**A·P·I·E·L**

**Industria**

## Automated warehouses AW series



**Figure 1**

This machine series is designed for storage of crates boxes coils, containers and minipallet. The available models are 6 and differ in the width of the corridor in which run the stacker crane and for the type of motorization gripper.

different widths: the narrow aisle allows a considerable reduction of overall dimensions, while the version of a width exceeding enables higher performance.
The models differ than that for the size for the type of engine. For each of the two dimensions of the middle lane,the solutions to achieve the movements of the axes are:

1) Longitudinal and vertical movements of the stacker crane made with three-phase asynchronous motors with inverter, movements of the gripper with pneumatic cylinders.

2) Longitudinal and vertical movements of the stacker crane made with brushless servomotors, movements of the gripper with pneumatic cylinders.

3) Longitudinal and vertical movements of the stacker crane made with brushless servo motors, motion of the gripper made with brushless servomotors.

The shelving of containment of the products are commercial; the type is the one depicted in figure 2 The useful width "A" of the shelf varies from 200 to 600mm (from 200 to 400 for the model with reduced lane) as well as the depth.
The reduced middle lane has width of 800mm, while the lane standard measure 1650mm.

# Automated warehouses

The features common to all models are:

- Stacker crane with bottom rails made with recirculating balls guides.
- Vertical framework made with aluminum sheet
- Vertical guide with recirculating balls
- Transmission
- Longitudinal upper guide attached to the shelving.
- Useful vertical stroke 4000mm (max vertical encumbrance 5000mm).
- Longitudinal and vertical transmission axes created with worm gearboxes Bonfiglioli.
- Monitoring and control with PLC Omron CP1L on the stacker crane.
- Connection of the stacker with the panel on the ground with chains Cable holder for longitudinal travel of less than 10 mt.
- Command of the machine by means of the operator panel; an alternative network connection and commands through the pages of your web browser.
- Longitudinal and vertical transmission made of polyurethane timing belts AT10
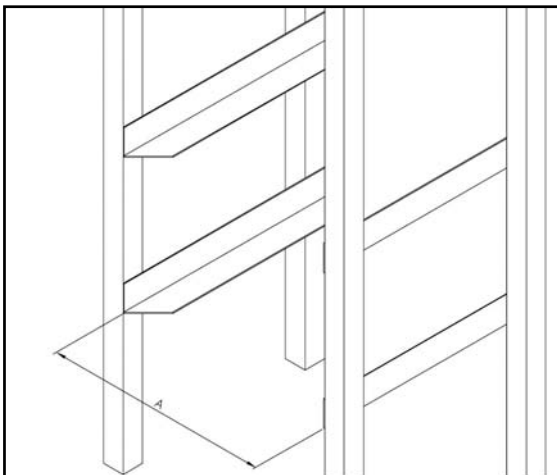


## AW80AS Model

Reduced middle lane 800mm to handle products with a maximum size of 400x400.
The longitudinal and vertical movements of the gripper are realized by means of two-phase asynchronous motors with brake.
The maximum load is 350N.
The handling of the clamp is realized by means of a pair of pneumatic cylinders.

## AW80S2 Model

The longitudinal and vertical movements of the gripper are realized by means of two servomotors Panasonic.
The other features are the same of the model AW80AS.

## AW80S4 Model

The handling of the clamp is realized by means of a pair of brushless servomotors Panasonic.
This solution provides high performance with very low handling times.

# Automated warehouses

## AW160AS Model

Middle lane standard 1650mm to handle products with a maximum size of 600x600.
The longitudinal and vertical movements of the gripper are realized by means of two-phase asynchronous motors with brake.
The maximum load is 500N.
The handling of the gripper is realized by means of a pair of pneumatic cylinders.

## AW160S2 Model

The longitudinal and vertical movements of the gripper are realized by means of two servomotors Panasonic.
The other features are the same of the l AW160AS model.

## AW160S4 Model
The handling of the gripper is realized by means of a pair of brushless servomotors Panasonic.
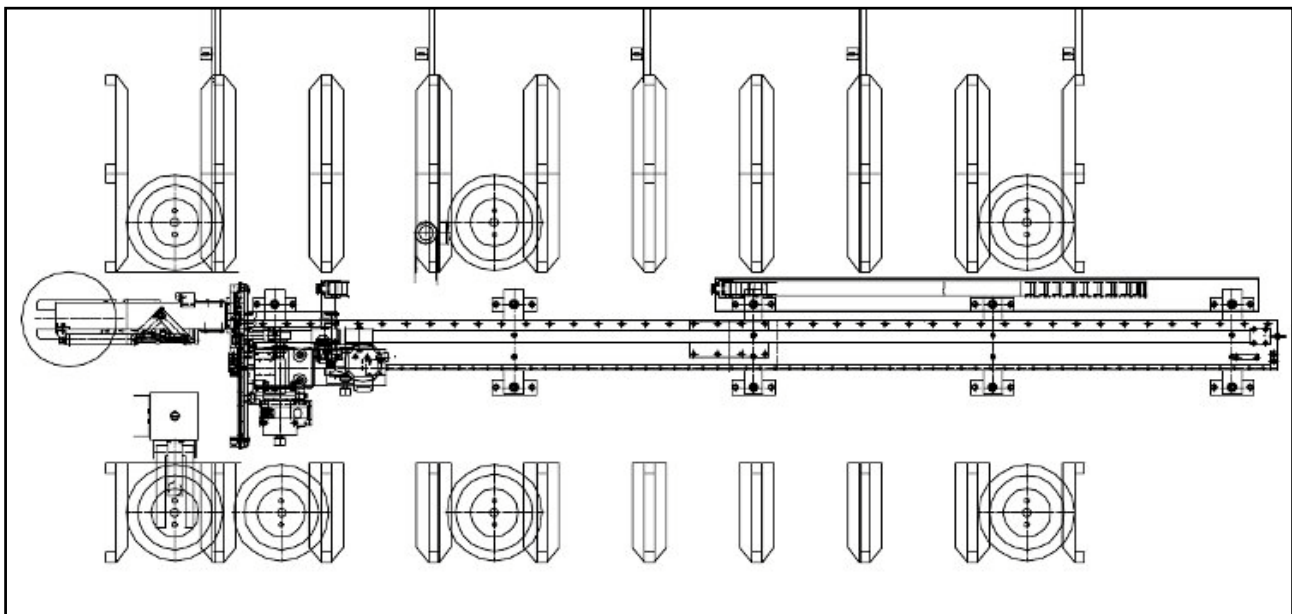This solution provides high performance with very low handling times.



Figure 3 shows the plan of a extremely compact implementation with horizontal stroke of 3660 mm to 2800 mm vertical capable of enslaving 99 locations product. The machine is accompanied by other 3 to achieve a single automatic warehouse with 3 stacker cranes for a complex of 297 locations of the product.

## Automated warehouses Prel&va2 series

The picture in Figure 4 shows the photo of the automated warehouse Prel&va2; the system manages parallelepiped boxes with minimum dimensions of 70x40x12 and maximum ones of 250x125x125. The number of entries that can be managed even exceed 10,000. The warehouse can work with both boxes equipped with barcode that no code.

With boxes encoded with a bar code, the loading can be achieved in a fully automatic way; the operator needs only to overthrow the pieces into a hopper and loading happens automatically. The device for automatic identification of the codes is equipped with sensors and readers of barcode that will recognize the item by storing,-independent of the position of the barcode.

With not coded boxes, it must be the operator to enter the product code.

The size of the warehouse are flexible and adapt to the needs of the customer. The product recall happens through computer. The pieces are then placed on conveyor belts and elevators up to the required point.



**Figure 4**

# Automated warehouses

There are 3 possible configurations:

- System which allows to manage the load pickup in a fully automatic and high productivity way. In this case, the machine can remove up to 700 pieces per hour and load up to 500 pieces per hour.
- System with semi-automatic loading in which the operator adds products inside the drawers of containment. In this case the machine can remove up to 700 pieces in an hour and it can load up to 300 pieces in an hour.
- warehouse with loader loading. The productivity of the levy and loading are respectively 700 and 400 parts in an hour.



**Figure 5**

## Stocking

The products are stored inside of two opposing shelving. On each shelf we have drawers containing the product
The drawers have 5 widths: 80, 125, 163, 205, 243 The depth of the drawer is 400mm; a product can be contained in one or more drawers. As you can see from Figure 5, the packages can be placed in the drawers with the long side or the short side of the front panel.
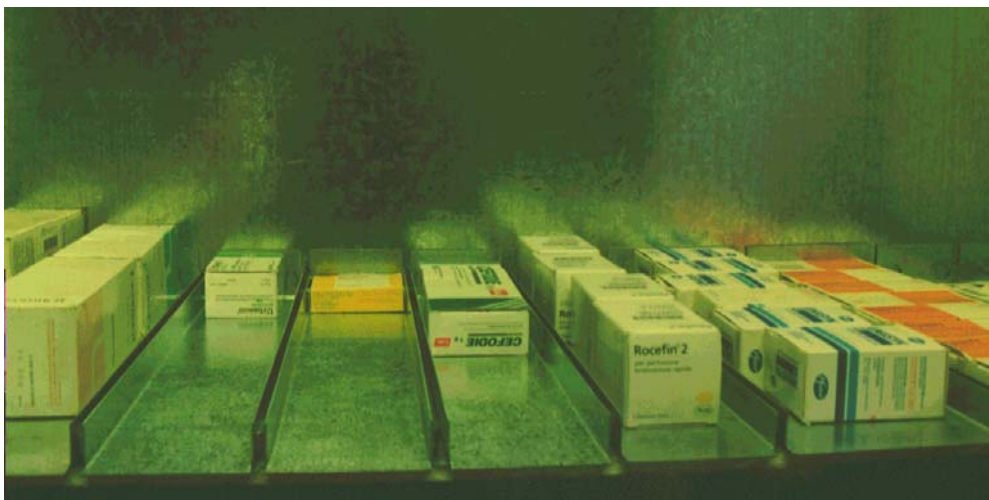


**Figure 6**

The vertical space between two planes defines the maximum height of the package; plans can be mounted in free distance one from the other. On the same plane can be supported also drawers of different sizes.

# Automated warehouses

## Loading

The loading can be done in a completely automatic and semi-automatic way. In automatic mode, it is sufficient to overturn the products in the loading hopper to allow the system to manage in a fully autonomous way the loading procedures.
This system is fast as charging 500 parts per hour.

The automatic loading system is recommended if you need to upload products in large quantities and with high dispersion (upstream items with limited availability).

The fully automatic loading can be supplied in two versions: with only the reading group of codes or even with a second automatic warehouse temporary, interlocked by a dedicated robot.

In semi-automatic mode,
there are two systems.
Under the first system, including in all configurations, the server has to read the bar codes of the packages with a light pen. The robot brings the tank of the product to the loading station where the assistant arranges the products in the tank through the flap load. Subsequently, the robot loads the tank inside the warehouse. This system is ideal for loading all the products that have not been identified by the automatic loading and is extremely fast to load packs of the same reference.

The second system has been developed to replace the fully automatic loading. In this case, the server reads the barcode of the packages and places them one after the other on a conveyor loader until it is full. At this point the machine takes the products from the conveyor and loads them in the respective compartments within the warehouse. With this system, the commitment of the assistant is low because his time involved is limited only to check the packages. This system is less expensive than the automatic loading and does not require a minimum height of the room. Moreover, its productivity is similar to that of the automatic system. In the remainder of this document equipment will be defined as "Automatic Feeder".

# Automated warehouses

## Picking

The withdrawal of the products happens by sending to the PC an order picking that manages the warehouse. This order is a file containing product code and quantity for each item. The transmission of the orders takes place by means of a LAN network. Orders received are stored in a folder; there is no limit to the number of orders.
Orders received are processed in chronological order from oldest to most recent.
Once you have taken charge of an order, an optimization routine order intakes in order to reduce the movements of the robot.
The robot inserted between the shelving, place a gripping head in front of the drawer from which to take a pack; the gripping head is inserted into the tray until it touches the first box. The contact with the box creates a vacuum on the suction cups of the grip head which hook the boxes. The head escapes from the tray by sliding the box.

The process is repeated until the outlet of order completion. The packages are picked discharged onto a conveyor or into a discharge bay.
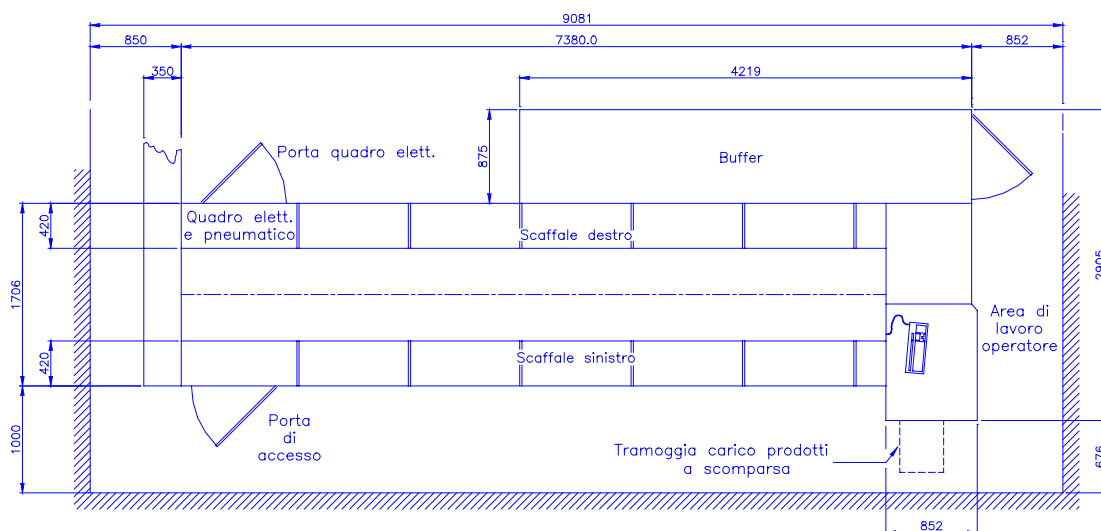


**Figure 10**

Figure 10 is a typical example of installation: the machine shown has the automatic loading high performance.
The maximum useful length of the shelves and 10 meters, and the maximum height is 3.5 meters.