CE EN

Original Instructions

SP20059_EN REV5 // **February 2026**

Instruction Manual

Battery Dedicated Mower

ES-30 / ES-36

DENNIS

Original Instructions in English (UK).
Part number: SP20059_EN.
Models covered: ES-30 (D169) / ES-36 (D151).

Rev.	Date	Description of Changes	Author
5.0	19/FEB/ 2026	Complete redesign of manual.	C.B.

For a digital copy of this manual, parts catalogue and other information regarding this product, please scan:

Serial numbers:

Chassis
Battery
Drive Motor
Cylinder Motor

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1.1. Introduction

1.1.1. Operator Manual Overview

This operator manual contains important information regarding the safe, proper and efficient operation of the ES-30 / ES-36, referred to as 'machine' in this manual. This operator manual must always be available and read by every User of the machine. 'User' is defined as an authorised person tasked with working on or with the machine, typically operators, groundskeepers and maintenance personnel.

Adherence to this operator manual will help to avoid and minimise risk to you as the User and to the machine. It will also lead to a greater quality of cut, lower repair costs and reduce downtimes. Prior to use, every User must ensure they have:

- Fully read and understood these instructions,
- Understood the machine controls,
- Understood the dangers and hazards involved, and methods to mitigate risk.

In the case of any difficulty or if further information is required, call Howardson Group or your Dealer. In the interests of speed and accuracy of information, please quote the serial number of the machine when making enquiries.

Location descriptions (e.g. left/right hand) throughout this manual are observed from the operators view whilst in normal drive position, as per Fig.1.

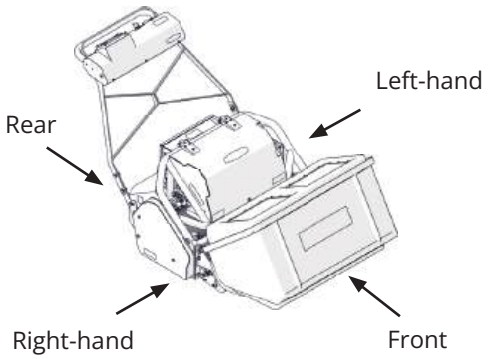


Figure (Fig.) 1 - Viewpoints

1.1.2. Machine Description

The ES-30 and ES-36 are professional electric grass mowers, using a 30" (760 mm) or 36" (910 mm) dedicated cylinder respectively. This cylinder is designed for the cutting of grass only.

All machine models are powered by a pair of 48V permanent magnet AC motors via an 5.7 kWh lithium ion battery, with one motor controlling the rear roller and one motor controlling the cylinder.

The rear roller and cylinder are controlled independently, operated from the 4.3" colour display screen on the upper handle bar. This display screen also shows battery state of charge (SoC), clip rate and maintenance information.

The design of the machine incorporates a system for quick adjustment of the height of cut and a tubular assembly system for easy service and maintenance of the main components. A mechanical parking brake is fitted which, when applied, disengages drive.

1.2. Safety Instructions

Throughout this manual, potential safety risks are identified with a word and coloured coded box. They denote the following:

DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTE

Indicates information considered important but not hazard related.

1.2.1. Warning Symbols & Decals

The following symbols and decals are used throughout this Operator Manual and across the machine. Familiarise yourself with them prior to operating the machine. They are located near areas of potential danger or convey further information on machine use.

Warning Signs

General warning sign

Warning; Electricity

Warning; Sharp element

Warning; Toxic material

Warning; Flammable material

Warning; Corrosive substance

Warning; Crushing of hands

Warning; Explosive material

Warning; Battery charging

Prohibition Signs

General prohibition sign

No smoking

No open flame; Fire, open ignition source and smoking prohibited

No metallic articles or watches

Do not touch

No sitting

Do not alter the state of the switch

Not to be serviced by users

Mandatory Signs

General mandatory action sign

Refer to instruction manual/booklet

Wear ear protection

Wear eye protection

Wear a mask

Wear safety footwear

Wear protective gloves

Wear protective clothing

Disconnect before carrying out maintenance or repair

Disconnect mains plug from electrical outlet

Other Signs

Take note

Recycle

Heavy weight

Safe Condition Signs

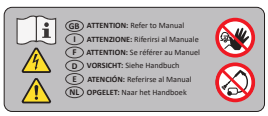
Emergency stop button

Decals

Your machine decals must be replaced when they become worn or damaged. Contact Howardson Group Service department with the part number listed below:

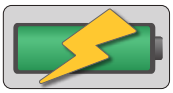
SP18029 - REV0

SP18048 - REV0



SP18026-2 - REV0

SP18026-3 - REV0



SP18026-6 - REV0

SP18026-7 - REV0

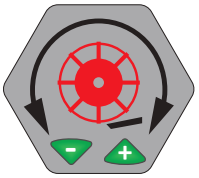
SP18067 - REV0

B32902_REV2 (200x50mm)
J20362_REV2 (120x30mm)

B32903_REV0

SP18051 - REV0

SP18052 - REV0



SP18034 - REV0

1.2.2. Important Safety Instructions

DANGER - IMPORTANT SAFETY INSTRUCTIONS

- ***Always*** read this operator manual carefully and understand the controls and safety signs before commencing work. Improper use or care of the machine may result in injury or death.
- This machine is dangerous if not used correctly - take great care and consideration when using it.
- ***Always*** keep hands, feet and any other body part clear of the cylinder and rollers. Remember that blades, brushes and rollers can continue to rotate even after the motor has stopped.
- ***Always*** use the correct personal protective equipment (PPE) - see *"1.2.4. Personal Protective Equipment (PPE)" p.9.*
- ***Always*** use the machine with all safety guards correctly fitted. They are supplied for your protection.
- ***Always*** look behind before reversing.
- ***Always*** be alert for pedestrians.
- ***Always*** switch off the power and disconnect the battery before servicing or making repairs.
- ***Always*** keep the machine maintained with the schedule and procedures found in *"4. Maintenance and Servicing" p.37.* Doing so keeps the machine in good condition, thereby reducing accidents and injuries, and maintaining better turf.
- ***Always*** use genuine Dennis parts for servicing and replacements.
- ***Always*** operate standing behind the machine with two hands on the handlebar.
- ***Always*** wait for the cylinder to stop rotating before travelling over anything that is not grass.

DANGER - IMPORTANT SAFETY INSTRUCTIONS

- ***Always*** assess the job prior to starting. This includes:
  - Slopes - mitigate use on slopes where possible. Take extra caution and use horizontally across the face of slopes, not up and down.
  - Remove any debris and objects such as stones and branches prior to working in the area. Also observe and avoid anything that can damage the machine such as sudden dips, verges etc
  - Lighting - always operate in daylight or good artificial light.
- ***Never*** use the machine if it is damaged or faulty in any way.
- ***Never*** put any body parts, including limbs, near moving parts of this machine.
- ***Never*** carry out adjustments whilst the machine is running.
- ***Never*** allow any unauthorised person to operate the machine, in any way, at any time.
- ***Never*** operate the machine if you are experiencing any of the following conditions: illness, reduced physical capacity, or under the influence of drugs or alcohol.
- ***Never*** let a child operate the machine or be in the work area when it is being operated.
- ***Never*** open or attempt any work inside the electrical box.
- ***Never*** replace any component with a non-genuine Dennis part.
- ***Never*** attempt to charge the machine from any non-Dennis charger.
- ***Never*** operate the machine if electrical wires are damaged or bare cable is exposed.

DANGER - IMPORTANT SAFETY INSTRUCTIONS

- ***Never*** **lift or carry a machine whilst any parts are moving.**
- ***Never*** **use the machine in adverse weather conditions, particularly in heavy rain, storms or high winds.**
- ***Never*** **use the machine at a speed greater than your walking pace.**

1.2.3. Intended Use and Residual Risks

This machine is designed for the cutting of fine grass surfaces only. Any use beyond this is outside the scope of this machine and could cause injury or damage to the machine. This includes, but not limited to, riding on the machine, using it to transport goods and using it to cut thick vegetation.

WARNING - INTENDED USE AND RISKS

Personal injury and damage to the machine can result in using the machine for alternative uses. *Never* use the machine for anything else other than its intended use. Risks will always be present and you must be vigilant at all times while operating machine.

You must follow instructions and information found in *"1.2. Safety Instructions" p.6* and *"3.6. Operating Environment" p.34.*

1.2.4. Personal Protective Equipment (PPE)

During use you must adhere to local rules and regulations regarding Personal Protective Equipment (PPE). In addition to this we recommend:

- **Footwear;** heavy duty, slip resistant boots to protect against injury.

- **Eye protection;** to protect from flying debris.

- **Hearing protection;** must be worn at all times when the machine is activated.

- **Clothing;** suitable for the environment you are operating in (hot, cold, wet etc)

- **Hand protection;** to avoid cuts and blisters.

- **Respiratory protection;** for when there are occurrences of high dust and pollen.

1.3. Assembly, Installation and Commissioning

1.3.1. Unpacking and Inspection

The machine will arrive on a wooden pallet base, with either a cardboard or wooden outer frame. Carefully remove this outer packaging. You alternatively may have the machine delivered direct from our factory or your Dealer.

Visually inspect the machine for any signs of damage which may have occurred during transport. Contact Howardson Group or your Dealer as soon as possible should there be damage.

Included with the machine is this operator manual, a warranty registration document and machine parts catalogue.

To remove the machine from the pallet:

1. Remove all tie-down straps.
2. Wherever possible, use a suitably rated ramp to roll the machine off backwards to the ground. Refer to sections ***"3.2. Power***

On and Shut-Down" p.24 and *"3.3. Drive" p.25* for the relevant procedures.

CAUTION - MACHINE WEIGHT

The machine is very heavy. Machine weight can be found on the serial plate or section *"2.1.2. Specification Table" p.12*. Take care when removing from the wooden pallet - we recommend two people to help with this. Follow all manual handling techniques for your business and region.

3. If a ramp is not available, disengage the parking brake and, while following correct manual handling techniques, ***gently*** lower the rear roller to the floor. Continue to roll backwards, keeping pressure on the handlebar so the front wheels remain in the air. Once clear of the pallet, lower the front to the floor ***gently***.

Dispose of all packaging according to local laws - recycle where possible.

1.3.2. Assembly Instructions

Minimal assembly is required to get your machine into a ready state:

1. **Re-connect the battery terminals;** use a 5 mm hex key to open the battery cover and locate the two terminals. Insert positive to positive and negative to negative (Fig.2A). An audible 'click' will be heard to indicate a secure connection. Secure the battery cover.
2. **Attach the grass box;** lower the grass box frame towards the front of the machine. Lift the grass box onto this frame (Fig.2B), removing any plastic wrapping that may be left.
3. **Set handlebar height;** the handlebar may need readjusting to be optimum for your height. See section ***"4.3.1. Handlebar Height Adjustment" p.52*** for further information.

Fig. 2 - Assembly Instructions

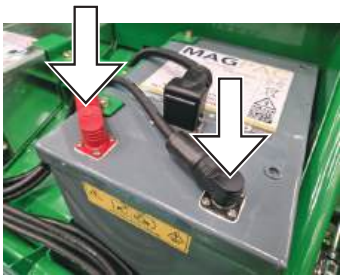


Fig.2A - Battery terminal re-connection

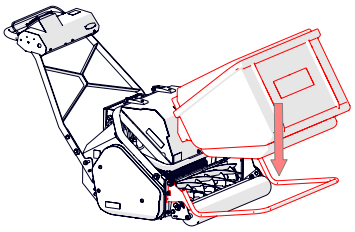


Fig.2B - Grass box fitment

1.3.3. Installation Requirements

Adjustments will be required to make adequate space for the charging, storage and routine maintenance of the machine:

- See section ***"2.1.1. Dimensions" p.11*** for minimum space requirements.
- See section ***"4.6. Storage" p.52*** for correct storage requirements.
- The charger unit will require a mains power outlet source of 110-230V ±10% within 2 m of it. There is a further 2.5 m of lead from the charger unit to the charger plug. For further charger specifications, consult the charger User Manual supplied.

1.3.4. Commissioning

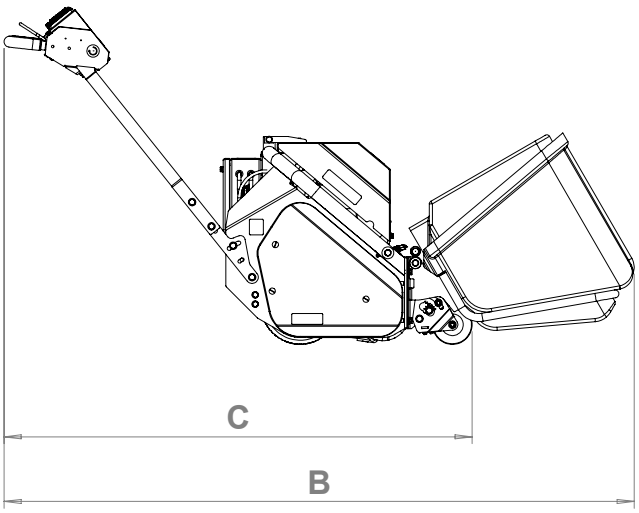
Your Dealer or a Howardson Group representative will be present to commission and set-up your machine. They will walk through the process of basic controls and getting started with your machine.

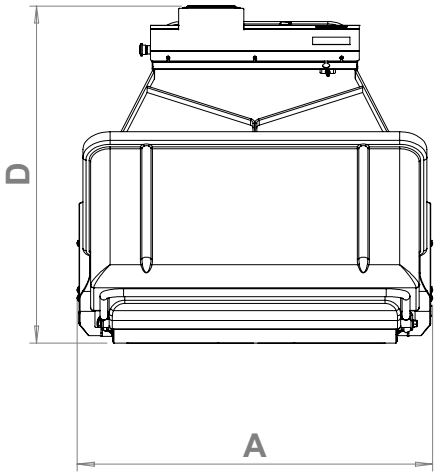
1.3.5. Calibration

No calibration procedures are required.

2.1. Technical Specifications

2.1.1. Dimensions





View	Model	
	ES-30	ES-36
A	982	1147
B	2031	
C	1512	
D	1086	

2.1.2. Specification Table

System		Model	
		ES-30	ES-36
Weight	Machine	312	290
	Charger	13 kg	
Drive	Drive Motor	1200 W	
	Drive System	Timing Chain	
	Cylinder Motor	1200 W	
	Cylinder Drive System	Multi V Belt	
	Rear Roller Diameter	228 mm	
	Front Roller Diameter	127 mm	
Electrical	Battery Type	Lithium Ion - Sealed, Removable	
	Battery Chemistry	Lithium-Ion NMC	
	Battery Capacity	5.8 kWh	
	System Voltage	48 V	
	Charger Supply Voltage	115–230 V	
	Charger Frequency	50-60 Hz	
Speed	Forwards	2.0–8.5 (in 0.1 increments) km/h	
	Reverse	1.5 km/h	
Cutting	Blade unit	Cylinder, fixed	
	Cutting Width	30" [760 mm]	36" [910 mm]
	Number of blades	6 or 8 *(depending on order)*	
	Clip-rate range (per metre)	85–110 cpm	
	Height of cut	09–44 mm	
	Grassbox volume	180 L (fibreglass) / 280 L (plastic)	220 L (fibreglass) / 330 L (plastic)
Environmental	Operating temperature range	-20ºC to +40ºC *(+10ºC to +30ºC optimal)*	
	Charging temperature range	0ºC to +45ºC *(+10ºC to +40ºC optimal)*	
	Storage temperature range	-20ºC to +35ºC (machine) +10ºC to +30ºC (battery) For additional information, see section ***"4.6. Storage" p.52***.	

2.1.3. Noise and Vibration

System		Model	
		ES-30	ES-36
Noise	Measured Sound Power Level	84 dB(A)	84 dB(A)
	Guaranteed Sound Power Level	88 dB(A)	88 dB(A)
	 **WARNING - NOISE LEVELS** **Hearing protection must be used when using this machine.**		
Vibration	Total value to which the hand-arm system is subjected	<2.5 m/s^2	<2.5 m/s^2

2.2. Machine Components

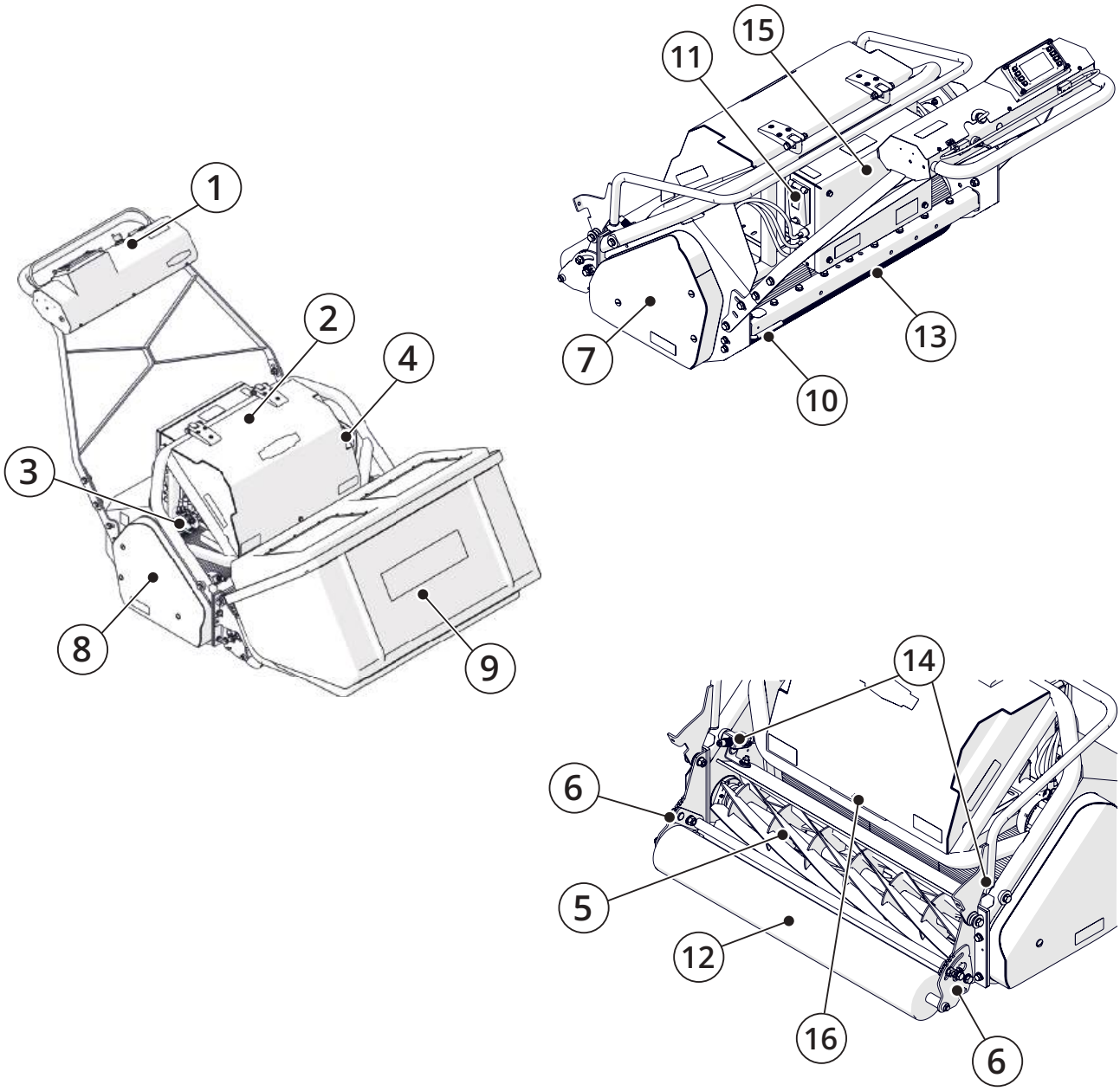


Fig. 3 - Machine components overview

1. Control Components - see ***"2.3. Control Components" p.17***
2. Battery Cover
3. Drive Motor
4. Cylinder Motor
5. Cutting Cylinder
6. Cut Height Adjuster
7. LH Belt Guard
8. RH Belt Guard
9. Grass Box
10. Parking Brake
11. Charging Port
12. Front Roller
13. Rear Roller
14. Shear Blade Adjuster
15. Electrical Box
16. Serial Plate *(hidden)*

1. Control Components
See *"2.3. Control Components" p.17.*

2. Removable Battery
Secured with a M8 bolt, the battery is protected by this cover. This must remain closed and only accessed for initial battery assembly and service purposes.

3. Drive Motor
This motor powers the rear roller and controls only the drive direction (forwards/backwards) and speed. The timing chain will require periodic checks, adjustment and replacement.

4. Cylinder Motor
This motor powers the cylinder, spinning the blades/discs towards the front of the machine. It can spin in reverse (i.e. towards the rear of the machine) during the backlapping process. The motor belt will require periodic checks, adjustment and replacement.

5. Cutting Cylinder
The cylinder is the cutting unit of the machine. It is a dedicated (i.e. non-removable) unit in operational use, but can removed for re-grinding and replacement.

Replace a worn or damaged cylinder with genuine Dennis replacement.

DANGER - CYLINDER BLADES

Worn or damaged blades are dangerous. Incorrect use or maintenance can cause serious injury or death. Inspect before and after every use, as per *"4.1. Maintenance Schedule" p.37*.

***Always* inspect the blades with the machine *off*.**

6. Cut Height Adjuster
Located either side of the machine, cut height is adjusted here - see *"3.4.1. Adjusting Height of Cut (Cylinder)" p.26.*

7/8. LH & RH Belt Guard
Behind the RH belt guard contains the belt to drive the rear roller. Behind the LH belt guard contains the belt to the cylinder and the parking brake mechanism. Both guards protect the operator and machine from injury and damage. They must be kept on and secured at all times.

9. Grass Box
The grass box collects the clippings from the cylinder. Maximum volume: ES-30 = 280 L, ES-36 = 330 L.

10. Parking Brake
The mechanical parking brake physically stops the rotation of the rear roller when engaged. This stops any unintended rolling and to be used when the machine is not in use. To engage, gently lift the brake lever up, insert through the hole towards the front of the machine and then lower.

When engaged, the display will automatically display Park (P). The parking brake must be disengaged before the gear selection can be changed.

CAUTION - PARKING BRAKE

- ***Always* engage the parking brake when the machine is not in use.**
- **Do *not* use the parking brake to stop the machine while moving. This may result in damage to the braking system. To stop, release the OPC and the machine will slow to a stop.**

11. Electrical Box Connector

The electrical box connector is located under the sprung flap on the electrical box. It connects to the battery to supply power to the machine. Lift the sprung flap to gain access to the connectors and remove/insert accordingly. For further details on charging, see ***"3.5.4. Charging Instructions" p.32.***

12. Front Roller

The front roller maintains stability and guides the machine. As standard a Smooth roller is supplied but a Weile roller is available as an optional extra.

13. Rear Roller

The rear roller also maintains stability like the front roller, but also creates a striping effect behind the machine. It is split into three segments, with the two outer segments operated by differential to aid in manoeuvrability.

14. Shear Blade Adjuster

Over time the quality of cut will decrease due to blade wear. Adjustment of the shear blade carrier is required to maintain the cut ***"4.3.2. Shear Blade Adjustment" p.49.***

15. Serial Plate

The serial number can be found under the battery cover, in front of the battery. Make a note of the serial number of your machine and battery in the table found on the inside cover of this manual. Always quote these in any communication with Howardson Group.

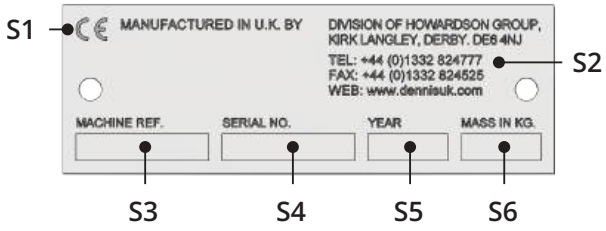


Fig. 3A - Serial plate components overview.

S1. CE marking
S2. Business/manufacturer address and contact details
S3. Machine code designation
S4. Serial number
S5. Year of build
S6. Mass of machine (kg)

16. Electrical Box

This houses many of the machine control components including fuses, contactors and motor controllers.

WARNING - ELECTRICAL BOX ACCESS

Never open or attempt any work inside the electrical box. Doing so will void the warranty.

2.3. Control Components

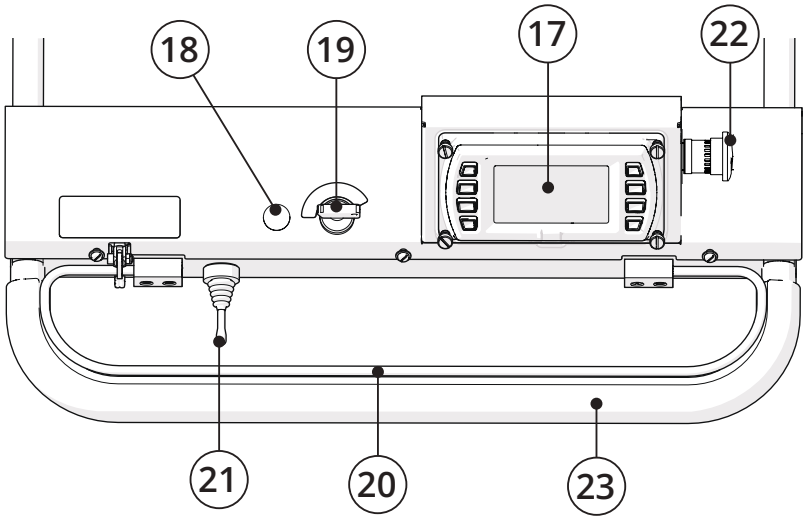


Fig. 4 - Control components overview

17. Display Screen
18. Start Button
19. Key Switch
20. Operator Presence Control (OPC)
21. Drive Engagement Switch (DES)
22. Emergency Stop
23. Handlebar

17. Display Screen

The display screen contains vital information and controls to operate the machine. See ***"2.5. Display Screen" p.19*** for more information.

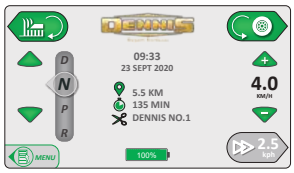


Fig. 4A - Display screen

18. Start Button

The start button, in conjunction with the key switch, is only used for powering up the machine. After turning the key switch to the ***on*** position, press and hold for approximately three seconds (until a 'click' is heard) to turn the machine ***on***.

19. Key Switch

The key switch, in conjunction with the start button, is needed to power on the machine. Turning to the ***off*** position will turn all electronics and functions off.
Two keys are supplied with your machine. Spares can be ordered from Howardson Group Spares.

20. Operator Presence Control (OPC)

This lever mechanism is a safety feature to prevent accidents. It signals to the machine of your control, active or otherwise, and either supplies or stops power to the motors, respectively.

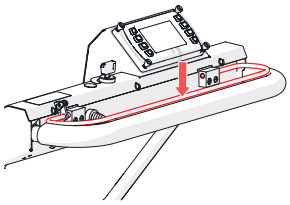


Fig. 4B - OPC

The OPC requires continuous engagement for the machine to be used. When used with the DES or the 'Drive start/stop' on the display screen, it powers the drive motor. When used with the 'Cutting start/stop' on the display screen it powers the cylinder motor.

When the OPC is released, this indicates you are no longer present or in control. At this, the machine automatically and immediately ceases all power to the motors, regardless of DES position or cutter/drive activation via display screen. This minimises risk caused by the machine being able

to operate unattended or in unsafe conditions.

DANGER - BYPASSING OPC

Never **interfere or tamper with the OPC in any way. This includes taping, tying up, altering the micro switch etc. Doing so bypasses a key safety mechanism of the machine and puts you and fellow pedestrians at risk.**

21. Drive Engagement Switch (DES)

The DES, in conjunction with the OPC, is used to power the drive motor. The DES position provides different drive functions:

- Neutral (DES in the middle) - no power is delivered to the motors. Leave in this position whenever the machine is being switch off or not actively used.
- 'Nudge' (DES moved to the right) - requires continuous compression to be used and self-centres on release. Used when a finer degree of movement is required, such as turning or moving around obstacles.
- 'Latched' (DES moved to the left) - used when long continuous operation is expected. It will 'lock' into position and not return to centre until manually moved back.

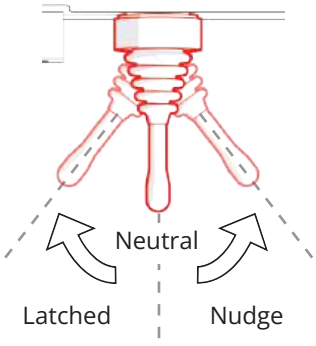


Fig. 4C - Drive Engagement Switch

NOTE - DES / DISPLAY CONTROLS

The machine drive motor can be operated from the display control buttons, however DES controls will override these.

22. Emergency Stop

Fig. 4D - Emergency stop

In case of emergency, press this button to immediately stop all functions and processes of the machine, including to the screen and motors.

To reset and resume power to the machine, firstly turn the button head clockwise and then hold the start button.

WARNING - EMERGENCY STOP

- **After using the emergency stop, resolve the issue which caused the fault before continuing to use.**
- **After using the emergency stop, fully assess the machine to ensure all safety functions are working.**
- **This button is for emergencies. Do not use as a regular stop mechanism.**

2.4. Cylinder

The machine will have either a six or eight blade dedicated cylinder. Unlike cassettes, it is fixed and remains in the machine at all times, only to be removed for servicing and grinding.

Cylinder clip rates can be changed via the display screen. Clip rates will automatically adjust based on the speed of the machine, ensuring the clip rate per metre remains the same. For more information on clip rate, see ***"3.4.3. Adjusting Clip Rate" p.29.***

2.5. Display Screen

Located directly in front of the handlebar is the display screen. Here is where important machine information and controls are accessed through the display. Additional machine functions and settings are also accessed through the screen via the menu.

On machine start-up it defaults to the Home Page (see Fig.5). From here you can view / action the following:

1. Cutter start / stop
2. Drive start / stop
3. Drive mode (selection)
4. Drive speed
5. Main menu
6. Battery level
7. Transport mode
8. Trip information
9. Time and date

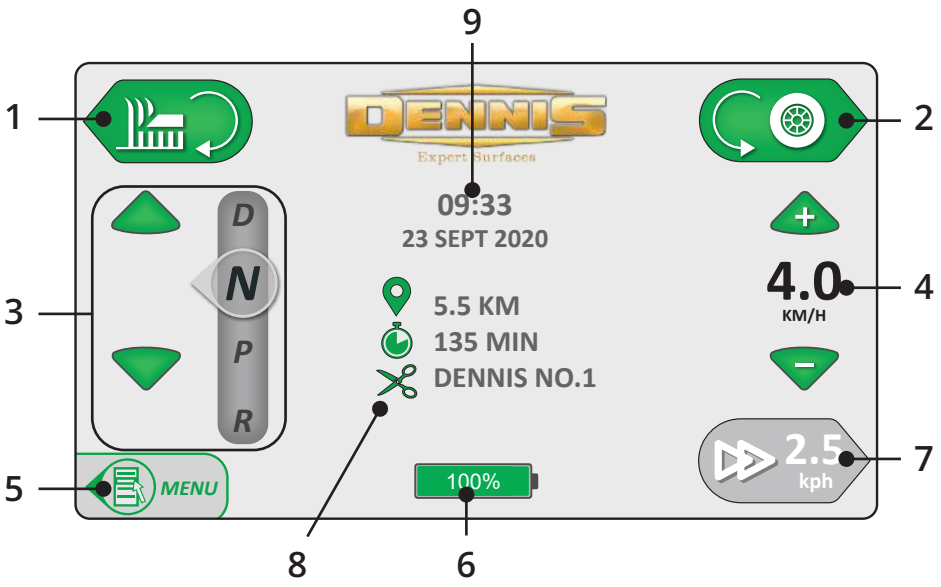


Fig. 5 - Home screen overview

1. Cutter start / stop

This button will illuminate ***green*** to allow the cylinder motor to ***start***. This happens only when machine checks have determined this is suitable (i.e. parking brake off, drive mode type etc).

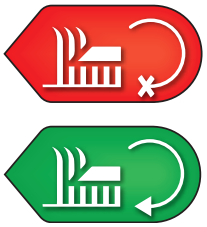


Fig. 5A - Cutting start/stop

If it is ***red***, either cutting start is not permitted or the motor is currently in use. If the latter, then pressing this button ***stops*** the cylinder motor (releasing the OPC will also achieve this).

2. Drive start / stop

This button will illuminate ***green*** to allow drive (forwards or reverse) to ***start***. This happens only when machine checks have determined this is suitable (i.e. parking brake off, drive mode type etc).

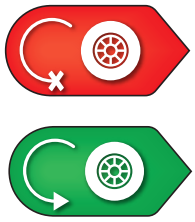


Fig. 5B - Drive start/ stop

If it is ***red***, either drive start is not permitted or the motor is currently in use. If the latter, then pressing this button ***stops*** the drive motor (releasing the OPC will also achieve this).

3. Set drive mode

Use the up and down arrows to select drive mode:

- **D - Drive**. Cut start/stop is only available in this mode. There is no motor braking in this mode, therefore it is possible for the machine to 'freewheel' (i.e. without DES use) which allows easier manoeuvrability for cornering or moving between pitches.

- **N - Neutral.** Automatically displays when the parking brake released. Machine will automatically enter Drive when OPC depressed and DES activated. Like Drive mode, there is no motor braking therefore allowing the machine to 'freewheel'. Do not use this mode while transporting off or between work sites - use Transport mode for this.

- **P - Park.** Automatically displays when the mechanical parking brake is set. Machine automatically goes into Neutral when park brake released.

- **R - Reverse**. Select to reverse the machine. Cut start/stop is not available in reverse. Motor braking is active in this mode, therefore trying to move the machine 'freewheel' (i.e. without DES use) is not possible.

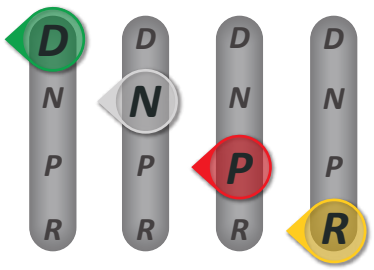


Fig. 5C - Drive mode

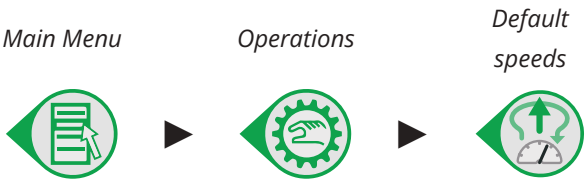
4. Drive speed

Select the '+' or '-' buttons to alter the top speed of the machine. Single presses change in 0.1 km/h increments, alternatively press and hold to scroll numbers quickly. Acceleration rate remains constant at all speeds.

Fig. 5D - Speed icon

Forwards speed: 2.0–8.5km/h.
Reverse speed: 2.0–8.5km/h.
Transport speed: 5.0km/h (default)

Speed units can be changed to either km/h, mph or m/s.
To change units:



5. Main menu

Within the Main menu, the following can be viewed/actioned:
(Note - all sub-menu's allow return to the previous page or the Home page.)

Operations:		*Change and view basic operational details*
• Default speeds		Edit default turning and forward speed. Modify speed units. This will become default on Home screen.
• Trip logs		View and reset logs. Distance / time / charge. Resettable trip & lifetime readouts
• Battery information		Last full charge / total charges / change icon.
• Edit clip rates		Edit five user defined rates. Edit clips per metre / name / add notes.
Machine Settings:		*Change and view machine settings*
• Machine name		Edit machine name
• Time / date		Edit time / date
• Screen brightness		Alter screen brightness
• Lock / unlock		Turn password on / off (stops users editing clip rates)
• Password		Change password code
• Download log		Download data to USB stick (additional cable and USB stick required)
Maintenance:		*Select and sign off daily / weekly / yearly checks.*
• Daily checks		Gives a list of daily checks. Log as complete once done.
• Monthly checks		Gives a list of monthly checks. Log as complete once done. Backlapping performed here.
• Yearly checks		Gives a list of yearly checks. Log as complete once done.
• Maintenance update		Shows last date checks were completed. Click button to expand log list.

Rate Selection		*Select your clip rate. Clip rate maintained even when speed altered.*	
	• Factory setting rate		Select as required. Screen returns to Home ready for operation.
	• Default rate		Select as required. Screen returns to Home ready for operation.
Information Screen		*View select manual pages, frequently asked questions and Howardson Group contact details. Top page shows machine type, software version, serial number and name.*	
	• Information		General machine information and pages from Operator Manual.
	• FAQ		Frequently Asked Questions.
	• Contact Information		Howardson Group contact details.
	• Factory Settings (Password protected)		For authorised personnel only - adjustment of various options.
Main Menu			
	• Service Icon (Yellow)		Monthly checks not completed and logged (see "4. Maintenance and Servicing" p.37).
	• Service Icon (Red)		Annual checks not completed and logged (see "4. Maintenance and Servicing" p.37).

6. Battery state of charge

Battery state of charge is shown either as a percentage, a visual battery indicator or both.

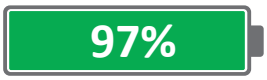
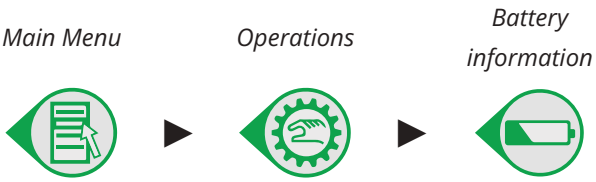


Fig. 5E - Battery icon

To toggle the percentage on/off and for further battery information:



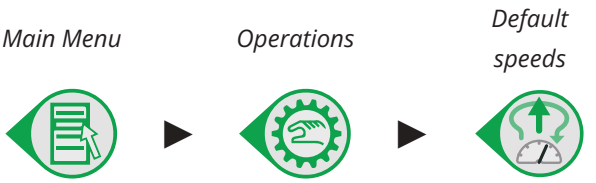
7. Transport mode

Choose this mode when moving the machine from its storage location to work site, loading onto trailers/ramps or moving between work sites. This mode caps the top speed at the value displayed.

Fig. 5F - Transport icon

As with the standard drive mode, the OPC requires to be depressed and throttle activated. Forward and reverse can both be used in transport mode, with the speed displayed on the screen.

To change units:



While transport mode is in use, cutting start/stop will not be available.

Motor braking is active in this mode, therefore trying to move the machine 'freewheel' (i.e. without throttle use) is not possible. Therefore it is ideal for when loading into vehicles or moving up ramps.

8 & 9. Trip information / Time & date

Centre of the screen shows the following information:

- Time
- Date (dd/mmmm/yy)
- Trip distance (since key on)
- Trip time run (since key on)
- Clip / RPM information (as applicable - see right)

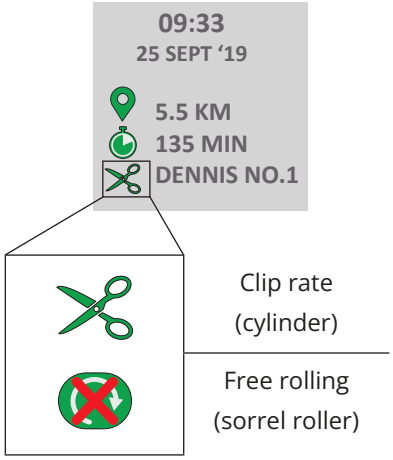


Fig. 5G - Trip information

3.1. Pre-Start Maintenance and Safety Checks

Before using the machine, ensure all maintenance checks are complete, as per ***"4.1. Maintenance Schedule" p.37.***

3.2. Power On and Shut-Down

WARNING - OPERATING RISKS

Prior to using the machine, ensure you read and understand this Operator Manual carefully. Failure to do so may result in personal injury and damage to the machine.

To turn your machine ***on***:

1. Insert the key into the barrel and turn to the ***on*** position (Fig. 6A).
2. Press and hold the start button (Fig. 6B) until an audible 'click' is heard (approximately three seconds). Release the button.
3. The display screen will show a start up sequence (Fig. 6C) until home screen appears (Fig. 5).
4. To shut-down the machine, turn the key switch to off (Fig. 6D) and remove the key.

Fig. 6 - Power on procedure

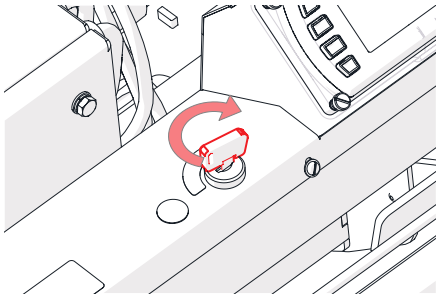


Fig. 6A - Key switch to on

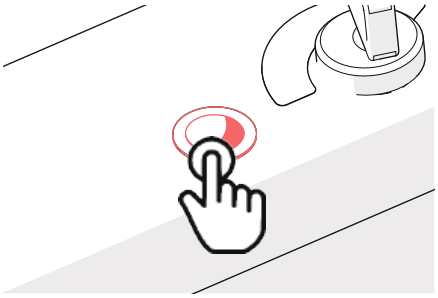


Fig. 6B - Start button

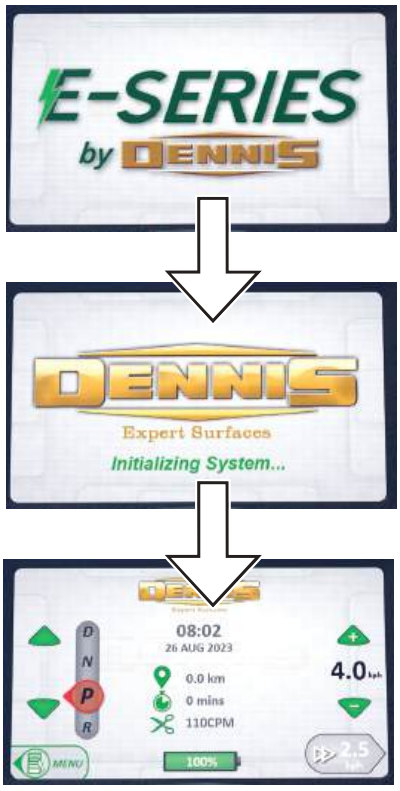


Fig. 6C - Start up sequence

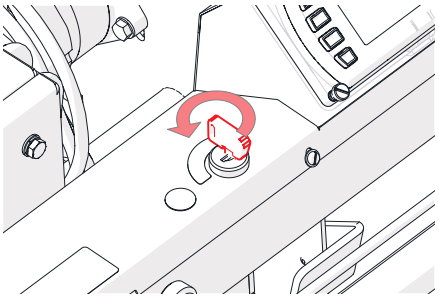


Fig. 6D - Key switch to off

3.3. Drive

3.3.1. Selecting Drive Mode and Moving

CAUTION - HANDLEBAR HEIGHT

Prior to moving the machine, set handlebar to the correct height. See *"4.3.1. Handlebar Height Adjustment" p.49*.

1. Release the parking brake (Fig. 7A).
2. On the display, select the drive mode required (Drive (D) or Reverse (R)) (Fig. 7B). The 'Drive start / stop' changes colour from grey to green.
3. Depress the OPC (Fig. 7C).
4. Use the DES to activate the drive unit (Fig. 7D). Alternatively select 'Drive start/stop' on the display screen.
5. To stop, release the OPC or return the DES to centre neutral position.

NOTE - DRIVING OVER HARD GROUND

When travelling over surfaces other than grass, tilt the machine backward to elevate the front roller, ensuring it travels solely on its rear roller. This avoids potential damage to the cylinder and blades.

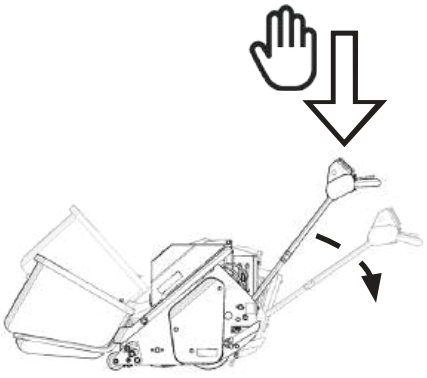


Fig. 7 - Driving procedure

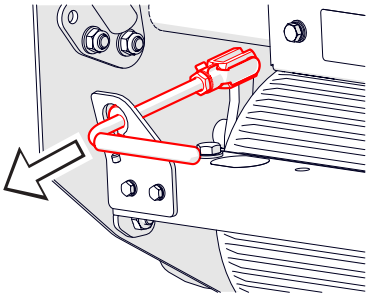


Fig. 7A - Parking brake release

Fig. 7B - Setting drive mode

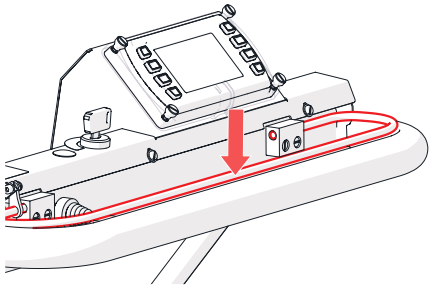


Fig. 7C - Depress the OPC

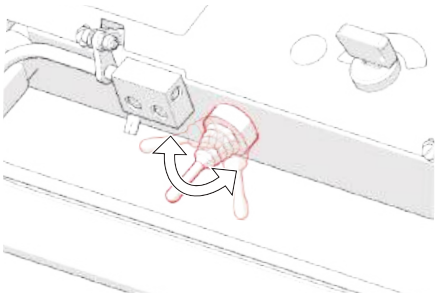
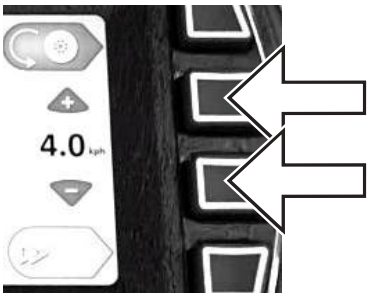


Fig. 7D - Using DES to select drive mode

3.3.2. Adjusting Drive Speed

- Adjust the drive speed by locating the speed icons on the right-hand side of the display. Increase (+) or decrease (-) accordingly. Single presses change in 0.1 km/h increments
- Changing speed can be actioned either prior or during moving.
- Speed units can be changed to either km/h, mph or m/s. Change units by going to: 'Operations > Default speeds'.



3.3.3. Operating on Slopes

WARNING - SLOPES

The machine operates best on flat ground. Follow the safety points below when operating on slopes:

- **Slopes can tip a machine over. Observe extreme caution. Check for obstacles or anything that may lead to instability (e.g. dips, bumps, uneven ground) prior to operating.**
- **There is no maximum operating machine slope angle; use personal judgement, taking into account surrounding environment and weather. If in any doubt, do not use on a slope.**
- **Operate across the face of a slope, never up and down.**
- **Avoid when wet as this can increase the risk of an accident occurring.**
- **Go slow; speed can increase the risk of an accident occurring. Take extra care when turning.**

3.4. Cutting Preparation

WARNING - CYLINDER SAFETY

- ***Always* turn the machine *off* before adjusting any part of the cylinder. Failure to do so creates a very high risk of cutting or damaging hands. *Always* wear hand protection.**

3.4.1. Adjusting Height of Cut (Cylinder)

Cut height is adjusted using the supplied setting bar and basic tools.

NOTE - HEIGHT OF CUT

- When adjusting both the height of cut and the shear blade setting, always set the shear blade first before modifying the height of cut. Doing the opposite way may result in a different height of cut than planned.
- Remember height of cut is affected by moisture of turf, weight of the machine and thatch density. We advise to set the height a little higher than your preference and reduce height by trial.

Tools required:

- 19 mm spanner
- Rule
- Setting bar

1. Turn the machine off and remove the key.
2. Remove the grassbox and fold the carry frame up.
3. On the setting bar, adjust the bolt against the rule until the distance between the underside of the bolt head and rule is that of the desired grass length. Secure with the nut [19 mm spanner] (Fig. 8A).
4. Tip the machine gently back so it rests on the rear roller and handlebar (Fig. 8B).
5. Two positions along the cylinder are

required to be measured and adjusted to result in an even cut. Choosing either end of the cylinder first, lay the setting bar across the front and rear roller. Correct height is achieved when the underside of the bolt head rests, or is level with, the lip of the shear blade (Fig. 8C). If it already is, then no further adjustment is needed. If not, then continue with step 6.

6. Loosen the top clamp nut of the roller quadrant [19 mm spanner] (Fig. 8D). Repeat on the opposite side quadrant.
7. Rotate the toothed gear to raise or lower the front roller. While doing this, position up the setting bar again between the front and rear roller. Stop adjusting when the head rests within the lip of the shear blade (Fig. 8E). Tighten lightly the top clamp nut.
8. Repeat step 7 for the second position on the other side of the cylinder (Fig. 8F).
9. Check the setting bar again for both sides. Adjust if necessary. Once at the desired height, tighten both top clamp nuts.
10. Lift the machine gently up to rest on its front and rear rollers. Unfold the grass box carry frame and return the grass box.
11. Normal use can now be resumed.

Fig. 8 - Adjusting Height of Cut

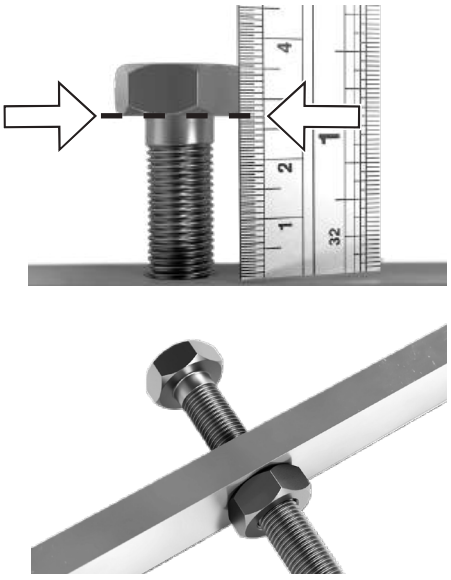


Fig. 8A - Adjust bolt to desired cut height and secure nut (above example set for 27mm)

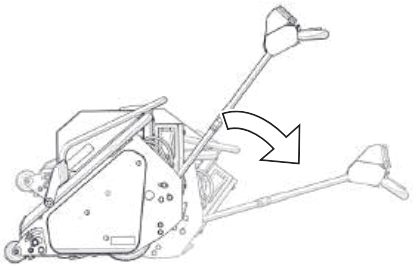


Fig. 8B - Gently tip the machine back

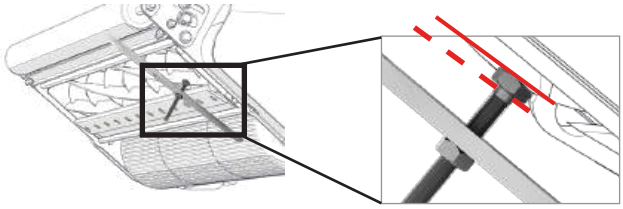


Fig. 8C - Position the setting bar and observe distance between the top of the shear blade and bottom on the bolt head. In this example, the underside of the bolt head is below (dashed line) the shear blade (solid line), indicating the machine cut height is currently too high and therefore needs lowering.

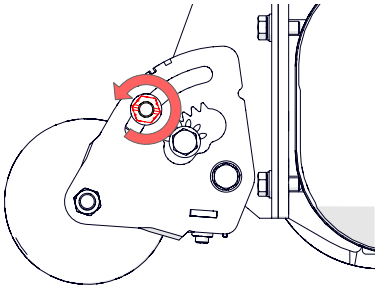


Fig. 8D - Loosen the top clamp nut of the roller quadrant

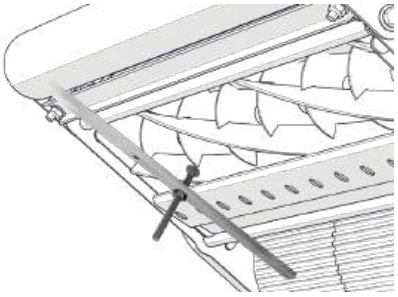


Fig. 8F - Repeat process on the other side

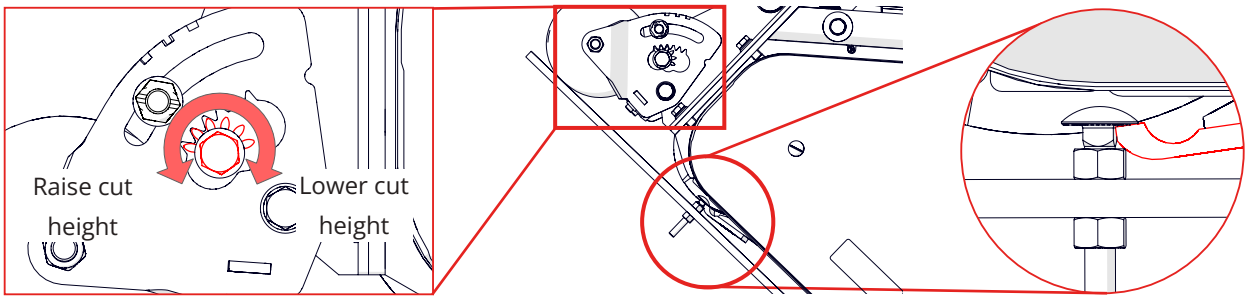


Fig. 8E - Rotate the toothed gear while offering up the setting bar. Stop when the head rests level/within the shear blade

3.4.2. Moving and Cutting

NOTE - HEIGHT OF CUT

Prior to cutting, set the cylinder to the correct cut height. See ***"3.4.1. Adjusting Height of Cut (Cylinder)" p.26.***

DANGER - POWER ON

Before turning the machine *on*, you *must* ensure the area is clear of people and obstacles, and all safety guards are present.

Hearing protection must be worn prior and during the cylinder in use.

1. On the display, set the drive mode to Drive (D) (Fig. 9A). The 'Drive start / stop' changes colour from grey to green.
2. Depress the OPC (Fig. 9B).
3. Press the 'Cutter start / stop' button to power on the cylinder (Fig. 9C).
4. Use the DES to power the drive motor. Alternatively select 'Drive start/stop' on the display screen (Fig. 9D).
5. To perform a gentle turn, exert pressure on the opposing side of the handlebar (i.e. LH to steer right, RH to steer left). For harder or 180º turns, tip the machine back slightly and use the DES on 'nudge'.
6. To stop the cylinder motor, release the OPC or press 'Cylinder start / stop'. Releasing the OPC will also stop the drive motor (Fig. 9E).
7. Return the DES to centre position.

Fig. 9 - Drive Procedure

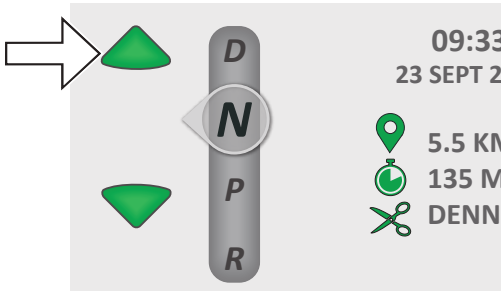


Fig. 9A - Setting drive mode

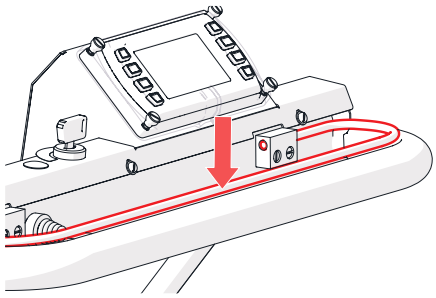


Fig. 9B - Depress the OPC

Fig. 9C - Power the cylinder unit on

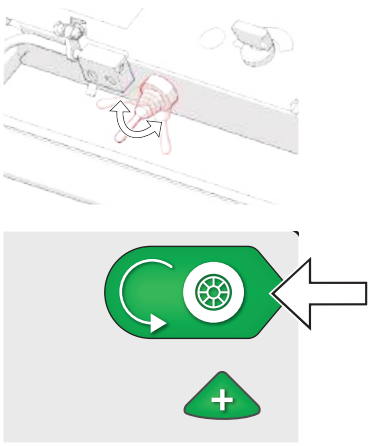


Fig. 9D - Activate drive with either the DES or drive start/ stop button

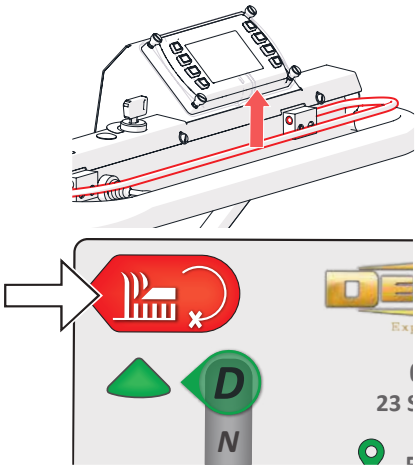


Fig. 9E - Stop the cylinder motor

3.4.3. Adjusting Clip Rate

Clip rate is the number of cuts made by the cylinder i.e. how often a cylinder blade passes over the shear blade, per metre. It is referred to as 'CPM' (Clips Per Metre) in the machine settings and can be set to several predetermined figures, as shown in the table below. The machine will automatically adjust the cylinder motor RPM based on machine speed, ensuring that the selected clip rate is always maintained. This creates an even and uniform cut regardless of the operator or walking speed.

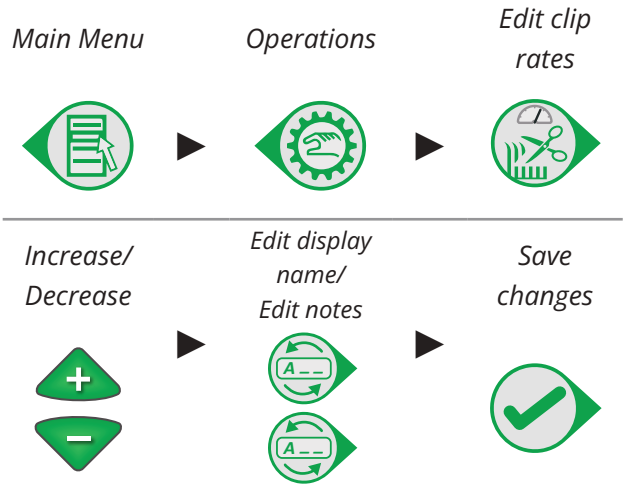
The CPM needs to be adjusted based on various factors, including but not limited to, cylinder blade number, ground conditions (e.g. moisture, slope etc), grass length and grass species - use professional judgement to determine which CPM to use. Incorrect clip rates can lead to poor surface finish and clipping collection.

	Cylinder (6 or 8 blade)
CPM options	85, 90, 95, 100, 105, 110

To adjust the clip rate of the cylinder, from the display screen, follow either method below:

Method 1:

Method 2:



Once the clip rate/RPM is set, it will remain fixed until it is manually altered again (even after turning the machine off).

3.4.4. Cutting Technique

There is no set technique for cutting as it will suit individual circumstances. However we recommend the following:

- Mow in straight lines - turning while cutting may damage the turf and produce an inferior quality of cut.
- To perform a turn, press the handlebar down to lift the front of the machine before applying force to the left/right side along with DES 'nudge'.
- Mow at a standard walking pace - alter the speed via the display screen to achieve this.
- Do not cut for too long in a single spot or without cutting grass. This can damage the grass and increase blade wear.
- Avoid cutting more than one third of the grass blade. Doing so can increase the risk of disease and stress for the plant.

3.5. Batteries and Charging

3.5.1. Safety Information

Follow the battery and charging guidance below to avoid damage and injury risk:

- ***Always*** use the charger supplied with the machine. Never attempt to charge the machine from any non-OEM charger.
- ***Always*** read the OEM Operator's Manual supplied with the charger. Additional information is supplied in that document which is not included in this manual.
- ***Always*** charge the battery in a well ventilated area, away from flammable materials.
- ***Always*** inspect the batteries and chargers regularly for signs of damage. If you see any physical damage (such as swelling or leakage), immediately stop using the machine and follow *"2.5. Display Screen" p.19*. Replace the battery.
- ***Never*** attempt to disassemble, repair or modify either the battery or charger.
- ***Never*** immerse the battery or charger in water or allow condensation to occur within the unit.
- ***Never*** touch the battery or charger with wet hands.
- ***Never*** expose the battery or charger to fire or open flame.
- ***Never*** strike or puncture the battery or charger.
- ***Never*** expose batteries or chargers to extreme temperatures, direct sunlight or moisture.
- Take care handling batteries to avoid damage. Use protective equipment when handling damaged or leaking batteries.

- Do not open the unit, puncture, crush, incinerate, immerse in water, short circuit, force discharge or expose to temperatures above the declared operating temperature range of the product. Risk of fire or explosion.
- Avoid contacting the batteries and fluid with eyes, skin or clothes. In the event of a spill, flush with water and seek immediate medical help.
- Keep children and unauthorised personnel away from this unit.

3.5.2. Battery Specifications

For battery and charger specification, see *"2.1.2. Specification Table" p.12* and on the battery and charger themselves.

The battery is retained within the chassis and must not be removed except for servicing and replacement purposes.

3.5.3. Battery Management System

A battery management system (BMS) is integrated into the battery. It is an electronic system that monitors the battery cells and controls several components to ensure a safe and optimised battery. This prevents against problems such as over/undercharging, reduced capacity and overheating.

No operator input is required and it runs automatically.

3.5.4. Charging Instructions

Follow the charging instruction below for correct and safe use:

1. Position the machine within range of the charger - the charger-to-machine lead can extend a maximum of 2 m, with an additional 1.5 m power lead from the wall outlet to the charger. Activate the parking brake and keep the machine switched ***on***.
2. Plug the charger into the power supply. Ensure power is live by checking the charger lights are illuminated (Fig. 10A).
3. Open the charging cover on the machine by twisting quarter turn anti-clockwise. Connect the charger into the mower - this will only connect one-way round (Fig. 10B).
4. The machine display screen will now show the machine is in charge mode. The charger will also show a solid red light to indicate charging in progress (Fig. 10C).
5. Once the battery reaches 100%, the red light on the charger will be replaced by a green light (Fig. 10D).
6. Unplug the charger from the machine. Close the charging cover.
7. Normal use can now resume.

Fig. 10 - Charging instructions

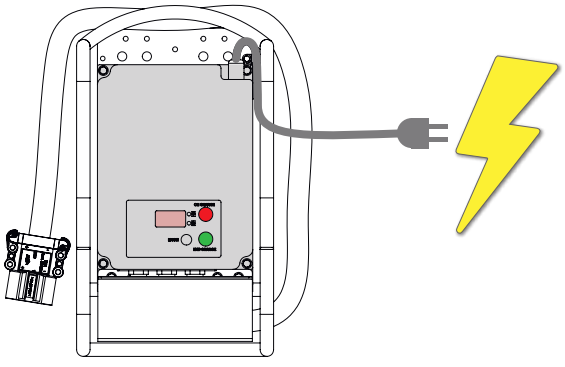


Fig. 10A - Plug the charger into the mains socket

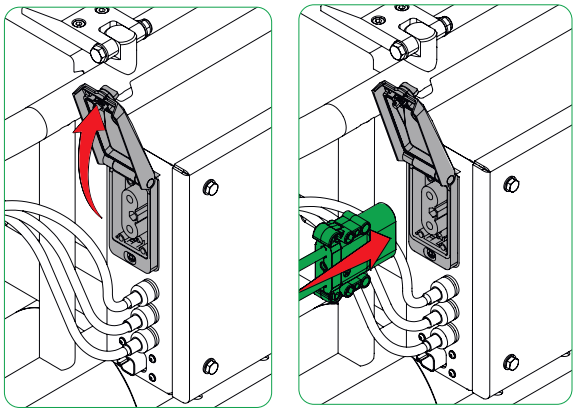
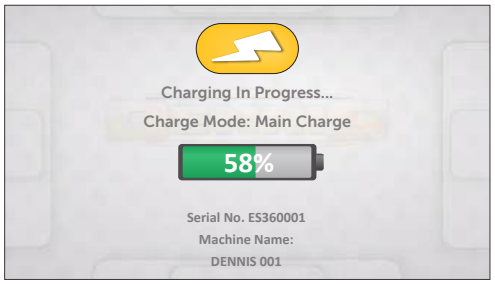


Fig. 10B - Plug the charger into the machine



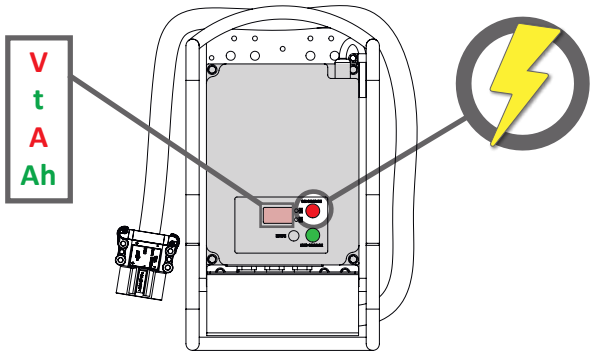


Fig. 10C - Check the charger indications

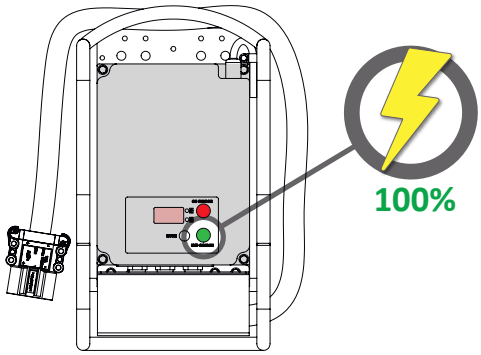


Fig. 10D - Wait until fully charged

CAUTION - BATTERY REMOVAL

Batteries are fixed and are not designed for removal. They must only be removed when being serviced by authorised personnel.

3.5.5. Low Power Mode

We recommend to keep the machine above 20% charge to avoid long term battery degradation. On reaching 3% the machine will enter 'low power mode' whereby the cylinder motor will stop and only the drive motor remains. This is shown on the display screen as a low power battery symbol in the position of the cut start/ stop symbol.

At this point you must return to the charging station and charge the battery before commencing any further.

3.5.6. Battery and Charger Tips

- Charging to 100% is not necessary; also known as 'opportunity charging', the battery can accept small durations of charge without degradation. It is safe to remove the charger at any point during the charge cycle.
- We recommend to unplug the charger once charging has been completed. Until this point however, the BMS will monitor and regulate the battery to prevent overcharging and to maintain a full battery.
- Store with a battery State of Charge (SoC) between 40–60%, in temperatures between -+5°C to +25°C. For further storage guidance, see *"4.6. Storage" p.52.*

3.5.7. Self-Discharge

Lithium battery packs will self-discharge over extended periods of time without maintenance. Once lithium-ion cells discharge below a certain voltage they become unusable and must not be discharged further (i.e. deep discharge state).

Regular monitoring and maintenance is essential for long storage or idle periods - see *"4.6. Storage" p.52*. Howardson Group will not be held responsible for damage due to neglect.

A battery reaching a 'deep discharge' state will not be recoverable and must be replaced.

3.5.8. Battery Disconnection

To disconnect the battery, open the battery cover using a 5 mm hex key and locate the positive and negative battery terminals. Press the release button located on the side of the terminal head and pull upwards. Stow the cables safely away.

On reconnection. Insert positive to positive and negative to negative leads. An audible 'click' will be heard to indicate a secure connection. Secure the battery cover.

3.5.9. Electrical Box

The electrical box is located at the rear of the machine and contains sensitive machine control components. Accessing the electrical box will void your warranty and is reserved only for Howardson Group or authorised personnel.

WARNING - RISK OF SHOCK

Opening the electrical box will void the machine warranty. If there must be access, then *always* disconnect the battery before opening due to risk of electrical shock and short circuiting.

3.5.10. Replacement and Disposal

The machine's lithium battery has a limited lifespan and it will gradually lose its capacity to hold charge. This lifespan will depend on the management and maintenance of the battery, and it will ultimately require replacement.

It is recommended to replace the battery when:

- The battery has reached a deep discharge state (typically ≤40V) or does not power the machine on at all despite being charge (i.e. 'dead' battery).
- The battery has visible signs of deterioration, such as leaking, swelling and corrosion.
- The battery gets excessively hot while charging or in use.
- The battery has a noticeably reduced run-time compared to new.
- Charge time increases significantly, or the battery struggles to hold a charge for a sustained duration.

Follow local regulations for the disposal and recycling of batteries. Dispose of at a suitable recycling facility.

Replace batteries with genuine Dennis replacement.

CAUTION - BATTERY PRECAUTIONS

- **Wear suitable PPE including gloves and safety glasses.**
- **Never touch leaked materials, avoiding contact with skin and eyes. Rinse immediately with water and seek medical attention if necessary.**
- **Secure the working area with appropriate warning notices.**

The chemicals in the battery are contained in a sealed package. Exposure to the contents will not occur unless the battery leaks, is exposed to high temperatures or is mechanically, physically, or electrically abused. However, in case of battery leakage:

1. Wear suitable PPE including gloves and safety glasses.
2. Release the parking brake and carefully move the machine to a well ventilated area (do ***not*** turn the machine ***on***).
3. Remove the battery, taking care to avoid tipping or shaking. Place into a clear plastic bag with sand or vermiculite. Label as hazardous.
4. Use a neutralising solution (such as white vinegar) on a cloth to remove leftover residue.
5. Dry thoroughly and dispose of cloths.
6. Safely dispose of the battery.

3.6. Operating Environment

The machine has been designed to be used on fine turf and meeting the demands of day-to-day use. The following operating conditions shall also be observed:

Temperature:
Use between -20 to +40°C. Usage in the upper and lower limits of this range will affect performance and battery life. It will also have an impact on the quality of cut and subsequent issues*. Operators must take necessary precautions against temperature, such as sun protection and suitable clothing. **The machine can operate beyond the temperature range of the optimum for grass cutting. Grass is best cut between 10-30°C.*
Humidity:
Use between 30–70% RH. High humidity can lead to rust and corrosion on metal parts. It can also lead to fungal diseases on the grass after cutting. Low humidity can lead to wilting and browning of the grass after cutting.

Weather:
Use in dry conditions. This avoids damage to motor components and traction hazards caused from slippery grass. Cutting wet grass leads to poorer cut quality, clumping and reduced collection into the grass bag. This results in additional cleaning of the machine . Compaction of the soil is more likely with wet weather. Operators must take necessary precautions against the weather, such as sun protection and suitable clothing.
Terrain/Slope:
Ensure the ground is firm and preferably dry. Soft or wet ground can cause manoeuvrability problems. There is no maximum slope angle, however use professional judgement when using on slopes (see ***"3.3.3. Operating on Slopes" p.26.)*** Free from obstacles and obstructions, including rocks, branches and debris.
Dust and particulate:
Avoid dusty or sandy conditions. Such environments can damage the machine and be hazardous to the operator.
Vibration and Shock:
Keep vibration and shock to a minimum to avoid damage to machine components. This includes, bumps, pot holes and kerbs. Store the machine away from passing traffic and avoid transporting over rough ground - lower gently over kerbs or use alternative routes.
Lighting Conditions:
Use the machine in good lighting conditions, either natural or artificial. This allows for the safe operation of the machine.
Safety Zones:
Other than the operator, all other personnel must keep their distance from the machine during use. This must be maintained by the operator to keep the zone free.

3.7. Emergency Procedures

3.7.1. In the Event of a Breakdown

WARNING - MACHINE BREAKDOWN

- **Take full care and attention while investigating the cause of a fault. Where possible, wear suitable PPE including gloves and safety glasses.**
- **Never touch leaked materials, avoiding contact with skin and eyes. Rinse immediately with water and seek medical attention if necessary.**
- **Secure the working area with appropriate warning notices.**

Regular service and maintenance will prevent the majority of machine breakdowns. The below procedure outlines the immediate actions if the machine fails to function entirely. If the machine is not working as intended and a minor issue, refer to ***"4.8. Troubleshooting & FAQ" p.53.***

In the event of a breakdown:

1. Turn the machine ***off*** and remove the key.
2. If possible, move the machine to a safe area where further investigation can be carried out. If the machine cannot be moved, clearly label it as 'faulty' and cordon around the machine to mitigate unauthorised personnel from accessing the machine.
3. If there are oil leaks, immediately clean up and adsorb with appropriate materials.
4. Once in a safe area or in a serviceable state, open the battery cover and disconnect the battery. Inspect the machine for any obvious defects.

- If the cause is related to the drive roller, check the drive motor for damage or loose connections. Remove both guard covers and inspect the drive chain and parking brake mechanisms. Ensure in good condition.

- If the cause is related to the cylinder, check the cylinder motor for damage or loose connections. Remove the LH guard cover to inspect the belt and mechanisms for good working order - see ***"4.2.1. Belt/Chain Replacement and Tensioning" p.40*** for reference.
- Do not attempt repairs beyond basic troubleshooting unless qualified. Full repairs to be carried out by qualified service engineer and documented accordingly.

5. If the source of the breakdown cannot be found, contact your Dealer or Howardson Group for further information.

3.7.2. Hazardous Substances and Fire

No hazardous substances are emitted by the machine during use. However the lithium-ion battery contains hazardous substances which would be toxic if it were to leak or catch fire.

In the event of a fire, use a suitably rated fire extinguisher which can be used on lithium batteries and electronics.

- Lithium battery - use a specialist Lith-Ex fire extinguisher,
- Electrical components - use a suitable electric-safe fire extinguisher, such as CO_2.

Only attempt to extinguish the fire if you are trained and it is safe to do so. Personal safety must always come first.

4.1. Maintenance Schedule

WARNING - CORRECT MAINTENANCE

Following the schedule set out below will prolong the life of your machine and deliver high performance.

Failure to carry out these checks at the specified intervals will result in damage to your machine and possible injury to personnel. If you are unsure of anything, contact Howardson Group or your Dealer.

Not servicing your machine correctly will invalidate your warranty. Always use genuine Dennis parts when servicing and replacement.

The following checks must be actioned as per date or running hours, whichever comes first. Ensure checks are performed in an appropriate area (such as a workshop), and not on the playing surface due to risk of containments/oil. Complete checks with the machine ***off***.

Service kits are available for the machine - see ***"Appendix B. Service Kit" p.56.***

Maintenance Check	Daily		Weekly 25hr	Monthly 100hr	6-monthly 600hr	Annually 1,200hrs
	Pre-use	Post-use				
Electrical (inc. battery)						
Check condition of the following for signs of damage: • Drive motor outer casing • Cylinder motor outer casing • Battery • Charge port cover and latch (and can close securely) • Display screen	•	•				
Check condition of cabling/harness for signs of damage and fraying.	•	•				
Check the battery level has enough charge for the intended session. Always keep the battery above 5% (47.6 V)	•	•				
Check no damage to the battery (corrosion etc).			•			
Check the charging port opens/closes correct and secures with the latch.			•			
Check no damage to the charger and it powers on correctly.			•			

Maintenance Check	Daily		Weekly 25hr	Monthly 100hr	6-monthly 600hr	Annually 1,200hrs
	Pre-use	Post-use				
Cylinder 						
Check cylinder and shear blade for wear or damage (impact, dents, material cracking and excessive thinning). Replace or re-grind worn blades. **Replace damaged blades.**	•	•				
Check the cylinder spins freely, with no grinding or metal-on-metal contact noises (***always*** turn the machine ***off*** first).	•	•				
Check the quality of cut. Adjust the shear blade if required.	•	•				
Grease cylinder bearings and shear blade adjuster block[1].			•			
Adjust the metal deflector.	*As required*					
Chassis						
Check all guards are fitted correctly.	•					
Visually check all fixings (secure and in place).	•					
Check the cutting height is set correctly.	•					
Check the grass box is fitted correctly.	•					
Clean off all grass cuttings from bodywork.		•				
 Clean off all grass cuttings from the cylinder blade (ensure the machine is turned off first. Use a long handled brush).		•				
Check front roller bushes and bearings for wear. Replace if necessary.			•			
Remove both guards and visually check condition of drive chain/belt. Adjust/ replace if required *(check within first 20hrs and after replacement)*.				•		
Check condition of rear roller bearings and bushes. Replace if necessary.					•	
Renew oil in rear rollers[2]						•

Maintenance Check	Daily		Weekly 25hr	Monthly 100hr	6-monthly 600hr	Annually 1,200hrs
	Pre-use	Post-use				
Controls						
Check the following for signs of damage and that they operate freely: • Key switch • OPC • Emergency stop • Parking brake.	•	•				
Check the DES works in both nudge and latch positions.	•	•				

[1] See section *"4.2.7. Greasing points" p.48*

[2] See section *"4.2.6. Changing Rear Roller Oil" p.47*

4.2. Servicing Instructions

WARNING - SAFETY

- **You *must* turn the machine *off* before service work. Failure to do so may cause major injury.**
- **Always wear suitable PPE for the job at hand.**

CAUTION - SERVICE LOCATION

When servicing the machine, position in a suitable environment for working on (for oil spills etc) and if planning leaving for extended periods.

4.2.1. Belt/Chain Replacement and Tensioning

The procedure and illustrations below describe the removal of the drive chain, however the cylinder belt is removed using the same method and tools. Behind the RH cover is the drive motor chain and behind the LH cover is the cylinder belt.

Tools required:

- Slotted screwdriver
- Spanners: 13 mm (x2) and 17 mm
- Replacement belt/chain (*if required, cylinder belt p/n SP11086, drive chain p/n SP11148)*

1. Turn the machine ***off*** and remove the key.
2. Remove 3 x outer screws of the LH/RH cover [slotted screwdriver] (Fig. 11A) and keep the cover to the side.
3. Loosen slightly the 3 x top nuts supporting the motor [2 x 13 mm spanner] (Fig. 11B).
4. Loosen slightly the central nut supporting the tensioner block/motor [2 x 13 mm spanner] (Fig. 11C).
5. While supporting the weight of the motor and chain/belt, loosen fully the tensioner block lock nut [17 mm spanner] below the tensioner block and lower (Fig. 11D & Fig. 11E).
6. Replace the chain/belt, if required (Fig. 11F).
7. Slide the entire motor assembly up until the chain/belt is taut. Tighten the tensioner block lock nut [17 mm spanner] (Fig. 11G).
8. Check the tension of the chain/belt. There must be no more than 10 mm deflection (chain) or 90º twist (belt). Re-adjust the locknut if necessary (Fig. 11H).
9. Tighten the nut supporting the tensioner block [2 x 13 mm spanner] (Fig. 11I).
10. Tighten the 3 x top nuts [2 x 13 mm spanner] supporting the motor (Fig. 11J).
11. Double check the deflection/twist tension of the belt. There must be no more than 10 mm (chain) or 90º (belt).
12. Attach the LH/RH cover [slotted screwdriver].
13. The machine is now ready for use.

Fig. 11 - Drive belt replacement / tensioning

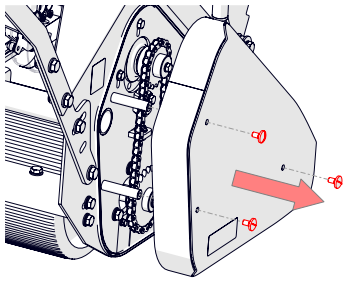


Fig. 11A - Remove 3 x outer screws and cover.

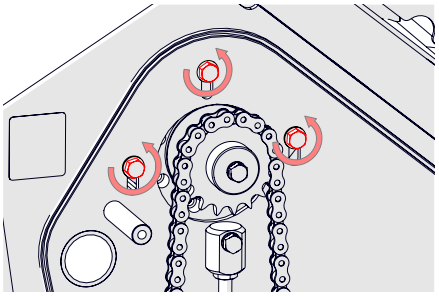


Fig. 11B - Loosen slightly the motor 3 x top nuts.

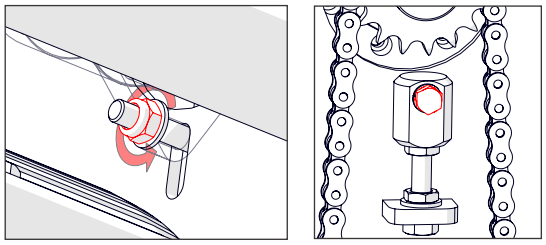


Fig. 11C - Loosen slightly the tensioner block/motor nut.

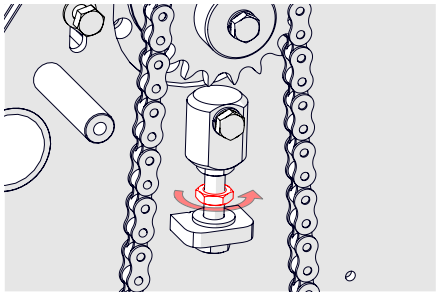


Fig. 11D - Loosen fully the tensioner block locking nut.

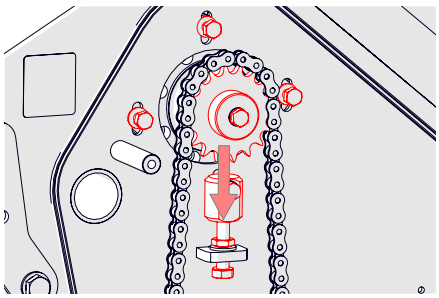


Fig. 11E - Support the weight and lower.

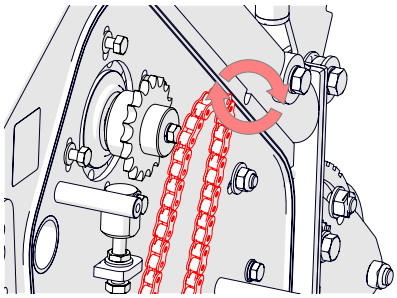


Fig. 11F - Replace the belt.

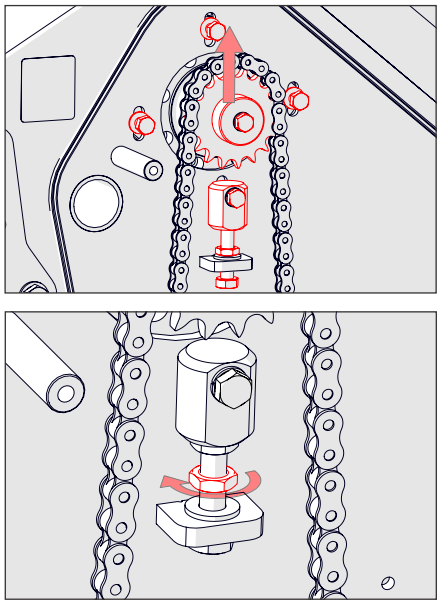


Fig. 11G - Tighten the belt and tensioner block locking nut.

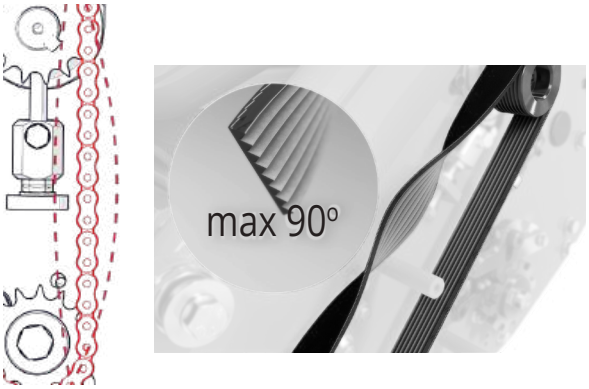


Fig.11H - Check the amount of deflection in the chain (8-10 mm) / belt twist tension

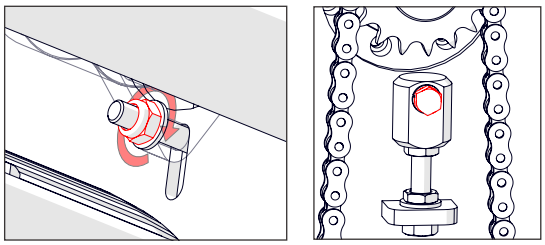


Fig. 11I - Tighten the tensioner block/motor nut.

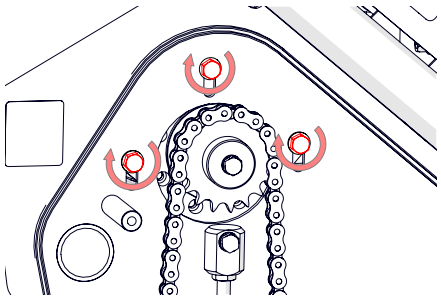


Fig. 11J - Tighten the motor 3 x top nuts.

4.2.2. Removing the Cylinder

The cylinder will need removing for replacement or for re-grinding, but for most of its working life it will remain fixed in the machine.

WARNING - SAFETY

- **You *must* turn the machine *off* before service work. Failure to do so may cause major injury.**
- **Always wear safety gloves when carrying out work on the cylinder.**

Tools required:

- Slotted screwdriver
- Spanners: 13 mm (x2), 17 mm and 19 mm

1. Remove the cylinder drive belt, following steps 1-6 in ***"4.2.1. Belt/Chain Replacement and Tensioning" p.40.***
2. Remove the cylinder drive pulley [19 mm spanner] (Fig. 12A).
3. Remove the pulley spacer and keyway (Fig. 12B).
4. Remove the 2 x M10 nuts from each side of the machine securing the deflector plate [17 mm spanner] (Fig. 12C). Remove the two bolts and slide the deflector out from the top (Fig. 12D).
5. Remove the R-clip from the clevis pin securing the shear blade adjuster from each side of the machine (Fig. 12E).
6. Remove the 2 x M12 top bolts [19 mm spanner] and saddle washers from both sides of the machine securing the shear blade adjuster block (Fig. 12F).
7. For both sides, remove the clevis pin from where the R-clip was removed. Remove both pivot blocks and adjusters away from the machine (Fig. 12G).
8. Support the shear blade carrier and remove the 2 x M10 bolts of the left hand shear blade carrier [17 mm spanner] (Fig. 12H). Lower that side to the floor gently.
9. Support the shear blade carrier and remove the 2 x M10 bolts and 1 x M8 bolt of the right hand shear blade carrier [17 mm & 13 mm spanner] (Fig. 12I). Remove the plate and cam bolt. Lower the whole carrier to the floor gently.
10. Tip the machine back to gain access to the underside. Remove the shear blade carrier (Fig. 12J).
11. Tip the machine forwards onto both rollers.
12. Remove the 3 x M8 bolts supporting the left hand cylinder bearing [13 mm spanner] (Fig. 12K).
13. Insert a piece of wood or similar though the cylinder and wedge it against the front roller to stop it rotating. Remove the 3 x M8 bolts supporting the right hand cylinder bearing [13 mm spanner], and the central cylinder bolt [19 mm spanner] (Fig. 12L). Support the cylinder and lower to the floor.
14. Tip the machine back to gain access to the underside. Remove the cylinder (Fig. 12M). It is now free to be replace/re-ground.
15. When inserting a cylinder, refer to ***"4.2.1. Belt/Chain Replacement and Tensioning" p.40.*** to aid in reapplying the belt and tensioning.

Fig. 12 - Cylinder Removal

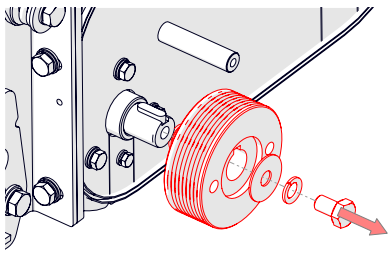


Fig.12A - Remove the cylinder drive pulley

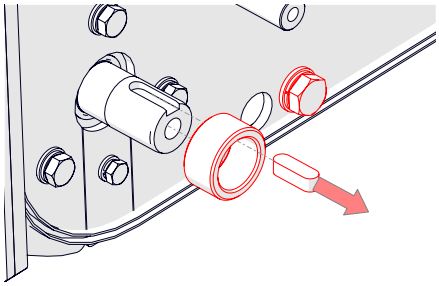


Fig.12B - Remove the pulley spacer and keyway

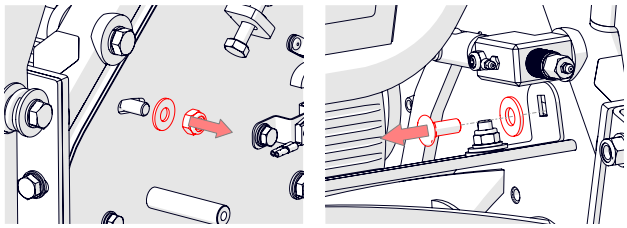


Fig.12C - Remove the deflector plate bolts

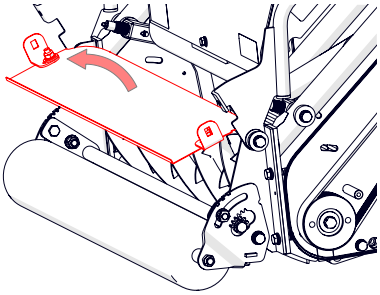


Fig.12D - Slide the deflector plate out

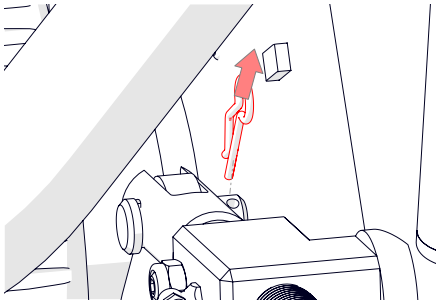


Fig.12E - Remove the shear blade R-clip

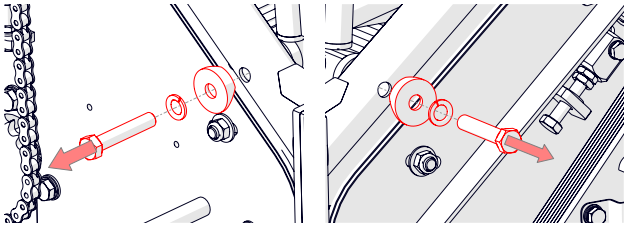


Fig.12F - Remove the shear blade top bolt and saddle washer

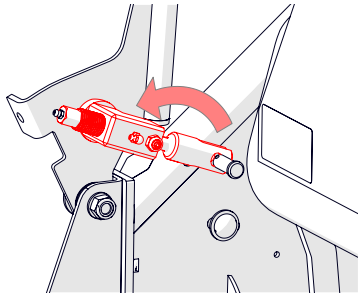


Fig.12G - Remove the pivot block and adjuster

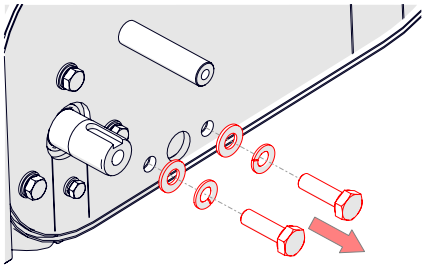


Fig.12H - Remove the LH 2 x shear blade bolts

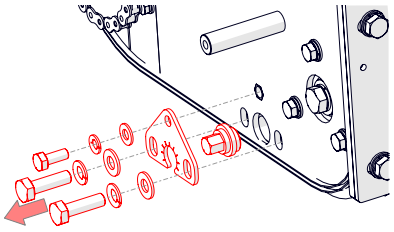


Fig.12I - Remove the RH 3 x shear blade bolts and cam

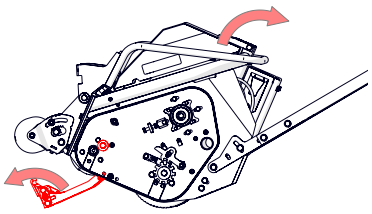


Fig.12J - Remove shear blade assembly

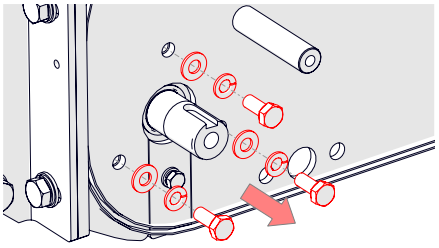


Fig.12K - Remove bolts from LH cylinder bearing

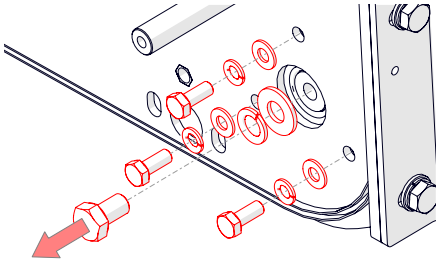


Fig.12L - Remove bolts from RH cylinder bearing, and central shaft

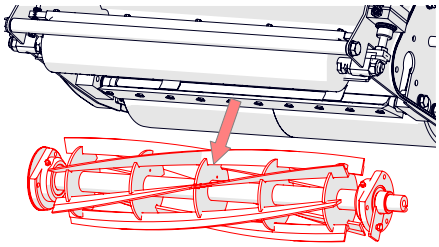


Fig.12M - Remove the entire cylinder and bearings from the machine

4.2.3. Backlapping

Cutting blades will become blunt over time, producing an inferior quality of cut. Backlapping is the method of sharpening both the cylinder and shear blade simultaneously using a grinding compound while running the drive in reverse. This maintains a temporary sharp edge on the blades to prolong their life, however it is not a substitute for a true grind. Do ***not*** backlap on damage blades or those beyond repair.

Grinding paste is required to achieve the sharpening of the blades. Three grit types are commonly available (80/120/220 grit) - the type chosen should be based on blade number, wear and expected use.

WARNING - BACKLAPPING

- ***Always*** **wear suitable PPE, including eye protection and gloves.**
- ***Always*** **use a long handled brush. This minimises risk of close contact with the spinning cylinder.**
- **Backlap in a suitable area where the paste can be washed away afterwards. The paste can splatter so ensure a distance is maintained around the machine.**

Tools required:

- Long handled brush
- Back lapping paste

1. Turn the machine on.
2. Tip the machine gently back so it rests on the rear roller and handlebar. This will expose the underside of the cylinder, with the shear blade pointing in an upwards direction. Chock the rear roller to stop unintended rolling.
3. Apply a small amount of grinding paste

along the whole length of each blade using a long handled brush.

4. Return to the display screen and navigate to the backlap menu:

Main Menu ▶ *Maintenance* ▶ *Monthly*

Start/stop backlap icon

5. Press the start/stop backlap icon. This will power on the cassette motor in reverse. This should be continued until a sharp lip is achieved on the leading edge of each cylinder blade. This may take a few minutes - stop periodically to check the edge and reapply paste as necessary.
6. When backlaping is complete, all grinding paste must be cleaned off the cylinder. This can be achieved with a low powered hose or a sponge and bucket of water. Failure to clean thoroughly will result in accelerated wear while cutting.
7. Return the cassette to the machine. The machine will now need the shear blade adjusting to account for the change to the cylinder, ***"4.3.2. Shear Blade Adjustment" p.49.***

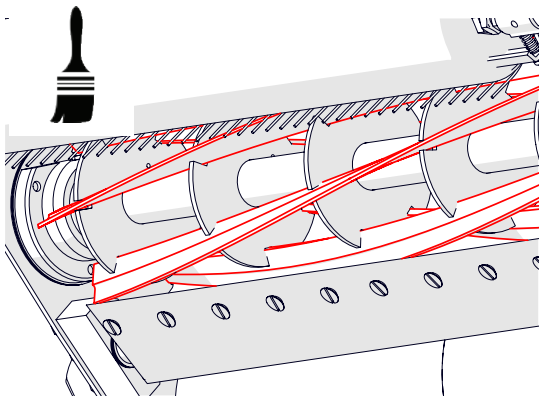


Fig. 13 - Backlapping

4.2.4. Grinding Cutting Blades

Grinding, as with backlapping, restores the sharp edge of the blades, allowing for a clean, precise cut. Grinding is highly recommended to maintain optimal performance and extend the life of the cutting cassette. However unlike backlapping, this method creates an 'as new' sharp edge, rather than a temporary honed one.

Grinding is recommended when paper does not cut cleanly from the shear blade test, or when backlapping does not achieve the sharp edge required (usually caused by the edge being rounded too far beyond the capabilities of backlapping). Grinding can also help restore the cylindrical shape of the cylinder, which without, would be seen in poor grass cutting quality and streak marks.

Two grinding methods are performed on our cutting cylinders - spin and relief. As standard, all Dennis cutting cylinders are spun ground, with those of eight blades or more having an additional relief grind. Relief grinding is the process of removing material from the back of each cylinder blade to create a slight angle (i.e. the 'relief').

This relief angle produces a number of benefits:

- Improved cutting quality.
- Increased efficiency: Relief ground cylinders have been shown to reduce the power required to achieve a cut, thereby reducing energy consumption. This is achieved from less friction between the cylinder and shear blade.
- Less wear between the cylinder and shear blade resulting in:
  i. Longer blade life for both cylinder and shear blades.
  ii. Less cylinder/shear blade adjustments.
  iii. Less backlapping maintenance.
- Longer service life of adjacent moving parts, such as bearings and gears.

Factory standard relief grind is 50% land area at 30 degrees (see Fig. 14). It is recommended to grind to these values.

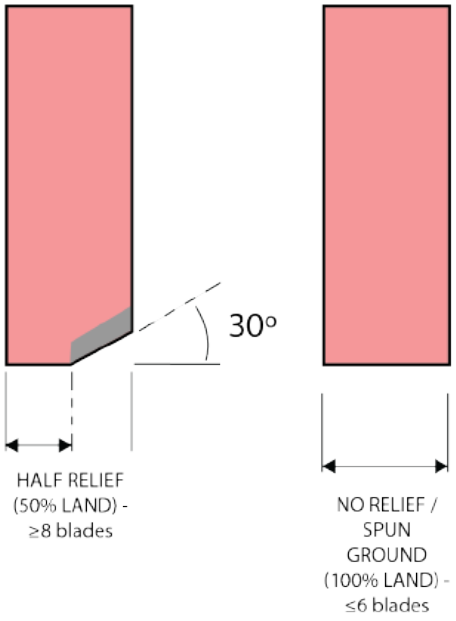


Fig. 14 - Recommended cylinder grind angle

Shear blades also need to be ground, ideally at the same time as the cutting cylinder. It is important to include a relief grind as this helps present the grass at the correct height for cutting. Without this, using a flat or positive front angle can lead to inconsistent cutting heights and an uneven grass surface (see Fig. 16).

Factory standard is a front angle of -10º and top angle of -8º, as shown in Fig. 15.

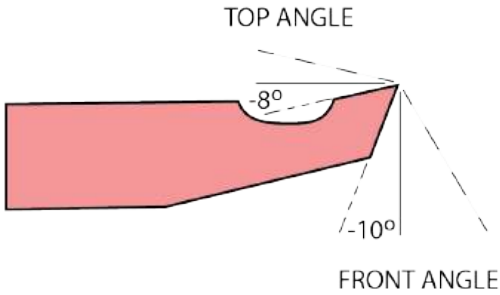
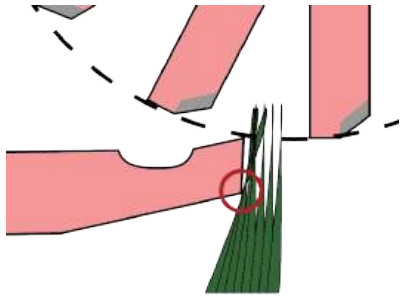
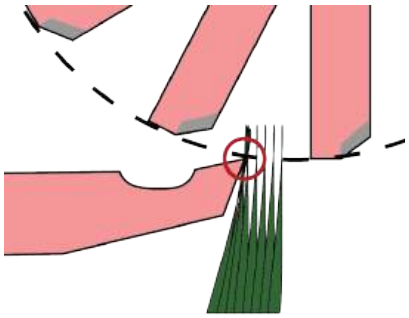


Fig. 15 - Recommended shear blade grind angle



Flat front angle



Negative front angle

Fig. 16 - Illustration of two different shear blade angles and their grass contact point

For any method of grind, you must use a professional grinding service or dedicated grinding machine. Fail to do this may result in a far inferior cut and increased risk of injury.

4.2.5. Checking/Tensioning Parking Brake

If the display screen shows the parking brake as engaged when it has been disengaged, there could be a problem with the micro-switch or brake disc which requires further investigation:

Tools required:

- Slotted screwdriver

1. Turn the machine ***off*** and remove the key.
2. Chock the front and rear rollers.
3. Remove 3 x outer screws of the LH cover [slotted screwdriver] and keep the cover to the side.
4. Operate the parking brake lever and look to see:

- The cut-out of the brake hammer engages with the cut-outs of the brake disc (Fig. 17A).
- The end of the brake hammer presses the micro-switch sufficiently when depressed (Fig. 17B).

Fig. 17 - Parking Brake Check

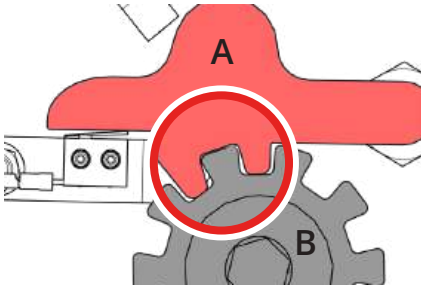


Fig. 17A - Brake hammer (A) engaging correctly with the cut-outs of the brake disc (B).

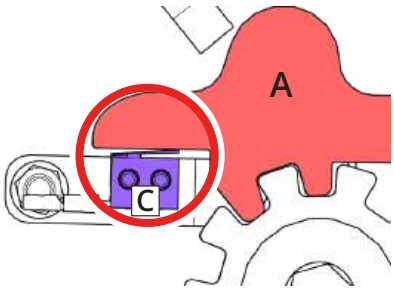


Fig. 17B - End of the brake hammer (A) presses the microswitch (C).

4.2.6. Changing Rear Roller Oil

To replace the oil in the rear roller:

Tools required:

- Lifting jack, raised platform or another method to raise the machine
- Wooden chocks
- Hex socket (8 mm)
- Oil tray (volume >1.0 L)
- Oil absorbent pads
- Oil (grade EP90) - 0.4L
- Oil funnel and tube, or similar

1. Turn the machine ***off*** and remove the key.
2. Chock the front rollers. Lift the rear of the machine enough to gain clearance for 8 mm hex socket and oil tray.

CAUTION - MACHINE SUPPORT

Ensure the lifting mechanism/support for the machine is in good condition and suitably rated. Raise on a flat, solid surface.

3. Place oil absorbent pads down under the roller along with an oil tray.
4. Rotate the central roller until the drain hole is pointing downwards (Fig. 18A & Fig. 18B).
5. Remove the tapered plug [8 mm hex socket] and let the oil drain.
6. Once fully drained, rotate the roller until the drain hole is pointing rearwards and above horizontal.
7. Fill the roller with the correct grade/quantity of oil using the funnel/tube or similar.
8. Insert the tapered plug - do not over-tighten. Remove the oil absorbent pads and trays and dispose of in a responsible manner.
9. Lower the machine. The machine is now ready for use.

Fig. 18 - Rear roller oil

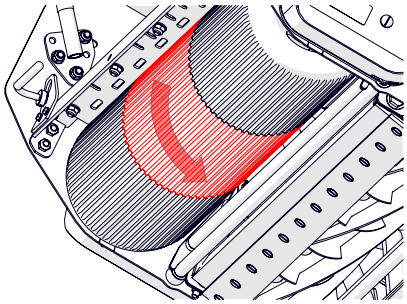


Fig. 18A - Rotate central roller.

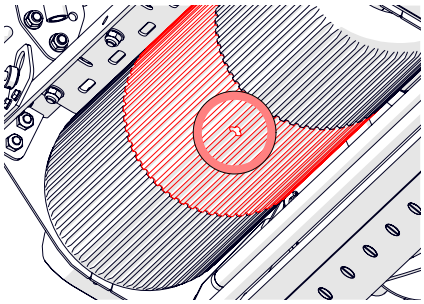
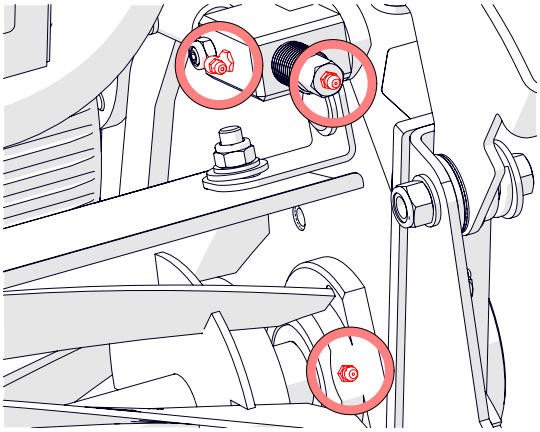
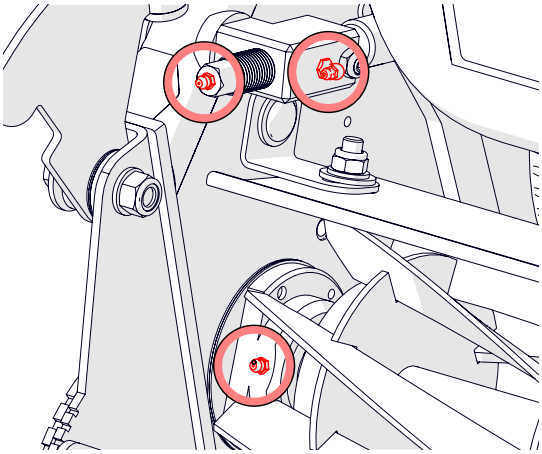


Fig. 18B - Roller drain hole pointing downwards.

4.2.7. Greasing points

Grease the following locations at the intervals stated. We recommend to use a grease gun with a multipurpose lithium EP2 grease.

Location	Frequency
Left hand side: • Cylinder bearing • Shear blade adjuster brass hex bolt • Adjuster pivot block 	Weekly or 25hrs
Right hand side: • Cylinder bearing • Shear blade adjuster brass hex bolt • Adjuster pivot block 	

4.3. Adjustments and Settings

4.3.1. Handlebar Height Adjustment

Tools required:

- 2 x 19 mm spanner

1. Turn the machine ***off***.
2. Choosing either side of the machine, locate the two nuts at the bottom of handlebar and loosen [19 mm spanner] (Fig. 19A & 18B). Secure the outer bolt head while doing so [19 mm spanner].
3. Repeat with the other side.
4. Adjust the handlebar to the desired height (Fig. 19C).
5. When set, tighten the 4 x inner nuts.

Fig. 19 - Handlebar adjustment

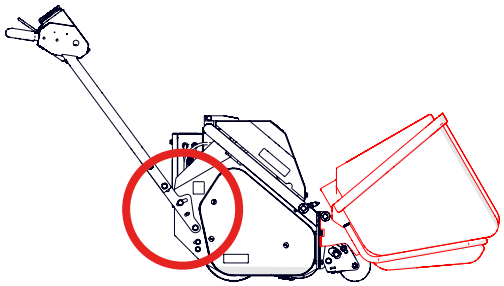


Fig. 19A - Securing the bolt head

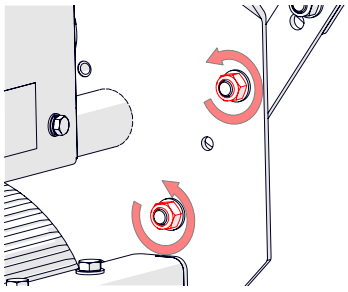


Fig. 19B - Loosening the inner nut

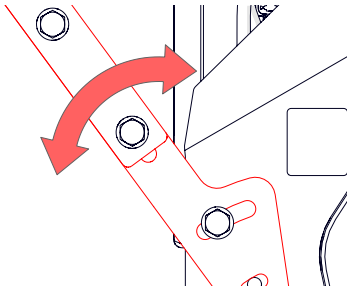


Fig. 19C - Repeating adjustment for other side

4.3.2. Shear Blade Adjustment

CAUTION - RISK OF INJURY

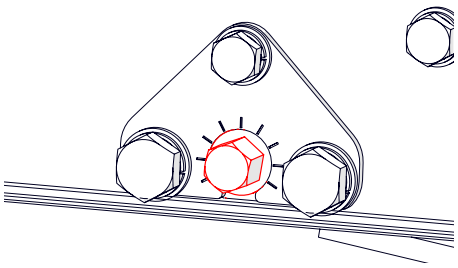
- ***Always*** turn the machine ***off*** before commencing this task.
- ***Always*** wear protective gloves to reduce risk of cuts and finger trapping.

NOTE - ORDER OF ADJUSTMENT

If planning on adjusting the height of cut at the same time, always adjust the shear blade first then adjust the height of cut. Doing the opposite way may result in a different height of cut.

NOTE - ADJUSTMENT AFTER BLADE REMOVAL

If replacing the shear blade or cylinder with a new or sharpened version, further adjustment is required to 'square' the blade to the cylinder using the cam located on the right hand side. This must be completed by competent person before following the steps below. Please contact Howardson Group if further guidance is required.



Tools required:

- Scrap paper
- 15 mm spanner

1. Turn the machine ***off***.
2. Remove the grassbox and fold the carry frame up.

3. Tip the machine gently back so it rests on the rear roller and handlebar (Fig. 20A). Chock the rear roller to stop unintended rolling.
4. Choosing the left or right hand side of the cylinder, test the cut by moving the cylinder blade with a gloved hand and using a piece of paper between the cylinder and shear blade (Fig. 20B). If it does not cut the paper, or does not cut cleanly, then adjustment of the shear blade is required - see step 5. If it does cut cleanly, repeat test on the other side before proceeding to step 5 if required.
5. Located at each end of a cylinder are two shear blade adjusters. On the side being adjusted, rotate the brass hex bolt of the adjuster [15 mm spanner] (Fig. 20C). Only very small adjustments are required - see note below. Start with one click and repeat the paper cut test. Repeat adjustment until the paper cuts cleanly.

NOTE - CLICK ADJUSTMENT

- Clockwise = Decrease gap (i.e. cut 'on').
- Anti-clockwise = Increase gap (i.e. cut 'off').
- Each click of the adjuster moves the shear blade 0.003 mm (3 microns). One full revolution moves the shear blade 0.1 mm.
- One full revolution equals 30 clicks.

6. Repeat step 5 on the opposite side.
7. Repeat the paper cut test on both sides. Adjust where necessary.
8. Lift the machine gently up to rest on its front and rear rollers. Unfold the grass carrier.
9. The machine is now ready for use.

Fig. 20 - Shearblade adjustment

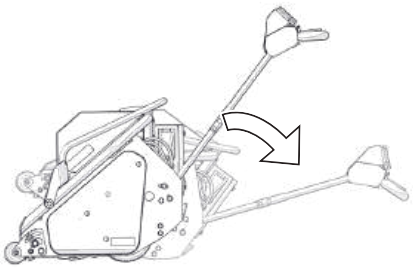


Fig. 20A - Tip to rest of handlebars

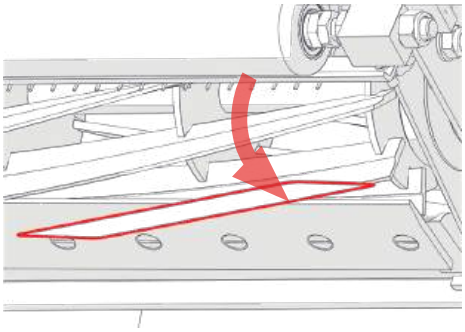


Fig. 20B - Test the cut with a piece of paper.

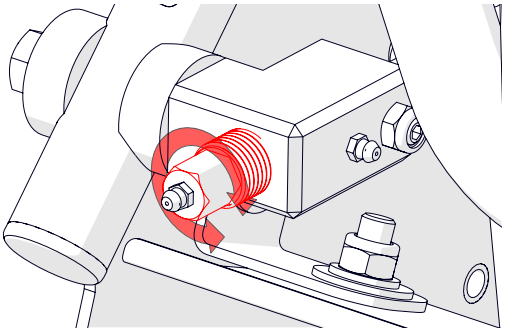


Fig. 20C - Fine-tune the cut by rotating the adjuster clockwise or anti-clockwise.

4.4. Cleaning

CAUTION - WATER DAMAGE

Do *not* use a pressurised hose to clean your machine. Doing so may cause water ingress, damage and invalidate your warranty.

WARNING - SAFETY

***Never* place your hands inside the cylinder area without firstly turning the machine *off* and removing the key. We recommend to wear safety gloves and to use a long handled brush for cleaning.**

Use a soft brush to remove as much grass and debris as possible. If further cleaning is required:

- **Chassis** - Close and secure the electrical box lid. Remove the grass box and tilt the machine backwards so it rests on the handlebars. Using a low pressure hose, wash all of the grass from under the machine and around the cassette. Take extra care around the motors and bearings, avoiding direct contact with the hose. Dry thoroughly after use.
- **Grass box** - Use a low pressure hose to rinse the inside of the box. Leave upside down to drip-dry before returning back to the machine.

4.5. Handling and Transport

WARNING - LIFTING

Do *not* lift the machine as it does *not* have designated lifting points. Lifting the machine may result in injury, damage to the machine, or both.

- Use a ramp to aid the machine onto a vehicle. For the technical specification of the machine, refer to ***"2.1. Technical Specifications" p.11.*** The weight can also be found on the serial number plate.
- Anchor the machine to the floor/pallet using suitably rated tie-down straps. Anchor points shown in Fig. 21.
- Transport with sufficient charge levels - see note.
- Turn the machine ***off*** during transport.
- Disconnect battery terminals.

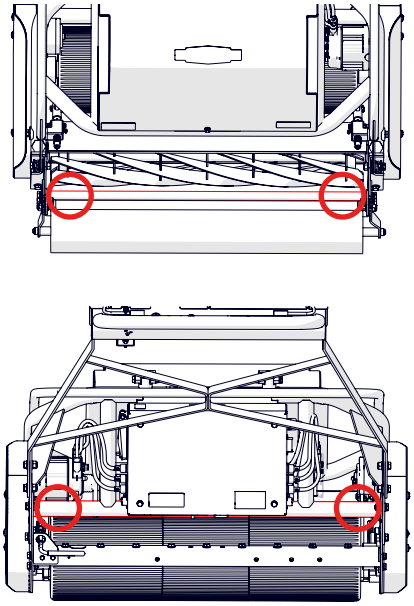


Fig. 21 - Anchor points for transport.

NOTE - SHIPPING LITHIUM BATTERIES

Regulations for the transportation and shipping of lithium batteries differ by country. Ensure compliance with the regulations of both the origin and destination countries.

4.6. Storage

4.6.1. Machine

CAUTION - INCORRECT STORAGE

Failure to store the machine correctly will cause machine degradation and reduce its operating life.

Follow the points below for correct storage of your machine. See section ***'4.6.2. Battery'*** for battery specific storage.

- Store in a location away from direct sunlight, flames, heat sources and areas with high shock/vibrations.
- Store in a location maintaining a consistent temperature between -20 to +35°C. Avoid high fluctuations. Note, if the battery is to remain in the machine, its storage temperatures will differ (see ***4.6.2. Battery'***).
- Store in a location that is dry, preferably with a relative humidity between 30%–70% RH.
- Thoroughly clean and dry the machine prior to storage.
- Apply a small amount of grease to the cutting edge of the cylinder and shear blade. Use a small brush to achieve this.
- Store on a flat surface with the parking brake ***on***. Chock the front and rear of the machine.
- Remove the key and keep safe.
- Cover the machine to protect from damage and dust.

4.6.2. Battery

CAUTION - BATTERY STORAGE

Batteries have additional requirements beyond those of the machine. Following the guidelines below will help maintain battery health and extend its long-term life. Failure to do so may significantly reduce battery lifespan.

- Store with a battery State of Charge (SOC) between 40–60%. Never store the battery fully discharged or fully charged as this can shorten the long-term life of the batteries.
- Disconnect the battery terminals when storing for >2 weeks.
- Store in an environment between +5°C–+25°C. Avoid storing below 0°C and above 30°C (storage at the extreme ends of the ***machine*** storage temperature range will shorten the long-term life of the battery).
- Store in a location with relative humidity between 30–70% RH.
- Every three months, check the battery SOC is between 40–60% — charge if it is below this value. Voltage can be measured to determine battery SOC if it is disconnected, see table below:

Battery SOC	Typical Voltage
100%	58.1 V
60%	53.3 V
50%	52.4 V
40%	51.5 V
25%	50.1 V
5%	47.6 V
2%	46.2 V
0%	44.1 V
DEEP DISCHARGE	39.2 V

4.7. Disposal

4.7.1. Machine Disposal

NOTE - DISPOSAL NOTES

Check and comply with all environmental regulations and local disposal guidelines.

Dispose of the product in an environmentally friendly manner. The machine is predominately made up from metal and electronic waste - these can be suitably recycled at a local refuse collection site.

CAUTION - INJURY

Take care when removing components from the machine. If done incorrectly it may cause injury to yourself or damage to the surrounding environment. Wear suitable PPE and dismantle in an appropriate area.

1. Take the machine to a suitable area to allow for the removal of parts. Take into account: access to the machine, tool availability, oil and other contaminants.
2. Wear suitable PPE. This must include safety glasses and gloves as a minimum.
3. Place oil absorbent pads under and around the machine.
4. Disconnect the battery and remove. Remove both motors and all electrical box.
5. Safely drain any remaining fluids, such as oil and dispose of them according to local regulations.
6. Clean the machine thoroughly.
7. Detach any removable parts, such as the handlebar, bodywork, rollers and cassette.
8. Separate recyclable parts like metal, plastic and electronic. Recycle at a recycling facility.
9. Dispose of non-recyclable components in accordance with local waste disposal regulations.
10. Document the decommissioning process for record keeping.

4.7.2. Hazardous Materials

The battery contains hazardous components and must be disposed of correctly. Follow local regulations for the disposal and recycling of batteries. Dispose of at a suitable recycling facility.

Other components to note include lubricating grease and roller bearing oil which may contaminate waste during recycling. All oil/grease should be removed prior to disposal with a suitable solvent or degreaser such as brake cleaner /denatured alcohol and wipes.

4.8. Troubleshooting & FAQ

WARNING - SAFETY

- **You *must* turn the machine *off* before actioning any cause. Failure to do so may cause major injury.**
- **Always wear suitable PPE for the job at hand.**

The most common troubleshooting issues are shown in Appendix D. If your fault is not shown or you are still experiencing problems, please contact Howardson Group directly.

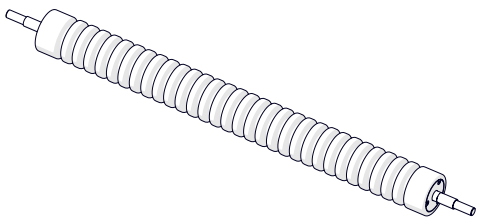
4.9. Warranty Policy

For full warranty terms and conditions, please contact your Dealer or refer to the warranty policy supplied separately.

Appendix A. Optional Items and Attachments

A1. Weile (Grooved) Roller

This option replaces the standard smooth front roller with a weile (grooved) roller. A weile roller has less surface area so the machine sits lower in the turf, allowing for the leaf blades to stand more upright in the grooves prior to being cut. This generally achieves a more consistent height and quality of cut. The grooves also help maintain better traction, so more suited to thicker turf, uneven ground and slopes.



However, a smooth roller distributes the machine weight more evenly provides and is therefore less aggressive on the turf. Use a smooth roller on well maintained level turf, or if your turf is stressed, recently aerated or in soft ground conditions.

To remove the roller:

Tools required:

- 17 mm spanner
- 19 mm spanner

1. Turn the machine ***off*** and remove the key.
2. Remove the grassbox and fold the carry frame up.
3. Remove the three fixings from the roller quadrant, as illustrated in Fig. 19A [19 mm spanner, 17 mm spanner].
4. Loosen (do not remove) the M12 bolt securing the tie-bar [19 mm spanner] (Fig. 19B).
5. The roller quadrant will now be able to move slightly to make space to remove the front roller (Fig. 19C).
6. Replace the roller as desired and move the roller quadrant back into position.
7. Tighten the M12 bolt securing the tie-bar [19 mm spanner].
8. Reattach and tighten the three fixings from the roller quadrant [19 mm spanner, 17 mm spanner].

Fig. 22 - Front roller removal

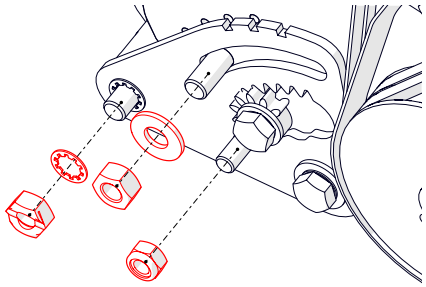


Fig. 22A - Remove the three fixings as illustrated.

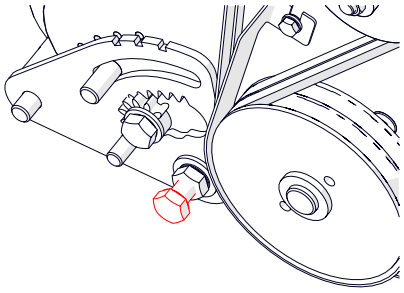


Fig. 22B - Loosen the tie-bar bolt.

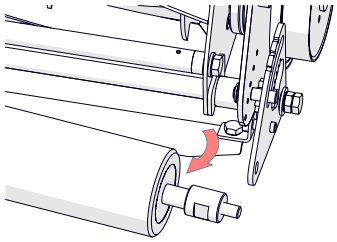
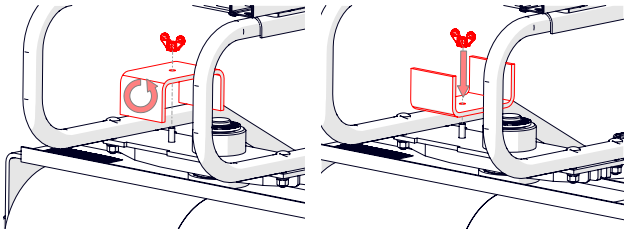


Fig. 22C - Remove the roller.

A2. Suspension trailer seat

Both the standard and self-steer trailer seats are designed to reduce operator fatigue during extended periods of use. They also add an additional level of striping along with the rear roller of the machine. Both seats have built-in suspension and adjustments for greater comfort.

The self-steer trailer seat has an additional pivot underneath the seat and a cross brace from the machine rear tie bar to the trailer seat rear roller. This allows for greater manoeuvrability, with the trailer seat following the turns of the machine more closely. On delivery, this trailer seat will have an anti-pivot bracket located above the roller to aid in transport; prior to machine coupling, remove the M8 wing nut and flip the bracket to face upwards. Secure in this position before proceeding with its use. Return to the downward position when transporting without being coupled to a machine.



Both seats are supplied with a towball bracket that is mounted to the rear tie bar of the machine.

To attach the trailer seat:

1. Turn the machine ***off*** and remove the key.
2. Position up the towball bracket to the rear tie-bar/scraper (Fig. 23A).
3. Insert two M10 bolts into the top holes and tighten loosely [17 mm spanner] (Fig. 23B).
4. Insert four M10 bolts into the side holes and tighten loosely [17 mm spanner] (Fig. 23C).
5. Return to each bolt and tighten fully.
6. Lower the towbar of the trailer seat onto the towball. Ensure it is seated correctly and fully secure.
7. Adjust the clevis pin of the trailer seat steering cross-brace, so that the pin is inserted through the hole in the towball bracket. Secure with the locknut (Fig. 23D).

Fig. 23 - Trailer Seat Attachment

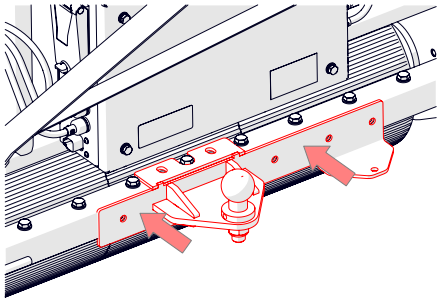


Fig. 23A - Position the towball bracket.

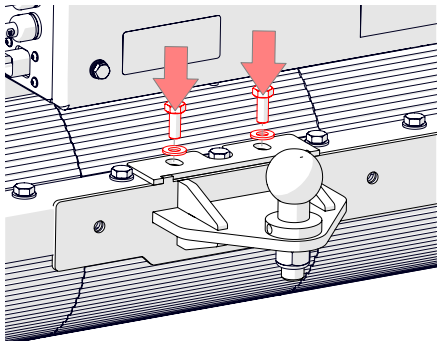


Fig. 23B - Insert the top bolts and tighten loosely.

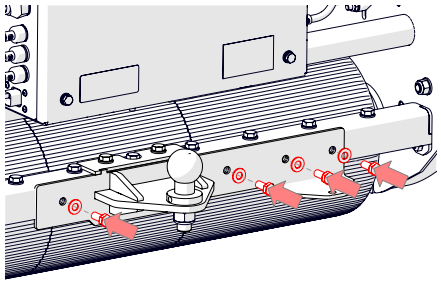


Fig. 23C - Insert the side bolts and tighten loosely.

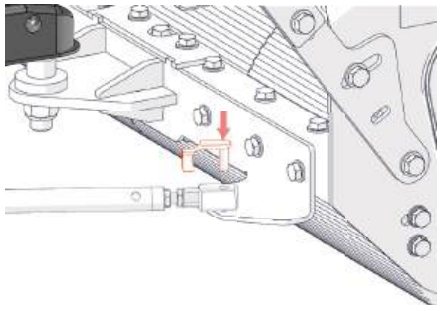


Fig. 23D - Secure steering cross-brace with clevis pin (self-steer only).

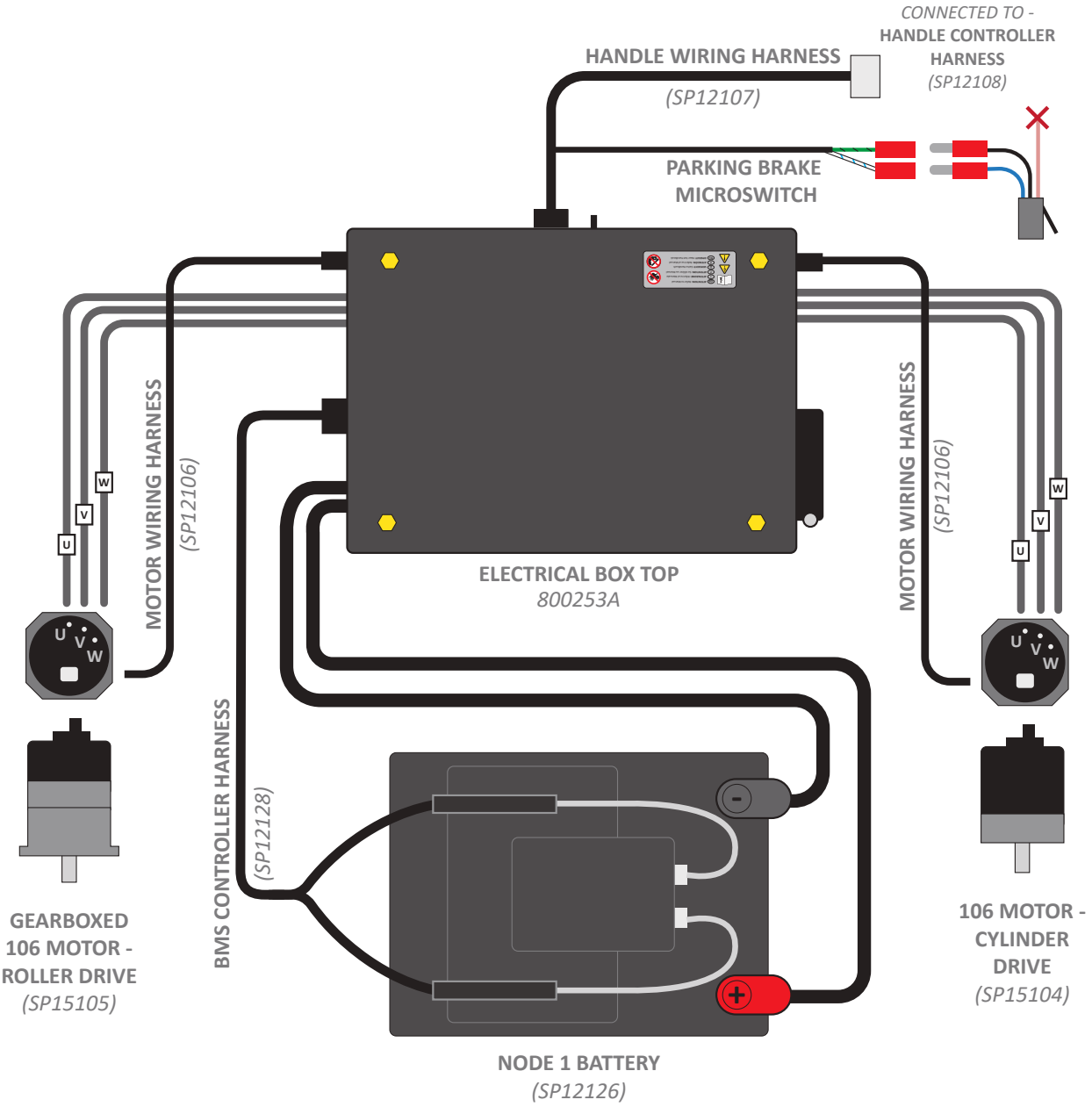
Appendix B. Service Kit

The service kits below are available to be purchased to aid in the servicing of the machine:

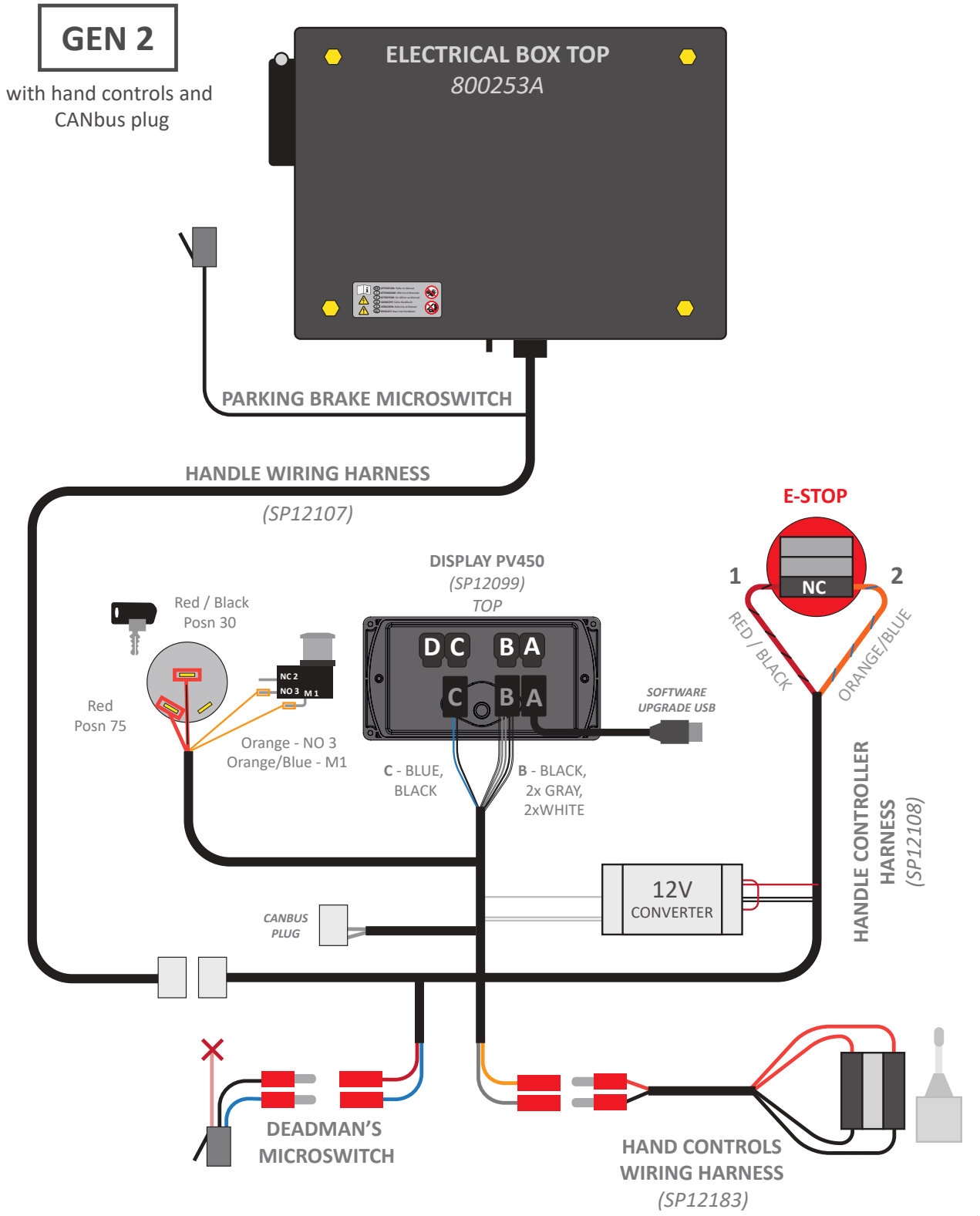
Machine	Service area of machine	Kit number	Item description	Item part number	Qty
ES-30 & ES-36	(SK02) - Rear Roller	SK02003	BEARING RLS9-2RS	065824	2
			GEAR OIL EP90	OIL	0.4L
			Roller Drive Chain	SP11148	1
	(SK05) - Drive / Power	SK05003	BELT V-RIBBED 8 PK 940	SP11086	1
			Roller Drive Chain	SP11148	1
		SK05011	ASM MOTOR BACK SHELL	370400	1
			ASM MOTOR CLIP - A	370401	1
			ASM MOTOR CLIP - B	370402	1
			MOTOR STUD	370407	3
			MOTOR STUD SPACER	370408	1
			WASHER M6 SPRING	E1-1061	3
			NUT M6 STD	SP02003	3
			NUT M6 NYLOC	SP02004	2
			WASHER M6 FORM A	SP03010	5
			MOTOR WIRING HARNESS (F42066)	SP12106	1
			NUT COVER CAP M6 (10mm AF)	SP14058	2
			106 MOTOR AND GEARBOX	SP15105	1
			U, V, W MOTOR COVER DECAL	SP18050	1
	(SK06) - Cutter	SK06004	BEARING 2205 2RS	228029	2
			OIL SEAL 32 x 47 x 7	229701	2
			Cylinder Drive Belt	SP11086	1
ES-36		SK06005	Shear Blade 36" Lipped	086792	1
			Blade Screw (12 needed)	185378	12
ES-30		SK06006	30" Lipped Shear Blade	067171	1
			Blade Screw (10 needed)	185378	10

Appendix C. Wiring Diagram

C1. Wiring Diagram (SP19031_REV4) - Part 1



C2. Wiring Diagram (SP19031_REV4) - Part 2



Appendix D. Troubleshooting and FAQ

Issue	Possible Cause	Action
Screen powers on briefly then switches off	1. Start button not held for long enough. 2. Wiring connection fault. 3. Battery BMS connection issue.	1. Ensure the ***start*** button is held for >3 seconds. 2. Check connections to ***start*** button. C (Common) and NO (Normally Open) terminals to be connected. 3. Check BMS cable connection.
Screen 'Parking Brake' icon (P) won't disengage	1. Mechanical brake engaged. 2. Parking brake microswitch faulty.	1. Release the parking brake. 2. a) Check the parking brake microswitch is being disengaged from the brake hammer. b) Test micro-switch continuity.
Machine will not charge	1. Charger not receiving sufficient power. 2. Charger not plugged correctly into the machine. 3. Machine not switched on.	1. Ensure the mains electrical socket is ***on***. Check lights and screen on the charger are illuminated - they will cycle through volts/time/ current/amp hours to indicate the machine is charging. If not, see below Issue. 2. Ensure the charger plug is fully inserted and the correct way round. 3. Power the machine on, then plug in charger. De-activate the E-stop.
Machine will not switch on	1. If the machine is brand new, battery terminals will be disconnected. 2. Fully drained battery. 3. E-stop activated. 4. Start button not being held long enough or faulty. 5. Harness plug not connected. 6. Damage to battery cables. 7. Wiring connection fault/fuse blown.	1. Connect battery terminals, see ***"1.3.2. Assembly Instructions" p.10*** 2. Re-charge the battery. 3. Release E-stop button. 4. Ensure the ***start*** button is held for >3 seconds. Check continuity of button. 5. Check BMS harness, handle bar harness connection and charger plug pins for signs of damage. 6. Visually inspect the cabling for damage. ⚠ **NEVER TOUCH ANY EXPOSED WIRES.** 7. Contact your Dealer or Howardson Group Service.

Issue	Possible Cause	Action
Machine will not operate and displays "PLEASE HOLD DEADMAN HANDLE [OPC]"	1. Check the OPC operates freely and no damage to pivot block. 2. Parking brake microswitch faulty.	1. Service/replace OPC if faulty. 2. a) Check the parking brake microswitch is being dis-engaged from the brake hammer - see ***"4.2.4. Grinding Cutting Blades" p.45*** b) Test micro-switch continuity.
OPC will not disengage when released		
Charger lights are not illuminating	1. Charger is not receiving power.	1. Ensure the mains electrical socket is ***on***. 2. Check the condition of the plug fuse - replace if required.
Charger lights are flashing	1. Charger is charging or there is a fault.	1. See Charging section ***"3.5.4. Charging Instructions" p.32***
Machine will not show charge (shows as empty)	1. BMS cable is not connected. 2. BMS cable is faulty. 3. Wrong battery type selected.	1. Check the BMS cable is connected correctly. 2. Unplug the BMS cable and check the condition of the internal pins. If the pins are bent a replacement cable will be required. 3. Contact your local dealer to change factory settings.
"BMS Comms" error showing on screen		
"Motor comms" error showing on screen	1. Faulty motor cable connection.	1. Check for secure connection from the electrical box to the motors 2. Check all three power cables to each motor are connected with the letters matching (U, V and W)

What do the 'Main Menu' icons mean?
*See **"2.5. Display Screen" p.19.***

How do I edit the default Forward and Turning speed?

Main Menu ▶ *Operations* ▶ *Default speeds*

Why does 'Daily Checks' show on start up?
The 'Daily Checks' screen will show on start up each day until the operator confirms they have completed the daily checks required before initial operation.

Once checks have been completed they can be registered as complete (tick icon), which will log the date on the checks register.

What is the default password?
1111.

Using a password protects your machine from unauthorised modification of values and settings (such as speed) only. It does NOT not lock out other users from using the machine. Contact Howardson Group or your Dealer if you have forgotten your password.

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