DLHonline

How to Choose the Right Manual Winch for Lifting Operations

A comprehensive guide for buyers and users

DLHonline

Contents

A comprehensive guide for buyers and users

Manual Lifting Winch Selection
Line pull -v- Safe working load

1.

When assessing the right winch for your job, the first important consideration is that the weight of the load you want to lift is not the same as the winch manufacturer's line pull rating.

This rating is a combination of the mechanical capacity of the winch and the tensile strength of the line on the drum. This rating is not to be considered the safe working load for the winch. Unless otherwise indicated, rated capacity is based on the first layer of winch cable (The layer closest to the drum).

Typically, winches have capacity for up to around 6 layers and that the first layer has the "lowest" gear ratio and the most pull.

The load plate on the winch shown above indicates that the 1st layer capacity of 1000 kg is reduced to 542 kg on the top layer

Unfortunately this useful information may not be shown on every winch. You should assume that the load capacity of the top or last cable layer is typically around 30% to 50% less than the first layer.

Where multi-layer capacity is unknown then we suggest as a rule-of-thumb, always select a winch with a line pull of twice the capacity of the maximum load being lifted.

Manual Lifting Winch Selection
Winch Use

2. Careful consideration should be given to the winch selection process. Safety should be a primary concern and questions such as which winch features are required for the application, what will be the experience level of the user, and what harsh environmental conditions will exist should all be answered.

If the lifting operation is frequent, arduous or would Be particularly labour intensive then a power operated winch could be a safer or more cost effective solution. The experience or skill of the intended user is important. Particularly so, if the equipment will frequently be used by inexperienced operators unfamiliar with the safe use of the winch. Ensure users have instructions for a use.

If the winch is likely to be used in a harsh environment, including salt water, a potential for damage or abuse of the winch, this should be accommodated in the selection process. Guards should be fitted to protect the winch from damage or abuse. Some models have a removable operating handle, which is particularly useful to prevent unauthorised use.

ATEX approved hand winches are available where explosion protection is a requirement.

For heavy duty applications a larger size winch should always be selected (See section 1. on winch load ratings). Where there is a likelihood of little or no periodic maintenance, then this should be factored into the winch selection.

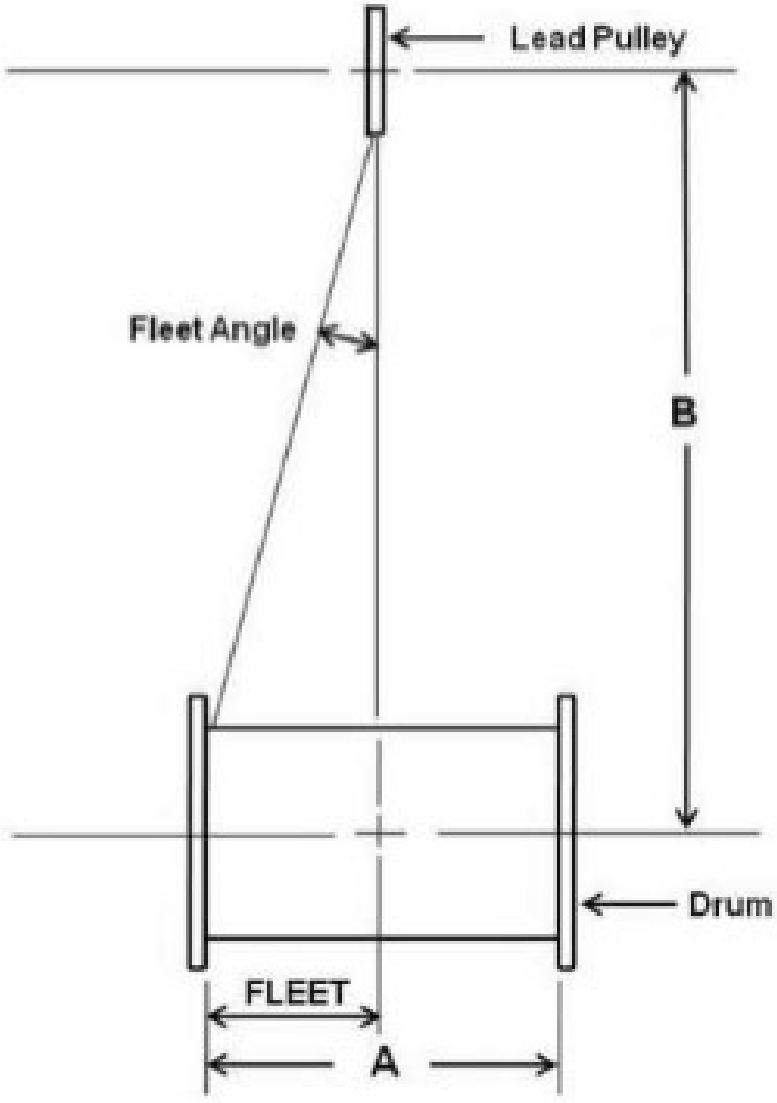
Lifting winches have either self-locking brake or are worm gear. These do not have a free-wheel rope pay-out facility, which is common on boat pulling or hauling winches. This means the winch operating handle has to be used for raising or lowering with or without a payload.

Manual Lifting Winch Selection
Winch Positioning

3. The winch should positioned directly in line with the load to be lifted.

Where the winch cannot be positioned in direct line with the load being lifted, one or more rope pulleys should be positioned to divert the rope.

Fig. 1



The fleet angle (fig. 1) should be between 1.5 and 2.0 degrees for smooth spooling.

In practice this means that for every cm of ½ drum width A. the lead pulley distance B. should be at least 14 to 19 cm away to prevent the cable from jumping the pulley.

For permanent installation a variety of base / ceiling or wall / side mounted pulleys are available, some with twin pulleys. When positioning the lead pulley (The one closest to the winch) the fleet angle should factored in. (See Fig.1)

For temporary applications snatch blocks can be used where a suitable suspension point can be utilised.

Manual Lifting Winch Selection
Winch Types

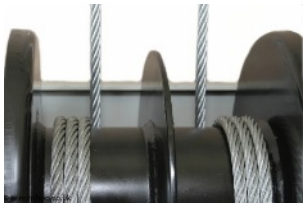
4. Lifting winches are either a spur gear type with a self-locking brake or worm gear type winches, which have a larger gear reduction and although slower offers a more effective brake.

Spur Gear

Worm Gear

Both types do not have a free-wheel rope pay-out facility, common on boat pulling winches. This means the operating handle has to be used for raising or lowering with or without payload.

For applications where the winch is not permanently attached to the load a dumpy weight or headache ball should be positioned above the lifting hook to keep the wire cable taut under no load.



For applications where the winch is required to have multiple ropes, compartments can be specified with additional rope anchor.

For applications where the load would be suspended in public places special winches are available with a double-acting safety retaining spring which reliably holds the load in every position. Plus a grooved drum and spring loading rope pressure drum for improved one layer rope coiling.

Manual Lifting Winch Selection
Winch Drum Capacity

5. By choosing a larger capacity winch (See section 1. Line pull -v- Safe working load) you will also ensure that the recommended cable (wire rope) size for the winch has a least 5:1 factor of safety for the load being lifted when using recommended standard 1770 tensile grade 7 x 19 steel wire rope.

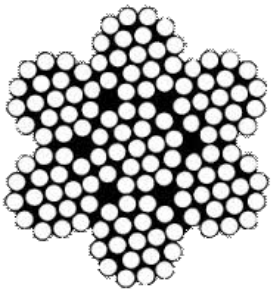
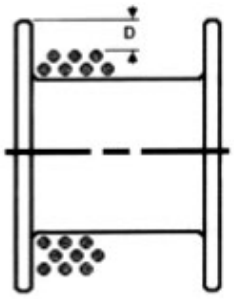


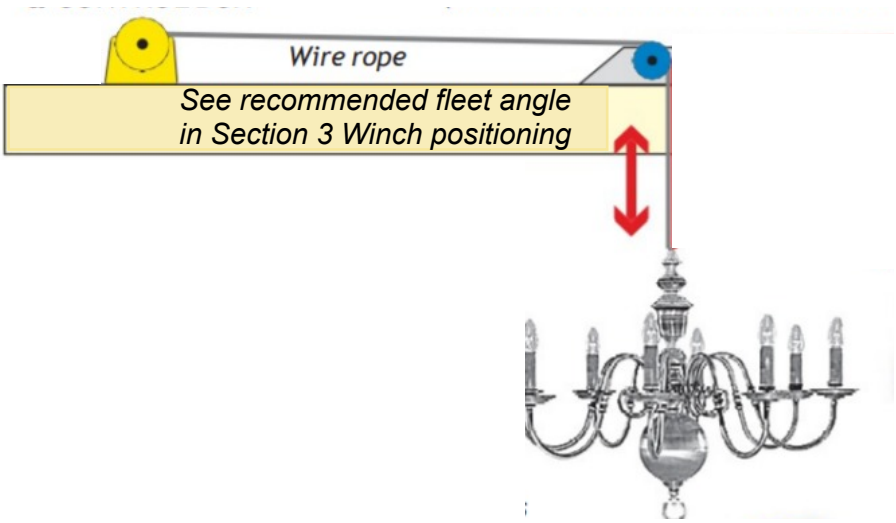
Fig. 1



For practical purposes some space from the top layer of the cable (wire rope) to the outside of the drum flange should be maintained ("D" in fig. 1). This margin is to prevent the cable (wire rope) from inadvertently coming off the drum during use.

Note: The one exception to this is Full Drum Storage. When the winch is not being used to move a load, the wire rope may be spooled to the top of the flange.

For applications with the winch permanently sited with diverting pulleys, where the rope travel is just between the load and the head pulley. The rope coiled on the drum should be kept to a minimum i.e. travel length + dead wraps (See section 6. Wire rope attachment). This will ensure maximum pull (Gear ratio) is utilised.



Manual Lifting Winch Selection
Winch Cable Attachment

6. Where the total cable (wire rope) capacity for the drum is given this will be the length of wire rope that can be tightly and evenly wound onto a drum, As a recommendation, the actual length of working rope should equal to 80% of total working drum capacity. This is a real world estimate of what can be expected due to less than perfect winding practices.

The anchoring) of the winch cable (Wire rope) is accomplished with the dead end fixed to a clamp and most importantly by the friction of the *dead wraps tightening against the drum barrel, as a load is applied. As the load increases so does the anchoring effect. Smooth cable (Wire rope) spooling can be affected by the initial wrap of the cable on the drum. With a plain cylindrical core the first wrap follows an imperfect helical path and the wrap jump at the end of the first wrap is difficult to control.

When installing the first wrap, time should be spent on making the wrap as perfect as possible. A space between each wrap of approximately *8-10%* of the cable diameter is ideal for achieving smooth spooling. The first layer wraps should not be touching each other. It is critical that the recommended number of, at least, five *dead wraps remain on the drum at all times in order for the load to be held. As hand winches are usually compact in size, it is unlikely that the first layer will figure in the actual lifting operation.

For the load end of the cable wire rope clips (Bull dog grips) should not be used as these are not suitable for lifting applications. Swaged terminations with a thimble eye should always be used. These require hydraulic presses for proper installation and do not readily lend themselves to re-application in the field under most circumstances.

Load attachments should be either a rated lifting hook with fixed or swivel eye fitted with a safety catch or a rated lifting shackle. For applications where the shackle is to be permanently attached to the load, a bolt and nut pin shackle is recommended.

Manual Lifting Winch Selection
Contact Us

7. Safe use and maintenance instructions are routinely included with any winch supplied by us. These are provided by the winch manufacturer and their instructions must be followed explicitly. Copies should be given to, and signed for, by each winch operative. If you require additional copies, please contact us.

As members of the Lifting Equipment Engineers Association (LEEA) we also provide general safe use instructions for lifting winches in PDF format CLICK HERE for a copy.

For further assistance in selecting the right winch and rope for your application, please don't hesitate in contacting our sales team:

DALE

Lifting and Handling Specialists
2 Kelbrook Road, Manchester,
M11 2QA England
Telephone: 00 44 (0)161 223 1990
Facsimile: 00 44 (0)161 223 6767
Email: sales@dale-lifting.co.uk
Website: www.dlhonline.co.uk