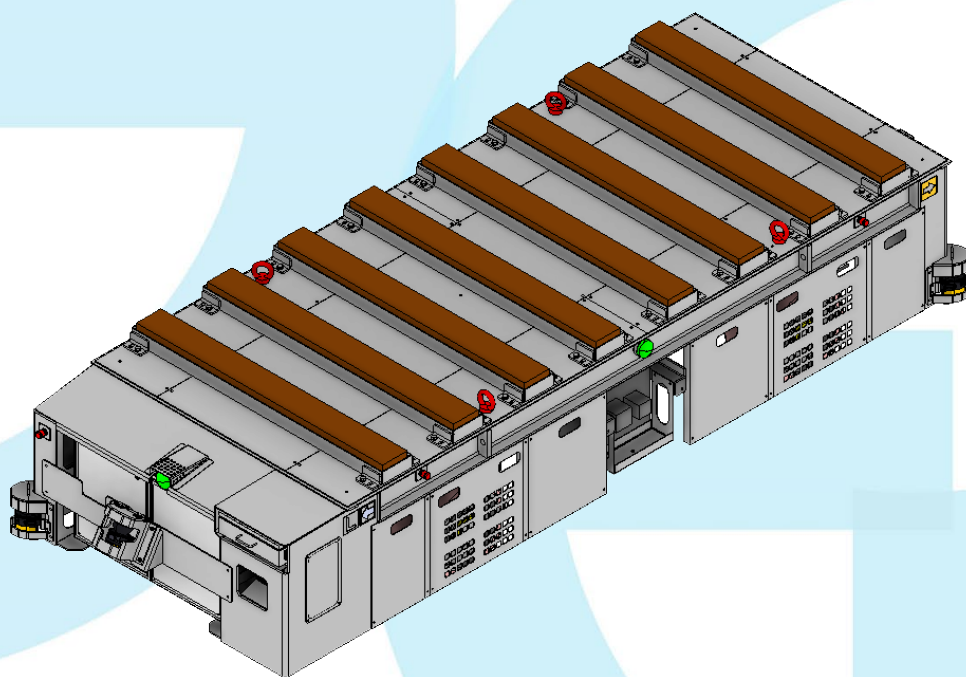


TRANSLATION OF
“ISTRUZIONI ORIGINALI”



SELF-PROPELLED ELECTRONIC TROLLEY AGV



USER AND MAINTENANCE MANUAL

Model:	SGAE VC P 40/2 - AGV	Revision:	00
Serial number:	2423 / 1 2423 / 2	Working load limit (WLL):	40 t
Version:	GROUND OPERATOR	Construction year:	2022

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REVISION

REVISION				
MODEL	LANGUAGE	DATE	VERSION	NOTES
SGAE VC P 40/2 - AGV	English	05/2022	00	First issue

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The company **Morello Giovanni S.r.l.** reserves the right to change, without prior warning, the characteristics of the product described in this manual.

In case of doubts or difficulties in understanding or interpretation of the manual, the original/official version referred to as "ISTRUZIONI ORIGINALI" on the cover, must be considered as the valid version.

Some of the pictures included in this handbook must be considered as an example, therefore they may not refer to the machine herein described.



NOTE

The **Self-propelled electronic trolley with tyres AGV**, described, herein after will be called "**machine**".

HANDBOOK STRUCTURE

The manual is divided into 9 chapters.

CHAPTER 1 – GENERAL INFORMATION

This chapter contains general information about the machine and the Manufacturer's data.

CHAPTER 2 – SAFETY

This chapter contains a description regarding the standards, the type of certification applied, working environment conditions, accident prevention devices used, residual risks, warning plates applied to the machine.

CHAPTER 3 – GENERAL DESCRIPTION

This chapter contains the description of the machine functioning principles, the general technical data and the description of the groups that constitute the same.

CHAPTER 4 – TRANSPORT AND STORAGE

This chapter contains instructions on how to use the proper packing, handling, transport and unloading at the user's plant.

CHAPTER 5 – INSTALLATION

This chapter contains the instructions to carry out any assembly, checking, inspection and adjustment operations to be performed before start-up.

CHAPTER 6 – USE

This chapter contains the instructions for machine start-up, use, with description of the controls available for the operator, the more important operating sequences and use of the diagnostics system.

CHAPTER 7 – DISMANTLING

This chapter contains information and warnings to properly decommission and dismantle the machine at end-of life.

CHAPTER 8 – MAINTENANCE

This chapter contains the machine maintenance schedule. It contains the warnings, precautions and instructions to correctly carry out the maintenance operations on the machine.

CHAPTER 9 – ATTACHMENTS

TABLE OF CONTENTS

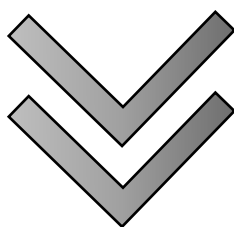
1.	GENERAL INFORMATION	1-1
1.1	INTRODUCTION.....	1-1
1.2	SERVICE DEPARTMENT	1-1
1.3	GLOSSARY	1-2
1.4	SYMBOLS.....	1-4
1.5	MANUFACTURER'S ADDRESS	1-5
1.6	SAFETY STANDARDS	1-6
1.7	RESPONSIBILITY OF THE MANUFACTURER.....	1-6
1.8	MANAGEMENT OF THE MACHINE	1-7
1.9	WARRANTY.....	1-7
2.	SAFETY.....	2-1
2.1	GENERAL INFORMATION.....	2-1
2.1.1	Certification of the machine	2-2
2.1.2	Foreseen and unforeseen uses	2-3
2.2	OPERATING ENVIRONMENTAL CONDITIONS	2-4
2.2.1	Installation of fire protection.....	2-4
2.2.2	Explosive atmosphere	2-4
2.2.3	Lighting	2-4
2.2.4	Vibrations	2-4
2.2.5	Noise.....	2-5
2.2.6	Electromagnetic emissions	2-5
2.3	DISPOSAL OF EXHAUSTED MATERIALS	2-5
2.4	DEMARCATON OF HAZARDOUS AREAS	2-6
2.5	OPERATOR WORKSTATION	2-7
2.6	SAFETY DEVICES	2-9
2.6.1	Power-on key selector switch	2-10
2.6.2	Emergency button/s	2-11
2.6.3	Retained action movement system	2-12
2.6.4	Fixed protections	2-13
2.6.5	Laser scanner	2-14
2.6.6	Visual and acoustic indications.....	2-17
2.6.7	Safety circuits	2-18
2.7	PERSONAL PROTECTIVE EQUIPMENT	2-19
2.8	RESIDUAL RISKS	2-20
2.8.1	General information	2-20
2.8.2	Residual risks	2-20
2.8.3	Plates on the machine	2-21
3.	GENERAL DESCRIPTION	3-1
3.1	LAYOUT.....	3-1
3.2	TECHNICAL DATA	3-3
3.3	DESCRIPTION OF GROUPS.....	3-5
3.3.1	Machine structure	3-5
3.3.2	Wheels group.....	3-6
3.3.3	Steering.....	3-7

3.3.4	Traction and braking	3-8
3.3.5	Laser scanner	3-9
3.3.6	Power supply	3-10
3.3.7	Light and acoustic signals.....	3-11
3.3.8	Modes of operation	3-12
3.3.9	Driving sensors in AGV mode.....	3-13
3.3.10	Wi-Fi communication system.....	3-14
4.	TRANSPORT AND STORAGE.....	4-1
4.1	STORAGE.....	4-1
4.1.1	Storage of battery/batteries	4-1
4.1.2	Complementary to the machine	4-1
4.2	TRANSPORT	4-2
4.3	LIFTING.....	4-3
4.3.1	Weight/s	4-3
4.3.2	Machine lifting	4-4
5.	INSTALLATION	5-1
5.1	INTACTNESS CHECK.....	5-1
5.2	INSTALLATION OF THE MACHINE.....	5-1
5.2.1	General safety precautions	5-1
5.2.2	Choice of place of use and check on requirements.....	5-2
5.2.3	Installation of ground components	5-3
5.3	CHECKS AND INSPECTIONS	5-4
5.3.1	Overall checks on mechanical units	5-5
5.3.2	Electrical system check.....	5-6
5.3.3	Checks on safety devices	5-7
5.4	UNIVERSAL INTERNATIONAL RECYCLING CODES	5-8
6.	USE.....	6-1
6.1	PUSHBUTTONS	6-1
6.1.1	Pushbutton on electric panel main.....	6-1
6.1.2	Shoulder strap push-button panel.....	6-3
6.1.3	Command panel on board	6-5
6.2	VISUAL AND ACOUSTIC INDICATIONS.....	6-6
6.3	VIDEO PAGES.....	6-7
6.3.1	Main page	6-7
6.3.2	Information page	6-9
6.3.3	Options Page	6-10
6.3.4	TAG Layout Page	6-11
6.3.5	Drive Information Page	6-12
6.3.6	Active Alarms Page.....	6-13
6.3.7	Alarm History Page.....	6-14
6.4	ALARMS.....	6-15
6.5	CHECKS PRIOR TO MACHINE OPERATION.....	6-20
6.6	MACHINE FUNCTIONING.....	6-21
6.6.1	Battery connection	6-21
6.6.2	Selecting the operating mode	6-21

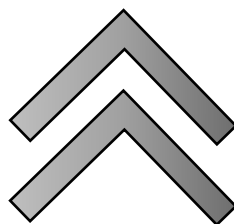
6.6.3	AUTOMATIC (AGV) Mode.....	6-22
6.6.4	MANUAL Mode	6-23
6.6.4.1	<i>Starting the machine with the wired control panel</i>	6-23
6.6.4.2	<i>Machine Handling (Traversing and Steering)</i>	6-24
6.6.4.3	<i>Visual Indications of Direction</i>	6-25
6.6.4.4	<i>Positioning the machine on the inductive cable</i>	6-25
6.6.5	SEMI-AUTOMATIC mode.....	6-26
6.6.6	Starting after an Emergency Stop	6-26
6.6.7	Laser Scanner Intervention	6-26
6.6.8	Parking Brakes	6-27
6.6.9	Switching Off the Machine	6-27
6.7	LOAD POSITIONING.....	6-28
6.7.1	Stability Area.....	6-29
6.8	BATTERY	6-30
6.8.1	Low Battery and Extra Time	6-30
6.8.2	Maintaining the Lithium Battery	6-30
6.8.3	Removing the Battery	6-31
6.8.4	Charging the Battery.....	6-32
7.	DISPOSAL.....	7-1
7.1	RECYCLING	7-2
7.2	DISPOSAL	7-2
8.	MAINTENANCE.....	8-1
8.1	GENERAL PRECAUTIONS FOR SAFETY	8-1
8.1.1	General hazards	8-2
8.1.2	General warnings.....	8-3
8.2	QUALIFICATION OF MAINTENANCE TECHNICIANS.....	8-4
8.2.1	General skills	8-4
8.3	PROCEDURE TO STOP MACHINE.....	8-5
8.4	PROCEDURE FOR MAINTENANCE POSITIONING	8-6
8.5	CONTROL PLAN ON SAFETY.....	8-10
8.5.1	Checks and functional tests on safety devices.....	8-10
8.6	MAINTENANCE FREQUENCY	8-11
8.7	LUBRICATION	8-13
8.8	CHAIN TENSIONING	8-15
8.9	TIGHTNESS CHECK.....	8-16
8.10	ACCESS TO THE STEERING ENCODER	8-17
8.11	ACCESS TO THE ELECTRIC PANEL	8-19
8.12	MAINTENANCE OPERATION CARDS.....	8-20
8.13	SPARE PARTS	8-21
8.13.1	Mechanical spare parts.....	8-21
8.13.2	Electrical spare parts	8-22
8.14	EXPLODED DRAWINGS.....	8-23
8.14.1	Motorised wheel assembly	8-23
8.14.2	Gearmotor unit.....	8-24
8.14.3	Tilting axle unit.....	8-25
8.14.4	Steering encoder group	8-27



9. ATTACHED DOCUMENTATION..... 9-1



GENERAL INFORMATION



**SELF-PROPELLED
ELECTRONIC TROLLEY WITH TYRES AGV
Serial number 2423**



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1. GENERAL INFORMATION

1.1 INTRODUCTION



NOTE

MORELLO GIOVANNI S.r.l. the machine manufacturing company, is indicated in the handbook with the name: **Manufacturer**.



NOTE

The Company purchasing the machine is indicated in the handbook with the name: **Customer**.

The manufacturer recommends a training course for personnel responsible for operating and maintaining the machine to increase familiarity and know-how of the various procedures.

This manual contains the features, performances, instructions for use and the references to the preventive and remedial operations of the machine.

The manufacturer compels the personnel in charge of operating and maintaining the machine, as well as the personnel in charge of transport and possible assembly operations, to read this document.

This document is the Use and Maintenance handbook for the:

SELF-PROPELLED ELECTRONIC TROLLEY WITH TYRES AGV MODEL SGAE VC P 40/2 - AGV WITH GROUND OPERATOR

and has been drawn up in compliance with machines directive 2006/42/CE.

The Use and Maintenance Handbook is to be considered an integral part of the machine and is to be kept until final dismantling. It is to be kept by the person in charge of the machining service after the final installation.

1.2 SERVICE DEPARTMENT

For technical assistance, contact the manufacturer:

Morello Giovanni S.r.l.

Head Office and Factory:

Lungo Dora Colletta 85/A

10153 – Torino (Italy)

TEL. 011.248.05.69

TEL. / FAX. 011.85.00.85

E-mail: info@morellogiovanni.it

Site: www.morellogiovanni.it

1.3 GLOSSARY

Emergency stop – to stop in an emergency; the purpose of this function is:

- to avoid or reduce hazards that exist for persons, damage to the machinery or to the work in progress and
- to be initiated by a single human action.

Machinery Directive: the DIRECTIVE 2006/42/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the approximation of the laws of the Member States relating to machinery.

Command device: device inserted in a command circuit for use of the machine.

Supplier: entity (Manufacturer, installer, system integrator) that provides equipment or services associated with the machine (the user can also act as a manufacturer for himself).

Safety function: machine function, the failure of which could cause an immediate increase of risks.

Failure: terms of the capacity of an element to perform a required function.

Machine:

- an assembly equipped or to be equipped with a drive system different from direct human or animal force, composed of parts or components, at least one of which is mobile, integrally connected together for a well determined application;
- an assembly as per the first section, lacks only the elements of connection to the site of use or connection to the sources of energy and movement;
- an assembly as per the first and second sections, ready for installation and that can only function after assembly on a means of transport or installed in a building or in a construction;
- a group of machines, as per the first, the second and the third section, or partly completed machines, that to attain the same result are arranged and controlled in a manner to have an integral functioning;
- a group of parts or components, one of which is mobile, integrally connected together for the lifting of weights, and having direct human forces as the only source of energy;

Malfunctioning: inability of a machine to perform the foreseen function.

Marking: symbol and wording for the identification of the machine, which is affixed by the Manufacturer.

Safety measure: means that eliminate or reduce a hazard.

Operator: person in charge of running the machine.

Hazard: Potential source of harm.

Qualified technician or skilled maintenance technician: the persons who have attended specialisation courses, vocational training, etc. and have experience regarding installation, putting into service and maintenance operations, repairs, transport and handling of the machine.

Protections: protection measures that use means of protection to safeguard persons against hazards that cannot be rationally removed from the risks in a manner sufficiently effective by the protection measures integrated in the project design.

Safety Protection: Shelter or protective device used as a safety measure for the protection of persons from a present or latent danger.

Guard: physical barrier, designed as part of the machine, to provide protection.

Fixed guard: fixed protection (for example: by screws, nuts, welding) so that it can only be opened or removed using tools or by removal of the means of anchorage.

Risk: combination of the probability of occurrence of harm and the severity of that damage.

Residual risk: risk that remains after the protective measures have been applied.

Transport: a set of operations designed to transfer equipment from the manufacturer to the final work position at the Customer's.

Foreseen use: use of the machine in conformity with the information provided in the instructions for use.

User: entity using the machine and the associated electrical equipment.

Danger zone: area within or near the machine in which the presence of an exposed person constitutes a risk to his health and / or safety.

1.4 SYMBOLS

The manual uses a number of symbols that are meant to draw the reader's attention and highlight some aspects that are particularly important.

SYMBOL	MEANING	NOTES
	DANGER	Indicates a hazard with risk of injury, even death, for the user. Pay close attention to text blocks indicated by this symbol.
	CAUTION	A warning of possible deterioration or damage to the machine and/or equipment. Pay attention to the texts indicated by this symbol.
	WARNING NOTES	Indicates a warning or note of key functions or useful information. Pay attention to the texts indicated by this symbol.
	ADDITIONAL INFORMATION	Indicates additional information. This information does not have a direct influence on the description of a function or with the development of a procedure. It may be a cross-reference to other additional documentation, for example attached instructions for use manuals, technical documents or other sections of this manual.

1.5 MANUFACTURER'S ADDRESS

For any kind of information or clarifications regarding the use, maintenance, etc., the Technical Office of the Manufacturer is always available to the customer requirements.

It is appropriate that the latter puts the questions in clear, with references to this manual, always indicating the data shown on the identification plate of the machine in question.

Any request for assistance, service at the client, or clarification regarding the technical aspects of this document should be addressed to:



MORELLO GIOVANNI S.r.l.

Lungo Dora Colletta 85/A 10153 – TORINO (TO) – ITALIA

TEL. 011.248.05.69 – TEL./FAX 011.85.00.85

E-mail: info@morellogiovanni.it

Site: www.morellogiovanni.it

1.6 SAFETY STANDARDS

Prescriptions, instructions, regulations and related safety notes described in the various chapters of the manual are intended to define a set of behaviours and rules to be observed when performing the various activities that constitute the mode of intended use of the machine in order to operate in conditions of safety for personnel, for the equipment and the surrounding environment.

The safety instructions are addressed to all authorized personnel, trained and authorized to perform the various activities and operations:

- Transport.
- Installation.
- Use.
- Management.
- Maintenance.
- Cleaning.
- Decommissioning and dismantling.

1.7 RESPONSIBILITY OF THE MANUFACTURER

The manufacturer declines any liability arising from the incorrect use or misuse of the machine in question and from damage caused by the use of non-prescribed spare parts, by maintenance not carried out properly and by tampering with circuits, components, and system software.

The responsibility for what concerns the application of safety requirements, mentioned below, it is the responsibility of the technical staff responsible for the activities provided for the machine. They should ensure that operators, authorized to carry out the required activities, are qualified, that respect and are aware of the requirements contained in this document and the safety regulations of a general nature applied to the machine itself.

Failure to follow the safety instructions can cause injury to persons and damage to equipment.

1.8 MANAGEMENT OF THE MACHINE

The machine control is allowed only to authorized and properly trained persons, or at least with adequate technical expertise.

Operators responsible for running and maintenance operations should be aware that the knowledge and application of safety standards is an integral part of their work.

Operators not authorised to work on the machine are not to have access to the pushbuttons.

Before starting the machine, do the following:

- Read this manual carefully.
- Know what protections and emergency stop devices are present on the system, where they are located and how they work.

Do not remove, even partially, the protections, safety devices and/or warning signs applied to the machine. In the event of malfunction or failure of such devices, they should be immediately repaired or replaced.

1.9 WARRANTY

The manufacturer guarantees that its machines are free of manufacturing flaws for the period specified in the relevant terms of the contract.

The buyer is only entitled to replacement of parts recognized as defective: the costs of packaging and transport, as well as any installation, are against him. In this case, must be specified:

- Date and number of the purchase document.
- Machine model.
- Serial number.

Will not be recognized claims for damages for loss of production caused by any periods of inactivity of the machine.

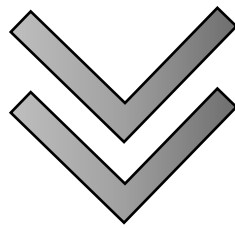
Damages are excluded caused by improper use to the contents of this "Use Manual and Maintenance" which is an integral part of the machine, including the maintenance, if not conforming to the instructions provided.

The warranty will not be recognized for the machines on which were performed unauthorized modifications. Modifications or tampering of safety devices are in every way strictly prohibited.

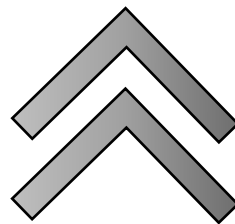
If damages occur during warranty period, the warranty is valid only using original spare parts.

Repair work may only be performed by skilled operators, who are familiar with the machine.

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SAFETY



**SELF-PROPELLED
ELECTRONIC TROLLEY WITH TYRES AGV
Serial number 2423**



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2. SAFETY

2.1 GENERAL INFORMATION

The Customer must provide instructions for the operators about the risks of injury, safety devices installed on the machine and the general rules regarding accident prevention as specified by the Community directives and the law of the country where the machine is used.

The operators must know the location and operation of all the controls of the machine and its characteristics.

Tampering, or unauthorized replacement of one or more components of the machine, the adoption of accessories and the use of particular parts other than those recommended may cause injury risks.



DANGER

It is absolutely forbidden to exclude/tamper with the safety devices on the machine. The manufacturer declines all responsibility for the safety of the machine in case of failure to comply with this prohibition.



CAUTION

It is the responsibility of the operator who uses the machine to check that during movement there are no objects or persons in the area.

2.1.1 Certification of the machine

The Machine is provided with the EC declaration of conformity to the essential safety requirements in accordance with Directive 2006/42/EC (annex II A) and EMC Directive 2014/30/UE.



NOTE

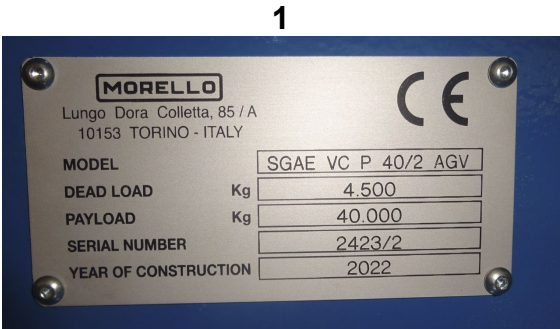
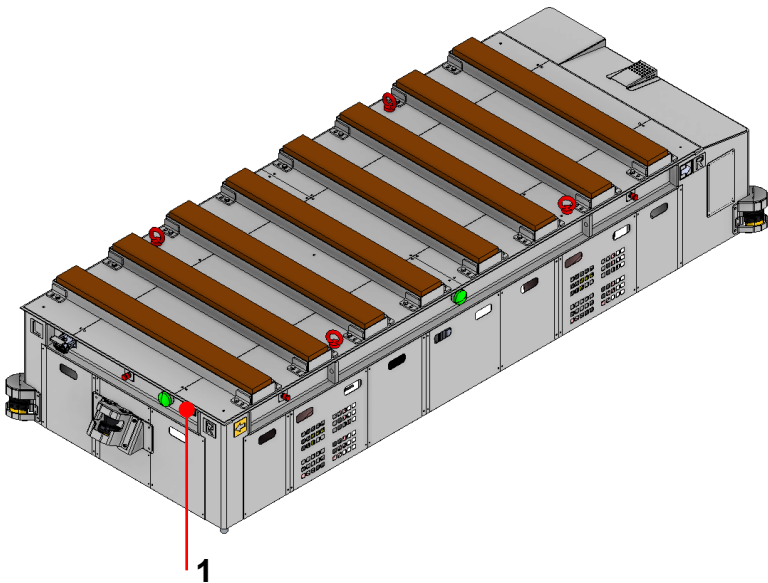
Any changes made to the machine immediately invalidate the CE certification issued by the manufacturer.



NOTE

The picture shown below is for the sole purpose of indicating the position of the CE plate, with the main machine identification data of the machine.

1. Plate EC



Example of the EC plate

2.1.2 Foreseen and unforeseen uses

The machine has been designed and built to handle heavy loads, distributed on the loading surface, according to the technical specifications indicated in this manual. It can be used indoors on a concrete or asphalt floor (flat, smooth and level).

The machine is not to be used on roads (road traffic).

Use is not possible of the machine for purposes other than those planned.



DANGER

The use of the machine for processing purposes not described in this manual is **IMPROPER USE**. The Manufacturer declines all responsibility for any damage caused to property and/or persons and considers annulled every kind of guarantee of the machinery. The manufacturer declines all responsibility in the event of tampering with the machine, unauthorised modifications or maintenance operations carried out by unskilled operators.



DANGER

In the event of abnormal behaviour of the machine, or lack of power, it is forbidden to carry out any movement because specific competence of maintenance personnel.



DANGER

Never climb on/transport persons on the machine.



CAUTION

Only one operator is required to manage the machine, who is to position as indicated in the paragraph "Operator workstation" and to follow the instructions as described in the chapter "Use".



CAUTION

The use of the machine is allowed only to the experienced and qualified operator, who has taken full vision and awareness of this document.

2.2 OPERATING ENVIRONMENTAL CONDITIONS

The machine is to be placed in an environment equipped with all safety requirements specified by the laws in the user country, and with adequate ventilation.

Operating environment conditions:

- Environment temperature ranging between 0 °C and + 30 °C.
- Humidity: <80% (without condensation).

2.2.1 Installation of fire protection

The machine is not equipped with its own sprinkler system.

2.2.2 Explosive atmosphere

The machine has not been designed and built to operate in zones with explosive or partially explosive atmosphere.

2.2.3 Lighting

The machine does not have its own lighting system.



CAUTION

It is the task of the Customer to provide correct lighting in the working area.

2.2.4 Vibrations

The machine does not produce hazardous vibration to the health of the operators who work there.



CAUTION

Excessive vibration can only be caused by a mechanical failure, that is to be immediately reported and eliminated.

2.2.5 Noise

Noise measurement has been carried out in conformity with the specifications of acoustic standards. The typical sound data are filed by the manufacturer.

The machine operating features are such that, with no load, the overall noise generated is less than 75 dB (A), measured in the workstations of the relevant operators.



NOTE

The sound pressure level in the actual working conditions depends on the characteristics and the capacity of the load.



NOTE

The measurement of exposure to noise levels of workers should be carried out by the user, in compliance with the legislation in force in your country.

2.2.6 Electromagnetic emissions

The machine contains electronic components subject to the regulations on Electromagnetic Compatibility, affected by radiated and conducted emissions.

Emission values are in accordance with regulations thanks to the use of EMC compatible components, suitable connections and installation of filters where necessary.



CAUTION

Any maintenance on electrical equipment made in a non-compliant manner, or wrong replacement of components, can impair the effectiveness of the equipment.

2.3 DISPOSAL OF EXHAUSTED MATERIALS

The machine generates exhausted materials (reducer oil).

For disposal there are specific regulations in each country for the protection of the environment.

The Customer must necessarily be aware of these regulations and must act in such a way as to comply with them.

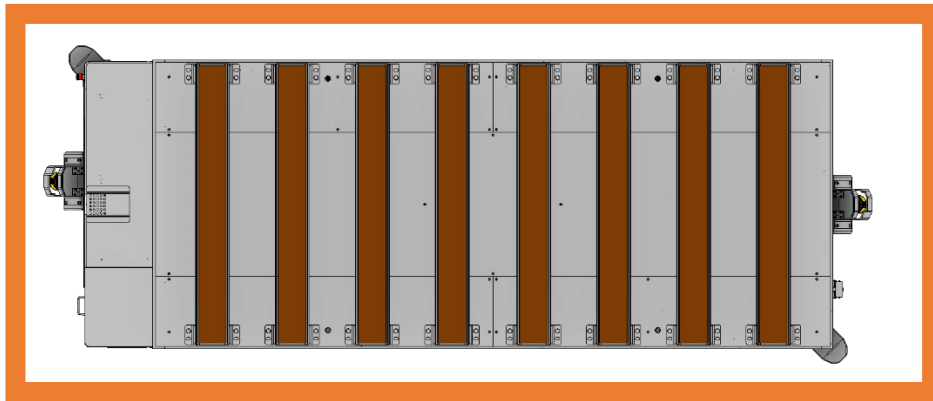
In particular, see Chapter 7 for the disposal of the materials that make up the machine.

2.4 DEMARCATION OF HAZARDOUS AREAS

The dangerous zones of the machine are segregated by fixed guards. Access to these zones is exclusively for maintenance operations, and to be carried out as indicated in this manual.

The following drawing shows the hazardous zones near the machine following its movement.

Forward



View of the machine from above



Dangerous zone

2.5 OPERATOR WORKSTATION

Manual mode

To run the machine, only one operator is required who is to position lateral to it, in the direction of travel, so as to have a complete view of the surrounding handling area, always remaining at a safe distance (**Figure A**). The operator must always stay out of the laser scanners' areas of operation.

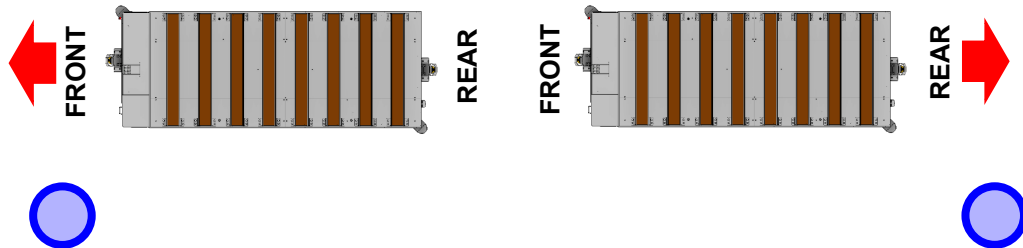
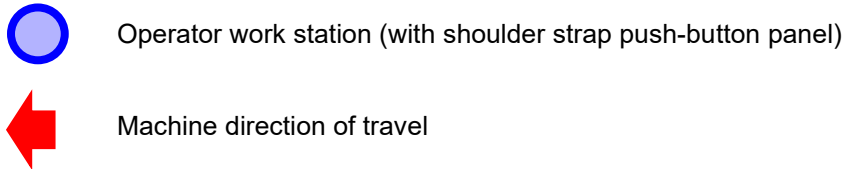


Figure A - Image for illustrative purposes

CAUTION



In the case of bulky loads, which limit the operator's view, the operator must be positioned frontally in the direction of travel (always at a safe distance), so as to have a complete visibility of both sides of the machine (**Figure B**).

The operator must always remain outside the laser scanners' operating areas.



Figure B - Image for illustrative purposes

**SELF-PROPELLED
ELECTRONIC TROLLEY WITH TYRES AGV
Serial number 2423**

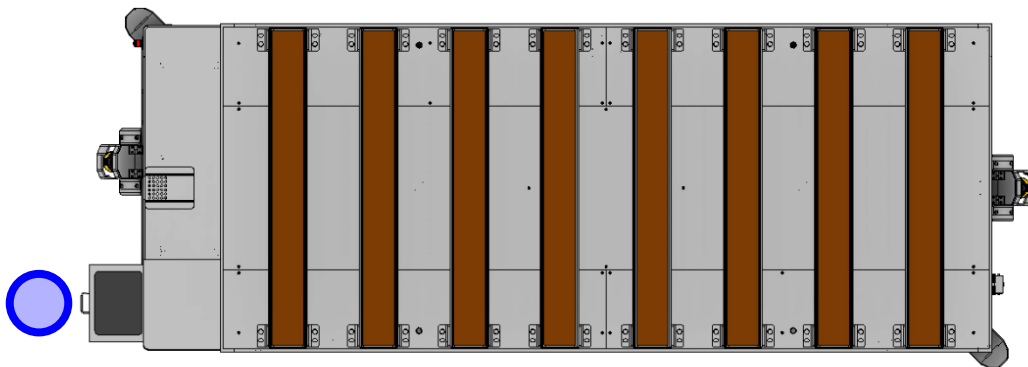


Automatic mode (AGV)

Only one operator is required to operate the machine, who must stand near the control desk located on the machine and select the machine's destination station.



Operator work station (Control panel)



CAUTION

The control panel is removable. Position it inside the machine perimeter to enable machine movement.



CAUTION

It is the responsibility of the machine operator to check that the area is clear of people and objects before sending the machine to its destination station.

2.6 SAFETY DEVICES

The machine is equipped with the following safety devices:

DEVICE TYPE	FUNCTION
Power-on key selector switch	To prevent machine movement.
Emergency button/s	Emergency stop of the machine.
Retained action movement system	Stops machine movements if the control is released.
Fixed protections	Segregation of machine hazardous zones.
Laser scanner	Slowing down and stopping the machine in case of interception of the intervention areas.
Visual and acoustic signalling systems	It indicates when the machine is in motion.
Safety circuits	Cuts-out the electric power supply in the case of overload or short circuit.

2.6.1 Power-on key selector switch

Function: To prevent machine movement.

Characteristics and methods: The machine electric power is disconnected by turning the “power-on key selector”, on the electric panel to position (0), and removing the key.

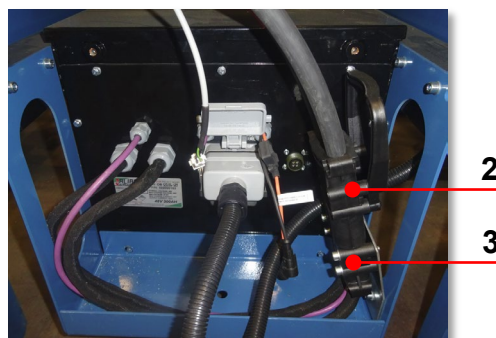
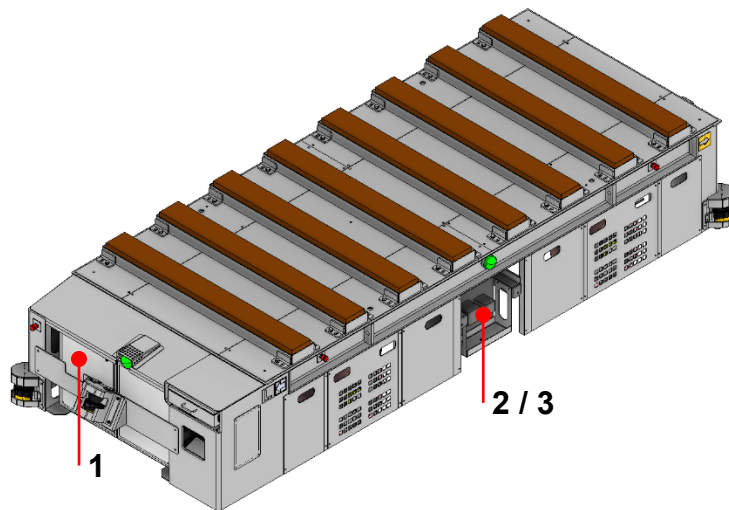
Subsequently disconnect the machine plug from the battery socket to cut out the power supply.



CAUTION

For maintenance, disconnect the battery, removing the machine power supply plug from the battery socket.

1. Power-on key selector switch
2. Machine power supply plug
3. Battery socket



2.6.2 Emergency button/s

Function: Immediate machine stoppage.

Characteristics and methods: Press this button in a hazardous situation to safeguard the operators and/or the machine.

Pressing this button **(1)** cuts-out the power supply of the motors, stopping machine movements.

If pressed, the emergency button remains in low position. To reset, turn it clockwise.

The emergency buttons are placed on the machine and on the control button.



CAUTION

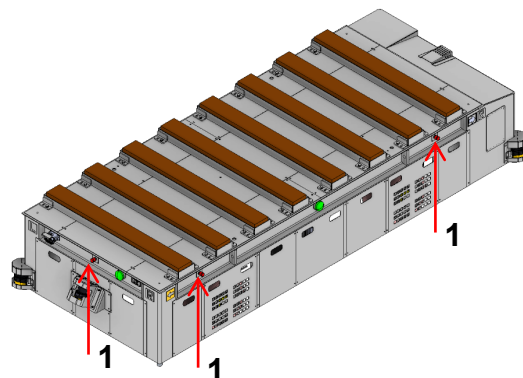
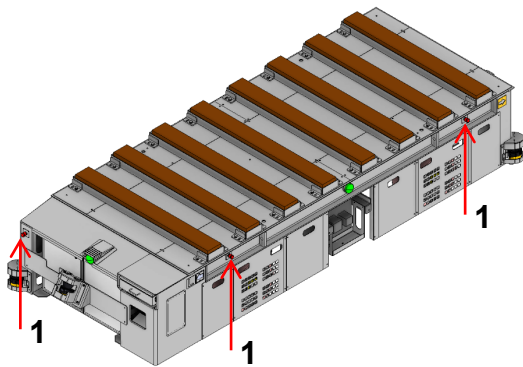
In case of maintenance is not enough to intervene on emergency button for cutting energy of the machine.



CAUTION

The emergency buttons need periodic checks to verify their correct operation.

1. Emergency button on the machine
2. Emergency button on control panel



2.6.3 Retained action movement system

Function: Machine movement, with presence of operator.

Characteristics and methods: For moving the machine in manual mode, there are levers on the wire control panel with maintained action.

If the lever is released, the respective movement is stopped.



CAUTION

For correct use of the shoulder strap pushbutton panel the operator has to position as indicated in the paragraph "Operator Work Station".

1. Maintained action lever



Shoulder strap pushbutton panel

2.6.4 Fixed protections

Function: Segregation of machine hazardous zones.

Characteristics and methods: The protections are fixed (casings) and firmly secured to the structure by screws that require a specific tool for removal.

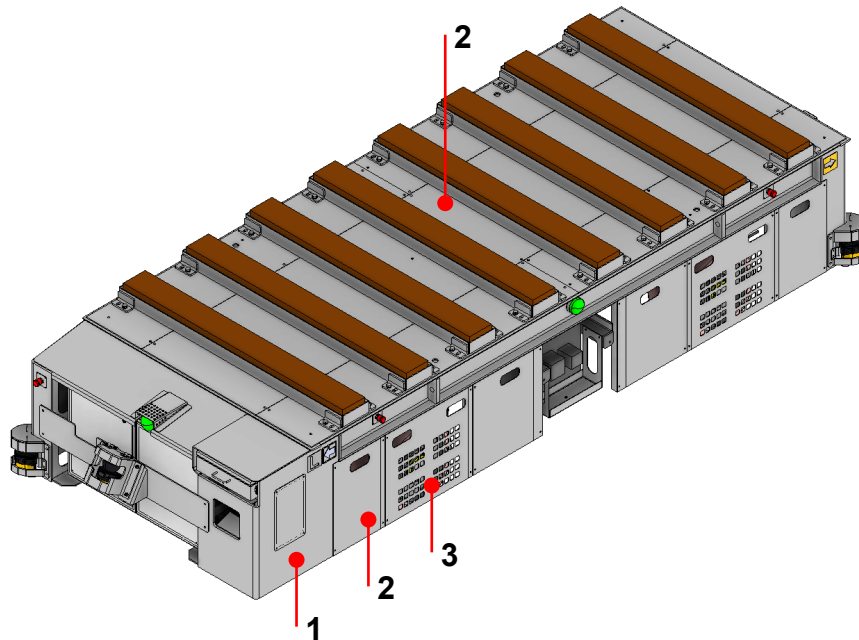
These protections are not controlled, and removal is only to take place for maintenance operations, with the machine energy source disconnected and cut-out.



CAUTION

The Manufacturer shall not be held liable if the machine is set in function without the protections.

1. Machine frame
2. Example of fixed protection in smooth sheet steel
3. Example of fixed protection in grilled sheet steel



2.6.5 Laser scanner

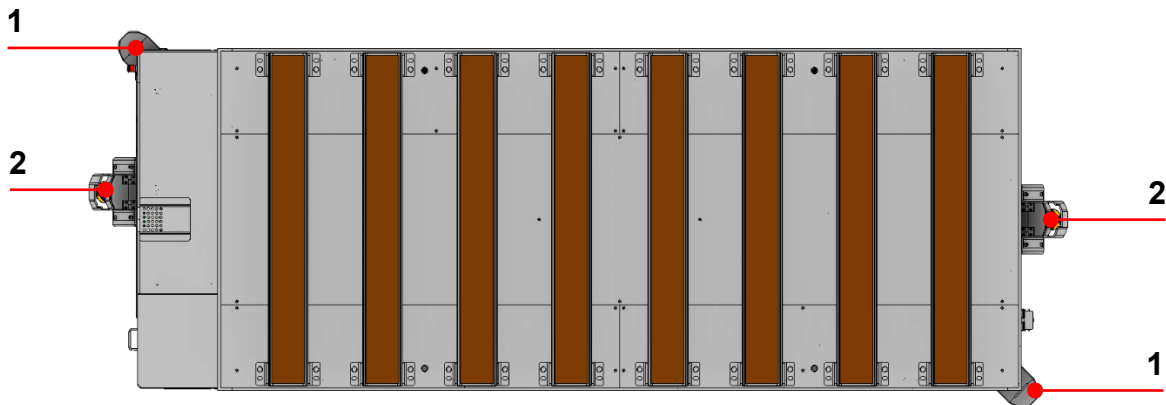
Function: Slowing down and stopping the machine in case of interception of the intervention areas.

Characteristics and methods: Two pairs of laser scanners are installed on the machine, one **(1)** with the function of detecting obstacles on the ground and a second one **(2)** directed upwards to detect any obstacles at height.

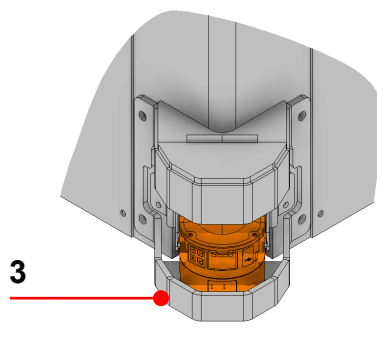
Each laser scanner is protected by special steel covers **(3)**.

Each of these devices is programmed with two areas of operation:

- Deceleration area (GREEN): the machine decreases its speed.
- Stop area (RED): the machine stops immediately.

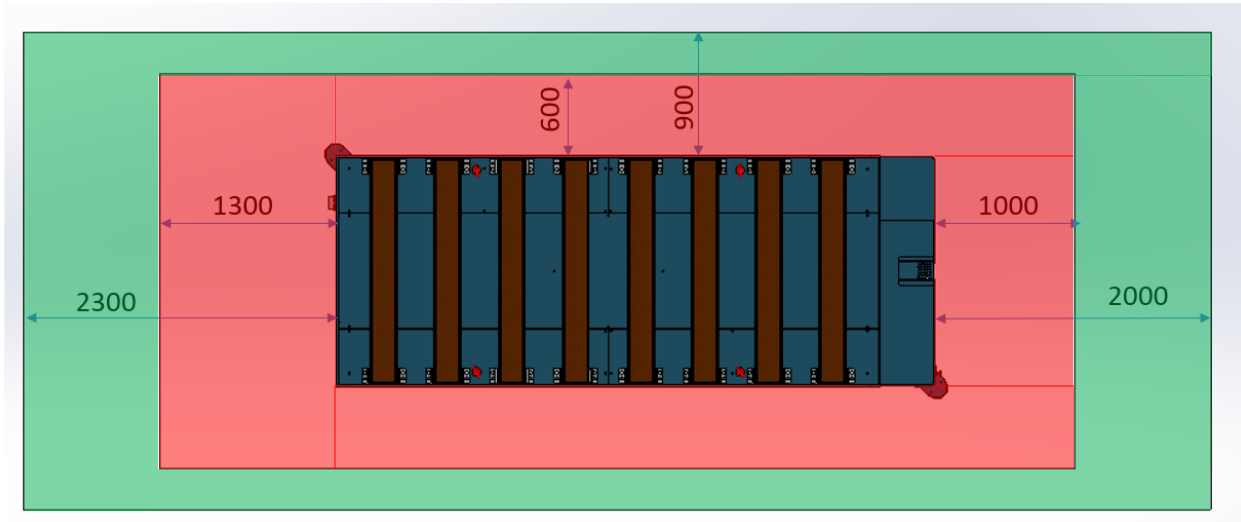


Laser scanner position



Below are diagrams of the laser scanner intervention areas (elevations in mm).

LASER SCANNER (1) STRAIGHT STRETCH



LASER SCANNER (2)

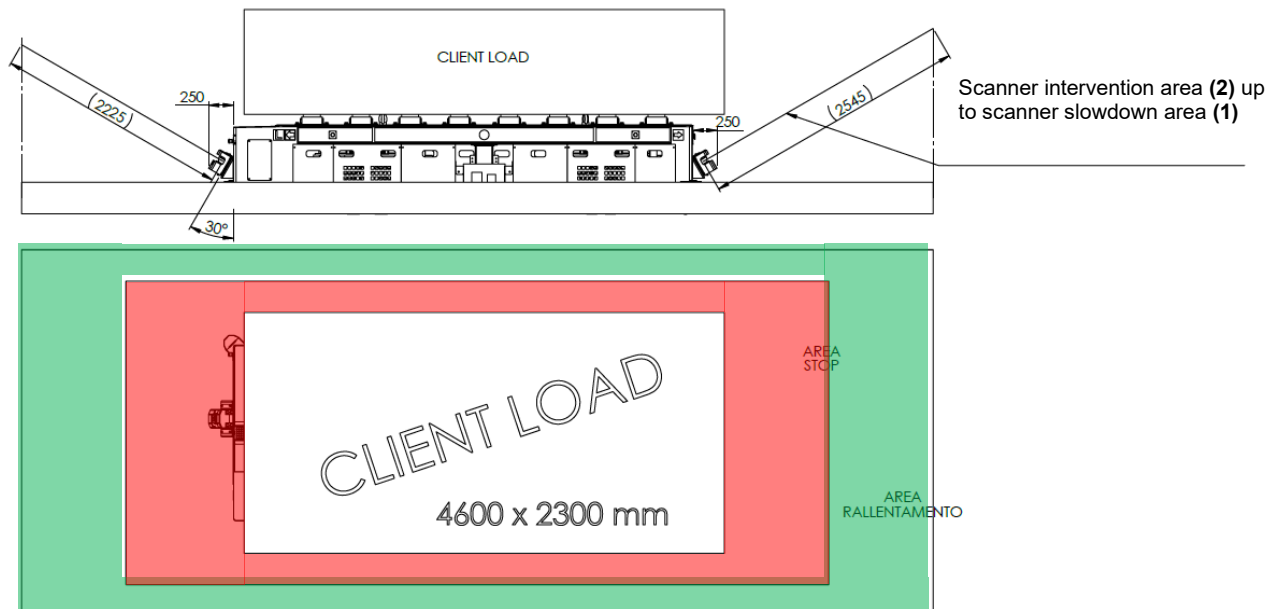


Image for illustrative purposes



ADDITIONAL INFORMATION

For more information, please refer to the attached laser scanner manual.



CAUTION

The beam interceptor must not be used to lock the machine for maintenance.
Any tampering with the devices involves a possible risk.



CAUTION

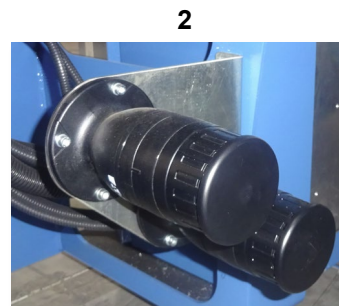
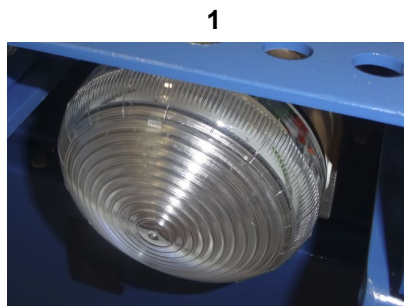
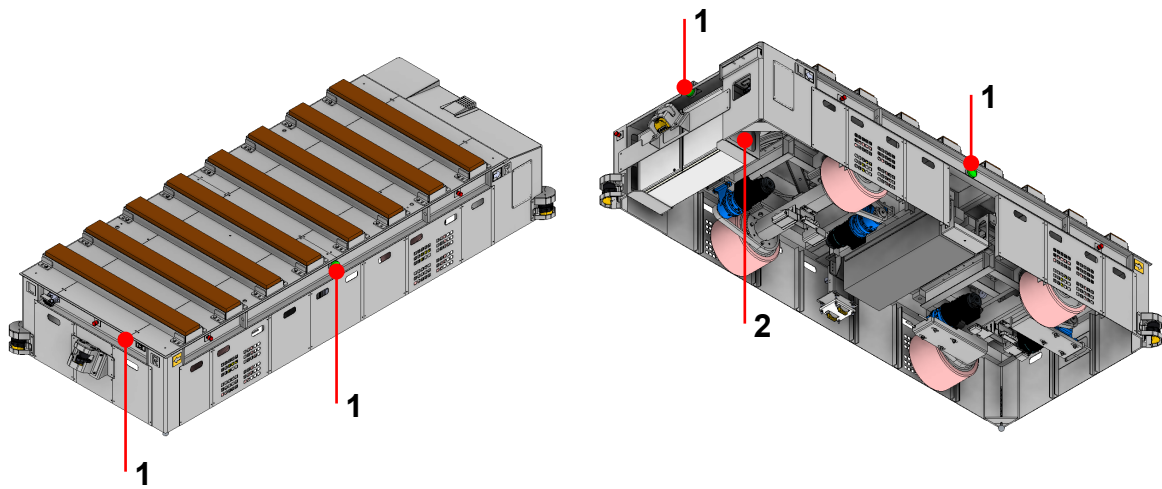
The protection of personnel involved in the operation and maintenance of the machine is not guaranteed if the laser scanners are not used in accordance with the relevant manual.

2.6.6 Visual and acoustic indications

Function: Visual and acoustic signalling of moving machine.

Characteristics and methods: The machine has four lamps and a buzzer that activate when it is in motion.

1. Indication lamp
2. Buzzer



2.6.7 Safety circuits

Function: To control electric circuits and interrupt electric supply before hazardous overloads/short circuits are generated.

Characteristics and methods: If an overload or short circuit occurs, the fuses installed inside the electric panel cut out the power supply to the circuits and immediately stop the machine.



ADDITIONAL INFORMATION

For information on the location of the fuses refer to the wiring diagram with its bill.

2.7 PERSONAL PROTECTIVE EQUIPMENT

The machine operator is to use the personal protection devices to reduce the possibility of risks to a minimum.



DANGER

The clothing of those who work or perform maintenance on the machine must comply with the essential safety requirements set by EU Directives and laws in the country where the machine is used.



DANGER

During the operations of management and maintenance, personnel should wear appropriate work clothing so as to prevent the occurrence of accidents.

To avoid mechanical risks, such as dragging, entrapment, etc., keep hair gathered up and do not wear bracelets, wrist-watches, rings or chains.

2.8 RESIDUAL RISKS

2.8.1 General information

In the design phase have been assessed all zones or high-risk parts and were taken as a result all necessary precautions to avoid risks to persons and damage to machine components.



NOTE

Periodically check the operation of all safety devices.

Do not dismantle the guards on the machine.

Do not insert foreign objects and/or equipment in the machine movement area.

2.8.2 Residual risks

After carefully examining all possible machine risks, all the necessary solutions have been applied to eliminate the risks and limit hazards for exposed persons.

In spite of all the precautions applied, some risks that cannot be eliminated remain on the machine indicating the applied precautions (warning plates) in the zones involved.

- **Crushing of lower/upper limbs hazard near the wheels**

This hazard is present when resetting laser scanners with the "SAFETY OFF" mode active.

The operator in charge of the machine is to remain at a safe distance from the machine and always have a complete view of the area, checking there is nobody in the zone during movement.



CAUTION

As a precautionary measure for safety purposes, you need to periodically check regular operation of the safety devices.



CAUTION

Never make any type of modification, to avoid creating additional unforeseen hazards and risks.

2.8.3 Plates on the machine

The Manufacturer has installed a series of plates on the machine, defined in compliance with the European standards regarding graphic symbols to be used. The plates in question are located in a prominent position on the machine.

The maintenance service is required to immediately replace all the plates which, due to wear, they should become illegible.



CAUTION

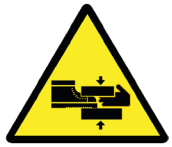
It is absolutely forbidden to remove the warning notices on the machine.

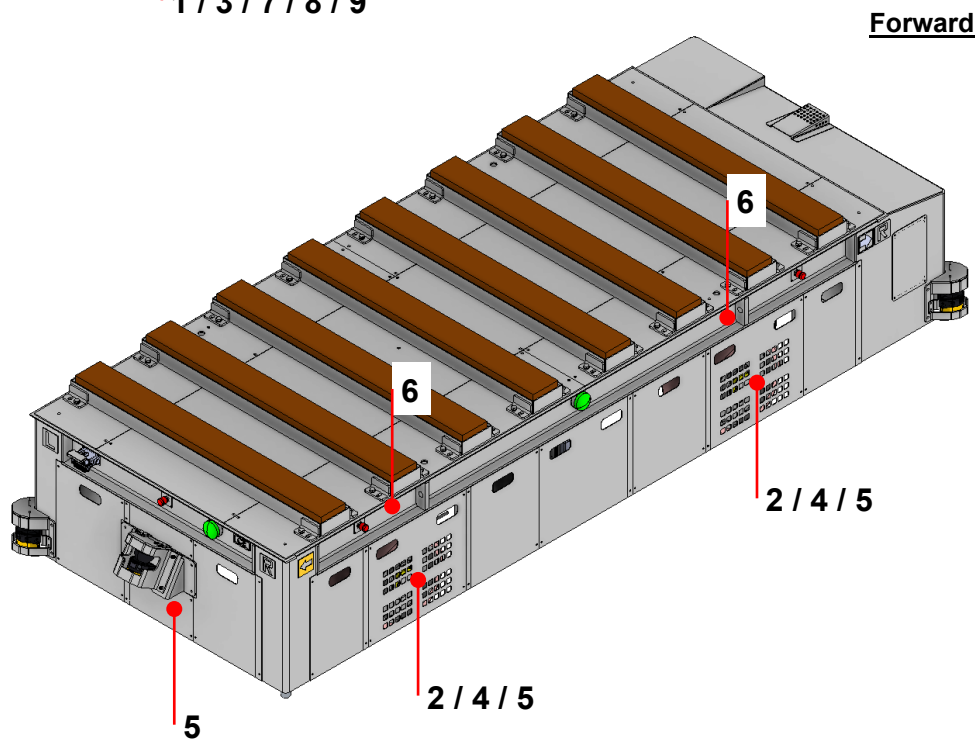
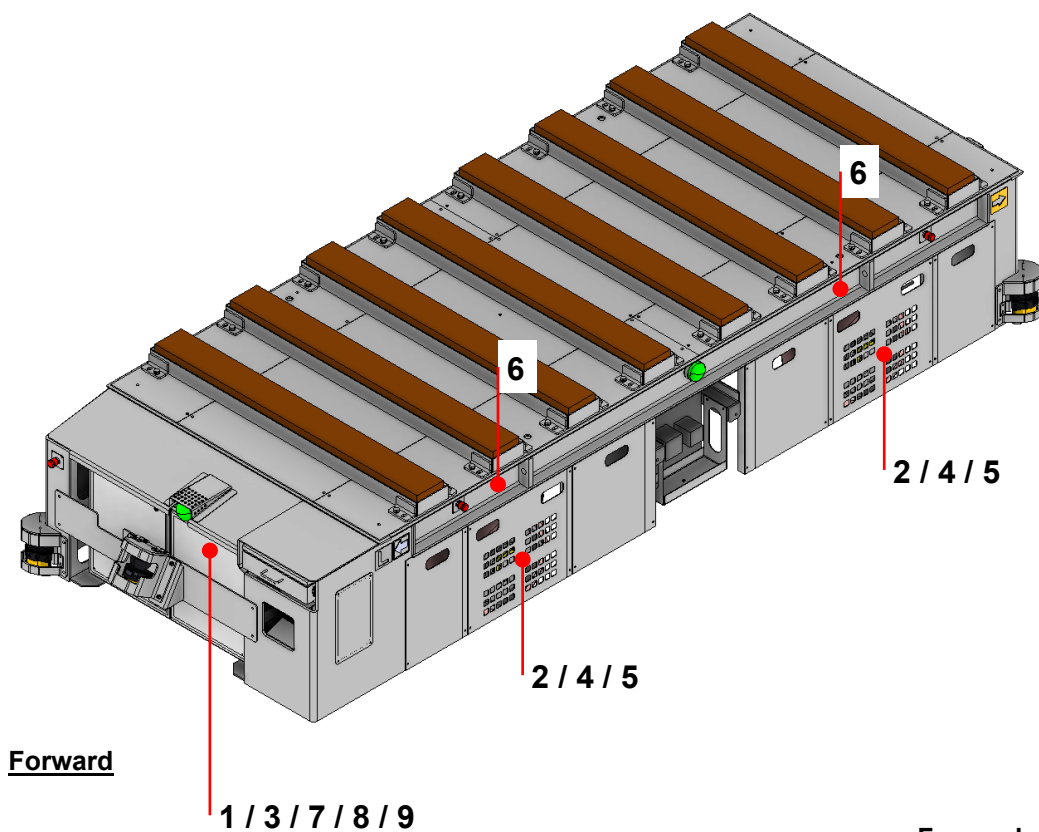
The manufacturer declines all responsibility for the safety of the machine in case of failure to comply with this prohibition.



ADDITIONAL INFORMATION

For information on the warning plates installed on the incorporated parts of the machine, consult the specific manuals.

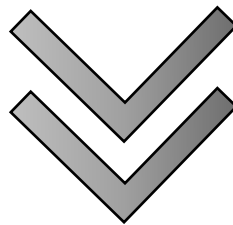
PLATES ON THE MACHINE		
Plate 1		Hazardous electric voltage
Plate 2		Upper and lower limbs crushing hazard
Plate 3	 ATTENZIONE È VIETATO ESEGUIRE LAVORI SU APPARECCHIATURE ELETTRICHE SOTTO TENSIONE - EVENTUALI DEROGHE DEVONO ESSERE AUTORIZZATE DAL PROPRIO RESPONSABILE - IN CONDIZIONE DI PARTICOLARE PERICOLO DEVE ESSERE PRESENTI UN'ALTRA PERSONA OLTRE A CHI ESEGUE IL LAVORO INIZIARE I LAVORI SOLO AD AVVENUTA ATTUAZIONE DELLE MISURE DI SICUREZZA	Do not carry out maintenance with equipment powered.
Plate 4		Do not clean, oil, grease, repair or adjust moving parts by hand
Plate 5		Do not remove safety devices
Plate 6		Do not climb on the machine
Plate 7		Do not extinguish fires with water
Plate 8		It is compulsory to wear protective gloves
Plate 9		Obligation to read the user and maintenance manual



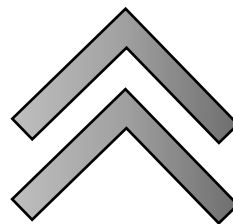
**SELF-PROPELLED
ELECTRONIC TROLLEY WITH TYRES AGV
Serial number 2423**



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GENERAL DESCRIPTION



**SELF-PROPELLED
ELECTRONIC TROLLEY WITH TYRES AGV
Serial number 2423**



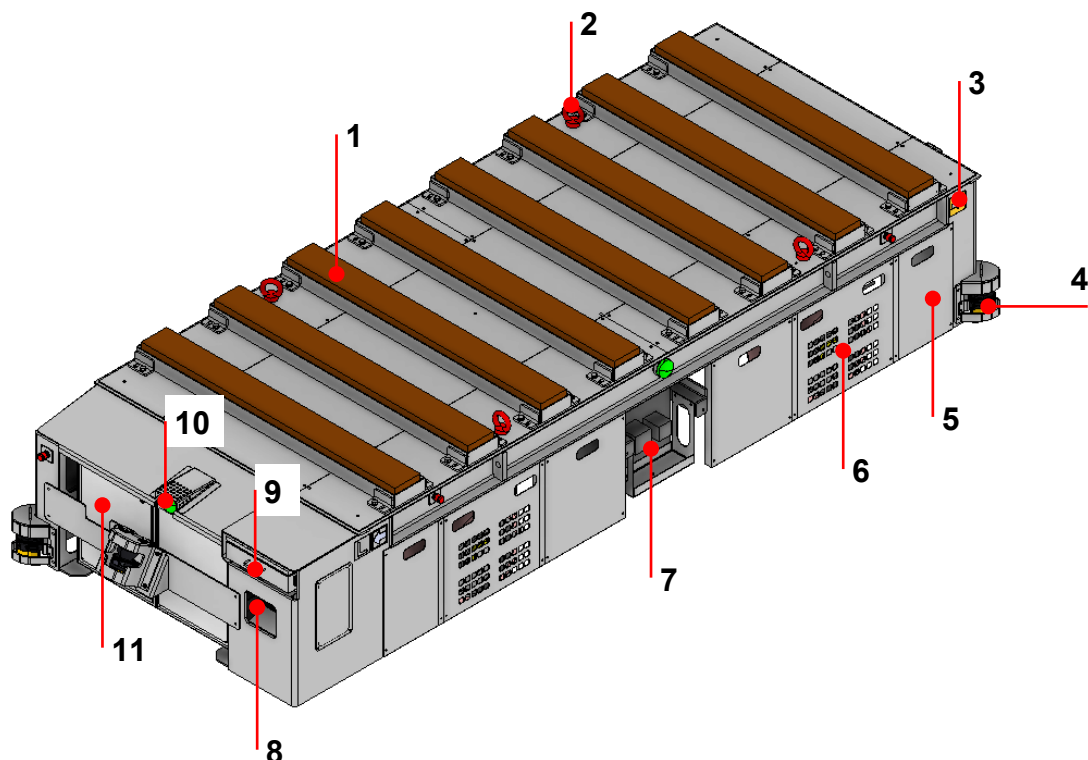
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3. GENERAL DESCRIPTION

The machine has been designed and built to handle heavy loads, distributed on the loading surface, according to the technical specifications indicated in this manual. It can be used indoors on a concrete or asphalt floor (flat, smooth and level).

3.1 LAYOUT

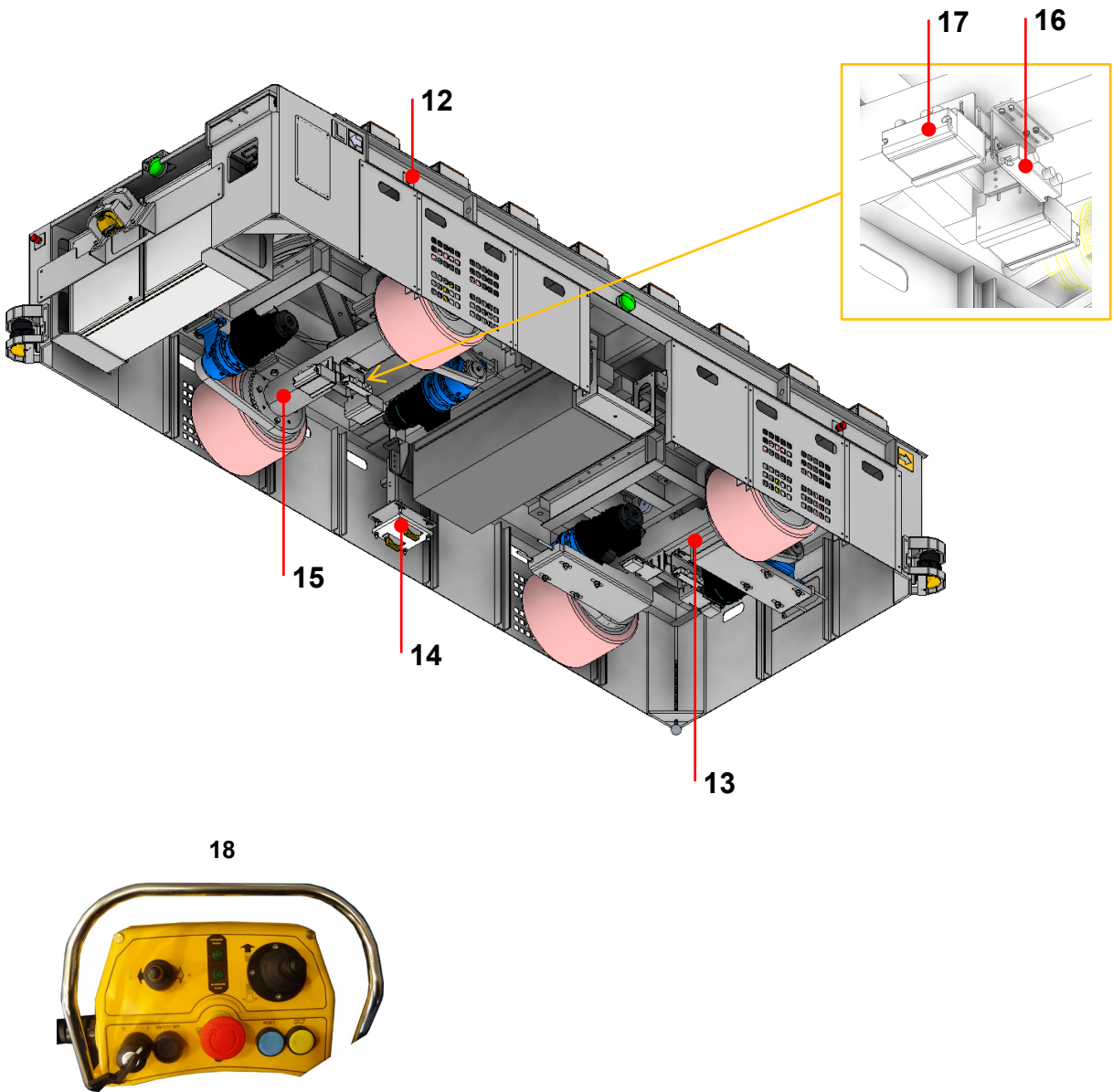
N.	DESCRIPTION
1	Load support crossbar
2	Machine lifting point
3	Running direction plate
4	Laser scanner
5	Smooth carter
6	Grilled casing
7	Battery
8	Shoulder strap push-button panel connection socket
9	Extractable control pulpit
10	Indication lamp
11	Electrical panel



**SELF-PROPELLED
ELECTRONIC TROLLEY WITH TYRES AGV**
Serial number 2423



N.	DESCRIPTION
12	Emergency button
13	Tilting rear axle
14	Charging pad
15	Rigid front axle
16	Transponder reading sensor (TAG RFID)
17	Inductive cable reading sensor
18	Shoulder strap push-button panel



3.2 TECHNICAL DATA

The following table contains the main machine data.

GENERAL	
Machine weight	Approx. 4.500 kg
Maximum working load (WLL)	40 t distributed
Machine dimensions	Approx. 4.700 mm x 2.000 mm
Height of load bearing crossbars	950 mm approx. from ground
Maximum permissible gradient	Approx. 2 %
Emergency buttons	1 on the shoulder strap push-button panel + 6 on the machine
Movement indicators	Acoustic and lights
Machine lifting points	4
Frame	Steel
Loading bed	Smooth steel sheet + 8 wooden crossbars
Transmission	Electro-mechanical
Translation	Adjustable electronic
Steering	Electric
Type of steering	Vault corrected in the centre
Steering angle	Approx. $\pm 35^\circ$
Axes	2
Steering axes	2
Wheels	4
Type of wheels	Polyurethane $\varnothing 500 \times 300$ mm
Traction motors	4 electric motors Brushless 3 kW 48 V 2.300 rpm
Maximum speed	30 m/min. approx. at full load level
Service brake	Negative electrical
Parking brake	Negative electro-mechanical
Control modes	Manual (shoulder strap push-button panel)
	Automatic (Pulpit on board)
	Semi-automatic (shoulder strap push-button panel)
AGV riding modes	Inductive cable embedded in flooring

POWER SUPPLY	
Type of power supply	1 Lithium Battery
Power supply voltage	48 V
Autonomy	Approx. 4 km
Nominal capacity	300 Ah
Recharging method	Pad on land / on board
Rectifier power supply voltage	460 V 60 Hz
Recharging time	- 50 % in 1 h - 100 % in 2÷5 h
Weight	Approx. 180 kg



NOTE

The data contained in the tables above may vary, therefore, for more precision or verification of the machine data, see the attached diagrams.



ADDITIONAL INFORMATION

For further information regarding components and devices installed on the machine, see the relevant attachments.

3.3 DESCRIPTION OF GROUPS



ADDITIONAL INFORMATION

For further information regarding the separate components of the different groups, see the working diagrams with the relevant bills of materials.

3.3.1 Machine structure

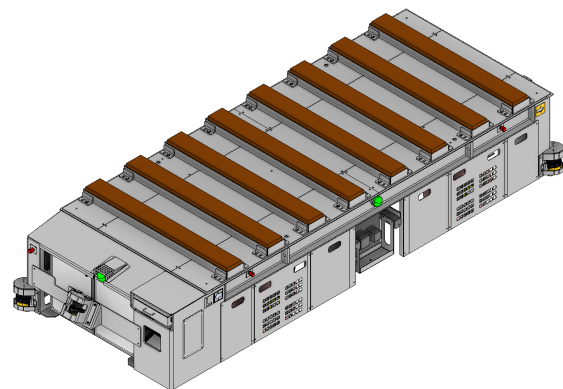
The machine has a frame (1) made of sheet metal and steel profiles and a perimeter protection guard made of smooth (2) and grated (3) sheet steel.

In the upper part of the frame there is the loading surface, in smooth sheet steel, onto which 8 crossbars (4) with a steel frame and wooden support are bolted.

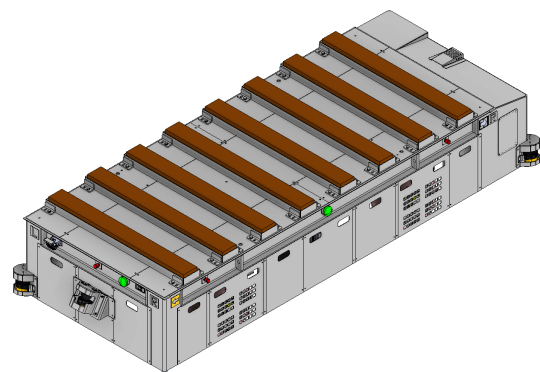
- On the loading surface there are also: N. 4 threaded holes for inserting as many eyebolts (5) for lifting the machine.
- 2 removable panels (6) for access to the steering encoders.

The paintwork is painted RAL 5009 blue.

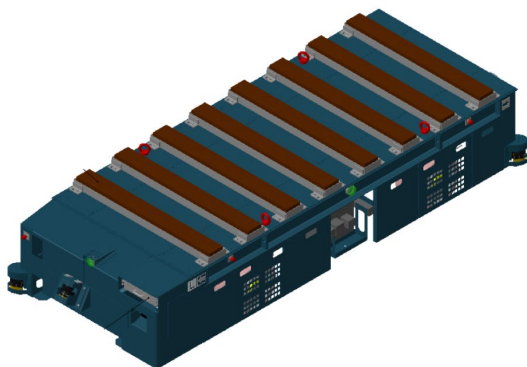
A static discharge chain is mounted at the front.



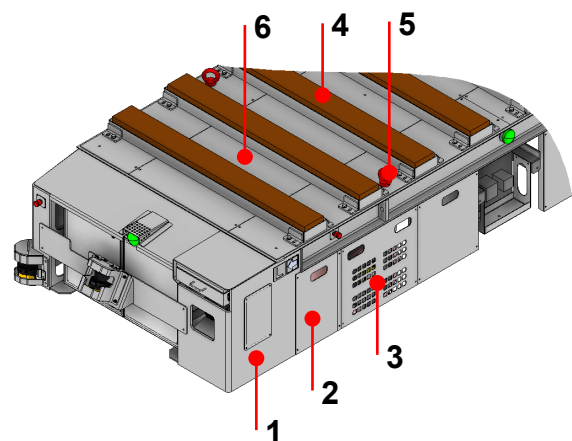
Front



Rear



Painting the machine



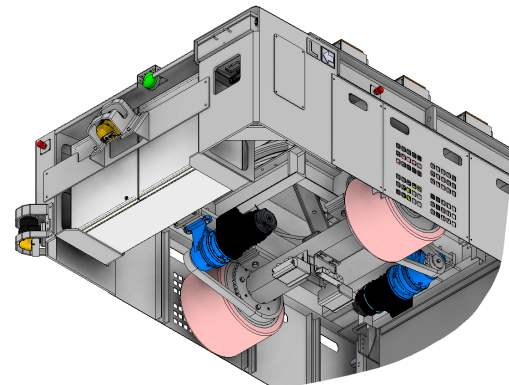
3.3.2 Wheels group

The machine is driven by four wheels **(1)**, mounted in pairs on two axles.

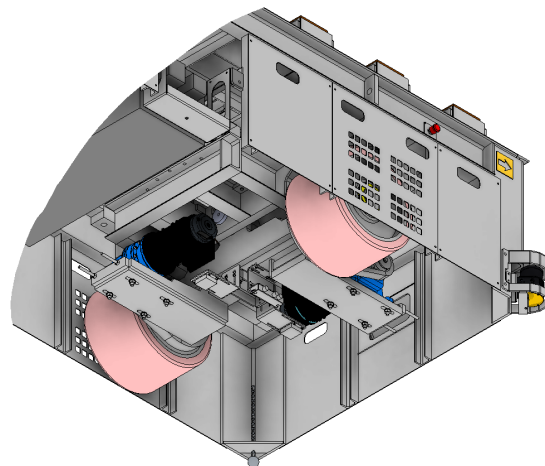
Each wheel has a steel core and polyurethane tread.

The rear wheels are mounted on a pivoting axle **(2)**. This axle is attached by means of a spindle **(3)** to a fifth wheel **(4)**, which enables it to be steered. The pivoting axle ensures that all wheels are in contact with the ground, thus ensuring better traction and correct load distribution.

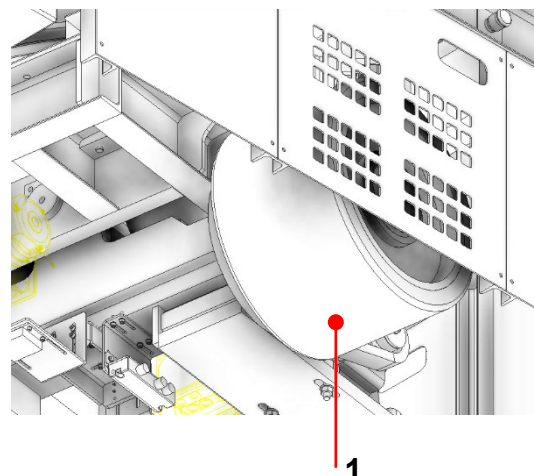
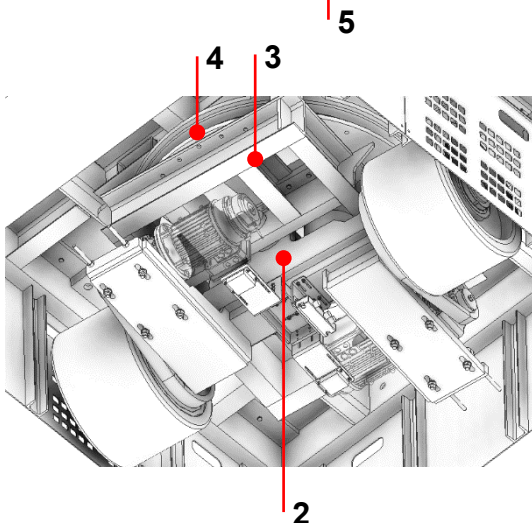
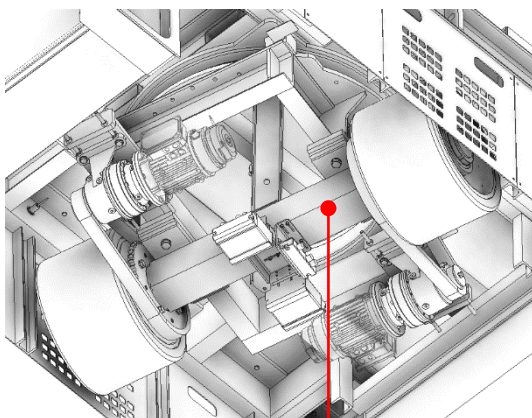
The pair of front wheels is mounted on a rigid axle **(5)**. The axle is attached by means of a spindle **(6)** to a fifth wheel **(7)**, which enables it to be steered.



Front axle



Rear axle



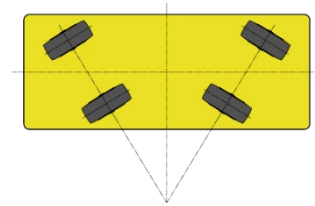
3.3.3 Steering

Electric steering is controlled by software. The steering is corrected at the centre of the machine: the wheels converge at a single point in accordance with the angle set by the operator.

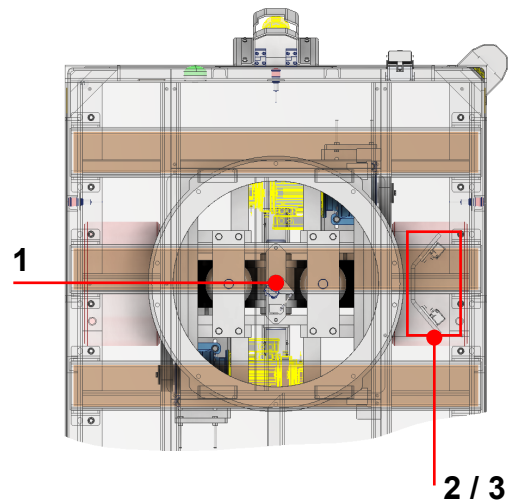
Both axles are steered. They steer via the difference in revolutions of the drive motors.

The steering angle of each axle is read by an encoder (1).

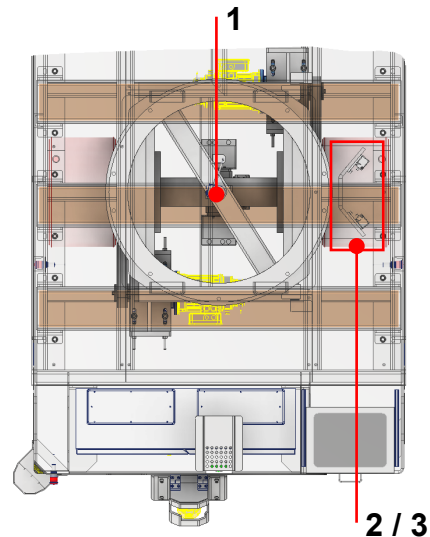
To ensure the safety of the machine, there are two types of limit switches in the event of encoder failure (the first is electrical (2) and the second mechanical (3)).



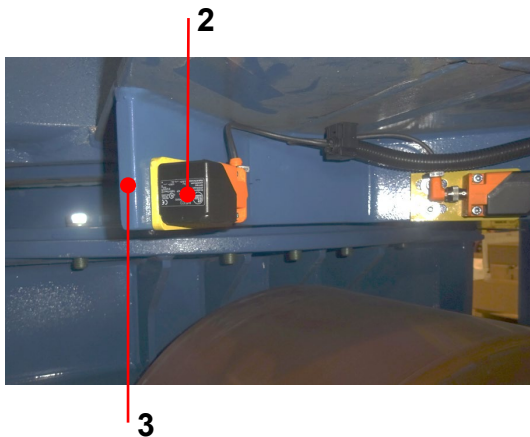
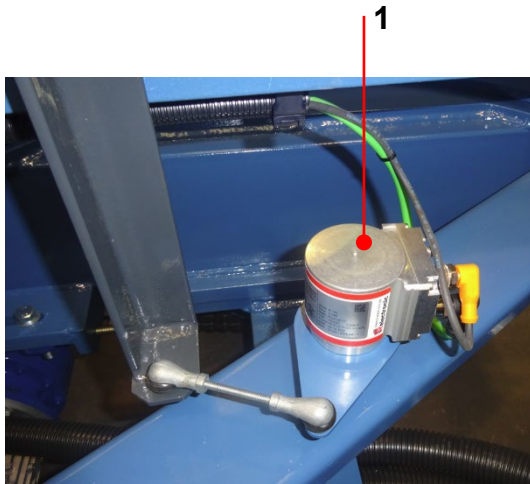
Centre-corrected vaulting



Rear axle



Front axle



3.3.4 Traction and braking

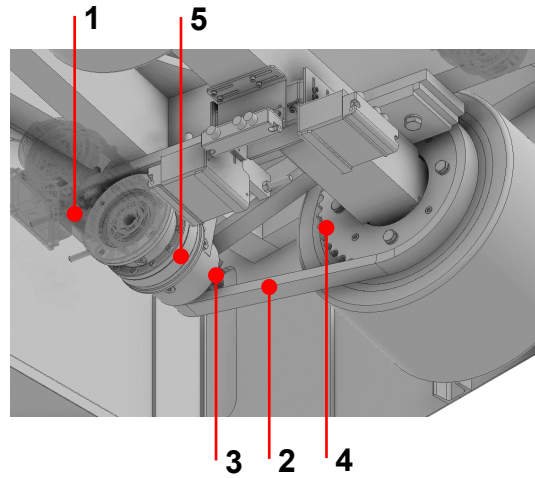
Traction is exerted on each wheel by means of an electric motor **(1)** of 3 kW and a chain **(2)** on a pinion **(3)** and crown **(4)**. Transmission is by means of a reduction gear **(5)** with helical teeth.

The electronic translation system allows gradual acceleration and deceleration ramps, millimetric movements and uniform speed variations.

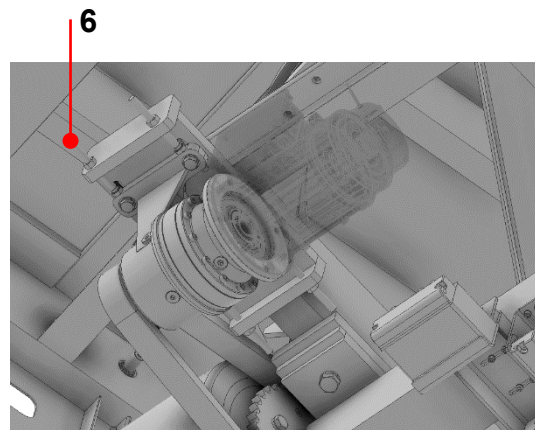
The tension of the drive chain can be adjusted by means of screws **(6)**.

Operating braking is achieved by negative torque on the traction motors.

Parking braking is achieved by negative electromagnetic brakes mounted on the traction motors.



Front axle transmission system



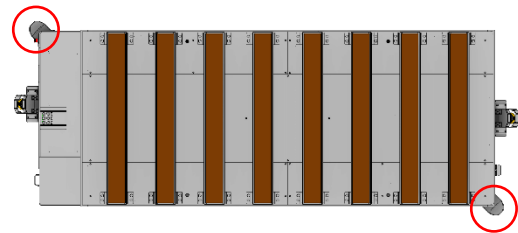
3.3.5 Laser scanner

Two pairs of laser scanners are installed on the machine, one with the function of detecting obstacles on the ground and a second oriented upwards to detect any obstacles at height.

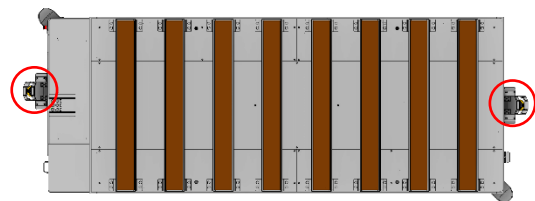
Each laser scanner **(1)** is protected by special steel covers **(2)**.

There are two intervention areas:

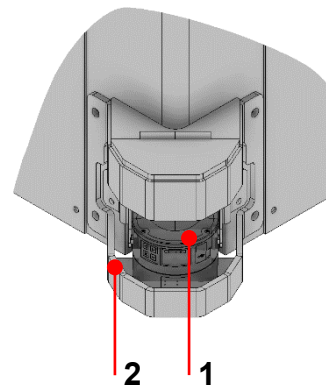
- Slowdown: If an obstacle is detected in this area, the machine slows down.
- Stop: if an obstacle is intercepted in this area, the machine stops immediately.



Laser scanner position for ground obstacles



Laser scanner position for height obstacles



SELF-PROPELLED ELECTRONIC TROLLEY WITH TYRES AGV Serial number 2423

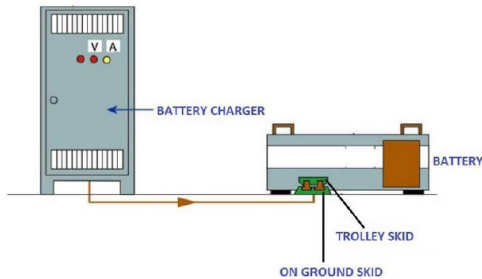
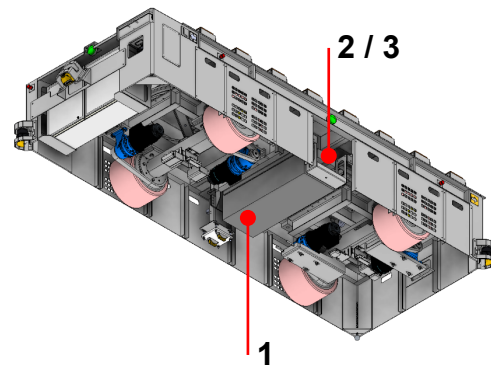


3.3.6 Power supply

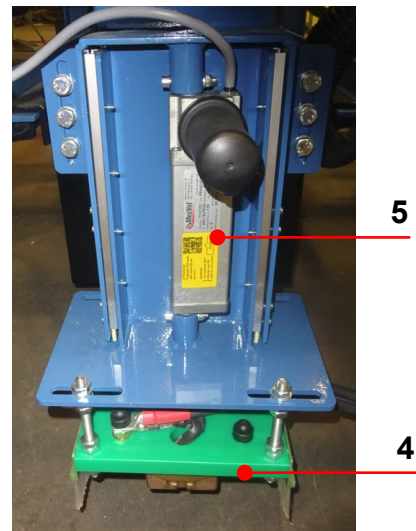
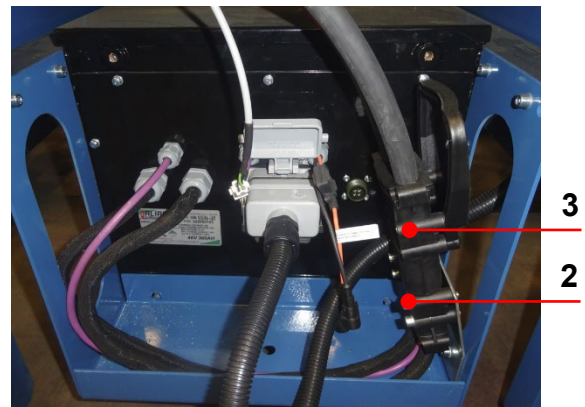
The machine is powered by a lithium battery (1), contained in a suitable metal box. The latter is equipped with special guides for insertion into the Machine frame.

The socket (2) of the battery is located on the support in front of the battery. It is connected to the plug (3) of the machine for its power supply.

The battery is recharged via the runner (4), which is attached to an electric actuator (5). At the charging station the runner (4) is lowered until it comes into contact with the rectifier runner, which is embedded in the floor.



Battery charging diagram

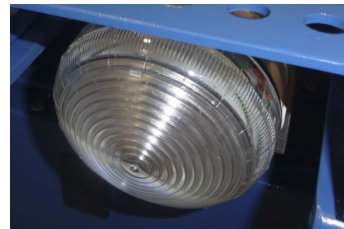
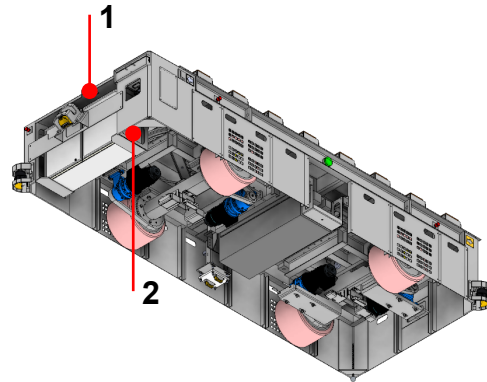


3.3.7 Light and acoustic signals

A signal lamp (1) is installed on each side of the machine.

This device activates, together with a buzzer (2), during machine movement.

There is a horn that the operator can use to warn that the machine is passing.



Lamp



Buzzer / Horn

3.3.8 Modes of operation

The machine has three operating modes.

Manual

Machine movements are controlled via the wired control panel.

There are two sockets **(1)** on the machine for connecting the wired control panel.

Automatic (bi-directional AGV)

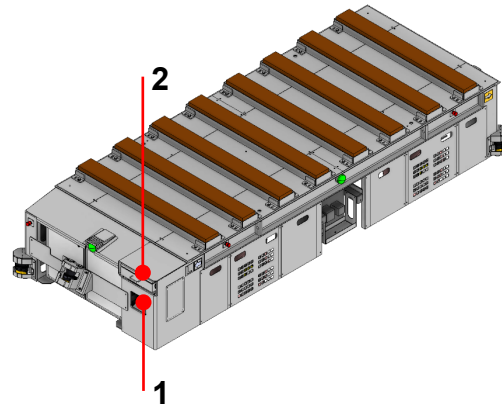
The machine is equipped with a bidirectional automatic guidance system within a predefined area.

The operator selects the destination station from the control desk **(2)** located on board. The machine moves autonomously, following a predetermined route.

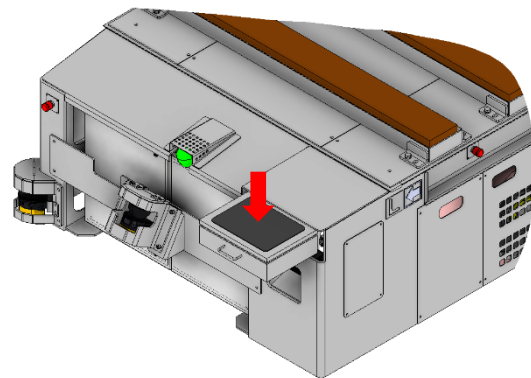
The control panel is removable. The "not withdrawn" position is detected by an inductive sensor **(3)**. If the pulpit is pulled out, movement of the machine is prevented.

Semiautomatic

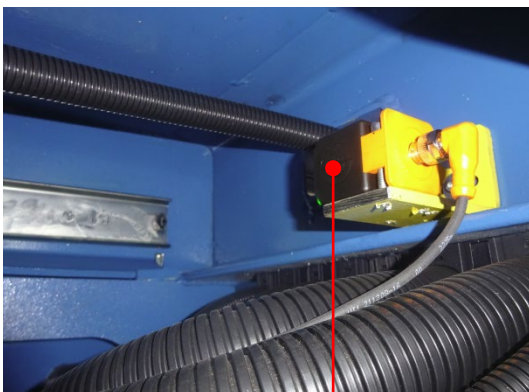
The machine's movements are managed via the wired control panel, with the exception of steering, which is managed automatically by following the path identified for automatic mode.



Shoulder strap push-button panel



Control pulpit on board the machine



3



CAUTION

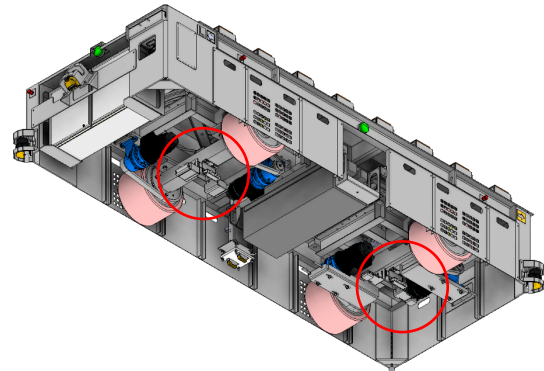
Only one operator is required to operate the machine, who must position himself as indicated in the paragraph "Operator's position".

3.3.9 Driving sensors in AGV mode

In automatic mode, the machine follows a predetermined path identified by an inductive cable buried in the pavement. The presence of the cable is detected by four guide sensors **(1)**, two for each axle.

The inductive cable is connected to a frequency generator.

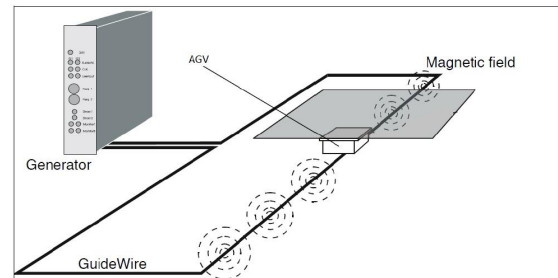
Transponders (RFID TAGs), embedded in the pavement, are used to slow down and stop the machine at stations. The transponders are detected by two reading sensors **(2)**, one for each axle.



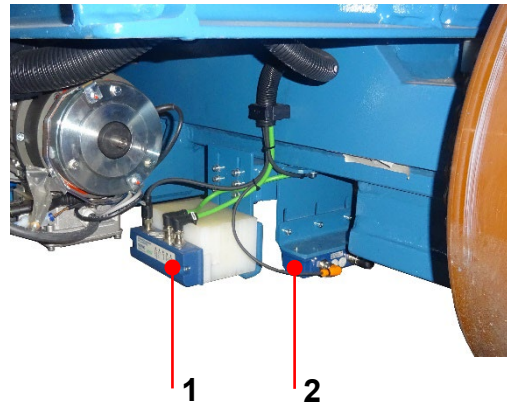
Position of cable and transponder reading sensors



Transponder



AGV operating diagram



3.3.10 Wi-Fi communication system

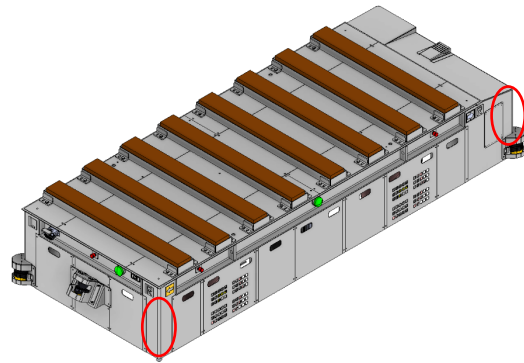


NOTE

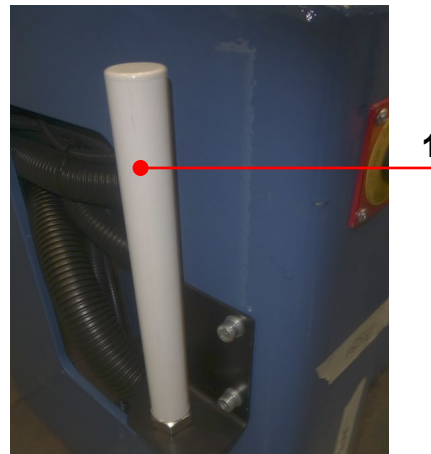
The supply includes two machines with serial numbers **2423/1** and **2423/2** with the same technical characteristics.

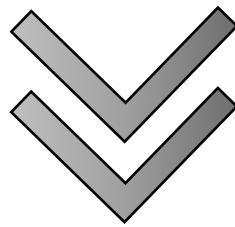
The machine is equipped with two antennas **(1)** for the Wi-Fi network generated by three Access Points conveniently installed at the plant.

The two machines communicate with each other via this network and a Siemens PLC and client, exchanging information on their respective positions, destinations and statuses. Based on this information, the control system decides on the routes to be followed and the priorities to be observed.

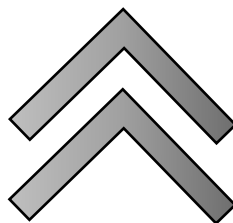


Wi-Fi network antenna position





TRANSPORT AND STORAGE



**SELF-PROPELLED
ELECTRONIC TROLLEY WITH TYRES AGV
Serial number 2423**



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4. TRANSPORT AND STORAGE

4.1 STORAGE

The machine is shipped by the Manufacturer already assembled and with the battery inside already charged.

The packaging does not protect the machine against external weather conditions, such as rain, snow, hail, etc even if it is transported in wooden cases. Therefore, if it remains exposed to weather conditions it is indispensable that it remains in the closed container until the final storage.

The storage site is to be appropriate for use as a machine warehouse: closed, protected against weather conditions, clean and ventilated. The floor is to be able to sustain the weight of the machine. Environment temperature is to be between 0 ° C and + 30 ° C.

The Manufacturer shall not be held liable for damage caused by long periods of storage or under conditions that differ from those indicated.

4.1.1 Storage of battery/batteries

When not used, the battery is to be kept in a covered area that is protected against weather conditions, dry, free of dust and protected against frost. Inspect and recharge at regular intervals, at least weekly. Run complete recharging cycles before periods of long inactivity.



ADDITIONAL INFORMATION

For any other information regarding the battery, see the relevant manual attached.

4.1.2 Complementary to the machine

The Manufacturer, as well as the delivery of the machine, also supplies:

- N.1 Rectifier for battery recharging, complete with cables.
- N.4 Fixed lifting eyebolts M30.
- N.3 Access Point.
- N.1 Frequency generator.
- Inductive cable.
- Transponder (TAG RFID).



ADDITIONAL INFORMATION

For further information regarding the additional devices, see the relevant documentation.

4.2 TRANSPORT

The machine may be shipped, according to the destination, in the following ways:

- BY SEA → The machine is enclosed in a flat-bottom case and anchored with tie-bars. The case is lined with tarred paper and has a hatch for Customs clearance; it also contains bags with drying salts to protect against humidity and salinity.
- BY AIR → The machine is enclosed in a flat-bottom case and anchored with tie-bars. The case is lined with tarred paper and has a hatch for Customs clearance; it also contains bags with drying salts to protect against humidity and other atmospheric agents.
- BY LAND → Land transport can be divided into two categories:
 - LONG-DISTANCE TRANSPORT the machine is covered with protective sheets, closed in a flat bottom wooden case and anchored on the truck loading bed with tie-bars.
To lift the case, scrupulously follow the instructions stamped on the outside of the packaging. The packaging can be recovered for possible re-use, it is therefore a good rule to keep it in a protected place, to avoid damage that could affect the reliability. If instead it is to be disposed of, it is the responsibility of the Customer to dispose of it in accordance with the regulations of the country.
 - MEDIUM AND SHORT-DISTANCE TRANSPORT the machine is secured to a flatbed and covered with protective sheets.

The anchorage points for lifting are indicated on the shipped packages.

Furthermore, externally on the packages there are all the indications to identify the contents and for the safe handling:

- Address of the receiver and the sender.
- Dimensions (length, width, height).
- Gross, net weight and tare.
- Centre of gravity.
- Notes and symbols (e.g. fragile, this way up, etc.).
- Packing list holder label (to be contained inside each package).

4.3 LIFTING

Before any handling and/or lifting operations, it is important to know the weight.



CAUTION

All handling and lifting operations are to be carried out by qualified operators, who know the standards regarding lifting and handling of loads, and fully observe the same.



CAUTION

Use suitable lifting equipment, appropriate for the weight and overall dimensions of the load to be handled.



CAUTION

Always check the correct balancing of the load. If it is unbalanced, immediately rest it on the ground and rearrange the slings appropriately.



CAUTION

When the load is lifted by more than 50 cm from the ground, the operators are to remain at a safe distance of more than 2 m from the perimeter.

Breakage of a chain or an uncontrolled movement of the load is, in fact, a serious hazard for the safety of the operators.

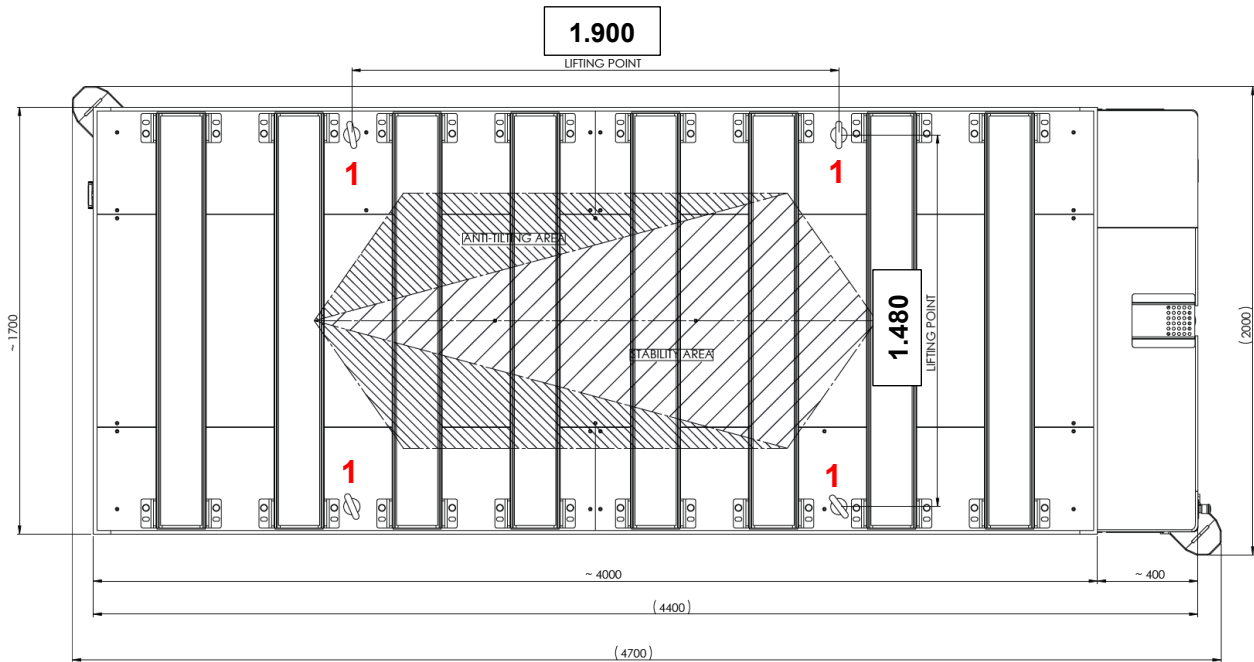
4.3.1 Weight/s

DESCRIPTION	WEIGHT
Machine	Approx. 4.500 kg

4.3.2 Machine lifting

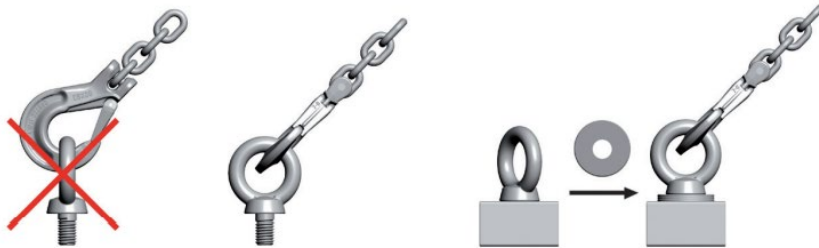
To lift the machine, proceed as follows:

- Make sure the loading bed is clear.
- Insert M30 fixed eyebolt in each of the four points **(1)** provided on the machine.



NOTE

Before using the eyebolt, check the integrity and cleanliness of the thread. To orientate the eyebolts correctly, insert suitable washers.



Images for illustrative purposes only

- Insert suitable hooks with chains into the four eyebolts.
- Attach the chains to the hook of the lifting gear.
- Slowly lift the machine taking care to balance it correctly.
- Transport is avoiding abrupt movements and keeping it as close to the ground as possible.
- Upon arrival at destination, slowly and gradually rest it on the ground.
- Only release the chains after the machine is resting perfectly on the ground.

- Remove the eyebolts.

Lifting diagram

1. Lifting point the machine

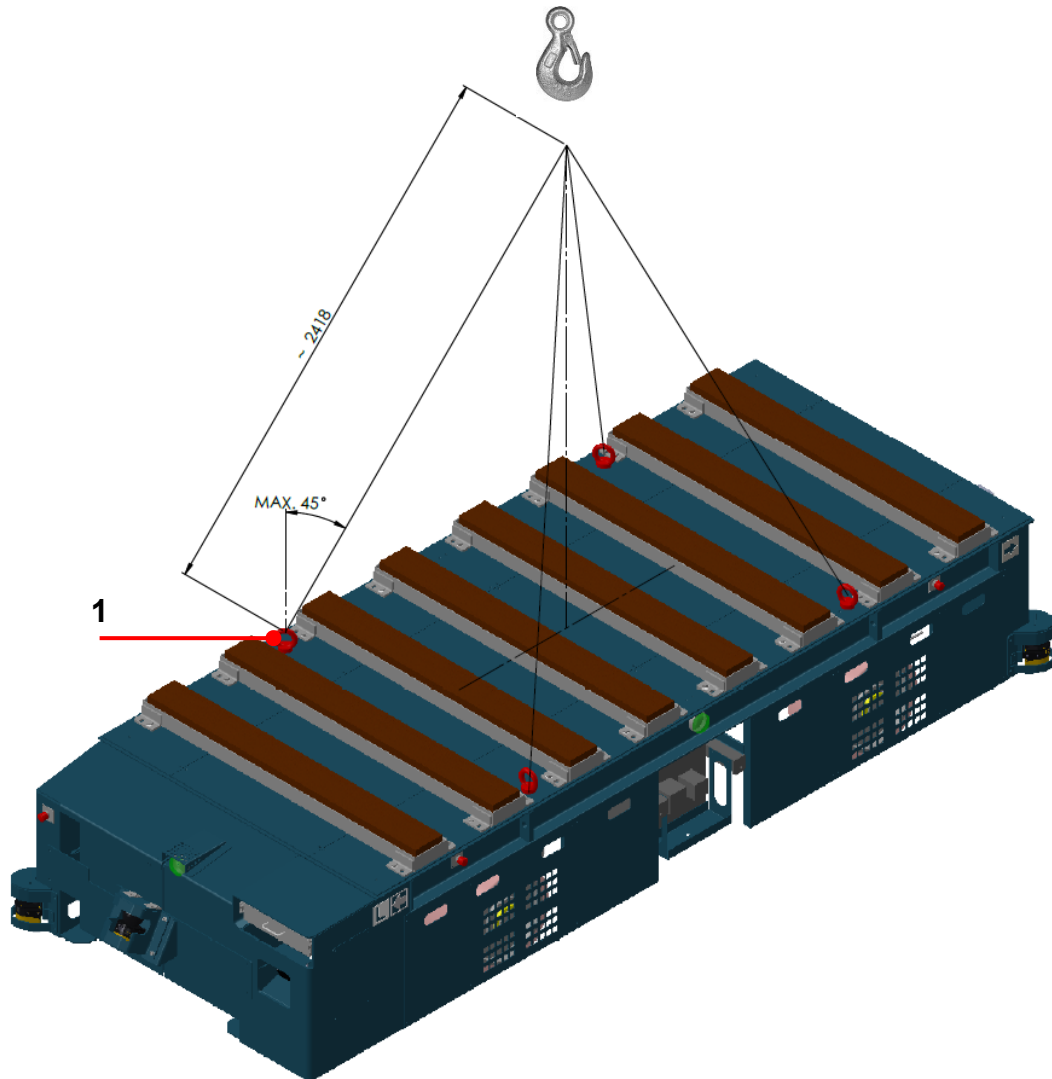
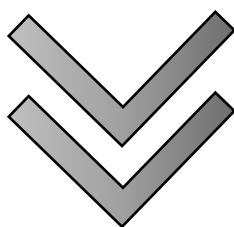


Image for illustrative purposes only

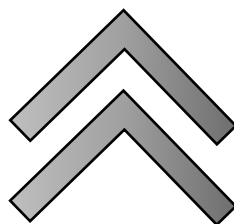
**SELF-PROPELLED
ELECTRONIC TROLLEY WITH TYRES AGV
Serial number 2423**



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INSTALLATION



**SELF-PROPELLED
ELECTRONIC TROLLEY WITH TYRES AGV
Serial number 2423**



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5. INSTALLATION

Before using the machine, the following have to be removed:

- Any fastening restraints used for transport.
- Protective packaging.

5.1 INTACTNESS CHECK

The machine has to be checked to ensure that no damage has occurred during transport. Therefore, in the case of accidents or if visible damage is seen (signs or traces of impact), please notify in this manner:

- With a written notification on the Shipping Document.
- Informing the carrier and the Manufacturer of the damage found by means of registered letter, within 48 hours of the machine delivery.

5.2 INSTALLATION OF THE MACHINE

5.2.1 General safety precautions

The operations described in this chapter are to be carried out by qualified technicians.



DANGER

Make sure there is nothing around the machine that could cause interference or hazards for the operators.



CAUTION

The operators assigned to the operations described in this chapter are to be suitably trained, so as to avoid wrong operations that could cause damage to the machine.



NOTE

The machine is shipped by the Manufacturer already assembled and with the battery inside already charged.



ADDITIONAL INFORMATION

See the specific manuals for further information regarding the incorporated devices.

5.2.2 Choice of place of use and check on requirements

The Customer **MUST** provide:

- A sufficiently large room, free of obstacles, equipped according to the safety standards in force in the user country.
- Correct ventilation and lighting.
- Appropriate lifting devices.
- Operational spaces.
- Passageways.
- Escape routes.
- A flat, level and smooth flooring, able to sustain the weight of the machine and the load on it.

5.2.3 Installation of ground components

The installation of the frequency generator, the inductive cable, the RFID transponders, the Access Points and the associated Wi-Fi network and the testing of the machine are carried out by the Manufacturer's technicians.



NOTE

For further information please contact the manufacturer.

Below is the layout with the routes of the machines and their stations.

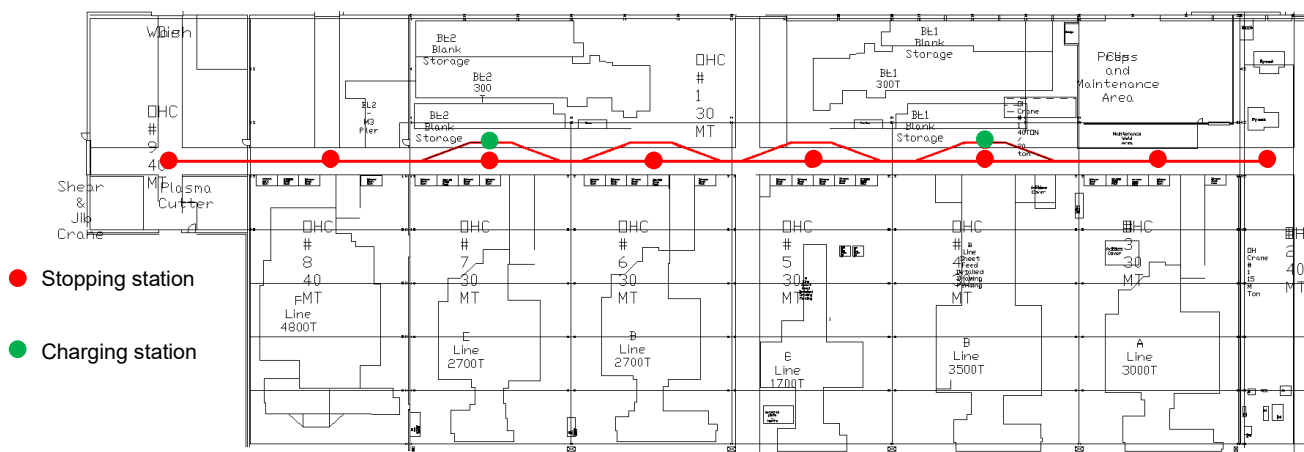


Image for illustrative purposes only



ADDITIONAL INFORMATION

For more information on the routes, please consult the attached layout.



NOTE

The electrical connection of the frequency generator and the rectifier to the factory network is the responsibility of the customer. For further information, please refer to the attached manuals.

5.3 CHECKS AND INSPECTIONS

Before starting the machine, some general controls and checks have to be carried out to avoid risks or problems during machine operation.



DANGER

These checks and preparation for the first start-up are to be carried out by a specialised technician of the Manufacturer.



CAUTION

Before starting any movement, make sure there are no anomalies to avoid damage to the machine. Before deleting any fault, check the cause and remove it.



NOTE

The checks and inspections that follow are to be considered as routine maintenance operations.



ADDITIONAL INFORMATION

For information regarding the checks and inspections to be carried out on incorporated machine parts, see the specific manuals attached.

5.3.1 Overall checks on mechanical units



DANGER

These checks and inspections are to be carried out with the machine stationary and energy source deactivated and cut-out. Ensure the working area is clear and free of obstructions.

- Visually check the wheel groups, checking there are no mechanical faults (ovalizing, crushing, warping due to loads and/or foreign objects).
- Perform a general visual inspection of the various groups that make up the machine, verifying that there are no particular mechanical anomalies or foreign bodies.
- Check that all the guards are mounted correctly.
- Check that moving parts are correctly lubricated.
- Check correct tightness of all nuts and bolts.



NOTE

To check the tightness, see the table in the paragraph “Tightening torques” in the chapter “Maintenance”.



NOTE

If problems arise, contact the Manufacturer immediately.

5.3.2 Electrical system check

Proceed with a general check on the electrical system and in particular check that all the junction boxes in the machine are closed and all the conductors are connected.

Main switch

- Rotate the voltage input selector on (1) and verify the presence of voltage, by turning on the appropriate lamp.

Motor/s

- Check correct connection of the motor/s.

Push-button panels

- Check correct functioning of the buttons and selectors with consequent switching on of the luminous indicators present.
- Check that the machine movement corresponds to the relevant control.

Indicators, antennas and sensors

- Check correct connection and functioning of the buzzer and the horn.
- Check the correct connection and operation of the lamps.
- Check the correct connection and operation of the sensors, limit switches and encoders.
- Check that the sensors for reading the inductive cable and transponders are correctly connected and functioning.
- Check that the Wi-Fi antennas are correctly connected and functioning.
- Check the correct connection and operation of the laser scanners.



ADDITIONAL INFORMATION

For further information and details, see the wiring diagram.

5.3.3 Checks on safety devices

Check that the guards and the safety devices are correctly assembled and functioning.



DANGER

Machine safety cannot be ensured if safety devices are removed or tampered with.



CAUTION

Carry out the functional, tightness and positioning checks of the safety systems as indicated in chapter 2.



NOTE

These procedures are to be applied as normal maintenance procedures.

5.4 UNIVERSAL INTERNATIONAL RECYCLING CODES

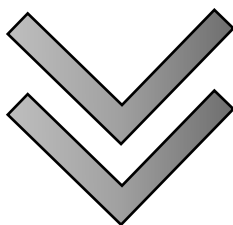
Symbol	Code	Description
Plastics		
	#1 PET or PETE	Polyethylene terephthalate or arnite: water bottles, soft drink bottles, shampoo bottles
	#2 HDPE	High-density polyethylene: containers of yogurt, detergent bottles
	#3 PVC	Polyvinyl chloride: food containers
	#4 LDPE	Low Density Polyethylene: frozen food bags, squeezable bottles
	#5 PP	Polypropylene or MOPLen: bottles
	#6 PS	Polystyrene or Styrofoam: disposable glasses
	#7-#19 O	Any other plastics
Paper		
	#20 PAP	Corrugated Cardboard: boxes of furniture to assemble
	#21 PAP	Paperboard, not corrugated: packaging of sandwiches in fast-food
	#22 PAP	Paper: pack of fries in fast-food, newsprint, paper bags
	#23-#39	Other types of paper
Metals		
	#40 FE	Steel
	#41 ALU	Aluminium: cans
	#42-#49	Other types of metal
Wooden materials		
	#50 FOR	Wood

Symbol	Code	Description
	#51 FOR	Cork
	#52-#59	Other types
Textiles		
	#60 TEX	Cotton
	#61 TEX	Jute
	#60-69	Other textile materials.
Glass		
	#70	Transparent / colourless glass: water bottles
	#71	Green glass: wine bottles
	#72	Brown glass: bottles of beer
	#73-79	Other materials in glass and cans
Composite materials		
	#80	Paper and cardboard / various metals
	#81	Paper and cardboard / plastic
	#82	Paper and cardboard / aluminium: bag of packed biscuits
	#83	Paper and cardboard / tin
	#84	Paper and cardboard / plastic / aluminium
	#85	Paper and cardboard / plastic / aluminium / tin
	#86-#89	Other composed materials
	#90	Plastic / aluminium
	#91	Plastic / tin
	#92	Plastic / various metals
	#93-#94	Other composed materials
	#95	Glass / plastic
	#96	Glass / aluminium
	#97	Glass / tin
	#98	Glass / various metals
	#99	Other composed materials

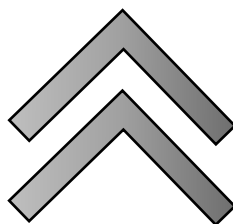
**SELF-PROPELLED
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Serial number 2423**



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USE



**SELF-PROPELLED
ELECTRONIC TROLLEY WITH TYRES AGV
Serial number 2423**

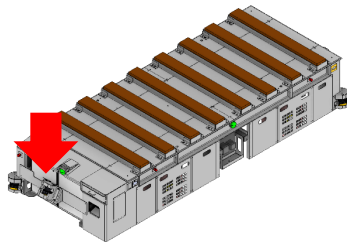


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6. USE

6.1 PUSHBUTTONS

6.1.1 Pushbutton on electric panel main



Position



Image

IMAGE	DESCRIPTION
	Power-on key selector switch Turn to position (1) to switch on the machine. Turn to position (0) to switch off the machine.
	Insertion services white luminous button Press to insert the auxiliary services.
	Voltage on white led When alight, it indicates the machine is powered.
	Battery additional time orange luminous button This switches on to indicate that the battery has reached approx. 30% autonomy. Pressing restores power to the machine for another 15 minutes, to be able to reach the recharging station.

IMAGE	DESCRIPTION
	Red luminous generic fault button When alight it indicates there is a fault/emergency. Check the cause of the fault/emergency on the display.
	Ethernet connection socket for PC connection.
	Key-operating mode selector switch Select the AUTO (automatic/semi-automatic) or OPERATOR (manual) operating mode.
	Battery display This instrument displays battery information (remaining charge, voltage, amperage, etc.). Please refer to the enclosed battery manual for further information.

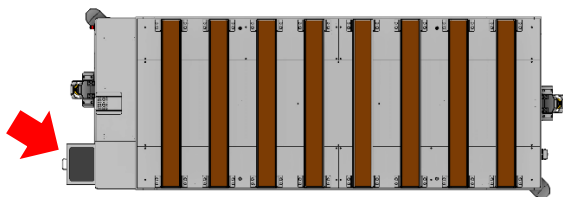
6.1.2 Shoulder strap push-button panel



IMAGE	DESCRIPTION
	Key switch to switch hand control on Turn to (1) to switch the hand control on. Turn to (0) to switch the hand control off.
	SAFETY OFF button Press when the laser scanner is triggered, to move the machine. An alarm is generated if pressed for more than 60 seconds.
	Emergency button Press in the event of danger to bring the machine to an immediate stop. To reset it, turn it clockwise.
	RESET button Press to reset the machine's safety functions after resolving the cause of the fault/emergency.
	CLACSON button While the machine is in use, press to operate the horn.

IMAGE	DESCRIPTION
	Steering lever LEFT / RIGHT Operate the lever to steer left or right. The lever has maintained action.
	FORWARD / REVERSE movement lever Operate the lever to move the machine forwards or backwards. The lever has maintained action. The travel speed is proportional to the pressure exerted.
	TRACK FORWARD / BACK LEDs These are used for the inductive cable search procedure. When the antenna detects the cable, the respective LED lights up.
	Green indicator light When lit, it signals that the hand control is switched on.

6.1.3 Command panel on board



Position



Image

IMAGE	DESCRIPTION
	Luminous green mission start button Press, after selecting the station, to send the machine to the chosen station. If the mission is paused, press to resume the mission.
	Black mission stop button Press once to pause the mission or twice to cancel it.
	Operating mode selector switch Select the AUTO (automatic) or SEMI-AGV (semi-automatic) operating mode.

CAUTION

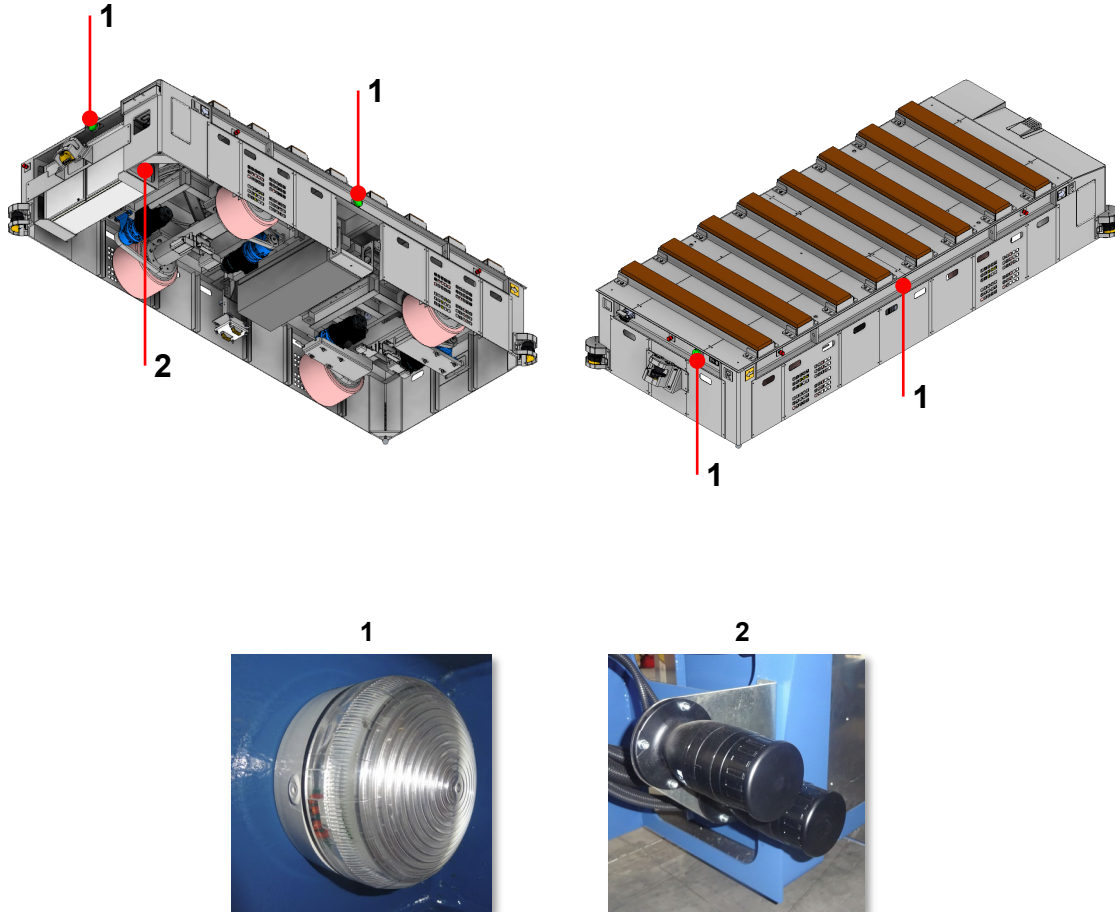
The pulpit is removable. Machine movement is only enabled with the pulpit inserted inside the machine profile, as shown in the following image.



6.2 VISUAL AND ACOUSTIC INDICATIONS

The following visual and acoustic indication devices are installed on the machine:

1. Indication lamp
2. Buzzer

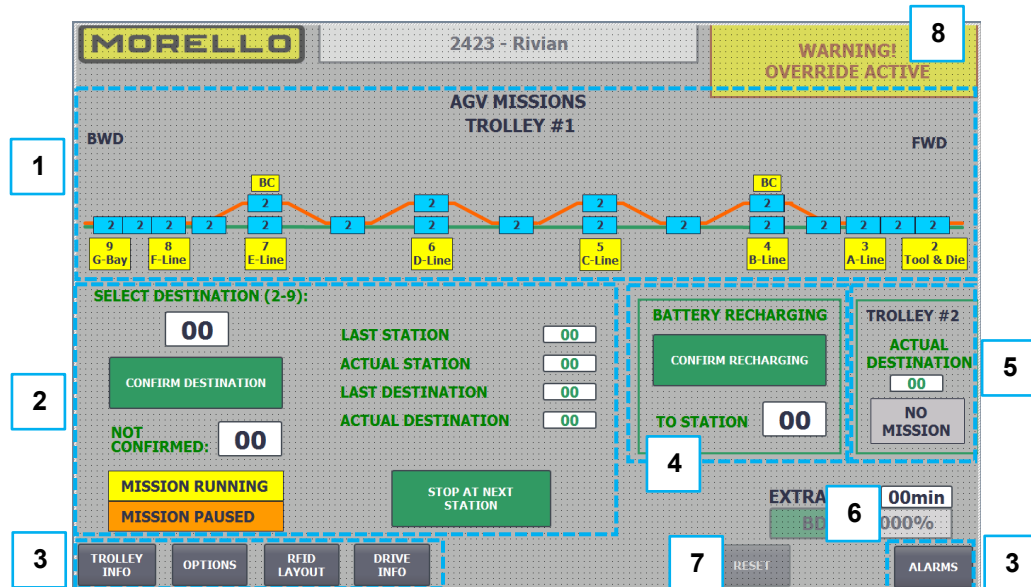


SIGNALLING	DESCRIPTION
FIXED GREEN LIGHTS	Machine stopped and ready.
FLASHING YELLOW LIGHTS	Machine in motion.
FIXED RED LIGHTS	An alarm is present.
FLASHING RED LIGHTS	A warning is present.
ALTERNATING YELLOW AND RED LIGHTS	Machine in motion (override function selected).
ALTERNATING GREEN, YELLOW AND RED LIGHTS	Battery charging in progress.
BUZZER	Machine in motion.

6.3 VIDEO PAGES

There is an LCD display on the control desk to display information about the machine and operate it in AGV mode.

6.3.1 Main page



1. This area shows the machine route and stations, the machine identification number and the direction of travel. The blue rectangle shows the position of the machine on the route.

Position BC (BATTERY CHARGING): battery charging station (the indicator is yellow if there is a machine in the station or grey if the station is free).

2. Destination selection field:
 - SELECT DESTINATION: Enter the number of the destination station. Tapping the white box opens a window with the numeric keypad.
 - CONFIRM DESTINATION: press to confirm the station entered.
 - NOT CONFIRMED: Indicates that the destination station has yet to be confirmed.
 - CONFIRMED: Indicates that the destination station, shown in the right-hand box, has been confirmed.
 - LAST STATION: Shows the last station the machine passed over.
 - ACTUAL STATION: Shows the station where the machine is located.
 - LAST DESTINATION: Shows the departure station.
 - ACTUAL DESTINATION: Shows the arrival station.
 - STOP AT NEXT STATION: In semi-automatic mode press this button to stop the machine at the first station reached. This operation is necessary for switching to automatic mode (in this mode the mission must always start at a station).
 - MISSION RUNNING: mission in progress.

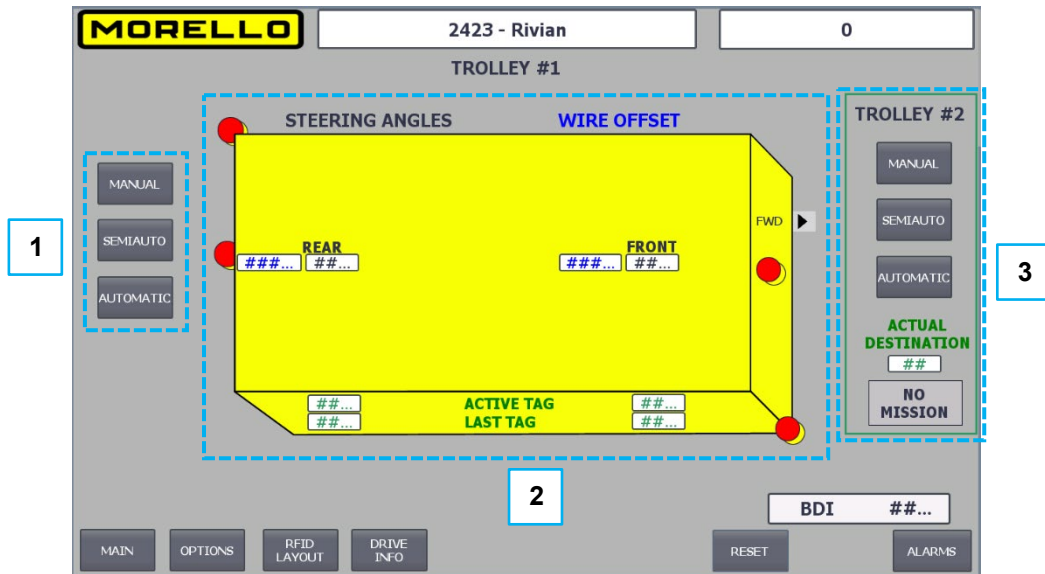
- **MISSION PAUSED:** Mission paused. Press **START MISSION** to resume the mission. Press **STOP MISSION** again to cancel the mission.
3. Press the button to open the respective page.
 4. Press **CONFIRM RECHARGING** to select the mission that takes the machine to the charging station chosen by the system and indicated in the box.
 5. Information on the status and arrival station of the second machine is shown in this area.
 6. **BDI:** percentage of remaining battery charge.
EXTRA TIME: time remaining for the activated extra time function.
 7. Press to restore the machine's safety functions after resolving the cause of the fault/emergency.
 8. **WARNING! OVERRIDE ACTIVE:** The **OVERRIDE** function has been activated to allow the machine to perform missions.



CAUTION

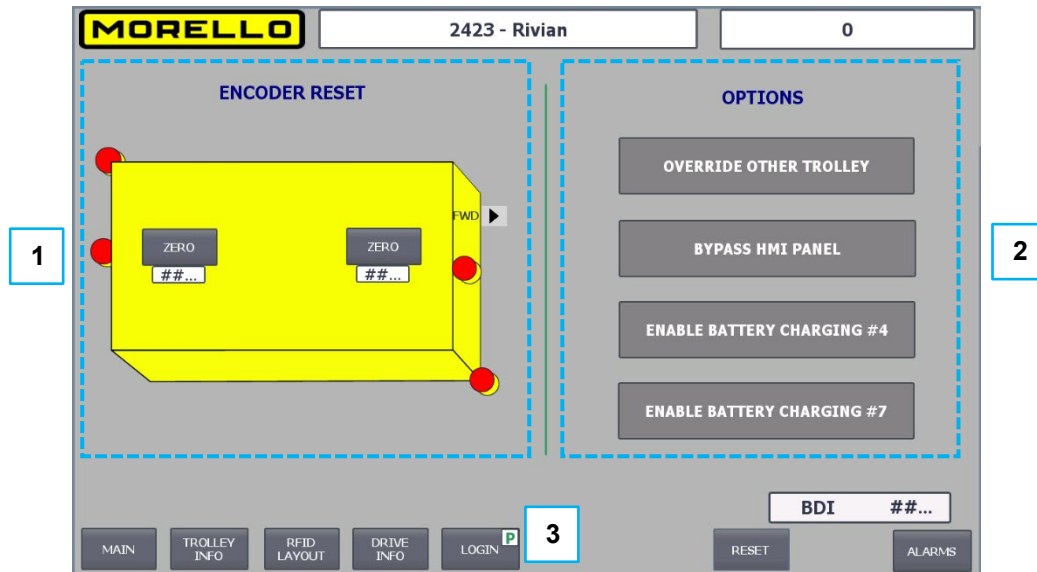
It is the responsibility of the operator using the machine (example: 2423 / 1) to check the absence of the second machine (example: 2423 / 2) on the route to be taken, before proceeding with the handling.

6.3.2 Information page



1. This area shows the operating mode active on the machine.
2. This area shows the layout of the machine with the status of the laser scanners, the value (in black) of the axis steering angle and the value (in blue) of the antenna offset from the inductive cable. Also shown for each axis is the number of the last TAG detected and the TAG on which it is currently located.
3. This area shows the operating mode active on the second machine, its status information and the target station.

6.3.3 Options Page



1. In this area, the steering angle of the respective axis can be displayed in white boxes. Press the respective ZERO button to reset the steering encoder to zero (function under password).
2. Options area (functions under password):

- **OVERRIDE OTHER TROLLEY:** When the machine does not know the position of the second machine (e.g. machine off, etc.) the mission cannot be executed.

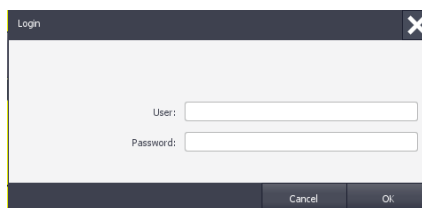
The OVERRIDE function virtually eliminates the other machine from the route, allowing missions to be carried out. The active function is indicated by the YELLOW / RED flashing of the warning lamps on board the machine.



CAUTION

It is the responsibility of the operator using the machine, with the OVERRIDE function active, to check the absence of the second machine on the route to be travelled, before proceeding with the assignment of a mission.

- **BYPASS HMI PANEL:** allows the machine to be operated even with the on-board control panel in the extracted position.
 - **ENABLE BATTERY CHARGING #:** this option allows the charging station to be included or excluded.
3. Press to enter the protected area. The following login window is displayed.

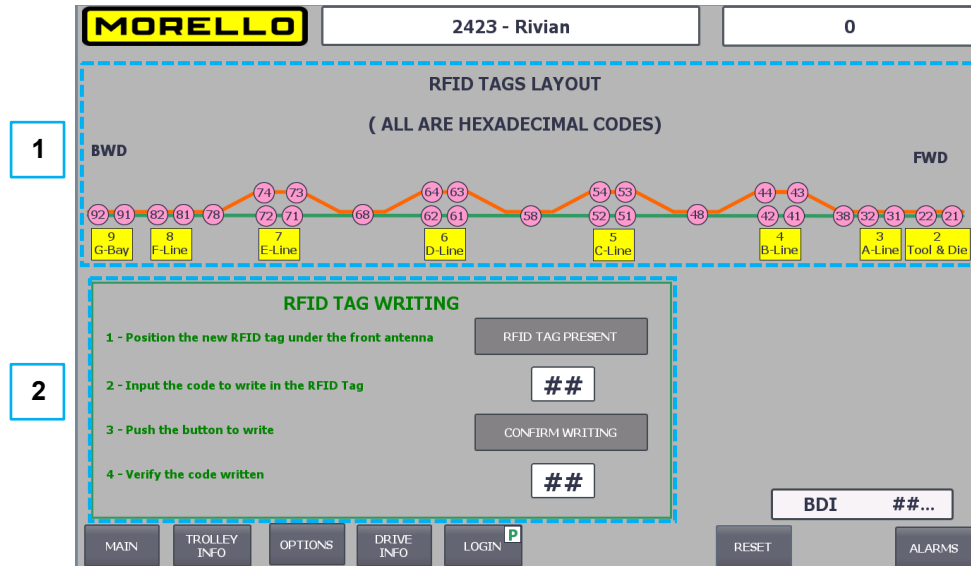


NOTE

For access credentials to the protected area, contact the manufacturer.

6.3.4 TAG Layout Page

This page shows the route of the machines with the existing stations, TAGs and their codes (1). Following the procedure (2) it is possible to code new TAGs in case of replacement (function under password).



NOTE

For more information contact the manufacturer.

6.3.5 Drive Information Page

This page shows information on drives and motors.

MORELLO

2423 - Rivian

0

DRIVE INFO

MOTOR	Front Left	Front Right	Rear Left	Rear Right
Working hours :	###...	###...	###...	###...
Motor temperature:	###°C	###°C	###°C	###°C
Drive temperature:	###°C	###°C	###°C	###°C
Fault code:	###	###	###	###

BDI###...

MAIN

TROLLEY INFO

OPTIONS

RFID LAYOUT

RESET

ALARMS

6.3.6 Active Alarms Page

This page shows the list of active alarms. Pressing HISTORY shows the history.

MORELLO 2423 - Rivian 0

ACTIVE ALARMS

No.	Time	Date	Message
-----	------	------	---------

BDI ##...

MAIN TROLLEY INFO OPTIONS RFID LAYOUT DRIVE INFO RESET HISTORY

6.3.7 Alarm History Page

This page shows the alarm history. Pressing ALARMS shows the list of active alarms.



6.4 ALARMS

A list follows of possible alarms that may be shown on the display of the electric panel.



CAUTION

All the operations to be carried out to reset/solve the fault are to be carried out by a specialised technician.



NOTE

For further information and details regarding how to solve faults that could occur, contact the Manufacturer.

ALARM DISPLAYED	CAUSE	ACTION
Emergency	Emergency circuit has activated.	Remove the cause of the error or the hazard and reset the emergency. SPECIALISED TECHNICIAN: Check electrical continuity of the emergency circuit and correct functioning of the emergency devices.
Emergency stop - Cabled controller		
Emergency stop - Trolley push button		
Inverter Fault Drive Motor Front Right (code)	Inverter fault.	SPECIALISED TECHNICIAN: Make sure the battery is charged. Check that the inverter protection fuses are intact. Check that the relevant motor is not blocked or impeded. Check that there is voltage on the auxiliary circuits (24 Vdc). Check drive alarms through the control desk or the configuration software.
Inverter Fault Drive Motor Front Left (code)		
Inverter Fault Drive Motor Rear Right (code)		
Inverter Fault Drive Motor Rear Left (code)		
Battery low	Battery flat.	Recharge the battery.
Too much time maintaining SAFETY OFF	The time limit for the activated function has been reached.	Release the SAFETY OFF button.
Front axis - Double overrun LS	The two limit switches are engaged simultaneously.	SPECIALISED TECHNICIAN: Check the correct functioning of the limit switches.

**SELF-PROPELLED
ELECTRONIC TROLLEY WITH TYRES AGV
Serial number 2423**



ALARM DISPLAYED	CAUSE	ACTION
Rear axis - Double overrun LS		
Front axis Steering encoder not connected or defective	The value read by the encoder is not valid or consistent.	SPECIALISED TECHNICIAN: Check the correct functioning and connection of the encoder.
Rear axis Steering encoder not connected or defective		
Profinet network - One node in fault	Profinet network anomaly.	SPECIALISED TECHNICIAN: Check if Profinet nodes are powered and not in alarm condition.
Profinet Network - Front Laser scanner in fault	Laser scanner anomaly.	SPECIALISED TECHNICIAN: Check whether the laser scanners are at fault. Contact the manufacturer for more information.
Profinet Network - Rear Laser scanner in fault		
Profinet Network - Wire antenna Front Forward in fault	Fault in the inductive cable reading antenna.	SPECIALISED TECHNICIAN: Check whether the antenna is at fault. Contact the manufacturer for more information.
Profinet Network - Wire antenna Front Backwards in fault		
Profinet Network - Wire antenna Rear Forward in fault		
Profinet Network - Wire antenna Rear Backwards in fault		
Profinet Network - Front RFID reader antenna in fault	TAG reading antenna fault.	SPECIALISED TECHNICIAN: Check whether the antenna is at fault. Contact the manufacturer for more information.
Profinet Network - Rear RFID reader antenna in fault		
Profinet Network - Front steering encoder in fault	Steering encoder fault.	SPECIALISED TECHNICIAN: Check whether the encoders are at fault. Contact the manufacturer for more information.
Profinet Network - Rear steering encoder in fault		
CM_CAN 1 CanBus Drive: Module not correctly configured	CAN message reception fault from the inverter.	SPECIALISED TECHNICIAN: Check whether the inverter is at fault. For more information, contact the manufacturer and consult the device manual.
CM_CAN 1 CanBus Drive Module: All foreseen messages not completely received		

ALARM DISPLAYED	CAUSE	ACTION
CM_CAN 1 CanBus Drive: Module Bus-off		
Assisted driving: Track lost going forward - Reset	Error in reading the inductive cable.	Make sure the machine is correctly positioned on the inductive cable and reset the error.
Assisted driving: Track lost going backwards - Reset		
Assisted driving: end of track going backwards	The machine has reached the end of the route.	Move the machine in the opposite direction.
Assisted driving: end of track going forward		
Assisted driving: Stop at next station reached	The machine reached the first available station.	It is now possible to switch to automatic mode.
AGV Mode: PB Abort mission pushed	The mission stop button is pressed.	Check the status of the button.
AGV Mode: Other trolley is not at a station: Move it or override	The other machine is in unknown position.	Move the other machine to a station.
AGV Mode: Mission paused: Push Start or Stop	The mission is pending.	Press start to start the mission or stop to cancel it.
AGV Mode: First mission must start from a station	AGV mode was selected, but the machine is not positioned on a station.	Place the machine on a station.
AGV Mode: Charging mission must start from a station	The recharging mission has been selected, but the machine is not located on a station.	Place the machine on a station.
AGV Mode: No Charging station available	Charging stations are not available or are occupied.	Free a station or enable it, if possible.
AGV Mode: Mission refused-Destination busy	The mission was refused because the destination station is busy.	Change destination or free the station.
AGV Mode: Mission refused-Same destination of other trolley	The mission was rejected because the same destination was assigned to both machines.	Change destination.
AGV Mode: Mission refused-Station 9 not accessible	The mission was refused because the station is not accessible.	Change destination or release station 8.
AGV Mode: Mission refused-Station 2 not accessible		Change destination or release station 3.

**SELF-PROPELLED
ELECTRONIC TROLLEY WITH TYRES AGV
Serial number 2423**



ALARM DISPLAYED	CAUSE	ACTION
AGV Mode: Mission refused-Trolley stopped in station 8	Machine in station 9 and blocked by the other machine.	Release station 8.
AGV Mode: Mission refused-Trolley stopped in station 3	Machine in station 2 and blocked by the other machine.	Release station 3.
AGV Mode: Mission refused-Station not existing	The mission was rejected because the station does not exist.	Select an existing existing station number.
AGV Mode: Mission refused-Trolley already on deviation	The destination is located on the other route.	Change the destination or move the machine in semi-automatic mode.
Assisted driving: Destination station missed going FW	During a forward mission, the destination tag was not detected.	Check the presence and correct functioning of the undetected tag.
Assisted driving: Destination station missed going BW	During a reverse mission, the destination tag was not detected.	
Front Axis Right Motor Inverter Alarm: Drive off or CAN fault	Inverter malfunction.	SPECIALISED TECHNICIAN: Check whether the inverter is at fault. Contact the manufacturer for more information.
Front Axis Left Motor Inverter Alarm: Drive off or CAN fault		
Rear Axis Right Motor Inverter Alarm: Drive off or CAN fault		
Rear Axis Left Motor Inverter Alarm: Drive off or CAN fault		
Asse Front - CW Overrun	The limit switch is engaged.	Steer the wheels in the opposite direction. SPECIALIST TECHNICIAN: Check the correct functioning of the limit switches.
Front Axis - CCW Overrun		
Rear Axis - CW Overrun		
Rear Axis - CCW Overrun		
HMI panel open	The command panel is pulled out.	Insert the panel inside the machine in order to move the machine.
Front Laser Scanner for suspended loads: Support not closed	The proximity sensor does not detect the front laser scanner holder.	Check that the front laser scanner holder (height obstacle detection) is correctly positioned. Check the functionality and correct connection of the sensor.

ALARM DISPLAYED	CAUSE	ACTION
Laser scanner FRONT SuspLoads interference: Push "RESET"	The stop area of the laser scanner was intercepted.	Clear the area by removing the obstacle present and reset the alarm.
Laser Scanner FRONT SuspLoads: internal defect	Laser scanner anomaly.	Consult the manufacturer.
Laser Scanner FRONT SuspLoads: Dirty lens ALARM	The laser scanner lens is dirty.	Clean the lens properly. See the device manual for information.
Laser scanner REAR SuspLoads interference: Push "RESET"	The stop area of the laser scanner was intercepted.	Clear the area by removing the obstacle present and reset the alarm.
Laser Scanner REAR SuspLoads: internal defect	Laser scanner anomaly.	Consult the manufacturer.
Laser Scanner REAR SuspLoads: Dirty lens ALARM	The laser scanner lens is dirty.	Clean the lens properly. See the device manual for information.
Laser Scanner FRONT SuspLoads: Dirty lens WARNING	The laser scanner lens is dirty.	Clean the lens properly. See the device manual for information.
Laser Scanner REAR SuspLoads: Dirty lens WARNING	The laser scanner lens is dirty.	Clean the lens properly. See the device manual for information.
Laser scanner FRONT interference: Push "RESET"	The stop area of the laser scanner was intercepted.	Clear the area by removing the obstacle present and reset the alarm.
Laser Scanner FRONT: internal defect	Laser scanner anomaly.	Consult the manufacturer.
Laser Scanner FRONT: Dirty lens ALARM	The laser scanner lens is dirty.	Clean the lens properly. See the device manual for information.
Laser scanner REAR interference: Push "RESET"	The stop area of the laser scanner was intercepted.	Clear the area by removing the obstacle present and reset the alarm.
Laser Scanner REAR: internal defect	Laser scanner anomaly.	Consult the manufacturer.
Laser Scanner REAR: Dirty lens ALARM	The laser scanner lens is dirty.	Clean the lens properly. See the device manual for information.
Laser Scanner FRONT: Dirty lens WARNING	The laser scanner lens is dirty.	Clean the lens properly. See the device manual for information.
Laser Scanner REAR: Dirty lens WARNING	The laser scanner lens is dirty.	Clean the lens properly. See the device manual for information.

6.5 CHECKS PRIOR TO MACHINE OPERATION

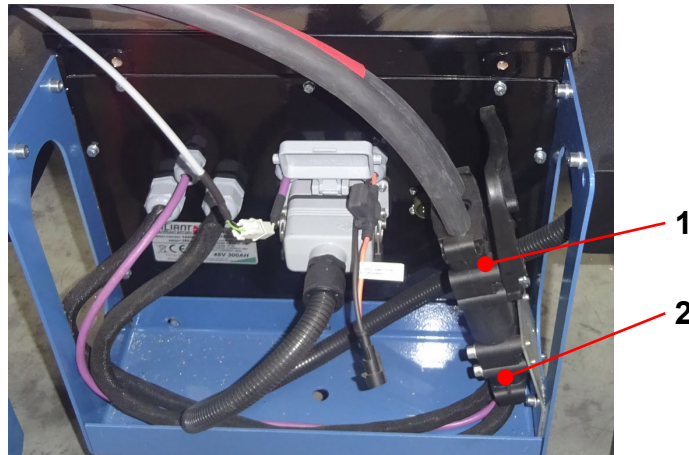
Before operating the machine, the operator must:

- Check that there are no foreign bodies attached to the wheels and that they are not deformed.
- Check the correct functioning and positioning of the safety devices present.
- Check that the machine is not in a maintenance/cleaning state.
- Check that all guards are correctly fitted.
- Check the correct functioning of the limit switches / sensors.
- Check the correct functioning of the control devices.
- Check the correct insertion of the machine's power plug into the battery socket.
- Check that the wired hand control connector is correctly inserted in the socket on the machine (if used).
- Check that the battery charge level of the machine is sufficient.
- Check that there are no fault signals.
- Check that the control cabinet doors are properly closed and locked and that there are no damaged or loose components on the push buttons.
- Reset all emergency buttons on the machine, if pressed.
- Check that the frequency generator is powered.

6.6 MACHINE FUNCTIONING

6.6.1 Battery connection

Before starting the machine, insert the machine's power plug **(1)** (coming out of the electrical cabinet) into the socket **(2)** on the battery.



DANGER

Before carrying out handling operations, ensure that no obstacles are in the vicinity of the machine and that no persons are in the danger zone.



CAUTION

It is forbidden to have the machine operated by unqualified and authorised personnel.

6.6.2 Selecting the operating mode

The machine has three operating modes:

- Automatic AGV ("AUTO").
- Semiautomatic ("SEMI-AGV").
- Manual ("OPERATOR").

Selection is by means of the selector switch on the control panel and the selector switch on the pull-out pulpit.

6.6.3 AUTOMATIC (AGV) Mode

To use the machine in automatic mode, proceed as follows:

- Ensure that the machine is correctly positioned on the path identified by the inductive cable (if not, see the positioning procedure in this chapter).
- **Electrical panel:**
 - Insert the key into the voltage on selector switch and turn it to position (1). The voltage on LED lights up.
 - Insert the key into the operating mode selector switch and choose the "AUTO" mode. Remove the key and store it properly.
- **Command panel:**
 - Turn the operating mode selector switch to 'AUTO'.
- **Electrical panel:**
 - Press the service button. The internal LED lights up steadily.

The machine is now ready to receive and execute missions assigned to it by the operator via the command desk.

To assign a mission, position yourself at the command desk and proceed as follows:

- Pull out the control pulpit, using the handle provided.
- Assign the mission via the appropriate video page.
- Insert the pulpit into the machine.
- Press the green mission start button.



NOTE

To abort the mission, and stop the machine, press the black mushroom-shaped mission stop button on the control console.

6.6.4 MANUAL Mode

6.6.4.1 *Starting the machine with the wired control panel*

To start the machine, proceed as follows:

- Connect the wired hand control connector to the socket on the machine.
- **Electrical panel:**
 - Insert the key into the voltage on selector switch and turn it to position (1).
 - The voltage on LED lights up.
 - Insert the key into the operating mode selector switch and choose the "OPERATOR" mode.
- **Wired control panel:**
 - Switch on the hand control by inserting the appropriate key and turning the selector switch to position (1).
 - The power indicator light lights up.
 - If pressed, release the emergency button.
- **Electrical panel:**
 - Press the illuminated white service button (alternatively press the RESET button on the hand control).
 - The internal LED at the service button lights up.

You are ready to move the machine.



CAUTION

Do not disconnect or connect the wired hand control unless the machine has first been de-energised (voltage switch in position '0').



CAUTION

Before carrying out any movement, ensure that there are no faults to avoid damaging the machine. Before cancelling any anomaly, check the cause and eliminate it.

6.6.4.2 Machine Handling (Traversing and Steering)

To operate the machine after start-up, proceed as follows.

Via the wired control panel:

- Exert pressure on the FORWARD / REVERSE movement lever to move the machine. The travel speed is proportional to the pressure exerted. Release the lever to stop the machine.
- In order for the machine to perform the required wheel angle change, exert pressure on the LEFT/RIGHT steering lever. The maximum steering angle of the wheels is $\pm 35^\circ$. Releasing the lever stops the steering movement.



CAUTION

It is the responsibility of the operator using the machine to ensure that the area is clear of people and things during handling.



CAUTION

During handling, pay attention and, if necessary, signal the passage of the machine by sounding the horn.



CAUTION

Only one operator is required to operate the machine, who must position himself as shown in the "Operator's Station" section.

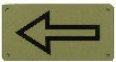


CAUTION

Before carrying out any movement, ensure that there are no faults to avoid damaging the machine. Before cancelling any anomaly, check the cause and eliminate it.
Pay attention to whether the general fault lamp lights up and the corresponding indications on the display.

6.6.4.3 Visual Indications of Direction

Visual indications of directions are shown on the machine frame.

INDICATION	DESCRIPTION
	FORWARD
	BACKWARD
	LEFT
	RIGHT

6.6.4.4 Positioning the machine on the inductive cable

To use the automatic mode, it is first necessary to position the machine in the path of the buried inductive cable. Proceed as follows:

- Bring the machine close to the buried inductive cable (by orienting it correctly). The maximum angle of incidence is approx. 30°.
- Select "AUTO" mode from the control panel and "SEMI-AGV" mode from the control desk, using the appropriate selectors.
- Operate the "FORWARD/REVERSE" lever to move the machine at reduced speed and 0° steering, until the antenna located in the direction of travel detects the inductive cable (on the wired control panel the LED for the direction concerned lights up steadily).
- The control system commands the steering of the axes to align the machine to the inductive cable.
- When both antenna pairs detect the inductive cable (the two LEDs light up steadily) the machine moves forward at normal speed.



NOTE

From the relevant video page, press the 'stop at next station' button to bring the machine to the first reachable station along the route.

It is now possible to use the automatic AGV mode.



NOTE

If you move the machine in manual mode, outside the inductive cable path, you must return it to that path before you can use the automatic AGV mode again.

6.6.5 SEMIAUTOMATIC mode

In semi-automatic mode, the machine is operated via the wire control panel, according to the instructions given for manual mode.

In this operating mode the steering lever is disabled. The machine is steered automatically by the system following the path identified by the inductive cable. The operator moves the machine along the path using the FORWARD / REVERSE lever.

To select semi-automatic steering, set the selector on the control panel to "AUTO" (and remove the key) and the selector on the control console to "SEMI-AGV".

6.6.6 Starting after an Emergency Stop

If movement is interrupted by an EMERGENCY STOP, proceed as follows:

- Eliminate the cause of the error or hazard.
- Reset the EMERGENCY STOP button by turning it clockwise.
- Switchboard: Press the white luminous service button and check that the internal LED lights up.

You are ready to move the machine.

6.6.7 Laser Scanner Intervention

In the presence of an obstacle in the stop area, the machine stops. On the switchboard, the general fault LED lights up steadily and the service activation LED flashes.

To reset the laser scanners, it is necessary

- Remove the obstacle.



DANGER

If it is not possible to remove the obstacle, use the "SAFETY OFF" command, located on the wired control panel, to exclude the laser scanners, and move the machine until the area is clear.

It is the responsibility of the operator using the machine to check that the area is clear of people and things during movement.

- Press the service button located on the control panel to reset the safety functions (or, alternatively, press the RESET button located on the wired control panel).

6.6.8 Parking Brakes

The machine is equipped with electromagnetic parking brakes that disengage when the movement command is given and engage when the machine stops.



NOTE

It is not possible to tow the machine because the negative brakes of the electric motors prevent movement.

If it is necessary to release the motor brakes, contact the manufacturer.

6.6.9 Switching Off the Machine

To switch off the machine, proceed as follows:

- Stop the machine on a level floor.
- Switch off the wire control, if you are operating the machine in manual or semi-automatic mode.



CAUTION

Do not disconnect the wired hand control unless the machine has first been de-energised (voltage switch in position '0').

- Switch off the machine by turning the voltage cut-off switch, located on the control panel, to position (0) and remove the key.
- If used, disconnect the wired hand control connection plug.



CAUTION

In case of prolonged stops, or maintenance work, disconnect the machine's power plug from the battery socket to cut off the power supply.



CAUTION

Do not leave the load on the machine.

6.7 LOAD POSITIONING

It is recommended that the load be placed on the crossbars of the support surface without shocks, which would cause additional stresses within the supporting structure and the mechanical parts of the machine.



CAUTION

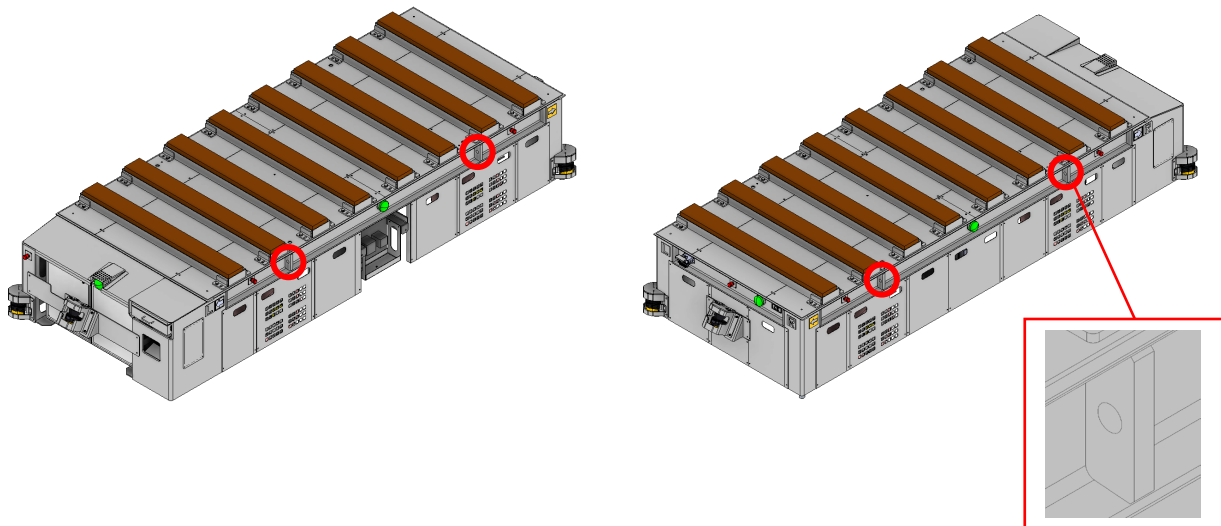
Distribute the load evenly over the machine plane, taking care to check that its centre of gravity is within the stability zone.



DANGER

It is the operator's responsibility to place the load correctly on the machine and to follow the maximum load capacity instructions.

The machine is equipped with four points for anchoring the load, as shown in the following picture.



Load anchorage points

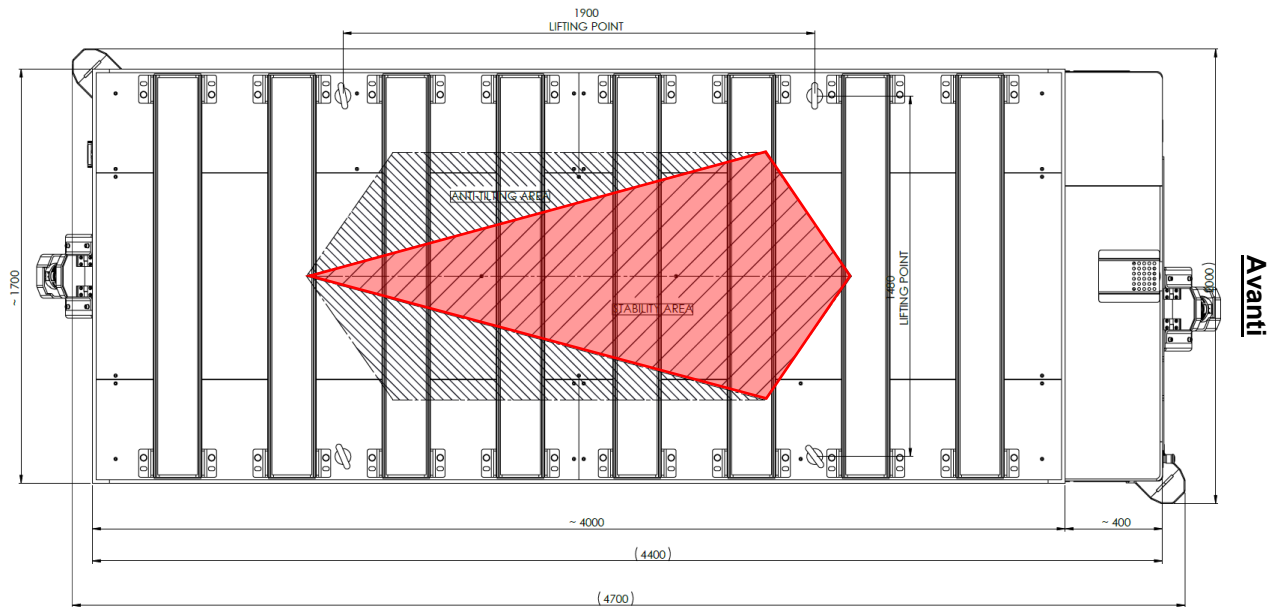


CAUTION

It is the operator's responsibility to anchor the load before handling the machine, using suitable slinging systems appropriate to the size of the load.

6.7.1 Stability Area

There are four points that allow the frame to discharge the weight of the load to the ground, as shown in the following image. There is therefore "an area of stability" given by the junction of these points.



Area of stability in red

To avoid tipping hazards, the centre of gravity of the load must always be positioned within the above area.

6.8 BATTERY

When first used, the machine does not need anything, as the battery inside is already 100 % charged.

6.8.1 Low Battery and Extra Time

The autonomy of the battery at 100 % charge, indicated in the table of technical characteristics, is calculated on actual flat use at 25° C (50 % fully charged and 50 % empty).

When a residual charge of about 30% is reached, the machine stops and the illuminated orange extra time button on the control panel lights up. To move the machine again, this button must be pressed. This gives an autonomy of about 15 minutes to reach the charging station.

Once the extra time has elapsed, the battery must be recharged.



CAUTION

It is not possible to tow the machine as the negative brakes of the electric motors prevent movement. Therefore, the only way to move it is to recharge/replace the battery or lift it. Please contact the manufacturer if you need to release the brakes.

6.8.2 Maintaining the Lithium Battery



CAUTION

For all information on the battery (frequency of charging, usage and storage modes and temperatures, maintenance, etc.) please refer to the battery manual in the appendix.

For battery maintenance, it is recommended to

- Do not go below 20% residual charge.



CAUTION

Deep discharge can irreparably damage lithium cells. Fully discharged cells are not replaced under warranty.

- When not in use, store the charged battery in a dry, frost-free place.



CAUTION

The battery charge level decreases even if it is not used. Therefore, even when not in use, recharge the battery periodically (at least once a week) to prevent it from slowly dropping below the indicated threshold.



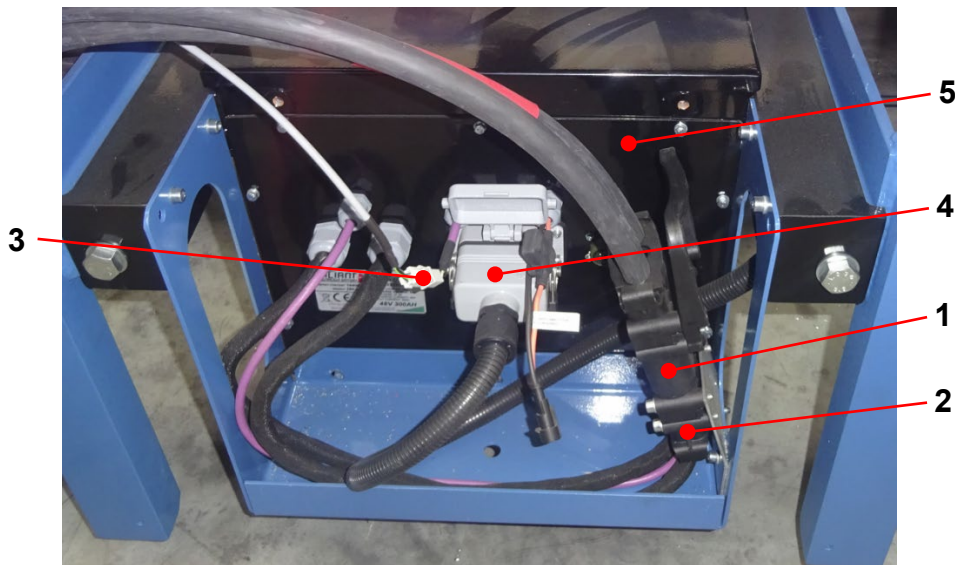
ADDITIONAL INFORMATION

For any further clarification on the battery and rectifier, please refer to the accompanying manuals.

6.8.3 Removing the Battery

To remove the battery, proceed as follows:

- Switch off the machine's power supply by turning the voltage cut-off key switch, located on the control panel, to position (0). Remove the key.
- Disconnect the power plug **(1)** of the machine from the socket **(2)** of the battery.
- Disconnect the cable **(3)** of the battery display and the connector **(4)** of the PLC.



- Unscrew the two TE M12 screws, which secure the battery **(5)** to the machine, and remove the respective washers.
- Place a suitable means of transport (e.g. pallet truck) under the battery **(5)**.
- Pull out the battery **(5)**.
- Lower it slowly and transport it, avoiding sudden movements.

To reposition the battery, proceed in reverse order.



ADDITIONAL INFORMATION

For further information on battery handling, please refer to the accompanying manual.

6.8.4 Charging the Battery

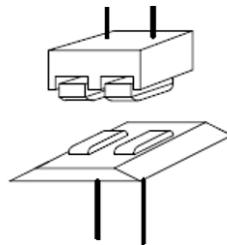
To recharge the battery in AGV mode, proceed as follows:

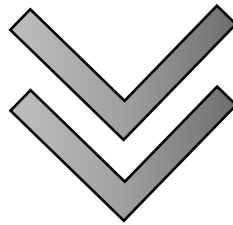
- On the 'main' video page, press CONFIRM RECHARGING. The system assigns the available recharging station and indicates it in the relevant field.
- Start the mission with the START MISSION button.
- When the machine is at this station, the charging skid is lowered and makes contact with the rectifier skid, which is buried in the floor. Charging is started.



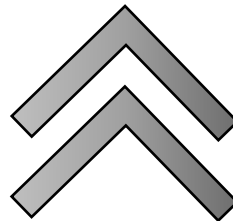
CAUTION

Voltage is only supplied to the rectifier skid when the machine is positioned in the charging station.





DISPOSAL



**SELF-PROPELLED
ELECTRONIC TROLLEY WITH TYRES AGV
Serial number 2423**



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7. DISPOSAL

The following paragraph contains some suggestions and indications to correctly carry out the operations for putting out of service, dismantling and removal of the machine at the end of its operating life.



ADDITIONAL INFORMATION

The following operations are the responsibility of authorized personnel.

- Make sure that, around the machine, there is sufficient space to enable staff to perform all the necessary movements without risk.
- Disconnect the electrical energy devices.
- Disconnect and remove the battery.
- Unload, disconnect and remove the oil tank from the machine (if present).
- Remove the lubricants.
- Disassemble the machine by taking, for each group.
- Remove the moving parts and separate, as far as possible, the various components for the type of materials (plastic, metal, etc.), in order to be able to be disposed of through a separate collection.
- Remove and move the machine parts from the work area by taking all the necessary precautions.
- Before lifting large/heavy components check correct anchorage of the lifting device and only use adequate slings and equipment.



ADDITIONAL INFORMATION

Disposal operations must be carried out in accordance with the provisions of the regulations in force in the country where the machine is used.



NOTE

In case of difficulty in dismantling, demolition of the machine, or for added security, please contact the Manufacturer and indicate cause of the removal and serial number of the machine.

- The machine is built with various materials, recyclable and not. For this reason, its removal involves adequate separation of the materials: steel, aluminium, copper, bronze, special alloys, plastic, etc.
- The manufacturer assumes no liability for any damage caused by any use of the individual components other than the one prescribed.



CAUTION

For disposal of the battery, see the relevant manual attached.



CAUTION

Demolition is to be carried out in compliance with the laws in force. These rules are to be observed.

7.1 RECYCLING

Part of the dismantled materials can be recycled. For the relevant indications, see the table in Chapter 5 "INTERNATIONAL RECYCLING CODES".

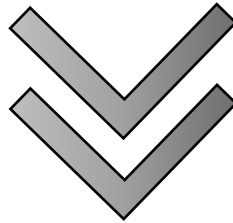
7.2 DISPOSAL

During the machine working life, waste materials are produced (lubricants).

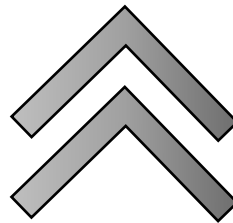
To dispose of some of these materials, specific standards are in place to safeguard the environment.

For the disposal of waste lubricants the disposal of waste lubricants/oils, it:

- The lubricants risk contaminating water and the soil, therefore never pour the products on the ground, in the water, or the sewage drain. Each breach of these rules can be prosecuted by law. When using lubricants, keep a container for oil within hand's reach.
- Carefully recover all lubricants by separating the mineral based products with those with a synthetic base. On disposal, comply with the regulations in force on disposal of exhausted oil.
- It is compulsory for the client to know the legislation in force in his country and work to ensure this legislation is enforced.



MAINTENANCE



**SELF-PROPELLED
ELECTRONIC TROLLEY WITH TYRES AGV
Serial number 2423**



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8. MAINTENANCE

8.1 GENERAL PRECAUTIONS FOR SAFETY

Maintenance, troubleshooting and repairs are only to be carried out by the authorised technicians.

The persons assigned to use and maintenance of the machine are to be well trained and have in-depth knowledge of accident-prevention standards. Unauthorized personnel must remain outside of the work area during operations.

The safety precautions contained in this paragraph shall always be strictly observed during the conduct and maintenance of the machine, in order to avoid damage to personnel and equipment.

These precautions will be recalled and further detailed in the manual, you will be prompted, each time a procedure involving risk of harm or injury occurs, through notes WARNING and DANGER:



DANGER notes prior to an operation indicate that, if not correctly followed, it could result in injury.



CAUTION notes precede an operation that, if not carried out correctly, could cause damage to the machine and/or injuries to the persons operating on it.

At the end of each maintenance operation is required to restore the protections, verifying the correct functioning.

8.1.1 General hazards

- High voltages can cause death upon contact. Always operate with extreme caution and following the accident-prevention standards in force in the country.
- When the machine is functioning there are moving parts that can cause serious harm to persons. Therefore, the cleaning and specialised maintenance operations regarding disassembly or replacement of components on the machine and on the control unit, are to be carried out with the system off.
- Place specific warning notices ("MACHINE BEING SERVICED – DO NOT POWER-ON") near the electric panel/s.
- Do not use inflammable or harmful solvents.
- Always wear protective goggles and gloves when carrying out maintenance on the equipment.
- Make sure that the tools to be used are in perfect condition and have insulated grips, where required.
- Check that the isolation of cables and conductors of testing equipment has no signs of breakage or damage.
- Lack of equipment connection to ground can cause serious harm to persons. Always make sure the ground is connected and that it complies to the standards.
- Long overloads or failures can cause overheating of electric motors and electrical equipment developing harmful fumes; immediately cut-out the power supply for safety and do not approach the equipment before dispersing the fumes by means of appropriate ventilation. Do not inhale residual fumes inside the equipment during the repair operations.
- In the event of fire, never spray water on the equipment; cut-out all power supplies and use CO₂ extinguishers.
- Avoid prolonged, excessive or repeated contact of the skin with lubrication products and change clothes immediately if they become impregnated, because lubricants are very hazardous for the skin.
- Do not handle lubricants (such as oils, greases, etc) where there are electric sparks and/or naked flames.



DANGER

Lubricants are inflammable products; follow the indications on the containers.

- Always make sure, before setting the machine in operation, that no tools or materials have been left near the equipment.
- Do not wear items that could become entangled in the equipment, or act as conductors (chains, bracelets, etc.).
- Maintenance, repair and troubleshooting operations are to terminate with verification of correct machine functioning and restoration of all safety devices.

8.1.2 General warnings

- Machine maximum reliability and minimum maintenance costs are the result of planned maintenance and inspection schedules, scrupulously followed during the entire machine life. Scrupulously observe the set maintenance time intervals and program the operations according to the specific requirements.
- It is advised, should major operations be necessary, to contact the Manufacturer for any explanations regarding the project or for technical assistance.
- Before starting to check and maintenance operations, remove any dirt from the machine.
- Always use perfectly dry air for cleaning and with a pressure not over 0.2 Mpa.
- Always use tools in perfect condition and that are specifically for the operation to be performed; use of inappropriate and/or inefficient equipment can cause serious damage.
- During disassembly, mark the separate parts with an identity tag to ensure the correct reassembly.
- After every maintenance operation that requires disconnection of cables and/or fixed and mobile parts, check that the number/tag on the fixed and on the mobile part coincide.
- Before resetting the equipment in operation after a failure, it is to be carefully inspected and checked to highlight any damage.
- Never act, unless following a failure, on adjustments and position of limit switch microswitches, where installed: tampering with them can cause serious damage.
- Always take utmost care when checking lubrication on machine components, because insufficient or defective greasing can jeopardise correct functioning.
- For lubrication, use only the recommended lubricants, or those with equivalent properties and of a known and proven quality.
- The lubricants used are to have a good emulsion stability and be unalterable with age.
- It is absolutely necessary to continue to use the same lubricants as used for the first filling.
- Upon completion of the normal maintenance activities, the maintenance technicians are to carry out, when foreseen, also predictive instrumental maintenance operations consisting in analysis and specialistic controls to predict, over time, breakdowns that can occur in certain machine components.

8.2 QUALIFICATION OF MAINTENANCE TECHNICIANS



CAUTION

The Security Officer will ensure that all persons operating on the machine have received all their instructions contained in this manual.

8.2.1 General skills

To be up to the ever-increasing qualifications needed in the field of maintenance, the maintenance technicians must have the following requisites:

- be aware of the standards in force regarding prevention of accidents, and be able to apply them,
- have read and understood the “Safety” chapter,
- know the basic structure and functions of the machine,
- know how to use and refer to the manufacturing papers and machine documentation,
- assume the responsibility to make autonomous decisions regarding interventions on the machine,
- be willing to adapt to technological changes on the machine,
- note irregularities and, where appropriate, take the necessary measures.

8.3 PROCEDURE TO STOP MACHINE



CAUTION

Maintenance operations are to be carried out with no load.

Make sure that the loading bed and the load saddles are completely empty before starting maintenance operations.

Before starting maintenance operations, the operator is to stop the machine and set it in maintenance state following this procedure:

- Cut-out the machine power supply sources, if required by the maintenance operation to be carried out. Otherwise this is not necessary.



NOTE

To deactivate and cut-out the electrical supply:

- Switch off the machine following the indications contained in the paragraph "Shutting-down the machine".
- Disconnect the machine power supply plug from the battery socket.

- Place the notice "DO NOT MOVE – MACHINE BEING SERVICED" on the electric panel near the power-on selector.



After the maintenance operations, restore the previously deactivated electrical supply.

Before resuming normal machine functioning, check the entire system again following the start-up procedure indicated in this manual.



CAUTION

After every maintenance operation check correct machine functioning.

8.4 PROCEDURE FOR MAINTENANCE POSITIONING

The following paragraph provides indications for the positioning of the machine on appropriate resting supports (maintenance-aid devices) for the maintenance operations where they are required.

Before lifting the machine, the Customer is to procure four suitable maintenance-aid devices, to place the machine.



NOTE

The Manufacturer shall not be held in any way liable if unsuitable devices are used.

The main purpose of the maintenance-aid devices is to stabilize the suspended trolley; therefore, the lifting device and the chains are to remain tensioned.

To position the machine on the devices, three operators are necessary:

- One operator in charge of the lifting device;
- One operator in charge of the maintenance-aid devices;
- One operator to ensure correct positioning of the machine on the maintenance-aid devices.



NOTE

Before lifting the machine, place the four maintenance-aid devices in an appropriate and segregated area, to which unauthorized persons are not permitted access.



CAUTION

Before starting the lifting, operations check that the lifting devices have an adequate grip and that all the operators are equipped with personal protection devices (DPI).

To prepare the machine for maintenance proceed as follows:

- Stop the machine and cut-out the power supply, following the procedure indicated in **paragraph 8.3**.
- If necessary, remove the protective perimeter casing using the specific wrench.
- Lift the machine, following the procedure indicated in **paragraph 4.3.2**.



CAUTION

Always check correct machine balancing. If it is unbalanced, rest it on the ground immediately and correctly reposition the chains.

- Transfer it, avoiding abrupt movements.
- Visually check that the machine resting points are aligned with the maintenance-aid devices.
- If necessary, correct the position of the devices.

- Rest the machine on these devices, avoiding abrupt movements, and check they are perfectly in contact with the frame.



CAUTION

The lifting equipment operator is to pay careful attention to avoid collisions against the devices when positioning the machine.

- Keep the lifting chains tensioned during the entire maintenance operations.

After the maintenance has been completed, slowly lift the machine, place it on the ground (following the indications contained in the paragraph regarding lifting) and refit any casings that were previously removed.

MACHINE LIFTING

1. Machine lifting point

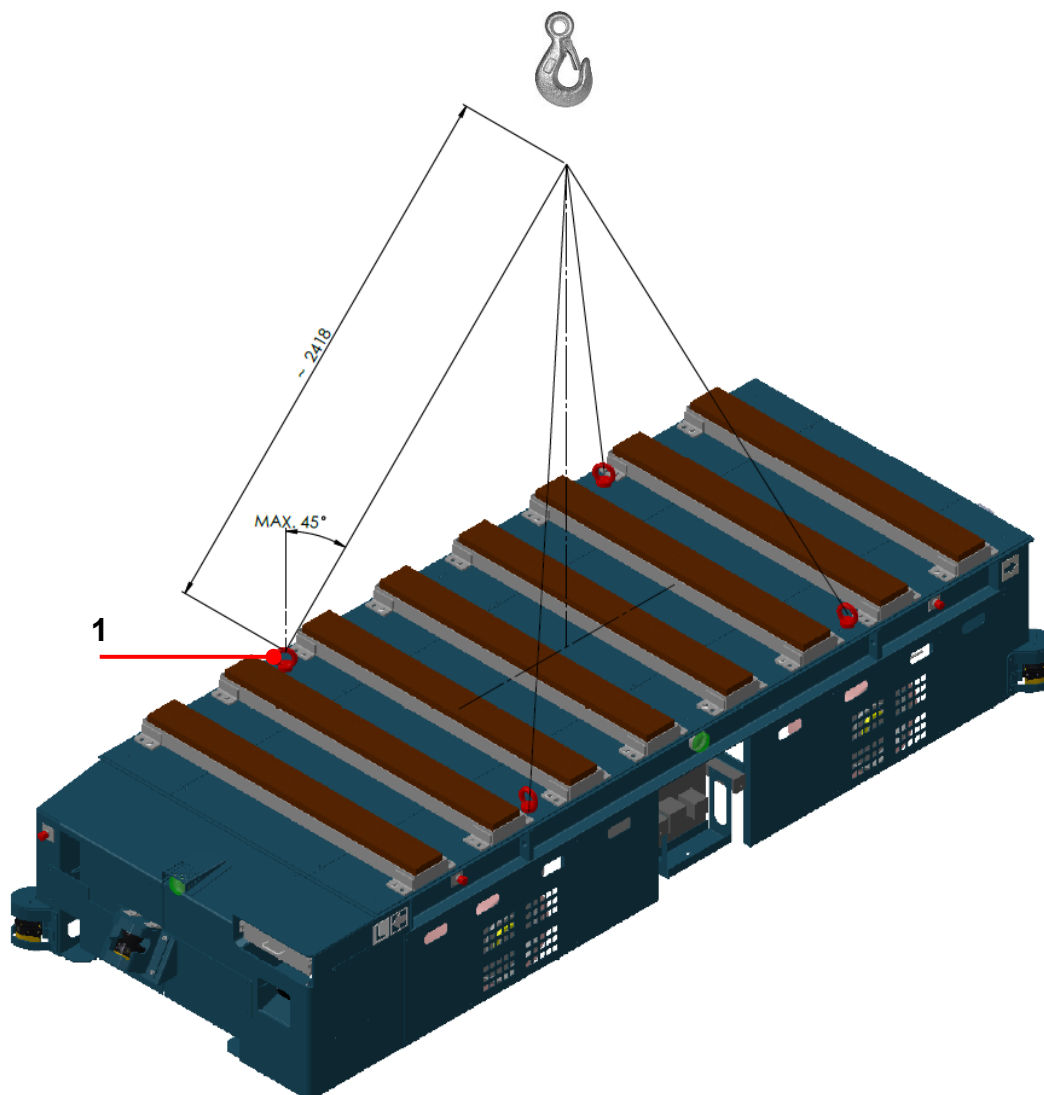


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MACHINE POSITIONING ON MAINTENANCE-AID DEVICES

1. Machine frame
2. Example of maintenance-aid device

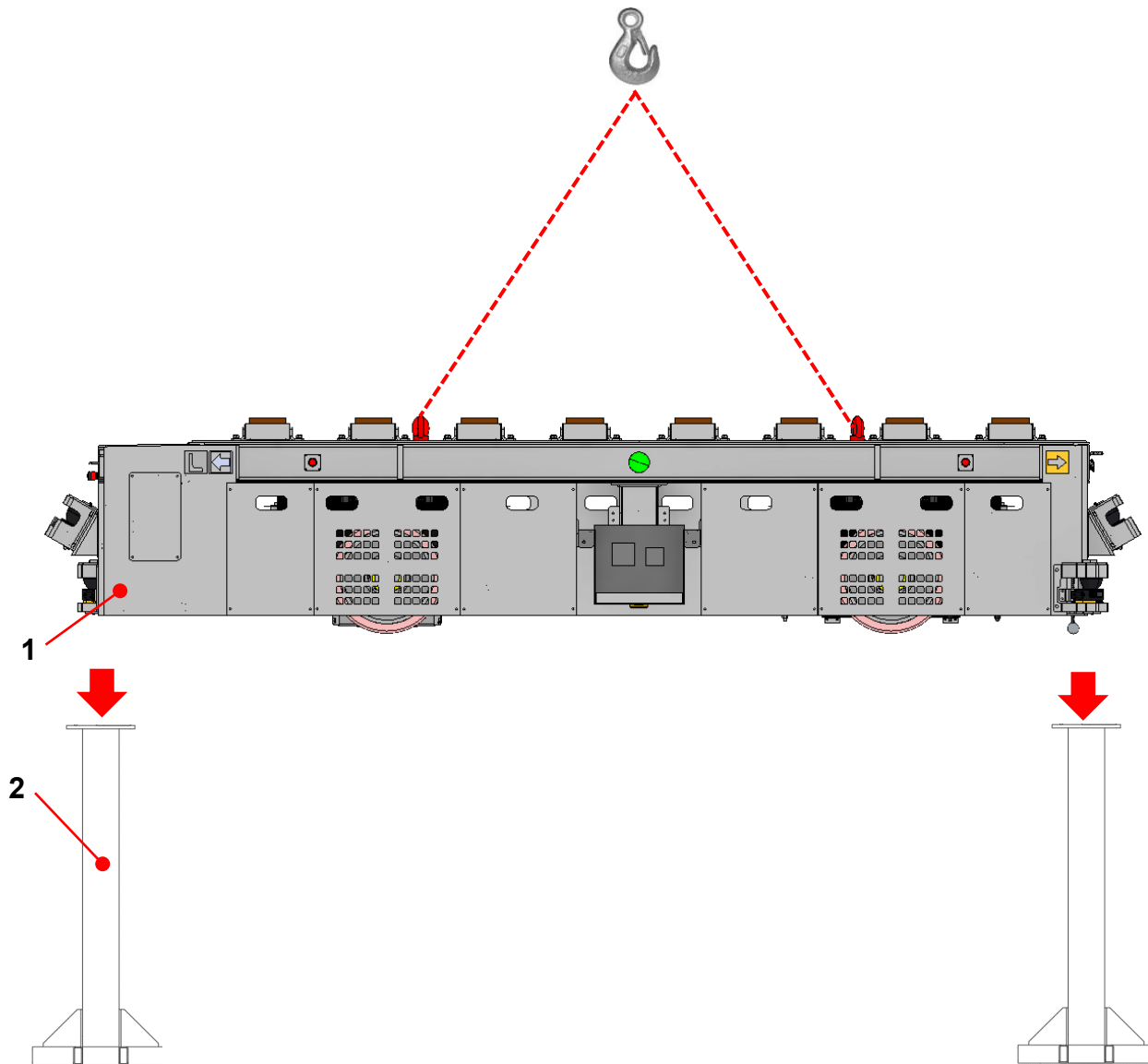


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8.5 CONTROL PLAN ON SAFETY



CAUTION

It is strictly forbidden to electrically or mechanically bridge the safety switches of the safety circuits or tamper with them in any way.

Periodically check the efficiency of security systems on the machine.

This procedure must be repeated as normal maintenance practices.

8.5.1 Checks and functional tests on safety devices

The maintenance technicians have the obligation to periodically check the functioning of the safety devices.

The operation is to be carried out by skilled technicians who have specific knowledge regarding the uses of the safety devices.



CAUTION

Carry out the functional, tightness and positioning checks of the safety systems as indicated in chapter 2.

8.6 MAINTENANCE FREQUENCY

To ensure machine reliability, regular and efficient maintenance is necessary and a constant control of the indicator instrument parameters. Maintenance, troubleshooting and repairs are only to be carried out by the authorised technicians.

FREQUENCY	DESCRIPTION
Daily	Check the integrity and proper functioning of the safety devices.
Every week	Full charge cycle, including equalisation, of the battery.
Every week	Check correct functioning of the horn.
Every week	Clean the laser scanner sensor with a suitable cloth. Refer to the relevant manual for more information.
Every month	Clean the wheels, the loading surface, traverses and the lamps.
Every month	Clean the control panel on the switchboard, the console on board and the wired control panel.
Every month	Check the correct connection and tightening of the encoders, sensors and limit switches. Check correct position and tightness of the cams.
Every month	Check that the sensors reading the inductive cable/transponder function correctly.
Every month	Check correct functioning of limit switches.
Every month	Check correct sliding of the fifth wheels. If faults are found, contact the Manufacturer.
Every month	Check the wear condition of the wooden crossbars. If necessary, replace.

FREQUENCY	DESCRIPTION
Every three months	Check tension of chains. If necessary, act on the chain tensioner to adjust (see the procedure in the paragraph "Chain tensioning").
Every three months	Visually check the condition of wear on the chain links. If necessary, replace.
Every four months	Visually check the cylindrical springs for signs of wear or damage.
Every six months	Make a general visual check on the various machine groups, checking there are no mechanical anomalies.
Every year	Check tightness of all nuts and bolts.
Every year	Check there are no signs of wear, damage or mechanical faults on the wheels. If necessary, contact the Manufacturer for the replacement.



ADDITIONAL INFORMATION

For information regarding maintenance of commercial devices incorporated / complementary see the relevant manuals.



CAUTION

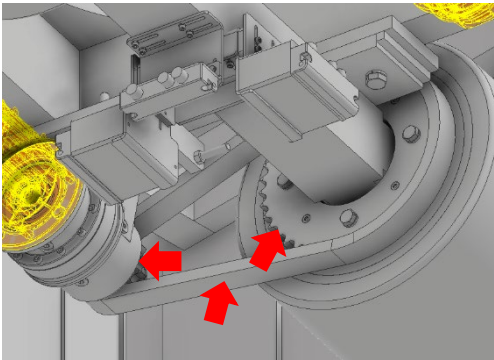
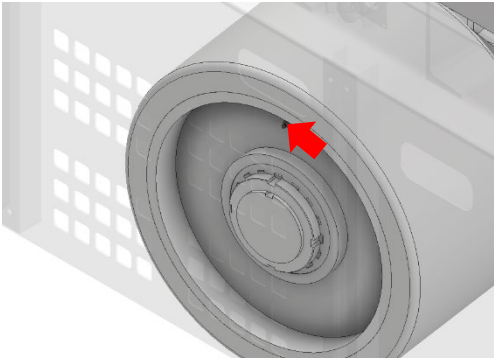
For information regarding replacement procedures, contact the Manufacturer.

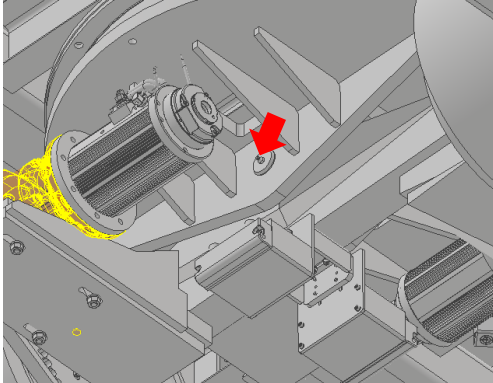
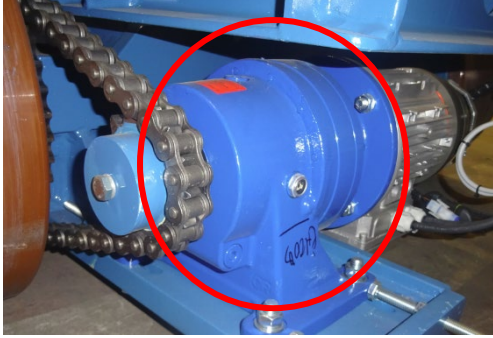
8.7 LUBRICATION

Before carrying out lubrication operations, stop the machine, cut-out the power supply and prepare it for maintenance as indicated in **paragraph 8.3** "Procedure to stop machine". If necessary, remove the outer casings (and reassemble them at the end of operations).

Where necessary, prepare the machine for maintenance as described in **paragraph 8.4** "Procedure for maintenance positioning".

The following table indicates the machine points to be lubricated.

FREQUENCY	COMPONENT	IMAGE	METHOD
Every three months for the first year, then every six months	Crowns Chains Pinions		Grease with a brush. Use MOTECX ORGREASE 2 grease or equivalent
Every three months for the first year, then every six months	Wheel bearings		Insert the grease in the nozzles with a specific greaser.  Use MOTECX ORGREASE 2 grease or equivalent
Every three months for the first year, then every six months	Fifth wheels	 <i>Example image</i>	Insert the grease in the nozzles with a specific greaser.  Use MOTECX ORGREASE 2 grease or equivalent

FREQUENCY	COMPONENT	IMAGE	METHOD
Every three months for the first year, then every six months	Swing axle box	 <i>Example image</i>	Insert the grease in the nozzle with a specific greaser.  Use MOTECX ORGREASE 2 grease or equivalent
-	Reduction units		For information regarding the reduction unit lubrication, see the relevant manual attached. Use synthetic oil PAO SHELL Omala S4 GXV ISO VG 320 or equivalent.



DANGER

Never mix oils/greases of different types and/or brands.
Waste oil is a special waste and has to be disposed of by authorised consortiums.



CAUTION

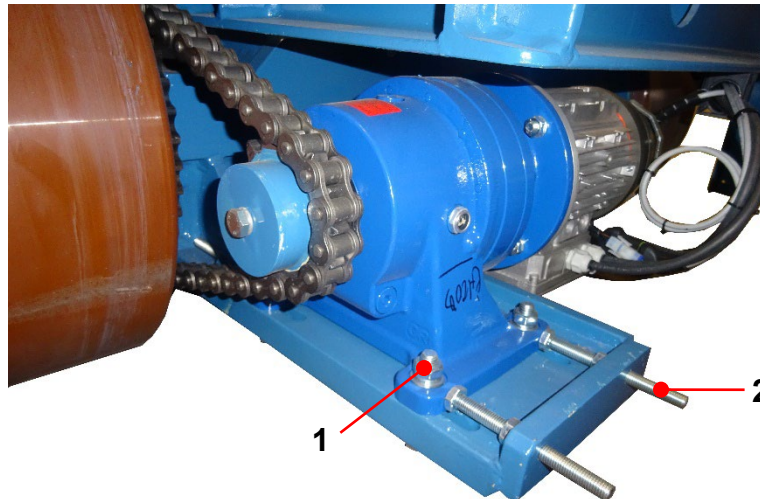
Use of a type of oil/grease that is not equivalent to that indicated annuls the warranty in the case of failures and/or breakdowns.

8.8 CHAIN TENSIONING

Before tensioning the chain, stop the machine, cut-out the power supply and prepare it for maintenance as indicated in **paragraph 8.4**.

To tension, proceed as follows:

- Access the gear motor and secure it with an appropriate supporting device (equipped with suitable wheels to allow translation in order to accompany the gearmotor during the adjustment of the chain tensioning).
- Loosen slightly the four screws **(1)** which anchor the gearmotor to the plate.
- Act on the four tensioner screws **(2)** to regulate the tensioning of the chain.
- At the end of the operation, tighten the four screws correctly **(1)** and then remove the supporting device of the gearmotor.



8.9 TIGHTNESS CHECK

The following table indicates the tightening torques for each screw dimension.



CAUTION

To tighten, use a torque wrench.

Ø Screw	Screw pitch	Pre-tightening torque [kgm]	Tightening torque [kgm]
M6	1	0.75	1
M8	1.25	1.8	2.4
M10	1.5	3.6	4.8
M12	1.75	6.5	8.5
M14	2	10	13
M16	2	15	20.5
M18	2.5	22	29
M20	2.5	30	40
M22	2.5	42	56
M24	3	50	70
M27	3	80	105
M30	3.5	95	130



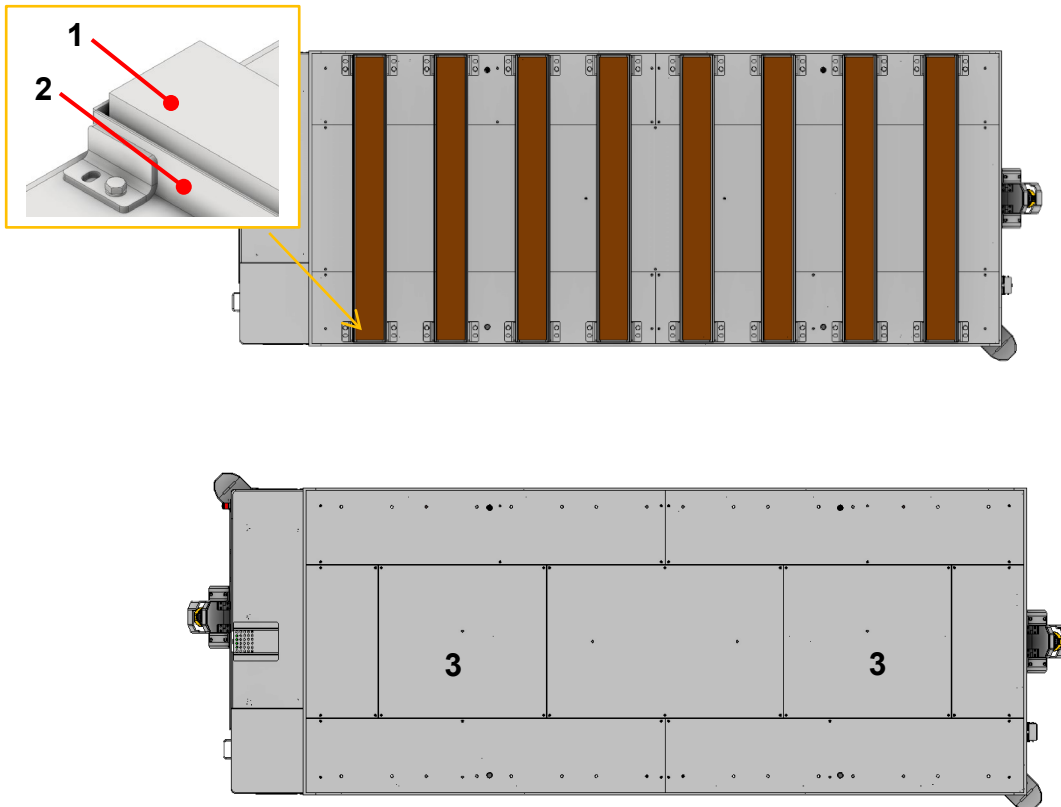
CAUTION

Check after the first month of machine use, then every year.

8.10 ACCESS TO THE STEERING ENCODER

The steering encoders can be accessed from the machine's loading surface, after removing the panels closing the respective compartments and the crossbars fixed to the loading surface.

DESCRIPTION	WEIGHT
Wooden crossbar (1)	Approx. 8,5 kg
Steel frame (2) (of the crossbar)	Approx. 46 kg
Steel panel (3)	Approx. 40 kg each.



Proceed as follows to remove each panel:

- Switch off the machine and cut-out electric energy.
- Remove the wooden crossbars **(1)** above the panel **(3)** to be removed.
- Unscrew the fastening screws (with interposed washer) of the frame **(2)** of the crossbar and remove it properly, taking all necessary safety measures. Repeat the operation for each frame.
- Unscrew the panel fixing screws **(3)**.
- Screw a suitable eyebolt M10 into the hole provided in the panel **(3)**.
- Insert and block an appropriate shackle (not part of the supply) in the eyebolt shown above.

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ELECTRONIC TROLLEY WITH TYRES AGV
Serial number 2423**



- Attach a strap to the shackle using a hook.
- Hook the strap properly on the hook of the lifting gear.
- Slowly lift the panel **(3)** avoiding abrupt movements.
- Rest it on the ground.

At the end of maintenance operations restore the removed panel and crossbars.

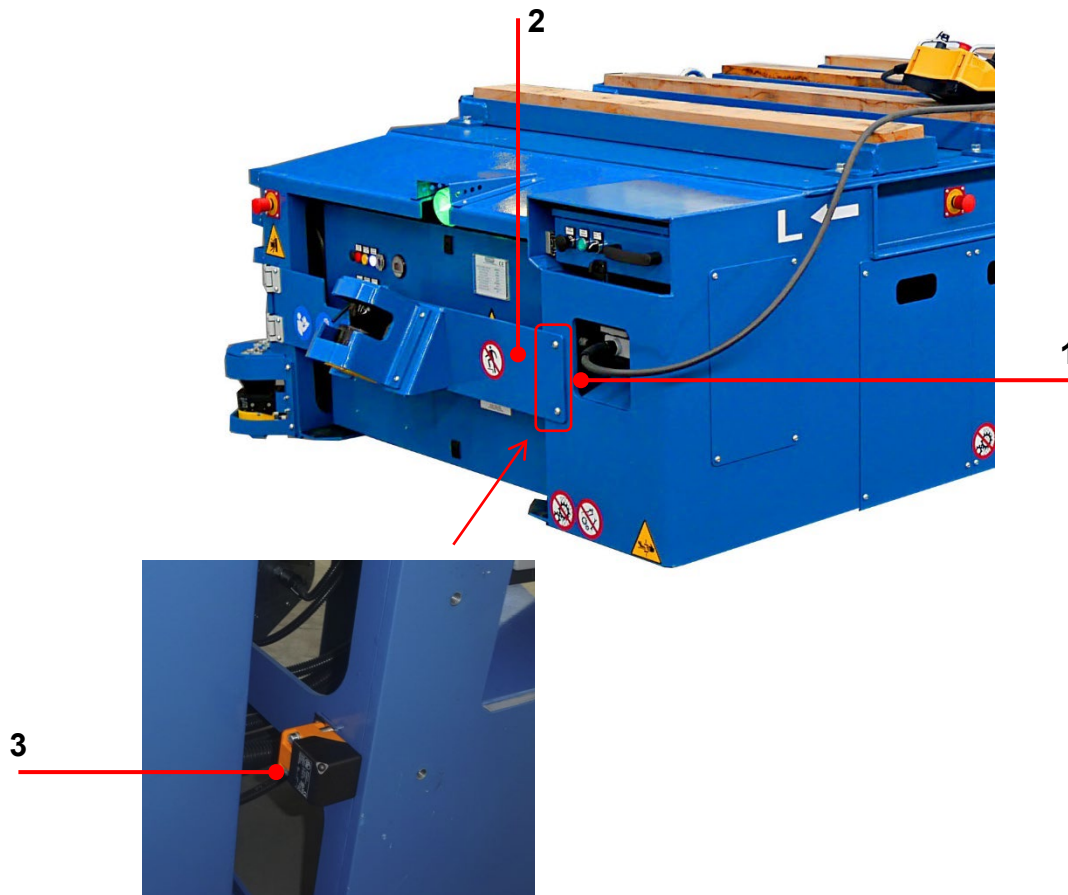
8.11 ACCESS TO THE ELECTRIC PANEL

To access the electrical cabinet, the front laser scanner support must be opened. This support is hinged to the machine frame.

Proceed as follows:

- Stop the machine and disconnect the power supply.
- Unscrew the 2 M10 screws **(1)**.
- Open the bracket **(2)**.

At the end of maintenance operations restore the support **(2)** following the procedure backwards. A special sensor **(3)** gives consent to move the machine only if it detects the presence of the support **(2)**.



8.12 MAINTENANCE OPERATION CARDS

Record all the maintenance operations in a specific logbook, for which an example follows.

DATE	OPERATOR	DESCRIPTION OF OPERATION

8.13 SPARE PARTS

A spare parts list follows. The letter “U” indicates parts subject to wear that it is recommended to keep in stock, whereas the letter “R” indicates those which could break (for which it is necessary to contact the Manufacturer).



CAUTION

Use only original spare parts. Replacement with parts that are not originals could jeopardise machine functioning.



CAUTION

The spare parts are to be kept clean, lubricated and stored in appropriate containers to preserve the integrity over time.

8.13.1 Mechanical spare parts

U / R	Description	Manufacturer	Quantity installed	Quantity recommended
U	Motorised polyurethane wheel Ø 500x300 mm	MORELLO	4	1
R	Crown 1" Z=42	MORELLO	4	-
R	Pinion 1" Z=14	MORELLO	4	-
U	Chain 1" L=1,480 mm + joint + false link	CATOR	2	-
U	Chain 1" L=1,660 mm + joint + false link	CATOR	2	-
R	Rubber cylinder spring Ø188x180 F.41 SH.60/65	GOMMA INDUSTRIALE	2	-
R	Planetary gearbox R 2EL 001A 32.6Y C038M1 P10a I24x200 B3	ROSSI	2	-
R	PMAC 48V motor 3000W 2300rpm, MRSinCOs sensor, KTY84-130 thermal sensor, 20Nm 48V brake with release lever and IP54 protection grommet	METALROTA	4	-
R	Planetary gearbox R 2EL 001A 32.6Y C038M1 P10a I24x200 B8	ROSSI	2	-
R	Fifth wheel outer diameter 1000 H.82	MORELLO	2	-
U	Tapered roller bearing 32022X	SKF	8	2
R	Locknut KM22 M110x2	SKF	4	-
R	Washer MB22	SKF	4	-
U	Wooden crossbar CARPLY 144x92x1.630	MORELLO	8	2

**SELF-PROPELLED
ELECTRONIC TROLLEY WITH TYRES AGV
Serial number 2423**



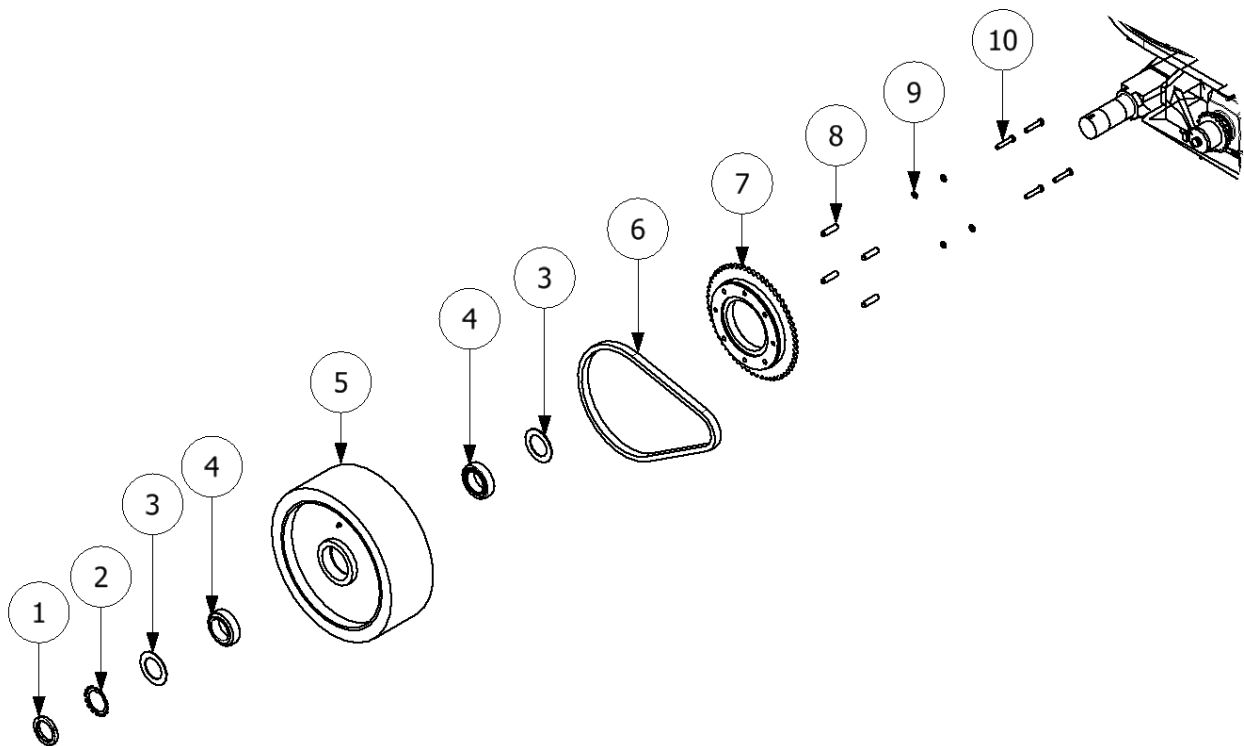
8.13.2 Electrical spare parts

U / R	Description	Manufacturer	Quantity installed	Quantity recommended
R	Lithium battery 48V 300Ah	ALIAN	1	-
R	Rectifier CB48160 BG9 UL CAN 480V 3F 50/60Hz 11A	ALIAN	1	-
R	Wired control panel	MORELLO	1	-
R	On-board power skid SA-BLS 200-2B/20-2-01 - dwg.139-81-068.095/8-01 (0590198/00)	VAHLE	1	-
R	Power pad BLS 200.2.01 VAHLE	VAHLE	1	-
R	Guide rail NS-01-40-270	IGUS	1	-
R	Pad DRYLIN NW-12-40-LLY	IGUS	1	-
R	Linear actuator ALI1-F/0150/M06/24/M0/C03/P1/A2	MECVEL	1	-
R	Guide wire antenna HG G-19330ZA	GOETTING	4	-
R	Antenna transponder RFID HG G-71450YA	GOETTING	2	-
R	Laser scanner MICS3-ABAZ55PZP01	SICK	4	-
R	Absolute encoder CMS582M-00014 8192/4096 PROFINET ANP12MM M12 side	T&R ELECTRONICS	2	-
R	Inductive sensor IMC4020BCPKG/US-100-DPA 40x40	IFM	4	-
R	Flashing beacon XLF RGA 90847	SIRENA	4	-
R	Frequency Generator HG G-57500SD	GOETTING	1	-
R	Motor drive 1232SE-6321 48-80V 250A	CURTIS	4	-

8.14 EXPLODED DRAWINGS

8.14.1 Motorised wheel assembly

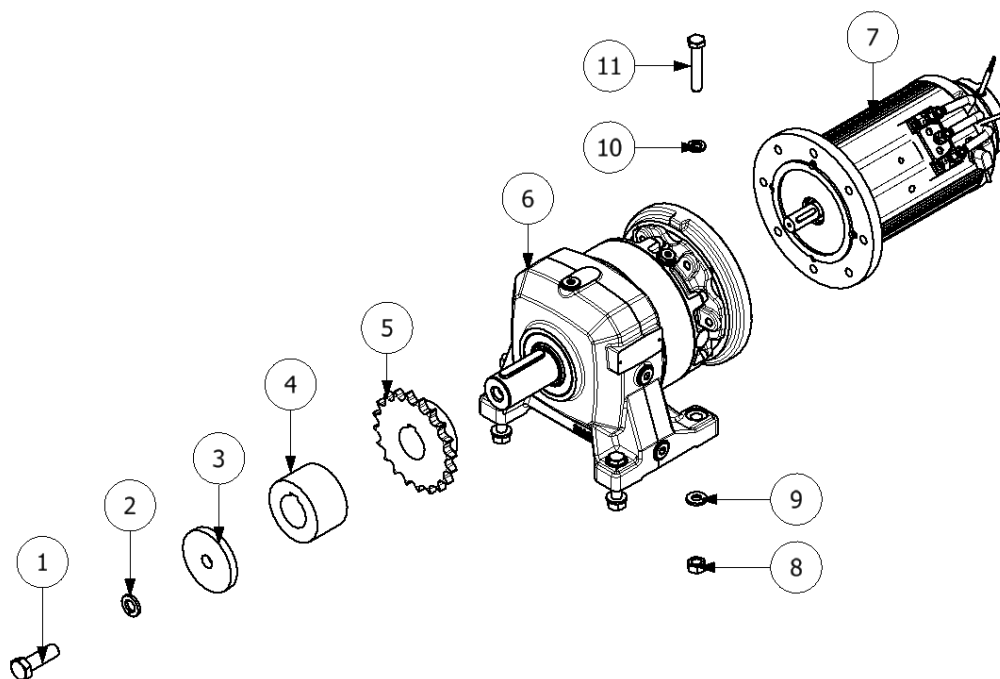
Pos.	Description	Quantity
1	Ring nut KM22	1
2	Safety washer MB22	1
3	Dust cover 110x170x3	2
4	Bearing 32022 X	2
5	Polyurethane wheel Ø 500 x 300 mm	1
6	Chain 1" L=1.480 mm o L=1.660 mm + joint + false link	1
7	Crown wheel 1" Z=42	1
8	Plug D16x80	4
9	Open spring washer M16	4
10	Hex head screw M16x80	4



Example image for illustrative purposes only

8.14.2 Gearmotor unit

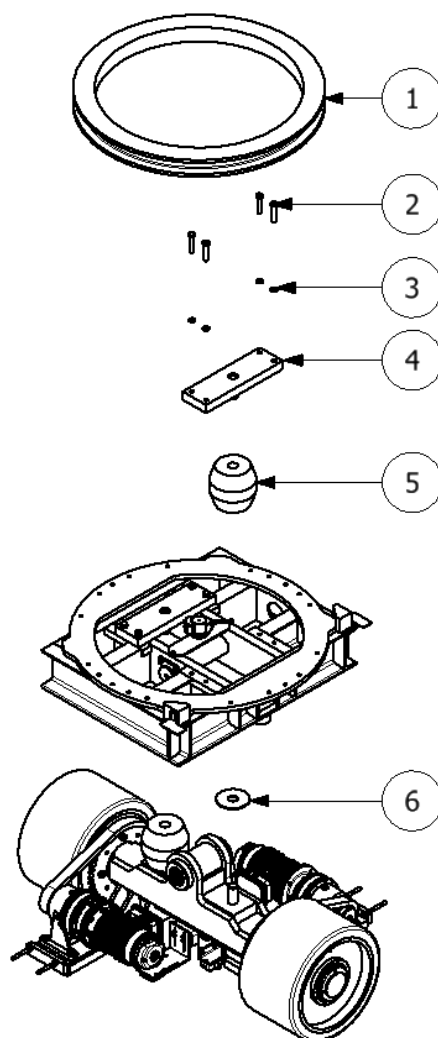
Pos.	Description	Quantity
1	Hex head screw M12x50	1
2	Open spring washer M12	1
3	Pinion cap	1
4	Pinion spacer	1
5	Pinion 1" Z=14	1
6	Reduction unit EPI 2EL 001A 32,6Y C038M1 P10a I24x200 B3 e B8	1
7	Motor BL 3 kW 48 V 2.300 rpm	1
8	Standard nut M14	4
9	Flat washer M14	4
10	Open spring washer M14	4
11	Hex head screw M14x80	4



Example image for illustrative purposes only

8.14.3 Tilting axle unit

Pos.	Description	Quantity
1	Fifth wheel external diameter 1000 H.82	1
2	Hex head screw M16x80	4
3	Open spring washer M16	4
4	Fixing plate	1
5	Cylindrical rubber spring Ø188x180 F.41 SH.60/65	1
6	Spacer	1

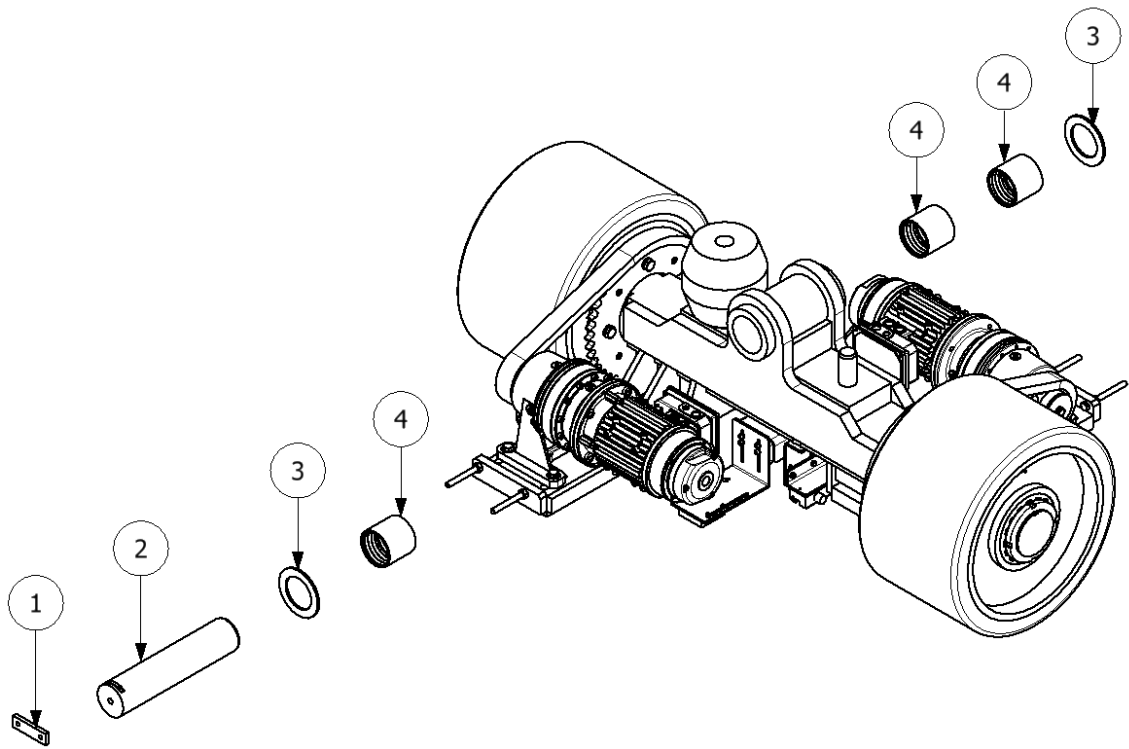


Shock absorber

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SELF-PROPELLED
ELECTRONIC TROLLEY WITH TYRES AGV
Serial number 2423

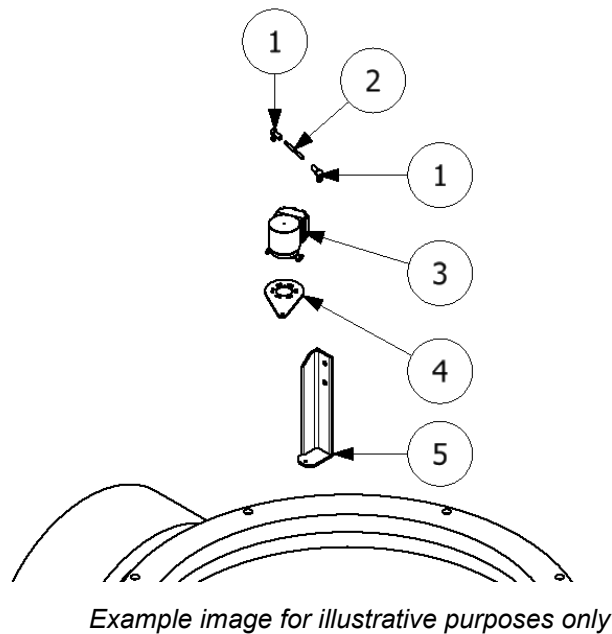
Pos.	Description	Quantity
1	Anti-rotation plate with pair of screws (and washers in between)	1
2	Pin	1
3	Spacer	2
4	Tilting axle bushing 080 090 080	3



Axle

8.14.4 Steering encoder group

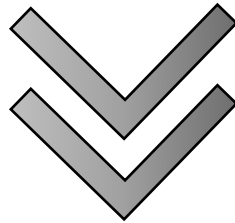
Pos.	Description	Quantity
1	Joint M5	2
2	Threaded rod M5	1
3	Absolute encoder CMS582M-00014	1
4	Fixing plate	1
5	Fixing bracket	1



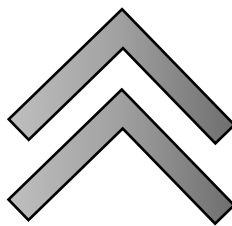
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Serial number 2423**



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ATTACHMENTS



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Serial number 2423**



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9. ATTACHED DOCUMENTATION

The documents below will be inserted at the end of this manual.

DESCRIPTION	
1	Machine layout and routes in AGV mode
2	Wiring diagram and bill of materials
3	Motor manual
4	Reduction unit manual
5	Rectifier manual
6	Battery manual
7	Frequency generator manual
8	Access point manual
9	Inverter manual
10	Laser scanner manual