MAGLOGIX®

Operation Manual

MagnaHoist™ MXL-2200

EN Lifting Magnet

Contents

Dear customer,

Thank you for purchasing a Maglogix® product. Please read these operating instructions closely before using your device for the first time and keep them along with the enclosed Product Control Card for later reference.

Safety Instructions

Serious accidents with fatal physical injuries can occur when using extremely strong magnetic clamps if they are improperly used and/or maintained. Please observe all safety instructions in this operation manual and contact the manufacturer if you have any questions.

Always...

- activate the lifting magnet completely
- activate the lifting magnet on metallic, ferromagnetic materials
- use the entire magnetic surface for lifting
- lift on plane surfaces
- check the magnetic holding force by lifting the load slightly a few inches
- clean the magnetic surface and keep it clear of dirt, chips and welding spatter
- set the lifting magnet down gently to prevent damage to the magnetic surface
- check the surrounding hazard area before pivoting the load
- respect the stated maximum load before pivoting the load
- inspect the magnetic surface and the entire lifting magnet for damage
- use suitable lifting devices, chains, hooks, slings, etc…
- follow the instructions in this operating manual
- instruct new operators in the safe use of lifting magnets
- respect local and country-specific guidelines
- keep and use in a dry environment
- read and follow guidelines specified in ASTM B30-20 and / or BTH-1

Never...

- lift round or arched objects
- exceed the stated maximum load
- lift loads over people
- lift more than one work piece at a time
- switch the lifting magnet off before setting down the load safely
- allow the load to sway or bring to a sharp and immediate stop
- lift loads exceeding the recommended dimensions
- lift loads with cavities, cut-out openings or drilled holes
- lift unbalanced loads
- modify the lifting magnet or remove operating labels
- use the lifting magnet if damaged or missing parts
- strain the underside of the magnet through heavy impact or blows
- position yourself beneath the lifted load
- lift loads while people are within the hazard area
- leave the lifted load unattended
- use the lifting magnet without having been properly instructed
- use if you have not read and understood these operating instructions completely
- use the lifting magnet to support, lift or transport persons
- operate the lifting magnet in temperatures higher than 60°C (140°F)
- expose to corrosive substances

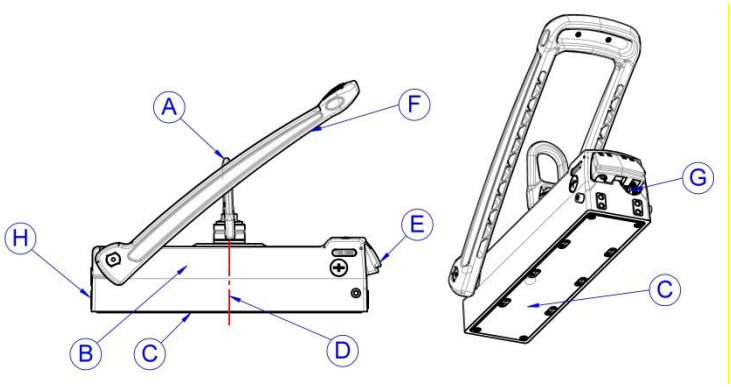
People using pacemakers or other medical devices should not use this lifting magnet until they have consulted with their physician.

Proper Use

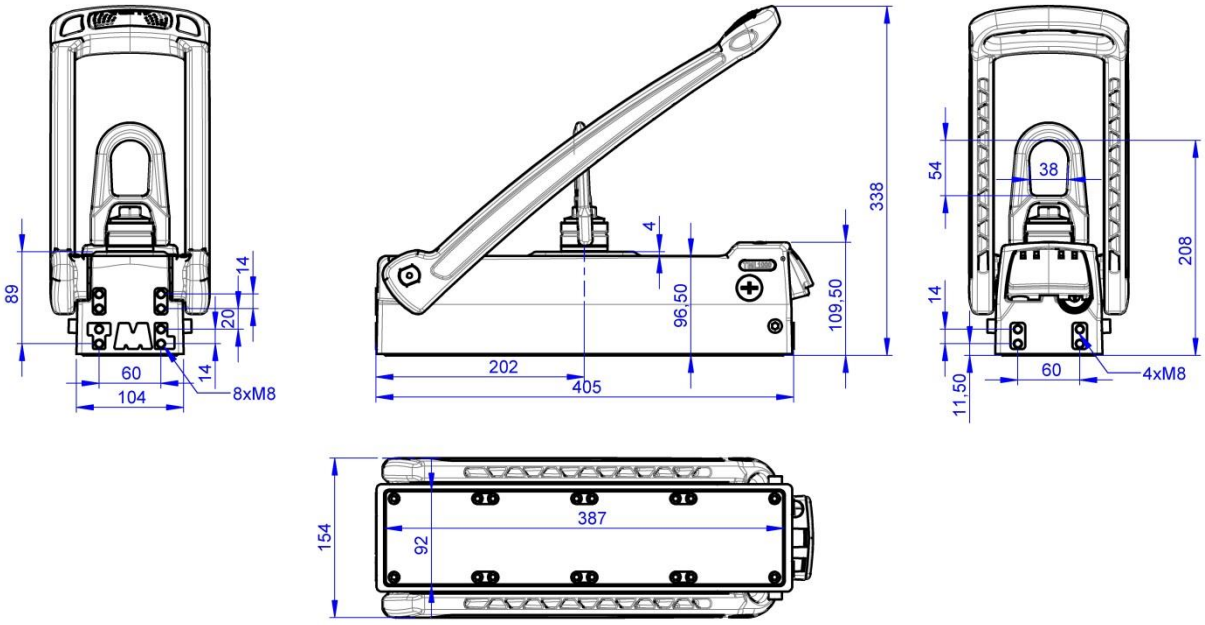
The MagnaHoist™ MXL-2200 permanent is designed to lift ferromagnetic, metallic loads and may only be used according to its technical data and determination. Proper use includes adherence to the start-up, operating, environment and maintenance conditions specified by the manufacturer. The user bears sole responsibility for understanding the operating manual as well as for proper use and maintenance of the lifting magnet.

Device Description

The MagnaHoist™ MXL-2200 is a switchable lifting magnet with manual actuation for the lifting, transporting and lowering of ferromagnetic materials. By pressing the lever (F) down, the magnetic field generated by the permanent magnet (D) can be activated in the lower magnetic plate area (C). Thanks to the special design, a very compact magnetic field is generated which develops excellent adhesive force, especially on thin materials (less than 10 mm). The magnet can be deactivated by first pressing the safety tab (E) with the heel of the hand and then moving the lever upwards.
An adjustable oil damper (G) is incorporated underneath the safety tab in order to absorb the recoil energy of the lever, especially during use on thin materials. Additional threads for mounting (H) are located on either front side of the magnet which, if desired, can be used as holding device. An eyelet (A) is situated on the top of the lifting magnet for attachment to a crane. The load-bearing capacity of the lifting magnet is equivalent to 1/3 of the maximum breakaway force of the magnet and thus is equivalent to the standard safety factor 3:1.



A) Load hook
B) Basic body
C) Magnetic surface
D) Center of the magnet
E) Safety tab
F) Lever for activation/deactivation
G) Shock absorber for lever
H) Additional threads for mounting

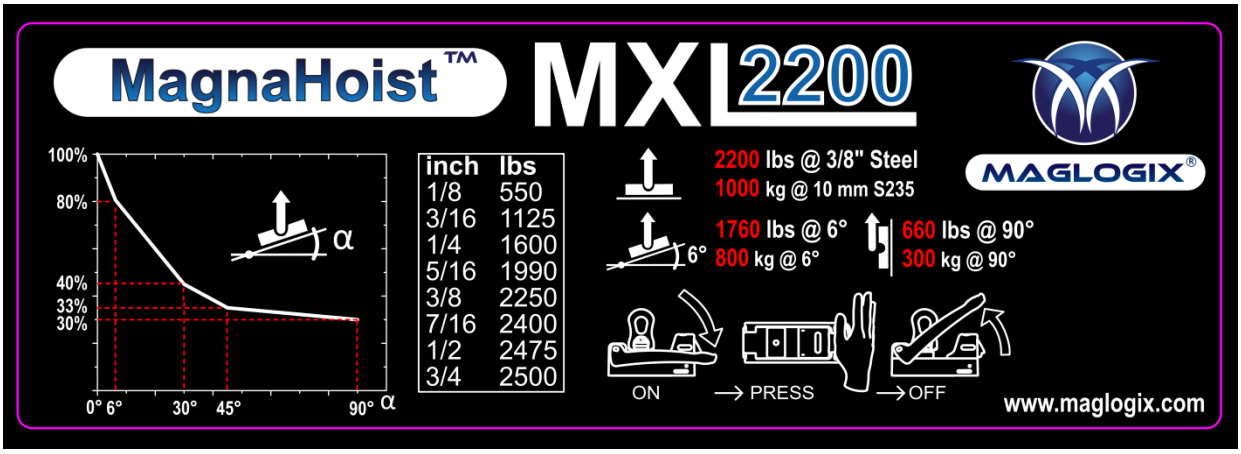


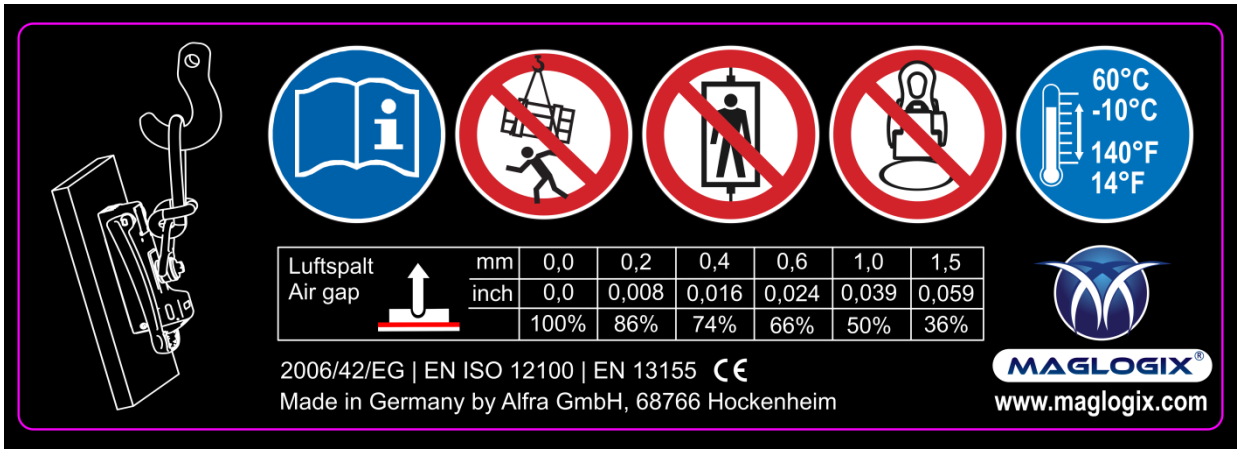
Technical Data

Prod.-No.:	**41700.MX**	
Designation:	MagnaHoist™ MXL-2200 Lifting magnet	
Breakaway force:	>7500 lbs on ½" AISI CRS 1020 Steel	>3400 kg on 12 mm S235
Max. load-bearing capacity: **(on flat material** **with safety factor 3:1)**	2200 lbs on 3/8" AISI CRS 1020 Steel	1000 kg on 10 mm S235
Max. load-bearing capacity: **(at 6° inclination acc. to EN 13155** **with safety factor 3:1)**	1760 lbs on 3/8" AISI CRS 1020 Steel	800 kg on 10 mm S235
Max. load-bearing capacity: **(at 90° inclination of the load** **with safety factor 3:1)**	660 lbs on 3/8" AISI CRS 1020 Steel	300 kg on 10 mm S235
Dead weight of the magnet:	39.4 lbs	17.9 kg
Storage temperature:	-22°F to +140°F	-30°C to +60°C
Operating temperature:	+14°F to +140°F	-10°C to +60°C

Markings on the Lifting Magnet

Additional detailed descriptions for handling and operating conditions can be found on both sides of the lifting magnet. This labeling must not be modified, damaged or removed, as otherwise the manufacturer cannot be held responsible for any personal injuries, property damage or accidents resulting from this fact. New labels must be ordered from the manufacturer if necessary.



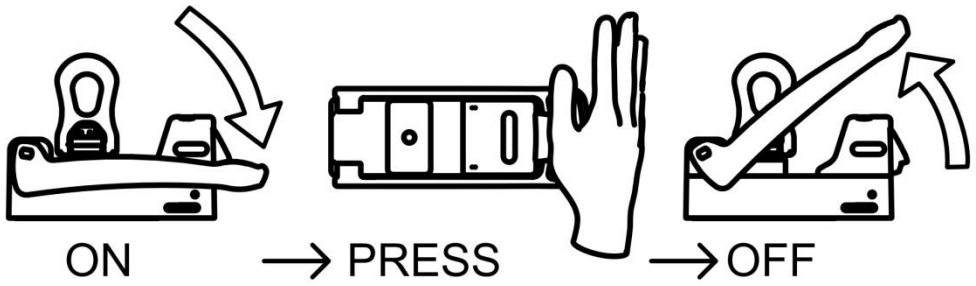


Start-up

You have received a completely assembled MagnaHoist™ MXL-2200 lifting magnet and detailed operating manual. Please check the condition of the goods upon receipt for any damage incurred during transport, and make sure the delivery is complete. If you have any problems, please contact the authorized reseller or manufacturer immediately.

Be sure to read the operation instructions completely before using this magnet for the first time!

1. The lever is facing upwards. The lifting magnet is deactivated.
2. Follow the safety instructions. Clean the work piece and the lower magnetic plate of the lifting magnet.
3. Position the lifting magnet at the center of gravity of the load. The lifting magnet is slightly magnetized in order to assist in positioning the magnet (e.g. when used in a vertical or other forced position).
4. Align the lifting magnet according to the desired application.
5. Press the lever down until it is fully engaged in the ON position. Make sure that the safety tab is securely locked in place.
6. Move the load hook to the required position and lift the load about several inches as a test lift to check for excessive deformation and to verify adequate magnetic holding force. Do not place any part of your body under the material at any time during lift. Ensure that only one piece is being lifted and that the load is safely held. Refer to ASTM B30-20 and / or BTH-1 for more detail.
7. Now move your load slowly and smoothly. Avoid swinging or jarring.
8. After the load has been set down completely and safely, you can deactivate the lifting magnet. To do this, press the safety tab using the heel of your hand and move the lever upwards into the OFF position.



Pivoting or Vertical Lifting of Loads

The special design of the MXL-2200 lifting magnet allows the user to turn and pivot the load freely. The suspended load can be turned around at 360° and pivoted at 90° in most cases.

1. Be sure to use a flexible soft eye to avoid jamming the lifting magnet into the hook of the crane since this would lead to extremely unfavorable load conditions and the lifting capacity would no longer be assured. In addition, this will protect your magnet from damage and extend its lifetime.

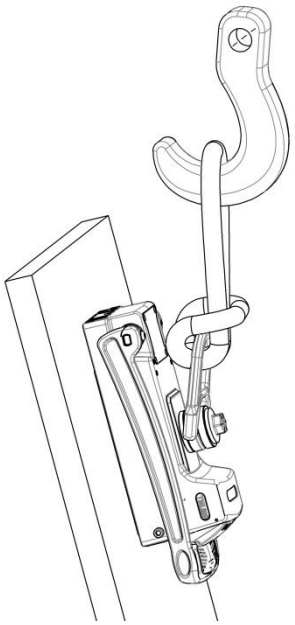


Figure 1

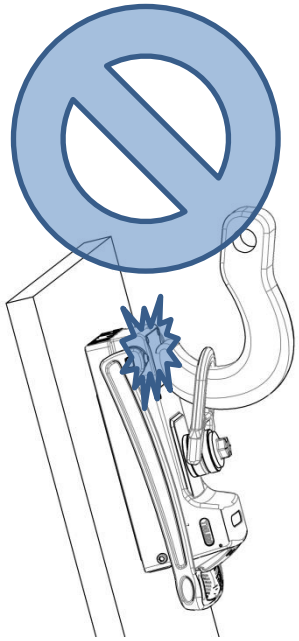
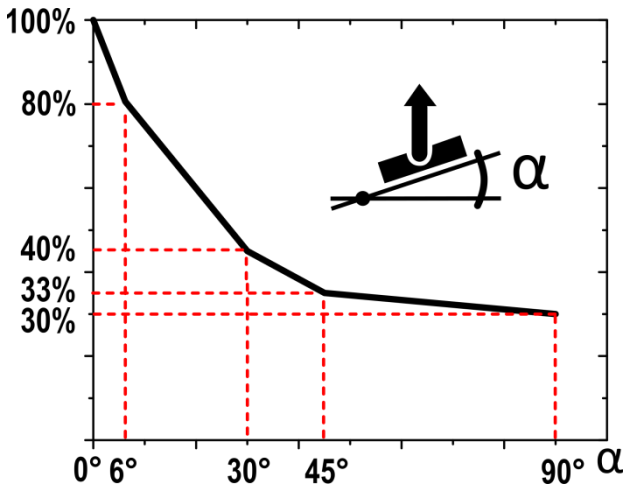


Figure 2

2. If the load is attached horizontally to the magnet, the entire breakaway force of the lifting magnet is acting on the load, so you can use 100% of the lifting capacity as stated in table 2 (page 12). However, if the load and the magnet surface tilt at an angle other than 0° to horizontal, the load-bearing decreases due to the new alignment of the magnet to the gravity of Earth. As soon as the load is suspended vertically, i.e. at an angle of 90°, friction will be the only effect exerted by the magnet which is not more than 10 - 35% of the maximum load-bearing capacity, depending on material being lifted.



Load-figures corresponding to the direction of the MXL-2200

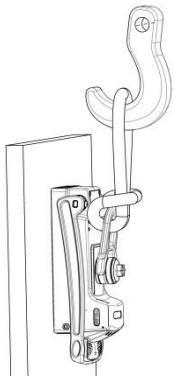
You can calculate the maximum load-bearing capacity of your magnet, including the 3:1 safety factor, on the basis of the load-figure that corresponds to the direction.

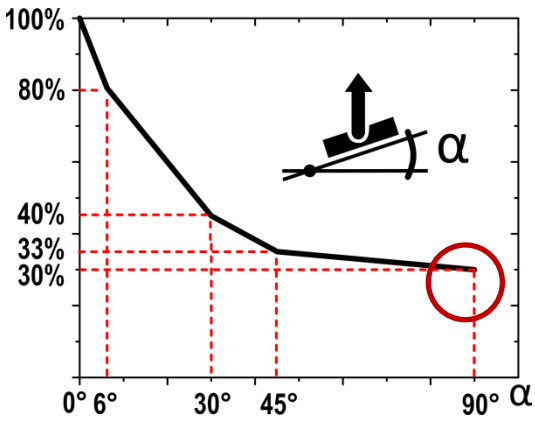
Example INCH:
You would like to lift a plate of mild Cold Rolled Steel (CRS) which is 1/4 inch thick. The plate stands vertically, i.e. at an angle of 90°, in your shelf rack and your magnet is ideally positioned, as shown in figure 1.

Material thickness:	1/4 inch → max. load-bearing capacity at 0° = 1600 lbs (see table 2, page 12)
Material:	mild steel → holding force, subject to material = 100% (see table 1, page 9)
Alignment of the load:	90° tilted; load hook facing upwards → load-figure corresponding to direction = 30%

Example mm:
You would like to lift a plate made of S235 which is 6.4 mm thick. The plate stands vertically, i.e. at an angle of 90°, in your shelf and your magnet is ideally positioned, as shown in figure 1.

Material thickness:	6.4 mm → max. load-bearing capacity at 0° = 727 kg (see table 2, page 12)
Material:	S235 → holding force, subject to material = 100% (see table 1, page 9)
Alignment of the load:	90° tilted; load hook facing upwards → load-figure corresponding to direction = 30%



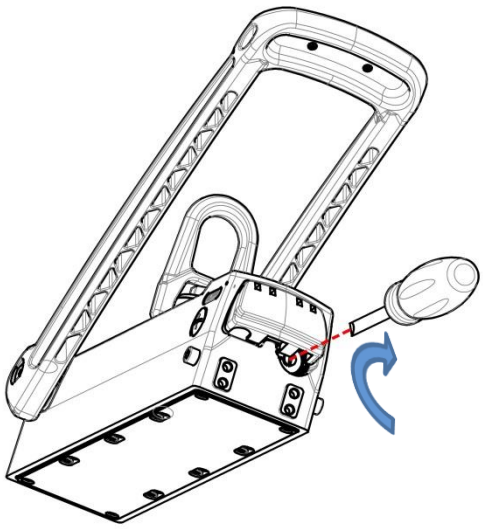


Maximum load weight with 3:1 safety factor = <u>1600 lbs x 100% x 30% = 480 lbs</u>

Maximum load weight with 3:1 safety factor = <u>727 kg x 100% x 30% = 218 kg</u>

Adjustable shock absorber

An oil filled shock absorber is incorporated on the backside of the magnet in order to absorb any recoil energy of the lever. The thinner the material to be lifted the higher the recoil energy to be absorbed. The set screw on the backside of the magnet makes it possible to adjust the shock absorber variably, so that the upward movement of the lever is controlled and operates smoothly. This adjustment should be made by using a flat-blade screwdriver.



Basic Information Concerning the Maximum Holding Force of the MXL-2200

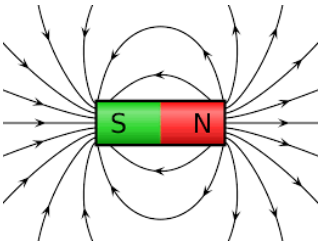
The magnetic contact area is located on the underside of the magnet incorporating multiple magnetic poles which generate the magnetic holding force when activated. The maximum holding force that can be achieved depends upon different factors which are explained below:

Material
Every material reacts in different ways to the penetration of magnetic field lines. The breakaway force of the magnetic contact area is determined by using common (low carbon) A36 steel. The given load-bearing capacity of the magnet should be De-Rated based on **Table 1**. It is up to the user to determine adequate magnetic holding force for alloys not shown in this table.

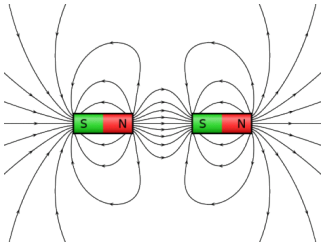
Table 1

Material	Magnetic force in %
Non-alloyed steel (0.1-0.3% C content, includes A36)	100
Non-alloyed steel (0.3-0.5% C content)	90-95
Cast steel	90
Grey cast iron	45
Nickel	11
Stainless steel, aluminium, brass	0

Material thickness
The magnetic flux (north to south field lines) of the permanent magnet requires a minimum material thickness to flow completely into and across the material below the magnetic contact area. Beyond this minimum material thickness, the maximum holding force continues to decrease (see ***Detailed Performance Data,*** Table 2).



Conventional (singular) switchable permanent magnet



Maglogix® (multi-field) switchable permanent magnet

Conventional switchable permanent magnets have a deep penetrating singular (north to south) magnetic field. The way conventional switchable permanent magnets hold onto steel would be similar to stapling paper together using one large heavy staple in the center of the page, and not bending the legs together.
The compact multi-field magnetic array of the Maglogix® switchable permanent magnets would be similar to stapling paper together in a circular pattern with many small lightweight staples close together, and bending the legs together to achieve an even greater holding force. An infinate number of small magnetic field arrays are the principle behind the Maglogix® patented switchable magnetic clamps.

Surface quality
The maximum holding force of a permanent magnet can be achieved in case of a closed magnetic circuit in which the magnetic field lines can connect up freely between the poles, thus creating a high magnetic flux. In contrast to iron, for example, air has very high resistance to magnetic flux. If an “air gap” (i.e. a space) is formed between the workpiece and the magnet contact area, the holding force will be reduced. In the same way, paint, rust, scale, surface coatings, grease or similar substances all constitute a space between the workpiece and magnetic contact area. Furthermore, an increase in surface roughness or unevenness has an adverse effect on the magnetic holding force. Reference values for your MagnaHoist™ MXL-2200 can also be found in **Table 2**.

Load dimensions
When working with large workpieces such as girders or plates, the load can partly become deformed during the lift. A large steel plate would bend downwards at the outer edges and create a curved surface which no longer has full contact with the magnetic contact area. The resulting air gap reduces the maximum load-bearing capacity of the Lifting Magnet. Hollow objects or those smaller than the magnetic contact area of the magnet will also result in less holding power being available.

Load alignment
During load movement care must be taken that the Lifting Magnet stays located at the workpiece center of gravity and that the Lifting Magnet's magnetic contact area respectively, stays balanced horizontally. In this scenario, the magnetic force of the Lifting Magnet's magnetic contact area and workpiece stay perpendicular to gravity, thus providing the maximum rated load-bearing capacity, resulting in a standard 3:1 safety factor.

> **Danger**: If by accident the workpiece and Lifting Magnet shift or change from a horizontal to a vertical position. The Lifting Magnet is now transitioning into shear mode and the workpiece can slip away to the edge or even detach. In shear mode, the load-bearing capacity decreases dependent upon the coefficient of friction between the two materials.

Maximum operating temperature
The high-power permanent magnets installed in the magnetic clamp will maintain their load-bearing capacity up to a maximum operating temperature of 176°F (80°C). Exceeding this maximum operational temperature may cause irreversible damage.

Maintenance and inspection of the lifting magnet

The user is obliged to maintain and service the lifting magnet in compliance with the specifications in the operating manual and according to the country-specific standards and regulations (e.g. ASME B30.20B, DGUV-Information 209-013; AMVO).

The maintenance intervals are classified according to the recommended schedule.

Before every use...

- visually inspect the lifting magnet for damage
- clean the surface of the work piece and the underside of the magnet
- free the underside of the magnet of rust, chips or unevenness
- verify the lock function of the safety tab on the lever

Weekly...

- inspect the lifting magnet and load hook for deformation, cracks or other defects
- make sure that the operating lever and safety tab are working properly
- inspect the load hook for damage or wear and have it replaced if necessary
- inspect the bottom of the magnet for scratches, pressure points or cracks and have the magnet repaired by the manufacturer if necessary

Monthly...

- check the markings and labelling on the lifting magnet for legibility and damage and replace them if necessary

Annually...

- have the load-bearing capacity of the lifting magnet checked by the supplier or an authorized workshop
- inspect the load hook thoroughly for damage, cracks or wear and have it replaced if necessary

After 5 years or 20,000 lifting operations

- After a maximum of 5 years of use or 20.000 lifting operations the load hook must be replaced with a new one by the manufacturer or an authorized workshop (thread locking adhesive, medium strength; 100 Nm torque).

An annual inspection is recommended for the safe use of this lifting magnet. We will be glad to perform this inspection for you in-house. Please send us an email to:

MX-Test@maglogix.com

You will then promptly receive an offer and have the assurance that the lifting magnet will be inspected in a process-reliable manner where it was actually produced.

Unauthorized repairs or modification to the lifting magnet are not permitted.
If you have any questions contact the manufacturer.

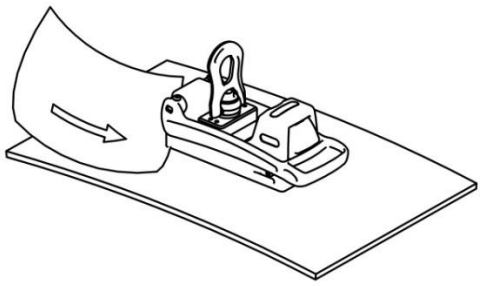
Detailed Performance Data for the MXL-2200 Lifting Magnet

Values shown for load capacity are based on material S235 JR comparable to AISI 1020 Cold Rolled Steel with the maximum, vertical breakaway force at 0° deviation from the load axis and additionally under a 6° inclined load in accordance with EN 13155, in each case with a 3:1 safety factor. This manual does not contain any instructions for use on round material, as the MXL-2200 is designed for flat material and round material or arched objects may not be lifted.

Table 2

	Load capacity in lbs					
Thickness of material	Clean, flat, ground surface		Rusty, slightly scratched surface		Irregular, rusty or rough surface	
	Air gap <0.00394 inches		Air gap = 0.01 inches		Air gap = 0.02 inches	
Inches	**0°**	**6°**	**0°**	**6°**	**0°**	**6°**
1/8	550	446	450	365	350	284
3/16	1125	912	1003	813	851	690
1/4	1600	1296	1440	1167	1216	985
5/16	1990	1612	1760	1426	1424	1154
3/8	2250	1823	1923	1558	1428	1157
7/16	2400	1945	2043	1655	1445	1171
1/2	2475	2005	2141	1735	1460	1183
3/4	2500	2026	2163	1752	1525	1236
	Load capacity in kg					
Thickness of material	Clean, flat, ground surface		Rusty, slightly scratched surface		Irregular, rusty or rough surface	
	Air gap <0.1 mm		Air gap = 0.2 mm		Air gap = 0.6 mm	
mm	**0°**	**6°**	**0°**	**6°**	**0°**	**6°**
3,2	250	203	205	166	159	129
4,8	511	414	456	370	387	314
6,4	727	589	655	530	553	448
7,9	905	733	800	648	647	524
9,5	1023	829	874	708	649	526
11,1	1091	884	929	752	657	532
12,7	1125	912	973	788	664	538
19,1	1136	921	983	796	693	562

The maximum dimensions of the loads to be lifted depend to a large extent on the geometry and flexural stiffness of the work pieces. If the material bends, an air gap will form under the magnetic surface which will decrease the load-bearing capacity significantly. During each lift, watch for any deformation of the work piece that might occur and, if necessary, check for any air gap developing at the edges of the TiN-coated magnetic surface (e.g. with a sheet of paper; 80g/m^2). Spreader bars with additional magnets may be required to safely lift large or flexible loads.



Immediately stop the lift if there is any excessive deformation or an air gap.

Never exceed the dimensions and/or the load-bearing capacity of the material thickness given in table 2.

EC Declaration of Conformity as defined by the Machinery Directive 2006/42/EC

We,

Alfra GmbH
2. Industriestr. 10
68766 Hockenheim/Germany

hereby declare that the switchable permanent magnet-type lifting magnet

MXL-2200
from serial number 1884M0620 onwards

complies with all relevant provisions of this directive.

Applied standards:

EN ISO 12100:2010
EN 13155:2003+A2:2009

This certificate is no longer valid if the product is modified without the manufacturer's consent. Furthermore, this certificate is no longer valid if the product is not used properly in accordance with the use cases documented in the user manual or if regular maintenance is not carried out in accordance with this manual or country-specific regulations.

Person authorized to compile the documents:

Alfra GmbH
2. Industriestr. 10
68766 Hockenheim/Germany

Hockenheim/Germany, 28.02.2018

Markus A. Döring
(Managing Director)