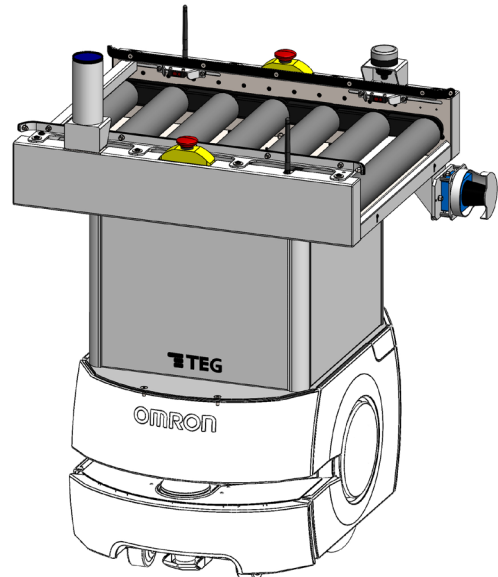
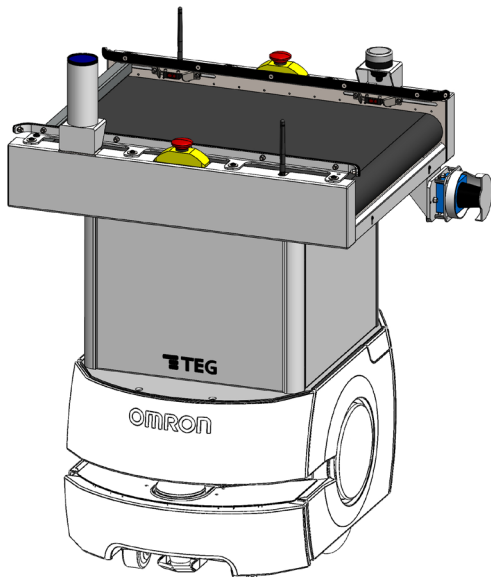
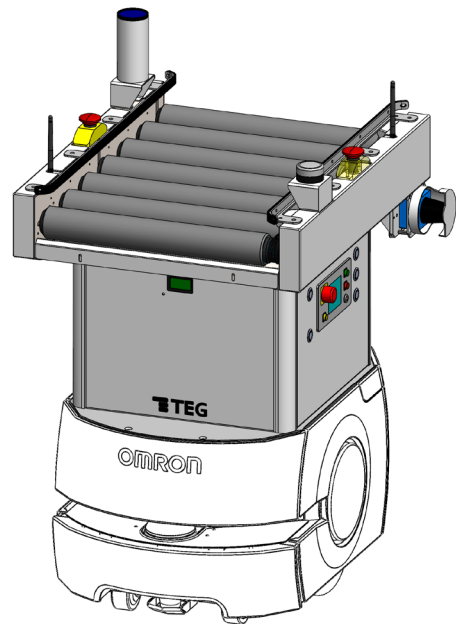
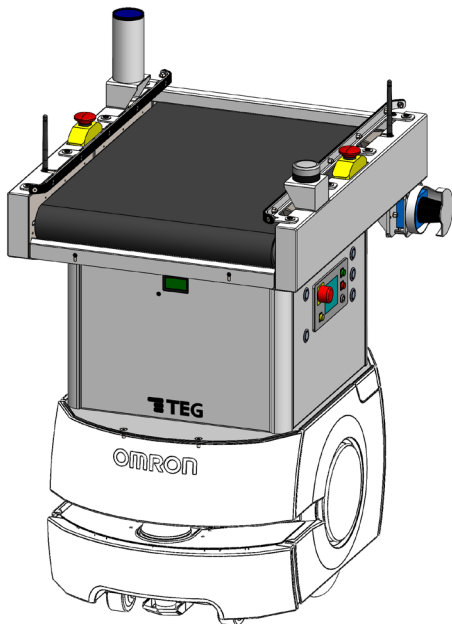


Conveyor Top

for Omron LD-60/LD-90 Autonomous Mobile Robots

Assembly Instructions

According to Machinery Directive 2006/42/EC (ANNEX VI)





This instruction manual is an integral part of the Top and must be stored to be used until the Top is finally dismantled.

Carefully follow all the instructions provided in this manual and keep it on hand for consultation while working.

Operators who are not familiar with the instructions and procedures described in this manual are not to be allowed to handle the Top.

The manufacturer is not responsible for any possible drawbacks, breakages or accidents due to ignorance or the failure to observe the instructions included herein.

The same applies to unauthorized changes and handling or the use of non-original accessories or spare parts.

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Revision History

Revision Code	Date	Revised Content
A	April, 2021	Original release

1. General information

1.1 Introduction

Tops developed by Tecno-Elèctric Girona S.L. consist of different models of motorized conveyors to be assembled on Omron LD-60/LD-90 Platforms:

- Belt conveyor for front loading/unloading (FB)
- Roller conveyor for front loading/unloading (FR)
- Belt conveyor for side loading/unloading (SB)
- Roller conveyor for side loading/unloading (SR)

These conveyor Tops are intended for the transport and handling of small parts such as boxes, trays, crates, etc.

The supply of a conveyor Top does not include the Omron LD-60/LD-90 Platform.

An AMR or an AMR fleet will execute transport jobs, by means of a specific hardware/software distributed computing system, implemented over a communications network, which will manage transportation orders and interaction with the logistical parts of the installation. This computing system is not included.

1.2 Definitions

LD OEM Platform (LD): a LD-60 or LD-90 Platform, for payloads of 60 or 90 kg, developed by Omron Robotics and Safety Technologies, Inc.

The Platform is the most basic part of the robot. It includes the chassis, drive assemblies, suspension, wheels, battery, lasers, an on-board LD Platform core with a built-in gyroscope, navigation software, connectors for interfacing with and powering the payload structure, and the Platform skins (external covers).

Payload structure (Top): Component attached to the Platform in order to handle products, parts or documents to transport. Payload structures developed by Tecno-Elèctric Girona S.L. consist of different types of motorized conveyors: belts and rollers.

AMR (Autonomous Mobile Robot) vehicle: a Platform with a payload structure attached to it. This is a complete mobile robot, which will transport products, parts or documents.

Fleet: Two or more AMR vehicles working in the same workspace.

Fleet Manager: System that manages an AMR vehicle fleet. It includes the Enterprise Manager 2100 appliance and the software that runs on it, both developed by Omron Robotics and Safety Technologies, Inc.


Acuity: Localization accessory for the LD OEM Platform. Used where laser localization is not possible and ceiling lights are adapted to light localization.

Side lasers: Accessory for the LD OEM Platform. Used to detect obstacles that are at heights the safety scanning laser of the LD cannot detect.


Optical communications: Accessory for the Top. Used for direct I/O status change between the AMR and the fixed conveyor.

1.3 Identification

Each Top is identified as shown below, according to the provisions of the current Directive:

		Riu Güell, 34 17180 Vilablareix Girona +34 972 244 606
Model	<input type="text"/>	
Item code	AMT-00X- <input type="text"/> 0- <input type="text"/> N- <input type="text"/> 0	
Serial number	AMR2 <input type="text"/> -0 <input type="text"/> 2	
Mfg. year	202 <input type="text"/>	

Top identification plate

		Riu Güell, 34 17180 Vilablareix Girona +34 972 244 606
Ref.	AMR2 <input type="text"/> -0 <input type="text"/> 2	EN60204-1
Un.	24 VDC	
In.	5 A	Year 202 <input type="text"/>
kW	0.12	IP 20

Rating plate

1.4 Company name of manufacturer

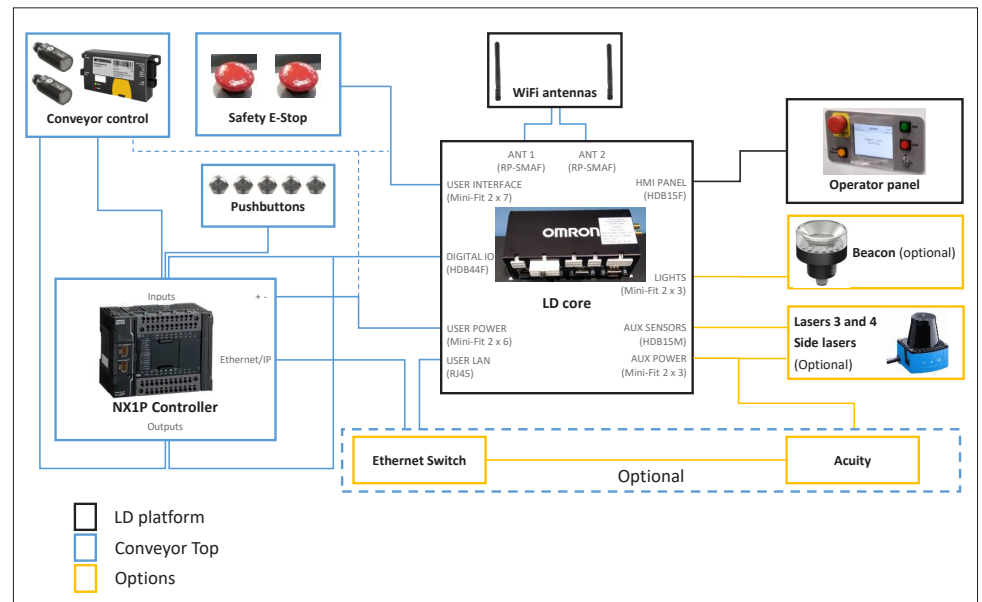
Tecno-Elèctric Girona S.L.
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 E-17180 Vilablareix
 Girona (SPAIN)
 Tel. +34 972 244 606
tecnoelectric@teg.es
www.teg.es

1.5 Architecture

Tops developed by Tecno-Elèctric Girona S.L. include an NX1P controller to manage the conveyor and for interconnections with the LD Platform Core by using the Sysmac ARCL library.

For the safety system, the internal device of the LD Platform is used.

An architecture diagram is shown below:



AMR architecture diagram

1.6 Planned use and limitations of use

Every Top is prepared for the automatic transport of boxes, with the features shown at Technical Specifications section. The manufacturer must be consulted for a different purpose than that described in that section, or with parts not described in that section.

Some of the parameters defined at Top technical specifications that have to be taken into account for use are:

- Maximum allowed payload for each AMR vehicle.
- Number and dimensions of boxes that will be transported.
- Other indications related to transportation process (movement speeds, environmental condition, etc.)

Workplaces

Interaction between people and Top during normal operation of the AMR must be taken into account.

During the Top life cycle, only operators who have been duly trained in Top use an/ or maintenance aspects described in this manual should interact with it.

More information can be found in the LD Platform User's Guide.

1.7 Warranty

The warranty coverage is specified in the sales contract.

1.8 Standards and directives used

The indications contained in the regulations in force and in the following codes in particular have been used for the design and manufacture of the Top:

Directive 2006/42/CE Machinery directive.

Directive 2014/30/EU Electromagnetic compatibility directive (EMC).

EN ISO 12100:2010

ISO 3691-4:2020

EN ISO 13849-1:2016

EN ISO 13857:2019

EN ISO 14120:2015

EN ISO 13850:2015

EN ISO 13854:2019

EN ISO 14118:2017

EN 60204-1:2018

EN IEC 61000-6-2:2019

EN IEC 61000-6-4:2019

1.9 About the instruction manual



IMPORTANT INFORMATION:

Do not try to use the Top until you have read this manual completely.

When this manual was written, it was fully up-to-date. However, due to the constant improvements made, the operating procedures may vary slightly with respect to the description in this manual. This implies that the Top has been improved to suit your requirements. In the event of any doubt, please contact your local Omron sales representative for assistance.

Although efforts have been made to ensure that the information in this manual is correct, Tecno-Elèctric Girona S.L. is not liable for any losses, damages or injuries caused by any faults or omissions that there may be in the information provided.

Partly completed machine

Tecno-Elèctric Girona S.L. conveyor Top is considered as a partly completed machine. To get an AMR (Autonomous Mobile Robot), a Top structure must be incorporated onto an LD-60 or LD-90 platform. The LD Platform is also considered as a partly completed machine.

It will be considered as a machine a set consisting of:

- An AMR fleet, consisting of one or more AMR vehicles made up of a platform and a payload structure
- An Enterprise Manager 2100 fleet manager, except single AMR fleets
- A specific hardware/software distributed computing system, implemented over a communications network, which will manage transportation orders and interaction with the logistical parts of the installation.

It is the responsibility of the system integrator to define and cover the compliance of the completed machinery, considering also the following: AMR fleet, Enterprise Manager 2100, specific computing systems and other elements of the application and its environment.

Purpose of the document

The instruction manual is compiled by the firm Tecno-Elèctric Girona S.L. and is an integral part of the supplied partly completed machine. Each Top is sold with its own instruction manual. The user is responsible for managing this manual throughout the service life of the Top, and have to preserve it until the Top is dismantled.



Tecno Elèctric Girona S.L. is not responsible for any alterations made to this manual or any amendments made to the Top by users, after its delivery, and that are not foreseen in this document.

The manufacturer reserves the intellectual property rights of this manual, and consequently, its whole or partial distribution in any form (printed, photocopied, microfilm or other media), as well as its processing, reproduction or distribution by electronic systems to companies or individuals, without its prior approval and registering, is forbidden.

This manual is a valid guide for learning about the Top and using it correctly. It contains information on technical data and useful advice on the Top transport, installation, safety, and step sequences for using, assembling, disassembling and maintaining the various components.

The aim of this manual is to provide users with the instructions and information that must be strictly observed to use the Top correctly and to ensure the safety of the operators involved with it. Therefore, users are recommended to:

- Ensure this document is easily accessible in the workplace.
- Inform all relevant operators of its presence.
- Transfer the manual to any subsequent owners of the Top, in the event it is sold.

Document identification

This instruction manual is made up of different sections and additional specific documents. They are identified as:

- User manual
- Maintenance procedures
- Dimensions drawing

Related manuals

This manual covers the installation, configuration, operation, and maintenance of Tops developed by Tecno-Elèctric Girona S.L. There are additional manuals from Omron Robotics and Safety Technologies, Inc. about LD platform configuration.

Look up the table below. These Omron Robotics and Safety Technologies Inc. manuals are available on the software media provided with the LD Platform.

Manual number	Title	Description
I611	Mobile Robot LD Platform User's Guide	It covers setup, operation, and user maintenance of an LD Platform.
I613	Mobile Robot LD Platform Peripherals Guide	It covers setup, operation, and user maintenance of LD Platform accessories.
I616	Mobile Robot Safety Guide	It includes general safety information for all AMRs based on the LD platform.
I631	Enterprise Manager 2100 User's Guide	It covers the Enterprise Manager 2100 system, which includes the hardware and software for managing an AMR fleet.
I635	Fleet Operations Workspace Core User's Guide	It covers the installation and use of the software FLOW Core to configure and manage an AMR fleet.
ARCL_ Comms_ Lib_[]_ Manual	Sysmac Function Block Library for Omron Mobile Robots User's Manual	It includes information that is necessary to use the Application Library with the Sysmac Studio.

Related manuals table

Use of this manual

This manual is intended for end users and for those who in one way or another are involved in the various stages and tasks during the Top's working life such as transport, installation, use, handling, maintenance and final removal.

More specifically, it must be consulted constantly regarding the following information:

- Foreseen conditions for using the Top.
- Post held by the operator.
- Instructions relating to:
 - Start-up
 - Use
 - Transport and installation
 - Assembly and dismantling
 - Setting operations
 - Maintenance and repair work

Legislation

Compliance with all the electrical legislation and standards regarding the equipment supplied with the Top, shall remain the exclusive responsibility of the client, who will apply them strictly and appropriately to their corresponding use.

As well as the standards included in this manual, the specific legal provisions regarding the prevention of accidents in the workplace must be respected.

2. Safety

The aim of this chapter is to specify the safety measures adopted in the partly completed machine Top in order to minimize all kinds of risks. As well as the safety measures to be adopted by the users in order to create a safe working environment, without faults and with optimum productivity.

The manual refers to the following definitions in terms of safety:

- **Head of safety:** The person in charge of this job is the one who authorizes the use and is the person who has decision-making power regarding safety.
- **Hazardous area:** Areas inside the partly completed machine or near it, where there is a real or potential hazard of any kind, for people's health and/or safety;
- **Residual risk:** A risk that remains even after taking all preventive measures.

2.1 Safety indications

According to currently applicable standards, a partly completed machine is generally said to be safe if it complies with the essential safety requirements. The means to reaching this objective include:

- Hazard reduction through design (intrinsic prevention).
- Means of protection.
- Information on its use (signals, signs, instructions).
- Individual protection equipment.
- Safety measures adopted by users (safe working procedures and safety organization methods).

The partly completed machine considered in the present manual has been built on the basis of the most modern technical know-how, so that it can be used with the maximum possible safety by trained, authorized and legal operators.

2.2 Intended use

The partly completed machine has been designed for automatic box transportation with the features listed in technical specifications section. For a different use than as described in that section, or items not described therein, must be expressly consulted with the manufacturer.

2.3 Liability limitations

The manufacturer cannot be held liable for any damages, in the following situations:

- Incorrect use of the partly completed machine.
- Use of the partly completed machine by untrained personnel.

- Use of the partly completed machine contrary to that set out in this manual.
- Use of the partly completed machine contrary to current standards and legislation.
- Use of the partly completed machine with faulty primary power supply.
- Use of the partly completed machine with a serious deficiency in the foreseen maintenance standards.
- Use of the partly completed machine with modifications or operations not explicitly authorized in writing by the manufacturer.
- Use of the partly completed machine with non-original spare parts or parts not specifically defined for the partly completed machine.
- Use of the partly completed machine with total or partial non-fulfillment of the instructions in this manual.
- Misuse of the partly completed machine or the machine (more information can be found in the LD Platform User's Guide)

The Safety Manager has to make sure that the general and specific safety rules needed to develop each operation, are known and applied correctly. The Safety Manager also has to check staff training qualifications, and not allow anyone without the necessary training requirements to use the partly completed machine. Follow the indications set out in the manual on the type of competence required to effectively carry out the various activities.

The Safety Manager responsible for the partly completed machine and its related activities, must only act with respect to the main purpose for which the partly completed machine is intended and with the knowledge of the foreseen functions, incorrect uses, limitations of use, materials to be used and the features to be requested.



The use of the partly completed machine for purposes other than those foreseen by the builder or with materials other than those expressly indicated, may constitute a hazard for the operators or damage the partly completed machine.

The instructions contained in this manual must be available at all times to the staff who can interact with the partly completed machine.

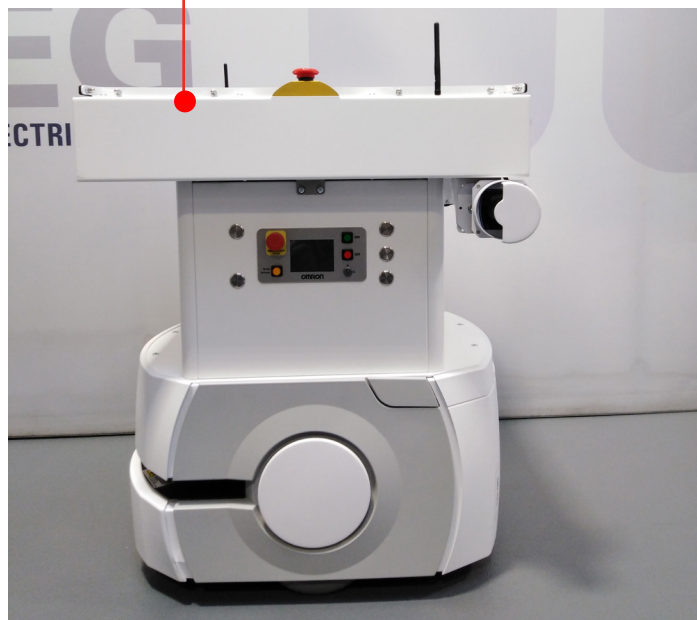
If any anomaly in the partly completed machine is detected, the Safety Manager must be informed quickly so as to intervene before the anomaly becomes dangerous.

In order to ensure over time the safety features envisaged by the manufacturer, the partly completed machine has to undergo appropriate preventive maintenance, and any repairs must be conducted by qualified personnel, always using original spare parts.

2.4 Graphical safety symbols

On the partly completed machine, each location shown below is provided with a caution label concerning safety. Carry out the operation and maintenance of the partly completed machine with due care to avoid personal injury.

2.4.1 Caution label locations



2.5 Risks related to the partly completed machine type

Due to the nature of the production and the type of operation, the partly completed machine involves certain intrinsic risks that are reduced to a minimum thanks to correct planning, correct installation and the appropriate behavior of the team involved.

The partly completed machine is made up of rotary elements and other movable elements that have mechanical risks.

2.5.1 Electric shock risk

Electrical risk exists both while attaching the Top to the LD Platform, and in cleaning and maintenance operations.

Electrical operations may only be carried out by people who are trained in these types of operations and who are aware of the risk involved in electrical operations.

Electrical risks may be caused by direct or indirect contact with parts or components with voltage.



Before performing these operations, disconnect the LD Platform battery.
More information can be found in LD Platform User's Guide.

2.5.2 Pinching risk

There is a risk of pinching in rotary parts such as shafts, gears and others. The pinching risk between rollers and rotary parts exists both in normal working stages, and in cleaning and maintenance operations, especially if any fixed or movable guard is not installed or bad positioned.

There is also pinching risk due to bad positioning of the fastening rod, which can cause conveyor falling and impact a part of the body.

In case of pinching, emergency stop must be used.

More information can be found in the LD Platform User's Guide.

2.5.3 Noise risk

The partly completed machine's continuous acoustic pressure level does not present any risk to the staff. The acoustic levels are within the legally permitted limits.

Applied ruling: The measurements and results have been considered taking into account the recommendations included in currently applicable international rulings.

2.6 Adopted safety protections and measures

2.6.1 General measures regarding the whole AMR

To ensure the health and safety of the people exposed, the partly completed machine has been designed and manufactured with particular solutions, whether mechanical, electrical, etc. as functional (software, circuits, etc.).



No electrically protected maneuvering of the partly completed machine can be modified or omitted without the express permission of Tecno-Elèctric Girona S.L. If modified or omitted, the partly completed machine Declaration of Incorporation will lose its validity and consequently Tecno-Elèctric Girona S.L. would not be liable for personal safety.

These are some of the adopted solutions:

- When designing the parts, any corners or sharp edges that might be dangerous or harmful have been avoided.
- The frames have been designed to fulfill both the permanent and the movable protection functions described above. The frames protect all the elements making up the transmission of movement, either linear movement or rotary movement.
- On roller models, fixed protections have been installed to cover the drive belts and between the rollers. These protections are fixed by bolts.



Before starting up the partly completed machine, a qualified operator must check the perfect working order and condition of the guards and other safety elements. In the event of breakdown, these elements must be repaired or replaced immediately.



The safety elements must not be opened during partly completed machine operation. It is forbidden to move or deactivate the safety elements and guards. Once the maintenance operations have finished, the safety elements and guards must be put back in their original position.

- Emergency stop: if the emergency stop is used, the AMR stops immediately. An emergency stop can be triggered by the three "mushroom" type pushbuttons, located on the control panel, next to the display, and on the top side of the Top.

The mechanism acts on active safety micro-switches that prevent the AMR from restarting until the device is manually reset.



Only use the emergency stop when there is a risk to the nearby staff or to the transported material.



The efficiency of the safety appliances must be checked frequently, controlling the installation of fixed guards, the activation of moving guards and the working order of all related installations and services (emergency push buttons, micro-switches, filters, etc.). Check the maintenance files delivered with the manual.

Emergency stop pushbuttons operation must be checked weekly.

2.7 Precautions when maintaining and cleaning

The cleaning operations are only to be carried out by one operator, and always when the AMR is off. The other operators are to stand away from the AMR.

It is not permitted to remove any fixed or movable guards and put the AMR into production until the guards have been fixed in place with their original fixations.



This manual describes the ideal machine cleaning and maintenance conditions to avoid any occupational accident directly or indirectly arising from these operations.

It is strictly forbidden to clean the AMR with it in operation, irrespective of the cleaning operation to be carried out.

2.8 Contraindications and hazards from non-intended use

The Top manufactured by Tecno-Elèctric Girona S.L. is intended to transport boxes. Using this partly completed machine for purposes other those intended and for which it has been manufactured, leads to anomalies and can result in damage to the working environment and a serious hazard for staff.

- The Top and the LD Platform are not designed to work in an explosion-risk area, so it is strictly forbidden to use them in an ATEX classified area.
- The final user must consult the manufacturer about any unforeseen use of the AMR, and check on any possible contraindications or dangers arising from incorrect use.

- In the event of any modification made to the Top after shipment, users must contact the manufacturer and check on any risks these modifications may imply, and whether they comply with current safety standards.
- The position and size of cinematic mechanisms must not be modified to vary Top operation under any circumstances.
- The environmental conditions for correct machine operations are a temperature between 15 °C and 40 °C (59 °F to 104 °F), and a humidity level between 30% - 90% without condensation.



Hazardous products (explosives, corrosive chemicals...) cannot be used inside the transported boxes without the express authorization of the partly completed machine manufacturer.

2.9 Precautions related to residual risks and other indications to be remembered

Residual risk: A risk that remains even after taking all preventive measures.

- During machine operation the guards must not be removed under any circumstances. Staff members, even experts, must follow the instructions and precautions indicated in this manual.
- Before switching on the AMR, an operator must check the perfect working order and condition of the guards.
- For any setting or replacement operation not described in this manual, consult the manufacturer or seller's qualified team.
- Any setting or replacement operation described on this manual, must be carried out by qualified operators.
- Use the setting controls, in order to adapt the machine to the different production requirements.
- Avoid long hair, necklaces, bracelets, loose clothing, ties, scarves and any other item that may get caught in the moving mechanical parts and drag the operator towards areas where there is a risk of getting crushed.
- Suitable AMR maintenance is the determining factor in ensuring a greater working life in optimum working and performance conditions, and also for guaranteeing the safety conditions foreseen by the manufacturer.
- Before any maintenance or replacement work, do not forget to carry out the following operations:
 - Turn off the AMR completely by pushing the red OFF pushbutton.
 - Remove the battery and secure the battery compartment by closing and removing its key, so that the AMR cannot be started up by third parties.

- The safety systems must only be set by staff authorized by the partly completed machine manufacturer or seller.
- It is compulsory to use safety footwear when handling the AMR.

More information can be found in the Mobile Robot Safety Guide and in the LD Platform User's Guide.

3. Transport, installation and configuration

3.1 Preparation on customer premises

The final customer is responsible for conditioning the installation site according to the current safety standards in their country.



The floor on which the AMR will be installed must be suitable to guarantee its correct movement and keep the load from failing. The floor must also be flat and sufficiently smooth.

Both Top and LD Platform will work under the following conditions:

- Temperature: +10 °C to +40 °C.
- Humidity: 30% to 90%, without condensation.

3.2 Transport

Tecno-Elèctric Girona S.L. prepare the transport of the Top. The Top is shipped in a single package.

The Top is appropriately prepared for transport to its installation site. The type of packaging and protection required depends on the transport means (ship, plane, truck, etc.) and the foreseen storage time, where applicable.

In case of maritime shipment, it is especially recommended to protect the various parts of the partly completed machine by means of rust-proofing protective lubricant. Some varnished, metallic parts are sprayed with oils or protective substances. Hoisting and handling areas are to be left uncovered to facilitate unloading operations. All elements are fixed so they cannot move during the shipment.

3.3 Unloading

Knowing how Tecno-Elèctric Girona S.L. ships the Top is important to optimally unload it upon arrival at the customer's facilities.

Before unloading the Top, you must be aware of the details of the packing list delivered with it, which specifies all of the shipping details, weights, size of the package, etc.



Assembly and installation of the Top after transportation must be carried out by qualified staff.

Upon arrival of the transport, inspect:

- Packing status.
- Damp areas.
- Parts or components that have moved during transit.
- Parts or components that appear to be damaged.
- Broken or knocked packaging.
- Accumulated water (inside the transport container, truck or boxes).
- Any other abnormality.

If any of the above-mentioned problems occurs, immediately contact the Insurance Company covering the transport, and also your Omron local sales representative. Do not unload anything until you receive clear instructions with respect to this and, if possible, take photographs of the defects in the load.



Tecno-Elèctric Girona S.L. products are precise and must be treated always with the utmost care during its unloading, transport and handling.

It is envisaged that the package be lifted from below, by forklift or pallet trucks. It can also be lifted from above, by crane or overhead crane.

3.3.1 Precautions associated with unloading

- During these operations, wear gloves and protective clothing.
- Open the packaging in an appropriate manner.
- Protect varnished areas with packaging cardboard.
- Dispose of all packaging materials according to current regulations.

In case of elevation:

- Use safety hooks for hoisting.
- Use appliances with a suitable scope for hoisting.
- Use suitably dimensioned belts or cables to support the weight. Do not knot or wind the cables so as to avoid reducing the hoisting capacity or transmitting torsion to the load. When hoisting unbalanced loads, use different length or adjustable length ropes.
- As you go along, control the state of the various elements (ropes, cranes, etc.) to handle the loads.

- During hoisting, people unauthorized for the operation should not pass by or stop near the hoisting area, whereas the people involved must stand at a suitable distance so as to avoid knocking into the package.

3.4 Possible stock

Particularly in maritime transport, the thermal containers can lead to humidity forming inside the packagings. Therefore it is necessary to unpack all the Top parts and leave them in a dry, ventilated area so as to prevent rusting or deterioration.

Place all the Top parts on the ground, preferably a smooth, flat floor. Make sure that the parts are stable and cannot fall. Do not stack the parts on top of each other.

If the Top is to be stored for a long period before mounting and installation, certain precautions must be taken to avoid damage or rusting: The Top needs to be stored in a closed site, protected from atmospheric conditions.

The following temperature and humidity conditions must be respected:

- Temperature: +10 °C to +40 °C
- Humidity: 30% to 90%, without condensation

All the non-varnished steel parts must be sprayed with antioxidant oil, but take care not to spray rubber or plastic elements.

Cover the pushbuttons and control appliances with plastic film.

Protect the Top with cloths or similar elements.

If the AMR is to be out of service for a prolonged period once it has been used, the following precautions must be taken to ensure it is correctly kept.

Mechanical components

Fully lubricate the unit in all the points indicated in the maintenance section.

All the bearing and sliding surfaces (that are not painted) must be protected with a layer of antioxidant.

When the AMR is stopped for a prolonged period, cover it with plastic or a cover to protect it from dust and humidity.

Electrical components

The equipment should be sprayed with a product that protects the contacts and electronic circuits.

3.5 Installation and assembly

The Top assembly in its final site must be carried out by the System Integrator and/or the end user.

In the event that the AMR uses the HAPS accessory, it is highly recommended that the sensors be installed before assembling the Top on the LD. More information can be found in the LD Platform Peripherals User's Guide.

3.5.1 Cleaning upon the arrival on client premises

Following the instructions below when starting the Top unpacking and cleaning process:

- In the areas where maritime antioxidant products have been applied, it is necessary to apply a degreasing agent that is suitable for metals and that does not damage paintwork. Leave the product to be absorbed for a few minutes, and then clean off.
- Never use hygroscopic products (water-based, or that can absorb water),
- No sharp, pointed elements should be used for cleaning.



Do NOT use petrol to clean rollers or rubber-clad components, as it may damage them.

If any problem occurs during reception, unloading and/or unpacking of the Top, contact your Omron local sales representative immediately.

3.5.2 Instructions for unpacking

The Top package is shown below. The value of the weight can be found in the Technical Specifications section.



Top package

The Top package cover is fastened by Torx T30 screws.

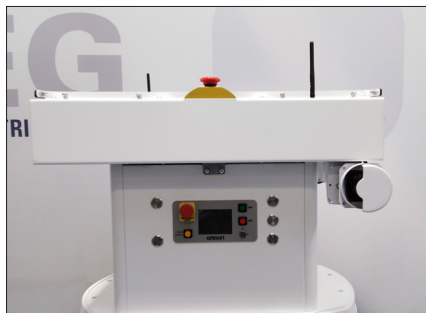
The Top is shipped assembled in one part, as shown below. A bag with the necessary screws to assembly the Top to the LD Platform is attached to it.



Packed Top

Also, a cutting tool to remove the packaging is needed. Be careful to avoid damaging the Top parts.

A supplied Top picture is shown below:



Supplied Top

3.5.3 Instructions for installation and assembling

Once unpacked, the Top is ready to be installed on the LD Platform. For the installation, the steps described below must be followed:

Removing the LD top plate

If the LD Platform is equipped with a top plate, it must be removed by removing the holding nylon screws.

The first step is to remove the WiFi antennas, which are held by thread. No tools should be used.

Next, the nylon screws that hold the top plate to the LD Platform must be removed by using a flat screwdriver.



LD OEM with original top plate

The next step is to disconnect and remove the Omron operator panel for later mounting on the Top. To remove it, remove the 4 nuts that hold it by using a 7 mm socket wrench. These nuts are going to be reused.



Omron Control panel

Next, the WiFi antennas cables must be removed by disconnecting them from the LD Core by hand or using a 9 mm fix spanner, as shown in the picture below:



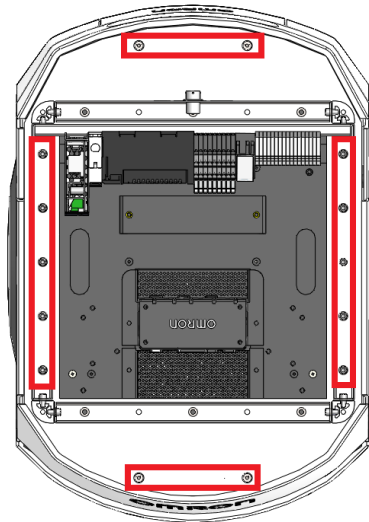
WiFi antennas connection
Right side of the Core

Top assembly

Once the LD Platform is ready, the Top can be attached.

The Top must be hoisted following the safety recommendations described in this manual.

Once placed, the Top must be attached to the LD Platform with the 14 provided M6x30 screws by using a 4 mm and a 5 mm Allen keys, as shown below:



Attaching the Top on the LD Platform

Operator panel mounting

Finally, the Omron operator panel must be installed in its housing. The use of M4 washers between the Top and the nuts is recommended.

The picture below shows a Top mounted on a LD Platform:



AMR (LD Platform + Top)

3.5.4 Connections with the LD

Once the Top is installed on the LD Platform, the connections between the Top and the LD Platform Core can be done.

For further information, check the Section 6.2 of the LD Platform User's Guide and the Section ["1.5 Architecture"](#).

Operator panel

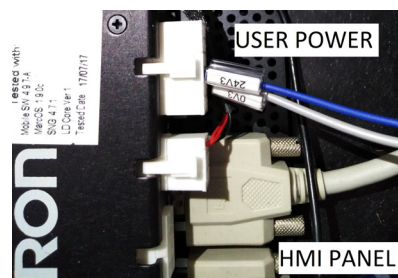
The Omron operator should be placed inside the Top so that it is not twisted or strained. It must be connected to HMI PANEL connector.



Omron Operator panel

Top power supply

The electrical system of the Top works at 24 VDC. This power supply is available on the 12-pin USER POWER connector.



USER POWER and HMI PANEL connectors
(LD Platform Core rear, upper)

Safety elements between Top and LD connector

The emergency stop pushbuttons of the Top and the conveyor drive are connected to the internal safety relay of the LD Platform through the USER INTERFACE connector. The 14-pin connector supplied with the LD must be replaced by the Top one.



USER INTERFACE connector
(LD Platform Core rear, upper)

Communication cables connection

The communications between the Top and the LD Platform Core are made through the USER LAN port of the LD Core and the Ethernet/IP port of the NX1P controller. Be careful to not connect the EtherCAT port of the NX1P controller nor the LD Core MAINT LAN port, as the AMR would not work.

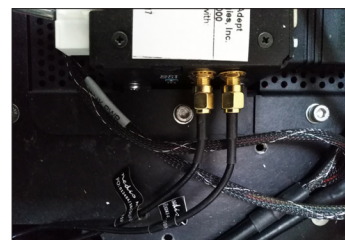
It is also necessary to connect the 44-pin cable to the DIGITAL IO connector of the LD core for wired communications.



USER LAN and DIGITAL IO connectors
(LD Platform Core front, upper)

WiFi antennas connection

The two WiFi antennas, supplied with the LD, should be located at the upper side of the Top. They are connected by thread. The antennas cables must be connected to the side of the LD Platform Core. These cables can be connected in any of both connectors.



WiFi antennas - Core connection
(LD Platform Core right side)

Options connections

Side lasers and Acuity must be wired as described in the LD Platform Peripherals User's Guide. The beacon must be connected to LIGHTS LD Core connector.

Additional connector for Joystick/Pendant

The Top is provided with an additional connector for the Joystick, located at the back of the Top, to avoid detection of the Joystick cable in case the Top includes Side lasers option.

To use the additional connector, the DB9F connector must be connected to the JOYSTICK connector, but LD Platform connector must be disconnected previously, and it will not be usable anymore unless connecting again.

3.6 Configuration

For the AMR to work properly, some configuration adjustments must be carried out before putting it into production.

More information can be found in the FLOW Core User's Guide.

3.6.1 Conveyor speed adjustment

To adjust the speed of the Top conveyor to the fixed conveyors of the installation, the Interroll Drivecontrol 20 is provided with DIP switches:



Interroll Drivecontrol 20

Speed can be adjusted by combining the position of the A, B, C and D switches, according to the table below:

Position of the DIP switch				Speed of the gear ratio
SPEED on the				for RollerDrive EC5000 AI
DriveControl				[m/s]
A	B	C	D	108:1
on	on	on	on	0,17
on	on	on	off	0,16
on	on	off	on	0,14
on	on	off	off	0,13
on	off	on	on	0,12
on	off	on	off	0,11
on	off	off	on	0,10
on	off	off	off	0,09
off	on	on	on	0,08
off	on	on	off	0,06
off	on	off	on	0,05
off	on	off	off	0,04
off	off	on	on	0,03
off	off	on	off	0,02
off	off	off	on	0,01
off	off	off	off	Corresponding to the signals

Nominal values at an ambient temperature of 20 °C on the inputs SPEED A, B, C

Speeds table

Dir and *Ramp* switches positions are factory set and should not be modified.

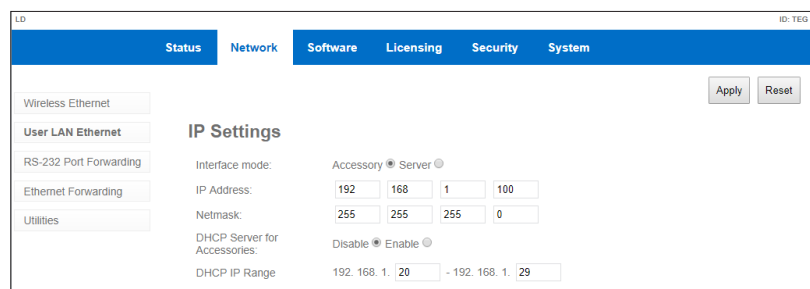
More information can be found in the Interroll Drivecontrol 20 manual, which is located at the following URL:

https://www.interroll.com/fileadmin/user_upload/Downloads_PDF_/User_Manuals/Controls/DriveControl/EN_-_Operating_Manual_DriveControl_Online.pdf

3.6.2 Setting up network connections

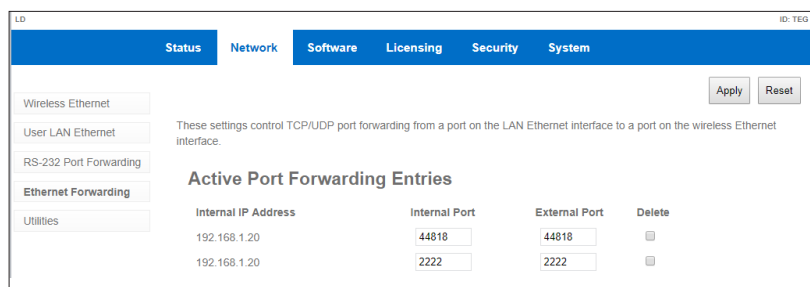
To enable the communication between the Top NX1P controller and the LD Platform Core, the network connection must be configured. To edit the network connections, the steps below must be followed:

- Access the *MAINT LAN* port on the rear right side of the LD
- Connect a PC by using an RJ45 network cable
- Access IP address 1.2.3.4 through an Internet browser
- Enter to the *Network - User LAN Ethernet* tab
- Set the parameters as shown in the image below:



SetNetGo - IP address settings

- Enter to *Network – Ethernet Forwarding* tab
- Set the parameters as shown in the image below to enable the Sysmac communication ports:

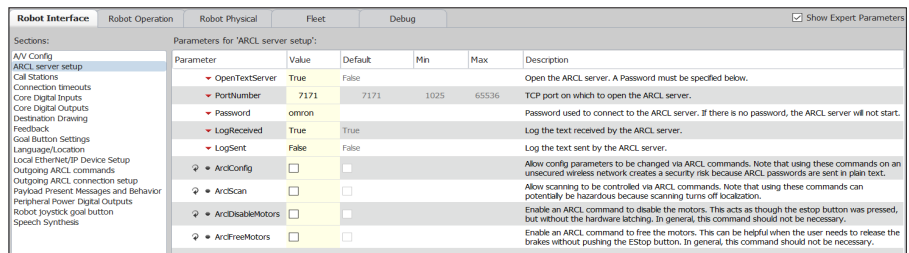


SetNetGo - Ports settings

3.6.3 Communications port opening

To open the communication port between the NX1P controller and the LD Platform Core, the port must be enabled by using the MobilePlanner software.

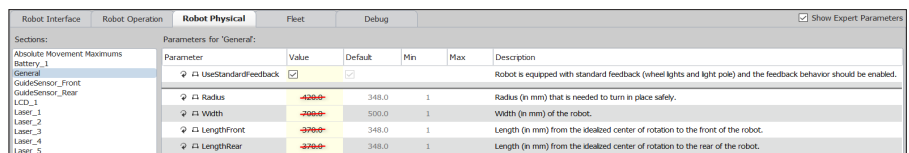
In the *ARCL server setup* section, parameters should be set up as shown in the image below:



MobilePlanner - ARCL Config

3.6.4 AMR dimensions settings

The AMR dimensions parameters must be set up by using the MobilePlanner software, in *General* section, as shown in the image below:



MobilePlanner - AMR dimensions

Parameter values vary, depending on the type of Top installed - front or side, with or without side lasers. The following tables show the values of the dimensions that have to be adjusted:

Without side lasers				
	Front belt AMT-00X-FB[]	Front roller AMT-00X-FR[]	Side belt AMT-00X-SB[]	Side roller AMT-00X-SR[]
Radius		445		445
Width		570		700
Front length		355		355
Rear length		355		355

With side lasers				
	Front belt AMT-00X-FB[]	Front roller AMT-00X-FR[]	Side belt AMT-00X-SB[]	Side roller AMT-00X-SR[]
Radius	480		500	
Width	670		860	
Front length	290		290	
Rear length	290		290	

Dimension parameters tables

The values of the tables above are higher than Technical Specifications section values, because these ones include a safety factor.

3.6.5 Other parameters adjustments

The value of the parameter *UseRearFraction* must be set to 1 by using the MobilePlanner software, in *Path Planning Settings* section.

The values of the parameters that are related to speeds, accelerations and decelerations must be modified according to the parts that are to be transported and the Center of Gravity. More information can be found in the LD Platform User's Guide.

Since Top side models are wider than the LD Platform, safety laser settings should be modified. For further information, please contact your local Omron sales representative.

3.6.6 Options settings

In case that the Top is provided with side lasers or Acuity, follow the steps described in the LD Platform Peripherals User's Guide.

The position parameters of the side lasers and of the Acuity are shown in tables below:

Laser_3				
	Front belt AMT-00X-FB[]	Front roller AMT-00X-FR[]	Side belt AMT-00X-SB[]	Side roller AMT-00X-SR[]
LaserX	-300		-205	
LaserY	-305		-395	
LaserZ	(Conveyor height - 140)			
Laser_4				
	Front belt AMT-00X-FB[]	Front roller AMT-00X-FR[]	Side belt AMT-00X-SB[]	Side roller AMT-00X-SR[]
LaserX	-300		-205	
LaserY	305		395	
LaserZ	(Conveyor height - 140)			

Side lasers parameters

Acuity Camera Position			
	Front belt AMT-00X-FB[]	Front roller AMT-00X-FR[]	Side belt AMT-00X-SB[]
CameraOffsetX	-200		205
CameraOffsetY	-250		-200
CameraOffsetZ	(Conveyor height + 185)		

Acuity Camera parameters

You can find the conveyor height value in the Item Code from your Top identification plate. Check the Section [7.1. Type designation](#) to see the Item Code description.

The light beacon does not need any configuration, only the connection to the LIGHTS port.

3.6.7 Parameters summary table

The table below shows the LD Platform parameters that should be configured by the user by using the MobilePlanner software:

Section	Parameter
ARCL server setup	OpenTextServer
	PortNumber
	Password
Core Digital Inputs	Input_1.3
	Type1
Path Planning Settings	UseRearFraction
Robot config	TransVelMax
	TransDecel
	TransAccel
	RotVelMax
	RotAccel
General	RotDecel
	Radius
	Width
	LengthFront
Laser_3	LengthRear
	LaserAutoConnect
	LaserX
	LaserY
Laser_4	LaserZ
	LaserAutoConnect
	LaserX
	LaserY
	LaserZ

Parameters to configure

3.7 Closure and dismantling

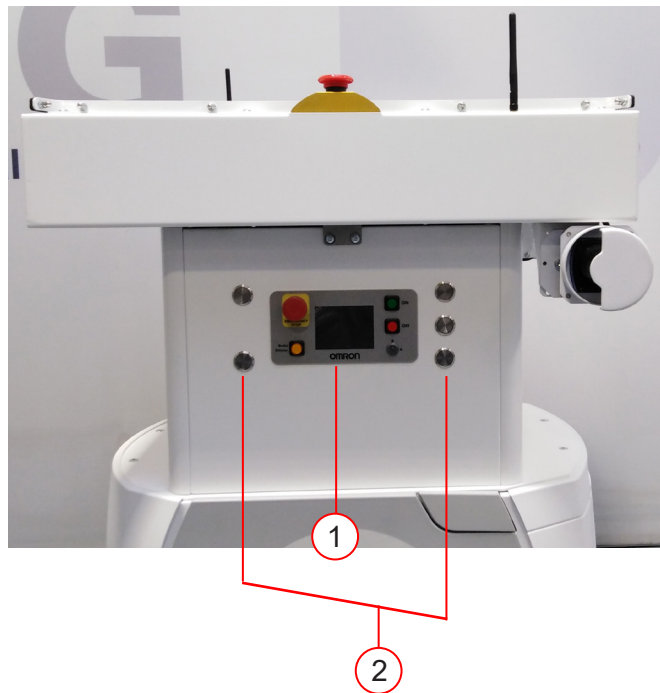
In the case of AMR dismantling or closure, there are some basic rules to be followed in order to safeguard personal health and the environment:

- Firstly request the pertinent licenses for carrying out the closing or dismantling.
- Remove even the smallest remains of oil and grease; lubricating substances must not be poured into the environment, and must be recovered or treated instead, by a company specializing in the removal of these products.
- Covers, hoses and plastic or non-metal components must be dismantled and disposed of separately.
- All the electrical components such as switches, transformers, etc. must be dismantled to be reused if they still are in correct working order, or otherwise they must be checked and recycled.
- The framework and all the metallic parts must be dismantled and grouped according to their material type. The various parts can then be removed and melted, so that the material making up the original machine can be recycled.

4. AMR control

4.1 Controls layout

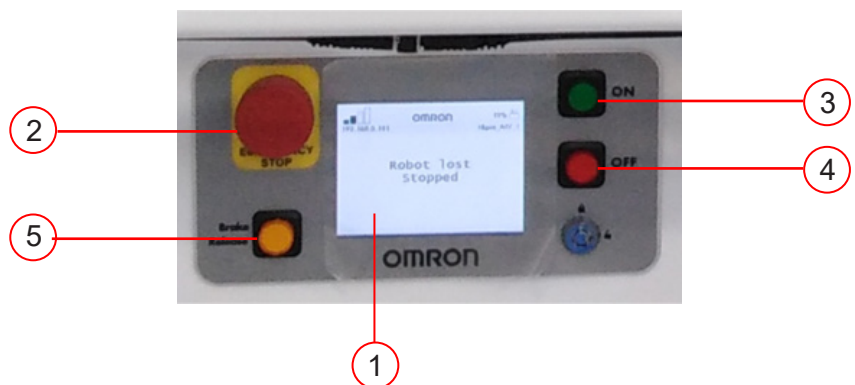
Controls are located on the left side (front models) or rear side (side models) of travel direction.



1. Omron Operator Panel
2. Pushbuttons

4.2 Omron Operator Panel

The Operator panel comprises a screen, an emergency stop button, ON and OFF buttons, a brake-release button, and a key switch.



1.- Screen: the screen shows the following information:

- IP address and WiFi range (in upper left side)
- Battery charge status and AMR name/identification (in upper right side)
- Status and sub-status messages (in central part)

2.- Emergency stop button: the emergency stop is used for immediately motors disabling and preventing any AMR motion. The E-Stop button has three purposes:

- Stopping the AMR to keep it from moving for any reason
- In case of an emergency
- To move the AMR (by pushing the brake release button)

There is a two-second delay before the AMR resumes its activity.

3.- ON button: used for turning on the AMR (switching on). It is also used to enable motors after an emergency stop (reset operation).

4.- OFF button: used for switching off the AMR by removing power from all systems except the charging hardware circuits. This button can be disabled by the key switch, which can be locked. The key can be removed in both positions.

5.- Brake-release button: used for moving the AMR manually. Releasing the brakes requires battery power (even if the AMR is powered off) and pressing an emergency stop pushbutton. The button must be held in for the brakes to remain released.

4.3 Pushbuttons



1.- Pushbutton 1: used to manually activate the conveyor in forward / dropoff direction.

2.- Pushbutton 2: used to manually activate the conveyor in backward / pickup direction.

3.- Pushbutton 3: when it is pressed for less than 4 seconds, *Docking* task is triggered. If it is pressed for more than 4 seconds, *Localize at goal "localize"* task is triggered.

4.- Pushbutton 4: reserved for *Start* function. By default, LD Platform Core input i3 is triggered when the pushbutton is pressed, through the NX1P Top controller.

The functionality of the pushbutton can be modified in Section *Core Digital Inputs* of the MobilePlanner software. Available options/tasks are:

- custom
- stay
- go
- instantMacro
- blockDriving
- multipleInputsOnWarning
- payloadPresent
- macro
- dock
- goal
- prox

To configure the LD Platform Core inputs, consult the FLOW Core User's Guide.

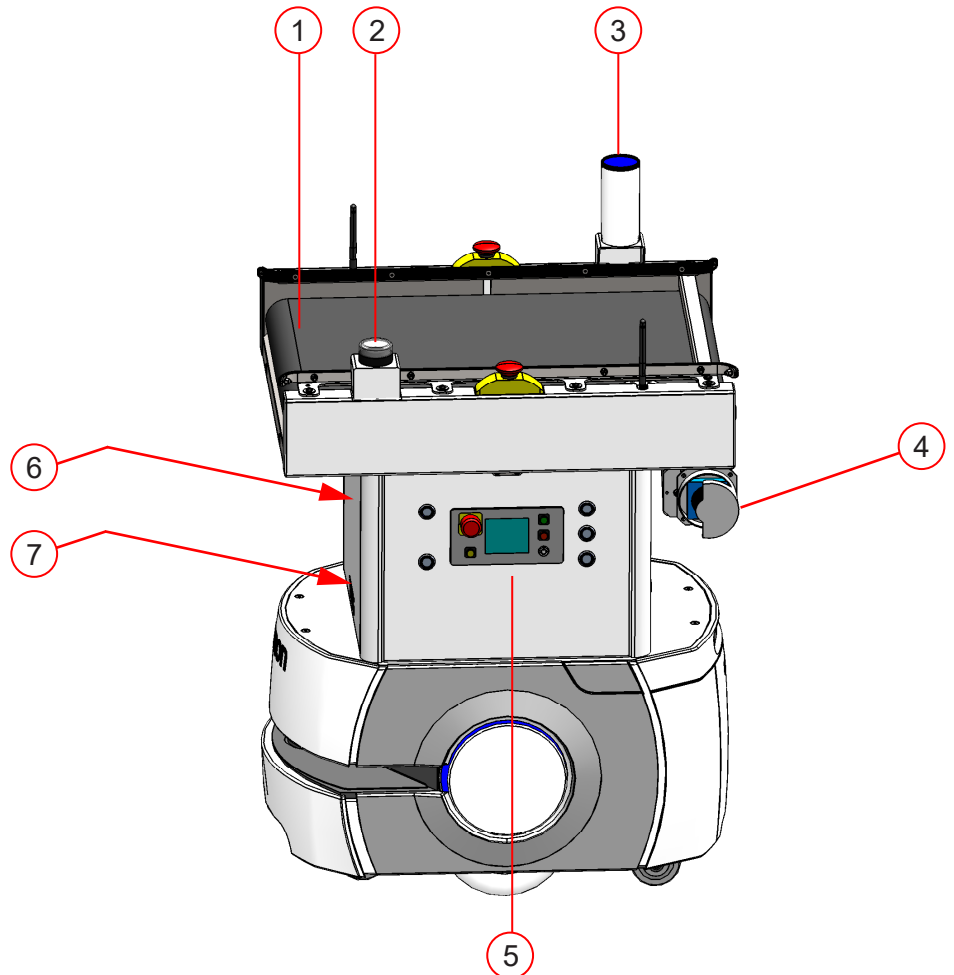
5.- Pushbutton 5: when it is pressed less than 4 seconds, *Wait* task is triggered. If it is pressed for more than 4 seconds, *Go* task is triggered.

In addition, an extra pushbutton has been added to duplicate the brake-release function, on the rear right side of the conveyor, in order to improve ergonomics.

5. AMR operation

The conveyor is activated for loading or unloading a box.

5.1 Parts description



1.- Conveyor (Belt or Rollers)

2.- Beacon (optional) Status indicator.

3.- Acuity Localization (optional) Used where laser localization is not possible and ceiling lights are adapted to light localization.

4.- Side lasers (optional) Used to detect obstacles that are at heights that the safety scanning laser of the LD cannot detect.

5.- Omron Operator Panel and Top Pushbuttons

6.- Optical communications (optional) Used for direct I/O status exchange between the AMR and the fixed conveyor.

7.- Electrical system (inside)

5.1.1 Beacon (optional)

If installed, the beacon is located at the top right side of the Top. The indications that are shown by the beacon partly coincide with LD sides light discs indications. The main indications are shown below:



Red light indicator

The indicator lights flash red when emergency stop is active.



Amber light indicator

The indicator lights flash amber if the LD is lost or if it stops for an obstacle in its safety zone.



Green light indicator

The indicator lights flash green when the LD is moving, and remains green when the LD is stopped but OK (ready).

More information can be found in Section 7.5 of the LD Platform User's Guide.

5.2 Setting up an automatic material loading point

To activate the automatic loading sequence, LD Platform Core output *o1* must be activated. When the box is loaded, LD Platform Core input *i1* is activated.

On the AMR or fleet map, in the tasks to be performed at the loading point, after the approach tasks, the ones shown below must be included:

```

▲ Pickup
  before this goal
  ▲ after this goal
    customOutputOn (o1)
    customInputsCheckAny (-1.0, , , i1)
    customOutputOff (o1)
  
```

5.3 Setting up an automatic material unloading point

To activate the automatic unloading sequence, LD Platform Core output *o2* must be activated. When the box is unloaded, LD Platform Core input *i2* is activated.

On the AMR or fleet map, in the tasks to be performed at the unloading point, after the approach tasks, the ones shown below must be included:

```

▲ DropOff
  before this goal
  ▲ after this goal
    customOutputOn (o2)
    customInputsCheckAny (-1.0, , , i2)
    customOutputOff (o2)
  
```

5.4 Troubleshooting

If the conveyor is not moving and/or the transfer is not carried out, follow the steps below:

- Check the Top protection switch. It must be in the ON position.
- Check the status of the Interroll Drivecontrol 20. More information can be found in its manual, which is located in the URL below:

https://www.interroll.com/fileadmin/user_upload/Downloads_PDF_/User_Manuals/Controls/DriveControl/EN_-_Operating_Manual_DriveControl_Online.pdf

The meaning of the light discs color states is shown in Section 7.5 of the LD Platform User's Guide.

6. Maintenance

6.1 Purpose of the document

The purpose of this document is to provide the partly completed machine user with essential information on how to create a safe environment, with optimum performance and maximum production.

Carrying out the preventive maintenance recommended below, guarantees personal safety and lengthens the partly completed machine lifetime.

The recommended actions below have been carefully studied, assessing which maintenance method has a more effective cost for each component that is prone to breaking down.

These actions are preventive, such as regularly cleaning and greasing the partly completed machine, or regularly replacing elements to ensure that the partly completed machine works properly and prevent faults with serious human and/or economic consequences.

6.2 Request for intervention

In case of trouble, please contact your Omron local sales representative.

Provide all the relevant information for identifying the partly completed machine that is the object of the request:

- Model.
- Serial number.

You will find the identification plate, as the one that appears in Section ["1.3 Identification"](#), on the bottom side of the conveyor.

6.3 Spare parts request

The client is responsible for acquiring original spare parts that guarantee the partly completed machine's safe and effective maintenance. Disassembly and assembly operations must be carried out according to the manufacturer's instructions.

Contact your local Omron sales representative, which will transmit the specifications for fulfilling the order and supply information related to the replacement. When ordering spare parts, indicate the complete partly completed machine identification details and those of the component to be replaced.

The spare parts order must specify the following:

- Exact address and name of the client (accompanied, where applicable, by the goods delivery address).
- Client order number.
- Model and corresponding registration number.
- Part code and description.
- Quantity.

6.4 Spare parts list

It is recommended that the spare parts list be checked annually so that:

- A minimum stock is available for each part that has to be replaced due to a fault.
- Unforeseen equipment idle time is minimum.
- A parts maintenance / replacement operation can be programmed.

Therefore it is recommended that:

1. A documented stock list is available: It is recommended that the maintenance technicians write a list of spare parts suited to the company's particular needs by following these considerations:

- This list only has to consider the minimum number of spare parts needed so that the idle time is not too long.
- The spare parts list must be considered according to the general wear of the partly completed machine and the year of manufacture.

2. A parts delivery system is available.

3. Optimum storage conditions are available. Humidity, light, lack of lubricant, etc. can damage some spare parts during storage.

6.5 General maintenance recommendations

Carefully read the chapter on Safety in this manual, particularly section ["2.7 Precautions when maintaining and cleaning"](#), before carrying out any maintenance operation.

Avoid using aggressive acetates and solvents in the cleaning and maintenance operations, replacing them with alcohol-based solvents (Ethanol, Ethoxypropanol, etc.).

Always use the appropriate tools for each operation. Respect the setting values of the parts, the nut torque, types of lubricants (oils and greases), etc.

Do not hit the parts during assembly, dismantling and setting.

If swinging the Top conveyor, use the fastening rod, which has been specifically designed for this purpose.



Top conveyor fastening rod

If in doubt over any of the points mentioned above, contact your local Omron sales representative.

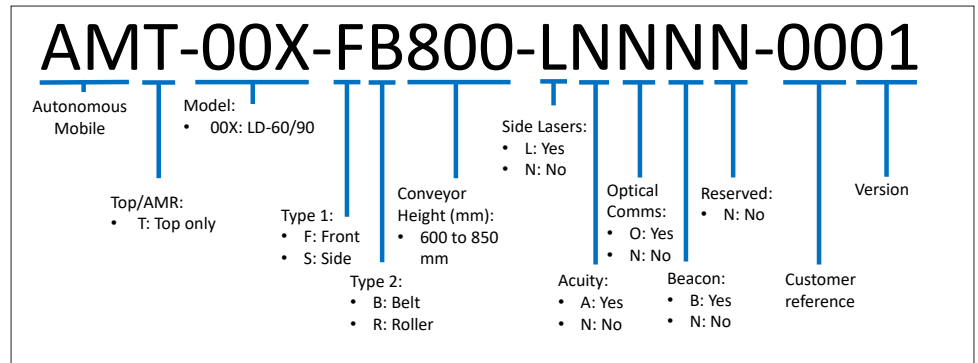
6.6 Preventive maintenance operations

The Top does not require preventive maintenance. However, a visual inspection must be performed periodically in order to detect any abnormality. Also, when deemed appropriate after visual inspection, cleaning tasks must be carried out on the surfaces of the Top, the rollers or belt and the side lasers (if installed). These cleaning operations should be performed with the AMR switched off.

7. Technical Specifications

7.1 Type designation

The item code is formed according to the features of the Top. A code structure is shown below:



Item code structure

7.2 Features

Tops and/or Top mounted on a LD feature tables are shown below.

For those features that do not appear in the following tables, values can be found in Omron Robotics and Safety Technologies Inc. LD Platform documentation.

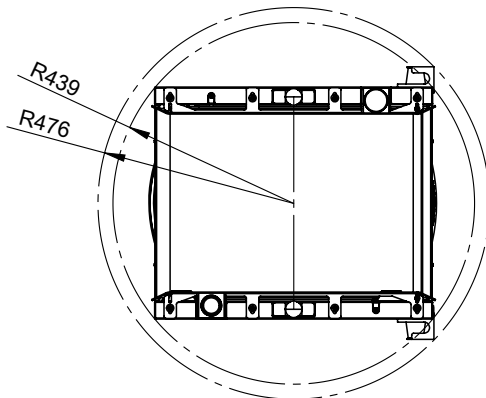
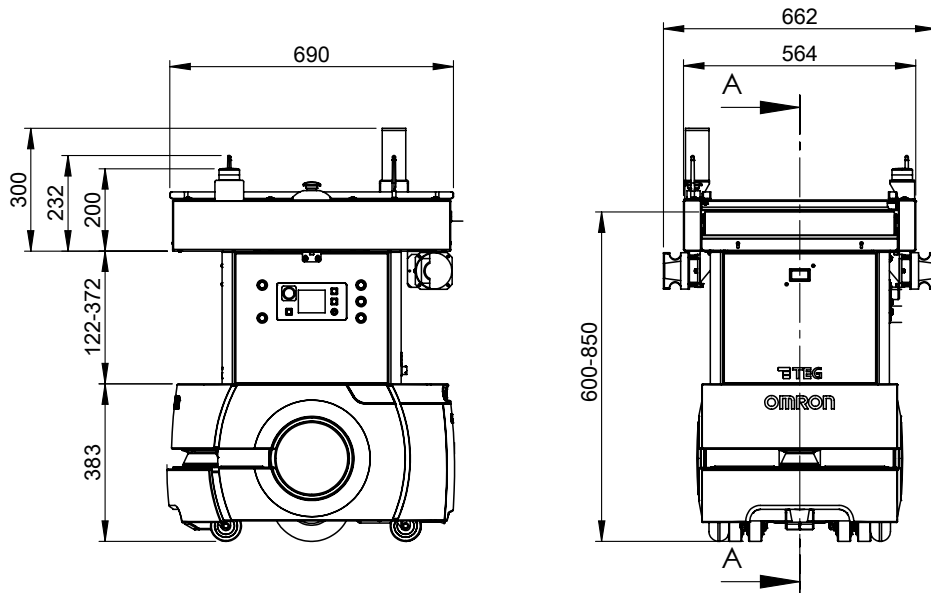
		Dimensions			
		Front belt AMT-00X-FB[]	Front roller AMT-00X-FR[]	Side belt AMT-00X-SB[]	Side roller AMT-00X-SR[]
Length (mm)	Top	690		564	
	Conveyor	420			
Width (mm)	Top only	564		690	
	Top including side lasers option	662		848	
	Conveyor	600			
Height (mm)	Total (Top with no options + LD)*	740 - 990			
	Conveyor (Top + LD)*	600 - 850			
	Total with Acuity option*	805 - 1055			
Radius (mm)	Top only	439			
	Top including side lasers option	475		492	
Minimum door width (mm)	Top only	1100			
	Top including side lasers option	1200			
Weight (kg)	Top only	36	42	36	42
	Top + LD	98	104	98	104
Shipping box	Length (mm)	980			
	Width (mm)	910			
	Height (mm)	870			
	Weight (kg)	90	96	90	96
Max payload (kg)	Top + LD-60	24	18	24	18
	Top + LD-90	40	50	40	50
Battery run time (h) Top + LD		12 - with 200 complete conveyor pickup/dropoff operations every 3 minutes			
* Customized conveyor height from 600 to 850 mm (by height increments of 10 mm).					

Materials				
	Front belt AMT-00X-FB[]	Front roller AMT-00X-FR[]	Side belt AMT-00X-SB[]	Side roller AMT-00X-SR[]
Materials (excluding belts and rollers)	Stainless steel, aluminum, polycarbonate, steel			
Structure color	RAL 9003 white, sprayed, low gloss finishing			
Belt/rollers color	Black	Gray	Black	Gray

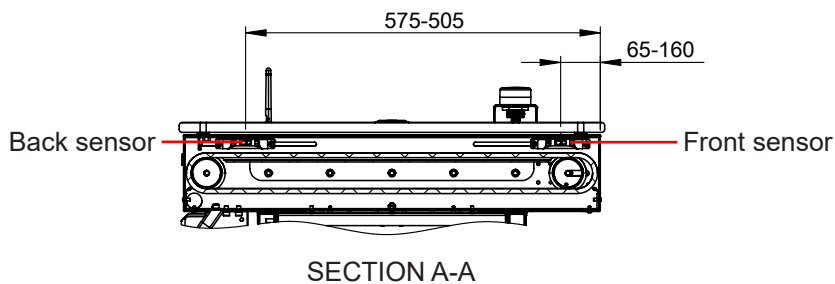
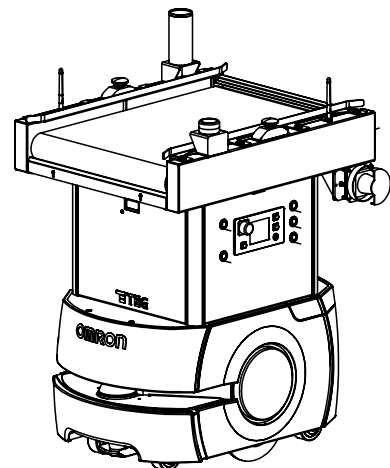
Control				
	Front belt AMT-00X-FB[]	Front roller AMT-00X-FR[]	Side belt AMT-00X-SB[]	Side roller AMT-00X-SR[]
Emergency pushbuttons	3 (1 at operator panel - left side, 1 at top - left side, 1 at top - right side)		3 (1 at operator panel - rear, 1 at top - front side, 1 at top - rear side)	
Top pushbuttons	5 pushbuttons (left side) 1 brake release pushbutton (rear left)		5 pushbuttons (rear) 1 brake release pushbutton (rear right)	
Pb1	Conveyor manual run (Forward/Dropoff)			
Pb2	Conveyor manual run (Backward/Pickup)			
Pb3	Dock/Localize at goal (4 seconds)			
Pb4	Spare - Start (Configurable)			
Pb5	Wait/Continue (4 seconds)			
Top controller model	NX1P2-9024DT1 (With optical coupler option, a NX-ID4442 is added)			
Top controller access	Sysmac Studio accessible via WiFi (when Ethernet Forwarding is configured)			
LD Core access	Easy access by swinging the Top conveyor			
Conveyor belt/rollers speed (m/s)	0,01 - 0,20, adjustable by roller drive controller switches			
Conveyor/belt direction (both ways)	Front - Rear		Left - Right	
Conveyor inlet	Front		Left and Right	
Optical payload detectors	2 Omron E3Z-LS photoelectric sensors			

7.3 Dimensions

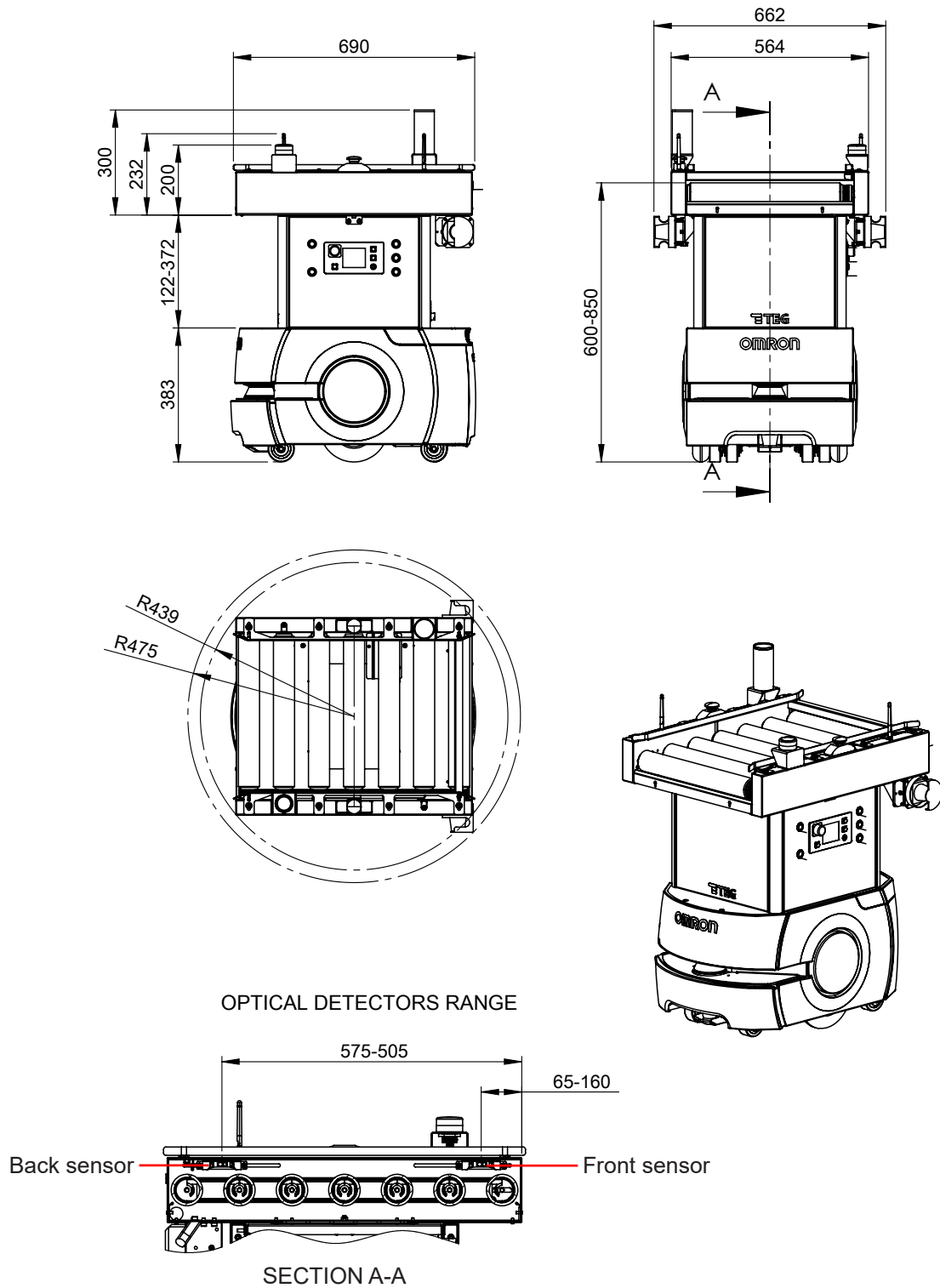
7.3.1 Front belt model (AMT-00X-FB[])



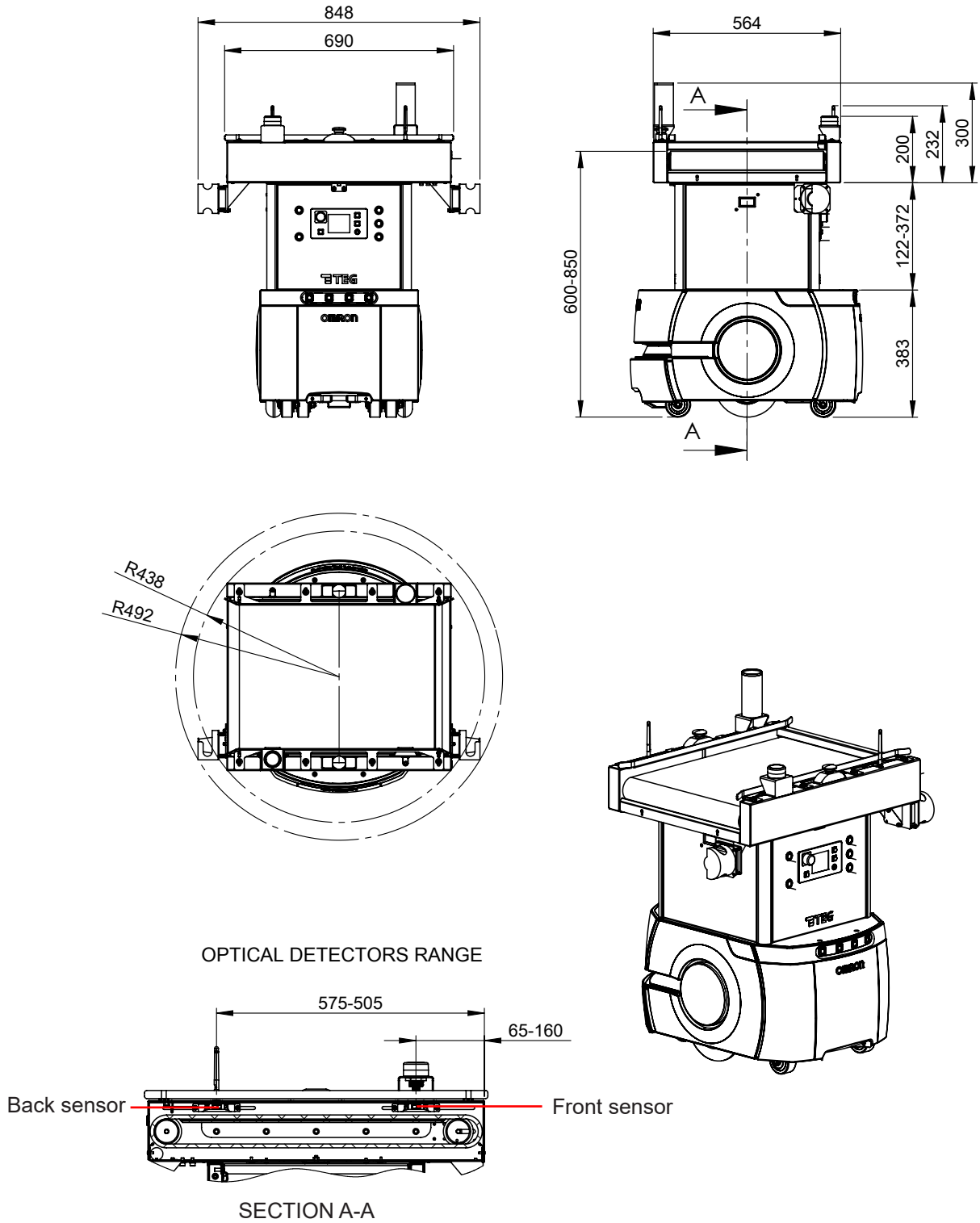
OPTICAL DETECTORS RANGE



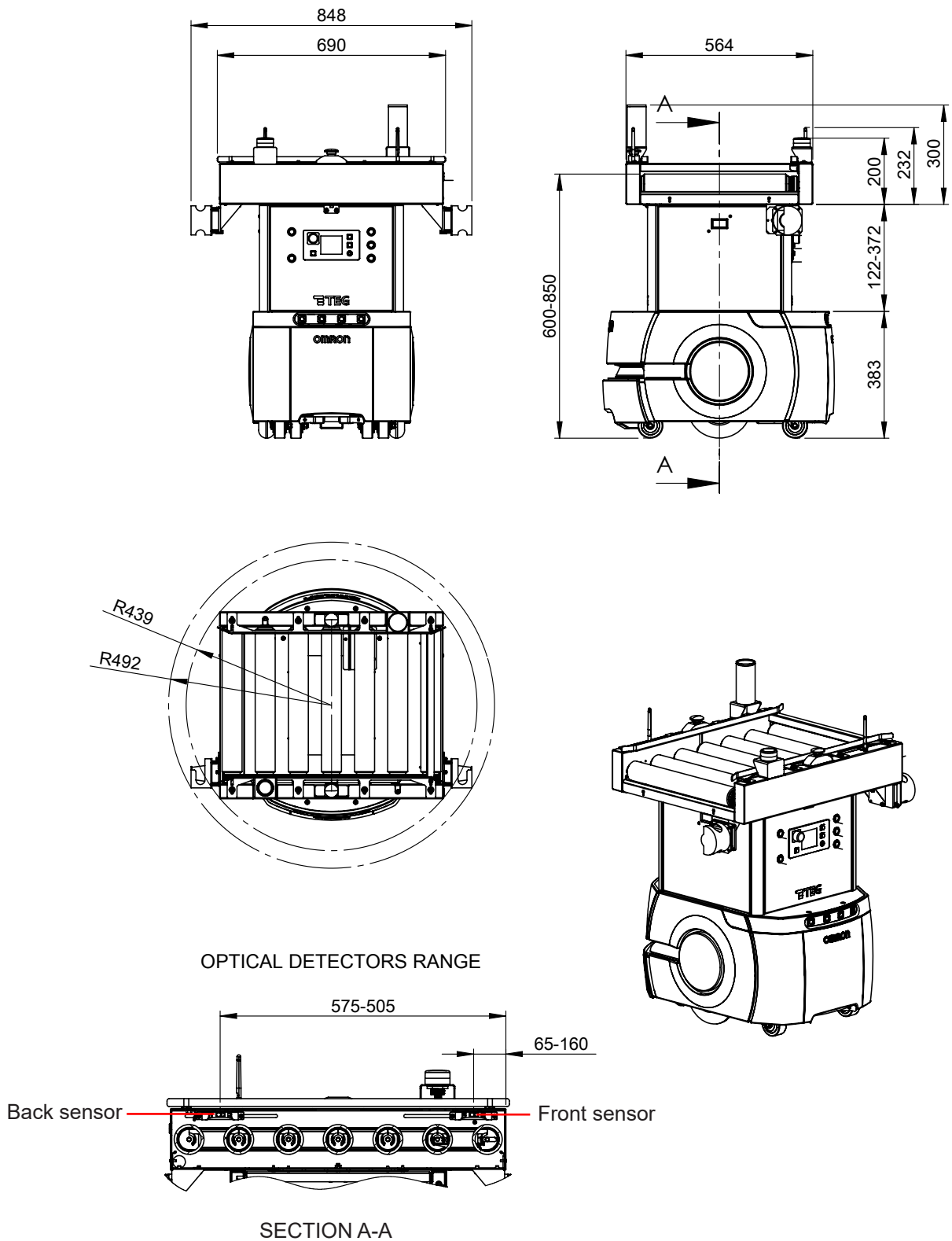
7.3.2 Front roller model (AMT-00X-FR[])



7.3.3 Side belt model (AMT-00X-SB[])



7.3.4 Side roller model (AMT-00X-SR[])





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