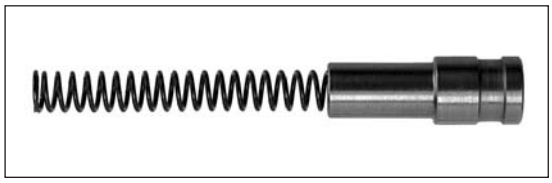
Cleaning

Blow the fixed section of the valve clean in the same way as during the inspection described above. Block off the underside.

Blow the servo shaft channel and hole clean.

Re-fitting

Fit the return spring on the opposite side in the correct position before fitting the e-clip; refer to the pictures above.

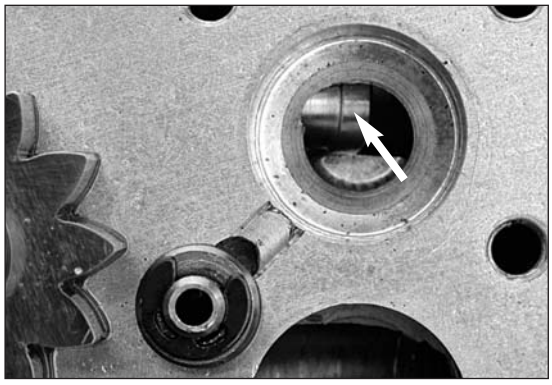


Brake valve

Function

The main task of the brake valve is to quickly slow the rotation of the blade once the start control has been released. This function is particularly important on the K2500 with its practically friction-free transmission system. Without a functioning brake valve, the blade on the K2500 would rotate even with the start control in stop position. (An explanation of this can be found on page 30.)

Problems with the brake valve are practically unheard of. However, sometimes it is a component that mechanics forget to re-fit!



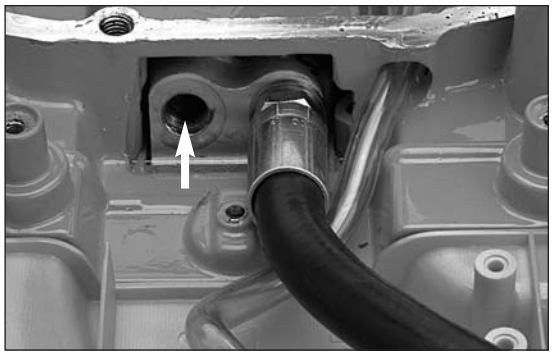
Inspection

From the position of the main valve: Push the valve towards the spring.

Inspection

Movement of the brake valve can be checked in two ways:

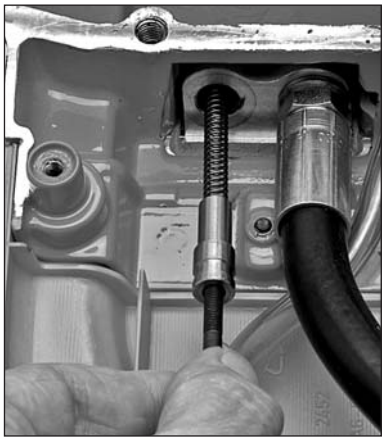
From the position of the main valve: With the hydraulic motor cover and the main valve removed, the brake valve becomes accessible. Push it towards the spring using a screwdriver.



Pressure hose position:
Insert a Philips screwdriver.

Pressure hose position:
It is best to test the brake valve from the pressure side of the hydraulic motor as the hydraulic hose has been removed. Insert a Philips screwdriver and test valve movement.

If the inspection is done in this way, the brake valve should be removed for inspection at the same time.



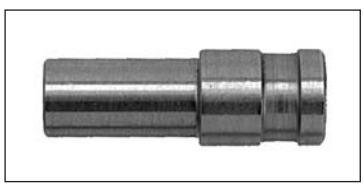
Removal

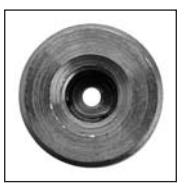
The brake valve has an M5 thread and is pulled out using a screw.

Removal

The brake valve has an M5 screw thread in the end towards the hydraulic hose. Screw a long screw into the brake valve and pull out the complete unit.

If the spring does not come out, this can easily be removed using a magnetic driver.



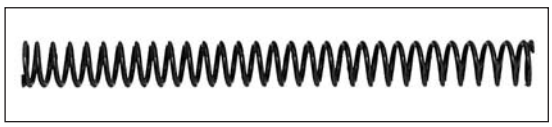


Inspection

Check that the units are free from external damage/corrosion and contaminants. Check that the centre hole is open.

Inspection

The valve and the spring must be free from external damage/corrosion and contaminants. Check that the centre hole of the brake valve is open.



● = Service action

506 38 85-01
Press tool for roller bearings, K3600 MkII

● Removal and fitting of engagement and support roller bearings.

● Fitting of support roller sealing collar.

506 37 53-01
Press tool for engagement roller bearing socket, K3600 MkII

● Removal and fitting of engagement roller bearing socket.

506 37 61-02
Bearing press, K2500

● Removal and fitting of blade shaft bearings.

Conversion tables

There are measurements for volume, pressure and flow other than those we have used in this workshop manual.

VOLUME

1 US gallon = 3,785 litres
1 litre = 0,264 US gallon

In terms of volume, there is also the British gallon (British Imperial System):

1 Imp. gallon = 4,546 litres
1 litre = 0,220 Imp. gallon

FLOW

gpm (US gallons per minute)

1 gpm = 3,785 litre/minute
1 litre/minute = 0,264 gpm

PRESSURE

psi (pounds per square inch)
kPa (kilopascal)

1 psi = 0,069 bar
1 bar = 14,504 psi

1 psi = 6,895 kPa
1 kPa = 0,145 psi

1 bar = 100 kPa

Calculation of power

Hydraulic power (P) expressed in kilowatts is calculated in the following way:

POWER

$$P = \frac{Q \times p}{600}$$

P = power, kW
Q = flow in litres/minute
p = pressure in bar

TORQUE

For conversion of screw tightening torques:

1 lbf·ft = 1,356 Nm
1 Nm = 0,738 lbf·ft

ARNE PALMQUIST • Print: Risbergs

Husqvarna

www.husqvarnacp.com

502 53 06-26
English
2007-08