

FITTING & OPERATING INSTRUCTIONS



BHW 12v & 24v DC ELECTRIC WINCHES

Prepared for use with High Tensile Synthetic Rope

MODELS BH DELTA S2300 & S3300

Part Nos: S2300: 12v = 15814 24v = 15813 S3300: 12v = 11971 24v = 11972

Also available with optional Load Limiting Device

CONFORMING TO
EN14492-1 Cranes – Power driven winches and hoists – Part 1: Power Driven Winches

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INTRODUCTION

Thank you for purchasing a BH Delta S Series, synthetic rope winch, one of a range of professional recovery winches available from the BHW Group Limited.

PLEASE READ THIS MANUAL CAREFULLY BEFORE INSTALLATION OR OPERATION OF THE WINCH

Those responsible for the installation and the operation of this winch must read and understand this manual. The first section deals with the installation requirements and the second section is for the user and provides information to ensure safe use of the winch.

This introduction also includes information on the European standard EN14492-1 for winches and the importance of correct product specification, installation and testing to ensure the essential Health and Safety requirements of the EC machinery directive are met.

PLEASE KEEP THIS OWNERS MANUAL WITH THE WINCH

EUROPEAN STANDARDS & BHW GROUP LIMITED

The harmonised European standard: EN14492-1 for power driven winches provide the means for conformity to essential Health and Safety requirements of the EN Machinery Directive. This standard is law throughout the European Union and must be applied. Conformity to these standards is the joint responsibility of the winch supplier, the installer and the company operating the machine.

Selecting the correct winch for the application is very important not only from the health and safety aspect, but also to maximise product life and value for money by reducing maintenance costs and vehicle down time.

BHW Group Limited products are fully compliant and carry a CE mark. A Declaration of Conformity is also supplied with each winch. BHW Group Limited aim to ensure the correct machine is supplied to suit the application and we welcome the opportunity of discussing the proposed application and offer advice. It will help us considerably if information regarding the maximum and average loads to be lifted or pulled - and approximate frequency of use can be provided.

These winches must only be used for intermittent applications. They are medium duty machines ideal for the recovery of vehicles and small plant when fitted to vehicles designed for this purpose.

The winch can also be used for front mounting to Fire appliances and 4 x 4 vehicles or similar applications – or used for a purpose specifically agreed with the BHW Group Limited.

BH Delta S2300 & S3300 winches have been developed and rated specifically for use on vehicles used by the fire service, utilities and recovery industry.

Winches with the potential to apply forces over 1000kg must be load limited to prevent them applying loads above the safe working capacity.

Maximum rope length permissible on the drum must leave 1.5 x rope diameter from the top layer to drum flange.

The standard EN14492-1 considers all types of winches used for all applications and suggests guards are fitted if there is a chance an operator may become entangled.

Personnel using vehicle-mounted winches are not generally close to the winch drum during recovery for this risk to occur. It is also important for the safety and ease of operation for the user to clearly see the rope wrapping onto the drum to ensure serious bunching and resulting jamming does not occur.

Winches can be used in many different applications and the user or installer should carry out a risk assessment to determine any guarding that may be required.

In an application where hand tension is applied to the hook whilst the rope is being wound back on to the drum for storage there is a risk of the hand being pulled into the roller guide or drum. A short webbing strap should be used that is looped onto the hook to prevent the risk of this occurring (See picture on front of manual).

These straps are supplied with synthetic rope provided with new winches and are available as a replacement part (Part no. 9867) from BHW Group, or online at www.red-bhw.com.

INSTALLER RESPONSIBILITY FOR CE COMPLIANCE

1. Mount winch in accordance with instructions.
2. Install an emergency stop switch in accordance with installation instructions included in this manual. (See page14). There are also options listed of BHW Emergency Stop systems listed in this section.
3. Install a compatible load limiting device to comply with EN14492-1.
These are available as optional items from BHW Group.
If an alternative load limiting system is used, it must be comply with the directive.
BHW Group cannot accept responsibility for any operational variances that alternative load limiting devices or systems may cause during installation or operation.

NOTE: In terms of the installation, if the line pull exceeds 1000kg in the required application, then a load limiter **MUST** be installed.

4. Use the correct synthetic rope for the model of the winch. Specifications of these ropes and safety hooks are listed page 6 - Winch Rating & Synthetic Rope Specification. Ropes supplied by BHW Group are the correct calibration, have the appropriate safety hook attached and also includes the customised BHW rope end fitting to secure the rope to the drum.
5. Attach rope to the drum in the correct manner.
IMPORTANT NOTE ON WINCH ROTATION: The direction of drum rotation during winching must be as per instructions to ensure correct functioning of the winch brake and an overload device if fitted.
This feature is only active in one direction. (See guidelines and installation details on page 15).
6. Install a heavy duty, slow burn fuse in fuse carrier as close to the battery as possible to prevent fire risk. For 12v winch this should be rated at 300amp and for 24v use 200 amp. Details on heavy duty fuses are on page 12.
7. Load test the winch following installation to check the integrity of the mounting and adjust to ensure the correct load setting is achieved (See page 17).

INSTALLATION AND OPERATION

BH Delta S2300 and S3300 winches have been built to a BHW Group specification to comply with EN 14492-1. These winches are tough and will provide many years of reliable service if it is being used for the correct application.

Like all machines they must be installed correctly in accordance with the fitting instructions (Pages 9-17) and subsequently the user must also adopt the correct procedures as those included in the section headed operating instructions. (Pages 18 – 19).

Irrespective of how the winch is mounted it is important that adequate provision is made so that the load is transmitted into the body of the vehicle and then into the chassis.



WINCH INFORMATION

WINCH SPECIFICATIONS

Model	BHW Delta S2300 and S3300 Low profile planetary gear type 12v or 24v DC winches For use with UHMPE high tensile synthetic rope EN 14492-1 Compliant
Typical Uses	Vehicles used for the Fire Service, Utilities and Vehicle Recovery industry for light duty car transporters and trailers, plant moving vehicles with GVW up to 3500, Spec-lifts and 4x4's.
Winch Rating	S2300: 2300kg S3300: 3300kg
Construction	Die cast aluminium end housings with steel drum.
Motor	High torque series wound 12v (6hp) or 24v (4.7hp)
Gear Reduction	216:1 for either 12v or 24v versions.
Switching	Heavy duty, double acting solenoids. These can be mounted adjacent to the winch or on the winch tie bars with straps provided.
Wanderlead	Tough, 2 button hand held control with 4.5m lead. Other lengths available (See page 21).
Freespool Clutch	Lever on gear housing to disengage clutch.
Drum Rotation	Clockwise viewed from motor end when winching in (See page 15).
Synthetic Rope & Hook	S2300: Marlow Ropes Winchline Dynaline® rope Minimum breaking strain 68.93kN (7020kg) 9mm dia x 23m maximum length. Hook 1.5 Tonne rated with safety catch. 80 or 100 grade to comply with EN14492-1. S3300: Marlow Winchline Dynaline Max® rope Minimum breaking strain 96.593kN (9835kg) 9mm dia x 23m maximum length. Hook 2.0 Tonne rated with safety catch. 80 or 100 grade to comply with EN14492-1.
Load Limiting Device (Optional)	The BHW electronic load limiting device that measures a millivolt change in the supply current. This includes the power supply cable incorporating a shunt wire that <u>must not</u> be modified or changed. This cable should be fitted between the winch motor and isolator switch.
Weight (approx.)	Winch with aluminium hawser fairlead, soft rope, solenoid pack, connecting wiring and 4.5m wanderlead: 30kg. Steel mounting plate: 10kg
Rope to Mean Drum Ratio	9.4:1
Drum Dimensions	76mm diameter x 225mm length. Flange diameter 151mm.
Drum Storage Capacity	23m maximum (Using 9mm diameter synthetic rope).
Aluminium Hawser Fairlead	Lightweight aluminium type. Fitted as standard.
Roller Guide (optional)	Heavy duty 4 way commercial type (See page 21).
Noise Level	72db
Ambient Temp. Operating Range	-28°C to 60°C

WINCH RATING AND SYNTHETIC ROPE SPECIFICATIONS

The synthetic rope supplied with either the BH Delta S2300 or the S3300 is a Winchline Dynaline[®] synthetic rope manufactured by Marlow Ropes Limited, customised by BHW Group Limited for securing to the drum.

The maximum winch rating takes into account the use of "Ultra High Modulus Polyethylene" UHMPE (Dyneema) synthetic rope on this machine and is based on a "Minimum Breaking Force" to winch line pull rating of 3:1.

This safety ratio is recommended by the Recovery Equipment Manufacturers and Suppliers Association (REMSA) in conjunction with major manufacturers of these high tensile strength (UHMPE) synthetic ropes when used on vehicle mounted winches used for recovery purposes only.

The ropes used and the winch ratings are as follows:

S2300

Winchline Dynaline[®]
Minimum breaking strain 68.93kN (7020kg). Winch rating 2300kg
9mm diameter x 23m length maximum
Maximum rope length allows for only 3 layers, to ensure adequate freeboard between top rope layer and the edge of the winch flange
Construction: 12 strand UHMPE Marlow Dynaline[®] with Marlow Armour Coat[®]

NOTE – S2300 SAFETY HOOK: Hook must include safety latch and minimum rated capacity of 1.5 Tonne. Use only high tensile grade 80 or 100. These hooks are rated and stamped for lifting and have safety factors of 4:1. A 1.5 Tonne hook has a minimum yield of $4.0 \times 1.5 = 6$ Tonne. For pulling applications with a 2:1 factor of safety they are suitable for up to 3.0 Tonne line pull.

S3300

Winchline Dynaline Max[®]:
Minimum breaking strain 98.45kN (19,035kg). Winch rating 3300kg
9mm diameter x 23m length maximum
Maximum rope length allows for only 3 layers, to ensure adequate freeboard between top rope layer and the edge of the winch flange
Construction: 12 strand UHMPE Marlow Dynaline Max[®] with Marlow Armour Coat[®]

NOTE – S3300 SAFETY HOOK: Hook must include safety latch and minimum rated capacity of 2.0 Tonne. Use only high tensile grade 80 or 100. These hooks are rated and stamped for lifting and have safety factors of 4:1. A 2.0 Tonne hook has a minimum yield of $4.0 \times 2.0 = 8$ Tonne. For pulling applications with a 2:1 factor of safety they are suitable for up to 4.0 Tonne line pull.

ROPES SUPPLIED BY BHW GROUP

Synthetic ropes supplied by BHW Group have the correct safety hooks and are customised for attaching to the drum of BH Delta S Series winches (See page 15).
S2300 Replacement rope and hook: Part No. 4414
S3300 Replacement rope and hook: Part No. 15317



The ratio of rope diameter to mean drum diameter is in excess of the minimum requirement of 8:1, as recommended by the rope manufacturers, necessary to prevent fatigue.

WINCH INFORMATION

WINCH PERFORMANCE

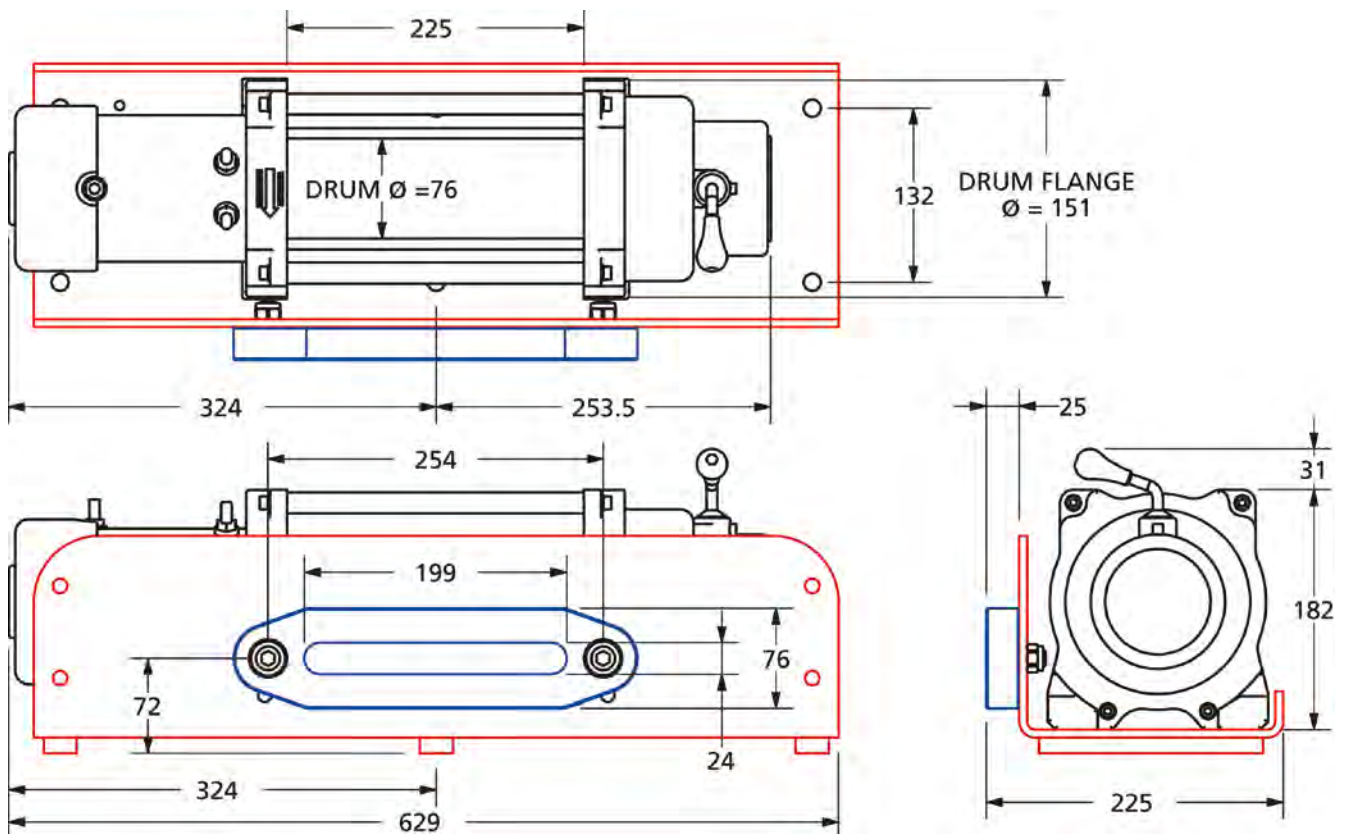
		LAYER			
		1	2	3	
Maximum Rated Line Pull by Layer*	S2300	kgf kN	2300 22.6	1910 18.7	1634 16
	S3300	kgf kN	3300 32.4	2740 26.9	2344 23
Cable Drum Capacity Cumulative by Layer	S2300 & S3300	m	7	15	23

By incorporating a snatch block in the line it is possible to double these capacities.

PERFORMANCE FIRST LAYER OF CABLE				
LINE PULL	LINE SPEED (approx)		AMP DRAW (approx)	
	kgf	12v m/min	24v m/min	12v
3000	2	2.1	320	160
3300	1.5	1.6	360	180

All figures are based on battery maintaining normal voltage.

WINCH DIMENSIONS



WINCH INFORMATION

WINCH LABELS

The four variants of end labels are as shown below. The ratings label will change according to winch model.

PLEASE NOTE: Winch ratings label shown here is indicative. Please refer to actual label on product and detail shown in Winch Specifications on page 5. You are advised to make a separate note of the winch serial number and date of manufacture for future reference, should you need spares, repairs or have any other general enquiry about the winch.

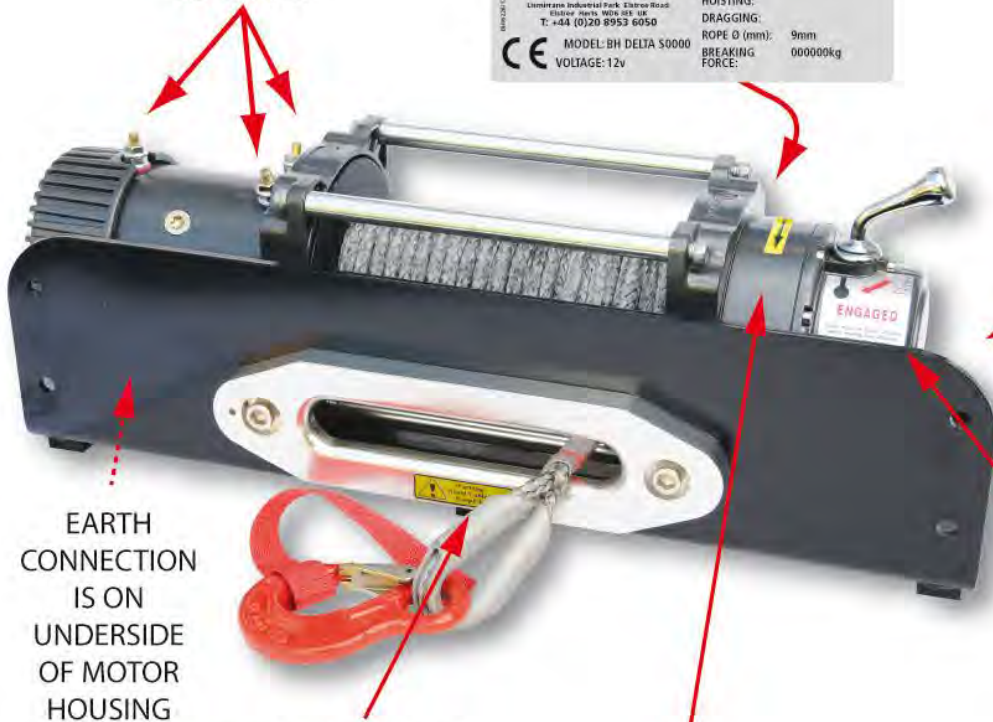
MODELS & VOLTAGES SHOWN ON END HOUSING OF FREESPOOL CLUTCH



COLOUR CODED
TERMINALS TO
SOLENOID

RATINGS

WINCH RATING	SERIAL NO:	00000000
BHW	DATE OF MANUFACTURE:	00/00/00
Bushey Hall Winchmaster	WORKING LOAD LIMIT:	00000kg
www.bhwgroup.com	HOISTING:	
Unit: 10m Industrial Park, Charnock Road, Ebbw Vale, NP23 5UR	DRAGGING:	
T: +44 (0)29 8953 6050	ROPE Ø (mm):	9mm
CE	BREAKING FORCE:	000000kg
MODEL: BH DELTA S0000		
VOLTAGE: 12v		



EARTH
CONNECTION
IS ON
UNDERSIDE
OF MOTOR
HOUSING

INJURIES WARNING



DRUM ROTATION



FREESPOOL
CLUTCH

INSTALLATION

WINCH MOUNTING

The winch must be securely mounted on a flat surface so that the three major sections (the motor end, cable drum and gear housing end) are properly aligned. It is advisable to use the standard mounting bracket for this winch that includes pre-punched holes to ensure correct alignment.

The mounting surface must be flat (level support) within 0.38mm and sufficiently stiff to resist flexing. Winch securing holes must be kept in alignment and not oversized.

Using the standard mounting bracket with the winch pre-fitted, install angle or channel sections between the first and second body cross bearer positioned so the centerline of the winch drum is on the centerline of the body.

The universal winch mounting plate from BHW Group (Part no. 10766) is available for the BH Delta S2300 or S3300 and requires the fixings as listed below.

FIXINGS

Winch to Mounting Plate requires:

4 x M10 x 35mm high tensile (8.8) BZP bolts, 4 x M10 plain square full nut BZP, 4 x M10 plain washer BZP, 4 x M10 spring washer BZP.

Roller Guide to Mounting Plate requires:

2 x M12 x 25mm high tensile (8.8) BZP bolts, 2 x M12 plain full nut BZP, 2 x M12 plain washer BZP, 2 x M12 spring washer BZP.

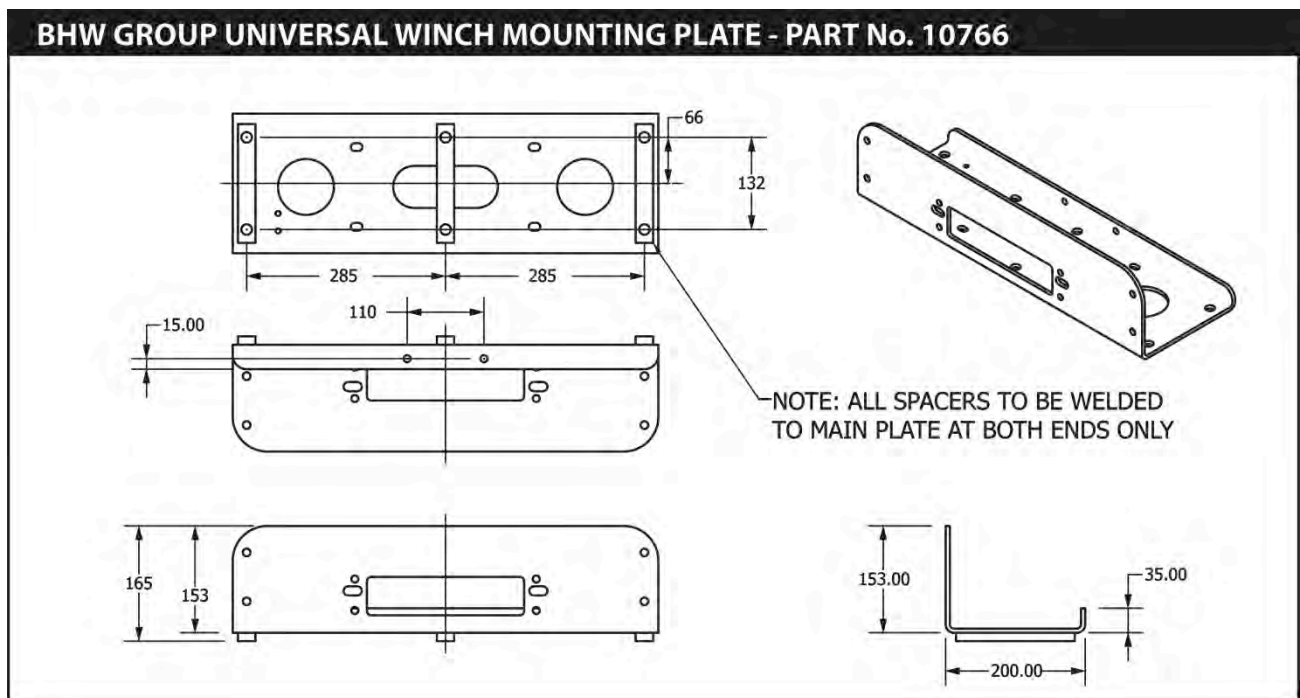
Mounting Plate to Body Floor /Subframe Sections (level support) requires:

6 x M12 high tensile (8.8) BZP bolts. 6 x M12 Nylock full nut BZP, 12 x M12 plain washer BZP – 2 per bolt.

Note: Bolt length dependant on fit, (there must be a minimum of 5mm length of the bolt thread showing through the Nylock insert after tightening).

(BZP = Bright Zinc Plated)

In many applications the body floor will be sandwiched between the mounting bracket and subframe sections.



INSTALLATION

ELECTRICAL CONNECTIONS & OPERATIONS

Always ensure the correct voltage corresponding to the chassis electrical system is used. If in doubt, consult the dealer. For general advice on batteries please see section in the back of this manual.

CORRECT ATTENTION TO THE WIRING OF THE WINCH IS ESSENTIAL FOR CORRECT FUNCTIONING AND SAFETY

SOLENOID PACK

BH Delta S2300 & S3300 winches are supplied with a solenoid pack which is fitted with OR without an electronic load-limiting device depending on the specification at the time of order from BHW Group.

Important note: A load-limiting device must be fitted to ensure compliance with EN14492-1. This is legal safety requirement throughout the European community. Some bodybuilders may however wish to install their own load limiting system.

Supplied from BHW Group with Load Limiting Device:

Solenoid is pre-wired with a red cable including a shunt wire.

On no occasion should the shunt wire be either shortened or removed.

Supplied from BHW Group without Load Limiting Device:

Solenoid pack is supplied with a 1.8m length red cable.

If longer cable length is required, replace red cable.

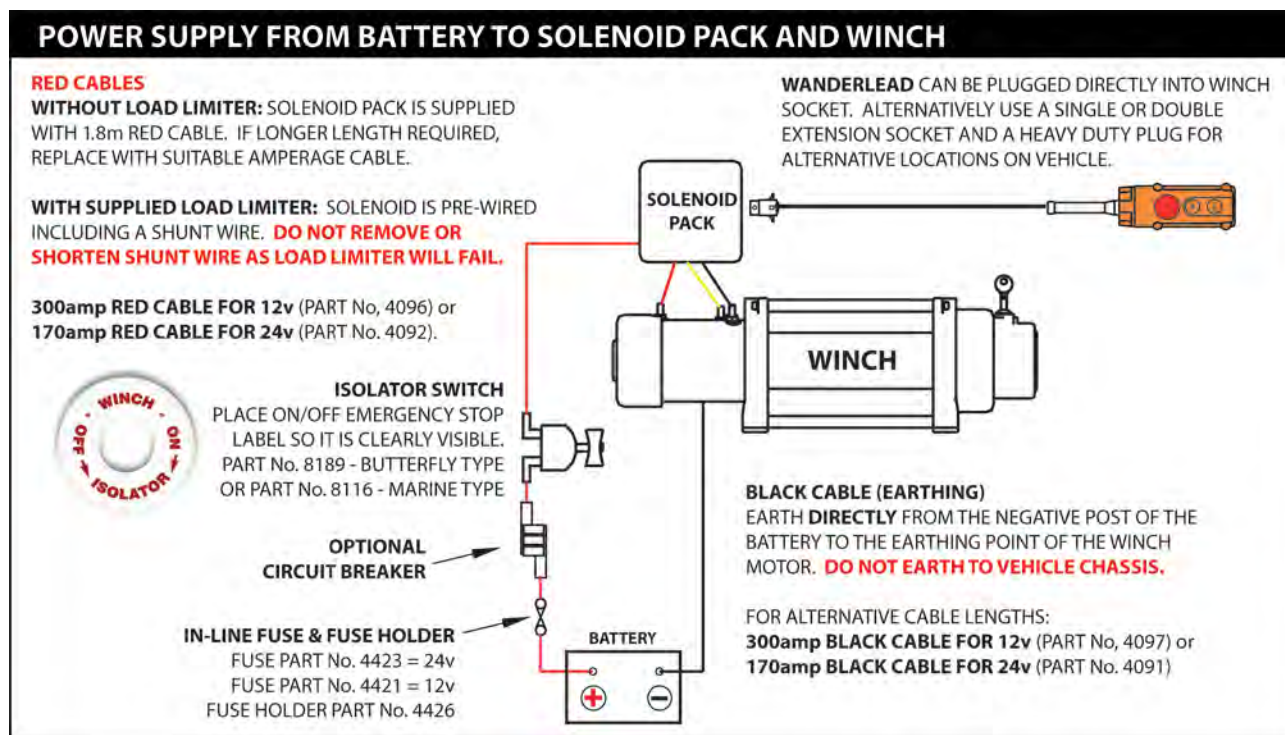
Ensure that cable size is correct for either 12v or 24v.

Mount the solenoid pack either on the winch using the winch tie straps provided or in a convenient position remotely from the winch so it is not susceptible to damage. Also consider water and snow ingress as the solenoid should be positioned so this cannot occur.

NOTE: It is very important that the solenoid control box is easily accessible to enable solenoid replacement in the event of a failure.

POWER SUPPLY FROM BATTERY TO SOLENOID PACK

The power feeds must be rated at 300 amps for 12v and 175 amps for 24v winches. Recommended cable types are shown below. Available from BHW Group or online from www.red-bhw.com.



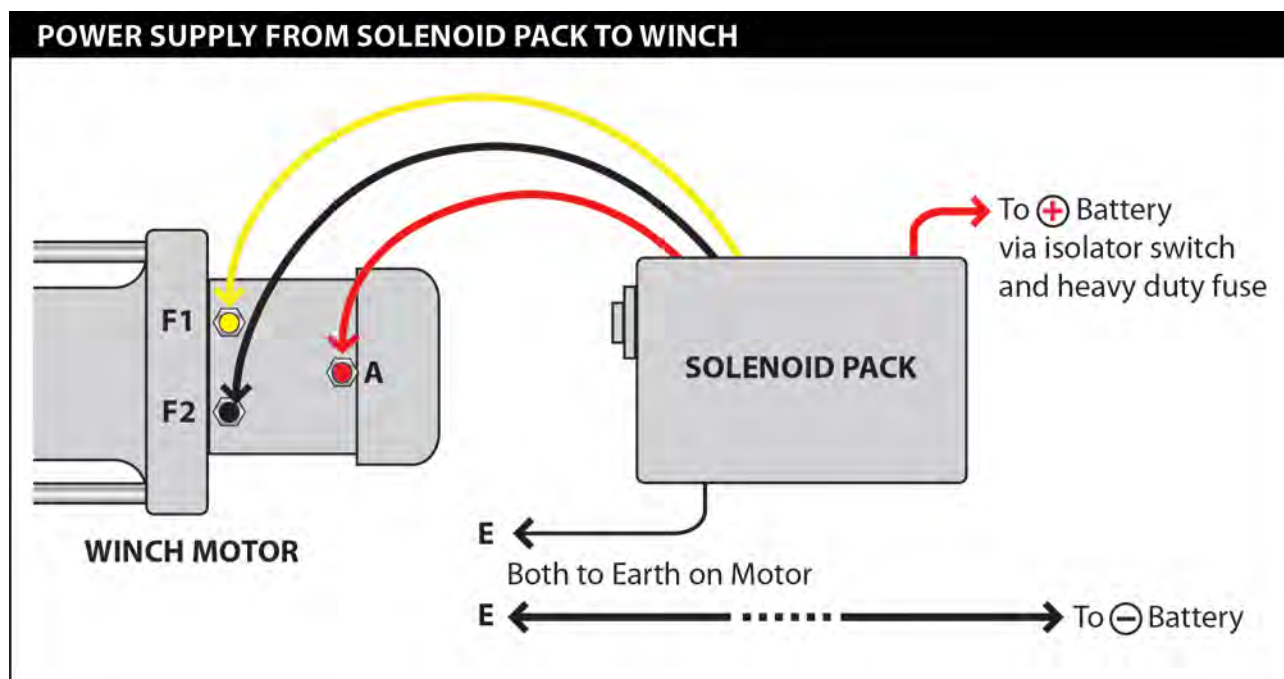
Cables from the batteries should be kept as short as possible to minimise any voltage drop.

INSTALLATION

POWER SUPPLY FROM SOLENOID TO WINCH MOTOR

The solenoid should be wired to the winch motor as shown below

ENSURE THAT THE CORRECT VOLTAGE WINCH IS FITTED TO MATCH THE VEHICLE ELECTRICAL SYSTEM



1. Short **RED** sleeved cable connects to red terminal (A) of the motor.
2. Short **YELLOW** sleeved cable connects to the yellow terminal (F1) of the motor.
3. Short **BLACK** sleeved cable connects to the black terminal (F2) on the motor.
4. Thin **BLACK** cable (e) connects to bottom terminal of the motor (earth).
5. Long **BLACK** cable (1.8m), one terminal (E) connecting to the bottom terminal (earth) of the motor, and the other terminal connecting to negative (-) terminal of battery.
The earth terminal on the motor housing is located underneath.
6. Long **RED** cable positive (+) connect to positive terminal of battery via the isolator switch and heavy-duty fuse.

Always connect an earth wire **direct to the battery** and not just to the chassis. Not only will this prevent a voltage drop to the winch motor but also on modern chassis this is a requirement to prevent damage to the vehicle electrics and to also ensure a good earth return. The power feed and earth wire cables should be kept as short as possible to avoid voltage reduction to the motor as this will result in reduced puling force and a slower line speed.

INSTALLATION

ISOLATOR SWITCHES

A high amperage isolator switch must be fitted - either:
 Marine type (left) - Part No. 8116.
 Butterfly type (right) - Part No.8189.
 Isolator switch kits include cable boots and rotation label.
 Available from BHW Group or online at www.red-bhw.com



Isolator must be placed so that rotation on/off label is in a clearly visible position.

ISOLATOR SWITCH MUST BE TURNED OFF WHEN WINCH IS NOT BEING USED.

HEAVY DUTY FUSES (MEGAFUSE)

A fuse and fuse holder must be fitted in the positive feed cable as close to the battery as possible to prevent fire risk to the vehicle in the event of a short circuit in the supply cable.

These can be purchased separately from BHW Group Limited , or online at www.red-bhw.com.



Please quote the following part numbers.

4421 **300 amp** Megafuse (for **12v** winch)
 4424 **150 amp** Megafuse (for **24v** winch)
 4426 Megafuse Enclosure for above fuses

In some circumstances when the vehicle is involved in high usage with only short driving distances between winching operations, it will be necessary to fit an additional heavy duty battery wired in parallel with the vehicle battery and kept as close to the winch as possible.

It is also advisable to have the vehicle fitted with a heavy-duty charging system and heavy duty batteries.

EMERGENCY STOP SYSTEM

It is a requirement under EN14492-1 and the Machinery Directive that all machines have Emergency Stops.

Whilst BHW Group can offer a comprehensive range of Emergency Stop systems, it is ultimately the responsibility of the person installing the winch to carry out a risk assessment to decide and provide the Emergency Stop suitable for the application.

BHW Group Emergency Stop options include:

1. A heavy duty Emergency Stop circuit breaker button that is wired into the main power feed, that when activated cuts the power to the winch.
2. An additional solenoid that utilises a diode and is energised as soon as either 'In' or 'Out' buttons on the wanderlead are activated. This diode ensures that the vehicle battery will not go flat if the operator forgets to turn off the winch isolator button after use. Emergency Stop circuit breaker button or buttons can be located in the appropriate position for the vehicle application. This system can work in conjunction with the BHW Group FM Connect radio remote system.
3. As No. 2 above but with an additional Emergency Stop circuit breaker button located on the wanderlead handset.
4. A complete control panel incorporating the directional solenoids, Emergency Stop and isolator switch. The control system can then be mounted in the most suitable work area and comes with a full wiring harness.

Please contact BHW Group sales to discuss any of these options on +44 (0)20 8953 6050.

INSTALLATION

ELECTRONIC LOAD LIMITING DEVICE

BH DELTA S2300 and S3300 winches can be supplied with an optional BHW electronic load limiting device that shuts the machine down when the maximum load limit is reached. If an alternative load limiting device is used, it must comply with EN 14492-1.

The BHW load limiting device is supplied with a factory set, shut down line pull calibration.

Due to elasticity in the rope and the vehicle suspension, this will need re-calibration for the specific application.

The sections below detail the connection, testing and adjustment of a BHW load limiting device supplied with the either the BH DELTA S2300 or S3300.

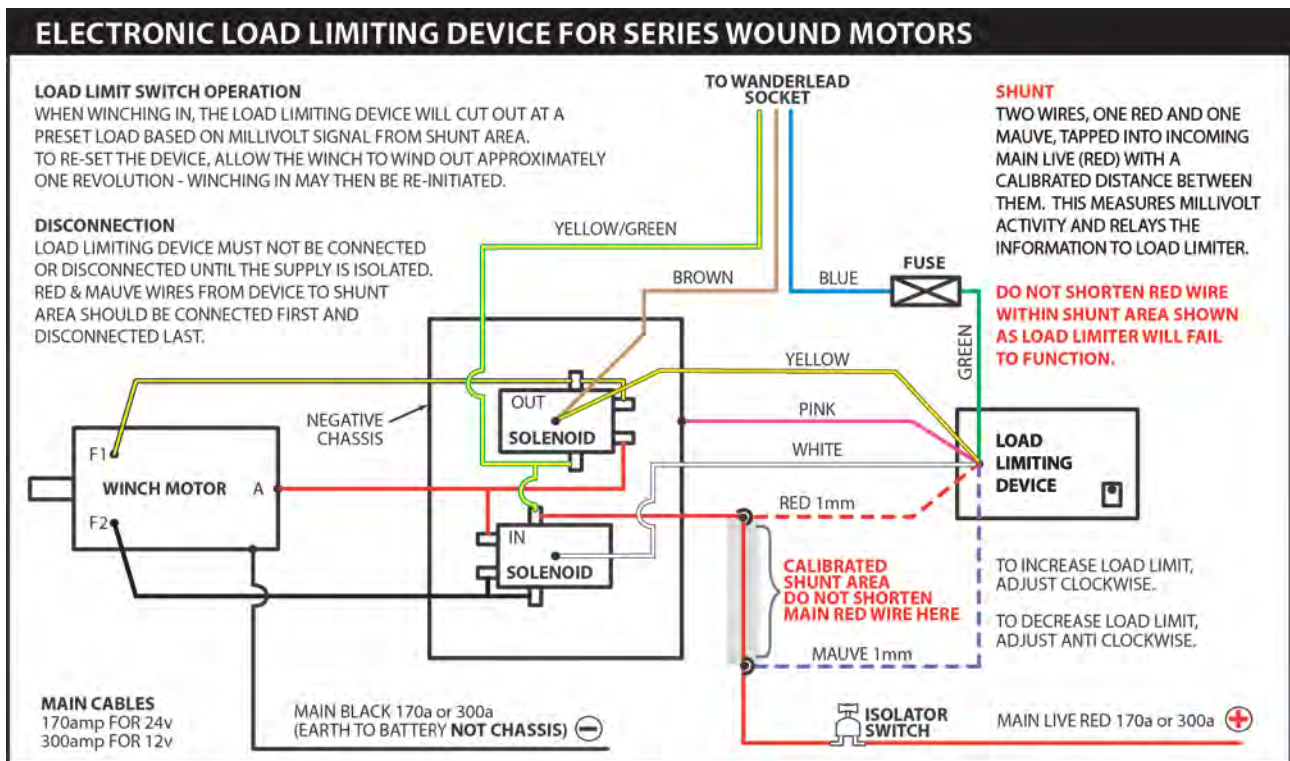
CONNECTING A BHW LOAD LIMITING DEVICE

The BHW load limiting device is contained in a sealed / potted container (usually positioned on the underside of the solenoid control) with wires for connection as shown in the diagram below. Other load limiting devices or systems vary.

IMPORTANT NOTE

The positive supply cable (Red 170a or 300a depending on voltage of winch) is pre-fitted, wired into the load limiter. Linked to this are two 1mm wires (Mauve and Red) whose connections to the positive supply cable are set to a calibrated distance between them. This circuit measures millivolt change in supply and determines when the load limiting device will register maximum load and shut down the operation of the winch.

**THIS SECTION OF THE POSITIVE SUPPLY CABLE AND THE ATTACHED WIRES
MUST NOT BE REMOVED OR MODIFIED IN ANY WAY
AS IT WILL CAUSE THE LOAD LIMITING DEVICE TO FAIL TO FUNCTION CORRECTLY**



INSTALLATION

WANDERLEAD REMOTE SOCKETS

Position female connector to accept a wanderlead at a convenient point that will avoid damage and water ingress. Connect a 3 core, 5amp waterproof cable and secure the cable to avoid chaffing. Route wire to winch position. Fit a male connector to plug into winch socket. Silicon waterproof sealant is recommended around all electrical connectors to prevent weather ingress.

Optional BHW kits are available for both single and double rear sockets.
Kit part numbers 11066 (single) and 7093 (double).

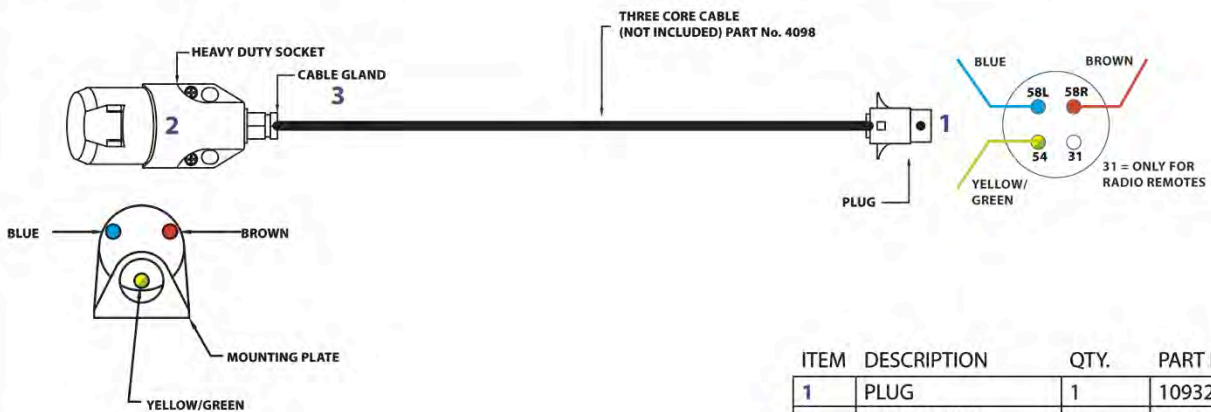
SINGLE EXTENSION SOCKET WIRING

TO WIRE HEAVY DUTY SOCKET

REMOVE TOP COVER PASS THREE CORE CABLE THROUGH GLAND AND ENTRY HOLE.
VIEW SOCKET FROM GLAND END WITH MOUNTING PLATE DOWN AND CONNECT THREE CORE CABLE AS SHOWN BELOW.
APPLY SILICONE SEALANT AROUND EDGES OF TOP COVER BEFORE IT IS SECURED IN PLACE TO PROVIDE WATER RESISTANCE.
FINALLY SCREW CABLE GLAND INTO SOCKET MOUNTING PLATE AND GENTLY TIGHTEN USING A SPANNER.

TO WIRE PLUG

BLUE TO 58L
BROWN TO 58R
YELLOW/GREEN TO 54.
FILL INSIDE OF PLUG WITH SILICONE SEALANT TO PROVIDE WATER RESISTANCE.
PIN 31 ONLY USED FOR RADIO REMOTE CONTROLS.



ITEM	DESCRIPTION	QTY.	PART No
1	PLUG	1	10932
2	H/D SOCKET	2	7078
3	CABLE GLAND	2	6067

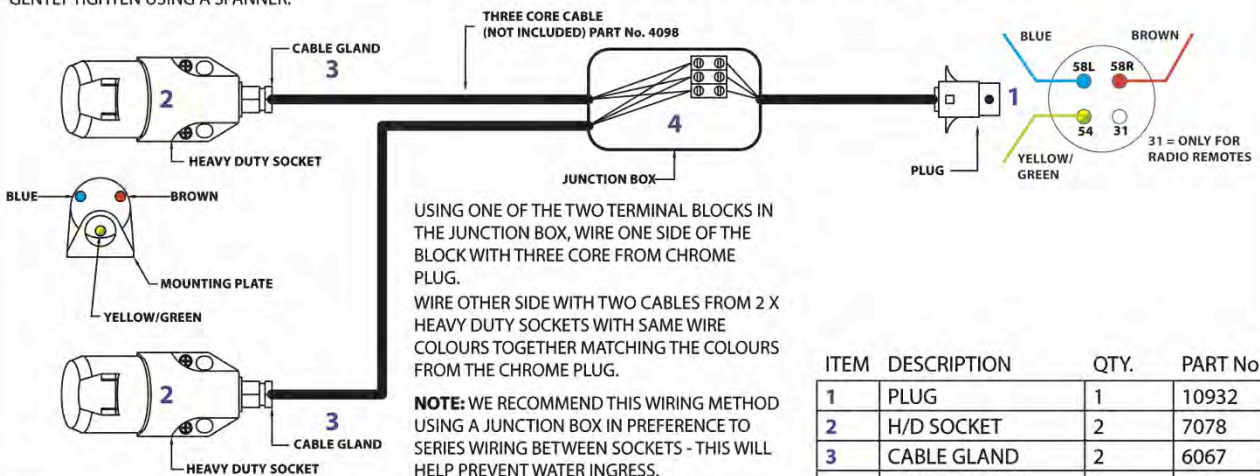
DOUBLE EXTENSION SOCKET WIRING

TO WIRE HEAVY DUTY SOCKET

REMOVE TOP COVER PASS THREE CORE CABLE THROUGH GLAND AND ENTRY HOLE.
VIEW SOCKET FROM GLAND END WITH MOUNTING PLATE DOWN AND CONNECT THREE CORE CABLE AS SHOWN BELOW.
APPLY SILICONE SEALANT AROUND EDGES OF TOP COVER BEFORE IT IS SECURED IN PLACE TO PROVIDE WATER RESISTANCE.
FINALLY SCREW CABLE GLAND INTO SOCKET MOUNTING PLATE AND GENTLY TIGHTEN USING A SPANNER.

TO WIRE PLUG

BLUE TO 58L
BROWN TO 58R
YELLOW/GREEN TO 54.
FILL INSIDE OF PLUG WITH SILICONE SEALANT TO PROVIDE WATER RESISTANCE.
PIN 31 ONLY USED FOR RADIO REMOTE CONTROLS.



ITEM	DESCRIPTION	QTY.	PART No
1	PLUG	1	10932
2	H/D SOCKET	2	7078
3	CABLE GLAND	2	6067
4	JUNCTION BOX	1	5978

INSTALLATION

ROPE ATTACHMENT TO THE DRUM

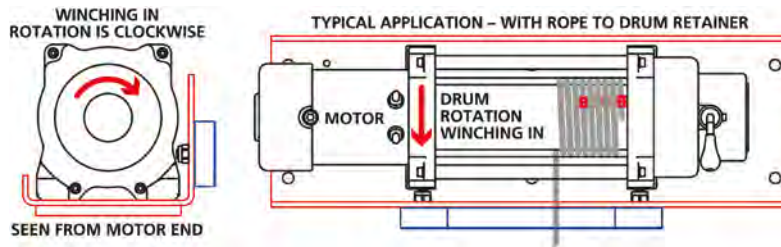
Unwind the synthetic rope by rolling it out along the ground and ensure there are no kinks or damage.

Rotate the cable drum on the winch to show the locking grub screw in the drum and ensure it is on top for easy access.

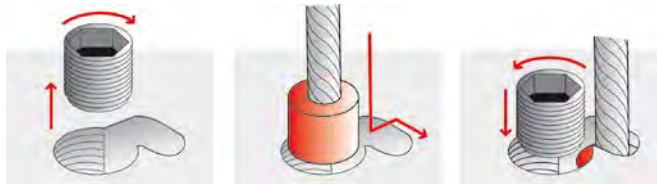
WINCH ROTATION **VERY IMPORTANT**

The rotation of the drum when winching in must be correct as the load holding brake is only operational in one direction. Whether BH Delta S2300 and S3300 winches are fitted with an optional BHW load-limiting device, or any other load limiter, the rotation direction has to be correct for load limiting to function correctly.

VIEWED FROM THE MOTOR END, THE 'WINCH IN' DRUM ROTATION IS CLOCKWISE



Below is a simple diagram of the grub screw and the placement of the rope end into the drum – **however**, you are advised to read the second section relating to the **rope to drum retainer strap**, for secure fixing of the rope to the drum. Fitting the retainer strap will ensure that a minimum of 5 wraps is always kept on the drum, as the strap will lock the rope once it has been paid out to its maximum length.



ROPE TO DRUM RETAINER STRAP: After threading the end of the rope through the hawser fairlead and under the drum of the winch, push the rope end through the retainer strap.

Pull enough of the rope (about 1.4m) through the retainer strap so the rope can be wrapped around the drum 5 times.

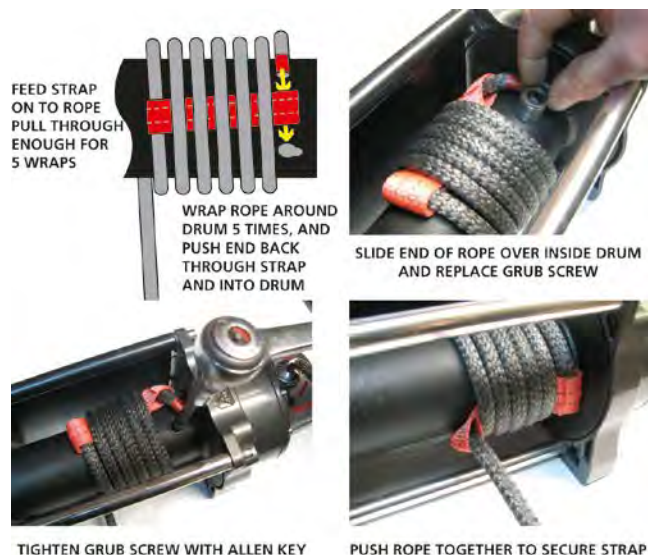
When wrapping the rope (5 wraps) around the drum, ensure that the retainer strap is underneath the rope.

With the last wrap, thread the end of the rope back through the retainer strap and into the grub screw hole on the winch drum. Slide the rope sideways inside the drum to clear the grub screw hole.

Replace the threaded grub screw and tighten into position.

Slide and tighten the coils of rope across the drum and ensure any slack is taken up.

The securing end of the rope needs to be tight up inside the inside of the drum casing as a drive shaft runs through the centre of the drum.



Please note: The photos show the operation without the hawser fairlead, for a clearer view of how to load the rope. The hook at the other end of the rope will not fit through a hawser fairlead – or a roller guide.

ALTERNATIVE DRUM WITH TUBE INSERT

To attach the rope to this type of drum pass the rope through the tube set into the drum and fasten it with the grub screw.



TRIALLING & TESTING

TO TRIAL THE WINCH

If the rope has been fitted, keep hand tension on the rope at all times during this trial using the webbing strap on the safety hook. (Testing the installed winch system without a rope can still be achieved by using the same procedure).

Turn on isolator switch.

Plug in the wanderlead control.

Check that the winch can be powered both 'In' and 'Out'.

Check that the load is automatically held safely when control button is released.

Once the winch and the installed system has been checked, the load-limiting device can be calibrated.

MEASURING THE SETTING OF THE LOAD LIMITING DEVICE

Wind in the synthetic rope on the bare drum to at least seven wraps.

The load limiter should be calibrated on the **FIRST LAYER** of the rope on the drum.

(See performance charts on page 7).

Connect the safety hook to a dynamometer (strain gauge), then to a suitable anchor point via a chain or webbing strap (capable of withstanding beyond the maximum force), to measure the load applied.

**IF A 'TRIAL' ROPE IS USED FOR THIS EXERCISE, IT MUST BE OF THE SAME CALIBRATION AND SPECIFICATION OF THE ROPE INTENDED FOR USE.
AN ALTERNATIVE SPECIFICATION WILL NOT NECESSARILY FULLY TEST THE WINCH – OR THE ROPE FOR APPROVED OPERATIONAL STATUS**

Make sure the battery on the vehicle is fully charged and the engine is running.

It is advisable to have two technicians during this process – one to slowly apply the load by powering the winch using the wanderlead control, and the other to record the reading on the dynamometer (strain gauge).

TECHNICIANS SHOULD STAND WELL AWAY FROM THE LINE OF THE ROPE AND HOOK IN CASE OF A ROPE OR INSTALLATION FAILURE

IT IS ALSO A GOOD IDEA TO PLACE A BLANKET OVER THE MID SECTION OF THE ROPE TO DAMPEN ANY WHIPLASH IN THE UNLIKELY FAILURE OF THE ROPE OR THE HOOK

On a new winch installation a proof load test of 125% of the rated winch capacity should be applied to prove the integrity of the winch and the supporting structure.

Following this, further adjustment should be made so that the winch rating is no greater than the maximum load specified on the plate attached to the winch.

LOAD LIMITING DEVICE ADJUSTMENT

BEFORE ANY ADJUSTMENT IS MADE THE LOAD MUST BE RELIEVED TO TAKE TENSION OUT OF THE ROPE

Once the load limiter has stopped the winch can be re-set by pressing the 'OUT' button on the wanderlead.

Usually a quarter turn of the winch will be sufficient to re-set it for operation.

An adjustment screw to enable an accurate load setting is bedded into the outer casing of the load-limiting device.

To make an adjustment: Using a screwdriver, wind in to increase the rating or wind out to reduce the rating.

The load-limiting device should then be measured again for load tolerance as per instructions above, and this process should continue until the correct calibration is achieved.

DO NOT ASSUME CALIBRATION IS CORRECT UNTIL FINALLY TESTED AND APPROVED

Following final adjustment a drop of nail varnish or similar proprietary compound can be placed in the hole containing the adjusting screw as this will show any tamper evidence on future inspection.

OPERATING INSTRUCTIONS

SAFETY PRECAUTIONS

PLEASE READ THIS CAREFULLY BEFORE OPERATING THE WINCH

It is important that you read and digest the information contained in this handbook.

The winch is of the highest quality and has been designed to give a robust and efficient service for many years if care and attention are given at all times to correct, safe operation and maintenance.

Respect for a winch and common sense in its operation, will ensure complete safety and reliability.

Do not underestimate the potential danger in winching operations.

Be aware of the basic dangers so you can avoid risk of accidents or unnecessary damage to the winch or the vehicle / application.

The following safety precautions must be observed at all times whilst using the winch.

Keep yourself and others at a safe distance to the side of the rope when pulling under load.

Never step over, stand near or guide a rope under tension.

Always use heavy-duty gloves when handling the rope to protect against abrasions or possible burns.

Take care of the rope. Replace if damaged or worn. (See pages 16 and 23 for rope maintenance tips and page 21 for replacement ropes).

Always apply tension to the rope (using the safety hook webbing strap attached to the hook) to ensure that the rope is rewound neatly and evenly on to the drum. Loose coils or uneven wrapping are dangerous and can result in trapping or snatching when next used - and also damage to the rope or the winch.

Do not drive the vehicle to pull a load on the rope, e.g. as a tow rope, Any resulting shock load could break the rope or damage the winch.

If the winch is being operated at maximum capacity, drape a heavy blanket or coat over the wire rope, halfway along its length. The blanket will reduce the speed of a snapped rope.

When recovering a vehicle, the winch hook should be attached to the towing hitch, if available, or to a strap or chain around a chassis leg or cross member.

NEVER ANCHOR THE WINCH HOOK ONTO BUMPERS, OR SHIPPING / TRANSIT ANCHORAGE.

Do not allow the load to 'snatch' during a pull, as this can momentarily double or even treble the load on the rope.

Try to position either your vehicle or the anchor point to ensure as straight a pull as possible. Use a snatch block if it is necessary to turn any corners with the rope.

When attaching the hook to the load, always double check that the hook is secure and the safety catch is fully closed. Remember that if the hook breaks away under tension, serious injury can result, as the hook will travel through the air at speed.

A minimum of five wraps of rope around the drum is recommended to hold the load.

Ensure that the rope to drum retainer strap has been fitted when the rope was installed on the drum.

NEVER HOLD THE SAFETY HOOK TO REWIND THE WINCH USE THE SAFETY HOOK WEBBING STRAP PROVIDED

OPERATING INSTRUCTIONS

NOTES ON SYNTHETIC ROPES

BH Delta S2300 and S3300 winches are designed for use with Ultra High Modulus Polyethylene (UHMPE) high tensile synthetic ropes. They are supplied with Marlow Winchline Dynaline[®] synthetic ropes with Marlow Armour Coat[®], including pre-fitted safety hooks and BHW customised end fittings, as described below.

BH Delta S2300 uses Winchline Dynaline[®] with a minimum breaking strain of 68.93kN (7020kg).
BH Delta S3300 uses Winchline Dynaline Max[®] with a minimum breaking strain of 98.45kN (19,035kg).
The rope specification for either the S2300 or the S3300 determines the setting of the load limiter.



Soft ropes offer benefits in many vehicle winching applications for example by fire and rescue services, the utilities and on recovery vehicles. The benefits include their ease of use and pleasant handling in comparison to wire ropes. Their lightweight also improves handling as well as being a benefit where, for example, front axle weights are critical. They also lie softly on the winch drum without springing away so less force is required to maintain constant tension on the rope when it is rewound onto the drum.

WARNING

Ultra High Modulus Polyethylene (UHMPE) Synthetic ropes, unlike wire rope, are more easily damaged by sharp edges or abrasive surfaces and they are unsuitable in applications where these cannot be avoided.

It is essential that the rope is inspected by the user on a daily basis

In addition a further inspection should be made and the result recorded at approximately weekly intervals, depending on the frequency of use. Tension should be applied to the rope whilst carrying out this procedure and at the same time the rope is checked to ensure it is serviceable.

Under no circumstances wrap the rope around the load being recovered and then attach the hook back on to the rope.

This can result in serious rope damage, equipment breakage or possible injury to personnel.

Always employ a webbing strap or polyester link from the hook to the load.

This method must also be used when connecting to vehicle tow-eyes.

Ropes are not covered under warranty.

Replacement ropes can be purchased separately from BHW Group Limited, or online at www.red-bhw.com.

ROPE CARE ADVICE

Inspection and Retirement

It is important that a rope is regularly inspected to ensure that it is undamaged and is still fit for service. The entire length of rope should be examined. The degree to which any of the following may be allowed before the rope is retired will be dependent on the assumptions made when the rope and safety factors were determined. The following are some of the points that should be checked:

- **External abrasion:** When a multifilament rope is subjected to abrasion then the outer filaments will quickly become broken and a furry finish will develop. This furry layer will protect the yarns underneath preventing further abrasion. If this condition does not stabilise and continues to develop then there may be excessive abrasion that could lead to significant strength loss.
- **Internal Abrasion:** The rope should be opened up so that the condition of the internal yarns can be assessed. If they show signs of abrasion then there could be some exposure to abrasive particles or there may be inter yarn abrasion.
- **Glazing:** If a rope has been subjected to excessive heat then there may be glazed or glossy areas of rope. The glazing is caused when the yarns melt; if this has happened then the nearby yarns will also have been exposed to elevated temperatures and will have been affected. This type of damage is often seen if ropes slip on winch barrels or capstans.
- **Discoloration:** This could indicate the presence of dirt that may cause internal abrasion or could be an indication of chemical damage. If chemical damage is suspected then the amount that the rope has been weakened is very difficult to assess and the rope should be retired.
- **Inconsistencies:** If any section of the rope is found to contain lumps, flat areas or thin bits then this could indicate that the rope has been damaged internally. This type of damage is often caused by overloading or shock loads.

NOTE: No rope will last forever. It is important to ensure that if there are any risks that a rope might fail then it should be replaced immediately.

Further information about rope care is shown in the maintenance section (See page 24).

OPERATING INSTRUCTIONS

WINCH RATING

The winch rating on the BH DELTA S2300 or S3300 models refer to their maximum rated line pull, measured as the force being applied to the winch in a horizontal plane.

As in the case of all winches, this refers to the first layer of rope on the drum.

In most cases, when the winch is being used, there is no way of accurately determining the exact pull being applied. It is important, however, to try and establish that it is within the working capacity of both the winch and wire rope and this can be done by considering the following formulae which applies for gradients up to an angle of 45°. For wheeled vehicles, the pull required to move the load equals:

$$\frac{W}{25} + \frac{(W \times \text{angle of gradient})}{60}$$

Where W = load in tonnes and angle of gradient is in degrees.

EXAMPLE: If W, the load of the vehicle is 2 tonne and is being pulled up skids, which form a gradient of 15°, the force on the rope is:

$$\frac{2}{25} + \frac{(2 \times 15)}{60} = 0.08 + 0.50 = 0.58 \text{ tonne.}$$

Remember the winch pulling capacity reduces as the number of layers of wire rope increase on the drum.

If it is necessary to work beyond the limits of either the winch or rope, it is essential that a snatch block be employed, which will enable the line pull to be nearly doubled. If you should have any queries regarding the maximum load applied in a particular application, please do not hesitate to contact BHW Group and we will be pleased to offer our assistance.

TO OPERATE WINCH

Operator familiarisation: Operators must firstly become familiar with the winch operating system with no loading applied.

Note the position of the power isolator switch and turn it on. All systems must by law include at least one emergency stop and these should be located in an easily accessible position and this should be noted. Plug in the wanderlead control and with the winch under no load but with hand tension applied through the strap attached to the hook power out and then in several times.

Now operate the freespool clutch to both see and feel the full engagement and disengagement position.

With the winch disengaged freespool rope of the drum and then re-engage freespool.

When you are familiar with the operating features turn on the isolator and plug in the wanderlead control.

The winch can be powered both in and out. The load is automatically held safely when control button is released.

The best way to become acquainted with how your winch operates is to make test runs. Plan your tests in advance. Remember that you hear your winch as well as see it operate. Come to recognise the sounds of a light steady pull, heavy pull, and sounds caused by load jerking or shifting. Gain confidence in operating your winch and its use will become second nature to you.

The uneven spooling of rope whilst pulling a load, is not a problem unless there is a pile up of rope on one end of the drum. If this happens, reverse the winch to relieve the tension on the rope and move your anchor point further to the centre of the load. After the job is complete, you can unspool and rewind the wire rope neatly. Always switch off the power supply isolator switch after use and always use the webbing strap attached to the safety hook when rewinding rope back onto the drum to prevent potential injury to hands from the roller guide.

FREE SPOOLING

To release clutch, power out winch until tension is released from cable. Turn the control lever on side of casing and turn 90°. To re-engage, turn lever back through 90°. Ensure that handle is fully engaged before imposing load on winch.

CAPACITIES

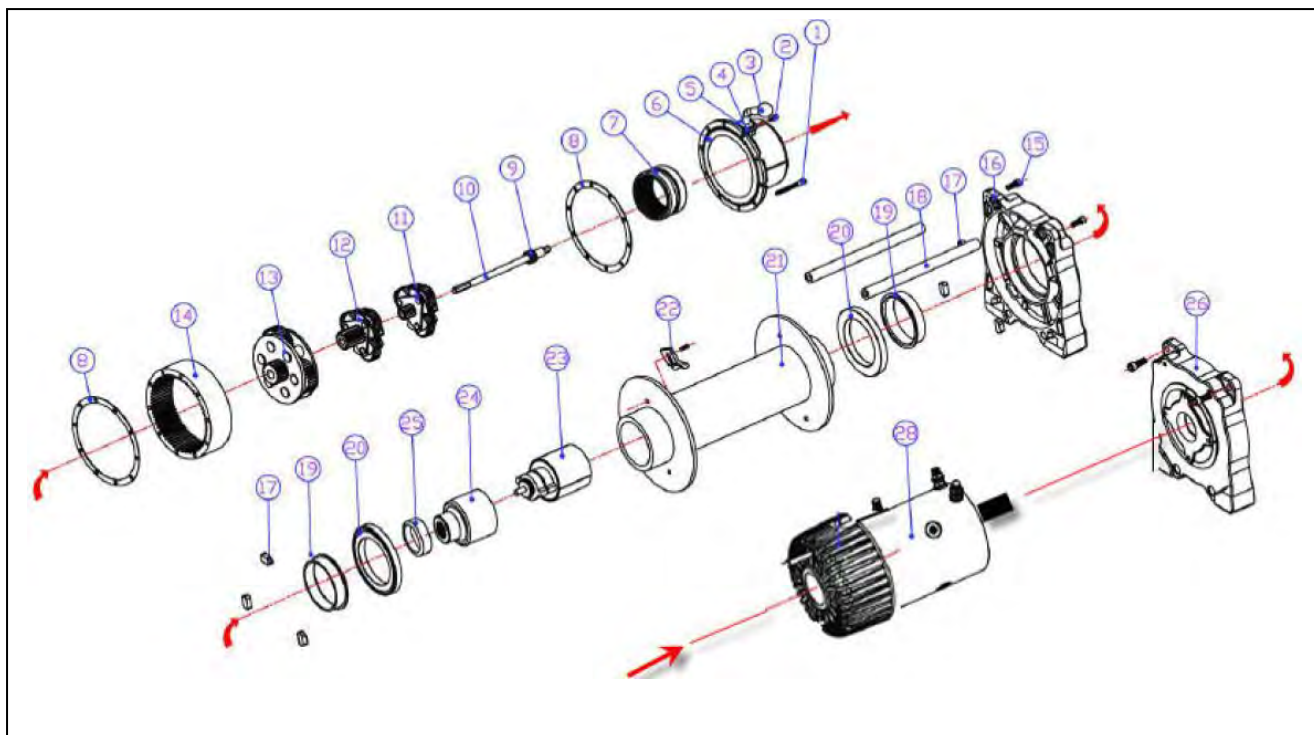
The BH DELTA S2300 is rated at 2300kg (23.45kN). The BH DELTA S3300 is rated at 3300kg (33.64kN).

This refers to its safe working load, measured as the force being applied to the winch in a horizontal plane.

As in the case of all winches, this refers to the first layer of rope on the drum.

WINCH PARTS

GENERAL PARTS DIAGRAM



GENERAL PARTS LIST

No.	BHW No.	QTY.	DESCRIPTION
1	10695	10	Socket head cap screw
n/s	10694	1	Decals label ' free spool'
2	10696	1	Detent screw
3	10698	1	Clutch lever
4	10697	1	O ring
5	10730	1	Metal cover (for item 4)
6	20762	1	End housing
7	16880	1	Ring gear sliding
8	10699	2	Gasket
9	10701	1	Sun gear
10	10700	1	Hex shaft
11	10702	1	Carrier assembly, stage 1
12	10703	1	Carrier assembly, stage 2
13	10705	1	Carrier assembly, stage 3
14	10706	1	Ring gear fixed

No.	BHW No.	QTY.	DESCRIPTION
15	10707	8	Flange head cap screw M8
16	10708	1	Drum support, gear train
17	16881	6	Anti-friction mat
18	10711	4	Tie rod
19	10710	2	Drum bushing
20	16883	2	Oil seal
21	10713	1	Drum standard
22	10718	1	Rope plug M20 x 18mm , 2.5 pitch
23	18198	1	Brake assembly GEN 4
24	15691	1	Brake coupling steel
25	16884	1	Brake spacer 8mm
25a	17238	1	Brake spacer 17mm
26	10709	1	Drum support, motor
28	10719	1	Motor 12 volt
28a	10720	1	Motor 24 volt

Brake Shoes also available in sets of 3. Item No.19983

WINCH PARTS

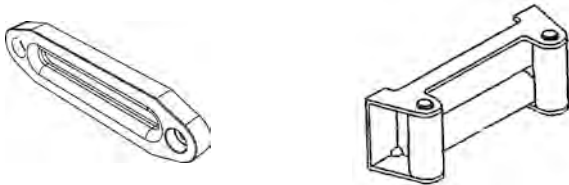
PARTS LIST – SOLENOID ASSEMBLIES, ROPES, HAWSER FAIRLEAD, ROLLER GUIDES, WANDERLEADS

Solenoid Kit Options

BHW No.	DESCRIPTION
13576	12v Heavy duty 4 pin socket, mounting plate, load limiter, shunt wire
13577	24v Heavy duty 4 pin socket, mounting plate, load limiter, shunt wire
13574	12v Heavy duty 4 pin socket, mounting plate only
13575	24v Heavy duty 4 pin socket, mounting plate only
13572	12v with standard Heavy duty 4 pin socket only
13573	24v with standard Heavy duty 4 pin socket only
13570	12v 3 pin chrome factory socket, mtg plate, load limiter, shunt wire
13571	24v 3 pin chrome factory socket, mtg plate, load limiter, shunt wire
13567	12v 3 pin chrome factory socket, load limiter, shunt wire only
13568	24v 3 pin chrome factory socket, load limiter, shunt wire only
13565	12v 3 pin chrome factory socket, mounting plate only
13566	24v 3 pin chrome factory socket, mounting plate only
10724	12v 3 pin chrome factory socket only
10734	24v 3 pin chrome factory socket only

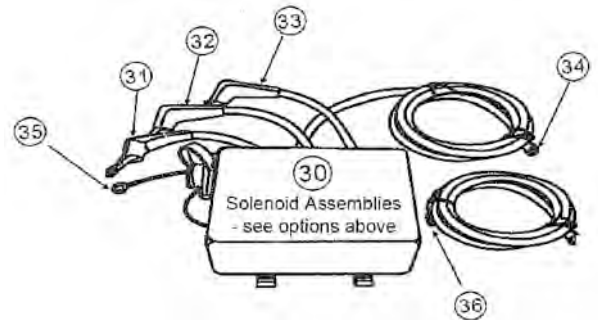
Solenoid Assembly Spares (see diagram below)

No.	BHW No.	DESCRIPTION
31	10725	Motor field wire (black)
32	10726	Motor field wire (red)
33	10727	Motor field wire (yellow)
34	10728	Positive (+) cable 2m
35	10729	Earth wire from solenoids to motor
36	10730	Earth cable black 2m
N/S	3357	12v Solenoid Unipoint
N/S	3358	24v solenoid Unipoint
N/S	15932	Black 4 pin plug only
N/S	10933	Black 4 pin socket only
N/S	6287	Load limiter only
N/S	11234	Solenoid mounting plate only
N/S	6256	12v Shunt wire only
N/S	6289	24v Shunt wire only



Hawser Fairlead / Roller Guide

BHW No.	DESCRIPTION
1415	Hawser Fairlead
10733	Heavy Duty 4 way roller guide (option)



Ropes and Webbing Straps

BHW No.	DESCRIPTION
4414	9mm x 23m Winchline Dynaline® rope with Safety Hook for BH Delta S2300
15357	9mm x 23m Winchline Dynaline Max® rope with Safety Hook for BH Delta S3300
14162	Rope to Drum Retainer Strap
9867	Safety Hook Webbing Strap

Wanderlead Options

BHW No.	DESCRIPTION
10722	3.5m wanderlead, standard factory chrome plug
10997	4.5m wanderlead, black 4 pin plug, 2 button IN / OUT
11974	10m wanderlead, black 4 pin plug, 2 button IN / OUT

TROUBLE SHOOTING

CONDITION	POSSIBLE CAUSES	CORRECTIONS
Clutch inoperative and will not rotate.	Dry gearbox and mechanism.	Strip gearbox clean and re grease.
Cable drum will not freespool	1) Winch not mounted squarely, causing end bearings to bind drum 2) Drum bearing dry	1) Check mounting, refer to winch mounting Page 12 2) Strip clean and grease
Winch will not hold the load	1) Excessive load. 2) Worn or damaged brake	1) Reduce the load or double line using snatchblock 2) Repair or replace brake
Motor runs in one direction only	1) Inoperative solenoid or stuck solenoid 2) Broken wire or bad connection 3) Load limit switch malfunctioning (if fitted)	1) Jar solenoid to free contacts. Check by applying 12 volts to coil terminal (it should make an audible click when energised) 2) Check for loose connection on wanderlead control 4) Replace load limiter and reset
Motor runs extremely hot	1) Long running period at high loading. . 2) Damaged motor 3) Damaged brake	1) Cooling-off periods are essential to prevent overheating 2) Replace motor 3) Replace brake
Winch runs in reverse	1) Motor wires reversed 2) Solenoids wired incorrectly	1) Check wiring 2) Recheck wiring
Motor will not operate	1) Isolator switch not turned on 2) Fuse has blown 3) Break in power lead or extension socket 4) Inoperative solenoid or stuck solenoid 5) Inoperative motor 6) Loose connections 7) Emergency stop button depressed	1) Turn on isolator switch 2) Replace fuse 3) Repair or replace wiring 4) Jar solenoid to free contacts. Check by applying 12volts to coil terminal (it should make an audible click when energised). If there is no click fit new solenoid 5) If solenoids operate, check for voltage at armature post, replace motor 6) Check all power lead connections are tight 7) Check emergency stop and if depressed, release
Motor runs but with insufficient power or line speed	1) Weak Battery 2) Battery to winch power lead too long creating voltage drop 3) Poor battery condition 4) Poor earth connection 5) Damaged brake 6) Poor isolator switch condition	1) Recharge or replace battery. Check charging system 2) Check correct amperage cable and/or reduce length 3) Check battery terminals for corrosion. Clean as required 4) Check and clean connection Cable should earth to battery not chassis. 5) Repair or replace brake 6) Repair or replace isolator switch
Motor runs but drum doesn't turn	Clutch not engaged Drive shaft damage	Engage clutch Repair or replace drive shaft

MAINTENANCE

REGULAR MONTHLY MAINTENANCE OF THE WINCH & INSTALLATION

Externally:

The winch should be kept clean in order to prevent any build up of corrosion on external working parts.

Inspect fairlead hawser (or roller guides if fitted) for grooving. If excessive, rope life will be reduced.

Worn guides should be replaced to ensure rope is not damaged.

- Check winch and rope for ANY damage. For more guidelines on ropes, please see pages 18 and 24.
- Check winch mounting for distortion and re-tighten mounting bolts if necessary.
- Operate free spool clutch mechanism to ensure correct operation, giving full engagement and disengagement.
- All external-moving parts should be lubricated with lightweight oil.
- All electrical connections and wiring should be inspected for loose connections, corrosion or fraying.
- Check the tie bars that hold the winch in alignment replace if bent or broken.
- Check the emergency STOP control to ensure it functions correctly by operating the winch and pushing the STOP button.

SPARE PARTS

If it becomes necessary to obtain replacement parts, refer to parts diagrams and lists shown on pages 20-21.

BHW Group Limited reserve the right to change specifications on parts without notice.

NOTES ON BATTERIES

As a result of radical changes in vehicle battery design and performance that have taken place over recent years it is essential that the correct type are specified on new vehicles that will include an electric winch or other high electrical power consumer.

Heavy Duty ED3/VB3 rated should be specified as these are vibration proof and have 2.5mm thick plates compared to the standard 1.5mm. They also have glass wool separators, which reduces the leeching problem. The operating duty cycle for this class of battery is 14 starts compared to only 6 on a standard battery.

For extra heavy duty applications where high start up surges are required, Holchstrom Gel filled batteries should be specified which have a flat instead of declining rate of discharge. These offer up to a 40% increase of cold start performance for a battery of the same physical size.

Incorrect type will cause problems for vehicles using equipment requiring high DC Power consumption such as an electric winch, flashing beacons and work lights.

A standard amp hour rating is used for all batteries and this indicates the amperage available when a constant discharge is achieved over 20 hours. As an example a battery with an amp hour rating of 75 means the battery can carry a load of 3.75 amps for 20 hours.

Vehicle manufacturers' requirements have changed due to improved engine efficiency and many now require hundreds of amps for a few seconds for starting and to save space they demand small lightweight batteries. These batteries are designed to discharge around 15% of their total capacity and then recharge quickly from the alternator.

The duty cycle design criteria for vehicle batteries is to crank a cold engine for 10 seconds and then rest for 1 minute allowing the battery to recover and the starter motor to cool down. The engine would normally have started consuming equipment like a DC winch is operated for much longer periods of time with only short breaks and then recharged this is referred to as deep cycling. In winching applications the battery is continuously subjected to deep cycling and recharging this will result in premature loss of battery capacity.

The new generation of starter batteries are now light duty designed to retain 75% - 85% charge throughout their working life with a maximum duty cycle of 6 – 7 starts.

If batteries are used for winch or similar applications and suffers voltage drop, soft lead sulphate deposits may appear on the plates and separators. If left discharged for a period of around 70 hours the lead sulphate hardens and crystallises forming an insulation barrier preventing it from accepting a charge and effectively causing irreparable damage.

All popular traditional batteries leech between the plates when not in use particularly in warmer weather causing a self-discharge. In poor quality batteries this problem is worse.

24v systems using two 12v batteries of this type: If one battery deteriorates and becomes weak it will resist charging and the stronger battery will take precedence. A voltage reading of 25-26v may be measured but under the very high load during winching this will reduce dramatically putting excessive strain on the good battery causing it to fail prematurely.

MAINTENANCE

ROPE CARE – FURTHER INFORMATION

STORAGE: Ropes should be stored in a suitable clean, dry place out of direct sunlight and away from extreme temperature. Do not store ropes on dirty floors or drag over rough ground – dirt and grit can work between the fibres and cause abrasion damage. Keep ropes away from chemicals and in cases of long term storage, hose down with fresh water to reduce dirt and salt that can affect the life and efficiency.

SHEAVES, PULLEYS & ROLLERS: When any rope is used around a sheave there will be a reduction in its strength and life. For most non-specialised applications a sheave diameter 8-10 times the rope diameter will suffice. The profile of the groove in a sheave should support the entire rope. Normally a semicircle of 10% greater diameter than that of the rope is appropriate. 'V' groove sheaves should be avoided since they compress the rope and have points of local friction reducing the life of the rope. Sheaves should be maintained so that they rotate freely in use.

ROPES ON WINCHES: When a rope is wound onto a winch it is important that the wraps are neat and tightly wound. This can be achieved by winding the rope on whilst under tension. If the rope is wound on slack then it will be more prone to burying between the turns of the previous layer. When using ropes on winches the friction between the rope and the barrel is vitally important since this will determine the amount of slip and the number of turns needed. This friction is dependent on the rope material and construction as well as the surface finishes in contact with the rope. Since the rope's geometry will change depending on load the friction can also change slightly.

CHEMICALS: The materials used in the construction of synthetic fibre ropes can be affected by exposure to chemicals; often this will reduce the strength of the rope. Each of the materials is affected differently by different chemicals, if chemical exposure is expected contact Marlow Ropes for advice. If a rope has been exposed to a chemical that may have caused damage it should be retired from use. Chemical damage often appears as discoloured or powdery / dusty yarns however the rope can be significantly weakened with no visible effects.

HEAT: Exposure to elevated temperatures can change the properties of a rope. In some cases these changes can be beneficial e.g. Pre-stretching and heat setting. More often the effects of heat will be to reduce the strength and damage the rope. It is important to avoid exposing a rope to localised heat sources or elevated temperatures. This must be ensured both in use and when the rope is stored.

FRICTION GENERATED HEAT: When a rope is used on a winch or capstan it is possible to generate enough heat through friction to melt or fuse the fibres of the rope resulting in a reduction in performance. To avoid this care should be taken to avoid excessive slipping or surging.

ULTRA-VIOLET RADIATION: All the materials used in the construction of synthetic fibre ropes are to a greater or lesser extent effected by exposure to UV radiation. Wherever possible try to limit the exposure of the rope to sunlight. Smaller ropes are affected more than large ropes since they have a larger exposed surface area in proportion to their volume. The effect of UV radiation on a rope is directly linked to the inherent UV properties of the yarn used in design and manufacture - see physical properties section for more information.

ABRASION: All ropes can be damaged if they are exposed to abrasive surfaces or sharp edges. Care should be taken to try and avoid running a rope over any non-moving surface. If the rope is run over sheaves or rollers they should be kept in good order with a smooth surface and they must be free to rotate. Abrasion can also be caused by the ingress of particles into the rope. Conditions where a rope will come into contact with sand, dirt, grit and other abrasive particles should be avoided. Damage caused by this type of abrasion may not be visible on the outside of a rope yet the strength may be severely reduced.

KNOTS: A knot will reduce the strength of the rope, sometimes very significantly. This loss is caused by the tight bends and compression found in any knot. The amount a rope will be weakened will depend on the knot, type of rope and the material from which it is made but can be up to 60%

TENSION-TENSION FATIGUE: Tension fatigue will occur any time a rope is loaded. It is related to the loads that the rope is subjected to. It is possible to improve the ropes resistance to this type of fatigue by applying marine finishes to the yarn. The life of a rope can be improved by using at a lower load. Rope constructions with low 'construction' have good resistance to this type of fatigue.

BENDING FATIGUE: Bending fatigue occurs any time a rope is flexed. It is important to allow for this if a rope is used on sheaves or rollers. This form of fatigue is related to the load and can still occur at very low tensions. Rope constructions with high 'construction' have good resistance to this type of fatigue.

COMPRESSION FATIGUE: This is a rare form of fatigue that only occurs if a rope or components of a rope go into compression. In this situation 'kink bands' can form in the individual filaments reducing their strength. Compression fatigue can be avoided by maintaining the tension in the rope, using a rope with more 'construction' and ensuring that any sheaves and rollers are large enough to prevent any component of the rope from going into compression.

WARRANTY

BHW GROUP LIMITED warrants each new winch and ancillary equipment supplied against factory defects in material and workmanship for one year from date of purchase.

The responsibility for removing the winch or ancillary equipment is the owner's together with its return, transportation prepaid to BHW Group Limited.

BHW Group Limited will, under this Warranty, without charge repair or replace at its option, parts, which on inspection are deemed to be defective.

The loss of use of the produce, loss of time, inconvenience, commercial loss or consequential damages are not covered.

Warranty does not apply where the product has been tampered with or altered in any way, or where the serial number or date stamp has been defaced, altered or removed, or if in the view of BHW Group Limited the damage or failure occurred from misuse, negligence or accident.

THIS WARRANTY EXCLUDES THE ROPE

BHW Group Limited reserve the right to change the design of any product without assuming any obligation to modify any product previously supplied.

Fitted vehicles or equipment returned under warranty should be sent to BHW Group Limited service department at the address indicated below, with full name and address of sender, and a statement detailing the defect.



Service Department
Lismirrane Industrial Park
Elstree Road
Elstree Herts WD6 3EE

Telephone: +44 (0)20 8953 6050

Email: sales@bhwgroup.com

Website: www.bhwgroup.com

BH DELTA S2300 or BH DELTA S3300
VOLTAGE
SERIAL NUMBER.....
DATE OF PURCHASE.....

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