

USE AND MAINTENANCE MANUAL

HEAVY LIFTING DIVISION

SERIES FXE-TT-4 / FXE-TT-6

MAGNETIC ELECTROPERMANENT SYSTEMS WITH FOR SINGLE STEEL HANDLING.



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Chapter 1 - GENERAL NOTES

The Electro-Permanent Magnetic Lifting System you bought, was built according to the state of technology and recognized safety technical regulations. Despite that, dangers to body and life for the user and / or third persons or damage to the electro-permanent magnetic system and / or other material assets can occur. This Electro-Permanent Magnetic Lifting System may only be used in flawless technical condition and according to its mission as well as with constant awareness of safety and dangers. Any problems, which could affect safety must be fixed immediately.

This Use and Maintenance Manual and operating instructions are intended to put you in a position to operate the Electro-Permanent Magnetic Lifting System safely and utilize the reliable usage options that it provides. The instructions also provide information about the function of important components and systems. Certain expressions are used in these operating instructions. In order to avoid misunderstandings, the same expressions should always be used.

This Use and Maintenance Manual and operating instructions have been translated to be best of one's knowledge. Manufacturer assumes no liability for translation errors. If you find any errors or if any misunderstandings arise when reading these operating instructions, please contact MANUFACTURER GmbH immediately.

For any request or information regarding the Electro-Permanent Magnetic Lifting System we advise you to contact the MANUFACTURER GmbH service department.

The descriptions and illustrations contained in this manual are to be considered non-binding.

Manufacturer, without prejudice to the basic features of the Electro-Permanent Magnetic Lifting System described herein, reserves the right to make changes to parts and accessories at any time in order to improve the type of product or for construction or commercial requirements.

Manufacturer reserves the ownership of this manual and prohibits the reproduction, even partial, and the possibility of disclosing it to third parties without our written authorization.

All updates or modifications to the Electro-Permanent Magnetic Lifting System described herein must be agreed exclusively with Manufacturer, for the analysis of any residual risks of the changes

Read this document carefully and get used to the operation of the Electro-Permanent Magnetic Lifting System before you use it. Keep this document within easy reach near the device for consulting in case of doubt.

Mounting, start-up, operating, maintenance and removing from operation must be done by qualified, specially trained staff that have carefully read and understood this manual before starting any work.

Manufacturer will assume no liability or warranty in case of usage for other purpose than the intended one, ignoring this Use and Maintenance Manual and operating instructions, operating by unqualified staff as well as unauthorized modifications to the device. The manufacturer is not liable for any costs or damages incurred at the user or third parties because of the usage of this product, in particular in case of improper use.

1.1: Duties of the User

A "user" within the meaning of these Use and Maintenance Manual and operating instructions is defined as any natural or legal person who either uses the Electro-Permanent Magnetic Lifting System himself, or on whose behalf it is used. In special cases (e.g. leasing or renting), the user is considered the person, who, in accordance with existing contractual agreements between the owner and the user of the electro-permanent magnetic lifting system, is charged with the observance of the operating duties.

The user must ensure that the Electro-Permanent Magnetic Lifting System is not abused and only used within its design limits and that all danger to life and limb of the operator, or third parties, is avoided. In addition to this, it must be ensured that the relevant accident prevention regulations and other safety-related provisions, as well as the operating, servicing and maintenance guidelines, are observed.

The user must also ensure that all persons operating the Electro-Permanent Magnetic Lifting System have read and understood these operating instructions.

If these operating instructions are not observed the warranty becomes void. The same applies if improper works are carried out at the Electro-Permanent Magnetic Lifting System by the customer and/or third parties without permission of Manufacturer Customer Service.

1.2: Importance of the User and Maintenance manual

A copy of this Use and Maintenance Manual and operating instructions must be made available to operators assigned to use and explained to the user by the service manager, installation personnel and persons in charge of maintenance of the equipment in order to be able to operate in compliance with the instructions contained in this Use and Maintenance Manual and operating instructions.

Reading the Use and Maintenance Manual and operating instructions will allow the equipment to be used appropriately and allows the operators to work safely for them and for others. Please remember that the Use and Maintenance Manual and operating instructions is an integral part of the equipment, so this must be handed over to any other subsequent owner. All rights of reproduction and disclosure of this Use and Maintenance Manual and operating instructions and the attachments are reserved to Manufacturer. It is forbidden to make changes or remove parts of this manual. Store with care and in places accessible to all the operators for further consultation

1.3: Symbols Definition

All warnings to the personnel involved in the operation described, involve a risk of exposure to residual risks, with the possibility of damage to health or injuries or death, if these are not performed as prescribed, they are indicated by the symbol below:



All the notes that indicate that the described operation must be performed by specialized and / or qualified personnel, are indicated by the symbol below:



WHEN OPERATE KEEP ALWAYS IN MIND THE POTENTIAL RISK

DO NOT underestimate the risks associated with using the Electro-Permanent Magnetic Lifting System and concentrate on the work in progress.

The operator must be at a safe distance from the load during lifting operations



Risk of fatal injury if operated incorrectly!

**Incorrect operation of the Electro-Permanent Magnetic Lifting System can result in death or serious injuries!
Only authorised and trained expert personnel are permitted to work on the Electro-Permanent Magnetic Lifting System**

The operator must be at a safe distance from the load during lifting operations

1.4: Personnel in charge



Some procedures described in this Use and Maintenance Manual and operating instructions must be performed only by qualified or specialized personnel. The types of qualification levels are described below in standard terms:

Qualified personnel have technical knowledge and / or experience to enable them to avoid the potential dangers of mechanical movements or electricity (technicians and engineers).

Trained personnel are appropriately advised and / or supervised by qualified persons to enable them to avoid the potential dangers of mechanical movements or electricity (operating and maintenance personnel).

The user is obliged to obtain confirmation from all the persons in charge, before they start working with the equipment, in relation to the following:

1. The staff received the Use and Maintenance Manual and operating instructions and have understood it.

2. The staff will work in the manner described in the Use and Maintenance Manual and operating instructions and explained by the supervisor.

1.5: Trained personnel



MACHINE OPERATOR: means the person or persons who, following appropriate and indispensable instructions, are appointed and authorized by the owner of the equipment to carry out the operations of running the equipment. This qualification presupposes the perfect knowledge and understanding of what is contained in this Use and Maintenance Manual and operating instructions.

HANDLING: this qualification requires specific skills (possibly acquired through compulsory courses if the law in force so requires) lifting equipment, methods and characteristics of slings and safety handling. This qualification also presupposes the perfect knowledge and understanding of what is contained in this Use and Maintenance Manual and operating instructions.

MECHANICAL MAINTENANCE: this qualification requires specific skills to carry out installation, adjustment, maintenance, cleaning and / or repair work. This qualification also presupposes the perfect knowledge and understanding of the contents of this Use and Maintenance Manual and operating instructions.

ELECTRIC MAINTENANCE (ref. EN60204 point 3.45): this qualification requires specific skills to carry out electrical interventions such as connections, regulation, maintenance and / or repair and is able to operate in the presence of voltage inside cabinets and panels electric. This qualification also presupposes the perfect knowledge and understanding of the contents of this Use and Maintenance Manual and operating instructions.

1.6: Protection devices



The trained personnel referred to in the previous paragraph must wear adequate safety clothing. It is mandatory to wear protective footwear, while the need for earmuffs, helmets and protective glasses must be assessed by the user. It is forbidden to wear clothes with fluttering parts or parts that could give rise to moving parts.

1.7: General safety warnings



The following rules and recommendations comply with current safety regulations and are therefore essentially based on compliance with these safety regulations. Manufacturer declines all responsibility for any damage caused to persons and things deriving from failure to observe the safety regulations in force and the instructions indicated below.

Therefore, all the operators in charge of respecting and putting into practice what is reported below and to scrupulously follow the accident prevention regulations in force in the country of installation and use of the equipment are referred to.

All ordinary and extraordinary maintenance operations must be carried out with the machine stopped with the electricity supply disconnected. To avoid the risk of accidental insertion of electricity during maintenance operations, place a warning sign on the equipment with the words:

ATTENTION: STOPPING EQUIPMENT WHEN MAINTENANCE IN PROGRESS

1.8: In case of emergency

In the event of emergency, it is always advisable to follow the procedures outlined in the operation and maintenance manual of the machine on which the system is installed.
In case of emergency or if a fire occurs, use the tools provided to put out the fire, taking care not to use water on the electrical parts.

1.9: Unintended or improper use



The Electro-Permanent Magnetic Lifting System is not designed to operate in an explosive environment. Unintended use of the Electro-Permanent Magnetic Lifting System may:

Cause personal injury.

Damage the Electro-Permanent Magnetic Lifting System or other equipment.

Reduce the reliability and performance of the Electro-Permanent Magnetic Lifting System.

The Electro-Permanent Magnetic Lifting System cannot be used for other purposes than those recommended and in accordance with the intended use, the following behaviours must be avoided:

Unsuitable lifting parameters.

Lacking maintenance.

Non-compliance with the Use and Maintenance Manual and operating instructions for use.

Unsecured or insecure fixing of the equipment or parts thereof.

In the event of doubts regarding use, contact Manufacturer for clarification.

For the handling of special materials indicated in this manual, the consent of Manufacturer must be requested.

1.10: Plate Information and data



All Electro-Permanent Magnetic Lifting Systems are fitted with identification nameplates that provide information on the manufacturer, in compliance with current laws.

Product identification and handling load plates information are applied to each material handling system. The plates must not be removed for any reason even if the Electro-Permanent Magnetic Lifting System is resold. In case of damaged or lost plates, contact Manufacturer to obtain the duplicate.

Failure to comply with the provisions in the data plate relieves Manufacturer from any damage or injury to persons or property, this makes the user himself solely responsible to the competent bodies.

The plate must not be removed at any time even if the Electro-Permanent Magnetic Lifting System should be sold again. Always refer to the serial number (reported near the hoisting points) when contacting the manufacturer.

Various safety drawings are placed on the structure; the warnings conveyed must be carefully observed by everyone dealing with the equipment.

Manufacturer is not to be held responsible for damage to property or accidents to people which might occur if the above-mentioned warnings are not observed. In such a case, the operator is the only person responsible.

1.11: Risk Assessment:

A correct risk assessment must be elaborated on the occasion of the introduction of this type of Electro-Permanent Magnetic Lifting System also with the help of the information provided by the Use and Maintenance Manual and operating instructions.

In particular, it must be taken into consideration whether such Electro-Permanent Magnetic Lifting System is appropriate and adequate in relation to the nature of the load and the operations to be carried out.

Furthermore, the risks deriving from the presence of people in the immediate vicinity of the loads must be taken into consideration.

Finally, in the risk assessment document there must be a planning for the controls aimed at the maintenance of the Electro-Permanent Magnetic Lifting System, together with the information, training and specific training to be transmitted to the workers in charge of the lifting operations.

Some fundamental FACTORS to consider for safe and correct use of the lift are:

Dimensions and maximum weight of the load to be lifted (= nominal capacity) and of the lifting equipment.

Thickness of the load (which can reduce the effective capacity of the lifter).

Composition of the steel constituting the material to be handled: alloy steels have a different magnetic behaviour depending on the content of the alloy elements present, which is reflected in a variation in the range of the magnet; the loads to be lifted must be ferromagnetic. Some high alloyed steels and cast iron, due to their composition, may have a lower magnetic permeability than low alloyed steels: this influences the lifting capacity of the magnet for these particular materials.

For this purpose, in the presence of different types of steel, it is essential to identify (and separate) the ferromagnetic steels from those not suitable for lifting with the Electro-Permanent Magnetic Lifting System.

Note: the above indications do not apply in the case of magnets designed specifically for lifting parts in alloy steel or cast iron.

Nature of the load; it is necessary to know if the loads must be taken individually (e. g. slabs, coils and sheets, beams), overlapping (e. g. sheets), in layers (e.g. billets, rounds, pipes, beams), in bundles (rod and merchant bars) or in bulk (e.g. scrap);

The nominal lift capacity or the weight of the maximum load to be lifted; lifting capacity of the Electro-Permanent Magnetic Lifting System which must be greater than or equal to the sum of the weight of the lift and the rated capacity of the lifter.

Planarity of the load; (e. g. for billets, sheets, bars and slabs).

Flexibility of the load; (e. g. sheet metal, bundles); the lifting of a flexible load such as bundles of bars, flat and thin sheets, can cause the load to detach from the Electro-Permanent Magnetic Lifting System during handling operations. The lifting of a flexible load that is characterized by certain lengths in combination with reduced thicknesses, small diameters etc., requires the evaluation of the "wing flexion" in order to allow a secure hold of the load. For this purpose, it is necessary to check, according to the length of the protruding part of the load with respect to the magnet and the thickness or diameter of the load, if the accessory used is suitable.

Air Gap; this term refers to the distance that is created between the poles of the Electro-Permanent Magnetic Lifting System and the contact surface of the material, due to surface defects, dirt, non-magnetic interposed material (e.g. paint, oil, paper, etc.). The distance between the Electro-Permanent Magnetic Lifting System poles and the load surface (the so-called air gap) can compromise the performance of the Electro-Permanent Magnetic Lifting System. Therefore, it is necessary to ensure good contact between the poles of the Electro-Permanent Magnetic Lifting System and the load, to obtain optimal and safe performance.

In general, to maximize the yield of the magnet, the contact between the poles of the Electro-Permanent Magnetic Lifting System and the load surface must be as smooth and clean as possible, in order to reduce the air gap. The surface roughness, the coating of the load and the presence of paint, rust, calamine, oil, ice and snow etc. are factors, which increase the air gap, thus reducing the effectiveness of the Electro-Permanent Magnetic Lifting System.

Even the poles of the Electro-Permanent Magnetic Lifting System, if worn or damaged, can create air gap. The necessary repairs can be mechanical with the rectification of the worn poles to realign them, where the wear is greater, a carry-over may be required of welded material, to restore the consumed material and subsequently mill or turn to realign the poles.

Temperature of the material; the standard execution foresees up to 70 ° C, but special executions can reach up to 650 ° C; Material temperature (load). The temperature of the load must be taken into account when using an Electro-Permanent Magnetic Lifting System. In fact, ferrous materials lose their magnetic properties with increasing temperature and cease to be magnetic at a certain temperature called the "Curie Point" (about 740 ° C for carbon steel). In the case of lifters with Electro-Permanent Magnetic Lifting System, it must be remembered that the permanent magnets that make up the magnetic circuit are sensitive to high temperatures: if used even only once on a too hot load, the permanent magnets could irreversibly lose their magnetization by reducing the Electro-Permanent Magnetic Lifting System capacity; subsequent use, even on cold materials, may be compromised.

Surface profile of the materials to be lifted; Uneven surfaces (e. g. corrugated, polygonal, corrugated or perforated sheets) can be raised by means of magnets, but the percentage of the load surface actually in contact with the poles of the Electro-Permanent Magnetic Lifting System must be evaluated.

Lifting rods and tubes; In the case of lifting pipes and rods, unless otherwise provided by the Electro-Permanent Magnetic Lifting System manufacturer, a reduction in the capacity must be considered. Therefore, the capacity rate is not the nominal one, but it is necessary to refer to the data plate shown on the Electro-Permanent Magnetic Lifting System. In both cases it is necessary to check the indications provided by the Electro-Permanent Magnetic Lifting System manufacturer.

Lifting multiple loads; (e. g. sheets) in the case of lifting multiple sheets, it is necessary to perform the PARTIAL MAGNETIZATION of the Electro-Permanent Magnetic Lifting System, lift slightly to check that the desired number of sheets has been hooked (compatibly with safe lifting) and, if the picking is correct, bring the magnetization to the maximum and complete the desired movement of the sheets.

Nature of lifting operation; an unbalanced load can compromise the grip of the Electro-Permanent Magnetic Lifting System. For this purpose, it is necessary to position the magnet on the center of gravity of the load.

Lifting loads with multiple magnets; - When using multiple magnets for lifting loads, they are usually fixed on a crossbeam. The magnetic suspension must be chosen so that there is a possibly uniform distribution of the load on the individual magnets, and that the magnets can adapt to the surface of the lifted load.

Lifting device suitability assessment; - Magnets connected to lifting equipment: the weight of the Electro-Permanent Magnetic Lifting System, and its accessories and the load to be lifted, must be taken into consideration when assessing the load capacity and safe operation of the lifting equipment.

MASS of Electro-Permanent Magnetic Lifting System + MASS LOAD ≤ CAPACITY OF THE LIFTING DEVICE (Crane)

Electro-Permanent Magnetic Lifting System connected to mobile cranes; in this case, in addition to the weight of the magnet, its accessories and the load to be lifted, it is also necessary to take into account the effects of inertia during rotation and movement. In addition, the risks associated with the sudden release of the load before it has been grounded must be assessed.

Power failure suspended load; - When using Electro-Permanent Magnetic Lifting Systems, the lack of electricity cannot cause the load to release.

Chapter 2 - TRANSPORT AND HANDLING

2.1: Acceptance

The Electro-Permanent Magnetic Lifting System it has been checked and control in all its functions before shipment. Upon receipt it is necessary to check the integrity of the material received in order to verify that the Electro-Permanent Magnetic Lifting System has not been damaged during transport and the supply corresponds to the order specification. Otherwise, report irregularities to Manufacturer and the carrier. The communication of any damage or anomalies must be made within 7 days from the date of receipt.

2.2: Inactivity

In case of storage or storage for a long period, the Electro-Permanent Magnetic Lifting System must be adequately cleaned and protected in the metal parts exposed with protective oils or greases. It is advisable to cover the Electro-Permanent Magnetic Lifting System with a waterproof sheet and to deposit it in a dry and sheltered place. The storage temperature must be between 0 ° C ÷ 55 ° C. Relative humidity must be between 30% and 90%.

The environment must be free of acid corrosive gases and salts, etc. In case of restarting follow the instructions in chapter 4.

Chapter 3 – DESCRIPTION OF THE SYSTEM

3.1: Introduction

The Electro-Permanent Magnetic Lifting System described in this Use and Maintenance Manual and operating instructions uses permanent magnetic systems principles capable of developing a magnetic field to generate an attraction force to anchor ferromagnetic material and be able to handle it in SAFETY.

The Electro-Permanent Magnetic Lifting Systems produced / assembled by VEGA TECHNIK are convenient because they always operate above the load, without compressing or deforming it.

These Electro-Permanent Magnetic Lifting System / assembled by VEGA TECHNIK optimize the work areas, as they do not require space for manoeuvre or interspaces between one steel load and another.

The Electro-Permanent Magnetic Lifting System described is intended for lifting and handling iron ferro-magnetic material.

European Community regulations, both in terms of safety in the workplace and electromagnetic compatibility (conducted and radiated emissions), make the Electro-Permanent Magnetic Lifting System an excellent alternative in the field of magnetic lifts. In fact, these systems meet the following requirements:

_They do not require a continuous external source of energy (unlike electromagnetic equipment), for operation it uses the power supply only for activation (MAG)/deactivation (DEMAG) cycles of a few seconds.

_Have an intrinsic safety being completely self-sufficient for the entire load handling period and therefore insensitive to power cuts. Thanks to permanent magnets the load remains locked with constant force.

_Do not affect the operation of the surrounding equipment (during the load release phase there is no energy return to the supply network).

3.2: Operation

Any magnetic lifter develops a force of attraction on a ferrous mass whether it is in perfect contact with it or with possible distance, a distance that we named: **Air Gap**.

Again, by Air Gap, we mean the average distance between the magnetic poles of the Electro-Permanent Magnetic Lifting System and the ferrous magnetic surface of the load.

Air Gap it is due to improper presences on the load (calamine, foreign bodies, etc.) and / or any surface deformation of the load (concavity, convexity, etc.). The presence of an air gap leads to a loss of strength that decreases proportionally with the increase in the air gap.

This feature is plotted on the Force-Air gap curve (see attachment - force / air gap curve) maximum load at an air gap min. of 0 mm (see EN 13155 standards).

The Electro-Permanent Magnetic Lifting System is normally sized to develop a force at least equal to 3 times the weight of the maximum load.

This allow a sufficient margin from the overloads generated during the movement of the load, provided that the conditions for using the Electro-Permanent Magnetic Lifting System are correctly followed (Positioning of the load well centred, load not exceeding the maximum capacity, elimination of foreign bodies, and so on).

At first the Electro-Permanent Magnetic Lifting System picks the load up (**PICK - UP stage**; a pre-defined % of magnetic force), then it moves the piece after carrying out the **FULL-MAG** stage (100 % magnetic force).



WARNING
Never handle during the PICK-UP stage
The operator must be at a safe distance from the load during lifting operations

The Electro-Permanent Magnetic Lifting System correctly operates (at full power and with a magnetic gap equal to 0) when, the poles are magnetically saturated (about 18000 Gauss), that is after the complete **FULL MAG** magnetization cycles. Using this function, (**PICK_UP/FULL MAG**) the anchoring force during movement will be higher than that with which the load was initially raised from the ground.

3.3: Factors that determine the magnetic force

The quantity of magnetic flux circulating in the ferrous magnetic material, which makes up the load to be handled, depends on its composition, on its dimensions (in particular the thickness), on the amount of contact surface between the load to be lifted and the poles of the Electro-Permanent Magnetic Lifting System, and the ease with which the magnetic flux can flow through the material itself. The condition that provides the highest force for lifting is obtained when we are in the presence of a high contact surface and minimum air gap. On the contrary, minimum contact surface and high air gap, we will get a reduction of the lifting force.

Refer to **1.11 Risk Assessment** section.

Chapter 4 – MAGNETIC ELECTROPERMANENT SYSTEMS FOR SINGLE STEEL HANDLING

4.1: Telescopic Electro Permanent Magnetic Beams FXE-TT4 FXE-TT6

Electro-Permanent Magnetic Lifting System **FXE-TT4** / 110-140-165-200 (from 11 to 20 tons capacity) for unitary handling/lifting of metal sheets with lengths up to 12 m. Composed of a main beam body with telescopic arms, which support 4 crossbeams, in which 8 electro permanent magnetic modules are located.

Electro-Permanent Magnetic Lifting System **FXE-TT6** / 160-200-240-300 (from 16 to 30 tons capacity): for unitary handling/lifting of metal sheets with lengths up to 16 m. Composed of a main beam body with telescopic arms, which support 6 crossbeams, in which 12 electro permanent magnetic modules are located.

These Electro-Permanent Magnetic Lifting System have the possibility of extending or retracting the telescopic arms, thanks to a dedicated hydraulic system, and the modification of the inter-axes between the external and inner ones is obtained. All combined with the possibility of selecting the various magnetic modules, allows the manipulation of various sheet formats. Some of the Electro-Permanent Magnetic Lifting System described can be equipped with additional hooks, useful for handling loads other than those for which the equipment is intended. Example: Bundles of various materials, to be manipulated by means of chains.



WARNING:
The maximum capacity of each hook is indicated in a dedicated indication plate, this value must not be exceeded.

Chapter 5 – INSTALLATION

5.1: Mechanical installation

On receiving the Electro-Permanent Magnetic Lifting System, check that:

Packings are unbroken and not damaged; the delivery corresponds to the order specifications.

If a thorough check shows that all is well, unpack Electro-Permanent Magnetic Lifting System (except when differently indicated by VEGA TECHNIK) and make sure the Electro-Permanent Magnetic Lifting System has not been damaged during transport.

Check for possible damages on the structure and for crushing or breakings of the electric/ hydraulic connections.

For this specific Electro-Permanent Magnetic Lifting System there is a single mechanical installation operation, hook the main ring of the lifting chains to the hook of the handling system (overhead crane, gantry crane, etc.)



WARNING

In case of damages or anomalies, please inform VEGA TECHNIK within seven days from receipt of the goods

5.2: Electrical installation



WARNING

All electric installation operations (connection of the Electro-Permanent Magnetic Lifting System to the mains) must be carried out by skilled personnel only.

Electrical safety is guaranteed only when the electrical system is correctly connected to an effective earthing system (see electrical safety standards). Manufacturer cannot be held responsible for any damage caused by the lack of earthing. For this specific equipment a mains supply is required: 400 V three-phase $\pm 10\%$ - 50 Hz (3 phases + Earth)

Use the special cable supplied with the equipment only, the cable must be wired to a plug (not supplied), then it will be possible to power the system on.



WARNING

The Electro-Permanent Magnetic Lifting System original configuration must not be modified in any way.

It is recommended to avoid non-useful repetitions of cycles MAG / DEMAG, to the operation of the system.

Chapter 6 – PROTECTION AND SAFETY RULES

6.1: General information

The maximum efficiency of any magnetic system is obtained when its poles are in contact with the load to be handled, as the magnetic field goes through non-magnetic material as well (air, dust, non-ferrous material in general), the Electro-Permanent Magnetic Lifting System will operate at full performances when its poles are well in contact with the load surface (Minor reluctance).

Therefore, **IT IS ADVISABLE** to avoid, as far as possible, placing the Electro-Permanent Magnetic Lifting System in dirty or highly uneven areas of the load, **IT IS ADVISABLE**, always as far as possible, to remove any foreign body present on the load surface before positioning the Electro-Permanent Magnetic Lifting System.

The Electro-Permanent Magnetic Lifting System is suitable for use in environments with the following operating conditions:

_Temperature = -5 °C ÷ 40 °C

_Humidity = <50% at 40 °C

_Altitude = 2000 m S.L.

The system has noise emission <70 dB

6.2: Safety Rules



Never lift the load when:

- _The load weight exceeds the maximum capacity reported on the Electro-Permanent Magnetic Lifting System identification plate.
- _The load size is greater than the one indicated in this Use and Maintenance Manual and operating instructions and Electro-Permanent Magnetic Lifting System data plate.
- _The load is very uneven and irregular in shape.
- _The load temperature is higher than 80°C or the one indicated in this Use and Maintenance Manual and operating instructions.
- _The Electro-Permanent Magnetic Lifting System is not well balanced after the **PICK-UP** stage.
- _The **PICK-UP** stage has not been completed successfully.

The operator must be at a safe distance from the load during lifting operations



Never move the load when:

- _The **RED** lamp is fixed ON
- _The Electro-Permanent Magnetic Lifting System is not operating at maximum power (**FULL-MAG** stage): the **GREEN** lamp is turned **OFF**.
- _Do not energize when the Electro-Permanent Magnetic Lifting System is not in contact with the load.
- _Do not move any Selector while **MAG** or **DEMAG** cycles are running.
- _Do not bump against the magnetic heads and mechanical structures.
- _Never cool the magnetic modules of the Electro-Permanent Magnetic Lifting System in water or other liquids.

6.3.1: Lamps signalling device

**MAGNETIC ELECTROPERMANENT BEAM SYSTEMS FOR SINGLE STEEL HANDLING
SERIES FXE-TT4 / FXE-TT6**

The Electro-Permanent Magnetic Lifting System is equipped with signal lamps, useful for indicating the various operating phases:
Description:

- _ **WHITE** lamp **OFF** = Electro-Permanent Magnetic Lifting System not powered electrically
- _ **WHITE** lamp **FLASHING** = Electro-Permanent Magnetic Lifting System powered electrically and in an **INDEFINITE** status
- _ **RED** fixed lamp **ON** = Electro-Permanent Magnetic Lifting System in **ALARM** state
- _ **RED** flashing lamp = Electro-Permanent Magnetic Lifting System is changing his status (Cycle is performing)
- _ **BLUE** fixed lamp **ON** = Electro-Permanent Magnetic Lifting System in **PICK-UP** state (magnetized)
- _ **GREEN** fixed lamp **ON** = Electro-Permanent Magnetic Lifting System in **FULL-MAG** state (magnetized)

6.4: Flexion

For the safe holding of the load, it is important to verify, the value of the "Wing deflection", stay within the maximum size of metal sheet as indicated in the data-plate of your Electro-Permanent Magnetic Lifting System. Failure to comply with this provision relieves Manufacturer from any damage to persons or property that may result.

6.5: Overload

For a correct and safe handling, it is very important to check that the load distribution is evenly distributed between the various modules involved in the lifting. Failure to comply with this provision relieves Manufacturer from any damage to persons or property that may result.

Chapter 7 – FUNCTIONS

7.1: Double Magnetization Cycle

1st "PICK UP" CYCLE: Magnetic force: generally, a certain % depending on selected PICK UP Power level (PICK-UP state)



The operator must stay away from the load during PICK UP stage!

2nd "MAG" CYCLE: Magnetic force 100: % (**FULL-MAG** state)

PICK UP it allows picking up the load and lift few centimetres with lower power and transferring it with full power **FULL MAG**.

This method of carrying out the magnetization allows to increase the safety of the manipulation, since during the first phase of "PICK-UP" a reduced value force generated, in this situation it is required to lift the Electro-Permanent Magnetic Lifting System with its load few centimetres from the ground, therefore it is possible to check the quality of the holding force before each handling operation, then the "FULL-MAG" cycle is performed which will bring the magnetic force to the maximum value (100%). This safety procedure ensures that you never operate at the limit of system performance.

A **Safety Device**, automatically activated by the suspension pull, prevents any type of load from being released, even accidentally. It cuts out the controller that can operate only when the lifting system is put in contact with the load and the chains are tight.



WARNING

Never handle during the PICK - UP state

The operator must be at a safe distance from the load during lifting operations

7.2: Power regulation

This selector enables to select different magnetization levels to operate on the load. Use the "**POWER**" selector on your remote controller to select the **PICK-UP** cycle power. The levels of "**POWER**" relating to the "**PICK-UP**" cycle are generally 4.

This function is useful to reduce the amount of magnetic flux circulating in the Electro-Permanent Magnetic Lifting System modules during the "**PICK-UP**" phase to allow a lower magnetic flux penetration of the load to be handle, with the aim of working on a lower thickness so as not to interfere with the underlying metal sheet. This function allows adjusting the Electro-Permanent Magnetic Lifting System power during the **PICK-UP** stage, whenever the initial force level is not high enough to lift the load. This "**POWER**" function facilitates the taking of the load, especially in the presence of reduced thicknesses. It acts to modify the absolute value of the magnetic force during the "**PICK-UP**" cycle.

POWER levels from 1 to 4 indicate the intensity of the magnetic force of the Electro Permanent Magnetic Modules in PICK UP Status, this function is used to increase/reduce the force to lift single metal sheets also with reduced thickness. Indicatively:

Level 1; Minimum Load Thickness

Level 2; Minimum/Medium Load Thickness

Level 3; Medium/Maximum Load Thickness

Level 4; Maximum Load Thickness

FULL MAG cycle must be always performed subsequent to any **PICK UP** cycle.

WARNING: This adjustment is very important as it selects the value of the force to be obtained in the first **PICK-UP** magnetization phase, to allow working at best on reduced sheet thicknesses.

WARNING: For the Electro-Permanent Magnetic Lifting System, equipped with Flux Control System (that allows to detect the quantity of flux generated by the magnetic module and consequently the work force), when settled on Level **1** and **2**, the Flux Control System is disabled.

Flux Control System is active only when working on levels **3** and **4**.

7.4: Safety Device

Safety Device it is an automatic device against accidental **DEMAG** (de-magnetization). It is located near the lifting chain shackle and it prevent any accidental de-activation of the Electro-Permanent Magnetic Lifting System modules, when the chains are tight.



WARNING

Before using the equipment, make sure that the **SAFETY DEVICE** is working properly, so as to ensure safe working conditions.

7.6: Radio control (optional)

Allows you to work safely away from the load, you can perform all the possible above-described operations through the Radio Control. For more information see the Radio-Control User Manual that will be delivered to you together with your Electro-Permanent Magnetic Lifting System. (refer to Radio Remote control User Manual for use and safety features).

7.6: Current sensor

The Current Sensor System verifies that the value of the current absorbed by the Electro-Permanent Magnetic Lifting System during the magnetization cycle has reached a minimum level, to guarantee the lifting force. It locks and activates the system alarms if the energizing current doesn't reach the set value: do not handle the load before the **FULL MAG** stage has been completed and the **GREEN** lamp is **ON**.

7.7 Thermal probe (optional)

This device must be used only when handling loads with a temperature above 200°C. The probe detects when the maximum allowed temperature is reached inside the Electro-Permanent Magnetic Lifting System. In this case, the only command available is **DEMAG** that enables to place the load back onto the ground.



WARNING

After the "FULL MAG" cycle, if the RED lamp is fixed ON, do not handle the load

Chapter 8 - RISK ANALYSIS

8.1: Analysis

During the engineering, the construction/assembling of the Electro-Permanent Magnetic Lifting System, the necessary care has been paid to the criteria and to the regulations in force concerning safety, in any case possible danger conditions remain. This chapter intends to warn the operator of the risks that could arise in particular situations. The Electro-Permanent Magnetic Lifting System in question is intended to be installed on a machine enabled for lifting. The operator assigned to use these systems must understand and assimilate, in addition to the instructions in this Use and Maintenance Manual and operating instructions, also those relating to the machine where the Electro-Permanent Magnetic Lifting System is installed. The individual protection devices (PPE) required for the use of the magnetic system are the same as those required for the use of the lifting machine on which it is installed. For any risks related to exposure to electromagnetic fields, a careful evaluation of the possible effects on pregnant women, subjects suffering from particular pathologies and subjects with pacemakers of other prostheses equipped with electronic circuits, hearing aids, etc. is recommended.

To this end take the following noted:

VEGA TECHNIK Electro-Permanent Magnetic Lifting System is considered as a static magnetic system, and as such does not emit electric fields, the value V / m (Volt / meter) issued during the work phases is equal to 0 (zero). The electromagnetic field emission, during the magnetization / demagnetization cycle, does not exceed 100 Gauss at a distance of 100 mm

Chapter 9 - USE OF THE EQUIPMENT

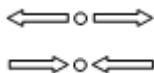
MAGNETIC ELECTROPERMANENT SYSTEMS WITH FOR SINGLE STEEL HANDLING SERIES FXE-TT4 / FXE-TT6

- 1) Connect to the main supply, turn on the Electro-Permanent Magnetic Lifting System using the magneto-thermal switch installed in the push-button panel; The **WHITE** lamp light flashing **ON**. The Electro-Permanent Magnetic Lifting System **INDEFINITE** status:
a first complete cycle of **PICK UP/FULL MAG/DEMAG** must be done to activate the functions.
- 2) Use the "**SELECT**" from auxiliary push-button panel selector to choose the magnetic modules to work with. Refer to the plate data on the Electro-Permanent Magnetic Lifting System body (area **A-B-C-D-E**) as indicated in the Data Plate fixed on the Electro-Permanent Magnetic Lifting System body.
When the active magnetic modules of the Electro-Permanent Magnetic Lifting System have been selected, perform working cycles in the specific selection, do not change the magnetic modules selection during **PICK UP** or **FULL MAG** cycles. The selection must be done only with the Electro-Permanent Magnetic Lifting System in DEMAG status.



This operation is possible only with system in DEMAG

- 3) Use the push button on remote controller
= Telescopic arms opening



= Telescopic arms closing

If the telescopic arms do not open, then invert the Phases wires in the main plug, until the telescopic arms open correctly.

For the positioning of the magnetic modules installed on the telescopic arms, to better adapt to the load (see plate indications and chapter 6.4 and 6.5)



WARNING

this operation is possible only with system in DEMAG and SAFETY device active
(Suspension chains in tension or system raised from the ground).

- 4) Use the "POWER" selector to select the desired PICK-UP cycle power.

WARNING: This adjustment is very important as it selects the value of the force to be obtained in the first PICK UP magnetization phase, to allow working at best on reduced sheet thicknesses.

Use the general references below to adjust the value:

Level 1; Minimum Load Thickness.

Level 2; Minimum / Medium Load Thickness.

Level 3; Medium / Maximum Load Thickness.

Level 4; Maximum Load Thickness.

- 5) Place the Electro-Permanent Magnetic Lifting System on the load to be handled, paying attention to centre the system (to avoid imbalance in the handling phase). The **WHITE** lamp is **ON**, the **GREEN** lamp is **OFF**.
- 6) Press the **PICK-UP** button, the **WHITE** lamp, at the end of the operation, turns **OFF**, the **BLUE** lamp turns **ON**. The first phase of magnetization is completed, but the system is not yet activated at its full power and the load cannot be moved yet.
- 7) Lift the load completely off the ground few centimetres and check that the setting the grip and centring are optimal. The **BLUE** lamp is **ON**. In this **PICK-UP** phase, the suspension chains of the system are in tension, the **SAFETY** device is active and prevents the accidental **DEMAG** operation.



WARNING

NEVER HANDLE THE LOAD IN PICK UP CONDITIONS.

The operator must be at a safe distance from the load during lifting operations

- 8) Press the **FULL-MAG** button, once the cycle is completed, the **GREEN** lamp becomes a steady light **ON**. The system is in full power, the load can be moved and handles safely.
- 9) Move the load to the desired position, place the load on the ground, lower until the chain pull is banned to allow the **SAFETY** device to switch off.
- 10) Press the **SAFE / DEMAG** buttons together **SAFE** first. The **GREEN** lamp turns **OFF** at the end of the cycle, the **WHITE** lamp turns **ON**.
- 11) The Electro-Permanent Magnetic Lifting System is in **DEMAG** status ready for a new manipulation operation.
- 12) To stop the system, turn off the magnetothermal main switch. The **WHITE** lamp turns **OFF**.
- 13) Store the Electro-Permanent Magnetic Lifting System in a safe area.

Chapter 10 – MAINTENANCE



10.1: Premise

An adequate maintenance increases the equipment life expectation and keeps it in excellent and efficient working conditions. It also ensures lasting safety standards throughout the years.

10.2: Safety rules during maintenance



The main precautions to be adopted during maintenance are:

Never touch uncovered connections and components without disconnecting the equipment from the mains (general switch on "0").

Disconnect the power supply before removing any part or replacing any electric component.

Make sure that there are no circuits under pressure in any part of the equipment.

Do not wear rings, watches, necklaces, bracelets, etc. during maintenance operations.

Use, if possible, an insulating rubber carpet under your feet when carrying out maintenance operations. Refrain from operating on wet floors or in very humid environments.

Always use protective gloves, safety shoes and other personal protection equipment which may be needed,



WARNING

SKILLED PERSONNEL ONLY MUST CARRY OUT MAINTENANCE OPERATIONS.

Maintenance operations must be carried out only and exclusively by trained personnel (Ref. Chap. 1.5).

The main warnings to be taken during maintenance operations are:

All maintenance must be carried out with the system stopped and possibly without power supply.

Never touch uncovered connections and components without disconnecting the Electro-Permanent Magnetic Lifting System from the power supply.

Repairs to the electrical system must be carried out in the absence of electrical voltage. Operating personnel must strictly comply with the accident prevention regulations in force in the Country where the Electro-Permanent Magnetic Lifting System operates.

Do not modify the Electro-Permanent Magnetic Lifting System 's electrical connections in any way. Any attempt to do so may impair the operation of the electrical devices causing a malfunction or accident.

Make sure that there are no circuits under pressure in any part of the equipment.

Use an insulating rubber carpet under your feet when carrying out maintenance operations. Refrain from operating wet floors or in very humid environments.

Always use protective gloves, safety shoes and other personal protection equipment which may be needed, as well as clothes covering body as much as possible.

During cleaning operations, be careful not to damage the indication plates on the system body.

Do not use water on electrical equipment.

Do not use open flames, needles or pins for cleaning.

If you hear unusual noises, or notice anything unusual, stop the Electro-Permanent Magnetic Lifting System immediately. Then, carry out an inspection and, if necessary, perform any repairs as required.

10.3: Daily maintenance

To be performed at the end of daily operation.

Check and cleaning of the surface of the magnetic **Poles** of the Electro-Permanent Magnetic Lifting System.

General cleaning of the Electro-Permanent Magnetic Lifting System.

Check the **Safety Device** correct functioning.
Make sure all cycles **Signalling Lamps** are functioning well.

10.4: Monthly maintenance

To be performed at the end of monthly operation.
Check, the condition of suspension **Chains** and **Springs**; make sure that the material of Eyebolts and beam is not bend or deformed.
Check the friction condition of the **Sliding Parts**, lubricate them if necessary.
Check the wear condition of the magnetic **Poles**; eliminate, as much as possible, any roughness keep in optimal conditions the evenness and homogeneity of the pole surface that is in contact with the load to be handled.
Check that chains are tight and that modules are correctly connected to the structure.
Before using the equipment, make sure that the **Safety Switch** device is clean so as to ensure optimal working conditions.
Check the status of the Power Cable.
Check all electric connections, particularly all connection screws and junction boxes.
Thoroughly clean the contacts and remove the dust from the electronic cards.
Make sure all fuses and rectifying units are complete.
Check the condition of the SCR cooling ribs and power diodes.
Make sure all cycle lamps are functioning well.
Carry out, at least once a month, the opening/closing manoeuvre of the telescopic beams.
Check the oil level in the tank and refill, if necessary.
Make sure there are no lubricant leakages.
Completely replace the hydraulic oil (ISO 46) once a year.

10.5: Yearly maintenance

Disconnect the discharge cables of the permanent electro- magnetic systems from the relative connection terminals (2 + T) on the control panel.
Measure the resistance and insulation values at 1000 V with ohmmeter or ampere-meter clamp.
Thoroughly clean the contacts and remove the dust from the electronic boards.
Check the integrity of all the fuses.
Check the condition of the SCR and power diodes.
Re-connect the discharge cables of the Electro-Permanent Magnetic Lifting System to the relative connection terminals on the control panel.
Test with an iron tool (Es. spanner) on the surface of the poles, to find the presence of magnetic residual (system in **DEMAG**)
Make sure there are no leakages.
Visual check of the magnetic module suspension system



WARNING

Before using the testing mega ohmmeter, make sure you have disconnected all the power cables and earth cables of the magnetic modules.

10.6: Not Ordinary maintenance

Maintenance operations not included in this manual are part of extraordinary maintenance and must be carried out by specialized personnel indicated by Manufacturer.

10.7: Information

Manufacturer is available for any customer need, to clarify doubts about the operation and maintenance of the magnetic system

Chapter 11 – SPARE PARTS

For all the Electro-Permanent Magnetic Lifting System described, spare parts are available and must be requested to Manufacturer service department. For any requests, communicate the equipment serial number.

Chapter 12 – DISPOSAL

The user, according to the CE directives or according to the laws in force in his country, have to take care with the demolition, disposal and elimination of the various materials of the Electro-Permanent Magnetic Lifting System.

If the need arises to dispose of the Electro-Permanent Magnetic Lifting System, it is mandatory to observe a few fundamental rules for the safeguarding of the environment.

Protective coverings, flexible pipes, plastic or non-metal material should be dismantled and disposed of separately.

The electric components should be disassembled and, when in good conditions, re-used or, if possible, recycled.

The equipment may contain CONTAINS POLLUTING OIL that must be disposed at authorized waste disposal sites. POLLUTING OIL must only be disposed of as stipulated in the national environmental protection regulations or waste disposal provisions. The manufacturer's specifications for disposal must be heeded.

Chapter 13 - WARRANTY AND SERVICE

13.1: Warranty

Manufacturer products are guaranteed for a period of 12 months from the date of the invoice, unless otherwise agreed in writing. The warranty covers all material and manufacturing defects and provides for the replacement of defective parts exclusively by Manufacturer and in our workshop.

The material being repaired must be sent FREE OF CHARGE. Once the repair has been made, the system will be sent to the customer in the EXW Condition (Incoterms).

The warranty does not provide for the intervention of our workers or employees on the place of installation of the system, nor its disassembly from the main lifting crane.

The warranty does not give the right to indemnity on any direct or indirect damage caused by our systems to things or people or on repairs carried out by the customer or third parties. Warranty repairs do not change the warranty period.

The warranty does not cover:

Damage caused by the use of spare parts other than those recommended by Manufacturer.

Damage or failure caused by incorrect use or assembly of the user.

Damage resulting from normal wear resulting from the use of the Electro-Permanent Magnetic Lifting System.

13.2: Forfeiture of the guarantee

The warranty is void in the following cases:

In the event of unpaid due Invoices or other contractual breaches.

If repairs or changes are made to the system without Manufacturer consent.

When the serial number has been tampered with or deleted.

When damage is caused by incorrect operation or use, as well as shocks and other causes not attributable to normal conditions of use.

If the system is disassembled, tampered with or repaired without the authorization of Manufacturer

Chapter 13 – ATTACHED

The following attachments are provided in this manual:

- 1) Dimensional drawing of the system
- 2) Installation diagram
- 3) Force / Air gap curve
- 4) Electrical diagram

14.1: Declaration of conformity

Manufacturer

Declaration of Conformity

Manufacturer, declares that the electro-permanent magnetic lifting system

HEAVY LIFTING DIVISION – SERIES FXE-TT4 / FXE-TT6

complies with the essential requirements and other relevant provisions established by the directive:

2006/42/UE ; 2014/30/UE; 2014/35/UE;

Regulations

UNI EN ISO 12100/2010; UNI EN 13001-3-1/2018; UNI EN 60204-32; UNI EN 13155/2009