

TECHNICAL GUIDE

A GLOBAL AGV SUPPLEMENT



STREAMLINING YOUR BUSINESS



GLOBAL AGV – GUIDE

The following document intends to provide insight into the technical aspects of the Global AGV and clarifying what things to be aware of when advising and selling an AGV solution.



2 PRODUCTS PICK-UP AND DROP-OFF

PRODUCTS - PICK-UP AND DROP-OFF

2.1 L12 AND L14

Standard Linde stacker converted into an AGV

Our AGV products are based on thoroughly tested Linde technology and standard vehicles, which are converted into our AGV with several efficient safety

functions. Thus, an AGV has an extremely high safety level, which prevent damage and accidents in the warehouse or production.

GLOBAL AGV L14

Support wheels



HEIGHT:
2270 MM
(89.4")

WIDTH:
860 MM
(33.9")

LENGTH:
2120 MM
(83.5")

GLOBAL AGV L12

Counterbalance



HEIGHT:
2270 MM
(89.4")

LENGTH:
2760 MM
(108.7")

WIDTH:
980 MM
(38.6")

SUITABLE FOR HANDLING EUR-PALLETS SHORT-SIDED

Capacity:	1400 kg / 3086 lb
Lifting height:	Max. 2844 mm (112")
Fork dimensions:	60 x 180 x 1150 mm (2.36" x 7.1" x 45.3")
Center spacing between forks:	Fixed at 380 mm (15")
Motor:	1.5 kW AC motor
Transmission:	Linde LAC transmission
Max. speed:	1.2 m/s

SUITABLE FOR HANDLING US, UK AND SEA-PALLETS

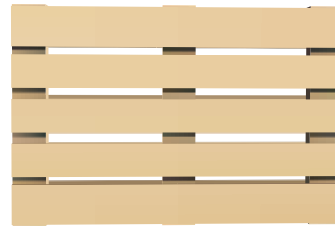
Capacity:	1200 kg / 2645 lb
Lifting height:	Max. 2844 mm. (112") Limit: 1000 mm (39.4")
Fork dimensions:	40 x 100 x 1200 mm (1.6" x 3.9" x 47.2")
Center spacing between forks:	Std. limit to 1000 mm (39.4")
Motor:	1.5 kW AC motor
Transmission:	Linde LAC transmission
Max. speed:	1.2 m/s

PRODUCTS - PICK-UP AND DROP-OFF

2.2 PALLET ORIENTATION:



← **1200 MM (47.2")
GRIPPING ON THE
LONG SIDE**



← **800 MM (31.5")
GRIPPING ON THE
SHORT SIDE**

2.3 DEFINITION OF DRIVING DIRECTION



2.4 PALLET TYPES

This guide shows examples with EUR-pallets. However, the Global AGV can handle the following pallet types.

- EUR-pallets 1200 x 800 x 144 mm (47.2" x 31.5" x 5.7")
- Industrial pallets 1200 x 1000 x 150 mm (47.2" x 39.4" x 5.9")
- UK Block pallets 1200 x 1000 x 162 mm (47.2" x 39.4" x 6.4")
- US Block pallets 1219 x 1016 x 141 mm (48" x 40" x 5.6")
- US Stringer pallets 1219 x 1016 x 130 mm (48" x 40" x 5.1")

2.5 DEFINITION OF DOCKING MODE

Docking mode is activated when the AGV is delivering or picking up a load, which means that the SICK safety scanners are deactivated. This is often a precondition for the AGV to drive close to conveyors, pallet racks etc. Additionally, it is necessary to deactivate the scanners when performing these tasks at floor level as the forks moves down and "block" the scanners.

To outweigh the deactivated scanners, an acoustic signal is warning during docking mode.



PRODUCTS - PICK-UP AND DROP-OFF

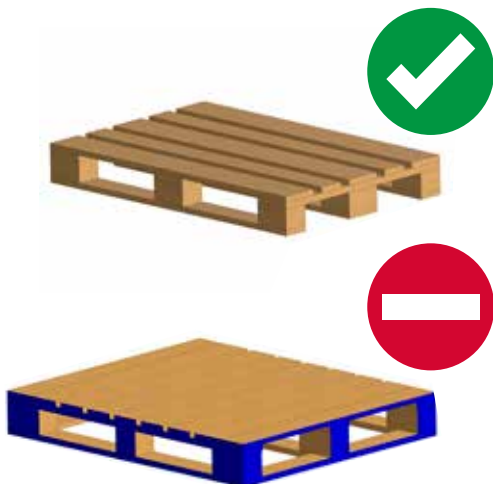
2.6 GLOBAL AGV L12 – LOAD HANDLING

The Global AGV L12 is equipped with free forks, making the model flexible. There is no requirement for none closed frames at the pallets or load, which means that the Global AGV L12 can handle pallets that are bottom-closed.



2.7 GLOBAL AGV L14 – LOAD HANDLING

The Global AGV L14 is without free forks and it can only handle open frames, not bottom-closed.





AGV SHOWN WITH STANDARD AND OPTIONAL EQUIPMENT

- 1** RED SPOT (WARNING LIGHT)
- 2** WARNING SIGNAL (SIDE)
- 3** LOAD SENSOR
- 4** SAFETY SCANNER (REAR-FACING)
- 5** MARSHALLING DETECTION SCANNER

FINELY TUNED SAFETY WITH PROVEN TECHNOLOGY



6 FORK SENSORS

7 AUTOMATIC CHARGER TOP

8 TOPSCANNER

9 WARNING SIGNAL (LIGHT AND SOUND)

10 TOUCHSCREEN

11 BLUE SPOT (WARNING LIGHT)

12 EMERGENCY STOP

13 TILLER FOR MANUAL OPERATION

14 SAFETY SENSOR (SIDE)

15 SAFETY SCANNER (FRONT)



3 STANDARD EQUIPMENT

STANDARD EQUIPMENT

3.1 USER INTERFACE WITH TOUCH

Intuitive touch screen which gives the operator control and system information of the AGV.

- Same interface regardless the device
 - Tablet
 - Phone
 - Browser.
- Control the AGV
 - Dual mode: Automatic or manual
 - Start, stop, and reset safety.
- Intuitive and user-friendly interface
 - Clear target location
 - Manual or Auto clear
 - Teaching
 - Settings
 - Initialise position
 - Help page with video instructions.



Operation

Main


Order List


Recipes


Clear


Config


Help

 Auto

 Manual


 Start

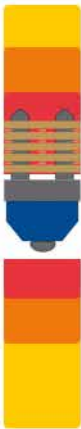
 Reset safety


 Unloaded manually

Mode:


Status:





 Acknowledge alarms

Position confidence: 100%

Battery: 54% 

STANDARD EQUIPMENT

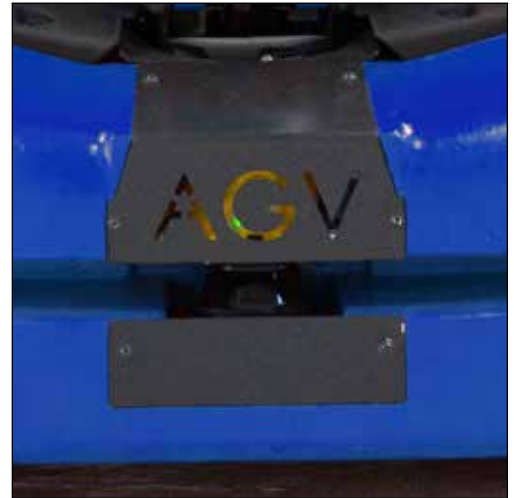


3.2 SAFETY SCANNER (FRONT)

Model: SICK S300 Expert

The safety scanner mounted in the front of the AGV detects objects located in the AGVs direction of travel.

The scanner divides its scanning range into zones according to the distance to the AGV (as illustrated on the picture), and can thus respond dynamically to obstacles. The scanner is configured so that the closer the obstacles get, the slower the AGV runs. When the obstacle reaches the innermost scan area, the AGV will stop until the object is removed.



STANDARD EQUIPMENT



3.3 SAFETY SCANNER (REAR)

Model: SICK S300 Expert

The safety scanner mounted in the rear of the AGV detects objects placed in the AGVs direction of travel when it reverses. This most often happens when picking up load, unloading, or when the AGV is facing in the wrong direction and has to turn around. The rear scanner is dividing its scanning range into zones according to the distance to the AGV, making it respond dynamically just like the front scanner.

Below is illustrated a situation where the AGV drives backwards and is about to drop off a load. The forks are raised 300 mm above the floor, and the safety scanner can detect the person standing in front of the pallet and will not start before the object is removed.



STANDARD EQUIPMENT



3.4 WARNING SIGNAL (SIDE)

Turning indicators of the AGV which flashes and indicates which way the AGV is about to turn. Furthermore, the warning signals flashes when the AGV is in docking mode.



3.5 SAFETY SENSORS (SIDE)

Safety sensors are located at the bottom right and left side of the AGV. The sensors ensure interruption of the AGV's operation if an object, such as a foot, is detected. For example when doing a sharp turn.



3.6 WARNING SIGNAL (LIGHT AND SOUND)

The AGV is equipped with warning lights on both sides, as well as a warning light on the top. The warning lights on both sides are used as turning indicators and signals in docking mode. The top warning light has a series of different visible warning signals.

The AGV is equipped with a buzzer on the top. It is used to warn personnel about the potential risk of the AGV. The buzzer has a series of acoustic warning signals as well.



STANDARD EQUIPMENT



3.7 FORK SENSORS

The fork sensors are located at the "end" of the forks and detects if something is located in front of the AGV. The fork sensors make sure that the AGV stops in time. The AGV mainly runs forward, however if the AGV needs to drive backwards the sensors are extremely useful. When driving backwards "docking mode" is often activated, because a load is being picked up. In such situations, the rear safety scanner will be disconnected, but the fork sensors will still detect any object.



3.8 LOAD SENSOR

The load sensor is located at the lifting tower of the AGV and is detects whether the pallet or load is correctly placed on the forks, thereby ensuring that the AGV does not start its operation before the load is properly handled.





4 OPTIONS OVERVIEW

OPTIONS OVERVIEW

HARDWARE OPTIONS

DEFINITION

Topscanner	▶ Pepperl+Fuchs top laserscanner with a 360-degree view, providing an accurate navigation in premises.
Marshalling detection scanner	▶ The function is used for marshalling, drop-off, and pick-up in lanes.
Blue spot	▶ Indicator for driving forwards.
Red spot	▶ Indicator for driving backwards.
I/O box	▶ For sensors and push-buttons.

BATTERY LEAD-ACID OPTIONS

DEFINITION

Standard lead-acid battery charger	▶ Used for standard lead-acid battery.
Extra standard acid battery	▶ Acid – 24V/375 AH. Makes it possible to swap around the lead-acid batteries and keeping the AGV running.
Battery trolley	▶ A trolley for transporting the lead-acid battery.
Battery table	▶ A table for placing the battery when charging.

BATTERY LITHIUM OPTIONS

DEFINITION

Lithium battery automatic charger top	▶ Lithium - 24V/200 AH.
Lithium automatic charging station	▶ Automatic charging station for lithium batteries The capacity is up to 3 AGV per charging station.



5 HARDWARE OPTIONS

HARDWARE OPTIONS

5.1 TOPSCANNER

Pepperl+Fuchs (2D LiDAR) navigation laserscanner with a 360-degree view. The scanner uses natural structures in the environment as its reference for localisation. There is no need for inductive wires, magnets, or reflectors. LiDAR instruments fire pulses of laser light at a surface. A sensor on the instrument measures the amount of time it takes for each pulse to bounce back. Light moves at a constant and known speed so the LiDAR instrument can calculate the distance between itself and the target with high accuracy. Furthermore, the AGV navigates and adapts without problem in a changing environment.



HARDWARE OPTIONS



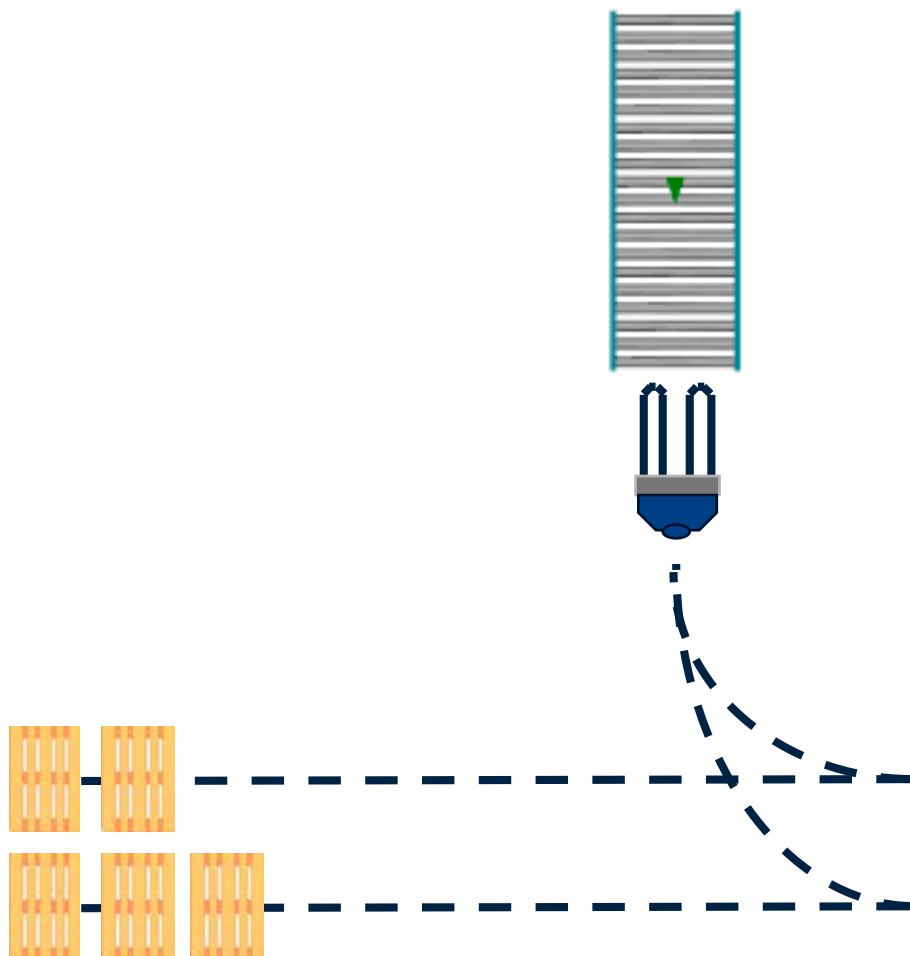
5.2 MARSHALLING DETECTION SCANNER

A scanner located at the rear end of the AGV allows you to perform “marshalling”, which is pick-up and drop-off in lanes.

Marshalling

Marshalling is used when delivering and picking up pallets placed in rows. The AGV detects where the next pallet is placed in the row.

- Requires accurate placement of pallets in the lanes – within a given tolerance.



HARDWARE OPTIONS



5.3 BLUE SPOT (WARNING LIGHT)

The blue spot signals to the surroundings that the AGV is driving forward.

Safety is improved in many cases, and especially where the AGV is moving around blind angles and sharp turns. Everyone are hereby informed that the AGV is on its way.



5.4 RED SPOT (WARNING LIGHT)

The red spot signals to the surroundings that the AGV is driving backward.

Safety is improved in many cases and especially where the AGV is moving around blind angles and sharp turns. Everyone are hereby informed that the AGV is on its way.



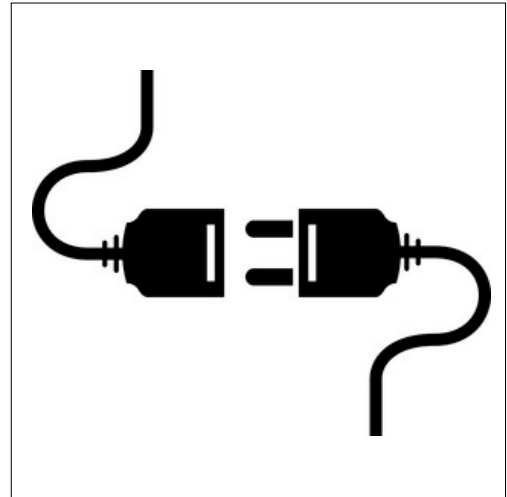
The background of the page is a light gray color with a repeating pattern of white circuit board traces. The traces form a complex, interconnected network of lines and small circles, resembling a printed circuit board (PCB) layout. The pattern is dense and covers the entire page.

6 BATTERY OPTIONS - LEAD-ACID

BATTERY OPTIONS - LEAD-ACID



The acid battery is the optimal choice in productions where the AGV is operating so much that breaks for charging are not possible, or when the duration of the breaks is not sufficient to maintain power on the AGV. If or when the AGV is running more than one shift, it is necessary to have minimum one extra battery, which can be swapped after 7-8 hours.



6.1 STANDARD LEAD-ACID BATTERY 24V/375 AH

A standard lead-acid battery can keep the AGV running for 7-8 hours depending on the weight of the load and driving needs. The battery must charge for 8 hours and then rest for 8 hours (with standard equipment). The charging routine of a lead-acid battery must follow the prescriptions, and it is therefore not allowed to charge the battery at small intervals. When running production in more than one shift, it is necessary to have minimum one extra battery, as the battery needs to be swapped and charged after 7-8 hours.

LIFETIME OF LEAD ACID BATTERY:

Expected 7 years lifetime. Requires charging and use according to restrictions.

- Fully charge every time
- Maintenance with distilled water
- Avoid running out of power.

100% battery guarantee the first 12 month.

6.2 EXTRA STANDARD LEAD-ACID BATTERY

Standard lead-acid battery – 24V/375 AH. An extra lead-acid battery makes it possible to swap around the batteries, keeping the AGV running while the other battery is charging.



BATTERY OPTIONS - LEAD-ACID



6.3 BATTERY TROLLEY

The battery trolley is useful when replacing the standard lead-acid battery on the AGV when taking the battery for charging.



6.4 BATTERY TABLE

The battery table is used for placing the standard lead-acid batteries when replacing and charging.





7 BATTERY OPTIONS - LITHIUM-ION

BATTERY OPTIONS - LITHIUM-ION

AUTOMATIC CHARGING STATION FOR LITHIUM BATTERY

The lithium battery is recommended in cases where the AGV takes small breaks between the orders. Here it can use the charging station during its breaks. In this way, the employees in the production does not need to think about charging the AGV as it manages the charge itself - even at 2 and 3 team shifts.



BATTERY OPTIONS - LITHIUM-ION



7.1 LITHIUM AUTOMATIC CHARGING STATION

Automatic charging station for lithium battery. There are no requirements for minimum charging time. The lithium battery can be spot charged for only a few minutes and then start a new task. The charging time is adjusted to the different tasks.

7.2 SHORT-CIRCUIT SAFETY

It is **not** possible to short-circuit the charger on the available terminals when there is no AGV in the charging station. CAN-bus connection to the AGV will be automatically ensured before voltage is applied to the terminals.



7.3 LITHIUM BATTERY AND CHARGER TOP

The lithium battery can be installed instead of the standard lead-acid battery. This is recommendable for many applications, as the charging time for a lithium battery is significantly lower.

For automatic charging, a charger top is required on AGVs with lithium battery. See the section “Battery type selection” for further details.

7.4 OPTION: LITHIUM BATTERY 24/200 AH

As an option, instead of the lead-acid battery, a lithium battery can be selected for a more flexible and faster charging time. The lithium battery keeps the AGV running for 4-5 hours, depending on the weight of the load and driving needs. The solution is more flexible than the lead-acid battery as it allows to charge the lithium battery at small intervals, making the AGV able to charge during breaks. The charging speed is around 1-2% per minute.

Advantages of lithium batteries:

- Reduces operating costs
- Full automatic charging
- No maintenance
- 100% battery guarantee the first 7 years.





8 SYSTEM AND SETUP STRUCTURE

SYSTEM AND SETUP STRUCTURE

8.1 AGV ORDER TRIGGERS

There are three different ways to communicate with the AGV and order tasks. This is called order triggers and are as described below:

- **Web interface**

The AGV can receive order triggers from a PC, tablet, or phone using the same network as the AGV. The devices only need to have a web-browser to open the control interface, and therefore no need to install any software.

- **I/O**

The AGV can communicate through Inputs and Outputs with the Global AGV I/O Box, which is being connected to the customers network through an Ethernet cable.

- Photocell on conveyor
- Physical push button
- Signal from conveyor PLC or other PLC.

- **IT interface**

The AGV can also receive order triggering signals and communicate with ERP/WMS/WCS/MES systems. The AGV delivers a standard XML protocol and it will be up to the IT system supplier to implement the Global AGV interface.

File-based or MQTT - XML interface / API

Supports any ERP/WMS/MES system that can implement Global AGV XML interface.



SYSTEM AND SETUP STRUCTURE

8.2 I/O BOX - IP55 CERTIFIED

When the AGV needs to communicate with internal equipment like speed-doors, pallet magazines, pushbuttons, or sensors, a pre-configured Input/Output Box from Global AGV is necessary.

The installation of the I/O Box will consist of connecting the inputs and outputs from the internal equipment into the box. The I/O box will communicate through the local WiFi to the AGV, meaning that the box needs to be WiFi connected, which is preferred to be done with an Ethernet cable.

The placement of the I/O Box can be decentral and near the equipment it is supposed to communicate with. All it requires, besides the input/output signals from the internal equipment, is a 230V power supply and the Ethernet cable for connecting to the WiFi.

In some cases, it might be preferred to have more than one I/O Box. Having I/O Boxes placed near the equipment can be beneficial to avoid pulling signal cables over long distances.

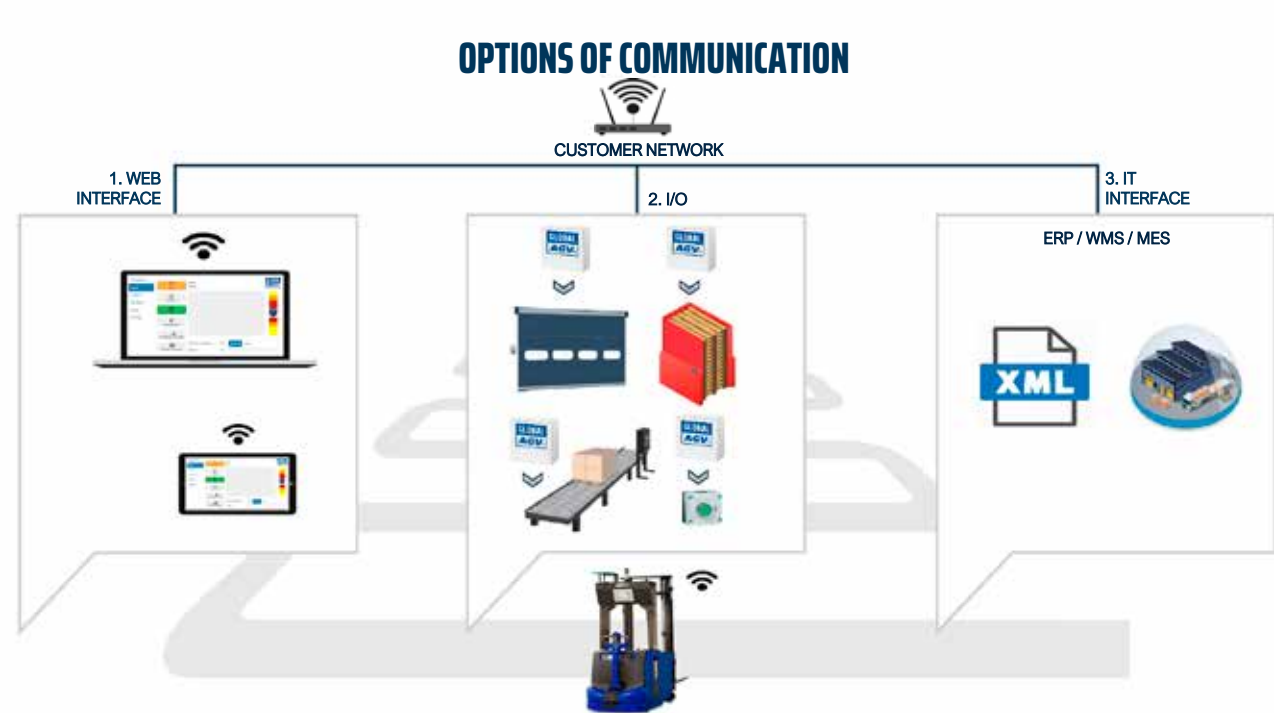
Furthermore, the I/O Box consists of:

- 16 input signals
- 8 output signals
- 4 potential-free output signals



SYSTEM AND SETUP STRUCTURE

8.4 STANDALONE AGV – NO BOX ON WALL





9 APPLICATIONS

APPLICATIONS

9.1 PREDEFINED, REPEATABLE TRANSPORTATION OF PALLETS FROM A TO B

The following list aims to identify applications for the AGV. The list refers to pallet transportation, where the load can consist of different types of materials.

Target applications

- Repeatable and defined A-B applications
- Delivery and removal of loads for production lines
- Cargo removal in storage areas
- Transporting cargo over long distances
- Platform loading and unloading
- Pick-up and placement on or in machines
 - Conveyors
 - Wrappers / Foil machines,
 - Palletising machines
 - PALOMAT® AGV
 - Etc.



APPLICATIONS

9.2 "NO GO" SOLUTIONS FOR GLOBAL AGV

- The AGV must not be used for towing loads, wagons or similar
- Outdoor operating
- Unloading trucks
- Comprehensive racking, distribution, and warehouse projects
- Cold storages (must not operate below 2 °C (35.6 °F))
- Rack stacking and destacking
- Block stacking and destacking.



Unloading trucks



Comprehensive racking, distribution, and warehouse projects



Cold storages (must not operate below 2 °C (35.6 °F))

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10 LOAD REQUIREMENTS

11 LOAD CHART

LOAD REQUIREMENTS / LOAD CHART

10.1 LOAD REQUIREMENTS

Requirements for the load that the AGV handles.

- The load must weigh a maximum of 1200 kg (2645") at a Global AGV L12 and a maximum of 1400 kg (3086") at the Global AGV L14
- The center of gravity of the load must not be more than 600 mm from the mast. Contact BILA A/S for calculation
- The load must be unevenly distributed on the forks.
- Width (max) = 1200 mm (47.2")
- Length (max) = 1200 mm (47.2")
- Height (max) = Depends on load stability
- Pallets are preferred for stability reasons
- Depending on the layout and distance, a maximum of 15 pallets can be operated.

11.1 LOAD CHART AGV L12

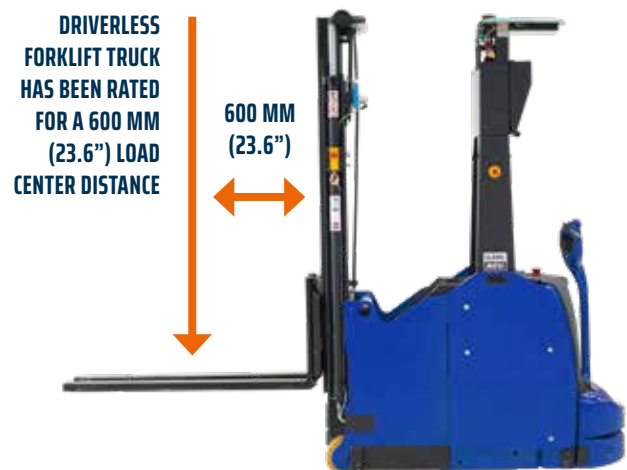
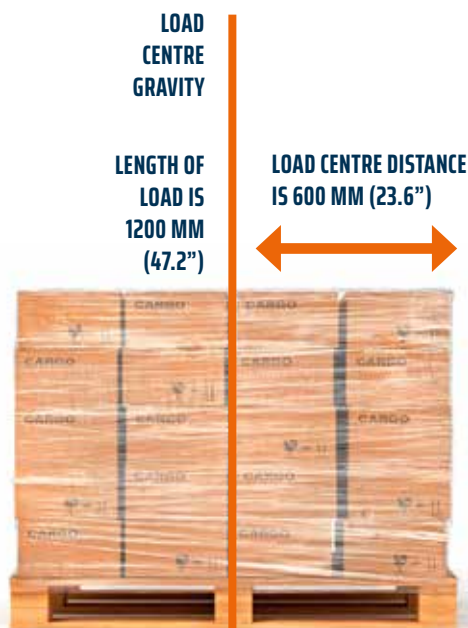
Load chart			
AGV L12 Linde 1173			
Load height	Load capacity		
2844 mm	1200	1200	1120 kg
2844 mm	1200	1200	1120 kg
2844 mm	1200	1200	1120 kg
	500	600	700 mm

GLOBAL AGV® Tlf.: +45 97 71 00 44

11.2 LOAD CHART AGV L14

Load chart			
AGV L14 Linde 1173			
Load height	Load capacity		
			kg
			kg
2900 mm	1400		kg
	600		mm

GLOBAL AGV® Tlf.: +45 97 71 00 44



12 ENVIRONMENT AND BUILDING REQUIREMENTS

Description of environment and buildings requirements for the AGV to operate in.

ENVIRONMENT AND BUILDING REQUIREMENTS

12.1 TEMPERATURE

The AGV must not be used in cold storages (down to 2 °C (35.6 °F)). Temperature transition must be avoided due to moisture formation on scanners. The temperature must not exceed +40° C (104 ° F). The humidity must be between 30 and 70%, to avoid moisture on scanners.

In addition, avoid driving between rooms with a high temperature difference, as this can create condensation on the scanners and can make the AGV stop driving.

12.2 SURFACE

The surface must be firm, clean, dry, no large holes and bumps, which all allows the AGV to operate in a safely manner. Maximum surface slope = 5% = 2,86° (test is recommended together with the load to carry).

12.3 RAMPS AND TRANSITIONS

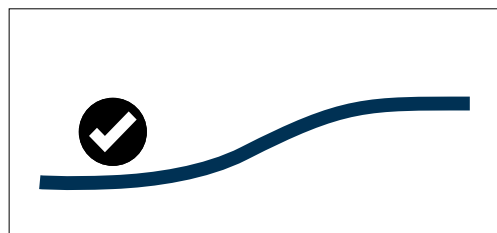
The transition from slope to horizontal must be smooth, otherwise the AGV will get stuck.

12.4 AGV-ROUTE

It is recommended that the route of the AGV is designed with a minimum of 500 mm (19.7") clearance on both sides of the AGV. The entire route must have sufficient headroom, where particular heights at gates etc. should be taken into consideration.

12.5 MARKUPS

Areas where the AGV pick-up or drop-off must always be clearly marked as it is seen as a "operating hazard zone" (below 500 mm (19.7")).



13 OPERATING REQUIREMENTS

Description of the operating requirements for a functional AGV.

OPERATING REQUIREMENTS

13.1 WIFI

Full coverage requirements and stable WiFi throughout the AGV's driving range + available bandwidth.

Network Strength: Wireless measurable signal strength through 5Ghz or 2.4Ghz

WiFi quality needs to be in accordance with Global AGV WiFi requirements. Ask Global AGV for this requirement description document.

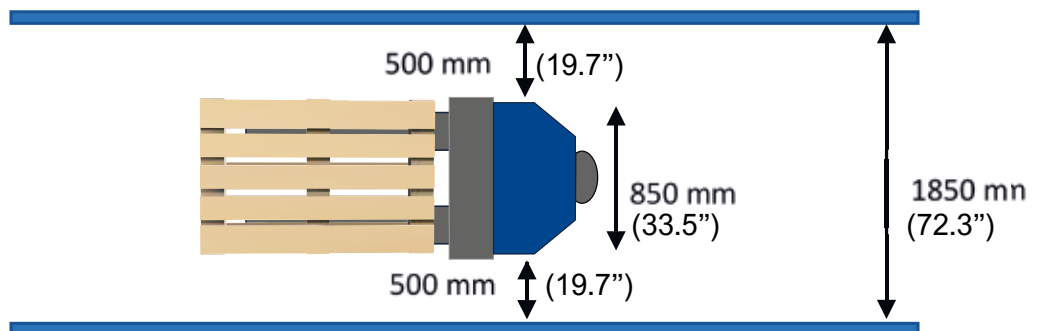


14 SPACE REQUIREMENTS

The following illustrations describe the law and required space requirements for the installation of the Global AGV according to DS/ISO 3691-1:2020 standard and US standard: ANSI/ITSDF B56,5-2019.

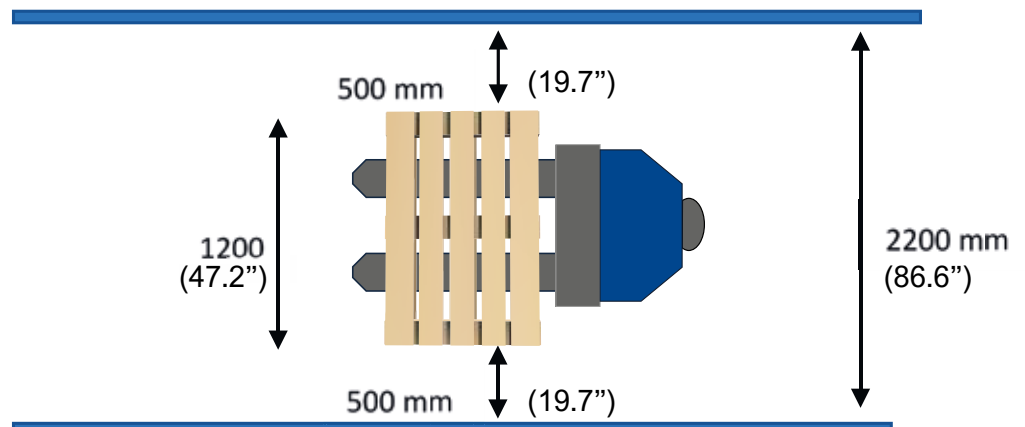
SPACE REQUIREMENTS

14.1 WIDTH FOR AGV ROAD EUR-PALLET TRANSPORT



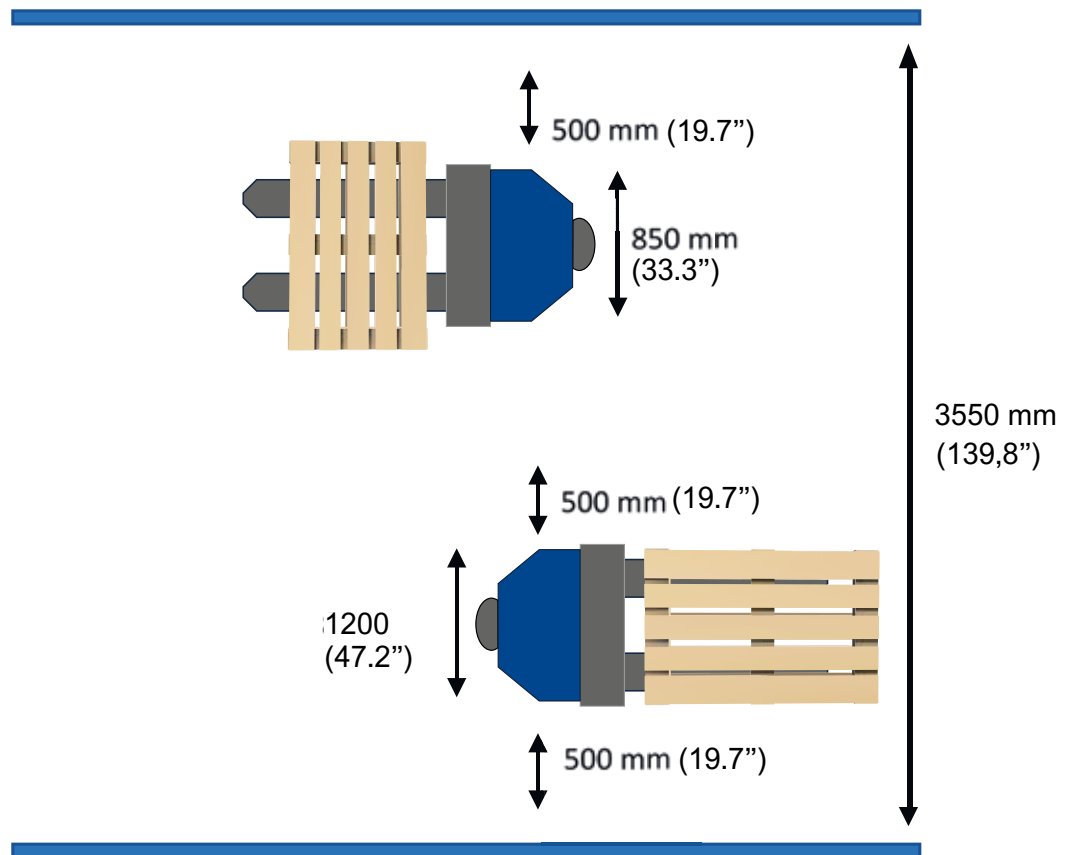
14.2 WIDTH FOR AGV ROAD EUR-PALLET (1200 MM (47.2") SIDE)

Pallet width + 2 x 500mm (19.7") = total minimum width for walking. (Reducible = slow travel 0.3 m / sec)



SPACE REQUIREMENTS

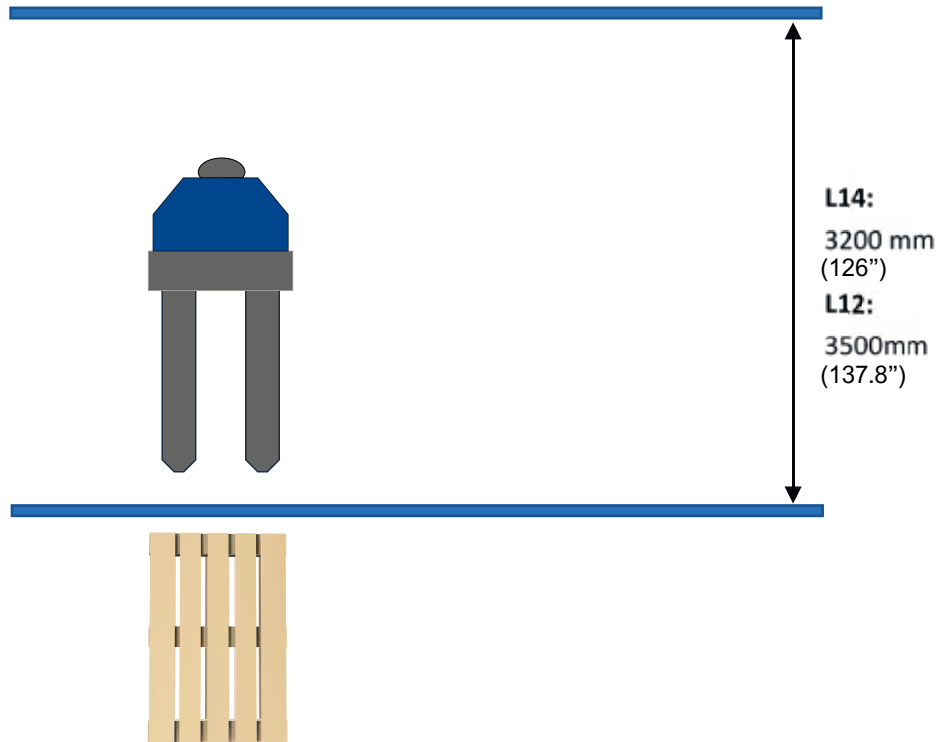
14.3 WIDTH FOR DOUBLE TRACK AGV ROAD EUR-PALLETS



SPACE REQUIREMENTS

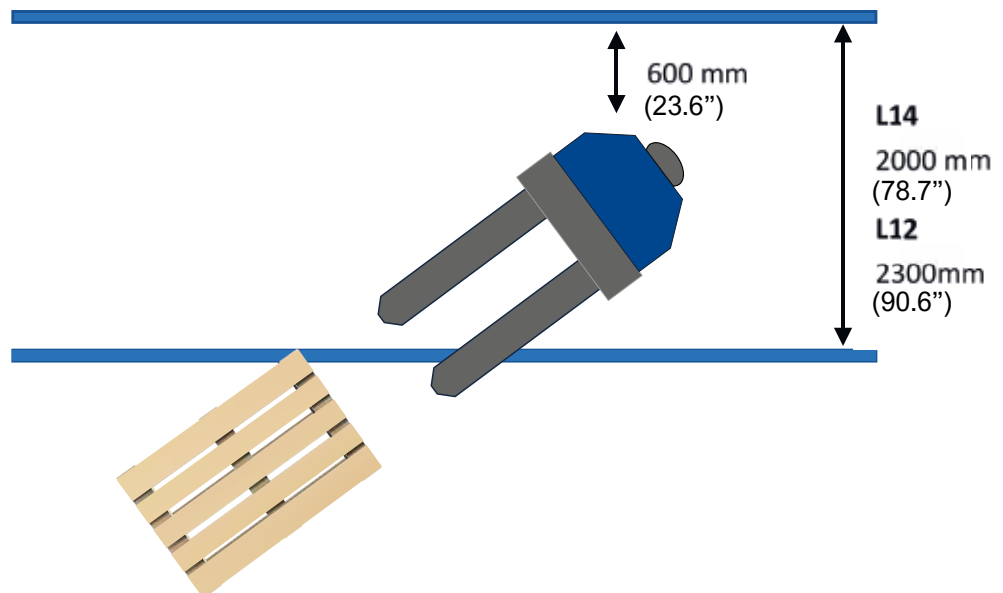
14.4 WORKING WIDTH OF AGV WHEN HANDLING PALLET

LOCATED 90°
TO DIRECTION OF TRAVEL



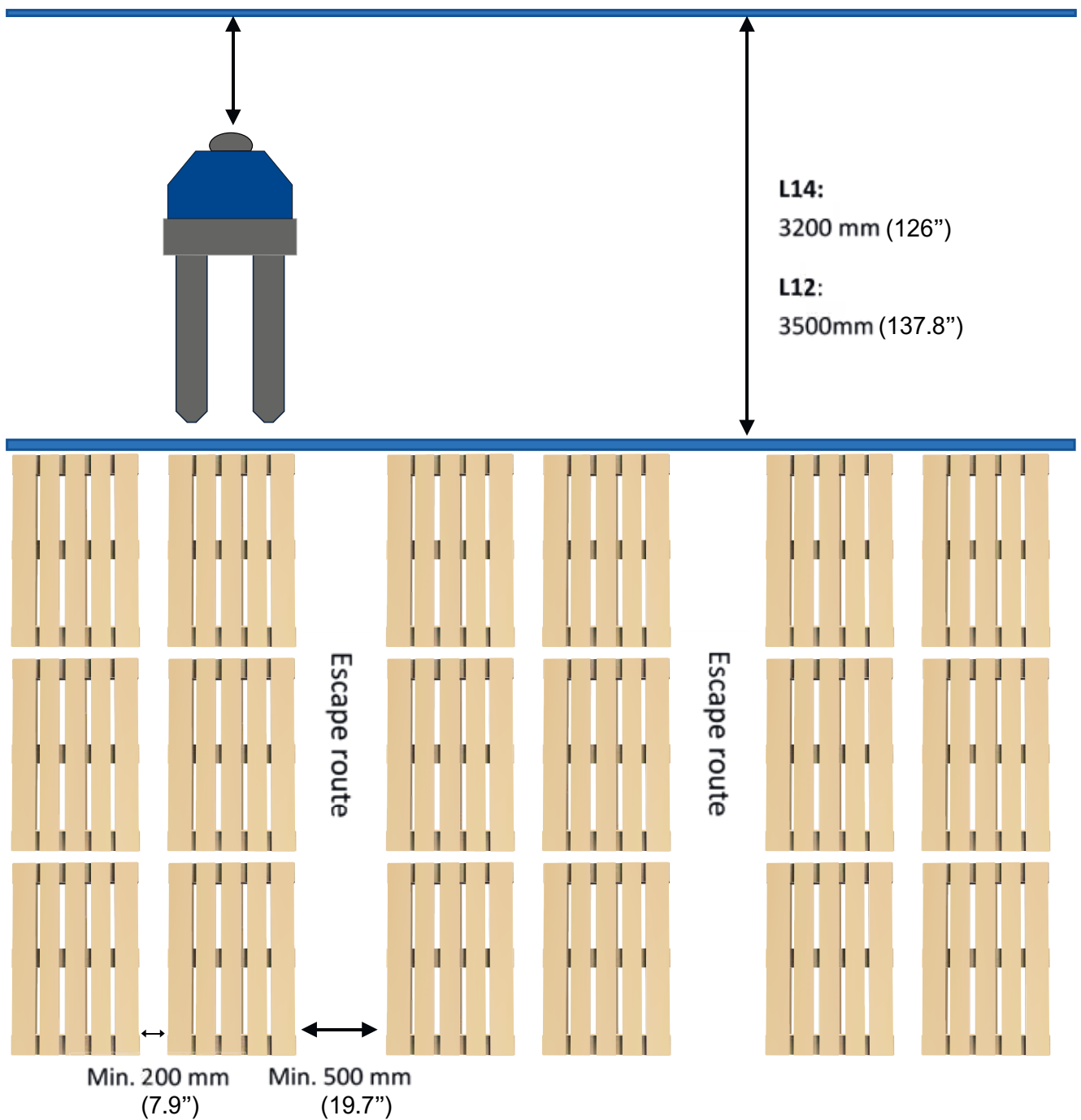
14.5 WORKING WIDTH OF AGV WHEN HANDLING PALLET

LOCATED WECTION OF TRAVEL



SPACE REQUIREMENTS

14.6 WORKING WIDTH OF AGV WHEN HANDLING ROWS AND ROW SPACING

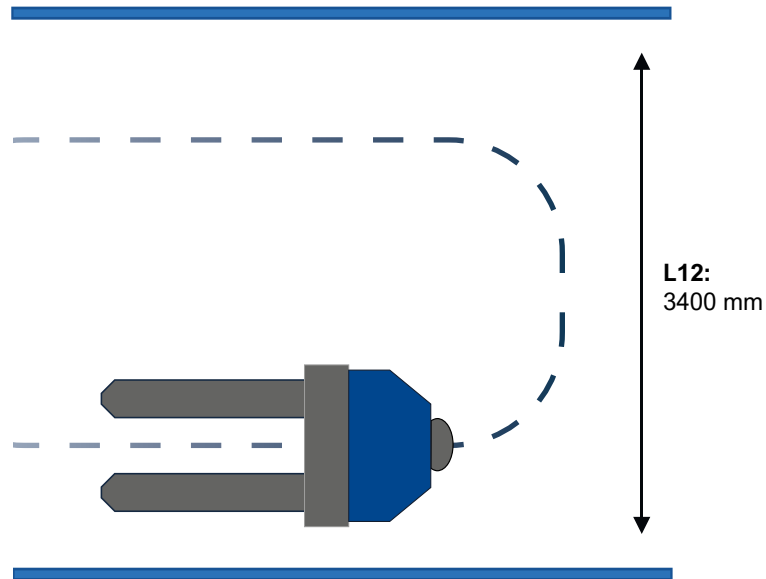


SPACE REQUIREMENTS

14.8 SPACE REQUIREMENTS FOR TURNING IN AN AISLE FOR GLOBAL AGV L12

When operating and installing the Global AGV L12, it is important to note that the space required to perform a turn with the AGV, requires a considerable larger amount of space, than the actual turning radius on the AGV. This is because the AGV has programmed emergency zones that will activate if they get too close to objects, like walls and such making the AGV go into a full stop.

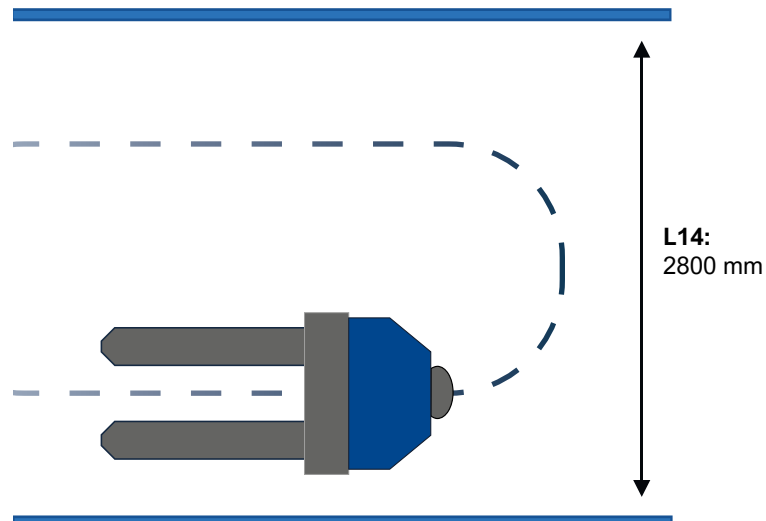
Our recommendations are therefore that the aisle width to perform a 180 degree, turn is minimum 3400 mm for the L12.



14.9 SPACE REQUIREMENTS FOR TURNING IN AN AISLE FOR GLOBAL AGV L14

When operating and installing the Global AGV L14, it is important to note that the space required to perform a turn with the AGV, requires a considerable larger amount of space, than the actual turning radius on the AGV. This is because the AGV has programmed emergency zones that will activate if they get too close to objects, like walls and such making the AGV go into a full stop.

Our recommendations are therefore that the aisle width to perform a 180 degree, turn is minimum 2800 mm for the L14.



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