

Operation Instruction

Permanent Magnet Lifter



Complies to AS4991

PLEASE READ ALL INSTRUCTIONS PRIOR
TO USING THIS PRODUCT



Ph: 02 9545 6633
Fax: 02 9545 4222
E: sales@garrickherbert.com.au
460-462 The Boulevard
Kirrawee NSW 2232

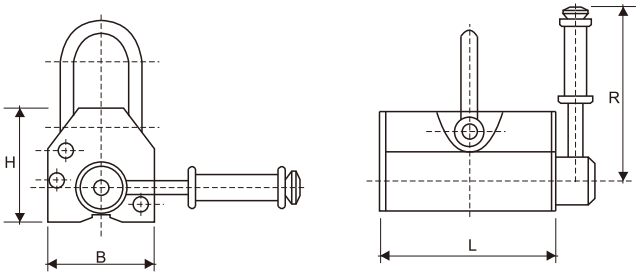
Operating Instruction

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1 Main application and features:
PML series strong permanent magnet lifter is mainly used in holding and lifting plate or cylindrical workpiece made of ferromagnetic materials. It features simple structure, easy operation, strong holding and lifting strength, safety and reliability, and can improve the working conditions of loading and unloading operations, and productivity. It acts as a lifting machine widely in factory, dock, warehouse and transportation field.

2 Main structure and data
The strong permanent magnet lifter uses high-energy permanent magnetic materials which can generate strong holding strength in magnetic circuit, and It can control the lifter On or OFF by using handle to rotate the pole core shaft, and no need of external power supply operation. When the lifter is in On, the holding surface at the bottom of lifter constitutes a pair of longitudinal magnetic poles, which firmly holds the workpiece of ferromagnetic material. There is a V-shaped slot on the holding surface, so that it can hold both the plate shaped workpiece and the cylindrical workpiece.

Main Technology Parameters



Type	Rated Lifting Strength (kgf)	Max. Pulling Strength(kgf)	Dimension (mm)				Net Weight (kg)
			L	B	H	R	
PML-100	100	350	94	72	78	145	3.2
PML-200	200	700	146	72	81	145	5.4
PML-300	300	1050	168	94	106	178	11
PML-600	600	2100	218	116	116	225	20
PML-1000	1000	3500	272	145	148	295	40
PML-2000	2000	6000	388	160	170	365	74
PML-3000	3000	9000	460	185	185	425	105
PML-5000	5000	15000	568	250	255	900	248

3 Type Choice

The following factors of object to be lift should be considered when selecting the suitable type

- thickness
- weight
- material
- surface area which can be held
- weight balance
- surface roughness
- gap between permanent magnetic lifter and object to be lift.

3.1 Reference chart for conversion of steel plate thickness and actual lifting capacity

	Thickness of steel plate		Actual lifting capacity						
	mm	inch	PML-5000	PML-3000	PML-2000	PML-1000	PML-600	PML-300	PML-100
								PML-400	PML-200
T1	Up 60	Up 2.36	100%	100%					
T2	55	2.16	90%	90%					
T3	50	1.97	85%	85%	95%				
T4	45	1.77	80%	80%	85%				
T5	40	1.57	75%	75%	80%				
T6	35	1.38	65%	65%	70%	85%			
T7	30	1.18	55%	55%	60%	75%			
T8	25	0.98	45%	45%	50%	65%			
T9	20	0.79	35%	35%	40%	55%	70%	85%	
T10	15	0.59	25%	25%	30%	45%	55%	65%	
T11	10	0.39	15%	15%	20%	30%	40%	45%	
T12	5	0.20	10%	10%	10%	15%	20%	25%	35%

3.2 Actual lifting capacity based on surface roughness (Fx) and material (Mx)

	0	50%	100%	125%
F1		1.6μm	125%	
F2		6.3μm	100%	
F3		12.6μm	90%	
F4		-	85%	

	0	50%	100%
M1		Low carbon steel	100%
M2		Medium carbon steel	90%
M3		High carbon steel	80%
M4		Low alloy steel	70%
M5		Cast iron	50%

3.3 Calculation of actual lifting capacity: $T_x \times F_x \times M_x \times \text{Rated Lifting Capacity}$

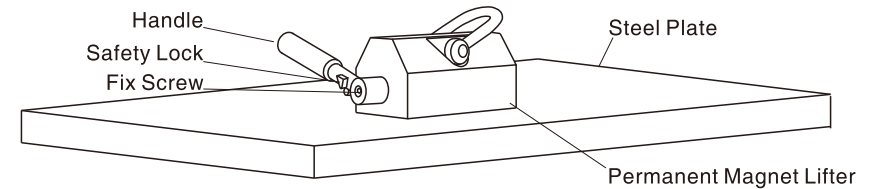
3.4 Example

Condition: T8, F1, M3, PML1000

Actual lifting capacity = $65\% \times 125\% \times 80\% \times 1000 = 600\text{kg}$

4 Operation

4.1 Installation: Refer to the picture as below.



4.2 Before put the lifter into operation, check the information about the object to be lifted, such as thickness, surface roughness, material, and calculate the required actual lifting capacity and select the suitable lifter.

4.3 The touch area of lifter and object to be lifted has great effect on lifting capacity. Keep this area be as large as possible.

4.4 The operation force of handle is based on actual lifting capacity. For example, the force will increase on the following conditions:

- Cylindrical object
- Thinner object
- The surface roughness of object is above $6.3\mu\text{m}$
- Smaller touch area

4.5 The working environment

- the ambient temperature is not higher than 80°C
- no violent vibration or impact
- no metal corrosive agent

4.6 When operation, put the lifter on the surface of object to be lifted, and make sure the lifting line coincides with the center of gravity of object. Turn the handle from "OFF" to "ON" and fix the handle by safety lock.

If the lifting line doesn't coincide with center of gravity of object, it may cause the object titling and the reducing of actual lifting capacity. The location of lifter should be adjusted to keep the balance of object.

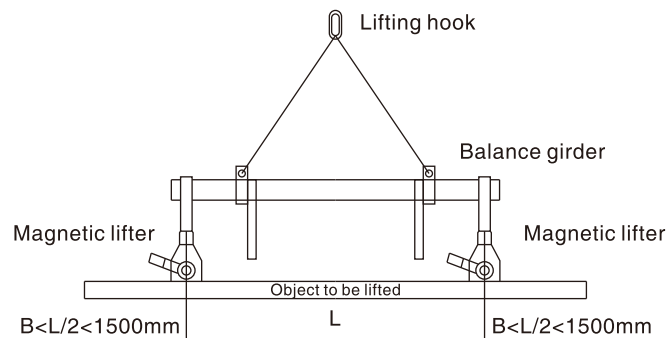
During lifting, the movement should be smooth to avoid the vibration or impact.

4.7 When lifting the cylindrical object, put the lifter on the surface of object and make sure the lifting line coincides with the center of gravity of object. The surface of object contacts with V-shap slot and there are only two touch lines, so the actual lifting capacity should be only 300-50% of rated lifting capacity, based on the diameter of object to be lifted.

4.8 After lifting operation, press down the button on the top of handle to unlock the safety lock, turn the handle to "OFF".

4.9 When lifting a longer object, its length should not be longer than 3000mm. If over 3000mm, the multiple permanent magnet lifters should be used in combination. Refer to the figure as below.

Multi sets of lifter are used for lifting



5. Maintenance and safety instruction

5.1 Rating of cranes

When attached to a crane, the weight of the magnet and its accessories should be taken into account when assessing the load carrying capacity and safe operation of the crane.

Mobile cranes not only have to contend with the weight of the magnet but also the inertia effects during slewing and travel. Guidance should be sought from the crane manufacturer on any possible de-rating on the normal SWL when using magnets.

5.2 Protection against lifting excess material

When lifting plates etc from a stack, the magnetic field can be such that more material than required is magnetized, with those items furthest from the magnet liable to be easily displaced. A reduced-power or similar facility can be used to avoid lifting excess material.

5.3 Lifting of bundles- protection against falling material

Where magnetic lifting devices are used to handle bundled materials, it is essential that appropriate risk control measures are in place to protect people, plant and equipment from the risk of falling material. In particular:

- A. the magnetic equipment used must be suited to the task; and
- B. the load should never be lifted by any banding wire/straps used to contain the material, as only the items closest to the magnet face are likely to be sufficiently magnetized to remain in place if the banding/strapping fails during handling.
- C. to reduce the risk of banding/strapping and jointing clips failing during handling, they must be "fit for purpose" ie of known SWL and adequate strength to withstand all the stresses from handling, and should be sufficient in quantity and so positioned around the bundle as to minimise the risk of the contents "peeling off". For incoming materials, account should also be taken of possible damage during transit
- D. persons should be prevented from entering any area where they could be injured if a bundle broke apart during lifting/handling.

5.4 Safe working practices/Safe operating procedures

A. Safe operating procedures should be prepared and kept readily available for each magnet lifting arrangement. In addition, tables detailing the maximum loads for each type of material eg plate, bar, tube, casting etc, the range of thickness of the materials, and different air gaps should be conveniently displayed.

B. The following safe working practices should be considered for inclusion in any operating procedures for the safe use of magnetic lifting devices, though some of them may be inappropriate for handling scrap:

- (1) use the right equipment and be aware of the limitations of each device eg "lift only one piece of material as a time", "unsuitable for scrap handling" etc
- (2) always follow the manufacturer's instructions
- (3) do not use magnet lifts to handle containers of gases or liquids
- (4) check the thickness of materials before lifting. Check tables for lifting capacities for different thickness
- (5) ensure that there is good contact between the surfaces of the magnet and the load.
- (f)Magnetic efficiency could be affected by surface contamination
- (6) take account of the rigidity of the load eg bundle shape and profile. Any lifting beam used must be fit for purpose.
- (7) where possible, use magnets only for handling single items. Fully assess the risk of items being lifted becoming detached/peeling off, where they are not in direct contact with the magnet is magnetism is transmitted through one or more other items closer to the magnet
- (8) never exceed the SWL. Where more than one magnet is used, the applied load on each magnet should not exceed that magnet's SWL
- (9) consider installing permanent magnets with electromagnetic drop off ie in the event of a power failure battery backup will not be needed
- (10) display warning notices at entrances to places where magnetic lifting is taking place. Prevent unauthorized access into lifting zones, especially at automatically controlled processes. Provide operators with safe places of work and ensure that they cannot be struck by displaced loads eg reinforced crane cabs
- (11) never transport a loaded magnet where there is a risk of injury to any person should the load or part of it fall off. All movements of materials should be properly organized and managed to prevent injuries and damage to plant and key services. Travel routes should be clearly defined and maintained.
- (12) transport loaded magnets at the lowest height possible, where practicable no higher than 1.5m above ground level Where this is not practicable, other precautions should be considered.
- (13) de-energize the magnet when not loaded and never leave a load hanging in the air, Magnets should also be de-energized before unplugging to prevent a high back EMF being generated when they are switched off
- (14) assess dangers of access to backs of vehicles eg to trim the load, where magnet lifts are used for loading lorries
- (15) prepare arrangements for dealing with emergencies eg equipment failure, displaced loads etc