

Automated Storage / Retrieval Systems (AS / RS)

# Rackpack / Robostack

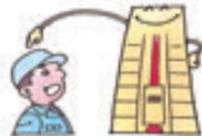


# Achieve space and labor savings and accurate inventory control at one time! IHI Automated Storage / Retrieval System (AS / RS) Series

## Benefits of AS / RS

### Drastically Reduced Storage Space

Vertical storage with integrated structure of racks and cranes enables maximum use of space up to the ceiling. Get the most out of current storage space.



### Easy Operation, Labor Saving

Anyone can control AS / RS with user-friendly interface such as touch panel and barcode reader. Receiving and shipping operations are fully automated.



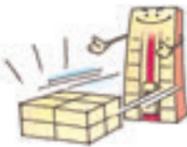
### Easy and Accurate Inventory Management

Accurate inventory management usually requires experienced and dedicated staff; however, with AS / RS, anyone can easily achieve accurate management by computerized inventory control.



### FIFO (First-in First-out)

AS / RS works together with inventory information on a computer for automatic FIFO; therefore, load damages and replacing work are minimized.

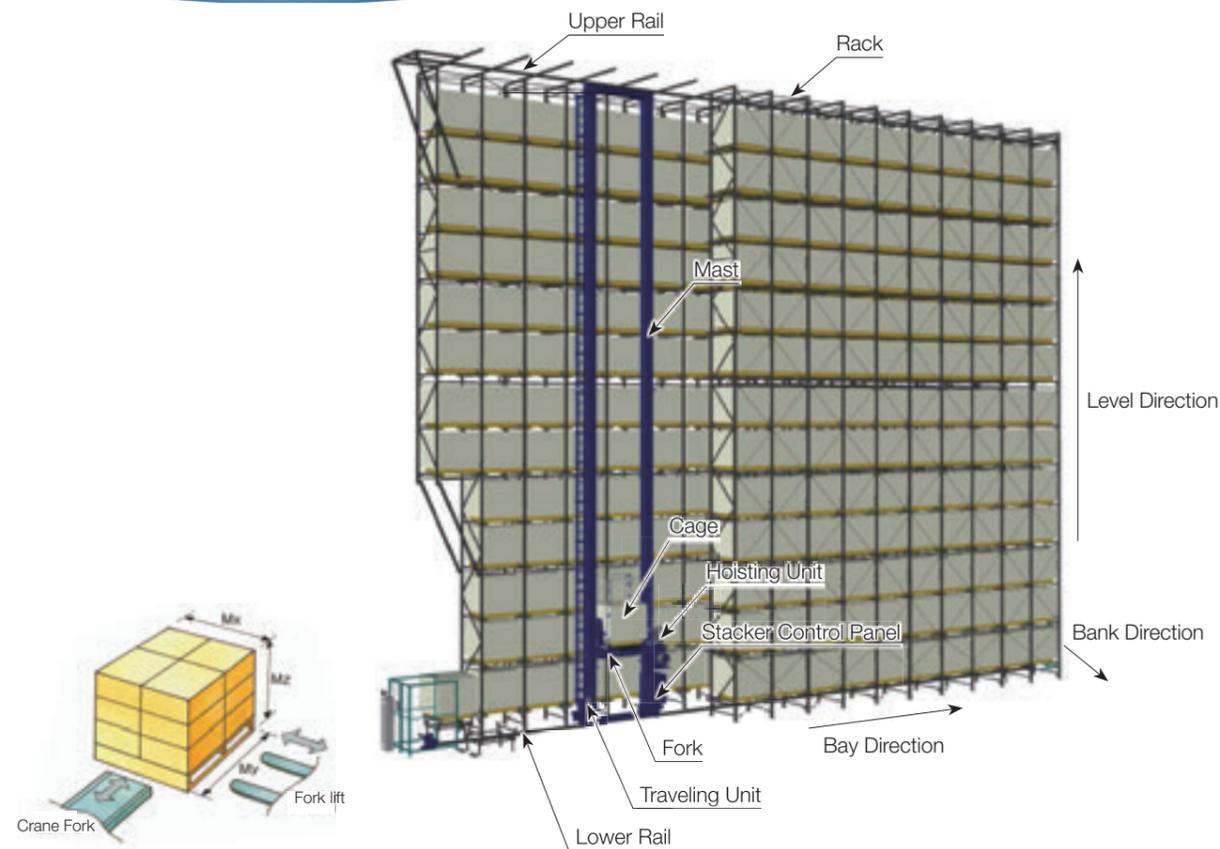


### Improved Working Environment and Safety

Storage space is completely kept separate from area accessible by workers to attain much safer environment. Furthermore, AS / RS drastically reduce error and work load to improve working environment. Working environment is kept neat, tidy, and clean, providing workers with safe and clean environment to work in.



## Structure and Terms of AS / RS



## Advantages of IHI AS / RS

IHI provides tailor-made facility suitable to each customer's needs!

### Abundant Experience and Achievement

Since the establishment in 1853, IHI has accumulated experience originally from shipbuilding to land, sea, sky, and space.

By making full use of cutting-edge technology obtained in various fields, IHI provides the best solution to reduce distribution cost.



(©JAXA)

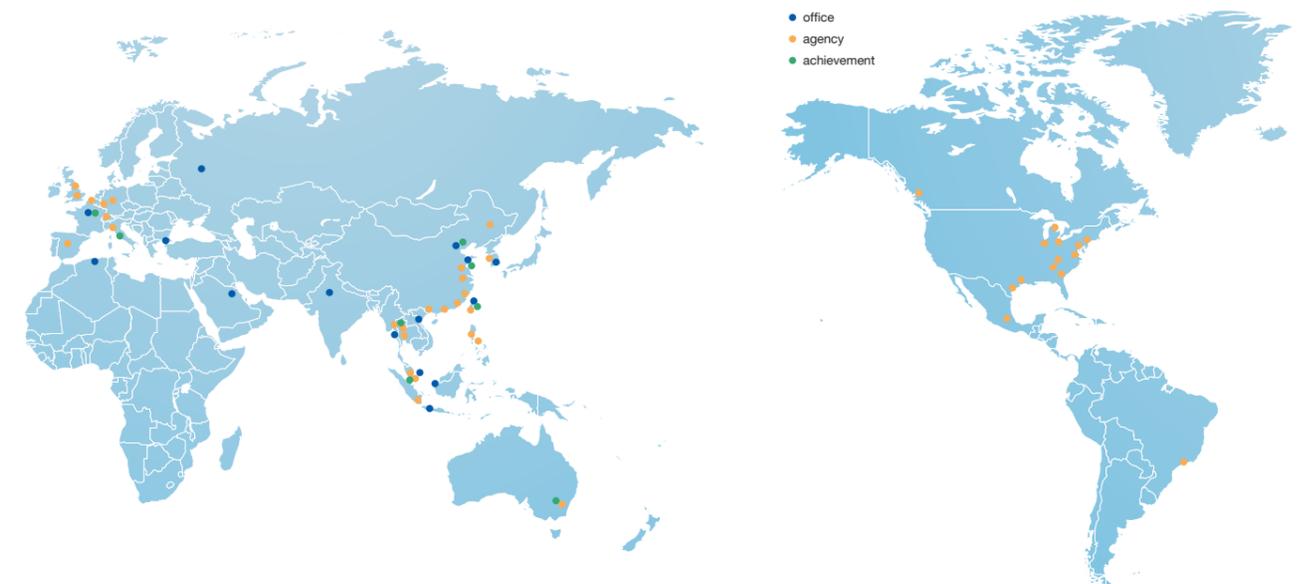
### Provided for Various Storage Materials and Environments

IHI AS / RS are capable of various materials and environments including frozen storage down to -60°C, hazardous material storage, and working in a cleanroom.



Pallet less, Roll objects, Long / Heavy objects, frozen objects, Hazardous materials, clean room

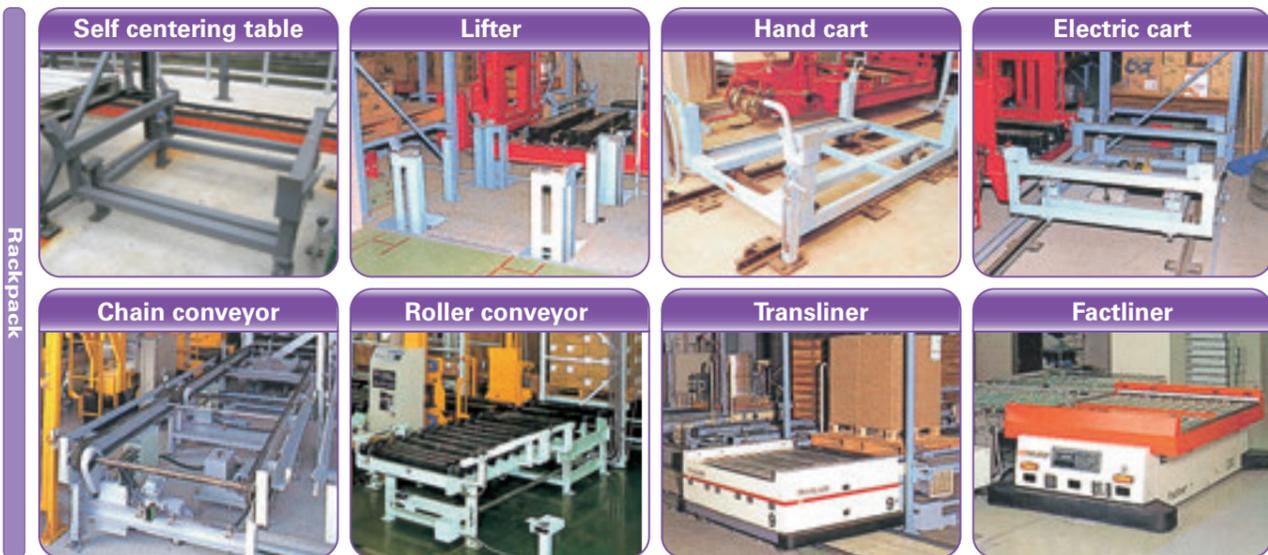
## IHI Global Net Work



# Rackpack *i*



## Loading and Unloading Equipment



Do you need quick storage, retrieval and careful material handling?  
IHI can provide the best solution with our advanced technology.

### Slim & Compact

Point 1

Every part including basic structure is thoroughly reviewed to reduce unnecessary part. Compared to our conventional products, crane weight has been reduced approximately 30%. Moreover, slim crane enables installation in a small space to utilize limited space more effectively.

### Quick & Smooth

Point 2

The control system achieves smoother and quicker operation that can reduce time for storage and retrieval, and at the same time, it minimizes vibration to handle materials carefully. In addition, servomotor is used to drive the fork. Fast speed and stable load handling are simultaneously realized.



servomotor

### Energy Saving and Ecology

Point 3

Consumption power is reduced compared to previous products, and unnecessary heat generation is also avoided.

With an optional capacitor, regenerated power is effectively utilized to reduce power at a peak time, which can lead higher effectiveness in power saving.

#### Rackpack i Standard Specifications

Overall height of rack	H ≤ 20m	
Loading capacity per shelf	Max.1ton	
Load size	Length Mx	850 ~ 1,300mm
	Width My	900 ~ 1,300mm
	Height Mz	500 ~ 2,000mm
Traveling speed	65 ~ 180m/min (Inverter)	
Hoisting speed	10 ~ 60m/min (Inverter)	
Forking speed	20 ~ 45m/min (Servo)	
Power source	AC200/220/380/400V 3 Φ 50/60Hz	



# Rackpack $\alpha$

## IHI AS / RS Entry Model Rackpack $\alpha$

### Increase in Storage and Work Efficiency with Easy Operation!



Rackpack  $\alpha$  is applicable to anyone and easy to introduce as an entry model of IHI high-rise AS / RS. IHI makes use of its long experience as an AS / RS manufacturer to offer the best AS / RS systems suitable for each customer.

#### Easy Operation

One-touch operation with touch panel is accessible to anyone. No special education or training is necessary.

#### Increasing Storage Efficiency

Vertical storage with integrated structure of racks and cranes enables maximum use of space up to the ceiling.

#### Improving Safety and Work Environment

Automatic operation increases safety and drastically minimizes error and workload. Thus, work efficiency is improved.



#### Rack Pack $\alpha$ specifications

Overall height of rack	3 ≤ Hz ≤ 10m	
Loading capacity (including pallet)	Max.9,800N/P (1,000kgf/P)	
Load size (including pallet)	Length Mx	1,000 ~ 1,300mm
	Width My	1,000 ~ 1,300mm
	Height Mz	500 ~ 1,700mm
Installation location	Indoor	
Environmental condition	Avoid direct sunlight, corrosive gas, inflammable gas, and excessive dust.	

Operating temperature	0 ~ 40°C
Operating humidity	45 ~ 85% Avoid condensation.
Power source	AC200/220/380/400V 3 φ 50/60Hz
Traveling speed	(Actual) 70/ (Empty) 70 m/min.
Hoisting speed	(Actual) 13/ (Empty) 18 m/min.
Forking speed	(Actual) 30/ (Empty) 45 m/min.

#### Security Operation Experience

IHI provides AS / RS Operation Experience Course in Japan. Customers can learn basic operations as well as various specifications by actually touching the system.



#### Security Easy Operation

Before using the system, IHI will explain how to operate it safely. IHI will also respond to special training necessary for crane manual operation according to customers' needs.

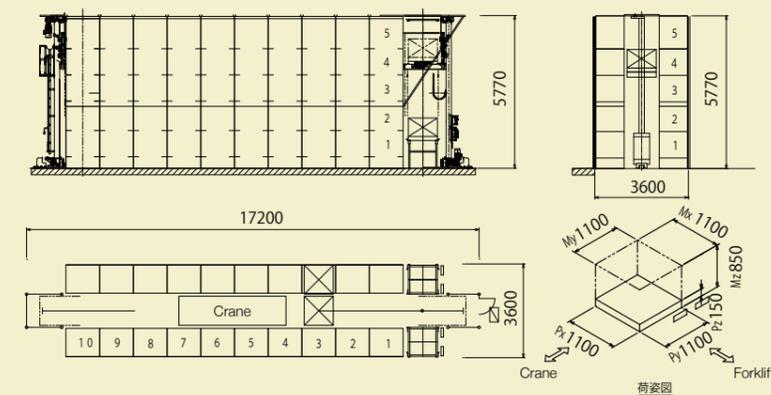
#### Security Safety Function

IHI Rackpack has many safety functions and interlocks as its standard features. Remote monitoring equipment is also provided.

#### Model Plan

Limited price for model plan 7.7 million yen (not including tax)

Estimation will be based on various specifications, such as load size and storage volume, and system layout.



Load size: length (Mx) 1,100 mm x width (My) 1,100 mm x height (Mz) 850 mm  
 Loading capacity: maximum 1,000 kg, average 800 kg (both including pallet)  
 Storage volume: 2 rows x 10 bays x 5 levels = 100 shelves  
 Loading and unloading equipment: self centering table

Delivery location: Japan (except for Okinawa and remote islands)  
 Delivery date: Two months after order  
 Design criteria: Specifications of used parts and equipment will be our standard. Customers are to prepare primary side power supply construction and pallets.

# Robostack

## IHI Motion Control Technology

### Vibration Control

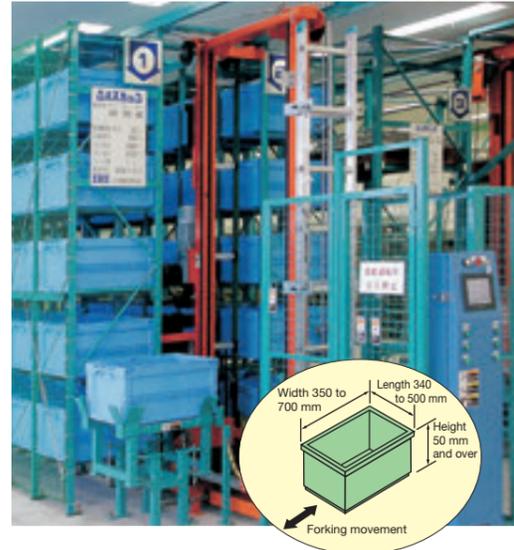
Vibration during crane is vertical movement is minimized. IHI ensures smooth movement that is on the loads.

### Low Noise

Urethane wheels are used as well as aluminum rails. Traveling noise is extremely low.

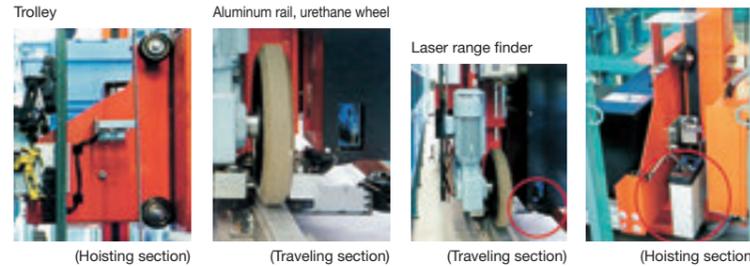
### High Stopping Accuracy

Laser range finder is used for positioning, traveling and hoisting of crane. The crane stops at the precise location.



### Robostack standard specifications

Overall height of rack	Max.8m	
Loading capacity	50kg (including Bin)	
Load size	Length Mx	340 ~ 500mm
	Width My	350 ~ 700mm
	Height Mz	50mm and over
Traveling speed	65 ~ 180m/min (Inverter)	
Hoisting speed	(Actual) 45/ (Empty) 65 m/min.	
Forking speed	(Actual) 40/ (Empty) 60 m/min.	
Power source	AC200/220/380/400V 3 φ 50/60Hz	



## Special Specification Type

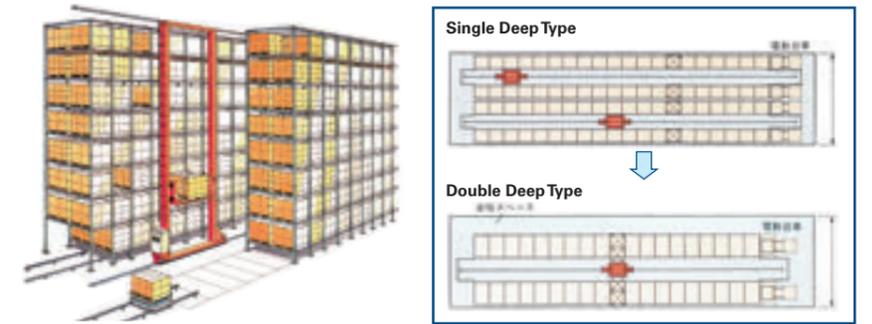
### Free Size Type

Various sizes and types of load size such as bucket and carton case can be handled, and storage case per shelf width is changeable.



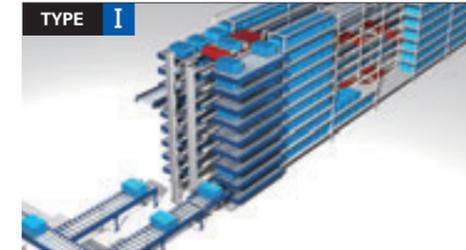
### Double Deep Type

A long-reach fork facilitates the handling of up to two pallets in a depthwise direction. It also enables a single crane to deal with the loads on two AS / RS crane, achieving excellent cost performance. This system satisfies the requirements of customers who prioritize storage volume.

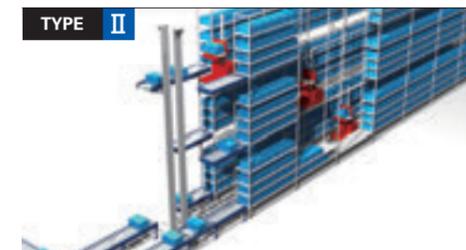
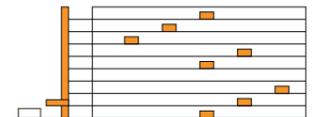


### Shuttle & Server

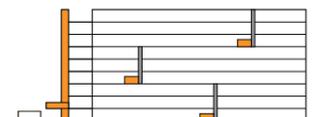
Multiple shuttles enable quick loading and unloading. Multiple shuttles running at high speed load and unload at the same time to show outstanding processing capacity. Type I shuttle, one shuttle serves each shelf level, while Type II shuttle, equipped with hoisting function, can serve multiple shelf levels with one shuttle.



Thoroughly pursue high-speed picking by the shuttle for each shelf.



Achieve both superior picking capability and profitability by the shuttle assigned for some shelves.



## Loading and Unloading Equipment



## Warehouse Management System for AS / RS Multibrain

Multibrain is the warehouse management package software for AS / RS. A wide variety of options for storage and retrieval functions and a variety of output functions make a significant impact on labor saving and accuracy improvement of warehouse management work.

Basic functions		Options	
Storage and retrieval functions	Management forms	Storage and retrieval functions	Management forms
Sequential storage and retrieval	Stock list, shelf list by item names	BCR storage and retrieval	Customer master list
Shelf-designated storage and retrieval	Stock list by shelves	IC card storage and retrieval	Section master list
Planned storage and retrieval	Storage and retrieval record list	Magnetic card storage and retrieval	
Inquiry storage and retrieval	Long-stored item list	Reservation storage, continuous storage and retrieval	
Inventory, emergency retrieval	Work history list	Line-off re-storage	
	Shortage stock list		

**Meiji Co., Ltd.**  
**Gunma Nutritional Plant (Gunma)**



AS / RS for nutritional foods

**Benefits**

- Combined the traceability of IHI and Meiji system.
- AGV and AS / RS for raw material and finished goods realized the total tracking from input to output of the factory.
- Minimized the storage space.
- Reduced manpower by automating the material handling process.
- Capable for high-mix low-volume production by quick response of automation system that caters a high throughput operation.

**System overview**

- Raw material & packaging material AS / RS
  - 1 lane of AS / RS (428 pallet storage)
  - Conveyors and traversers
  - De-palletize robot
- Finished goods AS / RS
  - 6 lanes of AS / RS (3,972 pallet storage)
  - Conveyors and Transliner (rail guided vehicle)
- AGV
  - 3 units of auto guided forklift
- WMS and WCS



● Finished goods AS / RS & Transliner (rail guided vehicle)



● AGV system



● Raw material & packaging material storage AS / RS



● De-palletize robot



● Product shipping station

**Hisaka Works, Ltd.**  
**Konoike office (Osaka)**



AS / RS for Molds

Over  
**11t**

**Benefits**

- Drastically improved efficiency of materials handling.
- Automated mold supply to 20,000-ton press machine.
- Real-time inventory management and count.
- 100% indoor storage. Improved transportation safety.

**System overview**

- Storing molds for a 40,000-ton press machine
  - Storage volume: 29 shelves, loading capacity: 11,800 kg per shelf
- Storing molds for a 20,000-ton press machine
  - Storage volume: 131 shelves, loading capacity: 7,700 kg per shelf
- Storing small parts / half-finished goods
  - Storage volume (large): 136 P, loading capacity: 5,000 kg/P
  - Storage volume (middle): 320 P, loading capacity: 2,160 kg/P

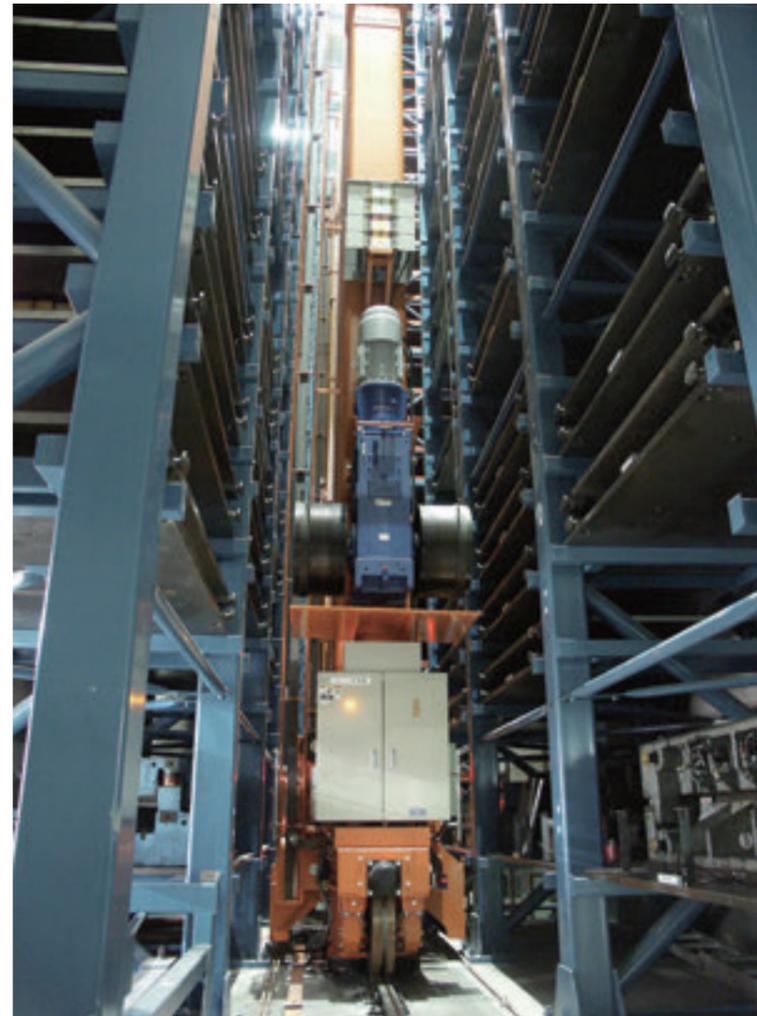
\* P: pallet, loading capacity: maximum, F: floor of shipping station



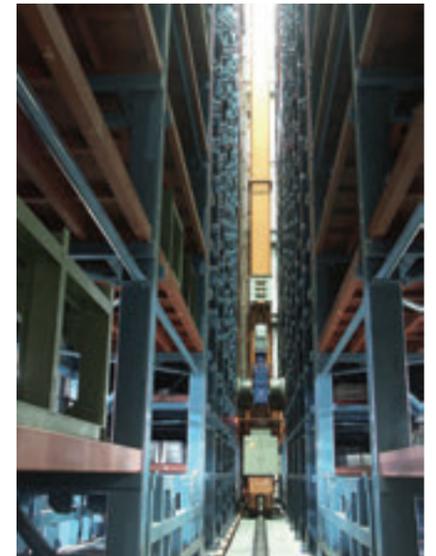
● Loading and unloading station of 40,000-ton press machine molds



● Storing condition of 40,000-ton press machine molds



● AS / RS for 20,000-ton press machine molds



● AS / RS for small parts and work-in-progress goods



● Loading and unloading station

**VOLKSWAGEN Group Japan  
Toyohashi Import Center (Aichi)**

AS / RS for finished car

Over  
**3t, 5m**



**Benefits**

- Achieved immediate shipment, prompt response to customers.
- Saved space.  
18 m<sup>2</sup> per car (flat storing)  
-> 2.1 m<sup>2</sup> per car (AS / RS)
- No rust and paint deterioration of finished cars.

**System overview**

High-rise AS / RS with ability to handle large-sized car

- Number of stored car: 1,234
- H : 302、 L : 932
- Load size  
H : Mx5,600xMy2,400xMz2,125  
L : Mx5,600xMy2,400xMz1,825
- Load weight  
H : Max.3,100kgf/P  
L : Max.2,350kgf/P

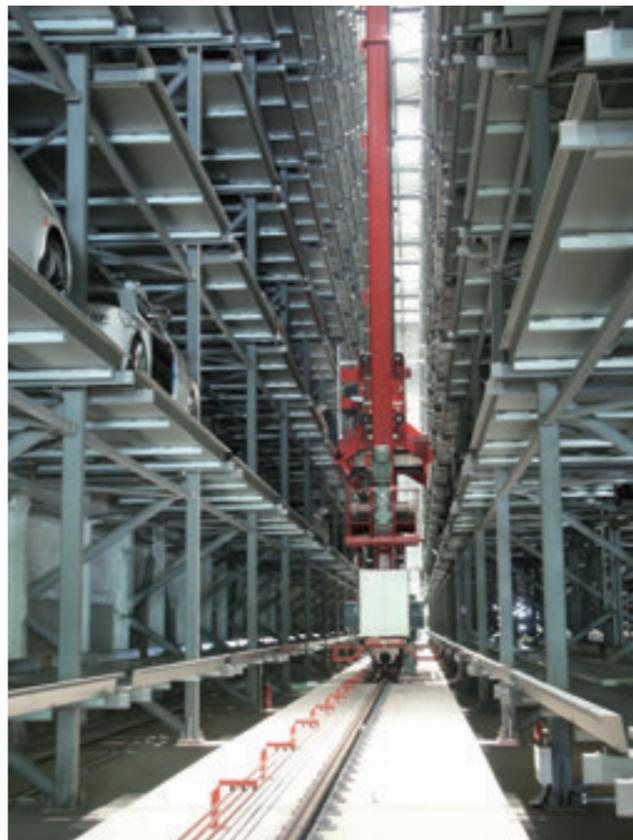
AS / RS with ability to handle sedan

- Number of stored car: 5,352



● Shipping automobiles

\* P: pallet, packaging / loading capacity (including pallet) mm



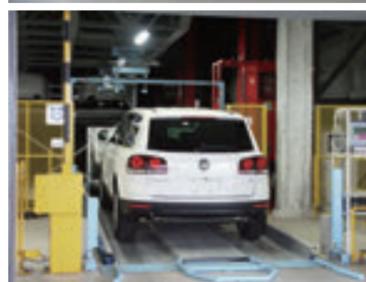
● AS / RS Crane



● AS / RS (Left) Sedan  
(Right) Large-sized car



● Receiving area



● Receiving automobiles

**Wood Energy Cooperative Association (Miyazaki)**

AS / RS for lumber

Over  
**6m**



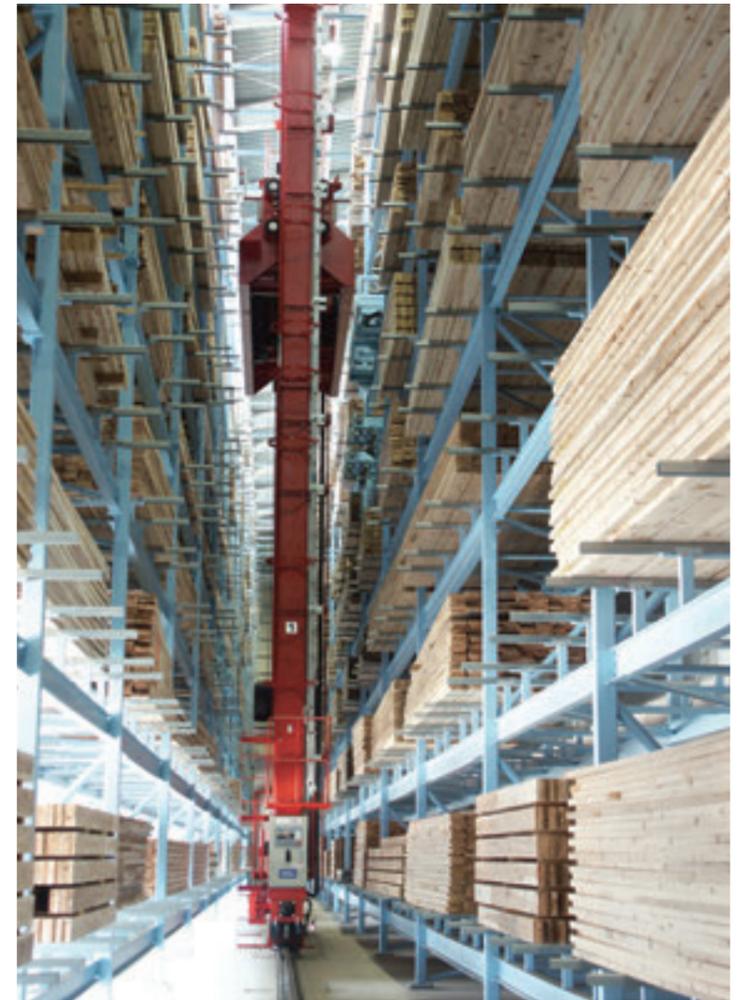
**Benefits**

- Computerized to manage enormous volume of lumber-related data.
- Improved safety, prevented load collapse.
- Secured quality. Prevented damage to freight.
- Improved efficiency of lumber handling between the first and second floor.

**System overview**

- Frequency of storage / retrieval: average 30 to 40 per day, maximum 60 to 70 per day
- Number of shelf: (A) 157 shelves, (B) 306 shelves
- Load size: (A) 6,200 to 3,000 Mx  
(B) 4,500 to 1,800 Mx  
1662Myx1000Mz
- Load weight: (A) maximum 3,000 kg per shelf  
average 2,400 kg per shelf  
(B) maximum 2,500 kg per shelf  
average 2,000 kg per shelf

\* P: pallet, packaging: mm (including pallet)



● AS / RS crane



● Steel racks for outdoor storage



● Second floor: laminated lumber factory



● First floor: loading and unloading station



● Second floor: loading and unloading station

SUS Corporation Fukushima Plant (Fukushima)

AS / RS for aluminum bar

Over  
5m



Benefits

- Increased productivity by standardization of work.
- Achieved further accuracy in operations and retrieval.
- Saved space by three-dimensional structure.

System overview

- Load size: Mx5150xMy750xMz575 (mm)
- Load weight: Max750kg, Ave.750kg
- Storage volume:
  - Crane No. 1
    - 1 lane x 4 rows x 8 bays x 4 levels
    - 18 shelves = 110 shelves
  - Crane No. 2 / crane No. 3
    - 2 lanes x 4 rows x 6 bays x 4 levels
    - 36 shelves = 156 shelves
- Total 266 shelves



● Inside of AS / RS



● Loading and unloading station



● Loading and unloading station



● Loading and unloading station

Chiba Metal Co., Ltd.  
Tohoku office (Iwate)

AS / RS for steel sheets

Over  
4m



Benefits

- Reduced crane-turning work. Allowed one operator to complete unloading work within a few minutes, which previously took two operators up to one hour to complete using overhead crane.
- Achieved safe and quick materials unloading.
- Enabled to cut materials right after retrieval to improve work efficiency.
- Enabled quick response for rush orders.

System overview

- Item handled: SUS steel sheets
- Load size: Mx4300mmxMy2200mmxMz265mm
- Load weight: Max.3000kg/P  
Ave.2400kg/P
- Storage volume: 89 shelves
- Speed:
  - Traveling: 60m/min
  - Hoisting: 20m/min
  - Forking: (Actual) 20/5 m/min. (Empty) 30/5 m/min.
- Shipping station: 2 locations

\* P: pallet, packaging: mm (including pallet)



● Full view of AS / RS



● AS / RS crane



● Loading and unloading electric cart



● Loading and unloading station



● Crane Fork

Hamamatsu Isuzu Corporation  
Head factory (Shizuoka)

AS / RS for steel coils / hoop products

Over  
5t



Benefits

- Increased storage capacity by 1,500 tons.
- Drastically reduced freight operation.
- Improved efficiency in in-house distribution.
- Minimized floor space.

System overview

- Item handled: raw material coils and hoop products
- Load weight: maximum 5,200 kg/P (including pallet)
- Load size: Mx1100xMy1350xMz1230
- Storage volume: 300 shelves
- 2 rows x 22 bays x 7 levels - 8 shelves

\* P: pallet, packaging: mm (including pallet)



● AS / RS Crane



● Storage site for raw materials / raw material coils



● Receiving raw material coils



● Shipping steel hoop



● Steel hoop

Asahi Shinbun Kyoto Plant (Kyoto)  
Tohshi Printing Service Co., Ltd.

Rolled paper storage / automatic paper feeding system



Benefits

- Increased space efficiency by high-rise paper storage.
- Automated entire process including rolling paper storage, transportation, paper feeding, and paper tube collection.

System overview

- <Paper storage: Rackpack>
- Number of shelf: 156
  - Crane: 2 units
  - Load weight: 1500kg
  - Load size: φ 900 ~ 1,270mm  
Width 813 to 1,626 mm/D.C.A roll
- <Transportation: Factliner>
- Number of unit: 10
  - Induction system: magnetic induction



● AS / RS for Roll objects



● Paper feeding / paper tube collection



● AGV transfer equipment



● Paper tube collection machine and accumulating machine



● High-rise paper storage

Akagi Nyugyo Co., Ltd.  
Honjo Senbon-zakura "5S" Plant (Saitama)

AS / RS for ice cream



Benefits

- Established cutting-edge safety and reliability in both hard and soft business aspects.
- Enabled flexible handling of both mass production and small manufacturing of a wide variety of products.

System overview

- Product pallet storage (-30°C or below)
- Product palletizing / loading from manufacturing line
- Load size: Mx1,200xMy1,200xMz1,500 (mm)
- Storage capacity: 2,310 shelves
- AS / RS crane: 5 units
- Palletized robot: 3 units



● Palletized facility (-10°C)



● Refrigeration AS / RS (-30°C)



● Storing in refrigeration automated storage

Yamasan Nishikawa Co., Ltd.  
Ohara factory (Chiba)

Fishery processing and refrigeration AS / RS



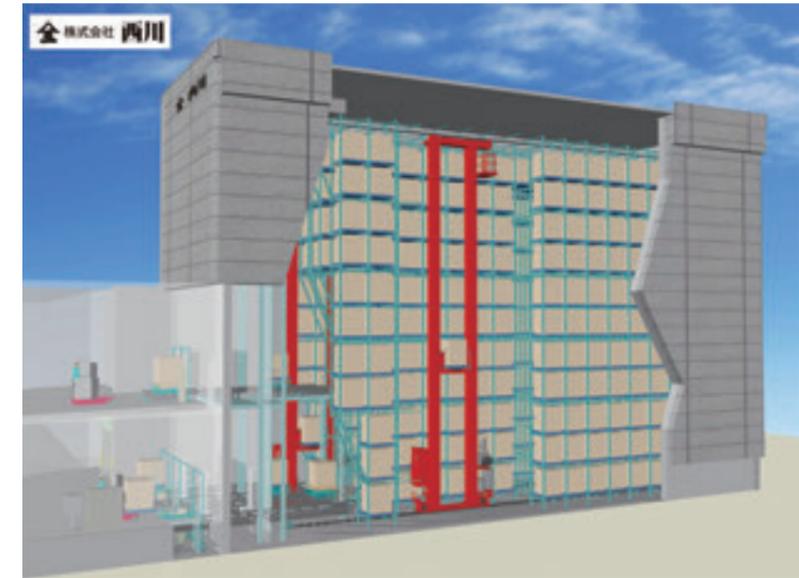
Benefits

- Enabled total temperature control from receipt to shipment.
- Automated all input work at site.
  - Scheduled instruction is created at an office. All input work at site is eliminated.
- Speeded up storage and shipment work, leading to increase efficiency.

System overview

- Stored item: fishery processing products
- Storage temperature: -25°C (front room 0°C)
- Number of storage shelf: 684 shelves (4 rows x 16 bays x 11 levels - 20 shelves)
- Load size: Mx1300xMy1300xMz1550
- Loading capacity: Max.1000kg/P, Ave.600kg/P

\* Unit: mm



● Shipping products



● AS / RS Crane



● Processing scene

Japanese Consumers' Co-operative Union  
Tosu frozen distribution center (Saga)

Frozen distribution center



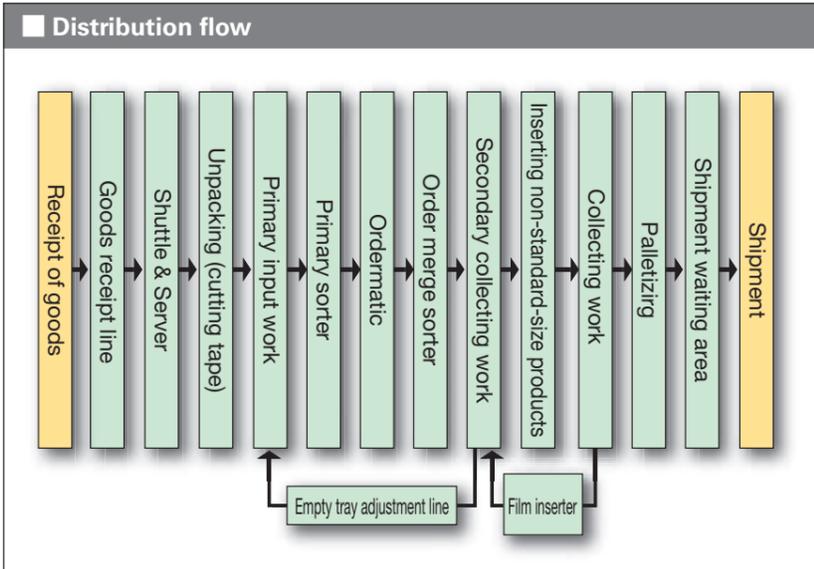
Benefits

- Secured high product quality by strengthening goods temperature management.
- Reduced error in goods collection: 1/100,000 or less.
- Realized high capacity system with seamless function.
  - Operating capability: 30,000 trays/H

System overview

- Shuttle & Server: 20,736 cases
  - Storage and retrieval capability: 2,400 cases/H
- Ordermatic: 31,500 trays/H
- Order Merge Sorter: 31,500 trays/H
- Mobile shelf: Rackrunner
  - 1,400 P, 50,000 cases

\* P: pallet, ST: station

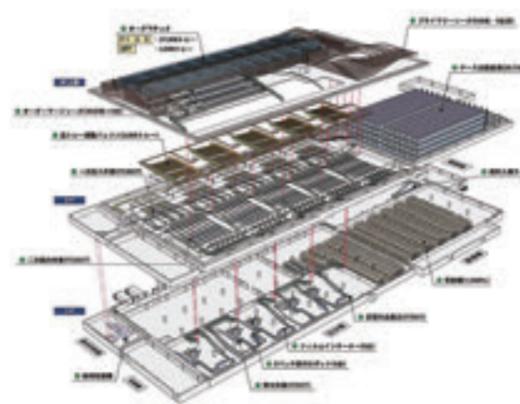


● Shuttle & Server



● Ordermatic

Picker



● Primary sorter

Japan Red Cross Kanto-Koshinetsu Block Blood  
Center Saitama factory (Saitama)

AS / RS for blood storage

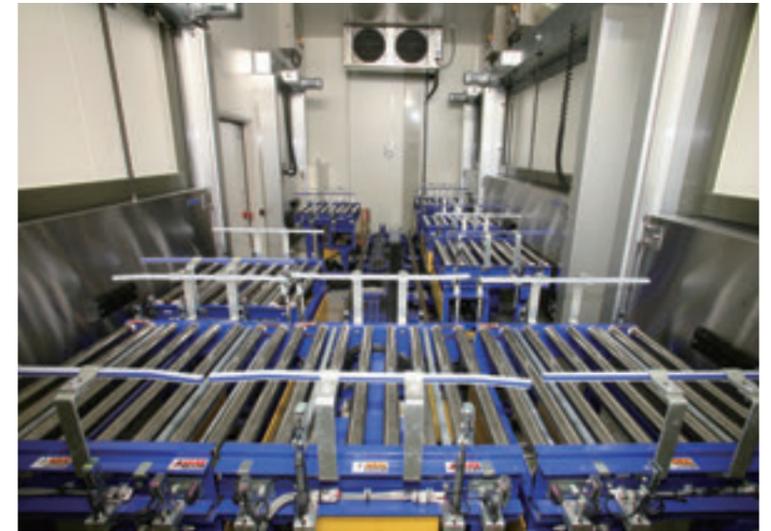


Benefits

- Enabled safe storage of blood products.
- More stabilized and accelerated the supply of blood products.
- Mechanized works under the environment of -30°C .

System overview

- Item stored: fresh frozen plasma (FFP)
- Number of shelf: 4990
- Load size: Mx350xMy530xMz200
- Loading capacity: maximum 12 kg/box, average 10 kg/box
- Number of crane: 2 units
- Environmental condition: -30°C



● Loading and unloading station



● 4990 shelves installed, space saving achieved



● Loading and unloading station



● Automatic transportation with two cranes

**Chikko Corporation  
Yokohama Chemicals Center (Kanagawa)**



AS / RS for hazardous materials

Benefits

- Decreased labor by 50% compare to flat storing.
  - Operations require only two forklift operators.
- Achieved quick response to wide variety of items and small lot.
- Storage and retrieval are managed by computer. Inventory is controlled in real time.

System overview

- Building-style AS / RS / auto-stack building
- Item stored: Class 4 hazardous materials under the Fire Service Act
- Storage capacity: 3,360 P (13,440 drums)
- Shipping volume: average 6,000 to 7,000 drums per day
- Area: 996.12 m<sup>2</sup> (one of the largest in Japan)
- Height: approximately 20 m
- Crane: 5 units
  - Transportation capability: 33 P/h
  - Traveling: 125 m/min. (inverter)
  - Hoisting: 30 m/min. (inverter)
  - Forking: (Actual) 20 m/min. (inverter) (Empty) 30 m/min. (inverter)
- Feeding system: cable bear system
- Loading / unloading equipment: electric cart 10 units
- \* Note: explosion-proof

\* P: pallet, packaging: mm (including pallet)



● AS / RS



● AS / RS Crane



● Electric cart



● Working instruction lamp



● CO<sub>2</sub> gas storage building (Right)



● CO<sub>2</sub> gas bomb room

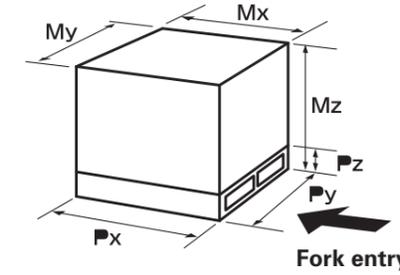
**AS / RS Planning Sheet**

Customer information

Company name \_\_\_\_\_ TEL \_\_\_\_\_  
 Department name \_\_\_\_\_ E-mail \_\_\_\_\_  
 Name of person in charge \_\_\_\_\_  
 Address 〒 \_\_\_\_\_

Items to be stored

\* Required to be filled out



\* (1) Handling item \_\_\_\_\_ (Example: electric parts)  
 \* (2) Shape \_\_\_\_\_ (Example: loaded in cardboard)  
 (3) Number of item type \_\_\_\_\_ type  
 (4) Mixed loading \_\_\_\_\_ (Yes / No)  
 \* (5) Load size Length Mx = \_\_\_\_\_ mm (including pallet)  
 Width My = \_\_\_\_\_ mm (including pallet)  
 Height Mz = \_\_\_\_\_ mm (including pallet height)  
 \* (6) Loading capacity (including pallet)  
 Maximum = \_\_\_\_\_ kg / Average = \_\_\_\_\_ kg

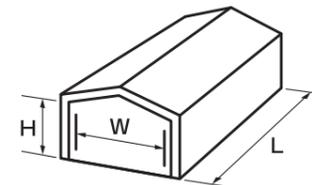
Pallet type

(For both (1) and (2), circle the applicable item.)

(1) Wooden / Steel / Plastic / Other ( \_\_\_\_\_ )  
 (2) Double side type / Single side type / Skid  
 (3) Pallet dimensions Px= \_\_\_\_\_ mm Py= \_\_\_\_\_ mm Pz= \_\_\_\_\_ mm

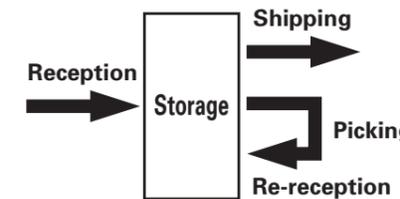
Installation location

\* Required to be filled out



\* (1) Building \_\_\_\_\_ (new construction / existing facility)  
 (2) Installation location \_\_\_\_\_ floor  
 \* (3) Installation space (available) W (width) = \_\_\_\_\_ mm  
 L (depth) = \_\_\_\_\_ mm  
 H (height) = \_\_\_\_\_ mm  
 (4) Maximum load weight \_\_\_\_\_ kg/m<sup>2</sup>

Number of times for goods reception and shipping per day and number of pallet to be stored



(1) Number of pallet to be stored \_\_\_\_\_ pallet  
 (2) Reception Maximum = \_\_\_\_\_ times/day  
 Average = \_\_\_\_\_ times/day  
 (3) Shipping Maximum = \_\_\_\_\_ times/day  
 Average = \_\_\_\_\_ times/day \*Please fill in the number of outgoing pallets.  
 (4) Re-reception Maximum = \_\_\_\_\_ times/day  
 Average = \_\_\_\_\_ times/day \*Please fill in the number of pallets to be outgoing and re-warehousing after picking.  
 (5) Hours of operation per day \_\_\_\_\_ hours/day

Peripheral equipment

Fixed table / Electric cart / Conveyor / Lifter

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