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A full range of shuttle from bins to pallets

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Shanghai Enfon Robotics Co., Ltd
Add: Room 701, Building 6, No. 1158 Zhongxin Road, Songjiang District, Shanghai

Huczhou Enfon Robotics Co., Ltd
No. 666, Dongni Road, Wuxing District, Huzhou , Zhejiang

WeChat

Website

Contact

Mobile：139 1874 2470
Tell ： 021−5407 5830
Web：www.enfonshuttle.com
Mail：wwg@enfon.com.cn

Shanghai Enfon Robotics Co., Ltd

ENFON

Intelligence warehouse partner

Professional shuttle manufacturer

Catalogue

About Us

Shanghai Enfon Robotics is a professional shuttle manufacturer, specializing in providing a full range of shuttle products from multi-shuttle to pallet shuttle, as well as system software. for handling in logistics and warehousing. Enfon is headquartered in Songjiang District, Shanghai, and the factory is in Huzhou City, Zhejiang Province. Enfon products have obtained CE certification and CNAS certification, providing global partners with advanced technology and reliable quality products, and serving global customer, such as production-oriented enterprises and intelligent warehousing in logistics centers.

Company Honor

The products of Shanghai Enfon Robotics have obtained IS09001 quality managem-ent system certification, CE certification, CNAS certification, and won honors such as Certification of High-tech Enterprise, Certification of Shanghai Software Enterprise, Certification of Specialized New-tech Enterprise, etc. Enfon has applied for several invention patents and software copyrights.

4D Pallet Shuttle

4 Directions pallet shuttle is an intelligent robot, which can be programmed to carry out operations such as picking up goods, transporting in four directions on the shelf, and placing goods, etc. It can communicate with host computer or WMS, and combine with RFID, bar code identification and other logistics information technology to achieve functions for example automatic identification of goods, single access, continuous access, and automatic tally.

Applicable types and advantages

Strong compatibility

Applicable to pallets and special vehicles, with a load range of 500-1500kg

Strong scheduling and functionality

Multiple shuttles can be scheduled through warehouse control system ,which can achieve storage and pallet picking functions

Flexible and expandable

Support non-standard customization and can be seamlessly connected with AGV multimodal transportation

High density storage

Meet the efficiency and intelligence requirements of pallet picking, inbound and outbound, and at the same time achieve high-density storage of pallet warehouses

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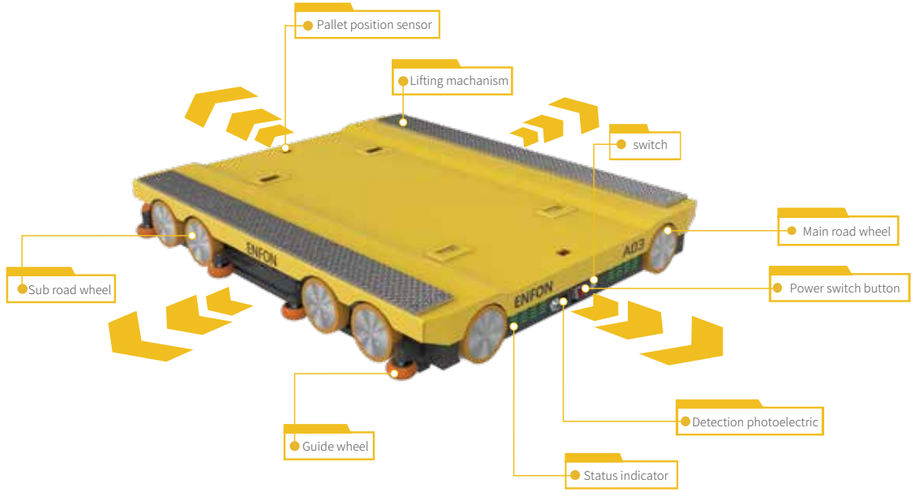
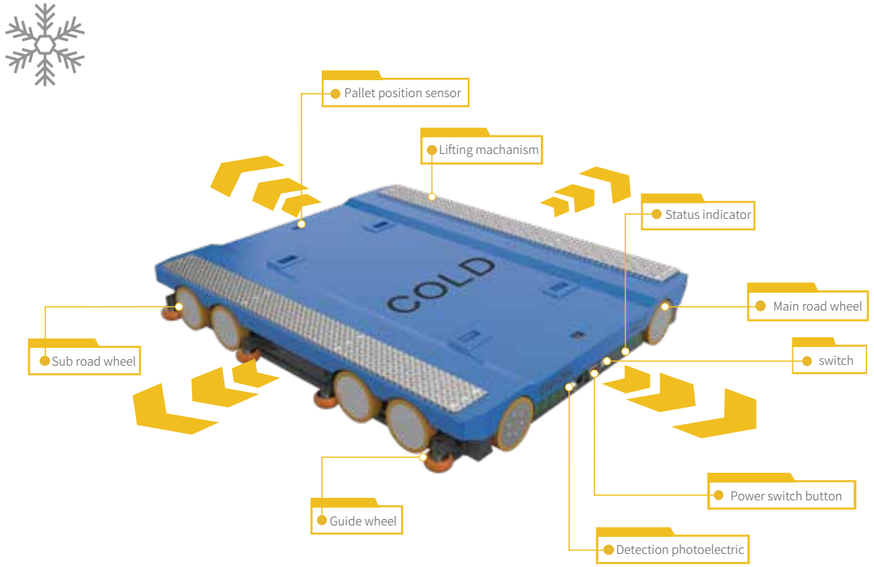
Schematic diagram of 4D pallet shuttle



Main technical parameters of 4D pallet shuttle

Number	Parameter specification	Equipment model HP–4D–1000–G1	Equipment model HP–4D–1500–G1
1	Dimensions	W977 X D1100 X H156mm	
2	Available pallet specifications	W1100 ~ 1250 X D800 ~ 1250mm	
3	Pallet type	III shape / 田 shape	
4	Maximum load weight	MAX 1000Kg	MAX 15 00Kg
5	Positioning method	photoelectric positioning + encoder positioning	
6	Unloaded maximum speed (XY axis)	1.7 m/s	
7	X-axis full load maximum speed	0.8 m/s	0.75 m/s
8	Y-axis full load maximum speed	0.8 m/s	0.75 m/s
9	Walking drive motor	DC48V	
10	Reversing/Lifting motor	DC48V	
11	Ambient temperature	0 ~ 45°C	
12	Program controller	SIEMENS PLC	
13	Power energy	Lithium battery	
14	Battery charge and discharge times	⩾2000 times	
15	Communication method	WIFI 2.4 / 5.8GHz / 5G	
16	Remote control mode	Using wireless remote control operation	
17	Braking mode	Servo motor, servo controller	
18	Shuttle acceleration	Maximum acceleration 1m/s^2	

Schematic diagram of 4D pallet shuttle cold storage version



■ Main technical parameters of 4D pallet shuttle cold storage version

Number	Parameter specification	Equipment model HP–4D–1000–G1	Equipment model HP–4D–1500–G1
1	Dimensions	W977 X D1100 X H156mm	
2	Available pallet specifications	W1100 ~ 1250 X D800 ~ 1250mm	
3	Pallet type	III shape / 田 shape	
4	Maximum load weight	MAX 1000Kg	MAX 15 00Kg
5	Positioning method	photoelectric positioning + encoder positioning	
6	Unloaded maximum speed (XY axis)	1.2 m/s	
7	X-axis full load maximum speed	0.8 m/s	0.75 m/s
8	Y-axis full load maximum speed	0.8 m/s	0.75 m/s
9	Walking drive motor	DC48V	
10	Reversing/Lifting motor	DC48V	
11	Ambient temperature	-25 ~ 0°C (Low temperature)	
12	Program controller	SIEMENS PLC	
13	Power energy	Lithium battery	
14	Battery charge and discharge times	⩾2000 times	
15	Communication method	WIFI 2.4 / 5.8GHz / 5G	
16	Remote control mode	Using wireless remote control operation	
17	Braking mode	Servo motor, servo controller	
18	Shuttle acceleration	Maximum acceleration 0.5m/s^2	

Project cases

Radio Shuttle

Radio shuttle is the core storage device of dense storage solution, powered by batteries or super-capacitors to achieve automatic back-and-forth transport-ation of palletized goods in aisles. Radio shuttle can be remotely controlled, using remote control, or networked automatic control.

Applicable scene

Strong compatibility

Compatible with different types of pallets and tracks of different cross-sections

Multi-shuttle scheduling

The same handheld terminal device can control multiple shuttles

Safe and reliable

Multiple sensors ensure precise handling, and laser detection ensures safe operation of shuttles

High density storage

Available as a semi-automatic or fully automatic storage solution. Improve space utilization and save costs

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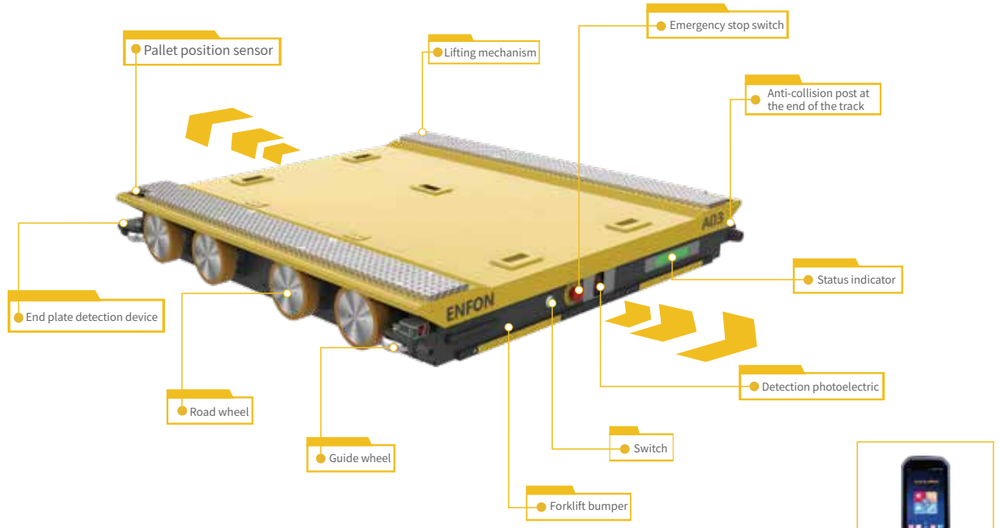
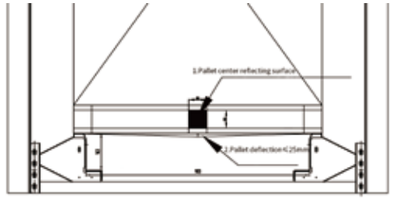
Schematic diagram of radio shuttle



Main technical parameters of radio shuttle

Number	Parameter specification	Equipment model HP–RS–1000–G3	Equipment model HP–RS–1500–G3
1	Dimensions	W977 X D1050 X H140mm	
2	Available pallet specifications	W700 ~ 1250 X D800 ~ 1250mm	
3	Pallet type	III shape / 田 shape	
4	Maximum load weight	MAX 1000Kg	MAX 15 00Kg
5	Positioning method	photoelectric positioning + encoder positioning	
6	Unloaded maximum speed	1.5 m/s	
7	Full load maximum speed	0.8 m/s	0.75 m/s
8	Walking drive motor	DC48V	
9	Lifting motor	DC48V	
10	Ambient temperature	0 ~ 45°C（Normal temperature）	
11	Program controller	SIEMENS PLC / control card	
12	Control circuit voltage	DC24V	
13	Power energy	Lithium battery	



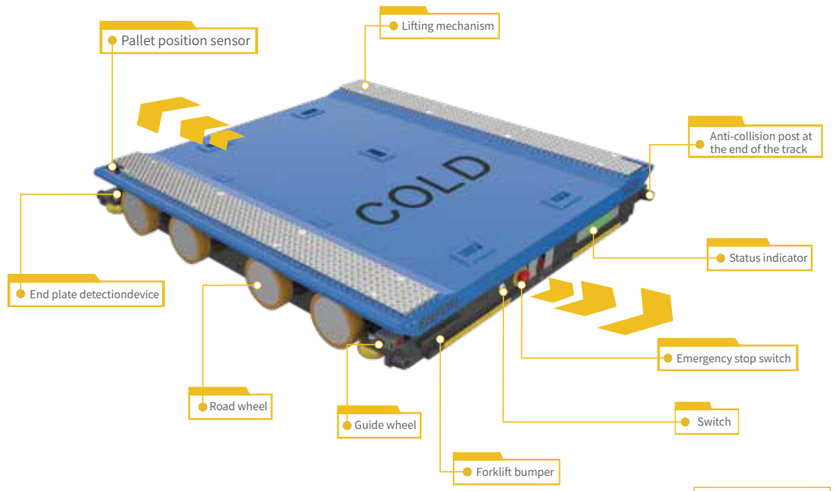
1 Pallet center reflecting surface

Pallet center reflecting surface must ⩾ 80mm x 80mm

2 Pallet deflection

When pallet is fully loaded, pallet deflection must ⩽ 25mm

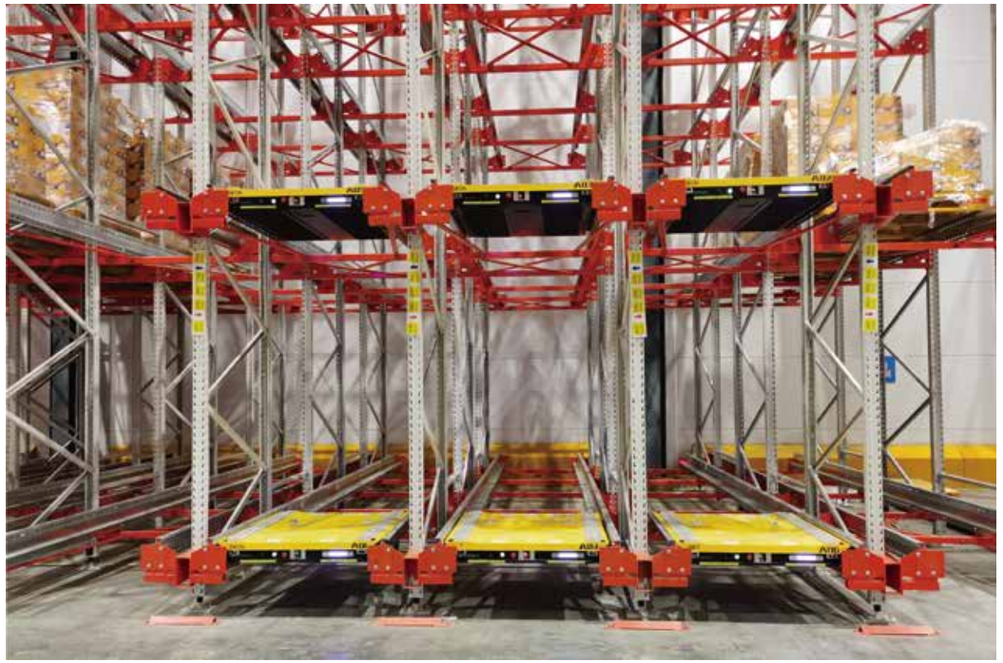
Schematic diagram of radio shuttle cold storage version



■ Main technical parameters of radio shuttle low- temperature version

Number	Parameter specification	Equipment model HP–RS–1000–G3	Equipment model HP–RS–1500–G3
1	Dimensions	W977 X D1050 X H140mm	
2	Available pallet specifications	W700 ~ 1250 X D800 ~ 1250mm	
3	Pallet type	III shape / 田 shape	
4	Maximum load weight	MAX 1000Kg	MAX 15 00Kg
5	Positioning method	photoelectric positioning + encoder positioning	
6	Unloaded maximum speed	1.2 m/s	
7	Full load maximum speed	0.8 m/s	0.75 m/s
8	Walking drive motor	DC48V	
9	Lifting motor	DC48V	
10	Ambient temperature	-25 ~ 0°C (Low temperature)	
11	Program controller	SIEMENS PLC / control card	
12	Control circuit voltage	DC24V	
13	Power energy	Lithium battery	
14	Battery charging and discharging times/ super-capacitor charging and discharging times	⩾2000 times/500,000 times	
15	Communication method	Industrial remote control WIFI 2.4 / 5.8GHz / 5G	
16	Remote control mode	Using wireless remote control operation	
17	Braking mode	Servo motor, Servo controller	
18	Radio shuttle acceleration	Maximum acceleration 0.5m/s²	

Project cases



Shuttle Carrier

Shuttle carrier system is composed of baby shuttle, shuttle carrier, lift, conveyor, control system software and other core products. This system is the core of automated dense storage system solution.

Shuttle carrier system is suitable for intensive storage with large storage capacity, high storage turnover and high throughput efficiency, such as food, beverage, FMCG, chemical and other industries.

Applicable scene

Strong compatibility

Applicable to pallets and special vehicles, with a load range of 500-1500kg

Strong scheduling and functionality

Shuttle carrier can be scheduled through warehouse control system, which can achieve high throughput efficiency

Flexible and expandable

Support non-standard customization and can be seamlessly connected with AGV multimodal transportation

High density storage

Meet the efficiency and intelligence requirements of pallet picking, inbound and outbound,and at the same time achieve high-density storage of pallet warehouses

Shuttle carrier lift

Main technical parameters

Number	Configuration description	Specification	Description
1	Dimensions	L3900 X W3000mm	Height is determined by the project
2	Goods size	L1200 X W1000mm	
3	Rated load	⩽1000Kg	Without goods
4	Ground bearing requirements	2.0 t/m^2	
5	Life speed	45m/min	
6	Lift acceleration	0.3m/s^2	
7	Control method	Servo control	
8	Positioning method	Encoder positioning	
9	Positional accuracy	±3mm	
10	Shuttle carrier power supply mode	Power supplied by conductor rail	

4D Pallet shuttle lift

Main technical parameters

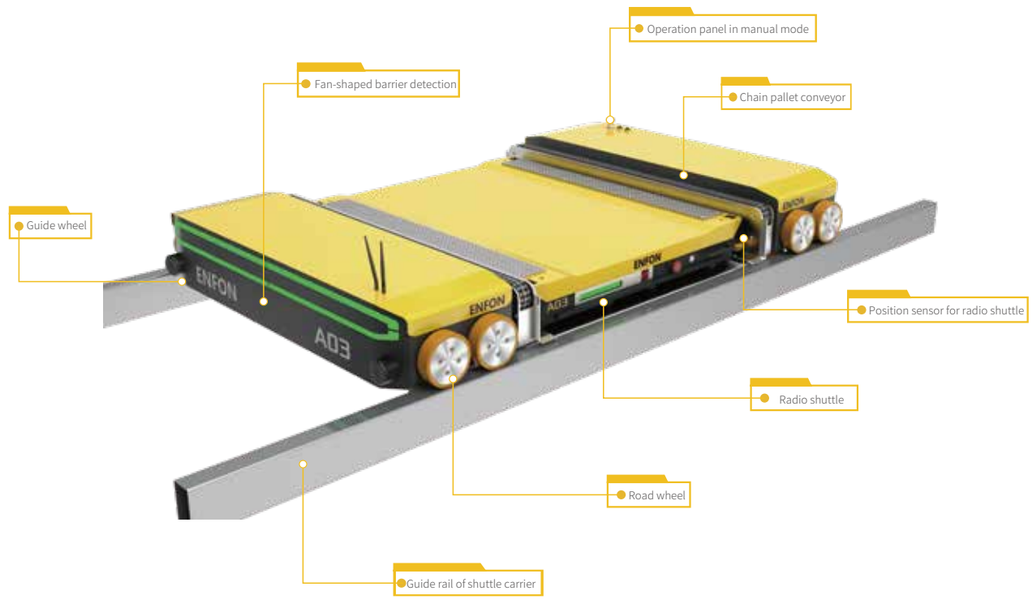
Number	Configuration description	Specification	Description
1	Dimensions	L2340X W1700mm	Height is determined by the project
2	Goods size	L1200 X W1000mm	
3	Rated load	⩽1500Kg	
4	Ground bearing requirements	2.0 t/m^2	
5	Lift speed	45m/min	
6	Lift acceleration	0.5m/s^2	
7	Transfer speed	12m/min	
8	Control method	Servo control	
9	Positioning method	Encoder positioning	
10	Positional accuracy	±3mm	

Structure diagram of shuttle carrier

Main technical parameters of shuttle carrier

Number	Parameter specification	Equipment model HP-SC-1000-G2	Equipment model HP-SC-1500-G2
1	Dimensions	W2308 X D1300 X H751mm	
2	Available pallet specifications	W1100 ~ 1250 X D800 ~ 1100mm	
3	Lateral movement conveying speed	0.2 m/s	
4	Maximum load weight	MAX 1000Kg	MAX 1500Kg
5	Positioning method	Barcode recognition	
6	Unloaded maximum speed	2.5 m/s	
7	Full load maximum speed	2.2 m/s	2 m/s
8	Walking drive motor	380V	
9	Lifting motor	380V	
10	Ambient temperature	0 ~ 45°C（Normal temperature） / -25 ~ 0°C（Low temperature）	
11	Communication method	WIFI 2.4 / 5.8GHz / 5G	
12	With radio shuttle (baby shuttle)	WIFI 2.4 / 5.8GHz / 5G	
13	Operating noise	⩽70DB	
14	Control method	Automatic mode/manual mode	
15	Braking method	Servo motor, servo controller	
16	Shuttle carrier acceleration	Maximum acceleration 0.6m/s²	

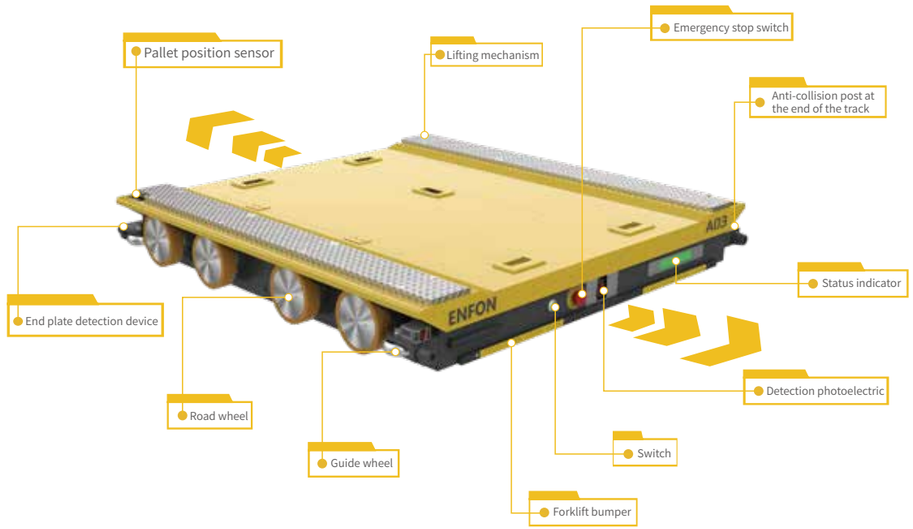
Structure diagram of 3rd gen shuttle carrier



Main technical parameters of 3rd gen shuttle carrier

Number	Parameter specification	Equipment model HP-SC-1000-G3	Equipment model HP-SC-1500-G3
1	Dimensions	W1940 X D1280 X H355mm	
2	Available pallet specifications	W700 ~ 1250 X D800 ~ 1250mm	
3	Lateral movement conveying speed	0.4 m/s	
4	Maximum load weight	MAX 1000Kg	MAX 1500Kg
5	Positioning method	Encoder control positioning	
6	Unloaded maximum speed	3 m/s	
7	Full load maximum speed	2.5 m/s	2 m/s
8	Walking drive motor	AC380V / DC48V	
9	Lifting motor	AC380V / DC48V	
10	Ambient temperature	0 ~ 45°C（Normal temperature） / -25 ~ 0°C（Low temperature）	
11	Communication method	WIFI 2.4 / 5.8GHz / 5G	
12	With radio shuttle (baby shuttle)	WIFI 2.4 / 5.8GHz / 5G	
13	Operating noise	⩽70DB	
14	Control method	Automatic mode/manual mode	
15	Braking method	Servo motor, servo controller	
16	Shuttle carrier acceleration	Maximum acceleration 1.2m/s²	

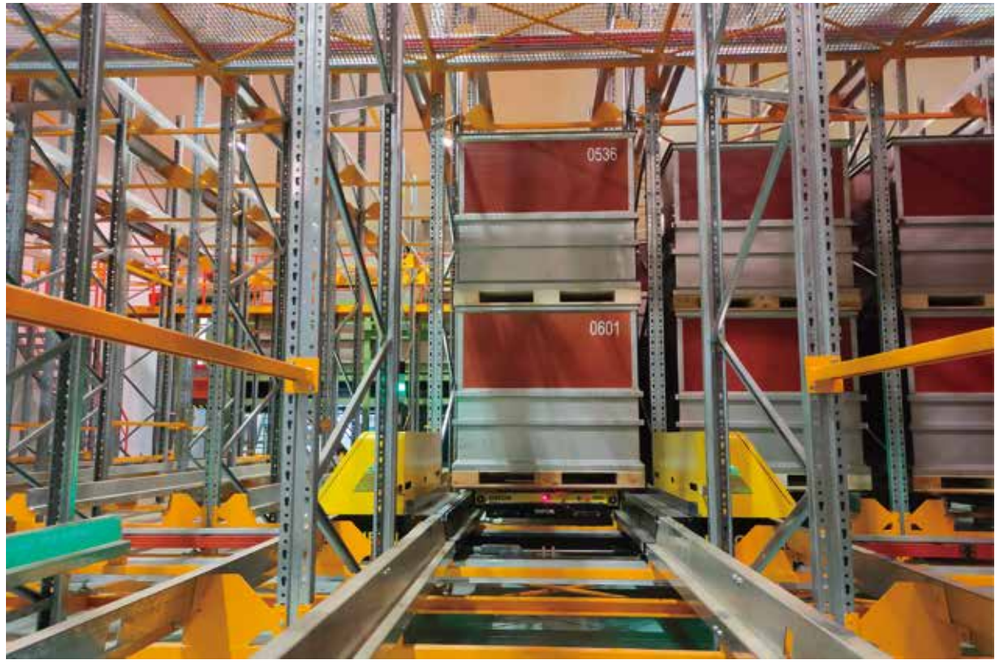
Schematic diagram of baby shuttle



■ Main technical parameters of baby shuttle

Number	Parameter specification	Equipment model HP–SC–1000–G3	Equipment model HP–SC–1500–G3
1	Dimensions	W977 X D1050 X H140mm	
2	Available pallet specifications	W700 ~ 1250 X D800 ~ 1250mm	
3	Pallet type	III shape / 田 shape	
4	Maximum load weight	MAX 1000Kg	MAX 15 00Kg
5	Positioning method	photoelectric positioning + encoder positioning	
6	Unloaded maximum speed	1.5m/s	
7	Full load maximum speed	0.8 m/s	0.75 m/s
8	Walking drive motor	DC48V	
9	Lifting motor	DC48V	
10	Ambient temperature	0 ~ 45°C (Normal temperature) / -25 ~ 0°C (Low temperature)	
11	Program controller	SIEMENS PLC / control card	
12	Control circuit voltages	DC24V	
13	Power energy	Lithium battery/Super-capacitor	
14	Battery charging and discharging times/ super-capacitor charging and discharging times	⩾2000 times/500,000 times	
15	Communication method	WIFI 2.4 / 5.8GHz / 5G	
16	Control method	Automatic mode/manual mode	
17	Braking method	Servo motor, Servo controller	
18	Radio shuttle acceleration	Maximum acceleration 1m/s^2	

Project case



Medium-duty pallet shuttle series

Medium 4D Pallet Shuttle

The Medium 4D pallet shuttle is mainly used in the intensive storage of medium-sized, medium-load tooling board materials, pallets and large-sized boxes, as well as the transfer, distribution, and picking scenarios between workshop production lines. It is an integrated intelligent handling robot that achieves the picking function in the warehouse, production line, and platform.

The Medium 4D pallet shuttle is equipped with a superchargeable power battery to achieve fast charging and increase the cruising range. It is using WIFI communication, through WCS to complete layer change from the three-dimensional warehouse, through the X-axis, Y-axis direction change, and then move into the lift to achieve the Z-axis direction change. Through the external track of three-dimensional warehouse, the round-trip transportation of materials between the three-dimensional warehouse, the production line, and the picking platform can be completed, so as to achieve point-to-point high-speed storage and transfer of materials by a single shuttle.

It is applicable to the side warehouse of the production line and the distribution between the production line and the picking platform, as well as the long-distance transportation and on-rail buffering of medium and large materials.

Applicable scene

Strong compatibility

Applicable to medium sized material boxes, tooling boards, and special vehicles, with a load range of 500-200kg

Strong scheduling and functionality

Multiple shuttles can be scheduled through warehouse control system , which can achieve storage, transshipment, and goods to person pickingfunctions

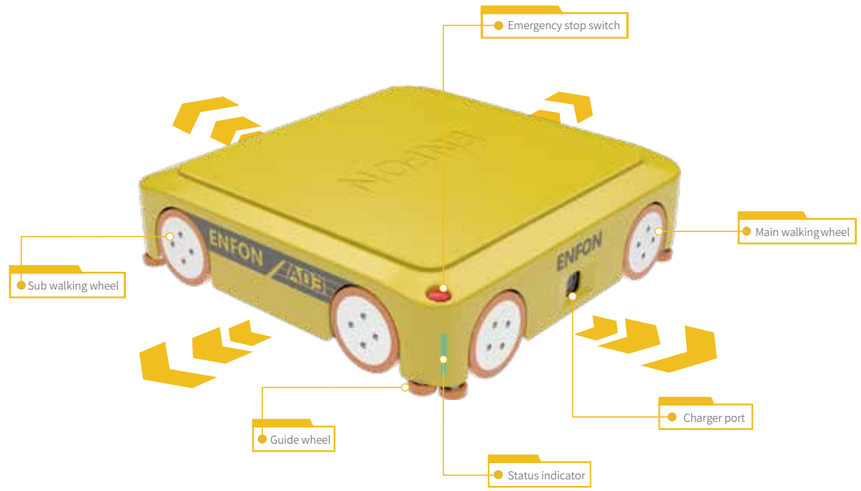
Flexible and expandable

Supports non-standard customization and can be seamlessly connected with shuttles, robot depalletizing,and AGV multimodal transport

High density storage

It can significantly increase the storage density of the factory's line-side warehouse, and at the same time achieve the efficiency and intelligent requirements of workshop transfer, distribution and sorting

Schematic diagram of the structure of medium 4D pallet shuttle



Main technical parameters of medium 4D pallet shuttle

Number	Ltemized description	Parameter specification
1	Dimensions	W695 X D700 X H132mm
2	Lifting distance	18mm
3	Equipment weight	Around 80KG (With battery)
4	Lode	50-200KG
5	Walking mode	8 wheels walking, X & Y direction have four wheels each
6	Unloaded maximum speed(x/ydirection)	3 m/s
7	Full load maximum speed(x/ydirection)	2 m/s
8	Lift time	1s
9	Walking drive motor	DC48V 600W
10	Lifting motor lift	DC48V 100W
11	Walking wheel	High performance wear resistant material
12	Battery capacity	DC48V 4AH
13	Charging times	⩾3000 times
14	Charging time	10 mins (Fully charged)
15	Environment temperature	-5°C ~ 45°C
16	Control method	Autocontrol/Manual control
17	Mobile operating terminal	Hand-held remote control
18	Control circuit voltages	DC24V
19	Communication method	WIFI 2.4 / 5.8GHz / 5G
20	Operating noise value	⩽70DB

Light-duty multi-shuttle series

Multi-shuttle

Multi-shuttle is based on sorting and small-piece storage solutions, and is a storage and handling equipment for efficient storage of plastic turnover boxes, cartons, and small packages, as well as goods-to-person sorting. It uses the supercapacitor power supply method, which fully broadens the product adaptability to different scenarios. Through cross-roadway operations and layer-changing operations, mutual backup between equipment can be achieved, giving the project layout great flexibility and diversity.

Applicable scene

Strong compatibility

Can be used in different sizes of cartons, workbins and standardized unitary goods

Strong functionality

Store, buffer and sequence commodities and other functions (such as picking and order combining)

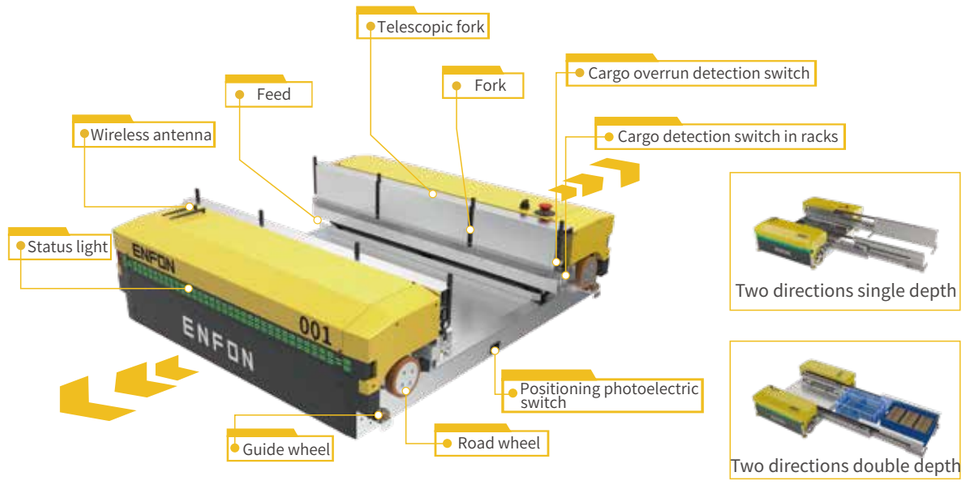
Flexible and expandable

Support customization, provide various models

High density storage

Significantly increase speed, storage density, accuracy and throughput of warehouse, factory and distributioncenter

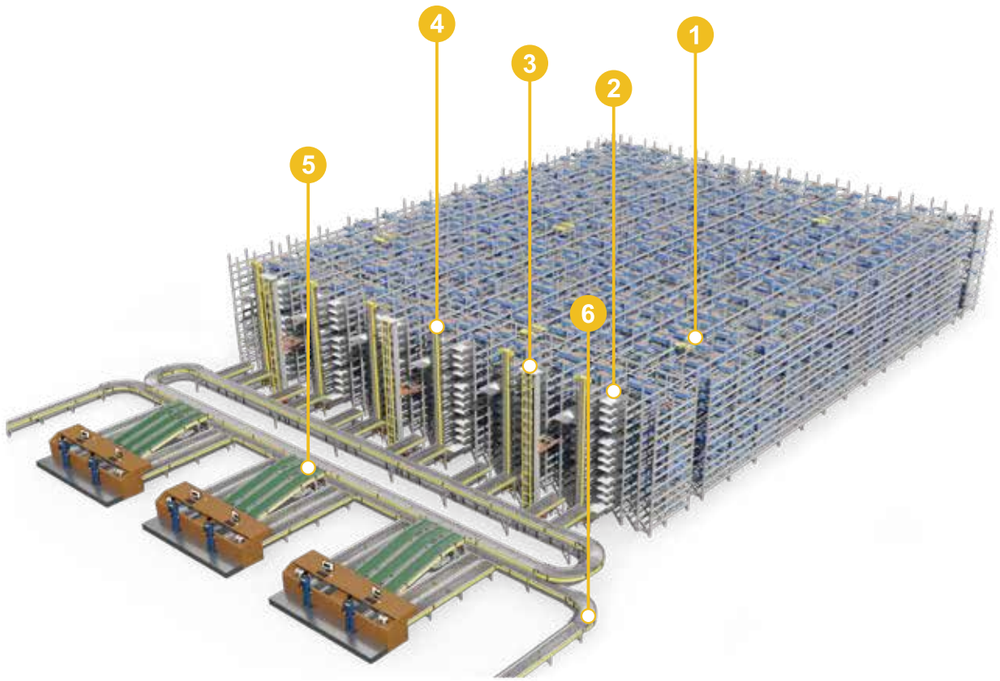
Schematic diagram of 2D multi-shuttle (conductor rail)



■ Main technical parameters of 2D multi-shuttle (conductor rail)

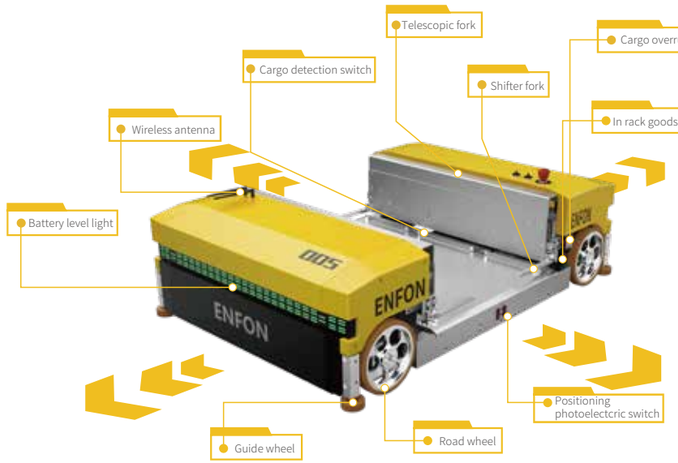
Number	Model	2 Directions single-deep	2 Directions double-deep
1	Dimensions	L960 X W770 X H340mm	L960 X W996 X H340mm
2	Multi-shuttle weight	70KG	85KG
3	Maximum load	50KG	
4	X-axis maximum speed	5m/s	
5	X-axis maximum acceleration	$2m/s^2$	
6	Cargo size	L600 X W400mm	L600 X W400mm
7	Minimum box height	80mm	
8	Communication method	WIFI	
9	Moving positioning accuracy	±2mm	
10	Moving control mode	Closed-loop servo control system	
11	Power supply mode	Conductor rail/Super-capacitor/Lithium battery (Optional)	
12	Power supply voltage	48V	
13	Battery/Super-capacitor charge and discharge times	⩾2000 times / 500,000 times	
14	Duration of a single full charge	Capacitor charged for 10s, can be used for 5 minutes/ Battery charged <2h， can be used for > 8h	
15	Charging method	Automatic charging	
16	Operating mode	Automatic mode/manual mode	
17	Operating ambient temperature	0 ~ 45°C（Normal temperature） / -25 ~ 0°C（Low temperature）	

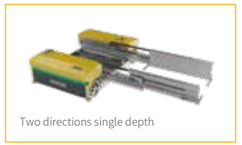
Effect drawing of The 4D multi-shuttle system

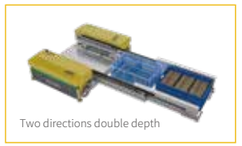


1 4D Multi-shuttle
2 Interlayer line
3 Shuttle Lift
4 Bin Lift
5 Material sorting system
6 Conveyor line

Schematic diagram of 4D multishuttle




Two directions single depth


Two directions double depth

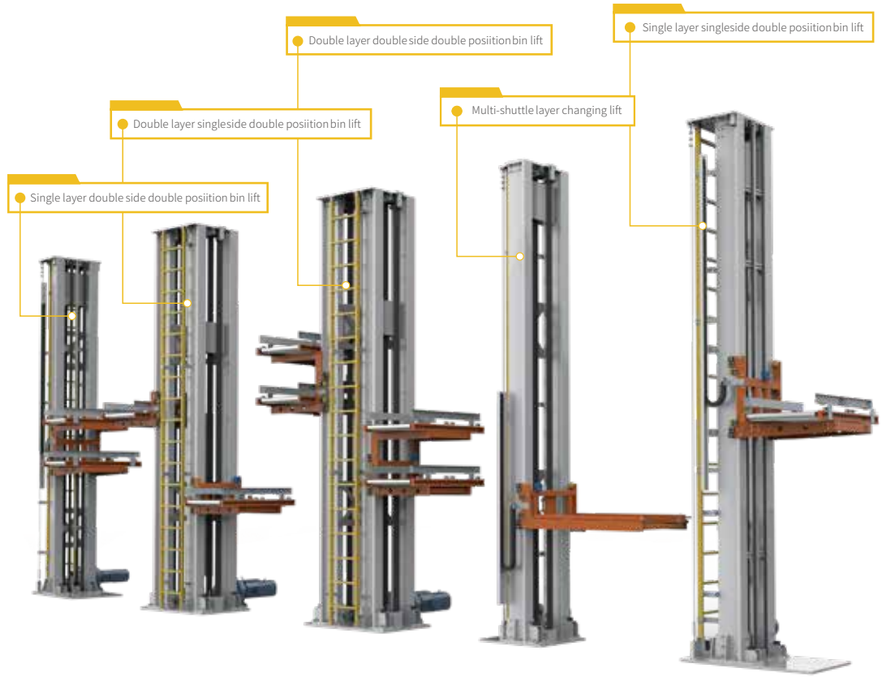
Main technical parameters of 4D multishuttle

Number	Model	Two direction single depth	Two direction double depth
1	Dimensions	L1086 X W770 X H340mm	L1086 X W996 X H340mm
2	Shuttle weight	100KG	115KG
3	Maxium load	50KG	
4	Maximum X-axis velocity	5m/s	
5	Maximum X-axis accelerated velocity	2m/s²	
6	Maximum Telescopic fork velocity	2m/s	
7	Maximum Telescopic fork accelerated velocity	1m/s²	
8	Maximum Cargo size	L600 X W400mm	L600 X W400mm
9	Minimum Cargo size	L300 X W300mm	
10	Minimum box height	50mm	
11	Communication mode	WIFI wireless communication	
12	Walking positioning accuracy	±2mm	
13	Walking control mode	Closed loop servo control	
14	Power supply mode	Supercapacitor	
15	Supply voltage	48V	
16	Number of charges and discharges times	⩾2000 times/500,000 times	
17	Single charge endurance	Charge 10s can work 15 mins	
18	Supply voltage	Automatic online charging	
19	Operation Mode	Auto mode/ Manual	
20	Operating ambient temperature	0 ~ 45°C（Normal temperature） / -25 ~ 0°C（Low temperature）	

Bin /Shuttle Lift

By operating the lifting for loading platform, the bin lift takes the material box to designated layer of the three-dimensional rack, and accurately connects with the conveyor in the buffer conveying section. The material box is transported to the buffer position through the conveyor, and then the multi-shuttle will be able to fulfill the material box handling and storage function.

Through the lifting of the loading platform, the shuttle lift takes the multi-shuttle to the designated layer of the three-dimensional rack, fulfill the lifting andaccurate positioning of lifting airborne platform, and complete the layer changing operation of multi-shuttle.



Bin Lift (single layer single side double position)

Parameters of bin lift (Single layer single side double position)

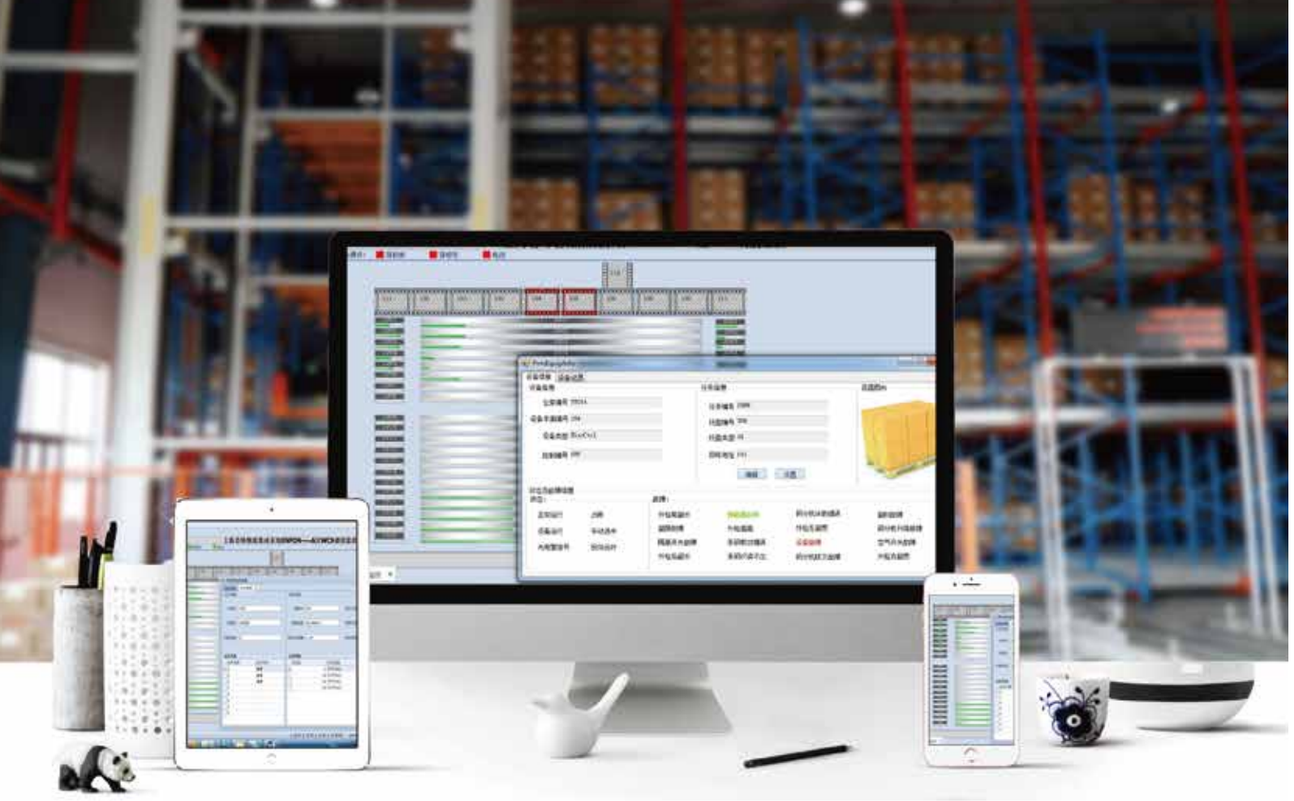
Technical requirement	Parameters	Note
Maximum payload	100kg	
Maximum lifting speed	5m/s	
Maximum lifting acceleration	3m/s²	
Workstation	Single layer single sidedouble position	
Transmission mode	Double timing belt drive	
Positioning mode	Bar code positioning	
Positioning accuracy	±2mm Include empty/ Full load variation	
Height of bottom conveying surface	350mm	
Maintenance ladder	Included	
Noise level	⩽70dB(A)	

Multi-shuttle Lift

Parameters of multi-shuttle lift

Technical requirement	Parameters	Note
Maximum payload	150kg	
Maximum lifting speed	3m/s	
Maximum lifting acceleration	2m/s²	
Transmission mode	Double timing belt drive	
Positioning mode	Bar code positioning	
Positioning accuracy	±2mm Include empty/ Full load variation	
Height of bottom conveying surface	450mm	
Maintenance ladder	Included	
Noise level	⩽70dB(A)	

Project cases



Warehouse Management & Control System（WMS/WCS）

Warehouse management and control system are software systems specially developed by Enfon for 4D pallet shuttle intensive warehouse and shuttle carrier intensive warehouse. The upper layer connects with ERP/MES through the API standard interface software system developed by Enfon to achieve goods information and task management in the warehouse. Through the PLC communication of underlying equipment, WMS and WCS help to achieve task decomposition, equipment scheduling, path planning, equipment monitoring for automation and intelligence of the warehouse.

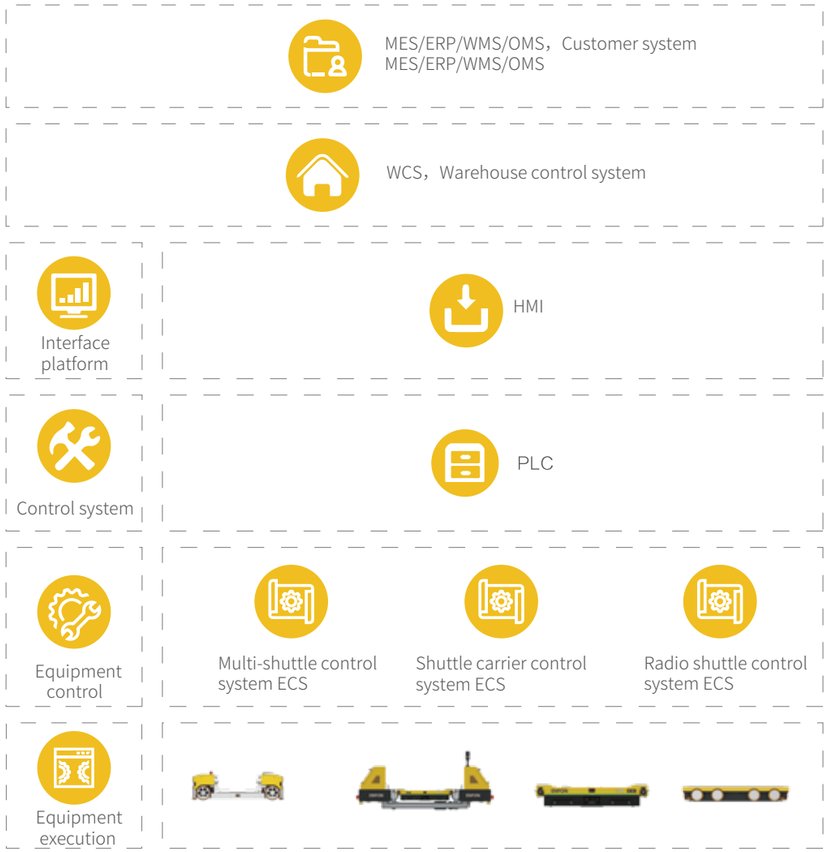
WMS

A management system that achieves the connection of inbound and outbound business data, task decomposition, and management and control of pallet positions and goods information.

WCS

An action execution system that achieves WMS inbound and outbound operations through scheduling, path planning, and monitoring of underlying equipment.

WMS/WCS network topology



WMS/MCS interface

- WMS achieves inbound and outbound business data connection, task decom position, management and control of pallet positions and goods information.

- WCS implements WMS inbound and outbound operations through scheduling, path planning, and monitoring of underlying equipment.