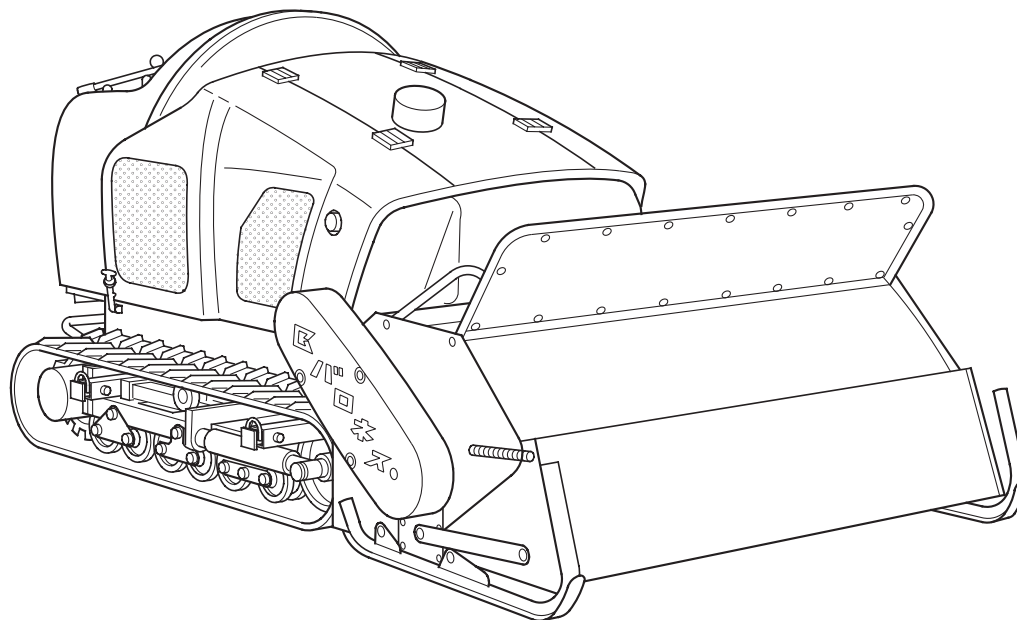


HMC156E

HMC172E

Hammer Knife Mower

Owner's operating manual



"Required reading" Read this manual and the owner's manual for the engine before using the machine.

BARONESS®
Quality on Demand

Serial No.10101-


Original Instructions Ver.1.2

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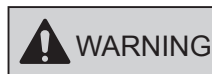
Warning for Safety

Warning labels with the  mark have been attached to this machine. The labels indicate the items which are particularly important from the safety point of view, so please work safely and always obey warnings.

Warning Marks



Negligence of the warning will cause death or serious injury.



Negligence of the warning may cause death or serious injury.



Negligence of the warning may cause injury and / or physical damage.



In case of negligence of the instruction, machine damage may be anticipated.

Symbols



See the Handling Manual



Caution mark
(Rotating parts)



Caution mark
(Hot surface)



Fuel mark
(Light oil No.2)



Caution mark
(Exhaust gas)



Caution mark
(Crushing)



Danger mark
(Flying objects)



Danger mark
(Blade rotation)



Grease
Every 50hours



Warning mark
(High-pressure oil)



Danger mark
(Strict prohibition of fire)



Warning mark
(Clothes for safety)

Greeting

Thank you very much for purchasing the BARONESS HAMMER KNIFE MOWER HMC156E/HMC172E.

This handling manual explains the method of correct use, adjustment and inspection of the HAMMER KNIFE MOWER. Carefully read this manual before operation so as to thoroughly understand the machine. The machine is shipped after sufficient trial operation and inspection when it is completed at the factory. However, whether or not the machine can exhibit its expected performance depends greatly on the handling method, as well as the skill of inspection, adjustment, and lubrication before and after operation. Carefully maintain your machine to bring out the best in the machine and for safe operation. Keep this manual near the machine for future reference to confirm unclear points as necessary.

= CAUTION =

- ◆ The type of the machine may change sequentially. Please inform us of the machine No. when making an inquiry.
- ◆ For improvement the contents of this manual are subject to change without notice.



- Warning marks have been used in this Manual and machine to ensure that you can operate it safely. Please read carefully to understand well.
- Thoroughly understand the operation procedure and safety cautions before you operate this machine.
- The marks and accompanying explanations should be preserved in their entirety. If they become lost or damaged please replace them immediately with new ones.

Purpose

This machine is intended for cutting grass. Do not use this machine in any way other than its intended purpose, and do not modify the machine. Operating this machine for other purposes and modifying it may be very dangerous and may cause damage to the machine.

This machine is not authorized for operation as a special motor vehicle. Do not operate it on public roads.

Safe Operating Practices

The following instructions include the ones from the CEN standard EN 836:1997, ISO standard 5395:1990, and ANSI B71.4-2004.

1. Training

- Read the Owner's operating Manual and other training material carefully. Be familiar with the controls, safety signs, and the proper use of the equipment.
- If the operator or mechanic can not read English it is the owner's responsibility to explain this material to them.
- All operators and mechanics should seek and obtain professional and practical instruction. The owner is responsible for training the users. Such instruction should emphasize:
 - the need for care and concentration when working with ride-on machines;
 - control of a ride-on machine sliding on a slope will not be regained by the application of the brake. The main reasons for loss of control are:
 - Insufficient crawler(s) grip;
 - Being driven too fast;
 - Inadequate braking;
 - The type of machine is unsuitable for its task;
 - Lack of awareness of the effect of ground conditions, especially slopes;
 - Incorrect hitching and load distribution.
- Never allow children or people unfamiliar with these instructions to use or service the machine. Local regulations may restrict the age of the operator.
- The owner/user can prevent and is responsible for accidents or injuries occurring to themselves, other people, or property.
- Keep in mind that the owner, operator, and mechanic are responsible for accidents or hazards occurring to other people or their property.

2. Preparation

- Evaluate the terrain to determine what accessories and attachments are needed to properly and safely perform the job. Only use accessories and attachments approved by the manufacturer.
- While operating, always wear substantial footwear, long trousers, hard hat, safety glasses, mask, and ear protection. Long hair, loose clothing, or jewelry may get tangled in moving parts. Do not operate the equipment when barefoot or wearing open sandals.
- Inspect the area where the equipment is to be used and remove all objects such as rocks, toys and wire which can be thrown by the machine.
 - Warning - Fuel is highly flammable. Take the following precautions:
- Store fuel in containers specifically designed for this purpose.
- Add fuel before starting the engine. Never remove the cap of the fuel tank or add fuel while the engine is running or when the engine is hot.
- Refuel outdoors only and do not smoke while refueling.
- If fuel is spilled, do not attempt to start the engine but move the machine away from the area of spillage and avoid creating any source of ignition until petrol vapours have dissipated;
- Replace all fuel tanks and container caps securely.
- Check that operator's presence controls, safety switches and shields are attached and functioning properly. Do not operate unless they are functioning properly.
- If the brake operation is faulty or the parking brake lever has noticeable play, be sure to adjust or repair them before operating the machine.
- Replace faulty mufflers.
- Before using, always visually inspect to see that the blades, blade bolts, and cutting assembly are not worn or damaged. Replace worn or damaged blades and bolts in sets to preserve balance.

3. Operation

- Do not operate the engine in a confined space where dangerous carbon monoxide fumes can collect.
- Only operate in good light, keeping away from holes and hidden hazards.
- Before attempting to start the engine, disengage all blade attachment clutches, shift into neutral, and engage the parking brake.
Only start engine from the operator's position.
- Avoid operating the equipment in wet grass, where feasible.
- Remember there is no such thing as a safe slope. Travel on grass slopes requires particular care.
To guard against overturning.
 - Do not stop or start suddenly when going up or downhill.
 - Machine speeds should be kept low on slopes and during turns.
 - Stay alert for humps and hollows and other hidden hazards.
- Never operate across the face of the slope, unless the machine is designed for this purpose.
- Never drive the machine on a slope with an angle of gradient that is greater than that specified or in a place where there is a danger of the machine slipping.
- Never operate the machine with damaged guards, shields, or without safety protective devices in place.
Be sure all interlocks are attached, adjusted properly, and functioning properly.
- Never operate with the discharge deflector raised, removed or altered.
- Do not change the engine governor settings or overspeed the engine. Operating the engine at excessive speed may increase the hazard of personal injury.
Do the following before leaving the operator's position:
 - stop on level ground;
 - disengage the power take-off and lower the attachments;
 - change into neutral and set the parking brake;
 - stop the engine and remove the key.

Disengage the drive to attachments, stop the engine, and remove the ignition key in the following conditions:

- before refuelling;
- before making height adjustment unless adjustment can be made from the operator's position;
- before clearing blockages;
- before checking, cleaning or working on the machine.
- whenever you leave the machine;
- after striking a foreign object or if an abnormal vibration occurs.

Inspect the machine for damage and make repairs before restarting and operating the equipment;

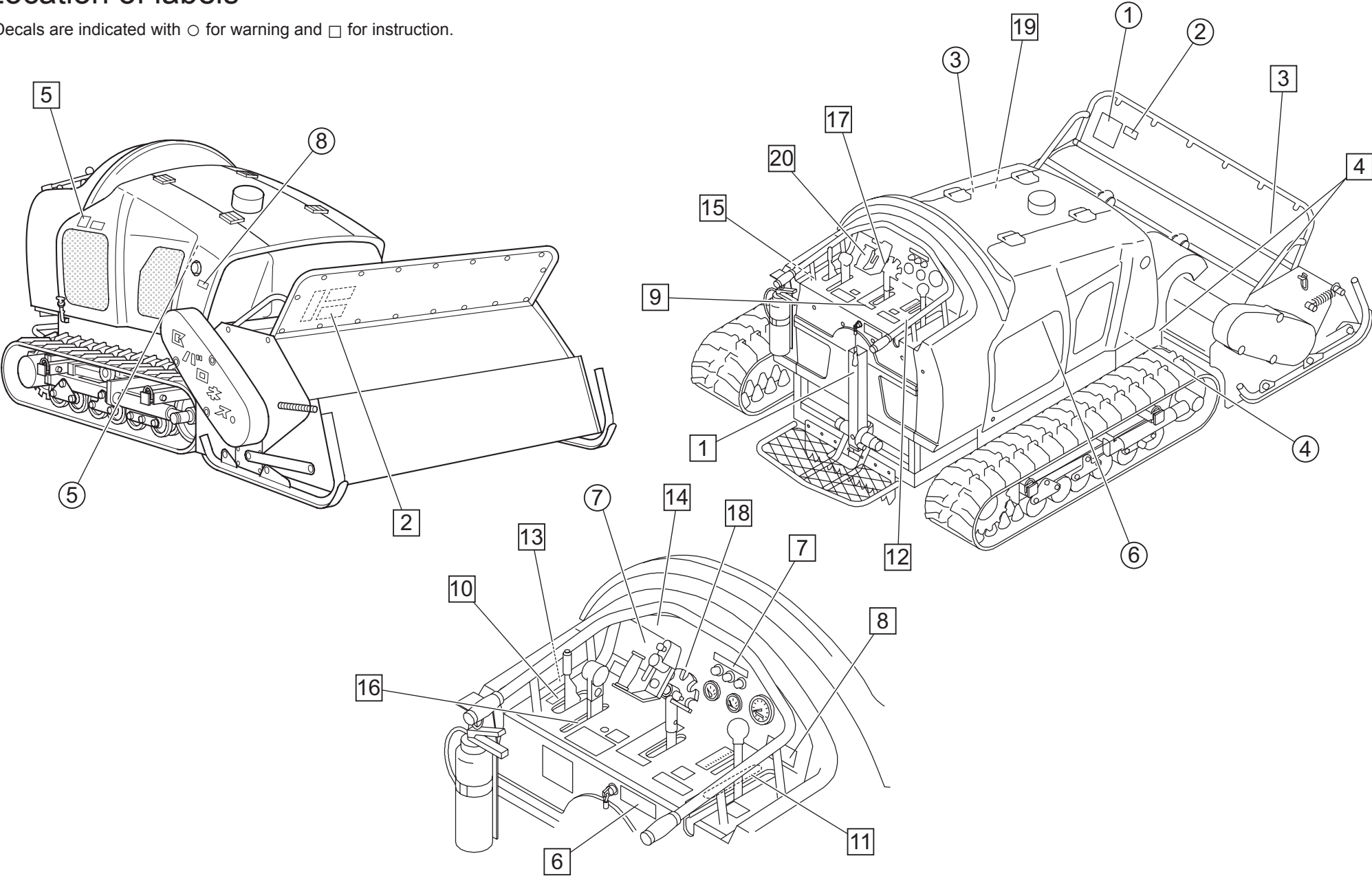
- Keep hands and feet away from the cutting units and the rotating parts.
- Look behind and down before backing up to be sure of a clear path.
- Do not carry passengers.
- Never operate while people, especially children, or pets are nearby.
- Slow down and use caution when making turns and crossing roads and sidewalks.
- Stop the blades rotating before crossing surfaces other than grass.
- Disengage drive to attachments when transporting or not in use.
- When using any attachments, never direct discharge of material toward bystanders nor allow anyone near the machine while in operation.
- Do not operate the machine under the influence of alcohol or drugs.
- Take care when loading or unloading the machine into a trailer or a truck. Load or unload the machine in a flat and safe place. Before loading or unloading, set the parking brake on the truck or trailer, stop the engine, and chock the wheels.
- When transporting the machine on a truck or a trailer, set the parking brake, stop the engine, and fasten the machine to the truck with a rope or other suitable restraining device that has sufficient strength.
- When using a running board, select one with sufficient strength, length, and width and that will not cause the machine to slip.
- Close the fuel valve before transporting the machine.
- Use care when approaching blind corners, shrubs, trees, or other objects that may obscure vision.
- Do not take your eyes off the road ahead. Do not operate the machine with no hands.
- Reduce the throttle setting during engine run-out and, if the engine is provided with a shut-off valve, turn the fuel off at the conclusion of operation.

4. Maintenance and Storage

- Disengage drives on level ground, lower the attachments, set parking brake, stop engine and remove key from ignition. Wait for all movement to stop before adjusting, cleaning or repairing.
- When machine is to be parked, stored, or left unattended, lower the cutting units unless a positive mechanical lock is provided.
- To reduce the fire hazard, keep the engine, silencer/muffler, battery compartment fuel storage area, cutting units and drives free of grass, leaves, or excessive grease. Clean up oil or fuel spillage.
- Allow the engine to cool before storing in any enclosure.
- Only cover the machine with a sheet after hot parts have sufficiently cooled down.
- Never store the equipment with fuel in the tank inside a building where fumes may reach an open flame or spark.
- If the engine is provided with a shut-off valve, shut off valve while storing or transporting.
- Do not store fuel near flames.
- Never allow untrained personnel to service machine.
- Appropriately manage and correctly use the tools necessary for servicing or adjusting the machine.
- Use jack stands to support components when required.
- Carefully release pressure from components with stored energy.
- Be sure to depressurize the hydraulic system before performing maintenance operations on it such as removing hydraulic equipment.
- Check whether line connectors in the hydraulic system are properly tightened. Before applying hydraulic pressure, check the connections of the hydraulic pressure lines and the condition of the hoses.
- When checking the hydraulic circuit for pinhole leaks or oil leakage from nozzles, do not use your hands. Use items such as paper or corrugated cardboard to find leakage points. Be extremely careful with high-pressure oil as it may pierce your skin, result.
- If fluid is injected into the skin it must be surgically removed within a few hours by a doctor familiar with this form of injury or gangrene may result.
- Disconnect battery before making any repairs. Disconnect the negative terminal first and the positive last. Reconnect positive first and negative last.
- Make sure that parts such as wires are not touching each other and that their covers have not come off.
- Use care when checking the blades. Wrap the blades or wear gloves, and use caution when servicing them. Only replace blades. Never straighten or weld them.
- Keep hands and feet away from moving parts. If possible, do not make adjustments with the engine running.
- Charge batteries in an open well ventilated area, away from spark and flames. Unplug charger before connecting or disconnecting from battery. Wear protective clothing and use insulated tools.
- Keep all parts in good working condition and all hardware tightened. Replace all worn or damaged decals.
- Keep all nuts, bolts and screws tight to be sure the equipment is in safe working condition.
- If the fuel tank has to be drained, do this outdoors.

Location of labels

*Decals are indicated with ○ for warning and □ for instruction.

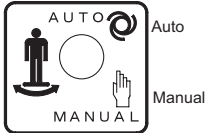




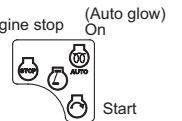





Warning and Instruction Decal List

*Decals are indicated with ○ for warning and □ for instruction.

①		<p>K4205001570 Decal, danger hammer knife</p> <p>DANGER</p> <p>Pay attention to the flying object - Do not allow people to approach the front of the machine. Hands injury - Keep a safe distance from the machine.</p>	⑧		<p>K4205001950 Decal, caution exhaust gas</p> <p>WARNING</p> <p>Pay attention to the exhaust gas - Keep a safe distance from the machine.</p>	8		<p>K4209001030 Decal, overheat alarm buzzer</p> <p>When overheated - Read the Owner's Operating Manual.</p>
②		<p>K4205001600 Decal, caution for severe injury</p> <p>DANGER</p> <p>May cut your hand or leg - Stop the rotation and engine. Otherwise you may get injured.</p>	1		<p>K4205001520 Decal, prohibition rope installation</p> <p>Do not use the step to tow or rope.</p>	9		<p>K4203001200 Decal, traveling lever</p>
③		<p>K4205001970 Decal, caution spouting coolant</p> <p>CAUTION</p> <p>Pay attention to the radiator - Do not open the cap of radiator when it is in the high temperature. High temperature - Do not touch, or you will get burnt.</p>	2		<p>K4209001090 Decal, oil handling instruction</p> <p>Read the Owner's Operating Manual about the designated oils.</p>			<p>K4203001210 Decal, P-brake</p>
④		<p>K4205001530 Decal, caution for rotating object</p> <p>DANGER</p> <p>Watch for rotating parts - Keep your hands away from the belts while the engine is running.</p>	3		<p>K4209001110 Decal, slope work instruction</p> <p>Operation on the slope - Read the Owner's Operating Manual.</p>	10		<p>K4203001230 Decal, knife clutch lever</p>
⑤		<p>K4205001540 Decal, caution for high temperature</p> <p>CAUTION</p> <p>High temperature - Do not touch. Otherwise, you will be burned.</p>	4		<p>K4209001040 Decal, instruction of hoisting</p> <p>Hoisting the machine - Read the Owner's Operating Manual.</p>	11		<p>K4204000080 Decal, mowing height scale</p> <p>When the cutting height set less than 3cm or over 30cm, disengage the knife clutch.</p>
⑥		<p>K4205001550 Decal, caution fire</p> <p>DANGER</p> <p>Pay attention to fire - Read the Owner's Operating Manual.</p>	5		<p>K4209001000 Fuel icon</p> <p>Use No. 2 diesel fuel. (Low sulfur or ultra-low sulfur diesel fuel only)</p>	12		
⑦		<p>K4205001560 Decal, read Owner's manual</p> <p>WARNING</p> <p>Instruction - Read the Owner's Operating Manual before operating or servicing the machine.</p>	6		<p>K4209001050 Decal, emergency engine stop</p> <p>Loop the cord of emergency switch around the arm or body tightly.</p>			
			7		<p>K4209000990 Decal, pilot lamp</p>			

*Decals are indicated with ○ for warning and □ for instruction.

13		K4209001060 Decal, step control changeover switch When cutting grass, switch to the AUTO mode.
14		K4209001070 Decal, manual step control Use it when the step control is in the MANUAL mode.
15		K4209001080 Decal, cylinder single/double changeover
16		K4203001220 Decal, engine rotation
17		K4204000070 Decal, mowing height switch
18		K4209001430 KEY SWITCH MARK
19		K4209000980 Hydraulic oil icon Read the Owner's Operating Manual.
20		K4209001020 Decal, read owners manual Read the Owner's Operating Manual.
Desired Locations		K4209000380 Decal, greasing 50 Hr

1. Precautions as to use

1-1. WARNING Preparation before use of machine

- ① Be sure to check and maintain the machine before and after use.
- ② The protective cover and other protective parts are provided to prevent users from danger. Be sure to install them at the specified locations, and replace them with new ones when they are broken.
- ③ Carefully read the warning labels and operation manual before operating the machine to thoroughly understand the machine operation.

1-2. WARNING Emergency switch

- Unless the emergency switch is used, the engine may not stop in an emergency, leading to death or serious injury.
- Be sure to install the emergency switch correctly. Wind the string of the emergency switch around your arm or body completely before using the machine.

1-3. DANGER Be careful of rotating parts

- ① The knife and other rotating parts are dangerous. Do not put your hands, feet, or any other object in them or do not touch them during work or maintenance.
- ② Check that there is no person or other objects that may break the machine around the machine or in the area within 30 degrees and 100 m at the front of the machine during operation.
- ③ Stones, wires, sticks, and other obstacles may cause damage to the knife or an accident due to flying objects. Remove them before operating the machine.

CAUTION

- ① Wires, vinyl and other objects may be wound around the knife shaft. When you hear an abnormal sound, stop the engine, and remove such objects after the knife shaft has stopped rotation.
- ② Should the knife be broken, the knife shaft will be unbalanced, causing vibration, which is very dangerous. Be sure to change the knives, otherwise the machine will be broken.

1-4. CAUTION Be careful of hot part

- Do not touch the cover or muffler during operation or right after the machine stops, otherwise a skin burn may result.

2. Safety operation

Blades rotate at high speed in the mowing machine under severe conditions such as vibration, slope, and dust. Operation conditions are subject to the place of use, existence of obstacles, condition of grass, etc. We sincerely desire that users should inspect and maintain the machine completely, make efforts to master the machine operation skill, take measures for safety, use the machine correctly so as not to do harm to others, and give top priority to safety operation.

2-1. Clothes for safety

Wear proper clothes that will not be caught in the machine, and wear protective gear, goggles, shoes, helmet, and gloves.

An apron and a towel wound around the waist, as well as long strings especially, will cause the operator to be caught in or pulled into the machine, which is dangerous. Provide a fire extinguisher, first aid kit and secure a means of communication to deal with an emergency.



2-2. Avoid such operation

- ① Do not use the machine when you are tired. When you feel tired while using the machine, stop the work and take a rest.
- ② Sick people, drunken people, and people under the influence of drugs are not allowed to use the machine. The visual sense, nimbleness in action, and judgment will be adversely affected.
- ③ When you are unfamiliar with machine operation, read the handling method and safety precautions to understand them well before operating the machine. Do not allow children to use the machine.

2-3. Check the operating place.

Before operating the machine, check the field by necessity. Pay attention to the holes or obstacles.

Remove the objects that can fly apart as possible as you can. Give attention to the flying debris not to injure people, animals, crops, buildings, automobiles and so on.

2-4. Fire prevention

Do not operate the machine with mown grass, dust, etc. accumulated in the cover, V-belt or around the engine or the transmission, otherwise fire or other trouble may result. Remove them carefully. Improper maintenance and incorrect operation and dry grass mowing might cause fire. Clean and check the machine as shown below before and during work.

- ① Remove dry grass, dust, and other obstacles from around the muffler and engine.
- ② Check the fuel hose for cracks due to deterioration.
- ③ Check for fuel leakage during fuel supply.
- ④ Fuel supply during engine operation is prohibited.
- ⑤ Check the wiring to prevent fire due to a short circuit.
- ⑥ Inspect the fuel tank and carburetor for fuel leakage due to operation on a slope.
- ⑦ Be sure to carry a fire extinguisher and water etc. when mowing dry grass.
- ⑧ When cutting dried grasses, clean the machine every 1 hour.
- ⑨ In case of fire, use extinguisher to extinguish it in the early stage. When the fire expanded, evacuate to the safety place and report to the fire department.
- ⑩ Make sure of the expiry date of extinguisher at any time.

2-5. Prohibition of nighttime traveling and work

The machine is not provided with any lighting equipment. Do not operate the machine at nighttime or when the visibility is poor due to bad weather, etc.

2-6. Remodeling of the machine prohibited

Do not remodel the machine. Use genuine parts for maintenance to ensure safety.

2-7. Prohibition of work other than mowing

Never use the machine for tree felling and wood chipping, tilling the farmland, or some works other than mowing, otherwise the machine may lose its knife shaft balance and cause failure.

2-8. When lending the machine to others

When lending the machine to others, an unexpected accident may occur because they have no knowledge about the safety precautions and handling method shown in the operation manual. Hand over the operation manual and tell them to read it carefully before using the machine, explaining the handling method well.

◆ Protection cover and Antiscattering chain

The protection cover is used to prevent stones, etc. from scattering forward. Be sure to lower the protection cover during mowing operation.

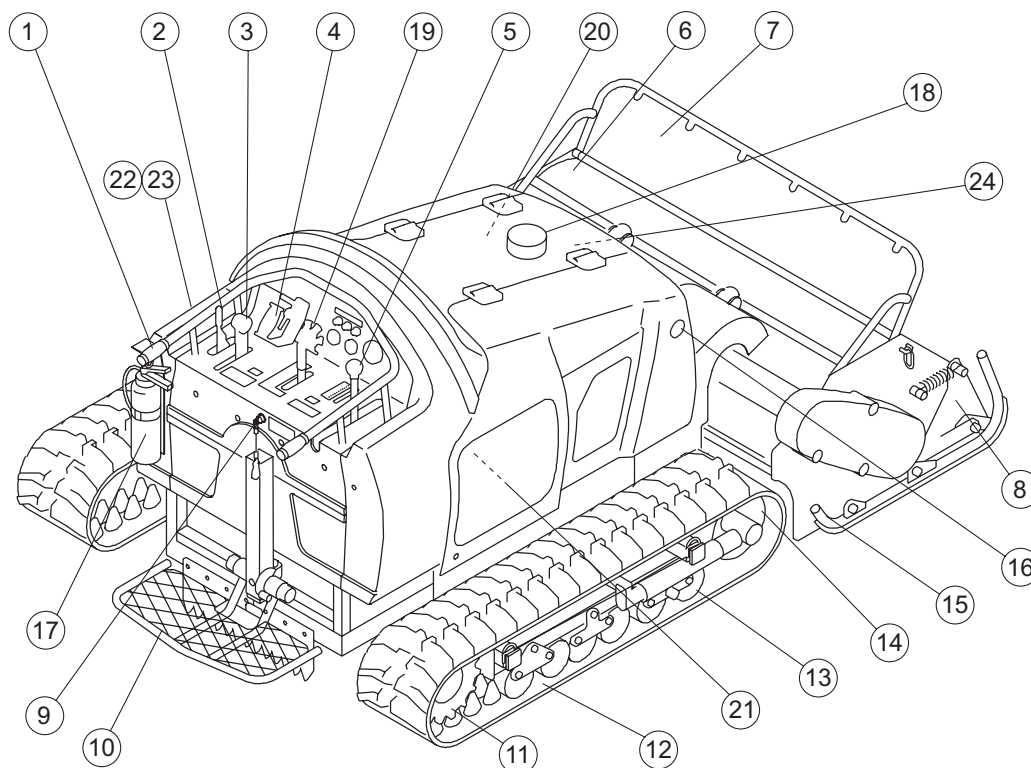
The antiscattering chain is also used to prevent stones, etc. from scattering forward. Be sure to install the chain to prevent damage to human beings, buildings, vehicles, etc.

However, due to the structure of the machine, the protection cover and the antiscattering chain can not prevent all the objects from scattering. Even when installing these equipments, always exercise due care for surrounding area (especially for forward) during operation.

CAUTION

Observe the precautions in "Precautions as to use" and "Safety operation" and pay sufficient attention to the area around the machine during operation.

3. Part names



No.	N a m e	No.	N a m e
1	Handle	13	Bottom roller
2	Side brake lever	14	Front roller
3	Throttle lever	15	Knife guard
4	Traveling lever	16	Muffler
5	Knife clutch lever	17	Fire extinguisher
6	Mower portion (Mower unit)	18	Precleaner
7	Protection plate	19	Main switch
8	Protection cover	20	Battery
9	Emergency switch	21	Fuel filler port (diesel fuel)
10	Step	22	Step control changeover switch
11	Sprocket	23	Cylinder single-/double- acting changeover switch
12	Crawler	24	Air cleaner

4. Features

- ◎ This energy-saving type large mowing machine with a diesel engine is manufactured for professional use especially for slope land operation. The mowing width is 154 or 170 cm, and the maximum output is 26.5 kW. The machine is ideal for mowing on river banks, skiing ground and major roads, as well as in other large areas.
- ◎ The rubber crawler ensure great hill climbing ability, and the low center of gravity permits safe work even on a slope. The crawler section is provided with a seesaw roller mechanism to cope with pitching, and the projections inside the crawler are made long to prevent crawlers from coming off. The grease cylinder used for crawler tension adjustment is easy to operate.
- ◎ The machine travels hydraulically at variable speed. The single traveling lever permits simple operation to move the machine forward and backward, change the speed, and turn the machine. The position of the traveling lever can be selected from five angles, ensuring satisfactory operation and improvement of work efficiency.
- ◎ The hydraulic system permits easy adjustment of mowing height. The special structure of the mower unit permits long grass cutting length and easy collection of cut grass. The grass stop shaft (option) makes the cutting length shorter.
- ◎ The step (simple riding unit) keeps the machine horizontal by using an angle sensor so as to enhance safety of the operator.
- ◎ The hammer knives are attached to move freely and the struction lessens impact of stones and other obstacles when they hit against the hammer knives, hardly causing damage to the hammer knives.
- ◎ The hammer knife is made of heat-treated special touch steel, ensuring sharp cutting and durability and permitting use of both sides by reversing. The hammer knives are attached by bolts and nuts, permitting easy change.
- ◎ The four-cylinder diesel engine with a starter is easy to start, and the forced lubrication system can withstand the instantaneous maximum inclination of 35 degrees.
- ◎ The hitch method is adopted to install the mower unit, permitting easy installation/removal of the portion.

5. Specifications

		HMC156E	HMC172E
Dimensions	Total length	3,000mm	
	Total width	1,717mm	1,910mm
	Total height	1,350mm	
Engine		Mitsubishi Diesel S4L2-E331KM 1.758L (1,758 cm ³)	
		Max. output: 27.0 kW/3,000 rpm (36.7 PS/3,000 rpm)	
		Fuel tank: 33 L (dm ³)	
Rubber crawler		30 × 7.2cm(51P)	35 × 7.2cm(51P)
Speed change (Hydraulic variable speed)		Forward: 0-6.5 km/h	
		Backward: 0-4.5 km/h	
Hammer knife		120 blades	140 blades
Knife clutch		Belt tension type	
Mowing height		3-30 cm	
Mowing width		154cm	170cm
Efficiency		70 are/h (6.5 km/h)	77 are/h (6.5 km/h)
		(Mowing width × Operation speed × 0.7)	
Max. operating inclination		35°	
Ground pressure		16.7kPa	14.7kPa
Dry weight		1,480kg	1,520kg
Curb weight		1,545kg	1,585kg

* The factory default maximum engine rpm is 2,400 rpm.

CAUTION

The idling speed of the engine is approx. 1,500 rpm. Set the idling speed to avoid sympathetic vibration with the machine. The engine revolution may reach 3,200 rpm under no-load condition.

CAUTION

For transportation of the machine, give attention to the width of the loading space.

HMC156E

Sound Pressure Level

This machine was confirmed to have a continuous A-weighted sound pressure level of 90 dB by measuring identical machines in accordance with the procedure specified in directive EN836:1997.

Sound Power Level

This machine was confirmed to have a sound power level of 105 dB by measuring identical machines in accordance with the procedure specified in directive 2000/14/EC.

Vibration Level

Hand-arm vibration

This machine was confirmed to transmit a maximum vibration level of 4.50 m/s² to hands and arms by measuring identical machines in accordance with the procedure specified in ISO5349-1: 2001, 5349-2: 2001.

Whole body vibration

This machine was confirmed to transmit a maximum vibration level of 1.30 m/s² to the whole body by measuring identical machines in accordance with the procedure specified in ISO2631-1: 1997, 2631-2: 2003.

HMC172E

Sound Pressure Level

This machine was confirmed to have a continuous A-weighted sound pressure level of 90 dB by measuring identical machines in accordance with the procedure specified in directive EN836:1997.

Sound Power Level

This machine was confirmed to have a sound power level of 105 dB by measuring identical machines in accordance with the procedure specified in directive 2000/14/EC.

Vibration Level

Hand-arm vibration

This machine was confirmed to transmit a maximum vibration level of 4.50 m/s² to hands and arms by measuring identical machines in accordance with the procedure specified in ISO5349-1: 2001, 5349-2: 2001.

Whole body vibration

This machine was confirmed to transmit a maximum vibration level of 1.30 m/s² to the whole body by measuring identical machines in accordance with the procedure specified in ISO2631-1: 1997, 2631-2: 2003.

6. Inspection before use

Inspect the machine according to "13. Maintenance schedule."

6-1. Lubrication to each part

- ① Supply the specified quantity.
- ② Don't use old oil.
- ③ Lubrication the friction surfaces of each part.



Refer to the diesel engine operation manual for the method of handling the engine.

6-2. Inspection of hydraulic oil

Approx. 28 liters of hydraulic oil is in the hydraulic tank. Place the machine horizontally and check that the level of the hydraulic oil is at the center of the oil gauge.

6-3. **CAUTION** Hydraulic oil change

- ① Change the hydraulic oil one year or 500 hours later, whichever comes earlier.
- ② Change the filter when the hydraulic oil is changed.
- ③ When the hydraulic oil is emulsified or its transparency is lost even slightly, change it instantly.
- ④ For filling up the hydraulic oil, use the designated oil.
Use Shell Tellus S3MT46 or equivalent of ISO VG46 as hydraulic oil.

CAUTION

- Change the hydraulic oil, after the machine cooled down sufficiently.
- When servicing the hydraulic system, lower the mowing units to the ground and release the pressure.

6-4. Battery

Inspection of Battery

For details on handling the battery, please refer to the separate Battery Instruction Manual.



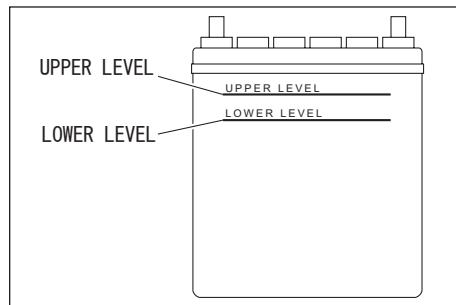
Keep fire away while inspecting or charging the battery.
The battery may explode.



Do not allow the battery fluid level to become lower than the LOWER LEVEL (minimum fluid level line).

The battery may explode if it is used or charged while the battery fluid level is at the LOWER LEVEL (minimum fluid level line).

- ① Clean the areas around the battery fluid level lines using a cloth dampened with water.
- ② Make sure that the battery fluid level is between the UPPER LEVEL (maximum fluid level line) and the LOWER LEVEL (minimum fluid level line).



Supply of Battery Fluid

For details on handling the battery, please refer to the separate Battery Instruction Manual.



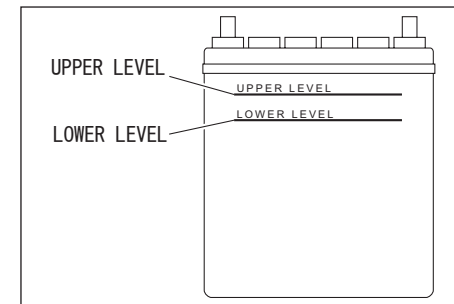
Be careful not to let your skin, eyes or clothes, etc., come into contact with battery fluid (electrolyte) or accidentally swallow the fluid.

Should your skin or clothes come into contact with electrolyte, immediately wash them away with water.



When you supply battery fluid, wear protective garments and safety glasses, etc.

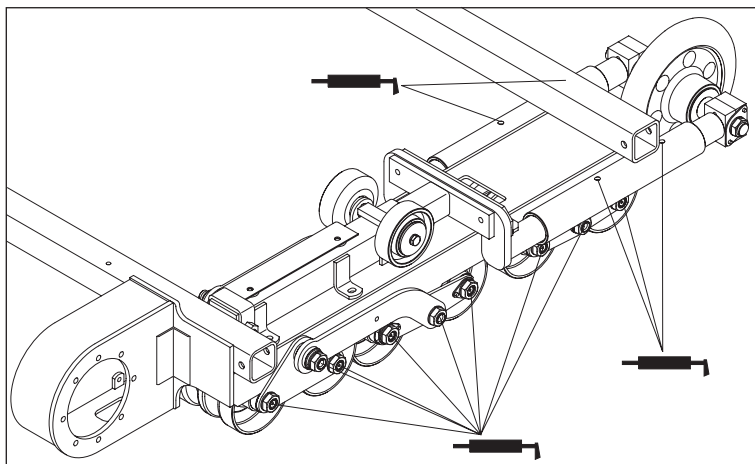
- ① If the battery fluid level is lower than halfway between the UPPER LEVEL (maximum line) and LOWER LEVEL (minimum line), add purified water up to the UPPER LEVEL (maximum line).



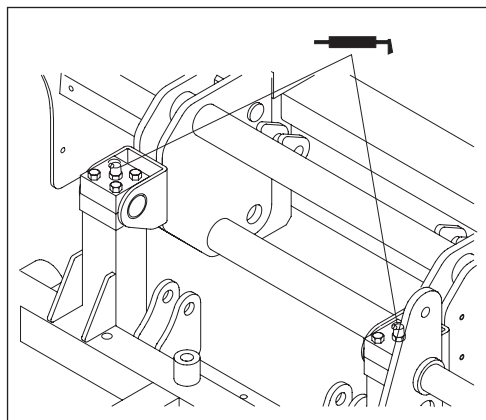
6-5. Lubrication of friction surface of each part

Supply oil constantly to the inlet/outlet of the wire and the joint of each part to prevent rusting. Supply grease to the grease nipple every 50 hours.

Crawler [26 places]

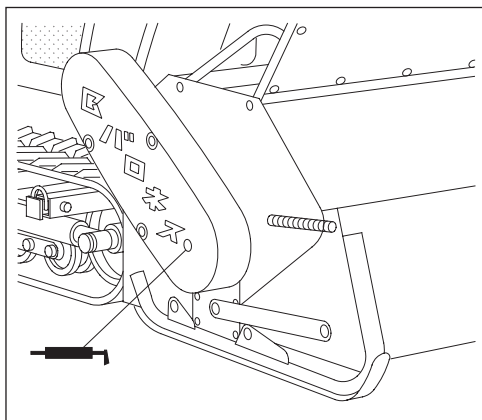


Fulcrum of mower unit [2 places]

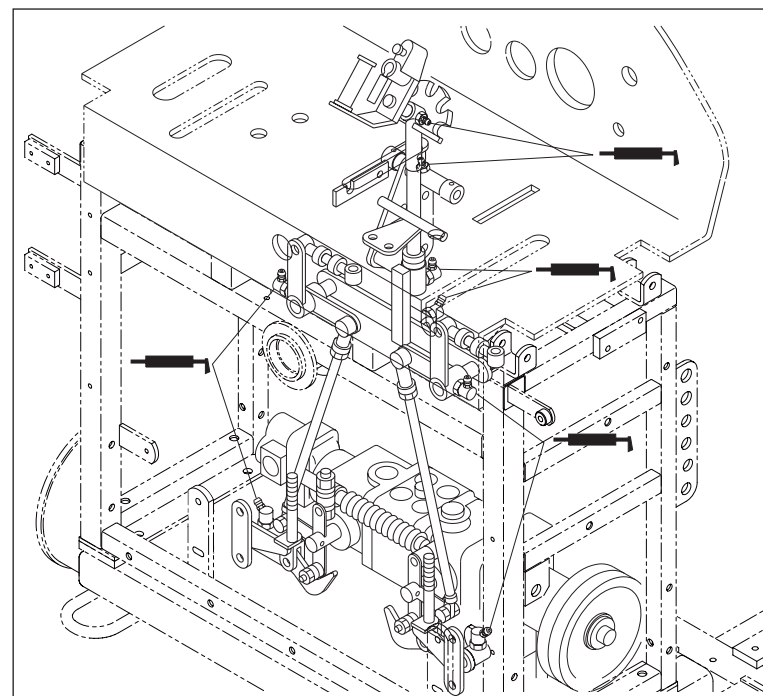


Both sides of knife shaft assy. (2 places)

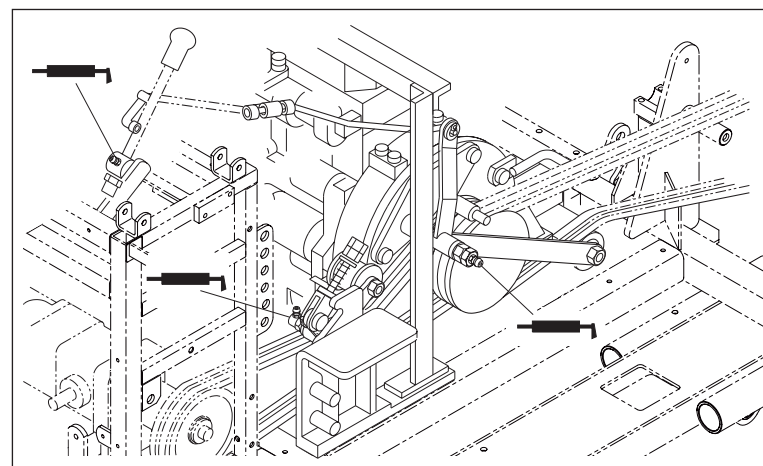
* The drawing shows the right side.



Operation lever and neutral positioning [8 places]



Tension [3 places]



7. Tightening each part

Bolts are used for each part. After initial use of the machine, the bolts and nuts may get loose. Tighten loose bolts and nuts.

Optimum tightening torque: N·m (kgf·cm)

	Ordinary bolt	Heat-treated bolt
M 6	8 (80)	16 (160)
M 8	18 (180)	36 (360)
M10	36 (360)	72 (720)
M12	60 (600)	120 (1200)
M14	90 (900)	

8. Engine starting sequence

8-1. WARNING Engine start



- Before starting the engine, read the diesel engine operation manual to thoroughly understand the contents.
- Put on the side brake and set all driving units at the neutral position.
- Check that the covers are at correct positions and that there is no one around the machine, and confirm safety before starting the engine.
- Do not start the engine in a room without an appropriate ventilator.
- Check that the knife clutch lever is disengaged before starting the engine.

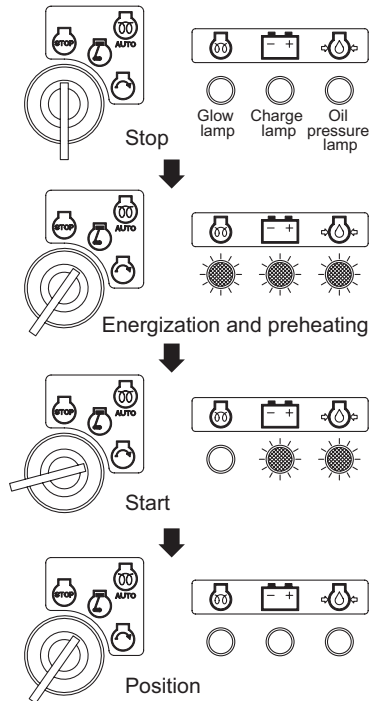


8-2. Engine start · operation method

① Shift the throttle lever to High rotation.

② Check the indicators and preheating.

Key to “ON” position (energization and preheating) lets preheating start automatically.



③ Start

After the glow lamp went out (completion of preheating), Key to “START” position makes the engine start.

* If starting the engine before the glow lamp goes out, it may cause blowout of the fuse.

④ Operation

Key to “ON” position.

CAUTION

- Within 5 seconds after starting the engine, the safety equipments do not function due to the control circuit. Accordingly do not operate the machine for a period of 5 seconds after starting.

8-3. Engine stop method

① Return the throttle lever to the slow-speed position.

② Turn OFF the switch and remove the key.

* When storing the machine outdoors or for a long time, be sure to put the rubber cap on.

8-4. CAUTION Precautions to take when leaving the machine

Park the machine in a horizontal state, turn off the engine, and check that all movable sections have stopped. Then put on the side brake and remove the key before leaving the machine. Never park the machine on a slope.

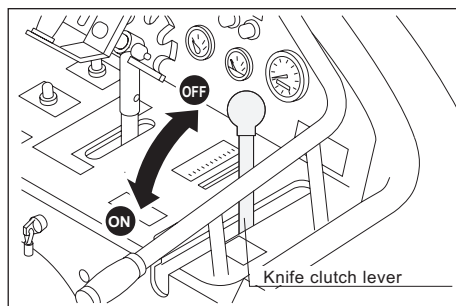
9. Machine operation

9-1. Machine operation

- Check that the operating condition of each part especially the safety of the side brake, traveling lever and mower unit before operating the machine.
- Operate the machine at slow speed so that the machine can be stopped immediately in any case.
- Remove obstacles from the operation area so that you and other people around the machine will not be injured.
- Do not start or turn suddenly, or the operator may be bucked off, or the machine may slip or turn over on the slope. It is dangerous.

9-2. Knife clutch

Pull the knife clutch to your side to engage it, and push it forward to disengage it. The engine cannot be started when the knife clutch is engaged.

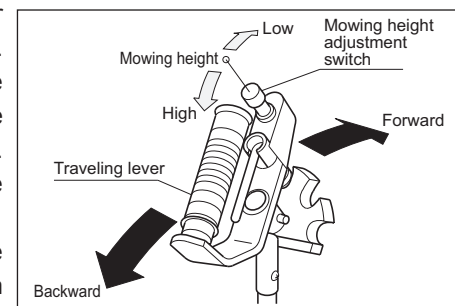


CAUTION

- Engage the knife clutch right before starting mowing operation. Be sure to leave it disengaged during any operation other than mowing.
- Since the knife shaft rotates by the centrifugal force, engage the clutch halfway until the rotation is normal. Do not engage the clutch completely at a stroke.
- Even if the knife clutch disengaged, the knife shaft freewheels for a while. Do not any operations until the knife shaft stops rotating completely.

9-3. Traveling lever

- The traveling lever is at the center of the rear section of the machine. Push it forward to move the machine forward, and pull it back to your side to move the machine backward. Adjust the speed by changing the inclination of the lever.
- Turn the traveling lever to the direction of the desired direction of turning. Return the lever to the original position, and the machine will move straight.
- The position of the traveling lever can be selected from five angles. Change the position of the lever according to the operating conditions.



WARNING

When driving the machine on a steep slope, the machine will not stop even if the traveling lever is released. When driving the machine on a slope, hold the traveling lever with one hand and the handle with the other hand so that the machine can stop any time. Never release them during traveling.

In case of losing control of travelling, stop the engine promptly.

9-4. Mowing height adjustment

The hydraulic method, in which a solenoid valve and cylinder are used, is adopted for mowing height adjustment. Tilt the mowing height adjusting switch on the traveling lever to your side to raise the mowing height, and tilt it forward to lower the mowing height. The mowing height adjusting range is 3-30 cm. The knife rotation above the range is prohibited for safety's sake though the mower portion itself can be raised higher for the sake of transportation or storage. Adjust the mowing height appropriately. Adjust the mower unit lowering speed with the valve unit, which will be seen at the back of the fuel filler port when the right side cover is opened.

CAUTION

Even though the engine does not run, key to "ON" position and control of the cutting height adjusting switch make the mowing unit lower. When stopping the machine, make sure to lower the mowing unit to the ground and after stopping the engine, make sure to remove the key.

9-5. Working speed

The working speed is hydraulic variable within the range of 0 - 6.5 km/h for forward operation and 0 - 4.5 km/h for backward operation. Adjust the speed appropriately with the traveling lever according to the condition of the geography and grass.

9-6. Step (simple riding unit)

The step is kept horizontal at all times by the angle sensor, automatic level control box and electric cylinder. The "step control changeover switch" atop the electrical equipment box permits switching from AUTO to MANUAL, and vice versa. When the step control changeover switch is in the "MANUAL" position, the "step control manual switch" on the control panel permits control.



However, be sure to set the step control changeover switch in the "AUTO" position during mowing. Use the manual position only when maintaining the machine, the automatic control circuit fails, or some other emergency arises. When the automatic circuit fails, replace the part with a new one immediately. Do not operate the machine for mowing on the manual control step.

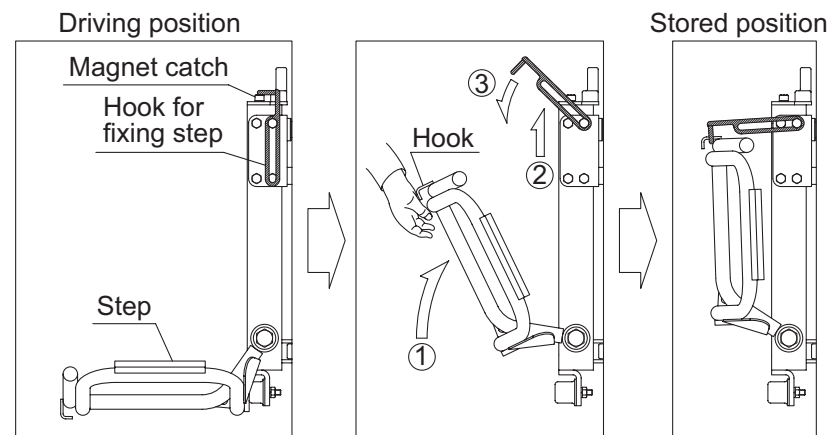


Impact to the step will impose a burden on the supporting point, causing failure. Exercise care so as not to strike the step against any object when moving the machine backward or turning the machine.

◆ Folding back the step

The step (simple riding unit) can be folded back to conserve space in the case of storage or transport by truck etc.

* How to fold back the step (driving position → stored position)



Lift up the step (①). Hold the pipe at the bottom of the step, when lifting. Keep lifting the step and raise the hook for fixing step (②) and lean it to the rear direction of the machine (③).

Make sure the hook for fixing step and the hook of the step clutch each other securely.

* How to fold back the step (stored position → driving position)

Apply the reverse procedure to the above mentioned (③→②→①). Avoid the step falling down due to its own weight and make sure to hold it. Fix the hook for fixing step with the magnet catch.



The steel mesh is used on the standing surface of the step for antiskid purpose. Do not touch the mesh directly for avoiding injury.



Prohibition of traveling and/or operating the machine with the step in the stored position.

In the case of traveling or operating the machine without riding on the step, the operator cannot keep the proper distance to the control devices and the operations become unstable. Be sure to stand on the step for starting the machine.

9-7. Traveling on the public roads and the limit of crew

This machine is not allowed to travel on the public roads. Carry this machine on the truck to move on the public roads.



Single operator are able to ride on this machine. No subsidiary worker is allowed to stand on the step or the other part of the machine. Especially when the engine is working, never let person ride on the mowing unit or crawler.

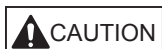
9-8. Alarm buzzer

When the alarm buzzer sounds, the engine is overheated. Stop operation, and remove dust that is jamming in the radiator or air cleaner etc.

9-9. Side brake

When the machine is not to be moved, pull the side brake lever fully to your side, and the brake will be applied to the hydraulic motor and the traveling lever will be locked at the neutral position.

10. Mower unit



When checking the knife shaft assy or replacing the knives, make sure to stop the engine and remove the key.



When the balance is lost, the knife shaft assy will vibrate because it is rotating at high speed, which is very dangerous. Exercise care sufficiently.

10-1. Use of both sides of knife

Both sides of the knife are sharpened. When one side is worn, remove the pair of knives, and attach them reversely. The knife is attached to the knife shaft mounting hitch section by 11 mounting pin 32 and the nut with disc washer, and the knife can be removed easily.

Attach the mounting pin in the same direction as before.

* The tightening torque of the knife mounting pin is 32 - 36 N·m (almost the same as ordinary M10 bolts).

10-2. Replacement of knife

The knife shaft assy is balanced when shipped from our factory; therefore, unless all the knives of the same weight each are replaced at one time, or unless replaced symmetrically on the right and left portions of the knife shaft, the weight balance may be lost and vibration may be generated.

Since the hammer knife shaft assy are rotated at high speed, pay attention to the weight balance when replacing the hammer knife.

10-3. Grinding the knife

When both sides of the knife are worn, grind each blade in a manner that the weight of each knife will be the same as much as possible.

When the weight balance of the knife shaft assy including the knife blades is poor, the knife shaft assy will generate vibration, breaking the machine.

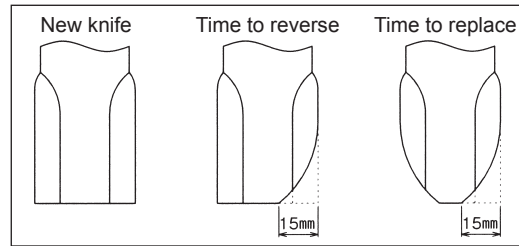


Wear protective goggles and gloves when grinding the knife.

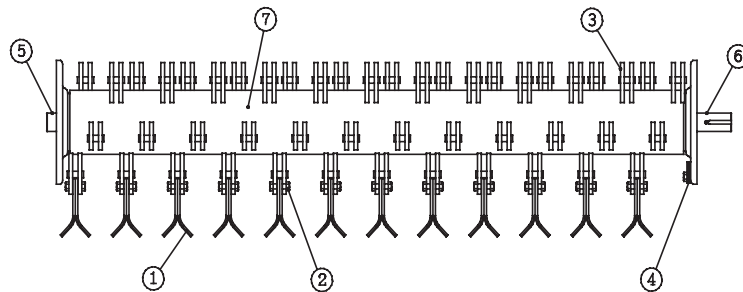
10-4. Standard time for knife replacement

Operation with a worn knife not only prevents efficient operation but also leads to loss of balance. Reverse or replace the hammer knife according to the illustration shown below.

Replace the hammer knife immediately with a new one when it is broken or abraded unevenly.



10-5. Hammer knife inspection items



No.	Part	Inspection item	Correction
①	Knife blade	Missing blades	Attach
		Abrasion	Reverse or replacement
		Breakage, curvature or uneven abrasion	Replacement
②	Mounting pin	Looseness	Tightening(*1)
		Wrong direction	Attach correctly
③	Mounting hitch	Curved or open	Correction or repair by specialist(*2)
		Breakage or uneven abrasion	Repair by specialist(*2) or replacement
④	Balance weight	Missing	Repair by specialist(*2)
		Abrasion	
⑤	Support shaft	Uneven abrasion	Repair by specialist(*2) or replacement
⑥	Bearing	No lubrication	Lubricate
		Unsmooth rotation	Replacement
⑦	knife shaft assy	Twining of vines or cords etc.	Remove
		Distortion as a whole	Replacement

*1 The tightening torque of the knife mounting pin is 32 - 36 N.m
Excessive tightening will damage the thread of the mounting pin.

*2 Special correction by balancing machine may be required.

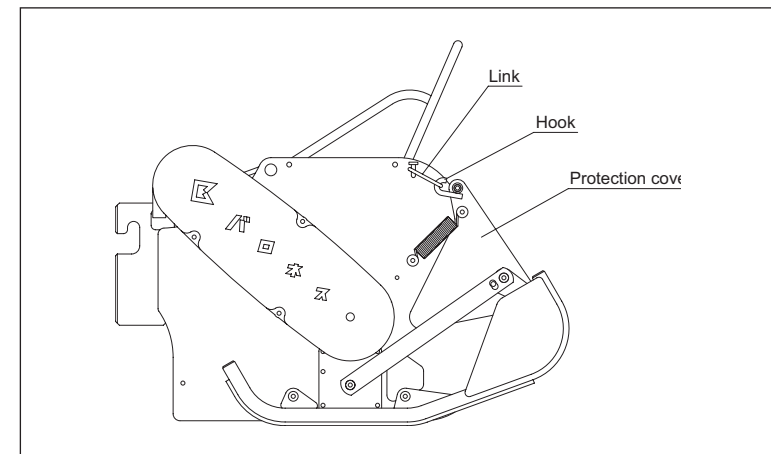
10-6. As for the protection cover

When checking the knife shaft assy, it is easy to work with raising the protection cover.

◆ How to raise and lower the protection cover.

For raising the protection cover, lift up the protection cover and hook up the hooks on both sides of the protection cover with the rings on both sides of the knife frame. After confirming the cover will not lower, get your hands off of the cover.

For lowering the protection cover, release the hooks from the rings on both sides and lower the cover slowly.

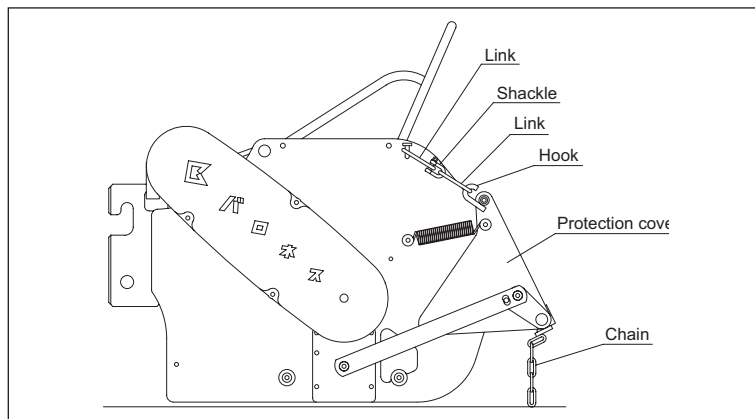


⚠ CAUTION

- Implement operation of the protection cover after the knife shaft assy stops completely.
- When lowering the protection cover, pay attention not to pinch hands and feet.
- When raising or lowering the protection cover, pay attention not to touch the knives.
- Protection cover should be kept lowering except for checking the mowing unit or replacing the knives.

◆ In regard to the anti-scattering chains

Adjust the height of protection cover with the attached rings and shackles. If you operate the machine without adjusting the height of cover, the chains are dragged with the lowered cover and it may cause the damage of chains and cover.



* Knife guard is omitted in the drawing.

11. Operation on slope

11-1. Operation on slope

When operating the machine on a slope, move the machine upward gradually from the bottom of the slope along the contour line.

Release the traveling lever, and the lever will be set in the neutral position, stopping the machine. For safety, stop the machine so that it will be positioned along the contour line. When stopping the machine vertically on a slope, the machine may not be able to stop immediately because of the inertia of the traveling machine. The machine is provided with a hydraulic traveling system, and the step is provided with an automatic level control sensor. When the machine is therefore turned toward the bottom of the slope, the machine will turn smoothly because the center of gravity of the machine changes favorably, also ensuring the operator since this way can avoid his position just below the machine during turn.

11-2. WARNING Precautions as to operation on a steep slope

Be sure to observe the following matters when using the machine on a steep slope of 20 degrees and above.

- ① Do not operate the machine when there is a risk of falling or slipping.
- ② Before starting operation on a steep slope, check for holes, rocks, tree roots, illegal throwaways, etc. Remove them, if any, and then carefully operate the
- ③ machine.

On a steep slope, operate the machine along the contour line, and turn the

- ④ machine in a place with a small angle of inclination as much as possible.

- Do not operate the machine on a slope of 35 degrees and above, because the
- ⑤ machine is very likely to fall down sideways.

Exercise care sufficiently also when working on a slope of less than 35 degrees,

- ⑥ because the machine may slip down depending on the condition of the work site.

When ropes are used on a steep slope while working together with an assistant worker, the machine may move to a very steep slope with an angle of inclination that exceeds the allowable angle and the risk of falling down sideways will increase, preventing safe operation. As a maker of the machine, we will prohibit such operation.

CAUTION

The angle meter on the operation panel shows rough indication. If you feel it is dangerous, stop the operation immediately.

CAUTION

On the border between slope and flat field, machine is rolling roughly. And so grip the handle tightly and maintain your position.

12. Precautions as to maintenance



Be sure to provide an appropriate support so that the machine will be secured completely when the machine is to be lifted during operation.

12-1. Precautions as to maintenance



- Thoroughly understand the method of required maintenance.
- Do maintenance in a dry, clean place.
- Before maintain the machine, stop the engine.
- When starting the engine to check the movement, do not approach the movable part.
- Stop all driving parts, and operate respective control units to release the pressure. (Lower the mowing unit to the ground)
- Install all parts in a satisfactory state.
- Repair or replace damaged parts immediately.
- Replace worn or damaged parts.
- Do not remodel the machine. Use genuine parts for maintenance to ensure safety.
- Remove dust, grease, and oil adhering to the machine.
- Remove the minus (-) wiring from the battery before maintaining the electric system.
- When starting the engine, pay attention to the exhaust gas.

12-2.




Prevention of damage due to high-pressure oil

- The high-pressure oil, when sprayed over the skin, will cause serious injury.
- Release the pressure before removing the high-pressure line, hose, and joints.
- Check the tightness of all joints before starting operation.
- Use a small piece of cardboard to check for leakage. When your skin is sprayed with high-pressure oil, you must see a doctor within two to three hours.

12-3. (JIS No.2 diesel oil)

Precautions as to fuel handling

- Use of fire is prohibited strictly during fuel supply. 
- Put out all open fire and cigarettes.
- Stop the engine to cool it outdoors before supplying fuel.
- To prevent fire, keep the machine clean without dust, grease, or oil at all times.
- Wipe off spilt fuel cleanly.

12-4. Precautions as to battery handling



Refer to the battery instruction manual for the method of handling the battery.



- Use of fire is prohibited strictly when checking or charging the battery. The electrolyte is dilute sulfuric acid. Do not allow it to contact your body or the machine. If the electrolyte adheres to your body or the machine, wash it off with water immediately. Especially when it enters your eyes or you swallow it by mistake, see a doctor immediately.
- When removing the cable from the battery, remove the negative side first, and when attaching the cable to the battery, attach the positive side first. When the sequence is reversed, tools may touch the machine and cause a short circuit, generating sparks. Connect the battery cables correctly to the positive and negative sides. If the direction of connection is wrong, the battery and its electric equipment will be damaged.

13. CAUTION Maintenance schedule

- ◆ Use the appropriate tools for the purpose of maintenance etc.



Refer to the diesel engine operation manual for the method of handling the engine.

- Inspection, adjustment, replenishment and cleaning
- Replacement

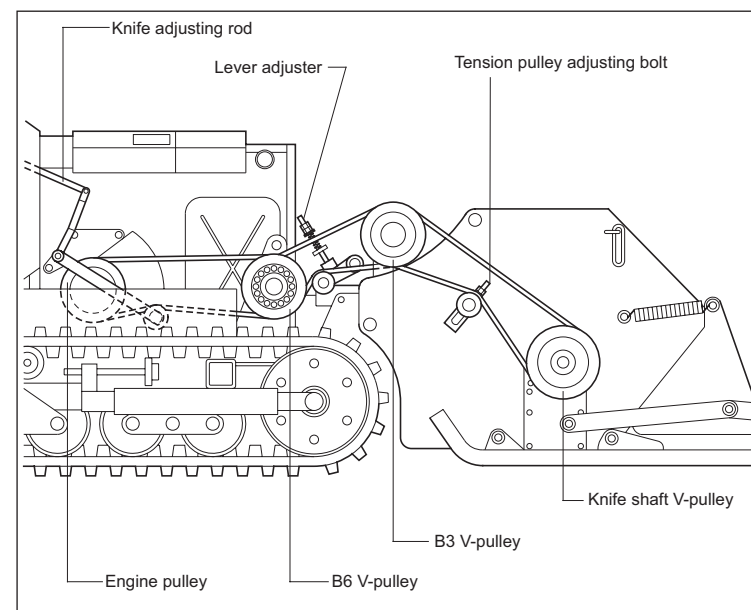
Maintenance		Before use	10hrs	every 50hrs	every 100hrs	every 200hrs	every 500hrs
Engine	Engine oil	Initial	●				
		After 10 hr	○		●		
	Oil filter				●		
	Fuel filter			○		●	
	Electromagnetic pump filter			○		●	
	Air cleaner element	○				●	
	Precleaner	○					
	Cooling water (qty, leakage, etc.)	○	●				
	Fuel (qty, leakage, etc.)	○					
	Hydraulic oil (qty, leakage, etc.)	○					●
Main unit	Hydraulic oil filter						●
	Tightening of hydraulic hose/joint	○					
	Hydraulic motor oil	Initial	●				
		After 50 hr				●	
	Electrolyte	○					
	Radiator core	○					
	Side brake	○					
	Traveling lever	○					
	Neutral position	○					
	Emergency switch operation	○					
	Step operation	○					
	Operation of respective switches and meters	○					
	Lighting of pilot lamp	○					
	Knife tension operation	○					
	Strength of knife tension	○					
	V-belt tension	○					
	Crawler tension	○					
Knife section	Breakage of hammer knife	○					
	Looseness of knife mounting bolt	○					
	Knife shaft bearing	○					●
	Dust-proof cover and protection plate	○					
Others	Greasing each section		○				
	Looseness of screw in each section	○					
	Accumulation of dust	○					
	Visible damage	○					

* Replace the hydraulic hoses every 4 years.

14. Belt adjustment

14-1. Knife

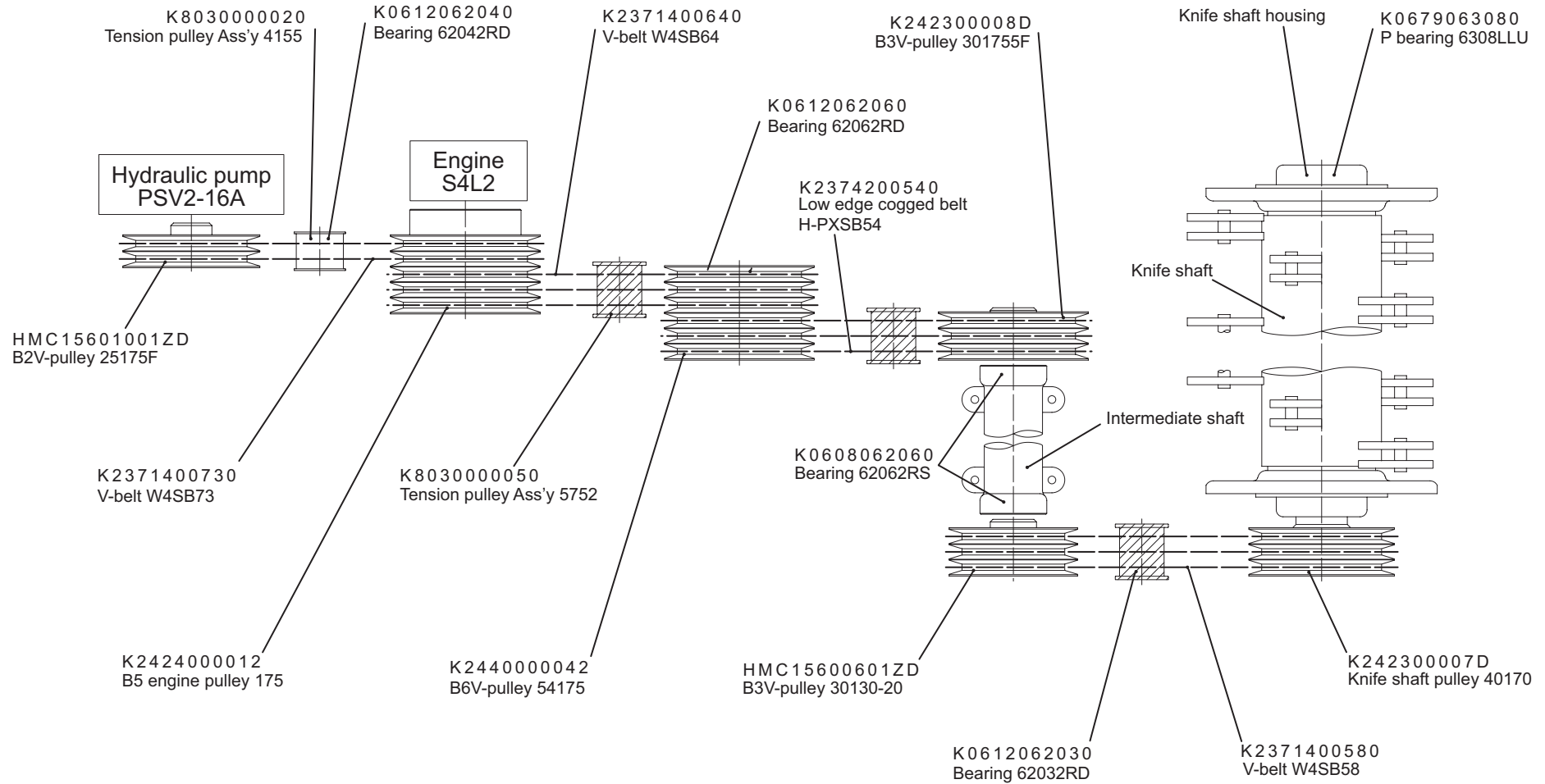
- Remove the knife shaft cover and adjust the tension of the belt put on the B3 V-pulley 30150 and knife shaft V-pulley by using the tension pulley adjusting bolt.
- Adjust the tension of the belt put on the B3 V-pulley 30175 and B6 V-pulley by using the lever adjuster.
- Adjust the tension of the belt put on the B6 V-pulley and engine pulley by using the knife adjusting rod.



14-2. Hydraulic pump

Adjust the tension of the belt put on the engine pulley and hydraulic pump pulley by using the lever adjuster.

14-3. List of the place using belts

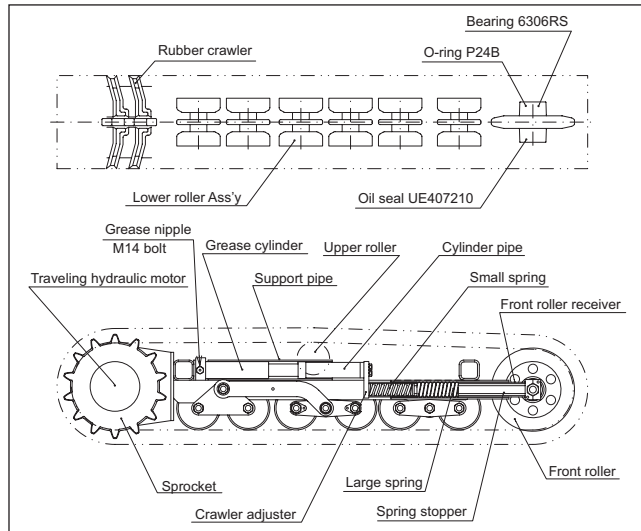


As for the fan-belt, please refer the Owners operating Manual of Engine.

15. Crawler

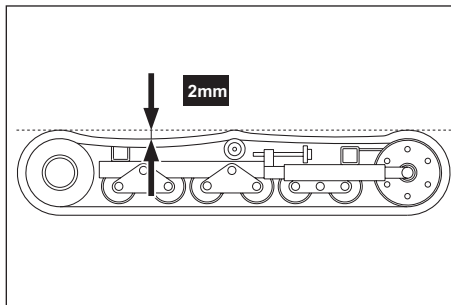
15-1. Crawler tension

Adjust the crawler tension by supplying grease to the grease cylinder. Make adjustment so that the crawler tension will be the same on both sides.



CAUTION

Excessive crawler tension will cause the front roller to lose the clearance, causing the crawler to come off easily and the machine to break easily. Exercise care.



15-2. Installation · removal of crawler

When removing the crawler, loosen the M14 bolt (width across flats: 22) on the grease cylinder, remove the grease, return the front roller to the original position, lift the crawler that is to be removed above the ground, and then remove the crawler. Reverse the order of removal when installing the crawler. Refer to the preceding paragraph for the crawler tension.

15-3. Prevention of crawler tearing loose

Be sure to check that the crawler is not slackened and the crawler tension is adjusted appropriately before operation.

15-4. Greasing the crawler

The seesaw roller fulcrum shaft in the crawler section is provided with a grease nipple. Supply grease to the nipple every 50 hours. Use Excelite EP2 grease or equivalent to ISO VG2. (Refer to "Lubrication of friction surface of each part")

16. Adjustment of traveling section

Conduct the following work before adjusting the traveling section:

- ① Remove the crawlers on both sides, or place the machine on a stable base to lift the crawlers on both sides.
- ② Remove the rear cover.



When lifting the machine, be sure to use an appropriate support to completely secure the machine.

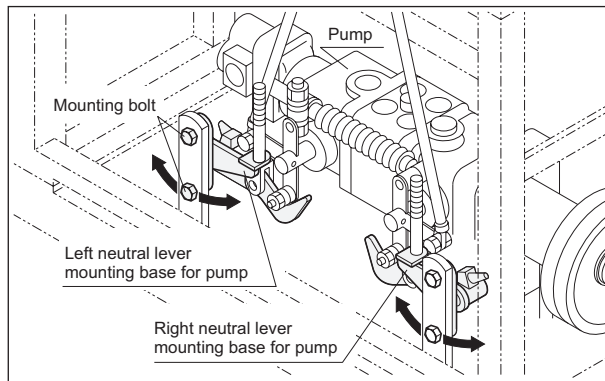
16-1. Adjustment of neutral position of piston pump

- ① Loosen the mounting bolts of the neutral lever mounting bases for the pump on both sides to keep the bolts loose.
Return the side brake lever to unlock the traveling lever.
- ② Start the engine, and move the neutral lever mounting bases for the pump by using a stick, etc. to determine the neutral position.



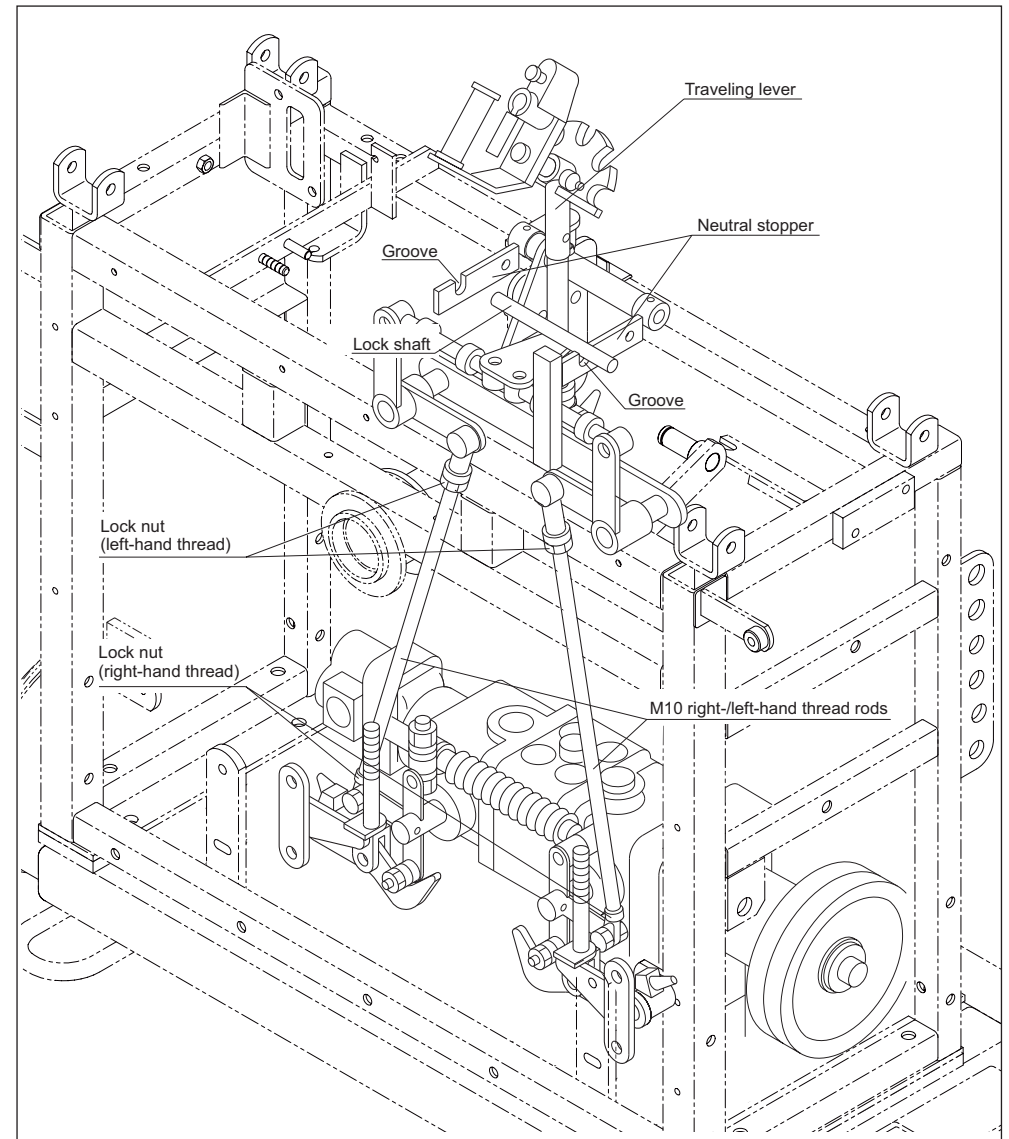
The engine is rotating. Be careful of the pulley, belt, sprocket (crawler), etc. during operation.

- ③ When the neutral positions of both bases are determined, stop the engine and tighten the mounting bolts.
- ④ Start the engine again to check that the sprocket (crawler) will not rotate.



16-2. Adjustment of neutral position of traveling lever

- ① Loosen all the lock nuts of the M10 right-/left-hand thread rods.
- ② Turn the two rods at right and left to adjust the length so that the lock shaft of the traveling lever will be set in the neutral stopper groove when the side brake is pulled.
- ③ Tighten all the lock nuts of the rods and check that the traveling lever is locked completely when the side brake lever is pulled and that the traveling lever is unlocked quickly when the side brake lever is returned.



16-3. Confirmation after adjustment

After the above-mentioned adjustment, confirm the following:

- ① Stop the engine and move the respective levers to check for interference.
- ② Check that the machine is in the neutral position and will not move even if the engine is in the full-throttle state.
(When the side brake lever is pulled and returned)
- ③ After moving the traveling lever to move the machine, release the traveling lever, and check that the machine will not move.

17. Engine



(JIS No.2 diesel oil)

Precautions as to handling of engine

- a) Use the low sulfur or ultra low sulfur diesel fuel (JIS No.2 diesel).
- b) The machine is to be operated under severe condition such as vibration, slopes, and dust. Change the entire engine oil 10 hours after the initial operation. Then while continuing inspection and replenishment before use, change the entire quantity every 100 hours thereafter.
Change all the oil filters simultaneously as well.
When using the machine in a dusty place, change oil and the oil filters more frequency.
The quantity of the engine oil is 5.5 liters. Use the diesel engine oil in the service class CD or above specified by the API standard.
- c) When air is sucked in the fuel system of a diesel engine, the engine will not be started. Inspect and maintain the diesel engine at all times to prevent entry of air into the fuel system. Operation will be difficult when the fuel filter and electromagnetic pump filter are clogged with dust or when water remains in them. Drain water or clean filters every 50 hours. Replace filters with new ones every 200 hours.
- d) Keep a pre-cleaner attached to the suction port of the air cleaner at all times during operation. Be sure to clean the dust cup before operation.
- e) Mix antiseptics (long-life coolant) into water, and put the mixture in the reserve tank up to the MAX position as a radiator cooling water. Change the cooling water every 50 hours. Check and supply the cooling water before operation. When the temperature is likely to drop below the freezing point, use an antifreeze mixture. When the radiator fins are clogged with dust, blow air to clean them.



Refer to the diesel engine operation manual for the method of handling the engine.



There is a risk of a skin burn. Do not open the radiator cap during or right after operation.

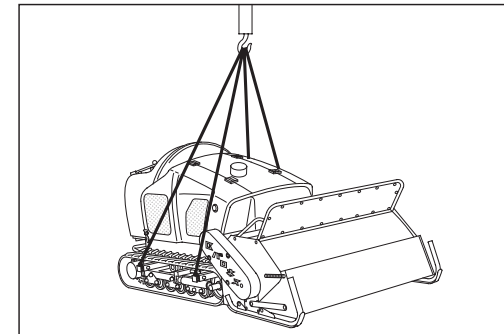
18. Hoisting and jacking up the machine

18-1. Hoisting



Precautions as to hoisting

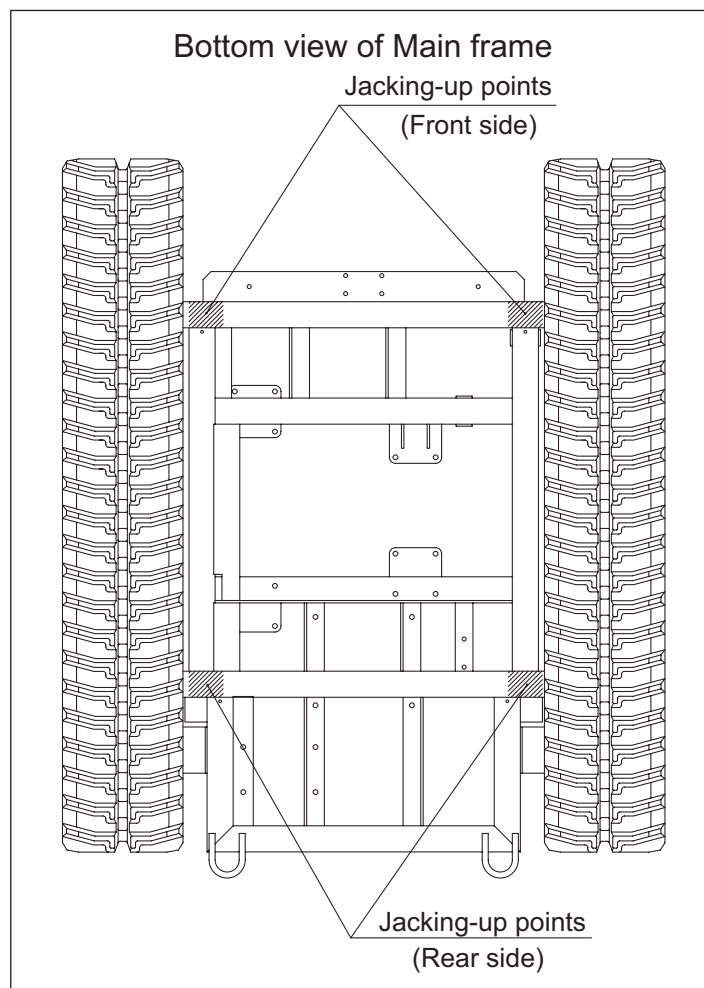
- a) Qualification necessary to use a crane to hoist the machine
For hoisting the machine, follow the appropriate laws of the country where it is hoisted.
- b) Hoisting procedure
Lower the mower portion until it touches the ground.
 - ① Pull out the four hoisting hooks and secure them with pins. Hook the wire ropes completely with shackles. Use wire ropes with sufficient strength. Be sure to use four ropes of 2.5 m or more in length.
 - ② Pay attention to the position of the center of gravity during hoisting to balance the machine sufficiently. Do not approach the machine inadvertently during hoisting.



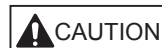
- ④ When lowering the machine, keep the machine horizontally and lower it in a manner that the crawlers at right and left will touch the ground at the same time. Impact applied to the traveling motor (sprocket) at that time will cause failure.

18-2. Jacking up

When jacking up the machine with hydraulic jacks, apply jacks to the jacking-up points on the following drawing.



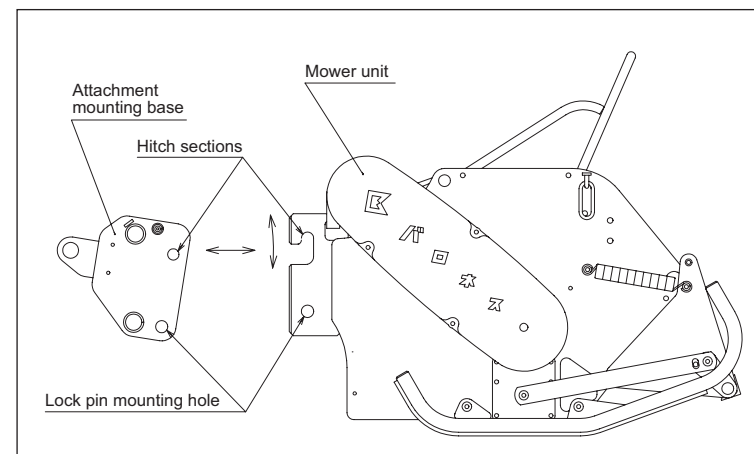
19. Attaching/detaching the mower unit



Be sure to install and remove the mower unit in a flat horizontal place. Stop the engine unless it is necessary to move the attachment mounting base up and down or to move the machine forward and backward.

19-1. Removal of mower unit

- ① Remove the intermediate shaft belt cover and right crawler cover, and then remove the belt that connects the machine and the mower unit.
- ② Pull out 6 clip pin and remove the lock pin.
- ③ Set the cylinder single-/double-acting changeover switch in the "double-acting" position, and lower the attachment mounting base.
- ④ After confirming that the hitch sections are separated, slowly move the machine backward, and the operation is complete.



19-2. Installation of the mower unit

- ① While engaging the hitch sections, slowly move the machine forward, and raise the attachment mounting base to engage the hitch sections.
- ② After confirming that the hitch sections are engaged completely, attach the lock pin and secure it with 6 clip pin.
- ③ Set the cylinder single-/double-acting changeover switch in the "single-acting" position.
- ④ After attaching the belt and adjusting the tension, attach the right crawler cover and intermediate shaft belt cover, and the operation is complete.

19-3. Hydraulic cylinder single-/double-acting changeover



Before starting ordinary operation, be sure to set the cylinder single-/double-acting changeover switch in the "single-acting" position, and change it to the "double-acting" position before installing or removing the mower unit.

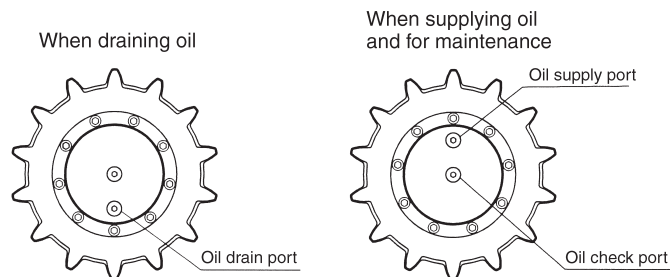
Operation with the changeover switch in the "double-acting" position will cause the hitch sections to be subjected to a load when the machine climbs over a large stone or some other obstacle, causing machine failure.

20. Gear oil change for traveling motor

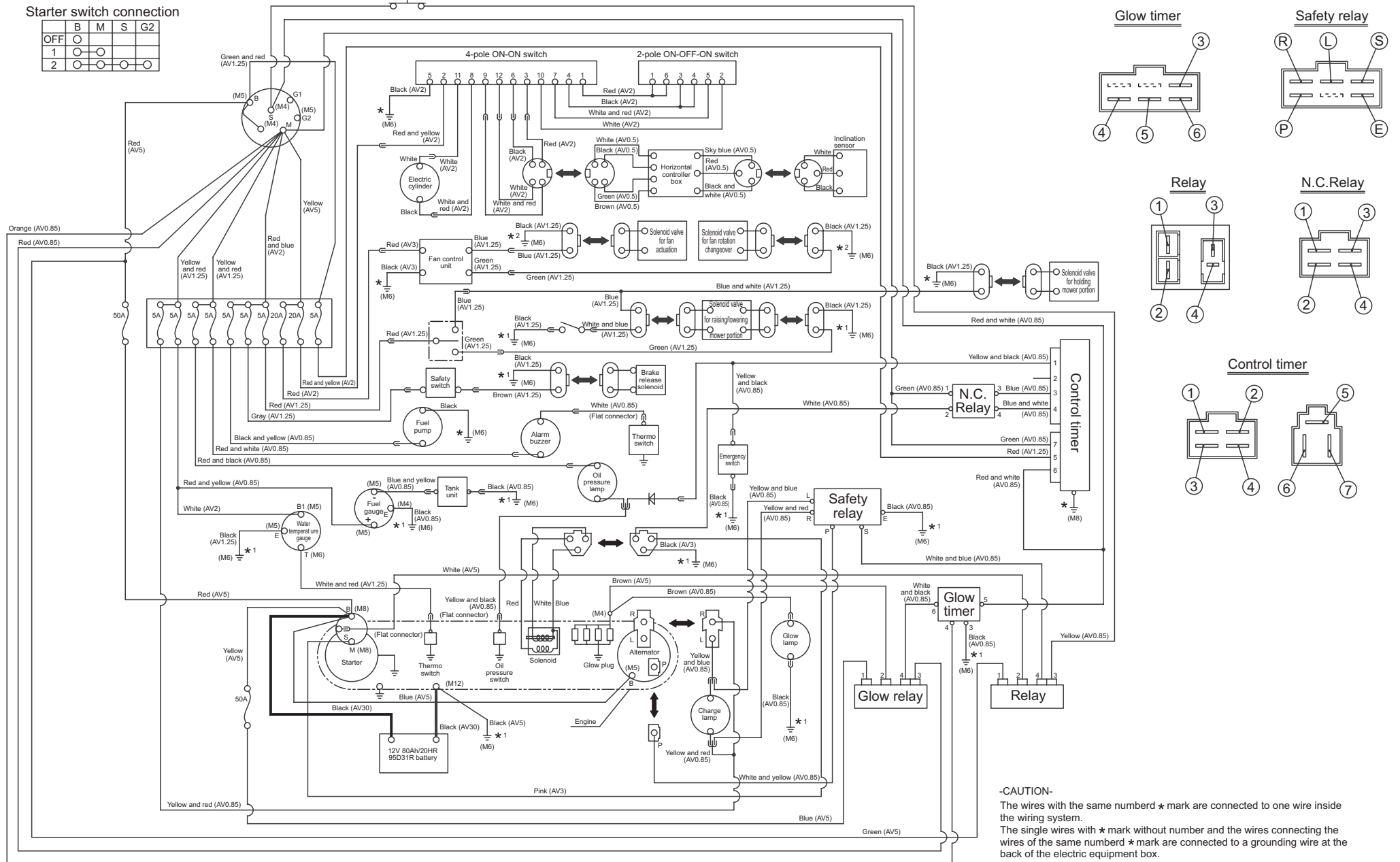
CAUTION

The speed reducer of the hydraulic motor for traveling is filled with 0.35 liter of gear oil. Flush the speed reducer 50 hours after initial operation and every 200 hours after that, and after each flushing, fill the speed reducer with a new gear oil #140 (ISO VG140).

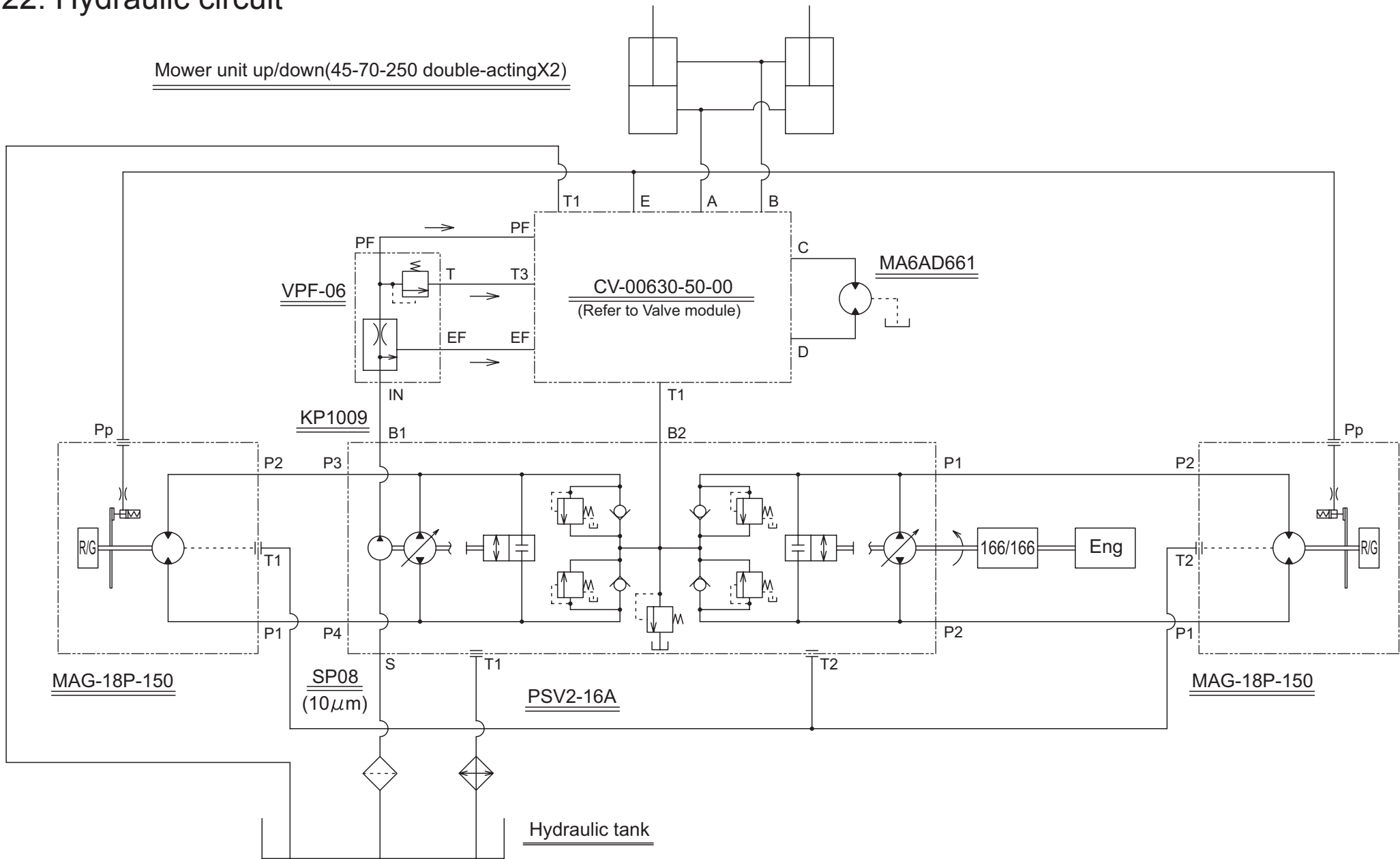
Unless the oil is changed according to the specified time, the motor failure will result. Be sure to change oil as specified.



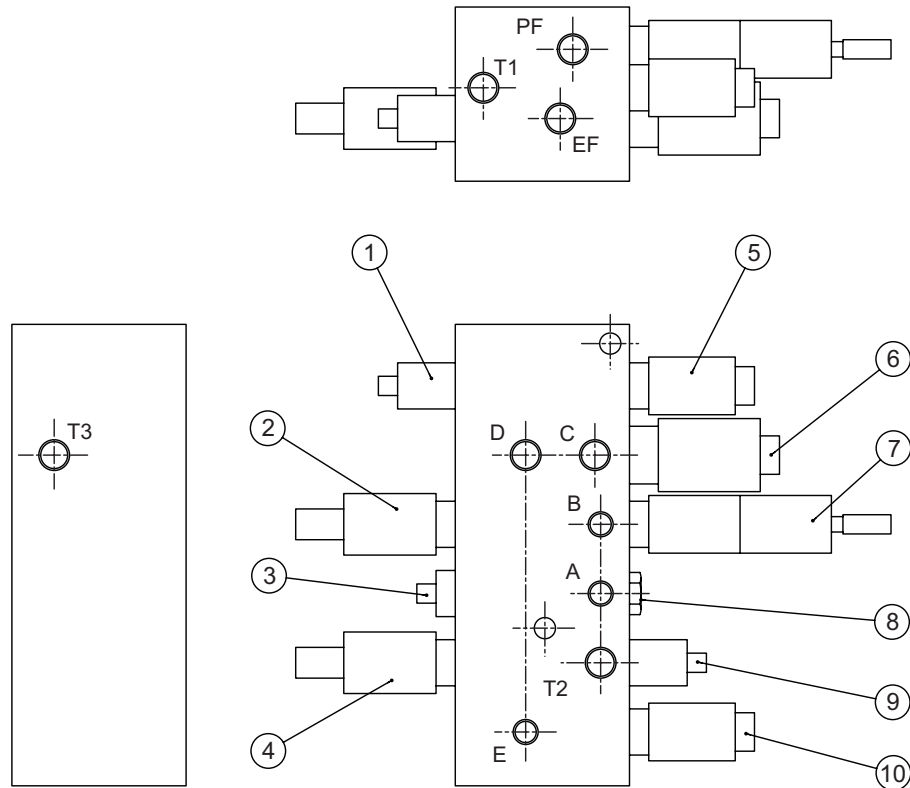
21. Wiring diagram



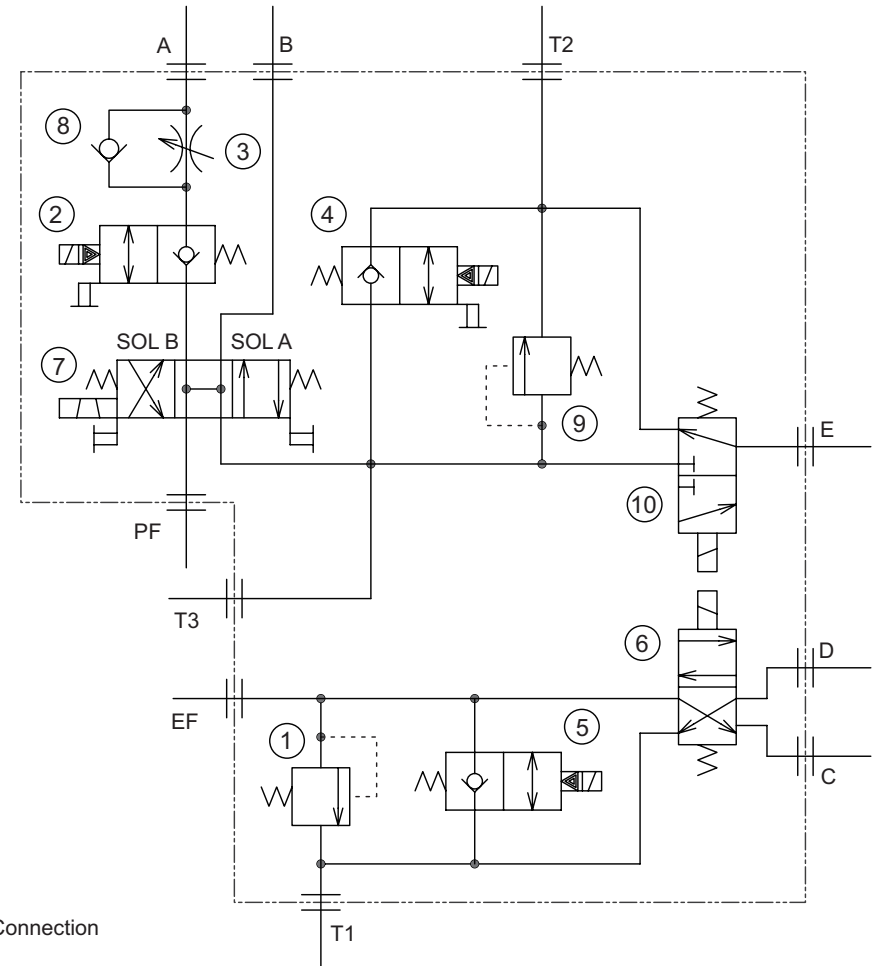
22. Hydraulic circuit



22-1.Valve module detail



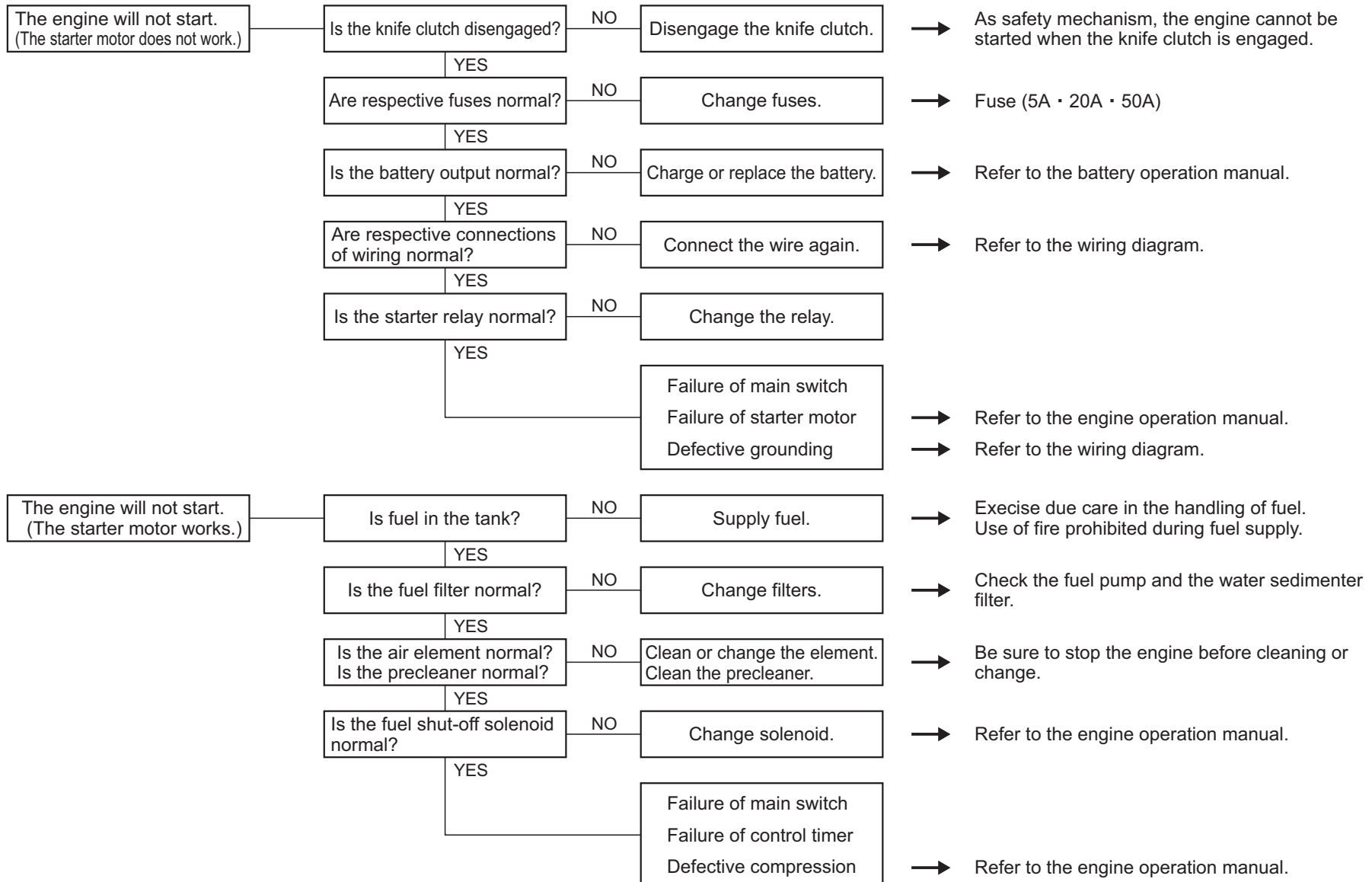
No	Name	Use
1	Relief valve	
2	Solenoid poppet valve	for holding mower portion
3	Needle valve (throttling valve)	for adjusting lowering speed
4	Solenoid poppet valve	Unload for emergency
5	Solenoid poppet valve	for cooling fan actuation
6	Solenoid valve	for cooling fan rotation changeover
7	Solenoid valve	for raising/lowering mower portion
8	Check valve	
9	Relief valve	
10	Solenoid valve	for brake release

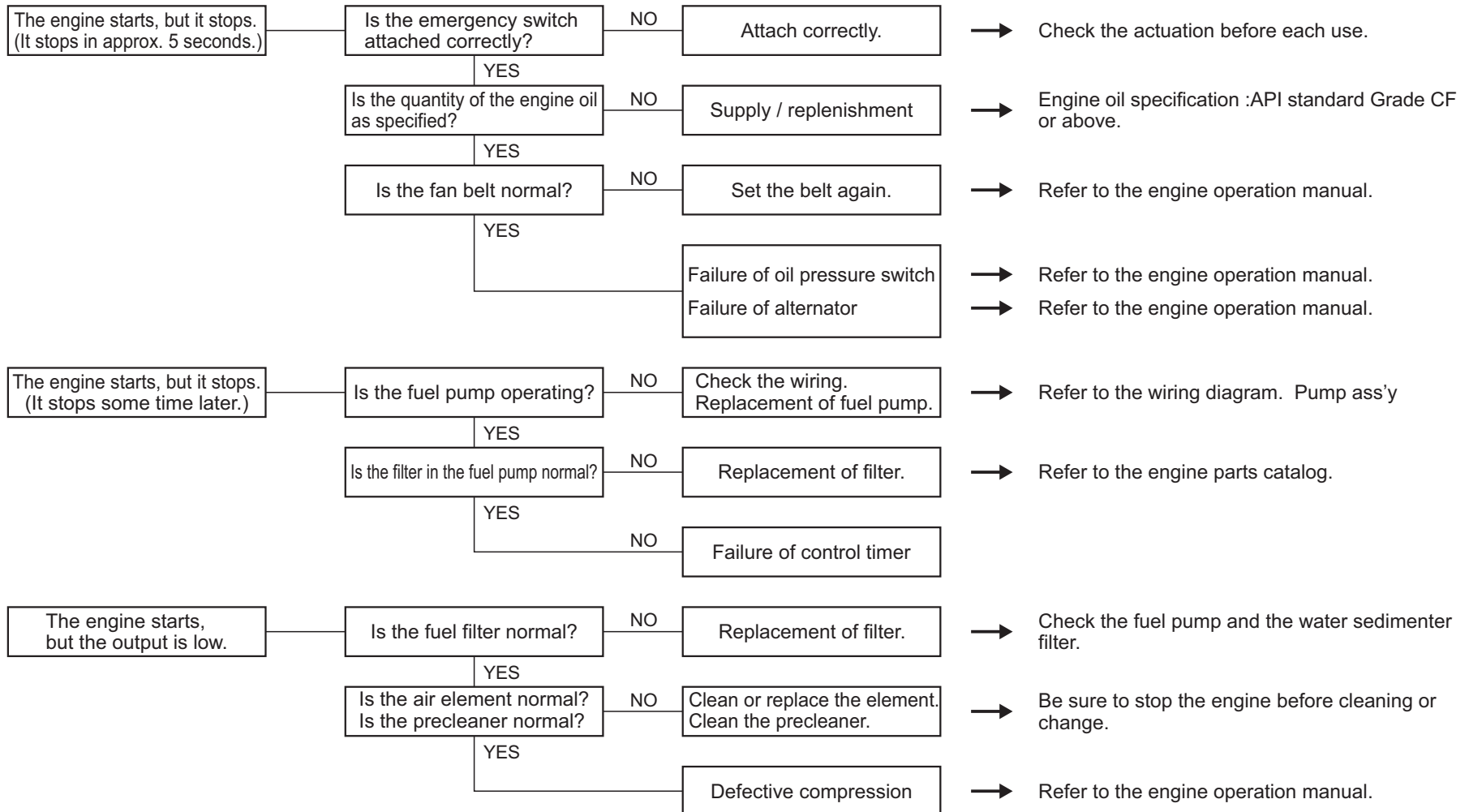


※Wiring No Connection

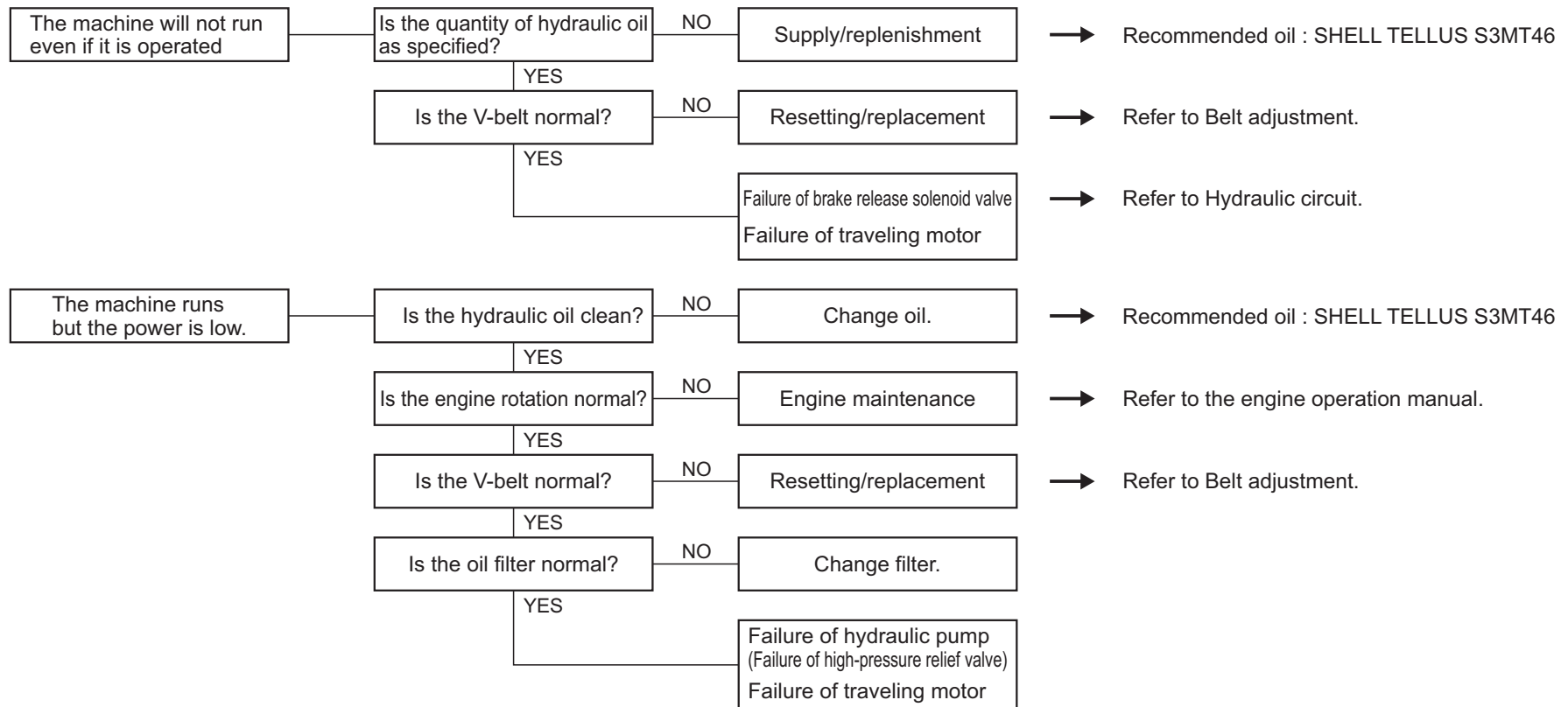
23. Troubleshooting

23-1. Engine trouble

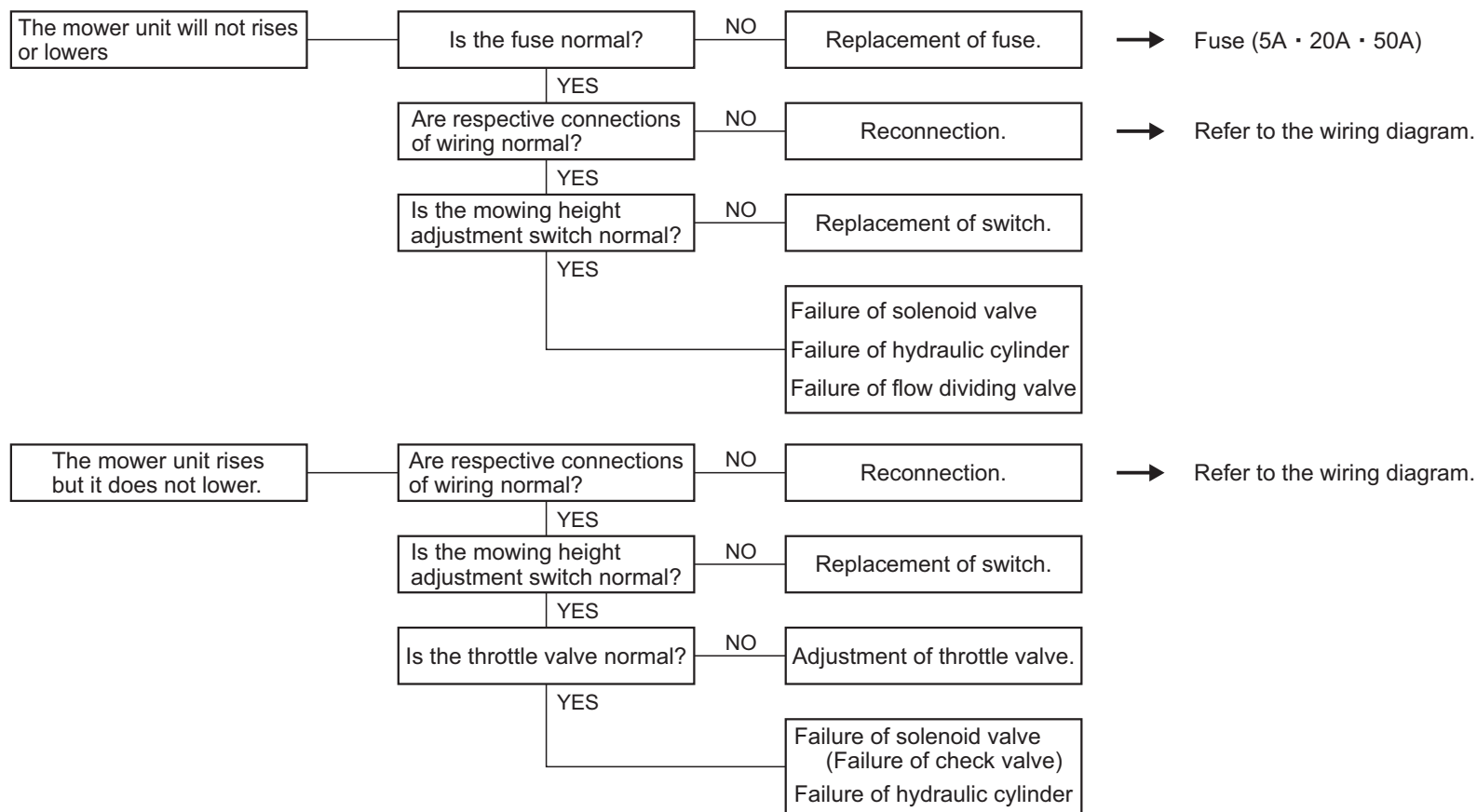


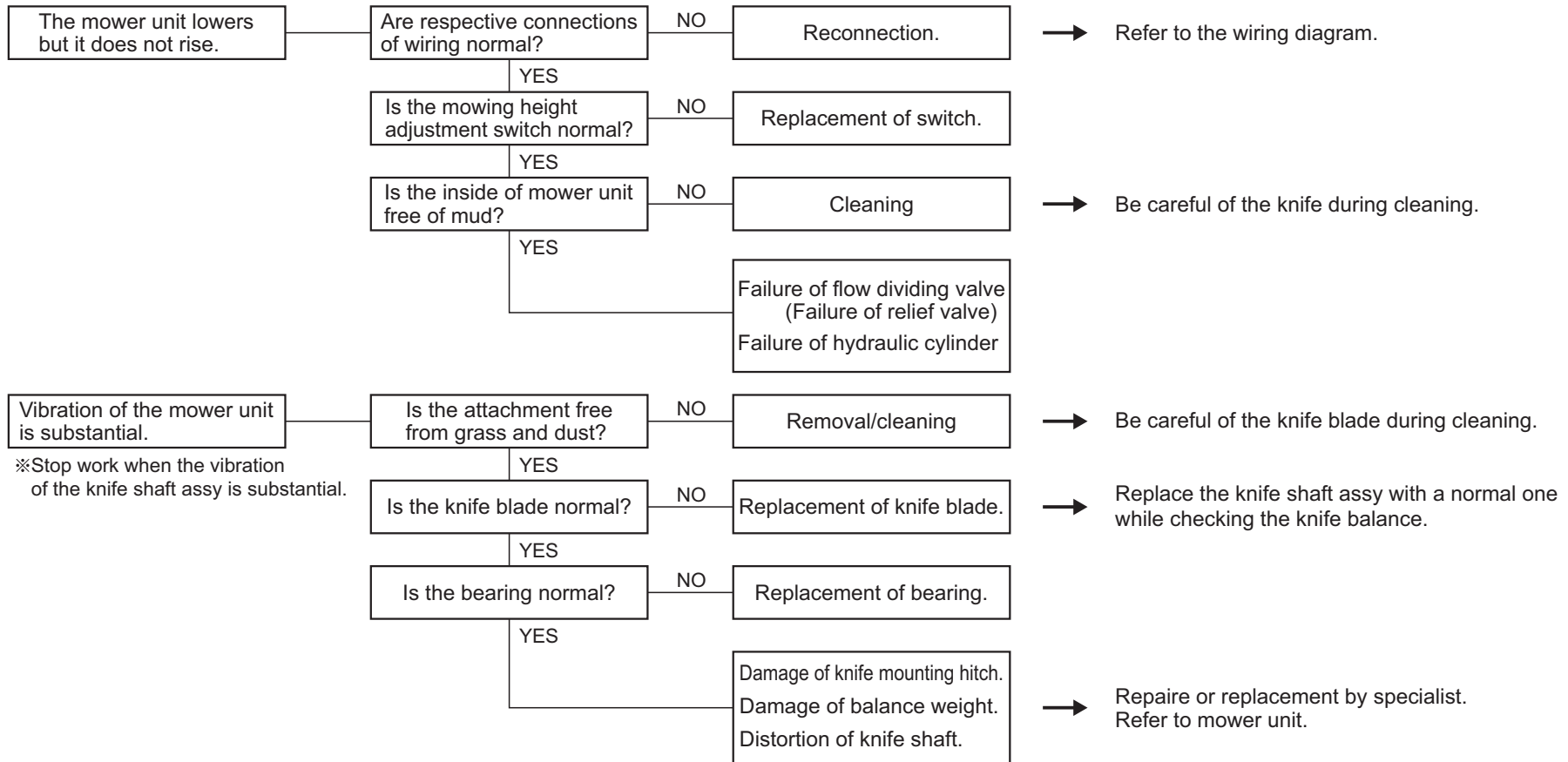


23-2. Traveling system trouble

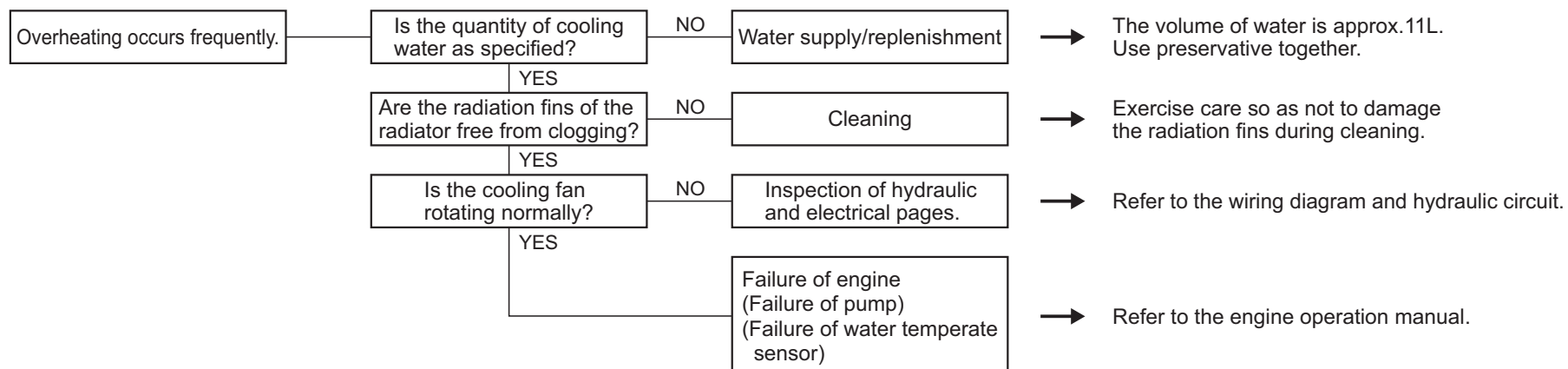


23-3. Mower unit trouble

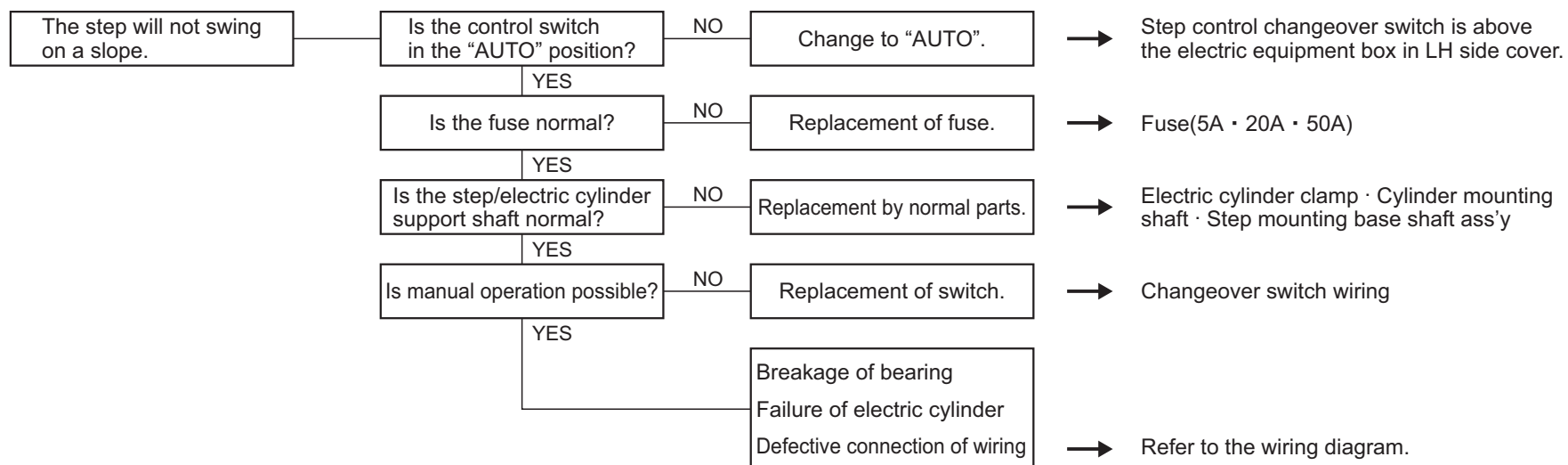




23-4. Overheating



23-5. Step trouble



24. Checklist

Symbol of judgment ○ : Normal ; △ : Adjustment/correction ; × : Repair/replacement

Model	Machine No.	Operating time	Performance date	Operating time	Performance date	Operating time	Performance date	Operating time	Performance date	Operating time	Performance date	Memo
Item	Judgment	Notes	Judgment	Notes	Judgment	Notes	Judgment	Notes	Judgment	Notes		
Engine (start/color of exhaust/number of revolutions)												
Engine oil (quantity/cleanliness)												
Engine oil filter												
Air cleaner precleaner (element)												
Radiator (cooling water/radiation fin)												
Fan belt tension												
Fuel (quantity/leakage)												
Hydraulic oil (quantity/cleanliness)												
Hydraulic oil filter												
Tightening of hydraulic hose/joint												
Traveling motor gear oil (quantity/cleanliness)												
Battery (qty of electrolyte/connection)												
Operation of operation levers												
Neutral position												
Operation of emergency switch												
Operation of step												
Operation of switches and meters												
Lighting of lamps												
Operation of wires												
Operation of knife tension parts												
Operation of knife tension spring												
Tension of V-belts												
Rubber crawler (tension/damage)												
Condition of rotation of front and bottom rollers												
Balance of knife shaft assy												
Knife (abrasion/breakage)												
Vertical motion of mower unit												
Damage to protective covers												
Greasing of respective parts												
Loosening of screws												
Accumulation of dust												
Damage to caution label												
Damage to appearance												
		Inspector		Inspector		Inspector		Inspector		Inspector		

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Q u a l i t y o n D e m a n d



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