

STIGA



WORKSHOP MANUAL

**MPV 320W - MPV 520W
2017-2019**



ALPINK

Mountfield

ATCO

CASTELGARDEN

WORKSHOP MANUAL

MPV 320W - MPV 520W

EDITION 2017

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INTRODUCTORY NOTES

The purpose of this manual is to provide a complete set of instructions related to the servicing, maintenance, disassembly, repair and installation of the mechanical components for models MPV 320W and MPV 520W.

All trained Servicing personnel must use this manual during all adjustment, disassembly and troubleshooting activities.

IMPORTANT NOTE - The information contained herein is destined exclusively to the Service Centres and professional operators, with the required expertise to perform, and use the correct equipment, all the operations described, with the objective of safeguarding machine performance and safety.

The Manufacturer is under no circumstances liable for any damage or injuries due to interventions performed by private individuals or inadequate facilities.

This manual does not contemplate interventions and repair work on the engine and transmission units, as it is necessary to contact the Service Centres of the respective Manufacturers or obtain documentation supplied by the same.

The manual has left out the simplest and quickest operations that can be handled by a good mechanic, while concentrating more on specific aspects with tips and advice on the best servicing procedures.

Please take the time to read through this manual to acquire a basic understanding of the machine, which is necessary for working rationally without making errors or wasting time. All problems related to user procedures are fully covered in the User manual.

All the information provided refers to the original versions of the machines, excluding therefore interventions on machines which have been subject to modifications that have altered their characteristics or components.

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1 - INTRODUCTION

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1.1 CONSULTATION GUIDE

1.1.1 Limitation of Responsibility

Despite the efforts made to ensure accuracy in the realisation of this manual, errors and inaccuracies may be found in the content. The author is not responsible for any missing or incorrect information.

The Manufacturer reserves the right to make any modifications to the product without warning or any obligation to promptly update this manual.

The introduction of new procedures or indications in addition to those contained in this Manual are reported to the Service Centres by means of ad hoc bulletins and press releases.


All information contained herein is based on data available at the time of publication.

The drawings and photos included herein, may not correspond exactly to the machine on which the intervention is required.

1.1.2 Structure of the Manual

The manual is divided into chapters, paragraphs and sub-paragraphs.

- The front inside cover provides the table of contents indicating the various chapters.
- Each chapter is dedicated to a specific topic, and is preceded by an index that marks the various paragraphs contained therein.
- Each paragraph is further divided into sub-paragraphs, relative to a single procedure.

Cross-references to other parts of the manual are indicated by the symbol  [...] followed by the relevant chapter, paragraph or sub-paragraph number.

1.1.3 Symbols and Definitions used

a) Symbols

They are used to draw the attention of the operator, reminding him to perform the interventions with the necessary attention and caution.



Indicates operations that should be carried out with utmost care to avoid impairing the functionality and safety of the machine.



Indicates operations that should be carried out with utmost care to avoid injury to operators.

► Highlights all those operations that require different working methods depending on the type of machine, subsequent modifications and the accessories fitted.



Indicates cross-reference to other parts of the manual, followed by the number of the relevant chapter, paragraph or sub-paragraph.

b) Safety terminology and notes

Some paragraphs are preceded by a definition that highlights their importance:

NOTE *General reference for the correct maintenance execution and methods.*

IMPORTANT *Specific procedures or information necessary to avoid damage to the machine or equipment.*

WARNING! *Non-observance will result in the risk of injury to oneself or others.*

DANGER! *Non-observance will result in the risk of serious injury or death to oneself or others.*

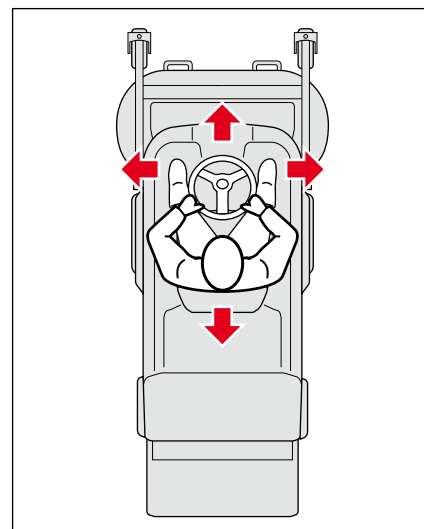
c) Spatial References

Whenever reference is made to a position on the machine “front”, “back”, “left” or “right” side, this refers to the positions of the seated operator.

d) Abbreviations and glossary

The following abbreviations are used in this manual

Rh / Lh	= Right / Left
Min / Max	= Minimum / Maximum
Chap.	= Chapter
Par.	= Paragraph
HST	= Hydrostatic Transmission
PTO	= Power takeoff



1.2 WORK SAFETY INSTRUCTIONS

1.2.1 Qualification of operators

All maintenance, disassembly and repairs must be carried out by expert mechanics who are familiar with all the accident prevention and safety regulations after reading through the procedures in this manual.

1.2.2 Preparing to work

Before starting any work, it is very important to provide adequate preparation to achieve more efficient work. A clean work area at the beginning of each intervention makes for quicker and easier repairs.

To reduce the nuisance of having to search for tools or parts out of place, place the parts removed on a clean work surface, with all the fixing bolts arranged in their order of disassembly.

Organisation is a key element for correct reassembly. The required utensils, tools and components must be gathered before starting work.

Interrupting a job to locate tools or components is a useless waste of time.

1.2.3 Precautions during servicing

The operations described in this manual do not entail particularly hazardous situations besides the normal hazard related to mechanical operations and that can be avoided by taking the necessary care and attention normally required for this type of work.

As well as following the usual accident prevention regulations that apply to most repair shops, we recommended you:

- remove the ignition key before beginning any repair work;
- protect hands with suitable protective gloves, especially when working near the cutting unit;
- check that you do not cause accidental petrol leaks or other losses;
- do not smoke when working on the tank or when handling petrol;
- do not inhale oil or petrol fumes;
- clean up all traces of spilt petrol immediately;
- let the engine and exhaust system to cool before starting any repair or maintenance work. The engine and the exhaust system heat up considerably during operation.
- test the engine in a well-ventilated environment or where there are adequate exhaust fume extraction systems;
- do not pollute the environment with oil, petrol or other waste which has a strong impact on the environment. Dispose of all waste in accordance with the laws in force;
- ensure that other persons cannot accidentally carry out actions that may physically endanger those working on the machine.

1.2.4 Safety measures to be adopted

All the machines are manufactured in accordance with the strict European safety regulations in force. To maintain these levels of safety in the longer term, the Service Centres should work to this end by making appropriate checks every time there is the chance to do so.

In particular, every time there is work done on the machine the Service Centre should:

- check:
 - that the safety microswitches function correctly;
 - that the casings and protection covers have not been removed;
 - that the labels with instructions or provisions have not been removed or have become illegible (these form an integral part of the safety system).
- and also:
 - restore to proper working order any safety devices which have been manipulated or removed;
 - reassemble inefficient, damaged or missing casings and protection covers;
 - replace illegible labels;
 - not endorse any repair or modification on the machine or the engine which results in a change in performance or use that is incorrect or different from the purpose for which it was designed and approved;
 - warn the Customer that failure to comply with the above points automatically voids the warranty and the responsibility of the Manufacturer.

1.3 SERVICE CENTRE PROCEDURES

1.3.1 Machine registration

The Warranty registration card must be completed, signed and returned at the time of purchase. This activates the warranty card.

Claims that meet the requirements will be honoured during the limited warranty period.

1.3.2 Interventions under Warranty

The Manufacturer acknowledges the interventions performed under warranty as per the terms, procedures and limits stated in the contract.

As far as the engine and the transmission unit are concerned, the conditions provided by their respective Manufacturers apply.

1.3.3 Exceptions to the use of the Warranty

- The warranty does not cover damages caused by:
 - Lack of knowledge and familiarisation of the accompanying documentation on the part of the user.
 - Carelessness.
 - Incorrect or prohibited use or assembly.
 - Use of non-genuine spare parts.
 - Use of accessories not supplied or approved by the manufacturer.

- Furthermore, this warranty does not apply to:
 - Components subject to wear such as blades, belts, wheels, batteries and cables.
 - Normal wear and tear due to use.
 - Engine and transmission. These components are covered by the warranties of the respective manufacturers, with terms and conditions specified separately.

The purchaser is covered by national legislation of the Country he resides in. The legal rights of the laws that refer to the purchaser are not limited by this product warranty.

1.3.4 Service repairs outside warranty

The Service Centre has to make out a report containing the machine serial number, a summary of the problems, the repairs carried out and any spare parts used for each repair done on the machine.

A copy of these reports must be retained and made available to the Manufacturer together with the replaced parts in case of any subsequent disputes with Customers.

1.3.5 Fault notification

The Manufacturer welcomes any notifications of faults that recur with particular frequency. It gives the opportunity for a careful inspection of the problem and the implementation of corrective action at production level.

Similarly, the Manufacturer will report any faults discovered on the machines produced, with recommendations for the most suitable procedures for their remedy.

1.3.6 Spare parts requests

When requesting spare parts, the code number must be given, referring to the exploded charts for the year of manufacture, shown on the product identification label.

1.3.7 Non-original spare parts

Use original spare parts only. Replacement of any machine component with anything other than a part authorised by the Manufacturer can adversely affect performance, working life or safety of this machine and will void the Warranty.

The manufacturer disclaims all liability for any claims or damages, albeit under warranty, property damage, personal injury or death resulting from the use of unauthorised spare parts.

2 - SERVICING RECOMMENDATIONS

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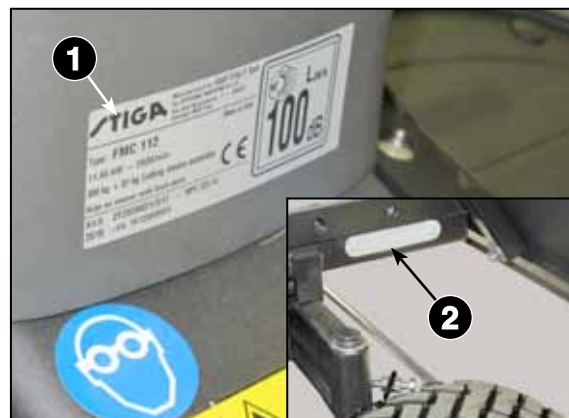
2.1 IDENTIFICATION OF THE MACHINE AND COMPONENTS

2.1.1 Machine identification

Each machine has a label (1) which shows the technical specifications, the model and the serial number.

The serial number is also indicated on a second label (2), riveted on the left rear side of the chassis.

The model and serial number must be shown on each repair sheet when requests are made under Warranty, and are indispensable for spare part orders.



2.1.2 Engine identification

The engine is made to precise technical specifications which differentiate it from similar items by this same Manufacturer.

The engine has a serial number that clearly identifies the product and its specifications; this number must always be quoted when requesting spare parts or any information from the Manufacturer.



2.1.3 Transmission Unit identification

The machine is equipped with a transmission hydro-static unit.

This unit is made by another manufacturer according to precise technical specifications which differentiate it from similar items by this same Manufacturer.

The transmission unit has a serial number (see transmission manual) that clearly identifies the product and its specifications; this number must always be quoted when requesting spare parts or any information from the Manufacturer.



2.2 EQUIPMENT REQUIRED

2.2.1 Basic equipment

All the operations can be carried out with the tools normally available at any good car Servicing Centre.

The availability of an adequate lifting platform for the weight and dimensions of the machine makes it more practical to perform the interventions in the lower area of the machine.

2.2.2 Special equipment

No special tools or equipment are required to perform standard servicing operations.

2.3 TRANSPORTATION AND HANDLING

2.3.1 Machine transportation

Pay utmost attention when loading the machine on or off a trailer or truck.

- Use the machine chassis to fasten it to the means of transport
- NEVER fasten it to bars or joints that could get damaged.
- DO NOT transport the machine with the equipment (if any) in the raised position.

2.3.2 Front lifting

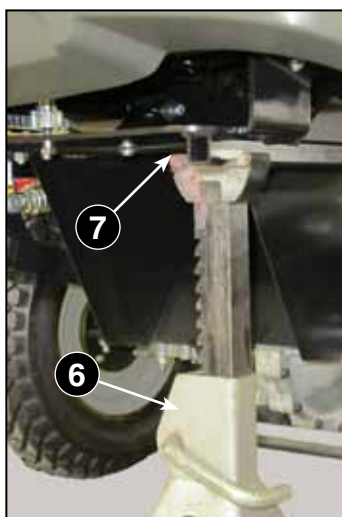
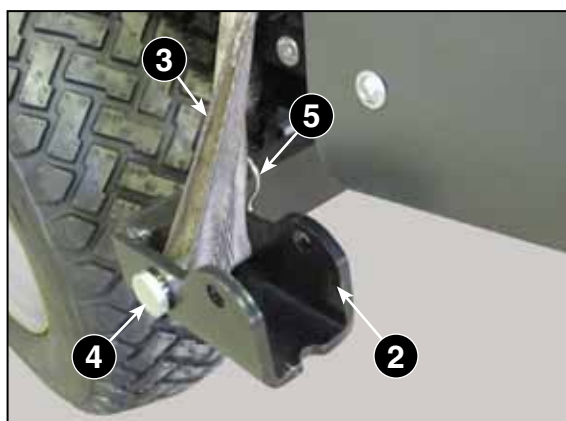
- Remove the cutting deck [👉 6.1.3]

Position two suitably sized wedges behind the rear wheels to prevent all uncontrolled movement of the machine.

The front can be lifted in two different ways:

- place a jack (1) under the lifting forks (2) of the cutting deck;
- place a belt (3) around the pin (4) of each lifting fork (2) and connect them to a hoist of adequate capacity.

WARNING! Replace the split pin (5) to prevent the pin from accidentally sliding out (4).



Lift it just enough to insert two stands (6) under the front part of the longitudinal sections (7) of the chassis ..

! Lower the lifting device and make sure the machine is stable before starting any work.

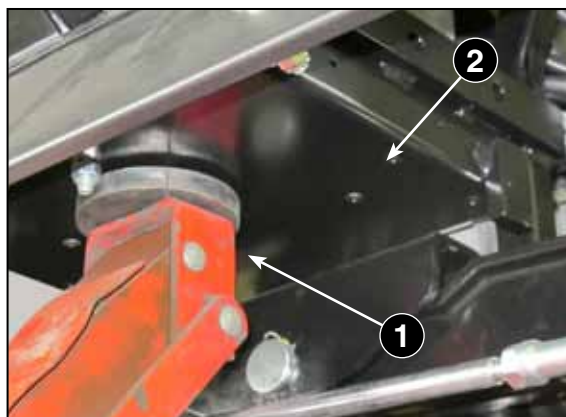
2.3.3 Rear lifting

- Remove the cutting deck [👉 6.1.3]

Engage the parking brake to prevent any uncontrolled movement of the machine.

Place a jack (1) at the centre of the rear chassis plate (2) and lift it just enough to insert support stands in the most suitable positions, according to the work to be performed.

! Release the jack and make sure the machine is stable before starting any work.





2.4 MAINTENANCE

2.4.1 Criteria for maintenance

The Instruction Handbook has a number of operations to be carried out by the Customer for a minimum of basic maintenance, and other operations not always within his capacity. For this reason the Service Centre should undertake to keep the machine in perfect working order adopting a routine maintenance schedule.

2.4.2 Routine maintenance schedules


The routine maintenance schedule includes a series of interventions, at the intervals indicated in the table below:

INTERVAL	OPERATION	ACTION
Every 25 hours or seasonally	Check the safety systems	DANGER! <i>Failure of the safety lock system and incorrect operation of the machine can result in death or serious injury.</i> Check that the safety systems are working correctly as indicated. 7.1.2
	Cleaning the machine	Clean the machine (seat, cutting deck, etc. removing all dirt and debris). Do not use high pressure washers, solvents, aggressive detergents or abrasive cleaners. Restore damaged paint using STIGA paint
	Check and sharpen the cutting deck blades	Check that the blades are not worn or damaged. Sharpen and balance the blades. 6.2.1
	Check the tyre pressures	See the technical specifications 3.1
	Check the tension of the transmission belts	Adjust the upper belt spring 5.1.1 Adjust the lower belt spring 5.1.2
	Check the tightness of the wheel bolts	Tighten the screws to the prescribed values 5.2.2
Every 50 hours or seasonally	Lubrication	1) PTO belt tensioner greaser  2) Forward drive pedal support greaser 
After the first 75 hours of operations	Interventions on the hydrostatic transmission unit	1) Oil change 5.1.6 a) 2) Oil filter replacement 5.1.6 b) 3) Bleeding of the hydraulic circuit 5.1.6c)
Every 400 hours	Interventions on the hydrostatic transmission unit	1) Oil change 5.1.6 a) 2) Oil filter replacement 5.1.6 b) 3) Bleeding of the hydraulic circuit 5.1.6 c)


2.4.3 Control of safety devices

It is of utmost importance that all the safety systems present upon delivery of the machine are kept in efficient working order over time, conducting appropriate checks every time there is the chance to do so. The machine safety system includes:

a) Electric safety devices

 Always check the operation of the safety microswitches, simulating various situations of use as indicated in the specific chapter [\[7.1.2\]](#).

b) Safety labels and symbolss

 These labels are considered an integral part of the safety devices. Always replace illegible and missing labels, as shown in the layout below.



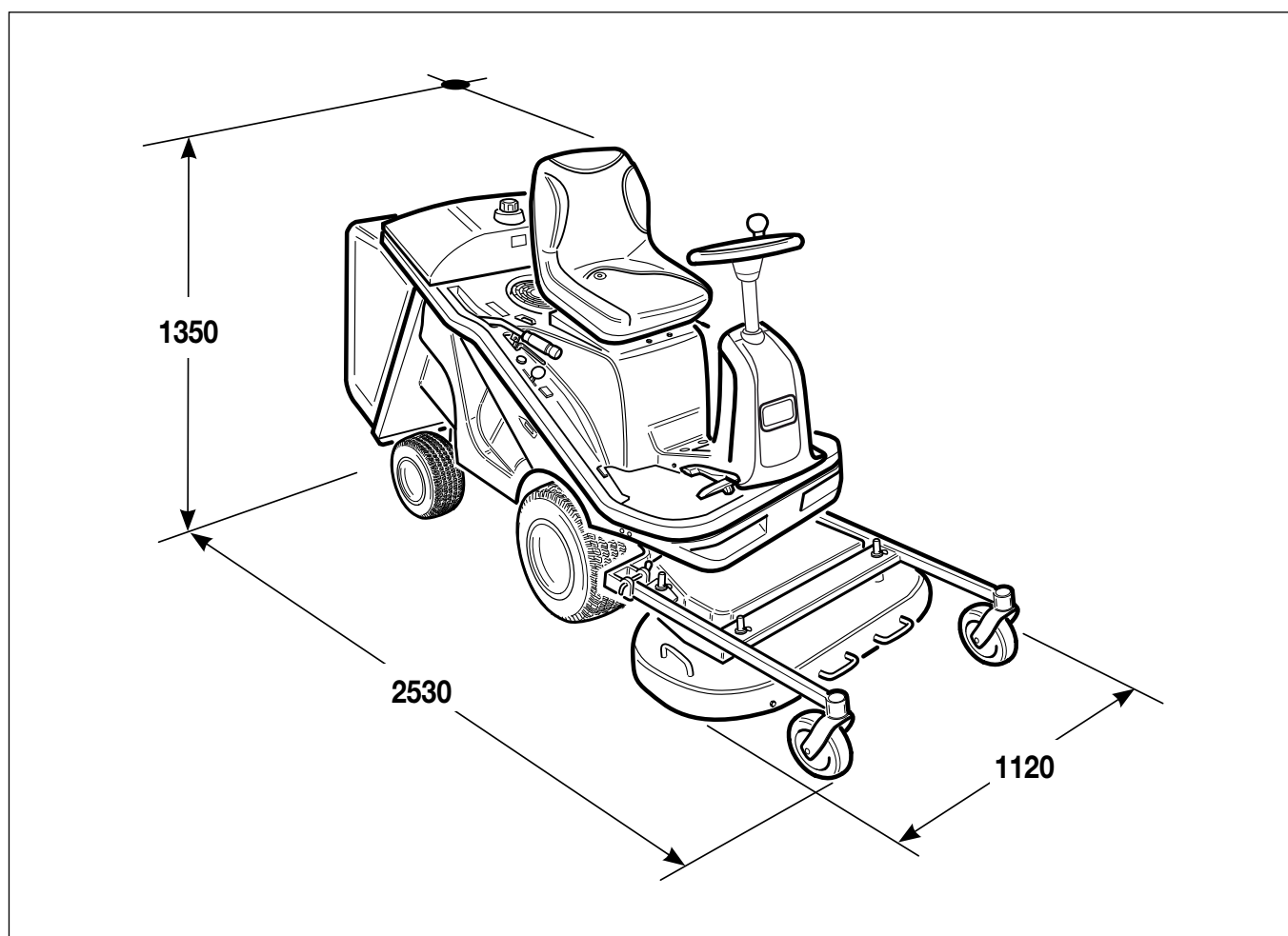
3 - TECHNICAL DATA

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3.1 TECHNICAL SPECIFICATIONS

Machine Model STIGA		MPV 320W	MPV 520W
General information	Dimensions (Length x Width x Height) (mm)	2530 x 1120 x 1850	
	Machine weight (Kg)	350	
Engine and Fuel tank	Engine Brand and Model	B&S Vanguard 16 V-Twin 3057 480cc	B&S Vanguard 21 V-Twin 3587 627cc
	Power and Engine Speed	8.38 kW @ 2400/1'	11.66 kW @ 2400/1'
	Tank capacity (litres)	24	
Electrical system	Voltage	12 V	
	Battery	44 Ah - 420 CCA	
Transmission	Transmission unit brand and model	Hydro-Gear® G730 Transaxles	
	Maximum forward speed (km/h)	8	
	Maximum reverse speed (km/h)	7	
	Control belts	Gates Quad Power III XPA 1082 Gates Quad Power III XPA 690	
Wheels and Tyres	Front (Tubeless)	16 x 7.50-8	
	Rear (Tubeless)	13 x 5-6	
	Front tyre pressure (kPa)	1.4 bar	
	Front tyre pressure (kPa)	1.9 bar	
Cutting deck	Cutting width (cm)	1120	
	Number of blades	2	
	Number of cutting heights	6	
	Minimum cutting height (mm)	20	
	Maximum cutting height (mm)	70	
	Control belt	Gates Power Grip GT2 Twin Power	
	Blade connection belt	Optibelt SPB 2330	

3.2 OVERALL DIMENSIONS

4 - ENGINE AND FUEL TANK

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4.1 ENGINE

4.1.1 Engine tuning and maintenance

Kindly refer to the Manuals and the Technical Documentation supplied by the Manufacturer for information on all interventions on the engine, such as adjustments, maintenance, removal and replacement of components.

If in doubt of for any further assistance, please contact the Manufacturer or an authorised Service Centre.

4.1.2 Removal of the engine

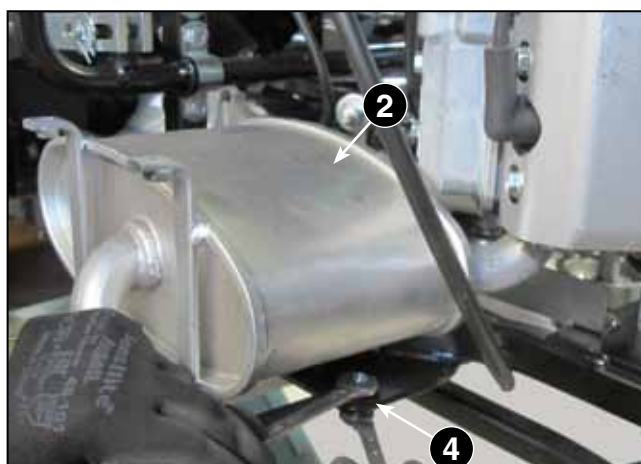
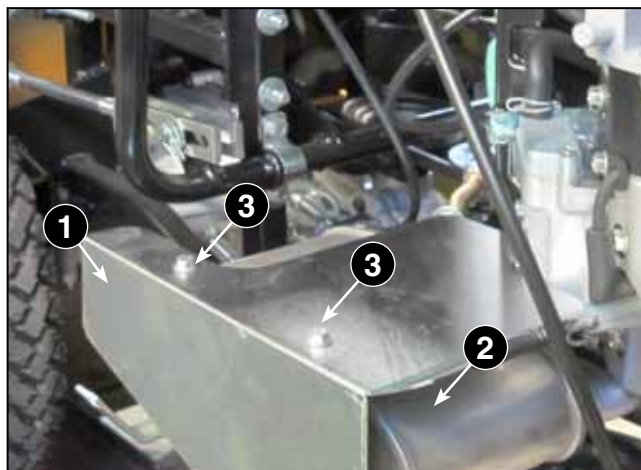
- Remove the protective bar and the electromagnetic clutch, following steps 1 to 7 of the "Replacement and adjustment of the lower belt" procedure [👉 5.1.2].

1. Remove all engine connections:

- the accelerator cable;
- the choke cable;
- the cabling connector;
- the starter motor connector;
- the earth cables.

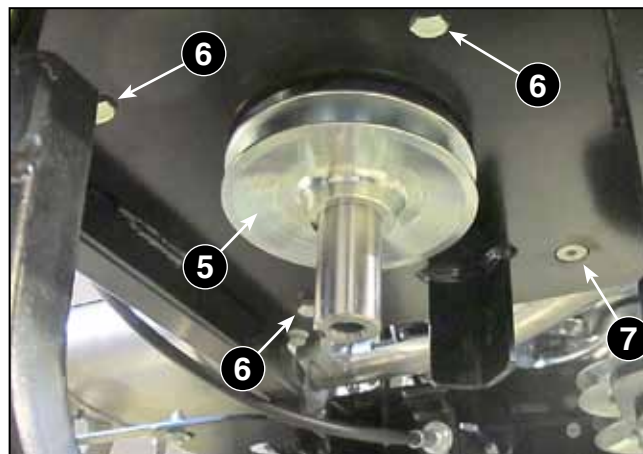
2. Remove the muffler (2) protection (1) secured by screws (3).

3. Remove the muffler (2) secured by screws (4).



4. Remove the pulley (5) from the engine crankshaft.

! Identify and undo the three screws (6) and the screws (7) that fasten the engine to the chassis, then carefully lift and remove the engine using equipment suitable for the weight of the engine (about 45-50 kg) and the designated lifting points to guarantee safe working conditions.



NOTE All the engine screws are different, so it is recommended to label them so that no errors are made during reassembly.

NOTE If the engine must be replaced with a new one, retain the accessories and fasteners that may not be included in the new engine supplied.

To reassemble, follow the operations described above in the reverse order, taking care to:

- tighten the engine fastening screws to a torque of 23-27 Nm.
- carefully reinstate all electric connections;
- reconnect the fuel pipe, making sure there are no leaks;

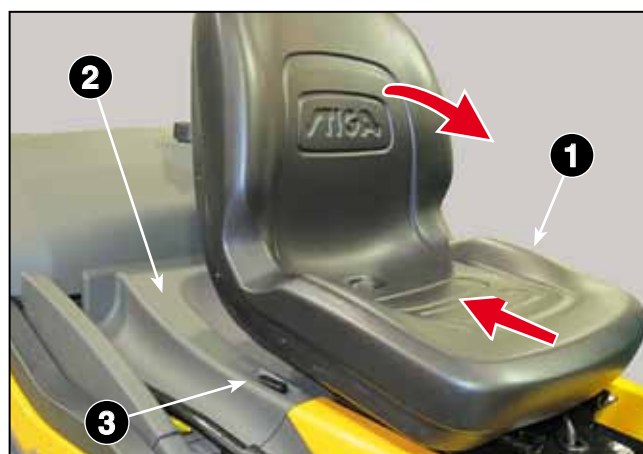
After reconnecting the choke and the accelerator cables, check that the minimum and maximum engine speeds conform to the Manufacturer's requirements.

4.2 TANK

4.2.1 Removal of the fuel tank


- Remove the grass catcher [👉 6.4.1].

1. Move the seat (1) in the fully rearward position and tilt it forward.
2. Remove the rear cover (2) fixed with two quick release fasteners (3).



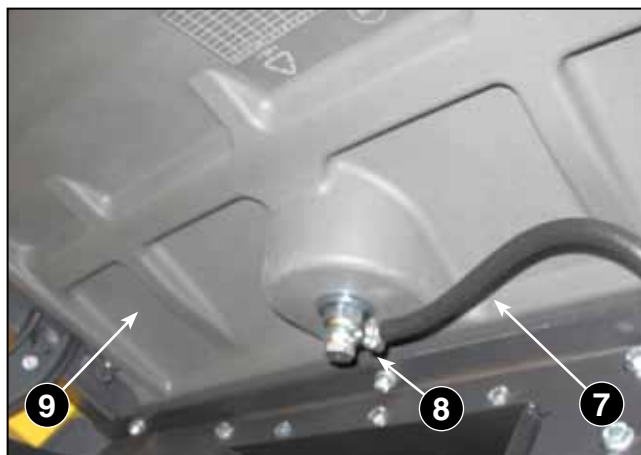
3. Close the fuel tap (4), remove the clamp (5) and disconnect the outlet pipe from the tap (6).

4. Prepare a suitable container, open the tap (4) and collect all the fuel in the tank and in the tank connection pipe.

 **WARNING!** - *Be careful not to disperse petrol in the work area and thoroughly clean up all traces of any spillage.*

5. Remove the clamp (8) from under the tank (9) and disconnect the petrol pipe (7), without removing it completely.

6. Undo the four screws (10) and remove the tank (9).



To reassemble, follow the operations described above in the reverse order, taking care to:

- replace all the clamps (5) and (8);
- check there are no fuel leaks.

5 - TRANSMISSION - WHEELS - STEERING

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5.1 TRANSMISSION

5.1.1 Replacing and adjusting the upper belt

The upper belt connects the return shaft (which receives the drive from the engine) to the hydro-static transmission unit. For interventions, follow the procedure below.

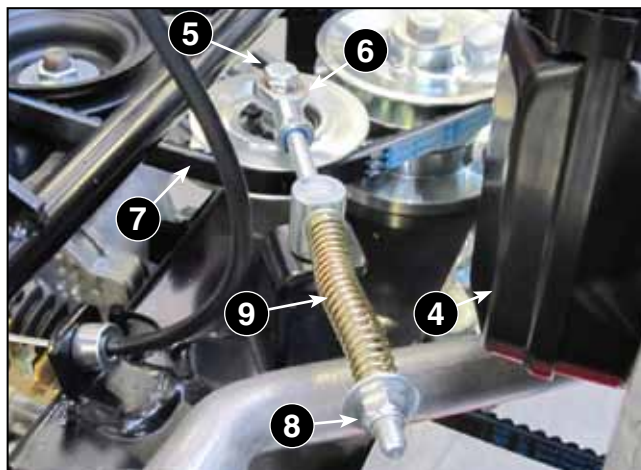
1. Remove the left side (1) fixed by a quick release fastener (2) and by a knob (3).



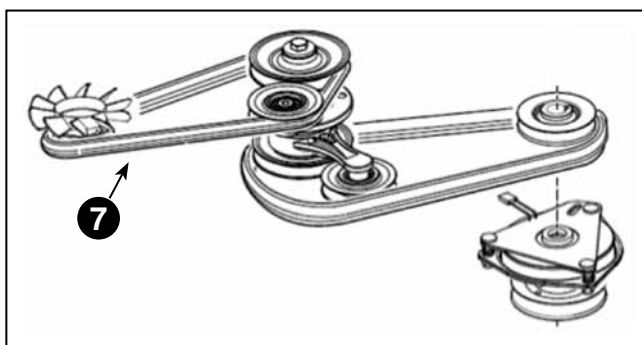
2. Remove the engine air filter cover (4), which would prevent the passage of the belt
3. Undo the screw (5) and the joint head (6).

! Pay attention to the loading the spring which causes a sudden movement of the head after loosening the screws

4. Loosen and remove the belt (7) from the pulleys.



5. Fit the new belt (7), following the diagram.
6. Replace the head (6) and adjust the nut (8) until the spring (9) is 80 mm long.



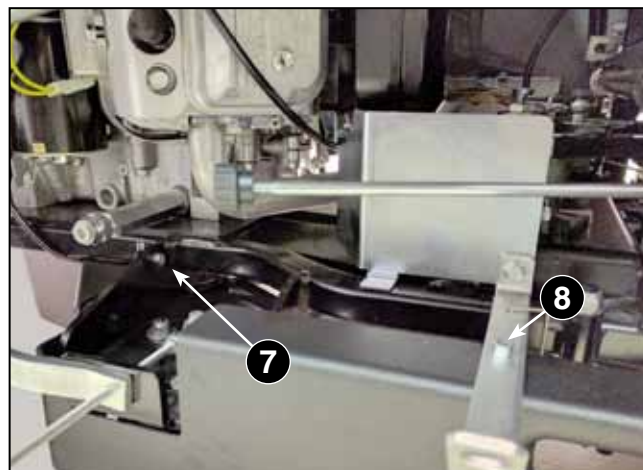
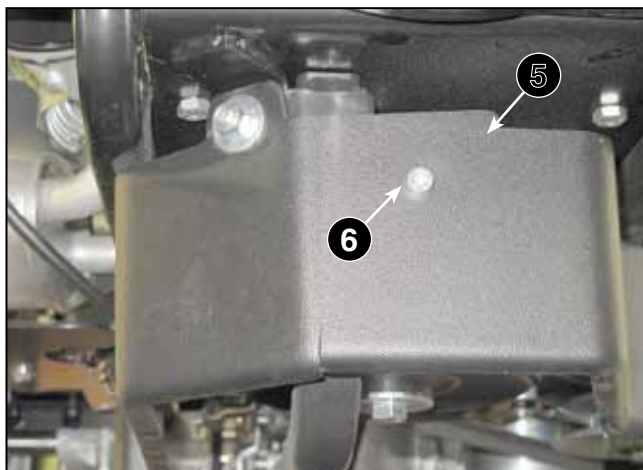
5.1.2 Replacing and adjusting the lower belt

The lower belt connects the engine to the return shaft. For interventions, follow the procedure below.

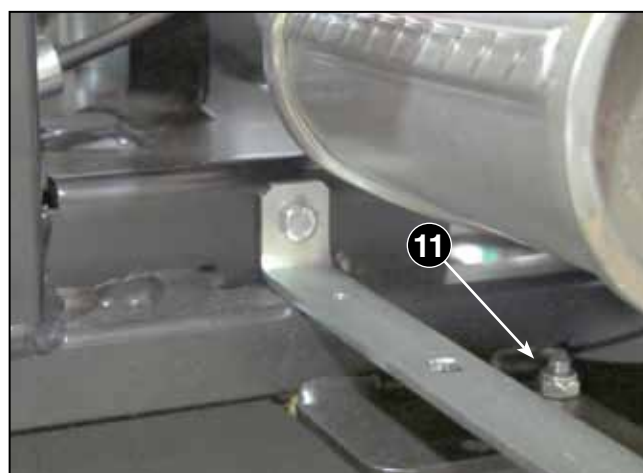
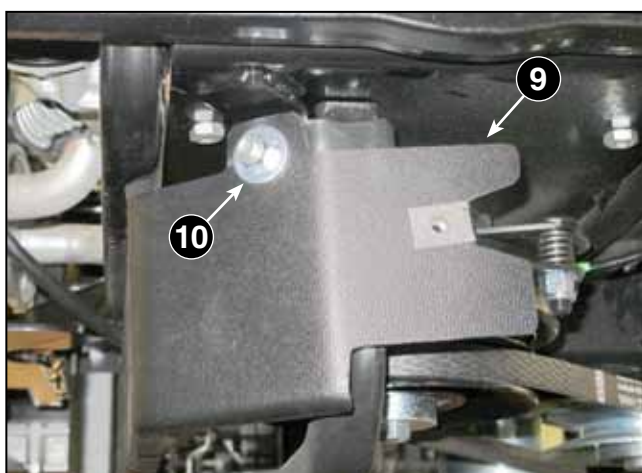
1. Pull the lever (1), located near the right front wheel, to loosen the cutting deck drive belt.



2. Remove the right side (2) fixed by a quick release fastener (3) and by a screw (4).

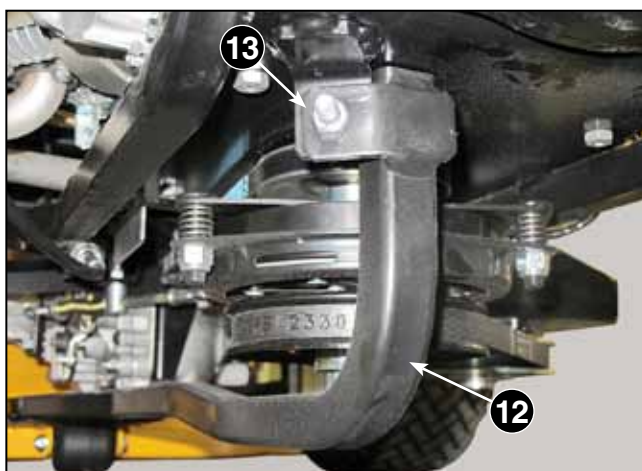


3. Remove the right rear guard (5) fixed by the rear screw (6), by a screw on the right side (7) and a top screw (8).



4. Remove the left rear guard (9) fixed by the nut (10) and by a screw (11) with nut positioned near the muffler.

5. Remove the longitudinal protective bar (12), fixed at the back by one nut (13) and at the front by two nuts (14).



6. Disconnect all electromagnetic clutch cables.

7. After freeing the blade drive belt from the pulley (15), undo the screw (16) and remove the electromagnetic clutch (17).

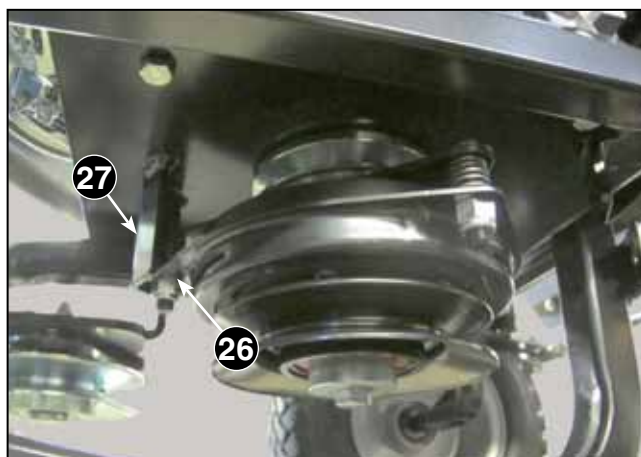
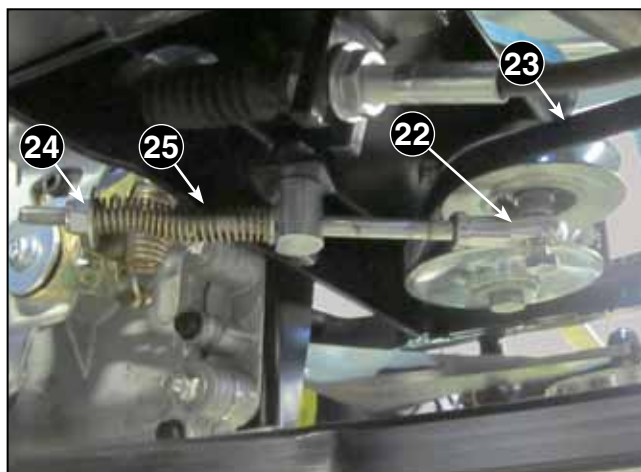
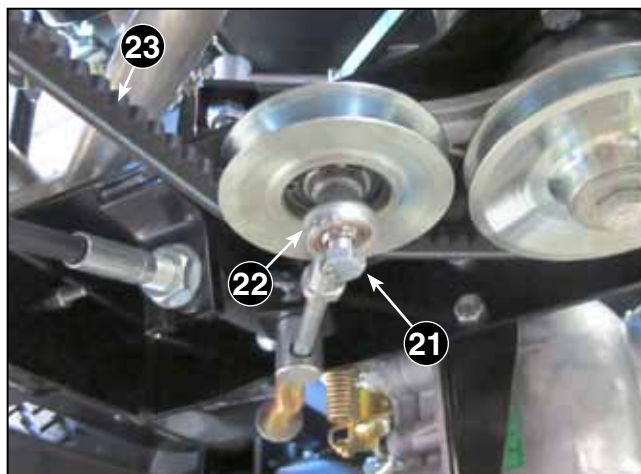
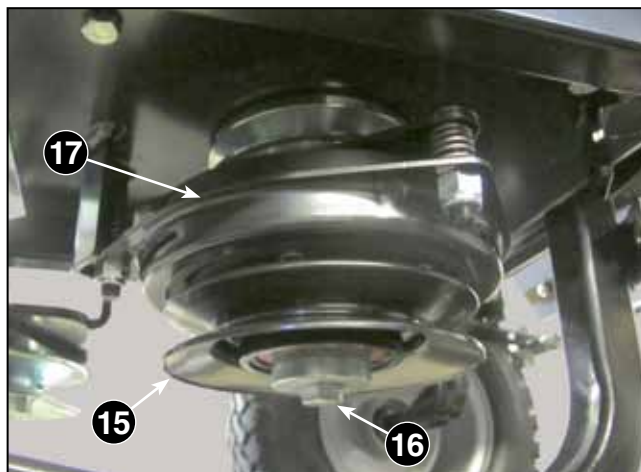
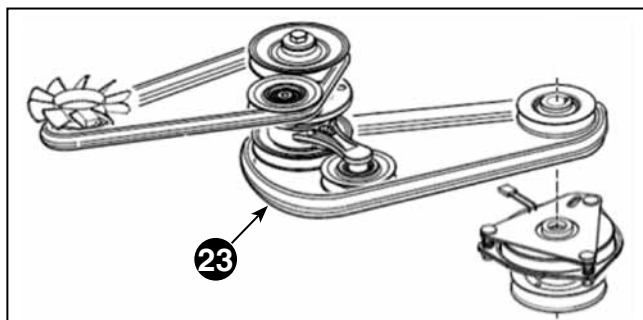
8. Undo the screw (21) and the joint head (22).

! Pay attention to the loading the spring which causes a sudden movement of the head after loosening the screws

9. Loosen and remove the belt (23) from the pulleys.

10. Fit the new belt (23), following the diagram.

11. Replace the head (22) and adjust the nut (24) until the spring (25) is 60 mm long.



To reassemble, follow the operations described above in the reverse order, taking care to:

- tighten the clutch fastening screws to a torque of 48-52 Nm.
- make sure that the end of the reaction arm (26) is properly inserted into the angular seat (27).

5.1.3 Adjusting the “neutral” gear

The "neutral" return mechanism on the transaxle is designed to move the command to a "neutral" position when the operator lets go of the controls.

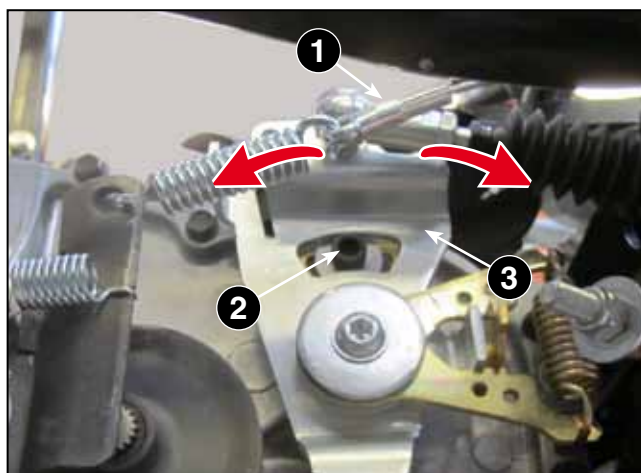
Follow the procedures illustrated below to adjust the “neutral” return mechanism on the transaxle.

- Lift the front part of the machine [👉 2.3.2].
- Remove the front wheels [👉 5.2.2].



WARNING! - *Activate the seat microswitch to allow the engine to start, being careful not to cause any hazardous situations.*

1. Make sure the transaxle is properly engaged (bypass disengaged).
 2. Remove the starter cable (1) from the control lever
 3. Start the engine and take the accelerator to maximum speed.
 4. Check the axle rotation. If the axle does not rotate, proceed to Step 5. If the axle does rotate, proceed to Step 6.
 5. Stop the engine and reconnect the rod and adjust the mechanical linkage of the machine.
 6. Observe the direction of the axle rotation. Switch the engine off. Loosen the adjuster screw (2) so that it is possible to rotate the control arm (3). Rotate the control arm in the same direction as the axle rotation with small movements until the axle comes to a halt.
 7. Tighten the adjuster screw (2) to a torque of 20 Nm. Repeat the control as specified in steps 3 and 4.
- If the forward and reverse speeds are not correct, adjust the connection cable with respect to the pedal [👉 5.1.5].




5.1.4 Adjusting the parking brake

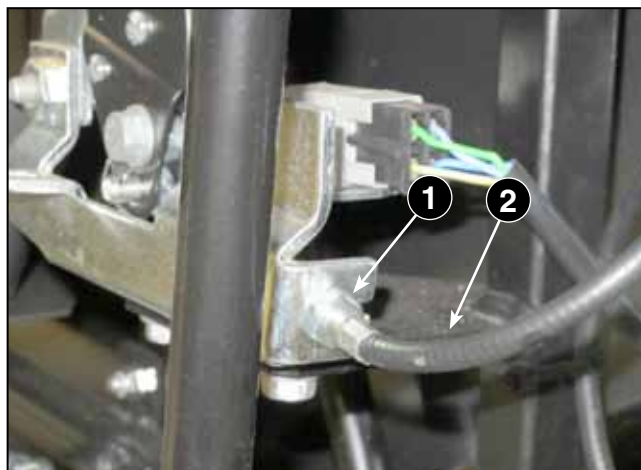


WARNING! - *When the adjustments have been made, the parking brake should prevent the machine from moving on a slope of 30% (16°) with the driver in position.*


a) Adjusting the parking brake

Adjustment is achieved by tuning the register (1) of the control cable (2).

 The parking brake is adjusted correctly when it stops the hydrostatic unit and activates the safety microswitch.



b) Adjusting the parking brake microswitch

 Check that the microswitch (1) works correctly by engaging and disengaging the parking brake.

To adjust the microswitch (1), loosen the screws (2) and reposition it so that it opens and closes the contacts each time the lever is used.

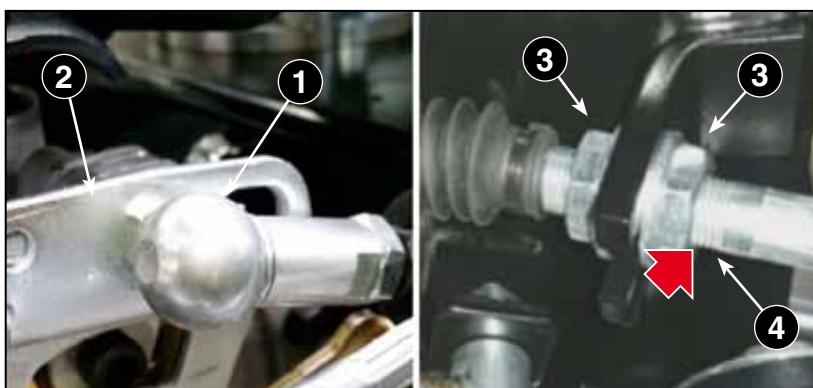


5.1.5 Adjusting the transmission cable

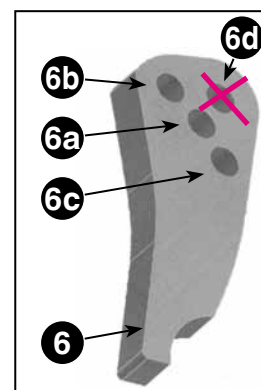
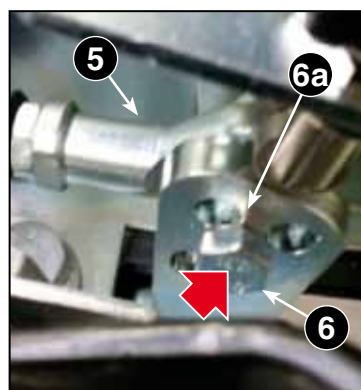
NOTE The hydrostatic transmission unit has a predetermined range of use, given by the sum of the maximum speeds in forward and reverse gear. Therefore, any increase of either of the two parameters reduces the other, and vice versa.

Adjusting the cable makes it possible to pre-determine the maximum pedal travel in forward gear, according to the following procedure.

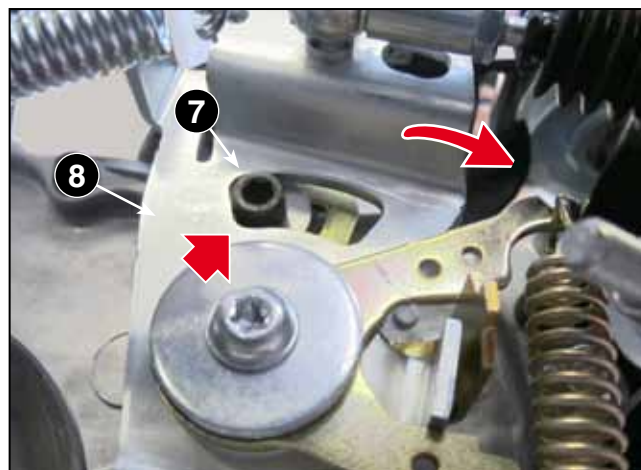
1. Make sure that the rear joint head (1) is correctly screwed onto the transmission unit regulator lever (2).
2. Adjust the register nuts (3) so as to leave 4 mm of the screw thread exposed (4), then tighten the nuts (3).




3. Connect the front head (5) to the lever (6) using the central hole (6a).



4. Press the foot pedal to stroke end whilst in forward gear and check that at least 1 mm of light remains between the screw head (7) and the slot (8) on the regulator.



5.  Try the machine and check the behaviour of the transmission and the release of the pedal if this causes an overreaction to tears, or the return of the pedal in the "neutral" does not occur within 3.5-5 seconds from the release, use one of the other two available holes (6b) or (6c) of the lever (6). In that case, you may need to take action on the front register (8) to find the optimal conditions provided for in sections 2) and 4).

NOTE *If the pedal is not reacting properly, check and / or replace the gas spring which facilitates the return to "neutral" position of the pedal.*



5.1.6 Transmission Unit maintenance

This transmission is provided with an external filter for ease of maintenance.

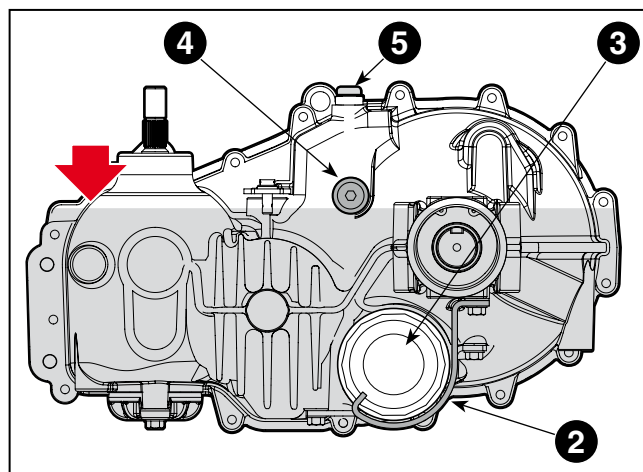
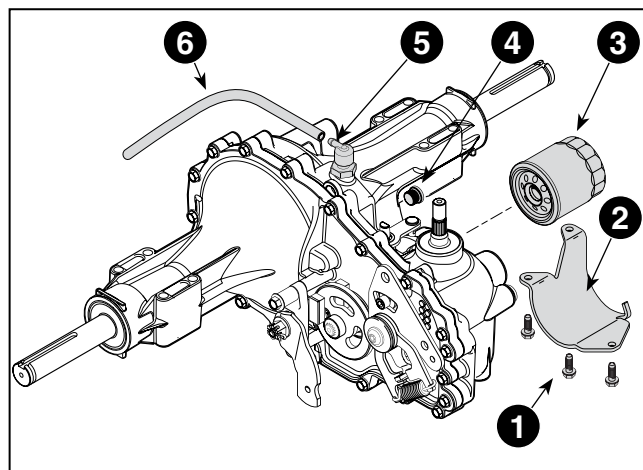
IMPORTANT *To ensure constant levels of quality of the liquid and a long operating life, we recommend performing an oil and filter change after 75-100 hours and, subsequently, a replacement every 400 hours.*

The procedure described below can be implemented with the unit installed and the machine resting on the ground.

- Engage the bypass valve and lock the machine parking brake.

a) Changing the oil and oil filter

1. Undo the three 1/4" screws (1) and remove the filter guard (2). Remove any debris from around the perimeter of the filter.
2. Place an oil collection pan (with a diameter of about 30 cm and a capacity of 8 litres) under the oil filter. Remove the oil filter (3) from the transaxle.
3. After draining the oil, wipe the surface of the filter base and apply a film of new oil on the gasket of the new filter being installed (GGP code 118830389/0).
4. Screw on the new filter manually, rotate by from 3/4 of a turn to a full turn from when the filter gasket makes contact with the surface of the filter base.
5. Replace the filter cover (2) with three screws (1) tightened with a torque of 7.5 Nm.
6. Remove the oil from the old filter before disposal. Collect the oil in appropriate containers and dispose of it in an approved recycling facility.
7. Remove the oil level cap (4) before pouring in the oil, to allow air to vent during filling.
8. Remove the upper cap (5).
9. Fill with 20W50 motor oil until it reaches the correct level. Replace the cap (4) tightening it with a torque of 20 Nm.
10. Fit and tighten the upper cap with a torque of over 20 Nm.
11. Bleed the system as indicated in point c).



b) Topping up the oil

When topping up with oil, remove the upper cap (5), if installed, and the level cap (4). Fill until the oil is close to the lower edge of the level hole.

c) Bleeding the oil circuit

Because of the effects air has on the efficiency of the hydrostatic transmissions, it is essential to bleed it from the system.

The air creates inefficiency because its rate of compression and expansion is higher than that of oil recommended for use in hydrostatic transmission systems.

These bleeding procedures should be implemented every time a hydrostatic system has been opened to facilitate maintenance or the oil has been replaced.

The symptoms resulting from the presence of air can be:

- Noisy operations.
- Loss of power or traction after a short operation time.
- High operating temperature and excessive expansion of oil.

Before starting check the oil level is correct. If it isn't, top up according to the specifications described in point b) of this chapter

It is preferable to perform the following procedures with the machine drive wheels raised off the ground.

Then, repeat the same operations under normal operating conditions. If this is not feasible, perform the procedure in an open area, keeping a distance from objects or persons.

1. Disengage the parking brake if engaged.
2. With the bypass valve open and the engine running, slowly move the drive pedal forward and backward (5 or 6 times) ..
3. With the bypass valve closed and the engine running, slowly move the drive pedal forward and back (5 - 6 times). Check the oil level and top up if necessary, after stopping the engine
4. You may need to repeat steps 2 and 3 until the air has been completely bled from the system. The transmission unit is deemed bled when it runs with normal noise levels and moves backwards and forwards at standard speed.

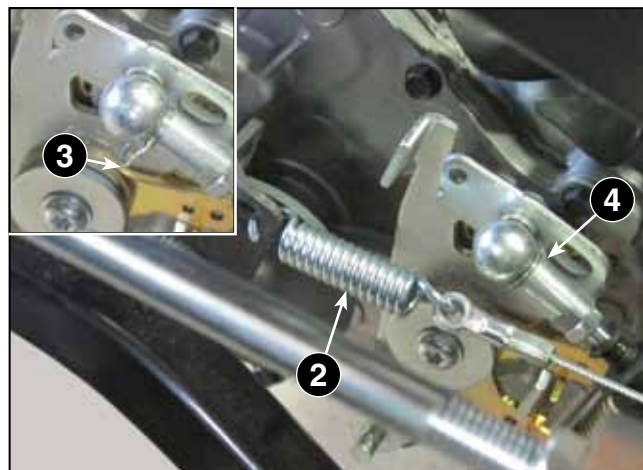
5.1.7 Removing the transmission unit

- Lift the front part of the machine [👉 2.3.2].
- Remove the front wheels [👉 5.2.2].
- Remove the discharge chute [👉 6.3.1].
- Free the upper belt, following steps 1 to 4 of the "Replacement and adjustment of the upper belt" procedure [👉 5.1.1].
- Remove the protective bar (1), following steps 1 to 5 of the "Replacement and adjustment of the lower belt" procedure [👉 5.1.2].

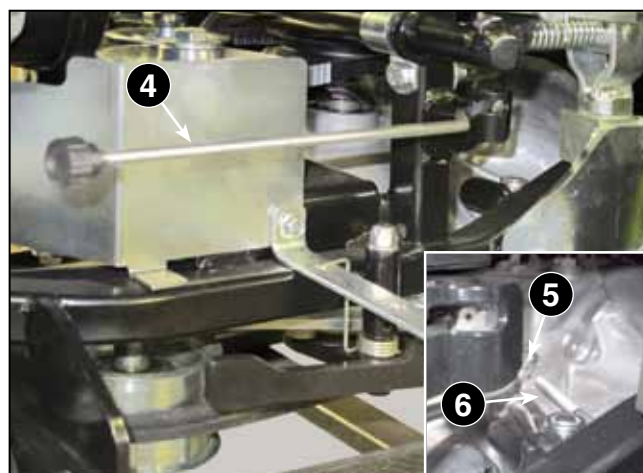


2. Release the parking brake spring (2).

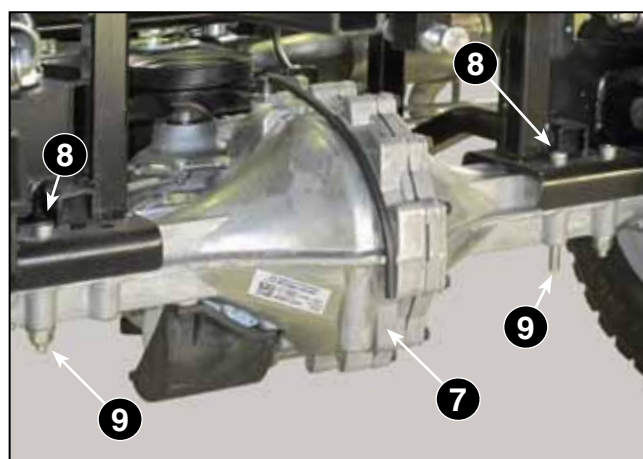
3. Unhook the split pin (3) and disconnect the head (4) of the drive control cable.



4. Remove the by-pass control rod (4), connected to the transmission unit lever by the pin (5) and the spring (6).



5. The hydrostatic unit (7) is fastened to each side of the chassis by means of three screws (8) with relative (9). Carefully unscrew the lower nuts (9), adequately supporting the unit so it does not fall.



When reassembling, perform the operations described above in the reverse order.

- Tighten the nuts (9) with a torque of 23-27 Nm.

When assembly is complete,

- Check the parking brake works properly [👉 5.1.4].
- Adjust the transmission cable [👉 5.1.5].

5.2 WHEELS AND TYRES

5.2.1 Removing and replacing the rear wheels

- Lift the rear part of the machine [👉 2.3.3].

The rear wheels (1) are held by a snap ring (2) which can be removed with a screwdriver after removing the cap (3).

NOTE If a wheel is jammed onto the shaft, use a release spray directing it around the press-fitting hole.

⚠ WARNING! - ALWAYS replace deformed rims as they could impair the hold of the tyre.

On assembly it is advisable to spread grease on the shaft to facilitate the next wheel removal.



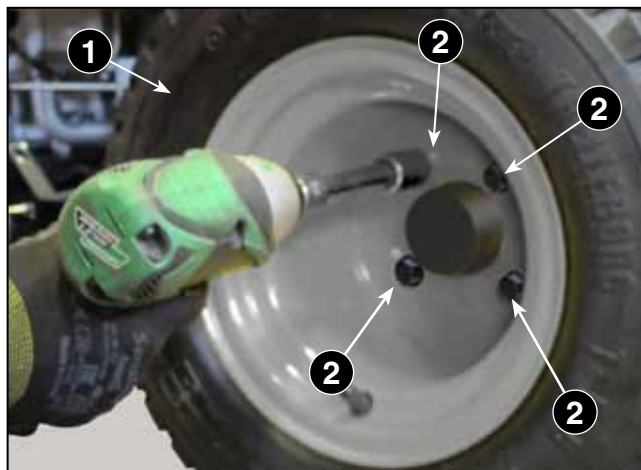
5.2.2 Replacing the front wheels

- Lift the front part of the machine [👉 2.3.2].

The front wheel (1) is fixed by four screws (2).

⚠ WARNING! - ALWAYS replace deformed rims as they could impair the hold of the tyre.

When replacing, tighten the screws (2) to a torque of 89-93 Nm.

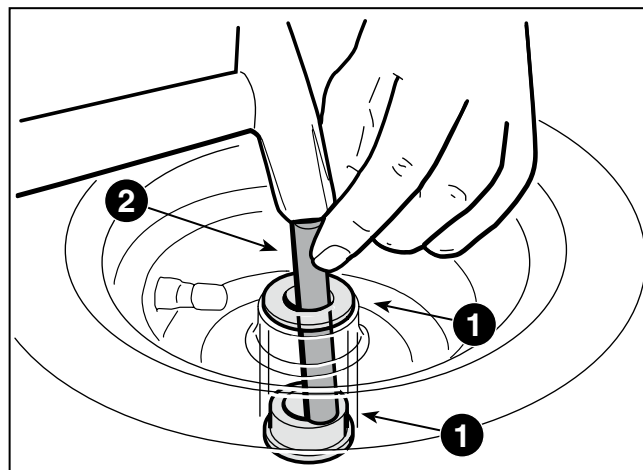


5.2.3 Replacing the rear wheel bearings

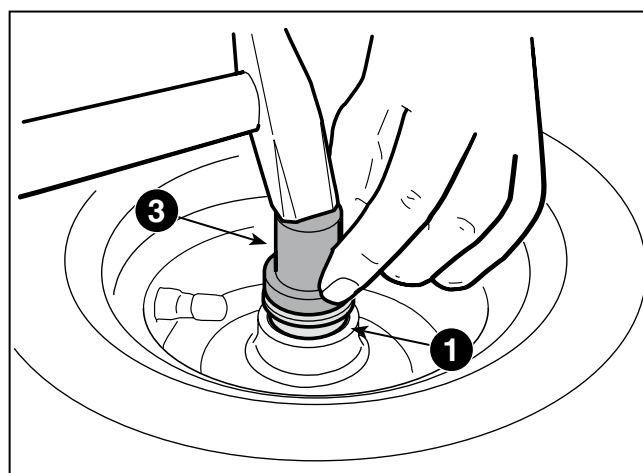
- Remove the wheel in question [👉 5.2.1].

The front wheel bearings are force shrink-fitted into the front wheel hub.

1. Remove each bearing (1) using a 10 - 12 mm diameter round bar (2); insert it from the opposite side and hammer it on various points around the internal circumference of the bearing.



2. The new bearing must be inserted with the help of a plastic mallet or a bronze buffer (3) working only on the outer ring of the bearing.



IMPORTANT *We recommend you always replace both hub bearings.*

5.2.4 Replacement and repair of tyres

The tyres used on this machine are of the «Tubeless» type and so every repair of a hole in the tyre must be done by a tyre specialist according to the methods used for this type of tyre.

IMPORTANT *The rear tires can have different rolling diameters, due to wear or after replacement of one of the two. These differences must never be offset by varying the inflation pressure, which must ALWAYS be the same for both.*

After the replacement of one or both tyres, it is always necessary to:

- Check the inflation pressure [👉 3.1].

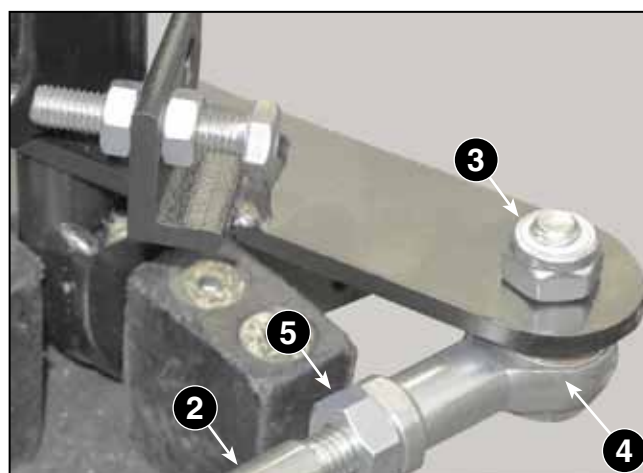
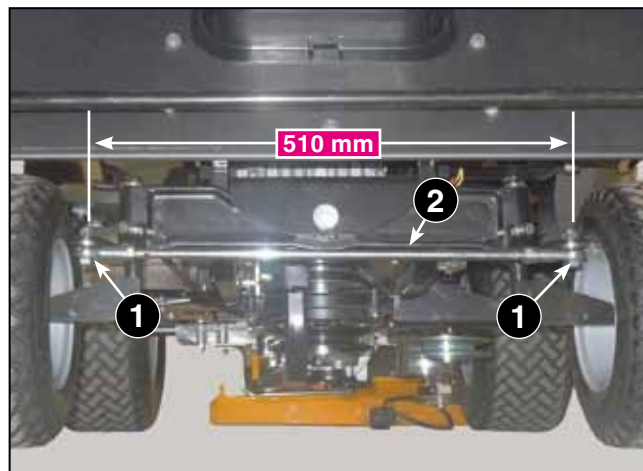
5.3 STEERING

5.3.1 Toe-in adjustment

The exact toe-in is obtained with a centre distance of 510 mm, measured between the centres of the pins (1) of the wheel connection rod (2).

If the measurement differs, proceed as follows.

1. Unscrew the nuts (3) and disconnect each head (4) from the connection rod (2).
2. Loosen the lock nuts (5) and screw or unscrew the heads (4) on the rod, until the indicated distance is achieved.
3. Remount the rod and fully tighten the nuts (3) and lock nuts (5).

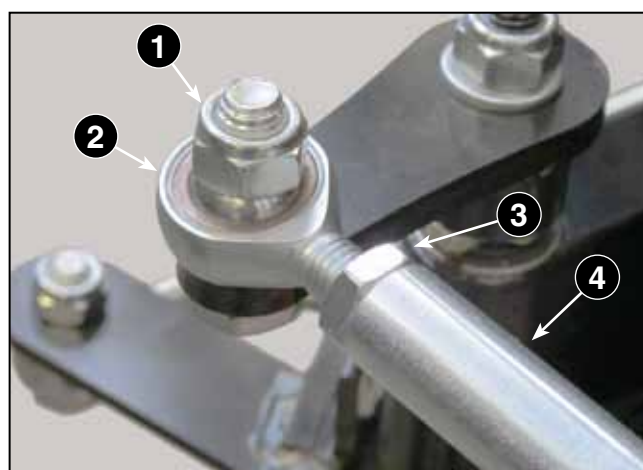


5.3.2 Adjusting the drive direction

This adjustment must be carried out if the machine tends to deviate its trajectory to the right or left with the steering wheel straight.

- Check the toe-in [👉 5.3.1].;
- Align the rear wheels.

1. Unscrew the nut (1) and remove the head (2).
2. Loosen the lock nut (3) and screw or unscrew the head (2) on the steering rod (4), until the steering wheel is aligned.
3. Remount the rod and fully tighten the nuts (1) and lock nuts (3).



5.3.3 Adjusting the steering stroke ends

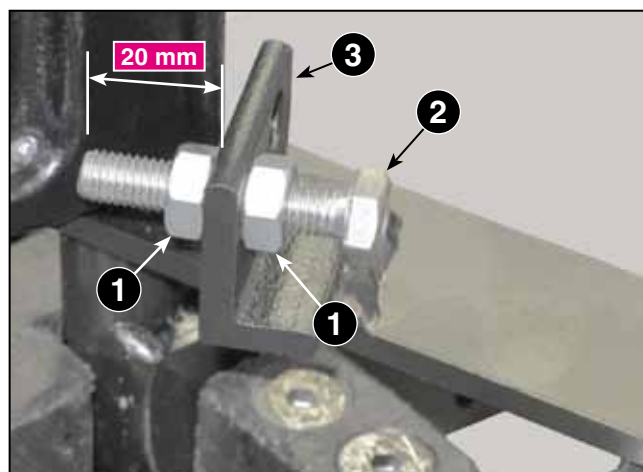
This adjustment limits the steering angle, avoiding interference with other parts of the machine when at maximum steering angle, and is performed in two steps.

a) Preliminary adjustment

This adjustment avoids interference between the steering components and other mechanical organs, when the steering wheel is turned to the maximum angle right or left.

IMPORTANT *The adjustment must be the same on both sides.*

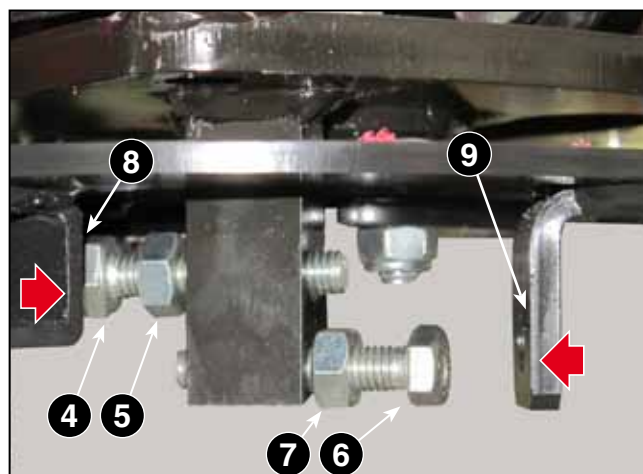
1. Turn the nuts (1) until the screw (2) thread protrudes from the plate (3) by 20 mm.
2. When finished, fully tighten the two nuts (1).



b) Final adjustment

This setting determines the two steering stroke ends.

3. Loosen the two screws (4) and (6) and the relative lock nuts (5) and (7).
4. Turn the steering wheel to the right up to the limit determined by the screw (2).
5. Tighten or loosen the corresponding screw (4) until leave 1 mm of light between the screw head and relative block point (8), then tighten the lock nut (5).
6. Turn the steering wheel fully to the left and repeat the previous step. Tighten or loosen the corresponding screw (6) until leave 1 mm of light between the screw head and relative block point (9), then tighten the lock nut (7).

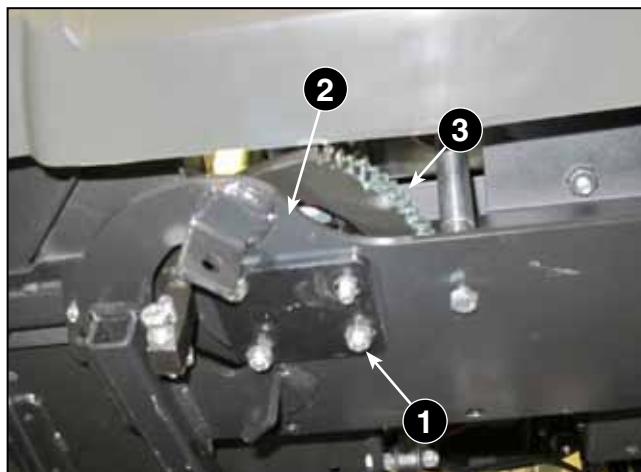


7. Tighten the lock nuts (5) e (7) again after completing the procedure.

5.3.4 Steering allowance adjustment

The steering allowance should never be excessive if driving is not to be impaired. The clearance between pinion and crown must be adjusted as follows.

1. Loosen the four screws (1).
2. Move the whole crown (3) support plate (2) forward or backward to eliminate any clearance between the crown teeth and the pinion, while maintaining a sufficient degree of fluid movement.
3. Tighten the screws (1) to a torque of 23-27 Nm.



6 - CUTTING DECK AND COLLECTION

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6.1 PREARRANGEMENT FOR ACCESSIBILITY

6.1.1 General information

The conformation of the cutting deck that characterises this machine is particularly useful during servicing and repair work, as it allows each operation to be performed in the most suitable way, with significant time savings. More specifically:

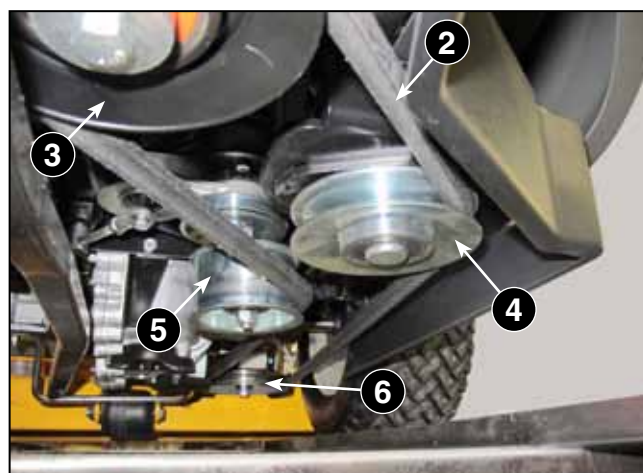
- **verticalisation** [👉 6.1.2] allows quick intervention on the blades for maintenance, sharpening and replacement activities;
- **removal** [👉 6.1.3] ideal to provide easier access to the blade connection belt and for the replacement or repair of the blade flanged supports.

6.1.2 Verticalisation of the cutting deck

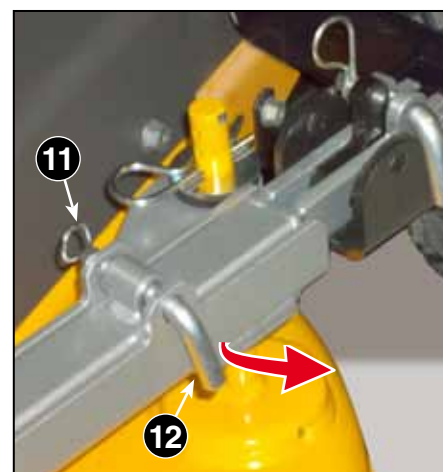
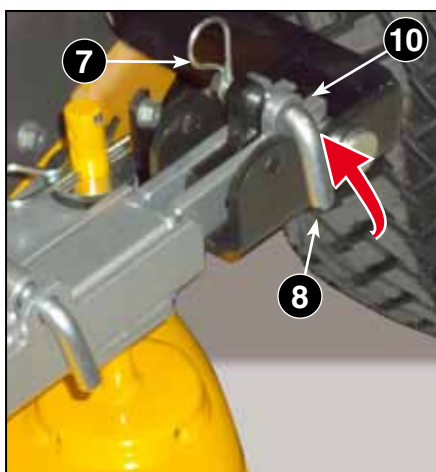
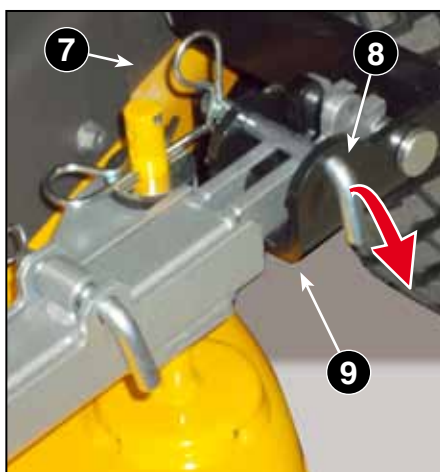
1. Pull the lever (1), located near the right front wheel, to loosen the cutting deck drive belt.



2. Free the belt (2) from the three clutch (3), drive (4) and tensioner (5) pulleys, leaving it around the cutting deck pulley (6) only.

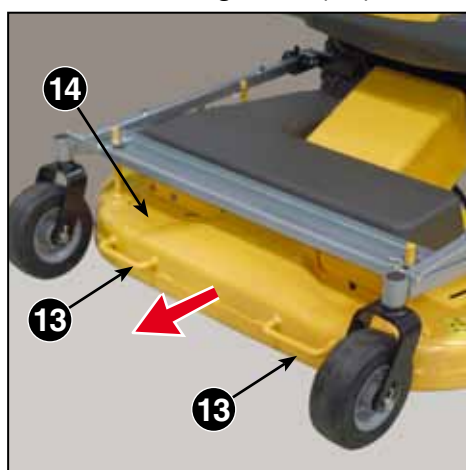


3. Remove the two rear split pins (7) from the left and right sides and remove the respective pins (8) from the lifting fork holes (9).
4. Reposition the same pins (8) in the rear holes (10) of the sliding carriage and replace the relative split pins (7).
5. Remove the two front split pins (11) from the left and right sides and remove the respective pins (12) to allow the carriage to slide on the guides.



6. Align the two front wheels.
7. Grasp the two handles (13) and pull the cutting deck (14) forwards as far as possible.
8. Using the same handles, move the cutting deck (14) into a vertical position.

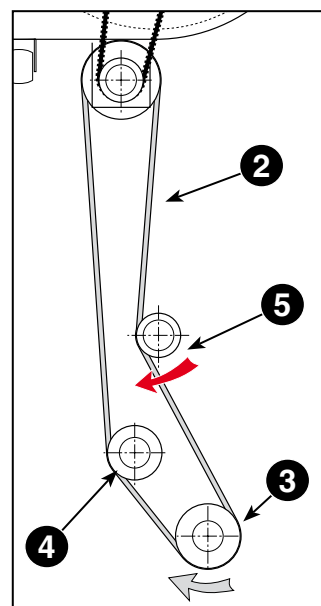
⚠ WARNING! - Secure the cutting deck to a bearing structure of the machine in order to prevent it from accidentally falling and causing injury or damage during maintenance.



To return the cutting deck to the working position, follow the above operations in the reverse order, taking care to properly reinstate the belt (2) around the clutch pulley (3), the clutch pulley (4) and the tensioner (5), according to the diagram indicated below.



Remember to reinstate the belt tension moving the tensioner lever (1) to the forward position.

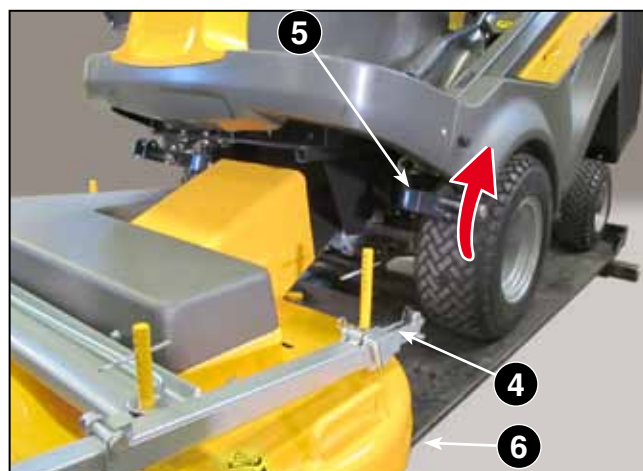
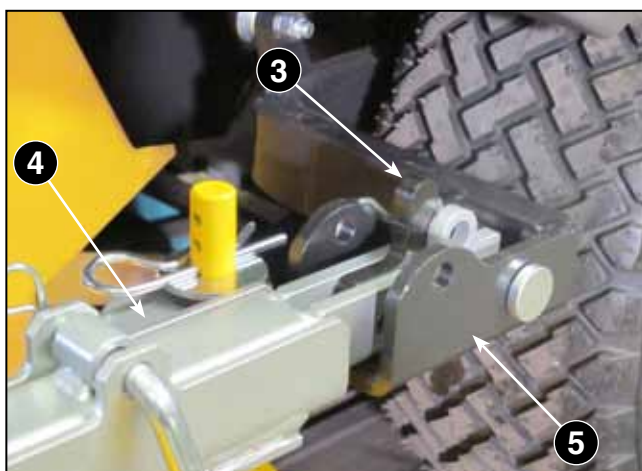


6.1.3 Removal of the cutting deck

- Place the machine on a flat, solid surface, wide enough to allow the extraction of the cutting deck from the front.
- Follow steps 1 to 2 of the "Verticalisation of the cutting deck" procedure [👉 6.1.2].

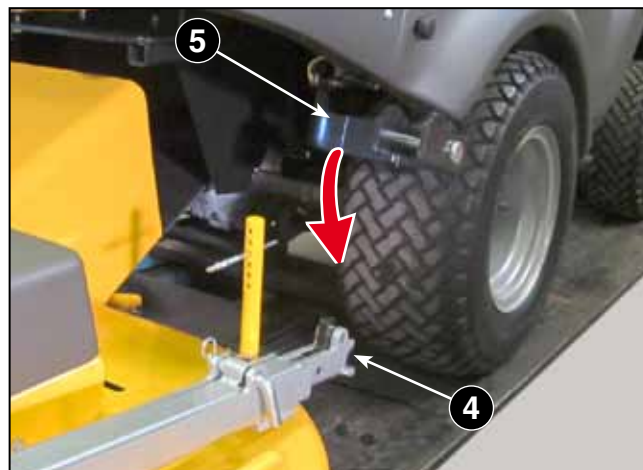
1. Release the two rear split pins (1) from the left and right sides and remove the respective pins (2).
2. Rotate the levers (3) forwards to the right and to the left to unlock and disengage the respective pivot arms (4) from the forks (5).
3. Grasp the cutting deck (6) using the handles and pull it forward by releasing the arms (4) from the fork (5).

⚠ WARNING! - Make sure that the release of the arms causes the sudden movement of the two forks upwards. Maintain the due distance from the forks and make sure no other people access the area during the extraction of the cutting deck.



To reassemble the cutting deck, repeat the above operations in the reverse order, taking care to keep the forks lowered so as to ease the insertion of the pivot arms.

⚠ WARNING! - To counter the load of the springs on the forks, the assistance of an additional person is required to keep them lowered to safe mode.



6.2 INTERVENTIONS ON THE CUTTING DECK

6.2.1 Removing, sharpening and reassembling the blades

⚠ WARNING! - Always wear protective gloves when handling the blades.

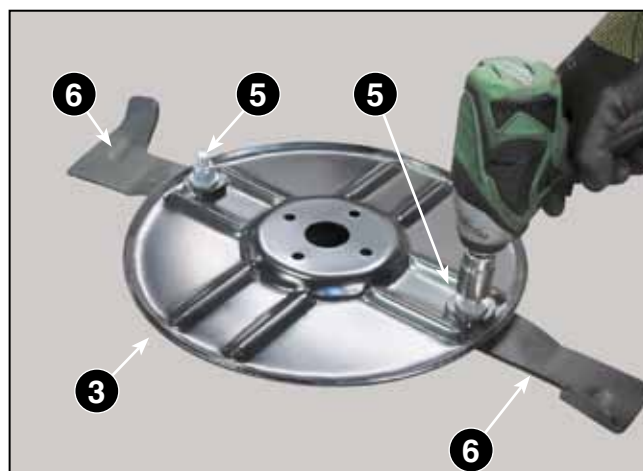
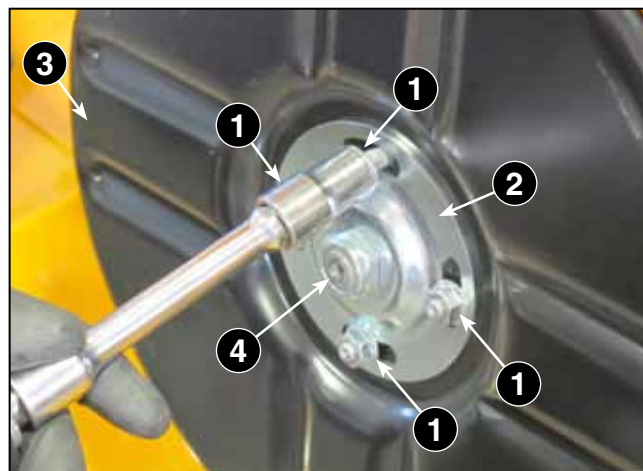
⚠ WARNING! - The blades are connected to each other; the rotation of each blade engages the rotation of the other.

- Follow all steps of the "Verticalisation of the cutting deck" [👉 6.1.2].

1. Unscrew the four nuts (1) and remove the plate (2) and the blade holder disc (3).

NOTE Do NOT unscrew the central nut (4) to remove the blade holder disc (2).

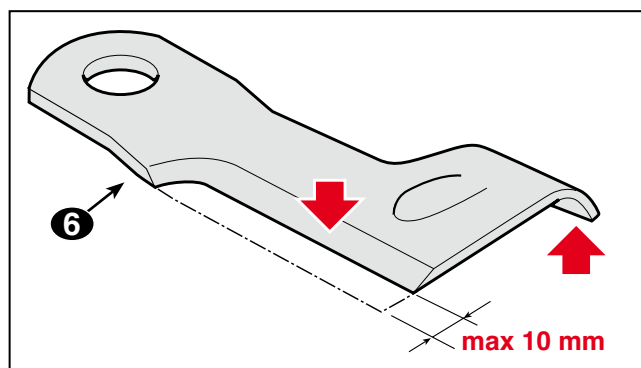
2. Turn over the blade holder disc (3) and loosen the two nuts (5) to remove the blades (6).



A badly sharpened blade causes grass to become yellow and reduces grass collection capability; if not balanced, excessive vibration can be caused during use.

Sharpen the cutting edge of the blade, using a medium grade grinder.

IMPORTANT Sharpening must only be performed from the side shown in the diagram, removing as little material as possible.



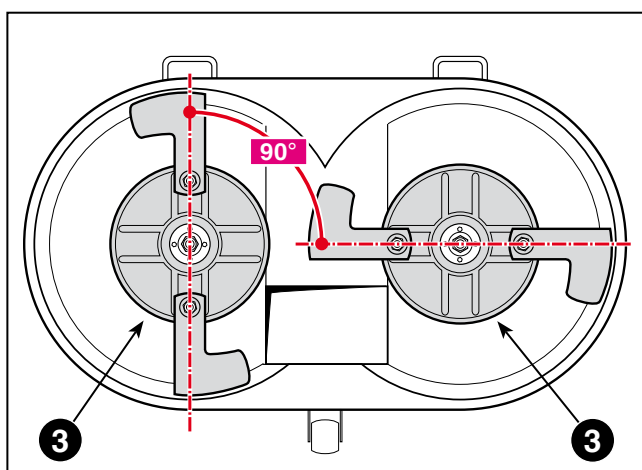
The blade is to be replaced when the cutting edge has worn down to 10 mm.

IMPORTANT To maintain the balance of the blade holder disc, check that the difference in weight between the two blades after sharpening does not exceed 5 grams.

IMPORTANT In case of replacement, it is always advisable to replace both blades. The replacement blades are supplied in pairs, or are already assembled on the disc; bear in mind that the unit and the right side blades are different from those of the left.

When assembling them, repeat the operations described above in the reverse order, taking care to:

- Observe the blade assembly direction (6) on the disc, with the tabs pointing toward the inside of the cutting deck and the cutting edge consistent with the direction of rotation, and replace the bolts in the indicated sequence.
- Tighten the nuts (5) with a torque of 70-80 Nm using a power screwdriver and a torque wrench.
- Replace the two blade holder discs (3) respecting the direction of rotation, and ensuring that the blades are oriented at 90° to each other; to this end, use the slots (7) present on the plate (2) that allow sufficient possibility of rotation to provide the optimal condition.
- Tighten the nuts (1) with a torque of 30-34 Nm using a power screwdriver and a torque wrench.

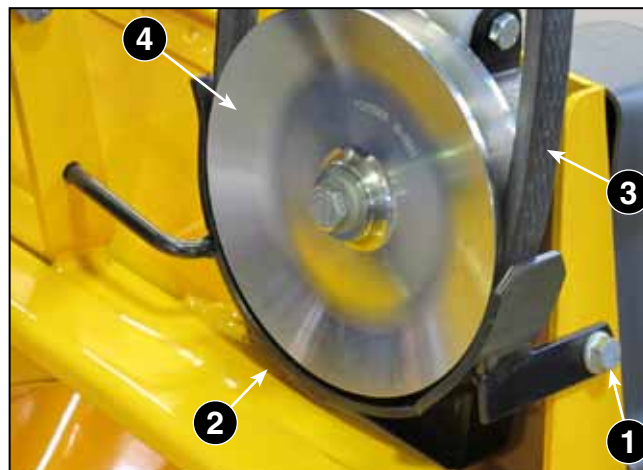


6.2.2 Blade control belt replacement

- Follow steps 1 to 10 of the "Verticalisation of the cutting deck" procedure [👉 6.1.2].

With the cutting deck in the vertical position, loosen the screw (1) and remove the belt guide (2) to free the belt (3) from the pulley (4).

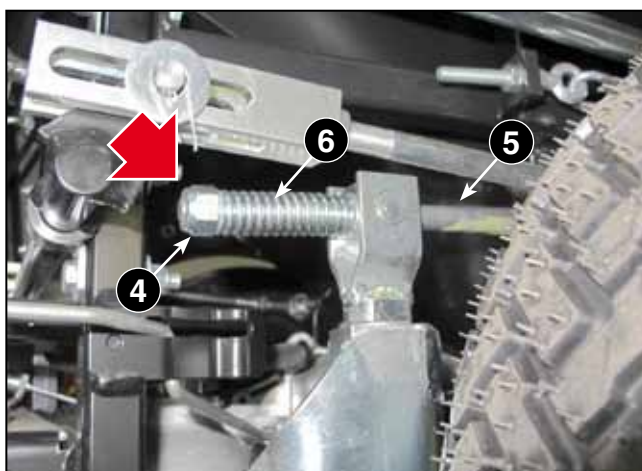
Reassemble all removed parts, following the above instructions in the reverse order.



6.2.3 Adjusting the tension of the blade control belt

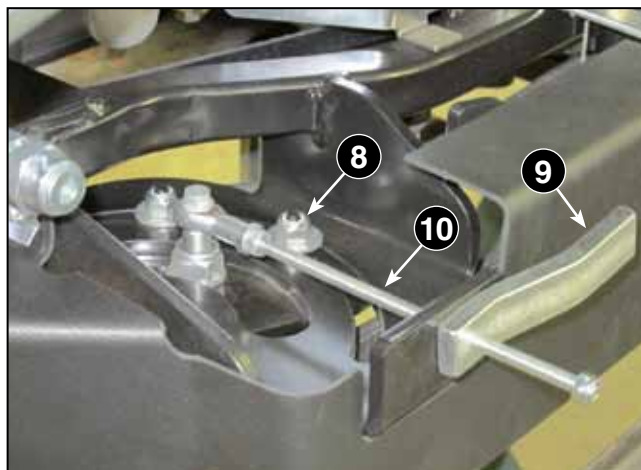
NOTE Make the adjustment with the cutting deck correctly assembled and in a fully lowered position.

1. Remove the right side (1) fixed by a quick release fastener (2) and by a screw (3).
2. Perform a preliminary adjustment by screwing or unscrewing the nut (4) until it is brought to 1 mm from thread limit of the pin (5), corresponding to a length of the spring (6) of 58-62 mm.
3. Use a frequency meter to measure the tension of the belt (7). The measured value should be about 20-22 Hz when measured at the centre of the branch along the longitudinal axis.



4. In different values are detected, loosen the nut (8) and turn the handle (9) screwing or unscrewing it on the bolt (10) until the correct value is reached.
5. When the adjustment has been made, tighten the nut (8).

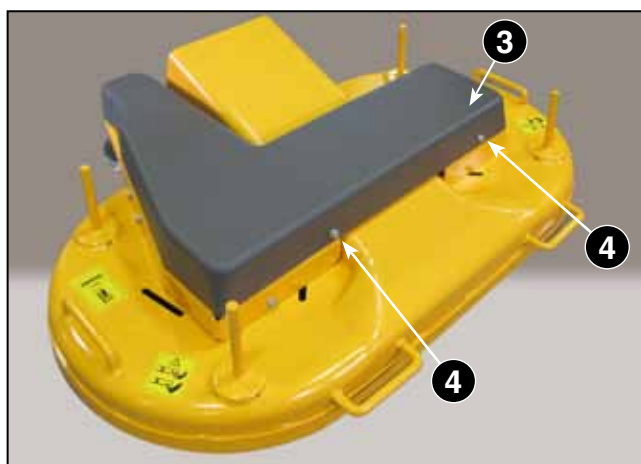
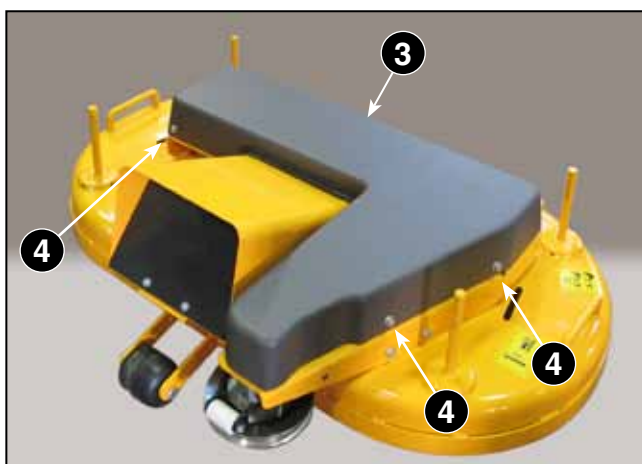
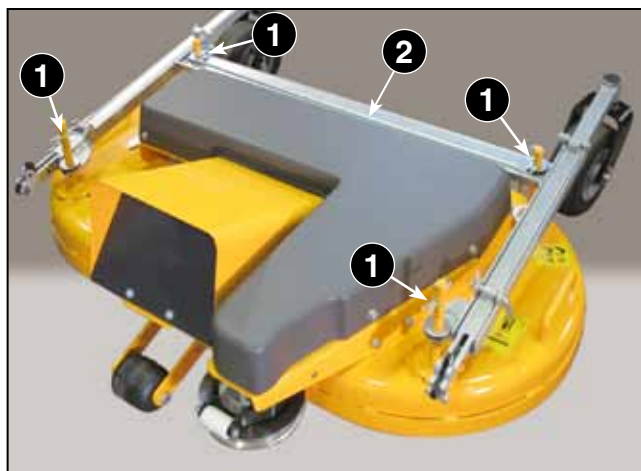
NOTE *If the correct value cannot be reached, it is necessary to adjust the spring (6) nut (4) again.*



6.2.4 Replacing and adjusting the blade connection belt

- Follow all steps of the "Removing the cutting deck" procedure [ 6.1.3].

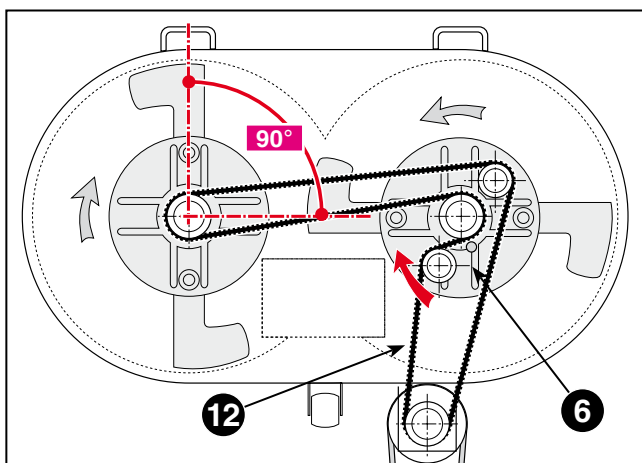
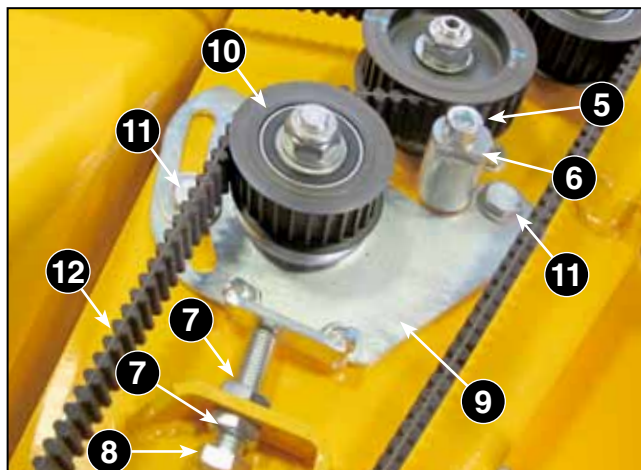
1. Release the four split pins (1) and remove the pivot arm carriage (2).
2. Remove the protective cover (3) fixed by the five screws (4).



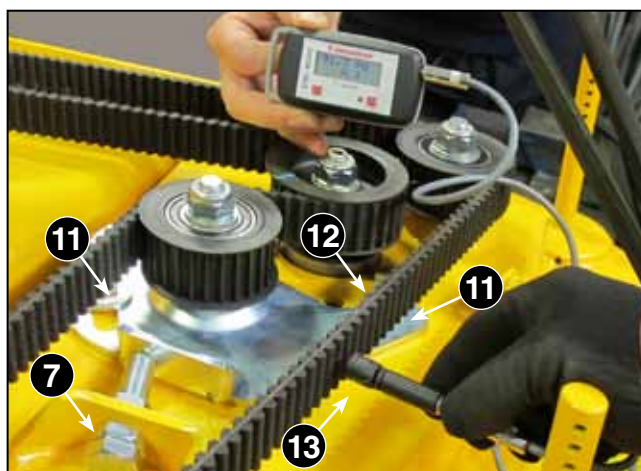
3. Undo the screw (5) and remove the eccentric belt guide pin (6).
4. Completely loosen the nuts (7) on the adjustment screw (8) so as to allow ample movement of the tensioner pulley (10) plate (9).
5. Loosen the screws (11) and turn the tensioner pulley (10) plate (9) to completely loosen the toothed belt (12).
6. Remove the belt (12).

When reassembling, perform the operations described above in the reverse order.

IMPORTANT Replace the belt reinstating the trajectory indicated in the diagram and making sure the blades are oriented at 90° to each other.



- Replace the eccentric belt guide (6) leaving a 0.5 mm clearance between the belt and the surface of the belt guide.
- Before tightening the screws (11) adjust the tensioner (7) in order to achieve a belt value on the frequency meter (13) of 88-92 Hz.



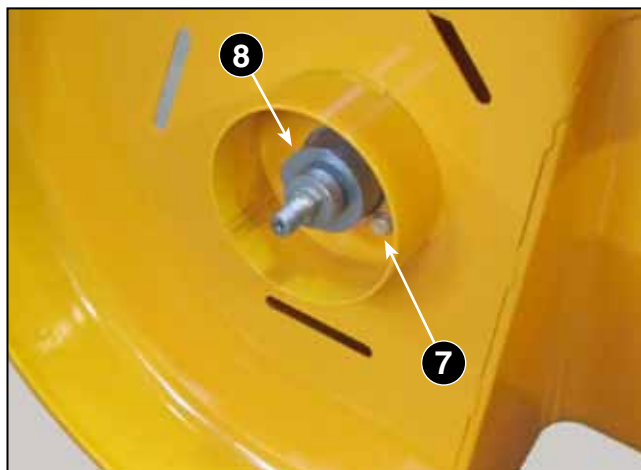
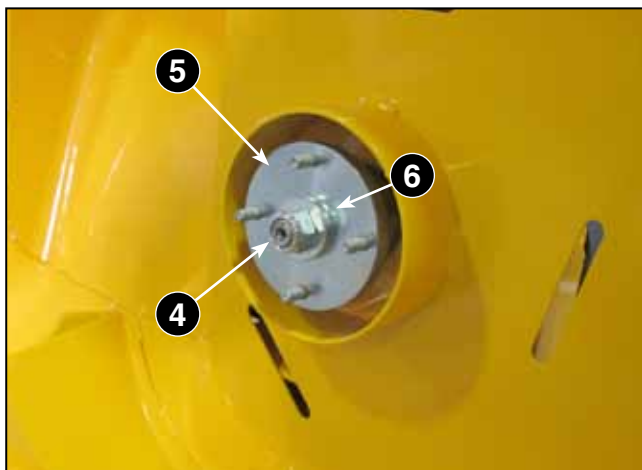
6.2.5 Removing the cutting deck flanged supports

- Follow steps 1 to 5 of the "Replacing the blade connection belt" procedure [👉 6.2.4].

The subsequent steps require accessibility from both the top and from the bottom of the cutting deck.

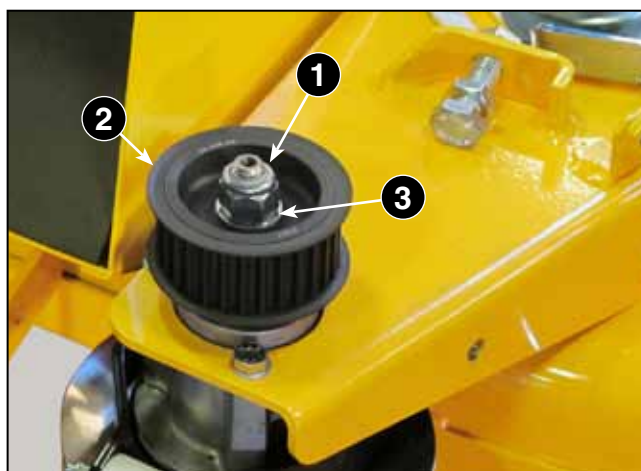
⚠ WARNING! *Place the cutting deck so that both sides are accessible, securing it so as to ensure stability and safety when working.*

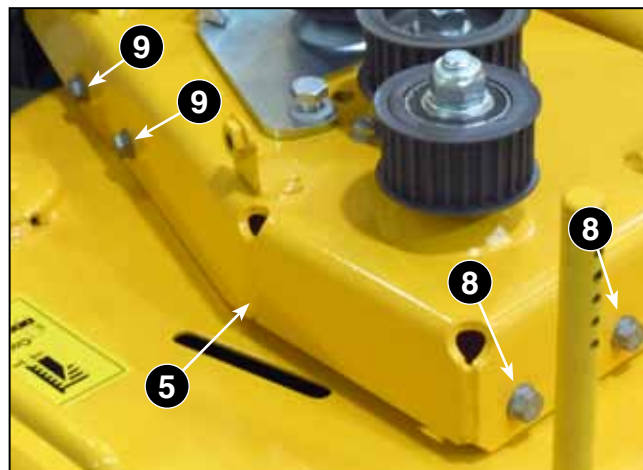
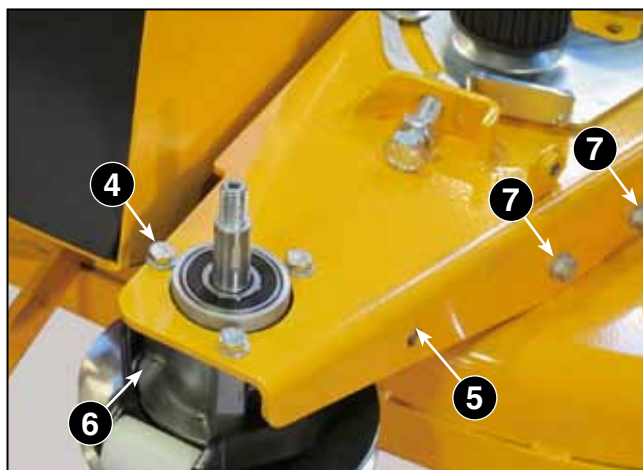
1. Unscrew the four nuts (1) and remove the plate (2) and the blade holder disc (3).
2. Unscrew the nut (4) and remove the entrainment plate (5) together with the washer (6) below.
3. Undo the three screws (7) fastening each flanged support (8) to the cutting deck.



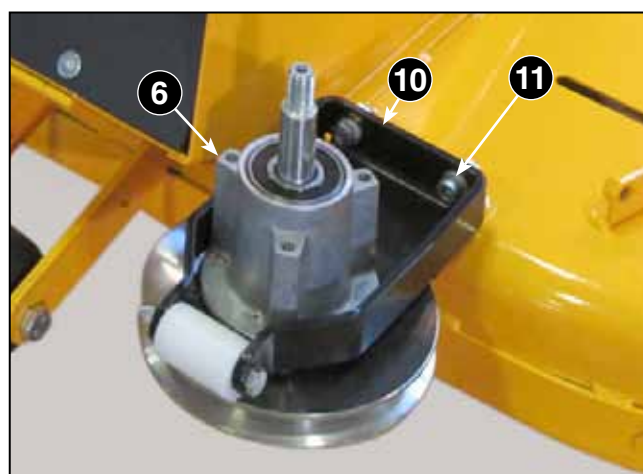
a) Removal of the drive pulley support

1. Unscrew the nut (1) and remove the pulley (2) and the washer (3).



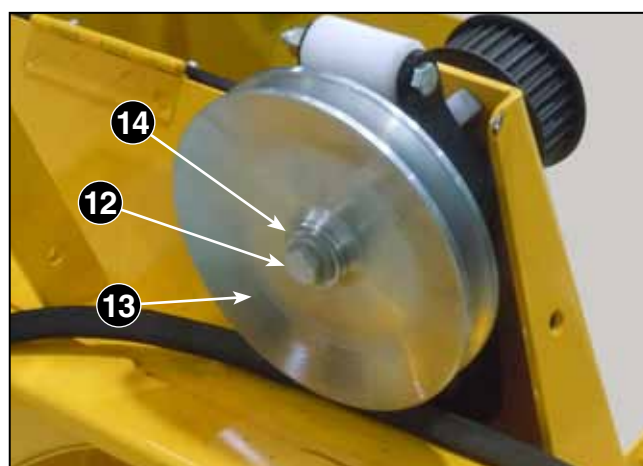


2. Undo the three screws (4) fastening the support plate (5) to the drive pulley flanged support (6).
3. Remove the support plate (5), fixed by two screws (7) on the right, two screws (8) on the left and two front screws (9).
4. Remove the bracket (10) fixed by the screws (11).
5. Unscrew the nut (12) and remove the lower pulley (13) and the washer (14).
6. Locate and undo the three fixing screws and release the flange support from the drive pulley.



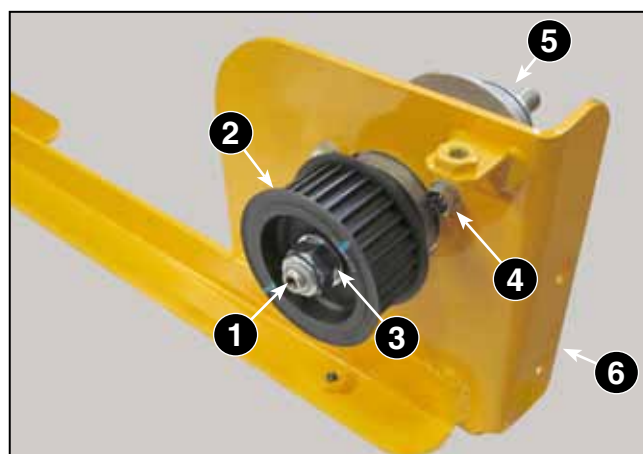
When reassembling, perform the operations described above in the reverse order.

- Tighten the nuts (1) with a torque of 23-27 Nm.



b) Removal of the blade pulley supports

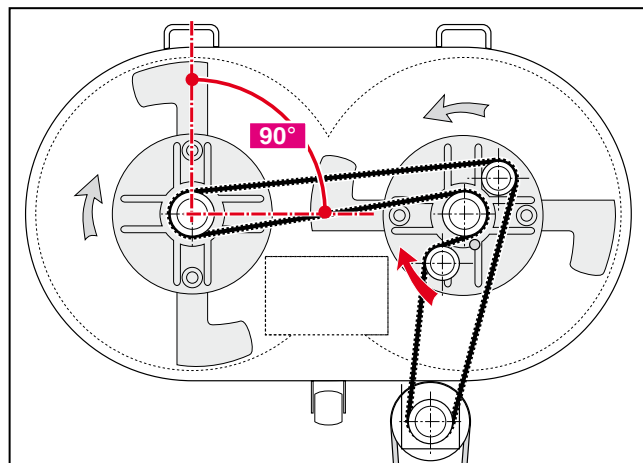
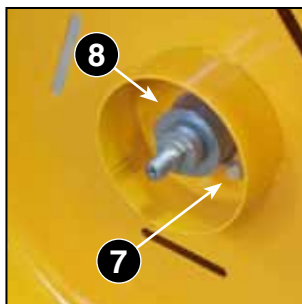
1. Unscrew the nut (1) and remove the toothed pulley (2) and the washer (3).
2. Undo the three screws (4) fastening each flanged support (5) to the support plate (6).



c) Reassembly of the flanged supports

To reassemble, follow the operations described above in the reverse order, taking care to:

- Tighten the flanged support (8) fixing screws (7) to a torque of 14-18 Nm.
- Make sure the blades are oriented at 90° to each other.



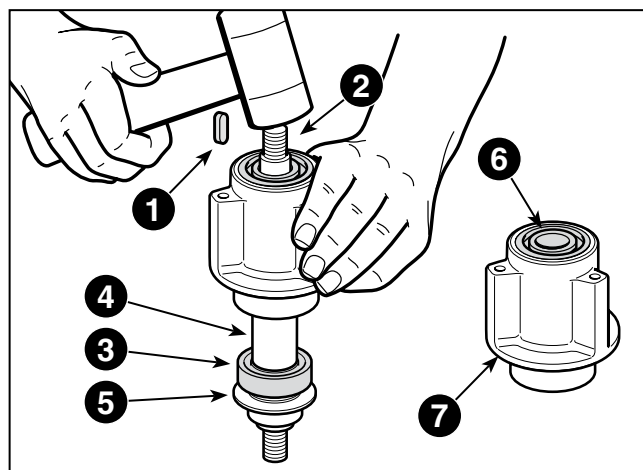
6.2.6 Flanged supports maintenance

Noise or abnormal vibrations during cutting can be caused by worn bearings or deformation of the drive shaft due to accidental impact. In this case, proceed with the necessary verifications and replace the parts as required.

NOTE The flanged supports, although some details are different, require the same procedures for removing and replacing components.

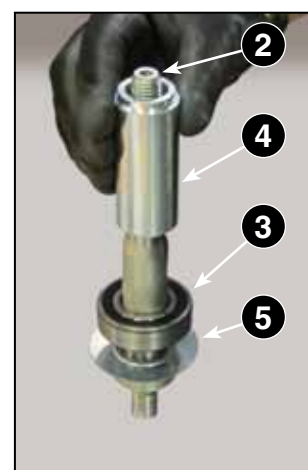
To replace the drive shaft or bearings, follow the procedure below.

1. Remove the key (1) and hit the shaft with a plastic mallet on the toothed pulley side in order to remove the shaft (2) together with the lower bearing (3), the spacer (4) and the dust guard disc (5).
2. The upper bearing (6) still in place must be removed by hitting it from the inside of the flange using a 10 ÷ 12 mm round bar.



When reassembling,

1. Fit the shaft (2) into the hole on the lower bearing (3).
2. Assemble the dust guard disc (5) and spacer (4) on the shaft (2).
3. Insert everything in the support (7), mount the upper bearing (6) using a bushing of suitable diameter capable of acting on the inner ring of the bearing.



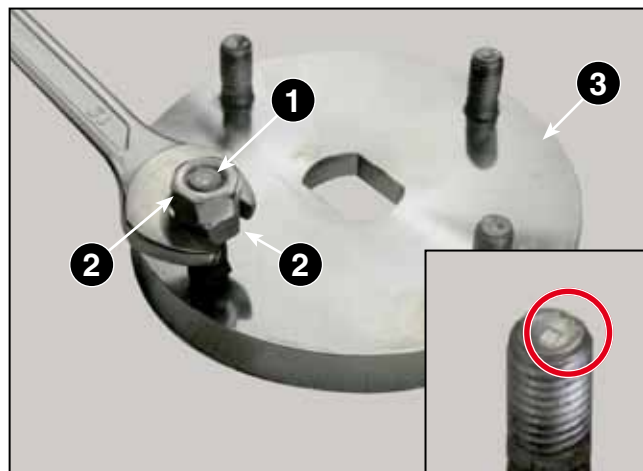
6.2.7 Replacing the entrainment plate stud bolts

Deformed stud bolts can be replaced by following the instructions below to ensure the proper execution of the work.

1. Unscrew the stud bolt (1) using two of the nuts (2) blocked together, used for fastening the blade holder disc.
2. Apply a thread brake product on the threaded part to be screwed into the entrainment plate (3).

NOTE The protruding part of the thread is recognisable by the punch on the head of the stud bolt itself.

3. Use the two nuts (2) to fully tighten the stud (1) in the hole on the plate (3).

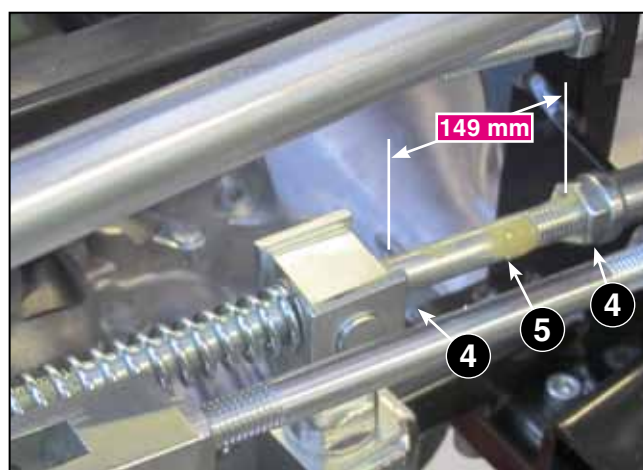
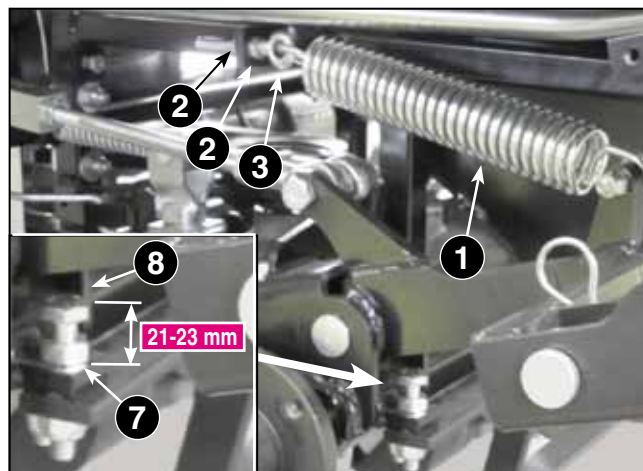


6.2.8 Preliminary adjustment of the tie rods and lifting springs

NOTE This adjustment is NOT included in the standard controls as it is set to default factory settings and requires no further adjustment. The calibration of the tie rods and springs should only be performed if the relative components are replaced.

Follow the steps in the previous procedure, intervening alternately from both sides.

1. Completely loosen the spring (1) using the nuts (2) of the tie rod with eye bolt (3), to decrease the load, without removing it completely.
2. Adjust the nuts (4) on the tie rod (5) until there is a 149 mm distance between the two nuts.
3. Loosen the nut (7) and set the locknut (8) so as to obtain a position of 21-23 mm from the base plate.
4. Reinstall the tension of the spring (1) using the nuts (2) up to the maximum allowed by the tie rod thread (3).



6.2.9 Setting the electromagnetic clutch air gap



WARNING! - This adjustment must be carried out if the blades do not stop within 5 seconds of disengagement.

IMPORTANT The correct adjustment foresees an air gap of from 0.38 to 0.6 mm between the rotor and the armature.

NOTE - This setting can be executed without removing the clutch from the machine. The figure shows the disassembled clutch only to make the procedure clearer. [👉 5.1.2].

1. Insert a thickness gauge between the armature and the rotor, through the designated slit.
2. Slowly tighten the brake adjuster nut (10) until the thickness gauge comes into contact with the armature and the rotor.

NOTE This clutch uses 24UNF adjustment nuts, therefore one turn of the nut is equivalent to about 1 mm of axial movement.

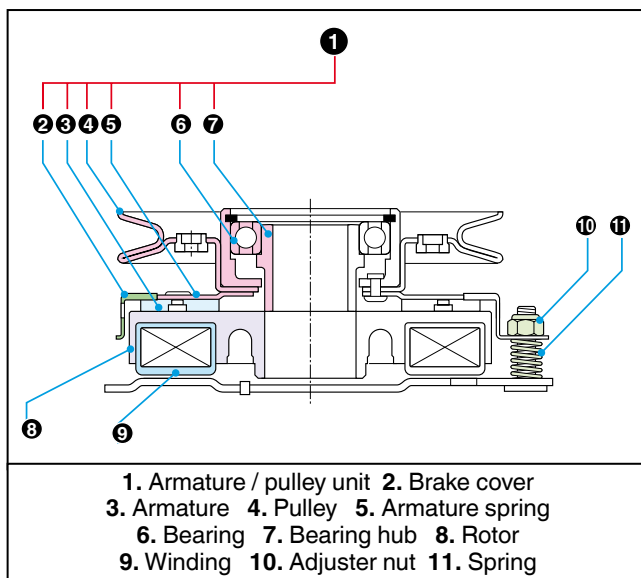
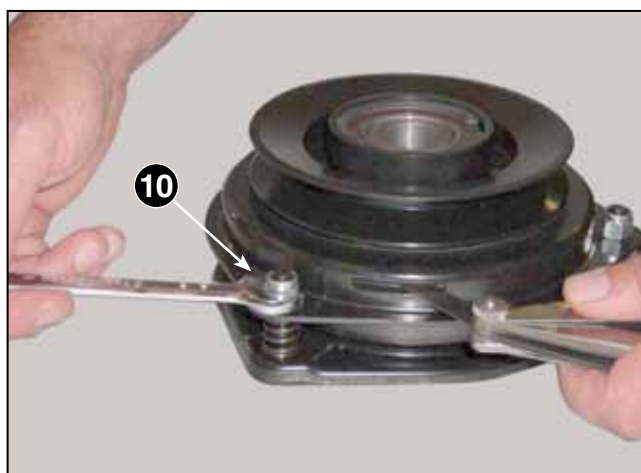
IMPORTANT During the adjustment, bear in mind that:

- the air gap with lower set values increases the period that elapses between one regulation and another.
- the gap set to a lower value reduces to a minimum the duration of the clutch.

3. Transfer the same adjustment settings to all the nuts.

On completing the setting process:

4. Engage the clutch.
5. Rotate the armature and the rotor to ensure that there is no contact between the armature and brake. In case of contact, loosen the brake nuts and try again until the contact has been eliminated.

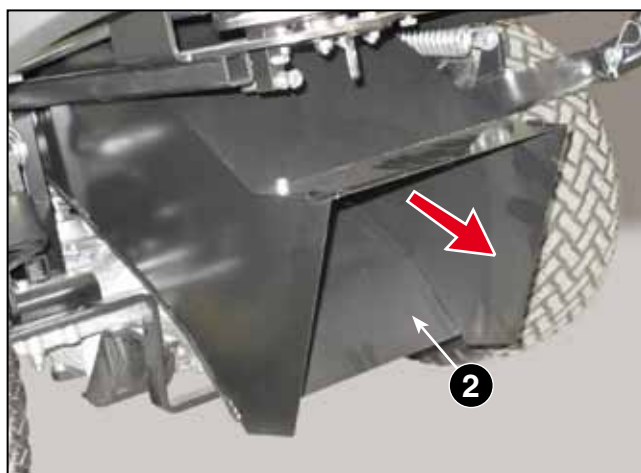
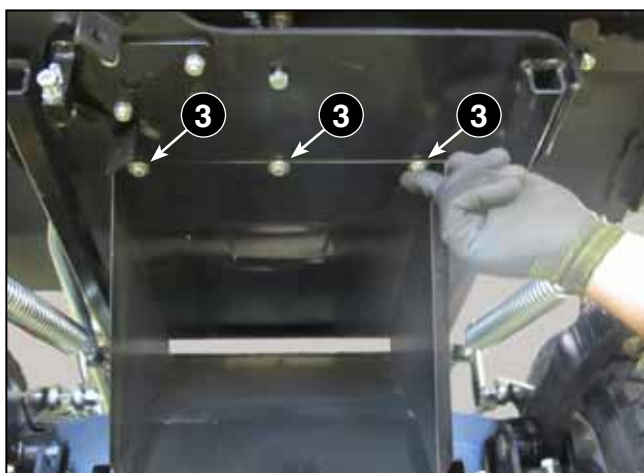
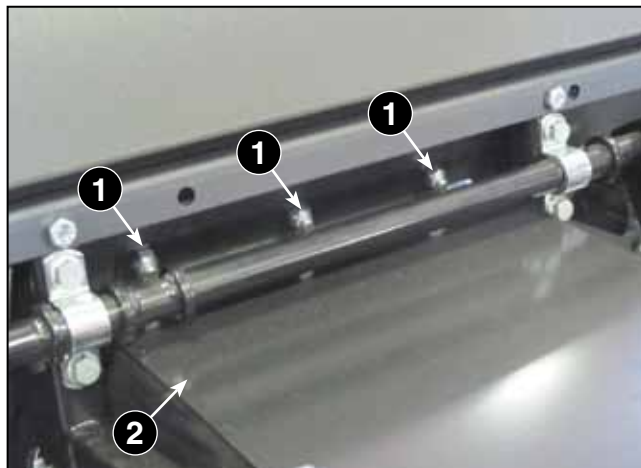


6.3 COLLECTOR CHANNEL

6.3.1 Removal of the collector channel

- Follow all steps of the "Removing the cutting deck" procedure [👉 6.1.3].

1. Unscrew the three nuts (1) fixing the rear of the collector (2) in place.
2. Undo the three screws (3) located inside the outlet nozzle.
3. Remove the conveyor (2).

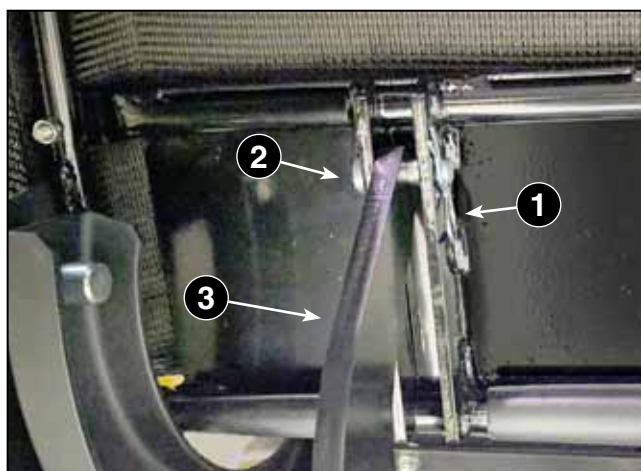


6.4 GRASS CATCHER


6.4.1 Removing the grass catcher

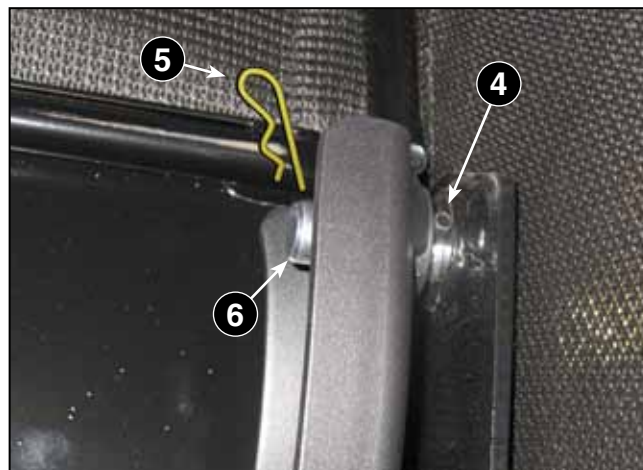
- Use the designated lever to raise the grass catcher and block it in the raised position.

1. Extract the cotter pin (1) and remove the tilting system (3) connection pin (2).



2. Extract the pin (4) from both sides using a suitably sized pin punch.
3. Extract the cotter pin (5) and remove the side catcher support connection pin (6).

 Take necessary measure to adequately support the catcher which may be subject to uncontrolled movements when disconnected from its supports.



7 - ELECTRICAL SYSTEM










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7.1 TROUBLESHOOTING

7.1.1 Electrical system problem table

Below are some of the most common problems connected to the malfunctioning of the electrical system are shown, with their probable cause and the remedial action to be taken.

PROBLEM	CAUSE	REMEDY
Engine does not start	The ignition consent conditions have not been complied with	Comply with all consent conditions and all the microswitches  7.1.2] - [ 7.2.3]
	Low battery	Recharge the battery [ 7.2.2]
	Uncertain battery cable connections	Check and clean the terminals [ 7.2.2]
	Uncertain spark plug connections or faulty spark plugs	Check and replace
Electromagnetic clutch malfunction	The operator is absent	Comply with the consent conditions  7.1.2]
	The operator present switch is faulty	Check and replace [ 7.2.3]
	Faulty switch, diode or clutch	Check the components [ 7.2.3] - [ 7.2.8] - [ 7.2.9] and replace them

7.1.2 Safety device intervention table



The safety devices intervene on the engine, preventing ignition or stopping it in the event where the required machine operating conditions are no longer met.

The engine ignition conditions are:	The blade engagement and grass cutting conditions are:
<ul style="list-style-type: none"> - Parking brake engaged. - Blades disengaged. - Grass catcher closed. - Right side bonnet shut - Bonnet behind the seat shut 	<ul style="list-style-type: none"> - Operator seated. - Parking brake disengaged. - Grass catcher closed. - Right side bonnet shut

The following tables show the correlations on the engine produced by the action of the operator in the case study of the various possible situations.

a) During ignition:

Operator	Brake Parking	Engine	PTO Blade Control	Action	Result
Seated	Engaged (ON)	Off	Disengaged (OFF)	Machine ignition	The engine starts
Seated	Disengaged (OFF)	Off	Disengaged (OFF)	Machine ignition	Engine does NOT start
Seated	Disengaged (OFF)	Off	Disengaged (OFF)	Machine ignition with the drive pedal pressed	Engine does NOT start
Seated	Engaged (ON)	Off	Engaged (ON)	Machine ignition	Engine does NOT start
None	Disengaged (OFF)	Off	Disengaged (OFF)	Machine ignition	Engine does NOT start
None	Disengaged (OFF)	Off	Disengaged (OFF)	Machine ignition with the drive pedal pressed	Engine does NOT start
None	Disengaged (OFF)	Off	Engaged (ON)	Machine ignition	Engine does NOT start

b) While mowing the grass:

Operator	Brake Parking	Engine	PTO Blade Control	Action	Result
Seated	Engaged (ON)	Running	Disengaged (OFF)	Inserting the blades	The blades engage
Seated	Disengaged (OFF)	Running	Disengaged (OFF)	The operator leaves his seat	The engine stops
Seated	Engaged (ON)	Running	Engaged (ON)	The operator leaves his seat	The engine stops
Seated	Engaged (ON)	Running	Disengaged (OFF)	The operator leaves his seat	The engine keeps running
Seated	Disengaged (OFF)	Running	Engaged (ON)	The operator leaves his seat	The engine stops
None	Engaged (ON)	Running	Disengaged (OFF)	Press the transmission pedal	The engine stops
None	Engaged (ON)	Running	Disengaged (OFF)	The transmission pedal is in "neutral"	The engine keeps running

Notes

- 1) In any case, the top cover and the left bonnet must be closed.
- 2) The tilting of the catcher always causes the disengagement of the PTO of the blades.

7.1.3 Equipment

There are some specialised tools and test equipment that are needed for electrical repair work. A brief description of these follows.

- **Needle-nose or long pliers.** Used to connect or bend wires and connectors in tight positions.
- **Diagonal cutters.** Used to cut wires or trim connections.
- **Wire stripper / crimping tool.** Available separately or as a combined tool. Used to strip insulation from wires of various sizes, crimp terminals and connector or wires.
- **Soldering iron and soldering gun.** Used to weld all joints and connections to terminals, connectors, etc. A soldering gun is faster and more convenient than a soldering iron, which must heat up first.
- **Multimeter - analog or digital.** To measure voltage, amperage and ohms.
- **Tachometer.** Used to measure engine speed. Required to properly test alternator and charging circuits where output is dependent upon engine speed.
- **Heat gun.** Used to hot shrink insulated tubing in place. Used to replace electrical tape or insulated sleeving. To use, place a piece of shrink tubing over a wire joint, heat with the heat gun, until it shrinks slightly around the joint.
- **Consumable materials** Electrical tape, resin core solder (never use acid or acid core solder on electrical joints), an assortment of various sized terminals, connectors, insulated or heat shrink tubing (for use on joints and connections), and an assortment of automotive type wire (in several colours).

IMPORTANT *STIGA highly recommends that all interventions be performed in a professional manner. The use of the tubing to cover joints and the soldering of connections contribute to a professional looking job. In addition to a pleasing appearance, repairs made in this manner are more likely to withstand vibration. (The weakest points in an electrical system are the joints where wires are attached.)*

IMPORTANT *Replace all faulty components with STIGA replacement parts only. Engine parts, such as rectifiers or alternator components should be repaired by the nearest engine service center. STIGA does not recommend attempting to repair electrical components. Most do not lend themselves to repair and you would have more money invested in "time of repair" than the part would cost and the results may not be as good.*

7.1.4 Electrical measure gauges

In many electrical circuits, there is some visible effect which indicates that the circuit is functioning properly. A switch is turned "ON" and a lamp lights up. A key is turned, a starter motor runs and cranks the engine. If the lamp does not light up, or the starter motor does not run, some means of measuring voltage, current flow, resistance and continuity is needed, (continuity means there is a complete electrical path through the circuit or component.)

To know exactly what conditions exist in an electrical circuit requires AC and DC Voltmeter, AC and DC Ammeter, and an Ohmmeter.

Combination meters that do all of these things are available and called a Multimeter or Volt Ohm-multitester (VOM).

Meters of this kind are available in many forms and all change functions and ranges with switches, or by plugging test leads into different jacks. Multimeters are available in two basic types, Analog and Digital.

- **Analog Meters**

Analog meters have a needle that provides the reading moving along a scale. The longer the scale, the easier it is to read and more accurate the reading will be. A jewelled movement is used in this type of meter which is more likely to be damaged through rough handling (except for over-loaded Protected Meters) or by measuring high values that exceed the range set on the meter, than a digital meter.

They provide excellent service for the money as long as they are used with care.

- **Digital Meters**

Digital Meters have no movement and are therefore more sturdy. The reading shows up directly on a display window of some type. Since they read directly, no skill in reading the scale is required, nor is it necessary to set the range. The meter switches the ranges automatically.

The user only has to select the function volts DC, AC amps, ohms, etc.), connect the test leads and the reading is displayed on the display. Because of the internal circuitry and the lack of a movement, these meters are not likely to be damaged by overloads.

In the discussions that follow, either type of meter may be used. Test procedures are the same. It is best to learn proper procedures, even though some meters may be more forgiving of mistakes. Where differences in use may occur, they will be covered in the explanations.

7.1.5 Electrical measurements

- **Voltage Measurement**

There are two basic rules to be remembered when using a voltmeter. A voltmeter measures the voltage difference between the test leads and the voltmeter is always connected across the circuit under test.

- **Current Measurement**

The two rules to remember when measuring current with an ammeter are; an ammeter measures the current that flows through the meter, and to measure current an ammeter must be connected into the circuit.

The latter rule means that the circuit must be opened, and the ammeter wired into it. Because this procedure is usually difficult, an ammeter is seldom used for troubleshooting.

- **Resistance Measurement**

An Ohmmeter is used to make resistance measurements and to check continuity through wires and electrical components.

There is one rule to keep in mind when using an ohm meter. The ohmmeter has a self contained battery and requires no electrical power. Using the ohmmeter on a circuit that has voltage applied may result in damage to the meter.

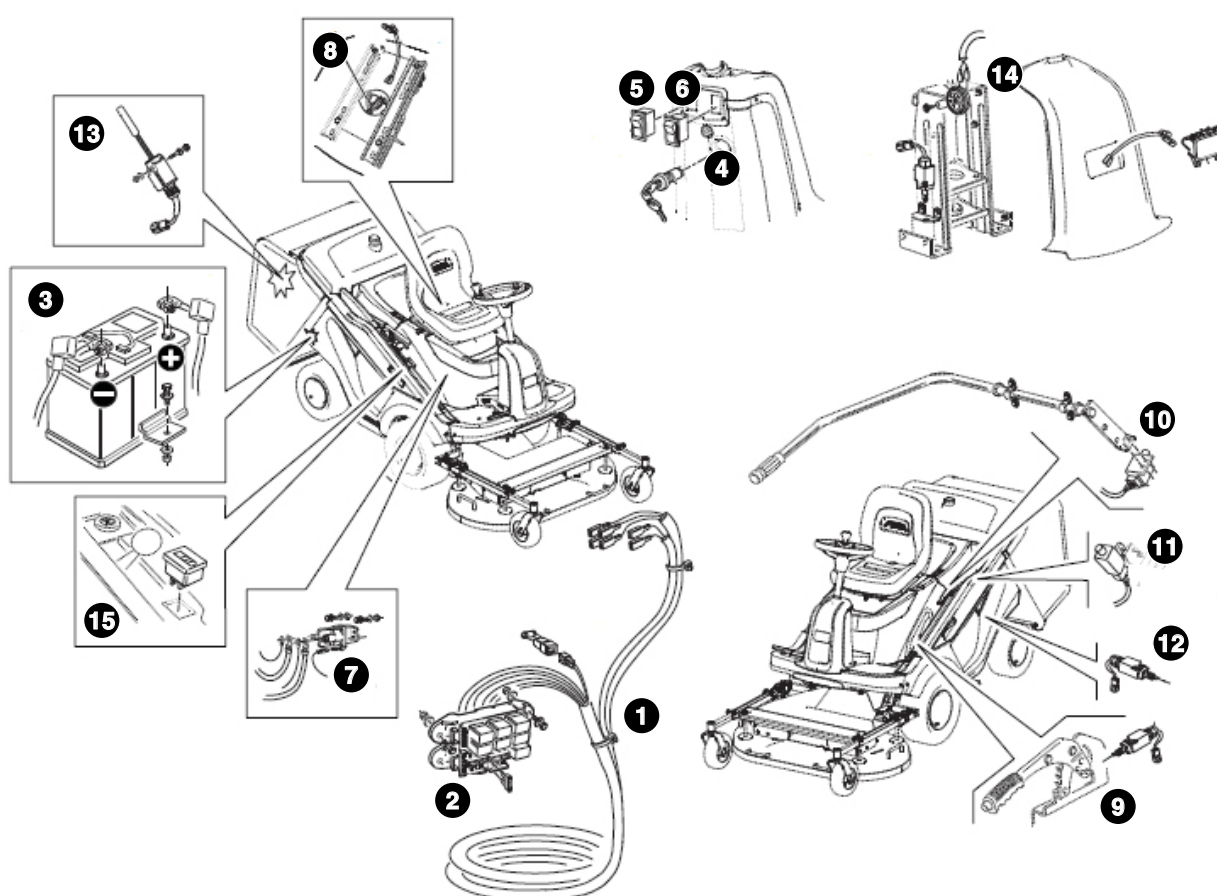
IMPORTANT - Disconnect the battery from the machine when performing Ohmmeter tests or damage to the Ohmmeter may occur.

IMPORTANT - An ohmmeter reads the resistance of whatever component is connected between the test leads. It can be used to check wires, coils, light bulbs, or any item that conducts current.

7.2 SYSTEM AND COMPONENT DESCRIPTIONS

7.2.1 Wiring

The diagram shows the cabling layout and the arrangement of the utilities.



1. General wiring
2. Fuse box and relays
3. Battery
4. Ignition unit
5. Headlight switch
6. PTO switch
7. Starter relay
8. Operator presence microswitch
9. Parking brake microswitch
10. Grass catcher tilting microswitch
11. Upper casing microswitch
12. Left bonnet microswitch
13. Grass catcher full warning microswitch
14. Grass catcher full warning signal device
15. Hour counter (if present)

7.2.2 Battery

NOTE - The machine comes equipped with a maintenance-free battery that requires no regular maintenance except the cleaning of the terminals.

! DANGER! - Battery poles, terminals and related accessories contain lead and lead compounds, chemicals known to cause cancer and damage to the reproductive apparatus. Wash hands after handling

Remove battery before servicing.

a) Battery Removal and Installation

- Disconnect negative (-) cable first, then positive (+) cable.
- Remove the battery hold-down bracket and battery from the machine.
- Connect positive (+) cable first, then negative (-) cable.
- Apply petroleum jelly or dielectric grease to battery cable ends and terminals.



b) Inspection, cleaning, drying, and maintenance

- Inspect the top of the battery, terminals, cables, poles and the battery unit for any accumulation of dirt, corrosion cracks or loose or broken parts. Keep the battery and its terminals clean. Replace the battery if damaged.
- Clean or service the battery after removing it from the machine. Remove corrosion from battery terminals and cable connections with a wire brush, then wash with a weak baking soda solution.
- Scrub the exterior of the battery and cable terminals with a nonmetallic brush which has been dipped into a mixture of baking soda and water.
- After cleaning, apply a thin coat of grease or petroleum jelly to terminals and cable ends to delay corrosion.

c) Recharging the battery

NOTE - ALWAYS follow the information provided on the battery by the battery manufacturer. Contact the battery manufacturer for further instructions on how to charge the battery.

- To charge the battery:
 1. Remove the battery from the machine
 2. Place the battery on bench or other well ventilated place.
 3. Connect the positive (+) lead of the charger to the positive (+) terminal, and the negative (-) lead to the negative (-) terminal.

The approximate charge status can be determined by the remaining open circuit voltage (OCV) at room temperature, and the charge time required can then be estimated, as indicated in the table of examples.

- If you use a 12 volt automatic battery charger, select a good quality charger with minimum 5-10 Ampere output at 15 VDC and charge for 3-12 hours depending on the battery charge status (see table).

Voltage (OCV)	Charge %	Charging time
12.60	100%	--
12.40	75%	3 hours
12.20	50%	7 hours
12.00	25%	10 hours
11.80	0%	12 hours

- If you are using a constant current charger, charge at 1-2 Amperes for the time indicated in the table.


IMPORTANT - *Charging at higher rates will damage the battery and cause excessive gassing and acid spewing.*

d) Charging with an alternator

Under normal conditions the engine alternator will keep the battery charged. If the machine is not used for a long period of time and the battery was fully discharged, a battery charger must be used to charge it again.

e) Replacing the battery


The battery used on this machine is characterised by a CCA value, critical for good ignition. This value indicates the number of amperes that a battery can support for 30 seconds at a temperature of -17.8°C before the voltage drops to unusable levels.

The replacement must take place with a battery of similar or higher CCA [ 3.1].

f) Emergency jump-start with cables

Jump starting, battery charging, or replacement is required when the starter motor will not crank the engine.

IMPORTANT - *The machine used for jump starting should have a 12 volt battery with at least 500 cold cranking amperes, and a negatively grounded system.*

 **DANGER!** - *FROZEN BATTERIES CAN EXPLODE and result in death or serious injury. DO NOT charge a frozen battery. Let the battery thaw out before putting on a charger. UNIT MOVEMENT can result in death or serious injury. NEVER jump-start the machine with cables directly on the starter motor or solenoid valves The machine could move forward or backward and injure the person jump starting it.*

To jump-start with the cables:

1. Ensure battery is not frozen. If the fluid is frozen, remove the battery from unit and allow to thaw before charging.
2. Connect the positive (+) jumper cable to the positive (+) terminal of the discharged battery.
3. Connect the other end of the same jumper cable to the positive (+) terminal of the booster battery.
4. Connect one end of the second jumper cable to the negative (-) terminal of the booster battery.

5. Make the final jumper cable connection to the engine block or the furthest ground point away from the discharged battery.

WARNING! - *Make sure the cables are clear of any moving engine parts before starting the engine.*

6. Start the engine. If the engine will not start after several tries, the machine or battery may need servicing.
7. After the engine starts, leave the cables connected for one to two minutes.
8. Disconnect cables in reverse order.
9. Use the machine normally to charge the battery.

7.2.3 Switches

Switches either open a circuit to stop current flow or close and allow current to flow through.

- A normally open (NO) switch prevents current flow until the switch is actuated, completing the circuit and allowing current to flow through it. An example is a light switch - the lights are off until the switch is actuated and the lights go on.
- A normally closed (NC) switch allows current to flow until the switch is actuated, breaking the circuit and stopping current flow through it. An example is an ignition switch that grounds the magneto when in the OFF position (completing the circuit) but opens the circuit when in the ON position allowing the engine to operate. The switches are selected with reference to their nominal current (the contacts must be of sufficient size to carry the required current), rated voltage and type of actuation (pressure switches, traction, rotation, momentary contact or microswitches).

NOTE - *Check that the connections to the switches are stable and that the switch is actuated correctly before performing an electrical test (Safety switches may need adjusting in order to be actuated correctly).*

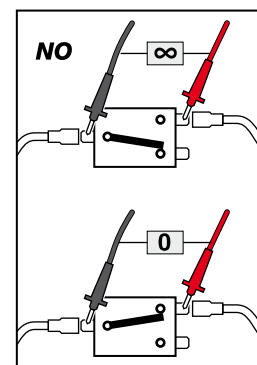
IMPORTANT - *During the check process, remove the switches from their respective circuit, unplugging the connector. If the cables are left in place, the machine components or the meter may be damaged.*

a) Normally open switch (NO)

To test a normally closed switch connect the ohmmeter between the switch terminals.

- The meter should indicate an open circuit (infinite resistance «∞»).
- Activate the switch. The Ohmmeter should indicate a closed circuit (zero resistance «0»).

This indicates the switch is operating properly. Variation from test results described indicates a defective switch.

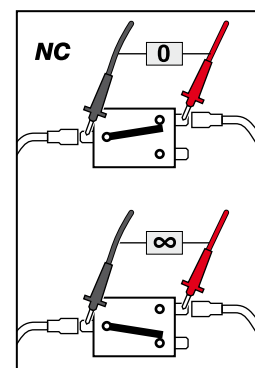


b) Normally closed switch (NC)

To test a normally closed switch connect the ohmmeter between the switch terminals.

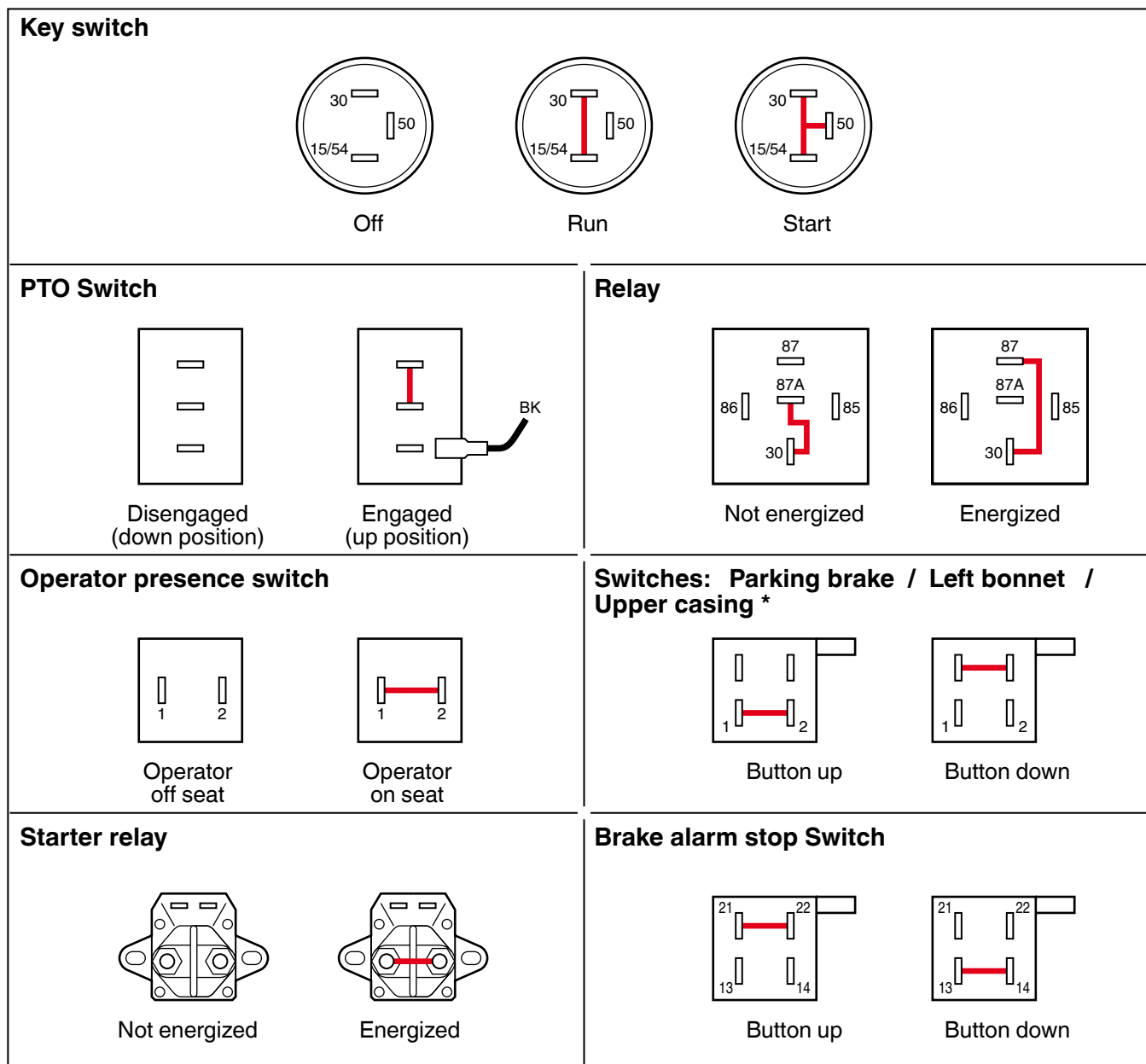
- The meter should indicate a closed circuit (zero resistance «0»).
- Activate the switch. The Ohmmeter should indicate an open circuit (zero resistance «∞»).

This indicates the switch is operating properly. Variation from test results described indicates a defective switch.



The diagrams show the connections of the electrical components in different situations.

NOTE - The continuous line indicates the electrical continuity of the circuit. All switches are shown from the rear.



* The normally closed switch contacts are marked with "NC"; normally open contacts do not have a mark.

7.2.4 Ignition switch

NOTE - Refer to the wiring diagram of the machine (continuity diagram) to determine switch functions and test using the methods described.

The ignition switch incorporates a number of functions. It is a three-position switch: OFF, RUN, START with momentary contact.

Use an ohmmeter to check for continuity in each position.

- «OFF» Position - There must be no continuity between contacts.
- «RUN» Position - There must be continuity between contacts 30 and 15/54.
- «START» Position - Hold the switch in the START position while testing. There must be continuity between contacts 30, 15/54 and 50. These connections apply power to close the solenoid contacts and engage the starter motor.

In addition to the tests above, set the switch to the «RUN» position and check between each contact and the ground (metal part) to ensure that no terminals are grounded. If the switch is functioning properly, there will be no continuity between the contacts other than that described.

7.2.5 Solenoids and Relays

Solenoids and relays are both magnetically operated devices. Both devices operate on the principle that passing a current of electricity through a coil of wire will create a magnetic field strong enough to attract a piece of iron or steel. Each device uses this principle in a slightly different manner.

- **Solenoids** - A basic solenoid consists of a coil of wire wound around a hollow tube. A magnetic core slides inside the tube. When current is passed through the coil, the core is pulled into the solenoid with considerable force. With proper design, a solenoid can exert considerable force over a distance of several inches. A solenoid can therefore, pull a lever, close a heavy contact, or perform other jobs that require a straight line pull.
- **Relay** - A basic relay consists of a coil of wire wound around a soft iron (magnetic) core. When current is passed through the coil, the core is magnetized and pulls down on a magnetic lever. The lever in turn is attached to several switch contacts which open or close other electrical circuits. In this fashion, a small current can control one or more larger electrical currents and actuate several other devices. In most cases a relay contact moves only a fraction of an inch and the magnetic pull is low.

If a relay or solenoid fails to operate the cause may be either electrical or mechanical.

To check electrically, connect a voltmeter across the coil of the device and activate the circuit that operates the relay or solenoid. If the meter indicates no voltage is applied, the cause lies in the control circuit.

If the meter indicates proper voltage across the coil but the device does not function, remove the power, disconnect the wiring and check the continuity of the coil with an ohmmeter. The meter should indicate resistance, in the order of 3 to 5 ohms, if the coil is intact. A high resistance indicates an open coil and a faulty device.

There are also a number of mechanical issues that may cause the problem.

The starter solenoid used on STIGA machines is a sealed unit used to actuate the starter motor on the engines. These solenoids may have three or four connections. The two major connections carry high current to operate the starter motor. The minor connections are connected to the coil and carry the control current.

To check the solenoid, disconnect the cables to the starter motor, turn the ignition switch to the start position, and listen for the solenoid to snap inside contacts closed.

If no snap is heard, check across the coils with a voltmeter. The voltage should read 12 volts with the ignition switch in the «START» position. If no voltage appears, the defect is in the start circuit.

If the voltage is correct, turn off the power and check continuity of the coil with an ohmmeter. If the coil is open, the solenoid is faulty and must be replaced. If the coil has the proper voltage applied, and the continuity check indicates the coil is intact, the solenoid plunger is stuck or the contacts are welded shut and the solenoid must be replaced.

If the solenoid snaps shut, but the starter motor does not work, check the power contacts with an ohmmeter. If there is no continuity when the solenoid snaps shut, the contacts are faulty and the solenoid must be replaced.

7.2.6 Fuses

Fuses are inserted in electrical circuits to protect the circuits from damage due to overload or short circuits. Fuses are a “weak link” in the circuit. They contain a metal link designed to melt when a certain current value is exceeded thus opening or disconnecting the wiring.

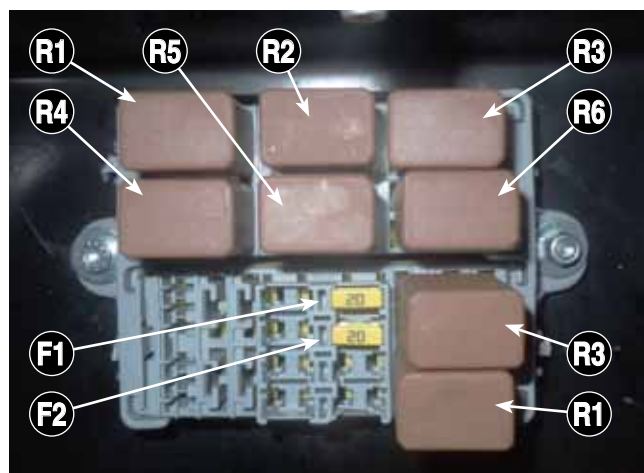
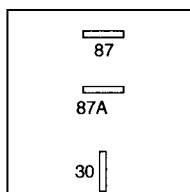
Once a fuse blows or melts it must be discarded and replaced with a new fuse of the same value. Since the function of the fuse is to protect the circuit, NEVER attempt to repair the protective device by bridging or replacing it with one with a higher current rating.

Electrical testing of these devices is simple, as the device either conducts current (and is therefore functioning) or the device is open and is therefore faulty. Use an ohmmeter to check for continuity

7.2.7 Relay and Fuse operating faults

The machine has several fuses and relays, collected in a box, accessible by tilting the driver's seat.

The table shows the functions of each component and the effects resulting from an anomaly with respect to the contacts of the relays shown below.



Component	Effect generated by an anomaly
F1 - Fuse 20 A - General	Nothing works
F2 - Fuse 20 A - PTO Clutch	The clutch does not work and the blades do not engage
R1 -Ignition consent relay from PTO	<ul style="list-style-type: none"> • If contact 30 remains stuck to contact 87, the engine will not start • If contact 30 remains stuck to contact 87A, the engine will start with PTO ON
R2 -PTO safety switch relay	<ul style="list-style-type: none"> • If contact 30 remains stuck to contact 87, the PTO is always ON • If contact 30 remains stuck to contact 87A, the PTO does not work and if engaged it switches OFF the engine
R3 -Ignition consent relay from safety switches	<ul style="list-style-type: none"> • If contact 30 remains stuck to contact 87, the engine will not start • If contact 30 remains stuck to contact 87A, the engine will start with the operator on the ground
R4 -Engine switch off relay with key	<ul style="list-style-type: none"> • If contact 30 remains stuck to contact 87, the engine will not switch off using the key • If contact 30 remains stuck to contact 87A, the engine will not start
R5 - Hour counter relay	<ul style="list-style-type: none"> • If contact 30 remains stuck to contact 87, the hour counter will not work • If contact 30 remains stuck to contact 87A, the hour counter will always work
R6 -PTO relay	<ul style="list-style-type: none"> • If contact 30 remains stuck to contact 87, the PTO is always ON • If contact 30 remains stuck to contact 87A, the PTO will not work
R1 -Engine switch off relay from the seat	<ul style="list-style-type: none"> • If contact 30 remains stuck to contact 87, the engine will start with the operator on the ground • If contact 30 remains stuck to contact 87A, the engine will not start
R3 -Engine switch off relay from safety devices	<ul style="list-style-type: none"> • If contact 30 remains stuck to contact 87, the engine will not start • If contact 30 remains stuck to contact 87A with the PTO ON, the moment the engine basket is opened it does not switch off

7.2.8 Diodes and Rectifiers

Diodes are solid state, semiconductor devices. They contain no moving parts and conduct current better in one direction than the other.

- **Diodes** - Diodes allow current to flow through one circuit without “backing up” into another. In engine alternator circuits, a diode is used to convert current which flows back and forth (AC) in a circuit to current which flows only in one direction (DC). A device which converts alternating current to a direct current is called a RECTIFIER. A diode is one type of rectifier.

To check a diode, isolate it from the circuit by disconnecting one end. With a multimeter set on the lowest ohms scale setting, measure the resistance in one direction, reverse the test leads, and measure in the other direction.

Readings should be high in one direction and low in the other.

- If the readings are the same in both directions, the diode has short-circuited.
- If the readings are high, the diode is open.
- If the readings are the same in both directions, the diode is faulty and must be replaced.

IMPORTANT - Diodes are marked to indicate polarity (a band on one end, an arrow on the side, or they fit on a holder only one way to prevent inverting the polarity).

• **Rectifiers** - The battery is charged via an alternator on the engine. A charging circuit contains a rectifier because alternators produce alternating current (AC) and batteries require direct current (DC) for charging.

The rectifier may be built into the engine or it may be an external component. It may also contain a regulator to prevent overcharging the battery.

NOTE - The repair of rectifiers integrated in the engine must be performed by a service centre authorised by the engine manufacturer, which has access to the information and parts needed for the checks and repairs.

7.2.9 Electromagnetic clutch

The electromagnetic clutch is used to connect or disconnect, via a switch, the equipment used on the machine. In addition, the clutch is designed to activate a brake on the output shaft, when it is disengaged.

The field coil is mounted to a bearing support and does not rotate.

The rotor is attached to the power output shaft and rotates around the field assembly.

The armature is connected to the output pulley.

The armature unit is assembled close to the brake unit rotor. The clutch is engaged by applying current to the coil connection.

This results in a current flowing through the coil, magnetizing the coil pulling the armature onto the rotor with sufficient force to hold the two pieces together, connecting the output and the input shafts firmly together.

The force of the armature against the rotor pulls it away from the brake, hence releasing the brake.

To adjust it, follow the " Setting the electromagnetic clutch air gap" [👉 6.2.9].

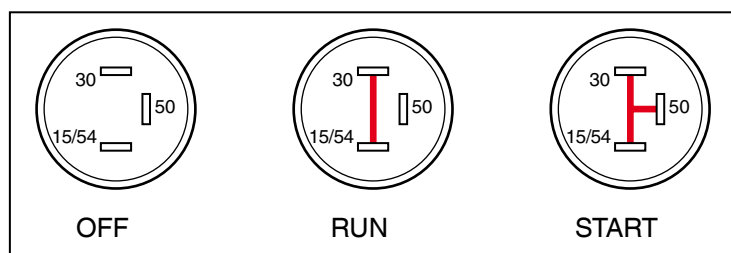


7.3 FUNCTIONAL CHECKS

7.3.1 General system checks

Make sure all switches are in the correct ignition position: :

- 1) PTO disengaged;
- 2) Hydrostatic transmission in "neutral";
- 3) Operator seated.
- 4) Parking brake engaged.



If there is no voltage supply to the battery to start the engine, perform the checks as follows.

• Phase 1

Check the battery. Use a voltmeter to check the correct voltage. Replace the battery if necessary and/or charge to the correct level.

• Phase 2

Use a voltmeter to check for battery voltage on terminal (30) on the rear side of the ignition switch in the «OFF» position. If there is no battery voltage on terminal (30), check the battery connection and the fuse on the red wire.

• Phase 3

With the ignition switch in the «RUN» position, check if the battery voltage is transferred from terminal (30) to terminal (15/54).

• Phase 4

With the ignition switch in the «START» position, the battery voltage is transferred from terminal S2 to supply terminal of the contractor R8 .

• Checking the clutch of the PTO.

Remove the clutch connectors. Check the coil resistance of the clutch with a multimeter to see if the coil is working fine. The clutch needs to have the coil resistance of $2,53 \pm 5\%$ ohm. The coil is defective if the measured resistance is higher or non-existent.

7.3.2 Checking the components

• Clutch

The resistance of the coil has to be $2,53 \pm 5\%$ ohm. If the coil is defective, the resistance will either be higher or non-existent.

• Ignition switch test.

Check the battery voltage in the «OFF» position, test for voltage at terminal 30. There must be no voltage on terminal 51/54.

With the ignition switch in the «RUN» position, test for battery voltage at terminal 51/54.

- **PTO switch test.**

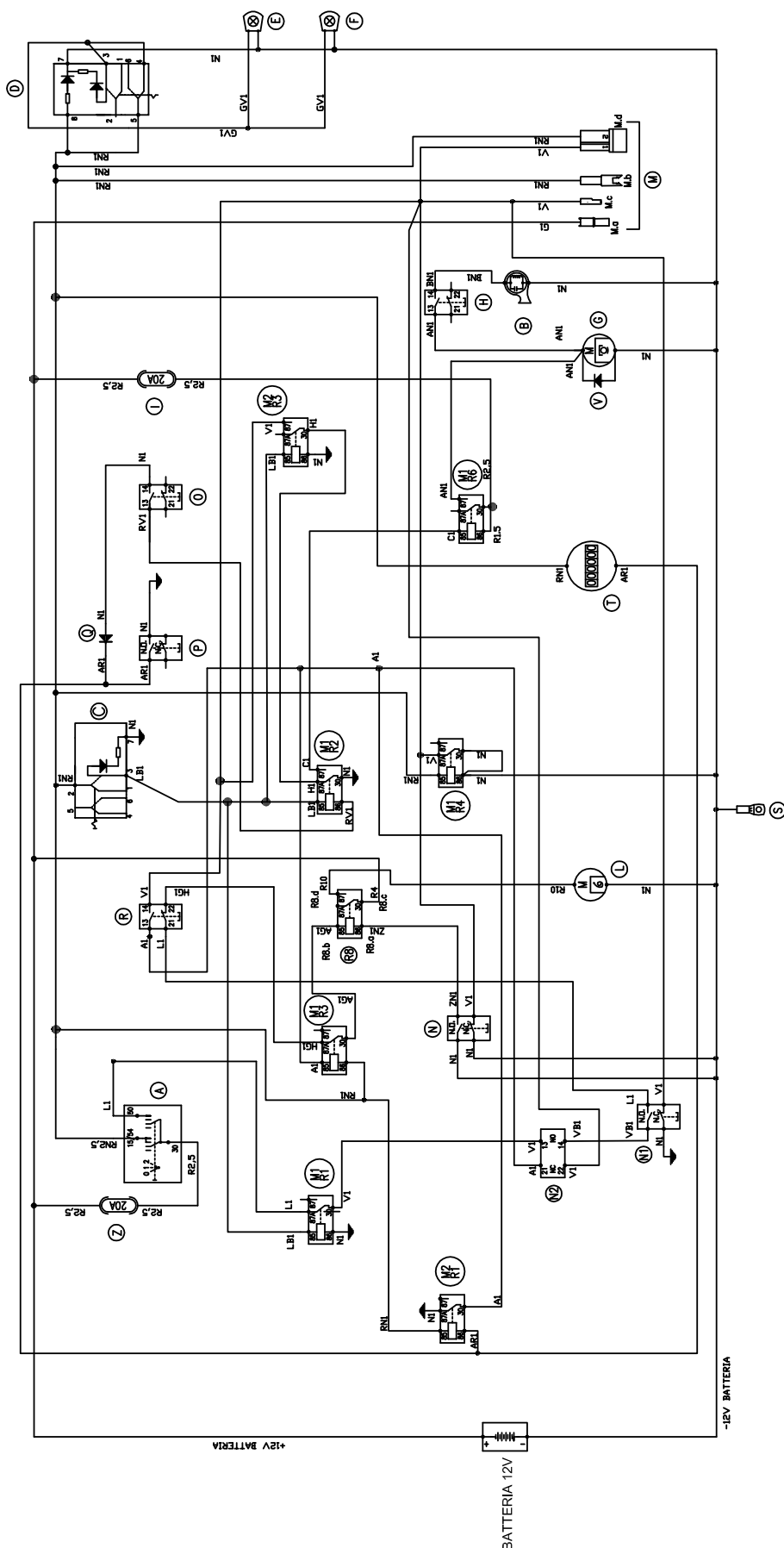
The PTO switch is a push/pull switch with normally open and closed contacts. Test for transfer of power with a voltmeter. The switch contacts should be tested using an ohmmeter after disconnecting the wiring connector.

- **Diode test.**

The diodes are tested with an ohmmeter set to diode testing. Voltage must travel in one direction only. If voltage travels in both directions or there is no voltage at all, the diode is faulty and must be replaced.

7.4 ELECTRICAL WIRING DIAGRAMS

7.4.1 Wiring layout



A Ignition switch
B Grass catcher full warning signal
C PTO switch
D Headlight switch
E Work headlight
F Work headlight
G Blade clutch
H Grass catcher full microswitch
L Starter motor
M Engine connections
N Upper casing microswitch

N1 Left side microswitch
N2 Brake alarm stop microswitch
O Operator presence microswitch
P Diode suppressor on PTO switch
Q Parking brake microswitch
R Ignition Contactor
R8 System earthing
S Hour counter
T Battery
U Diode suppressor on blade clutch

Y PTO fuse
Z System protection fuse

M1-R1 Ignition consent relay from PTO
M1-R2 PTO safety switch relay
M1-R3 Ignition consent relay from safety switches
M1-R4 Engine switch off relay with key
M1-R6 PTO relay
M2-R1 Engine switch off relay from the seat
M2-R3 Engine switch off relay from safety devices



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