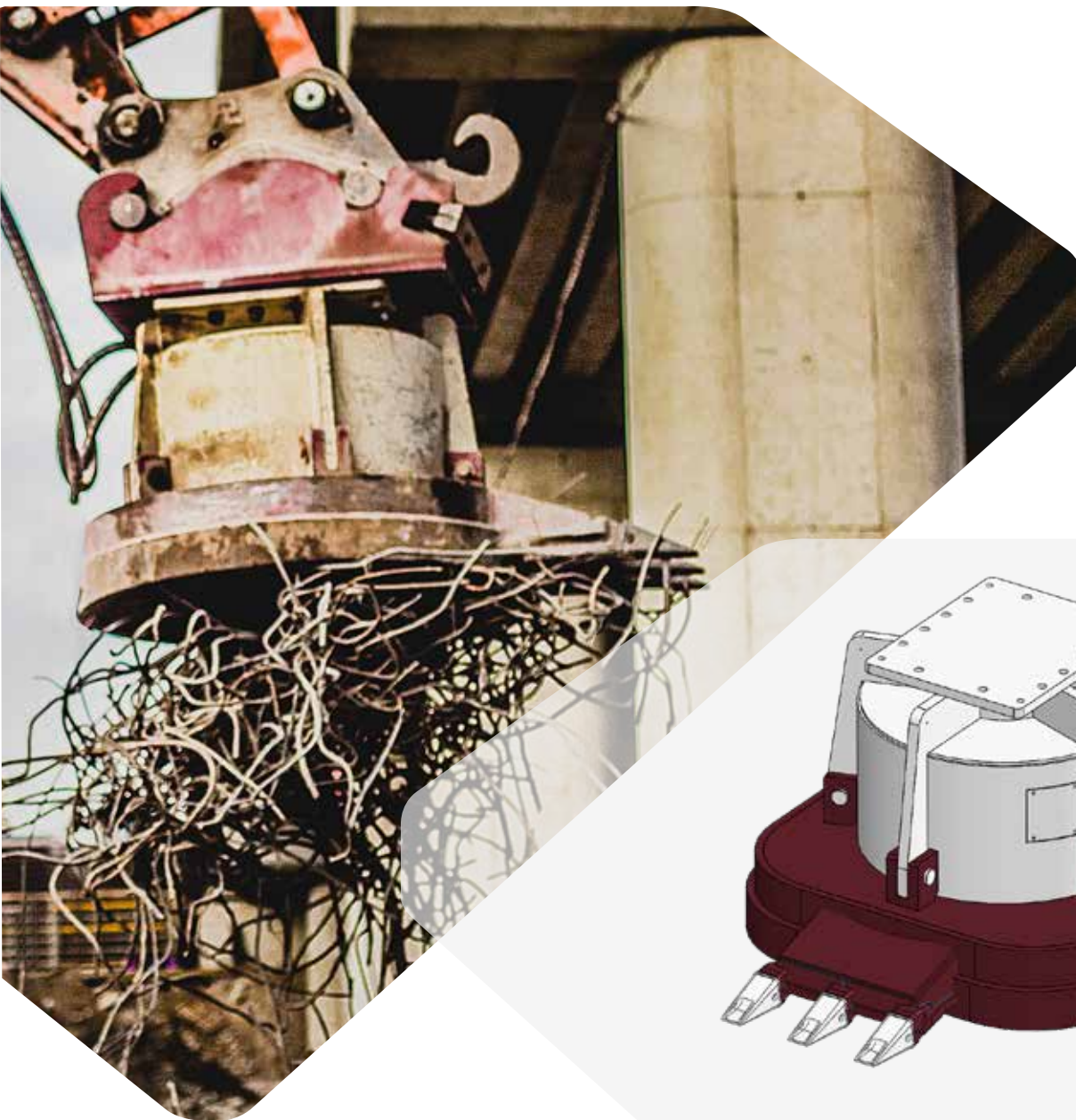




# HYDRARAM<sup>®</sup>

DEMOLITION & RECYCLING EQUIPMENT



## HYDRAULIC MAGNET - HMG & HMG T SERIES

*Operation and maintenance manual*

**Hydraram B.V.**  
Meander 7, 9231DB, Surhuisterveen Holland  
Tel : +31 512 365 981 - info@hydraram.com  
www.hydraram.com

05-2021



Certified company





## Table of contents

<b>1. Introduction</b>	1	<b>5. Installation</b>	18
1.1. Purpose of the user and maintenance instruction manual	1	5.1. Moving and handling	18
1.2. Safekeeping of the instruction manual	2	5.2. Storage and disposal	18
1.3. Updating the instruction manual	2	5.3. Preparation prior to installation	19
1.4. Who is this manual intended for?	2	5.3.1. Machine and hydraulic system preparation	19
1.5. Glossary and symbols	2	5.3.2. Preliminary checks of mechanical units, electrical connections and safety systems	20
1.6. Copyright	4	5.3.3. Environmental conditions	21
<b>2. General information</b>	4	<b>6. Using the attachment</b>	21
2.1. Manufacturer's identification data	4	6.1. Visual checks and inspections	21
2.2. Attachment identification data and plate	4	6.1.1. Functional testing	22
2.3. Set-up procedures to be carried out by customer technician	4	6.2. Working cycle	22
2.4. General warranty conditions	5	6.2.1. Restrictions during operation	23
<b>3. Safety</b>	6	6.2.2. Load restrictions	24
3.1. General precautions	6	6.3. Leaving the equipment at rest	25
3.2. Intended use	8	<b>7. Maintenance</b>	25
3.3. Unforeseen improper use	8	7.1. Precautions	25
3.4. Safety indications relating to use of the attachment	10	7.2. Periodic maintenance	25
3.5. Safety indications relating to maintenance of the attachment	10	7.2.1. Pole tips	25
3.6. Operator's position	11	7.2.2. Lower closure with anti-wear non-magnetic steel	26
3.7. Safety devices	12	7.2.3. Chains and suspension bolts	26
3.8. Accident prevention plates and labels	13	7.2.4. Storage	26
3.9. Safety pictograms	13	7.3. Lubrication and cleaning	26
3.10. Residual risks	13	7.4. Layout, adjustments and replacement of components	26
3.11. Lighting	14	7.4.1. Adjustment and replacement of the hydraulic control valve (HCV), pressure control	27
3.12. Vibration	14	7.4.2. Hydraulic control valve adjustment procedure, oil flow control	28
3.13. Noise emissions	14	7.4.3. How to check the revolution hydraulic motor and generator	30
<b>4. Description of the attachment</b>	15	7.4.4. How to replace HCV hydraulic control valve	31
4.1. Description of the attachment	15	7.4.5. Replacement of the hydraulic motor	31
4.1.1. Installation Limits	15	7.4.6. Replacement of the complete elastic coupling	32
4.2. Technical Description	16	7.4.7. Replacement of the three-phase generator	33
4.2.1. Permitted environmental conditions	16	7.4.8. Replacing the electronic power supply	34
4.3. Attachment technical data	17	7.5. General Malfunctions	35
		7.6. Diagnostics and troubleshooting	35

## 1. Introduction

### 1.1. Purpose of the user and maintenance instruction manual

This manual forms an integral part of the attachment and is intended to provide all the information necessary to:

- Inform operators correctly regarding safety issues;
- Handle, pack and unpack the attachment safely;
- Install the attachment safely;
- Ensure users are fully aware of its operating features and limits;
- Ensure the attachment is used correctly and safely;
- Ensure maintenance operations are carried out correctly and safely;
- Dismantle the attachment safely and in accordance with the standards and regulations regarding health and safety in the workplace and environmental protection.

#### **❗ IMPORTANT!**

Under current law, the personnel responsible for using and operating this attachment are obliged to read the contents of this document carefully and to ensure the operators and maintenance technicians have read the parts relating to their specific duties. The time spent doing this will ensure correct and safe operation of the attachment.

This document assumes that the applicable laws on safety and occupational hygiene are adhered to where the attachment is to be used. The instructions, drawings and documentation contained in this manual are of a confidential, technical nature and may not be reproduced in whole or in part.

This manual is subject to the following limitations:

- It may never take the place of an adequately experienced user;
- For particularly demanding operations, the manual can only provide a summary of the main steps.

The manual should be regarded as an integral part of the attachment and must be kept for future reference until the attachment is dismantled for disposal. The manual must be stored correctly and kept where it may be readily consulted when using the attachment with the operating machine.

#### **The company Hydraram may not be held liable in the following cases:**

- Improper use of the attachment;
- Use contrary to specific national law;
- Incorrect installation (in the case where the attachment was installed by unauthorised personnel);
- Power supply defects;
- Serious failures to perform the required maintenance;
- Unauthorised modifications and operations;
- Use of replacement parts or materials not specific to the model;
- A total or partial failure to follow the instructions provided;
- Use of the attachment with an incompatible machine;
- Exceptional events.

## 1.2. Safekeeping of the instruction manual

The manual must be stored carefully and kept together with the attachment whenever the latter changes hands throughout its working life. The manual will last longer if it is handled carefully with clean hands and not placed on dirty surfaces.

No parts of the manual should be removed, torn out or modified arbitrarily. This manual should be stored in a cool, dry place near to the attachment it refers to. The manufacturer can supply additional copies of the manual upon request.

## 1.3. Updating the instruction manual

The manufacturer reserves the right to change the design of, and make improvements to, the attachment without notifying customers and without updating manuals that have already been delivered to the user. Moreover, if the manufacturer makes changes to the attachment already in use at the customer's premises that require changes to one or more chapters of the manual, the manufacturer shall be responsible for sending the manual holder the chapters affected by the change, together with a copy of the new manual revision list.

## 1.4. Who is this manual intended for?

This manual is intended for: Installation personnel, Operators and Technicians qualified to carry out maintenance on the attachment.

➤ **OPERATOR** refers to the person assigned to operate, adjust, clean and perform regular maintenance on the attachment.

➤ **QUALIFIED PERSONNEL** or **QUALIFIED OPERATOR**, refers to those persons who have attended specialisation and training courses etc. and who have experience in the installation, operation and maintenance, repair or transport of the attachment.

➤ **EXPOSED PERSON** refers to any person located inside an area inside and/or near an operating machine where their presence may be hazardous to their safety, health or well-being.

The attachment is intended for industrial use and, thus, professional and not general use. As a result, it may only be operated by qualified persons and persons who specifically:

- are adults;
- are physically and mentally able to perform work of particular technical difficulty;
- have been adequately instructed in the use and maintenance of the attachment;
- have been judged suitable by the employer to perform the work entrusted to them;
- are capable of understanding and interpreting the manual and the safety instructions;
- are familiar with the emergency procedures and how to implement them;
- are able to operate the specific type of attachment;
- are familiar with the regulations in force;
- have understood the operating procedures defined by the manufacturer of the attachment.

## 1.5. Glossary and symbols

This section defines the abbreviations used and the meaning of the symbols used to indicate the operator qualification level and the status of the attachment. Their use allows for information regarding the correct and safe use of the attachment to be communicated quickly and clearly.

#### **OPERATOR AREA**

The area where the operator must work during normal use of the attachment.

#### **DANGER ZONE**

An area inside and/or near the attachment where the presence of an exposed person is a risk to the health of that person.

#### **EXPOSED PERSON**

Any person wholly or partially located inside a danger zone.

#### **MAN-OPERATING MACHINE INTERACTION:**

Any situation where an operator interacts with the attachment during any of the operational phases at any time during its life cycle.

#### **OPERATOR QUALIFICATION LEVEL**

Minimum skill level that the operator must have to perform the operation described.

#### **NUMBER OF OPERATORS**

The number of operators required to perform the operation described. This number is derived from a careful analysis by the manufacturer, meaning that the presence of a different number of personnel could prevent the expected result from being achieved or expose the personnel to danger.

#### **STATUS OF THE OPERATING MACHINE**

The status of the operating machine includes its operating mode, for example, automatic, jog, stopped, etc., the condition of the safety devices on the operating machine, such as safety devices enabled, safety devices disabled, emergency stop button pressed, power source insulation type, etc.

#### **RESIDUAL HAZARD**

A hazard that it has not been possible to eliminate or reduce sufficiently during the design stage, and against which the existing safety device are not (or are not completely) effective. Information on the presence of such hazards is provided in the manual, as well as instructions and precautions on how to avoid it.

#### **SAFETY COMPONENT**

This is a component used to guarantee a given safety function and whose failure or poor operation may have a negative impact on the safety and/or health of exposed persons: its specific function is to guarantee safety and is ancillary to the main function of the machine.

#### **P.P.E.**

Acronym for Personal Protective Equipment.

#### **⚠ WARNING!**

Descriptions preceded by this symbol contain very important information/instructions regarding safety. Failure to observe them may:

- Endanger the well-being of the operators;
- Render the warranty null and void;
- Result in the manufacturer not accepting liability.

#### **❗ IMPORTANT!**

This symbol is used to indicate particularly important information regarding the use of the attachment that the operator must make sure that he/she has read and understood thoroughly.

## 1.6. Copyright

The copyright of this manual is the property of Hydraram. This manual is intended for use by operating and maintenance personnel. It contains instructions and technical diagrams that may not be copied, in whole or in part, distributed or examined by unauthorised persons for competitive purposes or divulged to any other third party.

## 2. General information

### 2.1. Manufacturer's identification data

Hydraram B.V.

Meander 7 9231DB Surhuisterveen - The Netherlands

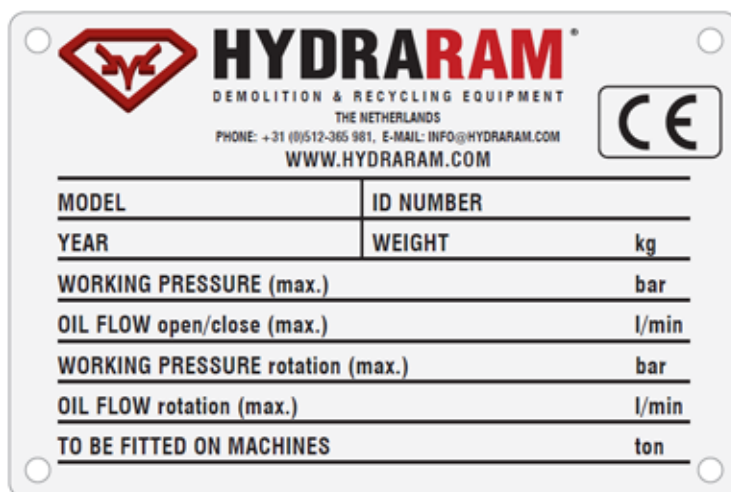
AFTER-SALES SERVICE / SPARE PARTS / CALL CENTRE

Tel: +31 (0)512-365981 - info@hydraram.com

www.hydraram.com

### 2.2. Attachment identification data and plate

Each attachment is identified by a CE plate indelibly marked with all the relevant machine information. Always provide this information when contacting Hydraram or the customer service centre. The plate is secured to the attachment in a protected position where it is easy to read. This position may vary depending on the model.



### 2.3. Set-up procedures to be carried out by customer technician

Except where otherwise stipulated in the contract, the customer shall be responsible for:

- Preparing the working environment/area and operating equipment in conformity with the legally applicable specific safety regulations in the country where the attachment is to be used;
- Checking that the attachment is coupled to the operating machine in compliance with the legally applicable specific safety regulations in the country where the attachment is to be used;
- Providing the hydraulic supply system for the attachment, in conformity with the regulations applicable in the country of use and the instructions in this manual.

**⚠ WARNING!**

It is the specific responsibility of the customer/user to integrate these instructions into the system/plant user and maintenance manual and to provide any additional information the operator may require.

## **2.4. General warranty conditions**

Hydraram guarantees that all products are free from material or manufacturing defects. Under the terms of this warranty, Hydraram's responsibilities are limited to the repair or replacement with a similar part at the company's plant, on condition that the product is returned within 8 days of the date on which the defect is detected, and provided the defect is correctly identified by photographs or the product is returned with all shipping expenses prepaid.

The company will replace or repair, at its own discretion, any part that, after examination, is determined to demonstrate material or manufacturing defects. In any event, Hydraram's responsibility shall be limited to the original purchase price of the product; any costs incurred in relation to the necessary inspections or report generation are excluded. No repairs will be carried out on site; the warranty applies exclusively when the product is returned to the company.

This warranty replaces any other warranties, expressed or implied, including, but not limited to, guarantees of marketability and suitability, irrespective of purpose; furthermore, under the terms of this warranty Hydraram's obligations and responsibilities shall not include any shipping or other expenses, i.e. installation costs or liability for any direct, indirect or resultant damages or for delays caused by any such defect.

This warranty applies exclusively to new products manufactured by Hydraram. Products manufactured by third parties are covered exclusively by warranties offered to Hydraram by the respective suppliers and will be subjected to any inspections or checks as requested by such parties.

Products manufactured or welded by Hydraram as standard units are guaranteed for twelve (12) months from the delivery date. This guarantee period is completely independent of the effective date the product was put into operation.

If the customer tampers with the product or attempts to disassemble in any other location than the supplier's premises or repair workshop, and/or without notifying the manufacturer in advance, this warranty shall be considered null and void. Hydraulic cylinders or components returned under the guarantee must not be disassembled and must be returned intact to Hydraram. Any welding, modifications or repairs to the attachment must be authorised in writing in advance by Hydraram; any service operations performed without such authorisation shall result in this warranty being considered null and void. Hydraram may not be held liable for any costs/charges deriving from the customer's failure to meet these warranty conditions.

Hydraram reserves the right to make changes or modifications to the accessories, which, in the company's reasonable opinion, may improve the performance and efficiency of the machine or improve production techniques, at any time. Hydraram is under no obligation to implement such changes or modifications retroactively on any machines that are already in use. Any operations that are expressly forbidden, either verbally or in any written document, or repairs or assembly procedures that are not recommended or



authorised by Hydraram shall result in the warranty being considered null and void.

The warranty does not include any parts that are subject to normal wear and tear, or any that are broken or damaged due to improper use of the attachments supplied by Hydraram. In this case, the customer shall arrange for delivery and collection at our factory at their own expense; if the customer requests repairs at their own premises (assuming this is possible), they shall be required to pay for the seller's travel expenses. If, during the warranty period and as a result of customer negligence or any other factor out of the control of Hydraram, the company is unable to intervene promptly in the aftermath of breakdown or fault condition, the customer shall be responsible for any further deterioration or damages resulting from the continued use of the Hydraram products. Any such additional damage is not included in the terms of the warranty.

The company Hydraram may not be held liable for any expenses for repairs performed by, or requested by the customer in workshops other than the authorised structures or in the event where such activities were not authorised in advance. The customer may not claim compensation for any damages deriving from machine downtime during the warranty period.

**! IMPORTANT!**

This warranty is valid only if the product has been entirely paid for in conformity with the required supply conditions and is returned within 2 weeks from the date of purchase. Failure to pay for the products within the agreed terms shall result in the warranty being considered null and void, even if the goods in question are entirely paid for at a later date.

### 3. Safety

#### 3.1. General precautions

Operator safety is one of the manufacturer's main concerns. When designing and manufacturing a new attachment, we attempt to foresee all possible danger situations and, naturally, to adopt suitable safety measures, paying particular attention to operations that are especially hazardous. The manufacturer may not be held liable for the consequences of any failure to adhere to the safety and accident prevention instructions set out in this manual.

**! IMPORTANT!**

Before using the attachment, operators must read the instructions contained in this manual carefully read and ensure they adhere to the instructions it contains.

The manufacturer has fitted the attachment with all the protection and safety devices considered necessary and, in addition, has provided sufficient information for its safe and correct use. To this end, wherever necessary, each chapter contains the following information regarding every possible man-attachment interaction:

- Minimum operator qualifications required;
- Number of operators necessary;

- Status of the attachment;
- Residual risks;
- Necessary or recommended personal protective equipment;
- Prevention of human errors;
- Prohibitions/obligations regarding reasonably foreseeable incorrect behaviour.

**⚠ WARNING!**

This information must be adhered to scrupulously.

The user may supplement the manufacturer's information with additional instructions, provided that they do not conflict with that set out in the manual, in order to contribute to the safe use of the attachment. All personnel assigned to work on the attachment must ensure they are wearing appropriate clothing.

- Avoid the use of clothing that could become entangled with parts of the attachment;
- Avoid wearing ties or other loose items of clothing;
- Avoid wearing rings or bracelets that could cause hands to be trapped in the components of the attachment.

Wherever necessary, the manual provides additional recommendations for preventive measures to taken by the user, personal protective equipment, helpful information for avoiding human errors and instructions designed to prevent reasonably foreseeable prohibited behaviours. It is, however, extremely important to adhere scrupulously to the following instructions:

- It is strictly forbidden to operate the attachment with the fixed protection panels removed;
- It is strictly forbidden to inhibit or bypass the safety devices installed on the attachment;
- Washing must be performed with the hydraulic separation devices disconnected;
- Do not modify any parts of the attachment;
- The manufacturer may not be held responsible for malfunctions caused by failure to respect the above instructions. In the event it is necessary to modify the attachment, we strongly recommend contacting the manufacturer directly.

**❗ IMPORTANT!**

The manufacturer may not be held liable for personal injury or damage caused by the attachment in the case of:

- Use of the attachment by inadequately trained personnel;
- Improper use of the attachment;
- Defects in the hydraulic power supply;
- Incorrect installation;
- Lack of the required maintenance;
- Unauthorized service or modifications;
- Use of non-original or unsuitable spare parts;
- Total or partial failure to follow the instructions;
- Use contrary to specific national law;
- Disasters or exceptional events.

### Control and checks

Checks must be performed by an expert; they must be visual and functional, with the purpose of guaranteeing the safety of the attachment. They include:

- Inspection of all structures, which must be free of any cracks, breakage, damage, deformation, corrosion, wear or alterations compared to their original characteristics;
- Inspection of all mechanical organs;
- Inspection of all the safeties installed;
- Inspection of all the connections with pins and screws;
- Operational inspection of the machine;
- Inspection of the machine condition.

### **⚠ WARNING!**

If anomalies are found, they must be eliminated before putting the attachment back into operation.

If the person performing the check finds any dangerous cracks or faults, s/he must notify the manufacturer of the attachment immediately. In the event of a malfunction, stop using the attachment immediately and carry out the appropriate checks and/or repairs.

Make sure that there are no objects between the parts of the attachment. After any maintenance work, check that there are no objects remaining between moving parts.

To guarantee maximum safety when transporting the attachment, it is **FORBIDDEN**:

- To tamper with any part of the attachment;
- To leave moving parts unattended;
- To use the attachment when it is not working at 100% efficiency;
- To modify the attachment with respect to its intended use without explicit authorisation from the manufacturer or without assuming full liability as per current legislation;
- To attempt to move the moving parts manually in the absence of power.

### **3.2. Intended use**

The hydraulic magnet HMG is designed to lift ferromagnetic materials when installed on truck cranes, self forklifts, etc. **It is for professional use only.** It is intended to be used by a person in possession of knowledge and experience in the use of systems of this type.

The HMG-T version includes teeth in addition to the hydraulic magnet. The magnet can be used to lightly dig on loose surfaces in order to find hidden or buried pieces of metal or mix materials such as ferrous metals and crushed concrete. The T version cannot be used as a digging bucket. Pressure and stress from the excavator arm can cause immediate damage upon the magnet.

### **3.3. Unforeseen improper use**

It is strictly prohibited for anyone to use the attachment for any purpose other than that expressly permitted and documented. Any improper use of the latter will absolve the manufacturer of all and any damage to property and persons and render any guarantees null and void. The attachment must always be used in the manner and at the times and places required by good practice and in conformity with the applicable legislation, even if there are no laws regulating the sector in the country of use.

Specifically, the attachment must not be used:

- For any purpose other than those set out in para. 3.2, or for any other purpose not mentioned in this manual.
- In explosive or corrosive atmospheres or atmospheres with a high concentration of dust or oily substances suspended in the air.
- With safety devices excluded or not operating.
- With hydraulic supplies that are different than what is indicated.
- As a walking area or storage area for other items.
- In conditions with a low level of safety for the operator or other individuals.
- In the event of tampering.
- If a visual inspection shows damage to the magnet or a malfunction.
- For moving people or animals.
- For lifting and moving loads other than those deriving from the effect of magnetization.
- By operators who are not qualified or who have not read, understood and learnt the contents of the manual.
- Do not use T version magnets to dig in hard ground.
- To pass, stand, operate or manoeuvre underneath the hanging load.
- To put hands on the chain or hook during the tensioning phase.
- To leave the hanging load unsupervised.
- To move loads that are heavier than the nominal capacity.
- To move unbalanced loads.
- To make the load swing during movement.
- To use the system for pulling or dragging.
- To use the chains as a grounding for welders.
- To use the system to keep elements bound to the ground in tension.
- To lift “guided” loads and/or lift restricted loads.
- To remove the plug/pin with the magnet energized.
- To perform selections with the magnet underloaded.
- To cool the magnet with water.
- To immerse the magnet in water.
- To impact the structure of the building or other machines and systems with the load.
- To use the system in unforeseen environmental conditions.
- To reach the “end stroke” areas at full speed during movement.
- To perform abrupt direction changes during lifting and movement.
- To perform temporary repairs or operations not set forth in the instructions.
- To use non-original replacement parts or those not recommended by the manufacturer.
- To entrust the maintenance and repair operations to individuals who have not been trained by the manufacturer.
- To abandon the system when work is complete without having activated the related safety procedures.
- To perform routine maintenance, inspections or repairs without putting the system out of service and activating the related procedure.
- To use the magnet as a hammer or mallet to align ferrous materials or as an element of demolition.
- To use the magnet on hot materials.
- To use the magnet with bare hands during service or after deactivation, to avoid possible burns.
- To make the load swing to deposit it out of the vertical position.

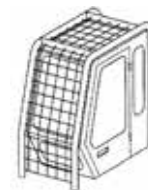
- To use the magnet without periodic maintenance having been performed.
- To use the magnet with lack of concentration or carelessly. This conduct can lead to serious accidents.
- To use the magnet when in a hurry deriving from the pressure to maintain the magnet in operation in all circumstances. This conduct can create potentially non-compliant work conditions.
- To use the magnet when there are people, equipment or vehicles in the immediate area.

**⚠ WARNING!**

The arm must be moved safely, with slow, accurate movements. Avoid abrupt movements.

### 3.4. Safety indications relating to use of the attachment

Overhead working may result in falling debris or blocks of material. Make sure that the machine the attachment is installed on has the necessary protections for performing this type of work and that the cab has falling object protective structures (FOPS).



- Before operating the attachment, the operator must read this manual carefully and have thorough knowledge of the operating machine's technical specifications and controls.
- It is recommended that the operator be trained to make best use of the attachment. Unauthorized and/or unqualified personnel may not use the attachment.
- Do not approach to within 20 metres of the range of action of an operating machine when working with an attachment.
- Before starting work with the attachment, warn any persons in its vicinity.
- Wear personal protective equipment whenever the attachment is in use.
- The attachment may only be operated by a qualified operator who has read and understood the contents of this manual.
- Do not allow unauthorized personnel to operate the attachment or perform any type of maintenance on it.
- The operator must quickly release their grip on the attachment in the event of danger.
- Do not use the attachment if it is not working properly.
- The attachment may only be used when it is installed on the operating machine using the upper bracket and the pins provided.
- Make sure that the floor can support the load of the operating machine.
- Make sure in advance that the work area contains no pipes with pressurised gas or fluids that could be damaged during demolition: risk of explosion.
- Ensure the operating machine remains at a distance of at least 10 metres from live, overhead electrical lines.
- In the event of a malfunction of the attachment or damage to its components, contact the maintenance manager without attempting to repair it.
- Do not remove the safety devices or protective guards.

### 3.5. Safety indications relating to maintenance of the attachment

- Maintenance must only be performed by qualified personnel. Unauthorized and/or unqualified personnel may not adjust or repair the attachment.
- Use the most suitable tools for the tasks required.
- All adjustments, maintenance, repair or cleaning must be performed while the operating machine's engine is off, the attachment must be stably supported on the ground and there must be no residual

hydraulic pressure. All maintenance operations must be marked on the card in the cabin.

- When cleaning, assembling, disassembling, performing maintenance and transporting, ensure that the attachment is perfectly stable.
- For the hydraulic connections, only use hydraulic hoses and fittings that conform to the SAEJ517 or DIN20066 standards for the specified pressures. Failure to observe the above could compromise the safety of the attachment.
- Always check the hoses are intact and that they have not been damaged in any way. If necessary, ensure they are replaced immediately. Search for leaks using small pieces of paper or cardboard and never with fingers to avoid injuries to the skin due by high pressure oil.
- The oil can reach very high temperatures. Before performing any service on external surfaces, wait for them to completely cool.
- Never perform hasty or makeshift repairs that could compromise the correct operation of the attachment. If in doubt, always request service by specialized personnel.
- It is forbidden to perform checks and/or replace parts during operation.
- All checks and maintenance that require the removal of the safety protections shall be performed entirely at the user's risk. Therefore, we recommend that such operations be performed exclusively by specialised and authorised technicians.
- In the case of operations or repairs that need to be performed in positions that are not directly accessible from the ground, use ladders or lifting devices that are safe and that conform to national safety regulations.
- In the event of repairs near or below the attachment, make sure that there are no moving parts that can start working and that parts that are unstable by nature are not positioned on or near the attachment; always block them using adequate tools.
- Unless expressly specified by this manual, do not repair or adjust the attachment (or parts of it) during operation, in order to avoid being hooked by moving parts.
- Wear personal protective equipment whenever the attachment is in use, or when working in its vicinity.
- Only use original spare parts to replace worn parts.
- Do not make any adjustments or changes that the manufacturer has not previously agreed to and approved in writing.

**⚠ WARNING!**

- These safety standards supplement and do not replace current local safety standards.
- Any tampering by the user shall absolve the manufacturer of all and any liability and shall render the user solely responsible to the competent authorities for the prevention of accidents.

**❗ IMPORTANT!**

Hydraram declines all liability for any accidents, injuries to personnel or damage to property resulting from the failure to adhere to the general safety instructions and the standards set out in this document.

### **3.6. Operator's position**

When the operating machine is working, the operator must pay particular attention to his/her own position in order to avoid potential hazards to him/herself and persons nearby. The area adjacent to the attachment

is divided into two areas:

#### **Operator Areas:**

These are the areas in which the operator must work during normal operation of the attachment. The “operator areas” are considered potentially dangerous areas. In these areas, which are indicated on the following diagram, the operator should pay the maximum attention while working to protect the well-being of persons close by;

**It is extremely important to follow all the accident prevention rules described up to this point.**

#### **Danger Zones:**

The danger zone is defined as all of the area around the working vehicle. For a detailed view of the area, refer to the manual for the working vehicle on which the equipment is installed.

It is forbidden for everyone except the operator to be in the danger zone and in the working vehicle operating area during operation. All of the areas considered dangerous must be cordoned off in order to prevent access by unauthorized individuals when the hydraulic magnet is in motion.

All of the area involved in the work and movement of the equipment itself is considered dangerous and must therefore be cordoned off.

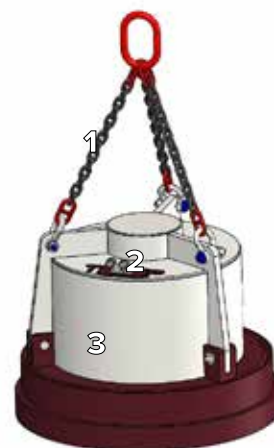
#### **⚠ WARNING!**

Only authorized and specialized personnel may enter danger zones to perform operations.

### **3.7. Safety devices**







The hydraulic magnet has the following safety devices installed:

1. Lifting chain
2. Hydraulic control valve with hose fitting
3. Fixed guard: Unit protection cover for all components and magnetic plate support




### 3.8. Accident prevention plates and labels

The accident prevention plates attached to the attachment include the main warnings and instructions that should be borne in mind during use. They must be cleaned, legible and replaced when damaged.







Symbol	Description	Symbol	Description
	<b>“Read the manual”</b> Read this Use and Maintenance Manual carefully.		<b>“Safety distance”</b> Remain at a safe distance from the range of operation of the operating machine.
	<b>“Burn hazard”</b> Surfaces that can reach high temperatures resulting in burn hazards. Wait for the attachment to cool before carrying out any work on it.		<b>“Danger of ejected material”</b> Remain at a safe distance from the range of operation of the operating machine.
	Cleaning, greasing, repairing or adjusting moving parts manually prohibited		Removal of safety devices prohibited

### 3.9. Safety pictograms

In the manual various pictogram are used to indicate warnings regarding DANGER, PROHIBITION and OBLIGATION.


Symbol	Description
	Generic hazard

The following pictograms indicate when it is obligatory to wear personal protective equipment (PPE)

Symbol	Description	Symbol	Description
	Protective goggles obligatory		Work clothing obligatory
	Ear defenders obligatory		Protective gloves obligatory
	Safety shoes obligatory		Hard hat obligatory

### 3.10. Residual risks

Below is a list of potential risks that need to be borne in mind during the operation of the hydraulic magnet. These are risks due to dangers that cannot be completely reduced through design and safety techniques.

-  **Impact and crushing:** The risk is due to the magnet’s movements when hooking the materia to be lifted. Do not access the work zone or approach the hydraulic magnet during operation.





**Slipping:** Possible lubricant leaks and/or residues in the area surrounding the interchangeable equipment can cause those using, running, and maintaining the battery magnet to slip. Access these zones with no-slip shoes and keep the areas clean.



**Fire:** The risk is due to the possible presence of combustible liquids between the scrap and the presence of oil from the working vehicle on which the magnet is installed. Therefore, evaluate this possibility and equip the working vehicle or hydraulic magnet operating location with adequate fire extinguishing equipment according to the fire safety and prevention laws in the country where it is used.



**Flying objects:** This risk can occur during the attraction phase for the ferromagnetic material. This force exerted on the material could cause the projection of smaller pieces. Do not access the work zone or approach the hydraulic magnet during operation.



**Hydraulic line brak:** The breakage or damage of hydraulic system hoses can cause a whipping effect which can injure anyone that is located in the work area. It is essential to perform periodic inspections of the hydraulic lines and replace anchors, hosing, and pipes. Do not use hydraulic hoses as a foot support base.



**Working vehicle failure:** Due to possible failures, the safety circuits on the working vehicle can lose their effectiveness, lowering the level of safety. You must perform periodic checks of operating conditions of safety devices installed on the working vehicle to prevent this.



**Intense magnetic field:** Prohibit individuals with pacemaker from passing near the area where the hydraulic magnet is used.



**Electric risk:** The magnet power supply is electric (batteries/electric alternator). Do not open cases or remove casings. Only authorized and trained personnel can perform those operations.

### 3.11. Lighting

Lighting in the work area must conform to applicable legislation law in the country where the attachment is being used and must provide good visibility at every point, not create dangerous reflections and allow for clear visibility of the controls and the entire work area up to the safety limits required for objects that may be ejected. Since the attachment has no independent lighting, the environment must be provided with general lighting of 250 to 400 lux at every point in the work area.

### 3.12. Vibration

During operating conditions that are compliant with the instructions for proper use, vibrations will not cause hazardous situations for the operator. Excessive vibration can only be the result of a mechanical failure which must be immediately reported and eliminated in order to avoid jeopardizing the operator's safety and the integrity of the hydraulic magnet.

### 3.13. Noise emissions

The continuous weighted sound pressure near the magnet does not exceed 70 dB(a). The maximum c-weighted instantaneous sound pressure near the hydraulic magnet does not exceed 63 pa (130 dB compared to 20 pa). Other sound level measurements in the work environment must be made in accordance with the regulations in the country of use.

Refer to the use and maintenance manual for the working vehicle for any personal protective equipment necessary for hearing protection.

## 4. Description of the attachment

### 4.1. Description of the attachment

The hydraulic electromagnet is a piece of equipment used for the movement of ferrous material, specifically for movement of ferrous scrap metals intended for material recycling. The hydraulic electromagnet is designed for installation on machines equipped with an auxiliary hydraulic circuit, such as excavators or vehicles with hydraulic cranes. Hydraulic power is derived from the service lines of the hydraulic circuit of the machine, to which the electromagnet must be connected. The power circuit line of the hydraulic hammer or the rotation of adequate power is suitable for the hydraulic connection. The hydraulic electromagnet uses the hydraulic power supplied by the circuit of the machine using a hydraulic motor coupled with a synchronous alternator that generates the electricity used to power the magnet.

The hydraulic electromagnet does not have its own controls. It is brought to full power by activating the hydraulic flow in the circuit to which it is connected. The condition of “magnetization” or “demagnetization” of the hydraulic magnet only develops through the movement or nonmovement of the hydraulic oil under pressure. Adequate hosing connects the hydraulic force points between the machine and the hydraulic magnet. The electronic power circuit on board the HMG provides two possibilities.

- Standard: consists of an oversized continuous current contactor and a device that, thanks to its discharge resistance, prevents dangerous surges that are generated at the time of demagnetization.
- Optional: circuit with insulated-gate bipolar transistor (IGBT) with a high-power transistor, a device that prevents dangerous surges that are generated at the time of demagnetization, and an electronic circuit that generates a polarity reversal due to the rapid demagnetization of the magnet.

The hydraulic electromagnet and the lifting chains are included in the standard supply of the machine. The mechanical connection of the magnet to the machine takes place through three-arm chain with central arms; the maximum capacity of the system is 11,000 kg.

The end-user can decide to replace the chains with other systems of attaching to the machine, for example quick couplings. It is the responsibility of the end user to ensure compliance with the requirements of law and regulations of the attachment system adopted, and also verification of the adaptability with its own functions and the features of a specific model.

#### 4.1.1. Installation Limits

The hydraulic magnet is provided with two different ways of lifting, and can be used only in these two ways.

- HMG: With a chain with terminal ring.
- HMG and HMG-T: With a steel plate welded on the cover, to be connected with a bolted bracket.

The HMGT hydraulic magnet is always supplied with a cover equipped with a drilled plate for attaching a bracket. The bracket must be firmly fixed to the magnet welded plate by means of screws/bolts of adequate size. The coupling of the excavator to the magnet is made through the bracket.



## 4.2. Technical Description

Energy is provided by the machine's hydraulic system on which the magnetic lifting system is installed. The hydraulic motor is activated when oil is sent to the circuit via the control lever. When the hydraulic motor rotates, the three-phase alternator produces electricity that is sent to the electronic power supply unit. By means of an alternate/continuous power conversion, the electronic unit transforms the electricity in input into energy that is suitable to power the magnetic plate, that then generates the magnetic field required to attract the ferromagnetic parts.

### Operation Process

1. The operator in the cabin of the machine activates the hydraulic magnet lever, which sends oil through the hydraulic line towards the hydraulic magnet.
2. Upon arrival at the hydraulic magnet, the oil turns the hydraulic motor.
3. The hydraulic motor turns the current generator that sends voltage to the electronic control box.
4. The electronic control box evaluates the incoming voltage and if it decides that the voltage value (> 80V input into the electronic control) is sufficient, then it transfers electricity to the magnetic plate which becomes magnetised, attracting ferromagnetic material.
5. If the electronic control considers the voltage insufficient it does not send electricity to the magnetic plate.
6. To keep the magnet magnetized, it is essential to continue operation from the cabin.
7. If the operator interrupts operation from the cabin, the motor-generator no longer sends voltage to the electronic control, and the magnet will be demagnetized.

Demagnetization may happen for other reasons related to a decrease in hydraulic performance (flow and/or pressure) of the machine. For example, the simultaneous use of several hydraulic services or the loss of revolutions of the machine could lead to a drop of oil flowpressure to the hydraulic magnet. This can reduce the revolutions of the hydraulic motor, thus reducing the revolutions speed of the generator and also reducing the voltage sent to the electronic control.

If the hydraulic variations are significant, the electronic control may interpret these changes in voltage as a command to stop magnetization. For this reason, it is advisable to use an independent and/or permanent service for the operation of the hydraulic magnet that never falls below the minimum values required.

### 4.2.1. Permitted environmental conditions

The attachment is suitable for operating in environments that are:

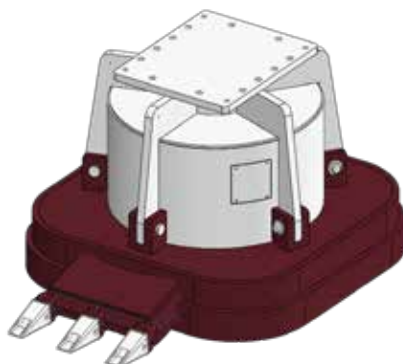
- At altitudes no higher than 3,000m above sea level;
- At temperatures between -20 °C and +50 °C with an average temperature of about 25°C;
- At relative humidity between 30% and 95%.

#### **⚠ WARNING!**

The attachment is **NOT** suitable for use in environments that are:

- Explosive.
- Subject to high fire risk.
- Corrosive.

### 4.3. Attachment technical data



		HMG-850	HMG-950	HMG-1100	HMG-1150	HMG-1300	HMG-1500
Excavatorclass	T.	10 - 14	14 - 17	19 - 23	20 - 25	26 - 32	30 - 60
Weight	Kg.	780	960	1100	1200	1880	2500
Diameter	mm.	850	950	1050	1130	1250	1500
Workingpressure	Bar	180	180	180	180	180	180
Oilflow	L/min.	38 - 200	50 - 200	70 - 200	80 - 200	100 - 200	100 - 200
Approx. hydraulic motor generator speed	rev/min	2350 - 2400	2480 - 2500	2490 - 2510	2500 - 2540	2580 - 2620	-
Three-phase voltage on generator connections	Volt.	180	180	180	180	180	180
Output	Kw.	3.5	4.5	5.5	6	7	12
Resistance at 20°	Ω	13,8	10,7	8,8	8	6,9	-
Voltage	Volt.	230	230	230	230	230	230
Current	Amp	15,9	20,5	25	27,2	31,8	-
Loose scrap	Kg.	250	350	450	650	900	1500
Massive plate	Kg.	3500	3500	7000	11000	12000	20000

Same specifications apply to the respective T-versions, with the exception of weight and excavator class.

T-VERSION		HMG-T850	HMG-T950	HMG-T1100	HMG-T1150	HMG-T1300	HMG-T1500
Excavatorclass	T.	10 - 14	14 - 17	19 - 23	20 - 25	26 - 32	34 - 60
Weight	Kg.	950	1130	1315	1400	2100	3000

## 5. Installation

### 5.1. Moving and handling

No special equipment is needed to unload and move the equipment and electrical system. The suspension ring must be used along with lifting equipment with a capacity equal to the weight of the magnet, as indicated on the identification plate. For movement and transport operations, the magnet must be rested and anchored to a wooden pallet to prevent slippage on the transport vehicle. To unload the magnet from the transport vehicle, proceed slowly to avoid damaging other parts. Each phase that is not performed properly can damage the component or lead to dangerous situations for the operators. It is recommended to use dedicated personnel and suitable lifting equipment and make sure that the operator is aware of these instructions.

Access to the area involved in the operation must be inhibited using protective barriers (road barriers). Signs warning of the presence of suspended loads and access and/or passage prohibited signs must be posted. Make sure the vehicles and logistic structures used are in compliance with the required use and in perfect condition.

- It is forbidden to climb on the attachment or loiter and/or pass underneath it during movement or handling.
- Unauthorized persons are forbidden to enter the movement and handling area.
- All operators must keep at a safe distance to avoid being hit if the attachment or one of its parts should fall.
- The the equipment and vehicles used to lift and transport the attachment must have sufficient load bearing capacity.
- When using lifting cables, check that they are certified and are labelled with manufacturer's information and load bearing capacity. Check for damage, broken wires and signs of wear.

The lifter is equipped with a ring (chain) suspension system which can only operate if hung from a suitable hook on the working vehicle or with a rigid connecting saddle with the working vehicle.

The manufacturer shall not be liable for damages or injuries due to the use of lifting systems other than those described.

#### **ⓘ IMPORTANT**

When the attachment arrives, the user must check it for any damage (breakage or significant dents) that may have occurred during shipping or unloading. If damage has occurred, immediately make it known to the transporter and add the words **"ACCEPTED WITH RESERVATIONS"** to the delivery document. In the presence of damage, submit a written claim to the transporter within 8 days of receiving the attachment. If significant transport damage is noted at the time of delivery and/or any parts are found to be missing notify the Manufacturer immediately. It is also necessary to check the received material against the detailed list on the transport document.

### 5.2. Storage and disposal

The following precautions must be taken if the attachment is to be stored due to inactivity:

- Store the attachment in a protected place.
- Protect the attachment from shocks and stress.
- Protect the attachment from humidity and large temperature variations.
- Keep the attachment away from corrosive substances.

When putting out of service, for demolition and disposal of the magnet or any of its parts, you must follow current legislation in force in the country of use. ‘Waste’ refers to any substance and object resulting from human activity or natural cycles that is abandoned or destined to be abandoned.

- Special waste: Those resulting from industrial, commercial, or artisanal process, agricultural activities and services that due to type or quantity can be assimilated with urban waste; deteriorated and obsolete machinery and equipment.
- Toxic waste: All wastes containing or contaminated by the substances listed in the Annex to Presidential Decree 915/52 implementing Directives 75/442/EEC, 76/403/EEC and 78/319/EEC.

For used oil, follow Directive 75/439 that forbids:

- Any discharge of waste oils into inland surface water, ground water, coastal waters and drainage systems.
- Any deposit and/or discharge of used oils that are harmful to the soil and any uncontrolled discharge of residues resulting from the processing of used oils.

#### **❗ IMPORTANT**

Specialized companies must be used for disposal of special and toxic wastes.

### **5.3. Preparation prior to installation**

Prepare a wide manoeuvring area based on the size of the equipment.

See technical data of the lifting equipment used and the size of the working vehicle.

The electromagnet installation area must be large enough for:

- Operating space
- Passage (forklifts, etc.)
- Escape routes

Minimum space needed to install the magnet inside a building is based on the dimensions of the magnet and the working vehicle on which it will be installed. Check that the mechanical components are fully secured and attached to the appropriate structure. Make sure personnel are equipped with PPE for the activity in compliance with current legislation in the country where the electromagnet is installed and used. The operational area must be free of material that can impede or limit vision, create obstructions or danger. Access to the area involved in the operation must be inhibited using protective barriers.

#### **⚠ WARNING!**

It is the customer’s responsibility to make sure the floor supports the static and dynamic load of the magnet and working vehicle on which it is installed.

#### **5.3.1. Machine and hydraulic system preparation**

For correct operation of the hydraulic magnet, the machine must be equipped with an adequate hydraulic system. It must be able to power the magnet hydraulic motor according to specs listed in the attachment technical data. The system must be designed and implemented according to law and the relevant commands must identify the effects they produce on the equipment accurately and reliably. Ensure the oil flow and pressure correctly reach the magnet even when other services are being used and the machine is in motion.

Alternatively, it is possible to use an independent hydraulic circuit to operate the magnet to achieve:

- Lower energy consumption and lower oil flow.
- Less heat generated by the machine oil.
- Reduced chance of material accidentally falling due to sudden drop in oil flow which can happen if another hydraulic device in the same circuit is used at the same time as the magnet.

It is the responsibility of the user to ensure that the machine complies with the following conditions:

- The magnet must be able to work only if the machine on which it is installed is running and the hydraulic flow is working.
- The magnet must not produce any movements without command when the machine is switched on.
- All hydraulic flows to and from the magnet must stop when the machine is switched off.
- The hydraulic circuit must be safely depressurized before any installation, maintenance or adjustment can be performed on the magnet.

**⚠ WARNING!**

If the hydraulic magnet is operated with low oil flow and pressure, do not improperly try to increase performance. This can be a serious danger to people in the area.

**⚠ WARNING!**

If the hydraulic magnet is operated with oil flow and pressure that is higher than recommended it poses a risk of damaging the equipment and hydraulic components and seriously endangers people in the area.

**⚠ WARNING!**

Hydraulic oil can reach very high temperatures. Before carrying out any operation that involves the possibility of coming into contact with hydraulic oil it is necessary to wait until it cools. Hydraulic oil is toxic and can cause injury upon contact with skin and eyes.

**ⓘ IMPORTANT**

Always follow these instructions to remove any hydraulic pressure before connecting or disconnecting the hydraulic fittings:

- Switch off the machine and depressurize the hydraulic oil tank.
- Operate the control levers of the machine several times, unladen, and in all directions.
- Check pressure gauges to ensure that the pressure has been eliminated.

### **5.3.2. Preliminary checks of mechanical units, electrical connections and safety systems**

Perform a general inspection of all mechanical parts before using the hydraulic magnet. All inspections must be performed with the working vehicle shut down with the hydraulic power off.

- Perform a general visual check of all parts of the equipment, making sure there are no mechanical anomalies or foreign objects in the work areas, and that all visible components are correctly fastened and positioned.
- Check that the mechanical units are fully installed and aligned, connected and secured to the relevant structure.

- Check the tightness of the screws and nuts on the primary parts of the magnet.
- Make sure the area where the equipment will be used is cleaned and free of material or parts that can obstruct moving parts.
- Install the hydraulic hoses, connecting the terminals of the hydraulic system installed on the machine to the connections fittings located on the hydraulic magnet equipment.
- Insert gauges into the hydraulic circuits (pressure outlets already provided on all models) and ensure that all the pressures are correct.
- Make sure that the fixed guards and safety devices on the working vehicle upon which the magnet is installed are correctly mounted and operational.
- Set up signs and barriers surrounding the work area to deny access to unauthorized personnel and people with pacemakers.

### **5.3.3. Environmental conditions**

Environmental characteristics of the installation area:

Temperature: from -10°C to 50°C

Maximum moisture: 80%

## **6. Using the attachment**

### **6.1. Visual checks and inspections**

Operation of the working vehicle on which the lifting equipment is installed must be entrusted to qualified and authorized operators who have read and understood the instructions in this manual and in the manual for the working vehicle, and that they are aware of the safety devices installed on it.

#### **⚠ WARNING!**

In the event of anomalies you should stop the working vehicle, report the condition and wait for the qualified technician.

All the checks must be performed by technical staff (operator) instructed and expert in the operation and use of the working vehicle. Checks consist of visual inspections followed by functional testing. Before starting the lifting equipment, the operator must check the following:

- Make sure there are no people near the lifting equipment and the working vehicle.
- Make sure that there are no foreign objects blocking movement present inside or around the working vehicle and the lifting equipment
- Make sure the bearing structure and all parts of the equipment have no cracks, deformations, corrosion wear or general alterations compared to the original condition.
- Make sure the lifting equipment or working vehicle is not in maintenance.
- Make sure all the guards on the lifting equipment and working vehicle are present, correctly positioned and firmly attached.
- Make sure all the mechanical and hydraulic connections between the lifting equipment and working vehicle (pins, plugs, screws hoses, couplings) are present and correctly installed.
- Make sure the lifting equipment is correctly connected to the hydraulic system on the working vehicle.
- Check the integrity of all hoses and couplings between the working vehicle and lifting equipment.



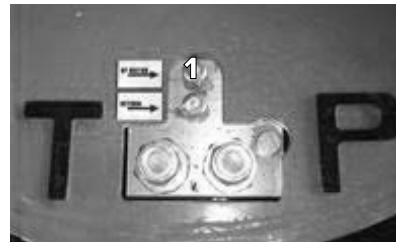
Once the previously listed conditions have been met, the next step is to introduce energy and power to the machine. This procedure should be provided by the user and maintenance manual of the machine on which the lifting equipment is installed and should be referred to for the operational description and instructions.

- Visually check the seal and efficiency of the entire hydraulic cycle.
- Check the correct positioning of the chains intended to support the lifting equipment

### 6.1.1. Functional testing

Before proceeding with lifting ferrous material, run several empty cycles of the magnet in order to highlight

1. Fit pressure gauge in appropriate pressure check point



any issues related to the dynamic movements of the booms and on which the magnet is installed.

#### **⚠ WARNING!**

It is strictly prohibited to proceed with lifting ferrous material with the equipment in unsuitable condition. The following is required:

- Quickly shut down the hydraulic magnet
- Immediately inform the supervisor of the problem.

### 6.2. Working cycle

You can proceed with the operating cycle only if complete safety of the working area has been ensured by setting up barriers around the working area, making sure no people, animals or objects can enter or obstruct visibility of the operator and no damage can be done to any surrounding structures or buildings.

1. Proceed with the working vehicle towards the work area.
2. Direct the equipment towards the material you wish to lift, at a distance of about 20 centimeters.
3. Verify the correct position of the lifting equipment and material. Use the controls on the working vehicle to best position the lifting equipment.
4. Enable the command that will result in magnetization.
5. Lift the magnet and direct it towards the unloading area.
6. Release the command to demagnetize the magnet.
7. Slowly proceed with new work cycles in order to become familiar with the system.

Avoid slanted or oblique pulls during lifting operations. They are difficult to control. The greater the surface area with which the magnet comes into contact with the piece to be lifted, the greater the force with which the piece itself is lifted. A good surface of contact with the magnetic lifter considerably diminishes the gaps (the empty spaces between the magnet and materials) thus obtaining a consistent force of magnetic anchorage.

**⚠ WARNING!**

The cycle time must be reduced when moving hot materials or during operation in very high ambient temperature (> 50°C).

### **6.2.1. Restrictions during operation**

The following is strictly forbidden during use of the hydraulic magnet:

- To pass, stand, operate, or manoeuvre underneath the hanging load.
- To allow the system to be used by non-qualified personnel.
- To use the system without suitable work clothing or personal protective measures.
- To operate without due attention during load lifting and movement.
- To put hands on the chain or hook during the tensioning phase.
- To leave the hanging load unsupervised.
- To move loads that are heavier than the nominal capacity and unbalanced loads.
- To make the load swing during movement or deposit.
- To use the system for pulling or dragging other items.
- To use the chains as grounding for welders.
- To use the system to keep elements bound to the ground in tension or lift bound loads.
- To cool the magnet with water.
- To change the range of the hook after having selected the load, resulting in an excessive slackening of the chain and cable.
- To bang the structure of the building or other machines and systems with the load.
- To use two or more pieces of lifting equipment at the same time to lift the same load.
- To use the system in unforeseen environmental conditions.
- To reach the “end stroke” areas at full speed during movement.
- To abruptly change direction during lifting and movement.
- To perform temporary repairs or operations not set forth in the instructions.
- To use non-original replacement parts or those not recommended by the manufacturer.
- To entrust the maintenance and repair operations to individuals who have not been trained by the manufacturer.
- To abandon the system when work is complete without having activated the related safety procedures.
- To perform routine maintenance, inspections, or repairs without putting the system out of service and activating the related procedure during maintenance.
- To use unsuitable equipment.
- To intervene without removing the lifted load and switch off the electrical connection and to activate the magnet before having it over the load.
- To use the magnet as a hammer or mallet to align ferrous materials or as an element of demolition.
- To use the magnet on hot materials.

- To use the magnet with bare hands during service or after deactivation, to avoid possible burns.
- To lift loads anchored to the magnet with ropes, chains, etc.
- To lift “guided” loads.
- To ignore the safety regulations in force in the country where used.
- To disregard all danger and safety precautions.
- To start the machine when the installation area is free of unauthorized personnel.
- Performing operations or interventions that are not the responsibility of the operator.

The operating area must always be kept free and clean of any oil, liquid and solid residues as well as any hazardous equipment. The electromagnet is a powerful magnetic field generator. It is absolutely forbidden for individuals with pacemakers or artificial cardiac stimulators to be near it (EN12198).

### 6.2.2. Load restrictions

The load must consist of ferromagnetic material. The lifting material must be a magnetic conductor. Material with the highest conductivity is mild steel (ferromagnetic), while the worst is aluminum (diamagnetic).

Below are the reduction factors of the performance depending on the type of material:

It is not permitted to lift loads exceeding the maximum defined in the technical data sheet in chapter 4.3.

Material to lift	Reduction factor for the force of attraction
Low carbon soft steel	1
Steel casting	0.9
Silicon steel (min .3%)	0.8
High carbon or alloyed steel	0.7
Cast iron	0.45
Nickel	0.2
Stainless steel, non-magnetic, brass, aluminum	0

#### **⚠ WARNING!**

If the magnet is connected to the operating machine through a rigid bracket, do not shake it to speed up load dumping. This may damage the internal electronics control box.

#### **⚠ WARNING!**

The HMGT magnet is not a digging tool. Teeth are used to move material which was already demolished or digged through with equipment intended for demolishing and digging. Magnet structure will be damaged if teeth are used to dig.

### 6.3. Leaving the equipment at rest

When leaving the hydraulic magnet after work, make sure that you do not leave the boom of the working vehicle over the magnet in order to prevent the boom lowering due to oil leaking into the cylinders. This can exert an abnormal force on the magnet and cause damage. Rest the magnet on the ground or on a stable surface when not in use.

## 7. Maintenance

### 7.1. Precautions

No intervention can be made on the hydraulic magnet until 20 minutes have passed since the last activation or operation. No person, even the most skilled, can touch the hydraulic magnet until 20 minutes have passed since the last activation or operation.

Check the good working order of the main mechanical components of the hydraulic magnet at the start of the shift. When performing maintenance or repairs, it is recommended to follow these points:

- Before starting any work, set up a sign stating “undergoing maintenance” in a visible position.
- At the end of the job, restore and correctly fix all safeguards that have been removed or opened.
- Maintenance operations of components and the plant must be performed with the hydraulic power isolated.
- The adjustment, cleaning, replacement of worn parts, controls and repairs must be performed with the machine at a standstill and in safe conditions.
- Maintenance personnel must use suitable PPE and wear work clothing.
- Where possible, guards and safety devices must not be removed. If this takes place, they must be restored as soon as the reasons for which they have been removed temporarily have been resolved and before commissioning the machine.
- Maintenance interventions are prohibited on moving parts.

### 7.2. Periodic maintenance

#### **WARNING!**

Wear P.P.E. whenever carrying out scheduled maintenance.



This chapter describes which parts must be checked during maintenance.

#### 7.2.1. Pole tips

Pole tips are the parts of the magnet that are in direct contact with the material to be lifted. They are subject to wear for that reason. Periodic inspection allows to identify potentially dangerous anomalies or poor efficiency. Check the pole tips to identify:

- Presence of air gaps between pole tip and polarity of the magnet, which reduces the capacity of the magnet.
- Presence of cracks on the connection welding, which weaken the mechanical structure and can cause sudden detachment of the pole tip from the body of the magnet.
- Mechanical wear which is especially present when the magnet is used to handle highly abrasive

materials. It must be verified that the wear affecting the welding between bottom cover and pole tips. Excessive wear leads to a substantial reduction of the contact surface and magnet's capacity.

### 7.2.2. Lower closure with anti-wear non-magnetic steel

This part comes into direct contact with lifted material often, therefore it is subjected to the same problems as the pole tips. Check it periodically in order to identify the eventual presence of:

- Cracks or splits in the connection welding with the casing that allows the passage of humidity towards the winding, causing damage.
- Dents or large deformations, since the winding could be in direct contact with the internal surface of the lid. Any deformation could damage it or break the insulation layer.

### 7.2.3. Chains and suspension bolts

Periodically check the chains, the suspension bolts and all attachment points. Check that the connection welding of the bolts with the lid has no cracks.

It is prohibited to weld a chain component, because the welding may affect the quality of the steel and cause breakage.

### 7.2.4. Storage

To prevent the penetration of humidity through damaged welding or defects in sealing of the gaskets, it is advised to not place the magnet in contact with the ground when not in use.

## 7.3. Lubrication and cleaning

### ⚠ WARNING!

The hydraulic magnet does not require any lubrication. There are no greasing points.

### ⚠ WARNING!

It is prohibited to wash the hydraulic magnet with pressurised or non-pressurised jets of water.

- The hydraulic magnet can only be cleaned manually using a damp cloth.

## 7.4. Layout, adjustments and replacement of components

1. Electronic control unit
2. Three-phase generator
3. Components support plate
4. Hydraulic control valve (HCV)
5. Motor-generator coupling flange
6. Flexible hoses
7. Motor fittings kit
8. Hydraulic motor
9. Magnetic plate

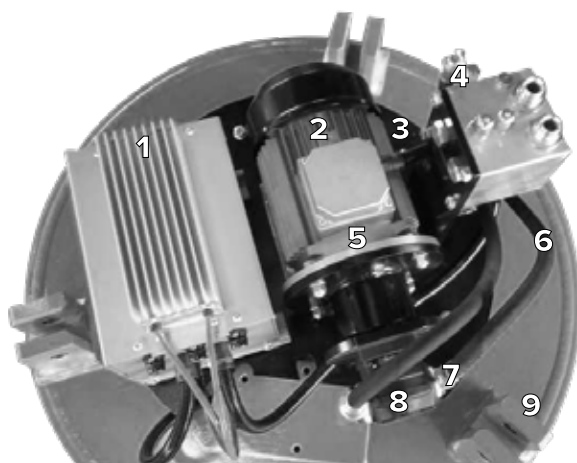


fig 7.1.

### 7.4.1. Adjustment and replacement of the hydraulic control valve (HCV), pressure control

**⚠ WARNING!**

The hydraulic valve is the component that determines the correct number of hydraulic motor revolutions, and signals the three-phase generator to provide the correct voltage to the magnetic plate. Its adjustment is essential and must be performed with great caution.

**⚠ WARNING!**

No adjustment can be performed on the hydraulic magnet components if it is not previously equipped with measuring instruments, i.e.

- Revolution counters for measuring the hydraulic generator revolutions.
- Alternating voltage measuring devices to measure the voltage at the generator clamps.
- Pressure gauge with full scale of 250 bar (3,626 psi) to measure the pressure on the flow line.
- Pressure gauge with full scale of 100 bar (1,450 psi) to measure the pressure on the return line.

**⚠ WARNING!**

All of the valves are pre-calibrated in the factory but flow regulation control always need to be checked on the specific magnet and excavator when HCV is replaced.

The valve has been adjusted in the factory. Find the procedure for calibration below.

1. HCV
2. Pressure control valve on the HCV side vertical face

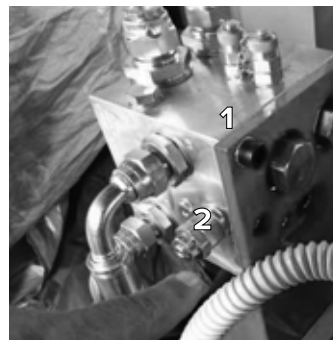


fig 7.2.

Remove the pipe from the right inlet of the motor (smallest motor coupling) and then:

1. Plug the pipe with a ½" bsp male plug
2. Plug the coupling on the motor with a ½" bsp female plug



fig 7.3.

1. 1. Hexagonal “L” shaped wrench adjustment  
5mm in the screw.
  2. 17mm socket wrench in lock nut.
2. Plug the pressure gauge into the pressure point

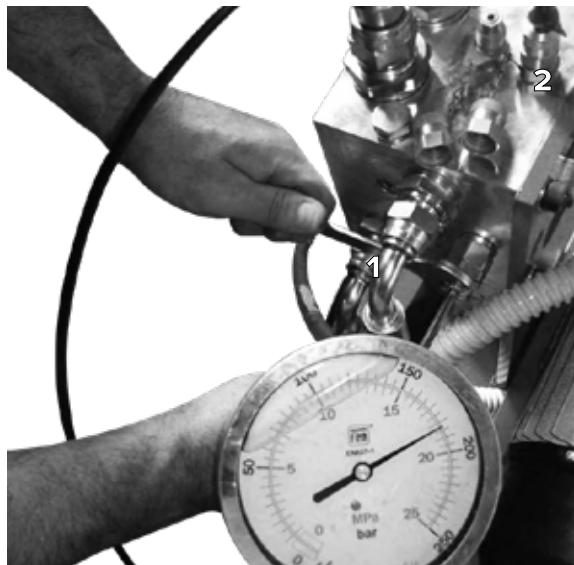


fig 7.4.

Procedure (fig. 7.2, 7.3, 7.4)

After having:

1. Plugged the flexible hose.
2. Plugged the connection on the hydraulic motor.
3. Introduced the pressure gauge into the pressure point.
4. Position the I wrenches for adjustment on the adjustment screw.
5. Position the hex wrench on the hex lock nut.
6. Holding the hex wrench still, loosen the lock nut a little bit to free the regulation screw.
7. Slowly turn the adjustment screw clockwise to increase the maximum pressure value or counter-clockwise to decrease the maximum pressure value until the value of 180 bar (2,610 psi) is reached.
8. Without moving the hex wrench, close the lock nut.
9. Activate the flow of oil and check if maximum pressure is correct.

#### 7.4.2. Hydraulic control valve adjustment procedure, oil flow control

##### **⚠ WARNING!**

The valve has been pre-adjusted with approximation of 4% (approx. 100 rpm). Whenever it must be re-calibrated, pay close attention because the adjustment screw is very sensitive and very small movements can cause great changes.

Turn the adjustment screw with millimetric movements!

##### **❗ IMPORTANT**

The valve is located underneath the body of the HCV hydraulic control valve inner face of the body.

1. HCV hydraulic control valve
2. Flow control valve on the HCV lower face

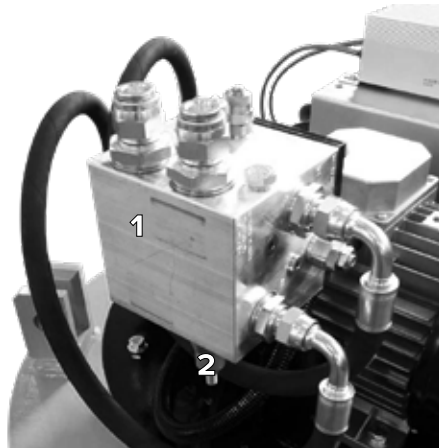


fig 7.5.

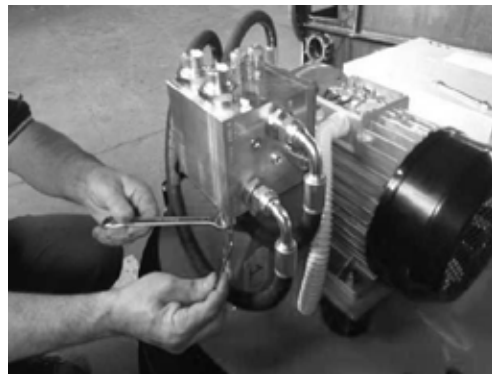


fig 7.6.

1. Position a 4 mm "L"-shaped wrench in the adjustment screw, **BUT DO NOT LOOSEN THE SCREW.**
2. Position a 15 mm socket wrench in the adjustment screw lock nut.
3. Holding the "L"-shaped wrench still, loosen the lock nut by about one turn to release the adjustment screw.
4. Turn the adjustment screw clockwise so the screw moves into the HCV body until the screw can't turn anymore.
5. Turn the 15 mm socket wrench to stop the screw lock nut.
6. Open oil flow and check that the hydraulic motor and three-phase generator are not stopped because the oil flow has completely stopped.
7. Position a 15 mm socket wrench in the adjustment screw lock nut and release it.
8. Holding the "L"-shaped wrench still, loosen the lock nut by about one turn to release the adjustment screw and then turn the adjustment screw counter-clockwise for approximately one turn.
9. Close the screw lock nut and check the revolutions of the three-phase generator and tension at generator clamps. Description on next page.
10. If the values are not correct, repeat the process from step 8 and take care when turning the adjustment screw.

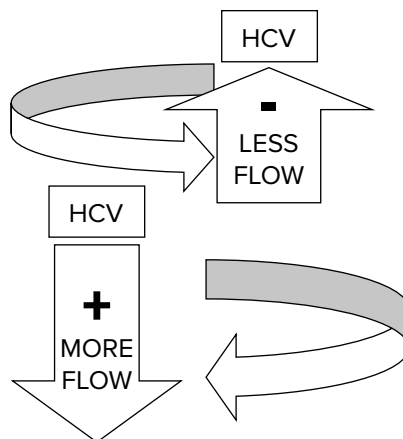


By turning as shown in the figure on the right, the adjustment screw enters the valve body.

**The flow of oil decreases until rotation of the motor-generator stops completely.**

By turning as shown in the figure, the adjustment screw exits from the valve body.

**The flow of oil increases as do the revolutions of the hydraulic motors and the voltage produced by the generator.**



**⚠ WARNING!**

Loosening or tightening of the adjustment screw must be performed with the motor off. After each adjustment of the adjusting screw and tightening of the lock nut it is possible to activate the oil flow to control the rotation of the engine generator.

**7.4.3. How to check the revolution hydraulic motor and generator**

Never exceed the values indicated in chapter 4.3.



fig 7.7.

Control the voltage at the clamps of the generator if the value exceeds 180 volts, decrease the hydraulic motor revs. and generator.



fig 7.8.

1. Flexible hoses



fig 7.9.

1. Valve fixing screws

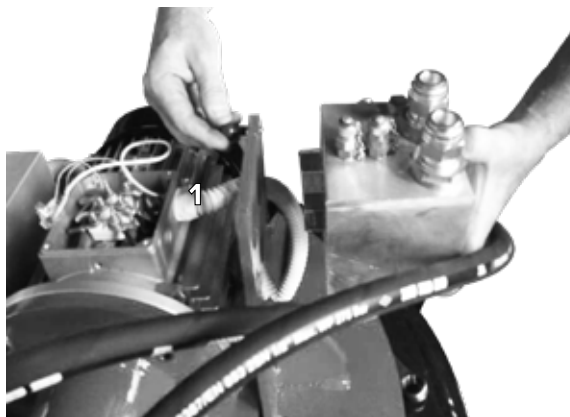


fig 7.10.

#### **7.4.4. How to replace HCV hydraulic control valve**

Procedure (fig. 7.9, 7.10):

1. Disconnect the flexible hoses on the side of the valve body, marking the position before removal.
2. Loosen the valve fixing screws.
3. Introduce a new valve with fixing screw.
4. Connect the flexible hoses to the valve according to that indicated in point 1.
5. Check the general functionality according to the hydraulic control valve adjustment procedure.

#### **7.4.5. Replacement of the hydraulic motor**

To remove hydraulic motor, the generator must also be removed.

Procedure (fig. 6.11, 6.12, 6.13):

1. Disconnect the flexible hoses from the hydraulic motor and plug them to prevent pollution.
2. Remove the screws fixing the generator to the bell.
3. Remove the screws fixing the hydraulic motor to the bell.
4. Remove the generator (complete with the elastic half-coupling) from the bell.
5. Loosen the half-coupling retainer nut positioned on the hydraulic motor shaft.
6. Extract its elastic half-coupling from the motor shaft.
7. At this point, it is possible to remove the hydraulic motor from the bell.
8. Introduce the new hydraulic motor, fixing it with its own screws.
9. Install the elastic coupling onto the hydraulic motor shaft, fixing it with the lock nut.

10. Reintroduce the previously-removed generator into the bell.
11. Block the generator with its own screws.
12. Connect the flexible hoses to the hydraulic motor.
13. Check the general functionality according to the hydraulic control valve adjustment procedure.

1. Hydraulic motor flexible hoses

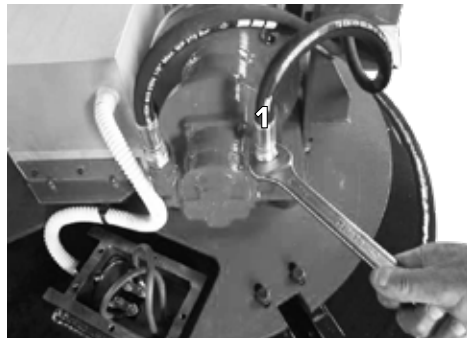


fig 7.11.

1. Bell housing
2. Generator fixing screws
3. Hydraulic motor fixing screws

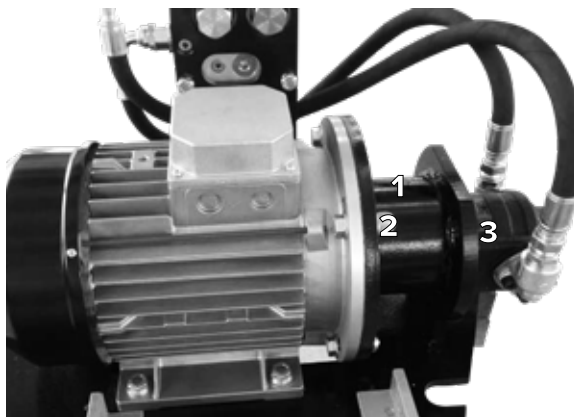


fig 7.12.

1. Generator side- elastic half-coupling
2. Hydraulic motor side- elastic half-coupling

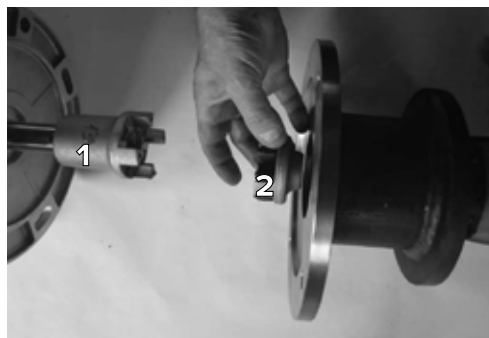


fig 7.13.

#### **7.4.6. Replacement of the complete elastic coupling**

Follow the replacement procedure of the hydraulic motor (section 7.4.5.), but in point 9 replace the elastic coupling with a new one.

### 7.4.7. Replacement of the three-phase generator

Procedure (fig. 7.14, 7.15)

1. Disconnect the electric cables (coming from the electronic control unit) from the three-phase generator clamps - 3 cables for the 3 phases plus 2 thin wires for temperature control.
2. Loosen the three-phase generator fixing screws.
3. Extract the three-phase generator complete with the flexible half coupling from the fixed support.
4. Remove the flexible half-coupling from the shaft of the old generator and mount it on the shaft of the new generator (replace the flexible coupling if worn).
5. Replace the three-phase generator, fixing it with the relevant screws.
6. Connect the cables coming from the electronic control unit - 3 cables for the 3 phases plus 2 thin wires for temperature control.
7. Check the general functionality according to the hydraulic control valve adjustment procedure.

1. Three-phase generator clamps

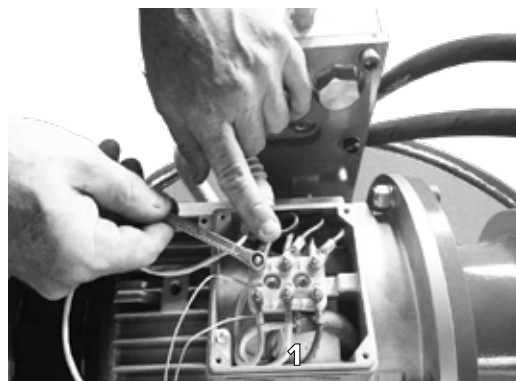


fig 7.14.

1. Three-phase generator fixing screws

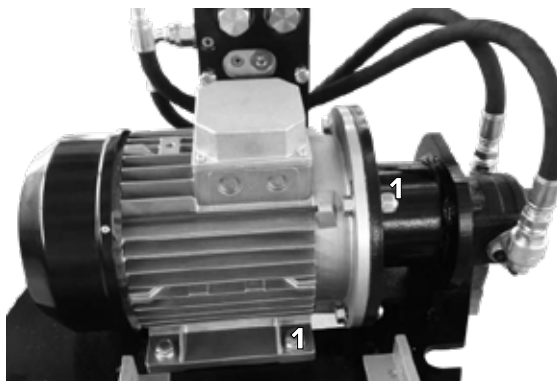


fig 7.15.

#### 7.4.8. Replacing the electronic power supply

The electronic power supply has been developed to only be replaced entirely.

Replacement procedure (fig. 7.16 ):

1. Disconnect the power supply cables in the magnetic plate box.
2. Disconnect the power supply cables in the three-phase generator box.
3. Loosen the screws that fix the power supply onto the components-holder plate.
4. Install a new electronic power supply unit, fixing it with the fixing screws.
5. Connect the cables to the magnetic plate box.
6. Connect the cables to the three-phase generator box.
7. Check the general functionality according to the hydraulic control valve adjustment procedure.

1. Three-phase generator cable box
2. Electronic power supply
3. Magnetic plate cables box

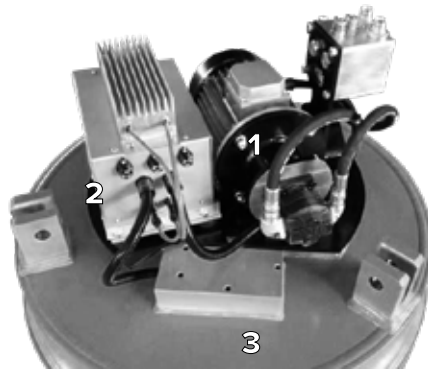


fig 7.16.

### 7.5. General Malfunctions

If the hydraulic magnet does not work properly:

- Check the pressure outlets (presence of pressure/flow or regular pressure when magnet is operated)
- Check for evidence on the electronic box that suggests components inside have been burnt.

### 7.6. Diagnostics and troubleshooting

Problem	Possible cause	Possible solution
The motor is rotating but the magnet does not exert an attractive force.	Voltage at the Coil input is 220V DC	→ Check coil continuity
	Voltage at the ECB input is 180V AC	→ Replace ECB
	Disconnect ECB from Generator and run Magnet. Voltage at the Generator output is 180V AC or higher	→ Replace ECB
	Disconnect ECB from Generator and run Magnet. Generator speed is around 2600 rpm	→ Replace Generator
	Oil pressure and flow are irregular	→ Regulate excavator pressure
	Valve is not clean or properly regulated	→ Clean inside and regulate valve
	Elastic joint is not working	→ Replace Joint
	Generator rpm is around 2600 rpm or faster	→ Replace ECB
	None of the above	→ Replace hydraulic motor
The motor is not rotating or is rotating very slowly	Disconnect ECB from Generator and run Magnet. Generator rpm is around 2600 rpm or faster	→ Replace ECB
	Oil pressure and flow are irregular	→ Regulate excavator pressure
	Valve is not clean or properly regulated	→ Clean inside and regulate valve
	Elastic joint is not working	→ Replace Joint
	None of the above	→ Replace hydraulic motor
Magnet is lifting the load but not releasing	ECB malfunction	→ Check ECB
Magnet is releasing the load with no prior command	Oil flow of the operating machine is irregular	→ Check oil flow fluctuations on the operating machine



**Hydraram B.V.**

Meander 7, 9231DB, Surhuisterveen Holland

Tel : +31 512 365 981 - [info@hydraram.com](mailto:info@hydraram.com)

[www.hydraram.com](http://www.hydraram.com)