Shuttle Product Technical Manual

Two-Way (Reciprocating) Shuttle Specifications and Technical Description



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I. Product Overview

1.1 Product Introduction

The two-way (reciprocating) shuttle is a high-density storage and handling device for palletized goods. It retrieves, transports and deposits loads inside the racking channel; the forklift works only at the rack face, and neither personnel nor forklifts enter the channel, so storage density and operational safety are improved at the same time.

Ready to Use · Zero Commissioning

Delivered together with the racking once installation is complete, with no additional commissioning procedure required.

Simple Operation · Operator-Ready in Minutes

A handheld remote control with visual information display; both automatic and manual modes are available.

Stable and Reliable • Fast Response, Prompt Diagnosis

Fault alarms allow the source of a problem to be traced quickly; remote after-sales service responds within 1 hour.

1.2 Vehicle Exterior

The cart body has an ultra-slim structure, with anti-collision blocks and blue status lights at its four corners and an anti-slip load surface on top. Orange-red and metallic grey are supplied as standard colour schemes, and custom colours are available on request.



Figure 1 Vehicle exterior (top: orange-red bottom: metallic grey)

II. Product Features

2.1 High Flexibility

An ultra-slim body and fast travel suit operating arrangements with multiple channels and multiple load types.

Different product types can be stored and retrieved flexibly by channel;

A range of racking configurations and operating methods meets the needs of different users and workloads.

2.2 Higher Space Utilization

High-density storage and efficient handling raise space utilization.

The racking can be arranged in dense blocks; the forklift need only work at the rack face, and the shuttle carries the goods to the designated position;

Warehouse space is fully used, with utilization inside the building reaching 80% or more;

Standard battery capacity 48V / 30Ah gives approximately 6–8 hours of continuous operation, enough for busy schedules.

2.3 Safety and Reliability

Dual laser + photoelectric positioning, compliant motion control and multiple safety protections.

Forklifts and personnel stay out of the channel, improving the safety of both people and goods;

Compared with drive-in and flow-through racking, the structure is more solid and the safety factor is higher;

Anti-collision strips and sensors at the front and rear of the cart, plus pallet-in-position detection and light-based fault indication.

2.4 Control System

The vehicle control system is PLC based and works with a self-developed 1.9-inch OLED handheld remote control for setting operating parameters and issuing task commands, with

both automatic and manual modes. The controller provides fault code prompts and operation statistics for fast on-site troubleshooting.

III. Two-Way Shuttle

The two-way shuttle is offered in three versions for different operating environments — ambient, low-temperature and networked — which differ in operating temperature, communication and control configuration. The main parameters are compared below.

3.1 Ambient / Low-Temperature / Networked Version Parameter Comparison (LS-1211 Model)

Item	Ambient version	Low-temperature version	Networked version
Model	LS-1211	LS-1211	LS-1211
Dimensions	1116 × 974 × 145 mm	1116 × 974 × 145 mm	1116 × 974 × 145 mm
Maximum load	1500 kg	1500 kg	1500 kg
Drive motor	48VDC 750W (lifting) / 1000W (travel)	48VDC 750W (lifting) / 1000W (travel)	48VDC 750W (lifting) / 1000W (travel)
Speed	1.2 / 0.9 m/s (unloaded / loaded)	1.2 / 0.9 m/s (unloaded / loaded)	1.2 / 0.9 m/s (unloaded / loaded)
Operating temperature	-10°C ~ 50°C	-25°C ~ 50°C	-10°C ~ 50°C
Dead weight	240 kg (standard)	240 kg (standard)	240 kg (standard)
Compatible pallet size	Pallet width 1200 mm in the fork-entry direction	Pallet width 1200 mm in the fork-entry direction	Pallet width 1200 mm in the fork-entry direction
Controller	PLC control	PLC control	PLC control
Functions	Pallet spacing 5–25 cm, adjustable; stocktaking; mixed pallet sizes	Pallet spacing 5–25 cm, adjustable; stocktaking; mixed pallet sizes	Pallet spacing 5–25 cm, adjustable; stocktaking; mixed pallet sizes
Charging time	⩽ 3 hours	⩽ 3 hours	⩽ 3 hours
Continuous operating time	⩾ 8 hours (48V 30Ah battery)	⩾ 8 hours (48V 30Ah battery)	⩾ 8 hours (48V 30Ah battery)
Colour	Orange-red, metallic grey	Orange-red, metallic grey	Orange-red, metallic grey

Item	Ambient version	Low-temperature version	Networked version
Low-battery mode	Below 20% charge a low-battery alarm is triggered; the shuttle completes its task, returns automatically to the rack face and the buzzer sounds	Below 20% charge a low-battery alarm is triggered; the shuttle completes its task, returns automatically to the rack face and the buzzer sounds	Below 20% charge a low-battery alarm is triggered; the shuttle completes its task, returns automatically to the rack face and the buzzer sounds

3.2 Full Technical Specification of the Ambient Model (LS_1211 Ambient Version)

The table below sets out the complete configuration specification of the two-way (reciprocating) shuttle as listed in the original Shuttle Parameters and Technical Description, covering travel, lifting, positioning, remote control, battery and safety protection.

Category	Item	Parameter	Remarks
Model	Model	LS_1211	Ambient version
Maximum load	Maximum load capacity	Max 2000 kg	—
Compatible pallet	Compatible pallet / type	1200 mm (fork entry) × 1100 mm; stringer (Chuan-type) and block (Tian-type)	—
Travel	Speed	1.1 m/s unloaded; 0.9 m/s loaded	—
	Acceleration	⩽ 0.5 m/s^2	—
	Motor	48VDC 1000W 3000rpm brushless servo motor	Kinco / Leadshine
	Reduction ratio	1 : 16	—
Lifting	Lift height	45 mm	—
	Motor	48VDC 750W 3000rpm brushless servo motor	Kinco / Leadshine
	Reduction ratio	1 : 200	—
Motion performance	Travel speed, loaded	0.9 m/s	—
	Travel speed, unloaded	1.1 m/s	—
	Cargo detection	Photoelectric	Panasonic
	Obstacle detection	Photoelectric	Panasonic
	Laser measuring range	0.03 – 10 m	—
	Travel positioning	Laser	Pepperl+Fuchs
	Pallet positioning	Laser + photoelectric	Pepperl+Fuchs + Panasonic
	Lift positioning	Proximity switch	Panasonic

Category	Item	Parameter	Remarks
	Repeat positioning accuracy	Error ⩽ 5 mm	—
Control method	Control method	PLC control	—
Remote control	Remote control	Self-developed 1.9-inch OLED remote control with Chinese keypad; 433MHz operating frequency, communication range ⩾ 100 m	—
Remote control parameters	Type	Wireless 433M remote control (self-developed)	—
	Communication	LORA, ⩾ 75 m	—
	Display	OLED 160 × 128, shows live shuttle information; operating parameters can be edited	—
	Operating temperature	-10 ~ 45°C	—
	Power supply	Lithium battery, 1500 mAh	—
Pallet spacing control	Pallet spacing control	5 – 25 cm, set on the remote control; oversize-pallet issues handled on site as required	—
A/B working face switching	A/B working face switching	Set on the remote control	—
Fault indication	Fault indication	Fault code prompts	—
Low power mode	Low power mode	Configurable; standby time over 5 days	—
Power supply	Power supply	Lithium iron phosphate rechargeable battery	Quality domestic brand
Battery performance	Battery type	Custom lithium battery supplied by Xianzhong	Quality domestic brand
	Rated voltage	48 V	Quality domestic brand
	Battery capacity	30 Ah	Quality domestic brand
	Charge cycles	2000 cycles	Quality domestic brand
	Operating time at full charge	8 h	Quality domestic brand
	Charging method	Battery removed for charging	Quality domestic brand
	Battery degradation	Normal ambient use: 98% in year 1, 95% in year 2, 75%–80% after year 3, approx. 70% in year 5	Quality domestic brand
Speed control	Speed control	Variable speed control; compliant travel control	—
Addressing	Addressing method	Photoelectric + laser positioning	—

Category	Item	Parameter	Remarks
Shuttle board control	Shuttle board control	Remote control	—
Noise level	Operating noise level	⩽ 70 dB	—
Painting	Painting requirement	As required	—
Ambient conditions	Ambient temperature	Temperature -10°C ~ 45°C; humidity 10% ~ 85% (non-condensing)	—
Anti-collision	Anti-collision device	Anti-collision blocks and anti-collision sensors	—
Bottom anti-slip	Bottom anti-slip	Fork limit ribs + emery anti-slip tape	—
Rescue device	Rescue device	Mechanical rescue pin	—
Drive wheels	Drive wheel size / quantity	100 mm / 4	—
Guide wheels	Guide wheel size / quantity	100 mm / 4	—
Rail compatibility	Rail compatibility	140 mm	—
Inbound spacing	Inbound spacing	5 – 25 mm, adjustable	—
Safety protection	Safety protection	Front and rear anti-collision strips; pallet-in-position detection; light-based fault indication	—

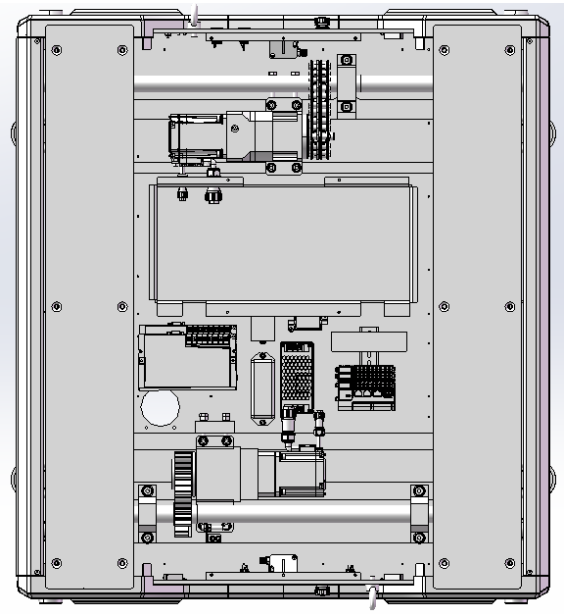


Figure 2 Top view of the internal structure

3.3 Options (LS-1211 Model)

Option	Available configuration
Compatible rail	⊙ 120 mm ~ 163 mm
Operating temperature	◎ -25°C ~ 50°C
Load capacity	◎ 2000 kg ／ ◎ 2500 kg
Charging method	◎ Charging cabinet ／ ◎ Charging station (automatic)
Battery capacity	◎ 48V 40Ah
Colour	◎ Per customer requirements
Speed	◎ 2.4 m/s (unloaded)

3.4 Operation Function List

The table below lists the functions supported by the shuttle and notes on their execution, grouped into operational, diagnostic and alarm functions.

Function category	Specific function	Execution notes / remarks
Operational functions	Automatic LIFO · single inbound	Supported
	Automatic LIFO · continuous inbound	Quantity cannot be entered; exit by operating the remote control
	Automatic LIFO · single outbound	Supported
	Automatic LIFO · continuous outbound	The user can set the number of consecutive outbound operations
	Automatic LIFO · pallet transfer	Not available in LIFO mode
	Automatic FIFO · single inbound	Supported
	Automatic FIFO · continuous inbound	Quantity cannot be entered; exit by operating the remote control
	Automatic FIFO · single outbound	Supported
	Automatic FIFO · continuous outbound	The user can set the number of consecutive outbound operations
	Automatic FIFO · pallet transfer	Quantity cannot be entered; exit manually or wait for the task to finish
	Stocktaking	Automatically counts the number of pallets on the racking

Function category	Specific function	Execution notes / remarks
	Locate shuttle	The buzzer sounds to help the customer find the shuttle
	Manual lift	The lifting mechanism rises to its highest position
	Manual lower	The lifting mechanism lowers to its lowest position
	Manual forward	Low-speed forward travel
	Manual reverse	Low-speed reverse travel
Diagnostic functions	Reach home point	Travel speed adjusts automatically to the loaded or unloaded condition so that the position is reached quickly
	Reach far point	Travel speed adjusts automatically to the loaded or unloaded condition so that the position is reached quickly
	Reach home position No. 1	Travel speed adjusts automatically to the loaded or unloaded condition so that the position is reached quickly
	Reach far position No. 1	Travel speed adjusts automatically to the loaded or unloaded condition so that the position is reached quickly
	Forced forward / forced reverse	Not supported
	Restart device	Restarts the motion controller software and resets the servo system; for fault handling only
	Operation statistics	Records travel distance, the number of inbound / outbound / transfer operations and lift cycles
Alarm functions	Low-battery alarm	When battery charge falls below the threshold, the shuttle returns to the home position after completing the current task and the alarm sounds

3.5 Remote Control and Standard Operations

3.5.1 Handheld Remote Control

The remote control was developed around actual warehouse requirements: the OLED screen shows shuttle status in real time and allows operating parameters to be modified, covering both automatic and manual operation. Communication uses LORA at 433MHz with a range of ⩾ 100 m (the remote control parameter table gives ⩾ 75 m — see the note at the end of this manual).

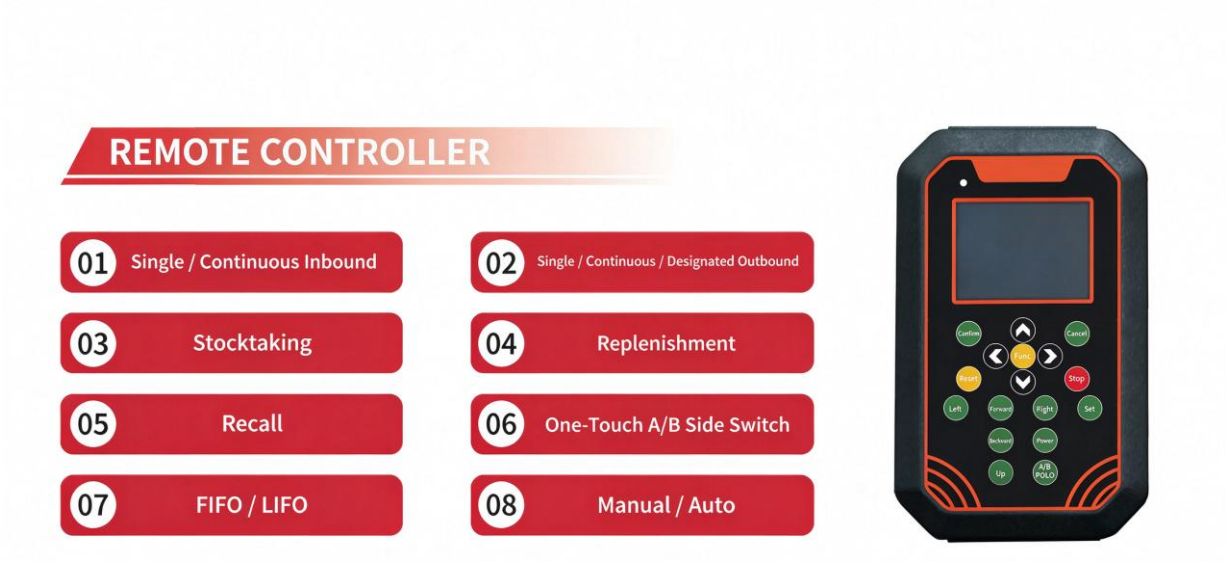


Figure 3 Handheld remote control and main operating functions

3.5.2 Standard Operation Modes

Nine standard operations are preset on the remote control, numbered as follows:

1 Single inbound	2 Single outbound	3 Tally
4 Stocktaking	5 Recall	6 Continuous inbound
7 Continuous outbound (pallet count set)	8 LIFO	9 FIFO





Note: besides the standard operations above, the equipment also supports stocktaking, shuttle locating, manual jog and fault diagnosis. See “3.4 Operation Function List”.

IV. Application Case

How the shuttle actually works inside high-density racking: the forklift places the goods on the load surface of the shuttle at the rack face, the shuttle then travels along the rail into the channel to complete storage or retrieval, and neither personnel nor forklifts enter the channel.



Figure 4 On-site application: pallet inbound, transport inside the channel and outbound operations