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***JF-STOLL***

# Chopping section for Chop Forage Wagon

ES 3000 | ES 3600 | ES 4200



## Instruction Manual

“Original instructions”

Edition 5 | April 2010

**EN EC-Declaration of Conformity**  
according to Directive 2006/42/EC

**DE EG-Konformitätserklärung**  
entsprechend der EG-Richtlinie 2006/42/EC

**IT Dichiarazione CE di Conformità**  
ai sensi della direttiva 2006/42/EC

**NL EG-Verklaring van conformiteit**  
overeenstemming met Machinerichtlijn 2006/42/EC

**FR Déclaration de conformité pour la CEE**  
conforme à la directive de la 2006/42/EC

**ES CEE Declaración de Conformidad**  
según la normativa de la 2006/42/EC

**PT Declaração de conformidade**  
conforme a norma da C.E.E. 2006/42/EC

**DA EF-overensstemmelseserklæring**  
i henhold til EF-direktiv 2006/42/EC

**PL Deklaracja Zgodności CE**  
według Dyrektywy Maszynowej 2006/42/EC

**FI EY : N Vaatimustenmukaisuusilmoitus**  
täyttää EY direktiivin 2006/42/EC

EN We,  
DE Wir,  
IT Noi,  
NL Wij,  
FR Nous,  
ES Vi,  
PT Me,  
DA Vi,  
PL Nosotros,  
FI Nöus,

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IT Dichiaro sotto la propria responsabilità che il prodotto:  
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PL deklarujemy z pełną odpowiedzialnością, iż produkt:  
FI ilmoitamme yksin vastaavamme, että tuote:

EN Model:  
DE Typ :  
IT Tipo :  
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FR Modèle :  
ES modelo :  
PT Marca :  
DA Typ :  
PL Model :  
FI Merkki :

**ES 3000**  
**ES 3600**  
**ES 4200**

**EN to which this declaration relates corresponds to the relevant basic safety and health requirements of the Directive:**

**2006/42/EC**

DE auf das sich diese Erklärung bezieht, den einschlägigen grundlegenden Sicherheits- und Gesundheitsanforderungen der EG 2006/42/EC

IT E' Conforme ai Requisiti Essenziali di Sicurezza a di tutela della Salute di cui alla Direttiva e sue successive modificazioni: 2006/42/EC

NL waarop deze verklaring betrekking heeft voldoet aan de van toepassing zijnde fundamentele eisen inzake veiligheid en gezondheid van de EG-machinerichtlijn no: 2006/42/EC

FR faisant l'objet de la déclaration est conforme aux prescriptions fondamentales en matière de sécurité et de santé stipulées dans la Directive de la: 2006/42/EC

ES al cual se refiere la presente declaración corresponde a las exigencias básicas de la normativa de la y referentes a la seguridad y a la sanidad:

2006/42/EC

PT a que se refere esta declaração corresponde às exigências fundamentais respectivas à segurança e à saúde de norma da 2006/42/EC

DA som er omfattet af denne erklæring, overholder de relevante grundlæggende sikkerheds- og sundhedskrav i EF-direktiv sam: 2006/42/EC

PL dla którego się ta deklaracja odnosi, odpowiada właściwym podstawowym wymogom bezpieczeństwa i ochrony zdrowia Dyrektywy Maszynowej: 2006/42/EC

FI johon tämä ilmoitus liittyy, vastaa EY direktiivissä mainittuja perusturvallisuus- ja terveysvaatimuksia (soveltuvien osien) sekä muita siihen kuuluvia EY direktiivejä: 2006/42/EC



Konstruktion (Design) + Produktion (Production)  
Sønderborg, 15.12.2009 Jørn Freudendahl

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# PREFACE

## DEAR CUSTOMER!

We appreciate the confidence you have shown our company by investing in a JF-product and congratulate you with your new machine. Of course, it is our wish that you will experience complete satisfaction with the investment.

This instruction manual contains information about correct and safe use of JF-Fabriken's ES product.

The ES product is a precision chop forage trailer, i.e. a combination of a precision chopper and a trailer unit.

When buying the machine you will receive instructions about use, adjustment and maintenance.

**However, this first introduction** cannot replace a more thorough knowledge of the correct technical use of the machine to keep the machine operational and ensure long life.

**Therefore you should read this instruction manual** before using the machine. Pay special attention to the safety instructions.

To make it easier for you to start working with the machine, the information in this instruction manual is mentioned in the order you will need it. Apart from this, we have made the instruction manual easier to read by using pictures with text in each chapter.

"Right" and "Left" are defined from a position behind the machine, facing the direction of travel.

All the information, illustrations and technical specifications in this instruction manual describe various equipment, which is not necessarily standard.

As JF-Fabriken wishes to constantly improve the technical standard in order to meet the requirements to a modern farm machine, the company reserves the right to make changes or improvements in the design or construction of any part without incurring the obligations to install such changes on any unit previously delivered.

We recommend you to keep this instruction manual so that it can be supplied with the machine in case it is sold later on.

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# 1. INTRODUCTION

## INTENDED USE

The precision chop forage trailer **ES is solely constructed and manufactured for the usual work in agriculture when you wish to:** 1) pick up and chop pre-dried swaths of grass for the production of silage intended for cattle feed 2) transport the loaded grass on public road from the field to the farm, and 3) unload the grass in a stack for storage at the farm.

Never dismount trailer from the precision chopper in order to use the remaining unit as a special precision chopper and/or forage trailer, respectively, as they will be neither legal nor safe when used separately.

The precision chop forage trailer may only be mounted on a tractor which considers the specifications of the trailer and is legal to use.

**Any use beyond this is outside the intended use. JF-Fabriken A/S is not responsible for any damage resulting from such use, the user bears that risk.**

It is assumed that the work with the forage trailer is performed under reasonable conditions, including that 1) the grass swath to be picked up is uniform, pre-dried and does not exceed the pick-up width of the precision chopper, 2) the trailer unit is not overloaded due to insufficient pre-drying 3) speed and driving technique are adjusted to the conditions.

ES is constructed for using when you wish to pre-dry the grass to minimum 30% dry matter. If ES is used for picking up and chopping of wet grass, it should be ensured that the allowable axle load and driving speed are observed according to the specifications applying to the machine. Likewise, you should always observe the traffic rules.

Intended use, of course, implies that the prescriptions concerning adjustment, operation and maintenance in the instruction manual are observed.

**The ES product should only be used, maintained and repaired by persons who, through relevant instructions and after reading the instruction manual, are familiar with the machine and, in particular, are informed of possible dangers.**

In the following there are a number of general and special safety instructions which **must** be observed altogether.

If changes are made on the machine and its construction without permission from JF-Fabriken A/S, JF-Fabriken A/S cannot be held responsible for any damage resulting from this.

### CONCEPT

As mentioned the ES product is a precision chop forage trailer which is intended for contractors and large professional farms.

In the development of the ES product it was a requirement that the machine should not only be able to ensure effective picking-up, chopping and transport of grass but also be simple to operate.

The product concept contains a number of special technical solutions as shown below:

- Precision chop unit with "Direct cut" chopping of grass.
- 32-blade chopping rotor with very high chopping frequency (24-blade on model 3000).
- Possibility of metal detector (not model 3000).
- Possibility of turning the delivery chute to parallel operation (option on model 3000).
- Trailer unit with high loading capacity.
- Sprung bogie.
- Turnable wheel axle with articulation (option on model 3000).
- Large low-profile tyres
- Double conveyor chain, hydraulic.
- Hardtop on the trailer.

Some of these technical solutions are described in the following

#### **"DIRECT CUTTING"**

Already in 1972, JF-Fabriken A/S had developed and manufactured its first precision chopper - FC 80 - which for a whole decade, until the late 80s, kept the rank as the most sold precision chopper in Europe. Contrary to the previously known machines, JF-Fabriken A/S developed a precision chopper on which the direction of rotation was opposite. This means that the rotor was chopping the crop upwards whereby the chopping effect at the same time is used to throw the material upwards and out through the delivery chute of the machine.

This opposite direction of rotation is often called "uppercut" or "Direct Cut". The idea is obviously to reduce the friction loss by not carrying the material around after it has been chopped before it is finally thrown out through the chute.

By using a "Direct Cut" concept and reduce friction losses, it is possible to:

- reduce wear of blades and shearbars as the material is not carried around in the rotor housing and
- limit the power requirements of the tractor, which again will mean lower operation and maintenance costs of the tractor.

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The power transmission in a precision chopper has been examined on several occasions, and for the conventional version it has been demonstrated that 40% of the total power is used to throw out the material, 40% is used for chopping and slightly over 20% for picking up. The chopping power itself in this analysis includes power for feed intake, compression and chopping.

Statens Maskin Provingar Sweden (1985) and American Society of Agricultural Engineers (1991) have, independent of each other, proved that Direct Cut will reduce the total power requirement by over 30% compared to the conventional working method.

## BLADE ROTOR

Another important characteristic of JF-Fabriken's precision choppers is the multi-blade rotor with the many blades and the high chopping frequency.

ES 3600 and ES 4200 have a rotor with blades i 8 rows (4 single blades in each), whereas ES 3000 has a rotor with 6 rows (4 single blades in each).

*The blade rotor works at 1600 RPM, which gives the following chopping frequency:*

- 32 blade rotor - Number of blade rows x number of rotations corresponding to  $1600 \times 8 = 12,800$  chops per minute.
- 24 blade rotor - Number of blade rows x number of rotations corresponding to  $1600 \times 6 = 9,600$  chops per minute.

The chopping frequency, the cutting length adjustment and the passage at the roller section are the most decisive elements for the capacity and almost correspond to that which you find on several self-propelled precision choppers.

Capacity, however, is difficult to define and compare as, for a forage harvester, it will depend not just on which crop is being cut but also how the crop has been treated before it is picked up or cut by the machine and finally which cutting length adjustment the machine is working with.

If we take a forage harvester which, in fresh, not pre-dried grass, can work 100 tons per hour, it is possible to calculate the capacity at different per cents of dry matter depending on the pre-treatment before cutting, as shown in the following table.

	<b>Dry matter</b>	<b>Capacity</b>
Dry matter	100 %	18 ton/h
Wet new grass	15 %	120 ton/h
Not pre-dried grass	18 %	100 ton/h
Pre-dried grass – no outflow of sap from clamp silo	25 %	72 ton/h
Pre-dried grass – no outflow of sap from high tower silo	33 %	55 ton/h
Very pre-dried grass	50 %	36 ton/h
Straw, very dry	90 %	20 ton/h

It will probably surprise most people that the capacity can vary between 20 and 120 ton/h, as a result of varying water content.

# 1. INTRODUCTION

## METAL DETECTOR

The metal detector is mounted on a type of ES 3600 and ES 4200. The detector is a valuable help to reduce possible damage in the blade rotor of the precision chopper as a result of metal parts, e.g. rake tines, conditioner flails etc. lost in the field.

The metal detector also has the effect that it subsequently protects the animals against sharp metal parts in the feed. It is obvious that metal parts can cause serious digestion problems for animals that - by accident - eat contaminated feed.

## LOADING CAPACITY

The loading capacity of the 3 ES models is 30, 36, and 42 m<sup>3</sup> respectively. The allowable axle load and drawbar load is, however, dependent on the predrying degree of the grass. It is normal practice for silage to seek at least 30 % dry matter to reduce waste and loss of fodder value as a result of an outflow of sap from the pile.

The requirements to the allowable axle load and drawbar load is, however, increased by the maximum driving speed. **The ES product is constructed to allow 40 km/h at 30-35 % pre-drying of the grass.**

If a lower driving speed is chosen, the requirement for pre-drying can also be lower. The maximum loads and the distribution are shown in the table below.

Model	Wheels	Speed	Weight drawbar		Weight wheel axles		Loading capacity	Total weight
			Empty	Full load	Empty	Full load		
ES 3000	550/60x22,5	25 km/h	1,580 kg	2,000 kg	5,480 kg	16,000 kg	10,940 kg	18,000 kg
ES 3000	550/60x22,5	40 km/h	1,580 kg	2,000 kg	5,480 kg	14,000 kg	8,940 kg	16,000 kg
ES 3600	700/40x22.5	25 km/h	1,660 kg	2,500 kg	6,400 kg	22,000 kg	16,440 kg	24,500 kg
ES 3600	700/40x22.5	40 km/h	1,660 kg	2,500 kg	6,400 kg	19,000 kg	13,440 kg	21,500 kg
ES 4200	750/45x22.5	25 km/h	1,680 kg	2,800 kg	7,600 kg	25,000 kg	18,520 kg	27,800 kg
ES 4200	750/45x22.5	40 km/h	1,680 kg	2,800 kg	7,600 kg	22,000 kg	15,520 kg	24,800 kg

**Note: “Full load max. on axles” in some countries it is not allowed on public roads!**

**This load may only be utilized at maximum tyre pressure according to the tyre pressure table in the section “MAINTENANCE”.**

## SPRUNG BOGIE WITH ARTICULATION

To increase the manoeuvrability in the field without damaging the grass roots, the rear axle of the trailer has articulated wheels. At the same time low-profile tyres are mounted, reducing driving damage caused by high tyre pressure.

*NB: Axle with articulated wheels is optional equipment for ES 3000.*

The suspension of the wheel axles obviously provides a more steady and comfortable operation with the ES product.

## SAFETY

Within agriculture there are generally many working-related injuries due to operation errors and insufficient instruction. The safety of persons and machines is an integral part of JF-Fabriken's development work. **We wish to ensure the safety of you and your family in the best possible way**, but this also requires an effort on your part.

A precision chop forage trailer cannot be constructed in such a way that it guarantees the full safety of persons and at the same time performs an efficient piece of work. This means that it is very important that you as user of the machine pay high attention and use the machine correctly and thereby avoid exposing yourself and others to unnecessary danger.

The machine demands skilled operation, which means that **you should read the instruction manual before you connect the machine to the tractor**. Even though you have been driving a similar machine before, you should read the manual - this is a matter of your own and other persons' safety!

This is also the reason why you should **never** leave the machine to others before you have made sure that they have received the necessary instructions how to operate the machine correctly.

## DEFINITIONS

The safety decals and the instruction manual of the machine contain a line of safety notes. The safety notes mention certain measures, which we recommend you to follow as to increase the personal safety as much as possible.

We recommend that you take the necessary time to read the safety instructions and inform your staff to do the same.



In the instruction manual this symbol is used where there are factors directly or indirectly of importance in regard to personal safety.

### **CAUTION:**

The word CAUTION is used to ensure that the operator follows the general safety instructions or the measures mentioned in the instruction manual to protect himself and others against injuries.

### **WARNING:**

The word WARNING is used to warn against visible or hidden risks, which might lead to serious personal injuries.

### **DANGER:**

The word DANGER is used to indicate measures which, according to legislation, must be followed to protect oneself and others against serious injuries.

# 1. INTRODUCTION

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## **GENERAL SAFETY INSTRUCTIONS**

The following is a brief description of the measures, which should be a matter of common knowledge to the operator.

1. Apart from the instructions in the instruction manual, you should always follow the generally applying safety rules.
2. Before you start working, you should become acquainted with the arrangement and operation of the machine as it is too late to do this while you are working.
3. Activate the parking brake of the tractor and stop the tractor engine before you leave the tractor. Also, always disengage the power take-out if you want to stand at or above the precision chopper and in or under the platform of the trailer in order to adjust, check, maintain and/or clean the machine.
4. Never start the tractor until all persons are safely away from the machine.
5. Make sure that all tools have been removed from the machine before starting the tractor.
6. Also make sure that damaged wearing parts have been replaced and that all guards are mounted correctly.
7. During work never wear loose clothes which can be pulled in by the moving parts of the machine. Always wear suitable shoes to avoid falling.
8. Do not change the guards or work with the machine when a guard is missing or defective.
9. Always drive with the statutory lights and safety marking during transport on public road and at night.
10. Limit the transport speed to the allowed speed for the trailer or the speed prescribed by law.
11. Do not stand near the machine while it is working.
12. When mounting the PTO drive shaft check that the number of RPM of the tractor matches those of the machine.
13. Always use hearing protectors if the noise from the machine is annoying or if you are working with the machine for a considerable period in a tractor cabin, which has not been silenced sufficiently.

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14. Never bring passengers in the tractor unless it is intended for passengers, and never let anybody stand on the platform of the trailer during working or transport.
15. Never use the machine for other purposes than what it has been constructed for.
16. Do not allow any children to be near when you are working with the machine.
17. Never stand between the tractor and the machine during connection and disconnection.
18. Do not feed material into the cutting unit, using hands or feet, while it is working.
19. Do not try to remove material from the cutting unit while it is working.
20. If material must be removed from the cutting unit, the PTO shaft must be disconnected completely. If in doubt stop the tractor engine before removing any material from the cutting unit.

## **CHOICE OF TRACTOR/REQUIREMENTS**

Always follow the recommendations specified in the instruction manual of the tractor. If this is not possible, technical assistance must be sought.

Use a tractor size which has maximum capacity on the power take-out (PTO) in the area 90 kW/120 HP up to 140 kW/190 HP.

The machine is as standard constructed for 1000 RPM and is delivered from the factory with a 1 3/8" – 21 splines yoke on the tractor side of the PTO shaft.

A suitable tractor will have a broad range of gears for driving speeds between 5 and 8 km/h.

The hydraulic outlet of the tractor should supply minimum 170 bar, and the safety valve on the tractor should be adjusted to 210 bar.

The ES 3600 and the ES 4200 require only 1 double-acting hydraulic outlet and a single-acting outlet for the brake hose, as the individual functions are operated electro-hydraulically.

The ES 3000 requires 2 double-acting and 2 single-acting hydraulic outlets as it has no electro-hydraulic system.

The hydraulic system for driving the conveyor chain in the trailer requires 0-30 l/min in case of normal operation. The maximum oil supply to the conveyor chain adjustment should not be higher than 50 l/min at 115 bar.

It is important that there is direct access to the 12-volt battery of the tractor. The lighting equipment requires a 7-pole outlet on the tractor with 12V continuous current.

# 1. INTRODUCTION

## CONNECTION AND DISCONNECTION

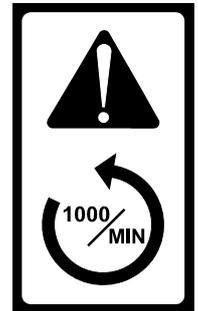
Always make sure that nobody is standing between the tractor and the trailer during connection and disconnection. An unintentional manoeuvre with the tractor may cause serious injury.



The ES product must be connected to the prescribed tractor device, hitch or towing hook.

When disconnecting the trailer it is important that the ground is even and stable so that the forage trailer does not move and injure persons or cause damage to other equipment. We recommend you to secure the forage trailer by means of stop blocks or by activating the parking brake of the trailer.

Check that the trailer is intended for the number and the direction of rotation of the tractor PTO. A wrongly chosen number of rotations may result in unsatisfactory chopping, and wrong direction of rotation may lead to unintended damage as the protection against overload of the transmission, the friction clutch, will not work as intended.



Always stop the tractor engine and remove the ignition key before connecting or disconnecting the PTO drive shaft.

Make sure that the PTO drive shaft has been mounted correctly, i.e. that the lock pin is in mesh and that the support chain has been fastened at both ends.

The PTO drive shaft must be correctly protected. If the guard is damaged it must be replaced immediately.

Check that all hydraulic couplings are correctly mounted and tight and that all hoses and fittings are undamaged before activating the hydraulic system.

When parking the machine and after the tractor engine has stopped make sure that there is no pressure in the hydraulic hoses by activating the tractor hydraulic spool valves.

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Check regularly if hoses and fittings are tight, and replace damaged hoses.

Hydraulic oil under pressure can penetrate the skin and cause serious infections. You should always protect the skin and the eyes against oil splashes.



If, by accident, hydraulic oil under pressure hits you, consult a doctor immediately.

### **ADJUSTMENT**

Before adjusting the machine, always:

- Disengage the PTO.
- Stop the tractor engine
- Wait until all moving parts have stopped.

It is important not to remove the guards until all revolving parts have stopped. This especially applies to the delivery chute above the blade rotor.

If the cutting parts in the blade rotor must be adjusted or replaced, it is important to block the rotor as the sharp blades can easily cause injury.

Before working, check that the feed rollers and the blade cylinder can move freely. Also check that the blades are intact and without cracks. Damaged blades must be replaced to prevent them from blocking or damaging the machine and to avoid metal parts being thrown out from the delivery chute.

Check periodically if blades and blade bolts are worn according to the rules in the instruction manual.

The first time you use the machine the blades and blade bolts may "bed in". For this reason you must check and tighten the blade bolts after the first working hour.

When lifting the delivery chute above the blade rotor make sure that nobody in the trailer is in danger of being hit by the guard. When lifting the guard, hold on to the hoop which is fastened to the intermediate guard with both hands.

It is important that nobody stands under the trailer unit while the conveyor chain is working.

Never stand under a raised rear door unless you have closed the ball valve which is mounted at the rear end at the side of the trailer. The ball valve prevents that the rear door is closed unintentionally with risk of injury. Also close the ball valve if leaving the trailer unit while the rear door is raised.

### **TRANSPORT**

Limit the transport speed to maximum speed allowed for the trailer in relation to the total weight or the maximum speed prescribed by law if this speed is lower.

Test the brakes of the trailer before driving on public road.

Always make sure that the trailer is stable and cannot move before maintaining brakes and hubs and replacing tyres.

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Repair of brakes, hubs and axles must only be made by persons with knowledge of the correct use of the necessary tools. Therefore, you should leave this kind of work to authorised workshops.

Check the tyre pressure regularly and make sure to observe the minimum values. The statutory lighting and traffic markings must be placed and connected correctly.

Reflectors and lighting equipment must be cleaned regularly.

### **WORKING**

Before you start working make sure that no persons are near the forage trailer, especially between the tractor and forage trailer. Likewise, make sure that the delivery chute points into the trailer unit as damaged blades may be thrown out when starting the precision chopper and cause serious personal injury.

Also make sure that no persons are in the trailer unit as there is a risk of suffocating in the flow of material or getting hit by metal parts.

If the feed rollers or the blade rotor are blocked, disconnect the power take-out, stop the tractor engine and activate the parking brake immediately and wait until all rotating parts have stopped before removing the material or the foreign matter.

Never remove material blocked in the machine while the machine is running and never feed material into the pick-up with your hands or feet as there is a serious danger of getting caught and pulled into the harvester which would cause dismemberment or death.

Therefore, never allow anyone to stand near the forage harvester while it is working, especially not children who do not know the danger and do unforeseen things.

Never load the trailer more than the allowed total axle load.

On hilly ground, the maximum inclination of the ground, at right angles to the direction of travel, should not exceed 10% otherwise a fully loaded trailer may overturn.

# 1. INTRODUCTION

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## UNLOADING

Drive to the clamp and make sure that no persons are near before you reverse and start unloading.

Pay special attention when driving in a stack to avoid the risk of overturning.

## PARKING

In the standard version the ES product has no parking brake. Therefore, when parking the machine always make sure to place stop blocks under the trailer wheels.



**WARNING:** Never park an ES product fully loaded, and always make sure that the machine is parked on an even and firm ground.

If working as contractor we recommend you to procure parking brakes.

Before parking the trailer the jack at the drawbar must be secured with a split pin, otherwise the trailer may overturn during parking.

Remember to disconnect the hydraulic hoses before driving away with the tractor.

## PREPARATION

In order to prepare the forage trailer it may be necessary to remove possible foreign matter in or under the trailer.

When preparing or maintaining the machine never let more than one person work at the machine at a time. This reduces the risk of getting fingers caught because another person by accident turns the revolving parts while you are still working with them.

Never be in or under the trailer until the PTO has been disconnected, the tractor engine has been stopped and the parking brake activated. This also applies if you will clean or grease the trailer.

## GREASING

When greasing or maintaining the machine never let more than one person work at the machine at a time. This reduces the risk of getting fingers caught because another person by accident turns the revolving parts while you are still working with them.

## GRINDING

When grinding always follow this procedure:

- Stop the tractor engine.
- Activate the parking brake.
- Wait until all moving parts have stopped.

Unfortunately it is necessary to remove some of the guards to change the direction of rotation of the rotor when grinding the blades. As there are chain and belt transmissions your hands may be injured if the revolving parts have not stopped before the guards are removed.

Grinding is performed according to the following procedure:

# 1. INTRODUCTION

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1. Check if the grindstone is undamaged and if the device is able to move back and forth easily.
2. Lower the guard behind the grinding device to give access to the blade cylinder.
3. Adjust the stone and guard the grinding device again.
4. Remove the guard above the blade cylinder transmission and change the direction of rotation of the rotor.
5. Fasten the guard again and check that there are no persons near the machine.
6. Start the tractor again and keep the rpm close to idling.
7. Perform the grinding carefully.

Always use safety glasses when grinding as small particles from the grindstone might hit you.

When grinding has finished, stop the tractor engine, change the direction of rotation and fasten all guards.

This cannot be said often enough: Only grind with all guards closed!

## **MAINTENANCE**

After approx. 2 days of operation, all bolts should be retightened, especially the blade bolts of the blade rotor and the wheel bolts.

Always make sure that the used spare parts are tightened to the correct torque.

When replacing parts in the hydraulic system always make sure that the pick-up rests on the ground and/or the lifting cylinders are blocked.

Hydraulic hoses must be checked by an expert before use, and after that minimum once a year. If necessary, they must be replaced. The working life of hydraulic hoses should not exceed 6 years, including maximum 2 years of storage.

When replacing, always use hoses which comply with the requirements stated by the manufacturer. All hoses are marked with date of production.

## 1. INTRODUCTION

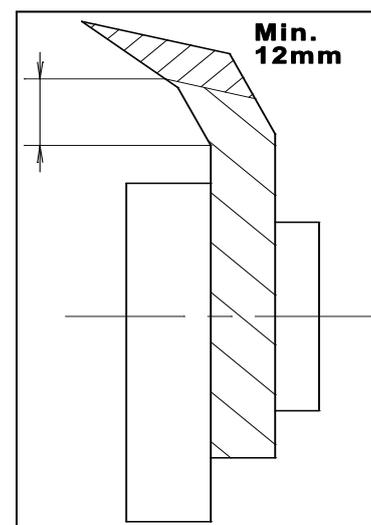
### REPLACEMENT OF WEARING PARTS

Blades, blade bolts and shearbar are made of high-alloyed, heat-treated materials. This heat treatment provides especially hard and ductile material which is able to withstand extreme stress. Damaged blades, blade bolts or shearbars must be replaced by original -JF- spare parts to ensure safe operation.

Blades and blade bolts must be checked every day during the season.

The special blade bolts must be tightened with a torque wrench to 40 kgm (400 Nm).

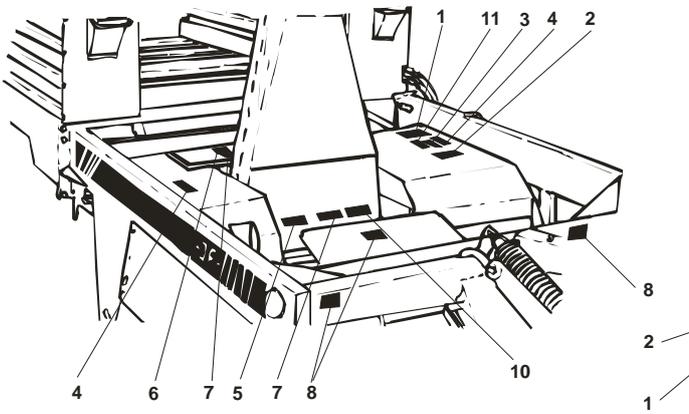
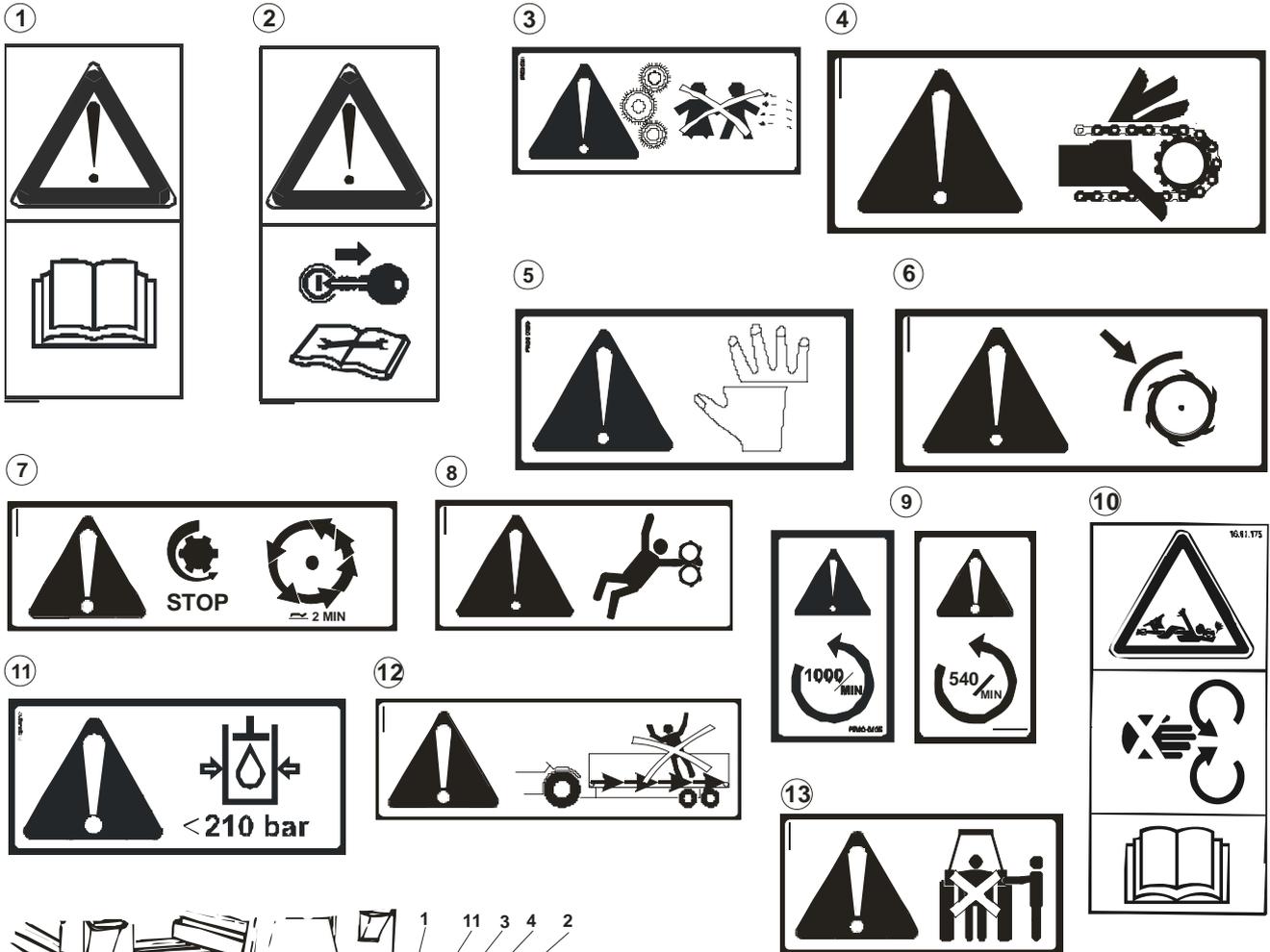
When the blades have been worn max. 8 mm or approx. 12 mm above the straight piece, they must be replaced.



After replacement of blades, blade bolts and the like check that no tools have been left in the machine.

Always use original -JF- spare parts to ensure safe operation.

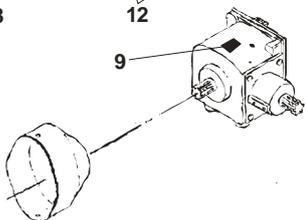
# 1. INTRODUCTION



VENSTRE / LEFT / LINKS



HØJRE / RIGHT / RECHTS



# 1. INTRODUCTION

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## Safety decals

The safety decals shown on the previous page are positioned as shown on the drawing. Before using the machine, check that all decals are present: if not, require those missing. The decals have the following meaning:

**1. Stop the tractor engine and remove the ignition key before touching the machine.**

Always remember to stop the tractor engine before lubricating, adjusting, maintaining or repairing. Also remember to remove the ignition key to ensure that nobody starts the engine until you have finished.

**2. Read the instruction manual and the safety instructions.**

This is to remind you to read the delivered documents to ensure the machine is operated correctly and to avoid unnecessary accidents and machine damage.

**3. Children.**

Never let children stand near the machine during operation. Especially not small children as they have a tendency to do unforeseen things.

**4. Chain drive**

One or more chain drives are placed under this guard. Make sure that the tractor engine has stopped before opening the guard.

**5. Risk of cutting.**

There is a risk of getting fingers etc. caught several places on the machine. Be careful when the machine is connected to the tractor and ready to work. The machine can easily crush or cut off any part of the body that might get caught in the machine.

**6. Remember the guards when grinding.**

Remember to close ALL guards before grinding.

**7. Rotating parts.**

After the PTO drive shaft has stopped, the blades will have a momentum where they keep rotating for up to 2 minutes. Wait until the blades have come to a complete stop before removing guards for inspection or maintenance.

**8. Risk of getting pulled into the machine**

Do not stand near the attachments or the feed rollers while the machine is running. Make sure that the tractor engine has stopped first.

**9. The number and the direction of rotations.**

Check that the PTO drive shaft runs with the right RPM and in the right direction. A wrong number of rotations and/or direction of rotation can damage the machine with the risk of personal injury as a result.

**10. The PTO drive shaft.**

This decal has the purpose to remind you how dangerous the PTO drive shaft can be if it is not correctly mounted or protected.

**11. Maximum 210 bar.**

Make sure that the hydraulic components are not exposed to more pressure than maximum 210 bar as there could be a risk of explosive damage of parts. Hereby you expose yourself and others to serious danger of getting hit by metal parts with high speed or oil under high pressure.

**12. Conveyor chain**

Under this trailer is a chain drive. Make sure that the tractor engine has stopped before you approach the chain drive.

**13. Risk of injury**

There is a risk of injury if standing under a raised rear door.

# 1. INTRODUCTION

## TECHNICAL DATA (ES 3000 AND ES 3000S)

Unit	Technical data	ES 3000	ES 3000S
ES forage trailer	Length	9.9 m	9.9 m
	Height	3.8 m	3.8 m
	Width with tyres	2.55 m	2.72 m
	Allowed axle load at 40 km/h	14,000 kg	16,000 kg
	Allowed axle load at 25 km/h	16,000 kg	18,000 kg
	Drawbar load	1,500-2,000 kg	1,500-2,000 kg
	Power requirement	70-110 Kw / 95-150 HP	70-110 Kw / 95-150 HP
	PTO rpm	1,000 rpm	1,000 rpm
	Hydraulic outlets	2 double-acting and 2 single-acting	2 double-acting and 3 single-acting
	Reversing valve (3 S-A outlets for 1)		Option
	Electric adjustments	Turning of chute deflector and reverse	Turning of chute deflector and reverse
	Friction clutch	Standard, 1200 Nm	Standard, 1200 Nm
	Freewheel	Standard	Standard
Chopping unit	Pick up width	1.8 m	1.8 m
	Capacity (dependent on the crop)	25-60 t/hour	25-60 t/hour
	Blade rotor width	0.72 m	0.72 m
	Rpm for rotor	1,600 rpm	1,600 rpm
	Number of blades, standard	24	24
	HD-blades	Standard	Standard
	Grinding device	Grindstone with "quick" adjustment	Grindstone with "quick" adjustment
	Reverse grinding	Standard	Standard
	Theoretical cutting length	7.5 / -15 (Standard) – 30 mm	7.5 / -15 (Standard) – 30 mm
	Turnable shearbar	Standard	Standard
	Number of feed rollers	4	4
	Reverse of feed intake	Standard, electric	Standard, electric
	Rubber wheels for pick-up	Standard	Standard
	Turning of chute	Option	Option
Trailer unit	Loading volume DIN	30 m <sup>3</sup>	30 m <sup>3</sup>
	Number of conveyor chains	4	4
	Type of conveyor chain	Kolhswa	Kolhswa
	Unloading time	1 -1½ min.	1 -1½ min.
	Sprung bogie axles	Standard	Standard
	Turnable axle with articulation	Optional (see S-model)	Standard
	Wheels	550/60 – 22,5	700/40 – 22.5
	Tyre pressure	Maximum 3.0 bar	Maximum 2.6 bar
	Track width	2.0 m	2.0 m
	Hardtop	Standard	Standard
	Platform sides	Aluzink	Aluzink
	Clevis eye	Turnable	Turnable
	Drawbar	Telescopic	Telescopic
	Bumper	Extra	Extra
Wheel guards	Extra	Extra	
Lighting equipment	Standard	Standard	
Parking brake	Extra	Extra	

# 1. INTRODUCTION

## TECHNICAL DATA (ES 3600 AND ES 4200)

Unit	Technical data	ES 3600	ES 4200
ES forage trailer	Length	11.2 m	12.1 m
	Height	3.8 m	4.0 m
	Width with tyres	2.72 m	2.85 m
	Allowed axle load at 40 km/h	16,000 kg	19,000 kg
	Allowed axle load at 25 km/h	18,000 kg	23,500 kg
	Drawbar load	approx. 1,500-2,000 kg	approx. 1,500-2,000 kg
	Power requirement	90-147 kW/120-200 HP	111-147 kW/150-200 HP
	PTO rpm	1,000 rpm	1,000 rpm
	Hydraulic outlets	1 single + no pressure return to tank and brake outlet	1 single + no pressure return to tank and brake outlet
	Max. oil flow from tractor	90 l/min.	90 l/min.
	Electric adjustments	Pick-up lifting, turning of chute, deflector, reverse, drawbar, rear door, conveyor chain and articulation (bogie)	Pick-up lifting, turning of chute, deflector, reverse, drawbar, rear door, conveyor chain and articulation (bogie)
	Friction clutch	Standard, 2100 Nm	Standard, 2100 Nm
Freewheel	Standard	Standard	
Chop-ping unit	Pick up width	1.8 m	1.8 m
	Capacity (dependent on the crop)	35-100 t/hour	35-100 t/hour
	Blade rotor width	0.72 m	0.72 m
	Rpm for rotor	1,600 rpm	1,600 rpm
	Number of blades, standard	32	32
	HD-blades	Standard	Standard
	Grinding device	Grindstone with "quick" adjustment	Grindstone with "quick" adjustment
	Reverse grinding	Standard	Standard
	Theoretical cutting length	15 mm (Standard)	15 mm (Standard)
	Turnable shearbar	Standard	Standard
	Number of feed rollers	4	4
	Reverse of feed intake	Standard, electric	Standard, electric
	Rubber wheels for pick-up	Standard	Standard
	Turning of chute	Standard, 210 degr.	Standard, 210 degr.
	Metal detector	Available version	Available version
Trailer unit	Loading volume DIN	36 m <sup>3</sup>	42 m <sup>3</sup>
	Number of conveyor chains	4	4
	Type of conveyor chain	Kolhswa	Kolhswa
	Unloading time	1 -1½ min.	1½ - 2 min.
	Sprung bogie axles	Standard	Standard
	Turnable axle with articulation	Standard	Standard
	Wheels	700/40 – 22.5	750/45 – 22.5
	Tyre pressure	Maximum 2.6 bar	Maximum 2.6 bar
	Track width	2,0	2.1 m
	Hardtop	Standard	Standard
	Platform sides	Aluzink	Aluzink
	Clevis eye	Turnable	Turnable
	Drawbar	Telescopic	Telescopic
	Bumper	Extra	Extra
	Wheel guards	Extra	Extra
Lighting equipment	Standard	Standard	
Parking brake	Extra	Extra	

## 2. PREPARATION

This section describes the preparation of the product at the importer's or at the dealer's.

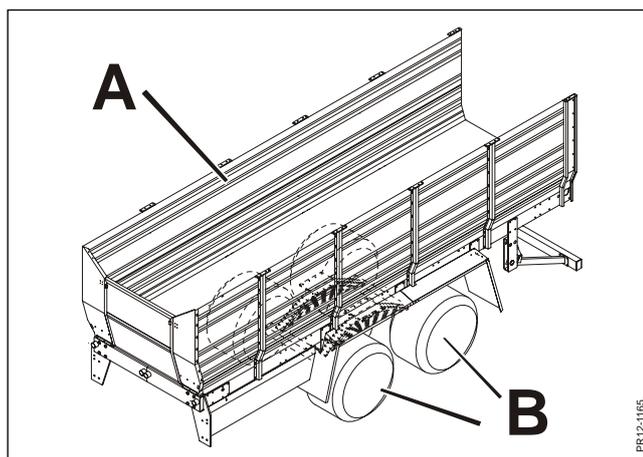
### LIFT FROM LORRY

After delivery from the factory, ES chopping unit and trailer unit must first be connected and then be prepared at an authorised workshop.

The ES chopping unit and the trailer unit are delivered separately on a lorry. It will usually not be possible to unload the trailer unit by means of a standard truck as the net weight will be too high. Therefore, lifting eyes have been placed at the top of the trailer unit where lifting hooks can be placed.

You can use the following weight indications when estimating the lifting task, whether it is with crane or with truck.

Model	Unit	Net weight	Distance between lifting points
All	Chopping unit	2,300 kg	approx. 1,100 mm
ES 3000	Trailer unit	4,210 kg	approx. 1,200 mm
ES 3600	Trailer unit	5,060 kg	approx. 1,200 mm
ES 4200	Trailer unit	6,180 kg	approx. 1,200 mm
ES 3000	Wheels (4)	approx. 550 kg	
ES 3000S / 3600	Wheels (4)	approx. 700 kg	
ES 4200	Wheels (4)	approx. 800 kg	

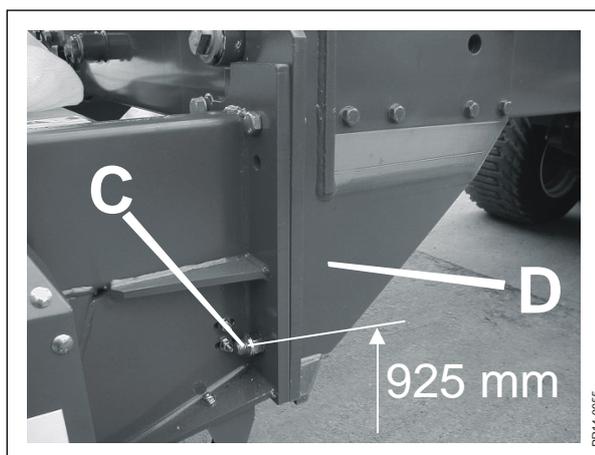


**Fig. 2-1**

**Fig. 2-1** When the trailer unit **A** is lifted, it is desirable to mount the supplied wheels **B** on the axles before the unit is placed on the ground.

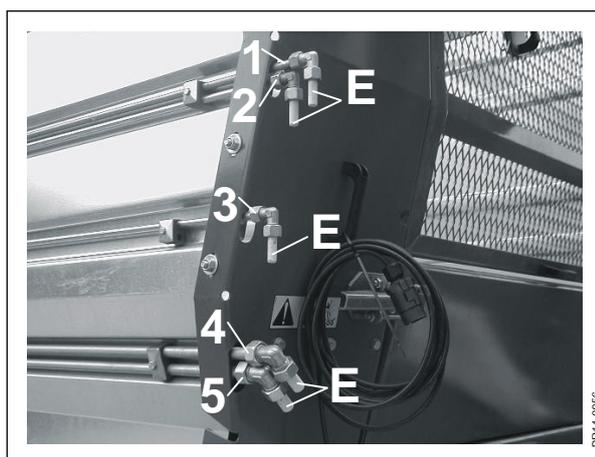
## 2. PREPARATION

### CONNECTION



**Fig. 2-2**

**Fig. 2-2** When connecting the chopping unit and the trailer unit, the lower bolt holes **C** on the flange **D** on the trailer must be used. The correct height to the lower bolts is **925 mm**, whereby the right pick-up adjustment ensures that the bottom of the trailer is approximately horizontal.



**Fig. 2-3**

**Fig. 2-3** After the connection of the chopping unit and the trailer unit, the hydraulic hoses are connected to the tubes **1** to **5** (**2** to **5** on ES 3000) on the trailer unit according to the following colours:

No. on fig. 2-3	Colour	Function
1	Yellow	Bogie lock/articulation (not on ES 3000)
2	None	Brakes
3	Green	Rear door
4	Red	Conveyor chain forward
5	Blue	Conveyor chain reverse

Before the connection, the yellow tube ends **E** must be removed from the tubes on the trailer as they are only mounted to prevent impurities in the hydraulic system during storage and shipment.

Mounting of the hardtop on the trailer unit is performed according to the figure in the spare parts book.

## 3. CONNECTION TO TRACTOR

### DRAWBAR

After preparation of the forage trailer according to section 2 "PREPARATION" it is necessary to adjust the trailer and the tractor to each other.

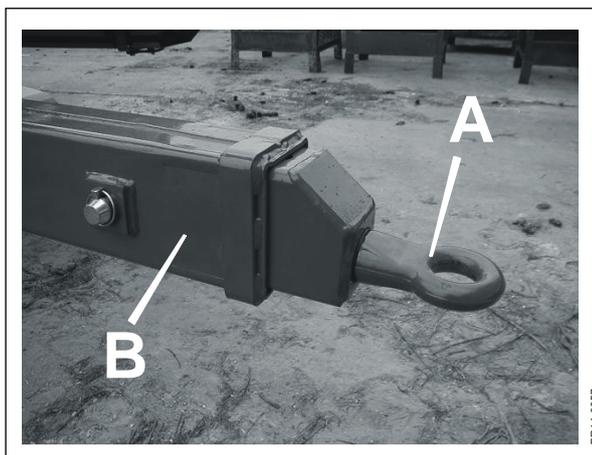


Fig. 3-1

**Fig. 3-1** Connect the forage trailer to the drawbar unit, towing hook or drawbar on the tractor. The connection is made by means of the turnable clevis eye **A**, which is fastened to the telescopic drawbar **B** of the chopping unit.

### ADJUSTMENT OF LENGTH

The length of the telescopic drawbar must be adjusted to ensure correct deviation of the wide-angle joint on the PTO shaft at the tractor side.

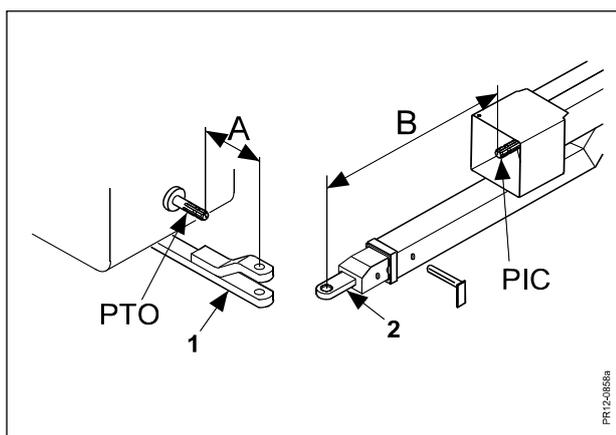
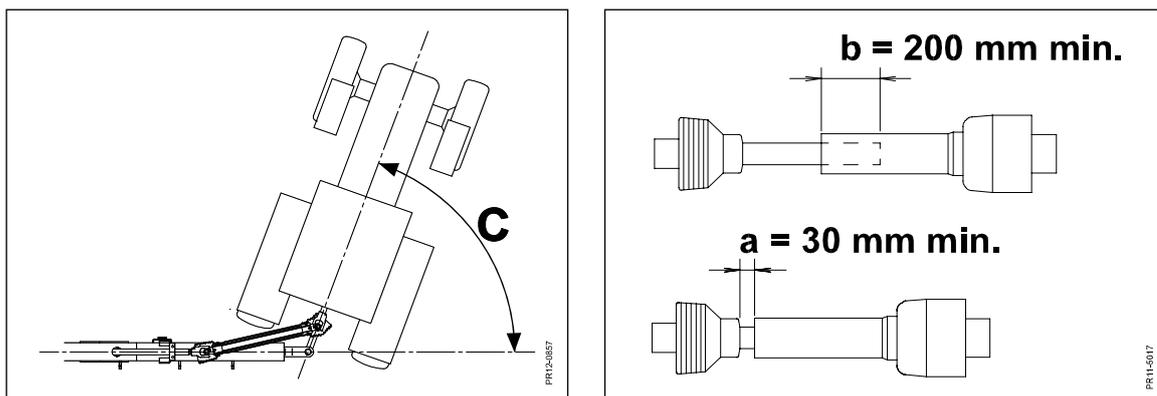


Fig. 3-2

**Fig. 3-2** Adjust the drawbar **(1)** of the tractor so that the distance "A" is as short as possible. Adjust the drawbar **(2)** of the machine so that the distance "B" is as long as possible. The drawbar **(2)** of the machine must be placed so that the PTO shaft is as close to horizontal as possible.

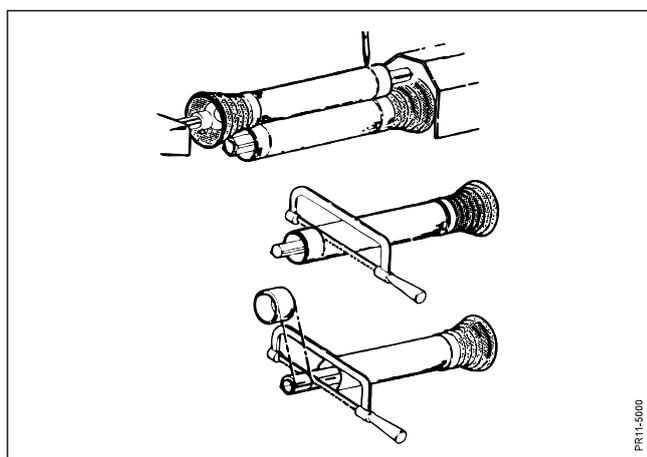
### 3. CONNECTION TO TRACTOR



**Fig. 3-3**

**Fig. 3-3** Check the maximum turning angle "C" with the machine raised. Due to the position of the PTO shaft, the turning angle "C" is limited by the fact that the PTO shaft is not compressed more than the prescribed 30 mm in order not to bottom the shaft. In some cases it is possible to increase the turning angle "C" by shortening the PTO drive shaft. The PTO shaft must only be shortened if the overlapping is more than 200 mm when driving straight ahead with the machine in working position.

#### SHORTENING OF THE PTO DRIVE SHAFT



**Fig. 3-4**

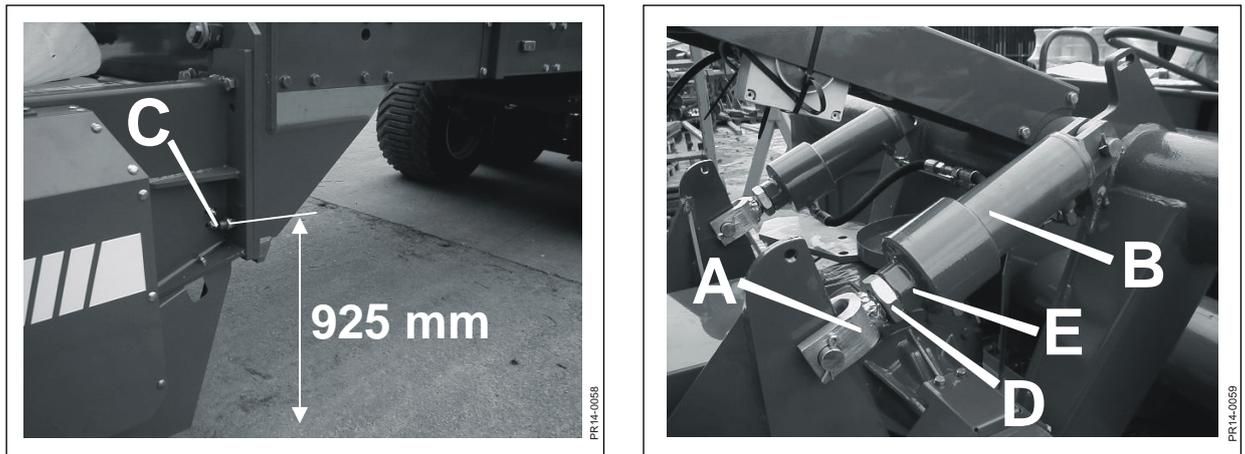
**Fig. 3-4** Fasten the halves of the shaft to PTO and PIC, respectively, when these are right opposite each other with the machine in working position. (The longest distance on this machine). Hold the shaft ends parallel to each other and mark the wanted shortening, minimum 200 mm overlapping. Shorten all 4 tubes equally. The ends of the profile tubes must be rounded off and burrs must be removed carefully. It is very important that the tubes are smooth and clean before greasing. Grease the tubes carefully before reassembling.



**WARNING:** Never turn sharper than the maximum turning angle "C". With some tractors the PTO shaft may "bottom". Hereby the shaft and/or other machine parts are damaged.

## 3. CONNECTION TO TRACTOR

### ADJUSTMENT OF HEIGHT



**Fig. 3-5**

**Fig. 3-5** Height adjustment is made by means of the yokes **A** on the two lifting cylinders **B**.

The following procedure is recommended when adjusting the height of the drawbar:

1. Lift the drawbar with a truck until the jack can be adjusted to a position where the forage trailer is horizontal.
2. Fix the jack and remove the truck.
3. Check the distance from the ground to the bottom pinhole **C** in the coupling flange of the chopping unit. This distance must be approx. 925 mm.
4. Lower/lift the drawbar of the forage trailer to the height of the tractor drawbar by adjusting the yokes **A** of the lifting cylinders **B**. This requires that the counter nut **D** is loosened and the piston rod **E** is turned.
5. When the yokes have been extended sufficiently so that the clevis eye on the drawbar is at the desired height in relation to the drawbar of the tractor, it must be checked that both yokes have the same length before the counter nuts **D** are tightened again.



**CAUTION:** There should not be too much clearance between the pin or towing hook on the tractor and the clevis eye as this will cause unnecessary wear.



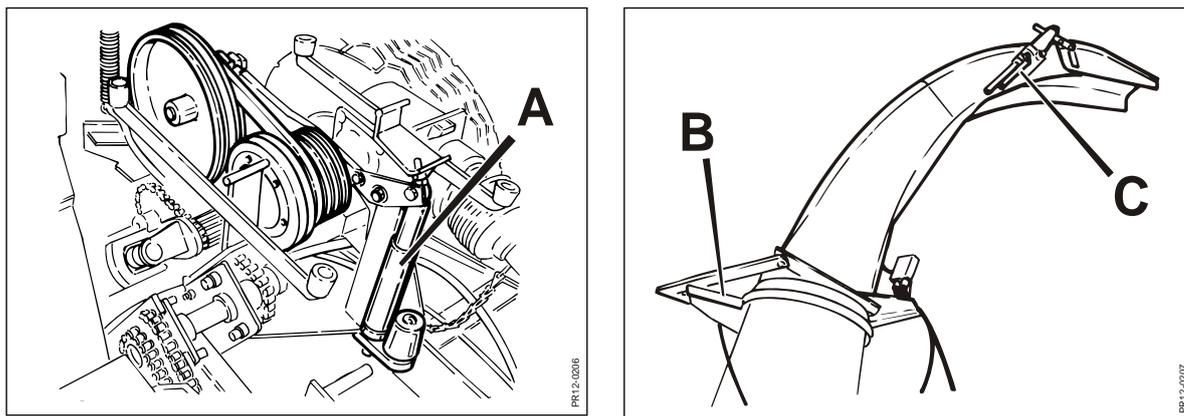
**WARNING:** When connecting the forage trailer, it should be guaranteed that the drawbar unit of the tractor is approved for the maximum drawbar load of the trailer and for drawing the allowed total weight.

## ELECTRONICS

This section only applies to standard machines without metal detector (MD). For machines with MD please see the section ELECTRONICS in chapter 5 "METAL DETECTOR".

The operation of all hydraulic and electric motors and all hydraulic cylinders is on ES 3600 and ES 4200 made by means of two electronic boxes. One is equipped with a joystick (the joystick box) and the other only has a number of switches (the switchbox). ES 3000 only has the joystick box.

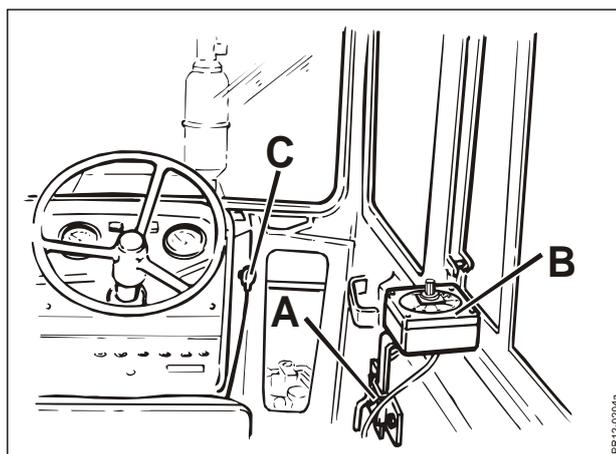
### 3. CONNECTION TO TRACTOR



**Fig. 3-6**

**Fig. 3-6** The electric motors adjust the reverse system **A** and the deflector **C** of the delivery chute. On ES 3600 and ES 4200 the delivery chute at **B** is driven by a hydraulic motor, whereas on ES 3000 it is driven by an electric motor. On all models the conveyor chain is driven by hydraulic motors.

#### THE JOYSTICK BOX (ALL MODELS)



**Fig. 3-7**

**Fig. 3-7** Mount the holder **A** in a suitable place within the reach of the tractor driver and mount the joystick box **B** to it. The joystick box is the most important control unit and should be given first priority when arranging the workplace for the tractor driver.

Mount the 2-pole socket **C** on the power supply cable at the instrument board in case such a socket is not already mounted in the cabin. Connect the cable directly to the tractor battery, connecting the cable with the fuse box to +(positive) on the battery (remember that the fuse must be placed near the battery).

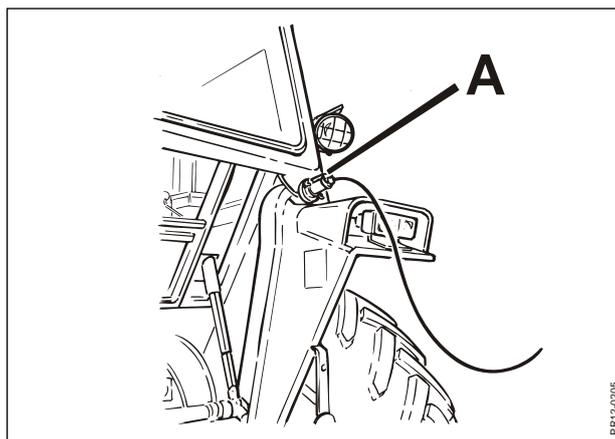
The 2-pole plug from the joystick box can now be connected to the power supply cable.



**CAUTION:**

**It is very important for the functioning of the electric system that there is a good connection to – (negative/earth) and + (positive) on the battery. We advise you not to connect to for instance the wiring of the lights as the wire thickness for these systems is usually not sufficient to transfer the necessary power.**

### 3. CONNECTION TO TRACTOR



**Fig. 3-8**

**Fig. 3-8** Mount the 7-pole socket (mounted on the cable from the joystick box) at the rear of the tractor just outside the cabin using the supplied wing nuts. The 7-pole plug **A** from the machine can now be connected to the joystick box.

It is now easy to dismount the electric equipment in the cabin if you are not going to use it for a considerable period of time.



**CAUTION:** If the electric equipment has been dismantled and is not going to be used for some time, it must be kept in a dry place and the plug on the machine must be wrapped up or placed under a guard.

#### **THE SWITCH BOX (ES 3600 AND ES 4200)**

Mount the switch box in a suitable place in the tractor near the joystick box (see fig. 3-7) where you can easily operate it. Under the box is a magnet which makes it easy to place the box at the desired place in the cabin.

The installation requirements for the switch box are the same as for the joystick box.

For control of functions via the switch box please see the section CONTROL OF FUNCTIONS in chapter 6 "DRIVING IN THE FIELD".

#### **LIGHTING EQUIPMENT**

The traffic rules require that a forage trailer has its own lighting equipment when driving on public roads. Therefore, the ES product has its own flasher, stop light, rear lights and lights at the side and front.

# HYDRAULICS

## COUPLINGS

The ES product has ordinary hydraulic coupling valves (quick-release couplings). The specifications correspond with the standard ISO A (ISO-7241) for tractor connections.



**CAUTION:** It is of course important that the quick-release couplings are always carefully cleaned before mounting to avoid that impurities get into the hydraulic system and damage important valve functions. When the hydraulic hoses are not connected to the tractor anymore, the couplings should be protected with caps.

## HOSES

**ES 3000:** Connect the hoses from the hydraulic system to the double-acting outlet on the tractor.

**ES 3600 and ES 4200:**

Connect the pressure hose (mounted with ½" quick-release coupling) to an A-port and if the tractor is equipped with a prioritised port this should be chosen.

The return hose (mounted with ¾" quick-release coupling) **must** be connected to a **pressure free wire to tank** dimensioned for minimum ø 18 mm and mounted with a ¾" socket quick-release coupling.

Connect the brake hose to the suitable brake outlet on the tractor.

## ADJUSTMENT TO THE TRACTOR SYSTEM (ES 3600 AND ES 4200)

The ES hydraulic system must be adjusted in order to adapt the system and thus the machine to the tractor, you want connected.

The ES hydraulic system can be adjusted to the 3 different tractor hydraulic systems (A, B and C).

- A Tractor with Open Center. These may be equipped with permanent flow pump or with variable flow pump. Open Center is standard on most tractors, both new and old types.



**IMPORTANT:** Max. oil flow from the tractor should be adjusted to approx. 50-60 l/min. to limit heating of the oil.  
Be aware that this will result in a reduced unloading speed.

- B Tractors with Closed Center will be with variable flow pump. Closed Center is especially found on older John Deere tractors.



**IMPORTANT:** For the above-mentioned systems, A) and B) the handle for the hydraulic outlet must be locked in pressure position to ensure continuous flow in the system of the machine.

### 3. CONNECTION TO TRACTOR

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- C) Tractors with externally established LS-system (Load Sensing), i.e. variable oil flow and oil pressure from special outlets, dependent on the requirement from the hydraulic functions. The LS-system will be additional equipment on most new tractors.

**IMPORTANT: See the section on the LS-system below.**

#### **The advantage of the LS-system (externally established)**

The advantage of the LS-system is that the oil flow is obtained directly from the pump via a specially mounted  $\frac{3}{4}$ " pressure and return outlet (P and T ports) and lead around the valve outlet of the tractor and directly to the machine's hydraulic system. Hereafter, it is the hydraulic system of the machine that ensures that the tractor's hydraulic pump is only working when it is needed. This message travels from the machine via a small  $\frac{1}{4}$ " hydraulic hose to an extra  $\frac{1}{4}$ " outlet on the tractor, through which oil for the LS-control signal runs. This avoids heat development in the oil and saves fuel.

The condition for driving with the LS-system on ES 3600 and ES 4200 is that your tractor has two  $\frac{3}{4}$ " outlets (P and T ports) as well as an extra  $\frac{1}{4}$ " outlet for the LS hydraulic hose.

If you wish to drive "Load Sensing" you must mount the LS-kit from JF-Fabriken on the chopping unit. See fig. 3-12 for correct connection of the parts from the kit.



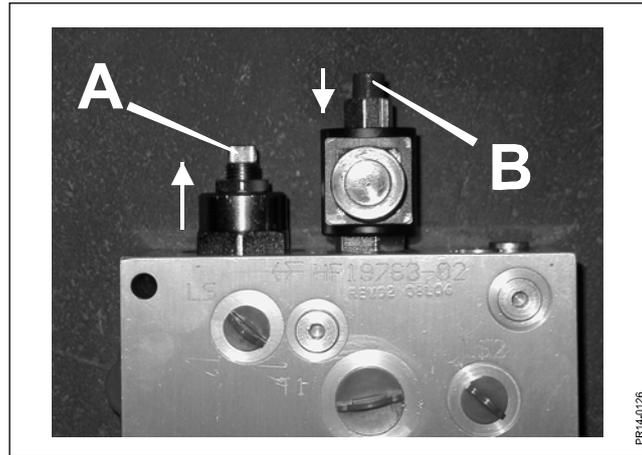
#### **CAUTION:**

**If you are in doubt which system your tractor has and if an external LS-outlet is established, please contact the authorised tractor dealer.**

**If the hydraulic system is adjusted incorrectly in relation to the tractor system, serious operational errors and break-downs may appear, already the first time you start the machine.**

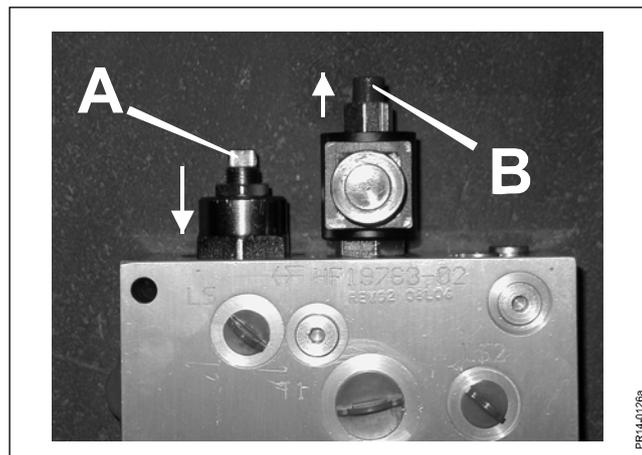
The only adjustment of the system is the hand wheel **A** (flow adjustment active or not active) and the adjusting screw **B** (bypass valve open or closed). Adjustments for the 3 systems are shown in the following figures 3-9 to 3-11:

### 3. CONNECTION TO TRACTOR



**Fig. 3-9**

**Fig. 3-9 A) Tractor with Open Center**  
Allen screw **A** is screwed out and adjusting screw **B** is pushed in and turned.



**Fig. 3-10**

**Fig. 3-10 B) Tractor with Closed Center**  
Allen screw **A** is screwed in and adjusting screw **B** is turned after which the elasticity will press it out.

### 3. CONNECTION TO TRACTOR

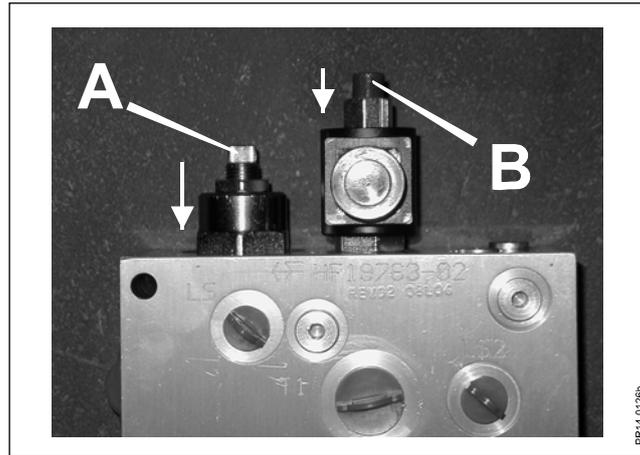


Fig. 3-11

**Fig. 3-11 C) Tractor with LS system**

Allen screw **A** is screwed in and adjusting screw **B** is pushed in and turned. This is the setting from the factory.



**IMPORTANT:** See the preconditions that it is an LS-system in the section "The advantage of the LS-system (externally established)" above.

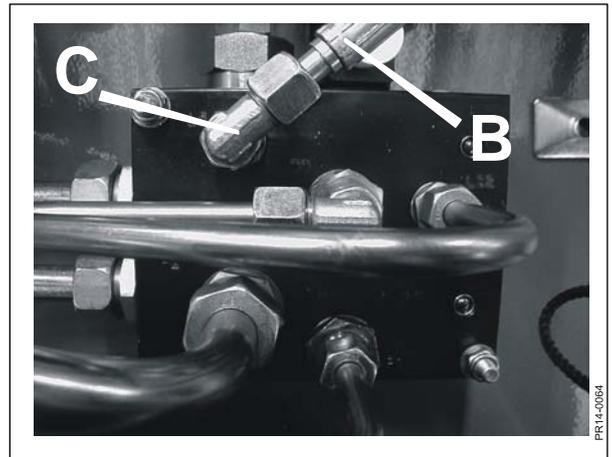
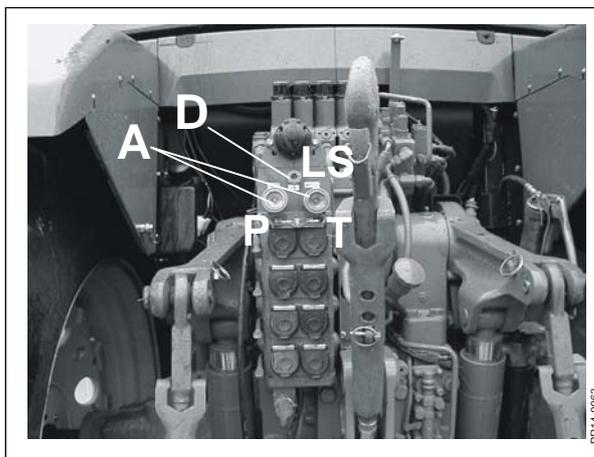


Fig. 3-12

**Fig. 3-12** Mount the two  $\frac{3}{4}$ " quick-release couplings from the LS-kit on the hoses from the hydraulic system and connect them to the special  $\frac{3}{4}$ " P- and T-outlet **A** on the tractor. Mount the LS-hose **B** (the  $\frac{1}{4}$ " hose from the kit) in the "LS" port **C** on the valve (where a plug is mounted from the factory) and then connect to the  $\frac{1}{4}$ " outlet **D** on the tractor.

## TRANSMISSION

The transmission for the precision chopper of the trailer runs through a PTO drive shaft, a bevel gearbox and sideways where a belt drive transmits the power to the precision chopper. The conveyor chain in the trailer is driven by a hydraulic motor through a worm gear.

### PTO DRIVE SHAFT

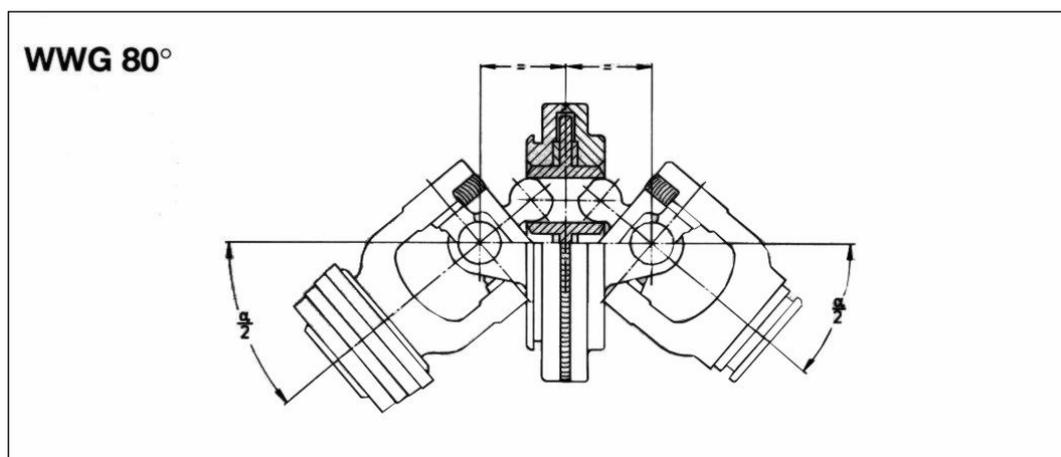


Fig. 3-13

**Fig. 3-13** The chosen PTO shaft between tractor and trailer has an 80 degree wide-angle joint which makes it possible to work with large deviation between the tractor and the drawbar of the machine and to maintain the number of rpm when turning in the field. The wide angle joint must be connected to the PTO of the tractor to work as intended.



**WARNING:** The angle deviation of the PTO shaft must not exceed 80 degrees as this would damage the wide angle joint.

### FRICITION CLUTCH – WHY?

The chosen PTO shaft between the tractor and the trailer also has a friction clutch with free wheel placed on the machine side.

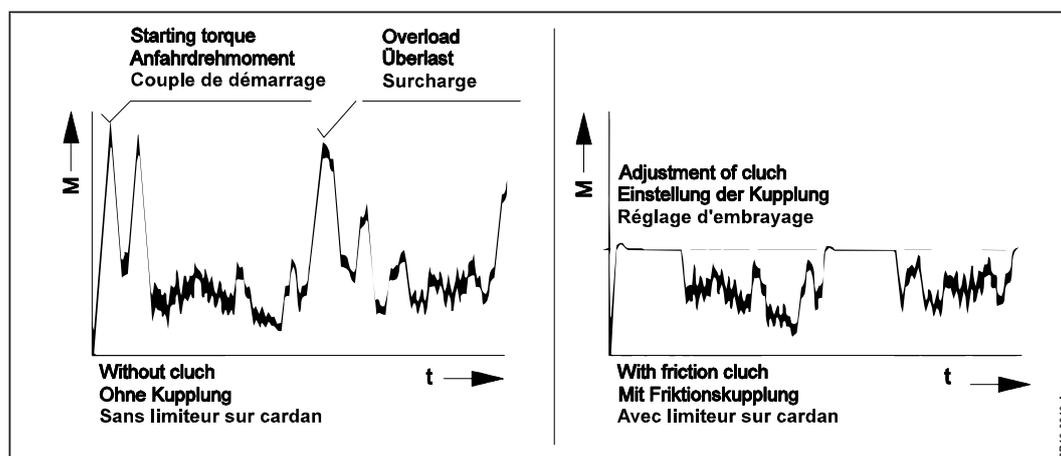


Fig. 3-14

### 3. CONNECTION TO TRACTOR

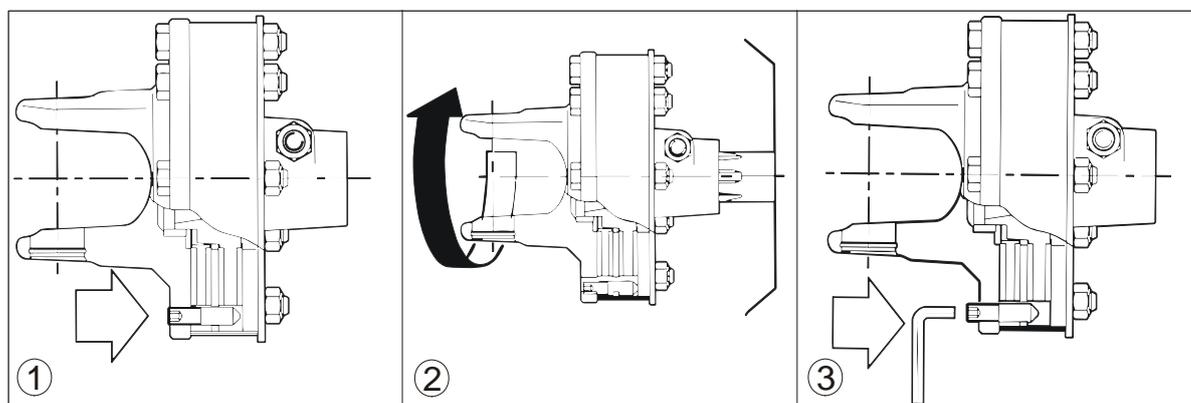
**Fig. 3-14** The friction clutch protects the tractor and the machine against long or short overload. The figure shows schematic how the clutch protects the transmission against high torque peaks while maintaining the maximum torque.

Contrary to an automatic clutch, the friction clutch will keep a maximum torque when activated. Another advantage of the friction clutch is that minor, short overloads do not cause operational stoppage when activating the clutch.



**CAUTION:** A disadvantage of the friction clutch is that there will be a risk that it will be overloaded if you do not disconnect the PTO quickly enough in case of a large blockage. A friction clutch cannot manage to be activated at high numbers of rpm and high torques for more than 2-3 seconds.

#### FRICION CLUTCH – START-UP OF NEW MACHINE



**Fig. 3-15**

**Fig. 3-15** The clutch is equipped with 4 countersunk hexagonal screw heads that reduce the pressure on the springs to a minimum when tightened.

**The clutch is delivered with reduced pressure on the friction discs, and only works correctly after execution of following operation:**

Block the rotor with a  $\frac{3}{4}$ "-1" thick board. Let the PTO drive shaft rotate at minimum speed for 3-6 seconds until the clutch slips. If the clutch doesn't slip the parts should be disassembled and cleaned as described under MAINTENANCE of clutch.

Loosen the 4 hexagonal screws with the enclosed tools. They are only partially equipped with thread and cannot be screwed completely out of the clutch.

Now the clutch is ready for use.

By the end of the season or in between-seasons the screws must be tightened and the clutch kept in a dry place.

## 4. ADJUSTMENTS

### THE PICK-UP UNIT

#### CLEARANCE

The pick-up of the precision chopper is equipped with a wheel on each side that can be adjusted in height. In general you should keep the biggest distance from the ground as possible to avoid that the pick-up tines mix dust and sand in the crop and at the same time the pick-up should be able to pick up the crop without waste.

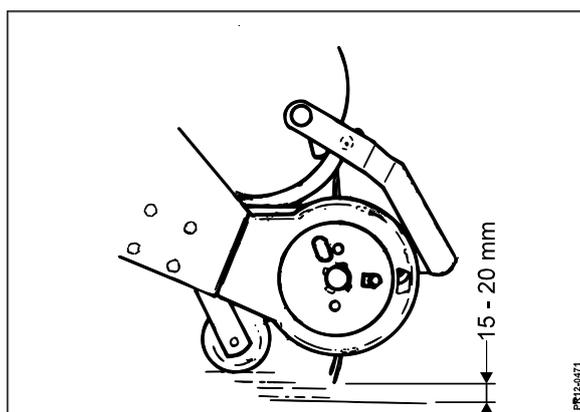


Fig. 4-1

**Fig. 4-1** JF-Fabriken recommends a clearance of 15-20 mm between the pick-up tines and the ground. Under special conditions, however, it may be necessary to change the basic adjustment which the pick-up is delivered with from the factory.

#### RELIEF

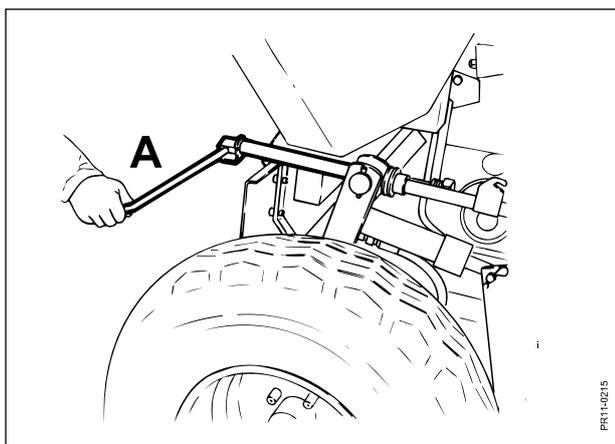


Fig. 4-2

**Fig. 4-2** The pick-up relief is adjusted from the factory, so that the ground pressure is approx. 20 kg, but this setting can be adjusted to the ground conditions. By tightening the spindle **A** the relief is increased whereby the ground pressure is reduced.

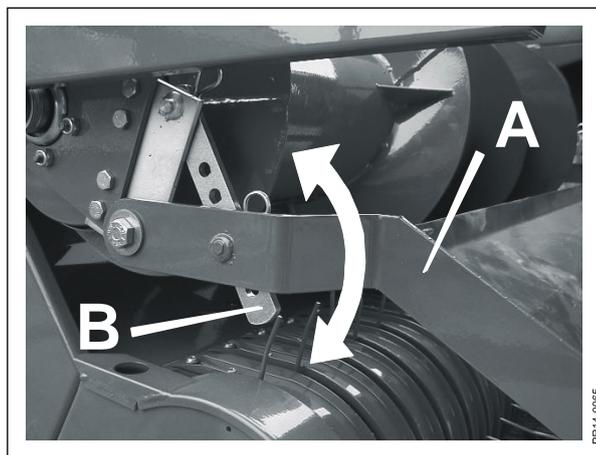
## 4. ADJUSTMENS



**CAUTION:** Be aware that the relief can be increased so much that the ground pressure is approximately 0 kg. This will result in a floating pick-up and thus minimum wear on wheels and pick-up tines, but it may result in waste of crop when picking up.

### FEED-INTAKE PLATE

With the feed-intake plate mounted on the pick-up, short grass is picked up easily. The crop is pressed between the feed-intake plate and the pick-up tines. This ensures that the crop does not fall forward and disturb the flow across the pick-up.



**Fig. 4-3**

**Fig. 4-3** Depending on the size and shape of the swath, the distance from the feed-intake plate **A** to the pick-up tines can be adjusted by means of the holes in the adjustment plates **B**. The bigger the swath, the greater the required distance between the feed-intake plate and the pick-up tines.



**CAUTION:** If you constantly work in a strong and not very dry crop over a long period, it may be desirable to work without the feed-intake plate. Under these conditions it may otherwise reduce the capacity when reversing and cause unnecessary stoppages during this process.

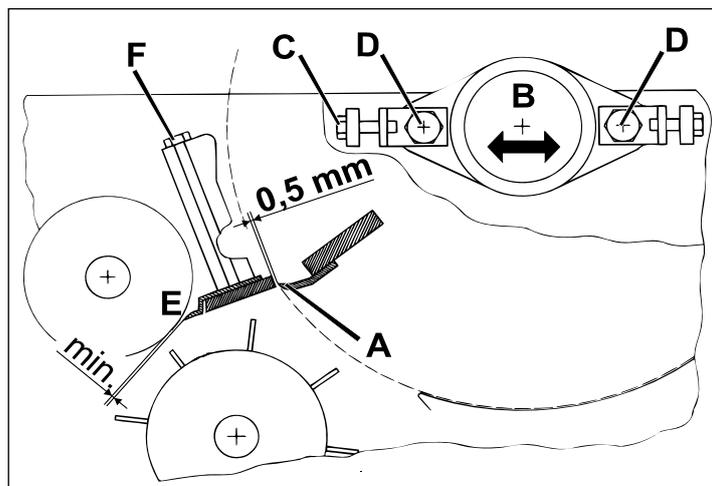
## AUGER

The auger which gathers the crop and delivers it to the roller section has its own friction clutch. The friction clutch of the auger is not in itself a security against overload but is supposed to be an indicator which releases before the other overload protections in the machine. The operator should gradually increase the driving speed until the friction clutch of the auger releases and then choose the gear which is one level lower. This is the best way to protect against serious blockages which may lead to long operational stoppages.

Under special conditions it may however be necessary to change the basic adjustment which the friction clutch of the auger is delivered with from the factory.

The operator should always ensure spare friction discs and spring washers are in the toolbox. If the clutch has often been activated, the coating of the friction discs is worn and it cannot transfer sufficient transmission. It may therefore be necessary to replace the friction discs. But remember they have to be of the same number and quality.

## ROTOR AND ROLLER SECTION

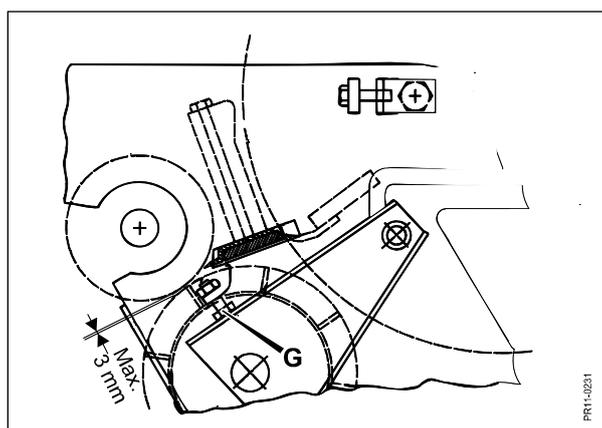
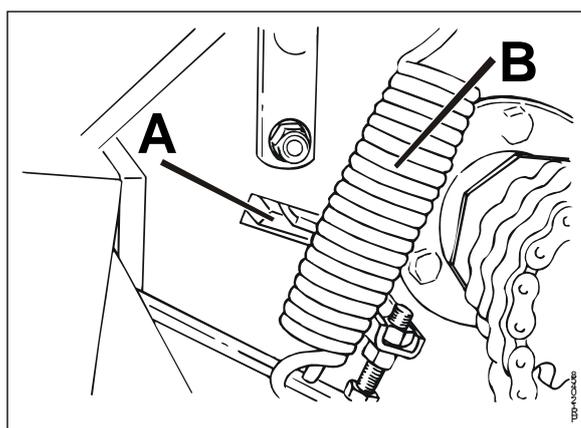


**Fig. 4-4**

**Fig. 4-4** The distance **A** between the blades of the rotor and the shearbar must be checked regularly with the delivered gauge (distance measuring device). The distance aimed at should be 0.5 mm. If it is necessary to adjust the distance, loosen the 2 bearing housings **B** and adjust with the screws **C**. When the distance has been checked, the bolts **D** of the bearing housings are tightened with a torque wrench to 27 kgm (270 Nm).

The machine is equipped with a scraper for the upper smooth roller **E**. The scraper is mounted together with the reversible shearbar just mentioned.

When mounting the scraper place it as close as possible not damaging the smooth roller **E** and then tighten the bolts **F** with a torque wrench to 10-12 kgm (100-120 Nm).



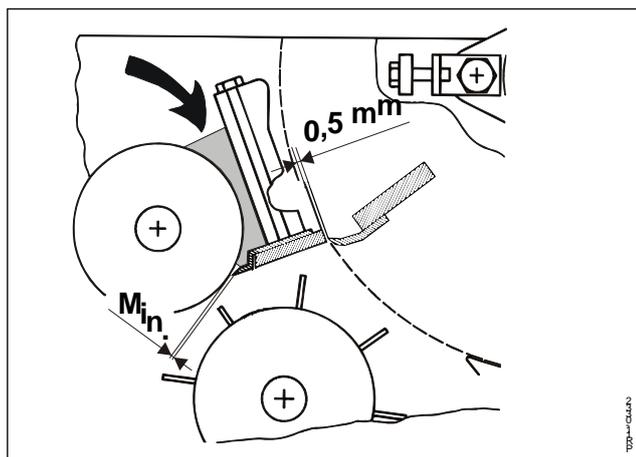
**Fig. 4-5**

**Fig. 4-5** The scraper is dismantled by removing the screws **F** (fig. 4-4) for the shearbar and pulling scraper and shearbar out of the opening **A** in the rotor housing. The spring **B** for the serrated roller must be loosened and removed first to get enough space.

If the shearbar has been worn it can be reversed for a new sharp edge.

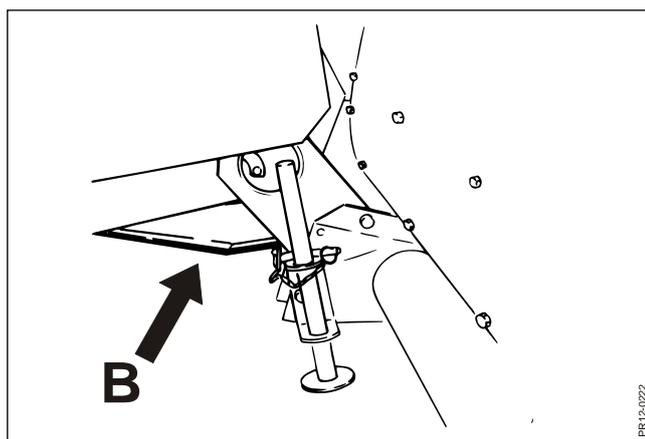
The distance between the rear upper smooth roller and the rear lower roller should be maximum 3 mm. Adjustment is made at the bolt **G** at both sides.

## 4. ADJUSTMENS



**Fig. 4-6**

**Fig. 4-6** Under some conditions, crop remains (small particles) can accumulate in the shaded area and this may result in overload of the transmission driving the rollers. Check the area after every 8 hours of operation and remove crop remains. Check, and if necessary adjust, the distance between scraper and smooth roller. The checking frequency can be reduced when the operator knows the machine under all conditions.



**Fig. 4-7**

**Fig. 4-7** A bottom plate **B** is available as optional equipment. This plate should be ordered and mounted when working in very dry and/or short crop to avoid waste under the rollers.



**IMPORTANT:** When working under normal conditions we recommend you to drive without this bottom plate as, otherwise, material can accumulate under the rollers causing reduced capacity and unnecessary overload of the transmission.

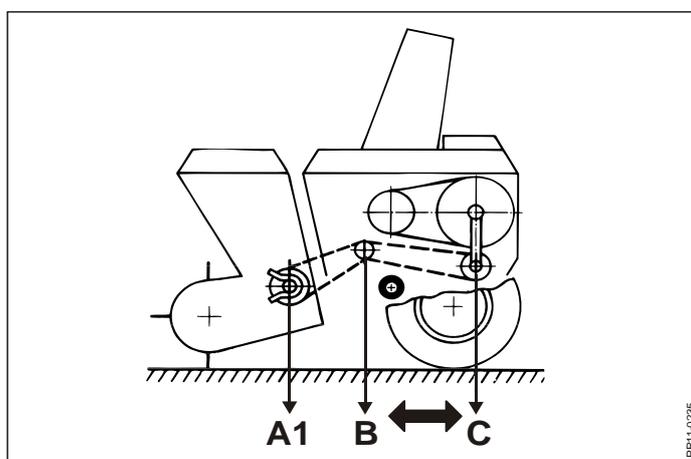
However, when driving in a crop where there is an excessive waste under the rollers, the bottom plate should be mounted. Waste material should be removed on a regular basis.

### CUTTING LENGTHS

The cutting length depends on the feed-intake speed which is adjusted by changing between the following sprocket wheels:

z14 = 2064-448X	z25 = 2064-450A
z18 = 2064-449A	z30 = 2064-451A
z21 = 2065-460X	z36 = 2062-442X

ES 3600 and ES 4200 are as standard equipped with an 8-row blade rotor with 4 blades in each row, i.e. 32 blades in total. From the factory the machines are mounted to 15 mm cutting length. ES 3000 is equipped with a 6-row blade rotor, i.e. 24 blades in total. From the factory the machine is mounted to 15 mm cutting length.



**Fig. 4-8**

**Fig. 4-8** **A1, B** and **C** refer to sprocket wheels which can be mounted. The table indicates theoretical cutting length for different combinations of the sprocket wheels mentioned.

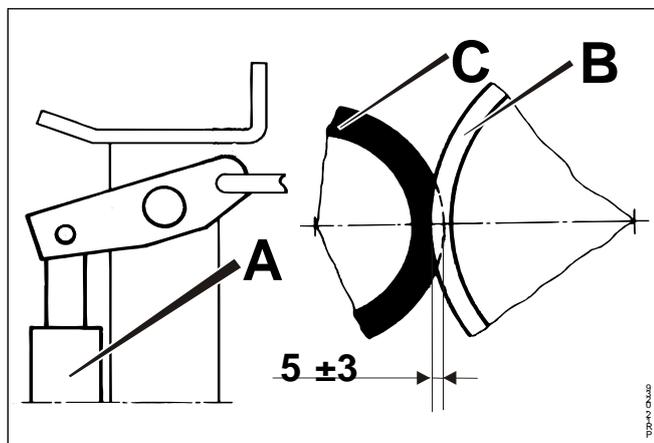
24-blade rotor	32-blade rotor	A1	B	C
	4.2 mm	18	30	14
	5.4 mm	18	30	18
	6.4 mm	21	25	18
	7.5 mm	21	30	25
7.5 mm		18	25	18
	9.0 mm	36	25	25
9.0 mm		21	25	21
	10.7 mm	36	25	30
12.0 mm		36	21	25
<b>15.0 mm (*)</b>	12.4 mm	36	18	25
	<b>15.0 mm (*)</b>	36	18	30

(\*) standard cutting length from the factory

All cutting lengths can be doubled by removing every second row of blades.

### REVERSE

The reverse function can be used at full rpm (1000 rpm on the PTO), but we recommend you to reduce the rpm to relieve the machine as much as possible.

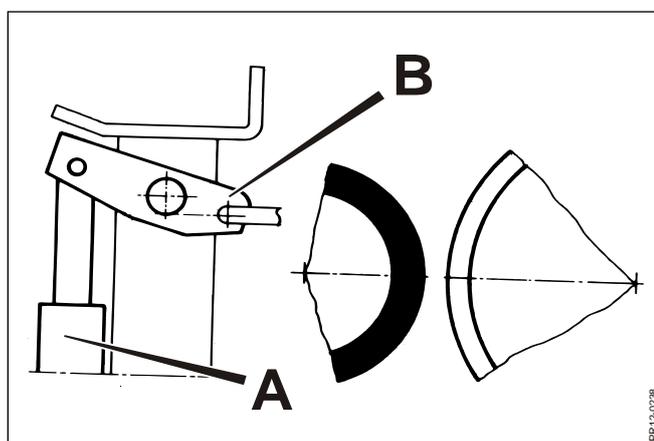


**Fig. 4-9**

**Fig. 4-9** The overlap between the friction disc **B** and the rubber disc **C** must be  $5 \pm 3$  mm. If the rubber disc is worn, the overlap is adjusted automatically by the electric motor **A**, as it always presses with the same maximum pressure and thus ensures a constant pressure between the two parts **B** and **C**.



**CAUTION:** Only use the reverse function for short periods to ensure correct functioning and long life of the rubber disc.



**Fig. 4-10**

**Fig. 4-10** The tightening of the V-belt drive is also adjusted automatically. It is also determined by the electric motor **A**, which always drives with the same constant power.



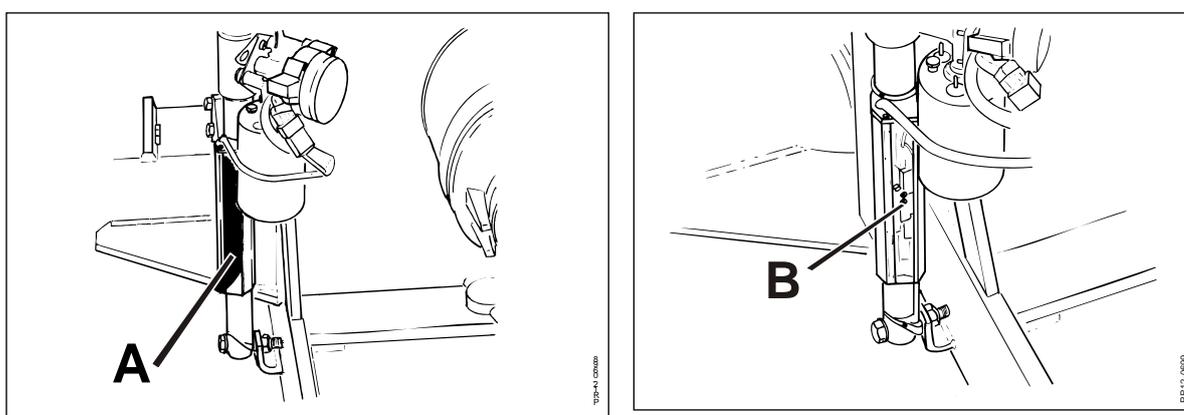
**IMPORTANT:** If the tightening of the V-belt is not correct it may be because the bracket (**B**), which transmits the correct power from the electric motor, is too tight or stuck. Disassemble the bracket and make it operational again.

### NEUTRAL POSITION

ES 3600 and ES 4200 are available in a version with a metal detector (MD) with a special reverse system with neutral position. This neutral position is between the reverse function where the rubber disc and the friction disc are in mesh and normal working position where the belt drive is tightened and drives the feed intake.

In neutral position, the belt drive for the feed intake section is slackened and it stands still. However, it is not a position which should be considered as standstill of the machine, for instance because the blade rotor still rotates.

In neutral position the distance between the rubber disc and the friction disc should be approx. 2-3 mm. Adjustment of the neutral position is made by moving the 2 contact elements that are placed in the electric motor for the reverse function.



**Fig. 4-11**

**Fig. 4-11** To get access to the contact elements, the plastic cover **A** on the electric motor must be removed.

Adjustment is made by moving the 2 contact elements **B** which **MUST** be placed against each other. When the elements are moved upwards/backwards, the distance between rubber disc and friction disc is reduced, and if the elements are moved downwards/forwards, the distance is increased.

The adjusted neutral position is checked by driving the electric motor in reverse and back to neutral position (NB: from normal feed intake to neutral position there will be a greater distance).



**WARNING:** Do not approach the machine when the feed intake is in neutral position and the rotor is rotating. Neutral position does not guarantee that the feed intake will not start.

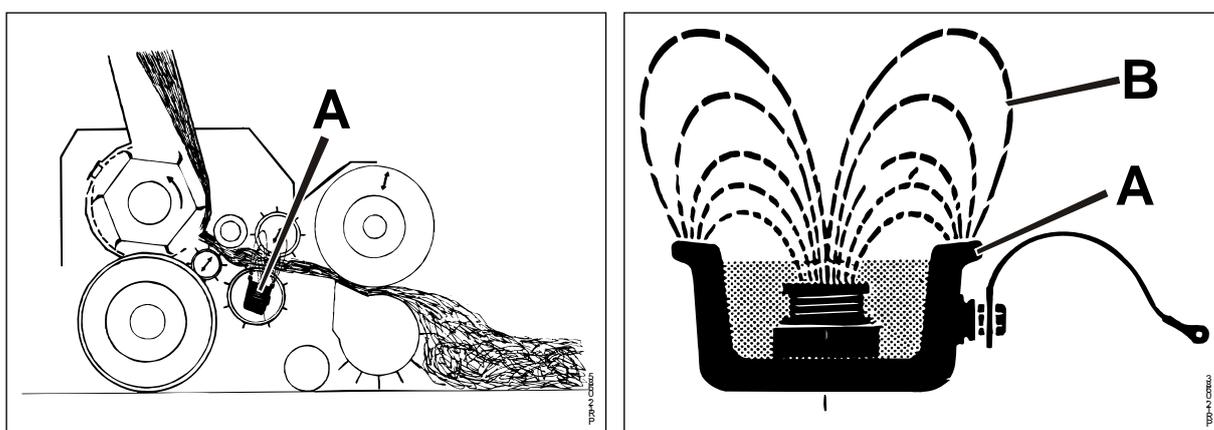
# 5. METAL DETECTOR

ES 3600 and ES 4200 are available with a metal detector (MD) integrated in the chopping unit.

The purpose of the metal detector is to secure the precision chopper against damage by possible metal in the grass and to ensure that no metal gets into the chopped material as it may cause diseases for the animals which are going to eat it.

In principle the forage trailer with metal detector is constructed as the standard machine but is equipped with a system which can detect ferrous metal (metal containing iron) in the feed intake section, and immediately stops pick-up, auger and feed intake if metal in the crop enters the front rollers.

### MAGNET TUB (METAL DETECTOR)



**Fig. 5-1**

**Fig. 5-1** The chopping unit is equipped with a magnet tub **A** mounted in the lower front feed roller, and its function is to detect ferrous metal (metal containing iron).

The magnet tub **A** has an upward magnetic field **B**. This magnetic field covers the whole opening between the 2 front rollers.

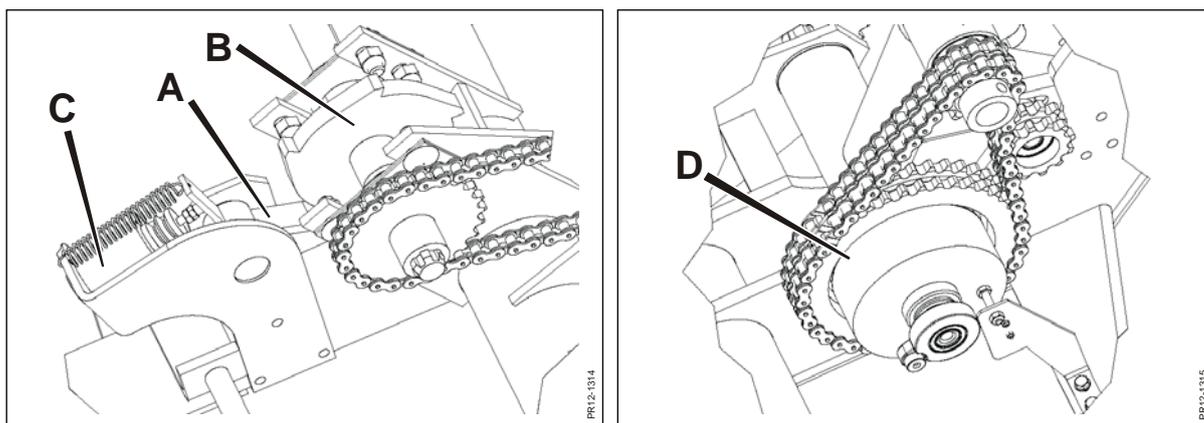
The accuracy that the detector registers the metal is approx. 95%. However, there are several factors which influence the accuracy of the sensor: They are:

- The size of the metal object.
- The shape of the metal object.
- The position in the feed intake section
- The cutting length and thus the feed intake speed.
- The distance between the pawl and the ratchet wheel in the stop system.

### REGISTRATION OF METAL

When a ferrous metal piece passes the magnet tub a voltage is induced which is immediately registered by the microprocessor in the electronics box which releases a programmed stop sequence.

### STOP OF THE FEED INTAKE SECTION



**Fig. 5-2**

**Fig. 5-2** When the metal has been detected, a signal will be sent so that there is voltage on the magnet coil **C**. Hereby the pawl **A** is activated and is engaged with the ratchet wheel **B** and the feed intake is blocked immediately. Through this blocking the torque in the transmission is increased immediately and the automatic clutch **D** is released. It glides until the belt transmission is disengaged. This is done by bringing the reverse motor into neutral position.

During the above mechanical blocking of the feed intake the microprocessor sends a signal to the electric motor for the reverse function whereby it moves to neutral position.

Hereby the V-belts are slackened and the feed intake is deactivated. This can be seen as the neutral gear of the feed intake.

This neutral position is necessary at any disengagement of the friction clutch, as the friction clutch would otherwise be overheated, with risk of damage or replacement. If disengagement happens too often it may be due to the fact that the friction coating is destroyed.

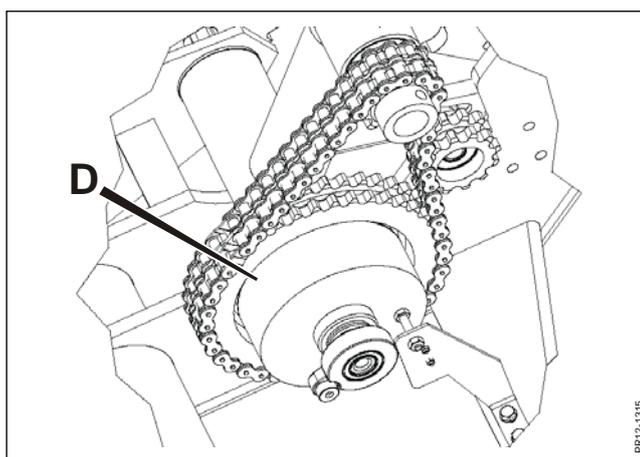


**WARNING:** Do not approach the machine when the feed intake is in neutral position and the rotor is rotating. Neutral position does not guarantee that the feed intake will not start.

### RESETTING OF THE METAL DETECTOR

To secure against misuse after a metal detection and to ensure that possible metal has been removed before restarting, the electronics does not allow normal feed intake function until the feed intake has reversed.

## 5. METAL DETECTOR



**Fig. 5-3**

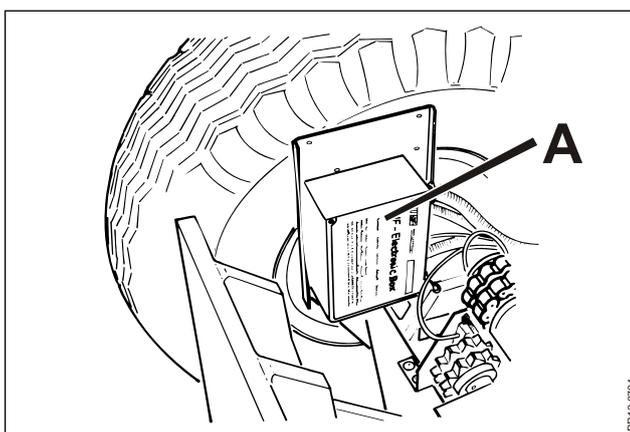
**Fig. 5-3** During reverse the clutch **A** drives a magnet switch **B** around. Hereby a signal is sent to the microprocessor that you have reversed and the stop system with the pawl will reset.



**CAUTION:** When the machine has reversed after a metal detection, check the area in front of the feed roller for possible metal pieces and remove these. If nothing is found there is a risk that the metal enters the feed intake again together with the crop when restarting the machine. Pay special attention when restarting the machine after metal detection.

## ELECTRONICS

### ELECTRONICS BOX



**Fig. 5-4**

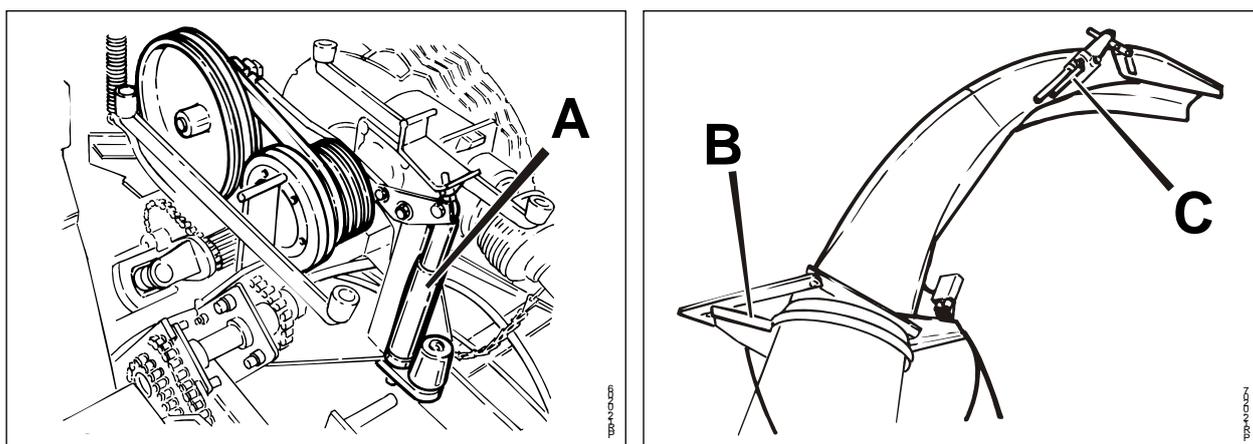
**Fig. 5-4** The electronics box **A** which is placed under the left rear guard contains a printed circuit board with relays and a microprocessor. The microprocessor is equipped with a programme which controls the electronic components of the machine and carries out the commands of the tractor driver or the metal detector of the machine. To protect the electronics a 2-ampere glass fuse (2AF 250V, IEC 127-2-2) has been mounted on the electronics box which is accessible without opening the box.



**WARNING:** Opening of the electronics box or replacement should only be performed by an authorised JF dealer / Service technician.

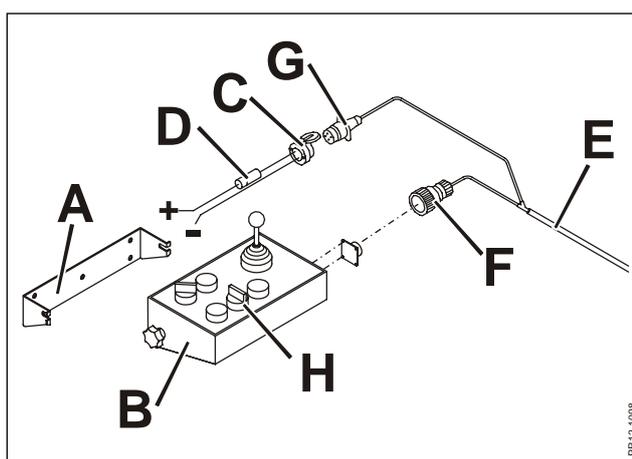
## 5. METAL DETECTOR

### POWER SUPPLY



**Fig. 5-5**

**Fig. 5-5** Electric motors **A** and **C** control the reverse function and the deflector on the chute while a hydraulic motor at **B** controls turning of chute. The motors are operated from a control panel in the tractor cabin.



**Fig. 5-6**

**Fig. 5-6** Mount the holder **A** for the control panel in a suitable place within the reach of the tractor driver and mount the control panel **B**. Mount the 3-pole socket **C** on the power supply cable somewhere in the tractor cabin. Connect the cable directly to the tractor battery, connecting the cable with the fuse box **D** to +(positive) on the battery (remember that the fuse must be placed near the battery). The cable has a strong conductor to ensure minimal voltage drop and thus optimal function and life of the electric components of the machine. The fuse is a 25 ampere fuse (25A DIN 72581-1).

Mount a 16-conductor cable **E** on the electronics box on the machines. This cable is placed along the drawbar together with hydraulic hoses from the hydraulic system.

2 plugs are mounted on the cable. A multiple plug **F**, which must be connected at the side of the control panel **B** and a 3-pole plug **G** which must be connected to the 3-pole socket on the power supply.

## 5. METAL DETECTOR



### CAUTION:

On few tractor types there is a 3-pole outlet. **It is very important for the functioning of the electric system that there is a good connection to -(negative/earth) and +(positive) on the battery.**

**We advise you not to connect to for instance the wiring of the lights as the wire thickness for these systems is usually not sufficient to transfer the necessary power.**

Subsequently it is easy to dismantle the electric equipment in the cabin if you are not going to use it for a considerable period of time.

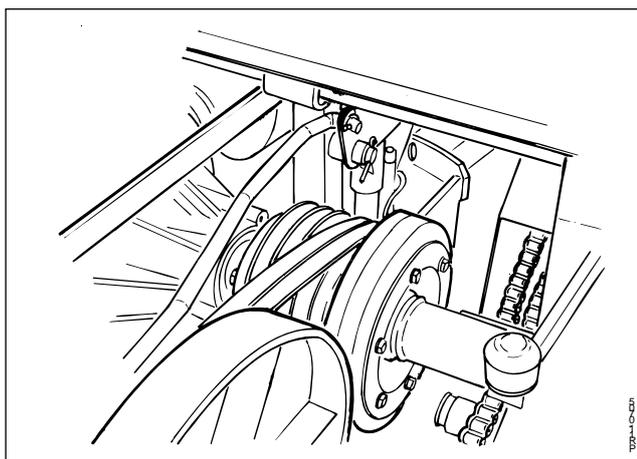


### CAUTION:

**When the electric equipment has been dismantled and is not going to be used for some time it must be kept in a dry place and the plug on the machine must be wrapped up or placed under a guard.**

## THE REVERSE SYSTEM

The reverse function was described in the section REVERSE in chapter 4 "ADJUSTMENTS". The following is a description of the special conditions for the reverse function on MD machines.



**Fig. 5-7**

**Fig. 5-7** The reverse function of the machine has 3 positions: Feed intake, neutral and reverse. The system is controlled from the control panel in the cabin and by the microprocessor. On the control panel the switch **H** (on fig. 5-6) is for operation of the reverse system. From the control panel a control current is sent to the electronics box on the machine which then connects the main current on the relay to the wanted function.

With the switch on the control panel you can change between the 3 positions:

- 1) When turning the switch to the right in position "feed intake" the machine is ready for work.
- 2) If the switch is placed in the middle, "neutral position", no control current (for feed intake or reverse) will be sent to the electronics of the machine and the reverse motor moves from the position in question to neutral position.

## 5. METAL DETECTOR

- 3) If the switch is turned to the left in position "reverse" the feed intake moves in the opposite direction and the crop is reversed out. Note: This position for the switch is with spring return, i.e. the switch moves to neutral position as soon as you let go of it.



**WARNING:** Do not approach the machine when the feed intake is in neutral position and the rotor is rotating. Neutral position does not guarantee that the feed intake will not start.

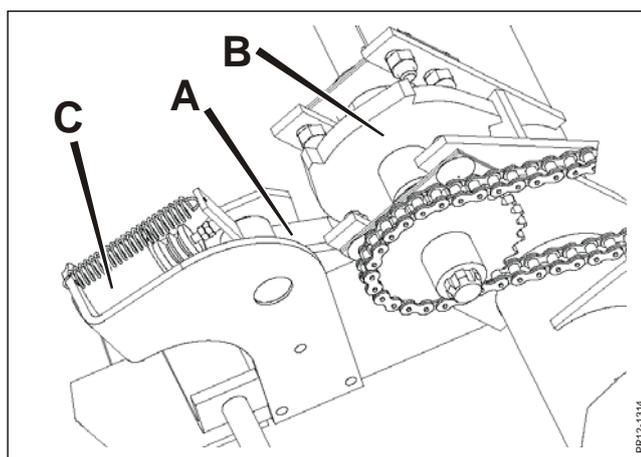
The electronics controls the reverse system in the following situations:

When the system is turned on:	The reverse motor moves to neutral position.
When metal is registered:	The reverse motor moves to neutral position and cannot move to feed intake until the machine has reversed.
When the belt drive has obtained correct tightening (position for feed intake)	The power to the motor is disconnected.
When the friction disc has obtained correct pressure on the rubber disc (reverse position)	The power to the motor is disconnected.

## ADJUSTMENTS

### RATCHET STOP

Machines with metal detector have an integrated stop system in the transmission for the feed intake system.



**Fig. 5-8**

**Fig. 5-8** The system consists of a pawl **A** and a ratchet wheel **B** which are activated by a coil **C**. The system is activated when metal is registered in the feed intake section and the coil gets a signal from the electronics which brings the pawl **A** in mesh with the ratchet wheel **B** and the feed intake section is blocked.



**WARNING:** The distance between the pawl and the wheel **MUST** be 1-2 mm as the distance determines the reaction time of the system in case of metal detection.  
Too large distance may mean that a metal object can reach the blade rotor before the feed intake stops and cause serious damage to the harvester.

The distance between pawl and wheel has been adjusted correctly from the factory. If it becomes necessary to readjust it is done by means of the adjusting screw **D** above the coil **C**.

### **FAULT-FINDING FOR MD**

In chapter 12 in this book "FAULT FINDING" is a table for fault finding on the MD system. The table contains the most known faults, possible cause and remedies.

# 6. DRIVING IN THE FIELD

In practice you want to drive the forage harvester in the highest possible tractor gear without causing frequent blockage. However, the amount of crop in the field will always vary, for instance where the mower conditioner has had to turn, change forward speed or change direction of travel. Therefore it is often appropriate either to drive with a power reserve so that the machine will not block, or to continuously adapt the driving of the forage harvester to the conditions.

The pick-up unit and the feed rollers are both secured against overloading resulting from a blockage by means of two friction clutches. The forage harvester also has a reverse function which makes it possible to remove a blockage without having to leave the tractor seat.

The intention is that the tractor driver increases the forward speed gradually in the beginning until the pick-up is blocked (the friction clutch of the auger slips). The crop is removed again by reversing and the user chooses a tractor gear which is one level lower to remove the risk of blockage.

However, it is not the intention that the friction clutch function of the feed rollers is activated. If this happens, the clutch adjustment of the pick-up must be reduced. The same will apply if the friction clutch on the PTO shaft between the tractor and the machine is activated during normal working.

Unfortunately it has been seen before that the torque adjustment of the friction clutch of the pick-up unit has been increased to the point where it is the friction clutch on the PTO shaft which is activated frequently. This friction clutch is not intended to be activated frequently but only for starting shock or when foreign matter gets into the machine. The same applies to the automatic clutch for the feed intake section.

The friction clutch on the PTO shaft cannot absorb the heat which is generated during long activation. The power transmitted at this clutch will be at least 10 times higher than the power needed to drive the pick-up unit.

Only the pick-up unit can be seen from the tractor, and therefore the clutch here should be activated first in case of a blockage.

The experienced tractor driver will be able to adapt the driving speed to the amount of crop. In this way the tractor driver works with minimum capacity reserve and, all other things being equal, with a maximum output.

## IN GENERAL

Always adjust the machine to the maximum cutting length acceptable for the crop in question. This will reduce the stress in the feed intake section and increase the possibility of working with the machine continuously without blockages.

The inexperienced tractor driver should always work with a capacity reserve and always make sure that the tractor can keep the correct number of revolutions.

Under difficult conditions we recommend you to ensure that spare friction discs for the clutch on the auger and for the feed rollers of the pick-up are in the toolbox, as a

## 6. DRIVING IN THE FIELD

clutch which is released several times will gradually be unable to transmit the wanted power.

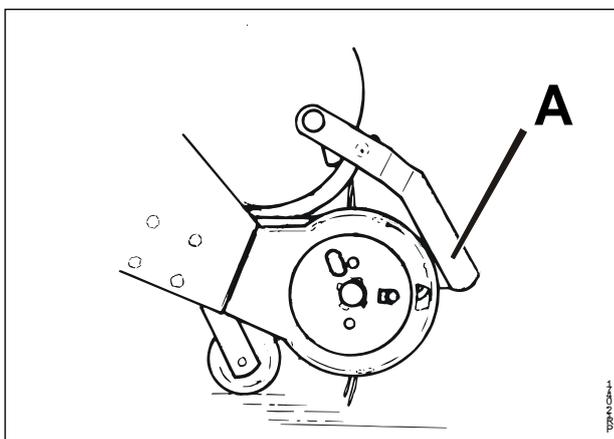
When working with a pick-up it is important that:

- The grass enters the machine regularly and that you, if possible, drive in the opposite direction of the swathing.
- The forward speed is adjusted to the amount of grass and is not so high that blockages occur frequently.
- You drive as straight as possible into the grass and are aware of this when turning in the field.

Always work with sharp blades and correctly adjusted shearbar. A short cutting length adjustment will not only increase the power requirements, but also result in increased wear of blade per amount of cut material.



**IMPORTANT:** Regular and even swathing is important for the subsequent chopping and will spare the tractor driver a lot of trouble.



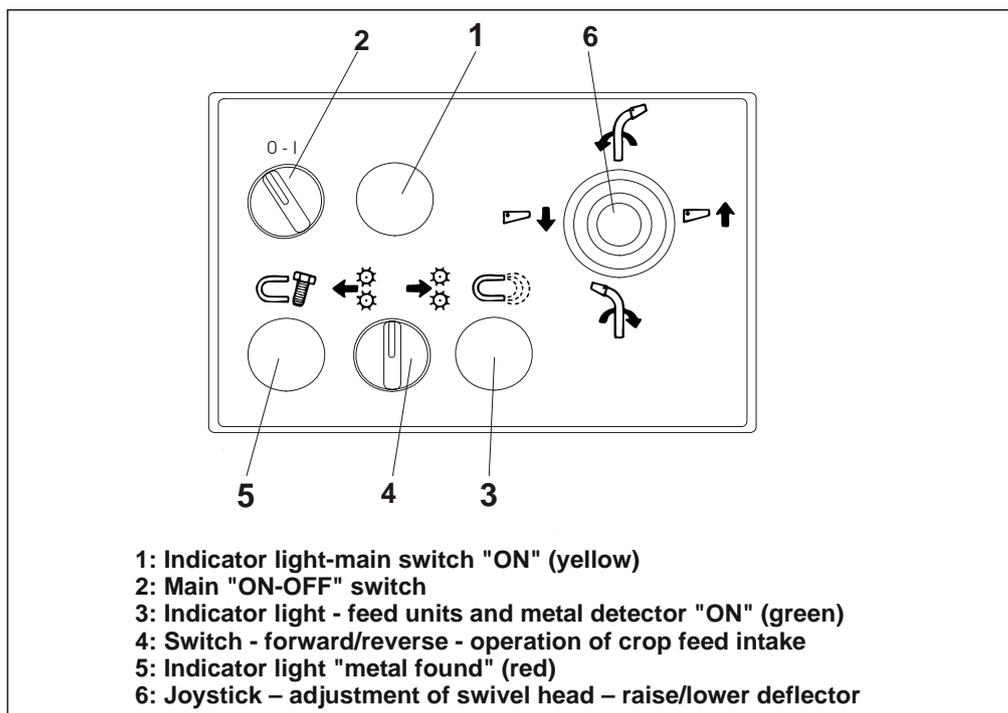
**Fig. 6-0**

**Fig. 6-0** The feed intake plate **A** above the pick-up can be dismantled when working in heavy and strong crops as the auger can easily pull the crop into the feed intake section under such conditions. At the same time you will have optimal preconditions for problem-free reverse as the feed intake plate **A** usually tends to prevent the crop from being reversed freely out of the auger.

## STARTING

There are differences in the starting procedures of a standard machine and a machine with metal detector (MD). On MD machines the electronics and the metal detector must be activated and checked before starting. Therefore the special procedures when starting MD machines are described first. Most of the procedures when starting and working in the field are in principle the same for the two models, and when there are differences the descriptions are divided into "*Standard machines*" and "*MD machines*".

### STARTING MD MACHINES



**Fig. 6-1**

**Fig. 6-1** Place the forage trailer at the end of a grass swath. Turn on the electronics by means of the On/Off switch **(2)** on the control panel.

#### Lights on the control panel:

- The yellow light **(1)** indicates that the electronics is on.
- The green light **(3)** indicates that the machine is working with normal feed intake and that the metal detector system is activated.
- The red light **(5)** indicates that the machine is in "metal found" status. i.e. the electronics has registered metal and the system has reacted (the pawl blocks the ratchet wheel and the reverse system is in neutral position).

When the electronics is turned on, the yellow light **(1)** and the red light **(5)** are on, and the reverse system is in neutral position.

Connect the power take-out (only the chopping rotor rotates) and move the feed intake to reverse with the switch **(4)** until the red light **(5)** turns off (the electronics has registered that you have reversed).

Turn the switch **(4)** to feed intake, and the green light **(3)** now indicates that the metal detector is in operation.

Disconnect the power take-off again and turn off the engine, but do NOT turn off the electronics of the machine. Test the functioning of the detector by moving a large metal piece across the front feed roller.



**WARNING:** Do not approach the machine when the feed intake is in neutral position and the rotor is rotating. Neutral position does not guarantee that the feed intake will not start. Do not approach the machine until the blade rotor has come to a complete stop.

When the metal detector has registered metal, the reverse system moves to neutral position and the red light **(5)** on the control panel is on again.

The detector has now been checked, and the machine is made ready for work as described above until the green light **(3)** is on.

### **CONTINUED STARTING PROCEDURE FOR ALL MACHINES**

Gradually increase to the correct number of rpm -1000 rpm on the PTO. Drive slowly into the crop and increase the forward speed as long as the tractor can keep the required number of revolution of approx. 1000 rpm.

An inexperienced operator should always work with a capacity reserve in the machine to avoid problems with the flow through the machine.



**IMPORTANT:** Always make sure that the tractor can keep the correct number of revolutions of 1000 rpm on the PTO. This ensures a regular load of the machine and you avoid torque increases (in case of reduced rpm) which wears the safety clutches and the transmission.

To obtain optimal pick-up function it is important that:

- The grass enters the machine regularly and that you, if possible, drive in the opposite direction of the swathing.
- The forward speed is adjusted to the amount of grass and is not so high that blockages occur frequently.
- You drive as straight as possible into the grass and are aware of this when turning in the field.

### **BLOCKAGE IN THE MACHINE**

#### **Auger and feed intake section:**

In case of blockage in the auger or the feed intake section activate the reverse function **immediately** by moving the switch to neutral position (*Standard version* = toggle switch, *MD version* = ON/OFF switch **(4)** on fig. 6-1) on the control box in the tractor, and reduce the number of revolutions.

Hereby the auger and the feed intake stop immediately, and you can obtain an overview of the situation.



**WARNING:** Do not approach the machine when the feed intake is in neutral position and the rotor is rotating. Neutral position does not guarantee that the feed intake will not start.

## 6. DRIVING IN THE FIELD

### *Standard machine:*

Now place the reverse system in reverse position at a low number of rpm, with the switch on the panel, and reverse the material out of the machine. After reversing move the reverse system back to normal feed intake, still at a low number of rpm. When the machine runs correctly, increase to correct number of rpm, and the work can be resumed.

### *MD machine:*

Turn the forward/reverse switch on again, and the electronics has ensured that the reverse system stays in neutral position. The electronics is now in position for "metal found" as the red light is on and the machine must be reversed before the work can be continued. See the description in the above section "STARTING MD MACHINES" In this chapter.

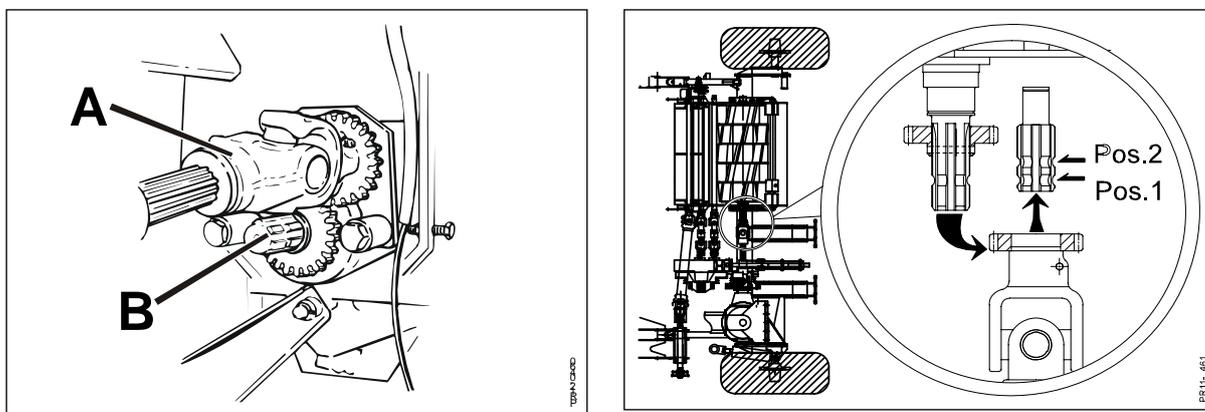
### **The rotor**

In case of blockage in the rotor, activate the reverse function immediately by moving the switch on the control panel in the tractor to neutral position and the power transmission is immediately turned off. To enable the feed rollers to pull the material out of the rotor, it must be disconnected during reverse. The procedure is as follows:

1) Go to the machine when the power take-off is disengaged and the motor has come to a complete standstill.



**DANGER:** Do not approach the machine until the rotating parts have come to a complete stop and be aware that neutral position does not guarantee that the feed intake will not start.



**Fig. 6-2**

**Fig. 6-2** 2) Move the PTO shaft **A** from the rotor to the alternative pin in **pos. 1** where the gear wheels are not in mesh. Thereby the rotor is not driven.



**WARNING:** It is important that the PTO shaft is **NOT** moved to **pos. 2**, where the rotor rotates in the opposite direction. This position is only used for grinding.

3) Connect the power take-out again at low number of rpm and move the reverse function to reverse position with the toggle switch on the control panel and reverse the material out of the machine.

## 6. DRIVING IN THE FIELD

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- 4) After reversing disconnect the tractor's power take-out again, the tractor is stopped, and the PTO shaft **A** for the rotor is moved back to the pin **B** for driving the rotor.
- 5) With the reverse function in neutral **it is now normally possible** to "blow" the cut grass, which is in the rotor housing, out of the chute - unless this is also blocked. In order to "blow the rotor housing empty" it is necessary to increase the number of revolutions to its maximum.
- 6) The reverse function is being brought back to normal.
- 7) When the machine runs, increase to correct number of rpm and the work can be continued.

### **METAL DETECTION DURING WORKING**

In case the magnet tub in the front lower feed roller registers metal, the metal detector ensures that the feed intake stops immediately as described in the section MD SYSTEM in chapter 5 "METAL DETECTOR".

Hereby the red light on the control panel is on, and you must do as follows:

- 1) Turn off the rpm of the tractor immediately and reverse a couple of meters.
- 2) Now the material can be reversed out of the intake area, after which the red lamp is turned off. It is recommended to drive backwards during reverse to facilitate the operation and spread out the material.
- 3) Disconnect the power take-out and stop the tractor engine.
- 4) When the blade rotor has stopped, remove the metal piece from the reversed grass. Be aware that small pieces may fall out at the rear lower roller.

**Alternatively:** Lift the pick-up and drive forward over the crop which has been reversed out of the machine. Start picking up grass from the swath again. The amount of crop with metal that has been left can be picked up at the end after metal has been found.

- 5) When the metal has been found, the feed intake section can be started and the work is continued.

### **AFTER WORK**

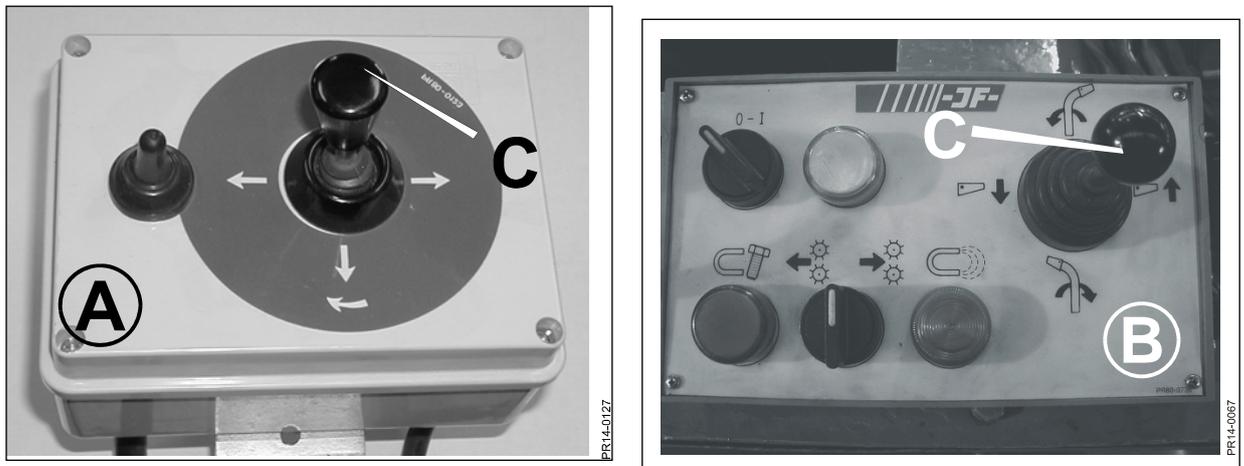
When you have finished working with the machine, always place the reverse system in neutral position. Hereby the belts on the V-belt drive are slackened.



**WARNING:** If an MD machine is stopped with the reverse system in position for normal feeding and you start the machine **WITHOUT** turning on the power to the control panel, the machine will not be able to work in the intake.

## CONTROL OF FUNCTIONS

### CHUTE AND DEFLECTOR



**Fig. 6-3** Adjustment of chute and deflector is either controlled via the joystick box **A** (*standard machine*) or the control box **B** (*MD machine*). If the joystick **C** is moved sideways to move the deflector up or down, power is transmitted to the electric motor of the deflector, and if the joystick **C** is moved up or down to turn the chute, power is transmitted to the electro hydraulic valve block which leads oil to the hydraulic motor on the chute. On the ES 3000 power is transmitted directly to the electric motor turning the chute.

The electric motor and/or the hydraulic motor runs until the joystick is released again. If the joystick is not released and the motors are blocked or meet other resistance, the electronics will disconnect the power to protect against overload.

### OPTIMAL FILLING OF THE TRAILER

If the ES chopping unit is equipped with a swivel chute there is a special technique which ensures an efficient and complete filling of the trailer. The best thing is to fill the trailer in layers, i.e. guiding the chute to the right and to the left, gradually lowering the deflector. This is done until the crop is delivered at the front of the trailer box. Then the deflector is lifted again, and the technique is repeated. Layer by layer the trailer is filled until the crop is right in front of the chute opening.

It is important to be aware that the chute is continuously being able to deliver the crop to avoid stops in the chute and in the rotor.

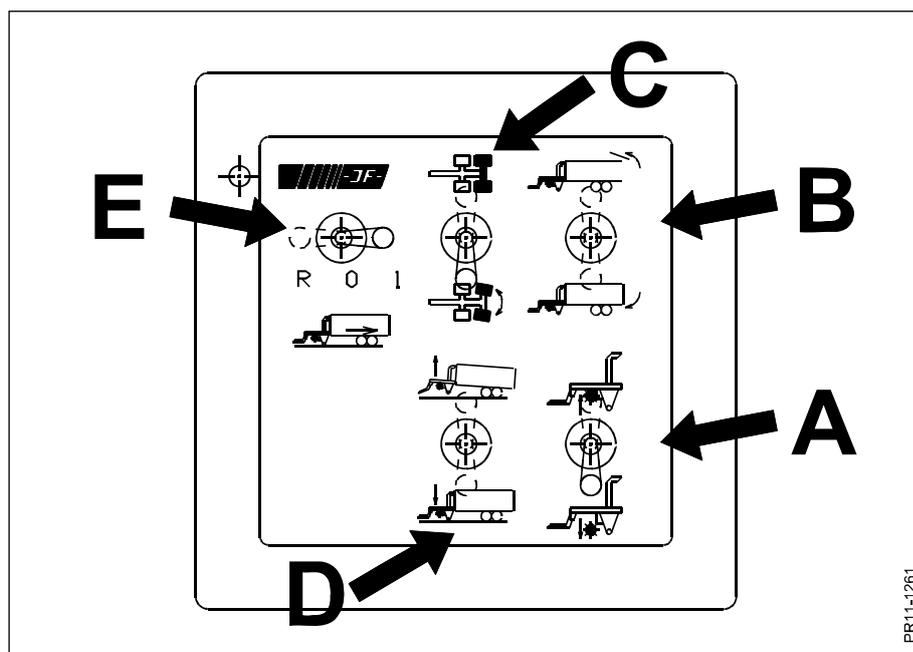
A 100 % filling is achieved by at the end swinging the chute once to both sides to fill up around the chute opening.

### PICK-UP

When turning in the field it is necessary to lift the pick-up from the field in order not to damage the swath and to limit the risk of damaging the pick-up when turning.

On the ES 3000 the pick-up is operated through a handle for a single-acting hydraulic outlet.

## 6. DRIVING IN THE FIELD



**Fig. 6-4**

**Fig. 6-4** On ES 3600 and ES 4200 the pick-up is raised and lowered by operating the **A** switch of the switch box. When the pick-up is lowered to the ground, the hydraulic system will be in floating position to ensure optimal ground following for the pick-up.

### **DRAWBAR**

The drawbar between the chopping unit and the tractor can be raised and lowered as required. If the drawbar and thus the whole forage trailer are lifted, the pick-up is lifted additionally.

This additional lift makes it possible to drive to and from the clamp.

On the ES 3000 the drawbar is raised and lowered by means of the handle for a double-acting outlet.

**Fig. 6-4** On ES 3600 and ES 4200 the pick-up is raised and lowered by operating the **D** switch of the switch box.

## 6. DRIVING IN THE FIELD

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### ARTICULATION OF BOGIE

The articulation of the rear bogie axle (not included in ES 3000) reduces damage on roots in the field as the wheels of the forage trailer are twisted when turning. When the articulation is activated the wheels of the rear axle can turn freely and will follow when the trailer turns in the field.

However, in 2 cases it is necessary to block the articulation:

- 1) When driving backwards with the forage trailer.



**WARNING:** The blockage will protect against unpredictable extreme loads of the axles and spring suspension of the forage trailer as a result of uncontrolled angular motions of the rear wheels.

- 2) When driving on public road.



**DANGER:** Here the blockage secures the directional stability of the forage trailer during transport. Hereby the risk of serious traffic accidents caused by lack of directional stability is reduced.

On an ES 3000S model where articulation is standard like on the larger models the articulation is activated and blocked through a handle for a single-acting outlet.

**Fig. 6-4** On the ES 3600 and the ES 4200 the articulation is activated and blocked by operating the **C** switch of the switch box.

### UNLOADING

To unload the forage trailer, open the rear door and then activate the conveyor chain. To ensure the conveyor chain is not activated at the wrong moment and thus cause the rear door and/or the conveyor chain transmission to be overloaded, a safety valve has been mounted which only allows the conveyor chain to run when the rear door is open.

On the ES 3000 the rear door is operated through a handle for a single-acting hydraulic outlet.

**Fig. 6-4** On ES 3600 and ES 4200 the rear door is raised and lowered by operating the **B** switch of the switch box.

**Fig. 6-4** Unloading is started by activating the conveyor chain.

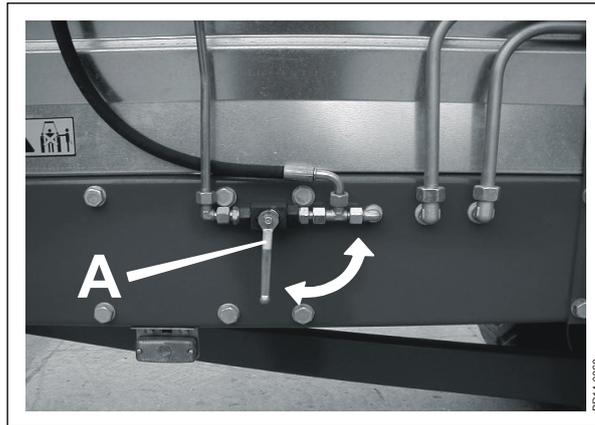
On the ES 3000 the conveyor chain is operated through a handle for a double-acting hydraulic outlet.

On ES 3600 and ES 4200 the conveyor chain is started and stopped by operating the **E** switch of the switch box. The switch is moved to the side with the symbol **1**.



**CAUTION:** The access to the platform of the trailer is at the front to obtain maximum safety that the conveyor chain is not activated while there are person on the platform.

## 6. DRIVING IN THE FIELD



**Fig. 6-5**

**Fig. 6-5** If it is necessary to stand under a raised rear door, for instance in order to maintain the conveyor chain, a ball valve **A** is mounted at the right side of the trailer close to the rear door. This valve must be closed (the handle positioned crosswise as shown in fig. 6-5), to protect against unintended movement of the rear door before standing under it.

## DRIVING IN THE FIELD

In general you should seek to limit the compression in the soil caused by driving with the trailer in the field. In case of major compression in the upper soil layers there will be a risk of less growth and thus lower output. The following are practical measures how to reduce the compression of soil in the field.

- If possible, avoid working in a wet field, i.e. after rain or early in the morning.
- Limit deep wheel tracks in the field.
- Limit the traffic in the field.
- Use wheels with maximum width.
- Use minimum tyre pressure in the wheels.
- Use articulation when turning.
- If possible, choose high driving speed.



**ADVARSEL:** When driving on hilly ground, choose maximum tyre pressure which is stated in the tyre pressure table in order to increase the sideways stability and prevent the risk of overturning.

# 7. MAINTENANCE

## IN GENERAL



**WARNING:** When repairing or maintaining the machine it is especially important to ensure correct personal safety. Therefore, always park the tractor (if mounted) and the machine according to the **GENERAL SAFETY INSTRUCTIONS** items 1-20 in the beginning of this instruction manual.



**IMPORTANT:** After approx. ½ day of operation, all bolts should be re-tightened. Especially the bolts for connection of chopping unit and trailer unit, the bolts connecting the trailer box to the side members, and the blade bolts in the blade rotor must be re-tightened properly.

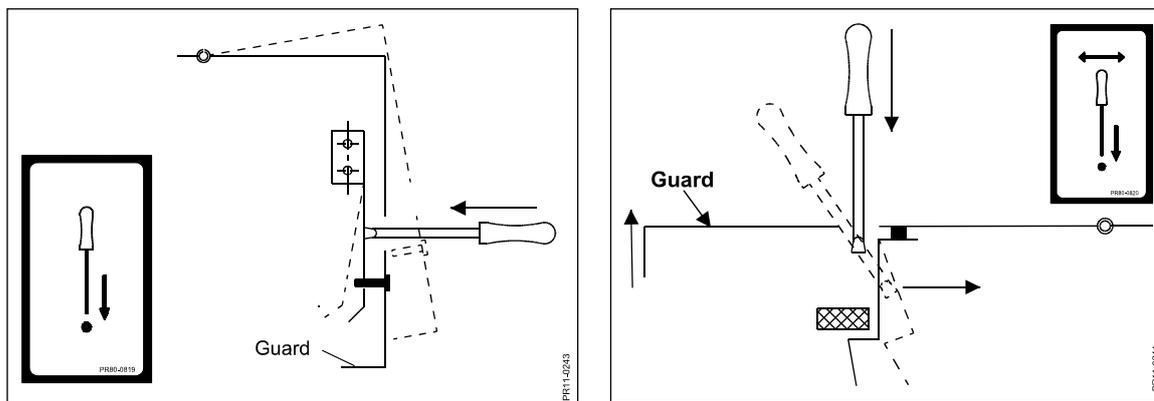
Torque moment  $M_A$  for bolts on the machine (if nothing else stated in this instruction manual).

A Ø	Size of jaw [mm]	Class: 8.8 $M_A$ [Nm]	Class: 10.9 $M_A$ [Nm]	Class: 12.9 $M_A$ [Nm]
M 8	13	25	33	40
M 10	17	48	65	80
M 12	19	80	120	135
M 12x1.25	19	90	125	146
M 14	22	135	180	215
M 14x1.5	22	145	190	230
M 16	24	200	280	325
M 16x1.5	24	215	295	350
M 18	27	270	380	440
M 20	30	400	550	650
M 24	36	640	900	1100
M 24x1.5	36	690	960	1175
M30	46	1300	1800	2300

Before long time of standstill, the machine should be cleaned and greased and be sprayed with rust-preventing oil, if necessary.

**Be careful when cleaning with a high pressure cleaner.** Never spray directly on bearings or electric parts and grease the grease spots of the machine carefully after cleaning.

## GUARDS



When maintaining the machine you often need to open or remove guards. For safety reasons all guards have been equipped with a lock. The lock ensures that the guard cannot be opened without tools.

**Fig. 7-1**

**Fig. 7-1** The two different locking principles and the corresponding transfers which indicate and illustrate the locks on the machine are shown above.

## REPLACEMENT OF BLADES

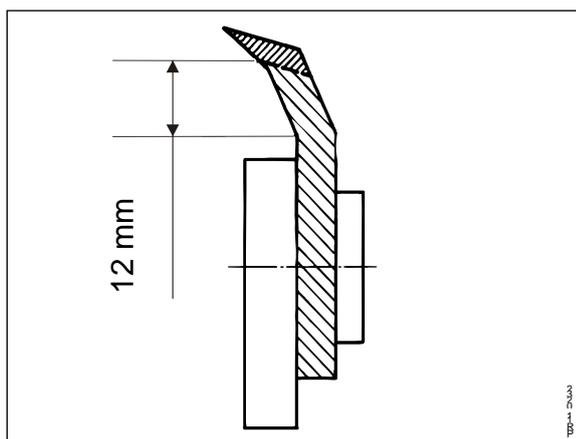
When replacing a single blade the blade must be placed at the same distance to the shearbar as the existing blades. To ensure that the rotor is in balance it may be necessary to replace the opposite blade as a used blade has a different weight compared to a new blade.

Even though that there is no visible damage to the blade bolts they must always be replaced when another blade is mounted, as they might have been overloaded.

**NOTE:** Check the distance between the blade and the shearbar (0.5 mm) with the supplied gauge before the bolts are tightened.

**NOTE:** Only original, special blade bolts must be used when replacing old ones. The blade bolts are tightened with a torque wrench to 40 kgm, or with the supplied wrench the bolts are tightened pulling the wrench one time to approx. 40 kg (400 Nm).

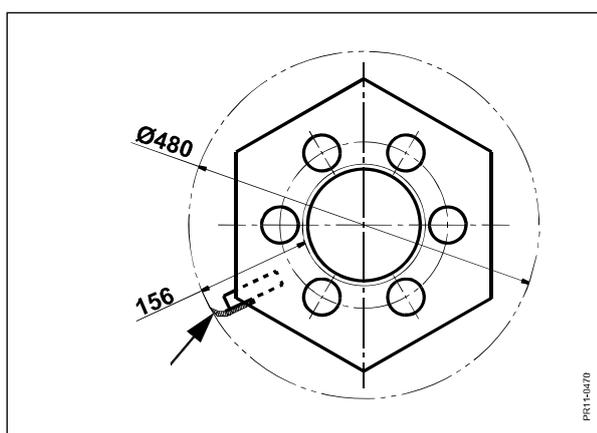
## 7. MAINTENANCE



**Fig. 7-2**

**Fig. 7-2** When the blades have been worn max. 8 mm or to the first bend, i.e. approx. 12 mm above the straight piece, they must be replaced.

**NOTE:** When all blades on the rotor have been worn and the rotor adjusted towards the shearbar, it **MUST** be adjusted back again before new blades are mounted. Otherwise there is a risk that new blades collide with the shearbar when the rotor is turned.



**Fig. 7-3**

**Fig. 7-3** When mounting the new blades these are pulled out so that the outer diameter of the rotor is 480 mm (alternatively measured from the rotor tube to the point of the blade = 156 mm).

## GRINDING

Adjustment of the PTO drive shaft for the rotor to or from grinding position, respectively, may only take place **when the machine has been stopped and the rotor has come to a complete standstill**. The rotor may only rotate when the grinding device is in grinding position.

### Check before grinding:

- that the grindstone is undamaged.
- that the device is easily sliding back and forth.
- that the device is parallel with the rotor.

## 7. MAINTENANCE

The grinding device is correctly adjusted from the factory and therefore there is normally no need for adjustment, but if it has been dismantled adjustment can be made at the oblong holes of the lateral guides. The bolts must be tightened firmly after the adjustment.

The stone is fed by turning the handle.

Normally you should grind the blades once a day – but avoid too much grinding.



**CAUTION:** Protect your eyes – always use safety glasses when grinding. The guard above the grinding device must be closed while grinding.

### GRINDING OPERATION

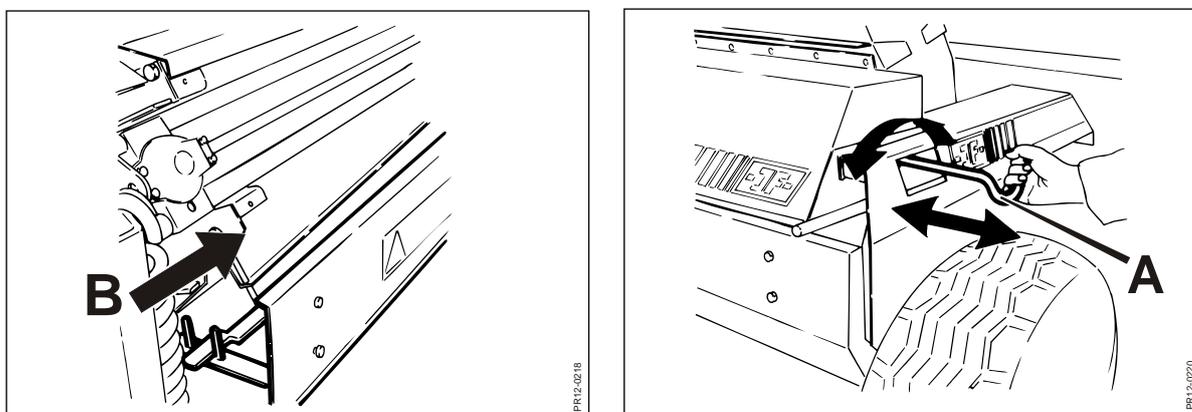


Fig. 7-4

- Fig. 7-4**
- 1) Lift the guard above the grinding device.
  - 2) Lower the guard **B** between the grinding device and the rotor so that there is free space between the device and the rotor.
  - 3) Adjust the grindstone so that there is 2-3 mm clearance between the stone and the blades by turning the handle **A**.

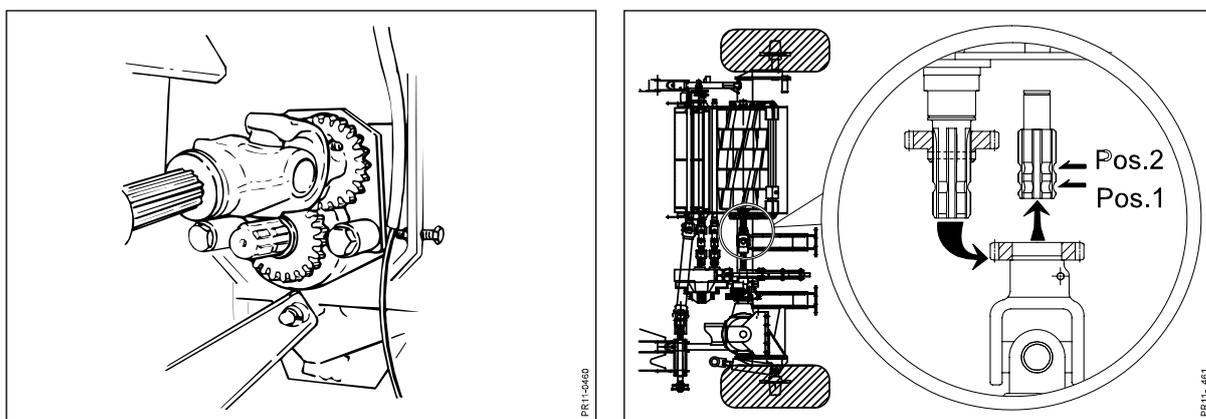


Fig. 7-5

## 7. MAINTENANCE

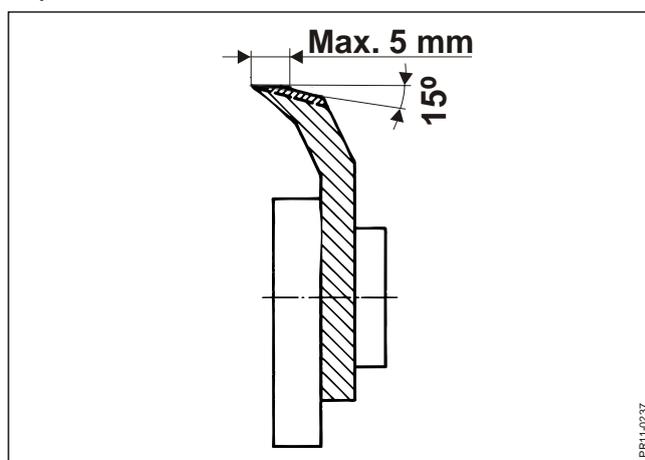
- Fig. 7-5**
- 4) Mount the PTO drive shaft for the rotor on the free pin on the rotor housing. The PTO drive shaft must be fixed at **pos. 2** whereby the rotor will rotate in the opposite direction.
  - 5) Close all guards.
  - 6) Start the tractor and keep the rpm at a little above idle speed.
  - 7) Feed carefully by turning the handle **A** (fig. 7-4) until the stone touches the blade. Move the stone in a sliding movement across the whole rotor and back again. Feed some more and repeat the movement across the whole width of the rotor.
  - 8) Push the handle in after grinding. Stop the tractor and when the rotor has come to a complete stop, the guard between the device and the rotor must be lifted back into its right position. The PTO drive shaft for the rotor must be moved back to the pin for normal direction of rotation.

**Check the distance between blades and shearbars.**



**WARNING:** Only grind with **CLOSED** guards.

Check wear of the grindstone regularly. If the stone has been worn to a thickness of 10 mm it must be replaced



**Fig. 7-6**

- Fig. 7-6** To avoid unnecessary power consumption and excessive wear of the grindstone during operation, it is necessary to make a rough grinding or adjustment of the blades when the cutting edge is 5 mm wide or more. Grind the rear edge to an angle of approx. 15°.

Rough grinding can be made by means of an angle grinder with the rotor and blades positioned in the machine.



**CAUTION:** **Be careful** not to grind down the cutting edge (front edge). **Block the rotor with a firm object (a piece of wood or the like) during rough grinding to make sure that the rotor does not move during this operation.**

### FRICITION CLUTCH

The friction clutches must be maintained at regular intervals. At the same time, the clutches must be checked if they have not been in operation for some time. This especially applies after winter storage before the machine is used for the first time in the season.

#### FRICITION CLUTCH ON THE PTO SHAFT

Before start of the season the friction clutch must as a minimum be "aired" as described in **SECTION 3 "FRICITION CLUTCH – START-UP OF NEW MACHINE"**. This must be done to ensure that the coating on the clutch and the steel thrust plates have not rusted during wither. A rusted clutch cannot protect the transmission parts if a foreign body should enter into the machine.

An even better solution is to disassemble the clutch by following the 4 steps below:

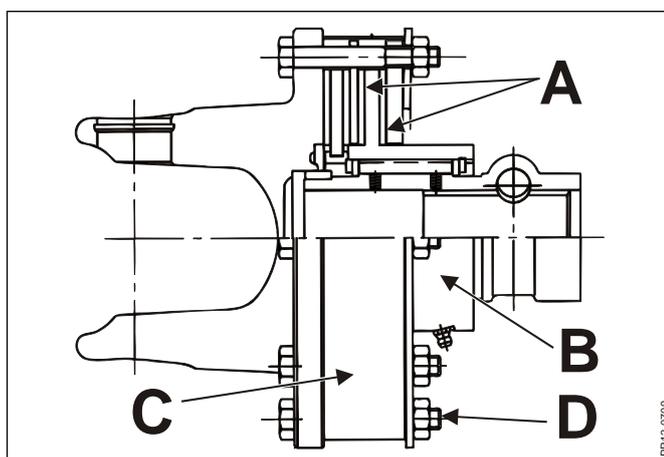


Fig. 7-7

- Fig. 7-7**
- 1) Disassemble the clutch and clean all parts of possible rust.
  - 2) Check the clutch discs **A** for wear and replace if required.
  - 3) Clean and grease the freewheel clutch **B**.
  - 4) Assemble and mount the clutch again. See also instruction delivered from supplier (is placed on the shaft on delivery).



**IMPORTANT:** The outer metal band **C** indicates whether the tightening of the springs is correct. Tighten the bolts **D** just so much that the metal band **C** can be turned (max. 0.5 mm play). The torque adjustment is not correct if the metal band is too tight or deformed due to excessive tightening of the bolts.

### THE FRICTION CLUTCH OF THE AUGER

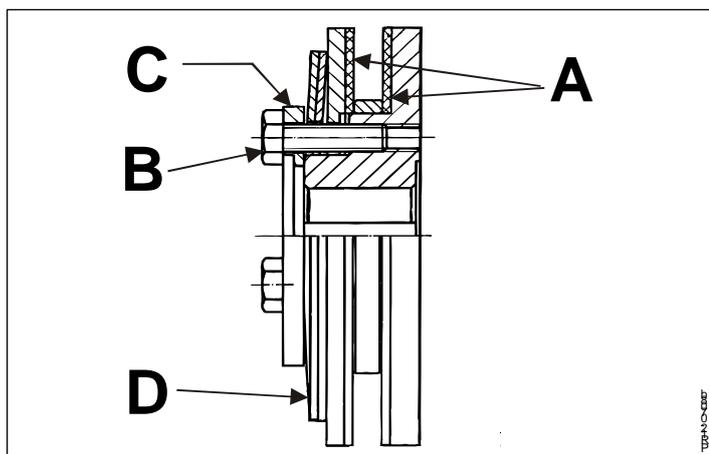


Fig. 7-8

- Fig. 7-8**
- 1) Disassemble the clutch and clean all parts of possible rust.
  - 2) Check the clutch discs **A** for wear and replace if required.
  - 3) Assemble and mount the clutch again. Tighten the bolts **B** with normal torque as the flanges **C** ensure the correct compression of the springs **D** and thus the correct torque setting.



**WARNING:** If the clutch is overloaded by slipping for more that 2-3 sec., it will get heated and thus be worn quickly. Overheating will damage the friction plates. If the clutch is blocked or put out of function in other ways, the factory guarantee will be discontinued.

### TRANSMISSION BELTS

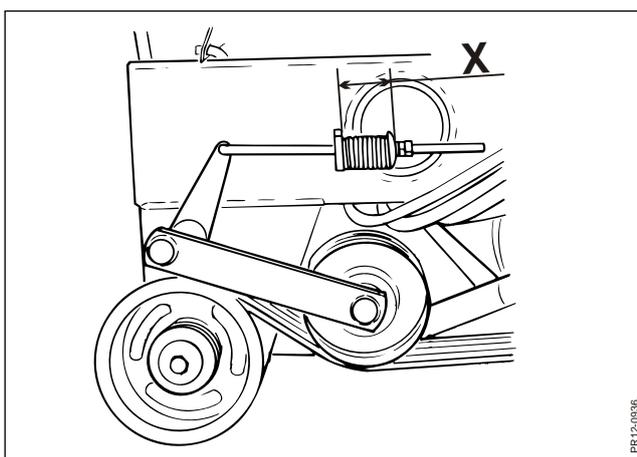


Fig. 7-9

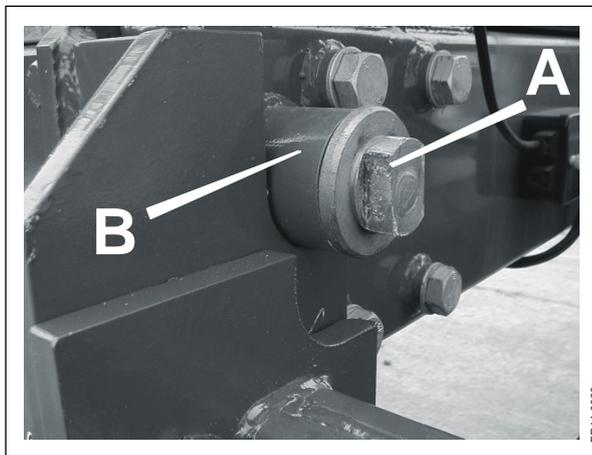
- Fig. 7-9** The V-belts along the chopping unit must be tightened by means of the spring for the support roller. The spring must be tightened to the length **X** = 100 mm.

The spring should never be tightened completely.

It is necessary to check the factory setting immediately after you have started to use the machine.

### CONVEYOR CHAIN

The conveyor chain drive is tightened up by 2 strong single springs for each chain drive. If foreign matter gets stuck, for instance a small stone between chain wheel and chain link, the chain wheel may move 5-10 mm.



**Fig. 7-10**

**Fig. 7-10** From the factory the conveyor chain is adjusted to maximum tightening of the springs, i.e. the spring tightening bolt **A** bears against the tubes **B** on the trailer. This in order to compensate for the fact that paint and burrs will be removed during the first hours of use.

After the first hours of work, the chain length will be adjusted. Therefore, the spring tension must be checked regularly and if necessary, the spring tightening bolt **A** must be re-tightened (fig. 7-10).

In order to be able to move if foreign matter gets stuck, the tightening must be adjusted so that there is a distance of 5 to 8 mm from the spring tightening bolt **A** (fig. 7-10) to tube **B** (fig. 7-10).

**When replacing one or more chain links, the following method is recommended:**

- 1) Loosen the six-sided nut of the chain tightening bolt until it is possible to move the front chain wheel axle back until it meets a stop.
- 2) The chain links are disassembled by turning two chain links to the position where they can be released.
- 3) Worn or defective chain links must be replaced.
- 4) Chain links are mounted by turning two chain links in the position where they can be connected.
- 5) Tighten the spring tightening bolt again until the distance to the tube is as required.

If the conveyor chains are worn unequally, it can be an advantage to exchange the chains.

### WHEELS

In connection with mounting of tyres, repairs must be made at an authorised workshop.

The tyre pressure should be checked regularly according to the following table:

<b>Tyre pressure table</b>					
<b>Unit</b>	<b>Size</b>	<b>Cover</b>	<b>Width</b>	<b>Diameter</b>	<b>Max. pressure</b>
Trailer	550/60-22,5	12 PR	537 mm	1,232 mm	2.7 bar
Trailer	700/40-22.5	12 PR	700 mm	1,170 mm	2.5 bar
Trailer	750/45-22.5	12 PR	754 mm	1,247 mm	2.6 bar
Chopping unit	140-6	6 PR	135 mm	327 mm	4.3 bar

**CAUTION:** Check the tyre pressure regularly and make sure that the wheel-fixing bolts are tightened correctly. Re-tightening is especially important in the period after a wheel has been changed. The required torque moments appear from the table at the beginning of this chapter.

### MISCELLANEOUS

#### HYDRAULICS

All hydraulic parts should be checked for possible leakage from time to time. It may be necessary to re-tighten screws and fittings in order to repair possible leakage.

#### HYDRAULIC HOSES

The authorities require that hydraulic hoses are replaced every 6 years though they do not seem to be worn or damaged in other ways.

### ROLLERS

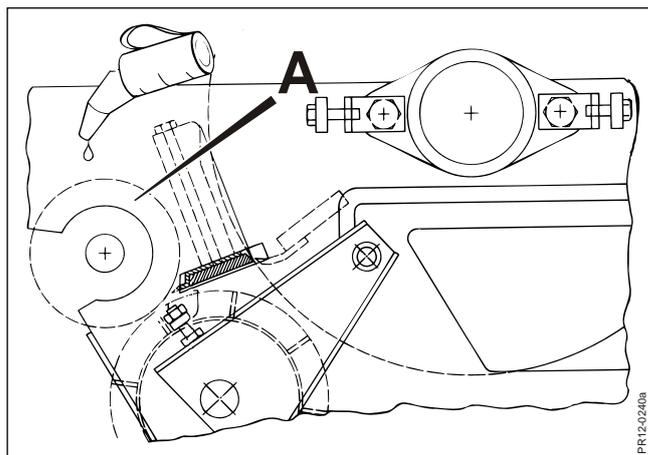


Fig. 7-11

**Fig. 7-11** The upper rear feed roller, the smooth roller **A**, should be secured against formation of rust on the surface. If the machine is not in use for more than one day, the whole surface should be lubricated with some oil.

### CHAIN TIGHTENER FOR PICK-UP AUGER

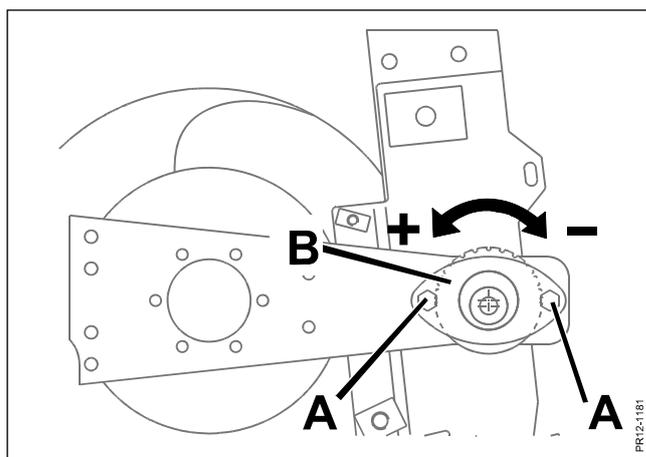


Fig. 7-12

**Fig. 7-12** Two bolts **A** are loosened after which the eccentric **B** can be turned with a screwdriver or the like. It is turned in **+** direction for tightening and in **-** direction for loosening.



**CAUTION:** It should always be possible to move the chain at least 20 mm up and down in the middle.

### ELECTRIC MOTORS

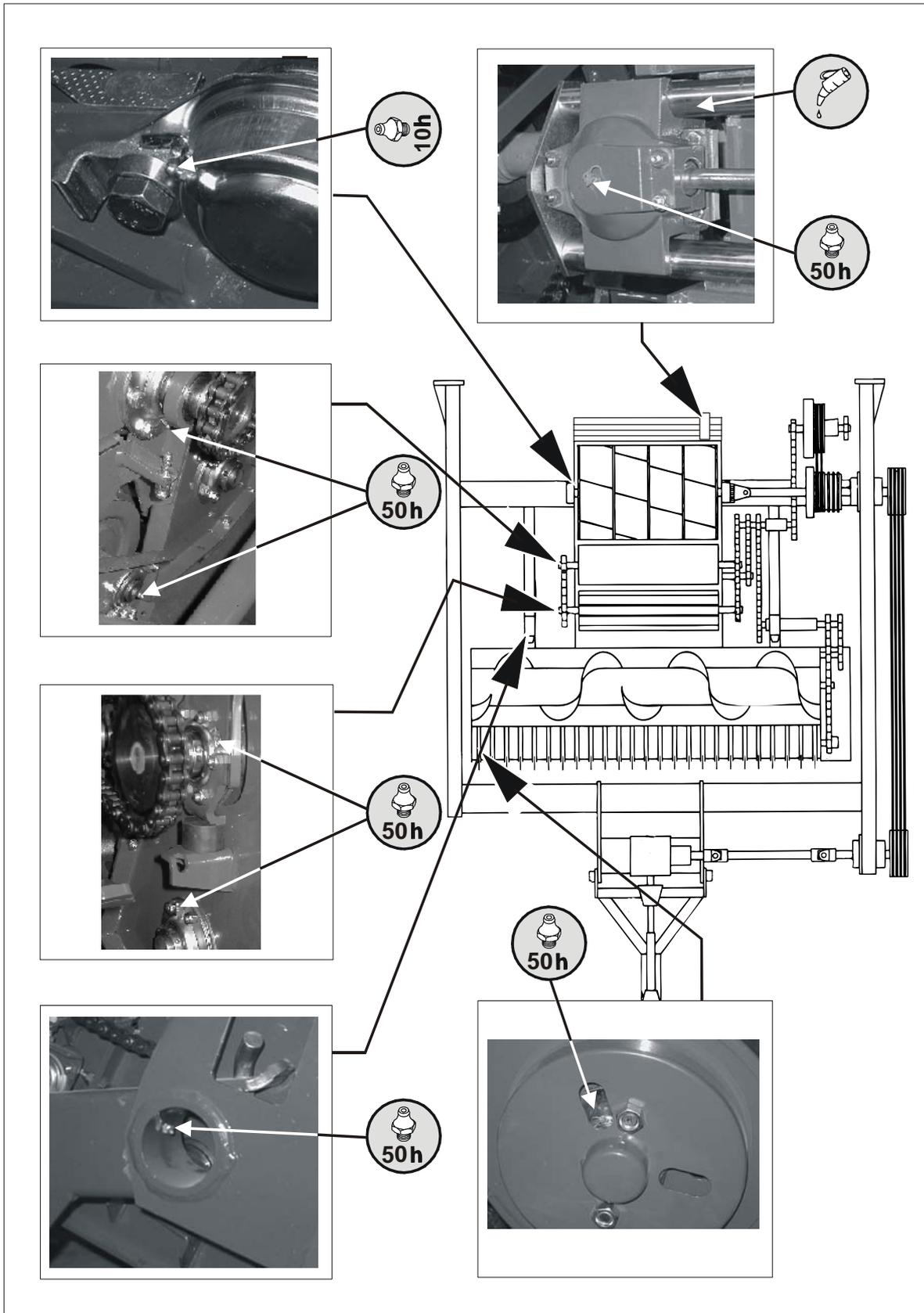
If the machine is not in use for a longer period, and in the winter time, it is recommended to pull the spindle on the electric motors in to avoid formation of rust. When dismantling the control panel in the cabin it should be stored in a dry and warm place.

The plugs on the cables of the machine must be placed under a guard or wrapped up to protect against wind and weather. They can be treated with spray.

# 8. GREASING

## LUBRICATION CHART FOR RIGHT SIDE OF CHOPPING UNIT

The indicated lubricating points must be lubricated according to instructions:

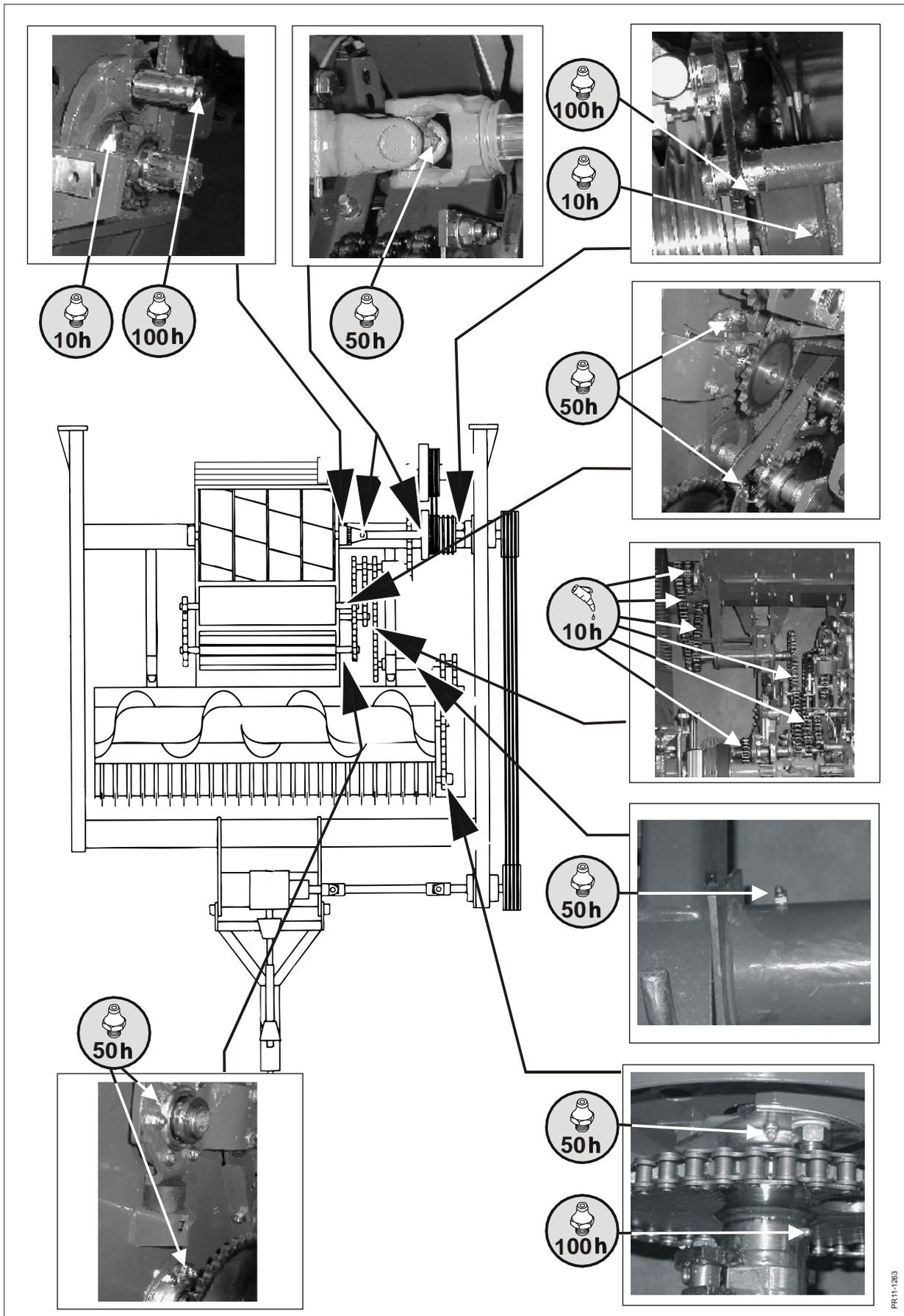


PRE11-1.202

## 8. GREASING

### LUBRICATION CHART FOR LEFT SIDE OF CHOPPING UNIT

The indicated lubricating points must be lubricated according to instructions:  
**IMPORTANT:** Lubricate chains daily with chain saw oil.

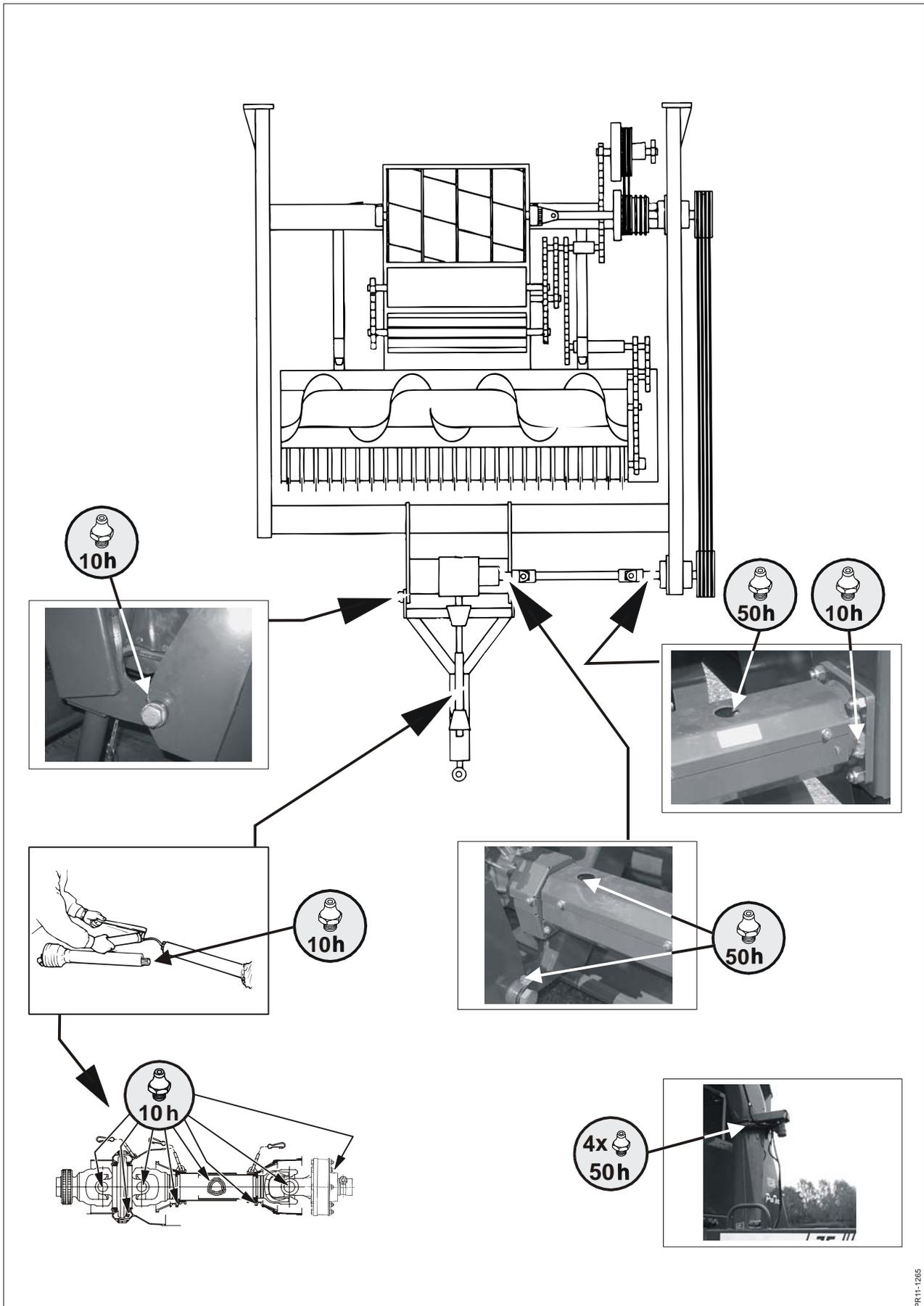


PR11-1283

## 8. GREASING

### LUBRICATION CHART FOR FRONT OF CHOPPING UNIT

The indicated lubricating points must be lubricated according to instructions:



PK11-1285

# 8. GREASING

## LUBRICATION CHART FOR TRAILER UNIT

The lubrication chart for the trailer unit consists of six photographs, each with arrows pointing to specific greasing points and circular callouts indicating the required frequency and quantity:

- Top Left:** Shows the top of the trailer unit with four greasing points. Callout: 4x 40h.
- Top Right:** Shows the front of the trailer unit with three greasing points. Callout: 40h.
- Middle Left:** Shows the axle area with two greasing points. Callouts: 2x 100h and 2x 100h.
- Middle Right:** Shows the underside of the trailer unit with two greasing points. Callout: 2x 100h.
- Bottom Left:** Shows the wheel hub area with two greasing points. Callouts: 2x 500h and 2x 500h.
- Bottom Right:** Shows the wheel hub area with one greasing point. Callout: 10 gr 100h.

PRE13-0070

## 8. GREASING

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### **PTO DRIVE SHAFT**

During the season, the PTO drive shaft from tractor to the ES chopping unit should be greased once every day before use. Be aware that there are more grease nipples than usually because the PTO drive shaft is with wide-angle joint.

It is important for any PTO drive shaft that the profile tubes are also lubricated every day. If you avoid this, damaging forces may appear as a result of friction in the profiles when turning in the field. It is necessary to separate the axle in two halves to obtain access to lubrication of the profile tubes.

### **BEVEL GEARBOX ON CHOPPING UNIT**

The bevel gearbox is positioned centrally at the front of the frame of the chopping unit and transmits power from the PTO drive shaft to the transversing drive shaft.

ES 3000 has another type of bevel gearbox than the larger models ES 3600 and ES 4200.

#### **Bevel gearbox on ES 3000 and ES 3000S:**

- **Oil type:** Quality API GL4 or GL5 SAE 80W-90
- **Oil content:** 3.1 litres
- **Oil change:** After the first 10 working hours and then once a year.

#### **Bevel gearbox on ES 3600 and ES 4200:**

- **Oil type:** Quality API GL4 or GL5 SAE 80W-90
- **Oil content:** 4.5 litres
- **Oil change:** After the first 10 working hours and then once a year.

### **CONVEYOR CHAIN GEARBOX ON TRAILER**

The gearbox is driven by a hydraulic motor and transmits power from there to the drive shaft for the conveyor chain.

- **Oil type:** Quality API GL4 or GL5 SAE 80W-90
- **Oil content:** 4.3 litres
- **Oil change:** After the first 10 working hours and then once a year.

### CLEANING

We have the following cleaning instructions from our supplier of paint.



**CAUTION:** After delivery of the trailer, the paint still needs a curing period of 2-3 weeks before the adhesion and wearing qualities are as intended. In this period, do not use high pressure cleaner and do not grease the surface of the machine with oil.

After the curing period, the following should be observed:

<b>Cleaning with high pressure cleaner</b>	
Pressure	Maximum 150 bar
Temperature	Maximum 50-60 degrees C
Minimum distance	50 to 100 cm

# 9. STORAGE (WINTER STORAGE)

When the season is over, the preparation for winter storage should be made immediately after. First, clean the machine thoroughly. Dust and dirt absorb moisture and moisture increases the formation of rust.



**CAUTION:** Be careful when cleaning with a high pressure cleaner. Never spray directly on the bearings and grease all grease points carefully after cleaning so that possible water is pressed out of the bearings.



**IMPORTANT:** Grease all grease points after cleaning the machine.

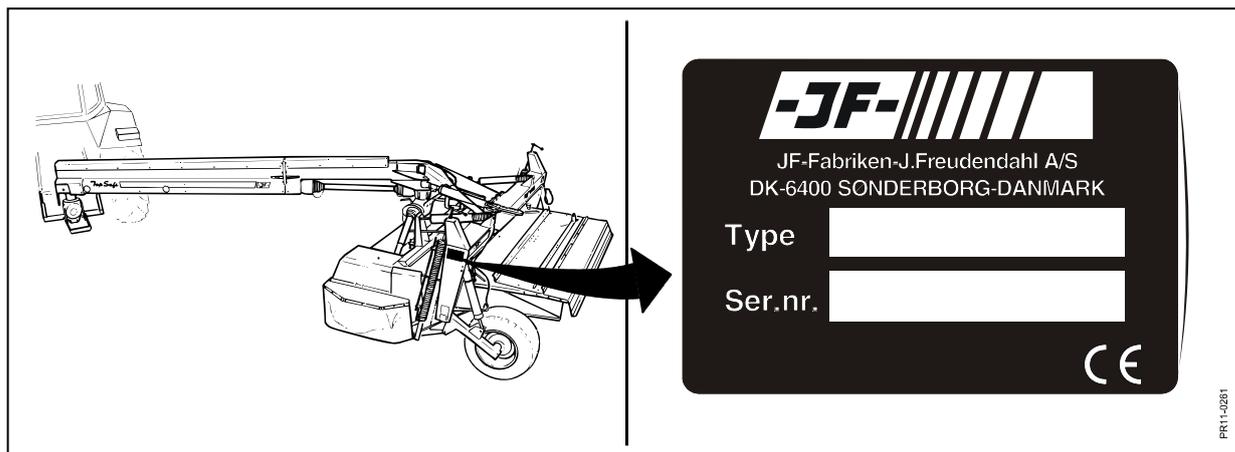
The following points are instructions how to prepare for winter storage.

- Check the machine for wear and other defects – note down the necessary parts you will need before the next season and order the spare parts.
- Dismount the PTO drive shafts, lubricate the profile tubes and keep them in a dry place.
- Spray the machine with a thin coat of rust-preventing oil. This is especially important on the parts polished with use.
- Change the oil in the hydraulic system and the gearboxes.
- Store the machine in a ventilated engine house.
- Lay up the machine to unload the tyres.

## 10. SPARE PARTS ORDER

When ordering spare parts, please state machine type and serial number.

This information is printed on the machine plate. We request you to write this information on the first page in the spare parts catalogue supplied with the machine as soon as possible after delivery so that you have the information at hand when ordering spare parts.



## 11. DISPOSAL

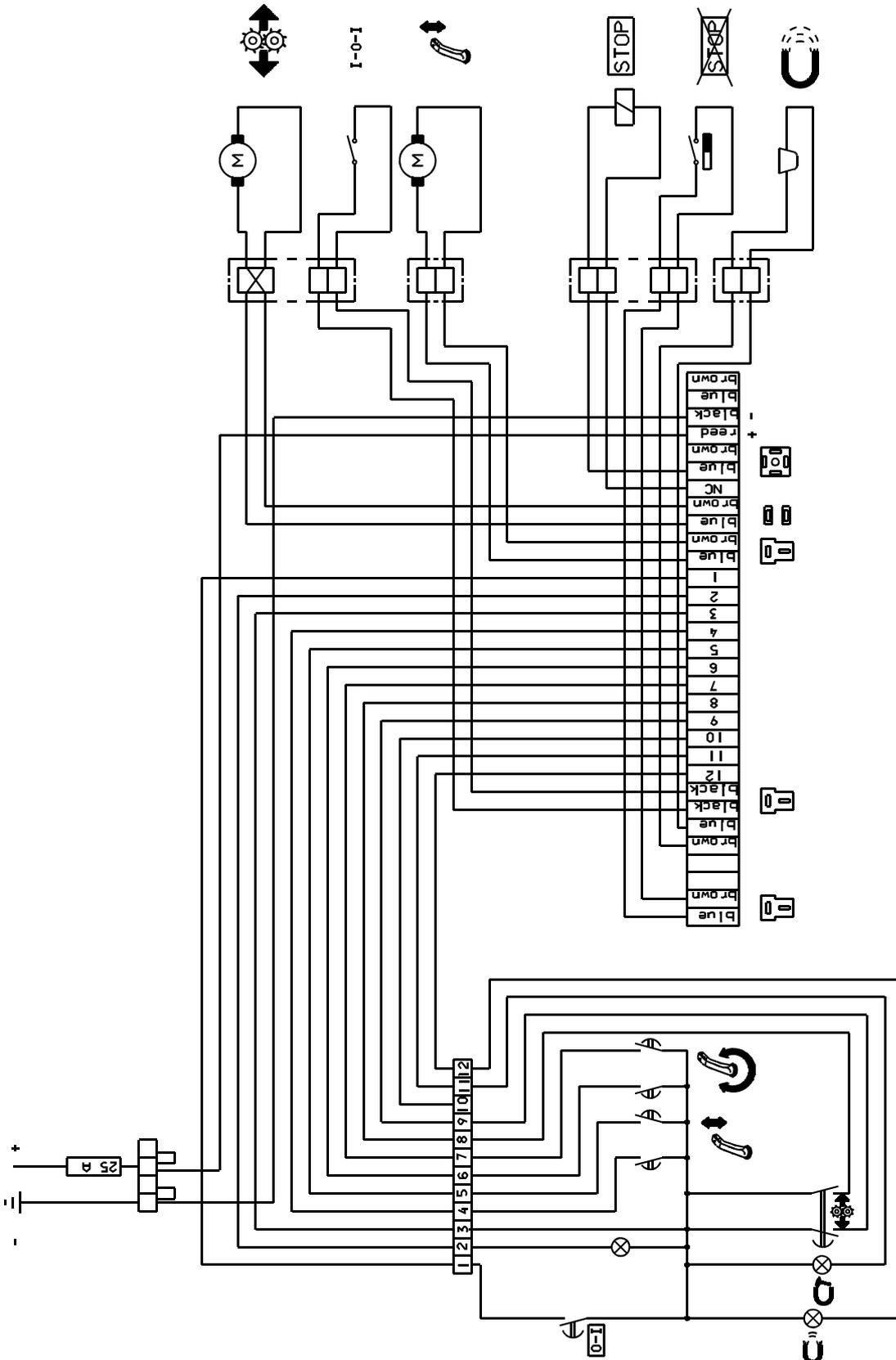
When the machine is worn-out it must be disposed of in a proper way.

Observe the following:

- The machine must **not** be placed somewhere outside.
- Gearboxes, cylinders, and hoses must be emptied of oil. These oils must be handed over to a destruction company.
- Disassemble the machine and separate the individual parts, e.g. PTO drive shafts, tyres, hydraulic components etc.
- Hand over the usable parts to an authorised recycling centre. The large scrapping parts are handed over to an authorised breaker's yard.

# 12. FAULT FINDING

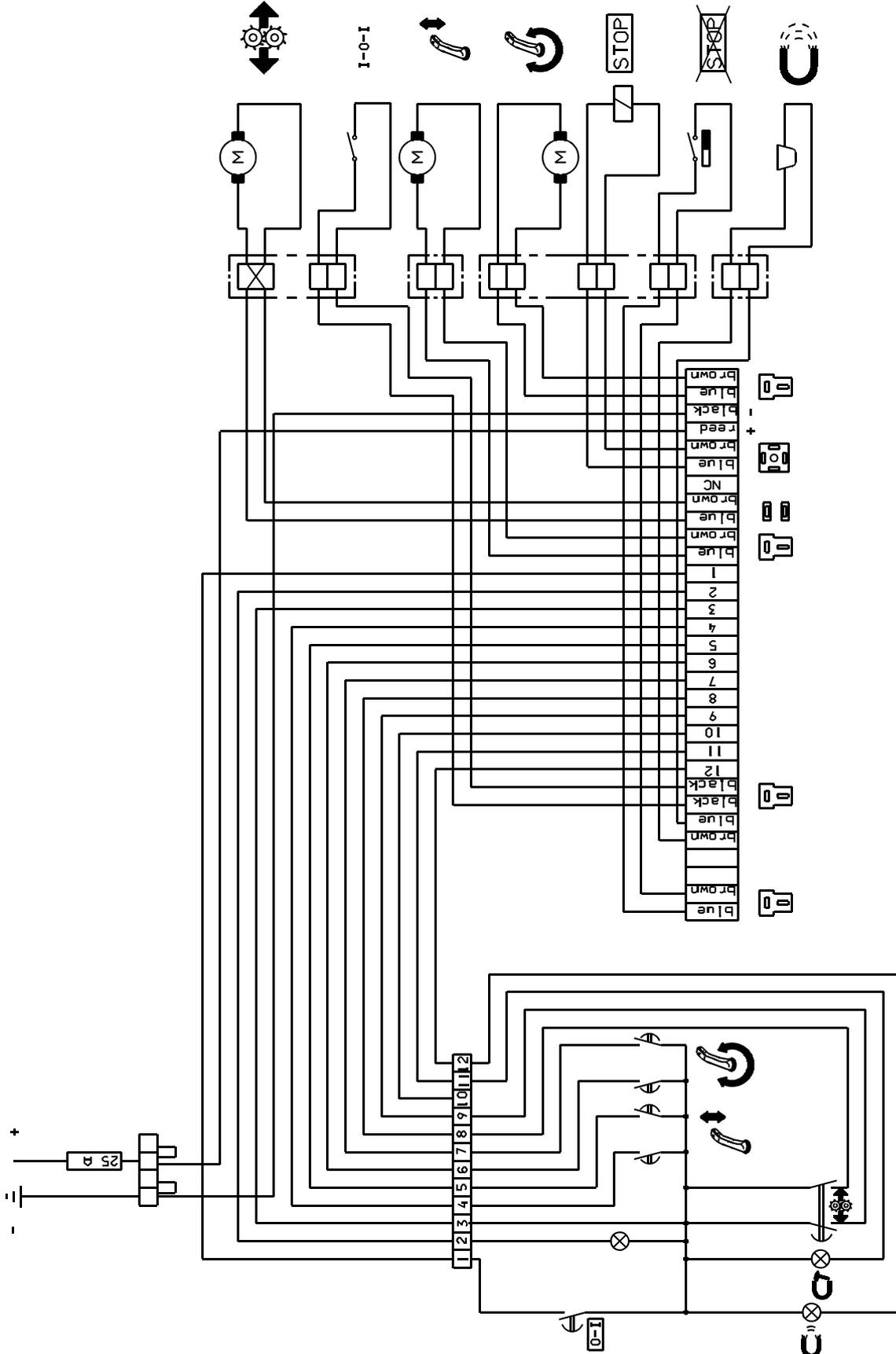
## ELECTRIC DIAGRAM FOR ES 3000 MD:



PR11-1266

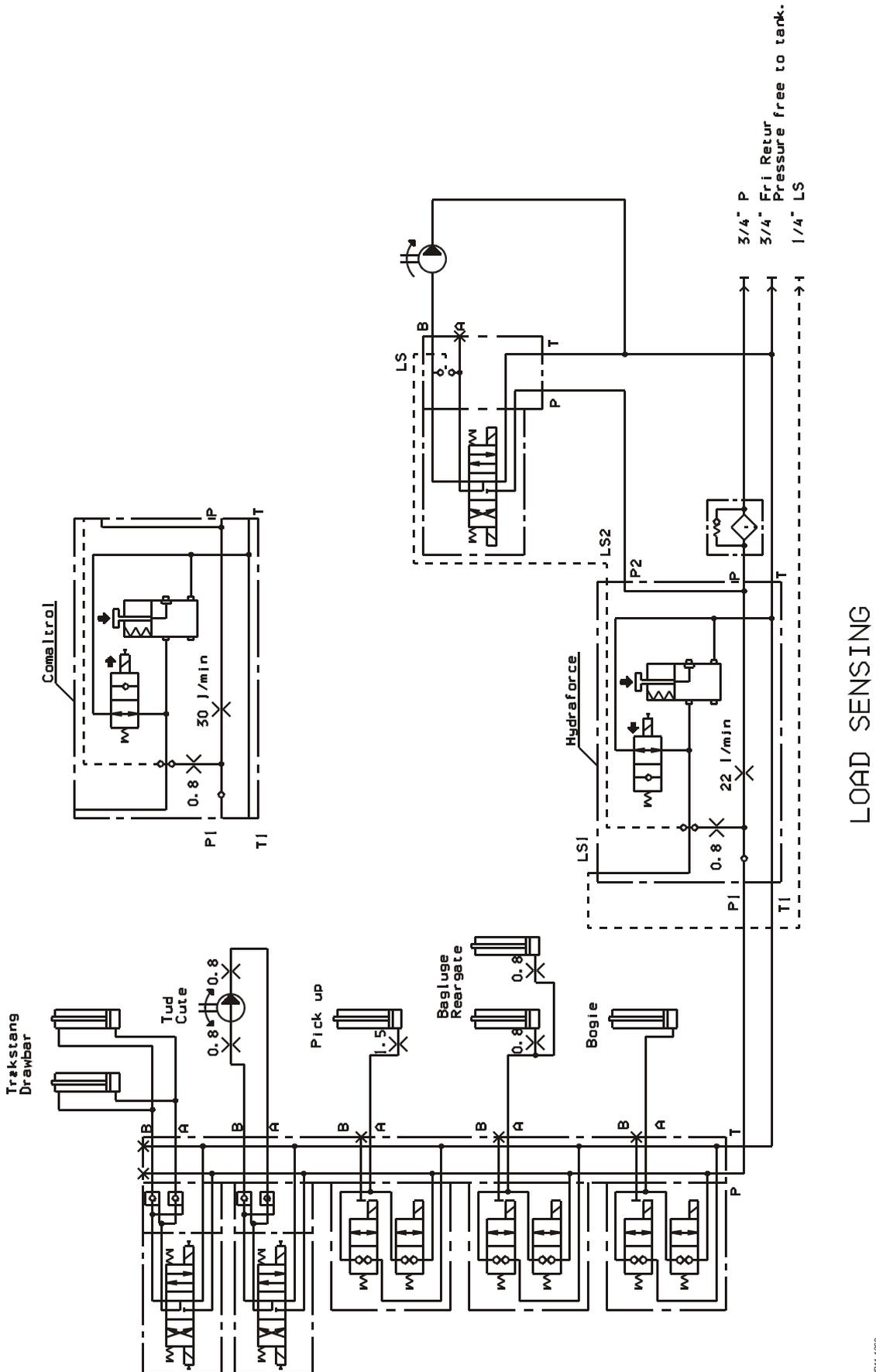
## 12. FAULT FINDNING

### ELECTRIC DIAGRAM FOR ES 3600/4200 MD:



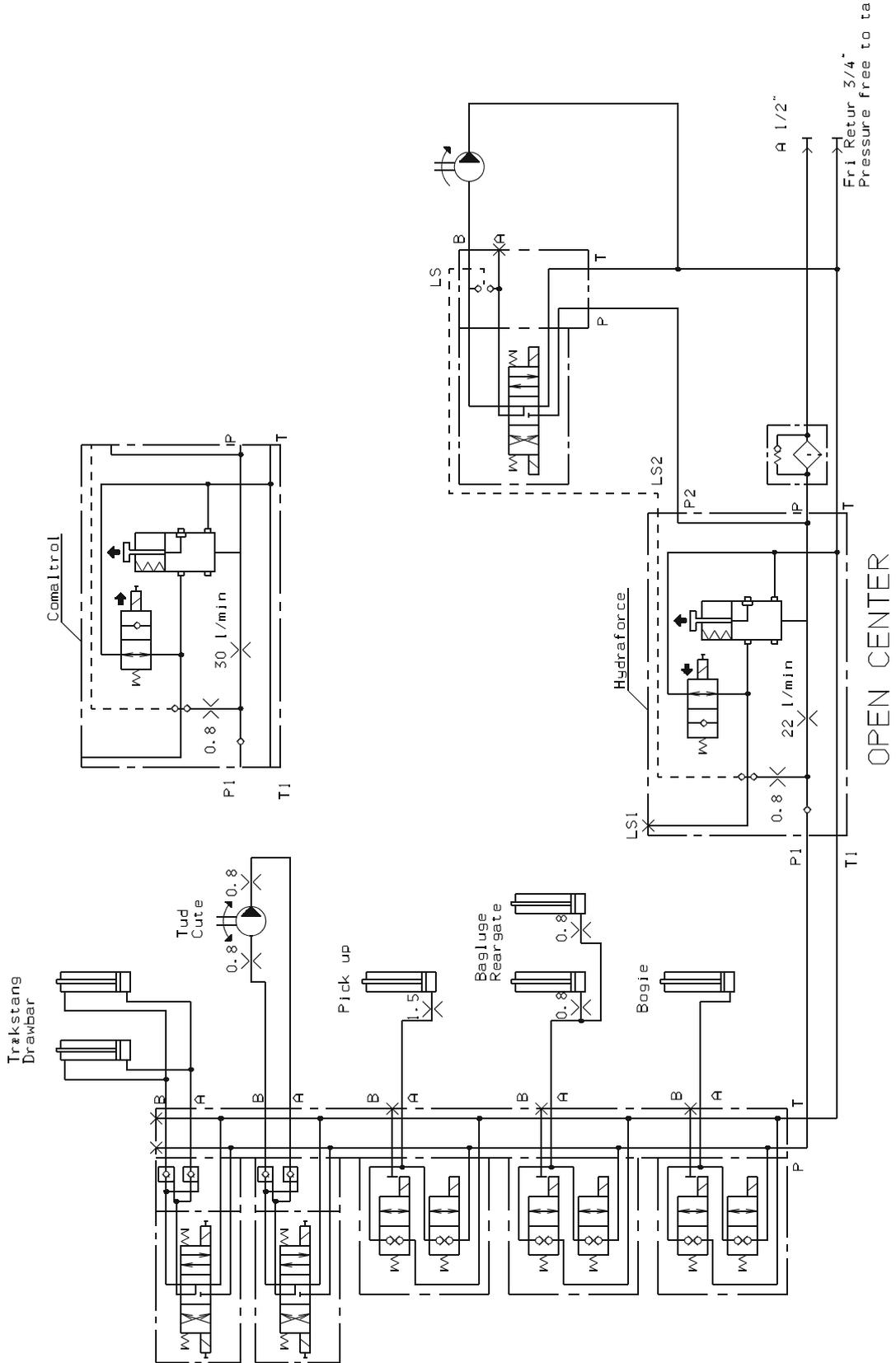
PR11-0267

# HYDRAULIC DIAGRAM FOR ES 3600 – LOAD SENSING:



LOAD SENSING

# HYDRAULIC DIAGRAM FOR ES 3600 – OPEN CENTER:

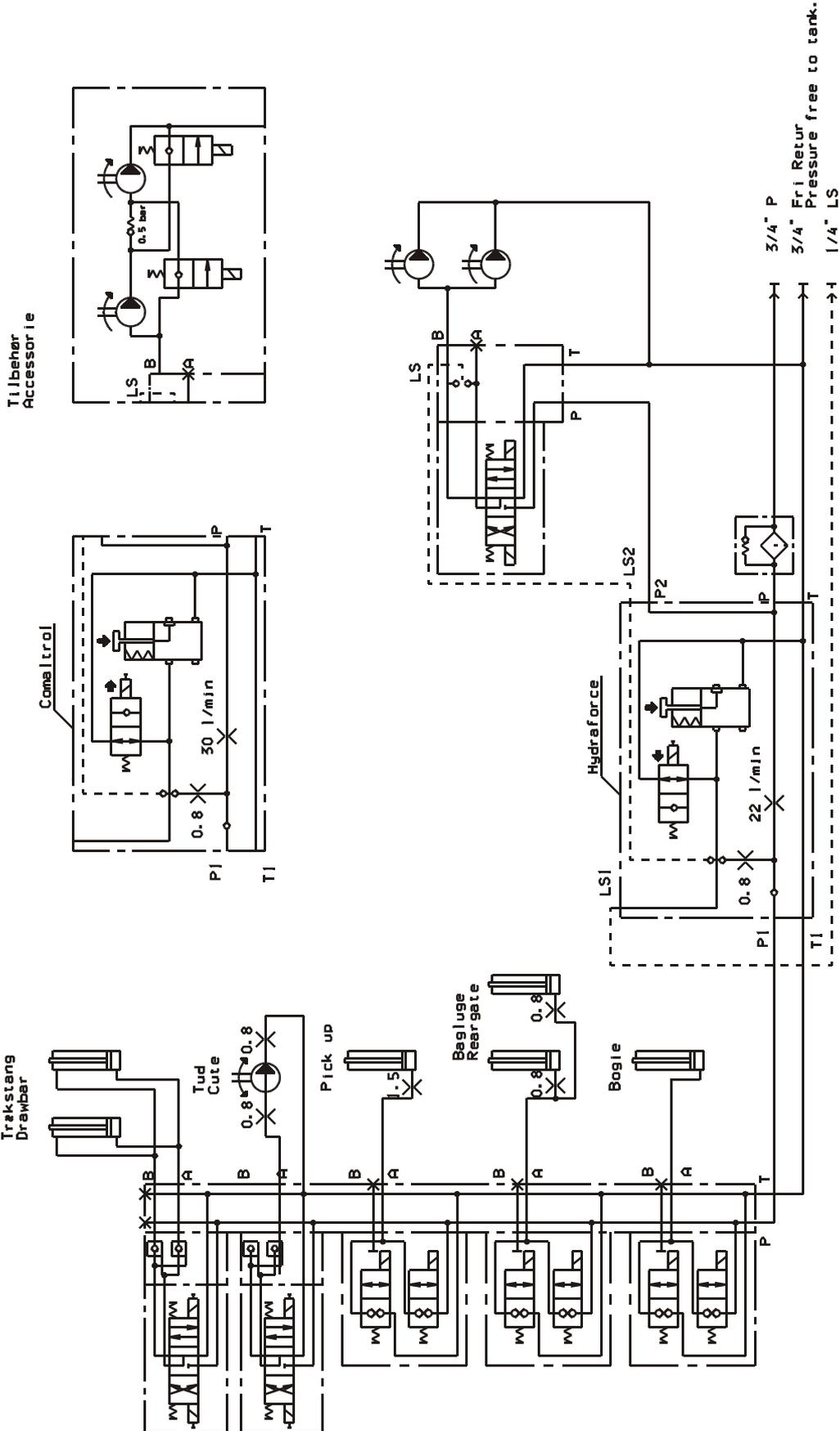


PR11-1348



# HYDRAULIC DIAGRAM FOR ES 4200 – LOAD SENSING:

2 STEP



LOAD SENSING

## FAULT FINDING (MD)

In the below table the most known faults in the metal detector system are described. The table describes the possible cause and what you can do to correct it.



**CAUTION:** If you are in doubt about how to handle a possible fault in the MD system, always contact a JF dealer or JF importer for professional instruction. Thus you avoid working with a defective system.

Problem	Possible cause	Remedy
The electronics is not activated when turning on the control panel with the ON/OFF switch.	<ol style="list-style-type: none"> <li>1) A fuse has blown either in the electronics box on the machine or in the power supply cable.</li> <li>2) Damage on one or more of the cables has caused short circuit.</li> </ol>	<ol style="list-style-type: none"> <li>1) Replace the fuse(s).</li> <li>2) Check the cable connections and repair/correct if necessary.</li> </ol>
No metal is registered when the MD system is checked with ferrous metal between the front rollers before starting or metal goes through the feed intake section without being detected.	<ol style="list-style-type: none"> <li>1) Fault or defect on the magnet tub.</li> <li>2) The cable connection to the magnet tub is defective.</li> </ol>	<ol style="list-style-type: none"> <li>1) Return the magnet tub to JF-Fabriken for readjustment or replacement.</li> <li>2) Correct/repair defect on the cable connection.</li> </ol>
Metal reaches the rotor although it is detected and the feeding stops.	The distance between the pawl and the ratchet wheel is too long, and the wheel turns too much before the pawl is in mesh.	Adjust the distance between the pawl and the ratchet wheel with the adjusting screw above the coil. The distance must be approx 1 mm and max. 2 mm.
After detection, the feed intake section stops because the reverse system moves to neutral position and the belts are slackened and not as usual because the pawl catches the ratchet wheel and blocks the feed intake.	The cable connection to the coil for the pawl is defective.	Correct the fault on the cable connection.
It is not possible to reverse after the pawl has been activated after detection and is in mesh with the ratchet wheel.	The cable connection to the electric motor for the reverse system is defective.	Correct the fault on the cable connection.

## 12. FAULT FINDNING

Problem	Possible cause	Remedy
After detection, the feed intake section stops because the reverse system moves to neutral position and the belts are slackened and not as usual because the pawl catches the ratchet wheel and blocks the feed intake.	The cable connection to the coil for the pawl is defective.	Correct the fault on the cable connection.
It is not possible to reverse after the pawl has been activated after detection and is in mesh with the ratchet wheel.	The cable connection to the electric motor for the reverse system is defective.	Correct the fault on the cable connection.
It is not possible to adjust the reverse system to position for normal feeding after reversing.	There is a fault on the contact element at the nylon disc on the automatic clutch. The contact element must reset the electric system after reverse so that the machine can work again.	Replace the contact element on the automatic clutch.
Metal is detected, but there is no metal in the feed intake section.	<ol style="list-style-type: none"> <li>1) The adjustment of the magnetic field from the magnet tub has been changed.</li> <li>2) There are loose metal parts/swarfs in the roller which disturb the magnetic field.</li> <li>3) The voltage supply from the tractor is not sufficient. The MD system "regards" reduced voltage drop (under 8 V) as a disturbance, i.e. metal detection.</li> </ol>	<ol style="list-style-type: none"> <li>1) Dismount the magnet tub and send it to JF-Fabriken where it will be adjusted.</li> <li>2) Clean the roller and the tub of loose metal parts/swarfs.</li> <li>3) Check if the voltage supply from the tractor is correct – 12 V.</li> </ol>

## 13. WARRANTY

### MD MACHINES

ES-CT 3600 can from the factory be delivered with an electronic metal detector system (MD) which registers ferrous metal parts the moment they pass the sensor in the lower front feed roller.

During tests in the field with a range of common metal parts it has been possible to detect 95% of the parts and stop the feed rollers before the blade rotor of the machine has been damaged seriously.

Though an MD cannot stop foreign matter such as: Stone, wood and tools made of chromium-nickel steel, it will provide a considerably higher safety against damage and operational stop as most wearing parts from agricultural machinery which may be lost in the field are made of metal. Furthermore there will be a higher security that there are no metal parts in the chopped crop for the herd.

**The following special warranty rules apply to machines delivered with an MD from JF-Fabriken A/S:**

- The MD manufactured by JF-Fabriken A/S is additional equipment which can only be delivered to some specific models from JF-Fabriken A/S.
- The MD will register a ferrous metal part the moment it passes the front feed roller of the machine, and immediately after it will send an electrical signal to a control unit which will block the feed intake section by means of a signal to an electrically activated stop system before the metal part reaches the blade rotor. The MD can only register ferrous metal parts (metal parts containing iron). Tests have shown a registration guarantee of 95%.
- All the components of the MD which have defects in material or manufacturing faults when delivered to the first buyer will be repaired or replaced free of charge for parts or pay if a warranty claim has been sent to one of JF-Fabriken A/S's authorised dealers without undue delay. However, this does not apply if the fault does not occur until 12 months after delivery or if the general submission time for warranty claims is not observed.  
However, the warranty does not apply to damage caused by normal wear, accidents for which nobody is at fault, insufficient maintenance, inadequate storage or unintended use. General maintenance and replacement costs must still be paid by the buyer.
- The warranty will be invalidated if the construction or adjustment of the equipment is changed to an extent which has not been approved by JF-Fabriken A/S.
- As the MD will not register all common magnetizable metal parts, no warranty can be granted for damage caused by insufficient registration or blockage.

### IN GENERAL

**JF-Fabriken - J. Freudendahl A/S**, 6400 Sønderborg, Denmark, hereafter called "**JF**", grants warranty to any buyer of new JF machines from authorized JF-dealers.

The warranty covers remedy of material and production faults. This warranty is valid within a year after date of sale to end-user.

- The warranty is invalidated in the following cases:

1. **The machine has been used for other purposes than those described in the instruction manual.**
2. **Improper use.**
3. **Damage caused by external sources, e.g. lightning or falling objects.**
4. **Insufficient maintenance.**
5. **Transport damage.**
6. **The construction of the machine has been modified without JF's written permission.**
7. **Unskilled repair of the machine.**
8. **Unoriginal spare parts have been used.**

JF cannot be held responsible for loss of income or legal claim as a result of faults either of the owner or of a third party. Nor is JF responsible for wages beyond current agreements in connection with replacement of warranty parts.

JF is not responsible for the following costs:

1. **Normal maintenance such as expenses for oil, grease and minor adjustments.**
2. **Transport of machine to and from workshop.**
3. **The dealer's travelling expenses or freight charges to and from the user.**

Warranty is not granted on wearing parts unless it can clearly be proved that JF has committed a fault.

The following is regarded as wearing parts:

**Protective canvases, blades, blade suspensions, shearbars, guide shoes, stone protections, crimper parts, tyres, tubes, PTO drive shafts, clutches, V-belts, chains, rake and pick-up tines and beater bars for farmyard manure spreaders.**

In addition, the user must note the following:

1. **The warranty is only valid if the dealer has undertaken a pre-delivery check and has given instruction to the end user in the use of the machine.**
2. **The warranty cannot be transferred to others without JF's written permission.**
3. **The warranty can be nullified if repair is not undertaken immediately.**









## Specialist in grassland machinery and complete diet mixers

When it comes to green feed techniques, JF-STOLL has gained a reputation as one of the world's leading suppliers and specialists. As a specialist manufacturer for over 50 years, we have gained a vast amount of experience from right around the world and, more importantly, unique regional requirements.

We also receive important inspiration in our development work through a close and continuous dialogue with customers, dealers and agricultural researchers.

No matter which type of JF-STOLL-machine you chose, you can be sure to obtain the best result to obtain a top result - in the shape of high performance and operational reliability, minimum maintenance, flexible working possibilities and optimal operating economy.

Dealer

# JF-STOLL

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