

BUSHRANGER

4x4 GEAR



REVO

VEHICLE RECOVERY WINCH
10,000LB



BUSHRANGER

4x4 GEAR

Congratulations on the purchase of your Bushranger vehicle recovery winch. This product has been designed to meet the specified applications (see limitations below in 'Warning') and with proper care and preventative maintenance will give you years of trouble-free operation. All information in this publication is based on the latest production information available at the time of print. We reserve the right to make changes without notice because of continued product improvement.

Your Bushranger winch has been designed to give safe and dependable service if operated according to the instructions. Please read and understand this manual before installation and operation of the winch. Careless winch operation can result in serious injury or property damage.

When requesting information or ordering replacement parts, always give the following information:

1. Winch model and voltage
2. Serial Number
3. Item. No. and Part Number
4. Part Description

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Warnings

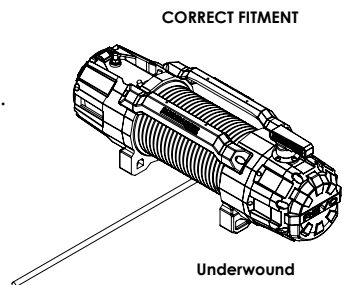
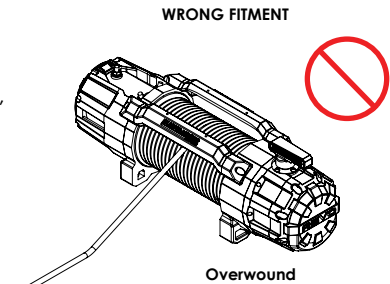
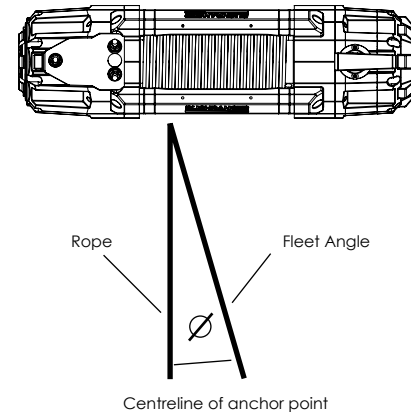
1. It is highly recommended that prior to using this off road vehicle recovery winch, that users undertake off road training including vehicle recovery. Recovering immobilised vehicles is a potentially dangerous exercise and this winch is to be used with great care.
2. The winch is rated at the first layer of rope on the drum for intermittent-periodic duty.
3. The winch is not to be used to lift, support or otherwise transport personnel.
4. A minimum of five (5) wraps of steel wire rope and ten (10) wraps of synthetic rope around the drum is necessary to support the rated load.
5. Keep clear of winch, rope, hook, and fairlead while operating.
6. Rope can break without warning. Always keep a safe distance from the winch and rope while under a load.
7. Failure to adequately align, support, or attach the winch to a suitable mounting base could result in a loss of efficiency of performance or damage to the winch, rope and mounting platform.

Safety

NOTE: This winch is a very powerful machine. Treat with extreme care and observe all cautions and warnings.

- Before use, ensure that you are familiar with all winching operations (winch speeds & direction).
- In some cases, the operator of a winch may be required to have qualifications according to applicable laws and ordinances.
- Check all safety and environmental conditions prior to and during use.
- Only use correctly rated rope. Inspect for damage and/or defects before use.
- Do not use an unsuitable hook or snatch block for rope.
- The operator must remain with the winch during operation.
- The winch duty rating is S3 (intermittent-periodic).
- Do not use the winch as a lifting device or a hoist for vertical lifting and moving people.
- Ensure that the winch is connected to the correct voltage (12VDC only).
- Do not exceed the maximum line pull ratings shown in this manual. Shock loads must not exceed these ratings.
- Pull from an angle below 15° in the horizontal plane to straighten up the vehicle or load.
- Always use appropriate gloves when handling the wire rope.

- When winching, always use a recovery damper. Place over the rope in the middle third of its length.
- A rope should be replaced if it shows signs of excessive wear, broken strands, corrosion for wire rope and excessive abrasion or fused and melted fibre for synthetic rope or any other defects.
- If the winch fails to pull a load under normal conditions, manually stop the operation, otherwise motor damage may occur.
- Check that the clutch handle is in the "Engaged" position during and after use.
- Remove the remote control from the winch when not in use and store in a safe, dry place.
- Do not wrap the rope around the load and back onto itself. Always use a tree trunk or winch extension strap.
- Keep hands and clothing clear of the winch, rope, and fairlead opening.
- Never unplug the remote control when winching a load.
- To avoid insufficient power when winching a load, the vehicle should be running and in neutral.
- Keep the remote control clear of the rope at all times.
- If noise or vibration occurs when operating, stop the winch immediately and inspect or return it for repair.
- The rope must be wound in an under-wound orientation only to ensure correct brake operation.
- Always inspect the hook, latch and pin prior to use. Do not use if there are any signs of excess distortion or bending.
- Ensure the pin of the hook is secured using a correctly installed split/cotter pin.

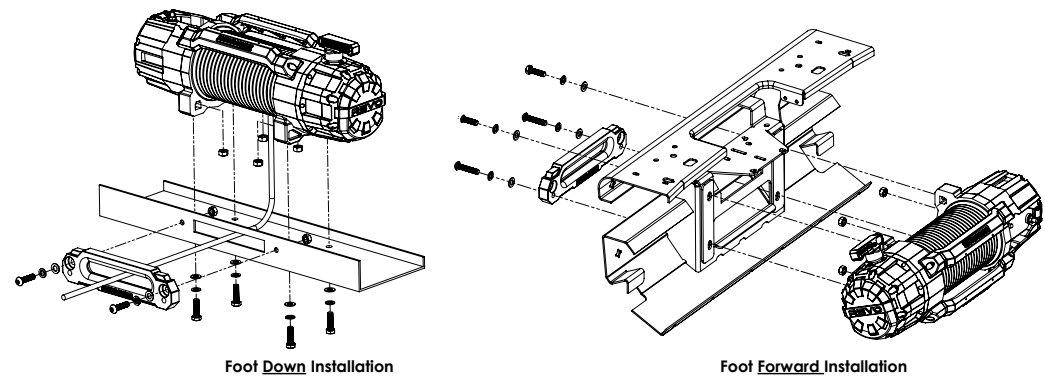


Installation

It is highly recommended that installation is performed by an authorised technician, familiar with this product.

Winch Mounting

- It is very important that the winch is mounted on a flat and hard surface or mounting channel or in a suitable winch-compatible bull bar to ensure the motor, drum and gearbox housing are aligned correctly.
- The fairlead is not designed to mount to the winch directly.
- The rope must be wound in an under-wound orientation only.



The winch is provided with a range of bolts to suit the different mounting options:

- 4 x M10x35mm Hex Head Bolts (for foot down installation)
- 2 x M10x50mm Button Head Bolts (for mounting Hawse Fairlead in foot forward mounting – REVO 10S only)
- 2 x M10x45mm Button Head Bolts (for mounting Roller Fairlead in foot forward mounting – REVO 10W only)
- 2 x M10x40mm Button Head Bolts (for mounting Hawse & Roller Fairlead in foot down mounting)
- 6 x M10 Spring Washers
- 6 x M10 Flat Washers
- 4 x M10 Hex Nuts
- 2 x M10 Lock Nuts

Note: Four (4) M10 x 1.50 pitch 10.9 grade high tensile steel bolts (supplied) must be used in order to sustain the loads imposed on the winch mounting.

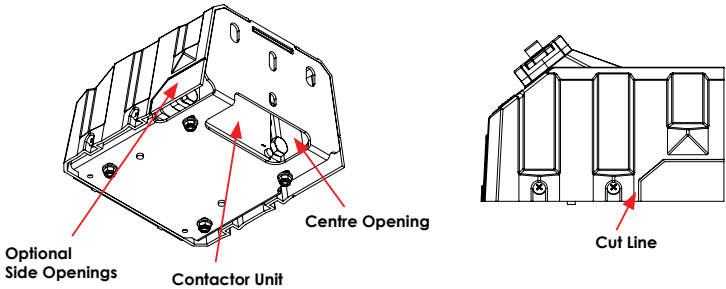
Torque Settings (Maximum)	
M10 x 1.5– 10.9 Grade	44 N.m

Control Box Mounting

The control box has been designed with multiple mounting options to suit a variety of mounting locations and orientations. The “Bushranger” stick on label is supplied loose in your winch kit and should be adhered to the Control Box once a suitable mounting method has been chosen and the correct orientation is known. When applying the label, ensure the surface is free from oil and debris. We recommend using a wax and grease remover to prepare the surface before applying the label.

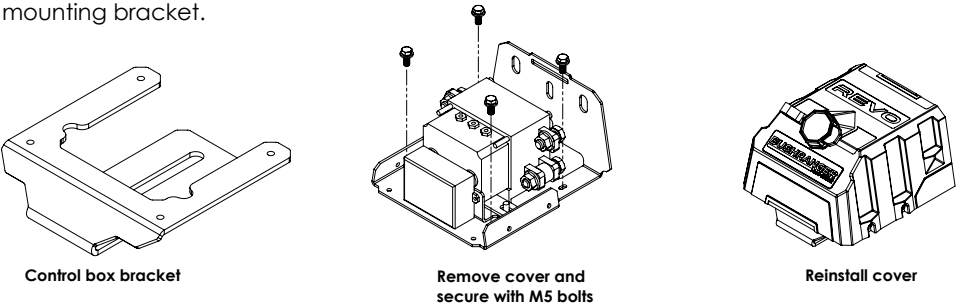
Cable Routing

The control box is supplied with the power cables exiting through the centre opening on the underside face. The cables can also be routed to leave through the sides of the control box, which may be more suitable for certain installations. To re-route the cables through the sides, remove the plastic control box cover and use a sharp knife or cutters to remove either the left or right hand side cut out section, as shown. The black contactor unit will need to be removed to allow the cables to be re-routed through the new opening created in the cover.



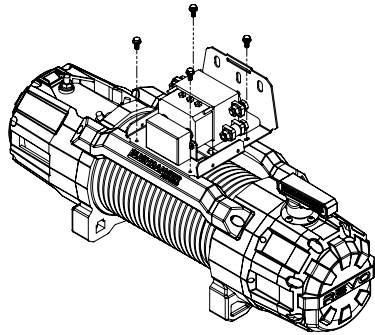
Mounting Option 1 - Mounting Bracket

A steel mounting bracket is supplied for applications where the control box is to be installed independently of the winch and requires clearance underneath. To fit, firstly remove the plastic control box cover by loosening 2 screws each side, then align the steel mounting bracket with the 4 holes in the base plate of the control box. Use 4 x M5 bolts to fasten the bracket to the base, as shown below, then reinstall the plastic control box cover. Secure the mounting bracket to the mounting surface using appropriate bolts (not included) fitted through the slots in the mounting bracket.

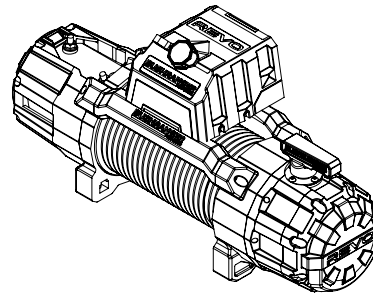


Mounting Option 2 - Directly to Winch

The control box may be fitted to the cross bars of the winch. Remove the plastic control box cover and align the 4 x holes in base plate with the 4 x threaded holes in the winch tie bars. Use 4 x M5 bolts to secure the control box to the winch, then reinstall the plastic control box cover.



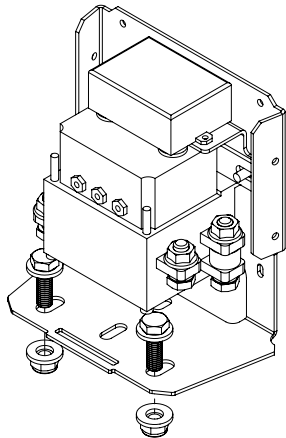
Remove cover & secure to winch with M5 bolts



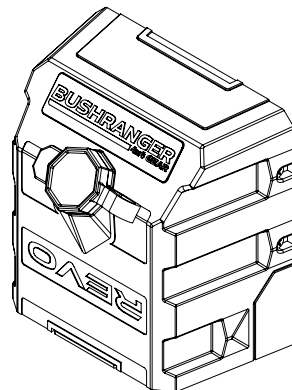
Reinstall cover

Mounting Option 3 - Vertical Mounting

The control box may also be fitted vertically to a surface. Remove the plastic control box cover and align the slots in base plate with the holes in the flat surface being mounted to. Use at least 2 x bolts (not included) to secure the control box to the surface, then reinstall the plastic control box cover.



Remove cover & secure with appropriate fasteners

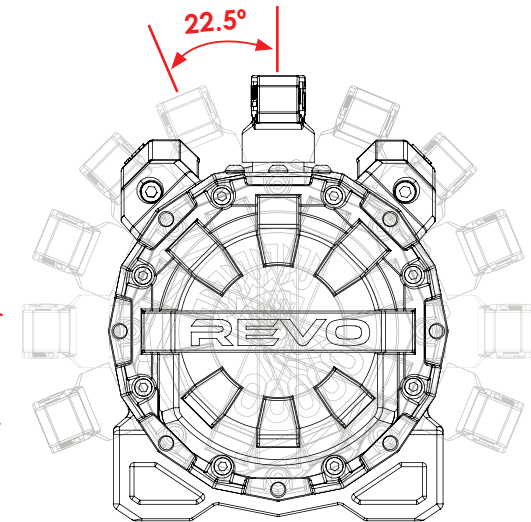
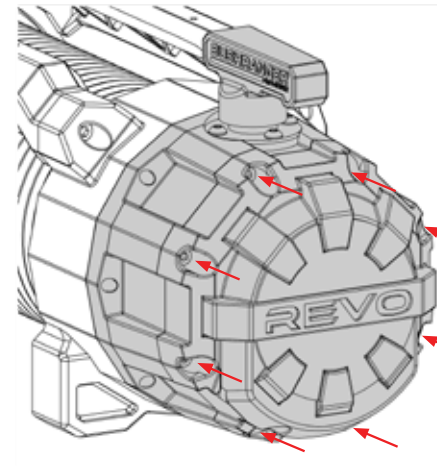


Reinstall Cover

Gearbox Rotation

The gearbox end of the winch can be rotated in 22.5° increments to allow for the clutch handle to be orientated to best suit the installation requirements.

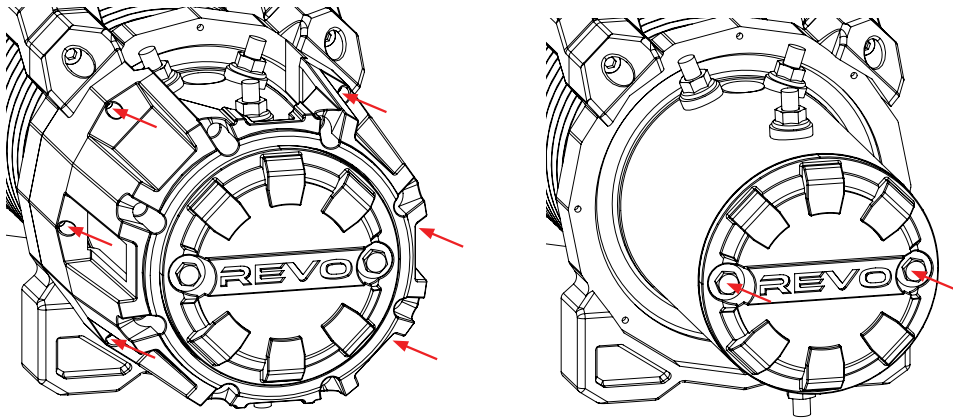
1. Loosen and partially remove the 8 x bolts (see red arrows below) that secure the two gearbox sections to the winch. DO NOT remove the gearbox sections from the winch.
2. Rotate the two gearbox sections and bolts simultaneously (all moving parts highlighted in grey) to achieve the target angle as highlighted below. Ensure the gearbox o-ring seal reseats in the correct position.
3. Reinstall and tighten all bolts to 6Nm torque.



Motor Rotation

The motor can be rotated in 90° increments to allow for repositioning of the poles to best suit the installation requirements.

1. Loosen and remove the 6 x bolts that secure the motor cover to the drum support. Remove the motor cover from the winch.
2. Loosen and partially remove the 2 x bolts that secure the motor to the drum support.
3. Rotate the motor to achieve the desired position, ensuring the motor seal reseats into the correct position. Reinstall motor bolts and tighten to 10Nm torque.
4. Reinstall the motor cover and tighten the 6 x bolts to 6Nm torque.



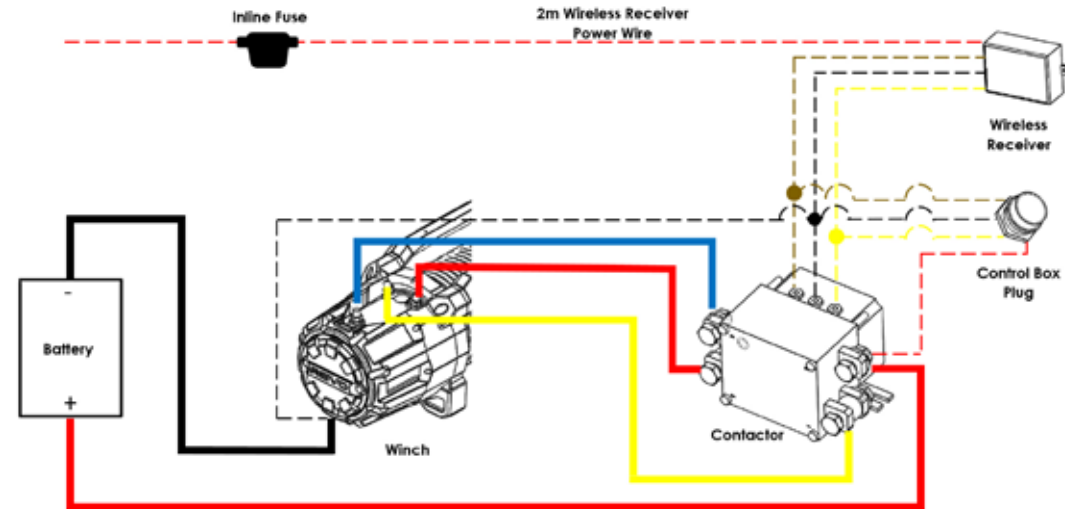
Battery Recommendations

A fully charged battery and good connections are essential for the proper operation of your winch. **The minimum requirement for a 12 Volt DC battery is 650 cold cranking amps.**

Wiring Diagram

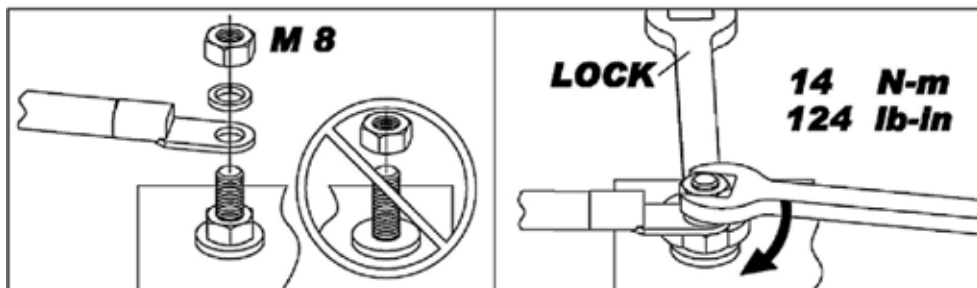
Attach the black lead firmly to the negative (-) battery terminal and red lead to the positive (+) battery terminal. The voltage drop for the winch motor must not exceed 10% of the nominal voltage of 12V. For best performance, mount the winch as close to the battery as possible.

For wiring of the wireless receiver on REVO 10S models, a 2m long red power wire with inline fuse exits out of the control box and should be connected to a switched power source. We recommend connection to the vehicles ignition or accessories circuits, which will allow for the wireless to be used only when the vehicle is turned on. Another option is to run it through a dash mounted on/off switch so that the user can turn the wireless function on and off as required.



Nut Fastening for Motor & Contactor

The nuts on the motor and contactor should be fastened to the specified torque as outlined in the diagram below. Attempting to fasten the top nut without locking the bottom nut could result in damage to the studs. Do not tighten top nut without locking bottom nut.



Rope Preparation

Prior to using the rope for the first time, it must be tensioned onto the drum under load to ensure a tight and uniform wrap is achieved. A rope that is not tensioned and wound tightly and evenly prior to use can be permanently damaged since the outer layers of rope can draw down into the inner layers leading to binding, pinching or wedging between layers.

One method for tensioning the rope onto the drum is to use the weight of the vehicle on a slight incline to pull on the rope while spooling in. This can be achieved by following the steps outlined in the following section "Winching Procedures" (Page 15). Prior to spooling in under this load, ensure the rope is pulled out to leave the minimum amount of wraps on the drum (5 wraps for wire rope and 10 wraps for synthetic rope).

Winching Principles

NOTE: Kingsley Enterprises Pty. Ltd. recommend that prior to using this recovery equipment, users should undertake formal training from an accredited industry body in winch use and vehicle recovery.

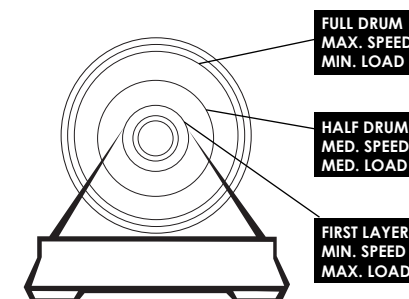
Calculating Fleet Angle

To obtain the best rope service, the direction of pull should be on a horizontal plane within ± 15 degrees and perpendicular to the centreline of the winch drum within ± 15 degrees. If the fleet angle is larger than the recommended angles, incorrect spooling may occur, resulting in the rope loading onto one side of the rope drum and possible damage to the rope or winch.

Load Rating

Load and speed varies according to how much rope is on the drum. The first layer of rope on the drum delivers the slowest speed and the maximum load. A full drum delivers the maximum speed and the minimum load.

For this reason, automotive winches are rated at their first layer capacities.



Duty Cycle Ratings

Duty cycle ratings usually specify continuous, intermittent, or special duty (typically expressed in minutes). The IEC (International Electrotechnical Commission) lists the following ratings:

- S1 - Continuous duty
The motor works at a constant load for enough time to reach temperature equilibrium.
- S2 - Short-time duty
The motor works at a constant load, but not long enough to reach temperature equilibrium, and the rest periods are long enough for the motor to reach ambient temperature.
- S3 - Intermittent periodic duty
Sequential, identical run and rest cycles with constant load. Temperature equilibrium is never reached. Starting current has little effect on temperature rise.

All automotive winches are rated at S3 intermittent periodic duty.

Required Pulling Force

Your winch must be powerful enough to overcome the resistance caused by an obstacle, such as moving water, mud, snow, sand or on a steep hill, as well as pulling the vehicle's full weight.

As a general guide, you need a winch with a maximum line pull at least 1.5 times greater than the gross vehicle weight.

There are three factors listed that have influence on the line pull effect required to recover the vehicle. The values and calculations in this section are approximate and are for reference only.

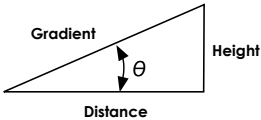
- a. Gross vehicle mass (GVM)
- b. Type of surface to be traversed
- c. Gradient to overcome

In recovery and loading, where the winch is used to pull something, the required pulling force (RPF) can be calculated according to the formula:

RPF = (Wt X S) + (Wt X G)

Where: Wt = the gross vehicle mass (GVM)
 S = the type of surface to be traversed
 G = the gradient to overcome

Surface Type	Surface Drag (S)	Gradient	Angle (θ)	Gradient (G)
Metal	0.15	5%	3°	0.06
Sand	0.18	10%	6°	0.11
Gravel	0.20	20%	11°	0.2
Soft Sand	0.22	30%	17°	0.3
Mud	0.32	50%	26°	0.44
Marsh	0.52	70%	35°	0.58
Clay	0.52	100%	45°	0.71



For example, if a vehicle weighing 3,000kg is winched up an incline of 100% on a marshy surface, the above formula would be used as follows:

Where Wt: 3,000kg, S: 0.52 G: 0.71

RPF = (Wt X S) + (Wt X G)
 = (3,000kg X 0.52) + (3,000kg X 0.71)
 = 1,560kg + 2,130kg
 = 3,690kg of effect required to recover the vehicle.

Note: A gradient of 10% is a rise of one metre in ten metres (Height/Distance).

Accessories

Snatch Block

A snatch block is an important aid to successful winching and can be used to increase the pulling power (or mechanical advantage) of a winch, or change the direction of a pull.

Where a double line pull is used (i.e. where a snatch block is used at the load or anchor point and the winch rope is connected back to the vehicle), twice the pull force is applied but the speed of recovery is halved.

One snatch block can be used in an indirect pull where the vehicle is limited due to unsuitable ground or obstruction. In this instance, the pull on the load is the actual line pull of the winch.

If more than one snatch block is used, they must be located at least 1m (40") apart

Tree Trunk Protector Strap

A tree trunk protector strap is useful for connecting a rope to almost any anchor point but is primarily designed to prevent a tree from ring barking. The tree trunk protector should be wrapped around the chosen tree or anchor point as low to the ground as possible and the two ends brought together and joined with a bow shackle. The bow shackle then becomes the recovery point to where the rope or extension strap is joined.

Recovery Damper

A recovery damper is a safety device designed to help eliminate the possibility of injury or property damage in the event of a rope failure. Placed in the middle third of a live rope, in the event of the rope breaking, the damper can help absorb the energy in the rope and reduce the likelihood of injury or damage.

Winch Extension Strap

Used when your rope isn't long enough to reach the recovery anchor point, extension straps are made from polyester webbing and come in various lengths and load ratings to suit varying recovery situations.

Bridal/Equaliser Strap

Designed to spread the load of the recovery across two points on the vehicle requiring assistance. Can be used in both Snatch Strap or Winching recoveries.

Bow Shackles

Only bow shackles that are load rated should be used for vehicle recovery. Load ratings are visible on the shackle and will be in the form of WLL (working load limit) or SWL (safe working load). The shackles, or any other recovery equipment, used should be sized correctly for the winching task.

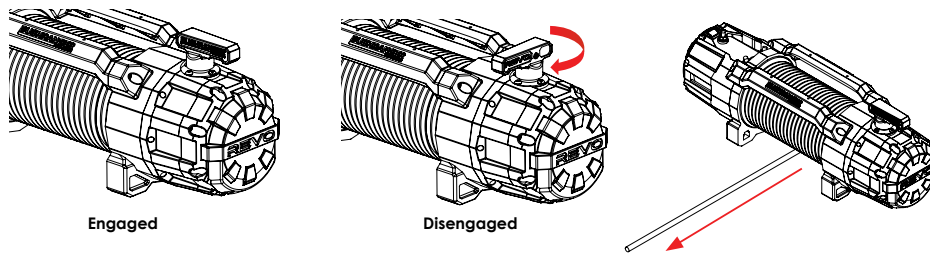
Winching Procedures

Important Notes Before Operating the Winch

Clutch Operation

Familiarise yourself with the clutch operation. The clutch handle either "Engages" the winch for operation or "Disengages" the winch for free spooling of the rope. The clutch must always be "Engaged" before operating the winch under power.

1. To disengage, turn the clutch handle 90° in a clockwise direction to the "Disengaged" position. The rope can now free spool off the drum.
2. To engage, turn the clutch handle 90° in a counter-clockwise direction to the "Engaged" position.
3. If the clutch handle cannot be properly locked in the "Engaged" position, rotate the drum to help the clutch device engage the gear train.
4. Wear appropriate gloves and use a pull strap when guiding the rope off the drum.
5. Never disengage the clutch while the rope is under load. The clutch handle must be returned to the "Engaged" position before winching.



Powering Out (No Load)

The unique proportional brake in the REVO winch allows for effortless powering OUT under NO LOAD, with no concern for damage occurring to the brake or motor. In some circumstances powering out the rope may be quicker and easier than free spooling by hand.

Powering Out (Under Load)

It is not recommended to power OUT the WITH LOAD for longer than 30 seconds. Exceeding this time will cause high amounts of wear to the friction brake.

Cable-in/Cable-out Operation

Wired Hand Controller

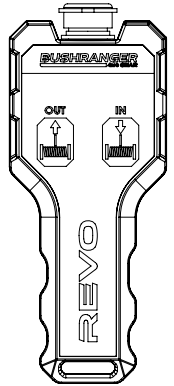
Connect winch hand controller cable to winch control box and to hand controller

Operating Procedure

To "Winch - Out", Press and hold the "OUT" Button

To "Winch - In", Press and hold the "IN" Button

To stop winching, releasing button.



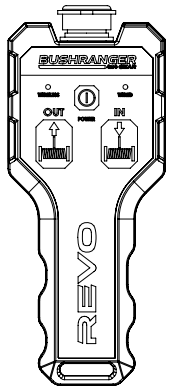
Wireless Hand Controller

The above operating procedure is the same for the wireless hand controller.

Activating wireless control

Press and hold the POWER button (ⓘ) for 3 seconds to activate the wireless control. The WIRELESS light will illuminate and flash slowly to indicate you are in WIRELESS mode. To turn off, press and hold the POWER Button (ⓘ) for 3 seconds until the WIRELESS light turns off. The controller is also equipped with an automatic power off function. If the hand controller is not operated for 2 minutes it will turn off automatically to conserve battery power.

The wireless hand controller can also be used in wired mode. When the cable is plugged in, the "Wired" light will illuminate and flash slowly. There is no need to press and hold the Power button.



Pairing of new Wireless Hand Controller

In the case of replacing a hand controller unit, or loss of pairing, a new controller can be paired to the wireless receiver by following the steps below. If the wireless receiver was previously paired to a hand controller, the previous pairing needs to be cleared from the receiver memory first.

Note: The wireless receiver is located in the control box and is usually wired into the vehicles ignition system or on a separate switch (refer to the wiring diagram on Page 10). Turn the key or flick the switch to turn the wireless receiver ON or OFF.

Clearing the Receiver Memory

1. Ensure that the wireless receiver is turned OFF.
2. Turn on the new wireless hand controller in wireless mode by pressing and holding the POWER button (Ⓟ) for 3 seconds.
3. Press and hold the "IN" and "OUT" buttons on the new hand controller at the same time. While continuing to press both buttons, the following process will happen:
 - a. The "WIRELESS" green indicator light and "Wired" red indicator light will illuminate solidly for 6 seconds
 - b. The two indicator lights will then flash slowly for another 6 seconds.
 - c. The two indicator lights will then disappear for another 6 seconds
 - d. The two indicator lights will then start to flash quickly

When the quick flashing begins, continue to hold the "IN and "OUT" buttons while turning ON the wireless receiver. Keep pressing the "IN and "OUT" buttons until the two indicator lights disappear. Release the buttons and the memory is now cleared.

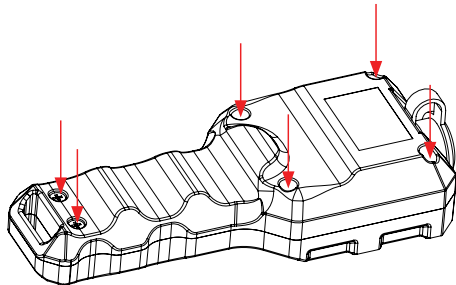
Pairing the new Hand Controller

1. Ensure that the wireless receiver is turned OFF.
2. Turn on the new wireless hand controller in wireless mode by pressing and holding the POWER button (Ⓟ) for 3 seconds.
3. Press and hold the "IN" and "OUT" buttons on the new hand controller at the same time. While continuing to press both buttons, the following process will happen:
 - a. The "WIRELESS" green indicator light and "Wired" red indicator light will illuminate solidly for 6 seconds
 - b. The two indicator lights will then flash slowly

When the slow flashing begins, continue to hold the "IN and "OUT" buttons while turning ON the wireless receiver. Keep pressing the "IN and "OUT" buttons until the two indicator lights disappear. Release the buttons and the hand controller is now paired.

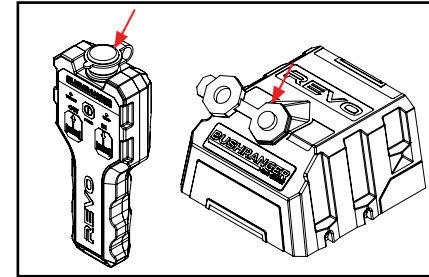
Changing battery in the WIRELESS Hand controller

From the rear of the hand controller, remove the 6 screws as shown below.



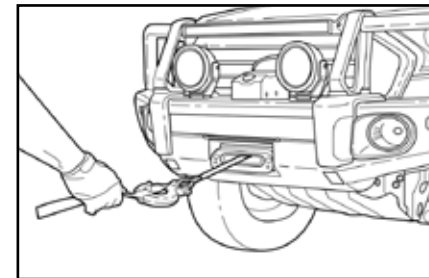
Once the screws are removed, the rear half of the hand controller can be separated allowing access to the battery. Replace the A23 battery and reassemble rear half of hand controller. When reassembling the hand controller, ensure that the rubber seal is aligned and not pinched. This will maintain the hand controller waterproof rating.

Preparation before Winching



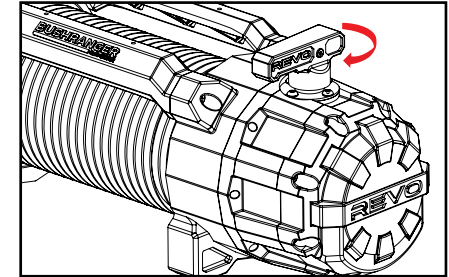
1. Connect the remote control

Connect each end of the remote control lead to the corresponding plugs on the remote control and control box, ensuring correct alignment. Tighten collars to ensure reliable connections. For wireless controller, press and hold the POWER Button for 3 seconds to activate controller. Always disconnect the remote control when not in use.



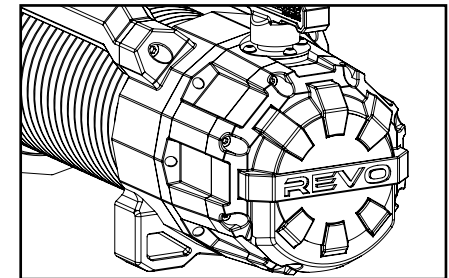
3. Pull or Power Out the rope to the anchor point

Wear appropriate gloves when handling rope. Hold Pull Strap and pull or power out enough rope to reach the anchor point. Keep tension on the rope when unspooling.



2. Disengage the clutch (for freespool operation)

Turn the clutch handle in a clockwise direction to the "Disengaged" position. The rope is now free to be unwound from the drum by hand. Never disengage the clutch while the rope is under load. Do not disengage the clutch if powering out in Step 3.



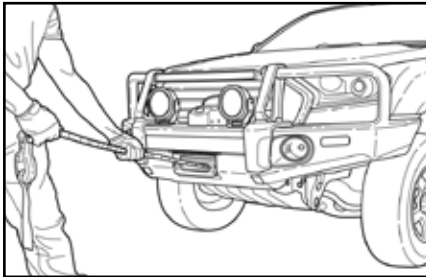
4. Engage the clutch

To engage, turn clutch handle in a counter-clockwise direction to the "Engaged" position. Never engage the clutch while the drum is rotating. The drum may need to be rotated slightly by hand to ensure proper engagement.

Anchor Point

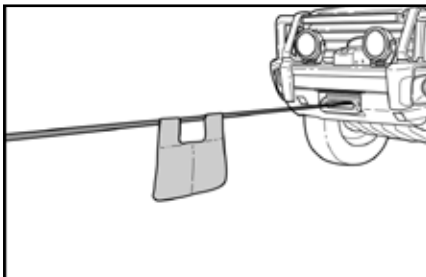
When choosing an anchor point, select a firm point such as a tree, stump or rocks. DO NOT WRAP THE ROPE AROUND THE ANCHOR POINT AND BACK ONTO ITSELF. Always use a tree trunk protector strap to prevent ring barking the tree and damage to the rope. If using a winch to retrieve another stranded vehicle, the rescue vehicle is considered the anchor point and should be made secure. The anchor point must be strong enough to hold the gross weight of the vehicle and be positioned to keep the fleet angle between the centre of the anchor point and the wire rope maintained at less than 15°.

Winch Operation



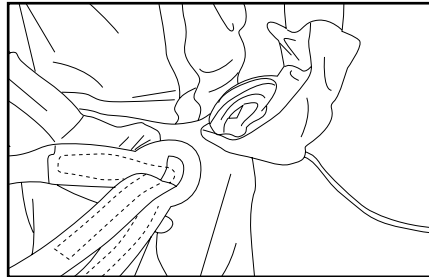
1. Check the rope

Before winching, ensure the rope is wound on the drum evenly. If unevenly wound, there is a possibility of damaging the rope when under load. Visually check rope for any signs of damage.



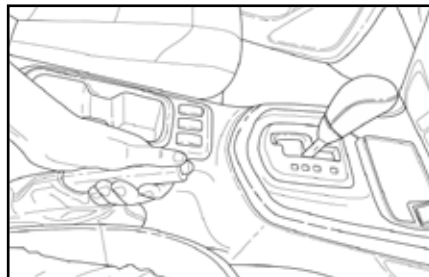
3. Use a Recovery Damper

Lay a recovery damper or heavy blanket over the rope in the middle third of its length. If a rope failure occurs, the damper can prevent the rope from whipping.



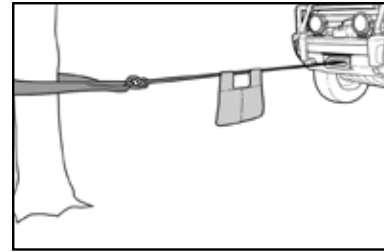
2. Attach shackle and hook

Use a shackle to lock both ends of the tree trunk protector and then attach to the hook.



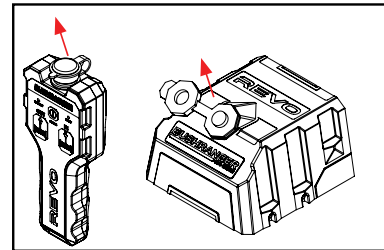
4. Prepare Vehicle

The recovery vehicle's engine should be running to provide maximum power to the winch. The transmission should be set in neutral and the hand brake applied to prevent the vehicle from moving.



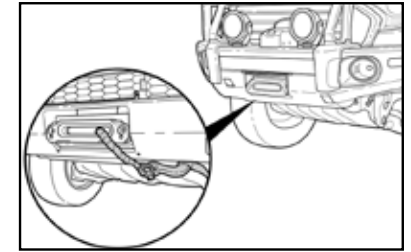
5. Begin winching

Keep tension on the rope to ensure it winds onto the drum tightly and evenly and does not sink into the lower layers. Release Hand brake and continue pulling until the vehicle is recovered.



7. Disconnect remote control

Disconnect each end of the remote control lead from remote control and control box. For wireless controller, press and hold the POWER Button for 3 seconds to deactivate controller. Store remote control in a safe, dry and easily accessible place.



6. Secure vehicle

Once the vehicle is secured, wind the remaining rope back onto the drum tightly and evenly and secure the hook firmly.

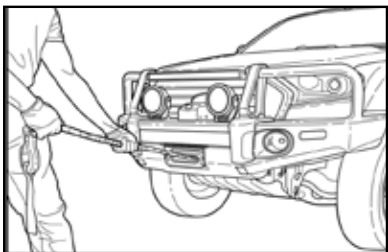
Precautions whilst Winching



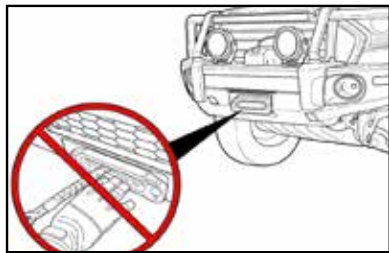
Make sure the rope is wound onto the drum tightly and evenly. Allowing the rope to become loosely wound can result in binding, pinching and wedging between layers, ultimately damaging the rope, shortening its life and increasing the risk of injury and failure under load.



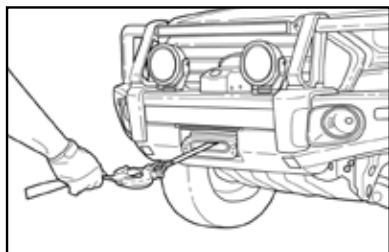
Keep winching area clear. Do not allow people to remain in the area while winching. Never step over a live wire rope whilst under load.



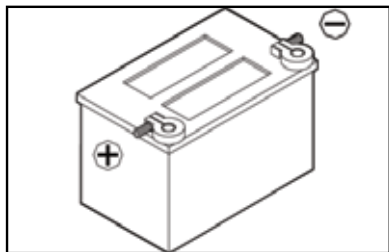
Avoid the remote control lead from coming in to contact with the winch, rope or fairlead, as damage to the lead may result.



Always keep clear of the winch, rope, hook and fairlead while winching.



Never guide a rope onto the drum with your hand. Use the supplied Pull Strap.



A winching operation requires extra consumption of battery power, so always maintain your battery and ensure it is in good condition.

Maintenance

Wire Rope Replacement

Always use a replacement rope that is correctly rated for the capacity of the winch. Use the following method to replace the wire rope:

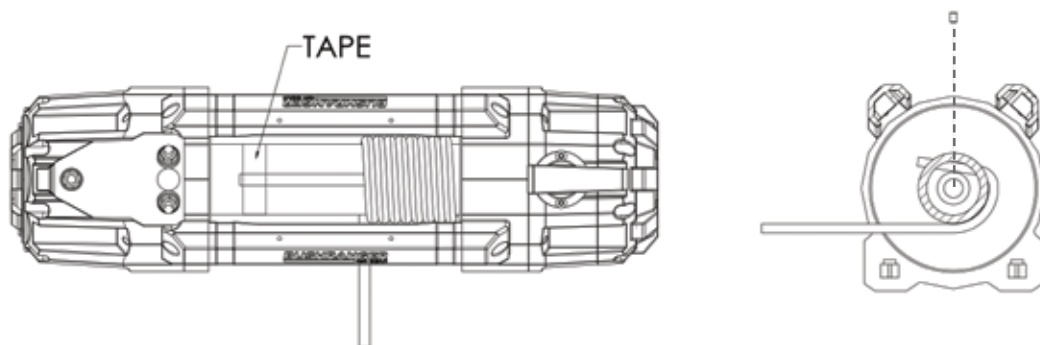
1. Disengage the clutch handle.
2. Spool out the entire wire rope, loosen the set screw and then remove the rope from the drum.
3. Feed the replacement wire rope through the roller fairlead opening, pass below the drum, and insert it into the hole on the drum end. Tighten the set screw to secure the wire rope.
4. Fit the clevis hook to the thimble end of the rope and ensure the split/cotter pin is correctly installed to secure the pin.
5. Wind the red section of rope onto the drum tightly and evenly (under hand tension) to have a minimum of five (5) wraps of wire rope on the drum.
6. Follow the procedure outlined in the previous sections "Rope Preparation" (Page 11) and "Winching Procedures" (Page 15) to complete the installation of the replacement wire rope.
7. A minimum of five (5) wraps of wire rope around the drum is necessary to support the rated load.
8. A red painted section of the rope warns the operator that there is 3 meters of rope left on the drum. Do not wind out past this point.

Synthetic Rope Replacement

Always use a replacement rope that is correctly rated for the capacity of the winch. Use the following method to replace the synthetic rope:

1. Disengage the clutch handle.
2. Spool out the entire synthetic rope, loosen the set screw and then remove rope from the drum and replace the hawse fairlead if necessary.
3. If the end of the rope is not shrink wrapped, cut the lateral side of the end of the rope at a 45° angle and apply 2-3 wraps of electrical tape to the end to hold cut strands in place.
4. Thread the rope through the hawse fairlead and under the drum, then insert the rope all the way through the hole in the end of the drum with 15-20cm protruding out.
5. Place the protruding section of rope across the drum and tape the end down to hold it in place. Lightly tighten the set screw to squeeze the rope. Do not over tighten.
6. Fit the clevis hook to the thimble end of the rope and ensure the split/cotter pin is correctly installed to secure the pin.

7. Wind the red section of rope onto the drum tightly and evenly (under hand tension) to have a minimum of ten (10) wraps of wire rope on the drum.
8. Follow the procedure outlined in the previous sections "Rope Preparation" (Page 11) and "Winching Procedures" (Page 15) to complete the installation of the replacement synthetic rope.
9. A minimum of ten (10) wraps of synthetic rope around the drum is necessary to support the rated load.
10. A red painted section of the rope warns the operator that there is 3 meters of rope left on the drum. Do not wind out past this point.



Tips for Prolonging the Life of Synthetic Rope

1. Periodically check the rope for damage or wear. Frayed, kinked or damaged winch rope must be replaced immediately. When the rope is used for the first time, the outer filaments may fray. This is a result of the out filaments breaking. The roughened surface will actually protect the inner fibres. Inspect both inner and outer fibres. Open the strands and look for powdered fibre. This is a sign of internal wear.
2. Protect your rope from rubbing against sharp or abrasive objects.
3. An aluminium hawse fairlead with rounded edges is highly recommended for synthetic rope as it resists damage more easily than a roller fairlead.
4. Keep your synthetic rope clean and dry. To clean it after use in muddy conditions, spool out the rope, rinse it with fresh water and let it dry completely before re spooling.
5. All synthetic ropes are affected by UV rays, chemicals, abrasion and heat. Once the synthetic rope has begun to deteriorate the breaking strength is compromised. It is recommended that synthetic rope is replaced every 12 months once fitted or UV exposed

Lubrication & Servicing

Servicing and repairs should only be carried out by an authorised dealer. Unauthorised repairs or servicing will void warranty. The maintenance scheduled should be followed to ensure reliable operation for the life of the winch.

The winch should be used regularly to ensure components are kept in good working order. At a minimum, it is recommended that the rope is powered out and then powered back in on a monthly basis by following the correct winching procedures (Page 15). The drum support seals are a wearing item and are critical to retaining the sealed design of the winch. These should be inspected and greased or replaced as required depending on the frequency of use and the operational environment.

All moving parts in the winch are permanently lubricated at the time of assembly. Under normal conditions, factory lubrication will suffice. If re-lubrication of the gear box is necessary after repair or disassembly, use Shell EP2 or equivalent grease. The clutch handle can be lubricated regularly with light oil.

Cleaning

Only use low pressure water to clean the synthetic rope. Do not use any chemicals. We recommend using low pressure water and a soapy sponge to clean the winch. If high pressure water is used, do not direct it at the drum area or the clutch handle. Using high pressure water in these areas can force water past seals and lead to internal water build up which can damage the winch.

Maintenance Schedule

1. Ensure that a responsible person carries out all inspections as per schedule.
2. Inspections are divided into Daily, Monthly and Three Months.

Classification of check			Item		Checking Method	Checking Reference
Daily	Periodical					
	One month	Three months				
○			Installation	Mounting bolts & alignment	Bolt tension & wear	Existence of abnormalities
○			Remote control	Correct operation	Manual	Reasonable actuation
○			Wire rope	Broken strands	Visual, measuring	Less than 10%
○	○			Decrease in rope diameter	Visual, measuring	7% of nominal diameter max
○				Deforming or corrosion	Visual	Existence of abnormalities
○				Fastening to hook and drum assemblies	Visual	Existence of abnormalities
○			Synthetic rope	Broken strands	Visual, measuring	Two or more adjacent strands are cut
○	○			Decrease in rope diameter	Visual, measuring	25% of nominal diameter max
○				Fused or melted fibres	Visual	Existence of abnormalities
○				Fastening condition of end	Visual	Existence of abnormalities
		○	Clutch assembly	Damaged clutch assembly	Visual evidence of wear	Free of wear or damage, reasonable actuation
		○	Motor	Staining, damage, smooth operation	Visual, auditory	Existence of abnormalities
○			Brake	Ability to hold loads	Visual	Reasonable actuation
		○	Gears	Smooth operation	Visual, auditory	Reasonable actuation
		○	Seals	Damaged or worn seals	Visual evidence of wear	Free of wear or damage

Troubleshooting

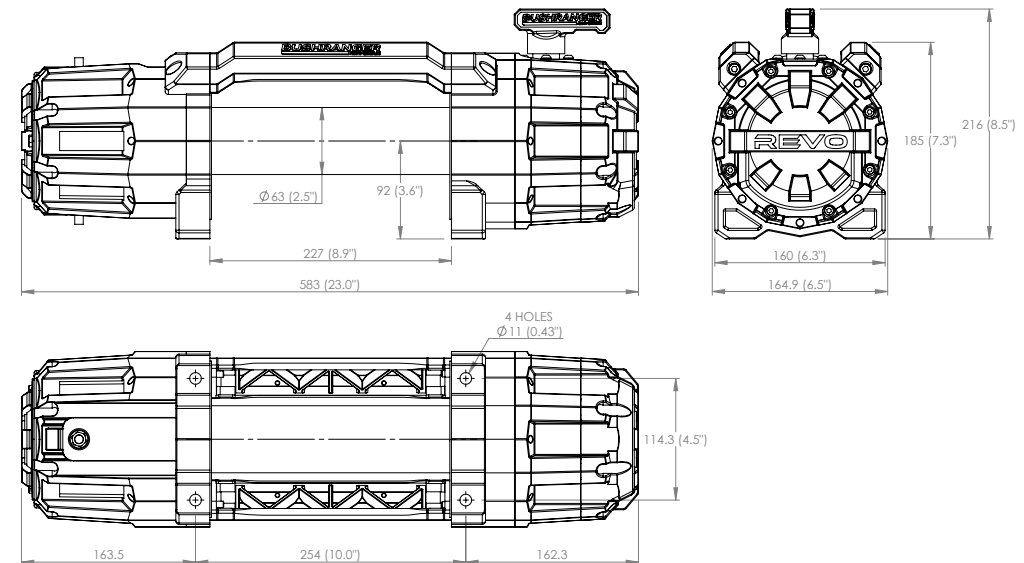
If the winch fails to operate after several attempts, or if there is any fault whilst operating:

Symptom	Possible Cause	Remedy
Winch will not operate	Cut circuit	Check battery lead
	Weak battery	Recharge or replace battery (at least 650CCA)
	Bad connection of wirings	Reconnect tightly
	Damaged contactor	Replace contactor
	Cut circuit on switch	Replace switch
	Damaged motor or worn brushes	Replace motor or brushes
	Faulty motor wirings	Replace wirings
Motor runs in only one direction	Broken wirings or bad connections	Reconnect or replace wirings
	Damaged or stuck contactor	Replace contactor
	Switch inoperative	Replace switch
	Faulty wiring	Replace wiring
Drum will not free spool	Clutch does not disengage	Engage clutch
	Damaged 1st stage shaft	Replace 1st stage shaft
	Damaged brake	Replace brake
	Damaged motor output shaft	Replace motor output shaft
Brake fails to operate	The gear train is mechanically binding up	Check to insure the winch is mounted on a flat, rigid surface
	Damaged brake	Replace brake
	Damaged gear box	Replace gear box
	Damaged ratchet	Replace ratchet components
Braking distance is too long	Worn brake	Replace brake
Brake jam	Proportional mechanism is damaged or worn	Replace
Damaged gear box	Hit by certain exterior force	Replace the damaged components
	Damaged gear train	Replace the damaged components
	Over load operation	Stop the winch operation and reduce a load
Motor runs extremely hot	Long period of operation	Allow to cool
	Damaged motor	Replace or repair motor
	Damaged or inoperative brake	Replace or repair brake

REVO 10 Specifications

Specifications:

Line Pull	4536kg/10,000lb
Motor 12V	3.9kW/5.2hp
Gear Train	4 stage gear driven
Gear Ratio	171:1
Free-spool	Rotating ring gear
Brake	Gearbox Mounted, Proportional Friction Braking System
Rope Size	Synthetic - 10mm x 28m (25/64" x 92'), Wire - 9.2mm x 28m (23/64" x 92')
Drum Size	63.5mm x 224mm (2.5" x 8.8")
Mounting Bolts Pattern	254mm x 114mm (10" x 4.5")
IP Rating	IP67
Winch weight (no rope)	24.5kg / 54lb
Gross weight	Synthetic 37kg / 81lb, Wire 49kg / 108lb



Performance Specifications:

1st Layer of Drum

Load (kg/lb)	Line Speed (mpm/fpm)	Motor Current (amps)
No load	14/45.9	50
1816/4000	3.6/11.8	206
2724/6000	2.9/9.5	270
3632/8000	2.4/7.9	329
4540/10000	1/3.3	392

Pull by Layer - Synthetic Rope

Layer	kg/lb	Total Rope on Drum (m/ft)
1	4536/10000	5.1/16.7
2	3561/7849	11.4/37.4
3	2930/6460	18.6/61
4	2490/5489	26.7/87.6
5	2164/4771	28/92

Pull by Layer – Wire Rope

Layer	kg/lb	Total Rope on Drum (m/ft)
1	4536/10000	5.5/18
2	3614/7969	12.2/40
3	3004/6624	19.8/65
4	2570/5667	28/92

REVO 10 Synthetic Model Parts List & Winch Assembly

Item No:	Description	Qty
1	Gearbox End Socket Head Cap Screw M5*75	8
2	Spring Washer Ø5	26
3	Gearbox End Cover	1
4	O Ring Seal	3
5	Gearbox Cover Ratchet Bearing	1
6	First Stage Gear Shaft	1
7	First Stage Anti-Wear Washer	1
8	Third Stage Sun Gear	1
9	Nut - M12*1.25	1
10	Stop Washer M12	1
11	Ratchet Bearing	1
12	First Stage Ratchet Gear	1
13	Ratchet Gear with Friction Pad	1
14	Friction Brake Block	1
15	Second Stage Pinion Shaft	1
16	Second Stage Bearing	1
17	Pawl Pin	2
18	Pawl Spacer Bush	4
19	Pawl	2
20	Clutch Cam Cross Pin	1
21	Gearbox Housing Second Stage	1
22	Wireless Handheld controller	1
23	Bearing Anti-Wear Washer	1
24	Needle Roller Bearing	1

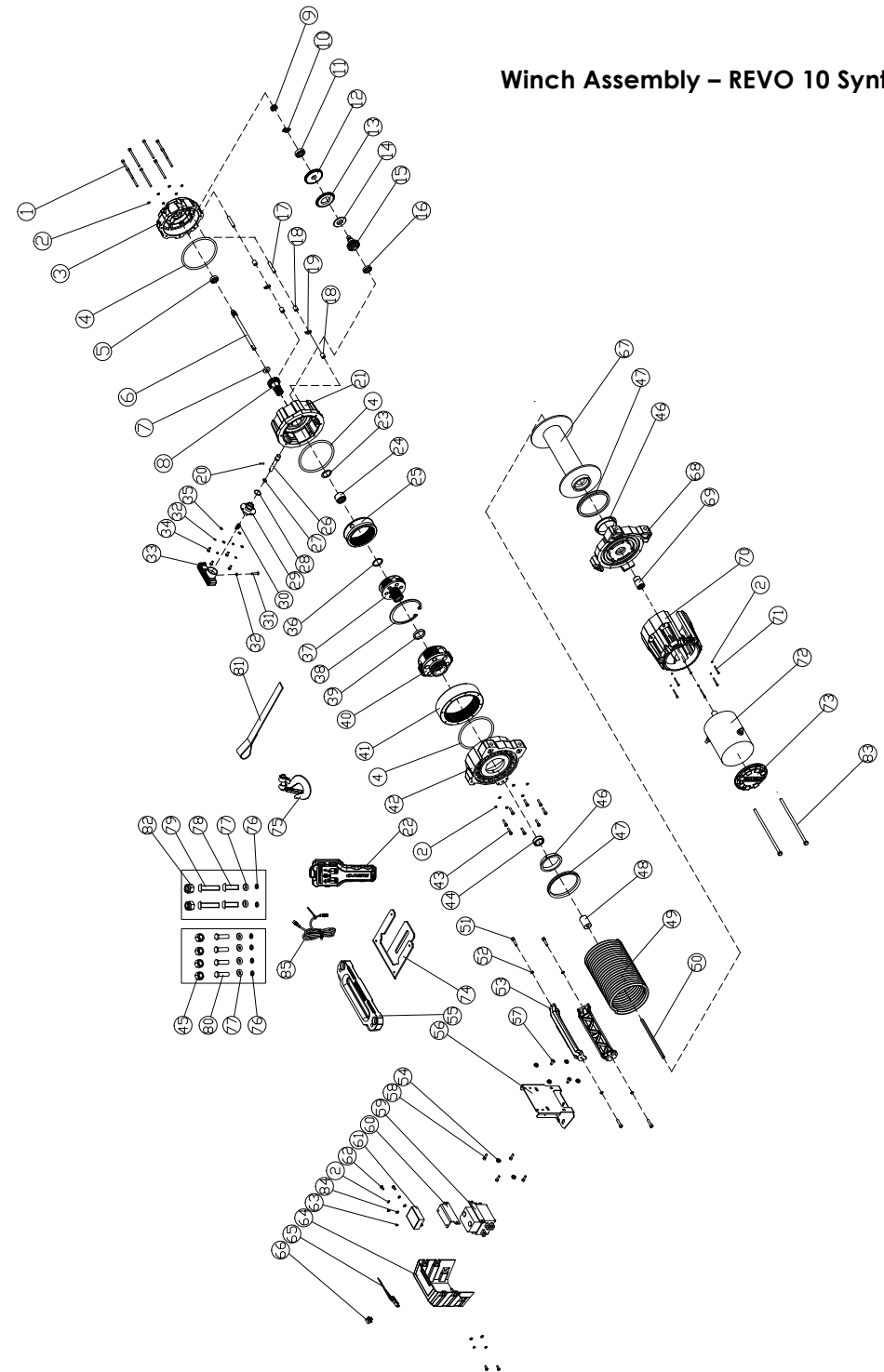
Item No:	Description	Qty
25	3rd Stage Rotating Ring Gear	1
26	Clutch Pin	1
27	Clutch Pin O Ring Small	1
28	Clutch Pin O Ring Large	1
29	Clutch Cam	1
30	Clutch Spring	1
31	Clutch Handle Socket Cap Screw M4x10mm	1
32	Clutch Spring Washer Ø4	5
33	Clutch Handle	1
34	Clutch Cam Button Head Cap Screws M4x12mm	4
35	Clutch Cam Flat Washer Ø4	4
36	Anti-Wear Washer	1
37	Third Stage Planetary Gear Assembly	1
38	Third Stage Retaining Circlip	1
39	Third Stage Anti-Wear Washer	1
40	Fourth Stage Planetary Gear Assembly	1
41	Fourth Stage Gear Ring	1
42	Drum Support Gearbox Side	1
43	Fourth Stage Retaining Socket Head Cap Screw M5*20	8
44	Input Shaft Bearing	1
45	Winch Mounting Nut M10	4
46	Drum Bearing	2
47	Drum Support Seal	2
48	Shaft Coupler	1

Winch Assembly – REVO 10 Synthetic

Item No:	Description	Qty
49	Synthetic Rope	1
50	Motor Output Shaft	1
51	Tie Bar Socket Head Cap Screw M8*25	4
52	Tie Bar Spring Washer Ø8	4
53	Tie bar	2
54	Contactors Mounting Flange Nut M5	2
55	Aluminium Hawse	1
56	Control Box Backing Plate	1
57	Contactors Mounting Screws M6*14	2
58	Control Box Mounting Hex Head Screw M5*16	4
59	Contactors	1
60	Mounting Board for Wireless Receiver	1
61	Wireless Receiver	1
62	Control Box Cover Screw M5*12	4
63	Wireless Receiver Mounting Screw M3*6	2
64	Control Box Cover	1
65	Control Box Dust Cover	1
66	Control Box Electrical Socket	1
67	Drum Assembly	1
68	Drum Support Motor Side	1
69	Motor Coupling	1
70	Motor Cover	1
71	Motor Cover Socket Head Cap Screw M5x50mm	6
72	Motor Assembly	1

Item No:	Description	Qty
73	Motor End Cover	1
74	Control Box Mounting Bracket	1
75	Synthetic Rope 1/2" Hook	1
76	Spring Washer Ø10	6
77	Flat Washer Ø10	6
78	M10 x 40mm Button Head Cap Screw (for foot down mounting)	2
79	M10 x 50mm Button Head Cap Screw (for foot forward mounting)	2
80	M10 x 35mm Hex Head Screw	4
81	Hand Strap	1
82	M10 Nyloc Nut	2
83	Motor Mounting Hex Head Bolts M6 x 160mm	2
84	Flat Washer Ø5	4
85	Remote Control Cable	1

Winch Assembly – REVO 10 Synthetic



REVO 10 Wire Model Parts List & Winch Assembly

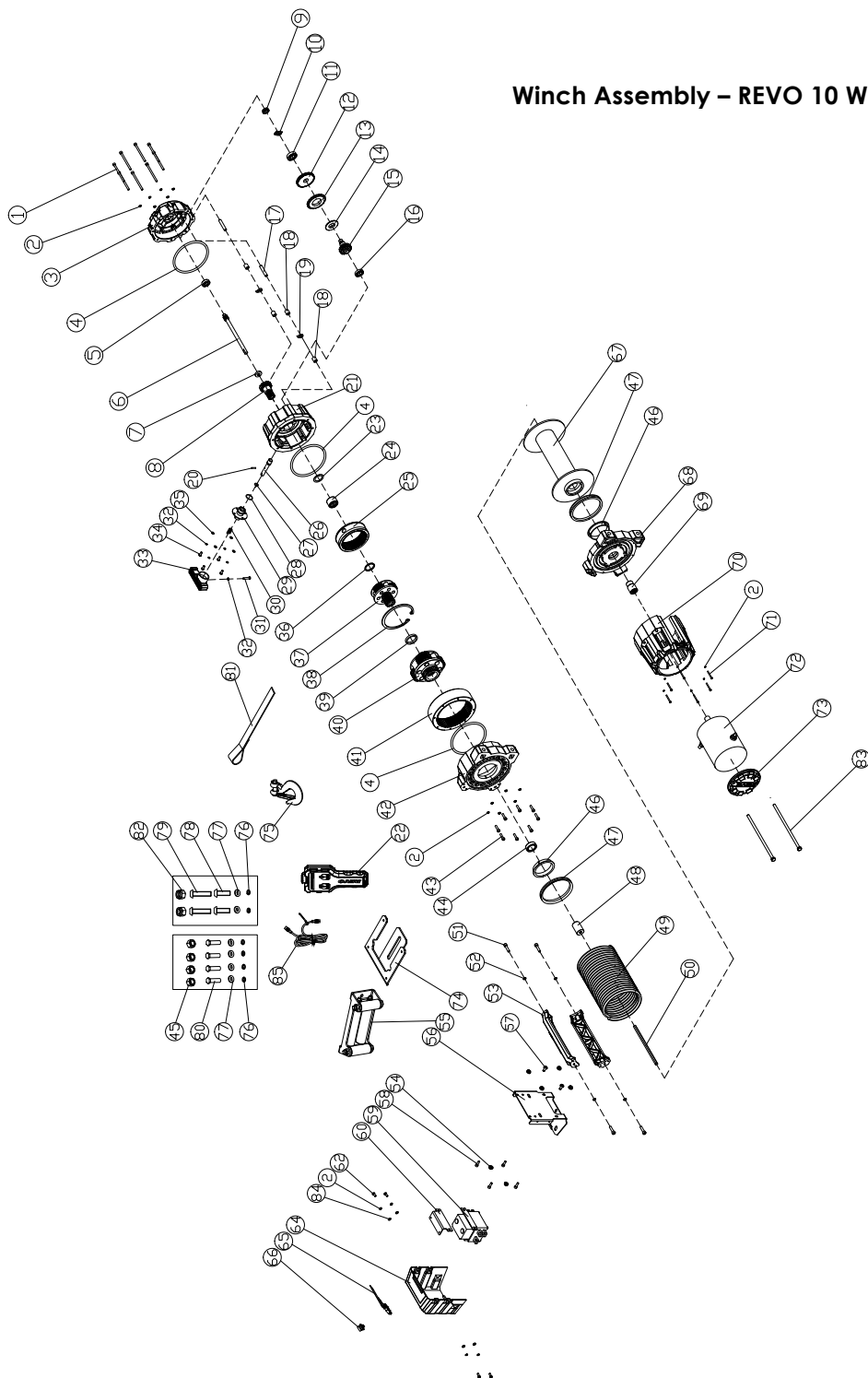
Item No:	Description	Qty
1	Gearbox End Socket Head Cap Screw M5*75	8
2	Spring Washer Ø5	26
3	Gearbox End Cover	1
4	O Ring Seal	3
5	Gearbox Cover Ratchet Bearing	1
6	First Stage Gear Shaft	1
7	First Stage Anti-Wear Washer	1
8	Third Stage Sun Gear	1
9	Nut - M12*1.25	1
10	Stop Washer M12	1
11	Ratchet Bearing	1
12	First Stage Ratchet Gear	1
13	Ratchet Gear with Friction Pad	1
14	Friction Brake Block	1
15	Second Stage Pinion Shaft	1
16	Second Stage Bearing	1
17	Pawl Pin	2
18	Pawl Spacer Bush	4
19	Pawl	2
20	Clutch Cam Cross Pin	1
21	Gearbox Housing Second Stage	1
22	Handheld controller	1
23	Bearing Anti-Wear Washer	1
24	Needle Roller Bearing	1

Item No:	Description	Qty
25	3rd Stage Rotating Ring Gear	1
26	Clutch Pin	1
27	Clutch Pin O Ring Small	1
28	Clutch Pin O Ring Large	1
29	Clutch Cam	1
30	Clutch Spring	1
31	Clutch Handle Socket Cap Screw M4x10mm	1
32	Clutch Spring Washer Ø4	5
33	Clutch handle	1
34	Clutch Cam Button Head Cap Screws M4x12mm	4
35	Clutch Cam Flat Washer Ø4	4
36	Anti-Wear Washer	1
37	Third Stage Planetary Gear Assembly	1
38	Third Stage Retaining Circlip	1
39	Third Stage Anti-Wear Washer	1
40	Fourth Stage Planetary Gear Assembly	1
41	Fourth Stage Gear Ring	1
42	Drum Support Gearbox Side	1
43	Fourth Stage Retaining Socket Head Cap Screw M5*20	8
44	Input Shaft Bearing	1
45	Winch Mounting Nut M10	4
46	Drum Bearing	2
47	Drum Support Seal	2
48	Shaft Coupler	1

Item No:	Description	Qty
49	Wire Rope	1
50	Motor Output Shaft	1
51	Tie Bar Socket Head Cap Screw M8*25	4
52	Tie Bar Spring Washer Ø8	4
53	Tie bar	2
54	Contacto Mounting Flange Nut M5	2
55	Roller Fairlead	1
56	Control Box Backing Plate	1
57	Contacto Mounting Screws M6*14	2
58	Control Box Mounting Hex Head Screw M5*16	4
59	Contacto	1
60	Mounting Board for Wireless Receiver	1
-	-	-
62	Control Box Cover Screw M5*12	4
-	-	-
64	Control Box Cover	1
65	Control Box Dust Cover	1

Item No:	Description	Qty
66	Control Box Electrical Socket	1
67	Drum Assembly	1
68	Drum Support Motor Side	1
69	Motor Coupling	1
70	Motor Cover	1
71	Motor Cover Socket Head Cap Screw M5x50mm	6
72	Motor Assembly	1
73	Motor End Cover	1
74	Control Box Mounting Bracket	1
75	Wire Rope 3/8" Hook	1
76	Spring Washer Ø10	6
77	Flat Washer Ø10	6
78	M10 x 40mm Button Head Cap Screw (for foot down mounting)	2
79	M10 x 45mm Button Head Cap Screw (for foot forward mounting)	2
80	M10 x 35mm Hex Head Screw	4
81	Hand Strap	1
82	M10 Nyloc Nut	2
83	Motor Mounting Hex Head Bolts M6 x 160mm	2
84	Flat Washer Ø5	4
85	Remote Control Cable	1

Winch Assembly – REVO 10 Wire



Warranty

Kingsley identified below (the Product) will be free from defects in materials and workmanship for the warranty period identified below commencing on the date of purchase from Kingsley ('the Warranty').

Kingsley, will rectify any defect in materials or workmanship appearing within the Warranty period by repairing or replacing the Product (at its option).

Kingsley reserves the right to determine whether the Product contains any defects in materials or workmanship covered by the Warranty.

The benefits offered by this Warranty are in addition to your rights and remedies under the Australian Consumer Law. Our goods come with guarantees that cannot be excluded under the Australian Consumer Law. You are entitled to a replacement or refund for a major failure and for compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure.

How to make a warranty claim

A claim under the Warranty must be made within the Warranty period identified below, which commences on the date of purchase from Kingsley. To make a Warranty claim, the Product must be returned to the place of purchase together with proof of purchase unless otherwise agreed by Kingsley.

Any costs incurred in making a Warranty claim or returning a Product to the place of purchase are to be borne by the person making the Warranty claim unless otherwise agreed by Kingsley.

Exclusions

Rope provided with the winch is not covered by this warranty, nor is the finish of the product. This Warranty does not cover any defect or injury caused by, or associated with improper installation or maintenance; unauthorised service, repair, modification or alteration; unsuitable physical or operating environment; electrical supply; acts of God; misuse, abuse or neglect; accidental damage, or other alterations or modifications which affect the reliability or performance of the product not attributable to a defect in materials or workmanship.

Warranty Period

The period in which a defect must appear in a Kingsley Enterprises or Bushranger 4x4 Gear product if the customer is entitled to claim the warranty is limited lifetime warranty (5 year electrical warranty) from the date of purchase from Kingsley Enterprises Pty Ltd. The warranty against defects contained in this document replaces any other warranty against defects or voluntary warranty given in relation to the products.

Kingsley Enterprises Pty Ltd

6A Brooks Road, Ingleburn 2565
New South Wales, Australia
Phone: 1800 654 767
International: +612 8700 0400
Email: sales@kingsleyenterprises.com.au

REVO10_Manual_01

BUSHRANGER

4x4 GEAR

bushranger.com.au



Free Call | 1800 654 767 (Australia only)

International | +61 2 8700 0400

Fax | +61 2 8700 0499

Email | sales@kingsleyenterprises.com.au

Address | 6A Brooks Road, Ingleburn NSW 2565