T-S

Operating Manual

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Language	EN
Ex machine no.	AC 49948
Type series	folding
Reference No.	AC754822

Identification of the machine

To support you as soon as possible your dealer requires several details of your equipment.
Please enter the information here.

Designation	T-S
Dealer's address	
Manufacturer's address	Kverneland Group Soest GmbH Coesterweg 42 D-59 494 Soest Telefon +49 (0)2921 / 974-0

Table of contents

Target group for this operating manual

This operating manual is directed at trained farmers and individuals who are otherwise qualified to perform agricultural activities and who have received training in the operation of this machinery.

For your safety
Study the contents of this operating manual carefully before assembly or initial operation of the machine. In this way, performance and work safety are optimised.

For the employer
All personnel are to be trained in the use of the machine regularly (at least once a year) in accordance with employers' liability insurance association guidelines. Untrained or unauthorised individuals are not permitted to use the machinery.

Training

Your dealer will provide instruction in the operation and care of the machine.

Meaning of the symbols

In order to make this manual clear and easy to read, we have used various symbols. They are explained below:

- A dot accompanies each item in a list

> A triangle indicates operating functions, which must be performed

→ An arrow indicates a cross-reference to other sections of this manual

[+] A plus sign indicates that this is additional equipment, which is not included in the standard version.

We have also used pictograms to help you find instructions more quickly:

NOTE The term, “Notes” indicates tips and notes on operation.

The screwdriver indicates tips during assembly or adjustments.

The warning triangle indicates important safety instructions. Failure to observe these safety instructions can result in:

- Serious operational faults for the machinery;
- Damage to the machinery;
- Personal injury or accidents.

A star indicates examples that assist understanding of the instructions.

For your safety

In this chapter you will find general safety instructions. Each chapter of the operating manual contains additional specific safety instructions, which are not described here. Observe the safety instructions

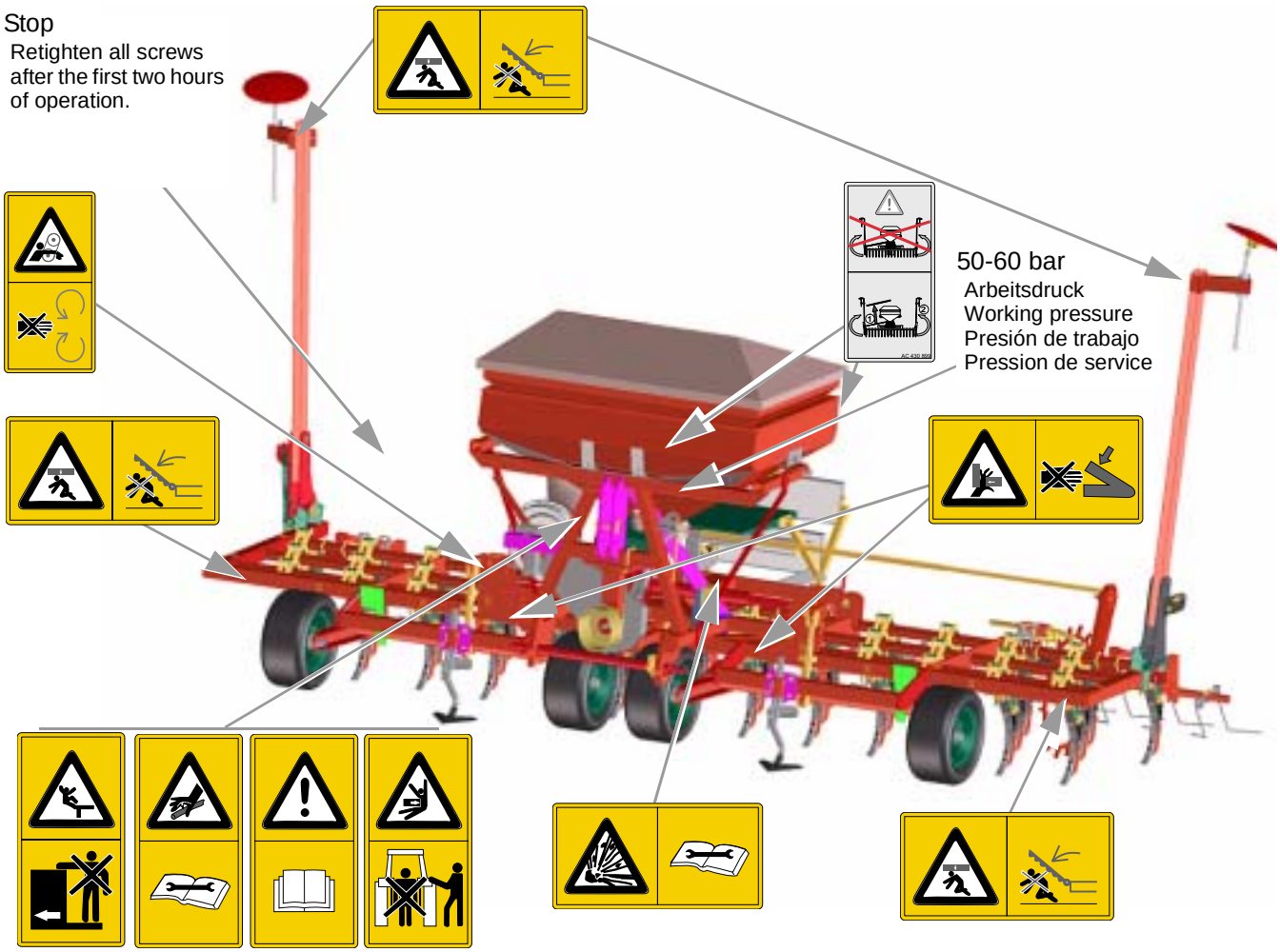
- in the interest of your own safety,
- in the interest of the safety of others, and
- to ensure the safety of the machine.

Numerous risks can result from handling agricultural machines in the wrong way. Therefore, always work with special care and never under pressure.

The employer should:
Provide instruction in these safety instructions for personnel working with the machine at regular intervals and provide information on statutory regulations.

Warning symbols

On the machine you will find decals for your safety. The stickers must not be removed. If any stickers have become illegible or have peeled off, new stickers can be ordered and attached in the appropriate places.



Meaning of warning symbols

Read the operating manual carefully and follow the instructions
Initial operation of the machine must not take place before the operating manual has been read and understood. This applies especially to safety instructions.

Do not stand between the tractor and the machine.
Standing between the tractor and the machine is especially prohibited during coupling and uncoupling and when the motor is running. The tractor must be additionally immobilised.

Riding on the machine is strictly prohibited
Serious or fatal injury can be the result.

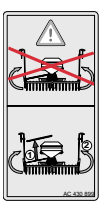
Proceed with great care in the event of leaking hydraulic fluid
Observe the corresponding safety instructions in the operating manual.

Never remove the guards.
Never open or remove the guards while the engine is running. Never operate the equipment without guards.

Stay clear of the slewing range
There is serious risk of injury in the slewing range due to swivelling or folding machinery components.

Risk of crushing
Avoid area of danger. Gaps between components may become smaller or disappear completely.

Caution, danger of explosion
Accumulator contains pressurized gas and oil. Disassembly and repair work must be carried out qualified specialists only.



Remove drive shaft before folding up
In the case of foldable machines, the drive shaft between the drive wheel and metering device must be removed before folding up the machine. If the drive shaft is not removed, it will be destroyed during the folding process, possibly resulting in damage to the machine and injuries through sharp burrs.

Who is authorised to operate the machine?

Only qualified personnel
Only qualified persons who have been informed of the dangers associated with handling the machine are permitted to operate, service or repair the machine. As a rule, such persons are trained and experienced in agricultural work or have been thoroughly trained in a similar fashion.

Coupling

Increased risk of injury
When coupling the machine to the tractor, there is an increased risk of injury. Therefore:

- secure the tractor in such a way that it cannot roll forwards or backwards
- the tractor and machine must belong in the same category
- never stand between the tractor and the machine during coupling
- actuate the three-point power lift system slowly and carefully.

Failure to observe these instructions can result in serious or fatal injury.

Connect electric wires or cables only after mounting the attachment
The electrical supply must not be connected to the tractor when mounting the lighting equipment. Short-circuits and damage to the electronics are possible.

Hydraulic connection at zero pressure only
Only connect hydraulic hoses to the tractor hydraulic system if the tractor and machine hydraulic system is depressurized. A hydraulic system under pressure can trigger unpredictable machine movements.

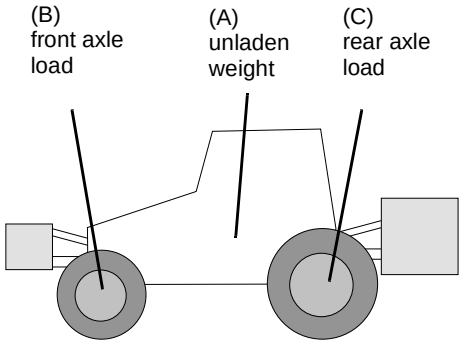
High pressures in the hydraulic system
The hydraulic system is under high pressure. Regularly check all pipes, hoses and bolted connections for leaks and externally visible damage. Only use suitable agents when looking for leaks. Eliminate damage immediately. Escaping fluid may result in injuries and fires. In the event of injuries, seek medical attention immediately.

Colour-coded hydraulic connections
To prevent operating errors, plug sockets and plugs for hydraulic connections between the tractor and the machine must be colour-designated. Incorrectly connected hydraulic tubes can trigger unpredictable machine movements.

Centre of gravity

Observe the total weight, axle loads, tyre load-bearing capacity, and minimum ballast specifications.
The machine's front or rear attachment must not exceed the tractor's permissible total weight, its permissible axle load or its tyre load-bearing capacity. In order for steering capability to be maintained, the front axle must bear at least 20 % of the tractor's empty weight.
By investing some effort in making the calculations it is possible to determine the:

- gross weight
- Axle load
- tyre load-bearing capacity and
- minimum ballast

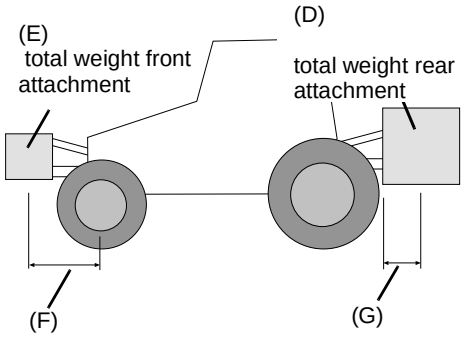


For this calculation, the following data is required:

Data from the tractor's operating manual:

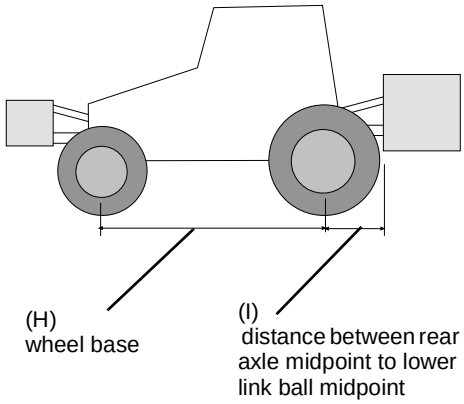
- (A) unladen weight
- (B) front axle load
- (C) rear axle load

Make allowances for the weight of water in the tyres, accessories, etc.



Data from this operating manual:

- (D) Gross weight of the equipment when rear-mounted; the supporting load with the equipment attached;
- (E) machine's total weight in the front attachment
- (F) distance between the machine's centre of gravity in the front attachment and front axle midpoint.
- (G) Distance between lower link ball midpoint and the machine's centre of gravity in the rear attachment. With equipment attached, G=0.



Data which you can determine by measuring:

- (H) the tractor's wheel base
- (I) distance between the rear axle midpoint and the lower link ball midpoint

Calculation

The measured values can now be inserted into the formulae.

Front ballast

Calculation of the **front ballast with front weights** for machines on the rear attachment.

$$\text{Front ballast in kg} = \frac{D \times (I + G) - (B \times H) + (0,2 \times A \times H)}{F + H}$$

Rear ballast

Calculation of **ballast with rear weights** for machines on the front attachment.

$$\text{Rear ballast in kg} = \frac{(E \times F) - (C \times H) + (0,45 \times A \times H)}{H + I + G}$$

Front axle load

Calculation of the **actual front axle load**

$$\text{Front axle load in kg} = \frac{E \times (F + H) + (B \times H) - D \times (I + G)}{H}$$

gross weight

Calculation of **actual total weight**

Total weight = E + A + D

Rear axle load

Calculation of the **actual rear axle load**

Rear axle load in kg = actual total weight - actual front axle load

tyre load rating

Data on the tyre load-bearing capacity of the front and rear wheels can be found in the tyre manufacturer's details.

The front tyre load-bearing capacity for two wheels is equal to twice the permissible tyre load-bearing capacity of a single front wheel. The rear tyre load-bearing capacity for two wheels is equal to twice the permissible tyre load-bearing capacity of a single rear wheel.

Summary

The actual values for the rear axle load must be less than the permissible values given in the tractor's operating manual. Tyre load-bearing capacity must be greater than the values for the rear axle load given in the operating manual.

The actual total weight must be less than the permissible total weight given in the tractor's operating manual. If not, the machine must not be coupled to the tractor.

NOTE If you have a sufficiently large weigh-bridge, you can determine the total weight and the rear axle load by weighing.

Road transport

Make sure that the condition of the machine conforms to traffic regulations.
The machine must conform to current traffic regulations if you intend to drive it on public roads. This includes, for example:

- lights, warning equipment and protective equipment are installed
- the permissible transport width and weight, axle load, tyre load-bearing capacity and total weight are observed.

If traffic regulations are not observed the driver and owner of the vehicle are liable for all damage.

Closing ball valves
If ball valves are provided at the connection lines of the hydraulic hoses or the chassis cylinders, the ball valves must be closed when travelling on public roads. Accidental actuation of control valves in the tractor can trigger machine movements. This can result in damage to the machine or accidents.

Check remote cord for the quick release coupling
Trip ropes must hang loose and must not, when in their lowered position, release the couplings of their own accord. Coupled machines could otherwise be released independently from the three-point linkage.

No riding on the machine
People or objects must never be transported on the machine. Riding on the machine is hazardous and strictly prohibited.

Altered driving and braking performance
Driving and braking performance are altered when the machine is attached to the tractor. Take the width and balancing weight of the machine into consideration, especially on sharp bends. A driving style which not adjusted to the road conditions can lead to accidents.

Adapting the speed
Extremely large forces may result with poor road conditions and excessively high speeds and these will severely load or overload the material of the tractor and machine. Therefore, adjust your speed to the road conditions. A driving speed which not adjusted to the road conditions can lead to accidents.

Putting the machine into operation

The machine should not be put into operation for the first time until the user has been trained to use it.
The machine must not be put into operation until the user has been given proper initial instruction, either by the dealer or by one of the manufacturer's representatives or employees. If the machine is commissioned without instruction, incorrect operation can result in damage to the machine or accidents.

Ensure that the machine is in perfect working condition.
Do not operate the machine unless it is perfect working condition. Check all important components and replace any defective components before starting the machine. Defective components can cause damage and personal injury.

Do not remove the protective equipment.
Protective equipment must not be removed or by-passed. Check all protective equipment before starting the machine. Unprotected machine components can cause severe or fatal accidents.

Check tyre pressures
Check tyre pressure regularly. If the tyre pressure is too high or too low, this can reduce the service life of the tyre and result in undesirable work results and can result in accidents when travelling on roads.

No riding on the machine
People or objects must never be transported on the machine. Riding on the machine is hazardous and strictly prohibited.

Height of machine and overhead power lines
During extension and retraction, components exceed a height of 4.00 m. Never extend/retract the equipment in the vicinity of overhead power lines! Danger of electrocution!
Should the machine come into contact with an overhead power line:

- Do not attempt to exit the tractor cabin.
- Do not touch any metal parts on the tractor.
- Do not create any conductive contact with the ground.
- Warn all persons in the area not to approach the tractor or the machine.
- Wait for help from professional emergency service personnel as power in the overhead line must first be switched off.

Make sure the immediate vicinity is clear
Before driving off, folding out, and operating the machine, check the immediate vicinity. Make sure the operator has a sufficient view of the work area. Do not begin work until the immediate vicinity is cleared of any persons or objects. Any use of the machine without verification of the situation around it can lead to accidents.

Retighten all nuts, bolts and screws
Nuts, bolts and screws should be checked at regular intervals and tightened if necessary. Screws can come loose unnoticed while operating. Damage can occur to the machine or injury to persons.

What to do in the event of a malfunction
In the event of a malfunction, shut down and secure the machine immediately. The malfunction may be eliminated immediately, or a workshop must be assigned the task. Continued operation of the machine can lead to damage or accident.

Uncoupling the machine

Increased risk of injury
There is an increased risk of injury when uncoupling the machine from the tractor. Therefore:

- secure the tractor in such a way that it cannot roll forwards or backwards
- never stand between the tractor and the machine during uncoupling.
- actuate the three-point power lift system slowly and carefully.
- make sure the machine is standing on a secure and level surface.
- only disconnect hydraulic hoses if there is no pressure in the tractor and machine hydraulic system.

Failure to observe these instructions can result in serious or fatal injury.

Care and maintenance

Adhere to the care and maintenance chart
Observe prescribed intervals for maintenance checks and inspections specified in the operating manual. Nonobservance of the time periods can lead to damage to the machine, poor quality of work or accidents.

Use only OEM replacement parts (original equipment manufacturers).
Many components have special characteristics which are essential for the machine's stability and correct function. Only those replacement parts and accessories supplied by the manufacturer have been tested and approved. Using other products may lead to malfunctions or reduce the safety of operation. The use of non-OEM replacement parts renders the manufacturer's guarantee null and void and frees the manufacturer from all liability.

When performing care and maintenance work:

- Switch off the tractor's power take-off shaft
- Depressurise hydraulic system
- Whenever possible, uncouple the tractor
- Make sure the unit is standing securely. Provide additional support as required
- Do not use parts of the machine to climb onto it; use only secure steps, ladders or other means of access
- Chock the machine wheels to prevent from rolling
- Never reach into the V-belt while it is moving.

Only by observing these specifications is safe maintenance and care work on the machine guaranteed.

Turn off the electrical supply
Prior to carrying out work on the electrical system, disconnect it from the power supply. Live parts can cause damage and personal injury.

Replace hydraulic hoses
Replace hydraulic tubes every three years. Hydraulic hoses can age without any externally visible damage. Defect hydraulic lines can lead to severe or fatal injuries.

Caution when cleaning with a high-pressure cleaner
The machine can be cleaned using either water or a steam jet. Only use a low pressure to clean bearings, fans, signal mixer units, plastic parts and hydraulic hoses. If pressure is too high, this can cause damage to these parts.

Prior to welding work
Prior to carrying out electrical welding work on the attached machine, disconnect the tractor's battery and generator. This prevents damage to the electrical system.

Tighten all screw connections
All screw connections that are released during maintenance and repair operations must now be retightened. Lose screw connections can lead to screws becoming loose unnoticed while working, thus loosening parts of the machine. Severe injury to persons or damage to equipment can result.

Further regulations

Observe the regulations
In addition to those listed above, please observe the following safety instructions:

- accident-prevention regulations
- generally recognised safety regulations, occupational health requirements and road traffic regulations
- information in this operating manual
- regulations pertaining to operation, maintenance and repair.

Getting to know the machine

This chapter contains general information about your machine as well as information about the:

- area of application
- features
- designation of the assemblies, and;
- technical specifications

Area of application

The T-S is a seed drill for the performance of soil preparation and seeding in one pass.

Proper use

Any application other than or beyond this, e.g. as a means of transport, for stump pulling or to transfer power to other objects is considered improper use. The manufacturer and dealer are not liable for damage caused by improper use. Improper use is solely at the risk of the user.

Features of the machine

Perfected design
Specially hardened materials combined with an optimised construction, a flexible modular design, and a favourable centre of gravity all make this efficient and precision machine a reliable and sturdy device.

Precise metering
The original Accord Pneumatic System ensures precision metering.

Quick conversion
Conversion from normal to fine seed is fast and does not require any tools.

Tramlining system
The T-S can be combined with the FGS or ESC.

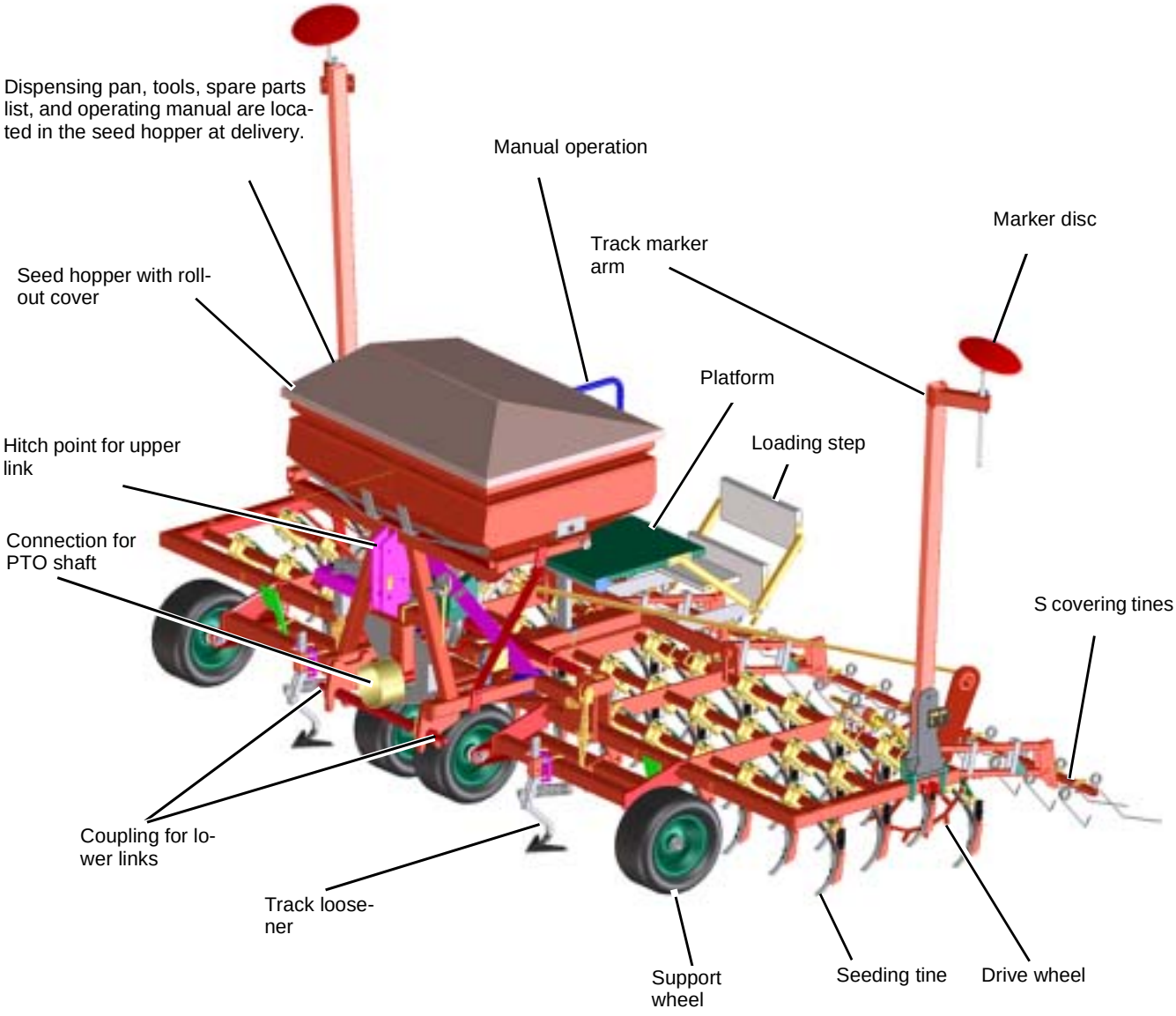
Seed rows
The seed rows are equipped with the Auto Reset System from Kverneland.

High area performance/output
The simple design of the machine makes high performance/output at driving speeds of 12 km/h possible.

Obstruction-free work
In the case of crop residues on the field, the high frame of the seeder and wide distance between the tine rows prevent the seeder from becoming easily obstructed.

Safety
The machine is constructed in accordance with EU and German national regulations, for maximum possible safety of operation. The machine bears the symbol of European Conformity (CE).

Component designations



Technical specifications

General

Height **(m)**	
without lifting height of tractor	2.70
Width (m)	
Machinery in operating position	4.00 / 4.50 / 4.80 / 5.60 / 6.00
Depth (m)	
Depending on the equipment, approx.	3.00
Gross weight (kg)	
Depending on equipment level, approx.	1630-1850

Drill technology

Seed hopper		
	Fill height (m)	0.80 / 1.00 / 1.20
	Hopper volume (l)	750 / 1000 / 1250
	Maximum hopper capacity, approx. (kg of wheat)	600 / 800
Noise level (dBa)		
	Fan at 1,000 rpm	98
FGS, ESC		
	Power supply (V)	12
	Fuse (A)	30

Miscellaneous

Tractor		
	Minimum towing capacity (kW/m)	20
	Tractor PTO shaft (rpm) Design	1000 1 3/8“, 6-part
Wheels	Tyre pressure (bar)	1.4

Checking the scope of delivery

Soil preparation and drilling technology
The equipment is supplied completely assembled for the areas soil preparation and drilling. If parts of the machine have not been assembled, please contact your dealer.

Do not assemble the machine yourself.
Do not do assembly work yourself since prerequisites for an orderly condition of the machine are :

- observance of a sequence of work steps
- observance of permissible tolerances and torques and
- safe handling of electronics

Electronic control system
An electronic control system is provided as additional equipment, for example, to create tramlines. Your agricultural equipment dealer will perform the final installation on your tractor.

NOTE If parts are missing or have been damaged during transportation, please submit a complaint immediately to your dealer, importer or the manufacturer.

Increased risk of injury
When coupling the machine to the tractor, there is an increased risk of injury. Therefore:

- secure the tractor in such a way that it cannot roll forwards or backwards
- the tractor and machine must belong in the same category
- never stand between the tractor and the machine during coupling
- actuate the three-point power lift system slowly and carefully.

Failure to observe these instructions can result in serious or fatal injury.

Coupling the machine

> Couple the lower and primary top link.

Connections

Increased risk of injury
When connecting the machine to the tractor, there is an increased risk of injury. Therefore:

- secure the tractor in such a way that it cannot roll forwards or backwards
- Switch off the tractor engine

After coupling, make the following connections:

- Electrical connections
- Hydraulic connections
- Fan drive

Electrical connections

Attach the following electrical cables to the tractor, if installed, for:

- the electronic control system
- the lighting of the machine

> Check the operation of the electrical connections.

Hydraulic connections

→ chapter »Hydraulic system«, section »Connection to the tractor«

Fan drive

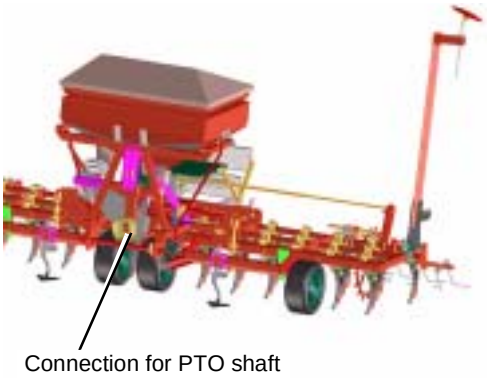
The fan can be driven:

- via a cardan shaft or
- hydraulically

PTO shaft installation

Increased risk of injury
When connecting the cardan shaft there is an increased risk of injury. Therefore:

- secure the tractor in such a way that it cannot roll forwards or backwards
- Switch off the tractor engine
- Install only the cardan shaft supplied or one of an identical type.
- When attaching it ensure that the cardan shaft locks engage securely



Depending on the tractor involved, the PTO will need to be shortened prior to installation. This task may only be performed by properly qualified individuals.
→ Separate operating instructions of the manufacturer of the cardan shaft

> Attach the cardan shaft. The cardan shaft must engage correctly and be secured with the safety chains.

Hydraulic fan drive

Connect the hydraulics as described in the chapter »Hydraulic system«, under Connection to the tractor »Connection to the tractor«

Electrical connections

Attach the following electrical cables to the tractor, if installed, for:

- the electronic control system
- the lighting of the machine

> Check the operability of all the electrical connections

Hydraulic connections

Connect the hydraulics as described in the chapter»Hydraulic system«, under Connection to the tractor »Connection to the tractor«

Hydraulic connection at zero pressure only
Only connect hydraulic hoses to the tractor hydraulic system if the tractor and machine hydraulic system is depressurized. A hydraulic system under pressure can trigger unpredictable machine movements.

Avoid mixing oils
If the machine is used with different tractors, incompatible types of oil may become mixed. Such a mixture of incompatible oils can result in the destruction of tractor components.

Check hoses and couplings
Prior to making connections, check all hydraulic hoses for damage. Following connection, check all hydraulic couplings for secure seating. Defective hydraulic hoses or incorrectly seated hydraulic couplings can trigger unpredictable machine movements and cause injury.

Secure the control unit
In the transport position, secure the control unit on the tractor against accidental engagement. Accidental actuation of the control unit can trigger unpredictable machine movements or lead to injury. Connect the hydraulic connections

Never exceed the maximum fan speed
The fan speed must not exceed 5,000 rpm for hydraulic fan drives. At higher speeds the fan can be destroyed by explosion, causing serious damage to the machine. Persons nearby can be seriously or fatally injured.

Familiarise yourself with the hydraulics.

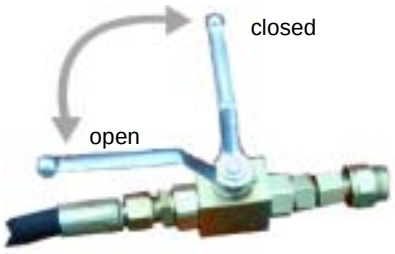
Apart from the hydraulic connections, all connections to the electronic control system must also be made.

Connection to the tractor

> Connect hydraulic hoses to:

One single-acting control valve each

Function (single acting)	Colour coding
• Track marker • Pre-emergence markers	Green
• Hydraulic fan drive (additional, zero-pressure return)	Blue



> Where present, open the ball valves on the hydraulic hoses to the tractor

Working with the hydraulics

Checking hydraulic hoses
Prior to operation, carefully inspect the hydraulic hose connections and the hoses themselves. Hot hydraulic fluid can squirt from insufficiently tightened or damaged hydraulic hoses, resulting in severe injury.

In addition, check:

- Is the electronic control system correctly connected?

Transport or operating position

The machine can be folded in to transport position or folded out to operating position by way of the corresponding control valve on the tractor.

The sowing depth can be adjusted in operating position.
→ Chapter »Preparations in the field«, page 87.

Retracting the track markers

The track marker is controlled via the hydraulic connection marked green.

NOTE:

- If an ESC or FGS is being used, the tramline sequence must be corrected after separately folding a track marker.

Hydraulic fan drive

The fluid is guided to a 3-way flow control valve and regulated according to the hydraulic motor speed. This constant fluid rate results in a specific rotational speed of the hydraulic fan drive. You can check this speed via the electronic control on the display.

Technical specifications

Refer to this table for the technical data of the hydraulic fan drive.

		Values
Hydraulic motor	Displacement (ccm) Speed (rpm)	8 4500
Fluid supply	Minimum feed line pressure (bar) Maximum return line pressure (bar) Oil flow rate (l / min)	160 10 43.5
Fan	Fan speed (rpm)	4500

- Speed: ± 50 rpm, if the speed has been set at a constant oil temperature.
- Feed line pressure: Minimum dimension DN 10
  External diameter = 12 mm, internal diameter = 9 mm
- Return line pressure: Minimum dimension DN 12
  External diameter = 15 mm, internal diameter = 12 mm

Prerequisites

Prerequisites for the hydraulic fan drive on the tractor:

- Adequate oil supply from the tractor;
- An appropriate number of control valves are installed;
- Control valves can be activated in parallel;
- An oil cooler has been installed.

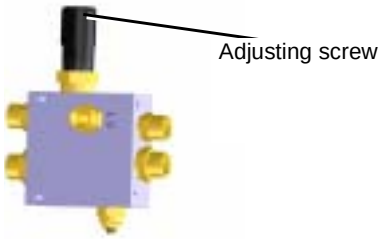
For John Deere tractors up to and including series 50:

- The flow control valve must be converted from 3-way to 2-way.

→ Section »Tractors without flow control valve, with regulating pump«, from page 26 onwards.

Type

The machine is equipped as standard with flow control valve type 2.



NOTE If your tractor has a flow control valve, the machine also can be equipped with a non-adjustable valve. You can recognize this by the absence of an adjustment screw on the valve. You then do not need to adjust the machine's valve. If the tractor is changed, please ensure that the new tractor is also equipped with a flow control valve.

Adjust fan drive speed

Checking connections and hydraulic hoses
Prior to operation, carefully inspect the hydraulic hose connections and the hoses themselves. Hot hydraulic fluid can squirt from insufficiently tightened or damaged hydraulic hoses, resulting in severe injury.

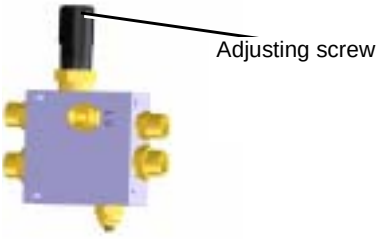
Observe the permissible fan speed
The permissible fan speed is max. 5000 rpm. At higher speeds the fan can be destroyed by explosion.

Wear hearing protection
Wear ear protection when working near the fan. Noise can cause temporary or permanent hearing impairment.

Make conversions only when the fan is stationary
Conversion from a 3-way to a 2-way flow control valve, or vice versa, and the setting of speed must only be performed with the fan turned off. Conversion while the fan is running can lead to machine damage.

Basic settings for the flow control valve must be made only during initial operation or when changing tractors. The adjustments may only be performed with shut-off tractor engine.

For tractors with flow control valves

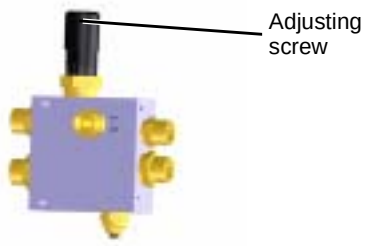


> Fully open the 3-way flow control valve.

NOTE The 3-way flow control valve is completely open when the adjusting screw is fully screwed in.

> Actuate control valve on tractor
> Adjust the desired speed with the oil flow at the tractor.

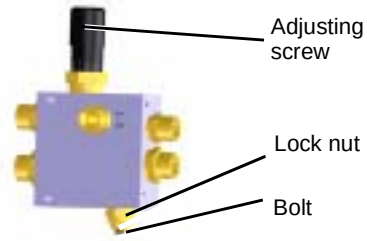
Tractors without flow control valve, without regulating pump



> Adjust the desired speed with the adjusting screw at the three-way flow control valve.

Tractors without flow control valve, with regulating pump

The flow control valve must be converted from 3-way to 2-way. The refitting is accomplished as follows:



> Loosen the lock nut.
> Turn the screw fully in.
Turning the screw fully in converts the 3-way flow control valve to a 2-way valve.
> Retighten the locknut.
> Adjust the desired speed with the adjusting screw at the two-way flow control valve.

Power Beyond

The hydraulic fan drive is a permanent consumer in the hydraulic system. This means that other consumers often have insufficient power. Using Power Beyond minimises losses incurred when the hydraulic fan drive is used as a permanent consumer and allows other consumers to run simultaneously. However, the conveying capacity of the hydraulic pump is not increased with Power Beyond.

Installation in specialist workshop
The installation has to be performed by a qualified garage only. Special skills are necessary for work on the hydraulic system. Incorrectly carried out work can result in damage to the machine.

Make conversions only when the fan is stationary
Conversion from a 3-way to a 2-way flow control valve, or vice versa, and the setting of speed must only be done with the fan turned off. Damage to the machine can result.

Switch off the tractor's power take-off shaft
Make connections only with the tractor PTO shaft switched off. A correct connection is otherwise not possible.

Checking hydraulic connections
Prior to operation, carefully inspect the hydraulic hose connections and the hoses themselves. Hot hydraulic fluid can squirt from insufficiently tightened or damaged hydraulic hoses, resulting in severe injury.

Prerequisites

Prerequisites for the use of Power Beyond:

The tractor is equipped with

- Regulating pump,
- Load sensing system,
- Feed line (P),
- Return line (T),
- Control line (LS),
- possibly a leak-off oil line (D)

The machine is equipped with

- a type 2 flow control valve

→ Page 25

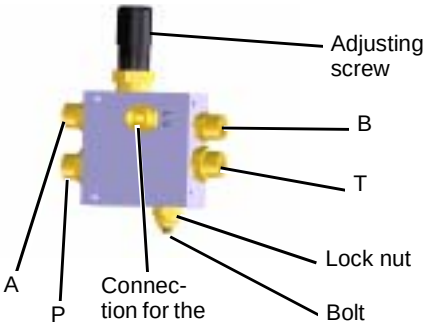
Calculation of the remaining conveying capacity

The delivery volume of the hydraulic pump is determined by the stroke speed. The greater the delivery volume, the higher the stroke speed. Power Beyond makes it possible to actuate other consumers parallel to the permanent consumer, although it does not increase the delivery volume of the hydraulic pump. The stroke speed drops.

Example:

Delivery volume of the hydraulic pump	100 l/min
Required quantity of oil for permanent consumer	40 l/min
Remaining delivery volume for other consumers	60 l/min
Reduction of stroke speed to	60 %

Conversion to 2-way flow control valve



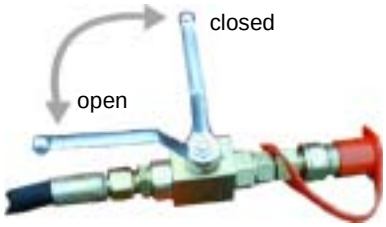
A = Feed line to hydraulic motor
B = Return line from hydraulic motor
P = Feed line
T = Return line
LS = Control line

The flow control valve must be converted from 3-way to 2-way. The refitting is accomplished as follows:

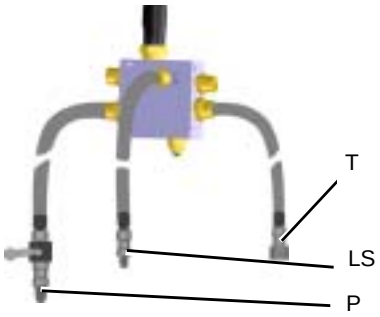
> Loosen the lock nut.
> Turn the screw fully in.
Turning the screw fully in converts the 3-way flow control valve to a 2-way valve.
> Retighten the locknut.
> Adjust the desired speed with the adjusting screw at the two-way flow control valve.

Connection to the tractor

NOTE The couplings and connectors may vary according to tractor manufacturer. Please contact your dealer before changing the tractor. If the tractor couplings still have to be installed, ensure that components are fitted which comply with ISO 17567. The hydraulic hoses have a connection with 18 L with a union nut M26 x 1.5.



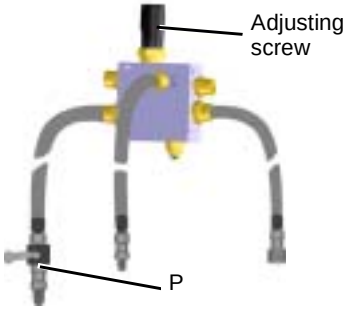
> Close the ball valve at the feed line (P).



> Make connections in the following sequence:
>
> 1. Return line (T)
> 2. Control line (LS)
> 3. Feed line (P)

> Activate the speed counter of the fan (depends on the available instruments or screens)

Operation



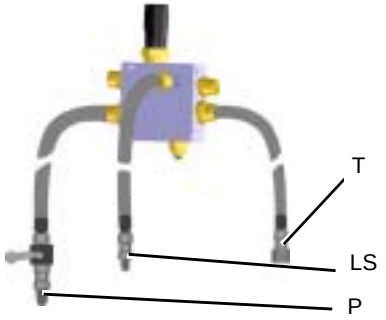
Speed settings must usually only be made during initial operation or when changing tractors. At the start of the season – and at high rate of work/output also in the interim period – a check should be carried out.

> Open the ball valve at the feed line (P).

Shutting down the fan
The adjustment of the speed is only allowed with stopped fan. Setting work while the fan is running can lead to machine damage.

> Adjust the desired speed with the adjusting screw at the two-way flow control valve.

Uncoupling the machine



> Switch off the tractor motor

> Close the ball valve at the feed line (P).

> Disconnect in the following sequence:
>
> 1. Feed line (P)
> 2. Control line (LS)
> 3. Return line (T)

Operation

Checking hydraulic connections
Prior to operation, carefully inspect the hydraulic hose connections and the hoses themselves. Hot hydraulic fluid can squirt from insufficiently tightened or damaged hydraulic hoses, resulting in severe injury.

Initial commissioning

For the initial commissioning with cold oil the following applies:
The fan speed is attuning itself until the hydraulic fluid has reached the operating temperature. Only when the fan speed persists the adjustment is completed.

> Constantly check the fan speed during the adjustment at the electronic control system

→ Chapter »ESC«, starting at page 41.
→ Refer to separate instructions for Tellus.

Repeated commissioning

For the repeated commissioning with cold oil the following applies:

- The fan speed is slightly higher during the warm-up phase.
- The fan speed is attuning after a short period of time to the value adjusted at the initial commissioning.

Operation with two hydraulic motors

The oil supply of the tractor must be designed to allow for the simultaneous operation of two hydraulic motors. If you have worked up to now only with one hydraulic motor, arrange the installation of a parallel switching under all circumstances.

Safety

Checking cables
Inspect cables prior to connection and replace any damaged cables. Damaged cables can lead to malfunctions or cable fires.

Observe the prescribed temperature range
The electronic control system only operates reliably in the specified temperature range.

Protect against getting wet
Protect switch cabinets and junction boxes from water and dirt.
Water and dirt in switch cabinets or junction boxes can lead to unforeseeable malfunctions

Eliminating malfunctions immediately
In the case of malfunctions, refer immediately to chapter »Eliminating malfunctions« and attempt to eliminate the fault yourself. If this is not possible, please contact Customer Service.

Interrupt the power supply to perform maintenance work
Interrupt the power supply to electronic control systems when performing maintenance work. Otherwise the possibility of damage to electronic control systems cannot be excluded.

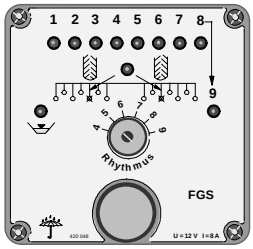
Range of application

The electronic tramlining control system, FGS, makes it possible to create tramlines.

Proper use

The ESC is only used in conjunction with seed drills. Any other use is prohibited.

Characteristics



Two versions of the FGS are available:
Type 1 for rhythms: 4,5,6,7,8,9
Type 2 for rhythms: 3,4S,5,6S,7,8S

The system consists of the following components:

- Switch box
- Plug board
- Cable with plugs

It also permits:

- Monitoring the hopper low level sensor
- V-belt monitoring of the fan V-belt drive

FGS connection

Shut-off valve

Plug board

Retainer

Prerequisites

- shut-off or combination valves are installed on the seed drill.
- the plug board is fitted on the machine and the sensors are connected.
- the tractor is provided with a bracket for securing the switch box.

> Insert the switch box into the bracket

If the bracket is not yet mounted:

On tractors with a cab:

> Select a suitable location that can be easily reached from the seat

On tractors without a cab:

> Attach the bracket with a slant

Plug connection

Plug for connecting to the switch box

Plug for 12 V socket

> Insert the plugs into the corresponding sockets.

Performing a calibration test

The calibration test is usually performed on the farm.
To perform the calibration test, refer to the section »Performing a calibration test« in the chapter ESC in these instructions, beginning on page 55

Tramlining rhythm

The tramlining rhythm defines when tramlines are to be set up on the field. The number of seed rows is determined by the track width and tyre width of the tractor you use for fertilising and spray work. At the factory, all settings are based on the information you provided at the time you ordered the machinery.

NOTE If the working width of the spraying/fertilising equipment or the tractor's track width changes, please contact your dealer.

Principles

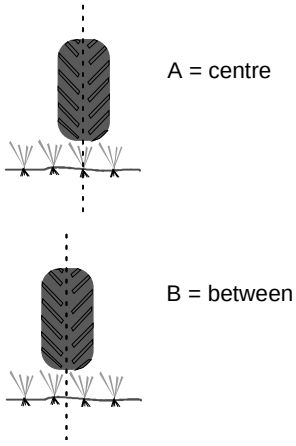
Before you can set up tramlines, it may be necessary to make alterations to the seed drill. This is always required if the machinery is to be operated with a spraying/fertilising unit with a different width. The installation or modification of shut-off valves is generally required. If these modifications are required, have them performed before setting up the tramlines.

The tramlining rhythm is calculated from the ratio of the spraying/fertilising unit and the seed drill working widths.

Example: Calculate the tramlining rhythm	
Field sprayer working width	20 m
Seed drill working width	4 m
Calculation	20/4=5
Result: tramlining rhythm	5

The working width ratio may also result in a remainder. How the various tramlining rhythms are handled is described in this chapter in the section »Select the rhythm«.

Setting up tramlines



Setting tramlines by blocking the sowing units is dependent

- on the tractor's track width
- the width of the spraying/fertilising unit, and
- the row width.

The tractor track width can be dimensioned so that the tractor tyres:

- drive over the centre of a seed row, or
- Drive between two seed rows.

Use the graphic in conjunction with the table. The following apply:

- A = the tractor moves over the centre of a seed row
  Please note: Select the number of blocked seed rows so that the tractor tyres do not drive over any seed row.
- B = moves between two seed rows
  Please note: Select the number of blocked seed rows so that the tractor tyres do not drive over any seed row.

NOTE For particularly wide tyres, you will need to block several adjacent seed rows to set up the tramline.

The table lists possible spraying/fertilising unit track widths dependent on the row width.

Row width [cm]	Seed drill width [m] with (number of seed rows)	Spraying/fertilising tractor track width [m]						
		A	B	A	B	A	B	A
11.1	4 (36)	1.41	1.50	1.59	1.69	1.78	1.88	1.97
10.3	6 (58)	1.34	1.43	1.55	1.65	1.75	1.86	1.96
12.5	6 (48)	1.38	1.50	1.63	1.75	1.80	2.0	–
15.0	6 (40)	1.35	1.50	1.65	1.80	1.95	2.10	–

Calculating the rhythm

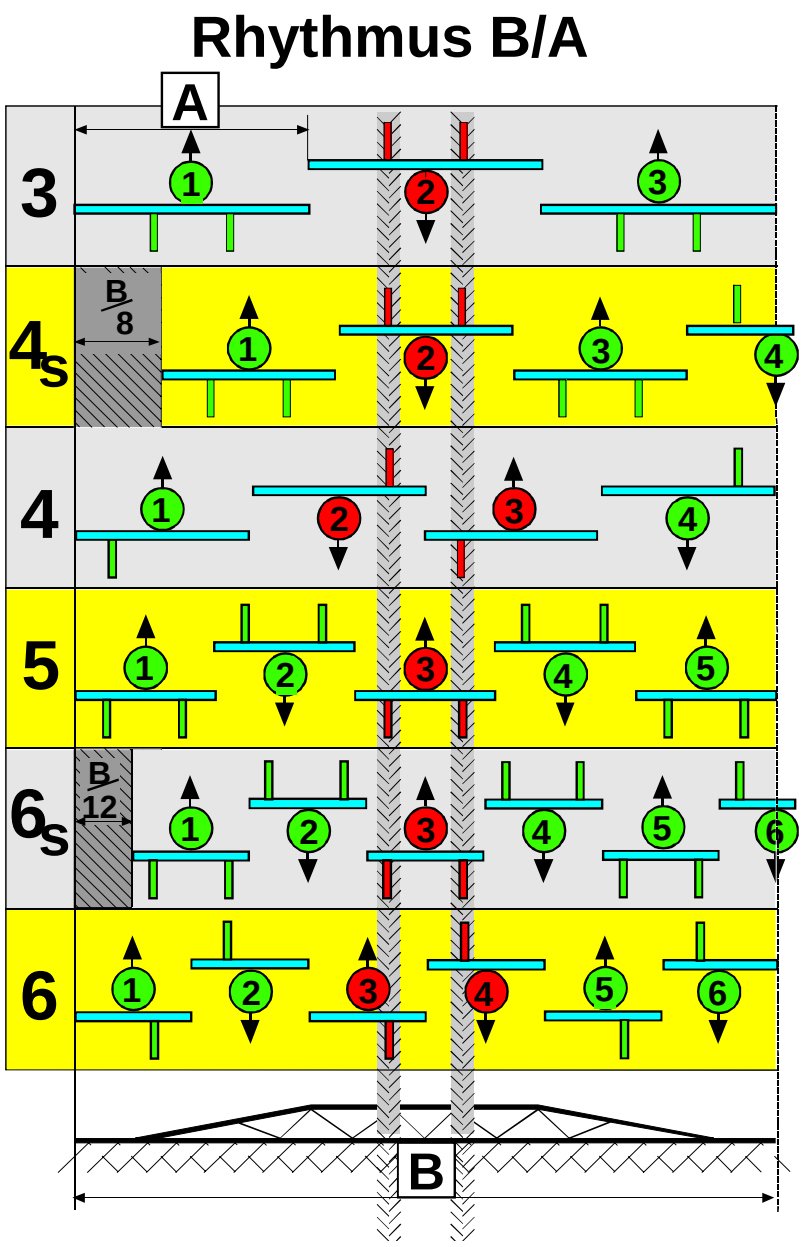
Overview

The table is merely intended as an overview. The table lists some of the most common tramlining rhythms for the seed drill, depending on the spraying/fertilising unit working width (m), e.g. field sprayers, fertiliser spreaders.

Common tramlining rhythms			
Working width of spraying/fertilising equipment (m)	**Working width of seed drill (m)**		
	4,00	**4,50**	**6.00**
12	3	–	2
16	4	–	–
18	4.5	4	3
20	5	–	3.3
24	6	5.3	4
27	–	6	4.5
28	7	–	–
30	7.5	–	5
32	8	–	–
36	9	8	6

The following chart contains several examples of tramlining rhythms.

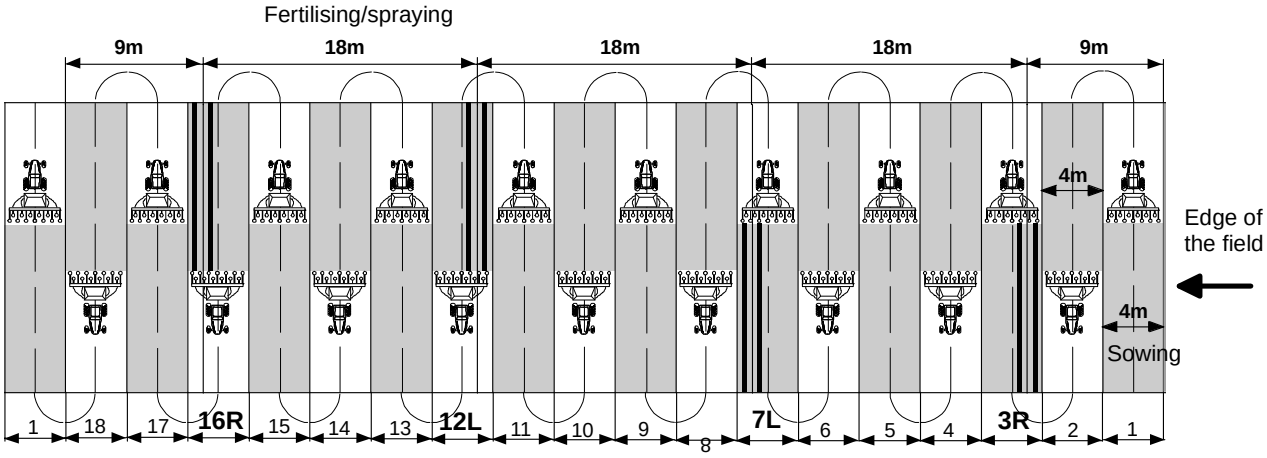
A	Sowing
B	Fertilising/spraying
B/8	of the working width of the sprayer, 1/8 or 1/2 of the working width of the seed drill
B/12	of the working width of the sprayer, 1/12 or 1/2 of the working width of the seed drill
Digits, left	Tramlining rhythm



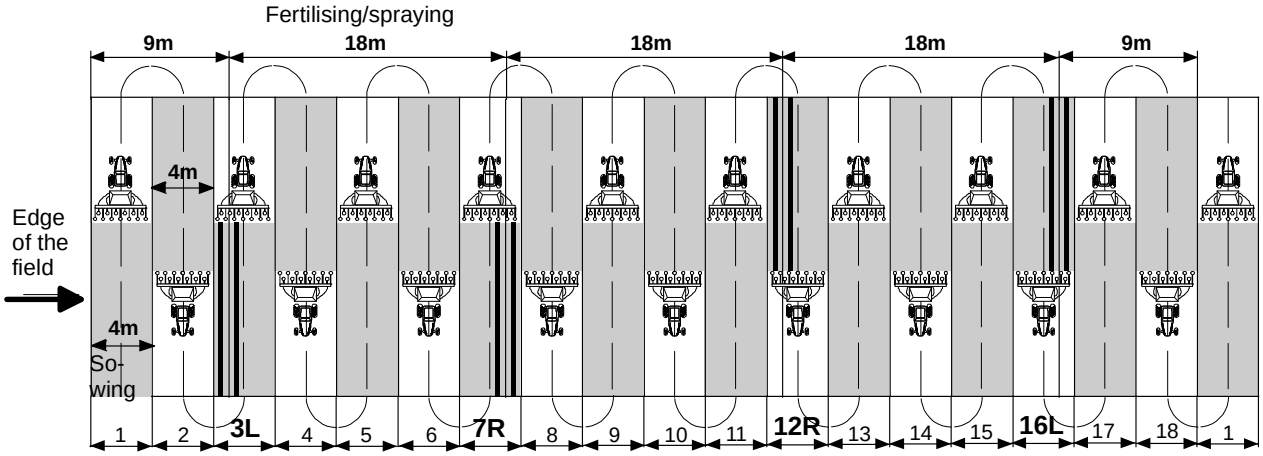
Example of a tramlining rhythm with a remainder:

- 18 m spraying/fertilising unit
- 4 m seed drill

Start at the right-hand edge of the field



Start at the left edge of the field



Select the rhythm

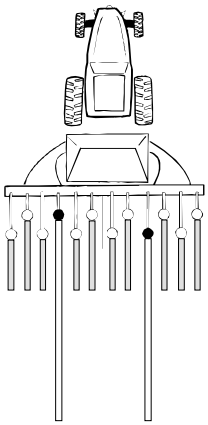
The rhythm is dependent on the working width of the seed drill and the spraying/fertilising unit. It may be

- uneven, or
- even, or
- symmetrical or
  (an "S" after the number indicates symmetry)
- a special rhythm

The type of rhythm affects the set up of tramlines.

NOTE When the tramline is set up, the digit on the display flashes as an additional reference.

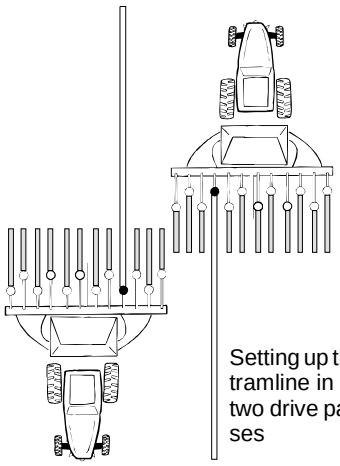
Uneven rhythms



Setting up the tramlines during a single pass

3, 5, 7, 9, 11
The tramline is always symmetrically created in one drive. You can begin cultivation on the right or left side of the field.

Even rhythms



Setting up the tramline in two drive passes

The tramline is set up during two drive passes. The side of the field on which you must begin working depends on which side of your seed drill (left or right) the shut-off valves are installed and on the rhythm you are using.

4, 8, 12
Begin on the side of the field on where the shut-off valves are installed.

6, 10, 14
Begin on the opposite side of the field to where the shut-off valves are installed.

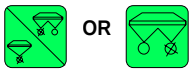
Selecting correct side of the field
If you start at the wrong side of the field, the tramlines do not fit to the cultivation devices.

NOTE When creating the tramline in two drives, the individual tracks cannot be created as exactly as in one drive. However, with even rhythms, the tramlines can be set up in a single pass. Your machine must be prepared for this in the factory.
Section »Symmetrical rhythms«, page 67.

Symmetrical rhythms

for example 2S, 4S, 6S

Symmetrical rhythms compensate for the disadvantage of even rhythms, i.e. having to make two drive passes. Symmetrical rhythms are additionally identified by an “S”. During the first drive at the start of the field you must turn off half the working width. The machine must be prepared for symmetrical rhythms ex works.



> Turn off half the working width and begin drilling on the corresponding side of the field. This pass is not counted in the tramline sequence. Switching off tramlining is indicated by a flashing triangle over the associated symbol on the display.

> On the return pass, drill with the full working width. This is then pass “1” of the tramline sequence. Do not drive in the track marker track, but along the boundary of the surface cultivated in the first pass.

Note special circumstances

If you do not switch off half the working area at the first drive or you do not drive back at the boundary of the cultivated area, the tramlines do not fit the cultivation devices.

Special rhythms

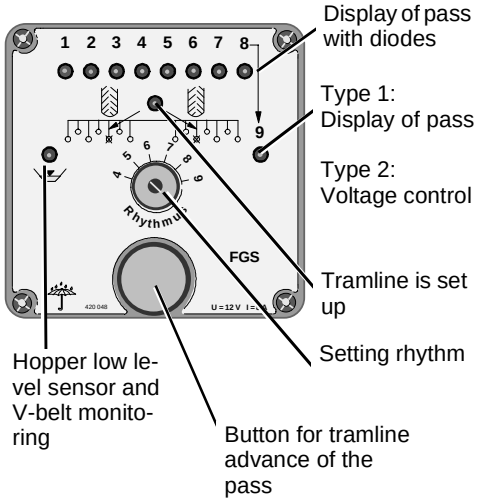
Special rhythms result from a poor ratio of seed drill working width to sprayer/fertiliser equipment working width. The machinery must be set up at the factory for special rhythms.

The side of the field on which you must begin working depends on the working width of both the seed drill and the sprayer/fertiliser.

Selecting correct side of the field

If you start at the wrong side of the field, the tramlines do not fit to the cultivation devices.

Setting the tram-



lining rhythm using the FGS

> Set the desired rhythm with a screwdriver.

> Extend the track marker on one side. In the field, extend the side on which the return pass is to be made

> Use the button to index through the pass once until diode "1" lights up.

Operation

Drilling in conjunction with the FGS is described in Chapter »Operation« in Section »Drilling«.

Safety

Checking cables
Inspect cables prior to connection and replace any damaged cables. Damaged cables can lead to malfunctions or cable fires.

Observe the prescribed temperature range
The electronic control system only operates reliably in the specified temperature range.

Protect against getting wet
Protect switch cabinets and junction boxes from water and dirt.
Water and dirt in switch cabinets or junction boxes can lead to unforeseeable malfunctions

Eliminating malfunctions immediately
In the case of malfunctions, refer immediately to chapter »Eliminating malfunctions« and attempt to eliminate the fault yourself. If this is not possible, please contact Customer Service.

Interrupt the power supply to perform maintenance work
Interrupt the power supply to electronic control systems when performing maintenance work. Otherwise the possibility of damage to electronic control systems cannot be excluded.

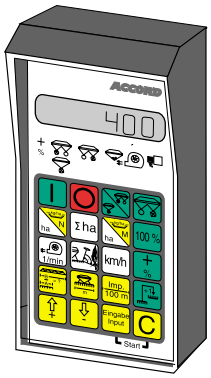
Range of application

The Electrical Sower Controller (ESC) provides economical seed distribution.

Proper use

The ESC is only used in conjunction with seed drills. Any other use is prohibited.

Characteristics



The ESC regulates and controls the essential drilling functions of the seed drill using signals and input data. In addition, the ESC also assumes important control functions, such as:

- Travel-dependent control of the metering devices
- Monitoring the fan speed, the hopper level, the metering devices, the drive wheel

The system consists of the following components:

- Computer;
- Signal distribution box
- Sensors

It also permits:

- The adjustment of the optimum amounts of seed;
- The start of seeding in inaccessible areas;
- Tramlines;
- Half-width shut-off;
- Metering device monitoring

Onboard computer

The onboard computer in the tractor cab is used to input and monitor seeding values. In conjunction with the sensors, faults are automatically detected and an acoustic alarm signal is generated.

Signal distribution box

This represents the link between the onboard computer and the sensors. It is mounted on the machinery frame.

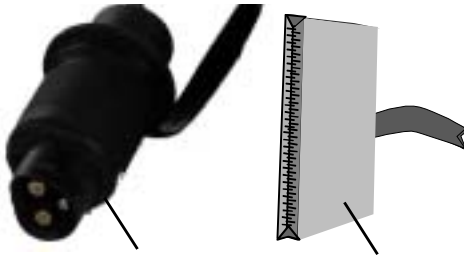
Sensors

A travel sensor determines the distance travelled. It is mounted on the drive shaft.

ESC connection

Prerequisites

- The ESC and the connecting sockets are completely and properly installed on the tractor



Power supply cable 2-pin

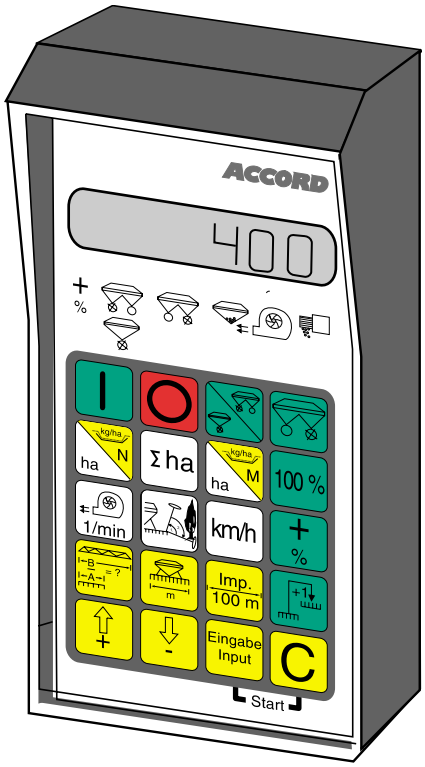
Control cable

> Connect the cable

Specifications

ESC	
Power supply (V)	12
Fuse (A)	16
Temperature range (°C)	-10 to + 60

Keyboard



The ESC keyboard contains:

- Operating keys for switching the unit on and off
- Control keys
  green keys for executing functions
- Information keys
  white and yellow keys to call up information during operation
- Input buttons
  yellow and white/yellow keys to input, save, and delete machinery data

The following sections explain the meanings of all the symbols on the keyboard and the display.

Symbols on the keyboard

The ESC is easy to operate by means of keys.
This section provides all the information concerning the symbols on the keyboard for the:

- Operating keys
- Control keys
- Information keys
- Input keys

Operating keys

The operating keys switch the ESC

ON (green key)

or

OFF (red key)

Control keys (green)

The control keys are used to implement functions. These keys control the

- Half-width shut-off / Stop shut-off;
- Seed rate adjustment
- Cancelling the seed rate adjustment
- Tramlining rhythm adjustment

Half-width shut-off / stop shut-off of the left-side metering device [+]
If two metering devices are being used, this key switches the one on the left side off (half-width shut-off). ▼ The “off” state is indicated by a triangle above the symbol on the display..  Switching the metering device off interrupts the hectare count.

NOTE If only a single metering device is being used, this key switches it on or off as required (stop shut-off).

Half-width shut-off, right side metering device
This function can only be used if there are two metering devices attached. Press the key to switch the metering device on the right side on and off as required. ▼ The “off” state is indicated by a triangle above the symbol on the display.. 

NOTE If only a single metering device is being used, this key is inactive.

Seed rate adjustment
This input increases the original seed quantity / ha in percentage steps (increased output).

▼ + % A triangle above the symbol on the display indicates that a seed rate adjustment has been made.

The prerequisite for seed rate adjustment is the adjustment of the setting screw on the metering device. This adjustment procedure is described in a separate section.

Seed rate adjustment cancellation;
This key is used to readjust the seed rate to its original value, without increased output.

NOTE:
- Corrections can only be made if the drive wheel is turning.
- Keys 

and 

can only be actuated after one another after a :ond

Tramlining rhythm adjustment.
The current tramline is manually advanced by one track. Necessary
- when setting the correct starting position;
- in case of undesired tramline advance during the work, e.g. by lifting the machine at barriers

NOTE The desired tramline can only be set by advancing the track. The track cannot be decreased.

Information keys (white and white/yellow)

These keys to call up information during operation. Information is available about:
- Cultivated area, in ha
- Total cultivated area per season;
- Currently cultivated area, in ha/hr.;
- Current fan speed;
- Operating hours;
- Working speed, in kph;

The display shows the tramline circuit, together with the following information:
- Working speed, in kph;
- Current fan speed;
- Currently cultivated area, in ha/hr.;

NOTE While this information is displayed you can use the green control key to advance the tramline by one track. The change is indicated by a horn sound and the display of the new tramline.

Cultivated area, in ha;
This key calls up information concerning the cultivated area. Measurement automatically stops when the machinery is at rest.

Total cultivated area, for example, per season
Displays the total area cultivated.

Current area performance, ha/hr.
This key calls up information concerning the current area performance, in ha/hr. Measurement automatically stops when the machinery is at rest.

Current fan speed
Displays the fan speed in rpm.

Obstacle
Press the button before lifting the track marker. The tramline sequence is not counted any further once the track marker is raised.

Example

Obstacle on the right side:

> Push the "obstacle" button
> Raise the right track marker
> Lower the left track marker and raise it again.
> Drive past the obstacle
> Lower the right track marker again. The tramline sequence is not counted any further - no correction is necessary.

Working speed, in kph
Indicates the speed during seeding.

Input keys (white and white/yellow)

The input keys are used to display and modify machinery data.

- Display of current setting by actuating the respective key
- Input of new values via the arrow keys
- Saving new values with the "Return" key
- Delete display
  by actuating the delete key

Tramlining rhythm
Displays the stored tramlining rhythm and the tramline.

Working width
Indicates the machinery working width.

Number of pulses / 100 m
Displays the number of pulses measured over 100 m.

Arrow keys
Use the arrow keys to change the current values. Pressing and holding an arrow key will continuously change the display until the key is released.

NOTE

You must save newly specified values with 

– otherwise they will not take effect.

Enter input
Saves the changed value.

Delete key
Several functions:

- Deletes values entered in the display;
- Performs various functions in conjunction with other keys. These will be discussed in the next section.

Key combinations with C

All combinations with the "Delete" key will first delete the memory. Combinations with a dual function will also activate a process.

Dual function combinations

C + kg/ha N / ha

"Cultivated area in ha" and "C"
Two functions

- Resets the cultivated area in ha memory to zero
- Initiates calibration procedure for normal metering
  The use of this function is only possible if the accessory "Metering device monitoring" is installed.

NOTE The preparations for the calibration procedure for normal metering and the calibration test are described in a separate section.

C + kg/ha M / ha

"Area performance in ha/h" and "C"
Two functions

- Resets the area performance in ha/hr. memory to zero
- Initiates calibration procedure for normal metering
  The use of this function is only possible if the accessory "Metering device monitoring" is installed.

NOTE The preparations for the calibration procedure for micrometering and the calibration test are described in a separate section.

Single function combinations

C + Eingabe Input

"**Enter input" and "C"**

Resets the memory of kg/ha N / ha to zero.

C + Σ ha

"**Total ha" and "C"**
Deletes the complete total ha memory for the entire area cultivated during the season.

C + Imp. / 100 m

"Pulses/100 m" and "C"
Deletes memory of pulses/100 m
Deletes the memory and restarts pulse counting as soon as the drive wheel turns.

C + ○

"C" and "OFF"
Resets all memories to zero.

Save the fan drive speed

Observe the permissible fan speed
The permissible fan speed is max. 5000 rpm. At higher speeds the fan can be destroyed by explosion.

Mechanical drive

Before saving, the precision drill has to be operating at the PTO shaft rpm rating. After the p.t.o. shaft r.p.m. has been reached, the following fan speeds result for the precision drill:

PTO shaft speed [rpm]	Fan speed [rpm]
1000	4300

Hydraulic drive

Prior to saving, the oil flow must be regulated such that a fan speed of 4300 rpm can be maintained.
→ Chapter »Hydraulic system«, section »Hydraulic fan drive«, page 24

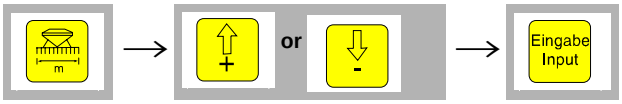
The fan speeds are identical for both mechanical and hydraulic fan drives.

> Press the button while the machine is running:
The instantaneous fan speed is displayed.

> Press the button:
The indicated fan speed is saved.

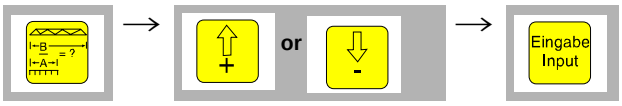
Working width adjustment

The seed drill working width must be specified in order to correctly set up tramlines and to calculate area performance.



Adjusting the tramlining rhythm

The tables and setup diagrams for the tramlining rhythm can be found in the section »Tramlining rhythm«.



Travel sensor calibration

The travel sensor receives one pulse for each rotation of the drive wheel. In order to assign a specific number of pulses to a distance travelled, the travel sensor must be calibrated. There are two options for doing this:

- Drive along a path that is exactly 100 m long, or
- Read the values from the table and store them.

Driving a path

> before driving perform a memory clearance of the "Impulses/ 100 m“
while stationary. Imp. 100 m C

> drive exactly 100 m, then save the number of impulses indicated when stationary

by pressing the button Eingabe Input

Saving table values

The values given in the table depend on the circumference of your seed drillers drive wheel and on the soil conditions. The current soil conditions may produce different values. Calibration by means of actually driving across the field is more accurate.

Working width (m)	Drive wheel	Pulses/100 m
3.00	Star wheel	42
4.00	Star wheel	42

> With the vehicle stopped, delete the "Pulses/100 m" memory

Imp. 100 m C

> Enter the desired value from the table. + -

> Save Eingabe Input

Display

The display shows the various symbols and their related numbers.

Symbols on the display provide information about:

- Operating conditions
- Machinery settings
- Fault

Numbers on the display provide information about:

- Machinery data
- Tramline position

Symbols at the bottom of the display provide information about:

- Current machinery settings
- Alarms

NOTE Some of the display symbols only appear when you are actually working with the ESC.

Symbols on the display

Arrow, circle, and triangle indicate different operating conditions, machinery settings, and faults.

Arrow

Switching the ESC on brings up an arrow on the display. The ESC is now operational.

Circle

A flashing circle below the arrow indicates that the drive wheel is turning. The machinery is in its operating position.

Triangle

Triangles on the display always appear in conjunction with the symbols at the bottom of the display. The triangles indicate machinery settings or, if they are flashing, indicate faults.

- Reference triangles = Display of current machinery settings

- Flashing triangles = Display of faults

NOTE The symbols at the bottom of the display are explained in the subsequent sections.

Numbers on the display

Operating data

This contains all the information you can call up by means of the white or white/yellow keys.

Machinery data

Contains all the information you can call up with yellow keys

Tramline position

The number after the vertical dotted line indicates the current tramline position. When a tramline is set, this number flashes.

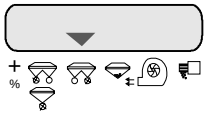
Symbols at the bottom of the display

The symbols at the bottom of the display are associated with the reference and flashing triangles and provide information about:

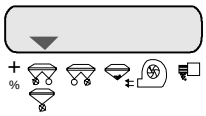
- Current machinery settings
- Fault

Machinery settings

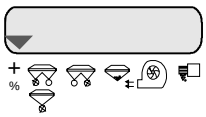
A triangle above the symbol indicates the current machinery settings.



Right side (rear) metering device switched off.



Left side (front) metering device switched off.



Seed rate adjustment set to increased output.

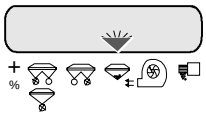
Alarms

Alarms may be generated during operation or when the ESC is switched on. Visually, they are indicated by flashing triangles above the symbols at the bottom of the display.

- Hopper low level alarm
- Fan speed alarm
- Metering device drive alarm

NOTE:

- Alarms cannot be manually activated.
- Generation of an alarm also produces an acoustic warning.

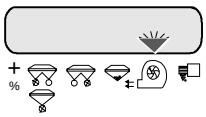


Hopper low level alarm

A triangle flashes above the hopper level symbol on the display. In addition, a horn sounds every 2 seconds to provide an acoustic alarm.

- Hopper reserves in use
- Residual quantity in the hopper below minimum level

The alarm switches off when the hopper is refilled.

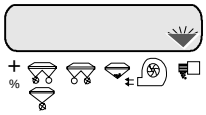


Fan speed alarm

A triangle flashes above the fan speed symbol on the display. In addition, a horn sounds every second to provide an acoustic alarm.

- The fan speed has dropped 10% below the saved lower fan speed limit.
- A drop in fan speed can result in seed blocking the seed delivery tubes.

The alarm switches off once you increase the fan speed.



Metering device drive alarm

A triangle flashes above the metering device drive symbol on the display. In addition, a horn sounds at given intervals to provide an acoustic alarm.

If the metering device drive is interrupted for longer than 5 seconds during stop or half-width shut-off, a triangle flashes above the fan speed symbol on the display. In addition, a horn sounds 5 times after operation is restarted to provide an acoustic alarm

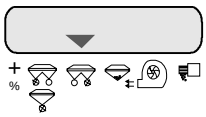
- The metering device drive has been interrupted.

The alarm switches off once the problem has been corrected.

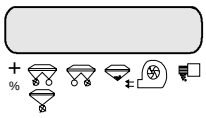
Calibration test with the ESC

General

The calibration test is essential for optimum cultivation. The prerequisites for performing a calibration test include:



- All required data must be entered.
- With seed drills with one metering device
  – switch off second metering shaft (right metering device).



- With seed drills with two metering devices
  – activate second metering shaft.

Please note the following before starting the calibration test:

NOTE:

- The calibration test can only be performed if the machinery is retracted and the tractor and PTO shaft are switched off.
- For seed drills with two metering shafts, the calibration test starts with the left (front) metering device.
- To avoid inaccuracies, perform a calibration test with each metering device.
- Perform a new calibration test every time you change seed type.
- The factory-defined default value for the micrometering system is “ON”. Change these settings only when you wish to operate with normal metering.

To work with normal metering, you have to switch off the micrometering at the seed drill.
→ Chapter »Preparation work - drilling«, section »Micrometering system adjustment«, page 78

NOTE However, the micrometering system on some seed drills is extremely difficult to access. In this case, bypass the deactivation:

- Leave the micrometering system turned on.
- Enter a larger setpoint value than indicated at the metering device.
- Perform one or more calibration tests for comparison purposes.

The micrometering must only be switched off at the seed drill if the quantity of fine seed being sown is more than 15% below that desired with the metering device fully opened.
Chapter »Preparation work - drilling«, section »Micrometering system adjustment«, page 78

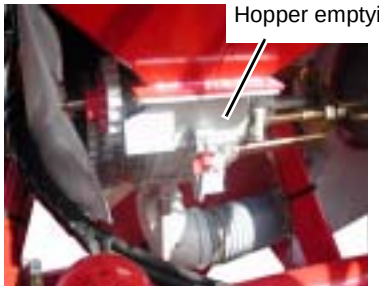
Performing a calibration test

Machine in transport position
For the calibration test, the machinery must be in the transport position, with wheels chocked to prevent rolling, and sides secured against extension. An unsecured machine can cause serious injury.

Checking seed hopper
Inspect the seed hopper for foreign objects. Foreign bodies in the seed hopper can cause damage to the machine.

If you are using two metering devices, you must perform the calibration test on each one.

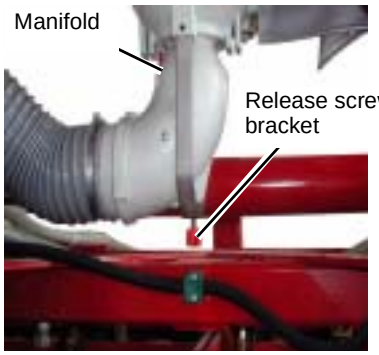
Before you can begin the calibration test:



> Close the hopper emptying flaps on both metering devices.

> Place the red locking tap in the “Fine” or “Normal” seed position.

> Place a catch pan under the metering device.
The catch pans must be large enough to hold the seed generated during the calibration.



> Loosen the screw on the bracket and hinge the bracket aside.

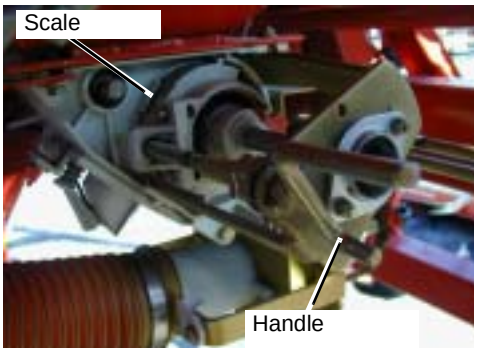
> Remove the elbow

Now use the ESC to prepare the calibration test.

You must use the correct adjustment value for your particular seed in order to perform the calibration test. → »Preparation work - drilling« section »Determining the setpoint value«, page 76.

> Read the adjustment value for normal or fine seed from the table.

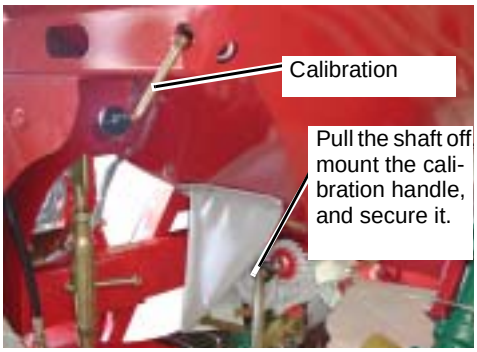
For example, the setting value in the table is 50 mm.



> Using the handle, adjust this value at both metering devices. Adjusting to this value changes the metering device cell width.

NOTE There must be no seed in the metering device if you are decreasing the cell width.

> Add sufficient seed to the hopper for the calibration test.
Please note: The hopper low level sensor in the seed hopper must be covered by at least 3 cm of seed.



> Remove the calibration handle from its retainer

> Pull the shaft off and mount the calibration handle on the shaft. Secure with a cotter pin.

The seed drill is now ready for the calibration test. Perform the calibration test according to the machinery settings for normal or micrometering.

Normal metering

For normal metering, the calibration test is performed for 1/10 ha.

> 

press simultaneously.

> Carry out 85 revolutions with the calibration handle mounted on the metering device. With metering device monitoring: A horn will sound after 85 revolutions.

Micrometering

For micrometering, the calibration test is performed for 1/10 ha

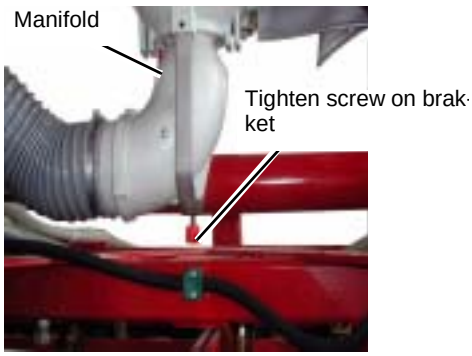
> 

press simultaneously.

> Carry out 86 revolutions with the calibration handle mounted on the metering device. With metering device monitoring: A horn will sound after 85 revolutions. Continue for one additional revolution.

Calibration test evaluation

NOTE:
- The calibrated quantity of seed represents the amount sown for 1/10 ha.
- We recommend performing the calibration test at 1/10ha for sowing quantities up to approx. 100 kg/ha, and at 1/20ha for larger quantities. At 1/20 ha, halve the number of revolutions.



At the conclusion of the calibration:

> Reattach the elbow

> Weigh the seed from both metering devices together.

If the manifold is not installed, this will result in the seed falling directly on the ground during sowing, and not being passed to the seed rows.

NOTE:
- The quantity of calibrated seed does not necessarily correspond to the value in the table. One reason for this is the difference in the thousand grain weight.
- For deviations in the seed quantity:

> Convert the difference to the quantity in the table into %.

> Correct the setting on the metering device up or down by this percentage. When doing this, make sure there is no seed in the metering device if you are decreasing the cell width.

Electrical seed rate adjustment

Electrical seed rate adjustment is only suitable for normal seeding. Once set, the additional seed quantity can easily be added or shut off via the ESC.

Before starting work you must:

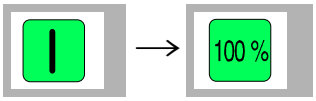
- Set the base quantity (100 %)
- Set the desired additional quantity (+ x%)
- Adjust the adjusting setting screw
- Check the additional quantity by running a calibration test.

NOTE The metering device cell width can be increased by a maximum of 20 mm when using the seed rate adjustment.

Base quantity

The base quantity is the amount of seed you wish to apply per ha. You have already performed these settings for both metering devices and checked them with a calibration test.

> Set the basic volume on the metering device



The ESC is now switched to a base quantity = 100 %.

> If necessary, repeat the calibration test as described in the last chapter.

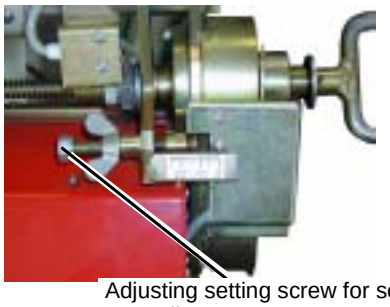
Set the additional quantity

Determine the additional quantity adjustment value as follows:

Additional quantity calculation example	
With a seed quantity corresponding to base setting on the metering device	100 % 50 mm cell width
Desired additional quantity	+ 10 %
Calculation	50 mm x 10 % /100
Result: Additional quantity adjustment value	5 mm cell width
After cut-in of seed rate adjustment	55 mm, new cell width

NOTE:
- Maximum cell width: Do not exceed a maximum cell width of 110 mm for the base setting + cell width for the additional quantity.

Adjust the adjusting setting screw



Adjusting setting screw for seed rate adjustment

Now set the calculated value for the additional seed at the adjusting setting screw on the seed rate adjustment.

> For this example, set the adjusting screw for the seed rate adjustment to 5 mm on the scale.

NOTE:
- Do not exceed the maximum cell width of 110 mm, including the seed rate adjustment
- Increasing the cell width: After the adjusting setting screw has been adjusted and the electrical seed rate adjustment is switched on, the cell width is automatically increased to the specified value.

Checking the additional quantity

After adjusting the adjusting setting screw, check whether the additional quantity is actually being output.

> 100 % press

> Fill the hopper

> connect with the + % additional quantity

> Performing a calibration test

→ Section »Calibration test with the ESC«, from page 54

Tramlining rhythm

The tramlining rhythm defines when tramlines are to be set up on the field. The number of seed rows is determined by the track width and tyre width of the tractor you use for fertilising and spray work. At the factory, all settings are based on the information you provided at the time you ordered the machinery.

NOTE If the working width of the spraying/fertilising equipment or the tractor's track width changes, please contact your dealer.

Principles

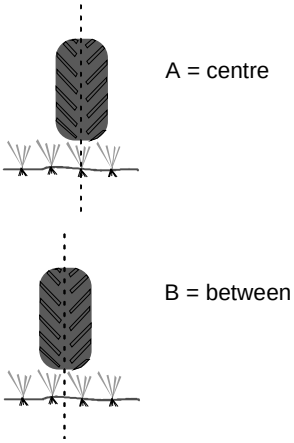
Before you can set up tramlines, it may be necessary to make alterations to the seed drill. This is always required if the machinery is to be operated with a spraying/fertilising unit with a different width. The installation or modification of shut-off valves is generally required. If these modifications are required, have them performed before setting up the tramlines.

The tramlining rhythm is calculated from the ratio of the spraying/fertilising unit and the seed drill working widths.

Example: Calculate the tramlining rhythm	
Field sprayer working width	20 m
Seed drill working width	4 m
Calculation	20/4=5
Result: tramlining rhythm	5

The working width ratio may also result in a remainder. How the various tramlining rhythms have to be handled is described in this chapter in the section »Select the rhythm«.

Setting up tramlines



Setting tramlines by blocking the sowing units is dependent

- on the tractor's track width
- the width of the spraying/fertilising unit, and
- the row width.

The tractor track width can be dimensioned so that the tractor tyres:

- drive over the centre of a seed row, or
- Drive between two seed rows.

Use the graphic in conjunction with the table. The following apply:

- A = the tractor moves over the centre of a seed row
  Please note: Select the number of blocked seed rows so that the tractor tyres do not drive over any seed row.
- B = moves between two seed rows
  Please note: Select the number of blocked seed rows so that the tractor tyres do not drive over any seed row.

NOTE For particularly wide tyres, you will need to block several adjacent seed rows to set up the tramline.

The table lists possible spraying/fertilising unit track widths dependent on the row width.

Row width [cm]	Seed drill width [m] with (number of seed rows)	Spraying/fertilising tractor track width [m]						
		A	B	A	B	A	B	A
11.1	4 (36)	1.41	1.50	1.59	1.69	1.78	1.88	1.97
10.3	6 (58)	1.34	1.43	1.55	1.65	1.75	1.86	1.96
12.5	6 (48)	1.38	1.50	1.63	1.75	1.80	2.0	–
15.0	6 (40)	1.35	1.50	1.65	1.80	1.95	2.10	–

Calculating the rhythm

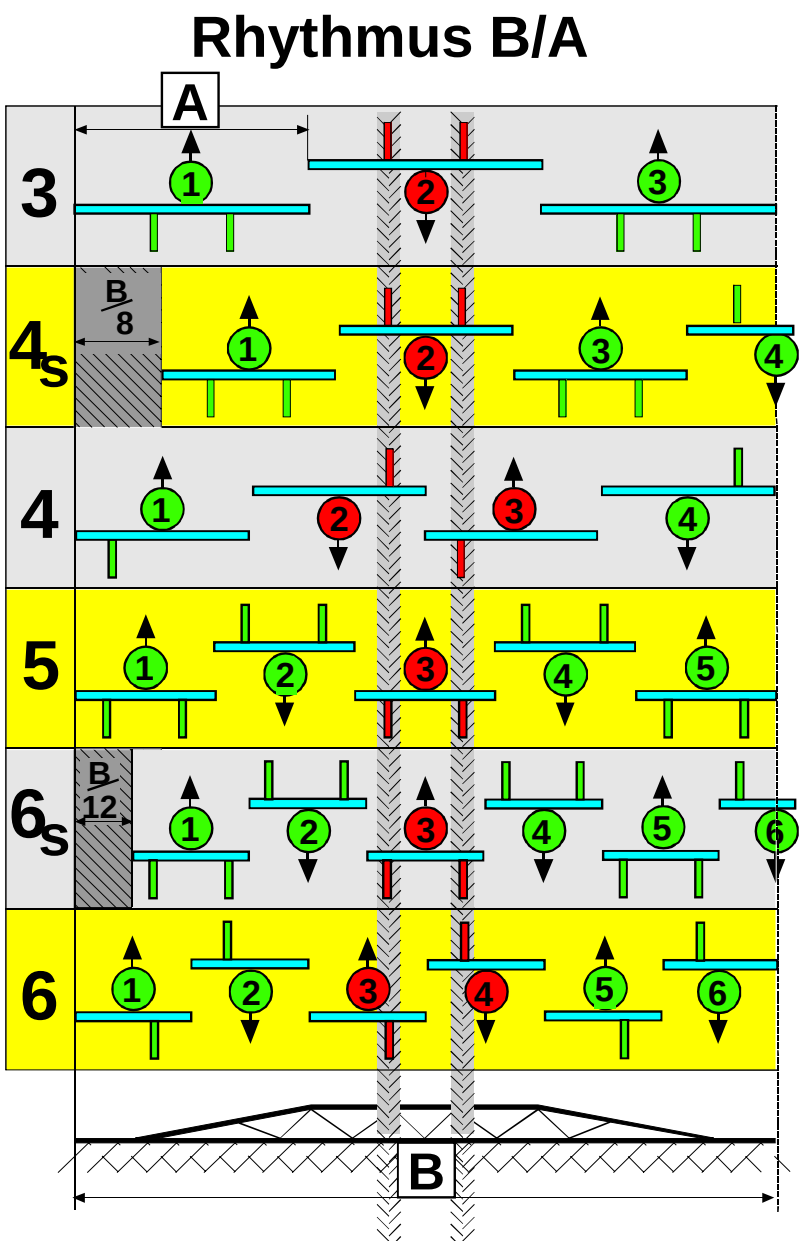
Overview

The table is merely intended as an overview. The table lists some of the most common tramlining rhythms for the seed drill, depending on the spraying/fertilising unit working width (m), e.g. field sprayers, fertiliser spreaders.

Common tramlining rhythms			
Working width of spraying/fertilising equipment (m)	**Working width of seed drill (m)**		
	4.00	4.50	6.00
12	3	–	2
16	4	–	–
18	4.5	4	3
20	5	–	3.3
24	6	5.3	4
27	–	6	4.5
28	7	–	–
30	7.5	–	5
32	8	–	–
36	9	8	6

The following chart contains several examples of tramlining rhythms.

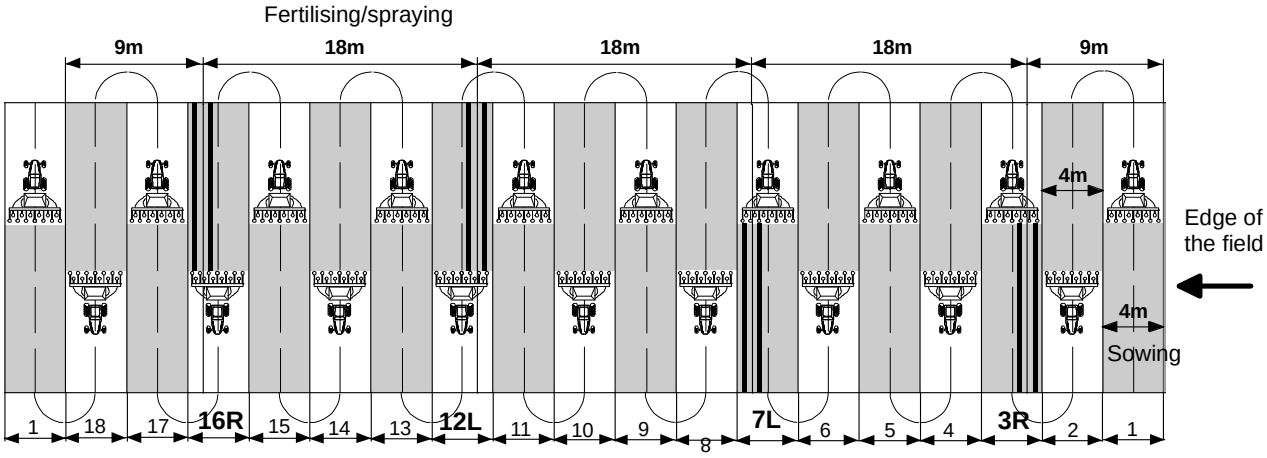
A	Sowing
B	Fertilising/spraying
B/8	of the working width of the sprayer, 1/8 or 1/2 of the working width of the seed drill
B/12	of the working width of the sprayer, 1/12 or 1/2 of the working width of the seed drill
Digits, left	Tramlining rhythm



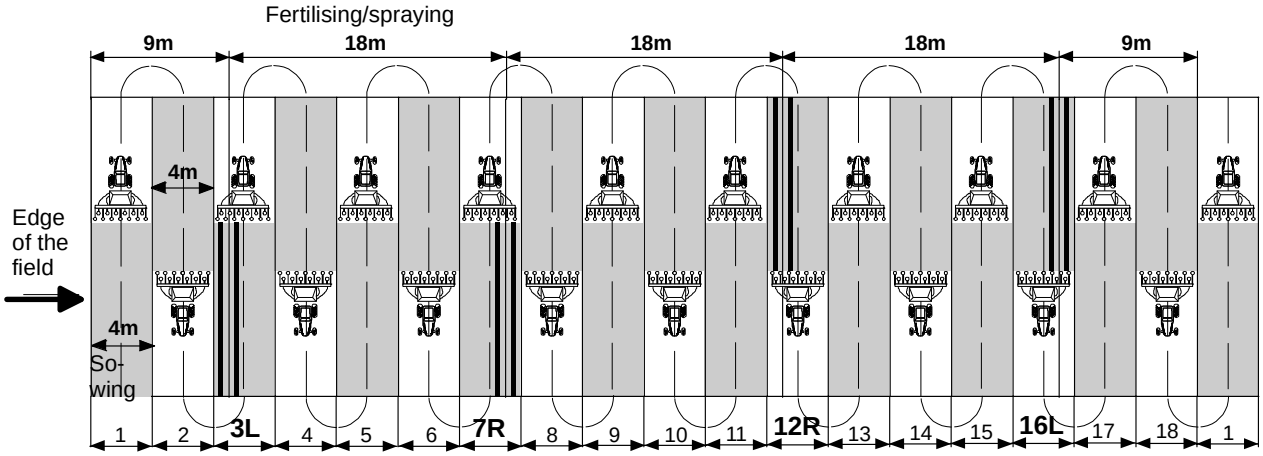
Example of a tramlining rhythm with a remainder:

- 18 m spraying/fertilising unit
- 4 m seed drill

Start at the right edge of the field



Start at the left edge of the field



Select the rhythm

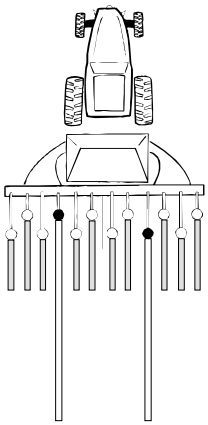
The rhythm is dependent on the working width of the seed drill and the spraying/fertilising unit. It may be

- uneven, or
- even, or
- symmetrical or
  (an "S" after the number indicates symmetry)
- a special rhythm

The type of rhythm affects the set up of tramlines.

NOTE When the tramline is set up, the digit on the display flashes as an additional reference.

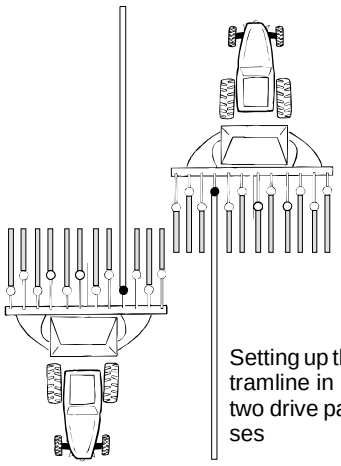
Uneven rhythms



Setting up the tramlines during a single pass

3, 5, 7, 9, 11
The tramline is always symmetrically created in one drive. You can begin cultivation on the right or left side of the field.

Even rhythms



Setting up the tramline in two drive passes

The tramline is set up during two drive passes. The side of the field on which you must begin working depends on which side of your seed drill (left or right) the shut-off valves are installed and on the rhythm you are using.

4, 8, 12
Begin on the side of the field on where the shut-off valves are installed.

6, 10, 14
Begin on the opposite side of the field to where the shut-off valves are installed.

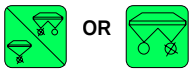
Selecting correct side of the field
If you start at the wrong side of the field, the tramlines do not fit to the cultivation devices.

NOTE When creating the tramline in two drives, the individual tracks cannot be created as exactly as in one drive. However, with even rhythms, the tramlines can be set up in a single pass. Your machine must be prepared for this in the factory.
Section »Symmetrical rhythms«, page 67.

Symmetrical rhythms

for example 2S, 4S, 6S

Symmetrical rhythms compensate for the disadvantage of even rhythms, i.e. having to make two drive passes. Symmetrical rhythms are additionally identified by an “S”. During the first drive at the start of the field you must turn off half the working width. The machine must be prepared for symmetrical rhythms ex works.



> Turn off half the working width and begin drilling on the corresponding side of the field. This pass is not counted in the tramline sequence. Switching off tramlining is indicated by a flashing triangle over the associated symbol on the display.

> On the return pass, drill with the full working width. This is then pass “1” of the tramline sequence. Do not drive in the track marker track, but along the boundary of the surface cultivated in the first pass.

Note special circumstances

If you do not switch off half the working area at the first drive or you do not drive back at the boundary of the cultivated area, the tramlines do not fit the cultivation devices.

Special rhythms

Special rhythms result from a poor ratio of seed drill working width to sprayer/fertiliser equipment working width. The machinery must be set up at the factory for special rhythms.

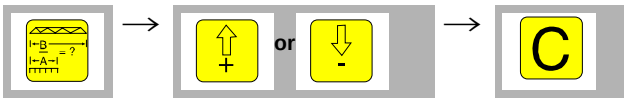
The side of the field on which you must begin working depends on the working width of both the seed drill and the sprayer/fertiliser.

Selecting correct side of the field

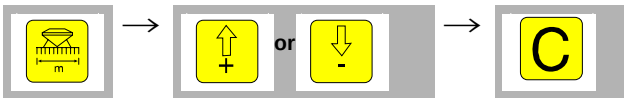
If you start at the wrong side of the field, the tramlines do not fit to the cultivation devices.

Setting the tram-lining rhythm using the ESC

You can now set the rhythm for your equipment via the ESC.
Use the following key combination for the spraying/fertilising unit width:



Use the following key combination for the tramlining rhythm:



A number appears on the display. The following table indicates which number is assigned to which tramlining rhythm.

Number in display	Rhythm	Begin on which side of the field?
0	No tramline	
2	2	at the field side without a locked shut-off valve
3	3	Any
4	4	at the field side with the locked shut-off valve
5	5	Any
6	6	at the field side without a locked shut-off valve
7	7	Any
8	8	at the field side with the locked shut-off valve
9	9	Any
10	10	at the field side without a locked shut-off valve
11	11	Any
12	12	at the field side with the locked shut-off valve
14	14	at the field side without a locked shut-off valve
Symmetrical rhythms		
2-5	2-S	Any
4-5	4-S	Any
6-5	6-S	Any
8-5	8-S	Any
10-5	10-S	Any
12-5	12-S	Any
Rhythms with remainders		
15	15m/6m and 20m/8m	Right
16	15m/6m and 20m/8m	Left
18	18m/4m	Left
19	18m/4m	Right
20	20m/6m and 10m/3m	Left
21	20m/6m and 10m/3m	Right
22	18m/12m	Left
23	18m/12m	Right
24	24m/4.50m	Left
25	24m/4.50m	Right
26	27m/6m	Left
27	27m/6m	Right
28	28m/8m and 21m/6m	Left
29	28m/8m and 21m/6m	Right
30	30m/4m	Left
31	30m/4m	Right
54, 55, 60, 61, 141,181	Not applicable to seed drills	

Operation

Drilling in conjunction with the ESC is described in the chapter »Operation« in section »Drilling«.

Preparation work - drilling

Depending on your machinery's configuration, prepare the following for drilling:

- S covering tines
- Track marker
- Pre-emergence markers
- Shut-off valves
- Reduction head
- Metering device and calibration test

The following are prerequisites for performing the preparation work:

- The machinery is coupled to the tractor.
- The hydraulic system must be connected and operational.
- The machinery must be secured and in its operating position.

The following are prerequisites for performing the preparation work:

- Machine is coupled to the tractor
- The machine frame must be parallel to the ground
- Hydraulic system is connected and ready
- The machinery must be secured and in its operating position

The following applies when performing all operations:

> Secure the machinery.
> Lower the machinery to its operating position.
> Make adjustments as desired.
> Return the machinery to the transport position.

S covering tines adjustment

Various adjustments of the S covering tines are possible.

- Rake angle;
- Bearing pressure.

Inclination angle adjustment

Depending on the amount and type of harvest residue, you can adjust the rake angle by a total of 45° (3 x 15°).

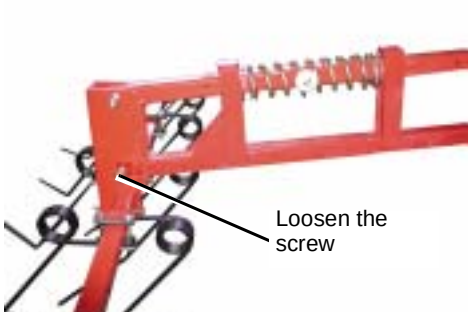
The following rule of thumb applies

- Light soil and soil without crop residues = steeper inclination angle
- Heavy soil and soil with crop residues = flatter inclination angle

Perform the adjustment uniformly for all brackets:

> Release and remove the screws.

> Adjust the rake angle as desired, reinsert and retighten the screw.



Bearing pressure adjustment

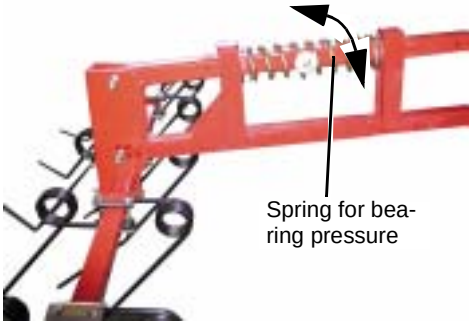
Using pressure, adjust the depth of the S covering tines based on the soil conditions.

The following rule of thumb applies:

- Heavy soil = Increase the pressure, turn spring to left
- Light soil = Decrease pressure, turn spring to right

Perform the adjustment uniformly for all brackets:

> Adjust the spring to the desired pressure



Track marker adjustment

During the forward pass, the track markers mark a path in the seed bed for the return pass. For this purpose, adjust the track markers to the:

- Tractor front wheels
  The centre of the front tractor wheel drives over the marked path
- Centre of tractor
  The centre of the tractor passes over the marked path

To the front tractor wheels

You will need the following information:

- Row width of the seed drill (= distance from seed row to seed row)
- Seed drill working width
- Tractor track width (= Distance from the middle of one front tyre to the middle of the other).

> Put the machinery into its operating position

> Lower the track markers

Calculation

Length of the track markers for the front tractor wheels

$$\frac{\text{Row width + working width - track width}}{2}$$

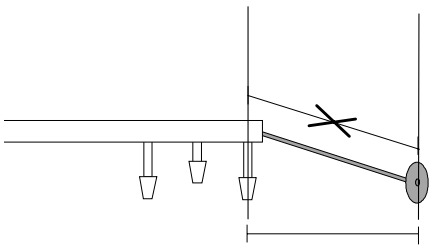
Example

Seed drill row width	12.5 cm
Seed drill working width	400.0 cm
Tractor track width	190,0 cm

$$\frac{12,5 + 400 - 190}{2} = 111,25$$

In this example, the calculated length of the track markers is 111.25 cm.

Adjusting the track markers to the front tractor wheels



Measure out the calculated track marker length on the ground, never directly on the track marker arm. The latter measurement is imprecise.

> Right track marker arm:
  Begin the measurement in the centre of the right seed row.

> Left track marker arm:
  Begin the measurement in the centre of the left seed row.

To the centre of the tractor

You will need the following information:

- Row width of the seed drill (= distance from seed row to seed row)
- Seed drill working width

> Put the machinery into its operating position

> Lower the track markers

Calculation

Length of the track markers for the centre of the tractor

$$\frac{\text{Row width + working width}}{2}$$

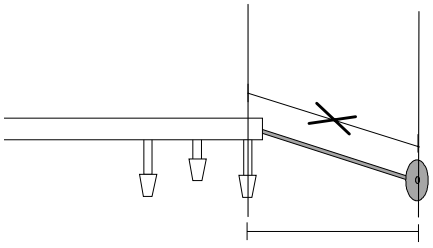
Example

Seed drill row width 12.5 cm
Seed drill working width 450.0 cm

$$\frac{12,5 + 450,0}{2} = 231,25$$

In this example, the calculated length of the track markers is 231.25 cm.

Adjusting the track markers to the centre of the tractor

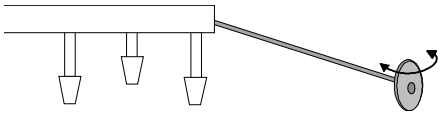


Measure out the calculated track marker length on the ground, never directly on the track marker arm. The latter measurement is imprecise.

> Right track marker arm:
  Begin the measurement in the centre of the right seed row.

> Left track marker arm:
  Begin the measurement in the centre of the left seed row.

Inclination angle adjustment



The adjustment of the track marker inclination angle is based on the soil conditions.

- Heavy soil = disc angled,
  adjust inclination angle at your discretion
- Light soil = disc vertical,
  no, or small, inclination angle

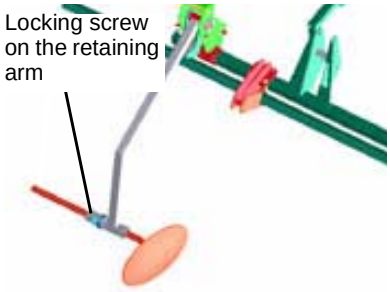
With regard to the inclination angle, adjust the track markers so that the tracks will subsequently be easily visible. The track markers must not "dig in"

Pre-emergence marker adjustment

Pre-emergence markers mark the tramlines for spraying/fertilising and are controlled via ESC or FGS.

The pre-emergence marker is equipped with two discs to mark tramlines for uneven and S rhythms. The pre-emergence marker marks both tramlines during a drive pass.

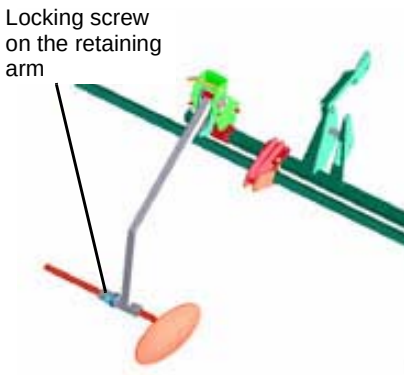
Fine adjustment



> Loosen the locking screw.
> Pull the retaining arm out until the pre-emergence marker passes behind the blocked seed units.
> Retighten the locking screws
> Adjust the second retaining arm correspondingly

NOTE The pre-emergence marker will lower when the seed rows to set up the tramline are blocked.

Inclination angle adjustment



Use the screw on the retaining arm to adjust the rake angle of the discs.

> Loosen the locking screw
> Adjust the desired rake angle and retighten the locking screw
> Adjust the second retaining arm correspondingly

Make sure this does not alter the fine adjustment.

Shut-off valve inspection

Shut-off valves regulate the setting up of tramlines. They block the flow of seed to the seed rows. The number of shut-off valves depends on the tyre width. The location of the shut-off valves depends on the track width of the spraying/fertilising tractor.

If the track or tyre width of the spraying/fertilising tractor changes, please contact your dealer. You may need to have additional shut-off valves installed or have different seed rows blocked.

Metering device adjustment

The following adjustments can be made for metering device:

- the setting (from the table)
- The micrometering system (on or off);
- The locking tap (to normal or fine seed).

Determining the set-point value

To determine the correct setpoint value, first specify whether the seeds are normal or fine.

- Normal seed grain size: between 4 and 10 mm.
- Fine seeds: between 1.5 and 4 mm.

NOTE If you intend to dress the seeds yourself, observe the dressing manufacturers safety information.

Normal seeds				Fine seeds	
Wheat	Barley	Corn	Peas	Grass	Clover
Rye	Oats	Beans	Lupines	Rape	
Kale	Rice	Soybeans		Turnips	

The table contains orientation values for a variety of normal and fine seeds, and for various amounts of seed per hectare. These values are for orientation purposes only, since seed varies with regard to grain size and relative density. Determine the exact seed value for your seeds by means of a calibration test.

→ Chapter »ESC« or »FGS«, section »Performing a calibration test«

Normal seed table

	Wheat	Rye	Barley	Oats	Beans	Peas	Lupines	Vetches	Corn	Grass
Relative density, kg / l	0,77	0,74	0,68	0,5	0,85	0,81	0,76	0,83	0,79	0,36
Setpoint value	Normal seed, kg / ha (Locking tap points to the metering device)									
10 *	34	33	32	24	23	21	28	32	8	-
15 *	51	49	48	35	42	40	45	51	24	18
20 *	69	66	64	47	61	59	62	70	47	26
25 *	86	83	79	59	79	78	79	89	70	34
30	104	100	95	71	98	97	96	108	92	42
35	122	117	111	82	116	117	113	127	115	50
40	140	134	127	94	135	136	130	146	137	-
45	157	151	143	106	154	155	147	165	156	-
50	174	168	159	118	172	174	164	184	175	-
55	192	184	174	130	191	194	181	203	194	-
60	210	200	190	141	209	213	198	222	212	-
65	228	217	206	153	228	232	216	241	231	-
70	246	235	222	165	246	251	234	260	249	-
75	264	252	238	177	265	270	251	279	267	-
80	281	269	253	189	283	289	268	298	285	-
85	298	286	268	200	302	309	285	317	304	-
90	316	302	284	212	320	328	302	336	323	-
95	335	319	300	224	338	347	320	355	342	-
100	352	337	316	236	356	366	337	374	361	-
105	370	354	332	248	374	385	354	393	380	-
110	387	371	348	260	393	404	371	412	398	-

Fine seed table

	Rape		Red clover		Grass		Turnips	
Relative density, kg / l	0,65		0,77		0,39		0,7	
Setpoint va-	Fine seed, kg/ha (Locking tap in the hexagonal shaft groove)							
2,5	2,2	1,1	2,3	1,15	-	-	2,5	1,25
5	4,6	2,3	5,3	2,65	-	-	5	2,5
7,5	6,8	3,4	8,6	4,3	2,8	1,4	7,5	3,75
10	9,1	4,55	12	6	5,2	2,6	10	5
12,5	11,4	5,7	15,3	7,65	7,2	3,6	12,5	6,25
15	13,7	6,85	18	9	9,2	4,6	15	7,5
17,5	15,9	7,95	21,3	10,65	11,2	5,6	17,5	8,75
20	18,2	9,1	24	12	13,2	6,6	20	10
22,5	20,5	10,25	26,6	13,3	15	7,5	21,5	10,75
25	22,8	11,4	27,5	13,75	16,2	8,1	23	11,5
	N	M	N	M	N	M	N	M
N = Normal seed, M = Micrometering system								

NOTE For low application rates (e.g. cell width ≤25 mm) turning on the micrometering system may produce a more uniform seeding result even in the normal seed range.

Dressed seeds

Dressing only in accordance with manufacturer's instructions
Dress seeds only in accordance with the manufacturer's instructions and observe all relevant safety precautions when dressing and handling dressed seeds.
Never perform dressing:

- in the machine
- by hand
- when filling the seed hopper

All of these procedures represent serious health hazards.

For fine seeds, please note: Glutinous dressing can influence the metering accuracy.

Filling seed

Observing maximum fill height
The maximum fill height depends on the seed. The maximum fill height must always be observed. Rape can be filled at maximum fill height under the screen in the seed hopper. If the max. fill height is exceeded, this can result patchy seeding.

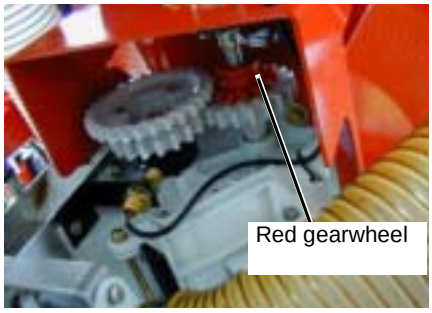
For the subsequent calibration test, it is sufficient to add enough seed by hand to cover the hopper low level sensor to a depth of at least 3 cm.

Micrometering system adjustment

The micrometering system permits fine seeds to be applied at the lowest possible amounts per hectare. The factory-defined default value for the micrometering system is “ON”.

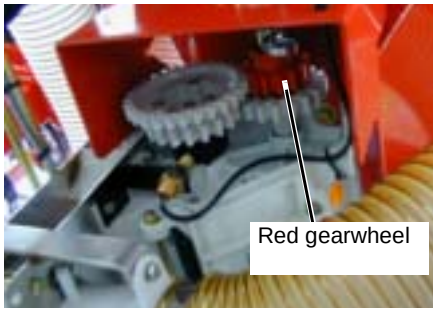
NOTE When inserted/pulled out, the gearwheels must align so that the red gearwheel can be easily pushed in or pulled out.

Switch off micrometering



> Push the red gear wheel into the grey gear wheel until they mesh

Micrometering system activation



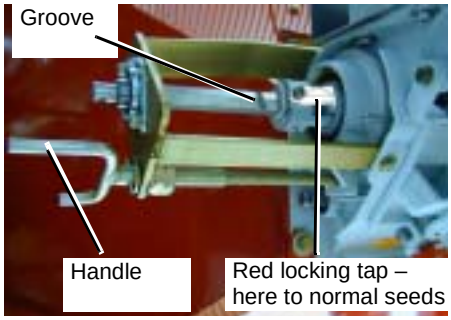
> Pull the red gear wheel out until it meshes with the front gear wheel on the left

Metering device adjustment

Once the micrometering system has been switched on, set the cell width for the metering device. The metering device is equipped with a metering scale labelled “Normal Seed” and “Fine Seed”.

ESC
To perform this setting, you will need the correct seed value from the tables on page 76 or 77

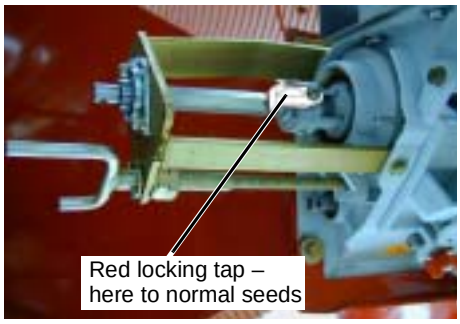
The maximum cell size for normal seed is 90-95 mm.



> Using the crank, set the seed value for the desired seed type until the seed value becomes visible at the edge of the housing

The locking tap for the adjustment for either normal or fine seed is located on the hexagonal tube on the metering device.

Only switch over with an empty hopper
Only switch from normal to fine seed if the seed hopper is empty. Changing the setting when the seed hopper is full can destroy the metering device.



> Now set the changeover switch on the metering device:

- Normal seed = Locking tap points towards the metering device;
- Fine seed = Locking tap must engage in the hexagonal shaft groove on the metering device.

Regulating flap adjustment

The regulating flap on the fan regulates the airflow for the seed. The default setting is "ON". When using fine seed such as rape or grass, check the field to determine whether seed is being blown out of the furrow. If so, close the regulating flap.

> Fold the securing frame upwards and turn it.

- CLOSED = Z
- OPEN = A

> Fold the securing frame downwards until it engages.

Performing a calibration test

The calibration test is performed with the aid of the ESC.
→ Chapter »ESC«, section »Performing a calibration test«, page 55

Safety

Before transporting the machinery on public roads, read the following safety information. Compliance is mandatory and will help you in avoiding accidents.

General

Make sure that the condition of the machine conforms to traffic regulations.
The machine must conform to current traffic regulations if you intend to drive it on public roads. This includes, for example:

- lights, warning equipment and protective equipment are installed
- the permissible transport width and weight, axle load, tyre load-bearing capacity and total weight are observed.
- The tractors steering ability must in no way be compromised. Even with the machinery in its retracted state, there must be sufficient weight on the steering shaft.
- Transport must be carried out only in transport position.

If traffic regulations are not observed the driver and owner of the vehicle are liable for all damage.

Prior to travel on public roads

Observe the machine width
All other swivelling portions of the machinery such as track markers, implements, drive wheel, S covering tines, etc., must be folded and securely locked down.

Closing ball valves
If ball valves are provided at the connection lines of the hydraulic hoses or the chassis cylinders, the ball valves must be closed when travelling on public roads. Accidental actuation of control valves in the tractor can trigger machine movements. This can result in damage to the machine or accidents.

Checking brake lines
Check all brake lines for proper connection. Incorrectly connected brake lines can result in serious accidents.

Braking, reversing and turn indicator lights
With the machinery in its retracted position, all brake, reversing, and turn indicator lights as well as the licence plate must be clearly visible. If an unimpeded line of sight is not possible, the lighting and the licence plate must be mounted on the seed drill.

Trips rope hanging loose
Trip ropes for quick-release couplings must hang loose and must not, when in their lowered position, release the couplings of their own accord. Accidental tripped can lead to serious accidents.

Remove contamination
Remove crop residue, stones and large clumps of earth. When driving on roads, these foreign bodies can fall off the machine and cause accidents.

Check locks
Check all locks for secure seating. Loose locks can become released when driving and trip unexpected machine reactions. This can result in damage to the machine or accidents.

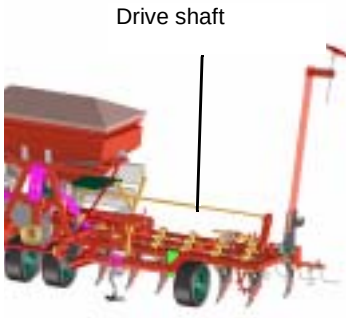
Attach lighting equipment
Attach lighting equipment or warning signs. All turn indicators and boundary lights must be clearly visible. Secure the lighting cables in such a way that they are not subject to tension when the vehicle goes around corners and they do not come into contact with the tractor wheels. If turn indicators or boundary lights are not visible, this can lead to accidents

Remove the drive shaft
If the drive shaft is not removed, it will be destroyed during the folding process, possibly resulting in damage to the machine and injuries through sharp burrs.

Removing drive shaft

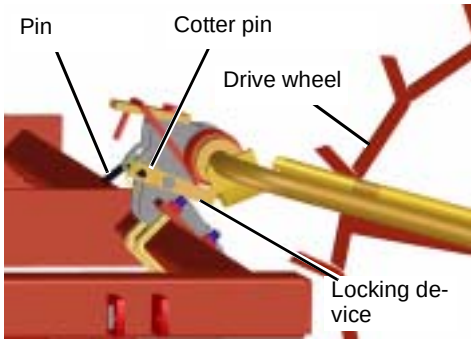
In the case of foldable machines, the drive shaft between the drive wheel and metering device must be removed before folding up the machine.

Remove the drive shaft
If the drive shaft is not removed, it will be destroyed during the folding process, possibly resulting in damage to the machine and injuries through sharp burrs.



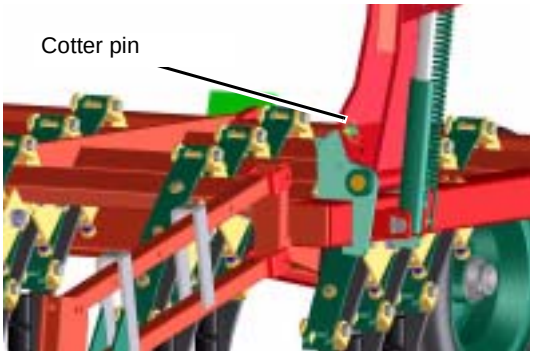
> Pull the drive shaft off the metering device and drive wheel

Folding up the drive wheel

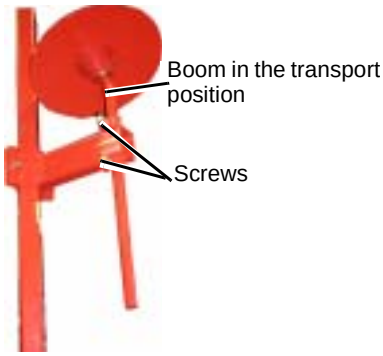


> Remove the cotter pin from the bolt
> Pull out the bolt and lift the drive wheel by hand
> With the other hand turn the locking device so that the bolt can be pushed through
> Secure the bolt with a cotter pin

Securing the track marker



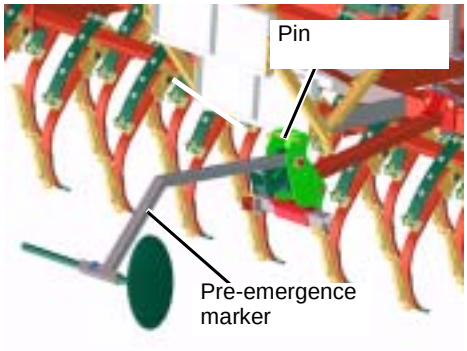
> Fold the track marker up and secure it with the cotter pin



> Loosen the screws on both track marker booms
> Take out the boom, rotate it through 180° and reinsert it
> Secure the boom again with the screws

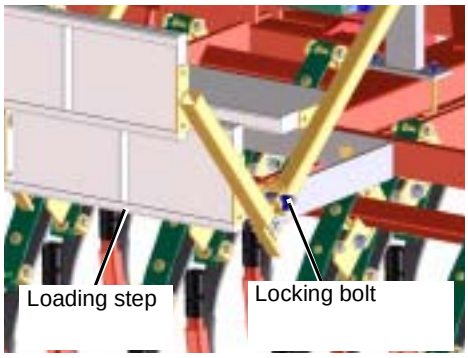
Pre-emergence markers in the transport position

The pre-emergence marker must be folded up and secured during transport.



> Remove pin
> Lift the pre-emergence marker
> Secure with pins. Secure the pin with a retractable cotter pin.

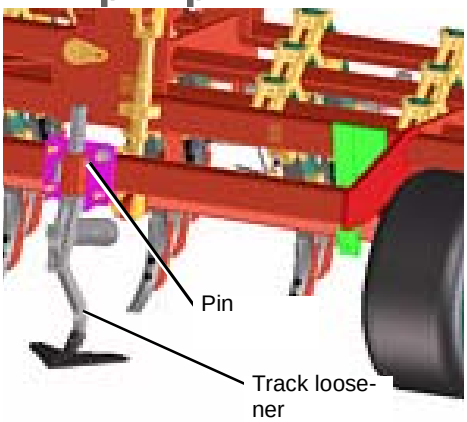
Loading step in the transport position



> Fold the loading step up. When doing this ensure that the securing bolt engages.

Track loosener in transport position

The track looseners must be raised prior to road transport.



> Remove pin
> Push the track loosener upwards
> Secure track looseners with pin
> Secure the pin with a retractable cotter pin.

Road transport

Ensuring a good view
Before starting, check the immediate surrounding area. Always ensure an unimpeded view and take particular care to watch for children in the vicinity of the machinery. Persons who could be struck when the machine starts up can sustain serious or fatal injuries.

Checking
Check that:

- all working tools are folded up,
- the folding ladder is folded up and secured,
- the lighting equipment is installed,
- brake hoses are connected and the brakes are operational,
- emptying flaps are closed.

Nonobservance can result in damage to the machine or accidents.

Locking control units
Lock all control units on the tractor when driving and close the shut-off valves at the hydraulic couplings. Accidentally actuated control valves can result in accidents.

Attaching the securing cable to the tractor
With oil-pressure brake systems, the securing cable for the manual brake hand lever must be secured to the tractor. If the machine becomes separated from the tractor, the cable forcibly brakes the machine. Road travel without securing cable is prohibited.

Never transport passengers
Do not transport people or objects on the machine. Transportation of persons is strictly prohibited and can result in fatal injuries.

Observing maximum speed
Do not exceed 25 km / h during transport. High speeds can result in accidents.

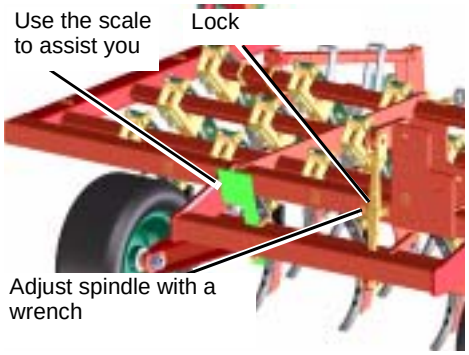
Adapting the speed
Always adjust your driving speed to the ambient conditions. Excessive speeds, on uneven terrain for example, can result in machine damage or accidents.

Avoiding fast load changes
Avoid sudden load changes (sudden movements to the right or left). Sudden load changes can result in accidents.

Ensure braking and steering capability
Make sure you have adequate steering and braking ability. Driving characteristics, steering, and braking behaviour are all influenced by the towed machinery (increased braking distance as a result of greater inertia).

Only drive with an empty seed hopper.
Driving on public roads is only permitted with an empty seed hopper. A seed hopper which is not empty influences the driving behaviour of the machine and can cause accident when driving on roads.

Working depth adjustment



The working depth is adjusted at the wheels.

> Release the lock on the spindle
> Using a large wrench, adjust the spindle as desired. Perform the adjustment uniformly for all spindles. The scale should only be used as an adjustment aid and does not indicate the working depth in cm.
> Perform the adjustment equally on both sides

Filling the seed hopper

- Only use the loading steps to climb onto the platform.
- Remove all seed residue from the hopper when changing seed types.
- The hopper emptying flaps on the metering devices must be closed before filling the hopper with seed.

Changing seed types

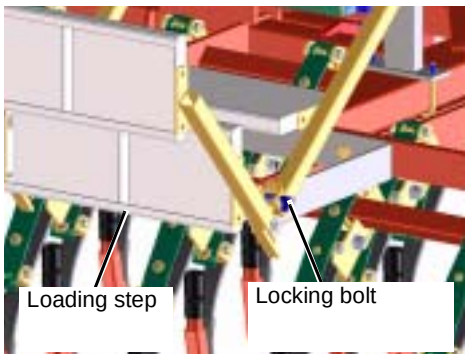
Before adding a different seed type to the seed hopper, remove all old seed residue from:

- the seed hopper
- metering device,
  as described in chapter »Operation« in section »After drilling«.

The hopper emptying flaps on the metering devices must be closed before filling the hopper with another type of seed.

Before filling

Unfolding the loading step



> Release the locking bolt
> Unfolding the loading step

Fold the tarp back.

Fold the tarp on the seed hopper back. By:

> Releasing the tarpaulin catches

Inspect the seed hopper for foreign objects and remove them.

Loading

> Fill the hopper in the normal manner.

NOTE:

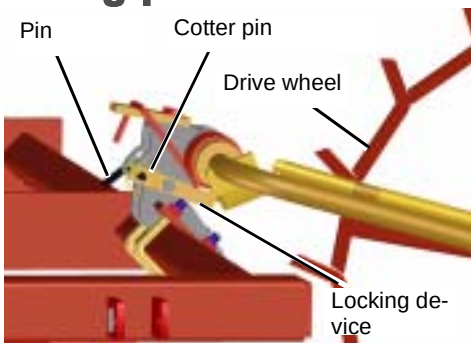
- Minimum seed hopper fill level:
  3 cm above the hopper low level sensor
- Maximum seed hopper fill level:

For grain	= lower edge of seed hopper cover
For rape or grass	= lower edge of screen in the seed hopper

After filling

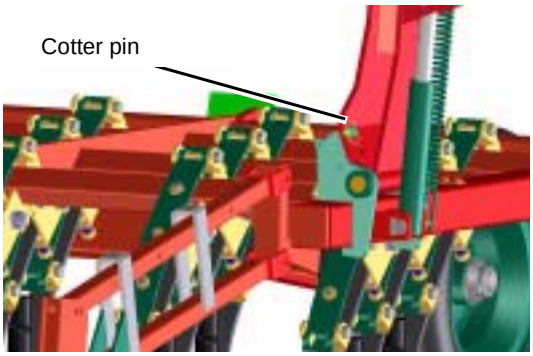
> Close the tarpaulin and lock it onto the seed hopper
> Fold in the loading step and secure it with the strut.

Drive wheel in operating position

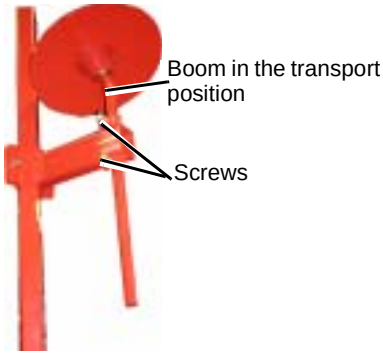


> Remove the cotter pin from the bolt
> Pull out the bolt and lower the drive wheel by hand
> With the other hand turn the locking device so that the bolt can be pushed through
> Secure the bolt with a cotter pin

Track marker in operating position

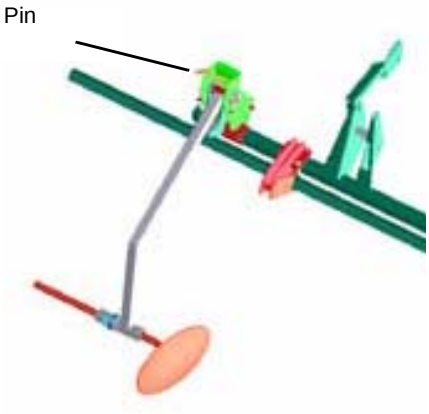


> Remove the cotter pin from both track markers



> Loosen the screws on the boom of both track markers
> Take out the boom, rotate it through 180° and reinsert it
> Secure the boom again with the screws

Pre-emergence markers in the operating position

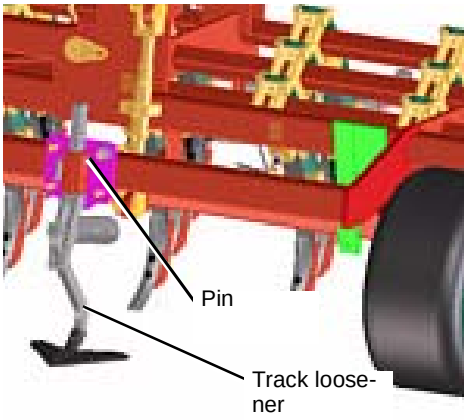


The pre-emergence markers must be unfolded into their operating position.

> Release the pre-emergence markers.
> Fold the pre-emergence marker down

The pre-emergence markers must be retracted for transport.

Track loosener adjustment



The track looseners must be adjusted to the tractor wheels. Depending on soil conditions, the track looseners can be set high or low.

> Remove pin
> Push the track loosener up or down
> Secure track looseners with pin
> Secure the pin with a retractable cotter pin.

Adjustments

Inspection tasks

Use the checklist for the inspection.

Prior to drilling

- Is the FGS or ESC operating perfectly?
- Have all counters on the ESC been set to zero before first use?
- Has the correct tramlining rhythm been set?
- Correct distributor head in the main distributor?
- Flow control valve properly adjusted?
- Micrometering system correctly switched?
- Cleaning brush OK?
- Seed value set?
- Shut-off valves OK?
- Seed delivery tubes checked for sagging?
- Track markers adjusted and extended?
- Drive wheel in operating position?
- Have sowing tubes been checked for obstructions?
- Hopper emptying flaps closed?
- Is the folding ladder retracted?

Test drive

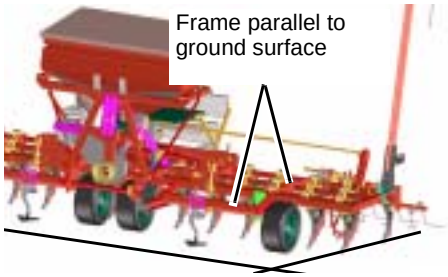
No riding on the machine
People or objects must never be transported on the machine. Riding on the machine is hazardous and strictly prohibited.

Make sure the immediate vicinity is clear
Before driving off, folding out, and operating the machine, check the immediate vicinity. Make sure the operator has a sufficient view of the work area. Do not begin work until the immediate vicinity is cleared of any persons or objects. Any use of the machine without verification of the situation around it can lead to accidents.

The loading step on the seed hopper must be folded up.

After completing all preparatory work, take a test drive. Lower the machinery to its operating position.

Lower the machinery to its operating posi-



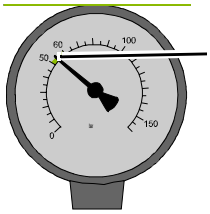
> Lower the machinery to its operating position. During cultivation, the frame should be parallel to the ground. Check the working depth via the gauge wheels.

Check the operating position
On the field check whether machine frame is parallel to the ground. An incorrectly set machine will not sow properly. Gaps and an uneven field progression may be the consequence.

Test drive

First perform a test drive in the operating position at operating speed (10-12 km/h). During this test drive, the tractor hydraulics are set to "floating".

Adjusting working pressure



Working pressure on the pressure gauge between 50 and 60 bar

To permit the side elements of the frame to work independently of each other and adapt to the ground contour, working pressure must be between 50 and 60 bar.

> Increase the pressure until a working pressure of between 50 and 60 bar is displayed on the pressure gauge

TIP Make the test drive, without sowing, over a typical section of the field. The headland or areas with obstacles, for example, are not suitable.

Do not remove the protective equipment.
Protective equipment must not be removed or by-passed. Check all protective equipment before starting the machine. Unprotected machine components can cause severe or fatal accidents.

No riding on the machine
People or objects must never be transported on the machine. Riding on the machine is hazardous and strictly prohibited.

Make sure the immediate vicinity is clear
Before driving off, folding out, and operating the machine, check the immediate vicinity. Make sure the operator has a sufficient view of the work area. Do not begin work until the immediate vicinity is cleared of any persons or objects. Any use of the machine without verification of the situation around it can lead to accidents.

Overhead lines
During extension and retraction, components exceed a height of 4 m. Never extend/retract the equipment in the vicinity of overhead power lines! Danger of electrocution!
Should the equipment come into contact with an overhead power line:

- Do not attempt to exit the tractor cabin
- Do not touch any metal parts on the tractor
- Do not create any conductive contact with the ground
- Warn all persons in the area not to approach the tractor or the machinery.
- Wait for help from professional emergency service personnel as power in the overhead line must first be switched off.

Drilling

Alarm messages
When drilling with the ESC always leave the ESC switched on during drilling, otherwise no alarms can be generated.

The extension and retraction of the implements and the track markers as well as the headlands, operating, and transport positions for the machinery are described in detail in the chapter »Hydraulic system«.

Adjustments and work that you perform via the ESC are described in the chapter »ESC« in detail, likewise the calibration test and calculation and adjustment of the tramlining rhythm.

During drilling you can access the required information via the ESC.

NOTE Each time before you begin sowing check the input values on the ESC.

Operating position and cultivation

> Move the machinery to its operating position
> Switch on the FGS or ESC
> Lower the track marker on the correct side.
> Switch on the fan
> Begin drilling.

ESC

As soon as the metering devices are under power a flashing circle appears on the display as an optical indicator, together with the most recent display.

> If desired, press the operating information key on the ESC
On the display, you will then see the selected current information.

Operating speed

During drilling, monitor the working speed. The possible working speed within the range of 5 - 12 km / hr depends on the soil type and soil preparation.

Where the soil is loose and the working speed is too high, the front seed rows can easily be covered by too much soil by the rear seed rows. In this case, drive a bit slower.

Raising the track marker

Raising a track marker arm, e.g. to avoid obstacles, interrupts the metering device drive.
When raised, a track marker must be retracted to its stop. This automatically switches the control block to the other track marker.

ESC
With the ESC, the tramline is advanced by 1 track. After clearing the obstacle you must reset the tramlining rhythm.

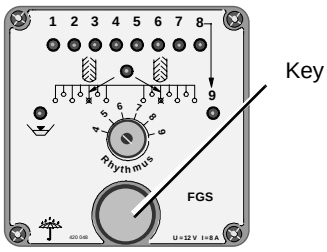
> Press and hold the key until the original tramline sequence reappears on the display

> Release the key

When the track marker arm is again lowered to the operating position, the metering device drive automatically restarts.

FGS
With the FGS, the tramline is advanced by 1 track. After clearing the obstacle you must reset the tramlining rhythm.

> Press the key until the original tramline sequence is displayed again



Turning

The machine is lifted prior to the turning procedure.

> Throttle the engine back just before reaching the edge of the field and raise the seed drill while still driving

ESC, FGS

> After the turn, lower the seed drill approx. 1 m ahead of where you want to begin sowing.

At the edge of the field the ESC and FGS automatically index by one cycle when the track marker changer is actuated.

NOTE ESC
This position remains in memory even if the power is switched off. Once power has been re-established, continue drilling with the same settings.

NOTE FGS
Following an interruption in the voltage, always check the displayed trip and correct if necessary. Depending on the type of tractor, the tractor may accidentally advance when switched on.

Checks during drilling

During drilling, use the checklist to examine the following:

- Does the PTO shaft speed remain constant during sowing?

From time-to-time, climb down and check the following:

- Sowing depth OK?
- Are all sowing tubes unobstructed?
- Are the shut-off valves switching properly?
- Is the seed flowing freely through the shut-off valves?
- For rape:
  Is the seed flow still OK?
- Is the rape brush working properly?
- Because of the tendency of glutinous seed to bridge:
  Is the seed flow still OK?

After drilling

After drilling

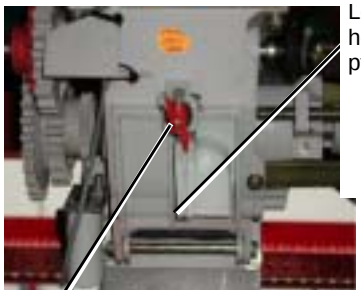
- Shut the machinery down
- Empty the seed hopper
- Empty the metering device.

Switch the machinery off

> Turn the p.t.o. shaft or hydraulic fan drive off.

> Park the tractor and machinery on a level surface.

Empty the seed hopper


Locking the hopper emptying flap

Locking the flap at the metering device

> Place a catch pan under both metering devices

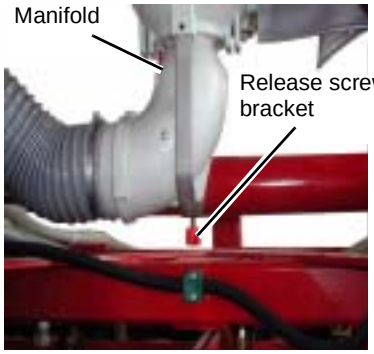
> Open the hopper emptying flaps. Catch the seed

> Close the hopper emptying flaps

TIPS

- You can also turn the star wheel or the hand crank to completely empty the cells.
- If there is as much seed remaining in the hopper as will fill the catch pan, open the flap on the metering device to empty the hopper more rapidly. However, the flap cannot be closed against the force of the seed running out.

Emptying the metering device



> Place a catch pan under both removal flaps

> Release screw on bracket

> Remove the elbow

> Attach the calibrating handle to the metering device and turn it. This empties the metering device cells and any residue from the seed hopper.

> Reattach the elbow and fix it with the bracket

> Secure the bracket with the screw

Cleaning

A high-pressure cleaner, for example, can be used to clean the machine.

Only use low pressure to clean the bearings

- Only use low pressure to clean the bearings. Water incursion shortens the service life of the bearings.
- Housings, signal distribution boxes, electric drive motors, screw-on connections, and ball bearings are not waterproof.

Loading steps and platform, seed drill

Seed drill

Clean the loading step and folding ladder
The loading step and folding ladder must be cleaned carefully after each use on the field. Dirt build-up presents an increased risk of accidents and injury.

Prior to cleaning:

> Pull the tarpaulin over the seed hopper and lock it in place

> Open the flaps on the metering devices to allow drainage of any water that accidentally gets into the hopper

After cleaning:

> Open the tarpaulin and inspect the seed hopper for moisture. Wipe it dry as required.

> Leave the flaps at the metering devices open

NOTE Only wash the outside of the seed drill with water.

Seeding tines, seed delivery tubes and seed hopper

Wear breathing protection
When blowing out, breathing protection must be worn, especially when dressed seeds were used. Dressing dust can be harmful to your health.

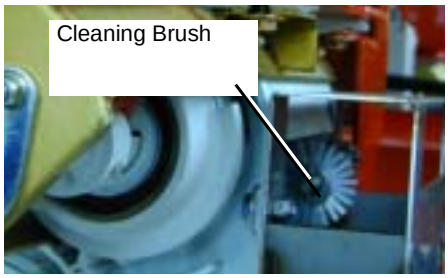
> Use compressed air to blow out the seeding tines, seed delivery tubes and seed hopper

Metering device

Under no circumstances may a high-pressure cleaner be used for the following cleaning operations.

After every seed change, remove the seed from the metering devices and the seed hopper via the hopper emptying flaps.
→ Chapter »Operation«, section »After drilling«, page 98

Cleaning brush



> Clean the cleaning brushes on both metering devices
> Check the brushes for freedom of movement while cleaning them

Care

To ensure the equipment's long service life, we recommend applying a protective coating of oil at the end of the season and during storage. Use only approved and biodegradable oil, e.g. rapeseed oil.

NOTE Cover the tyres of the gauge wheels before applying any oil. The oil can damage the tyres.

Parking and securing the machinery

Increased risk of injury
Uncoupling the unit from the tractor creates an increased risk of injury. Therefore:

- Make sure the unit is lowered onto a level and stable surface;
- After uncoupling, chock the tractor wheels to prevent the vehicle from rolling.

Empty the seed hopper

> Empty the seed hopper.

→ Chapter »Operation«, section »After drilling«, page 98.

> Cover the empty seed hopper with the tarpaulin

> Leave the hopper emptying flaps open

Uncoupling the machinery

> Switch off the ESC or FGS

> Demount the hydraulic connections, electrical connections and cardan shaft

> Uncouple the ESC or FGS and remove it from the tractor bracket

> Store the ESC or FGS in a dry place

Uncouple the machinery in the reverse order in which it was coupled, observing the special safety instructions.

Storing the machinery

The clean machinery should be stored in a dry location and on a level and stable surface as described in the section, “Parking and Securing the Machinery”. The machine can be placed in storage both in transport position as well as working position.
→ Section »Parking and securing the machinery«

Apply a protective coating of oil during storage. Use only approved and biodegradable oil, e.g. rapeseed oil.
→ Chapter »Cleaning and care«

For your safety

Special safety information

Prerequisites for maintenance tasks
Only perform the maintenance operations if you have the required expert knowledge and suitable tools. Insufficient technical knowledge or the use of unsuitable tools can lead to accidents.

Use only original replacement parts
Only use OEM replacement parts for components that are of particular importance to safety. Dimensions, stability and material quality must be guaranteed. If non-OEM replacement parts are used, the warranty shall no longer be valid.

Protect the machine against inadvertent activation
Maintenance and repair work and the correction of faults on the coupled machine may only be performed with the PTO shaft turned off, the engine turned off, the ignition key removed and the electronic control system turned off! If the machine is activated accidentally this can result in serious injury.

welding work
Before performing any welding work on the tractor or machine, always cut off the voltage supply to the electronic control system. Otherwise damage to the electronics cannot be excluded.

do not use pneumatic grease guns
Never use a pneumatic grease gun to lubricate bearings. The high pressure damages the bearings.

Protective measures for handling oils or lubricants

Additives in oils and lubricants may have adverse health effects. Since the hazardous material code does not require any special identification, please always observe the following:

Avoid skin contact
Avoid skin contact with these materials. Contact can result in skin damage.

Protect the skin
When handling oils and lubricants, protect your skin with lotion or wear oil-resistant gloves. Oils can be harmful to health.

Do not use oils for cleaning
Never use oils or lubricants to clean your hands. Burrs and grit in these materials can result in injuries.

Change contaminated clothing
Change clothing heavily contaminated with oil as soon as possible. Oils can be harmful to health.

NOTE:
- Used oil must be properly collected and disposed of.
- Immediately consult a doctor in case of skin damage caused by oils and lubricants.

General information

This information relates to general maintenance operations. For all maintenance work, the machinery must be extended and secured in its operating position. If it is necessary to put the machinery in its transport position for maintenance work, an appropriate reference will appear in the maintenance instructions.

TIP Working with the grease gun
One to two strokes of the grease gun handle are sufficient for lubrication. If you feel resistance during the second stroke, do not complete it. Too much grease will force the bearings apart. This will allow dust and dirt to enter the bearing, resulting in premature wear.

Fundamentals

The following table contains a brief explanation of the most important terms used for maintenance.

Task	Explanation
Greasing	Apply grease to sliding surfaces with a brush.
Lubrication	Explanation: Unless otherwise specified, 1-2 strokes with a grease gun are generally sufficient.
Oiling	Unless otherwise specified, use only vegetable-based oil such as rape seed oil. Mineral oils are not suitable. The employment of used oil represents a health hazard and is strictly prohibited.
Replacement	Replace the component in question according to the instructions in the “Maintenance” chapter.
Inspect	An inspection may be required in conjunction with the replacement of the component in question.
Observe the maintenance intervals	All information is based on average machinery usage. In cases of excessive usage (e.g. contract work), shorten the maintenance intervals accordingly. Shorter maintenance intervals may also be required under extreme operating conditions (e.g. heavy dust generation).

Screw connections

Retighten screws

All screws must be retightened

- After the first operating hours
- depending on the frequency of use
- at least once every season.

Tightening torques, general

Tighten all screw connections in accordance with the table. If other tightening torques are necessary, they will be specified. The minimum quality is "8.8".

Tightening torques in Nm			
Screw size	Screw quality		
	"8.8“	"10.9“	"12.9“
M6	9.9	14	17
M8	24	34	41
M10	48	68	81
M12	85	120	145
M16	210	290	350
M20	425	610	710
M24	730	1050	1220

Tightening torques, special

Track marker arm

Bolt	M20
Tightening torque	200 Nm

Maintenance intervals

	After the first operating hours	Daily	After 40 hours of operation	After excessive use	Once per season.	As required	In case of wear	grease / oil / lubricate	Inspect	Replacement	Adjustments	Cleaning	Page
General													
Retighten all screws	•			•	•								108
Visual inspection	•	•											–
Bearing				•	•			•					108
Hose connections					•				•				–
Pivot points (frame, track markers)		•							•				110
Wheels					•			•	•				112
Track marker				•	•			•	•				110
Hydraulics													
Hydraulic hoses every 3 years										•			112
Hydraulic hoses in general						•	•			•			112
Hydraulic fan drive					•				•				–
Electronic control system													
Sensors					•				•				111
Drill technology													
Drive shaft					2x			•					109
Sealing lip of metering device					•		•		•	•			109
Cleaning brush of metering device					•		•		•	•			110

Retighten screws

All screws must be retightened

- after the first two hours of operation and
- depending on the frequency of use,
- at least once every season.

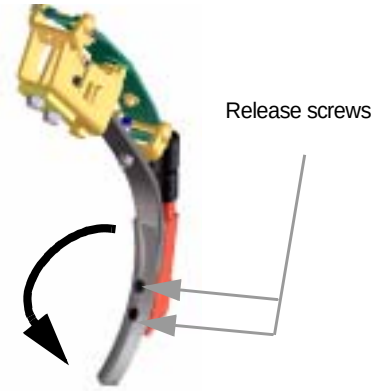
Lubricate bearings

The bearings must be lubricated regularly. In doing so, only lubricate with
1-2 strokes of the grease gun.

- After excessive use,
- but at least once every season.

Rotate or replace shares

If the shares are only worn on one side, they do not need to be replaced. You can turn the shares.



> Remove the screws, turn the shares, refasten them

If the coulters are worn on both sides, they must be replaced. Failure to replace the coulters in time will result in wear to the tines.

S covering tines

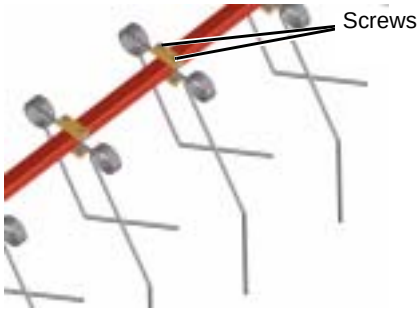
Task

- Replace the S covering tines.

If the covering tines are worn, they must be replaced. Individual tines can be replaced.

Covering tine replacement

When worn



> Release and remove the screws.
> Replace the covering tine(s).
> Insert the screws and tighten securely.

Drill technology

PTO shaft

A number of maintenance tasks must be performed at various intervals for the PTO shaft. You must perform the following:

- Greasing
- Lubrication

The individual maintenance tasks are described in detail in the PTO shaft manufacturer's instructions.

Drive shaft

Twice per season

Task

- Grease drive shaft

> Grease drive shaft between the drive wheel and metering device twice per season or as required.

Metering device

When worn

Task

- Remove residual seed.
- Replace the sealing lip.

Sealing lip

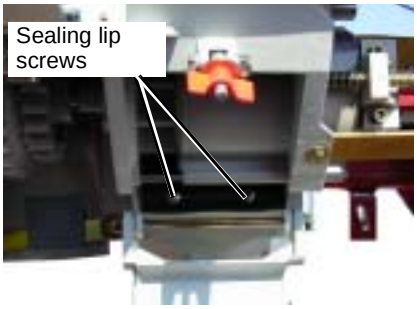
If the sealing lip behind the hopper emptying flap is worn, replace it.

Remove residual seed.

If residual seed remains in the seed hopper, you must first remove it.

Replace the sealing lip.

When worn



> Open hopper emptying flap

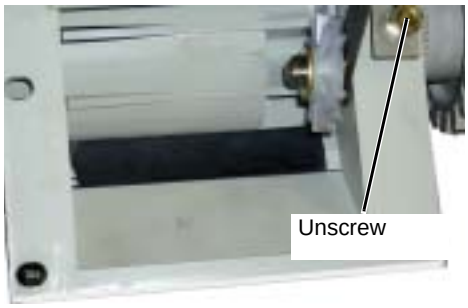
> Unscrew the worn sealing lips and replace them.

> Close the hopper emptying flap

> Reinstall the air hose under the hopper emptying flap and secure it with hose clips

Cleaning brush replacement

When worn



> Unscrew the worn cleaning brush from the rear of the metering device and replace it.

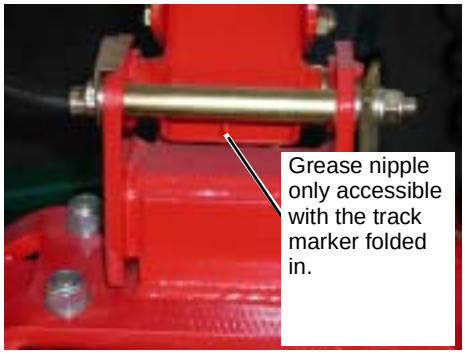
Hydraulically retracting track markers

Once per season.

Task

- Lubrication

Bring the machinery into its operating position and fold in the track markers.



> Grease both pivots of the hydraulically retractable track markers.

Sensors

As required

This section contains information concerning adjustment and sensor replacement.

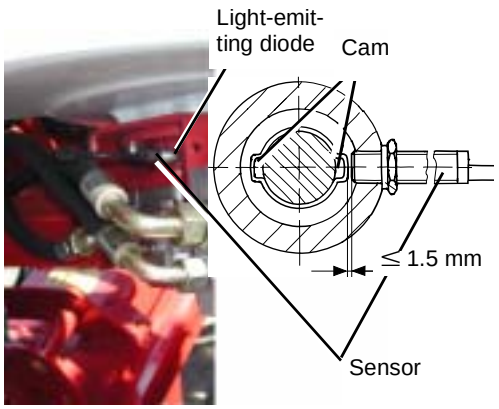
The following sensors are connected to the ESC:

Operation sensor;	ESC
Revolution counter	X
Radar sensor [+]	–
Shut-off valve sensors	X
Sensors on the metering shafts	X
Track marker sensors	X
Hopper low level sensors [+]	X
Travel sensor	X

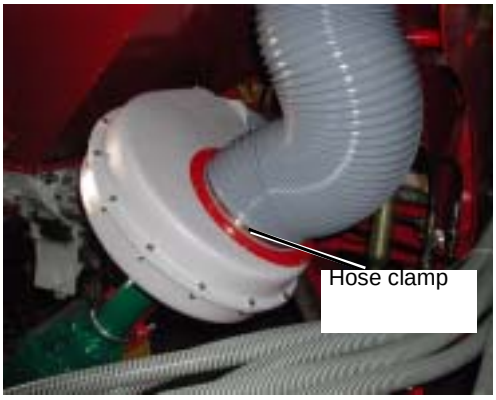
With the exception of the revolution sensor, all other sensors may only be adjusted in the shop.

Speed sensor adjustment

If you find that the rpm display does not increase in accordance with the speed, or if no rpm is displayed, it may be that the sensor pulse is only being generated by a single fan cam (normally, there are two pulses per rotation, from two cams). In this case, adjust the speed sensor setting.



> Slightly release the sensor nut
> Advance the sensor into the fan shaft bearing until it contacts a cam.
> Then back the sensor out one-half turn. The distance to the cam should be approx. 1.5 mm



Check that the cams pass by the sensor without hindrance.

> Release the hose clamp and remove the hose
> Slowly turn the fan by hand. The cams should not touch the sensor, but should produce two pulses per revolution.

As it passes the sensor, each cam generates a switching pulse, and the LED on the sensor goes on twice during each fan revolution.

> Secure the sensor with the nut again
> Refasten the hose

Hydraulic hoses

Hydraulic hoses can age without this being externally visible. Therefore, we recommend that the hydraulic hoses be replaced every three years.

NOTE Hydraulic hoses on the frame or track marker may only be replaced with the machinery extended and in compliance with all relevant safety regulations. All pressure must be released from the tubes.

Wheels

Once per season.

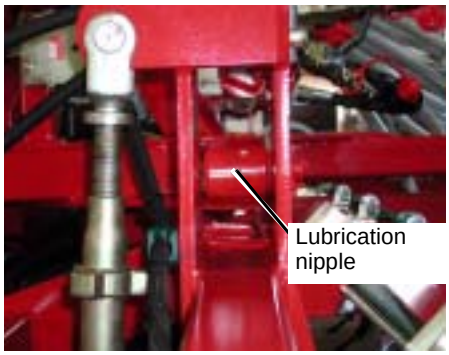
Task

- Lubrication

> Once a season lubricate with 1-2 strokes of the grease gun

Frame

Once per season.



Task

- Lubrication

Retractable machines have joints on the frame.

> Once a season lubricate with 1-2 strokes of the grease gun

Miscellaneous lubrication points

The following applies:

- Aside from the lubrication points cited in this manual, your machinery may have additional lubrication points.
- As a rule, lubrication points are located at pivots or bearings. Therefore, inspect your entire machinery for any such additional lubrication points.

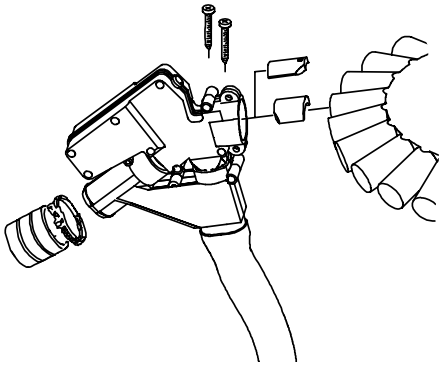
Lighting equipment

A lighting system is available which complies with regulations. The warning signs with the lights can be removed in a flash and used on other machines or devices. Only the brackets remain permanently installed.

Pre-emergence markers

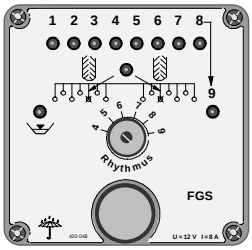
The pre-emergence markers mark the path for field sprayers or manure spreaders. The pre-emergence marker is equipped with one or two markers.

Shut-off valves



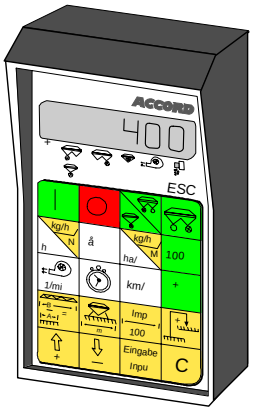
Shut-off valves are required if a tramline is to be set up. The seed blokked by the closed shut-off valve is distributed to the adjacent seed rows.

FGS



The electronic tramlining control system, FGS, makes it possible to create tramlines.

ESC



The ESC offers control and operation of the seed drill from the tractor. It monitors the metering device.

Several accessories are usable only in conjunction with the ESC. For example, the metering device cut-off or the electrical seed rate adjustment.

Hopper low level sensor

The hopper low level sensor provides an indication that only a residual amount of seed remains in the seed hopper.

Malfunctions can often be eliminated quickly and easily. Please read the associated safety information.

Hydraulics

Malfunction	Cause	Remedy
Hydraulic fan drive		
Hydraulic fluid overheating.	Although the oil flow can be regulated at the tractor, it was actually regulated at the machinery.	Fully open the 3-way flow control valve on the machinery and adjust the fan speed at the tractor.
Hydraulic fluid will overheat if the tractor is not equipped with a flow control valve.	The 3-way flow control valve on the machinery is set for 2-way flow control.	Adjust to 3-way flow control.
Hydraulic oil heats too much	Insufficient fluid in the reservoir. The returning oil is mixed with the low quantity of oil in the tank and thus becomes hot	Arrange the installation of an additional oil cooler
	The regulation of the pump at the tractor malfunctions because the conveyed oil volume is too high in a closed hydraulic system	Have the pump and regulation device on the tractor checked
Hydraulic motor intermission	Unfavourable return flow path for the hydraulic oil	Select another connection point for the unpressurized return flow
	Oil reserve on the tractor too low	Have a larger oil tank installed
	Accessory control valve actuated	Do not actuate during the work
Hydraulic motor provides insufficient speed	Three-way flow control valve incorrectly adjusted	Check the three-way flow control valve and readjust it
	Tractor does not supply enough oil or does not reach the operating pressure	• Arrange a check of the hydraulic pump • Arrange a check of the pressure limiting valve
Valve lever trips out of the catch	Pressure peaks in the feed line Cut-off pressure too low	Check the driving power of the pneumatic system
	Feed line pressure too high	Arrange the installation of the tube lines by a garage
Fan does not run at required speed.	Pneumatic lines not completely closed.	Completely close the seed drills pneumatic system.
The hydraulic motor shaft seal was pressed out	Excessive return line pressure	Reduce the return line pressure to a maximum of 15 bar
	Feed and return line interchanged	Mount the lines correctly and fit the hydraulic connections properly

Malfunction	Cause	Remedy
Fluid leaking from the hydraulic motor.	Worn or reversed shaft seal.	Have a new shaft seal installed or have the current one installed in the right direction.
Miscellaneous		
Track marker unfolds very quickly.	Throttle in the hydraulic line missing	Have a throttle valve installed
	Throttle valve in the hydraulic line is rated too large	Have the throttle valve replaced
Track marker unfolds too slowly or not at all.	Throttle valve in the hydraulic line is blocked	Have the throttle cleaned.
	Throttle valve in the hydraulic line is rated too small	Have the throttle valve replaced
Both track markers unfold simultaneously.	Defective change-over valve	Have the change-over valve replaced.
Pre-emergence marker does not move.	Throttle in the hydraulic line is blocked.	Have the throttle cleaned.

Fan

Malfunction	Cause	Remedy
Speed drops	Worn V-belt	Have the V-belt replaced
Increasing rpm drops to approx. half-speed	Pulse only being provided by one cam	Correct the revolution sensor setting → chapter »Maintenance«, section »Sensors«
Speed sensor only registering half the actual speed.	Pulse only being provided by one cam	Correct the revolution sensor setting → chapter »Maintenance«, section »Sensors«
Speed sensor shows no reading	No power supply	Check the electrical wiring and fuses
	No pulse triggered	Correct the speed sensor setting
	Sensor defect	Check the speed sensor and replace it if necessary

Drill technology

Malfunction	Cause	Remedy
No tramlines are set up	Insufficient voltage at the socket	Check socket and plug for corrosion
	Solenoid valve not switching	Replace the solenoid valve.
Sowing unit for generation of the tramline is staying blocked on each run	Shut-off valve blocked	Clean shut-off valve
	Foreign body in the main distributor	Remove foreign bodies
Pre-emergence marker does not move.	No power to the shut-off valve.	Check the wiring and connections.
Metering device making cracking noises	Very large seeds (e.g. beans)	Remove the clamping sleeve from the metering device agitator shaft.
Seed volume changes by itself	Seed has drawn in humidity	Empty the seed hopper overnight
	Spindle for the seed quantity adjustment is running too freely	Adjust the spindle different, retighten the nut at the crank
	The cell wheel at the metering device is sticky	Clean the cell wheel Check and clean the cleaning brush - replace it if necessary
	The red gearwheel of the micrometering system did not engage (e.g. with fine seed)	Switch on the micrometering system by letting the red gear wheel engage
For fine seed: Despite micrometering, the amount of seed does not drop below 4-5 kg/ha	Sealing lip at the metering device is defect	Renew the sealing lip
	The sealing lip does not contact properly at the cell wheel	Position the sealing lip properly
Distributed seed volume too large	Turning too fast at the calibration test	Only one revolution per second at the calibration test
	For fine seed: red gearwheel not engaged.	Switch on the micrometering system by letting the red gearwheel engage
Distributed seed volume too large or too small	False adjustment value	Correct the setting
	Error when weighing the seed	• Ensure functioning of the scale • Use a sufficiently precise scale, no bathroom scales • Do not take into account the hopper weight
Distributed seed volume too small	Normal seed: Micrometering is switched on	Switch off micrometering

Malfunction	Cause	Remedy
	Fine seed: Cells are dirty	Clean cells with brush
	Cleaning brush does not move anymore	Clean the cleaning brush or replace → chapter »Maintenance«, section »Metering device«
Every second seed row begins later	The rear seed rows are sown too deeply	Set primary top link correctly
No seed arriving at any seed tube	Injection gate clogged	Remove clogging and ensure the correct motor speed
	PTO shaft not switched on	Switch on PTO shaft
Seed delivery tube is blocked with seed	Seed tubes are blocked, e.g. with soil	Clean the blocked seed tubes
	Normal seed: Regulating flap at the fan is set to fine seed	Adjust the regulating flap to normal seed
	Hose is bent or sagging	Check the hoses outside of the seed hopper Shorten the hoses, if necessary
	Fan speed too low	Ensure correct fan speed
S covering tines working too deeply.	Pressure too high	Decrease pressure
	Depth adjustment wrong	Correct depth adjustment
S covering tines blocked.	Covering tine angle too steep.	Select a different angle setting.

When the service life of your machine is over, it must be properly disposed of. Please observe the current and valid waste disposal regulations.

Metal parts
All metal machine components can be sent for ferrous metal recycling.

Tyres
Tyres can be sent to tyre recycling facilities.

Oil
Store fluid from the hydraulic system in a suitable container for disposal at a used oil facility.

Electronics
PCB's and terminals of the electronic control unit are electronic scrap and are therefore special waste. Should there be no special waste handling facility in your area, you can return the electronic components to the manufacturer for proper disposal. It will then be disposed of in an environmentally-friendly manner.

EU Conformity Declaration

In accordance with EC Directive, 98/37/EC

Type plate and CE symbol

We

Kverneland Group Soest GmbH
Coesterweg 42
D-59494 Soest

declare under our sole responsibility that the product

T-S and accessories

to which this declaration relates, conforms to the relevant basic safety and health requirements of EU Directive 98/37/EEC.

For the relevant implementation of the safety and health requirements mentioned in the EU Directive, the following standards have been taken into account:

- EN 292-1;2 (11. 1991);
- EN 294 (06. 1992)

Kverneland Group Soest GmbH

Soest, 1.8.2002

Wolfgang Kreienbaum
Manager

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