

DLH ONLINE

A GUIDE TO PERMANENT MAGNETS FOR LIFTING PURPOSES

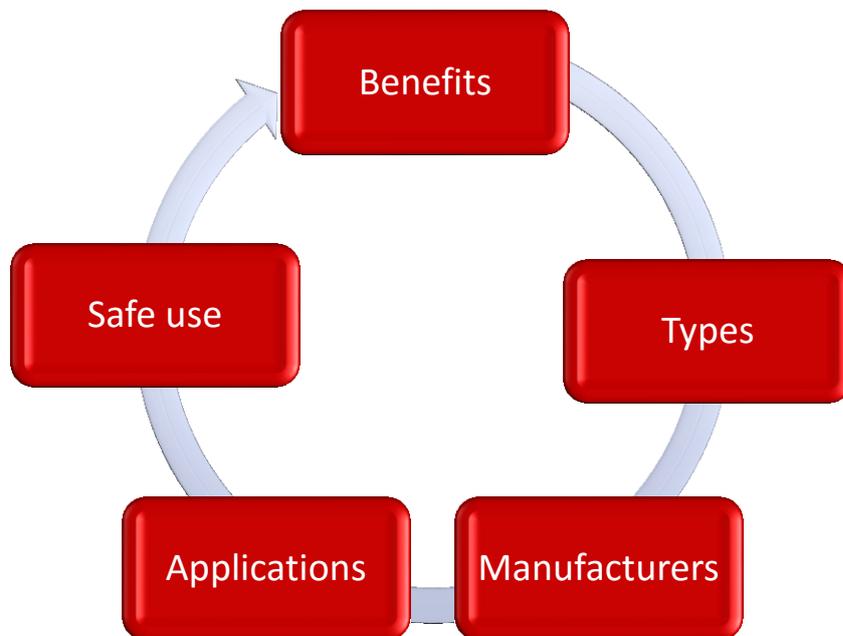


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1. Overview



This guide is for permanent magnetic lifters for attaching loads by adhesion. If you need to lift a long thin steel plate, a component profile cut from a piece of thick steel plate or a short length of large diameter bar stock, there are not many options when it comes to lifting accessories.

The difficulty of attaching to such items is often exacerbated by their flexibility, variations in shape, the need to avoid surface damage, the material being part of a stack without separators, etc.



Permanent lifting magnets can provide a cost effective solution for all these applications and many more.



Generally, lifting magnets are designed and rated to lift loads only in the horizontal plane. Attempting to use them at an angle may result in the load slipping so such applications should not be considered without a special beam (See right).

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2. Standards

There is a harmonised European Standard, EN 13155 Cranes— Safety—Non-fixed Load Lifting Attachments, which covers the essential requirements for lifting magnets. There are two types of permanent magnets, each having particular advantages and disadvantages.

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3. How They Work

Modern permanent magnets can be very powerful and the obvious problem in making practical use of them is how to detach them when required.



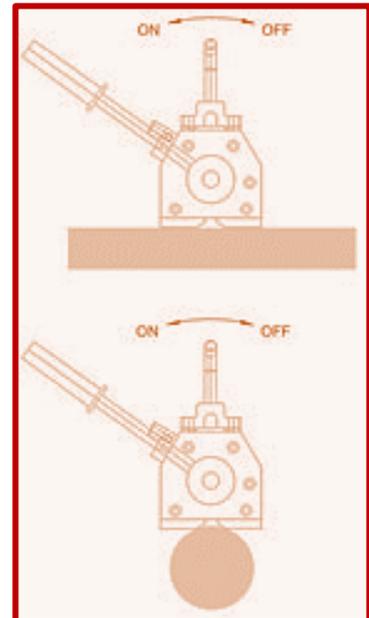
We have all played with small magnets at some time and are well aware that opposite poles attract and same poles repel.

Within the magnetic lifter are two sets of magnets, one of which can be rotated to reverse its polarity thereby controlling the magnetic field.

In one position the field is directed into the load thereby effectively switching the magnetic lifter on. In the other the field is directed internally away from the load thereby effectively switching the magnetic lifter off.

The rotation is usually controlled by a manually operated lever although some manufacturers offer the option of battery powered mechanisms.

Manual permanent magnets are most suitable for simple regular shaped loads and are frequently employed to handle rectangular or round materials such as may be required to position heavy components for machining.



The need to operate the lever means that this type of lifting magnet is only suitable for applications where the operator is not exposed to danger and can easily reach and operate the lever.

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The second type is the electro-permanent magnet which is a variation on the mechanically controlled permanent magnet.

In this type, the moving magnet is replaced by a coil enclosing magnetic material.



When a pulse of electricity is passed through the coil it creates a permanent magnet, the polarity of which can be created either way.

Changing the polarity of this magnet has the same effect as the mechanical movement within a permanent magnetic lifter.

It has the obvious advantage that the operator can be well away from the magnet and the danger zone near the load. There are no moving parts and the electric current is only required to create the magnet, not sustain it. Therefore, once switched on, the power supply can be disconnected from the magnet if necessary.

A further advantage is that, if the degree of magnetisation is controlled, the magnetic lifter can be partially magnetised or demagnetised. When lifting a load from a stack, it provides the facility to shed excess load before being fully magnetised to secure the remaining load. This type can be designed to use either electrical energy from batteries or the mains power supply.

Permanent magnets of both types need good contact between the magnet face and the load. They have little tolerance of an air gap. Therefore care is required if the load is not perfectly flat or if there is a surface texture or finish which prevents good contact. The magnet face may be shaped to suit particular loads.

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Many incorporate a V shape in the face to facilitate lifting loads with a round cross-section. The magnetic properties of the material the load is made from also affect the magnet's lifting capacity.



Therefore when lifting a particular type of load for the first time, it is good practice to check that an adequate adhesive force is achieved.

The alternative to the permanent magnet types are the electromagnets (Not available from us). Electromagnets do not contain permanent magnets. The magnetic field is generated by passing direct current through a coil enclosing a magnetically soft core.

Electromagnets rely upon a continuous electrical supply but offer the potential of much higher lifting capacity.

A typical example is in scrap handling. The random nature of scrap metal means that some is always likely to fall off during the process.



The easiest and safest solution is usually to exclude people from the area. Such magnets do not need any extra safety features.

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4. Safe Operation

For safe operation, permanent lifting magnets should have a tear off force of at least three times the working load limit when used under the conditions specified by the manufacturer.

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To verify that a similar level of safety is achieved under the actual operating conditions, the user can make a simple test.

Using the performance information provided by the manufacturer, the user can estimate the air gap which is expected to cause a loss of capacity of about 60%.

To test, introduce an artificial air gap of the estimated thickness by interposing, for example, thin card between the magnet face and the load.

If the magnet can lift the load with that artificial gap then the user can have confidence in the adhesive force when the artificial gap is removed. Clearly this test should only be made under controlled conditions which assume that the load might detach and the load need only be lifted a few millimetres.



Alternatively, the Eclipse Power Plus permanent lifting magnets are fitted with a 'Safety Shim' (patented). For pre-testing any load. The operator places the 'Safety Shim' on the load with the Ultralift Plus magnet on top.

The operator then activates the Ultralift Plus and attempts to lift the load a very short distance.

If the Ultralift Plus holds the load with the 'Safety Shim' then a 3:1 safety factor is guaranteed without it. The ability to pre-test any load could be especially useful if you lift loads of differing sizes, materials and surface finishes.

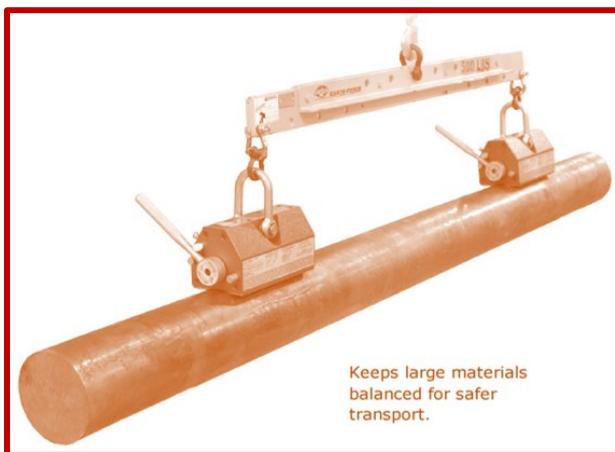
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5. Lifting Long Loads

Stiffness or flexibility of the load

Droop or overhang at the ends of a flexible load e.g. long bar, flat or thin sheet, may cause it to peel off the magnet under its own weight during handling operations.

A number of magnets may be selected to give greater coverage over the load area rather than reliance being placed on weight-lifting ability alone. Proper configuration/positioning of the magnets should minimise the sag or droop of the overhanging portions of a load.



Lifting long flexible loads will require the use of several magnet heads suspended from a lifting beam. See [Lifting beams and spreaders](#) page DLH Online.

However, so far as the magnet heads are concerned, the number required and their position along the lifting beam needs to be matched to the load.

The load must be shared so that no one magnet head takes more than its capacity.

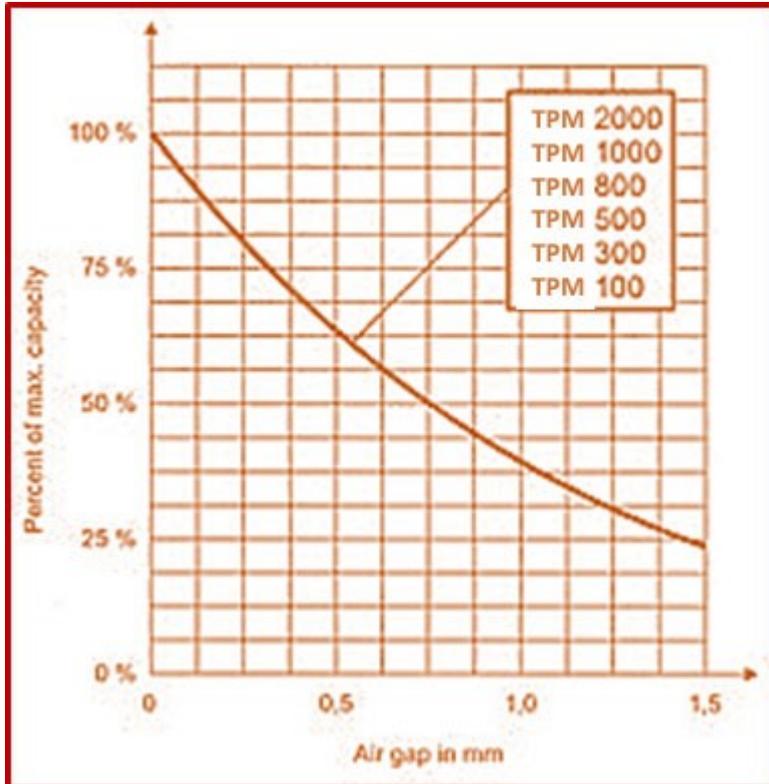
Also the load must be supported so that it doesn't flex so far as to damage it or to start it peeling from any of the heads.



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6. Air Gap

A non-magnetic discontinuity in a magnetic circuit (i.e. the distance between two magnetic poles). This gap often includes other materials



such as brass, aluminium or paint. Because an air gap reduces a magnet's capacity, once the load starts to peel off, it is almost certain to continue.

See example chart (Left).

To allow for variations in positioning of the magnets onto the plate there may need to be some redundancy built into the arrangement.

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7. Pros and Cons

To summarise, if the load has magnetic properties, lifting magnets complying with the standard offer a range of options to suit a variety of loads and working environments.

Some lifting equipment specifiers have a problem about lifting with magnets due to the absence of a visual clamp, strop or chain cradled under the load.

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For some reason they think very little about lifting from tapped holes with eyebolts, even though they cannot see the condition of the threads inside the hole while lifting or know how much thread engagement is needed to make the lift safe.

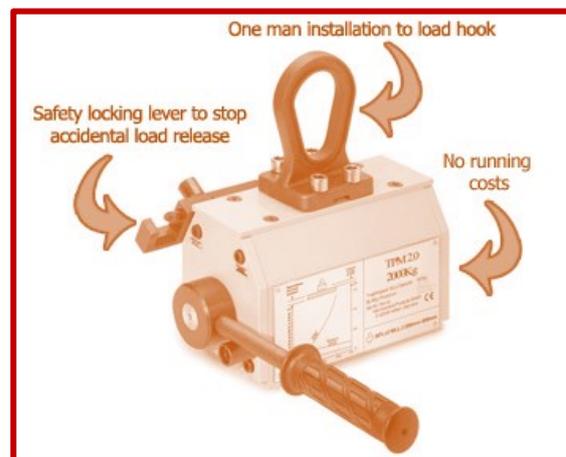
A damaged thread or an eyebolt only threaded in a few turns can easily strip causing the load to fall.

The main problem with magnets is mis-use. Specifiers who don't understand magnets think that bigger is always better and to ere to the side of caution.

Sometimes having an over-sized magnet can actually cause more risk than reward.

The benefit of using a permanent magnet is that it does not require power to hold the load.

With today's permanent magnets there are safety mechanisms in order to dis-engage them making them practical for more and more applications (mechanical manual release and electrical release).



While magnets are rarely the lowest cost solution, they are often safer and have fewer parts that require inspection, maintenance and regular replacement than typical clamps, strops, hooks and chains.

Permanent magnets in appropriate applications outlast and outperform vacuum systems, strops, clamps, and chains. Contact DLH Online [sales team](#) at Dale Lifting and Handling Specialists for advice on your application.

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8. Safe use

As with all lifting devices and operations, safety is of utmost importance. Here are some basic tips for ensuring optimum safety whilst using a lifting magnet.

- Refer to manufacturer's instructions before use.
- Never use to lift people
- Never lift over people
- Ensure the crane or hoist's hook is suitable for the magnet and that the SWL is appropriate.
- A load suspended with a lifting magnet should not be left unattended.
- Trial lifts should always be carried out to ensure the hold is secure.
- Where more than one lifting magnets are used together to lift larger objects then a lifting beam should be used for stability. See our [Lifting beam section](#)
- Ensure the surface of the steel is in good condition to prevent air gaps.
- Never lift or move loads whilst people are in the area of movement.
- Never magnetize the magnet lifter (by locking the handle down) without a load engaged.
- Never de-magnetize the device (by raising the handle) until the load has been completely set down.
- If lifting round objects the lifting capacity will be reduced as full contact will not be made.
- A lifting magnet is a lifting accessory and under LOLER should be inspected by a competent person at least every 6 months to verify it is safe for use.
- In use a visual check should be made by the operator prior to each use to check for defects such as cracked housing, broken handles, damaged suspension eyes and that it is free of dust and debris.

More information please manufacturers operating instructions provided with your lifter or refer to the tables provided in the [Lifting Magnets](#) section of DLH Online website. [Back to table of contents](#)

9. Manufacturers and Models (Available from DLH Online)

9.1 Eclipse Magnets



Eclipse Ultralift Plus Lifting Magnets



3 safety features for ultra-safe lifting

1. 'Safety Shim' (patented)

For pre-testing any load. Place the 'Safety Shim' on the load with the Ultralift Plus on top.

Activate the Ultralift Plus and attempt to lift the load a very short distance. If the Ultralift Plus holds the load with the 'Safety Shim' then a 3:1 safety factor is guaranteed without it. The ability to pre-test any load could be especially useful if you lift loads of differing sizes, materials and surface finishes.

2. Safety catch

When the Ultralift Plus is 'on' the operating handle is held by a safety catch to prevent accidental switching. The safety switch is release by pressing a button on the end of the operating handle.

3. Lifting eye mechanism (patented)

Patented mechanism prevents any switching, accidental or otherwise, of the Ultralift Plus while it is holding a load.



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Eclipse Ultralift TP Lifting Magnet (For thin plates)

Manually operated permanent lifting magnet specifically designed for lifting thin plate and removing single sheets from a stack.



Operating handle works like a car handbrake. A button on the end operates a safety catch which prevents accidental switching while a load is being held.

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Eclipse Ultralift LM Lifting Magnet

NO RUNNING COSTS No power required - no additional costs.

EASY TO INSTALL Simply hook to your crane or hoist

and you are ready to lift.

EASY TO USE One man can attach the load, effortlessly, in seconds.

SAFE LIFTING Safety locking mechanism prevents accidental release of load.



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Eclipse 90° Disc & Plate Magnet Lifter

Lift and rotate steel discs and plates for positioning and machine loading applications.

Frame with integrated lifting magnet allows you to pick the load from the floor and turn it through 90 degrees for final positioning.

EASE OF USE Lift and turn in one single operation.

Returning to the pallet is simply the reverse of this movement.

ADJUSTMENT The magnet position on the frame is adjustable to suit different load diameters.

The lifting point on the frame can also be adjusted to ensure a balanced lift.

SAFETY A neat handgrip on the frame makes it easy to guide the load to its location.

The lower location pins prevent the load sliding when it is lifted through 90 degrees and allow a lighter and more cost effective magnet to be use.



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Eclipse Battery Lifting Magnet

The power and ease of operation of an electro-magnet, the safety, the convenience and flexibility of a permanent-magnet lifter.

Watch the Battery Lifter in action on YouTube

Permanent magnet provides all the lifting power, onboard rechargeable battery powers switching only. This is not an electro-magnet.

Permanent magnet means lower operating cost and failsafe lifting - once the load is held it remains held until the lifter is switched off.

Lift up to 3000kg quickly and safely

Permanent magnet means failsafe operation – once load is held it stays held until switched

Push button or automated switching – operator does not have to be in lifting area

Only access to top face of load is necessary so stock can be stored more efficiently



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9.2 Yale Magnets



Yale TPM permanent lifting magnets

Are ideal tools for easy, quick and economical transport of heavy objects.

Made from ferro-magnetic material. Typical operating areas are workshops and warehouses, loading

and unloading of machines as well as construction of jigs and fixtures.

Compact design of the units for a large number of applications. The load is not affected mechanically which allows lifting of flat as well as round material. The efficient magnet body provides strong lifting capacity at low dead weight.

The permanent magnets do not require electric energy and will leave only minor residual magnetism on the material after use.

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Yale THM Manual magnetic claw



The THM manual magnetic claw is used for transporting steel sheets horizontally and vertically, lifting plates from racks, pulling steel sheets out of shelving, as well as transporting flat pieces of magnetisable steel.



The clamp, depending on the type, can be used for plate thicknesses from 1 to 5 mm.

Pressing down on the handle activates a cam which releases the magnetic claw from the work piece.

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10. Contact Us

For further advice on the above or for enquiries for lifting magnets to your requirements, please contact our sales team on: 0161 223 1990 or by email: sales@dale-lifting.co.uk

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