

## Penny Hydraulics Winching Guide

All Penny Hydraulics products are designed and engineered to provide safe and reliable service for the life of the product. However, every winching operation has the potential for misuse or abuse which potentially can cause damage or personal injury. Therefore it is important to familiarise yourself with the winch Operating Manual and ensure that the winch is maintained correctly. This booklet is to offer basic operating guidelines and service assistance.



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## Which winch?

When selecting a winch for a particular application there are two main questions:-

1. Capacity
2. Duty Cycle

## Capacity

To determine the capacity requirements of the winch it is necessary to understand:-

- a. The weight of the load and the type of load to be moved eg. Is it a static or rolling load, if it's a rolling load are the wheels and tyres in good condition? Are they flat OR the brakes locked on?
- b. The terrain the load is to be moved over such as roadway, mud, grass or sand and is the load to be pulled up an incline?

For winching purposes, the resistance to motion of a wheeled vehicle is dependent on 4 main factors;

1. The inherent resistance to move the vehicle.
2. The total weight of the vehicle.
3. The terrain to be crossed
4. The gradient of the incline.

## Approximate surface resistance figures are as follows:-

Roadway	0.04 x mass of load
Grass	0.143 x mass of load
Sand (hard wet)	0.167 x mass of load
Gravel	0.2 x mass of load
Sand (soft wet)	0.2 x mass of load
Sand (soft dry, loose)	0.25 x mass of load
Shallow mud	0.33 x mass of load
Boggy, marshy ground	0.5 x mass of load
Clay	0.5 x mass of load

As a rule of thumb the gradient resistance can be taken as 1/60<sup>th</sup> of the load mass for each degree of slope up to 45 degrees. After 45 degrees the full load mass should be used.

## **Example:-**

A vehicle weighs 5200 lbs on a gravel slope with an incline of 15 degrees.

Gradient Calculation:-

$$\text{Gradient} \times \text{mass} / 60 = 15 \times 5200 / 60 = 1300 \text{ lbs}$$

Surface Calculation:-

$$\text{Weight} \times \text{surface resistance} = 5200 \times 0.2 = 900 \text{ lbs}$$

Therefore in this example the effort required to pull the vehicle up this gravel incline =

$$1300 + 900 = 2200 \text{ lbs}$$

Please note that the power capacity requirement for the winch will be similar for electric, mechanical and hydraulic winches but the duty cycle will vary considerably.

## **Duty Cycle**

The duty cycle of an electric winch varies greatly depending on the amount of rope on the drum. Typically a winch motor will use around 75% of its available power with one layer of rope on the drum up to around 92% with three layers of rope. Obviously the winch continually operating at 80-90% of its power generates a lot of heat so consideration should be given to the length of time the winching process will take. Will the winch need to cool between operations? Obviously, if the winch is underrated or not allowed to cool this may cause thermal overload and could shorten the life of the motor.

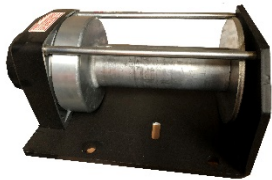
A mechanical or hydraulic winch however will quite comfortably work at 80 – 90% for long periods and will have a much longer life but the upfront cost is more expensive.

A vehicle mounted mechanical or hydraulic winch can be rated as continuous, where as an electric winch should be rated as intermittent duty.

## Winch basics



**Motor** - the motor can be 12 or 24 Volt powered by the vehicle battery or a secondary slave battery via a split charge relay. The motor via gear train delivers the power to rotate the winch gearbox and rotate the winch in both directions.



**Winch drum** – the winch drum is a cylindrical housing that the winch rope is wound onto.



**Wire rope (winch rope)** – the wire ropes diameter and length are governed by the designed load capacity of the winch. Penny Hydraulics winches have a hook with safety catch at one end and a special thimble end at the winch drum to prevent the wire rope from being pulled from the drum.

**Warning:-** when handling wire ropes always use heavy duty rigger gloves. Often small sprags of wire can protrude which easily puncture bare skin.



**Roller Fairlead** – the fairlead acts a rope guide, feeding the wire rope onto the drum evenly when pulling at an angle and helping to prevent rope damage.



**Winch gearbox or gear train** – the gearbox is a reduction gear type box which converts the motor power into a large pulling force. This design makes the winch lighter and more compact.



**Winch brake** – the winch brake is automatically applied to the winch drum when there is a load applied to the rope.



**Free Wheel (clutch)** – the free wheel knob allows the operator to manually disengage the drum from the gear train in order to allow the drum to rotate freely. This is known as free-spooling and allows the operator to pay out a length of rope quickly and easily. The winch will not drive until the free wheel has been reengaged.

**Warning:- Never try to disengage the freewheel device with a load on the rope and never try to engage the freewheel device whilst the gearbox is in motion.**



**Solenoid Box** – the solenoid box is powered from the vehicle battery and receives a signal from the winch remote control to power the winch in either direction.



**Remote Control** – the winch direction is altered using the remote control supplied. The standard remote control is a wander lead type but wireless remote controls are also available.

**A remote control is offered as standard with Penny Hydraulics winches so that the operator can stand in a safe place at all times, clear of the winching process.**

## Before you pull

Time spent on preparation before you start pulling is time well spent. Thought must be given to the winch process to ensure you keep yourself and those around you safe and out of harms way. Ensure you are familiar with the equipment.

All equipment should be inspected to ensure that's it's in good condition, gloves should be worn to protect hands against stray wires in the winch rope. Care must be taken to ensure that the battery has enough capacity to complete the winching process.

Before you start, inspect the winching area. Is an anchor required? If so is a suitable anchor point available or do you require a ground anchor? If using a tree do you have a suitable tree trunk protector? Is a pulley block required and if more than one person is present decide who is in charge?

If a banksman is required, decide on a system of hand signals if shouted instructions cannot be heard, over the noise of the engine for instance. If the freespool device has been disengaged to attach the load ensure that it is fully re-engaged before starting to winch.

**Warning:- Any onlookers must be in a safe place and at a safe distance.**

## Pulling

When the wire rope is connected to the load take up the slack by inching (running the winch slowly in short bursts). Get to know the sound of your winch this will help you to tell by ear if the winch is being overloaded.

If you fear that the winch is being overloaded stop! Have another look, can you reposition the winch carrier, can you utilise a pulley block to help relieve the load on the winch.

If the load is too heavy or you need to pull from a different direction a pulley block will assist and increase winch effort by around 80%.

**Warning:- Never use a winch rope to tow another vehicle!**

If possible, winch with the vehicle engine running to ensure full power to the winch and prevent possible starting failure. With light tension on the rope to start begin to winch slowly and steadily. Be sure that the wire rope winds evenly and tightly around the drum. Stop and pay out the rope before repeating the process if necessary.

**Warning:- Avoid overheating the winch motor. For extended periods of winching, stop at reasonable intervals and allow the motor to cool.**

Ensure that a minimum of 3 laps of rope remain on the winch drum at all times. With a Penny Hydraulics rope this is easily indicated by the fact that the rope is coloured red but may not be the case with other manufacturers ropes.

## Putting the winch to work

1. Review winching area
2. Decide on equipment required
3. Decide on method of operation
4. Put on gloves
5. Turn on power to the winch
6. Connect the remote control
7. Free the winch hook
8. Disengage the freewheel clutch
9. Pull wire rope to anchor point or load
10. Secure to anchor point
11. Lock the freewheel clutch
12. Inch the rope until it is under slight tension
13. Check the anchor point
14. Begin winching

## Thorough Examination of hoists and wire ropes

- The continued safe use of wire ropes depends on regular assessment of the condition of the ropes and the equipment with which they are used.
- Some winches operate in conditions where the wire ropes and equipment are particularly liable to damage, e.g. corrosive atmosphere, abrasive particles. In such circumstances, assessment of the condition of the rope and the equipment should be carefully carried out and the rope removed from service when the damage affects its safe operation.
- Records should be kept of the examination and replacement of wire ropes. These should consist of the reports of Thorough Examination for the winch and certificates of test for the wire ropes at time of supply.
- When carrying out inspections and examinations to assess the fitness of the wire rope for further service, both general deterioration and localized deterioration or damage should be considered. Therefore, the whole length of the rope should be examined, paying particular attention to the rope adjacent to the terminations, lengths that have been running or are stationary over drums, sheaves and deflection pulleys and any other areas likely to sustain damage.

*NOTE Information on the installation, maintenance and Thorough Examination of wire ropes is given in BS 7121-1.*

If you spot any defects it is important to replace the rope. Common indicators of a worn rope include:

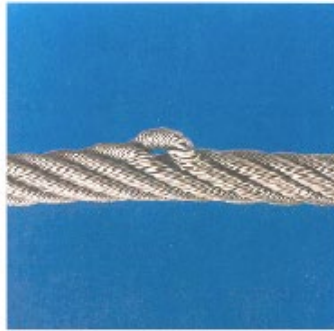




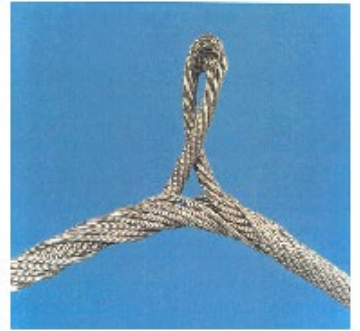
Kinking



Kinking in the line



Strand protrusion



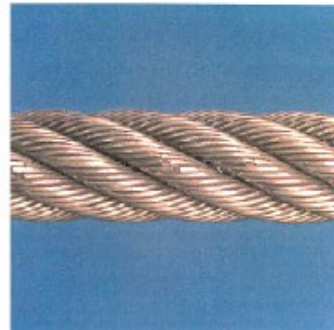
Core protrusion



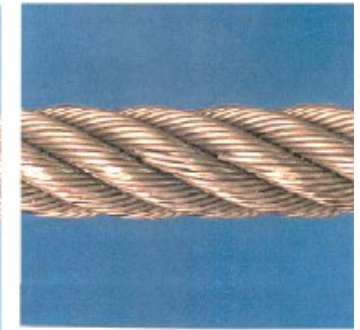
Basket deformation



Strand protrusion



Broken wires on the  
crown of the rope



Broken wires in the  
valleys of the rope

If you notice any of these malformations the integrity of your steel rope could be significantly weakened and you should contact Penny Hydraulics immediately to discuss a suitable replacement. You can call us on 01246 811 475 or email: [sales@pennyhydraulics.com](mailto:sales@pennyhydraulics.com)

## Stowing the winch

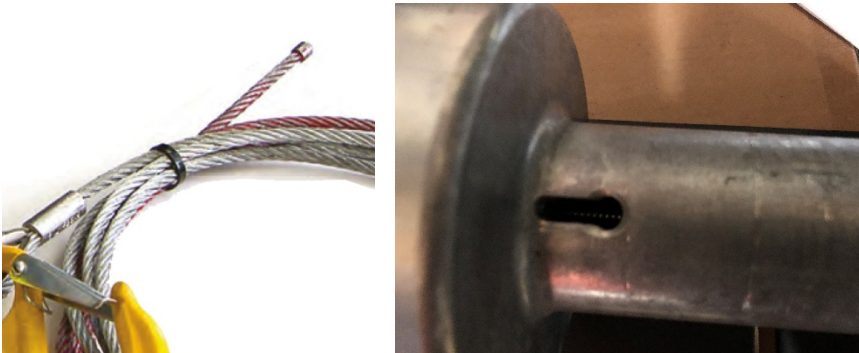
1. Ensure gloves are worn.
2. Disconnect rope hook from load / anchor.
3. Rewind the wire rope. The person handling the rope should be also in control of the remote.
4. Feed the wire rope onto the drum tightly and evenly.
5. Hold the hook between the thumb and forefinger. Never hold your hand around the hook.
6. Stop and pay out the rope if necessary to ensure an even feed onto the drum.
7. Secure the hook.
8. Isolate the winch.
9. Remove the remote control and store in a safe place.



## Winch accessories

Penny Hydraulics offer a range of winch accessories to enhance your winch these include:-

- Soft slings – a wide range of MWL's and lengths available.
- Wire rope slings – a wide range of MWLS's and lengths available.
- Shackles D and Bow type – a wide range of MWL's are available.
- Snatch blocks – increases the winch pulling power and allows changes in pulling direction.
- Winch Covers – help protect the winch from the extremes of weather.
- Tree Trunk Protectors – often used for self-recovery, these straps provide an excellent attachment whilst helping to protect the natural beauty of the trees.
- Spare wire ropes – all Penny Hydraulics ropes have a special thimble end to prevent the rope coming off the drum.
- A range of spare parts
- Wireless remote control
- Extra power connectors and booster cables.
- Emergency Stop Switch
- Key operated power switch
- Tow bar Winch mount
- Tow bar mounted Winch pack



***Special thimble on wire rope and keyhole in drum to prevent the rope from coming away from the drum.***

## Maintenance & Thorough Examination

Differing opinions currently exist within the industry about the application of PUWER and LOLER to winching operations in tree work, eg skidding and directional felling. As a result, queries are regularly raised particularly in respect to the inspection and thorough examination of winching equipment. These queries often stem from how the term 'lifting' is interpreted in respect to loads being winched.

The aim of this section is to clarify the application of health and safety legislation to the use of winches in tree work - in particular in relation to the requirement for thorough examination and inspection. PUWER/LOLER and winching operations.

In the first instance it is important to recognise that LOLER and PUWER require much the same thing for work equipment that they apply to: that the equipment is suitable for the task being undertaken; that it is properly maintained, and that it is operated correctly by competent people. PUWER is not a lesser standard. It requires a similar level of safety as LOLER if the risks demand it. The application LOLER to winching operations is determined by the interpretation of the terms lifting equipment and lifting operations. In the Safe use of lifting equipment - Lifting Operations and Lifting Equipment Regulations 1998 - Approved Code of Practice and Guidance (L113, second edition), Regulation 2(1) – Interpretation, defines lifting equipment as: "Lifting equipment" means work equipment for lifting and lowering loads and includes its attachments used for anchoring, fixing or supporting it, and lifting operation as: "Lifting operation" means an operation concerned with lifting and lowering a load.

Cable cranes (SwingLift) lift as part of their function therefore the requirements of LOLER apply. L113 provides guidance on these definitions and gives examples of equipment and operations that are not covered by LOLER. In the guidance to Regulation 2 (Interpretation, para 31) it states that "in most cases LOLER will not apply to work equipment which does not have as its principal function a use for lifting or lowering." L113 then goes on to provide guidance on specific equipment and operations not covered by LOLER including (para 32(b)) "winching a load where the load does not leave the ground." In addition, Figure 1 (p12) of the L113 is a decision tree which sets out the main elements that must apply to a piece of equipment for it to be subject to LOLER. It indicates that two of these elements are that the equipment's main purpose is to 'lift or lower a load' and that the load is 'lifted free from supporting structures', e.g. the ground. It also further clarifies the definition of lifting as 'an operation that usually involves lifting or lowering a load from one surface to another.' This interpretation makes clear the intention of LOLER and if applied to winching equipment used in most forestry winching operations it means that the equipment is not subject to LOLER. However, it also makes it clear that where LOLER does not apply then "a similar level of safety is required by PUWER in respect of the work equipment being used." (Para 33) Whilst the L113 interpretation excludes forestry winching operations from LOLER, other interpretations for lifting have been used within the industry and by trainers which imply that LOLER does apply. One such interpretation is contained in The International Rigging and Lifting Handbook (North Sea Lifting Ltd), which includes the following definitions to differentiate between lifting and pulling: a. A lifting application is one in which a load does not become stationary should either the machine or any of its associated equipment fail; b. A pulling application is one in which a load becomes stationary should either the machine or any of its

associated equipment fail. Applying this definition of lifting to LOLER would mean that there would be numerous circumstances where winching equipment and operations would be subject to the requirements of the regulations - for example, winching timber up a slope steep enough to cause the timber to move back down the slope in the event of the winching equipment failing. However, whilst this interpretation is useful for assessing the level of risk involved in a winching operation, the International Rigging and Lifting Handbook is not a guide to the application of LOLER. Guidance to the application of LOLER is provided by the LOLER ACOP, L113 which, as explained above, is clear about the application of the regulations to winching operations.

Again, it needs to be stressed that whether complying with LOLER or PUWER the outcome should be the same. The higher the risk associated with an operation, the more stringent the controls to make it safe and to comply with the regulations. Inspection and thorough examination.

Both PUWER and LOLER are risk based. Therefore, regardless of the regulation, emphasis should be placed on the completion of suitable and sufficient risk assessments. The risk assessment is necessary to determine the nature and frequency of both the maintenance and inspection of equipment used in winching operations. Risk assessments, carried out to meet the requirements of the Management of Health and Safety at Work Regulations 1999, Regulation 3, should identify any significant risks from the use of the work equipment considering the: a. type of load being winched, its weight, shape and what it consists of; b. risk of a load falling, moving, breaking up or striking a person or object and the consequences; c. risk of the winching equipment striking a person or an object and the consequences; d. risk of the lifting equipment failing while in use and the consequences; and e. risk of damage to the winching equipment that could result in failure.

As previously discussed, LOLER will not apply to tree work winching operations and the scope of PUWER Regulation 6 requirements (inspection and the competence of the person who carries it out) need to be established by risk assessment. In effect, Inspection (PUWER Reg.6); and Thorough examination and inspection (LOLER Reg.9) should be seen as a related package of requirements with the outcome of the assessment, whether for PUWER or LOLER, being the same where the risk demands it. Summary. The definition of 'lifting equipment' and 'lifting operations' is provided in the Approved Code of Practice and Guidance to the LOLER regulations (L113 – Second edition).

Under this interpretation, LOLER does not apply to winching operations that are regularly undertaken in tree work. However, PUWER is not a lesser standard of control but demands the same level of safety as LOLER if risks demand it.

Whilst under PUWER there is no specific requirement for 'thorough examination' of work equipment such as winches, PUWER requires risk-based inspection so the results of such an inspection, should be the similar to a 'thorough examination' under LOLER, where the risk requires it. Additionally, recording the outcomes of inspections under PUWER is as important as doing so for those under LOLER.

Penny Hydraulics Ltd offers a service package to meet customer requirements and conform with LOLER certification. Please request Service Contract form if required.

The following Planned Maintenance Schedule is designed to monitor the safe working order of the winch unit and includes a Thorough Examination by a Competent Person required by LOLER.

LOLER also requires that a Thorough Examination is carried out following any exceptional circumstance that may affect the safety of the equipment.

Any defects found whilst carrying out the Planned Maintenance Schedule must be reported and recorded and the equipment taken out of operation until action by a Competent Person is undertaken.

The Planned Maintenance Schedule may require the use of parts and consumables.

## **Planned Maintenance Schedule**

Before any work is undertaken, ensure the site supervisor is informed and that all safety precautions are observed and adhered to.

Pay attention to site specific safety and PPE requirements.

Unless dynamic checks, tests or setting up procedures are being carried out, always isolate the machine from the power supply.

Where dynamic checks are being performed, it is recommended that an assistant is designated to be on call if required.

Ensure a clean working area and sufficient cleaning materials.

Ensure the work area and sufficient cleaning materials.

Ensure the work area is cordoned off, paying particular attention to the sweep areas required for dynamic testing.

On receipt of a new winch unit check that there is no transit damage or evidence of mishandling.

Daily/Before Use.

- 1) Check visually for signs of external damage.
- 2) Check for loose or missing nuts, bolts and fasteners.
- 3) Check the wire rope for kinks, broken strands and corrosion.
- 4) Check the lifting hook and connection to the rope.
- 5) Check for damage to electrical cables and connectors.

6 Monthly.

- 1) Check all as for Daily.
- 2) Thoroughly examine all lifting attachments as required by LOLER.

12 Monthly.

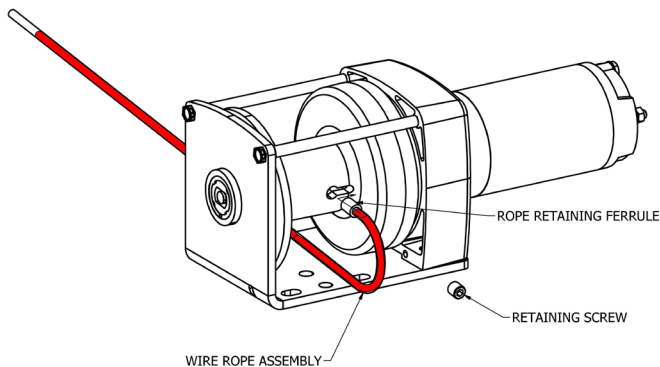
- 1) Check all as for Daily and 6 Monthly.
- 2) Carry out a statutory thorough examination as required by LOLER.

## Replacing a Wire Rope Assembly

A damaged wire rope is dangerous, always handle and dispose of with care and always use appropriate PPE.

To remove the rope

- 1) Ensure the work area is clear and well prepared and access to the winch unit is unrestricted.
- 2) Remove the winch guard (if fitted) and store in a safe place.
- 3) Using the winch power, select Lower and feed the rope to its collection point. An assistant may be required to help guide it into position.
- 4) Stop when the entry of the rope into the drum can be seen.
- 5) Adjust the drum to allow access to the retaining screw and isolate the power from the winch.
- 6) Clean and remove the retaining screw (3/16", 5mm Allen Key) and store in a safe place.
- 7) Pull the rope in line with the retaining screw hole and withdraw.
- 8) Store the rope safely and prepare for disposal.



Replacing a Wire Rope Assembly:

Replacement is the reverse of removal with the following exceptions:

- 1) Lay out the new rope in a straight line in the direction of pull
- 2) Ensure the rope is passed under the drum to maintain its correct working position.
- 3) With the help of an assistant and use of appropriate PPE, use the winch power to load the rope onto the drum whilst manually guiding it into position and keeping it in tension at all times.

<b>Recommended Spares</b>	
<b>Part Number</b>	<b>Description</b>
654-000004	20ft/609.6cm x 0.24inches/6mm Dia Wire Rope c/w Hook
654-000005	25ft/762cm x 0.24inches/6mm Dia Wire Rope c/w Hook
654-000006	30ft/914.4cm x 0.24inches/6mm Dia Wire Rope c/w Hook
654-000007	10ft/304.8cm x 0.24inches/6mm Dia Wire Rope c/w Hook
654-000008	15ft/457.2cm x 0.20inches/5mm Dia Wire Rope c/w Hook
654-000009	20ft/609.6cm x 0.20inches/5mm Dia Wire Rope c/w Hook
654-000010	30ft/914.4cm x 0.20inches/5mm Dia Wire Rope c/w Hook
654-000011	15ft/457.2cm x 0.24inches/6mm Dia Wire Rope c/w Hook
PH3312	V33 No Free Wheel Winch 12V
PH3324	V33 No Free Wheel Winch 24V
PH3312FW	V33 Free Wheel Winch 12V
PH3324FW	V33 Free Wheel Winch 24V
PH3312FWE	V33RE Free Wheel Winch Extended Drum 12V
PH3324FWE	V33RE Free Wheel Winch Extended Drum 24V
164-000003	V33 Gearbox With Free Wheel (No Motor)
614-000005	V33 Motor & Brake 12V
614-000007	V33 Motor & Brake 24V
PH6012	V60 No Free Wheel Winch 12V
PH6024	V60 No Free Wheel Winch 24V
PH6012E	V60E No Free Wheel Extended Drum Winch 12V
PH6024E	V60E No Free Wheel Extended Drum Winch 24V
PH6012FW	V60 Free Wheel Winch 12V
PH6024FW	V60 Free Wheel Winch 24V
PH6012FWE	V60RE Free Wheel Extended Drum Winch 12V
PH6024FWE	V60RE Free Wheel Extended Drum Winch 24V
164-000004	V60 Gearbox With Free Wheel
164-000005	V60 Gearbox With Free Wheel and Extended Drum
614-000021	V60 Motor and Brake 12V
614-000022	V60 Motor and Brake 24V



## **Service Contracts from Penny Hydraulics**

Our service contract will ensure continued safe, reliable use of the equipment and full compliance with current legislation. The contract allows for an annual service and an interim six monthly inspection, or a spares included package. A test certificate is issued with a copy left on site. Our database of all equipment ensures that statutory inspections are kept up to date and can help customers with many items of equipment to predict forthcoming servicing budgets.

A help line telephone number is provided with each service contract for the operators to seek assistance directly from the service department.

## **Acknowledgements**

Penny Hydraulics offer a range of winches both Electric, Mechanical and Hydraulic and acknowledge the help and assistance offered in the writing of this guide.

### **Contact us...**

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