

STIGA



WORKSHOP MANUAL

PARK
2008 - 2020



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1 General instructions

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General

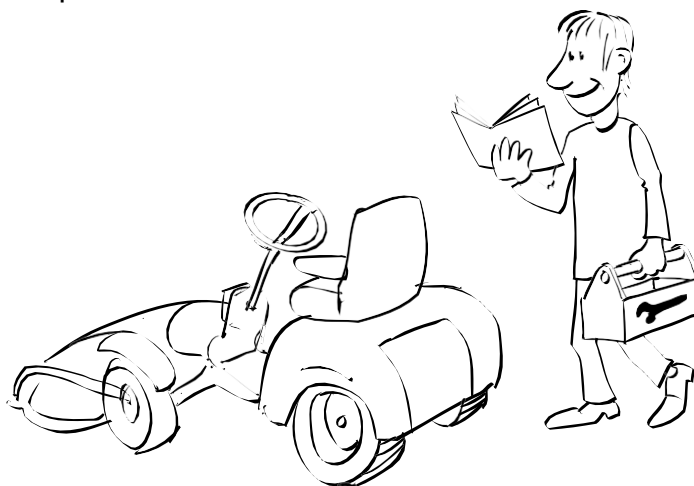
This Workshop Manual covers all Park – Park Pro models from 2008. The Park 120-220 have a separate workshop manual. The Park Pro models from 2015 with steering cylinder have a separate workshop manual.

This Manual do not cover repair instructions for the engines. Regarding engines, contact the respective representative in the actual country.

This Manual and its specifications are valid for machines in their original design. In case of modified or changed machine, i.e. the engine is replaced, the manual accordance is limited.

The manual is divided in the following chapters:

- Chapter 1 is this chapter**
- Chapter 2 Chassis**
- Chapter 3 Steering**
- Chapter 4 Hydraulic system**
- Chapter 5 Belts**
- Chapter 6 Control Wires**
- Chapter 7 Electrical system**



1.1 Introduction

1.1.1 Responsibility declaration

In spite of the great care we have taken there may be errors in this publication. The author cannot be made liable for incorrect or missing information. STIGA reserves the right to regularly change product specifications without prior notice. All the information in this book is based on the information available at the time of production. Illustrations and photographs may be arranged schematically, which implies that one picture may cover several models and therefore not correspond exactly with all models.

1.1.2 How this manual is used

To make this manual easy to understand we have divided the machine into its main systems and components. These parts are now the different chapters in the book. Each chapter is divided up into sections. There is a quick-guide on the cover of this book, which refers to the different chapters. In each chapter there is a detailed table of contents so that you can easily and quickly find what you are looking for. Always check that you are reading the right chapter for your particular machine before starting the repair work.

1.1.3 Abbreviations

The following abbreviations are used in this manual:

HST Hydrostatic Transmission

PTO Power Take Off

1.2 Safety Precautions

This manual has been written primarily for trained mechanics working in a well-equipped workshop.

A basic knowledge of repairs, tools and repair instructions is, however, always a prerequisite for first-rate results.

A qualified mechanic should always be consulted if the owner does not have sufficient knowledge to carry out repairs.

During the warranty period all service must be carried out by an Authorised Workshop for the warranty to be valid.

The following basic points should be observed if the machine is to function perfectly:

- Follow the service schedule.
- Be on the alert for sudden vibrations or abnormal noise to avoid major breakdowns.
- Always use Genuine Spare Parts
- Follow the descriptions in this manual carefully. Do not take any shortcuts.

1.2.1 Symbols and general warnings

Warning!



This symbol indicates a risk of personal injury or damage if the instructions are not followed.



Note!

This text indicates a risk of damage to the material or risk of unnecessarily complicated work if the instructions are not followed.

1.2.2 Warm parts

Please observe that engine and exhaust system picks up a lot of heat during use. This applies above all to the silencer of machines equipped with catalytic converter.

To avoid injuries, allow the machine to cool before any kind of repairs are made to or near parts of the engine or exhaust system.

1.2.3 Moving parts

The machines are all equipped with v-belt transmissions. Always stop the engine and remove the starter key before inspections or repairs are carried out.

Always use extreme caution when testing systems with moving parts to avoid injuries.

Always use Genuine Spare Parts during service work.

1.2.4 Lifting and blocking up

Before work under the machine, always make sure that lifting devices and jack-stands are approved for the weight. Work safe!

1.2.5 Cleanliness

Clean the machine before starting repairs. Dirt that penetrates into sensitive components can seriously influence the service life of the machine.

1.2.6 Tightening torque

Unless otherwise stated the tightening torque in the tables in the section Technical specifications must be used for the different sizes of screws. This does not refer to self-tapping screws, which are mainly used for the assembly of body parts.

1.2.7 Sharp edges

Watch out for sharp edges, especially when working with the mower deck. The blades can be very sharp. Always wear gloves when working with the blades.

1.2.8 Replacement parts

Always use Genuine Spare Parts during service work.

1.2.9 Inspection

Each part dismantled in conjunction with service work must be inspected. Examine for: wear, cracks, out of roundness, straightness, dents, discolouring, abnormal noise and jamming.

1.3 Unpacking and assembly

Every STIGA Park has undergone an extensive control programme before delivery. The machines are delivered as completely assembled as possible.

Thanks to this the assembly on delivery is rapid and easy.

The correct and careful assembly of the machine on delivery is a simple way of ensuring satisfied customers!



Note!

The machine shall remain placed on the pallet during the unpacking and assembly.

1.3.1 Unpacking

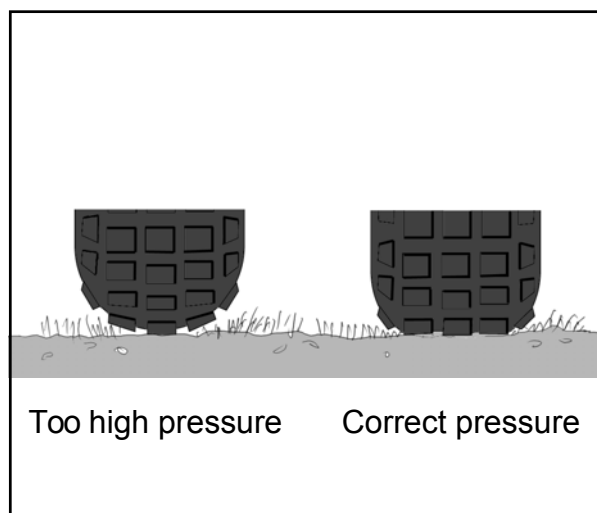
Open up the crate and release the part as follows:

1. Check the air pressure in the tyres. The pressure is designated on the floor mat. The air pressure in the tyres is of critical importance for the performance and handling of the machine. The correct air pressure for mowing is 0.6 bar (9 psi) in the front tyres, and 0.4 bar (6 psi) in the rear tyres.

When using heavy accessories, e.g. snow thrower, it may be necessary to increase the pressure somewhat. However, the maximum permitted pressure is always 0.8 bar (12 psi).

Too high pressure in the tyres leads to that the machine drives poor due to:

- A small surface in contact to the ground.
 - Hard tyre = less flexibility = self cleaning characteristic deteriorate.
2. Remove the following parts from the package and put them on the floor.
 - The battery (some models).
 - The steering wheel.
 - The plastic bag, containing owners manuals, information media and assembly screws.



1.3.2 Battery

The battery is a valve regulated battery.

Load and assemble the battery, following the instructions below.

The battery needs limited maintenance. It has no electrolyte levels or plugs.

Warning!



Do not wear rings, metallic bracelet, chain round the neck or similar metal objects when working with the battery. It can cause short-circuit, burns and fire.

Warning!



The battery must be fully charged before being used for the first time. The battery must always be stored fully charged. If the battery is stored while discharged, serious damage will occur.

Charging with the engine

The battery can be charged using the engine's generator as follows:

1. Install the battery in the machine as shown below.
2. Place the machine outdoors or install an extraction device for the exhaust fumes.
3. Start the engine according to the instructions in the user guide.
4. Allow the engine to run continuously for 45 minutes.
5. Stop the engine. The battery will now be fully charged.

Storage

The battery voltage is not allowed to drop under 12,5 V during storage.

Make sure that the battery voltage always is more than 12,5 during storage. If not, the battery will be destroyed.



If the cables are disconnected/connected in the wrong order, there is a risk of a short-circuit and damage to the battery.



If the cables are interchanged, the generator and the battery will be damaged.



The engine must never be driven with the battery disconnected. There is a risk of serious damage to the generator and the electrical system.

Charging using battery charger

When charging using a battery charger, a battery charger with constant voltage must be used.

Ordering number: 1136-0602-01.

The battery can be damaged if a standard type battery charger is used.

1.3.3 Final checks

Removing from pallet

All the above measures shall have been done with the machine standing on the pallet. Now, loosen the remaining straps and roll off the machine from the pallet. Fit and adjust accessories.

Test driving

Warning!



Do not drive without a work equipment (mover deck) attached. Risk for turning over.

Drive the machine for a few minutes. Test all the functions. Pay special attention to the safety functions. If the machine is to be delivered with mower deck or other accessories, fit these before test driving the machine.

HST oil

Check the oil level in the HST's expansion tank after test driving, and top up if necessary.

Engine oil

Check the oil level in the engine and top up if necessary.

Steering chain / Steering wire

Check that the steering chain / steering wire is sufficiently taut. Adjust if necessary.

Miscellaneous

Give the machine a general inspection.

- Is the machine clean?
- Is there any oil leakage?
- Abnormal noise or rattle?

Receipt

By filling in the guarantee certificate you guarantee that the delivery service has been correctly conducted.

Remember to make sure that the customer receives all the documentation when the machine is collected / delivered.

1.4 Service

Every new machine is delivered with a service book. This service book is part of the active post-market programme and shall be kept in a safe place during the entire lifetime of the machine. Hand over the service book if the machine is sold in 2:nd hand.

Service should generally be carried out at least every 50 operating hours (exception of the first service), although in accordance with the conditions below.

There are three different grades of service events. Every service event consists of a number of service points as described in the following paragraphs. Every service point has a number which refer to a describing text after the schedules.

The grades of service events are:

- First service
- Intermediate service
- Basic service

Some service points do not coincide with the scheduled service intervals, but shall be performed in connection with a scheduled service when possible. E.g. some items shall be performed at every second service and some also between two services. These service points are described with procedure and interval in the respective "Instruction for use".

Typical service points which not coincide with scheduled service intervals are:

- Cleaning/changing air filter in some engines.
- Change of oil in some engines.
- Valve adjustments for some engines.
- Change of transmission oil in 4 WD machines.
- Change of spark plug in some engines.

1.4.1 Service times

Petrol driven machines

Service	Shall be performed
First service	Within 5 hours of running
Intermediate service	After the first 50 hours of running and then 50 hours after/before every basic service.
Basic service	Every 100 hours or every year, which first occur.

Diesel driven machines

Service	Shall be performed
First service	Within 5 hours of running
Intermediate service	After the first 100 hours of running and then 100 hours after/before every basic service.
Basic service	Every 200 hours or every year, which first occur.

1.4.2 First Service

This service is very important to safeguard the continuing function of the machine.

The first service includes the service points as per the table below.

Number	Service point
1	Safety check.
2	Tyres, air pressure.
3	Engine oil and filter, see "Engine - Transmission" at page 14.
4	Oil level in HST, see "Engine - Transmission" at page 14.
5	Belt transmissions, check.
6	Steering adjustment.
7	Battery check.
21	Test driving.

1.4.3 Intermediate Service

The intermediate service is not as extensive as the Basic Service and can therefore be conducted by the customer, or by an authorised Service Workshop. Regardless of who conducts the service, it must be documented in the service book..

Number	Service point
1	Safety check.
2	Tyres, air pressure.
3	Engine oil and filter, see "Engine - Transmission" at page 14.
4	Oil level in HST, see "Engine - Transmission" at page 14.
6	Steering adjustment.
9	Air filter, cleaning.
10	Air filter catalytic converter, cleaning.
11	Cooling fins, clean.
12	Lubrication



Note! - Diesel driven machines:

Check/tighten engine support screws every 100 hours.

1.4.4 Basic service

The Basic Service must always be conducted by an authorized Service Workshop, and documented with a stamp in the service book.

Number	Service item
1	Safety check
2	Tires, air pressure
3	Engine oil and filter, see "Engine - Transmission" at page 14.
4	Oil level in HST, see "Engine - Transmission" at page 14.
5	Belt transmissions, check
6	Steering adjustment
7	Battery check
8	Air filter for engine, see "Engine - Transmission" at page 14.
9	Air filter catalytic converter, see "Engine - Transmission" at page 14. (Valid for machines with catalytic converter only)
10	Cooling fins, clean
11	Spark plug, check/replace
13	Transmission, check
14	Speed check
15	Bearing boxes, check**
16	Exhaust system, check*
17	Electrical system, check*
18	Mower deck, check**
19	Blades, check**
20	Power take-off, check
21	Control check
22	Valve play***
23	Test driving

*) See also "Safety check".

***) See also the mower deck manual.

***) See the engine manual.



Note! - Diesel driven machines:

Check/tighten engine support screws every 100 hours.

1.4.5 Description of service points

1. Safety check

Check the safety functions. It is often appropriate to do this check in conjunction with test driving. The following items shall be checked at all machines:

- No leakage on fuel lines and connections.
- No mechanical damages to the electrical cables. All insulation intact.
- The muffler shall be undamaged and its screws tightened. No exhaust leakage in connections.

Machines with mechanic PTO

Test	Status	Action	Result
1	Brake pedal not pressed. PTO not activated.	Turn the key and make a start attempt.	Engine shall not start.
2	Brake pedal pressed. PTO activated.	Turn the key and make a start attempt.	Engine shall not start.
3	Engine running. PTO activated.	Operator rises from the seat.	Engine shall stop.
4	Engine running.	Disconnect cable from the shut off valve.	Engine shall stop after a few minutes.

Machines with electric PTO

Test	Status	Action	Result
1	Operator not sitting in seat. Brake pedal pressed. PTO not activated	Turn the key and make a start attempt.	Engine shall not start.
2	Brake pedal not pressed. PTO not activated.	Turn the key and make a start attempt.	Engine shall not start.
3	Brake pedal pressed. PTO magnetic clutch activated.	Turn the key and make a start attempt.	Engine shall not start.
4	Engine running. PTO magnetic clutch activated.	Operator rises from the seat.	PTO magnetic clutch shall disengage.
5	Cruise control activated. (If applicable)	Operator rises from the seat.	Cruise control shall disengage
6	Engine running.	Disconnect cable from the shut off valve.	Engine shall stop after a few minutes.

Machines with electric PTO and hydraulic lift

Test	Status	Action	Result
1	Operator not sitting in seat. Brake pedal pressed. PTO not activated	Turn the key and make a start attempt.	Engine shall not start.
2	Brake pedal not pressed. PTO magnetic clutch not activated.	Turn the key and make a start attempt.	Engine shall not start.
3	Brake pedal pressed. PTO magnetic clutch activated.	Turn the key and make a start attempt.	Engine shall not start.
4	Engine running. PTO magnetic clutch activated.	Operator rises from the seat.	PTO magnetic clutch shall disengage.
5	Hydraulic lift in neutral position.	Attempt to engage the PTO magnetic clutch.	PTO magnetic clutch shall not engage.
6	Engine running.	Disconnect cable from the shut off valve.	Engine shall stop after a few minutes.

2 Tyres, air pressure

Check the air pressure. Adjust if necessary. The recommended air pressure is designated at the floor mat.

3 Engine oil and oil filter

See the "Instructions for use", delivered with the machine or "Instructions for use" at page 31. See also the engine manufacturer manual.

4 Oil, HST

See section 4 or the "Instructions for use", delivered with the machine.

5 Belt transmissions, check

Check the condition of all the belts and belt tensioners.

6 Steering, adjustment

See section 3.

7 Battery, check

Valid for dry charged batteries only. Check the acid level. Top up with distilled water if necessary. See page 6-7.

8 Engine air filter

See the "Instructions for use", delivered with the machine. See also the engine manufacturer manual.

9 Catalytic converter air filter

See the "Instructions for use", delivered with the machine. See also the engine manufacturer manual.

10 Cooling fins

Remove protective covers from the engine and clean between cooling fins. Use a brush and compressed air. See also the engine manufacturer manual.

11 Spark plug

Remove the spark plug (not valid for Pro Diesel) and clean it or replace if necessary. See also the engine manufacturer manual.

12 Lubrication

Lubricate the articulation point (4 nipples) and all moving parts such as wires and levers. See also the instruction manual, delivered with the machine.

13 Transmission

Listen for abnormal noise. Manual models: Check that the drive function works properly at all gears. Adjust if required.

14 Speed check

Check that the speed corresponds to the specified value. See pages 18-22.

15 Bearing boxes

Listen for abnormal noise from the bearings. Check that there are no wear, play or seizure.

16 Exhaust system

Check that there are no cracks, leakage or other damages. Check the attachment devices. See also the engine manufacturer manual.

17 Electrical system

Check that there are no damaged cables, contacts or other devices. Check that all cables are properly secured to the chassis and with cable holders. Check that there is no friction between cables and chassis, which can result in cable damage and short circuit.

**18 Mower deck
Warning!**

The blades are sharp. Always wear gloves when working with the blades to avoid injury.

Check if there are collision damages or wear at the deck body and painting. Align, repair and touch up the painting as required.

Check the tightening of the bearing boxes screws and tighten.

Rotate the blades and check the the shafts are correct, not bent, no abnormal bearing noise and no plays.

Check the belts and their tensions, see section 4.

Check that the lifting mechanism moves evenly, not jammed and no play and that it locks in desired position.

Check the electrical function of the elektrikal mower lifter (if applicable).

Check the plastic guide bar between the blades. Replace if required.

19 Blades**Warning!**

The blades are sharp. Always wear gloves when working with the blades to avoid injury.

Check that the blades are sharp. Sharpen as required.

20 Power take-off (PTO)

Check that the magnetic clutch (if applicable) engage the work equipment rotation in the desired time and that it not slips during normal load. Replace the clutch if necessary.

Check that the power take-off belt (if applicable) engage the work equipment rotation in the desired time and that it not slips during normal load. Adjust if necessary. See section 4.

Check that the power take-off brake (if applicable) brakes the rotation movement in the desired time. Adjust if necessary. See section 4.

21 Control check

Check that all controls function properly, that there are no jammings or excessive plays. Adjust if nesaccary. See section 5.

22 Valve play

See the engine manual regarding procedure and interval.

23 Test driving

Drive the machine during a few minutes and make the following attentions in different speeds and turnings in right and left. Check that all functions work evenly and proper and without any abnormal noise.

- Brake function
- Clutch function
- Power take-off
- Steering

Check that there are no abnormal vibrations.

1.5 Transmission

1.5.1 Transmission oil and filter change interval

Below is listed oil and filter data for the transmissions.

Machine	Transmission		Oil and filter change interval		Oil volume	Oil grade
	Description	Number	1:st time	Thereafter		
Park 2WD	K46	1137-0123-01	-	-	-	SAE 10W-30 (20W-50)
Park Compact and CH 4WD without servo	K574G	1137-0124-01	5 h	200 h	3,5 Liter	Synthetic oil 5W-50
	KTM10M	1134-6029-01				
Park CH 2WD with servo	K57-V	1137-0126-01			1,3 Liter	Synthetic oil 5W-50
Park CH 4WD with servo	K574F KTM10M	1137-0125-01 1134-6029-01			3,6 Liter	Synthetic oil 5W-50
Park Pro 4WD	KPL 10ALP	1134-5700-01	5 h	200 h	4,2 Liter	Synthetic oil 5W-50
	KTM10G	1134-5701-01				
	KTM10F	1134-5702-01				
	KTM-13	118475000/0	5 h	200 h	4,7 Liter	Synthetic oil 5W-50

1.6 Technical specifications

1.6.1 General tightening torque

Unless otherwise stated, the following tightening torque are applicable for screws and nuts on the machine:

Tightening torques

Thread	Torque
M5	5,7 Nm
M6	9,8 Nm
M8	24 Nm
M10	47 Nm

1.7 Instructions for use

Some procedures, e.g. changing engine oil, engine filter etc., are referred to the owner's manual, delivered with the actual machine.

The owner's manual can also be downloaded from STIGA's homepage. Go to www.STIGA.com and click further to your actual language and heading.

2 Chassis and body

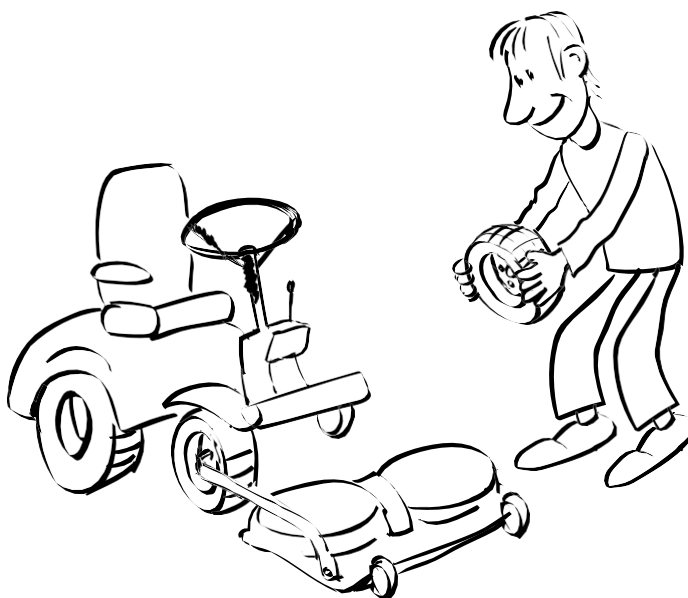
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General

To facilitate the driving, handling of work equipment and to make it comfortable for the driver, the machines are equipped with a various number of aid equipments. These equipments are mainly the same for all the machines covered by this manual, but in some cases configured in different ways. Where divergences occur between the machines, particular instructions are given for each particular equipment.

This chapter gives a brief description of the equipments and describes their repair and replacements.



2.1 Rear wheel

2.1.1 Assembly

1. Push the hub on the shaft until it rests against the transmission body.
2. Assemble the washer and the circlip onto the shaft. The washer shall rest against the circlip.
3. Check the key and assemble it in the groove, against the washer.
4. Assemble the rear wheel without tightening the nuts.
5. Measure the distance (X) between the front wheels and adjust the rear hubs until the distance between the rear wheels is the same (X).

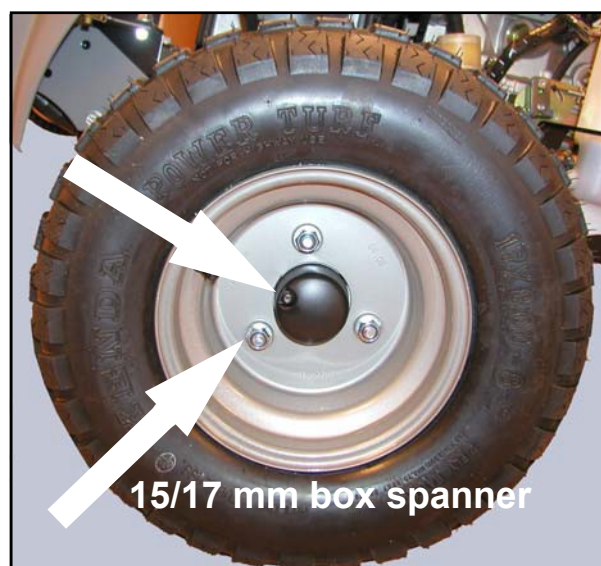
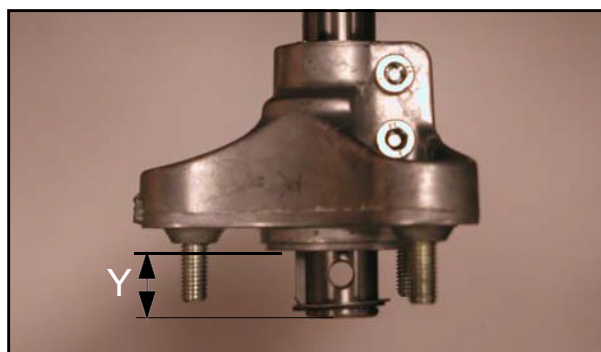
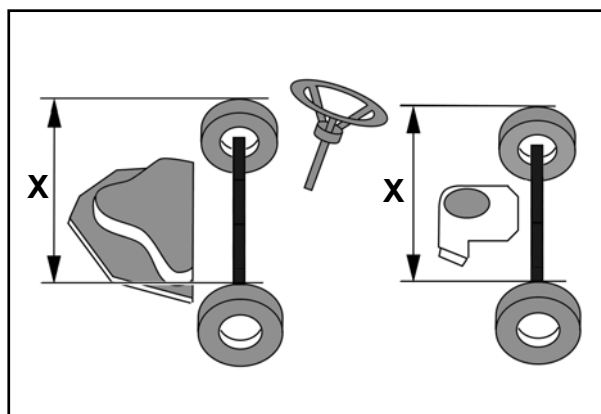
Pull out the hubs until the measure (Y) is the same at the both sides.

! Note!
If the measures between the wheels front and rear not is the same, the machine will be hard to steer.

6. Tighten the two allen screws, using a 8 mm allen key.
The tightening shall be performed in two steps. Tighten first to 18 Nm and then, finally to a torque of **24 Nm**.
7. Assemble the rear wheel and the protecting cover.

Assembly when tyre chains are used

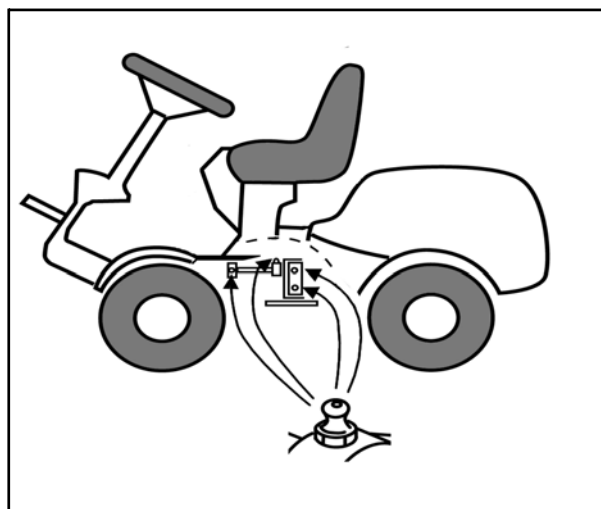
To give place for the tyre chains, the distance X can be increased. If necessary until the hub rests against the washer.



2.2 Lubrication chassis

The bearing for the articulation must be lubricated in accordance with the service schedule. Other moving parts are lubricated once per season, although at least every 50 operating hours.

- ! Note!
• Lubrication is equally important for a machine that is only used for a few hours per year.
- ! Note!
• The lubricant provides not only protection from wear but also from rust.
- ! Note!
• The machine should always be lubricated before prolonged storage.



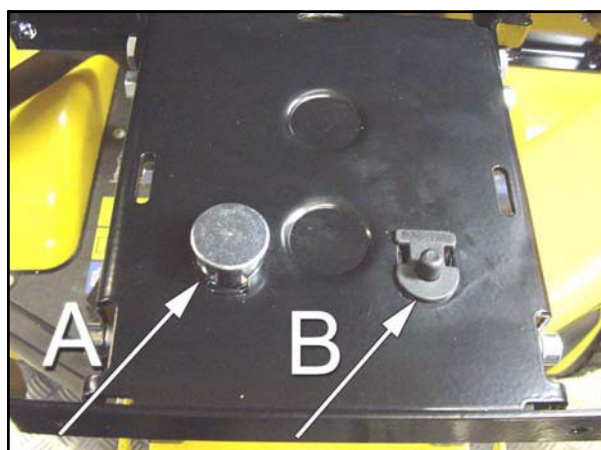
The bearing for the articulation has four grease nipples which must be lubricated with universal grease.

The steering chain must be lubricated with chain spray two or three times per season. If the chains are heavily fouled: dismantle the chains and wash them. Refit and lubricate them.

The pressure pin (A) in the seat suspension must be lubricated to avoid problems with the safety circuit.

Plastic bearings, e.g. the brake pedal bearing, hydrogear pedal bearing and steering-column bearing, must be lubricated with grease or lubricating spray.

Drop a little engine oil or lubricating spray in the ends of the control wires two or three times a year.



- ! Note!
• Wires on machines used in freezing conditions should not be lubricated with engine oil since this can lead to the control cables seizing in the cold. The wires on such machines should be lubricated with a fluent, strongly penetrating lubricant, e.g. 5-56 or WD40.

2.3 Hydraulic pump

This section will describe the replacement procedure for the external hydraulic pump in 4WD Park machines.

2.3.1 Dismantling

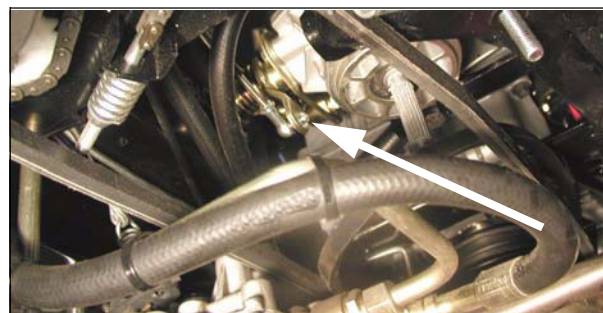
1. Remove the battery. See the owners manual.
2. Block up the machine. Use a lifting table or highjack and yokes.
3. Activate the parking brake.
4. Discharge the oil in the hydraulic system. See the owners manual.
5. Remove the tension pulley by using a 15 mm and a 17 mm spanner. See the figure.
6. Use a large polygrip and hold the pump pulley in a securely grip. Fit the polygrip around the belt, not direct to the pulley. Back off the pulley nut with a 17 mm sleeve. See the figure.

Warning!



Be carefully not to damage the plastic fan during the removal.

7. Remove the following parts from the pump shaft:
 - Nut
 - Washer
 - Pulley
 - Distance sleeve
 - Fan
 - Distance sleeve
8. Remove the speed control cable from the hydraulic pump by backing off the nut. Use a 8 mm spanner. See the figure.
9. Back off the circlip from the release lever rod and disconnect the rod from the lever.



10. Place a collecting tray under the pump for collecting residual oil from the pump and hoses.

Warning!



Do not spill any oil on the drive belts during the disconnection of hoses and tubes.

Warning!



Keep clean when handling hydraulic parts. Dirt in the oil will cause malfunctions and breakdowns.

11. Disconnect all hoses and tubes from the hydraulic pump. Always use two spanners, one to hold the respective connection in the pump and one to loosen the nut. See the figure.

12. Remove the pump from the chassis by unscrewing the two M10 mounting nuts and screws. Use two 17 mm spanners. See the figure.

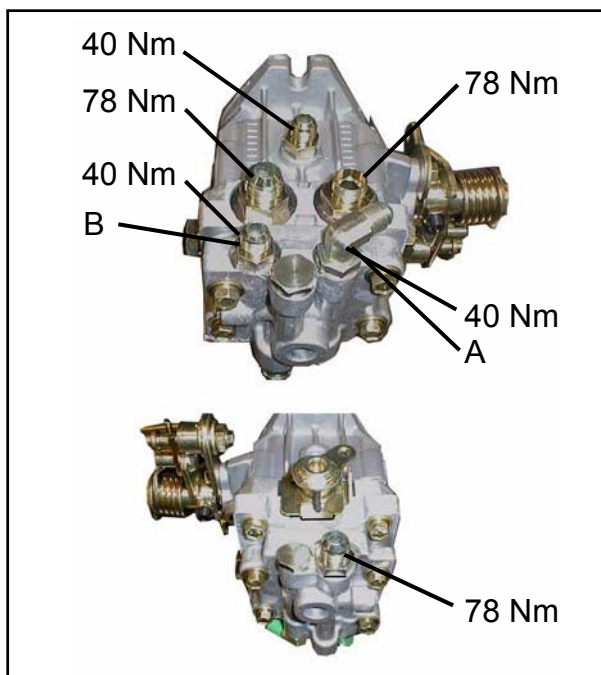
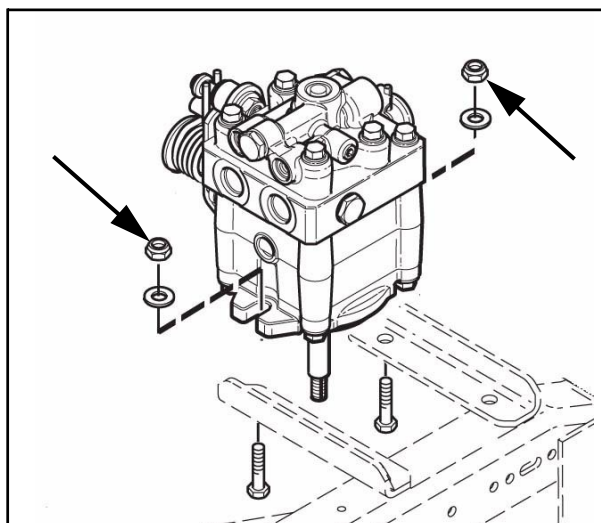
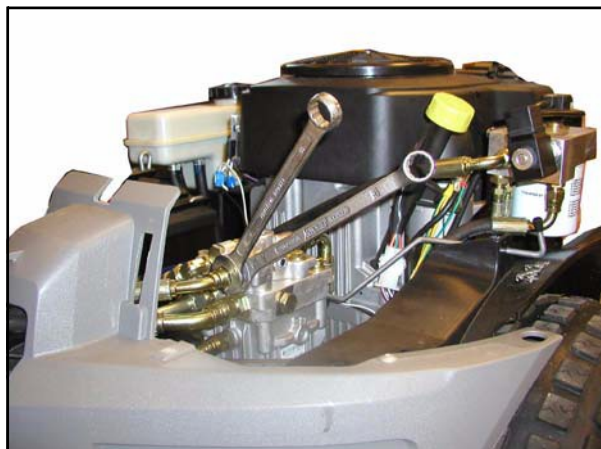
13. Place and fasten the pump in a table vice. Loosen the adapters from the pump.

14. Screw out the adapters and insert them in the corresponding places in the new pump one at a time. Check or replace the O-rings.

3. Place and fasten the new pump in a table vice. Tighten the adapters to torques according to the figures.

When tightening the angle adapter (A), adjust it to 45° according to the horizontal line. Use one 14 mm and one 19 mm spanner.

If a metal tube shall be fitted to the adapters A and B (machines without external hydraulics), the connection nuts shall be tightened with 41 Nm.



2.3.2 Assembly

Warning!



Keep clean when handling hydraulic parts. Dirt in the oil will cause malfunctions and breakdowns.

Warning!



Be carefully not to damage the plastic fan during the assembly.

Assemble all parts in the reverse order.



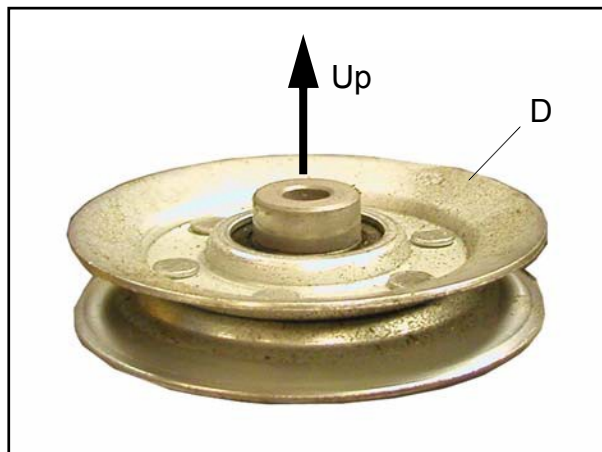
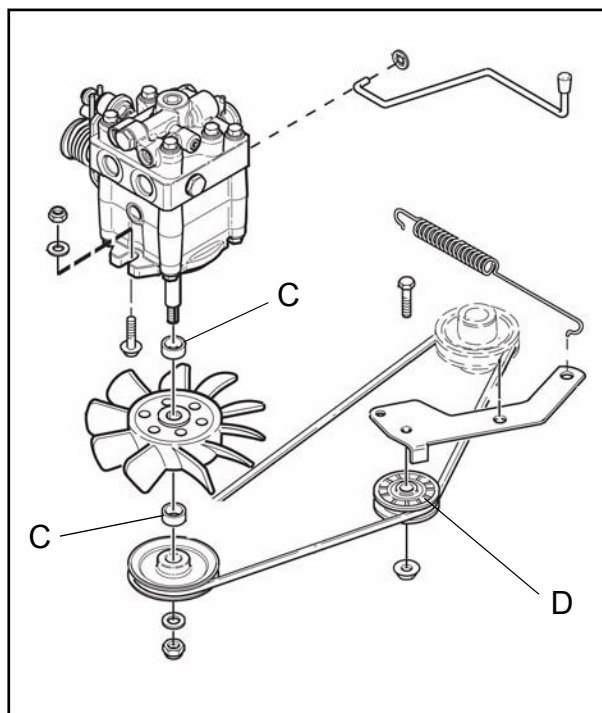
Note!
One distance sleeve (C) at each side of the fan.



Note!
The tension pulley (D) shall be fitted with the prolonged part of the sleeve upwards. See both figures.

Adjust the speed cable. See section 6.

When all parts are fitted and all actual tightening torques are applied, fill new oil and bleed the hydraulic system. See the owners manual.



2.4 Central joint dismantling and reassembly (for Park 4WD only)

This operation is required for pulley replacement and when the front and rear of the machine need to be separated.

2.4.1 Dismantling

Follow the photographic sequence of the images that depict the correct and necessary operating steps.





2.4.2 Reassembly

Perform the operations described above in reverse order being careful to correctly reposition all the previously removed washers and spacers.



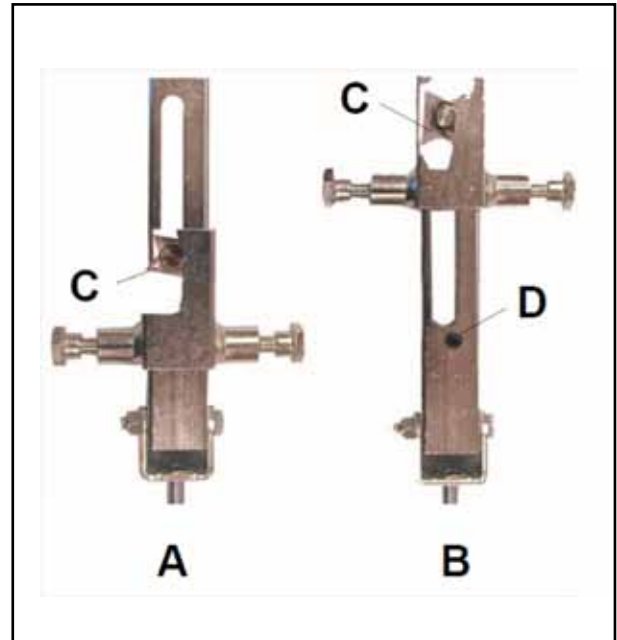
2.5 Lifting mechanism manual

2.5.1 Description

The work equipment lifting arm is automatic locked in elevated position by pressing down the lifting pedal. Next time the pedal is pressed, the mechanism will release and the arm drops down.

The locking function is created in the lifting lock. The principle is described below and shown in the figure.

- A. Locked in lifted position by the ratchet (C).
- B. Unlocked. Ratchet (C) is released.
- C. Ratchet which is tilted by the pin (D) every time the pedal is pressed down.



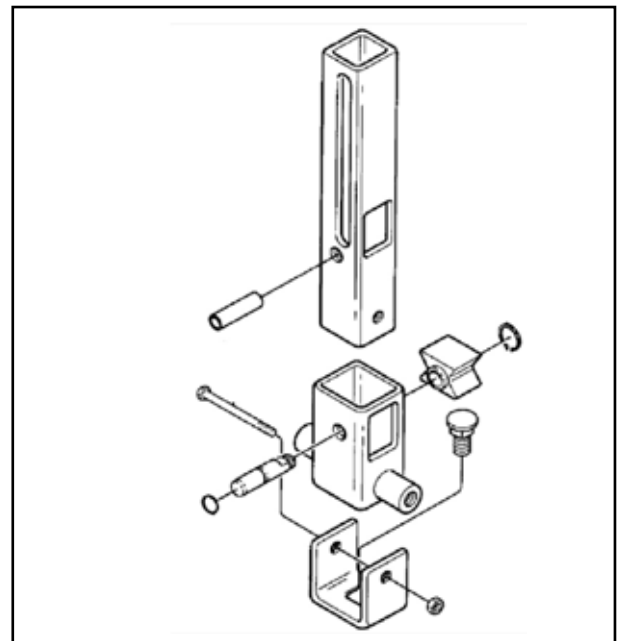
2.5.2 Repair of lifting lock

The lifting lock can be purchased as a complete spare part.

The parts can be lubricated with a thin lubricant, e.g. silicon spray, WD40, or the like, if the lock jams.

! Note!

Viscous lubricant such as consistent grease must not be used.



3 Steering

Contents in this chapter

3.1 Description	2	3.3 Bearings, steering shaft	7
3.1.1 Mechanical system	2	3.3.1 Replacement of sliding bearings and ball bearings	7
3.1.2 Hydraulic assisted system	2	3.3.2 Replacement of upper ball bearing (with steering booster)	8
3.2 Steering wires	4	3.3.3 Trouble shooting	9
3.2.1 Replacement	4		
3.2.2 Adjustment	5		
3.2.3 Steering chains	5		

General

The articulation steered machines are equipped with either a common mechanical system or a hydraulic assisted steering system. Both systems work with wires or chains, depending on the model. The hydraulic assisted system gets its power from the variable hydraulic transmission at the rear shaft.

This chapter contains a brief description of the function and describes repair, replacements and adjustments of stressed parts of the steering system.



3.1 Description

3.1.1 Mechanical system

The sprocket (A) is directly coupled to the steering wheel on the same shaft. A chain (and wires) (B) is engaged with the sprocket and connected to the steering disc (C) on the rear frame. Thus, the rear frame is forced into actual angles, related to the front frame when the driver turns the steering wheel.

3.1.2 Hydraulic assisted system

Below is given a brief description about how the steering torque converter works and its connection to the valves. For a complete description, see section 4 "Hydraulic system". Section 4 describes how the lifting cylinder works together with the steering torque converter. It also describes the pressure division between the two systems and adjustments.

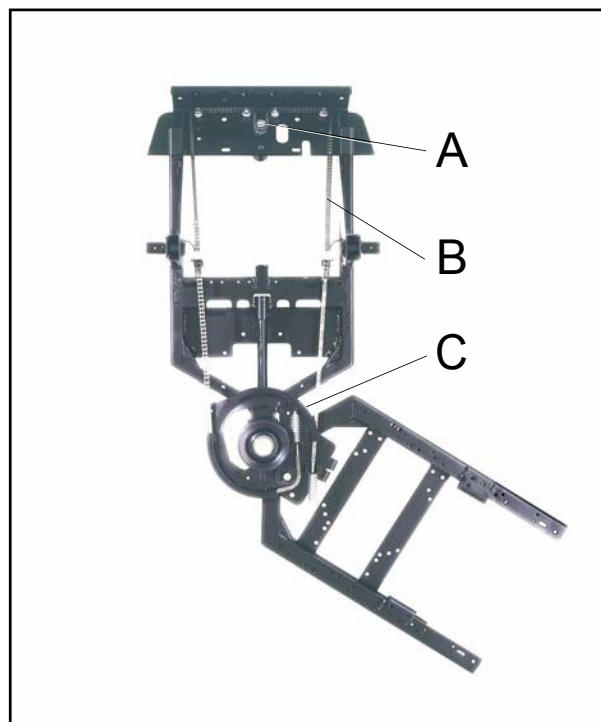
The power assisted steering is a hydraulic auxiliary system. The main components are the torque converter and the oil pump in the hydrogear.

As opposed to standard power steering (e.g. in a car), this power assisted steering has a limited capacity. This implies that in certain circumstances it has what may be experienced as negative characteristics.

At low engine speed, or in situations where extra steering power is required, the steering may be considered to be somewhat jerky.

The machine should always be in motion when the steering is used. Avoid turning the steering wheel when the machine is standing completely still and the accessory is in lowered working position.

The machine can be steered even when the engine is switched off. Nevertheless, it may require more force than normal to steer the



machine. This is particularly noticeable during cold weather.

Mainly, the hydraulic assisted system works similar to the mechanical system. The different is a torque booster (D), attached to the steering shaft between the steering wheel and the sprocket (A).

An oil flow from the HST is flowing through the torque booster via a filter.

As the driver turns the steering wheel, there occurs a pressure drop over the torque booster. The pressure drop, multiplied with the flow, gives a moment (M_a), which is added to the moment from the driver (M_d) and applied on the sprocket (A) as a moment (M_s).

The following items are shown in the figure:

A Sprocket of driving the steering chain.

D Torque booster.

M_h Steering power (moment) from the hydraulic transmission.

M_d Hand power (moment) from the driver.

M_s The sum of M_a and M_d as steering power (moment on sprocket A).

Hydraulic connections

The hydraulic lines have two alternative connections:

- Pressure plate with O-rings around the tubes.
- Banjo fitting.

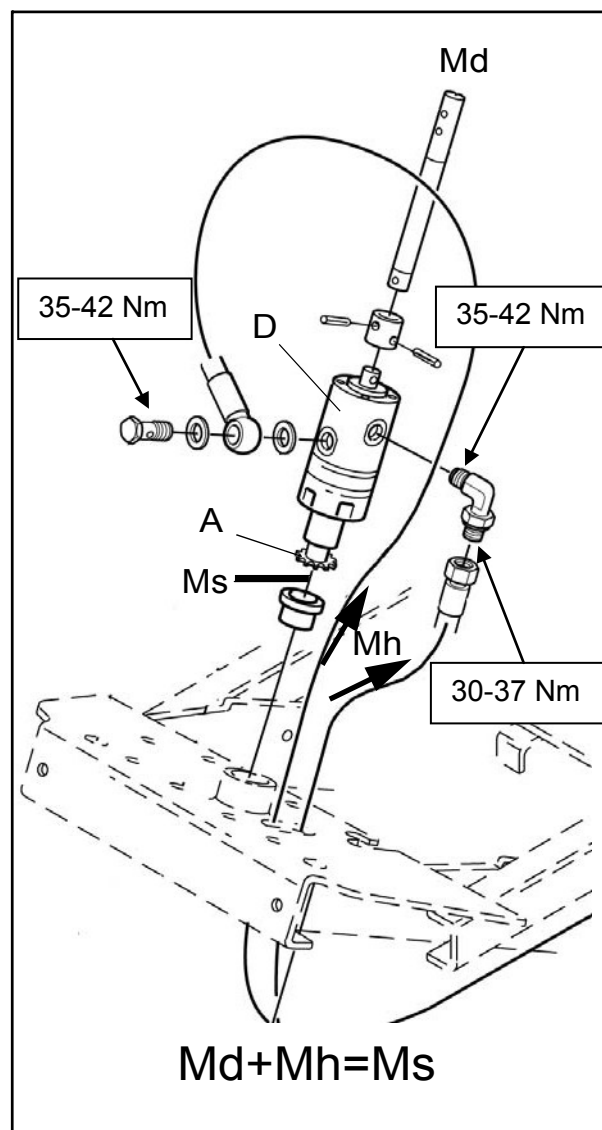
Pressure plate

Always mount new O-rings when assembling.

Banjo fitting

The connection have no gaskets.

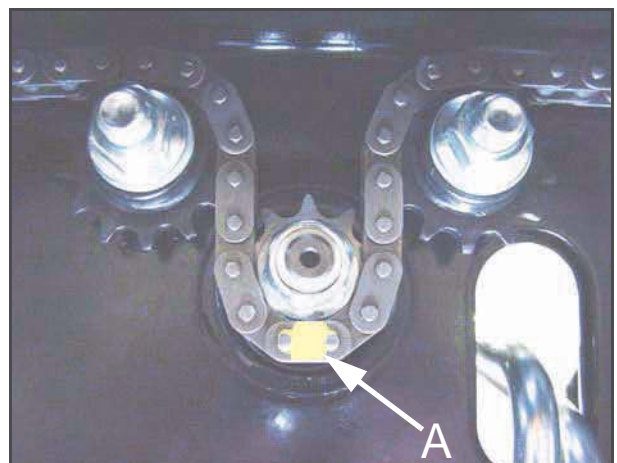
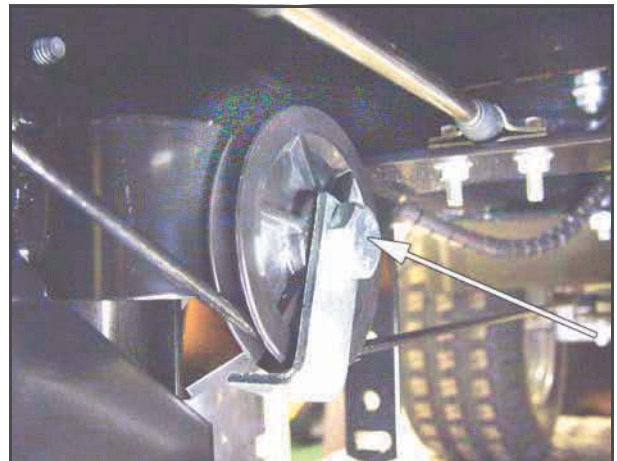
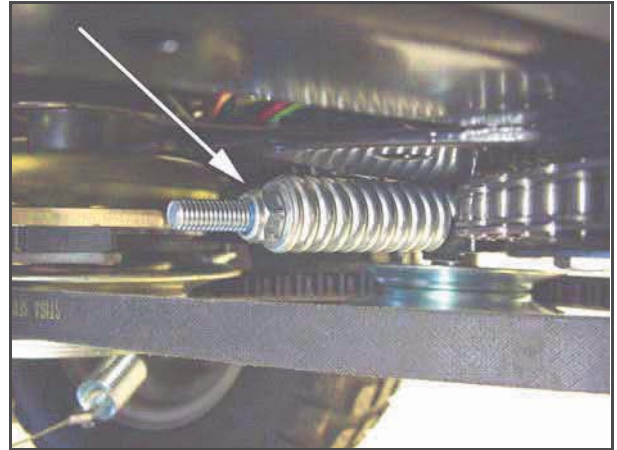
Always tighten the nipples with the correct tightening when assembling. See the figure.



3.2 Steering wires

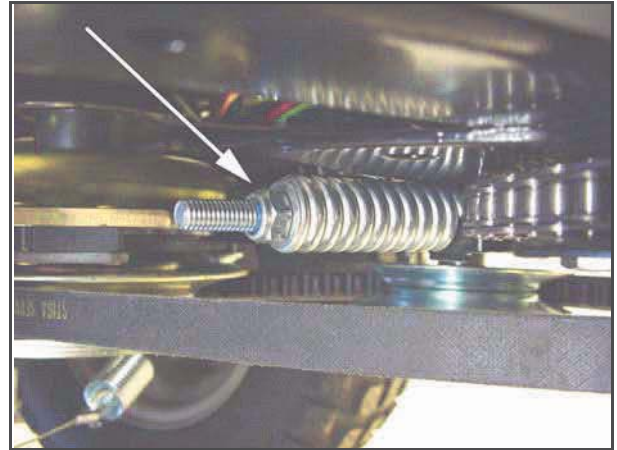
3.2.1 Replacement

1. Loosen the nuts on the steering wire. Brace with a spanner so that the wire does not rotate.
2. Loosen the screws that hold the pulley so that the wire can be taken out between the pulley and the wire retainer.
3. Unhook the chain at the front chain sprockets.
It can sometimes be easier to get the chain off by slightly unscrewing the screws that hold the chain sprockets.
4. Measure up the middle link (mark A) on the new chain and mark it.
5. Place the chain on the chain sprockets.
Make sure that the wheel is straight and that the marked middle link is placed on the middle of the chain sprocket.
6. Place the wire in the pulley and tighten the screws to the wire retainers.
7. Fit the washer and nut on the threaded rear ends of the steering wire.



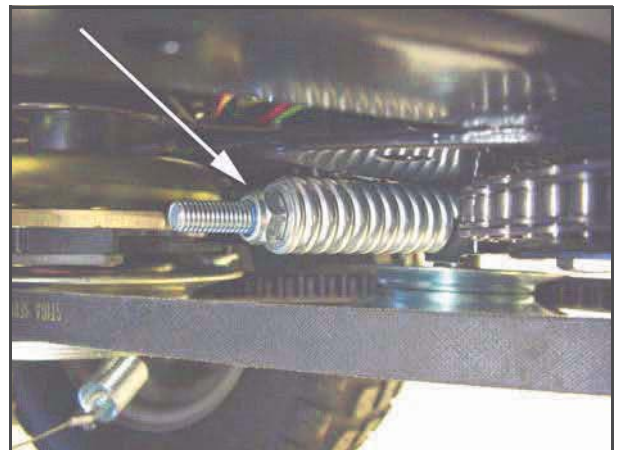
3.2.2 Adjustment

1. Tension the wire nuts equally on both sides so that the wheel is straight when the machine is straight.
Brace with a spanner so that the wire does not twist.
2. Turn the wheels fully out in both directions. Check that the chain does not go into the pulley and that the wire does not go into the chain sprocket.
3. Test drive. Check the tension of the wire after test driving.

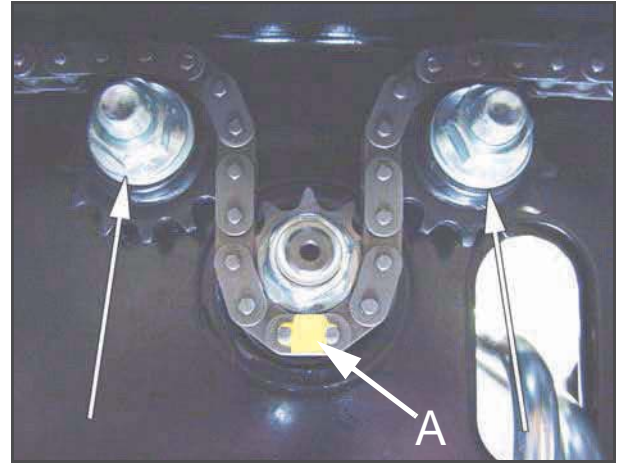


3.2.3 Steering chains

1. Loosen the nuts on the steering chain.
2. Loosen the screws that hold the chain sprockets so that the chain can be taken out between the chain sprocket and wire retainer.
3. Unhook the chain at the front chain sprockets.
It can be easier to get the chain off by slightly unscrewing the screws that hold the chain sprockets.

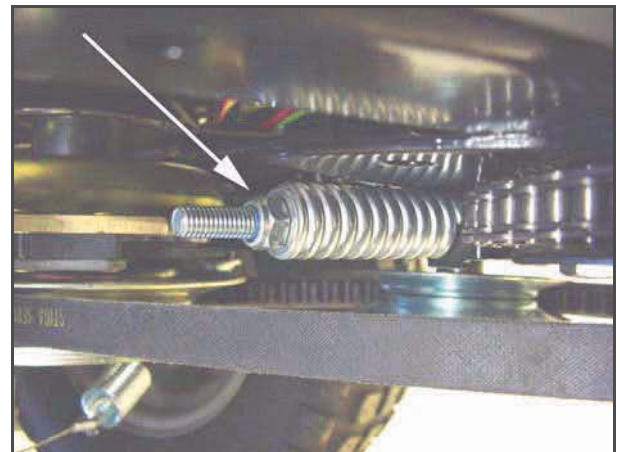


4. Measure up the middle link (A) on the new chain and mark it.
5. Place the chain on the chain sprockets. Make sure that the wheel is straight and that the marked middle link (A) is placed on the middle of the chain sprocket.
6. Place the wire on the chain sprockets and tighten the screws to the wire retainers.
7. Fit the washer and nut on the threaded rear ends of the steering chain.
8. Adjust as described below.



Adjustment

1. Tension the nuts equally on both sides so that the wheel is straight when the machine is straight.
2. Turn the wheels fully out in both directions. Check that there is no abnormal noise or abnormal resistance.
3. Test drive. Check the tension of the chain after test driving.



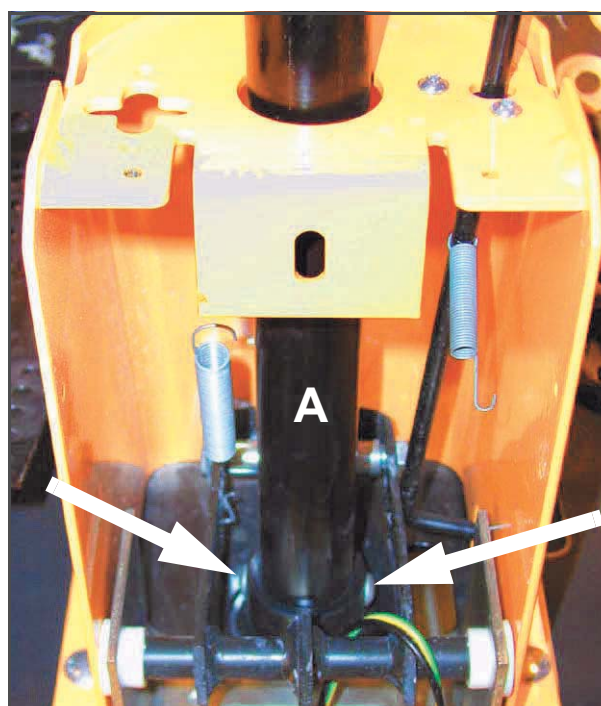
3.3 Bearings, steering shaft

The steering shaft bearings are configured in one of the following three ways:

- Two sliding bearings of the composite type.
- Two sealed ball bearings.
- One sealed ball bearing (upper) and one ball bearing in the torque booster (lower).

3.3.1 Replacement of sliding bearings and ball bearings

1. Remove the chain from the lower sprocket. See previous sections.
2. Tap out the spring pin that holds the steering wheel. Remove the steering wheel.
3. Pull up the parking brake knob, remove the upper cover and the lamp section.
4. Remove the two screws, holding the steering column and remove the steering column (A).
5. Tap out the bearings with a long drift, bar or similar.
6. Tap in the new bearings with a rubber mallet.
7. Reassemble in the reverse order and adjust the chain/wire. See previous sections.



3.3.2 Replacement of upper ball bearing (with steering booster)

1. Tap out the spring pin that holds the steering wheel. Remove the steering wheel.
2. Pull up the parking brake knob, remove the upper cover and the lamp section.



Note!
Do not forget the washer (G).

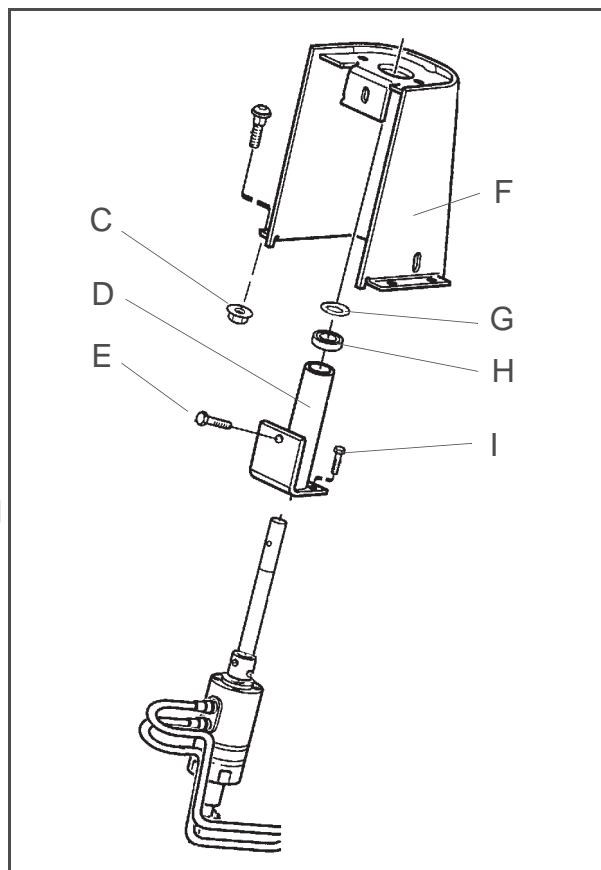
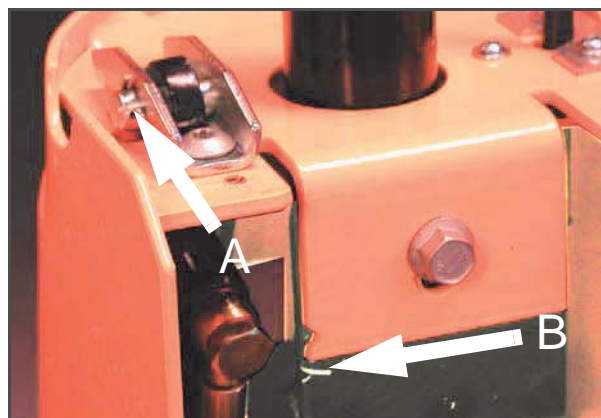
The correct number of shims must be used to avoid tensions in the steering column.

3. Remove the split pin from the hydraulic lift bolt (A) and push out the bolt.
4. Remove the spring (B).
5. Remove the four nuts (C) from the underside and the screw (E), holding the steering console (F) and lift out the steering console with its four screws.
6. Remove the three M8-screws (I) from the lower steering tube (D) and pull up the steering tube with the washer (G).
7. Press or knock out the ball bearing (H) from the steering tube and assemble a new bearing with help of a rubber mallet.
8. The assembling is performed in the reverse order.



Note!
Do not forget the washer (G).

The correct number of shims must be used to avoid tensions in the steering column.



3.3.3 Trouble shooting

One prerequisite for the function of the power assisted steering is the play in the steering. This play must always spring back to the starting position when the wheel is released. Test by slowly turning the wheel in one direction when the engine is switched off. At first there is a slight resistance, which increases when the machine begins to turn. Release the wheel. It should now return to the middle position.

The wheel should spring back approx. 10-20 mm when the wheel is released after turning. However, the machine will not automatically “drive straight forward” after turning in the same way as a car.

If the machine always turns in the same direction as soon as the engine is started, there is probably a fault in the torque converter.

Another conceivable fault can be that the bearing in the steering column tube is jam-

ming, so that the steering wheel cannot automatically return to the neutral position.

! Note!

If the steering does not function, this does not mean that there is always a fault in the steering booster. Faults can also occur in more simple mechanical parts such as chains and gear wheels and sprockets.

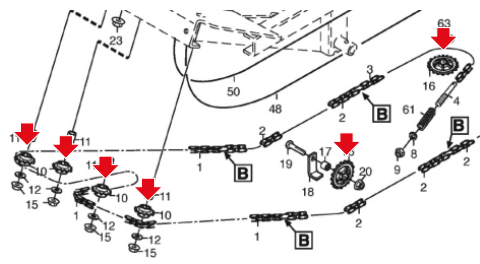
! IMPORTANT:

Transmission replacement is not an option to solve steering issue.

The machine has to be tested always in motion when the steering is used. Avoid turning the steering wheel when the machine is standing completely still and the accessory is in lowered working position.

Testing the machine with the engine at maximum rpm and assure that the tires have the right pressure.

PROBLEM	CAUSE	REMEDY	Reference
1. The steering wheel presents: <ul style="list-style-type: none"> • hard to movement • jerky to movement • locked • strange noises ▼	The central joint isn't greased.	Lubricate the central joint.	WORKSHOP MANUAL Chapter 2 Paragraph 2.2
	The steering wheel hasn't a minimum axial play.	Remove a washer under the steering wheel.	OWNER MANUAL Chapter 5 Paragraph 5.5
	The steering chain is not adjusted.	Adjust the steering chain by operating on the relevant registers.	WORKSHOP MANUAL Chapter 3 Paragraph 3.2
	The chain is dirty, seized and or not lubricated.	Remove the chain, clean it, check the smoothly movement of the chain links and lubricate.	

PROBLEM	CAUSE	REMEDY	Reference
▲ 1. The steering wheel presents: <ul style="list-style-type: none"> • hard to movement • jerky to movement • locked • strange noises 	Sprockets damaged or they doesn't work.	Replace the sprockets damaged, check the free movement, and lubricate them. 	
	The central joint isn't free to movement.	Raise the machine with a lift fork positioned in the centre of the machine, in the way that the rear wheels doesn't touch the ground and check the free rotation of the rear side of the machine.	
2. The steering isn't free to turn	The steering is getting a contact.	Check if the steering column has got a contact with others parts (e.g. with coiled spring pins).	
	The steering isn't stay in place.	Check if the steering column has go a damage (e.g. welds) and replace if necessary. Check if screws are loose and tighten if necessary.	
	The bearing in the steering column does not work smoothly.	Check that the bearing isn't jamming and replace if necessary.	WORKSHOP MANUAL Chapter 3 Paragraph 3.3

4 Hydraulic system

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General

The four wheel drive Park machines are equipped with hydraulic power transmission. I.e. the engine drives an hydraulic pump, which pumps oil through the rear and front axle drives. There are two main configurations; separate hydraulic pump and the hydraulic pump integrated in the rear axle drive.

The front axle and rear axle are connected in series, which means that the front wheels and rear wheels are forced to rotate at the same speed. To make turning easier, both axles are equipped with a differential.

Some of the machines, both 2WD and 4WD, are also equipped with hydraulic assisted steering and implement lifter.

Front-mounted implements are powered via drive belts.

This chapter contains a description of the hydraulic system, trouble shooting to isolate faults and information about adjustments and corrective measures.

Since the steering torque converter and lifting cylinder belong to the respective chapter (2 and 3), these components are described in detail in these chapters.



4.1 Safety

Hydraulic oil under pressure can be very dangerous if hoses, lines or other distribution parts are leaking. To avoid personal injuries, always wear protection gloves and protection goggles during works with the hydraulic system.

Before starting the motor, place the machine outdoors or install an extraction device for the exhaust fumes. Otherwise the personnel will be poisoned.

Cleanliness is mandatory at all works with the hydraulic system. Foreign substances and contaminations will jeopardize the function and reliability of the system. Always protect and close openings of hoses, lines and connections when replacing components.

4.2 Configuration

The machines are equipped with systems according to the table below:

Art. Number	Machine	2 Wheel drive	4 Wheel drive	Hydraulic pump in the rear axle drive See "4.3" at page 5	Separate hydraulic pump See "4.4" at page 8	Hydraulic steering, 4WD See "" at page 11	Hydraulic steering, 2WD See "4.6" at page 18	Hydraulic implement lifter See "" at page 11
13-6002-XX	Mountfield 4140H	X		X				
13-6003-XX	Mountfield 4155H	X		X				
13-6004-XX	Mountfield 4155H 4WD		X	X				
13-6100-XX	Park Silent	X		X				
13-6101-19	Park Compact 13	Manual gear 5-speed						
13-6102-XX	Park Compact 14 Castelgarden XK 140 HD Béal Master MBF 13,5 Mountfield 4135H	X		X				
13-6103-XX	Park Compact 16 Castelgarden XK 160 HD Béal Master MBF 15,5 Mountfield 4155H	X		X				
13-6104-XX	Park Compact 16 4WD Castelgarden XK4 160 HD Béal Master MBF 15,5 Mountfield 4155H 4WD		X	X				
13-6105-99	Mountfield XK 13	Manual gear 5-speed						
13-6106-99	Mountfield XK 16	X		X				
13-6107-99	Mountfield XK 16 4WD		X	X				
13-6109-XX	Park Compact 14	X		X				

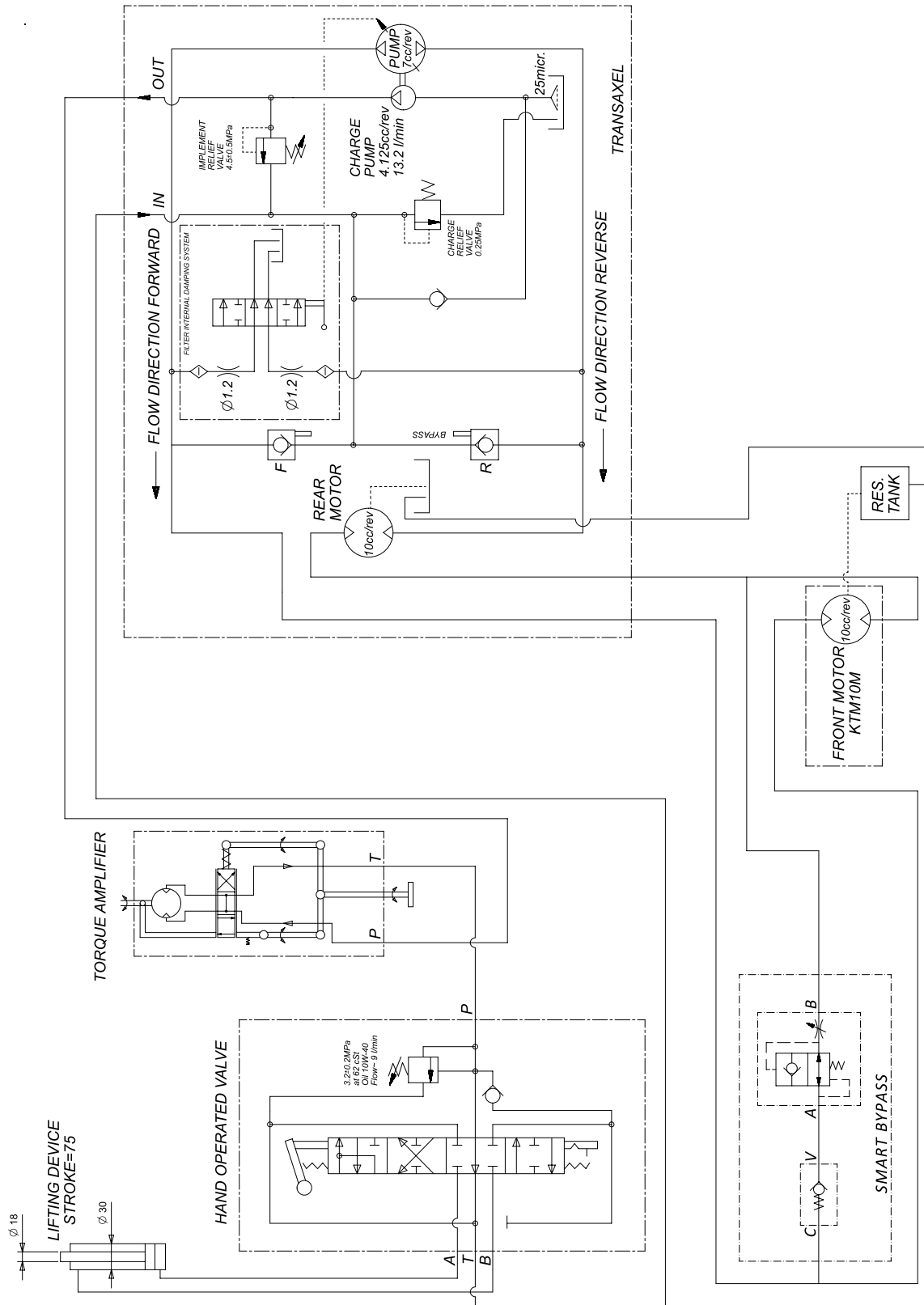
Art. Number	Machine	2 Wheel drive	4 Wheel drive	Hydraulic pump in the rear axle drive See "4.3" at page 5	Separate hydraulic pump See "4.4" at page 8	Hydraulic steering, 4WD See "" at page 11	Hydraulic steering, 2WD See "4.6" at page 18	Hydraulic implement lifter See "" at page 11
13-6111-61	OKAY Mcut 98-10/155 K4WD		X	X				
13-6116-XX	Castelgarden XK 140 HD	X		X				
13-6141-XX	Park Unlimited 14	X		X				
13-6142-XX	Park Unlimited Plus	X		X				
13-6144-XX	Park Silent	X		X				
13-6175-26	Park Power 4WD		X	X				
13-6176-16	Park Champion	X		X				
13-6177-XX	Park Prestige 4WD		X	X				
13-6178-15	Park Residence 4WD		X	X		X		
13-6178-16	Park Residence 4WD		X	X		X		
13-6179-04	Park Ranger	X		X			X	
13-6179-05	Park Ranger Svan	X		X			X	
13-6179-06	Park Ranger Svan	X		X			X	
13-6180-XX	Park Diesel	X		X				
13-6181-34	Park Diesel 4WD		X	X		X		X
13-6182-14	Park Comfort	X		X				
13-6182-15	Park Comfort	X		X				
13-6183-14	Park Royal	X		X				
13-6184-XX	Park President 14	X		X				
13-6185-XX	Park Prestige 4WD		X	X				
13-6189-XX	Park Excellent 16	X		X				
13-6193-XX	Park Ranger	X		X			X	
13-6195-14	Park Fairway 18	X		X				
13-6196-25	Park Power 4WD		X	X				
13-6197-XX	Castelgarden XKH4 165 HD		X	X				
13-6198-55	75 Years ltd version	X		X				
13-6199-15	Park Residence 4WD		X	X		X		
13-6241-XX	Park Pro 16 4WD		X		X			
13-6241-XX	Park Pro Svan 4WD		X		X	X		X
13-6242-64	Park Pro Bivoj 4WD		X		X			
13-6244-XX	Park Pro 20 4WD		X		X	X		X
13-6246-XX	Park Pro 25 4WD		X		X	X		X

Art. Number	Machine	2 Wheel drive	4 Wheel drive	Hydraulic pump in the rear axle drive See "4.3" at page 5	Separate hydraulic pump See "4.4" at page 8	Hydraulic steering, 4WD See "" at page 11	Hydraulic steering, 2WD See "4.6" at page 18	Hydraulic implement lifter See "" at page 11
13-6269-XX	Park Pro 18 4WD		X		X	X		X
13-6270-XX	Park Pro 21 4WD		X		X	X		X
13-6271-XX	Park Pro 16 4WD		X		X	X		
13-6272-XX	Park Pro Svan 4WD		X		X	X		X
13-6273-XX	Park Pro 20 4WD		X		X	X		X
13-6274-16	Park Pro 23 4WD		X		X	X		X
13-6275-16	Park Pro Silver		X		X			
13-6276-XX	Park Pro 25 4WD		X		X	X		X
13-6310-XX	Park Excellent 16, 620 W	X		X				
13-6311-XX	Park Plus	X		X				
13-6312-XX	Park Royal 4WD		X	X		X		
13-6313-11	Park Excellent	X		X				
13-6314-11	Park Plus Unlimited	X		X				
13-6317-32	Park 740 PWX		X	X		X		
13-6318-31	Park 520 DP	X		X			X	
13-6319-31	Park 520 DPX		X	X		X		
13-6320-11	Park 520 Anniversary	X		X			X	
13-6372-11	Park Power 16 4WD		X	X				
13-6373-XX	Park 740 WX, Park Ro. 4WD		X	X		X		
13-6374-11	Park Champion 4WD		X	X			X	
13-6375-11	Park Power 4WD		X	X				
13-6377-11	Park Prestige 4WD		X	X				
13-6378-XX	Park Residence 4WD		X	X		X		
13-6379-XX	Park Ranger Svan	X		X			X	
13-6380-XX	Park 620 PW	X		X			X	
13-6381-XX	Park 540 LPX		X	X			X	
13-6384-11	Park 123	X		X				
13-6384-12	Park 420 LM	X		X				

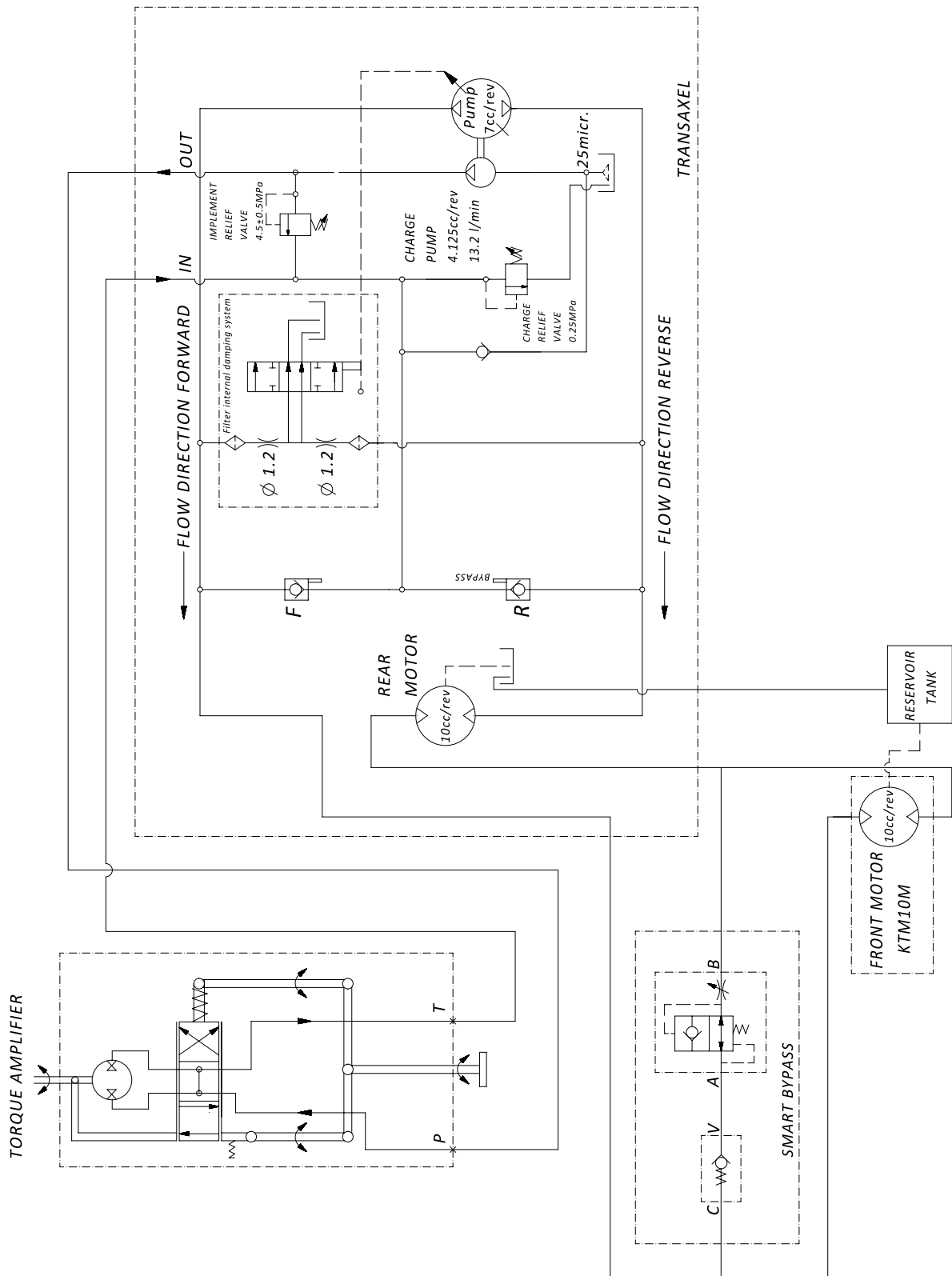
The power transmission and the hydraulic assisted steering and implement lifter work with the same oil, but in two separate parallel systems. Therefore, the descriptions are divided in the following headings:

The following sections will explain the physical arrangement of the hydraulic components and give a functional description.

4.2.1 Hydraulic diagram (Version 2019 - with lift)

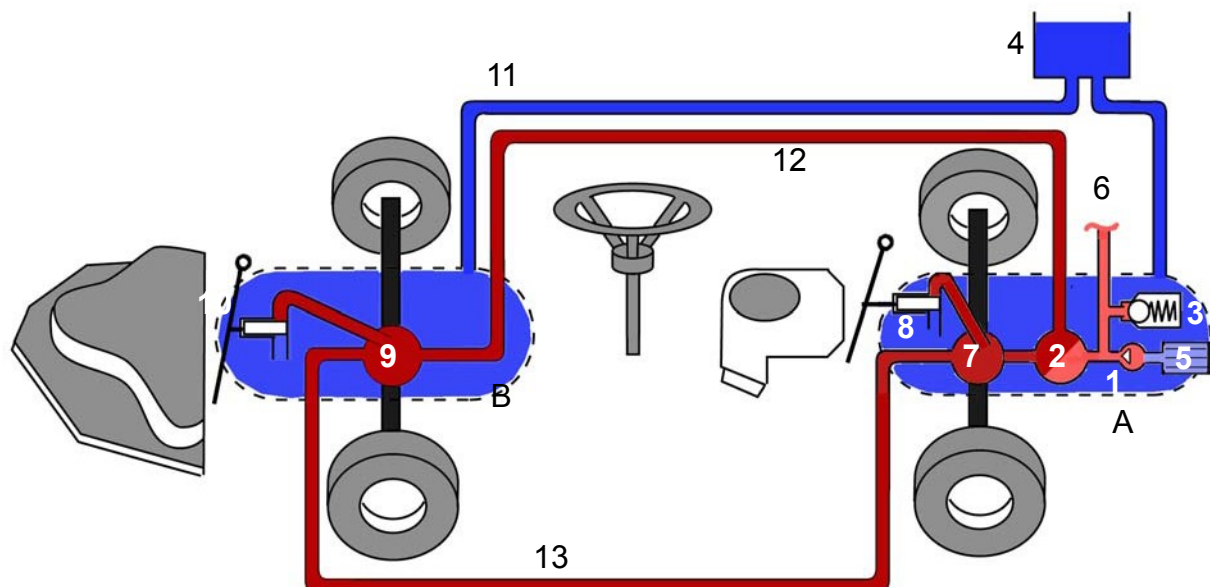


4.2.2 Hydraulic diagram (Version 2019 - without lift)



4.3 Hydraulic pump integrated in the rear axle drive

4.3.1 Physical description



A. Rear axle drive.

The parts 1-3 and 5-8 below are built in the rear axle drive.

1. Charge pump, 35-45 bar.
2. Main pump.
3. Pressure limit valve for the charge pressure.
4. Oil container.
5. Oil filter.
6. Connection to the external hydraulics (steering converter and implement lifter).
7. Hydraulic motor, rear axle.
8. By-pass valve, rear axle.

B. Front axle drive. The parts 9 and 10 below are built in the front axle drive.

9. Hydraulic motor, front axle.
10. By-pass valve, front axle.
11. Leak flow line.
12. Main flow line.
13. Main flow line.

Colour - Pressure

Red is the feeding pressure to the main pump and to the external hydraulics.

Dark red is the working pressure to the hydraulic motors.

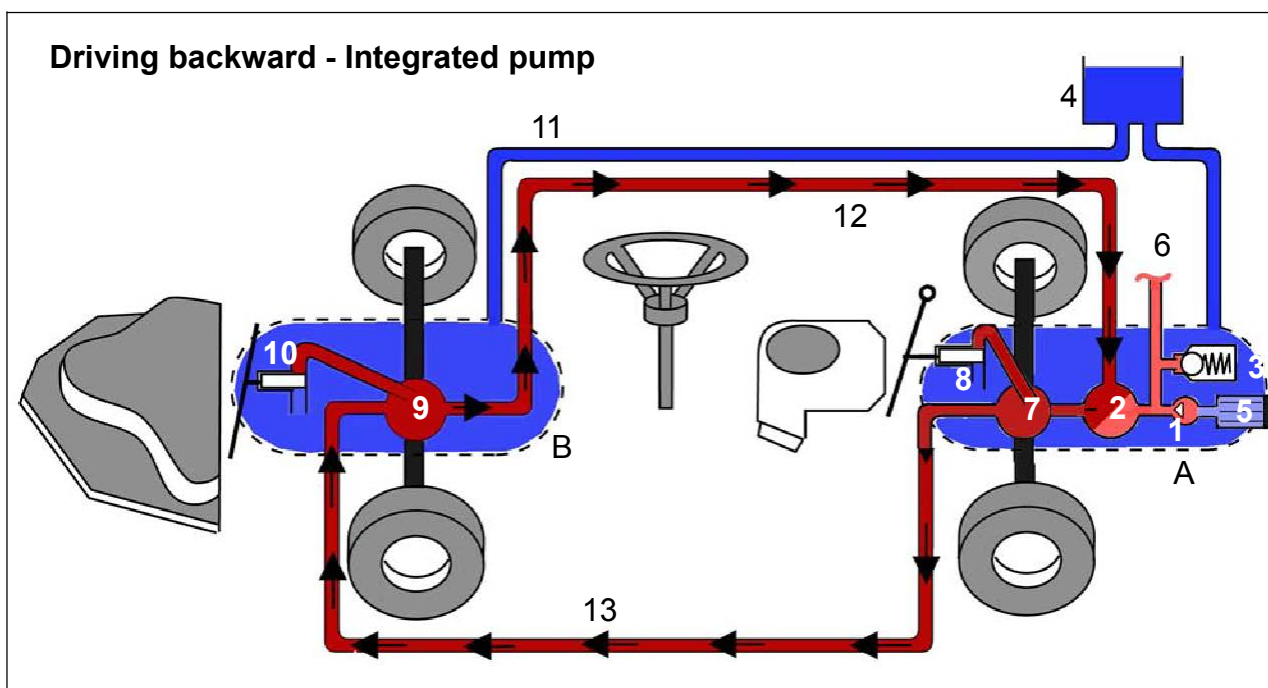
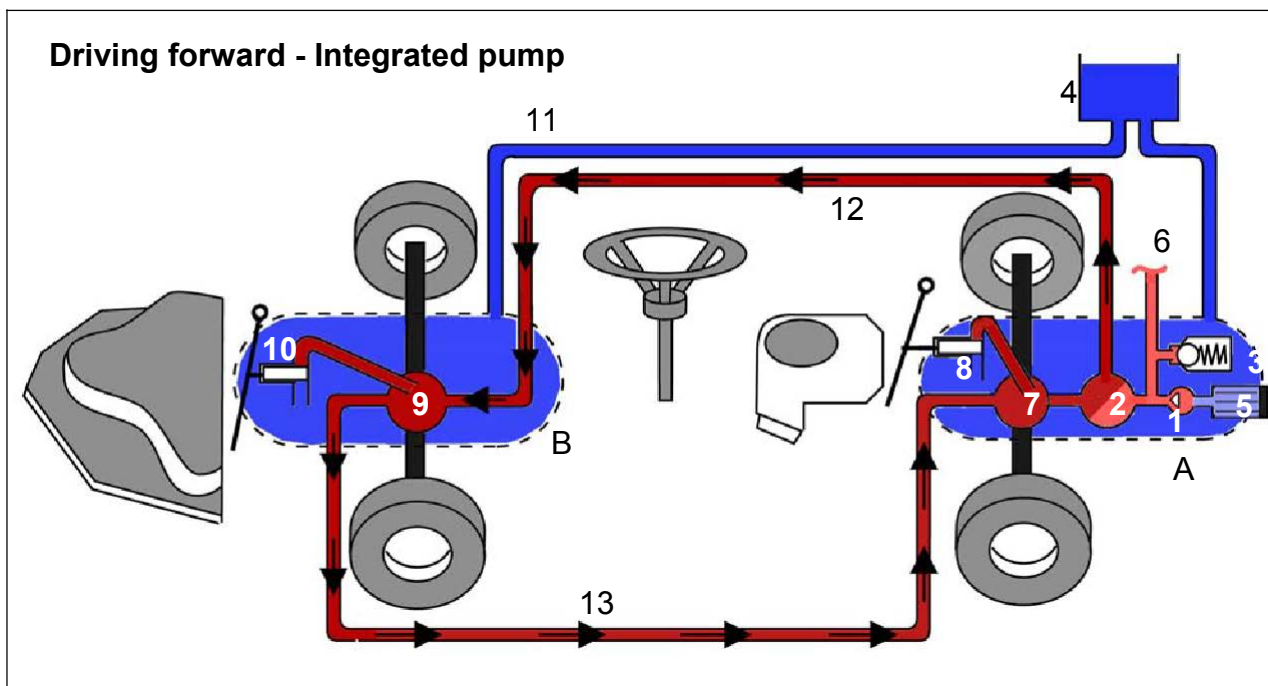
Blue is the atmospheric pressure in the oil container and housings.

Light blue is below the atmospheric pressure (pump suction side).

4.3.2 Functional description

Driving

The oil flows when driving forwards respectively backwards are shown in the diagrams below.



The engine drives the charge pump (1) and the main pump (2) with a constant speed. The charge pump is feeding the main pump. The oil, fed into the main pump during operation, is a replacement for the leak oil from the front and rear axle drives (A and B).

The charge pump sucs its oil from the rear axle drive volume and through the filter (5). The rear axle drive is supplied with oil from the oil container (4).

The oil flow and the flow direction through the main pump (2) - front hydraulic motor (9) - rear hydraulic motor (7) is controlled by the speed pedal, mechanical connected to the main pump (2) in the rear axle drive (A). The main pump pressure is depending on the power requirements at the wheel axles and is limited by the engine power.

The motors are connected in serie with the front motor (9) first, when driving forwards. This means, due to the leakage in the front motor, that the machine under normal conditions drives on the front wheels only. When the front wheels begin to slip (rotate with 1-4% higher speed than the rear wheels) also the rear wheels start to drive and the slipping is avoided.

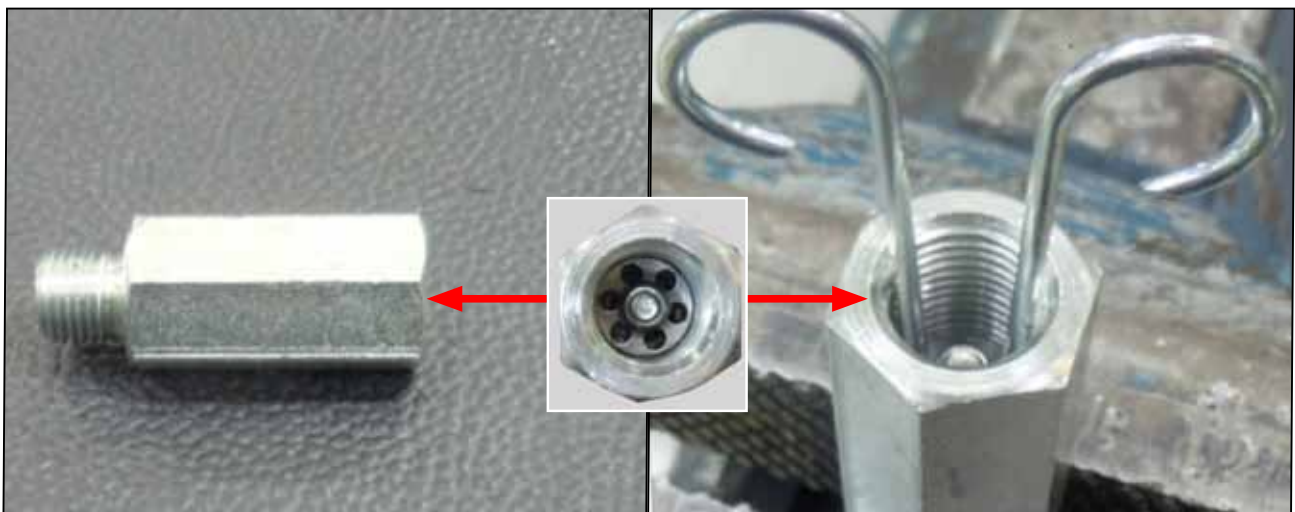
This fact is not noticed by the operator, since the machine is driven with its four wheels after demand.

Dynamic balancing valve.

The hydraulic circuit is equipped with a dynamic balancing valve for the correct balancing of the circuit. When the machine is stationary, the dynamic balancing valve is open and allows the hydraulic steering to rotate smoothly.

While when the machine starts to move forward, the dynamic balancing valve closes automatically, the front drive axle starts to transmit and then a few moments later, the rear drive axle also starts to transmit. The rotation of the hydraulic steering remains fluid.

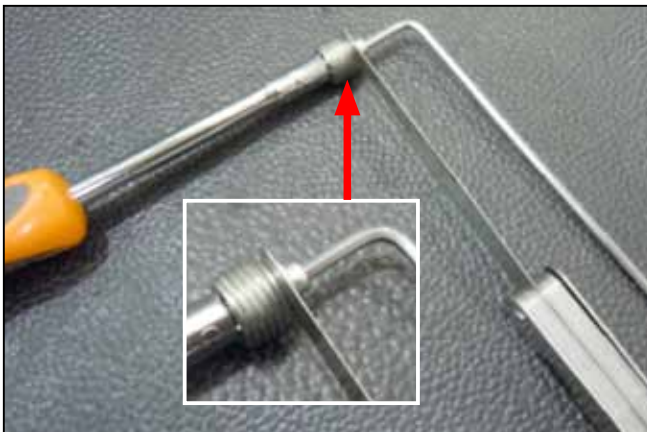
The time that passes between the engagement of the front axle and the rear axle is not normally perceived by the user.





The dynamic balancing valve has a standard calibration of 0.15mm, this can be adjusted in the +/- 0.05 range compared to the standard calibration.

With a dynamic balancing valve set to 0.10mm, the valve closing time will be reduced.



With a dynamic balancing valve set to 0.20mm, the valve closing time will be increased.

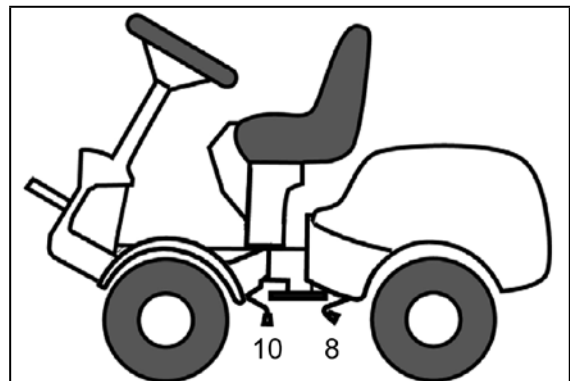
By-pass valves

The axle drives are equipped with by-pass valves. Each by-pass valve is connected to their clutch release lever. When the by-pass valve (10) is open, it allows oil to flow into the motor housing and the pressure drop

over the motor is such neutralized. The bypass valve is intended to make it possible to push the machine without heavy resistance from the axle drive.

The front by-pass valve is equipped with a mechanic interlock which always resets the valve, if previously opened, at driving attempts forwards

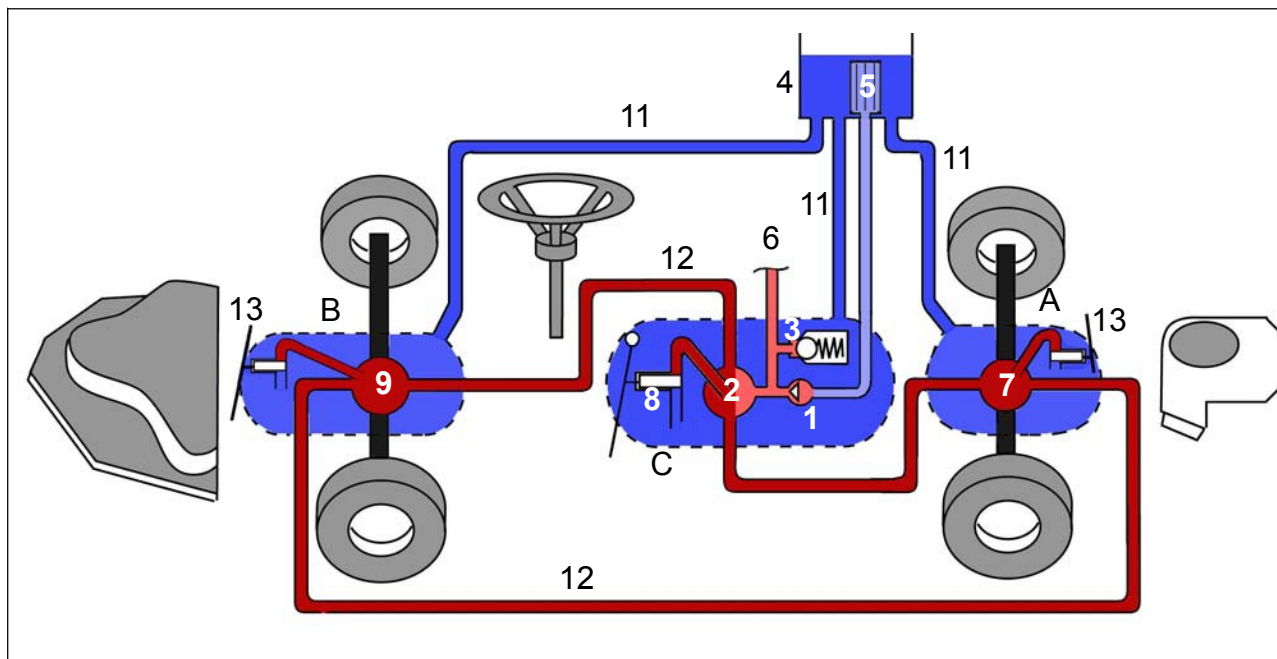
An attempted to drive the machine forwards with the rear by-pass valve (8) closed and the front by-pass valve (10) open will result in an powerful oil flow into the front axle drive housing. Since the leak flow line (11) not are dimensioned for this flow and the main flow line (13) is blocked, it will result in a hazardous pressure rise in the front axle drive housing. This pressure rise forces the oil to presses out through the sealings and can cause damages.



8. Rear clutch release lever, connected to the rear bypass valve.
10. Front clutch release lever, connected to the front bypass valve.

4.4 Separate hydraulic pump for the power transmission

4.4.1 Physical description



- A. Rear axle drive with its hydraulic motor (7).
- B. Front axle drive with its hydraulic motor (9).
- C. Hydraulic pump. The parts 1-3 and 8 below are built in the hydraulic pump.
 - 1. Charge pump, 35-45 bar.
 - 2. Main pump.
 - 3. Pressure limit valve for the charge pressure.
 - 4. Oil container.
 - 5. Oil filter.
 - 6. Connection to the external hydraulics (steering converter and implement lifter).
 - 7. Hydraulic motor in the rear axle drive (A).
 - 8. By-pass valve in the main pump (C).
 - 9. Hydraulic motor in the front axle drive (B).
 - 11. Leak flow lines.
 - 12. Main flow lines.
 - 13. B-pass valve (only used when oil change)

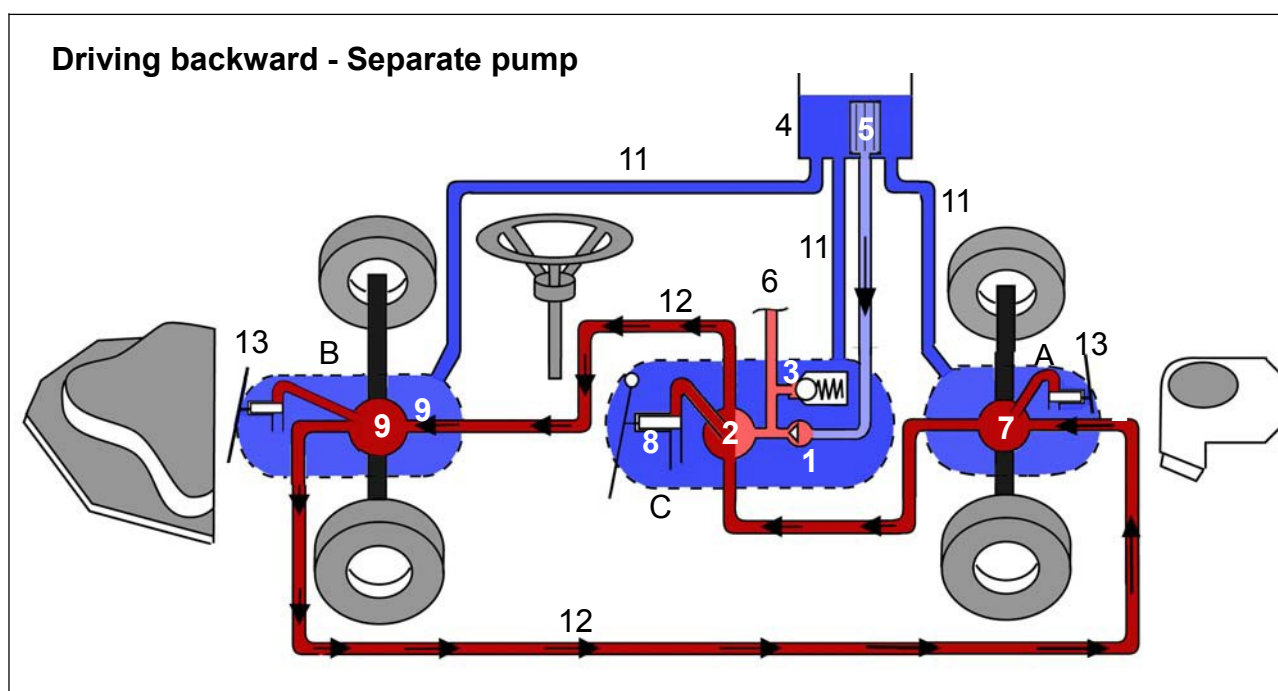
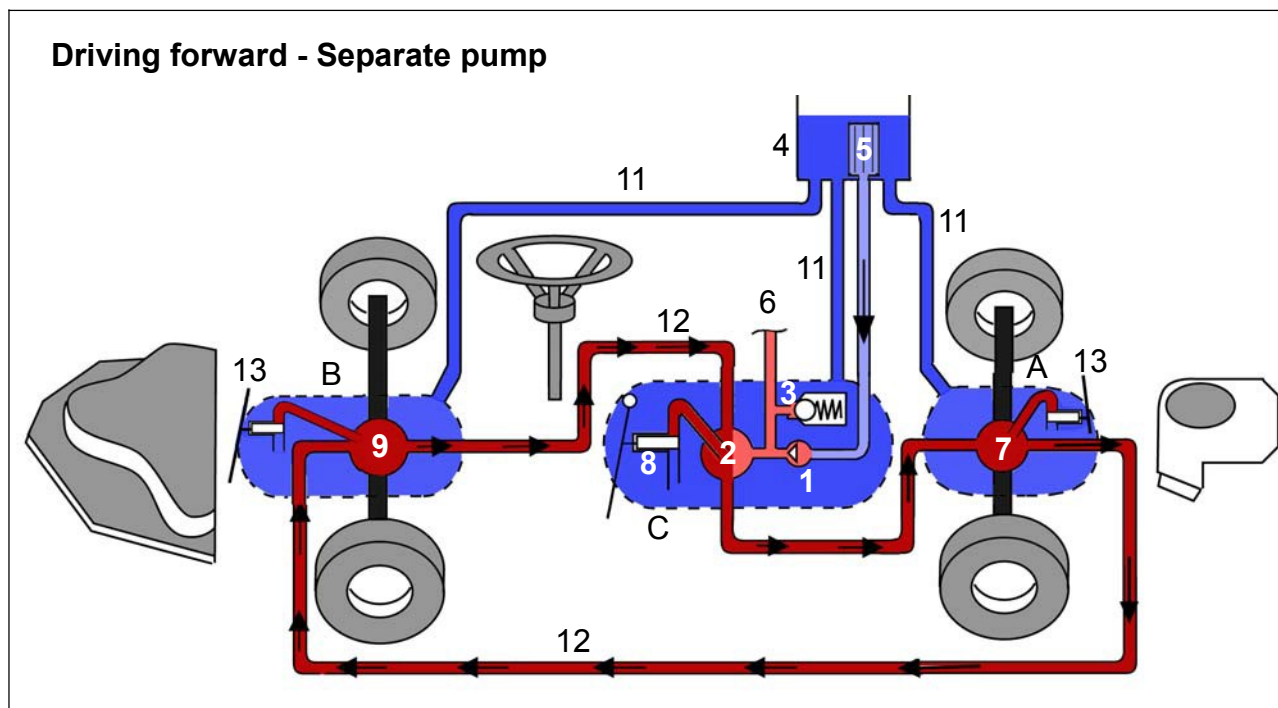
Colour - Pressure

- Red is the feeding pressure to the main pump and to the external hydraulics.
- Dark red is the working pressure to the hydraulic motors.
- Blue is the atmospheric pressure in the oil container and housings.
- Light blue is below the atmospheric pressure (pump suction side).

4.4.2 Functional description

Driving

The oil flows when driving forwards respectively backwards are shown in the diagrams below.



The charge pump (1) and the main pump (2) are integrated into one unit, the hydraulic pump (C) which is located separat in front of the engine.

The engine drives the the hydraulic pump (C) with a constant speed. The charge pump (1) is feeding the main pump (2) with 35-45 bar. The oil, fed into the main pump during operation, is a replacement for the leak oil from the front and rear axle drives (A and B) and the main pump (2).

The charge pump sucs its oil from the oil container (4) and through the filter (5).

The oil flow and the flow direction through the main pump (2) - front hydraulic motor (9) - rear hydraulic motor (7) is controlled by the speed pedal, mechanical connected to the main pump (2). The main pump pressure is depending on the power requirements at the wheel axles and is limited by the engine power.

The hydraulic motors and the hydraulic pump have a small oil leakage (1-4%), which increases with increased power requirement (increased pressure). The leakage oil is collected inside the unit housings an forwarded back to the oil tank through the leak flow lines.

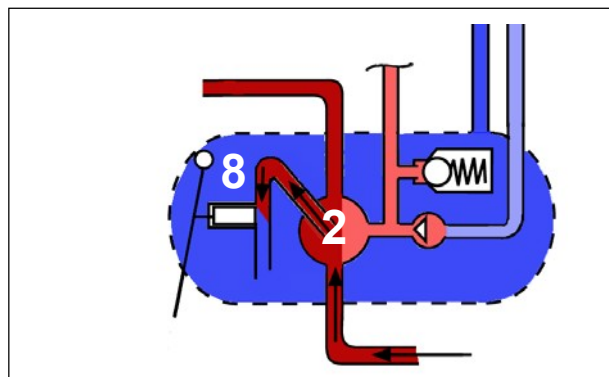
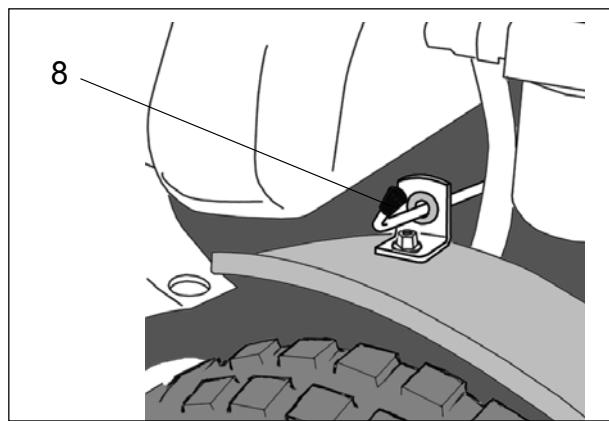
The motors are connected in serie with the rear hydraulic motor (7) first, when driving forwards. This means, due to the leakage in the rear motor, that the machine under normal conditions drives on the rear wheels only. When the rear wheels begin to slip (rotate with 1-4% higher speed than the front wheels) also the front wheels start to drive and the slipping is avoided. This fact is not noticed by the operator, since the machine is driven with its four wheels after demand.

By-pass valve

The main pump (2) is equipped with a by-pass valve (8), connected to its clutch release lever. When the by-pass valve is open, the main pump is disconnected from the oil circuit by an open passage out into the housing.

The pressure drop over the pump is such neutralized and the oil can flush free in the system. See the figure.

The by-pass valve is intended to make it possible to push the machine without heavy resistance from the main pump.



Charge pump

The charge pump has two tasks:

- To feed the external hydraulic with 35-45 bar.
- To feed the main pump with its initial pressure, 1,5-2,5 bar.

External hydraulic

The charge pump (1) sucks oil from the oil container (5).

When the external hydraulics are in use, the pressure in the out line (3) is limited to 35-45 bar by the pressure valve (4).

Without external hydraulic

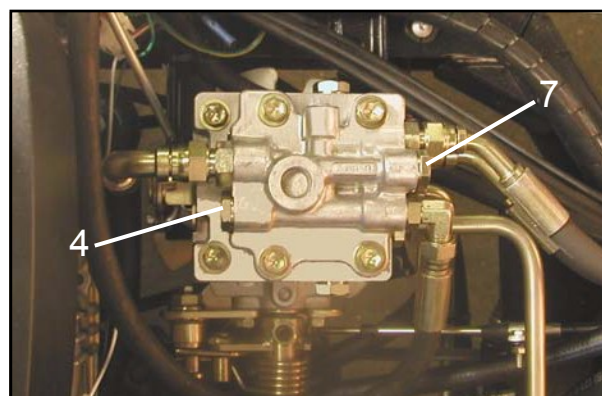
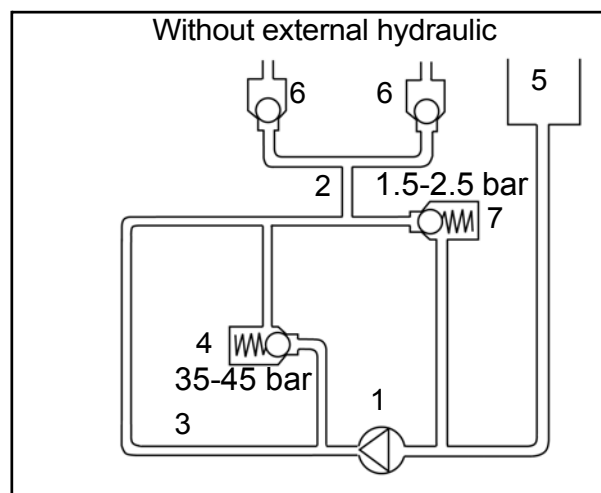
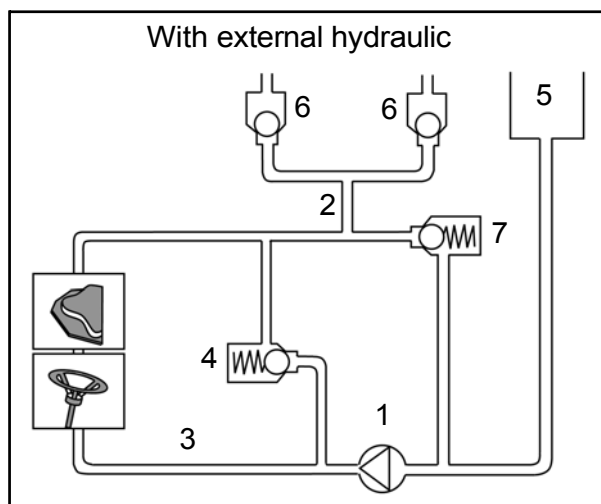
The connections for the external hydraulics are connected to each other. Compare the two figures.

The charge pump (1) sucks oil from the oil container (5).

The pressure valve (4) has no function because the pressure valve (7) is set to a much lower pressure (see below).

Feeding the main pump

The line (2) feeds oil to the main pump respective suction lines (depending on driving forwards or backwards) through the respective back valves (6). The pressure in the line (2) is limited to 1,5-2,5 bar by the pressure valve (7).

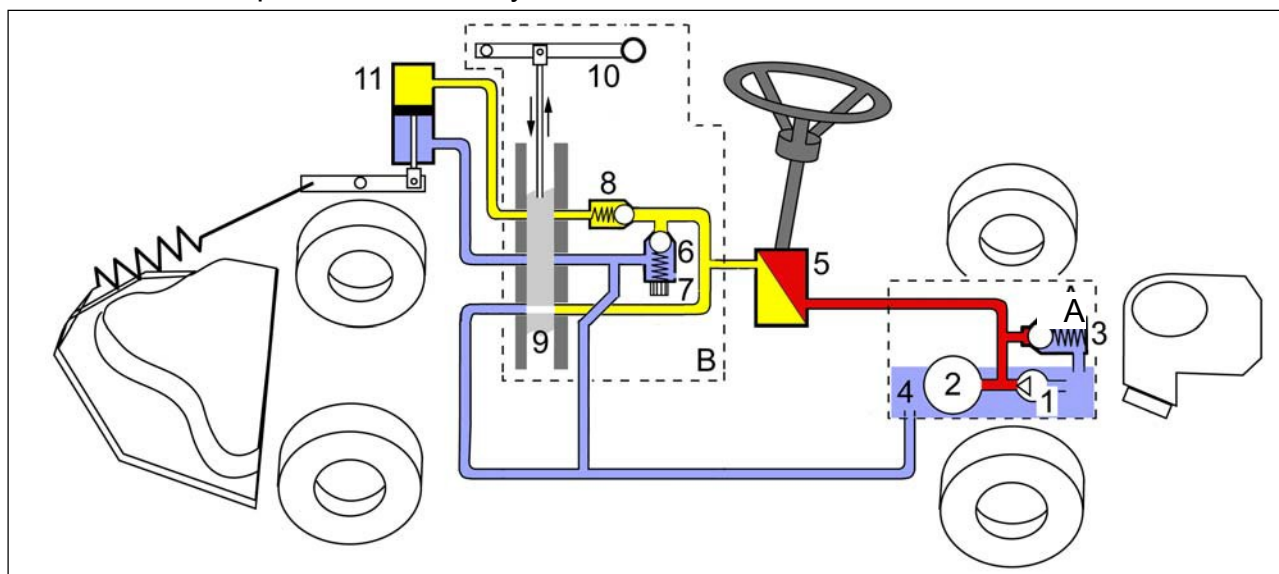


4.5 Hydraulic assisted steering and implement lifter

This section is valid for 4WD machines with steering chain.

4.5.1 Physical description

This section explains the physical arrangement of the hydraulic components and the different maximal pressures in the system.



- A. The dashed box indicates parts (1-4) which are built in the rear axle drive or arranged separat in front of the engine.
 - B. Hand operated valve unit with the built in parts 6-10.
 - 1. Charge pump.
 - 2. Main pump. This pump belongs to the driving system and supplies the oil pressure/flow.
 - 3. Pressure limit valve.
 - 4. Oil container.
 - 5. Steering torque converter.
 - 6. Pressure limit valve.
 - 7. Pressure adjustment screw.
 - 8. Non-return valve.
 - 9. Slide with 4 different hole patterns for the resp. functions. Illustrated in normal status.
 - 10. Hand lever, connected to the slide.
 - 11. Double acting lifting cylinder.
- Red lines indicate the maximum total pressure from the HST when the torque converter (5) works.
- Yellow lines indicate the maximum pressure to the lifting cylinder when it lifts the implement.
- Blue lines indicate return oil with low pressure (>1 bar).

4.5.2 Functional description

Normal condition

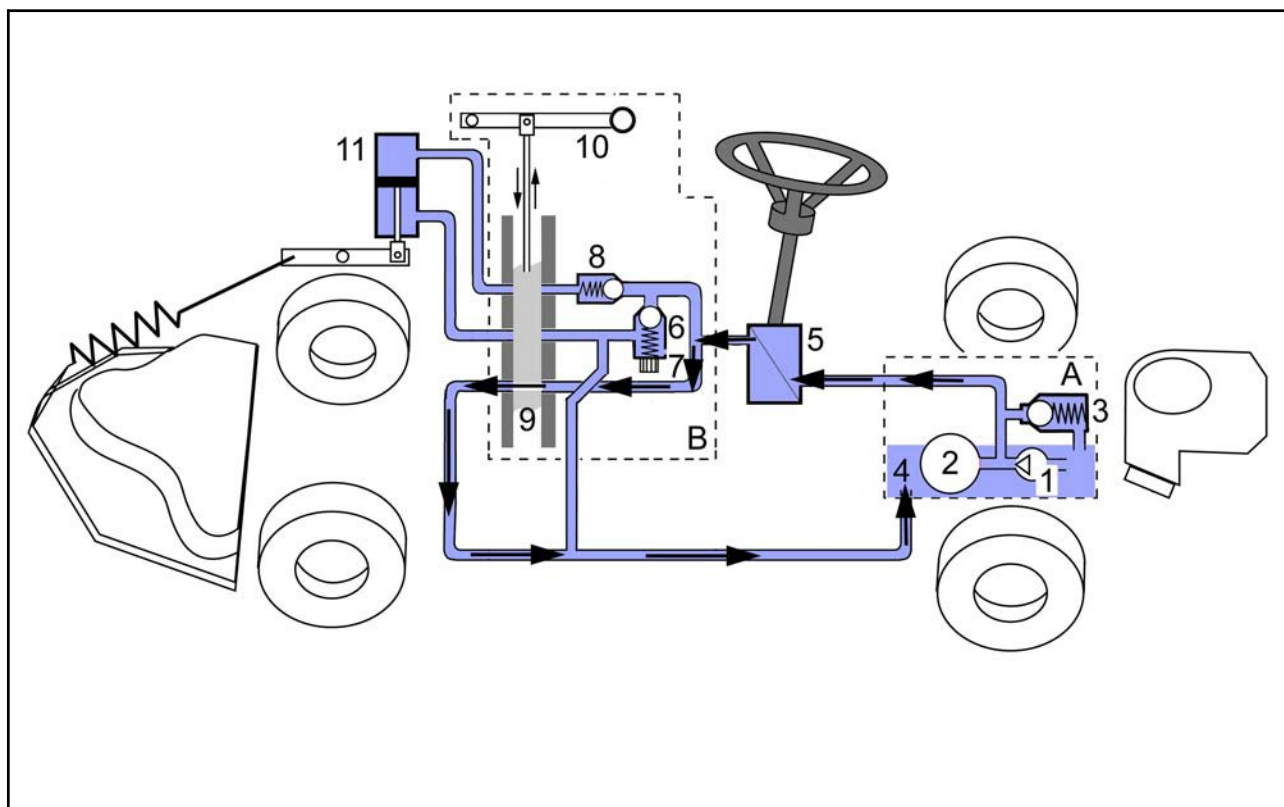
Operation state:

- Motor is running in full speed.
- The steering wheel is not actuated.
- The implement lifter is not activated.

The loading pump (1) is forcing oil through the steering converter (5), and the open valve (9).

The oil flow is indicated with arrows in the figure below. Since neither of the two items are working, the resistance can be ignored and the pressure is very low (<1 bar).

In the normal condition, the lifting cylinder (11) is locked in its set position, because no oil can flow out or in since the oil lines are shut by the slide (9).



Raising

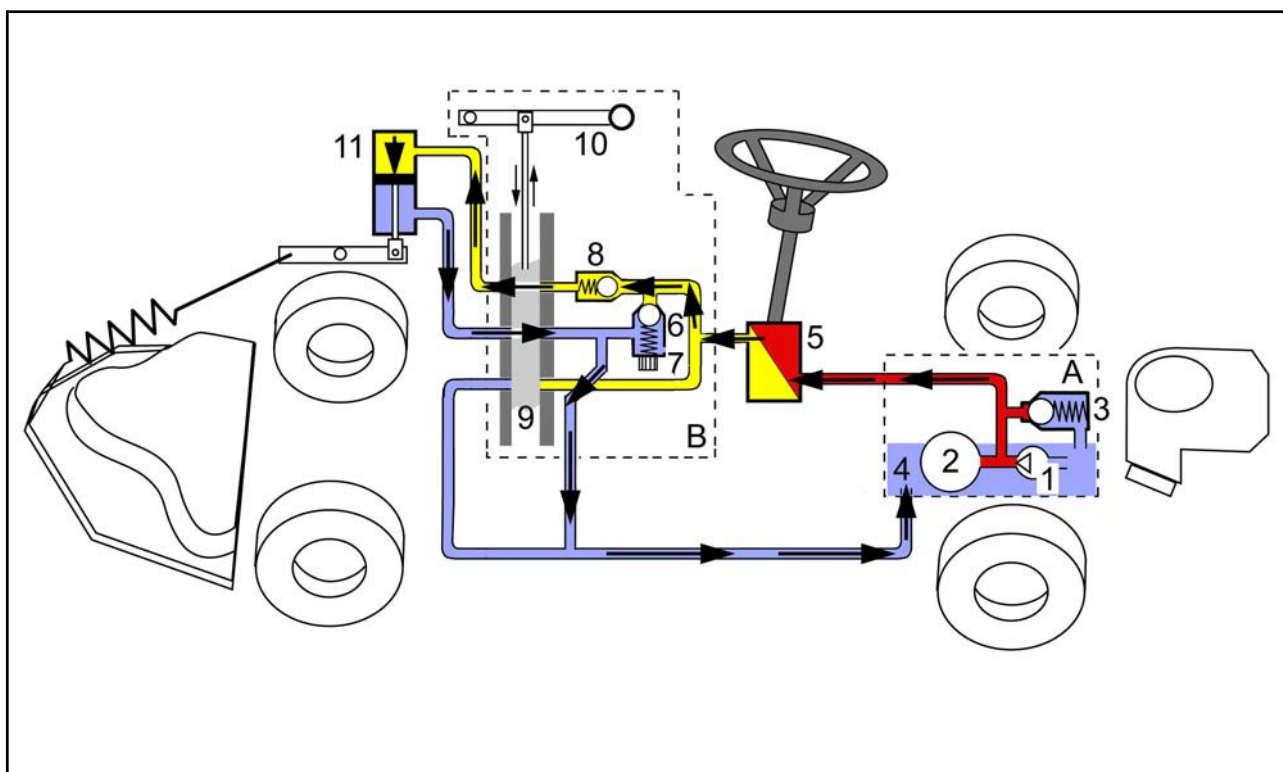
Operation state:

- Motor is running in full speed.
- The steering wheel is actuated or not.
- The implement lifter is activated upwards.

The operator has actuated the hand lever (10) to its raising position (rear position), which moves the slide (9) to change the hole pattern between the connections in the valve. The hole pattern is adapted for the raising procedure. Oil forces through the non-return valve (8), through the slide (9) and presses out the piston in hydraulic cylinder (11).

When the piston in cylinder (11) is fully extended and the hand lever still is activated, the oil will flow only through the valve (6) and a noise will be heard from the valve.

When the hand lever is released, valve (9) will return to its neutral position and the system switches over to its normal state. The piston in the hydraulic cylinder (11) is then locked in its actual position.



Lowering

Operation state:

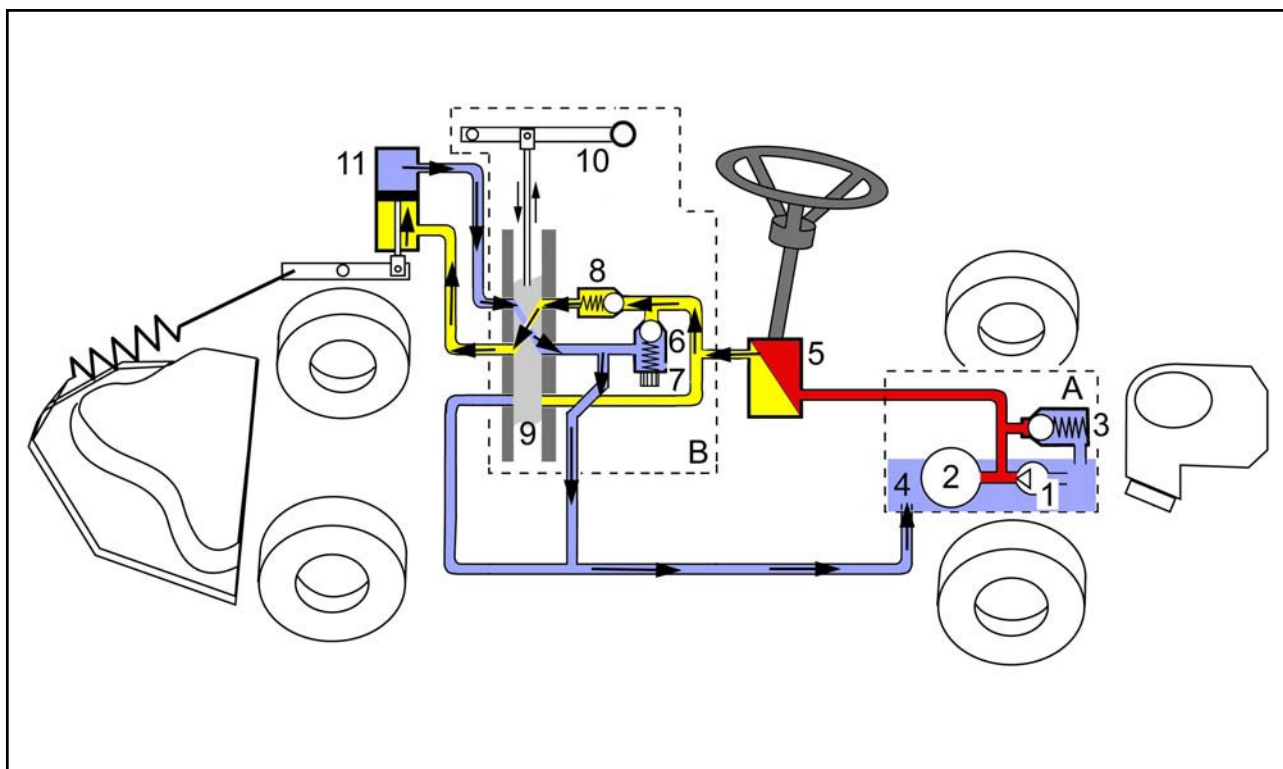
- Motor is running in full speed.
- The steering wheel is actuated or not.
- The implement lifter lever is activated upwards.

The operator has actuated the hand lever (10) to its lowering position (one step forwards), which moves the slide (9) to change the hole pattern between the connections in the valve. The hole pattern is adapted for the lowering procedure (crossed in the figure below). Oil forces through the non-return valve (8), through the slide (9) and presses back the piston into the hydraulic cylinder (11).

In this arrangement, the implement is forced down, irrespective its weight.

When the piston in cylinder (11) has reached its bottom position and the hand lever still is activated, the oil will flow only through the valve (6) and a noise will be heard from the valve.

When the hand lever is released, valve (9) will return to its normal position and the system switches over to its normal state. The piston in the hydraulic cylinder (11) is then locked in its actual position.



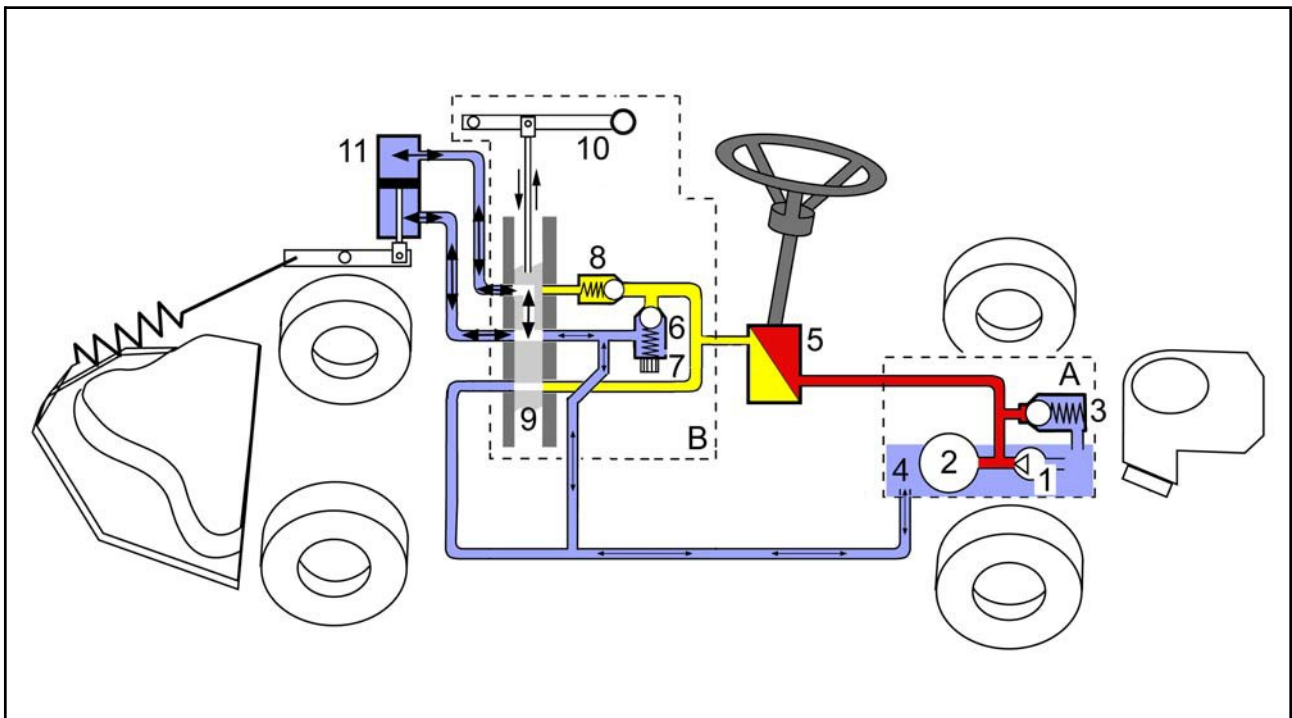
Floating position

Operation state:

- Motor is not running or is running in full speed.
- The steering wheel is actuated or not.
- The implement lifter is in its upper position.

The operator has actuated the hand lever (10), to its floating position (locked in front position) which moves the slide (9) to change the hole pattern between the connections in the valve. The hole pattern is adapted for the floating status. Both sides of the lifting cylinder (11) is connected to each other and to the return line in the slide (9). I.e. no pressure can reach any side of the cylinder. No oil pressure affects the cylinder. The main part of the oil is flowing between the upper part and the lower part of the cylinder. A smaller part is flowing between the oil container (4) and the cylinder due to the displacement of the piston rod. See the arrows in the picture below.

In the floating position, the implement always rests against the ground with the same force (the weight of the implement) and follows the contours of the ground.



4.6 Hydraulic assisted steering

This section is valid for 2WD machines (e.g. Park Ranger Svan).

4.6.1 Physical description

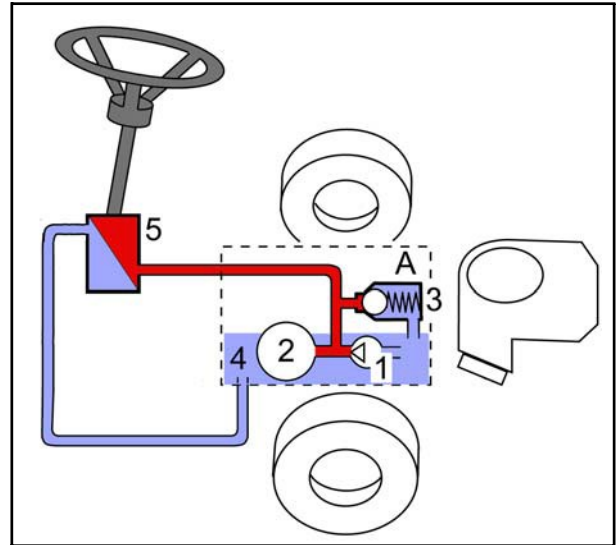
This section explains the physical arrangement of the hydraulic components and the different pressures in the system.

A. The dashed box indicates parts (1-4) which are built in the rear axle drive.

1. Charge pump.
2. Main pump. This pump belongs to the driving system and supplies the oil pressure/flow.
3. Pressure limit valve.
4. Oil container.

Red lines indicate the maximum total pressure from the HST.

Blue lines indicate return oil with low pressure (<1 bar).



4.6.2 Functional description

Steering wheel actuated

Operation state:

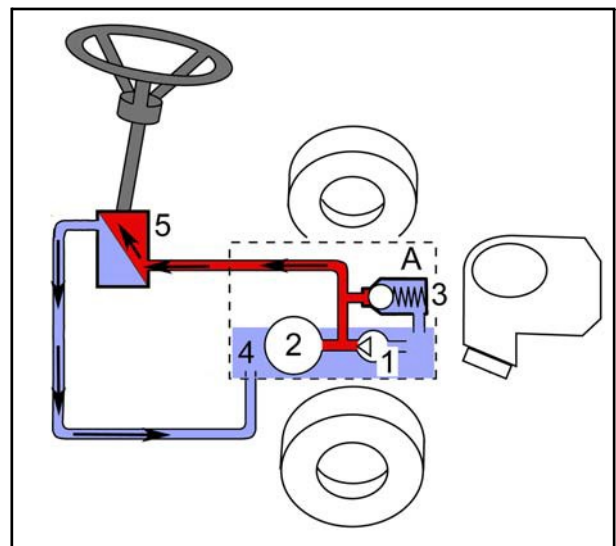
- Motor is running in full speed.
- The steering wheel is actuated.

The loading pump (1) is forcing oil through the steering converter (5).

The oil flow is indicated with arrows in the figure below. Since the steering converter (5) is working, a pressure drop will be built up over it.

The pressure drop =
 the pressure in the red line - the pressure after the steering converter (5)

The pressure drop is depending on the steering power needed and is limited of the built in valve (3).



4.7 Trouble shooting

Warning!

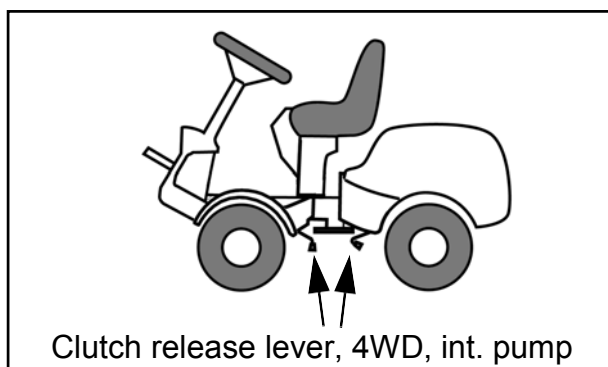
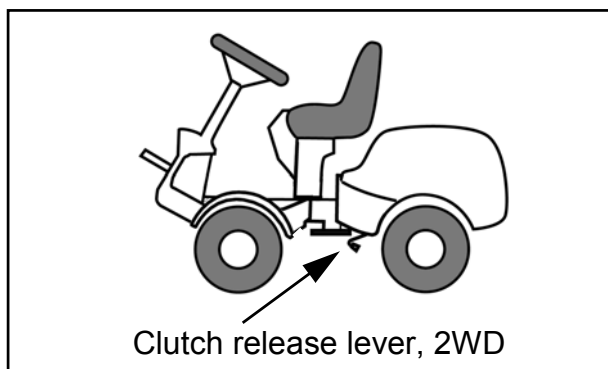
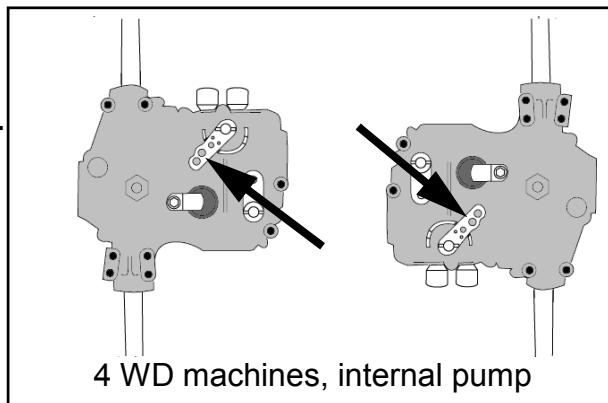


Hydraulic oil under pressure can be very dangerous if hoses, lines or other distribution parts are leaking. To avoid personal injuries, always wear protection gloves and protection goggles during works with the hydraulic system.

4.7.1 Drive system

Before the trouble shooting takes place, it is provided that the following states are fulfilled:

- Machines with external pump; the axle bypass valves are in drive position. See the figure..
- The clutch release lever (levers) shall be in the drive position. See the figures.
- Oil level in the oil container as desired.
- No air in the hydraulic oil.



Symptom	Valid for	Fault	Measure
The machine drives forwards but not backwards.	Machines with separate hydraulic pump.	Front by-pass valve open. Big leakage in the front axle drive.	Close the by-pass valve. Replace the front axle drive.
The machine drives backwards but not forwards.	Machines with separate hydraulic pump.	Rear by-pass valve open. Big leakage in the rear axle drive.	Close the by-pass valve. Replace the rear axle drive.
Reduced speed forwards and possibly faster backwards.	Machines with separate hydraulic pump.	Speed control cable housing is moved.	Adjust the cable housing.
Reduced speed and uneven drive.	All machines.	The suction filter (5) is clogged.	Clean the filter.
The front wheels don't drive.	All machines.	One of the axle keys is broken.	Replace the actual key.
The rear wheels don't drive.	All machines.	One of the axle keys is broken.	Replace the actual key.
Reduced or no speed.	Machines with separate hydraulic pump.	The belt between motor and pump is slipping. Check if the fan and pulley at the pump rotate.	<u>Worn belt</u> Replace the belt. <u>Maladjusted clutch wire</u> Adjust the wire.
		Big leakage in the external pump.	Replace the external pump.
		The charge pump defective.	Replace the external pump.
		The pressure limit valve (1,5-2,5 bar) for the charge pump defective.	Check the valve and its spring. See "" at page 11" at page 11.
	Machines with integrated hydraulic pump.	The belt between motor and pump is slipping. Check if the fan and pulley at the pump rotate.	<u>Worn belt</u> Replace the belt. <u>Maladjusted clutch wire</u> Adjust the wire.
		Big leakage in the rear axle drive.	Replace the rear axle drive.
	All machines.	Speed control cable loose or mowed.	Repair/adjust the speed control cable.

4.8 External hydraulic

Warning!



Hydraulic oil under pressure can be very dangerous if hoses, lines or other distribution parts are leaking. To avoid personal injuries, always wear protection gloves and protection goggles during works with the hydraulic system.

Warning!

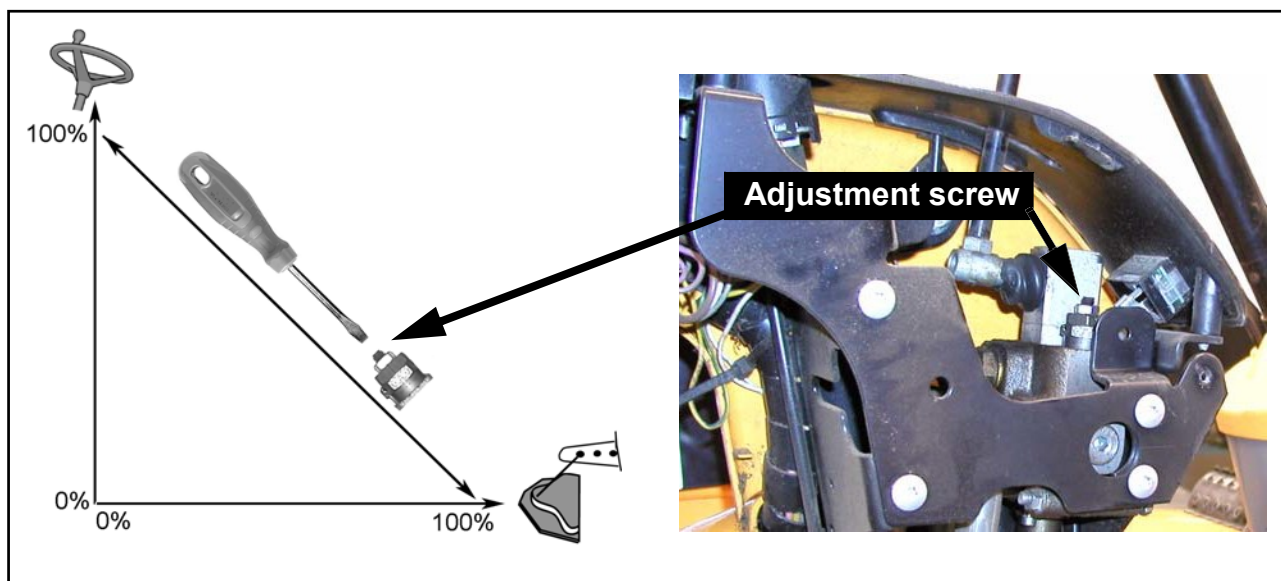


Before starting the motor, place the machine outdoors or install an extraction device for the exhaust fumes. Otherwise the personnel will be poisoned.

This section describes the trouble shooting procedures in absence of proper functions at the hydraulic assisted steering and implement lifter. It also describes the correction measures in each actual case. When following the trouble shooting table, it is provided that the following states are fulfilled:

- Parking brake not activated.
- A new filter installed
- Motor is running in full speed.
- The oil reservoir level shall be adjusted.
- The machine is warmed up during at least 10 minutes to a oil temperature of at least 50°C.

The pressure (about 35 bar) in the external hydraulic is divided between the implement lifter and the steering torque converter. If anyone of these gets more pressure, the other must gets less. See the diagram.



Adjustment

Warning!



Never screw out the adjustment screw too far, this will cause loss of steering capacity.

After adjustment; Always check the steering capacity with the implement lifter working against its stop.

Adjust the pressure (yellow line) by loosening the counter nut and rotate the adjustment screw.

Turn right (against bottom) to increase the lifting capacity and to decrease the steering ability.

Turn left (up) to decrease the lifting capacity and to increase the steering ability.

Lock the counter nut after the adjustment is finished.

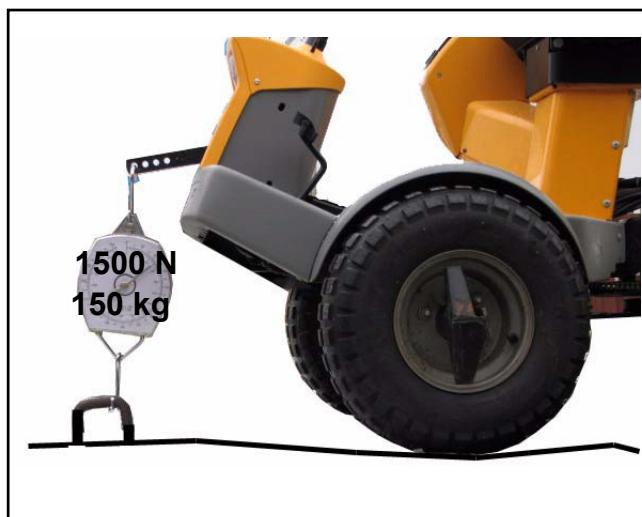
Adjustment procedure

1. The lifting capacity is set to about 1500 N / 150 kg at the factory. Measure the force and adjust if necessary..
2. Drive the machine and test the steering ability.

If the steering is comfortable, the adjustment is OK.

If the steering is not comfortable, decrease the lifting ability.

If it is possible to reach an adjustment, where both the heaviest deck used can be lifted, and the steering feels comfortable, the adjustment is OK. If not, see below:



If the steering is comfortable when the screw is in its upper position and the lifting capacity is OK when the screw is in its lower position, replace the charge pump in the HST.

If the steering is impossible to get comfortable even when the screw is in its upper position and the lifting capacity is OK when the screw is in its lower position, replace the torque converter.

Trouble shooting the torque converter

One prerequisite for the function of the power assisted steering is the play in the steering. This play must always spring back to the starting position when the wheel is released. Test by slowly turning the wheel in one direction when the engine is switched off. At first there is a slight resistance, which increases when the machine begins to turn. Release the wheel. It should now return to the middle position.

The wheel should spring back approx. 10-20 mm when the wheel is released after turning. However, the machine will not automatically “drive straight forward” after turning in the same way as a car.

If the machine always turns in the same direction as soon as the engine is started, there is probably a fault in the torque converter.



Note!

If the steering does not function this does not mean that there is always a fault in the torque converter. Faults can also occur in more simple mechanical parts such as chains and gear wheels.

4.9 Change of transmission oil, 4WD

4.9.1 Transmission with external pump

The oil and the filter in the hydraulic power transmission must be checked/adjusted or replaced at intervals according to the table below.

Action	1st time	Then at interval
	Hours of operation	
Check – adjusting level.	-	50
Changing oil. Cleaning tank filter.	5	200
Replace filter in the hydraulic circuit. Pro20, Pro25	5	200

Oil type: Synthetic oil 5W-50.

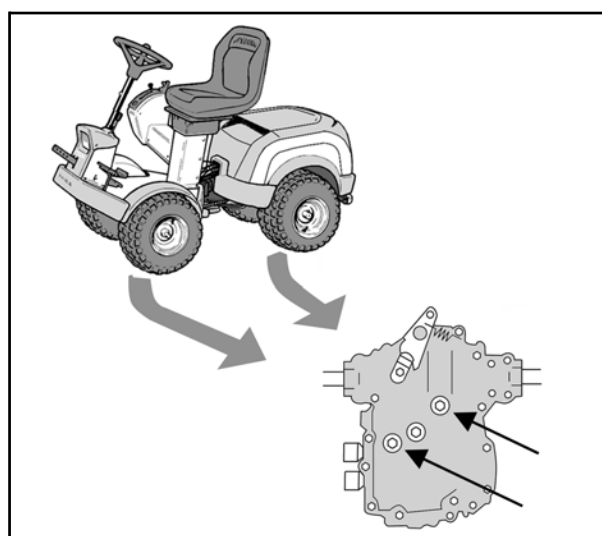
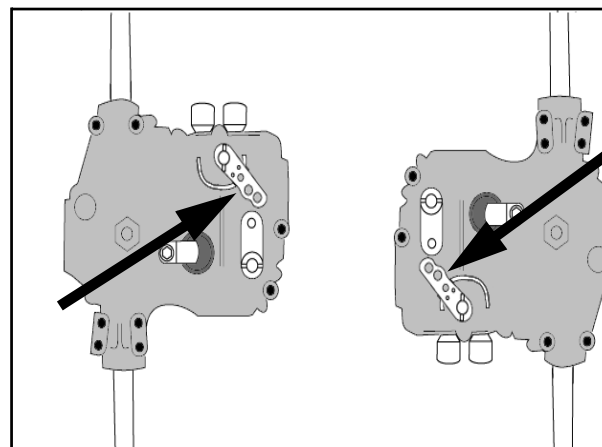
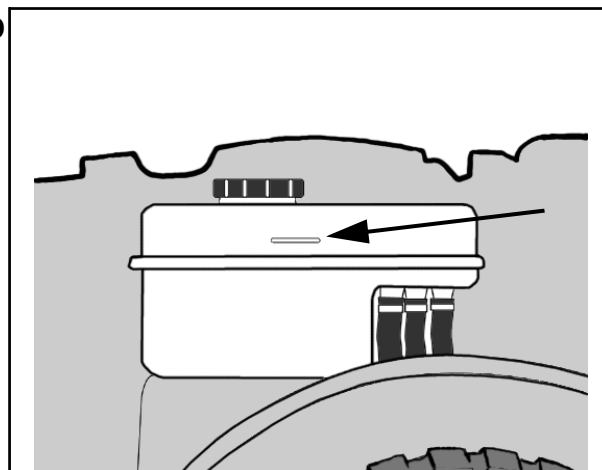
Oil volume at change: approx. 4.2 litres.

Check – adjustment

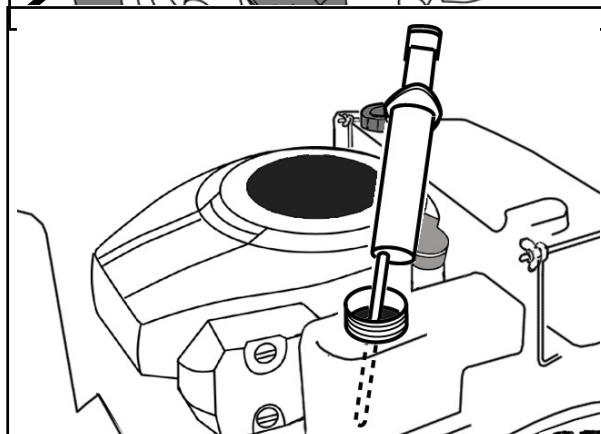
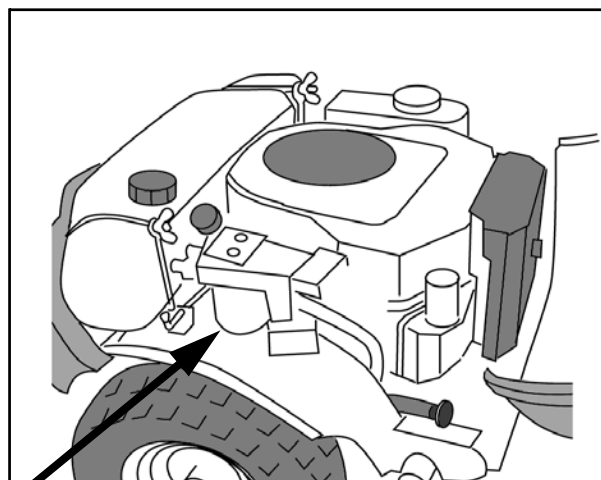
1. Place the machine on a flat surface.
2. Read off the oil level in the reservoir. See the figure. The level should be level with the line.
3. If necessary, top up with more oil.

Draining

1. Operate the machine at varying speeds for 10-20 minutes in order to warm up the transmission oil.
2. Open the drive shafts' valves in accordance with the figure.
3. Place one collection trough under the rear axle and one under the front axle.
4. Remove 2 drainage plugs from each axle. Use a 12 mm socket wrench. See the figure.
5. Remove the filler cap from the oil tank.



6. Machines with externa hydraulic: Clean the area around the hydraulic circuit's filter and dismantle the filter. See the figure.
7. Allow all the oil to run out into the collection trough.
8. Draw out the oil from the deeper section of the reservoir using an oil extractor. See the figure.
9. Hand in the oil for disposal in accordance with local provisions.



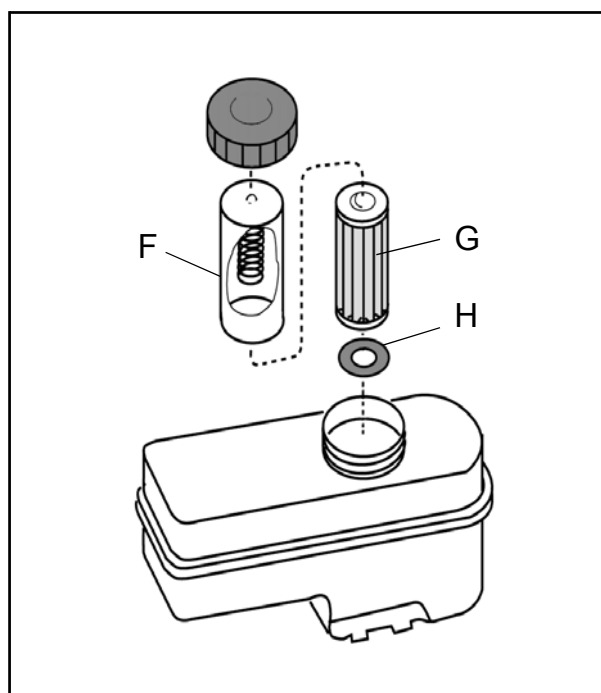
Cleaning/replacing the tank filter

Measures:

Metal filters shall be cleaned.

Paper filter shall be replaced.

1. Press the filter casing (F) down into the upper section of the tank and move the casing forwards to the hole.
2. Pull up the filter casing together with filter and spring.
3. Pull the filter (G) out of the casing.
4. Check that the rubber gasket (H) in the bottom of the filter is intact.
5. Fit the new filter and spring in the casing. Insert the filter until it snaps into position in the casing.
6. Reinstall the unit in the tank. The upper part of the filter casing must snap into position in the slot in the upper section of the tank.



Filling

1. Check that the gaskets on the 4 drainage plugs are intact. Reinstall the plugs. Tightening torque: 15-17 Nm.
2. Machines with externa hydraulic: Moisten the new filter's gasket with oil and install the filter.
3. Fill the oil reservoir with the new oil.
4. Check that the clutch release lever (R) is in the outer position (drive position).

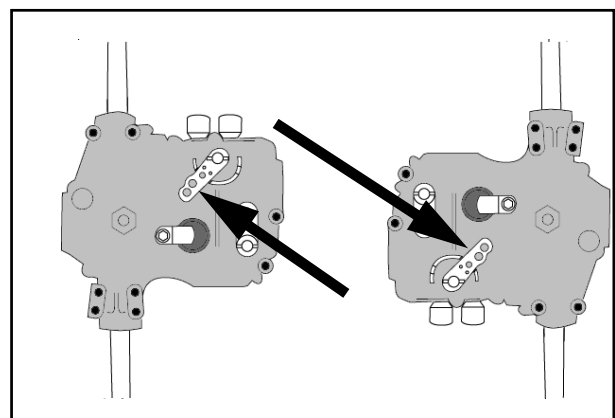
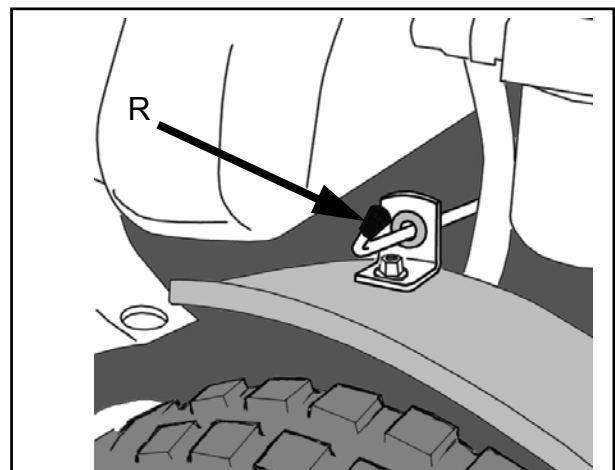
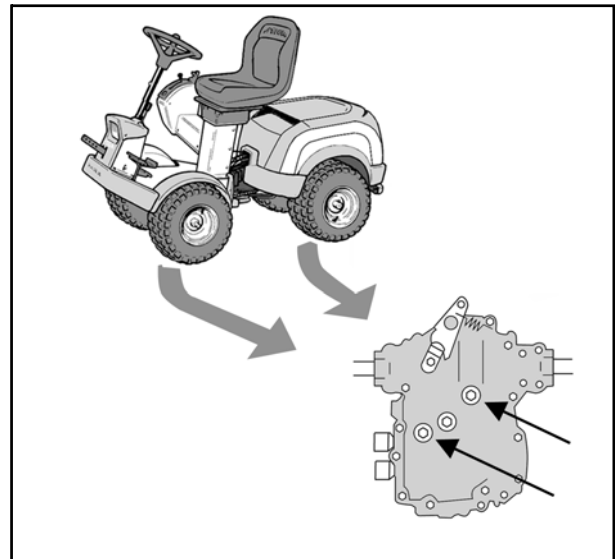


If the engine is to be run indoors, an exhaust extraction device must be connected to the engine's exhaust pipe.

5. Prepare a suitable vessel with the new oil.

NOTE! The oil is sucked into the system very quickly. The reservoir must always be kept topped up. Under no circumstances may air be sucked in.

6. Fill the oil reservoir with new oil.
7. Start the engine and allow it to idle. Gradually top up the oil in the reservoir so that the level constantly reaches the mark.
8. Reinstall the oil filler cap and close the engine casing.
9. Reset the drive shafts' valves in accordance with the figure.
10. Drive the machine 8-10 metres forwards and 8-10 metres backwards. If the machine has hydraulic power assisted steering, apply full steering lock at the same time.
11. If the machine has a hydraulic implement lifter, raise and lower the lifter 3-4 times.
12. Adjust the oil level in the reservoir.



4.9.2 Transmission with the hydraulic pump in the rear axle drive

The oil and filter in the hydraulic power transmission must be checked/adjusted and changed at the intervals given in the table below.

Action	1st time	Then at intervals of
	Hours of operation	
Checking – adjusting level.	-	50
Changing the oil Cleaning the filter.	5	200

The type of oil is dependent on the hours of operation according to the table below:

Hours of operation	Oil type
More than 100 hours of operation/year	Synthetic oil 5W-50
Less than 100 hours of operation/year	Synthetic oil 5W-50

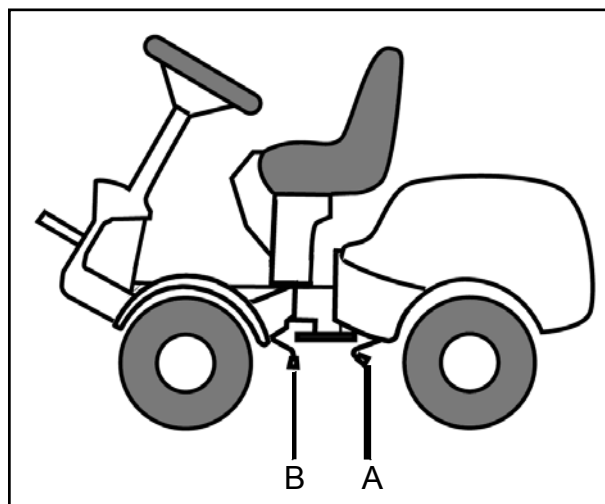
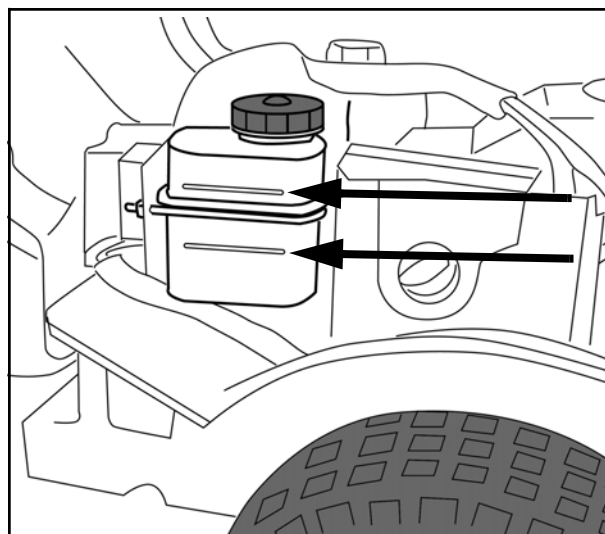
Oil quantity when changing: approximately 3.5 litres.

Check – adjustment

1. Place the machine on a flat surface.
2. Read off the oil level in the reservoir. See the figure. The level should be level with the line.
3. If necessary, top up with more oil.

Draining

1. Run the machine at variable speeds for 10-20 minutes to heat up the transmission oil.
2. Position the machine completely horizontally.
3. Pull out both disengagement levers A and B according to the figure.



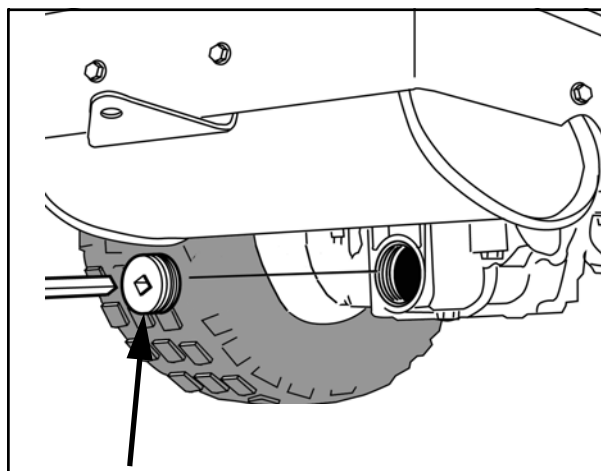
4. Place one container under the rear axle and one under the front axle.

5. Open the oil reservoir by removing the cover.



Only a 3/8" square drive may be used for the plug. Other tools will damage the plug.

6. Remove the plug from the rear axle. Clean the hole and use a 3/8" square drive. If the machine is equipped with filter, remove the filter and allow the oil in the rear axle and reservoir to run out. See the figure.



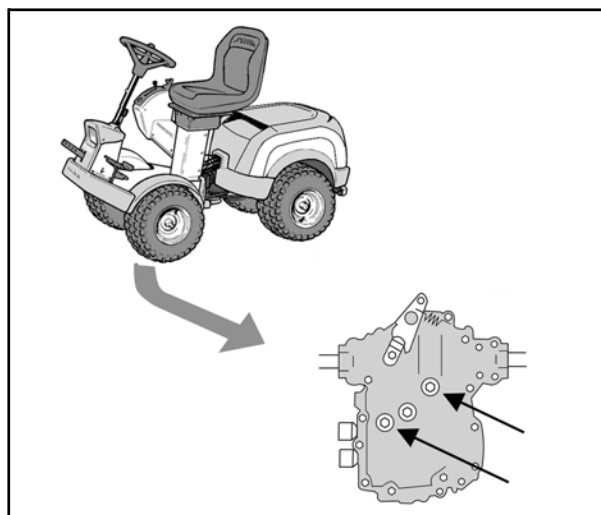
7. Remove 2 drain plugs from the front axle. Use a 12 mm socket. Allow the oil in the front axle and pipes to run out. See the figure.

8. Check that the gaskets on the drain plugs of the front axle are intact. See the figure. Reinstall the plugs. Tightening torque: 15-17 Nm.



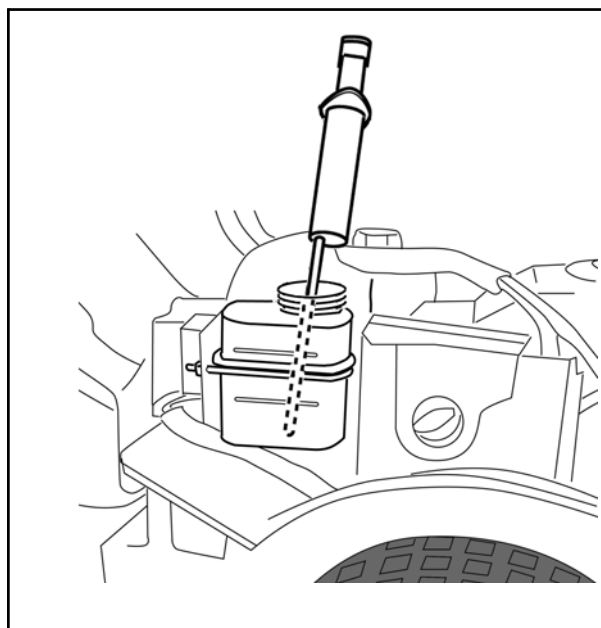
The plug will be damaged if it is tightened more to than 5 Nm.

9. Check that the gasket on the plug (V) of the rear axle is intact. Reinstall the (filter) and plug in the rear axle. Tighten the plug to 5 Nm.



10. Draw out the oil from the deeper section of the reservoir using an oil extractor. See the figure.

11. Dispose of the oil according to local regulations.



Filling.

The engine must never be run when the rear clutch release lever is pushed in and the front clutch release lever is pulled out.

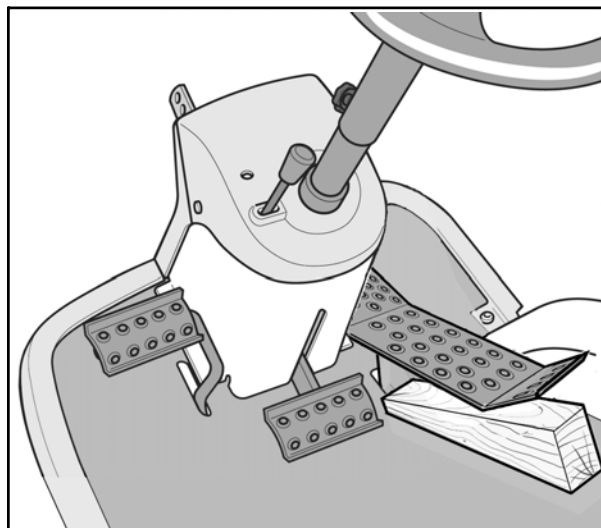
This will damage the front axle seals.

1. Fill the oil reservoir with the new oil.



If the engine is run indoors, exhaust extraction equipment must be connected to the engine's exhaust pipe.

2. Check that the rear axle's clutch release lever is pulled out.
3. Start the engine. When the engine is started, the front axle's clutch release lever slides inwards automatically.
4. Pull out the front axle's clutch release lever.
NOTE! The oil is drawn into the system very quickly. The reservoir must always be topped up. Air must never be drawn in.
5. Set the accelerator pedal to the forward position by blocking it using a wooden wedge. See the figure. Fill the oil reservoir by hand using new oil.
6. Run in the forward position for one minute.
7. Move the wooden wedge and set the accelerator pedal to the reverse position. Continue filling with oil.
8. Run in reverse mode for one minute.
9. Change driving direction once every minute as above and continue filling with oil until the bubbling in the reservoir stops.
10. Switch off the engine, install the oil reservoir cover and close the engine cover.
11. Test drive for several minutes and adjust the oil level in the reservoir.



5 Belts

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5.1.1 Why it is so important to use original belts from the retail dealer?	2
5.2 Replacements	4

General

All mechanical power, delivered by the motor, is conducted to the different power consumers by a belt system. The belt system has in general the same configuration in all the machines covered by this manual. Where divergences occur between the machines, particular instructions are given for each machine. The maximum tension of each belt is regulated by a spring loaded belt tensioner.

This chapter gives a brief description of the belt system and describes replacements of belts and adjustments of their tensions.

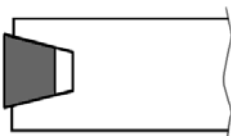
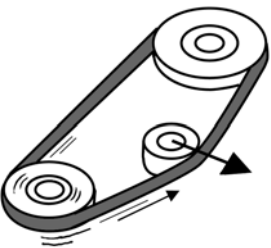
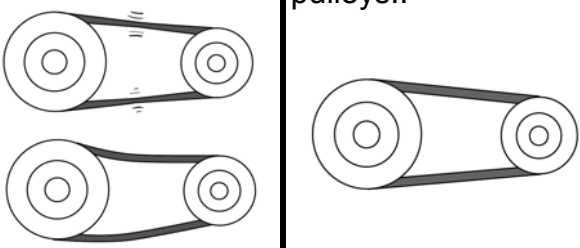


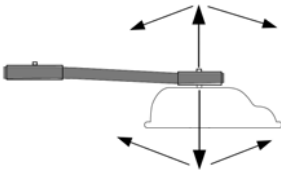
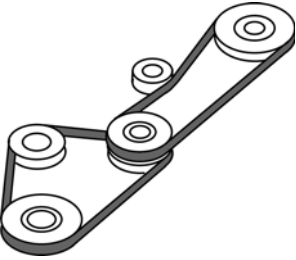

5.1 Belt theory

5.1.1 Why it is so important to use original belts from the retail dealer?

The table below shows the demands on normal commercial grade belts compared to demands on original spare parts belts from the retail dealer. The later are designed and manufactured in close connection between the subcontractor and the rider manufacturer.


The table is intended to display the importance to use the original belts.


Case	Commercial grade belts	Original spare parts belts	Remarks
Fitness to pulleys. 	The belt shall rest with its angled sides against the pulleys. There must be a space between belt and pulley bottom.	The belt shall rest with its angled sides against the pulleys. There must be a space between belt and pulley bottom.	Same demands. Original belts guarantee that the belt fits against the pulleys.
Acceleration. 	The belt follows the motor rpm in a continuous acceleration up to full speed.	Some belts shall engage to the pulleys with the motor running in full speed, which gives an excessive generation of heat.	Common belts are made of natural rubber, which can resist temperatures up to 70° only. Original belts are made of chloroprene rubber, which can resist temperatures up to 90°
Length 	Manufactured in standard lengths in steps..	Manufactured in predefined lengths to fit between the pulleys..	The distance between the pulleys is fix. The belt tensioner gives the original belt an optimal tension.

Case	Commercial grade belts	Original spare parts belts	Remarks
Floating pulley at the implement. 	Designed to transmit power between aligned, parallel and fixed pulleys.	The original PTO belt is designed to operate, even if the pulleys are moving up and down and are tilting at the same time	The implement follows the ground which involves that its pulley is constant moving. To resist the excessive operating conditions, the original belts are made of fibre reinforced rubber.
Bending in two directions 	Designed to bend around pulleys in one direction only	Most of the belts at the machine have tension rollers, actuating from the outside of the belt. This means the the belt has to bend both inwards and outwards during the operation.	All original belts which operate with tension rollers actuating from the outside have reinforcements. The reinforcement is special designed for the actual case.
Noise 	Manufactured without any special respect to the actual case.	The original belts are carefully selected to give the lowest noise increment to the machine during operation.	Depending on the function of the belt, any of the following belt types are itemised: <ul style="list-style-type: none"> • Wrapped • Non-friction • Raw-edge

5.2 Replacements

When replacement belts, respective when the fitting is complete, the following measures shall be considered if applicable:

 **Warning! Be carefully not to damage the plastic fan. Damage results in insufficient cooling of the HST.**

 **Warning! Do not bend the lever when loosening or tightening lever mounted pulley nuts.**

● **For machines produced until 2019:**

Assemble tension pulleys with the flange upwards.

● **Form machines produced after 2020:**

The tension pulleys are equipped with flanges on both sides and thus the assembly position needs not be met.

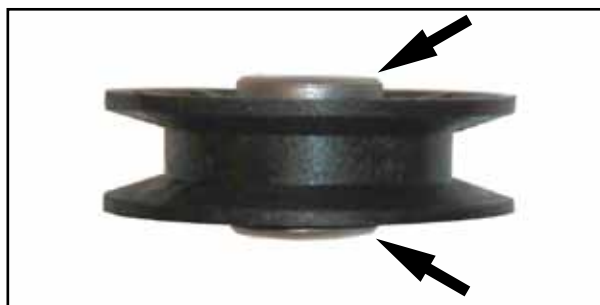
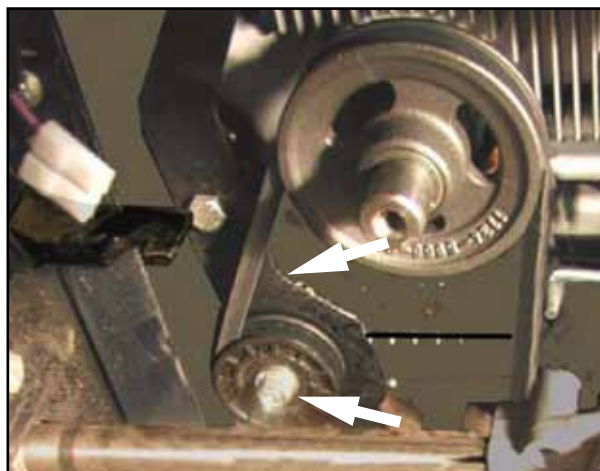
When applicable, make adjustments below.

See instructions in the actual section.

- Brake and clutch.
- Power take-off brake and the work equipment lever.

Magnetic clutch

The tightening torque for the magnetic clutch screw is **50 Nm**.



6 Control Wires

Contents in this chapter

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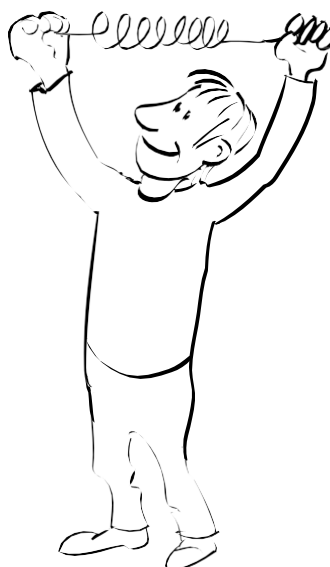
General

All the manoeuvring functions are incorporated on the control panel. This is an excellent solution in terms of ergonomics and comfort. It also simplifies the service work since all the controls and adjustments can be accessed in one place.

All mechanical control movements from the operator to the respective device on the machine are conducted by wires and in some cases with rods.

These equipments are mainly the same for all the machines covered by this manual, but in some cases configured in different ways. Where divergences occur between the machines, particular instructions are given for each particular equipment.

This chapter gives a brief description of the equipments and describes their repair and replacements.



6.1 Description

All wires consist of a wire and a conduit. In the wire ends one part, the wire or the conduit, is fastened to the body and the other part to a lever. The levers are connected to the operator control and to the controlled device. I.e. PTO wire, throttle wire, etc.

The wires are also in most cases fitted with adjustments sleeves with locking nuts or angle links at one or both ends.

- A. Rod
- B. Wire with conduit
- C. Fastening to body
- D. Lever
- E. Spring
- F. Elbow link

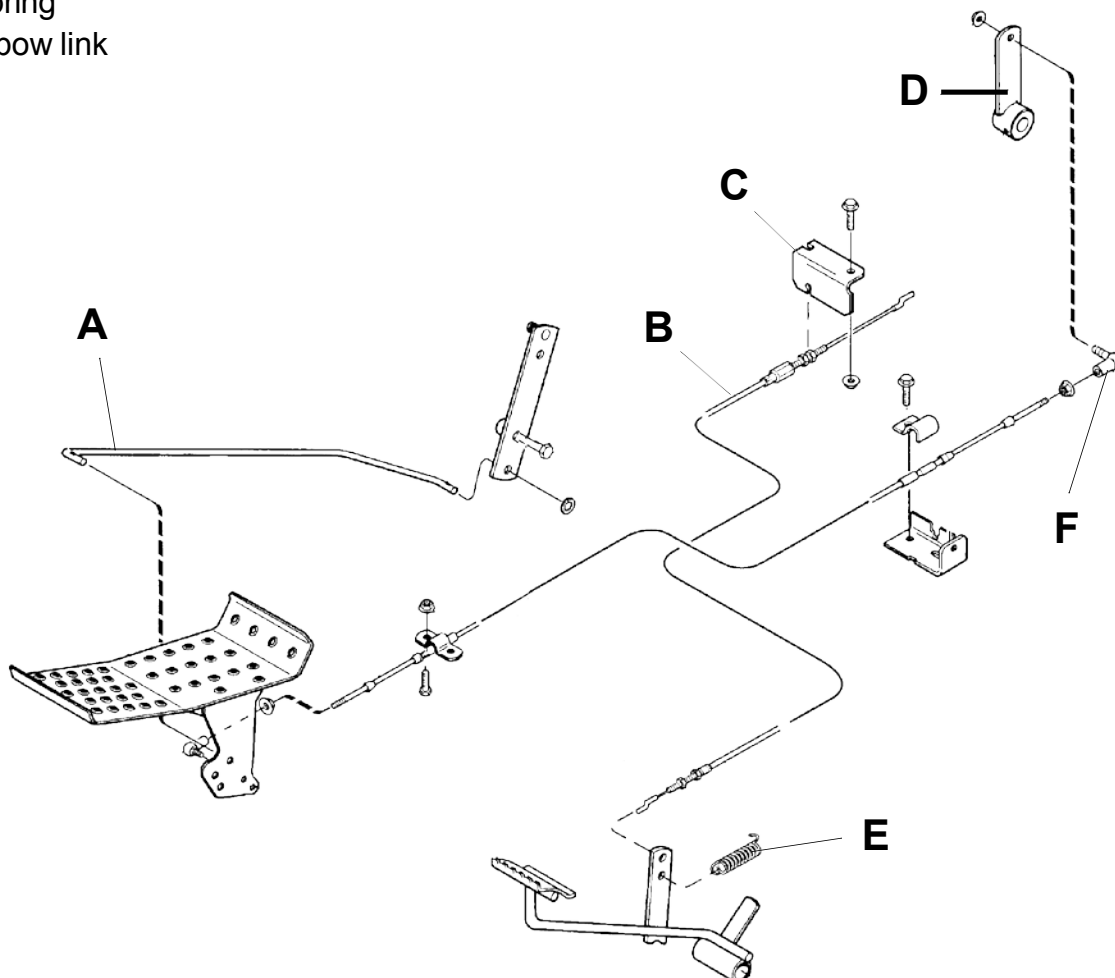
Wires (except the HST wire) can only transfer traction forces. The return forces for the wires are maintained by return springs.

The HST wire is dimensioned to transfer also pushing forces.

To transfer higher forces and both pushing and traction forces, rods are used, i.e. brakes, etc.

Maintenance of wires:

Drop a little engine oil or lubricating spray in the ends of the control wires two or three times a year.



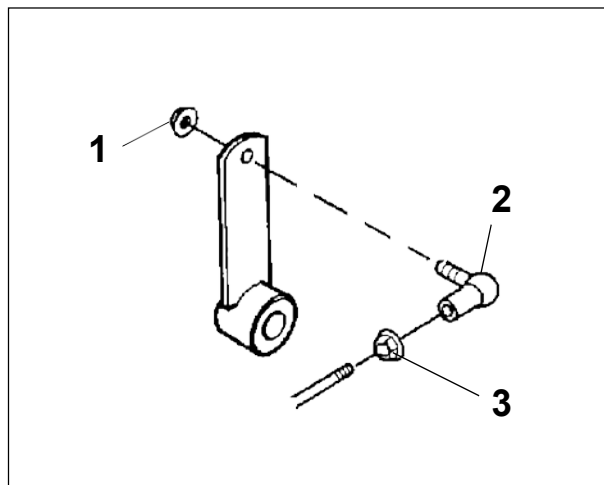
6.2 General measures

6.2.1 Elbow links

In many cases there are elbow links mounted at the wire ends. The elbow links have two functions as follows:

- To transmit the movement to/from the actual lever.
- For wire adjustment purpose. The wire tension is adjusted by screwing the link on/off the threaded rod at the wire.

- ! Note!**
 At the adjustment, at least 5 threads shall be engaged.



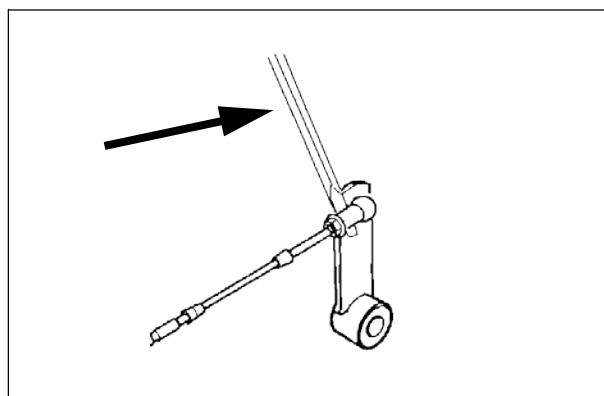
To change an elbow link

1. Loosen the nut (3) with a 8 mm wrench.
2. Remove the nut (1) with a 8 mm wrench. Hold the elbow stud with a 7 mm wrench.
3. Screw the elbow link off the rod.
4. The assembly is performed in the reverse order.
5. After the assembly, adjust the wire.



To apart an elbow link

1. Fold up the circlip (4) from the elbow link body.
2. Pull out the circlip.
3. Pry off the link body from the stud sphere by help of a screwdriver or similar.
4. The assembly is performed in the reverse order. The link body is pressed onto the sphere by help of a polygrip or similar.

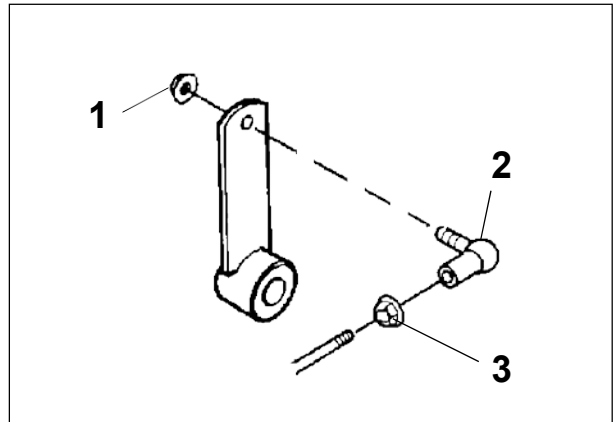


- ! Note!**
 It is important that the circlip (4) is inserted in both holes in the elbow link body, otherwise the link will separate during operation.

Adjustment

1. Loosen the nut (3) with a 8 mm wrench.
2. Apart the elbow link as described above.
3. Screw the link body in the desired direction on the wire stud. If necessary, move the nut (3) on the stud.
4. Check the adjustment result by pressing on the elbow link onto the sphere and without assembling the circlip.
5. After adjustment, assemble in the reverse order and tighten the nut (3) against the elbow link body.

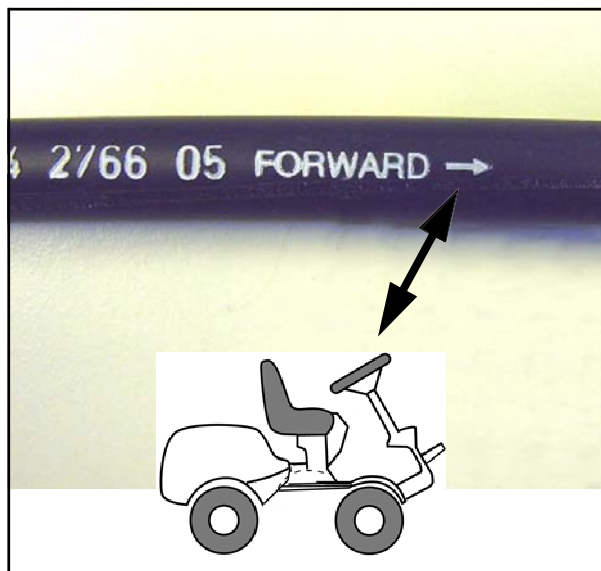
! Note!
It is important that the circlip (4) is inserted in both holes in the elbow link body, otherwise the link will separate during operation.



6.3 HST control wire (2WD and 4WD with int. pump)

6.3.1 Replacement

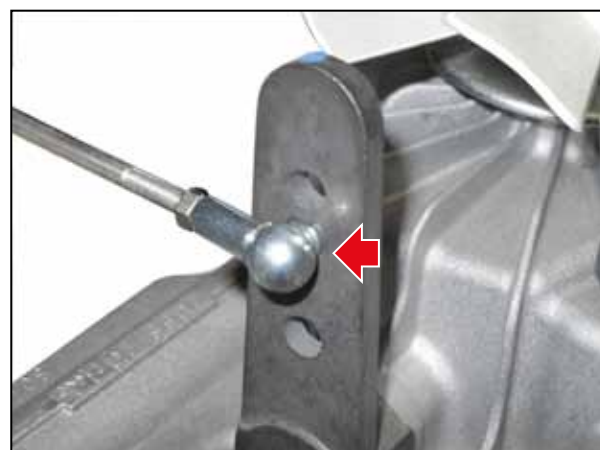
1. Dismantle the control wire.
2. Fit the new control wire. Check that the wire is fitted in the right direction. **The arrow on the wire casing should always point forwards.**



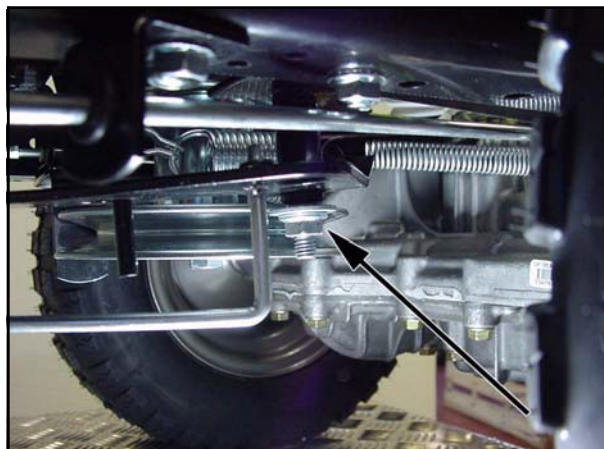
3. Fit the wire in the rear attachment, and tighten the screw.



4. Connect the rear elbow link to the centre hole of the HST lever.



5. Check that the belt tensioner for the engagement of the deck functions correctly when the screw has been tightened, since the screw is also a link for the tensioning arm.



6. Fit the wire in the front attachment. Check that the slot on the control wire coincides with the bulge in the cap. If these parts are fitted incorrectly it will be difficult to adjust the control wire since the wire will slide in the attachment.



7. Thread the stop nuts on both ends of the control wire and fit the elbow link bodies. See "Elbow links" at page 3.

! Note!
Refit all cable holders.

Follow-up work

Adjustment of control wire as described below.

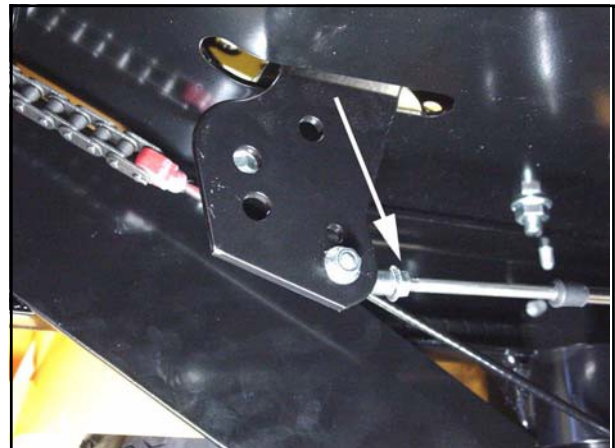


6.3.2 Adjustment (2WD)

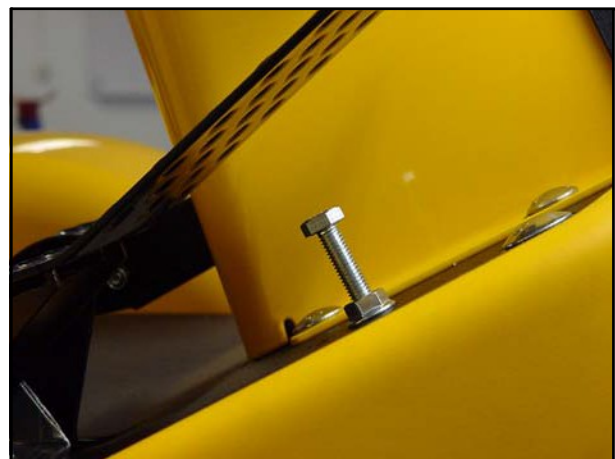
In theory this machine can go just as fast both forwards and backwards. It is therefore important that the basic position of the hydrogear pedal is correctly adjusted.

Procedure

1. Adjust the distance by moving the elbow links on the control wire. See "Elbow links" at page 3.



2. Release the upper nut on the stop screw and screw down the screw a few turns.



3. Press the pedal forwards as far as possible. Screw up the stop screw so that it touches the pedal.
4. Release the pedal and then screw up the stop screw a further $\frac{1}{2}$ - 1 turn. Tighten the stop nut.



Note!
The movement of the pedal must always be limited by the stop screw, to avoid overloading the control wire.

**Follow-up work:**

Test driving.

6.4 HST control wire (4WD with external pump)

6.4.1 Replacement

1. Dismantle the control wire.
2. Fit the new wire in the same location as the old one.

! Note!
 The longer support tube (C) shall be located forwards.

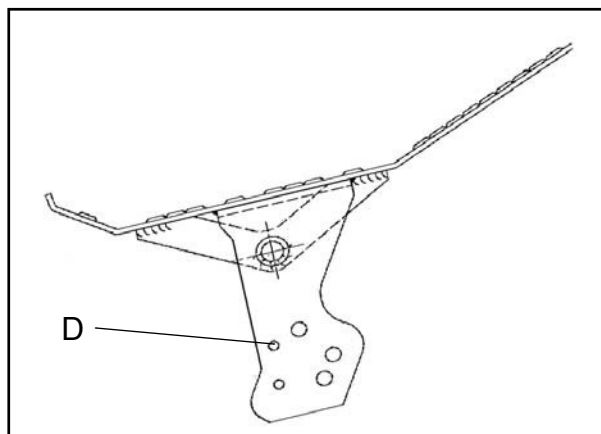
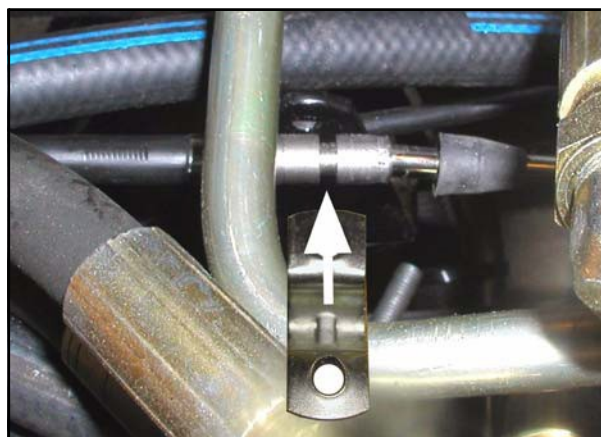
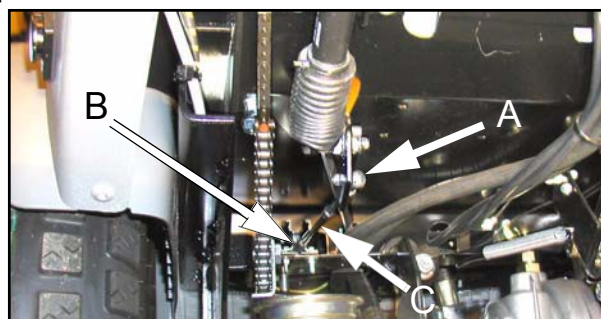
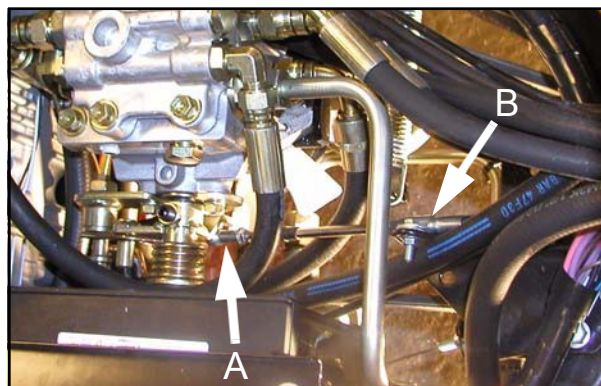
3. Check the elbow links for damage or wear. Replace with new links if necessary. Fit the elbow links with their locking nuts at the wire ends. The links shall be screwed onto the wire ends about 1 cm.

4. Fit the front and rear clamps (B). Make sure that the dogs at the clamps fit in the grooves in the wire cover. Both front and rear. See the figure.

5. Fit the elbow links (A) to the levers. See "Elbow links" at page 3. The front elbow link shall be fitted to the pedal in hole (D). See the figure.

6. Assemble a new cable holder for the right cable bundles.

7. Adjust the control wire as described below.



6.4.2 Adjustment (4WD with external pump)

The length of the wire is adjusted by screwing the elbow links in the desired direction. Perform the adjustment at both links. The links shall be screwed onto the wire about the same amount. See "Elbow links" at page 3.

1. Set the rear stop screw in its lowest position.
2. Block up the pedal with a piece of wood or similar until the pedal rests against its rear stop. If the pedal doesn't reach its rear stop, adjust the elbow links.
3. Check that the pump lever has fully reach its stop position. If not, adjust the elbow links.
4. Block up the pedal with a piece of wood or similar until the pedal rests against its front stop. If the pedal doesn't reach its front stop, adjust the stop upwards.
5. Check that the pump lever has fully reach its stop position. If not, adjust the elbow links.

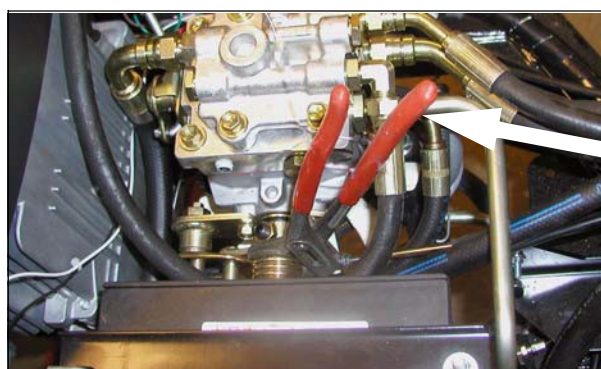
When the control wire is properly adjusted, the following conditions shall be fulfilled:

- Both elbow links shall be screwed onto the wire ends about the same amount.
- The pedal shall easily reach its rear stop (moved backwards). Simultaneously shall the pump lever reach its stop position.
- The pedal shall easily reach its front stop (moved forwards). Simultaneously shall the pump lever reach its stop position.

Warning!



If the pump lever reach its stop and the pedal not, abnormal push/pull forces will occur in the wire. This will limit the wire durability.



6.5 Brake/clutch

6.5.1 Senator

Replacement of wire

1. Dismantle the wire.

Notice how the wire is routed, since it considerably simplifies fitting if the new wire is routed in the same way as the old one.

2. Fit the adjusting nipples and hook on the wire.

! Note!
Refit all cable holders.

Follow-up work

Adjust the brake, see below.

Adjust the clutch, see "Adjustment of clutch" at page 13.

Adjustment of brake

The brake and clutch are two separate systems on Senator. However, the systems are operated by a joint pedal.

Warning!



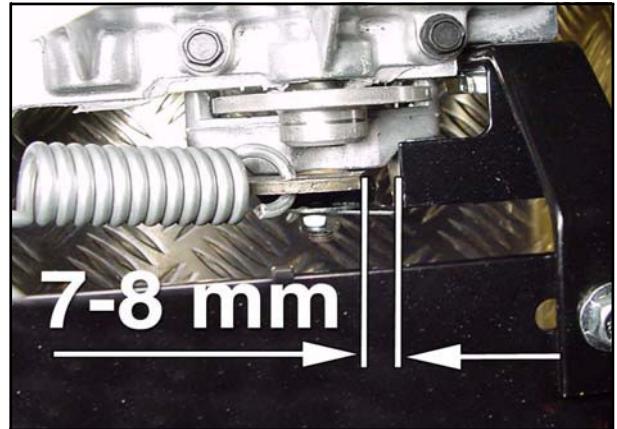
The clutch must always be activated before the brake comes into operation to avoid unnecessary wear and overloading of the brake.

Procedure

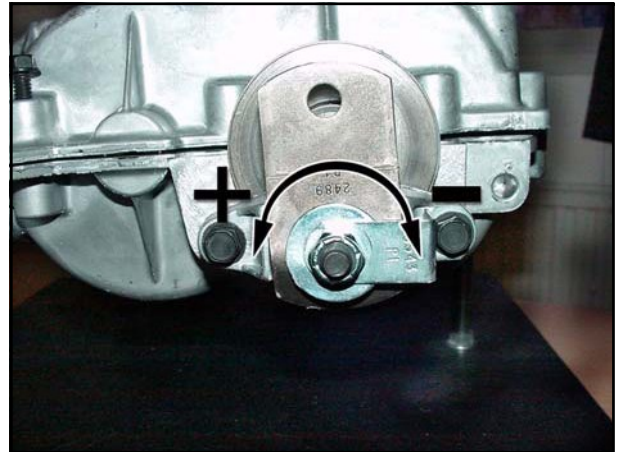
1. Check that there is a play of 10-15 mm in the combined brake/clutch pedal before the brake arm is actuated.
Adjust if necessary by using the adjusting screws on the wire casing.
2. Activate the parking brake. Check that the spring that actuates the brake arm is tensioned somewhat.



3. When the parking brake is activated the distance between the brake arm's rear stop and the brake arm should be 7-8 mm. *In the illustration the brake arm's return spring has been dismantled to make the picture more explicit.*
4. If the distance is not correct it is adjusted by turning the nut on the brake calliper. Release the parking brake and turn towards + to increase the distance, and towards - to reduce the distance.

**Follow-up work**

Test driving.



Adjustment of clutch

The brake and clutch are two separate systems on Senator. However, the systems are operated by a joint pedal.

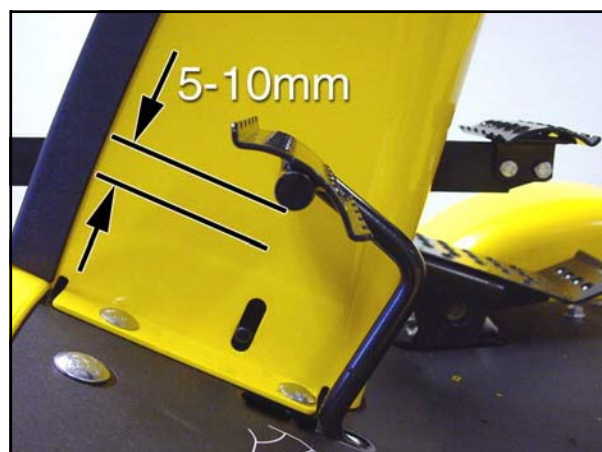
Warning!



The clutch must always be activated before the brake comes into operation, to avoid unnecessary wear and overloading of the brake.

Procedure

1. Check that there is a play of 5-10 mm in the combined clutch / brake pedal before the tensioning arm is actuated. Adjust if necessary by using the adjusting screws on the wire casing.



2. Check that the spring for the tensioning arm is still tensioned. If the spring is completely contracted then the belt is too long and must be replaced.



Note!

If the spring does not tension the belt properly the clutch will slip.

3. Activate the parking brake and check whether the belt tensioner disengages properly.



Follow-up work

Test driving.

6.5.2 President, Royal, Pro 16, Pro 20, Pro Diesel

5.9 Replacement of brake / clutch wire

- 1..Dismantle the wire.
Pay careful attention to how the wire is routed. It simplifies fitting if the new wire is routed the same way.
2. Fit the wire.
Make sure that the new wire is not bent unnecessarily since this will shorten its service life.
3. Hook the Z nipple in the brake arm and fit the adjusting screw in the support.
4. Hook the Z nipple in the tensioning arm and fit the adjusting screw in the support.



Note!
Refit all cable holders.

Follow-up work

Adjustment the brake and clutch, see below.

Adjustment of brake and clutch

The brake articulation consists of two parts. A front brake wire and a rear pull bar. The relative adjustment between these parts is very important for the satisfactory functioning of the brake and clutch. The governing principle is that the drive belt should always be disengaged before the brake comes into operation.

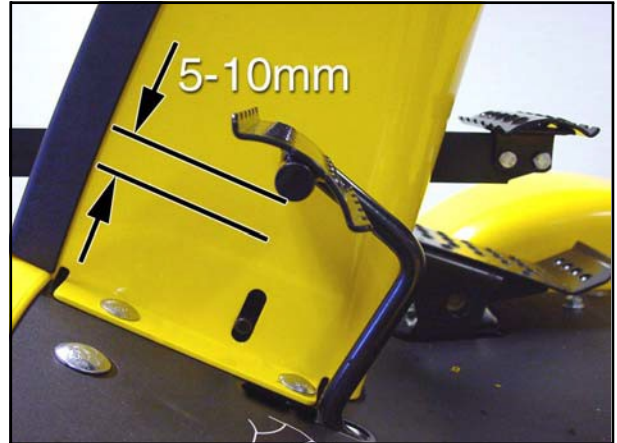
Warning!



It is extremely important that these parts are correctly adjusted. Incorrect adjustment leads to increased wear. The machine can also be difficult to manoeuvre.

Procedure

1. Release the stop nuts at the ends of the wire.
2. The clutch pedal should have a clearance of 10-15 mm. Adjust if necessary.
3. Activate the parking brake.
The length of the brake arm spring should be 35 mm when the parking brake is activated. Adjust if necessary by turning the nut.



4. Test drive.
A comprehensive test drive is required to check the function of the brake and transmission.
A. Test the disengaging function by driving slowly forwards and simultaneously pressing down the brake pedal half way. The machine should slowly stop as the drive belt is disengaged.
B. Release the clutch and the machine should start to move forwards again. Now press the brake fully down, more quickly than the former test. The machine should now stop immediately.
C. Now park the machine on a slope and activate the parking brake. Switch off the engine. Check that the machine does not move. If the machine moves, adjust the parking brake as above.



6.6 Replacement of PTO wire

6.6.1 Machines with the control panel to the right

This procedure is valid for machines with the control panel to the right of the operator, e.g. Comfort, Royal, Senator etc.

Dismantling of PTO engagement wire

1. Remove the cover over the control panel.
2. Release the wire from the tension spring at the belt tensioner.
3. Release the nuts at the wire's lower attachment point, and dismantle the wire from the support.
4. Release the nuts at the wire's upper attachment point, unhook the Z nipple from the control arm, and remove the wire from the machine.

Cut off the cable holder that holds the cables and wires in the articulation point. Notice how the wire is routed, since it simplifies fitting if the new wire is routed in the same way as the old one.

Assembly of PTO engagement wire

Assemble in the reverse order.

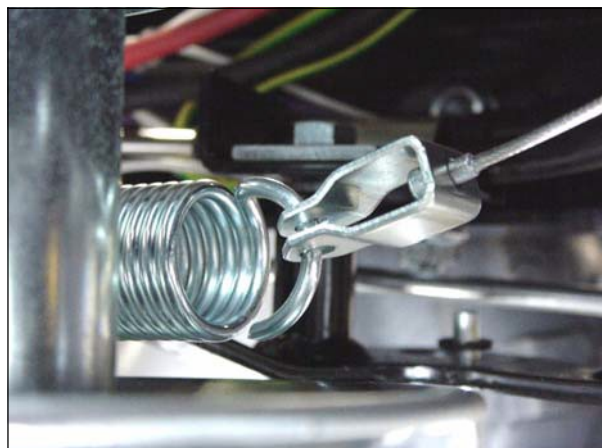
It is often easier to fit the wire from underneath, since the Z nipple is easier to guide correctly through the seat bracket than the spring attachment in the bottom end of the wire.

Follow-up work Warning!



The PTO brake is part of the machine's safety system. It is therefore especially important that it is checked and adjusted correctly.

Adjust the wire and the PTO brake.
See "Adjustment of PTO wire and brake" at page 18.



6.6.2 Compact

This procedure is valid for Compact machines which have the control panel in front of the operator.

Dismantling of PTO engagement wire

1. Release and unhook the upper and lower adjustment sleeves.
2. Release the wire from the tension spring at the belt tensioner.
3. Release the wire Z nipple from the lever under the seat.
4. Remove the wire from the machine.
Do not forget to cut off the cable holder that holds the cables and wires in the articulation point.
Notice how the wire is routed, since it simplifies fitting if the new wire is routed in the same way as the old one.

Assembly of PTO engagement wire

Assemble in the reverse order.

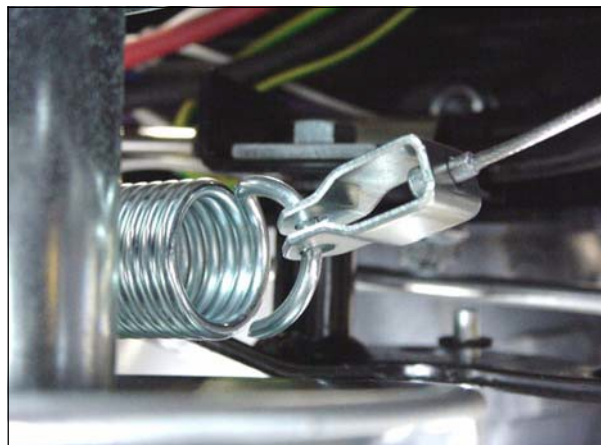
It is often easier to fit the wire from underneath, since the Z nipple is easier to guide correctly than the spring attachment in the bottom end of the wire.

Follow-up work Warning!



The PTO brake is part of the machine's safety system. It is therefore especially important that it is checked and adjusted correctly.

Adjust the wire and the PTO brake.
See "Adjustment of PTO wire and brake" at page 18.



6.6.3 Adjustment of PTO wire and brake

This procedure is valid for machines with the brake mechanically linked to the tension pulley only.

The wire tension and the brake are working together.

Adjusting influences both the power take-off engagement and the power take-off brake, and must always be conducted thoroughly.

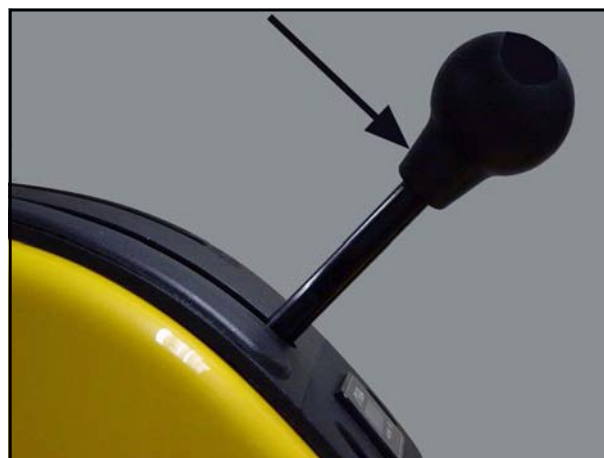
Warning!



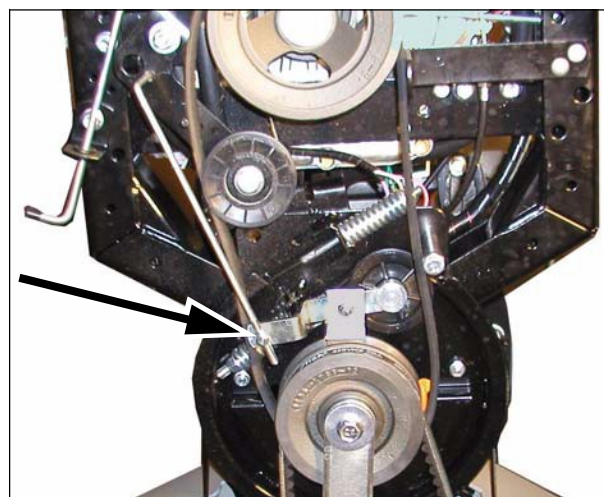
The power take-off brake is part of the machine's safety system. It is therefore especially important that it is checked and adjusted correctly.

Procedure

1. Disengage the power take-off.

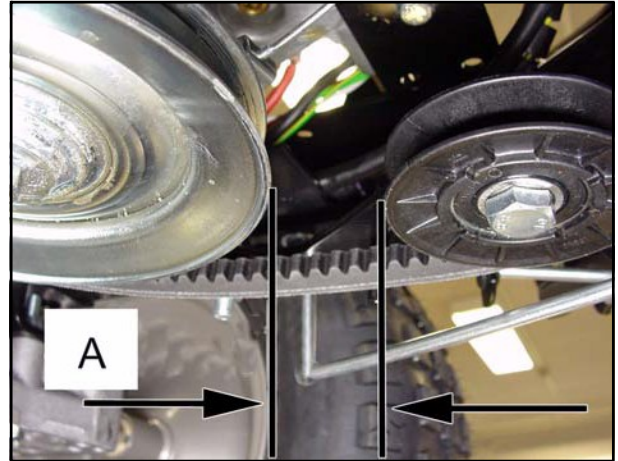


2. Disconnect the brake rod from the brake shoe arm.



3. Adjust at the wire adjusting sleeves until the space (A) between the tension pulley and motor pulley coincide with the table below:

Machine	Measure (A)
2WD machines with the control panel to the right of the operator, e.g. Comfort, Royal, Senator etc.	30 mm
4WD machines with the control panel to the right of the operator, e.g. Comfort, Royal, Senator etc.	35 mm
Compact	20 mm

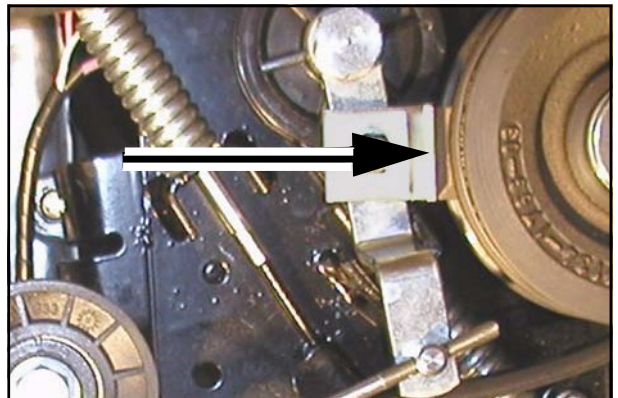


Warning!

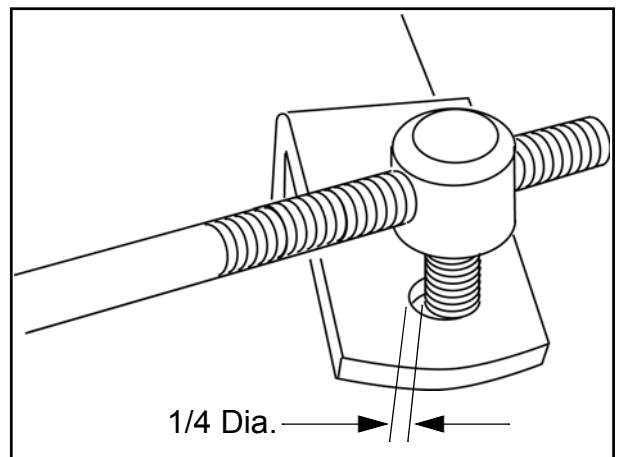


It is important that the movement of the tensioning arm is always stopped by the brake pad, and not by the engagement wire. If the wire stops the movement, the braking capacity can be completely lost when the parts become worn.

4. Press the brake shoe hard against the pulley.



In this position, 1/4 of the hole shall be visible when the nipple is compared with its hole.



5. Adjust the nipple towards + to increase the distance between the tension pulley and the engine belt pulley, or towards - to reduce.

6. When 1/4 of the hole is visible, fit the nipple in the hole and assemble the nut as follows:

A. Screw on and tighten the nut moderately.

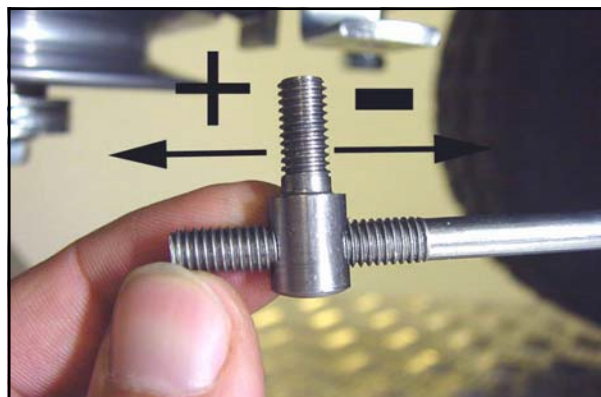
B. Loosen the nut 1/2 turn.

The nipple shall be movable in the hole.

Warning!

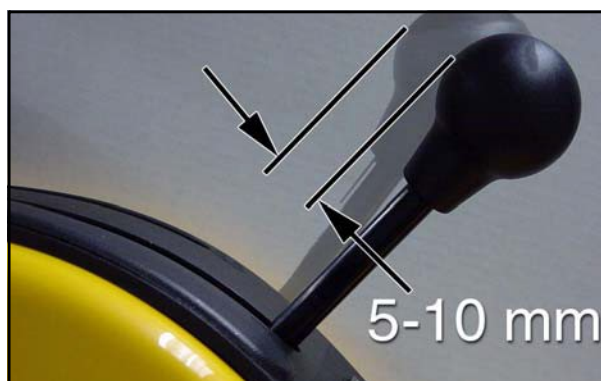


If the nipple is tight in its hole, abnormal stress will occur to the mechanical parts.



7. When the adjustment is complete, the following items shall be fulfilled:

- There is a clearance of 5-10 mm respective 10-30 mm at the engagement lever.
 - Engage the power take-off and check that the brake pad no longer brakes the articulation belt pulley. If the brake pad still brakes the belt pulley, move the nipple some more.
 - The brake pad will never completely leave the groove in the belt pulley. When the brake is correctly adjusted the brake pad should be pulled out approx. 1 mm from the innermost position.
 - Disengage the power take-off and check that the power-take off brake works.
- If everything is correctly adjusted the brake should be applied just enough for the articulation belt pulley to be turned round by hand only with extreme force.
- Check the stopping time as below.



Stopping time check

1. Run the machine at full speed with the cutting deck activated.
2. Rise from the seat and start the time measurement.
3. The time from rising from the seat to that the cutting deck has complete stopped is not allowed to exceed 5/7 seconds as follows:

For cutting decks with a cutting width of under 120 cm - **5 seconds**.

For cutting decks with a cutting width of 120 cm or more - **7 seconds**.

4. If the time above is exceed, the adjustments must be repeated.

Warning!



If the stopping time exceed 5/7 seconds, the machine is not allowed to be used.

7 Electrical System

Contents in this chapter

7.1 Description	2
7.2 Trouble Shooting	3
7.3 Repair and replacements	44
7.3.1 Replacement of switches	44
7.3.2 Replacement of switch knob	44
7.3.3 Connections	45

General

Each machine has its own electrical system, configured to fit the purpose and demand of the actual machine. The electrical system has two main duties, to maintain the machine safety and to make the different functions easy to handle.

The main part of this chapter consists of trouble shooting of the electrical system to isolate faults and to give information about corrective measures. The electrical system is also described. There are also given instructions about general repair and replacement procedures.



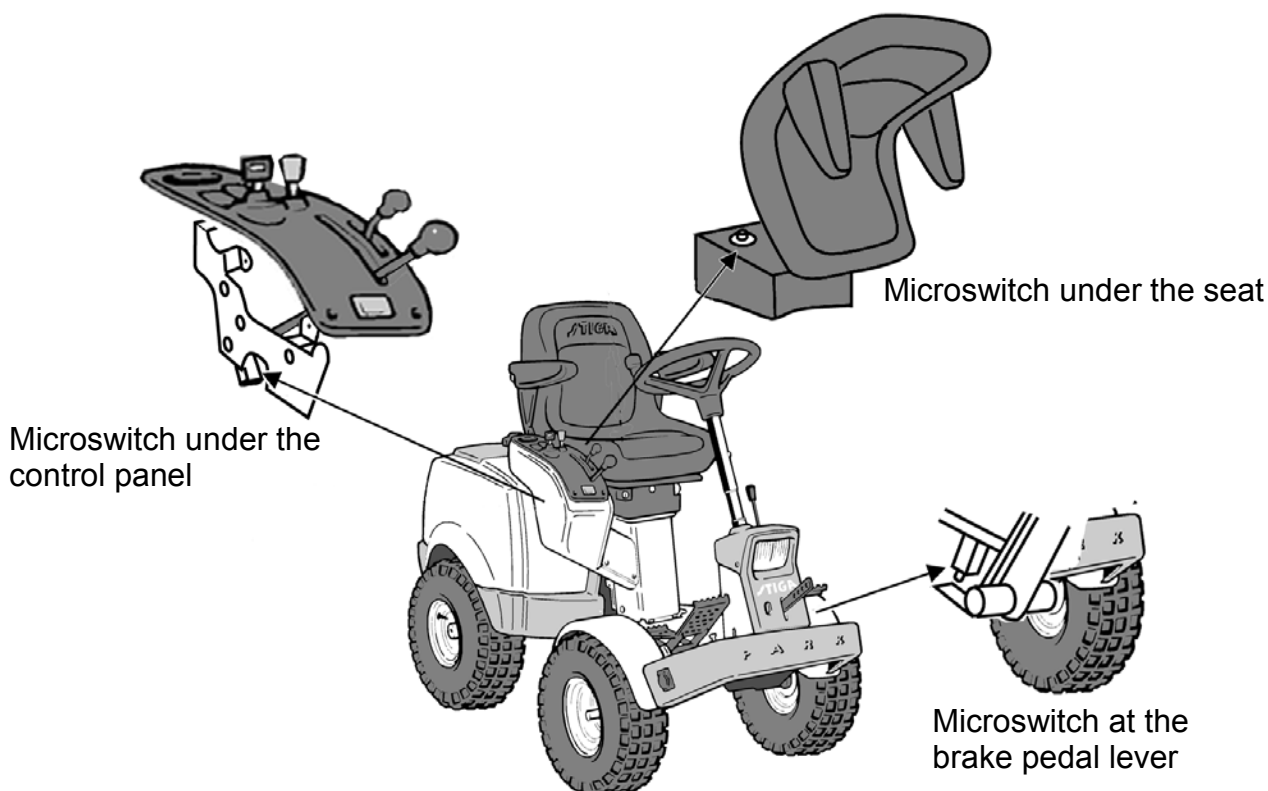
7.1 Description

The electrical components are connected with cables, integrated in a complete insulated harness, which is unique for each machine model. Thus the cables are protected against wear, contaminations and other stresses. The cables are connected to the actual components with tab or screw connectors and in some cases with multi-contact connectors.

The electrical system contains several safety circuits. Therefore actual levers and pedals are provided with micro switches. The micro switches are shown in the figure below. The signals from the micro switches are used to interlock the actual circuit in case of a forbidden manoeuvre attempt. Some manual switches and relays have also built in interlocks, related to the safety system.

The wiring diagrams are presented separately in the respective spare parts manual. To achieve a complete understanding of the electrical system for a certain machine, read also the actual wiring diagram.

All current consumption circuits except the start circuit are protected by 1-3 fuses, depending on the machine model.



7.2 Trouble Shooting

Warning!



Do not wear rings, metallic bracelet, chain round the neck or similar metal objects when working with the electrical system. It can cause short-circuit, burns and fire.

This section describes the trouble shooting procedures in absence of an electrical function. It also describes the correction measures in each actual case. When following the trouble shooting tables, it is provided that the following states are fulfilled:

- All fuses are checked and, if necessary replaced.
- The battery shall be charged.
- All harnesses are OK.
- All connectors are OK.
- The requirements for the actual measure shall be fulfilled. E.g. if it is advised to perform a start attempt, the operator shall sit down on the seat, press the brake pedal and the power take off shall be in disengaged position.

When following the trouble shooting tables, it is in normal cases assumed that conductors and connectors to conductors are OK. However, in some cases, after a long period of use or in case of mechanical damages, the cables at the articulating point can be damaged. The circuit diagrams are presented after the tables.

Circuit diagrams; From models 2015 there are also ISO-rules implemented in the electrical diagrams, where this occurs additional diagrams, marked "20015" included.

For trouble shooting, first find the actual machine in the list at the next page and then go to the page with the trouble shooting tables for that machine.

The trouble shooting tables below do not need any complicated measurements, checks or other logic steps to isolate the fault. The actions to be taken are listed with the most probable fault first.

That means, if not the first action helps, then try with the next one. Continue thus until the fault is repaired.

Faults related to the safety system are located first in the tables and marked with .

Art. Number	Machine	Page
13-6002-XX	Mountfield 4140H	7
13-6003-XX	Mountfield 4155H	7
13-6004-XX	Mountfield 4155H 4WD	7
13-6100-XX	Park Silent	26
13-6101-19	Park Compact 13	5
13-6102-XX	Park Compact 14 Castelgarden XK140 HD Béal Master MBF 13,5 Mountfield 4135H	7
13-6103-XX	Park Compact 16 Castelgarden XK160 HD Béal Master MBF 15,5 Mountfield 4155H	7
13-6104-XX	Park Compact 16 4WD CastelgardenXK4160HD Béal Master MBF 15,5 Mountfield 4155H 4WD	7
13-6105-99	Mountfield XK 13	7
13-6106-99	Mountfield XK 16	7
13-6107-99	Mountfield XK 16 4WD	7
13-6109-XX	Park Compact 14	7
13-6111-61	OKAY Mcut K4WD	7
13-6116-XX	Castelgarden XK 140HD	7
13-6141-XX	Park Unlimited 14	10
13-6142-XX	Park Unlimited Plus	10
13-6144-XX	Park Silent	13
13-6175-26	Park Power 4WD	10
13-6176-16	Park Champion	10
13-6177-XX	Park Prestige 4WD	10
13-6178-15	Park Residence 4WD	10
13-6178-16	Park Residence 4WD	10
13-6179-04	Park Ranger	13
13-6179-05	Park Ranger Svan	13
13-6179-06	Park Ranger Svan	13
13-6180-XX	Park Diesel	15
13-6181-34	Park Diesel 4WD	15
13-6182-14	Park Comfort	10
13-6182-15	Park Comfort	10
13-6183-14	Park Royal	13
13-6184-XX	Park President 14	10
13-6185-XX	Park Prestige 4WD	10
13-6189-XX	Park Excellent 16	10
13-6193-XX	Park Ranger	10
13-6195-14	Park Fairway 18	10
13-6195-14	Park Fairway 18	10

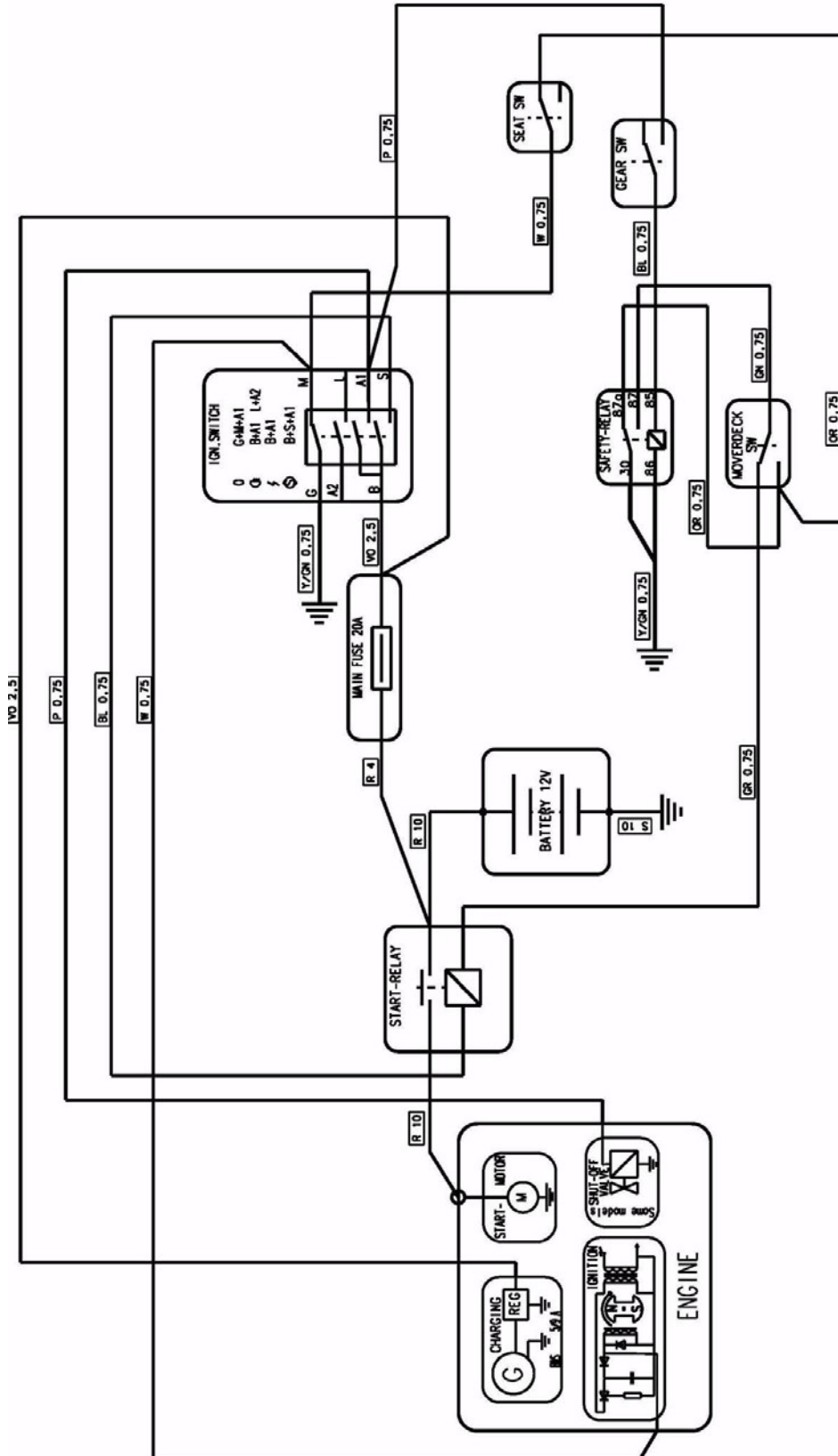
Art. Number	Machine	Page
13-6197-XX	Castelg. XKH4165HD	10
13-6198-55	75 Years ltd version	10
13-6199-15	Park Residence 4WD	13
13-6241-XX	Park Pro 16 4WD	17
13-6241-XX	Park Pro Svan 4WD	17
13-6242-64	Park Pro Bivoj 4WD	20
13-6244-XX	Park Pro 20 4WD	17
13-6246-XX	Park Pro 25 4WD	20
13-6269-XX	Park Pro 18 4WD	30
13-6270-XX	Park Pro 21 4WD	30
13-6271-XX	Park Pro 16 4WD	18
13-6272-XX	Park Pro Svan 4WD	23
13-6273-XX	Park Pro 20 4WD	17
13-6274-16	Park Pro 23 4WD	17
13-6275-16	Park Pro Silver	20
13-6276-XX	Park Pro 25 4WD	26
13-6311-XX	Park Plus/520	10
13-6312-XX	Park Royal 4WD	23
13-6313-11	Park Excellent	10
13-6314-11	Park Plus Unlimited	10
13-6317-32	Park 740 PWX	33
13-6318-31	Park 520 DP	35
13-6319-31	Park 520 DPX	35
13-6320-11	Park 520 Anniversary	33
13-6372-11	Park Power 16 4WD	38
13-6373-XX	Park 740 WX, Park Royal 4WD	33
13-6374-11	Park Champion 4WD	10
13-6375-11	Park Power 4WD	10
13-6377-11	Park Prestige 4WD	13
13-6378-XX	Park Residence 4WD	13
13-6379-XX (not -21)	Park Ranger Svan	13
13-6379-21	Park Ranger	38
13-6380-XX	Park 620 PW	33
13-6381-XX	Park 540 LPX	34
13-6384-11	Park 123	34
13-6384-12	Park 420 LM	34
2F6120520/S15	Park 320 M	40
2F6130520/S15	Park 340 MX	40
2F6220610/S15	Park 520 P	42
2F6220620/S15	Park 720 PW	42
2F6220820/S15	Park 620 P	42
2F6230620/S15	Park 540 LX	42
2F6230820/S15	Park 640 PX	42

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Valid for (Art. Number)	1005-0072		
13-6101-19	-	-	-

Fault	Cause/Alternative	Action
The engine can be started with the mower deck activated.		Adjust or replace the mower deck switch.
The engine can be started with a gear activated.		Adjust or replace the gear switch.
The engine does not stop when the operator leaves the seat and the mower deck is activated.	The engine can be stopped with the ignition key.	1. Adjust or replace the seat switch 2. Adjust/replace the mower deck switch.
	The engine can not be stopped with the ignition key.	Replace the ignition switch.
The engine does not stop		1. Check the white cable and its connection to the engine. 2. Replace the ignition switch.
The starter does not rotate and there is no "click" heard at the start attempt.	Fault in the safety circuits.	1. Adjust/replace the mower deck switch. 2. Adjust or replace the gear switch. 3. Replace the safety relay. 4. Replace the ignition switch. 5. Replace the start relay.
The starter does not rotate and there is a "click" heard at the start attempt.	Faulty start engine or start relay	1. Check cable connections. 2. Replace the start relay. 3. Replace the start engine
The starter rotate, but the engine does not start.		1. Check the fuel supply. 2. Check the engine according to the engine manual. 3. Check that the white short circuit cable is not connected to earth. 4. Replace the ignition switch. 5. Replace the shut off valve.
The battery runs repeatedly empty.	A connected voltmeter to the battery shows a higher voltage at high speed than if the engine not is running.	Replace the battery.
	No voltage different.	1. Check engine socket connections. 2. Replace the ignition switch. 3. Replace the voltage regulator. 4. Replace the alternator.

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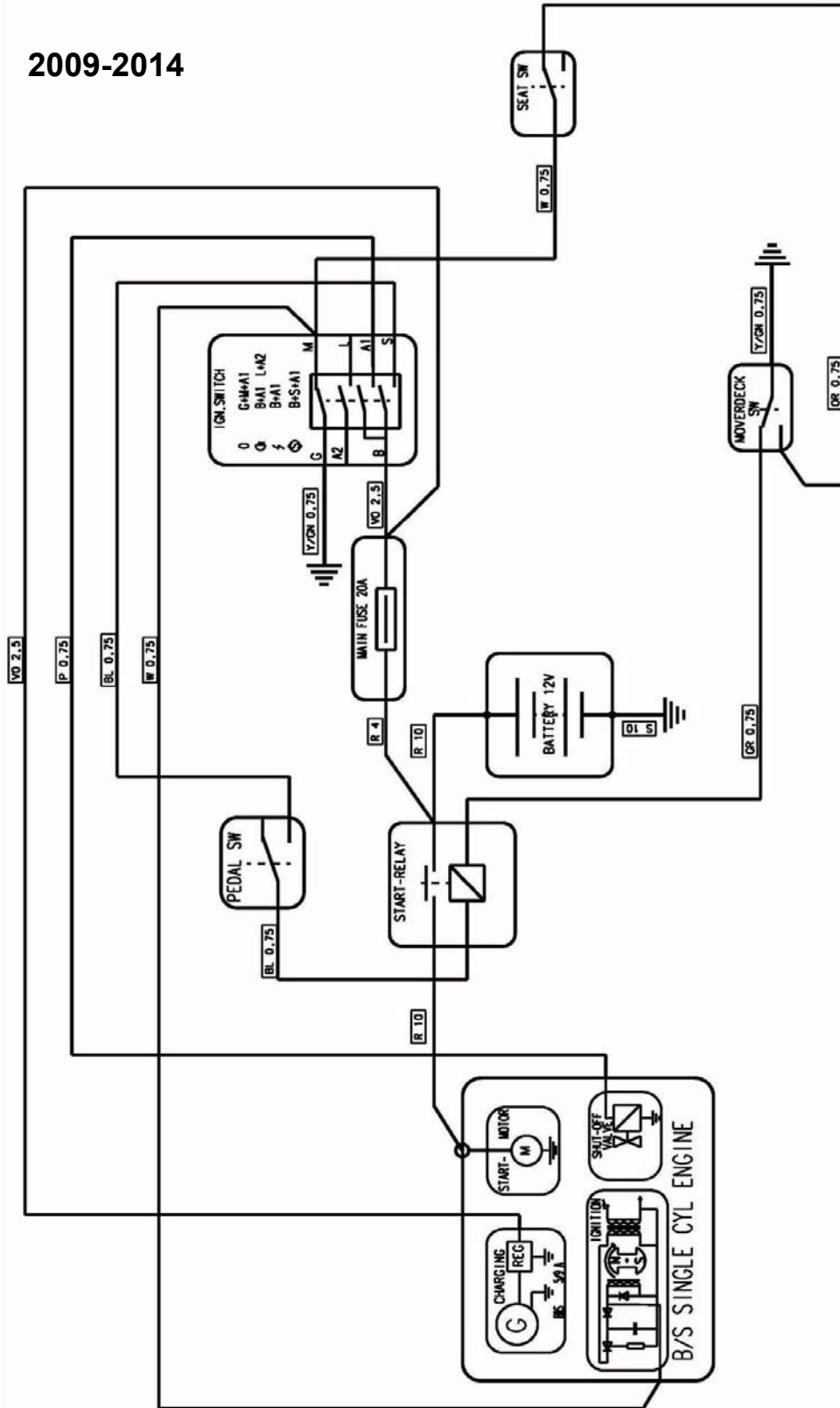
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Valid for (Art. Number)		1005-0073	1005-0105
13-6002-XX	13-6003-XX	13-6004-XX	13-6102-XX
13-6104-XX	13-6105-99	13-6106-99	13-6107-99
13-6111-61	13-6116-XX	-	-

Fault	Cause/Alternative	Action
The engine can be started with the mower deck activated.		Adjust or replace the mover deck switch.
The engine does not stop when the operator leaves the seat and the mover deck is activated.	The engine can be stopped with the ignition key.	1. Adjust or replace the seat switch 2. Adjust/replace the mover deck switch.
	The engine can not be stopped with the ignition key.	Replace the ignition switch.
The engine can be started without the brake pedal pressed.		Replace/adjust the pedal switch.
The engine does not stop		1. Check the white cable and its connection to the engine. 2. Replace the ignition switch.
The starter does not rotate and there is no "click" heard at the start attempt.	Fault in the safety circuits.	1. Adjust/replace the pedal switch. 2. Adjust/replace the seat switch. 3. Adjust/replace the mover deck switch. 4. Replace the ignition switch. 5. Replace the start relay.
The starter does not rotate and there is a "click" heard at the start attempt.	Faulty start engine or start relay	1. Check cable connections. 2. Replace the start relay. 3. Replace the start engine
The starter rotate, but the engine does not start.		1. Check the fuel supply. 2. Check the engine according to the engine manual. 3. Check that the white short circuit cable is not connected to earth. 4. Replace the ignition switch. 5. Replace the shut off valve.
The battery runs repeatedly empty.	A connected voltmeter to the battery shows a higher voltage at high speed than if the engine not is running.	Replace the battery.
	No voltage different.	1. Check engine socket connections. 2. Replace the ignition switch. 3. Replace the voltage regulator. 4. Replace the alternator.

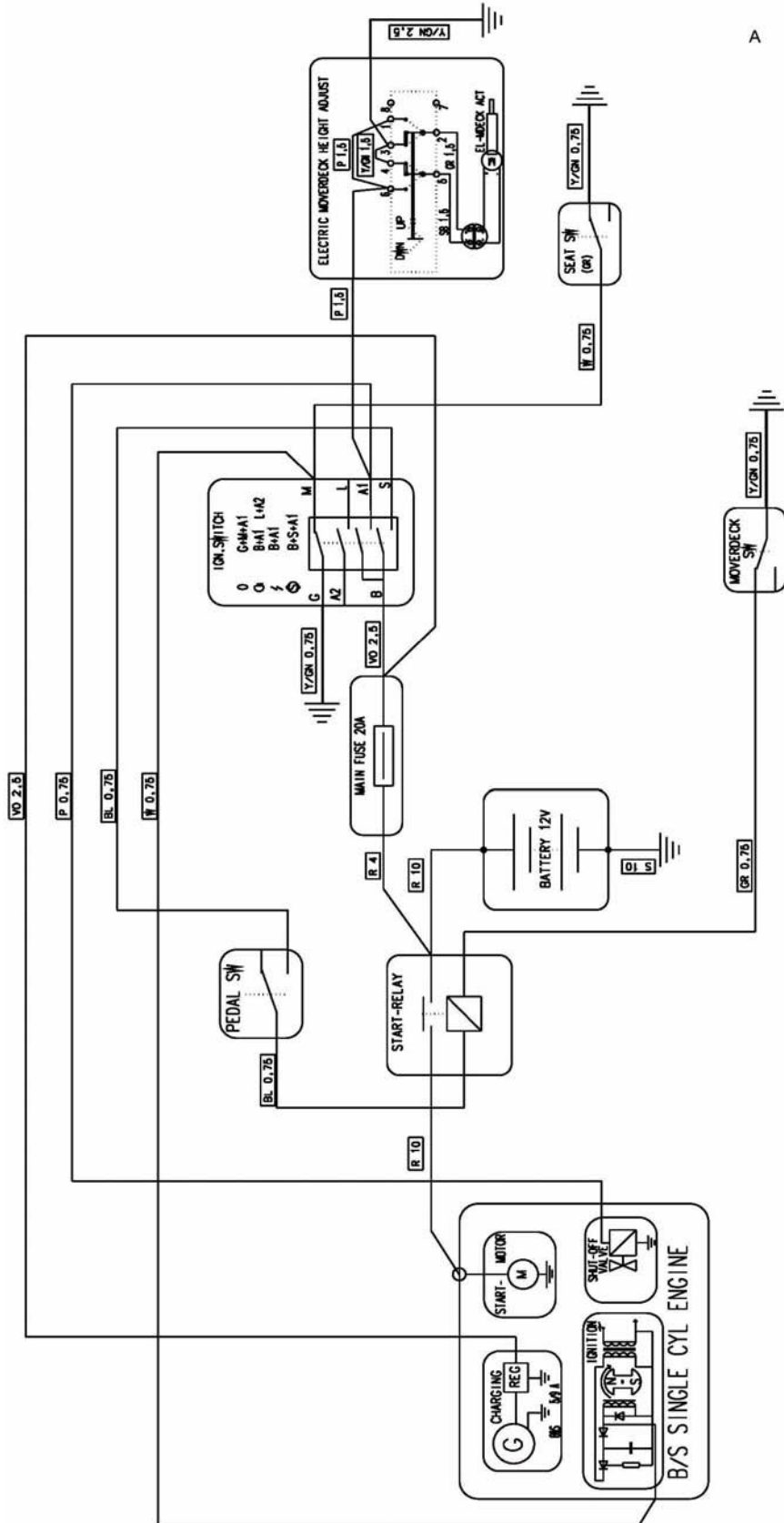
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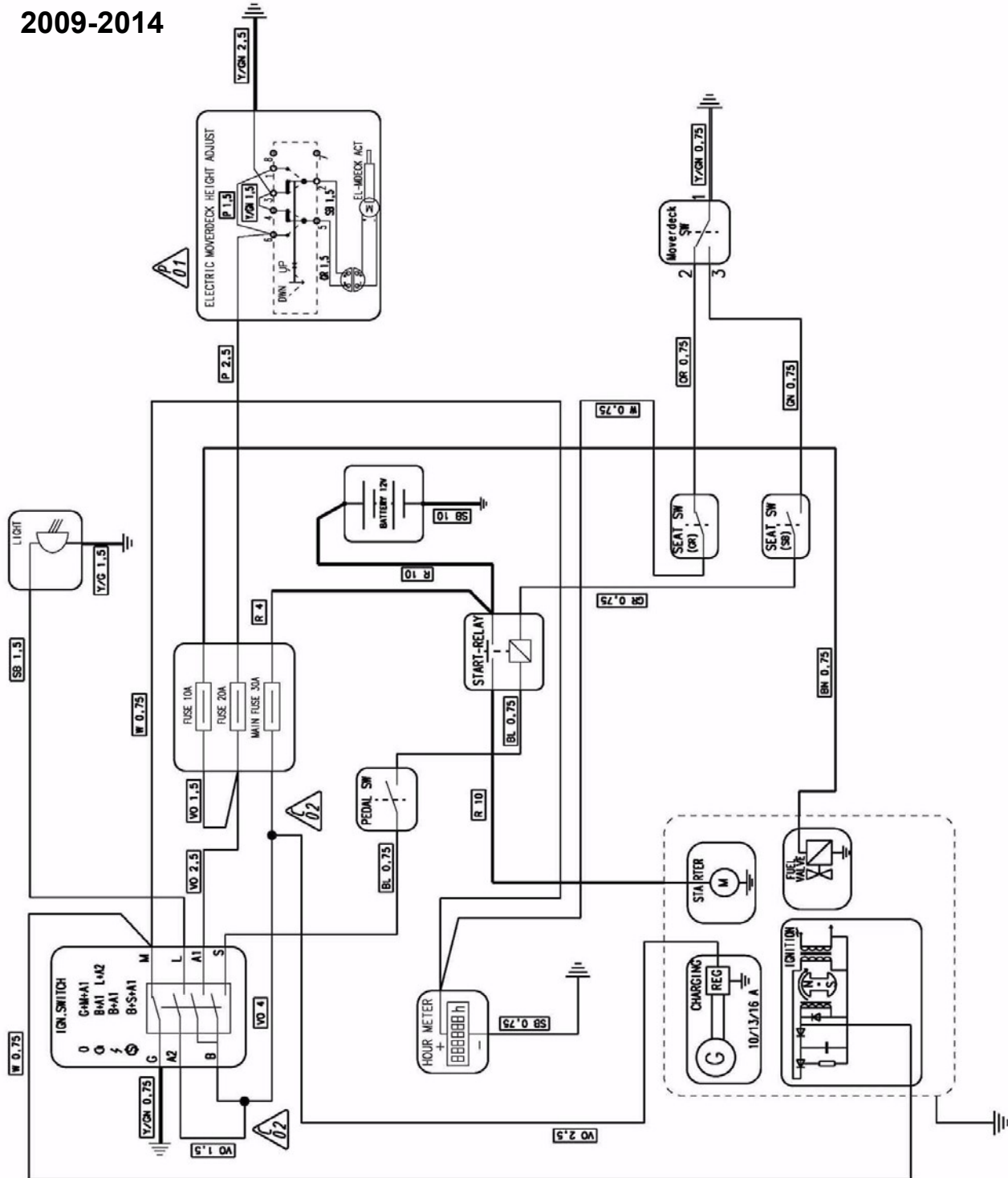
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Valid for (Art. Number)		1005-0080			
13-6141-XX	13-6142-XX	13-6175-26	13-6176-16	13-6177-XX	13-6311-11
13-6178-15	13-6178-16	13-6182-14	13-6182-15	13-6184-XX	13-6375-11
13-6185-XX	13-6189-XX	13-6193-XX	13-6195-14	13-6196-25	13-6374-11
13-6197-XX	13-6198-55	13-6311-XX	13-6313-11	13-6314-11	

Fault	Cause/Alternative	Action
The engine can be started with the mower deck activated.		Adjust or replace the mover deck switch.
The engine can be started without the brake pedal pressed.		Replace/adjust the pedal switch.
The engine does not stop when the operator leaves the seat and the mover deck is activated.	The engine can be stopped with the ignition key.	1. Adjust or replace the grey seat switch 2. Adjust/replace the mover deck switch.
The engine does not stop		1. Check the white cable and its connection to the engine. 2. Replace the ignition switch.
The engine can be started without the operator in the seat, brake pedal pressed and deck not activated.		Adjust/replace the black seat switch.
Electric mower deck adjustment does not work	Works in one direction only.	Replace the height adjustmen switch.
	Works not in any direction.	1. Check the contact. 2. Check the cables. 3. Check the motor by connecting an additional battery to the deck cable. 4. Replace the switch.
The starter does not rotate and there is no "click" heard at the start attempt.	Fault in the safety circuits.	1. Adjust/replace the pedal switch. 2. Adjust/replace the black seat switch. 3. Adjust/replace the mover deck switch. 4. Replace the ignition switch
The starter does not rotate and there is a "click" heard at the start attempt.	Faulty start engine or start relay	1. Check cable connections. 2. Replace the start relay. 3. Replace the start motor
The starter rotate, but the engine does not start.		1. Check the fuel supply. 2. Check the engine according to the engine manual. 3. Check that the white short circuit cable is not connected to earth. 4. Replace the ignition switch. 5. Replace the shut off valve.
The battery runs repeatedly empty.	A connected voltmeter to the battery shows a higher voltage at high speed than if the engine not is running.	Replace the battery.
	No voltage different.	1. Check engine socket connections. 2. Replace the ignition switch. 3. Replace the voltage regulator. 4. Replace the alternator.

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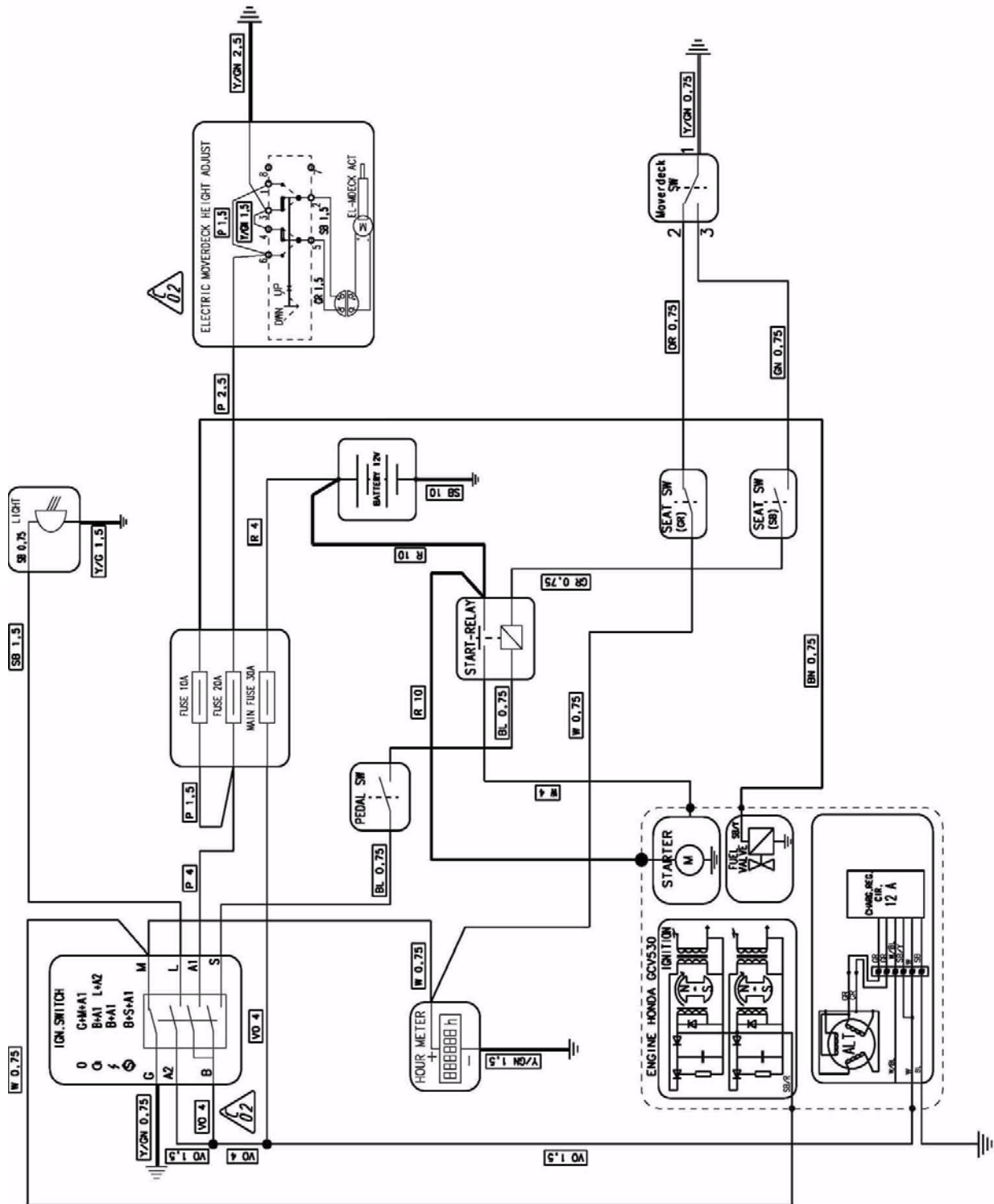


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Valid for (Art. Number)		1005-0078		
13-6179-XX	13-6199-15	13-6377-11	13-6378-XX	13-6379-XX

Fault	Cause/Alternative	Action
The engine can be started with the mower deck activated.		Adjust or replace the mover deck switch.
The engine can be started without the brake pedal pressed.		Replace/adjust the pedal switch.
The engine does not stop when the operator leaves the seat and the mover deck is activated.	The engine can be stopped with the ignition key.	1. Adjust or replace the grey seat switch 2. Adjust/replace the mover deck switch.
The engine does not stop		1. Check the white cable and its connection to the engine. 2. Replace the ignition switch.
The engine can be started without the operator in the seat, brake pedal pressed and deck not activated.		Adjust/replace the black seat switch.
Electric mower deck adjustment does not work	Works in one direction only.	Replace the height adjustmen switch.
	Works not in any direction.	1. Check the contact. 2. Check the cables. 3. Check the motor by connecting an additional battery to the deck cable. 4. Replace the switch.
The starter does not rotate and there is no "click" heard at the start attempt.	Fault in the safety circuits.	1. Adjust/replace the pedal switch. 2. Adjust/replace the black seat switch. 3. Adjust/replace the mover deck switch. 4. Replace the ignition switch
The starter does not rotate and there is a "click" heard at the start attempt.	Faulty start engine or start relay	1. Check cable connections. 2. Replace the start relay. 3. Replace the start motor
The starter rotate, but the engine does not start.		1. Check the fuel supply. 2. Check the engine according to the engine manual. 3. Check that the white short circuit cable is not connected to earth. 4. Replace the ignition switch. 5. Replace the shut off valve.
The battery runs repeatedly empty.	A connected voltmeter to the battery shows a higher voltage at high speed than if the engine not is running.	Replace the battery.
	No voltage different.	1. Check engine socket connections. 2. Replace the ignition switch. 3. Replace the voltage regulator. 4. Replace the alternator.

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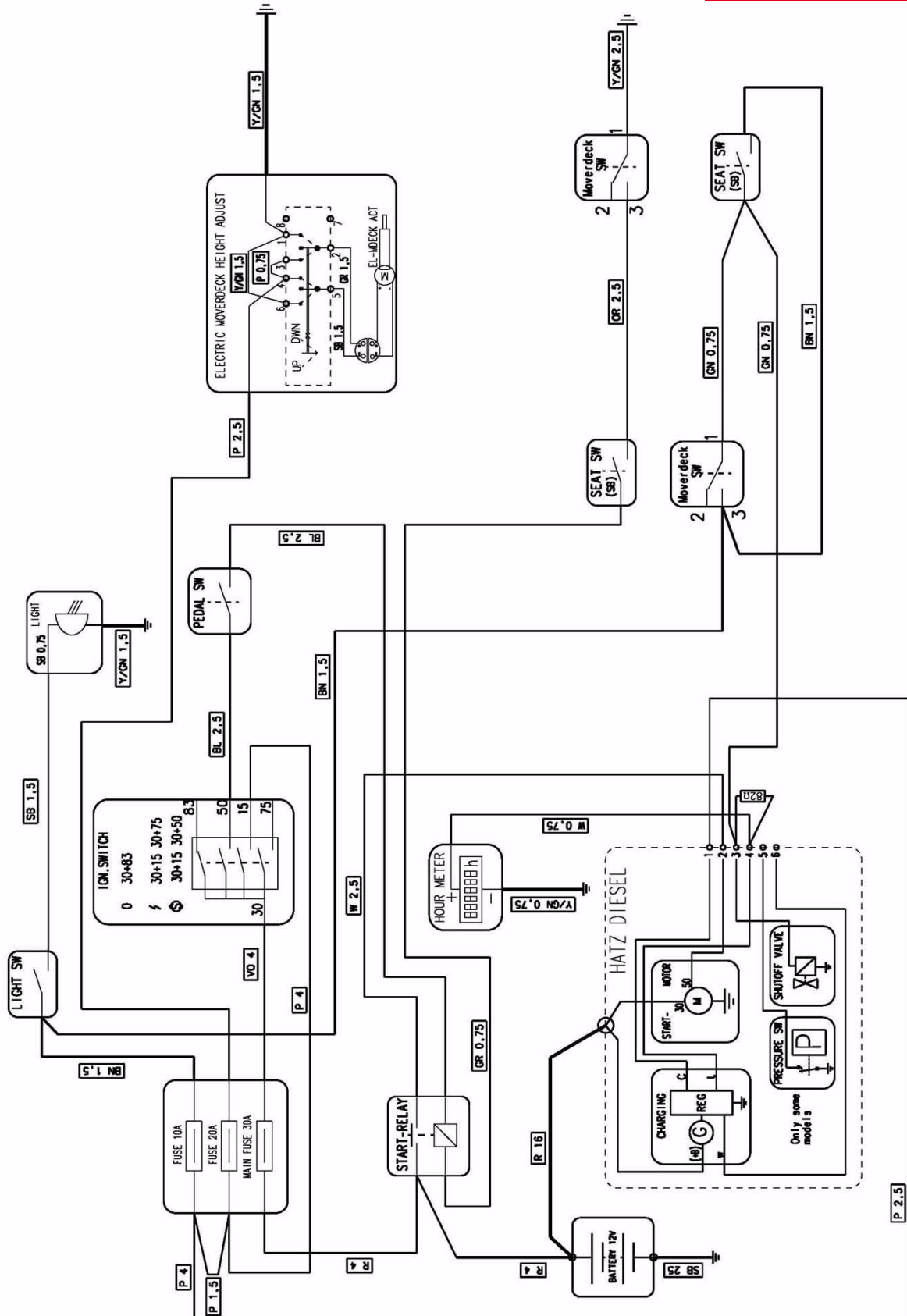


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Valid for (Art. Number)		1005-0081		
13-6180-XX	13-6181-34	-	-	-

Fault	Cause/Alternative	Action
The engine can be started with the mower deck activated.		Adjust or replace the mover deck switch.
The engine can be started without the brake pedal pressed.		Replace/adjust the pedal switch.
The engine does not stop when the operator leaves the seat and the mover deck is activated.	The engine can be stopped with the ignition key.	Adjust or replace the grey seat switch.
	The engine can not be stopped with the ignition key.	Replace the ignition switch.
The engine does not stop.		Replace the shut off valve.
The starter does not rotate and there is no "click" heard at the start attempt.	Fault in the safety circuits.	<ol style="list-style-type: none"> 1. Adjust/replace the pedal switch. 2. Adjust/replace the black seat switch. 3. Adjust/replace the mover deck switch. 4. Replace the ignition switch
The engine can be started without the operator in the seat, brake pedal pressed and deck not activated.		Adjust/replace the black seat switch.
The starter does not rotate and there is a "click" heard at the start attempt.	Faulty start engine or start relay	<ol style="list-style-type: none"> 1. Check cable connections. 2. Replace the start relay. 3. Replace the start engine
The starter rotate, but the engine does not start.	The light does not work.	Replace the ignition switch.
	The light works.	<ol style="list-style-type: none"> 1. Check the fuel supply. 2. Check the engine according to the engine manual. 3. Adjust/replace the seat switch. 4. Replace the shut off valve.
The battery runs repeatedly empty.	A connected voltmeter to the battery shows a higher voltage at high speed than if the engine not is running.	Replace the battery.
	No voltage different.	Replace/repair the charging unit in the engine. See the engine manual.
Electric mower deck adjustment does not work	Works in one direction only.	Replace the height adjustmen switch.
	Works not in any direction.	<ol style="list-style-type: none"> 1. Check the contact. 2. Check the cables. 3. Check the motor by connecting an additional battery to the deck cable. 4. Replace the switch.

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Valid for (Art. Number)		1005-0087		
13-6241-XX	13-6244-XX	13-6271-XX	13-6273-XX	13-6274-16

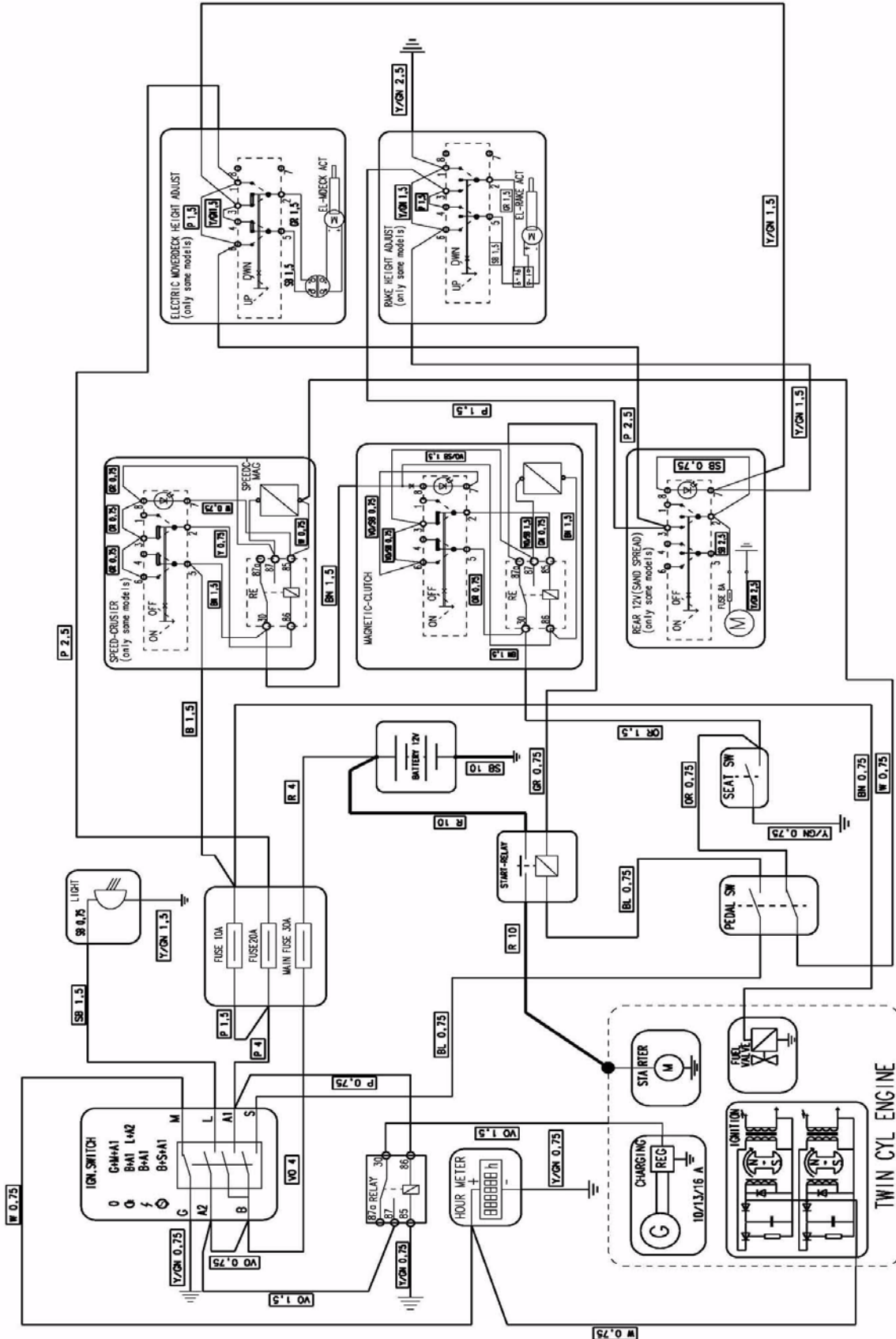
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Fault	Cause/Alternative	Action
The engine can be started with the mower deck activated.		Adjust or replace the mover deck switch.
The mower deck does not disengage when the operator leaves the seat and the mover deck is activated.		Replace the seat switch.
The engine does not stop.		1. Check the white cable and its connection to the engine. 2. Replace the ignition switch.
The speed cruiser does not disengage when the brake pedal is pressed.		1. Clean the brake plate. See section 3. 2. Adjust/replace the pedal switch.
The engine can be started without the brake pedal pressed.		Replace/adjust the pedal switch.
The engine can be started without the operator in the seat, brake pedal pressed and deck not activated.		Adjust/replace the seat switch.
The starter does not rotate and there is no "click" heard at the start attempt.	Fault in the safety circuits.	1. Adjust/replace the pedal switch. 2. Adjust/replace the seat switch. 3. Adjust/replace the mover deck switch. 4. Replace the ignition switch
The starter does not rotate and there is a "click" heard at the start attempt.	Faulty start motor or start relay	1. Check cable connections. 2. Replace the start relay. 3. Replace the start motor
The starter rotate, but the engine does not start.		1. Check the fuel supply. 2. Check the engine according to the engine manual. 3. Check that the white short circuit cable is not connected to earth. 4. Replace the ignition switch. 5. Replace the shut off valve.
The battery runs repeatedly empty.	A connected voltmeter to the battery shows a higher voltage at high speed than if the engine not is running.	Replace the battery.
	No voltage different.	1. Check engine socket connections. 2. Replace the ignition switch. 3. Replace the voltage regulator. 4. Replace the alternator.

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Fault	Cause/Alternative	Action
Electric mower deck adjustment does not work	Works in one direction only.	Replace the height adjustment switch.
	Works not in any direction.	<ol style="list-style-type: none"> 1. Check the contact. 2. Check the cables. 3. Check the motor by connecting an additional battery to the deck cable. 4. Replace the switch.
The PTO clutch does not engage	The speed cruiser is also out of function.	Replace/adjust the seat switch.
	The clutch engages, but do not remain engaged.	Replace/adjust the clutch switch.
	The LED in the switch lit when engagement attempt is done.	<ol style="list-style-type: none"> 1. Check the clutch cables. 2. Replace the clutch.
	Other alternative.	<ol style="list-style-type: none"> 1. Replace the relay. 2. Replace the clutch switch. 3. Replace the hydraulic lift switch (if any).
The sand spreader does not work	The LED in the switch lit when engagement attempt is done.	<ol style="list-style-type: none"> 1. Check/replace the fuse in the sand spreader. 2. Check the cables and connectors. 3. Replace the sand spreader motor.
	The LED in the switch does not lit when engagement attempt is done.	Replace the sand spreader switch.
The speed cruiser does not work.	The clutch engages, but do not remain engaged.	Replace/adjust the clutch switch.
	The LED in the switch lit when engagement attempt is done.	<ol style="list-style-type: none"> 1. Check the cables to the speed cruiser magnet. 2. Replace the speed cruiser magnet.
	Other alternative.	<ol style="list-style-type: none"> 1. Replace the relay. 2. Replace the switch. 3. Replace/adjust the pedal switch.
The hydraulic lift does not work	Malfunction at mowing down	<ol style="list-style-type: none"> 1. Replace the lifting switch. 2. Replace the release valve.
	Malfunction at mowing up	<ol style="list-style-type: none"> 1. Replace the lifting switch. 2. Replace the pressure valve.

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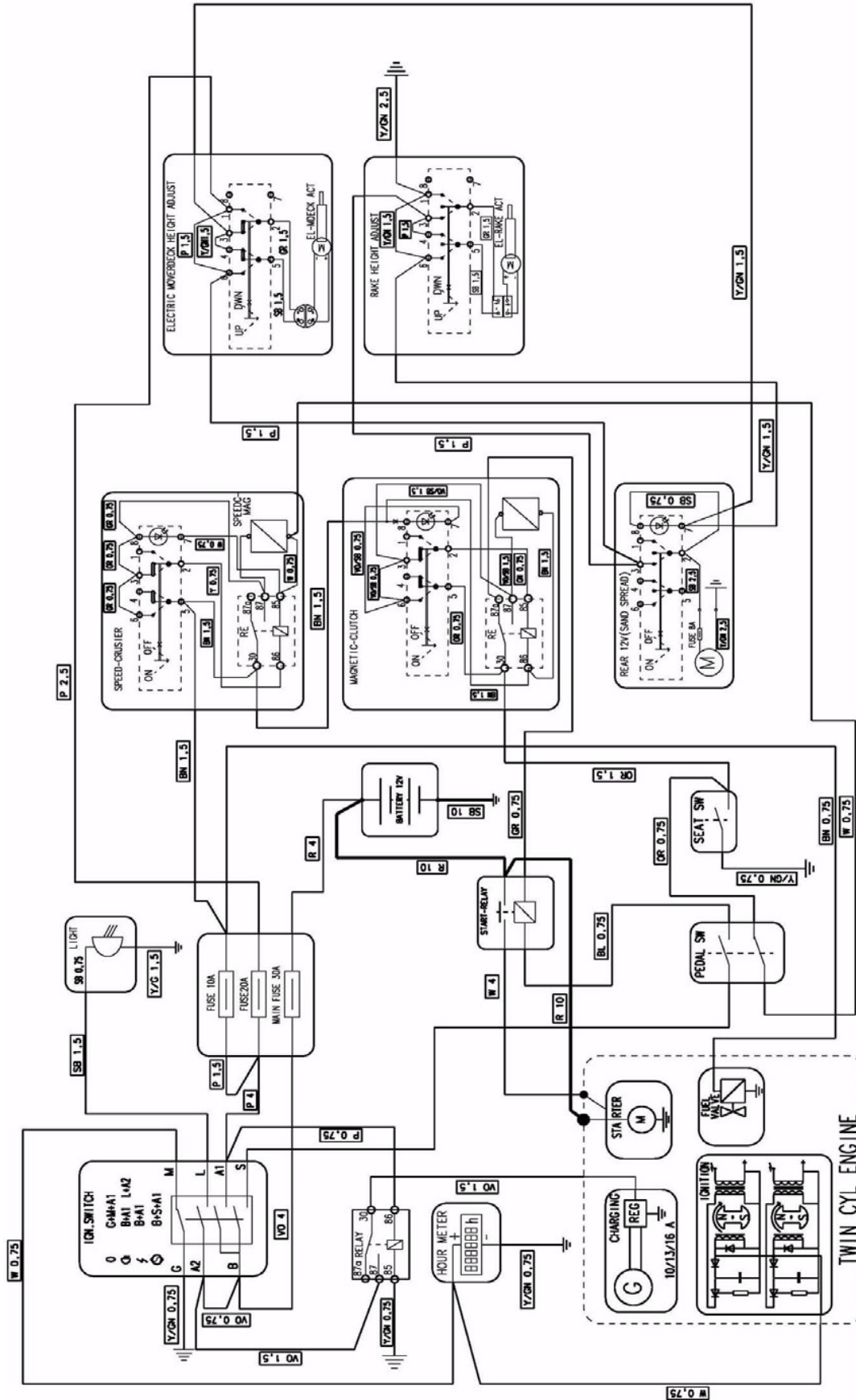
Valid for (Art. Number)		1005-0086		
13-6242-64	13-6246-XX	13-6275-16	-	-

Fault	Cause/Alternative	Action
The engine can be started with the mower deck activated.		Adjust or replace the mower deck switch.
The mower deck does not disengage when the operator leaves the seat and the mower deck is activated.		Replace the seat switch.
The engine does not stop.		<ol style="list-style-type: none"> 1. Check the white cable and its connection to the engine. 2. Replace the ignition switch.
The speed cruiser does not disengage when the brake pedal is pressed.		<ol style="list-style-type: none"> 1. Clean the brake plate. See section 3. 2. Adjust/replace the pedal switch.
The engine can be started without the brake pedal pressed.		Replace/adjust the pedal switch.
The engine can be started without the operator in the seat, brake pedal pressed and deck not activated.		Adjust/replace the seat switch.
The starter does not rotate and there is no "click" heard at the start attempt.	Fault in the safety circuits.	<ol style="list-style-type: none"> 1. Adjust/replace the pedal switch. 2. Adjust/replace the seat switch. 3. Adjust/replace the mower deck switch. 4. Replace the ignition switch
The starter does not rotate and there is a "click" heard at the start attempt.	Faulty start motor or start relay	<ol style="list-style-type: none"> 1. Check cable connections. 2. Replace the start relay. 3. Replace the start motor
The starter rotate, but the engine does not start.		<ol style="list-style-type: none"> 1. Check the fuel supply. 2. Check the engine according to the engine manual. 3. Check that the white short circuit cable is not connected to earth. 4. Replace the ignition switch. 5. Replace the shut off valve.
The battery runs repeatedly empty.	A connected voltmeter to the battery shows a higher voltage at high speed than if the engine not is running.	Replace the battery.
	No voltage different.	<ol style="list-style-type: none"> 1. Check engine socket connections. 2. Replace the ignition switch. 3. Replace the voltage regulator. 4. Replace the alternator.

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Fault	Cause/Alternative	Action
Electric mower deck adjustment does not work	Works in one direction only.	Replace the height adjustmen switch.
	Works not in any direction.	1. Check the contact. 2. Check the cables. 3. Check the motor by connecting an additional battery to the deck cable. 4. Replace the switch.
The The PTO clutch does not engage	The speed cruiser is also out of function.	Replace/adjust the seat switch.
	The clutch engages, but do not remain engaged.	Replace/adjust the clutch switch.
	The LED in the switch lit when engagement attempt is done.	1. Check the clutch cables. 2. Replace the clutch.
	Other alternative.	1. Replace the relay. 2. Replace the clutch switch. 3. Replace the hydraulic lift switch (if any).
The sand spreader does not work	The LED in the switch lit when engagement attempt is done.	1. Check/replace the fuse in the sand spreader. 2. Check the cables and connectors. 3. Replace the sand spreader motor.
	The LED in the switch does not lit when engagement attempt is done.	Replace the sand spreader switch.
The speed cruiser does not work.	The clutch engages, but do not remain engaged.	Replace/adjust the clutch switch.
	The LED in the switch lit when engagement attempt is done.	1. Check the cables to the speed cruiser magnet. 2. Replace the speed cruiser magnet.
	Other alternative.	1. Replace the relay. 2. Replace the switch. 3. Replace/adjust the pedal switch.
The hydraulic lift does not work	Malfunction at mowing down	1. Replace the lifting switch. 2. Replace the release valve.
	Malfunction at mowing up	1. Replace the lifting switch. 2. Replace the pressure valve.

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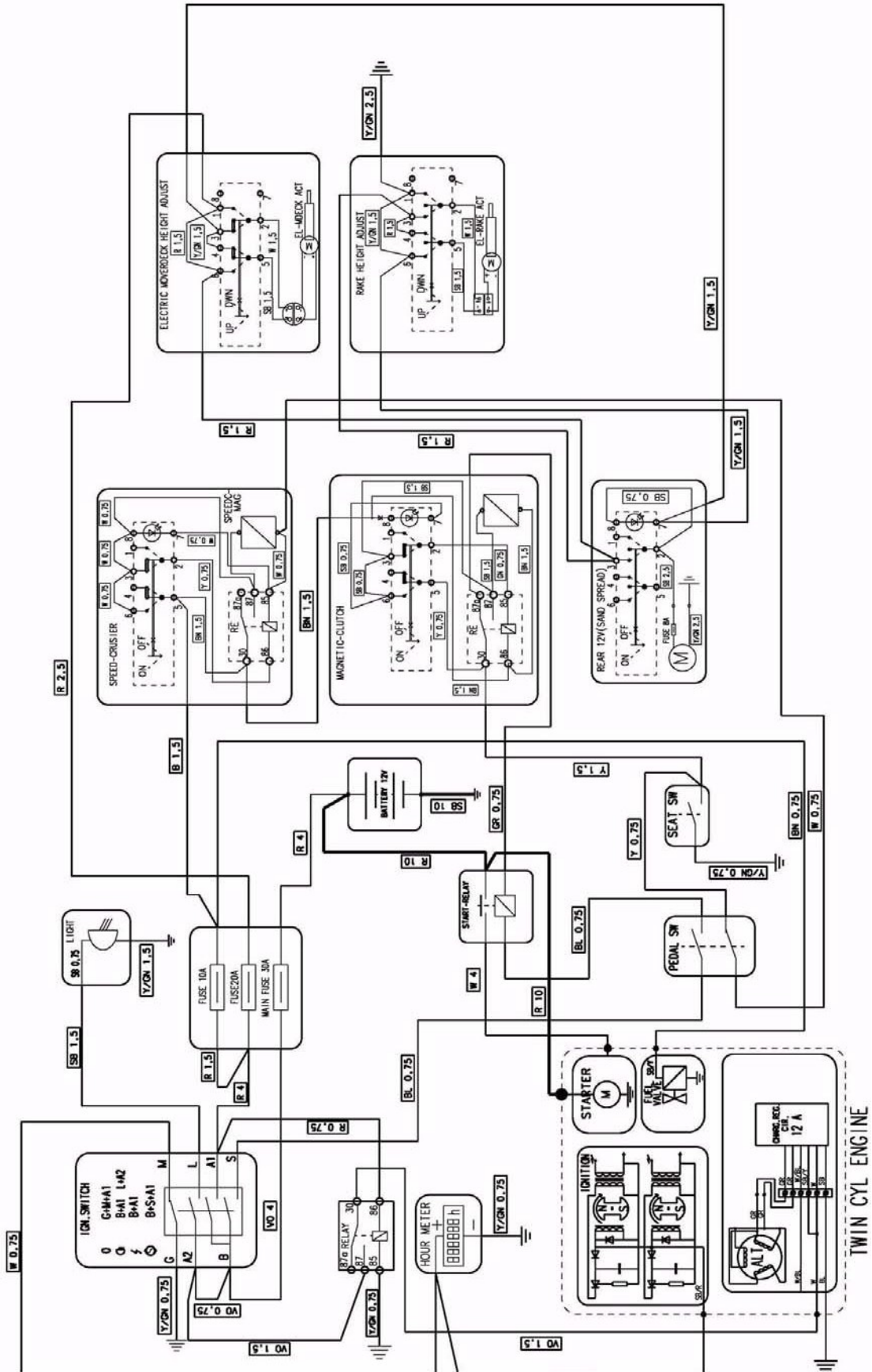
Valid for (Art. Number)		1005-0088		
13-6272-XX	13-6312-XX	-	-	-

Fault	Cause/Alternative	Action
The engine can be started with the mower deck activated.		Adjust or replace the mower deck switch.
The mower deck does not disengage when the operator leaves the seat and the mower deck is activated.		Replace the seat switch.
The engine does not stop.		<ol style="list-style-type: none"> 1. Check the white cable and its connection to the engine. 2. Replace the ignition switch.
The speed cruiser does not disengage when the brake pedal is pressed.		<ol style="list-style-type: none"> 1. Clean the brake plate. See section 3. 2. Adjust/replace the pedal switch.
The engine can be started without the brake pedal pressed.		Replace/adjust the pedal switch.
The engine can be started without the operator in the seat, brake pedal pressed and deck not activated.		Adjust/replace the seat switch.
The starter does not rotate and there is no "click" heard at the start attempt.	Fault in the safety circuits.	<ol style="list-style-type: none"> 1. Adjust/replace the pedal switch. 2. Adjust/replace the seat switch. 3. Adjust/replace the mower deck switch. 4. Replace the ignition switch
The starter does not rotate and there is a "click" heard at the start attempt.	Faulty start motor or start relay	<ol style="list-style-type: none"> 1. Check cable connections. 2. Replace the start relay. 3. Replace the start motor
The starter rotate, but the engine does not start.		<ol style="list-style-type: none"> 1. Check the fuel supply. 2. Check the engine according to the engine manual. 3. Check that the white short circuit cable is not connected to earth. 4. Replace the ignition switch. 5. Replace the shut off valve.
The battery runs repeatedly empty.	A connected voltmeter to the battery shows a higher voltage at high speed than if the engine not is running.	Replace the battery.
	No voltage different.	<ol style="list-style-type: none"> 1. Check engine socket connections. 2. Replace the ignition switch. 3. Replace the voltage regulator. 4. Replace the alternator.

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Fault	Cause/Alternative	Action
Electric mower deck adjustment does not work	Works in one direction only.	Replace the height adjustmen switch.
	Works not in any direction.	1. Check the contact. 2. Check the cables. 3. Check the motor by connecting an additional battery to the deck cable. 4. Replace the switch.
The The PTO clutch does not engage	The speed cruiser is also out of function.	Replace/adjust the seat switch.
	The clutch engages, but do not remain engaged.	Replace/adjust the clutch switch.
	The LED in the switch lit when engagement attempt is done.	1. Check the clutch cables. 2. Replace the clutch.
	Other alternative.	1. Replace the relay. 2. Replace the clutch switch. 3. Replace the hydraulic lift switch (if any).
The sand spreader does not work	The LED in the switch lit when engagement attempt is done.	1. Check/replace the fuse in the sand spreader. 2. Check the cables and connectors. 3. Replace the sand spreader motor.
	The LED in the switch does not lit when engagement attempt is done.	Replace the sand spreader switch.
The speed cruiser does not work.	The clutch engages, but do not remain engaged.	Replace/adjust the clutch switch.
	The LED in the switch lit when engagement attempt is done.	1. Check the cables to the speed cruiser magnet. 2. Replace the speed cruiser magnet.
	Other alternative.	1. Replace the relay. 2. Replace the switch. 3. Replace/adjust the pedal switch.
The hydraulic lift does not work	Malfunction at mowing down	1. Replace the lifting switch. 2. Replace the release valve.
	Malfunction at mowing up	1. Replace the lifting switch. 2. Replace the pressure valve.

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Valid for (Art. Number)		1005-0095		
13-6276-XX	13-6100-XX	-	-	-

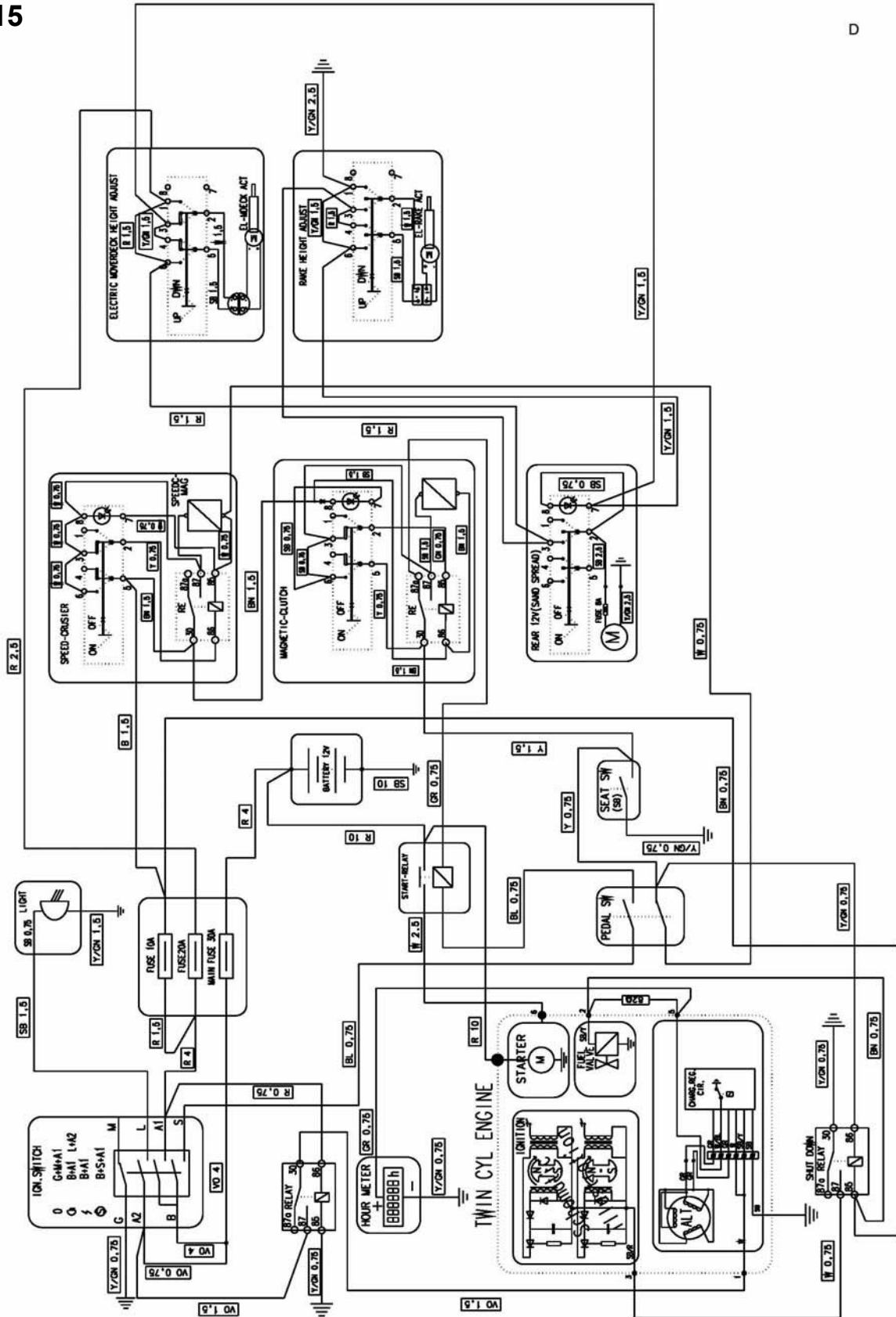
Fault	Cause/Alternative	Action
The engine can be started with the mower deck activated.		Adjust or replace the mover deck switch.
The mower deck does not disengage when the operator leaves the seat and the mover deck is activated.		Replace the seat switch.
The engine does not stop.		<ol style="list-style-type: none"> 1. Check the white cable and its connection to the engine. 2. Replace the ignition switch.
The speed cruiser does not disengage when the brake pedal is pressed.		<ol style="list-style-type: none"> 1. Clean the brake plate. See section 3. 2. Adjust/replace the pedal switch.
The engine can be started without the brake pedal pressed.		Replace/adjust the pedal switch.
The engine can be started without the operator in the seat, brake pedal pressed and deck not activated.		Adjust/replace the seat switch.
The starter does not rotate and there is no "click" heard at the start attempt.	Fault in the safety circuits.	<ol style="list-style-type: none"> 1. Adjust/replace the pedal switch. 2. Adjust/replace the seat switch. 3. Adjust/replace the mover deck switch. 4. Replace the ignition switch
The starter does not rotate and there is a "click" heard at the start attempt.	Faulty start motor or start relay	<ol style="list-style-type: none"> 1. Check cable connections. 2. Replace the start relay. 3. Replace the start motor
The starter rotate, but the engine does not start.		<ol style="list-style-type: none"> 1. Check the fuel supply. 2. Check the engine according to the engine manual. 3. Check that the white short circuit cable is not connected to earth. 4. Replace the ignition switch. 5. Replace the shut off valve.
The battery runs repeatedly empty.	A connected voltmeter to the battery shows a higher voltage at high speed than if the engine not is running.	Replace the battery.
	No voltage different.	<ol style="list-style-type: none"> 1. Check engine socket connections. 2. Replace the ignition switch. 3. Replace the voltage regulator. 4. Replace the alternator.

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Fault	Cause/Alternative	Action
Electric mower deck adjustment does not work	Works in one direction only.	Replace the height adjustmen switch.
	Works not in any direction.	1. Check the contact. 2. Check the cables. 3. Check the motor by connecting an additional battery to the deck cable. 4. Replace the switch.
The The PTO clutch does not engage	The speed cruiser is also out of function.	Replace/adjust the seat switch.
	The clutch engages, but do not remain engaged.	Replace/adjust the clutch switch.
	The LED in the switch lit when engagement attempt is done.	1. Check the clutch cables. 2. Replace the clutch.
	Other alternative.	1. Replace the relay. 2. Replace the clutch switch. 3. Replace the hydraulic lift switch (if any).
The sand spreader does not work	The LED in the switch lit when engagement attempt is done.	1. Check/replace the fuse in the sand spreader. 2. Check the cables and connectors. 3. Replace the sand spreader motor.
	The LED in the switch does not lit when engagement attempt is done.	Replace the sand spreader switch.
The speed cruiser does not work.	The clutch engages, but do not remain engaged.	Replace/adjust the clutch switch.
	The LED in the switch lit when engagement attempt is done.	1. Check the cables to the speed cruiser magnet. 2. Replace the speed cruiser magnet.
	Other alternative.	1. Replace the relay. 2. Replace the switch. 3. Replace/adjust the pedal switch.
The hydraulic lift does not work	Malfunction at mowing down	1. Replace the lifting switch. 2. Replace the release valve.
	Malfunction at mowing up	1. Replace the lifting switch. 2. Replace the pressure valve.

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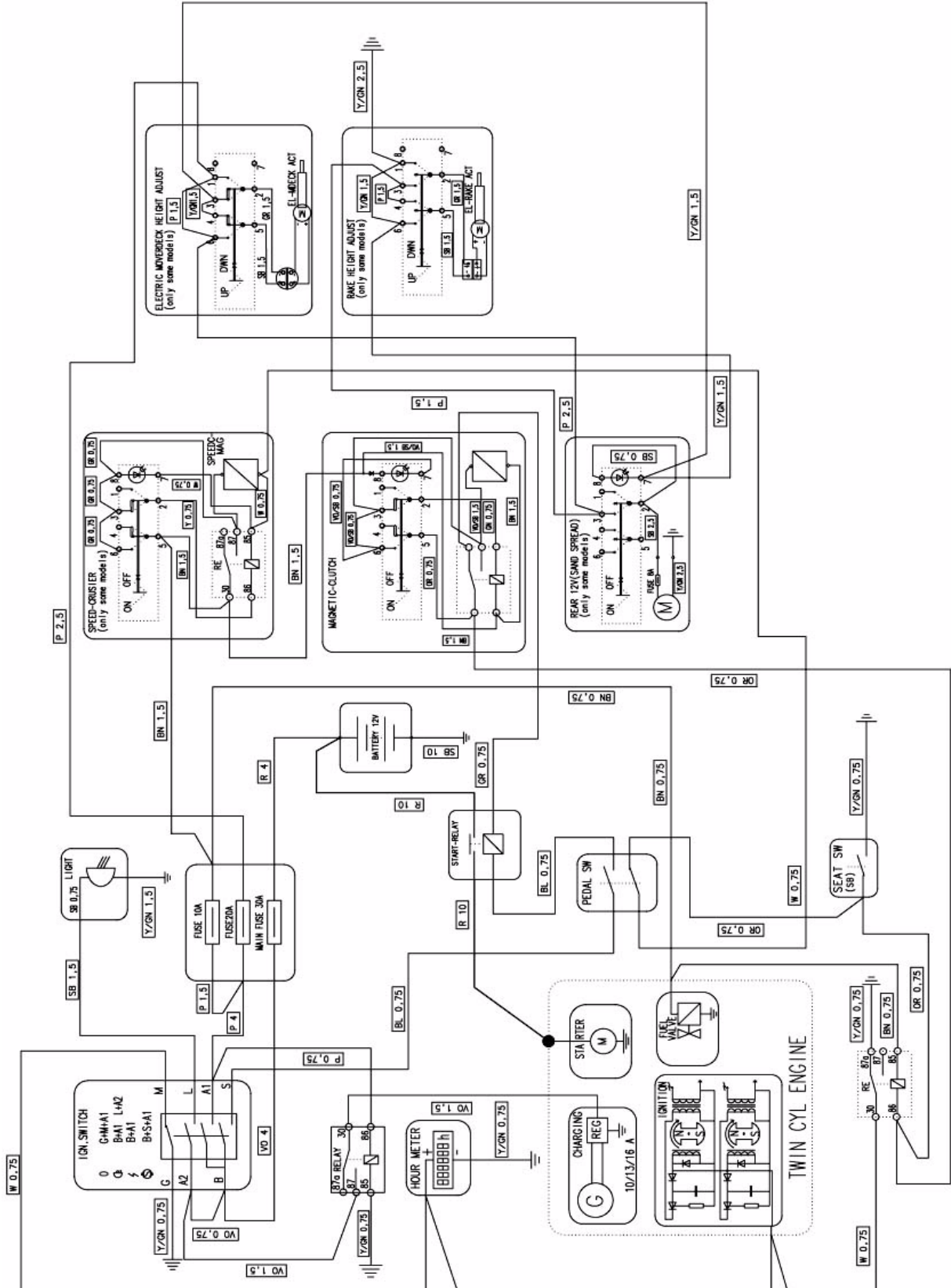
Valid for (Art. Number)		1005-0101		
13-6269-XX	13-6270-XX	-	-	-

Fault	Cause/Alternative	Action
The engine can be started with the mower deck activated.		Adjust or replace the mover deck switch.
The mower deck does not disengage when the operator leaves the seat and the mover deck is activated.		Replace the seat switch.
The engine does not stop.		1. Check the white cable and its connection to the engine. 2. Replace the ignition switch.
The speed cruiser does not disengage when the brake pedal is pressed.		1. Clean the brake plate. See section 3. 2. Adjust/replace the pedal switch.
The engine can be started without the brake pedal pressed.		Replace/adjust the pedal switch.
The engine can be started without the operator in the seat, brake pedal pressed and deck not activated.		Adjust/replace the seat switch.
The starter does not rotate and there is no "click" heard at the start attempt.	Fault in the safety circuits.	1. Adjust/replace the pedal switch. 2. Adjust/replace the seat switch. 3. Adjust/replace the mover deck switch. 4. Replace the ignition switch
The starter does not rotate and there is a "click" heard at the start attempt.	Faulty start motor or start relay	1. Check cable connections. 2. Replace the start relay. 3. Replace the start motor
The starter rotate, but the engine does not start.		1. Check the fuel supply. 2. Check the engine according to the engine manual. 3. Check that the white short circuit cable is not connected to earth. 4. Replace the ignition switch. 5. Replace the shut off valve.
The battery runs repeatedly empty.	A connected voltmeter to the battery shows a higher voltage at high speed than if the engine not is running.	Replace the battery.
	No voltage different.	1. Check engine socket connections. 2. Replace the ignition switch. 3. Replace the voltage regulator. 4. Replace the alternator.

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Fault	Cause/Alternative	Action
Electric mower deck adjustment does not work	Works in one direction only.	Replace the height adjustmen switch.
	Works not in any direction.	1. Check the contact. 2. Check the cables. 3. Check the motor by connecting an additional battery to the deck cable. 4. Replace the switch.
The The PTO clutch does not engage	The speed cruiser is also out of function.	Replace/adjust the seat switch.
	The clutch engages, but do not remain engaged.	Replace/adjust the clutch switch.
	The LED in the switch lit when engagement attempt is done.	1. Check the clutch cables. 2. Replace the clutch.
	Other alternative.	1. Replace the relay. 2. Replace the clutch switch. 3. Replace the hydraulic lift switch (if any).
The sand spreader does not work	The LED in the switch lit when engagement attempt is done.	1. Check/replace the fuse in the sand spreader. 2. Check the cables and connectors. 3. Replace the sand spreader motor.
	The LED in the switch does not lit when engagement attempt is done.	Replace the sand spreader switch.
The speed cruiser does not work.	The clutch engages, but do not remain engaged.	Replace/adjust the clutch switch.
	The LED in the switch lit when engagement attempt is done.	1. Check the cables to the speed cruiser magnet. 2. Replace the speed cruiser magnet.
	Other alternative.	1. Replace the relay. 2. Replace the switch. 3. Replace/adjust the pedal switch.
The hydraulic lift does not work	Malfunction at mowing down	1. Replace the lifting switch. 2. Replace the release valve.
	Malfunction at mowing up	1. Replace the lifting switch. 2. Replace the pressure valve.

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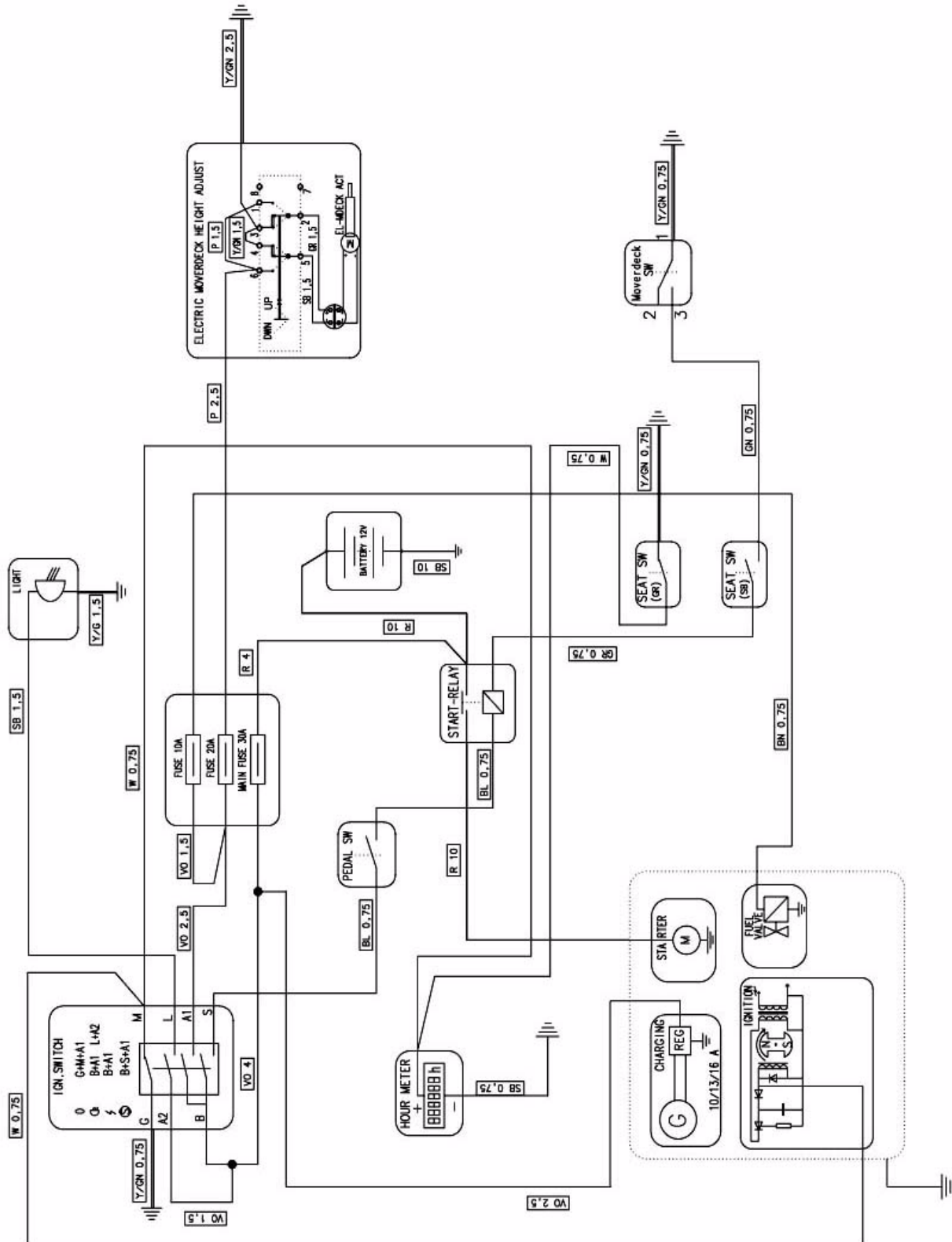


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Valid for (Art. Number)		1005-0106		
13-6317-32	13-6320-11	13-6373-XX	13-6380-XX	-

Fault	Cause/Alternative	Action
The engine can be started with the mower deck activated.		Adjust or replace the mover deck switch.
The engine can be started without the brake pedal pressed.		Replace/adjust the pedal switch.
The engine does not stop when the operator leaves the seat and the mover deck is activated.	The engine can be stopped with the ignition key.	1. Adjust or replace the grey seat switch 2. Adjust/replace the mover deck switch.
	The engine can not be stopped with the ignition key.	Replace the ignition switch.
The engine does not stop		1. Check the white cable and its connection to the engine. 2. Replace the ignition switch.
The engine can be started without the operator in the seat, brake pedal pressed and deck not activated.		Adjust/replace the black seat switch.
Electric mower deck adjustment does not work	Works in one direction only.	Replace the height adjustmen switch.
	Works not in any direction.	1. Check the contact. 2. Check the cables. 3. Check the motor by connecting an additional battery to the deck cable. 4. Replace the switch.
The starter does not rotate and there is no "click" heard at the start attempt.	Fault in the safety circuits.	1. Adjust/replace the pedal switch. 2. Adjust/replace the black seat switch. 3. Adjust/replace the mover deck switch. 4. Replace the ignition switch
The starter does not rotate and there is a "click" heard at the start attempt.	Faulty start engine or start relay	1. Check cable connections. 2. Replace the start relay. 3. Replace the start motor
The starter rotate, but the engine does not start.		1. Check the fuel supply. 2. Check the engine according to the engine manual. 3. Check that the white short circuit cable is not connected to earth. 4. Replace the ignition switch. 5. Replace the shut off valve.
The battery runs repeatedly empty.	A connected voltmeter to the battery shows a higher voltage at high speed than if the engine not is running.	Replace the battery.
	No voltage different.	1. Check engine socket connections. 2. Replace the ignition switch. 3. Replace the voltage regulator. 4. Replace the alternator.

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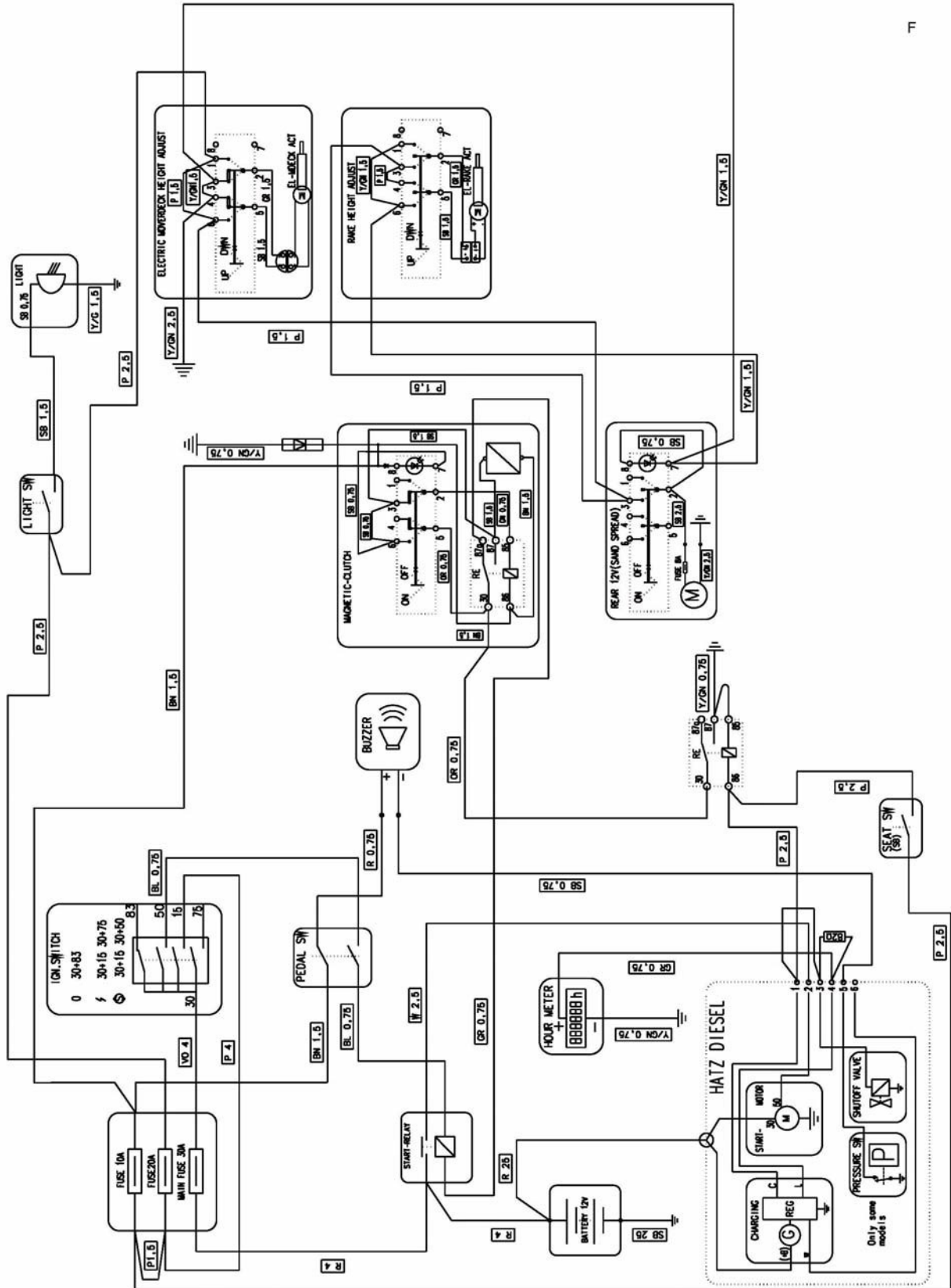
Valid for (Art. Number)		1005-0112		
13-6318-31	13-6319-31	-	-	-

Fault	Cause/Alternative	Action
The engine can be started with the mower deck activated.		Adjust or replace the mower deck switch.
The mower deck does not disengage when the operator leaves the seat and the mower deck is activated.		Replace the seat switch.
The engine does not stop.		<ol style="list-style-type: none"> 1. Check the white cable and its connection to the engine. 2. Replace the ignition switch.
The speed cruiser does not disengage when the brake pedal is pressed.		<ol style="list-style-type: none"> 1. Clean the brake plate. See section 3. 2. Adjust/replace the pedal switch.
The engine can be started without the brake pedal pressed.		Replace/adjust the pedal switch.
The engine can be started without the operator in the seat, brake pedal pressed and deck not activated.		Adjust/replace the seat switch.
The starter does not rotate and there is no "click" heard at the start attempt.	Fault in the safety circuits.	<ol style="list-style-type: none"> 1. Adjust/replace the pedal switch. 2. Adjust/replace the seat switch. 3. Adjust/replace the mower deck switch. 4. Replace the ignition switch
The starter does not rotate and there is a "click" heard at the start attempt.	Faulty start motor or start relay	<ol style="list-style-type: none"> 1. Check cable connections. 2. Replace the start relay. 3. Replace the start motor
The starter rotate, but the engine does not start.		<ol style="list-style-type: none"> 1. Check the fuel supply. 2. Check the engine according to the engine manual. 3. Check that the white short circuit cable is not connected to earth. 4. Replace the ignition switch. 5. Replace the shut off valve.
The battery runs repeatedly empty.	A connected voltmeter to the battery shows a higher voltage at high speed than if the engine not is running.	Replace the battery.
	No voltage different.	<ol style="list-style-type: none"> 1. Check engine socket connections. 2. Replace the ignition switch. 3. Replace the voltage regulator. 4. Replace the alternator.

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Fault	Cause/Alternative	Action
Electric mower deck adjustment does not work	Works in one direction only.	Replace the height adjustmen switch.
	Works not in any direction.	1. Check the contact. 2. Check the cables. 3. Check the motor by connecting an additional battery to the deck cable. 4. Replace the switch.
The The PTO clutch does not engage	The speed cruiser is also out of function.	Replace/adjust the seat switch.
	The clutch engages, but do not remain engaged.	Replace/adjust the clutch switch.
	The LED in the switch lit when engagement attempt is done.	1. Check the clutch cables. 2. Replace the clutch.
	Other alternative.	1. Replace the relay. 2. Replace the clutch switch. 3. Replace the hydraulic lift switch (if any).
The sand spreader does not work	The LED in the switch lit when engagement attempt is done.	1. Check/replace the fuse in the sand spreader. 2. Check the cables and connectors. 3. Replace the sand spreader motor.
	The LED in the switch does not lit when engagement attempt is done.	Replace the sand spreader switch.

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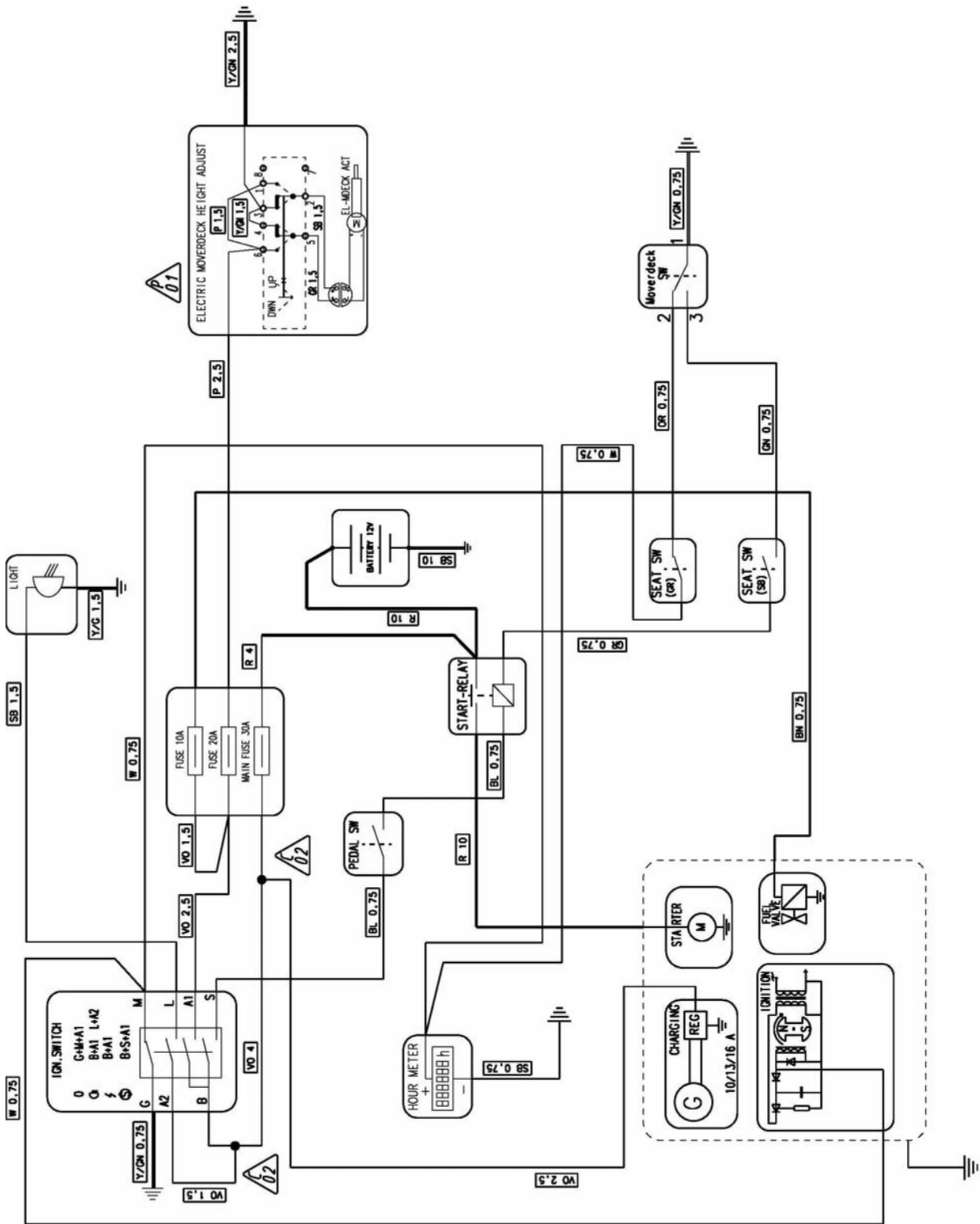
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Valid for (Art. Number)		1005-0080		
13-6372-11	13-6379-21	-	-	-

Fault	Cause/Alternative	Action
The engine can be started with the mower deck activated.		Adjust or replace the mover deck switch.
The engine can be started without the brake pedal pressed.		Replace/adjust the pedal switch.
The engine does not stop when the operator leaves the seat and the mover deck is activated.	The engine can be stopped with the ignition key.	1. Adjust or replace the grey seat switch 2. Adjust/replace the mover deck switch.
The engine does not stop		1. Check the white cable and its connection to the engine. 2. Replace the ignition switch.
The engine can be started without the operator in the seat, brake pedal pressed and deck not activated.		Adjust/replace the black seat switch.
Electric mower deck adjustment does not work	Works in one direction only.	Replace the height adjustmen switch.
	Works not in any direction.	1. Check the contact. 2. Check the cables. 3. Check the motor by connecting an additional battery to the deck cable. 4. Replace the switch.
The starter does not rotate and there is no "click" heard at the start attempt.	Fault in the safety circuits.	1. Adjust/replace the pedal switch. 2. Adjust/replace the black seat switch. 3. Adjust/replace the mover deck switch. 4. Replace the ignition switch
The starter does not rotate and there is a "click" heard at the start attempt.	Faulty start engine or start relay	1. Check cable connections. 2. Replace the start relay. 3. Replace the start motor
The starter rotate, but the engine does not start.		1. Check the fuel supply. 2. Check the engine according to the engine manual. 3. Check that the white short circuit cable is not connected to earth. 4. Replace the ignition switch. 5. Replace the shut off valve.
The battery runs repeatedly empty.	A connected voltmeter to the battery shows a higher voltage at high speed than if the engine not is running.	Replace the battery.
	No voltage different.	1. Check engine socket connections. 2. Replace the ignition switch. 3. Replace the voltage regulator. 4. Replace the alternator.

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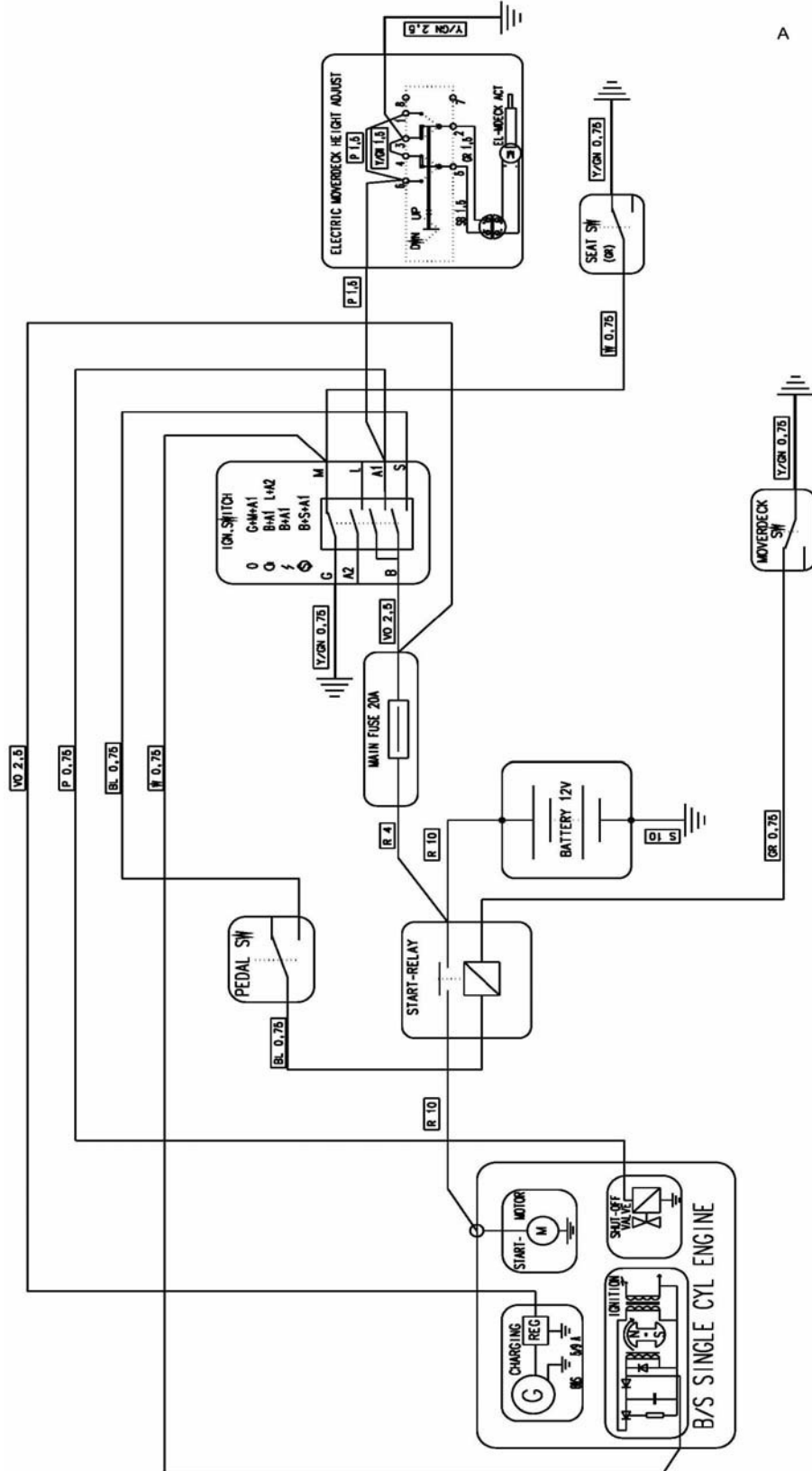


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Valid for (Art. Number)		1005-0105		
2F6120520/S15	2F6130520/S15	-	-	-

Fault	Cause/Alternative	Action
The engine can be started with the mower deck activated.		Adjust or replace the mover deck switch.
The engine does not stop when the operator leaves the seat and the mover deck is activated.	The engine can be stopped with the ignition key.	1. Adjust or replace the seat switch 2. Adjust/replace the mover deck switch.
	The engine can not be stopped with the ignition key.	Replace the ignition switch.
The engine can be started without the brake pedal pressed.		Replace/adjust the pedal switch.
The engine does not stop		1. Check the white cable and its connection to the engine. 2. Replace the ignition switch.
The starter does not rotate and there is no "click" heard at the start attempt.	Fault in the safety circuits.	1. Adjust/replace the pedal switch. 2. Adjust/replace the seat switch. 3. Adjust/replace the mover deck switch. 4. Replace the ignition switch. 5. Replace the start relay.
The starter does not rotate and there is a "click" heard at the start attempt.	Faulty start engine or start relay	1. Check cable connections. 2. Replace the start relay. 3. Replace the start engine
The starter rotate, but the engine does not start.		1. Check the fuel supply. 2. Check the engine according to the engine manual. 3. Check that the white short circuit cable is not connected to earth. 4. Replace the ignition switch. 5. Replace the shut off valve.
The battery runs repeatedly empty.	A connected voltmeter to the battery shows a higher voltage at high speed than if the engine not is running.	Replace the battery.
	No voltage different.	1. Check engine socket connections. 2. Replace the ignition switch. 3. Replace the voltage regulator. 4. Replace the alternator.

from 2015 ...



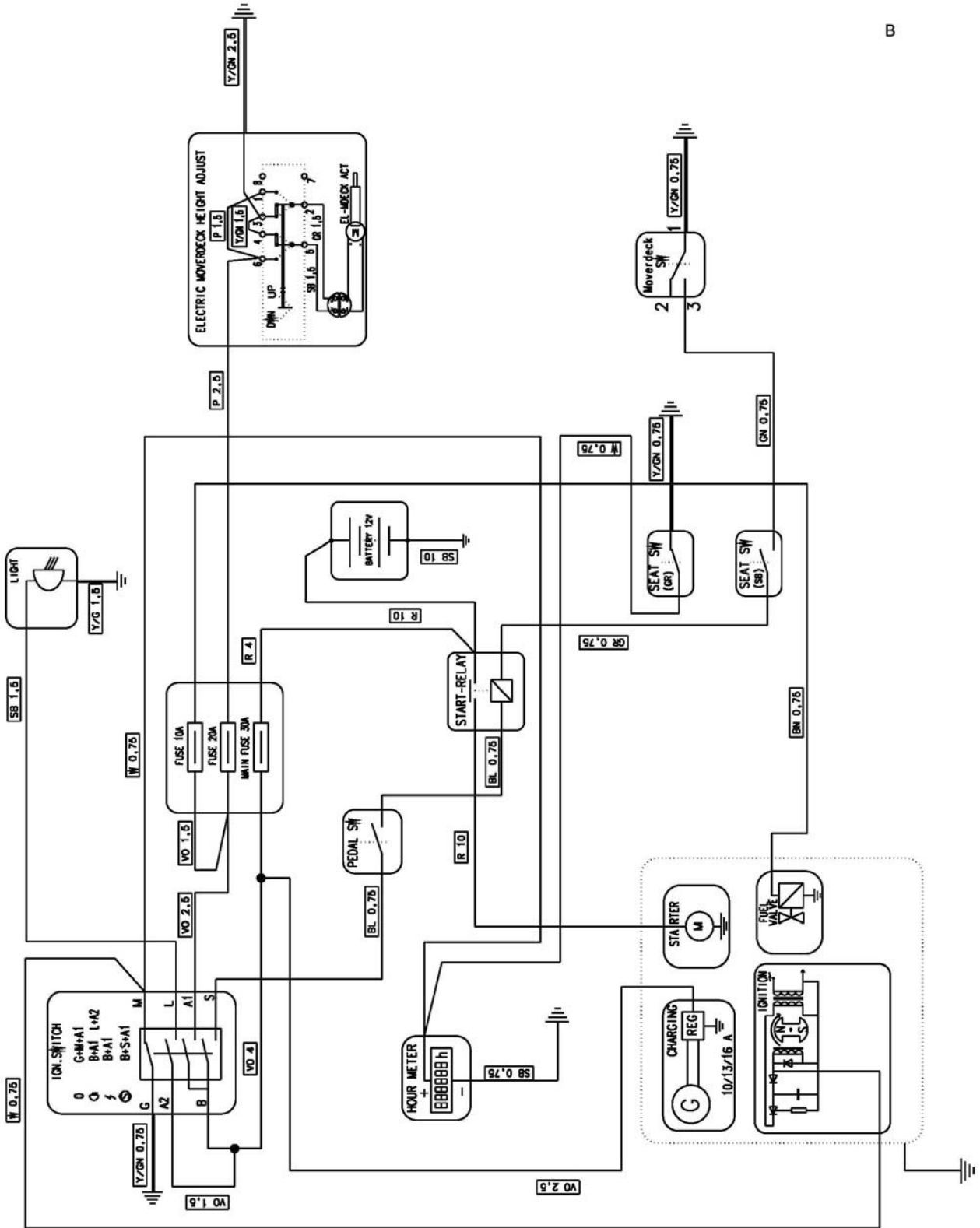
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from 2015 ...

Valid for (Art. Number)		1005-0106			
2F6220610/S15	2F6220620/S15	2F6220820/S15	2F6230620/S15	2F6230820/S15	

Fault	Cause/Alternative	Action
The engine can be started with the mower deck activated.		Adjust or replace the mover deck switch.
The engine can be started without the brake pedal pressed.		Replace/adjust the pedal switch.
The engine does not stop when the operator leaves the seat and the mover deck is activated.	The engine can be stopped with the ignition key.	1. Adjust or replace the grey seat switch 2. Adjust/replace the mover deck switch.
The engine does not stop		1. Check the white cable and its connection to the engine. 2. Replace the ignition switch.
The engine can be started without the operator in the seat, brake pedal pressed and deck not activated.		Adjust/replace the black seat switch.
Electric mower deck adjustment does not work	Works in one direction only.	Replace the height adjustmen switch.
	Works not in any direction.	1. Check the contact. 2. Check the cables. 3. Check the motor by connecting an additional battery to the deck cable. 4. Replace the switch.
The starter does not rotate and there is no "click" heard at the start attempt.	Fault in the safety circuits.	1. Adjust/replace the pedal switch. 2. Adjust/replace the black seat switch. 3. Adjust/replace the mover deck switch. 4. Replace the ignition switch
The starter does not rotate and there is a "click" heard at the start attempt.	Faulty start engine or start relay	1. Check cable connections. 2. Replace the start relay. 3. Replace the start motor
The starter rotate, but the engine does not start.		1. Check the fuel supply. 2. Check the engine according to the engine manual. 3. Check that the white short circuit cable is not connected to earth. 4. Replace the ignition switch. 5. Replace the shut off valve.
The battery runs repeatedly empty.	A connected voltmeter to the battery shows a higher voltage at high speed than if the engine not is running.	Replace the battery.
	No voltage different.	1. Check engine socket connections. 2. Replace the ignition switch. 3. Replace the voltage regulator. 4. Replace the alternator.

from 2015 ...



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7.3 Repair and replacements

Warning

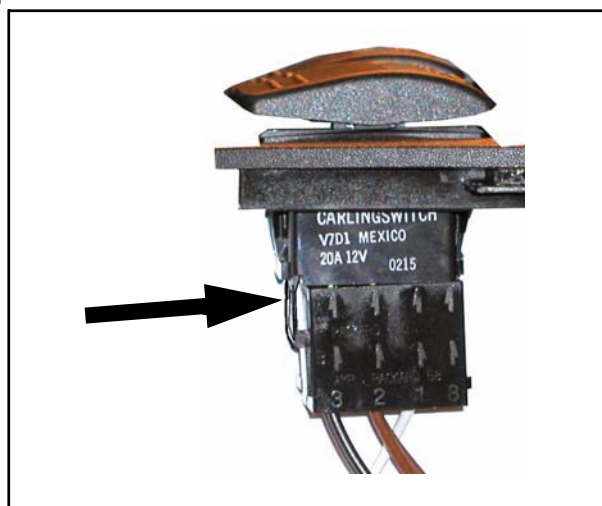


Do not wear rings, metallic bracelet, chain round the neck or similar metal objects when working with the electrical system. It can cause short-circuit, burns and fire.

7.3.1 Replacement of switches

All switches are pressed into place in their rectangular holes at the control panel. To change a switch proceed as follows:

1. Remove the actual cover to get access to the switch.
2. Press the fixation pig at the connector and pull the connector from the switch.
See the figure.
Some connectors have 2 pigs.
3. Press the fixation tongues on both sides of the switch against the switch. Use a screwdriver or similar and work up the switch.
See the figure.

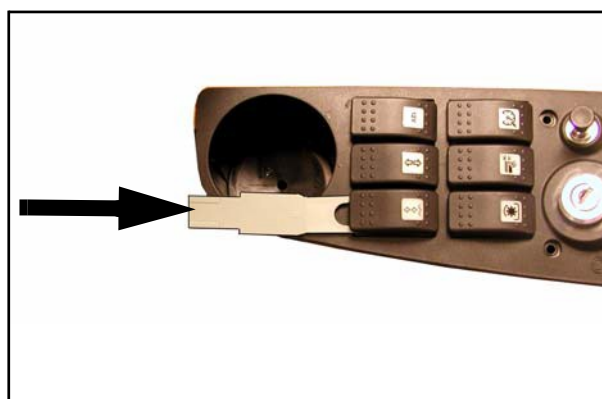


7.3.2 Replacement of switch knob

To replace the switch knob, there is a special tool available. Regarding reference number, see the spare parts list

Remove the knob by pushing in the tool backwards and press until the knob jumps up.

The knob is easily assembled by pressing it down in its hole in the switch.



7.3.3 Connections

The machine is equipped with three kinds of connectors:

- Fixed connectors in plastic holders.
- Tab connectors
- Screw connectors

All connectors shall be kept free from contamination, corrosion and damp.

Fixed connectors in plastic holders

To remove the connectors from the plastic holder, put a small screwdriver behind the connector, hold the cable and pull out the connector.

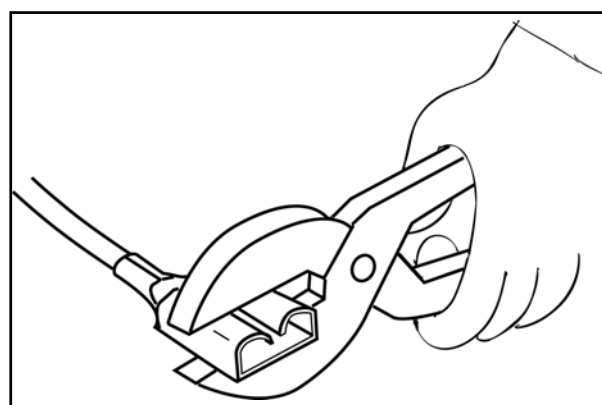
See the figure.



Tab connectors

To restore tab connectors if bad crimp forces occur, e.g. after a long time of use, the connector can be pinched by a pliers.

See the figure.



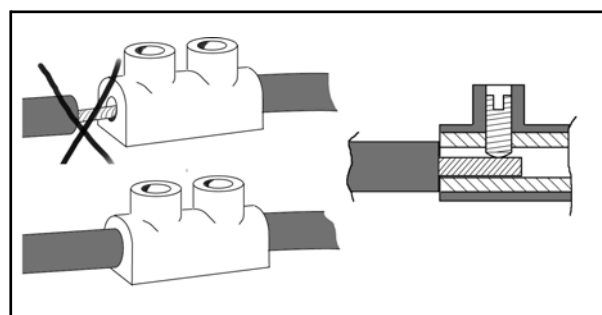
Screw connectors

When cables shall be connected into screw connectors, the cable shall be stripped off 5 mm only. No metallic conductor is allowed to be exposed outside the terminal.



Warning!

Exposed conductors can cause short-circuit and fire.



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STIGA S.p.A - Via del Lavoro, 6 - 31033 Castelfranco Veneto (TV) - Italy
www.stiga.com