

Sensor Light Indicator Smart Material Rack User Manual

Model: HHKCSS Series Fixed / Mobile Sensor Smart Material Rack

Manufacturer: Honghui Kuaicang Technology (Shenzhen) Co., Ltd.

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Version: V1.0

Applicable Materials: 7/13/15-inch reel-mounted electronic components, tube materials, IC Tray materials

Compliance Standards: ESD International Anti-static Standard, US 110V Power Supply Standard

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1. Important Safety & Anti-static Instructions

1.1 Electrical Safety (US Standard AC 110V 60Hz)

1. Export models of this equipment are rated for AC110V 60Hz power supply. Each rack is equipped with an independent power circuit and overcurrent protection. Wiring must be performed by licensed electricians in accordance with the U.S. National Electrical Code (NEC).

2. Do not pull, bend or damage the power cord. Cut off the main power supply before cleaning, overhauling or disassembling any modules of the equipment.
3. Do not operate the equipment with wet hands. The control mainboard, infrared sensors and wiring areas must not come into contact with liquid, dust or corrosive gas.
4. Do not store overloaded materials on a single layer or apply concentrated heavy pressure on laminates, which may cause sheet metal deformation and sensor failure.

1.2 ESD Anti-static Specifications (Compliant with ANSI/ESD S20.20 Standard)

1. The whole machine adopts anti-static plastic spraying process with surface impedance of $10^9\Omega$, meeting international anti-static standards. Static discharge time ≤ 1 second, and anti-static performance remains undegraded for 10 years.
2. The equipment is equipped with a standard anti-static grounding chain, which must be reliably connected to the factory's anti-static ground wire during installation to release static electricity and protect chips and components from electrostatic breakdown damage.
3. Operators working in ESD-controlled areas must wear anti-static wrist straps and anti-static shoes.
4. Do not place ordinary foam, non-anti-static cartons or insulating materials directly on rack storage positions.

1.3 Mechanical Structural Safety

1. Fixed racks shall be fixed to the ground with expansion bolts after installation to prevent tipping. For mobile racks, lock the casters during operation.
2. Do not climb, strike or apply heavy loads to the rack frame. Reserve sufficient passage space when transporting with AGVs.
3. Place the equipment away from direct sunlight, high temperature and high humidity. Operating ambient humidity: 10%~85% RH, no condensation.

1.4 Operation Warnings

1. The light-guided error-proof alarm function cannot be manually disabled. Material picking errors will trigger simultaneous sound and light alarms to avoid scrapped products caused by wrong material usage.
2. The equipment has built-in power-off data storage, but continuous power cut-off exceeding 72 hours is not recommended. Export inventory data to PC background regularly for backup.
3. Unauthorized disassembly of the controller, infrared sensors and CAN bus wiring will void the full-machine warranty.

2. Product Overview & Application Scenarios

2.1 Product Introduction

The sensor light indicator smart material rack is an intelligent storage device specially designed for SMT electronic warehouses and production line material preparation stations. Equipped with customized infrared through-beam sensors and independent storage position indicator lights, it can automatically record material storage locations, guide picking via indicator lights, trigger sound-light alarms for wrong picking, and track real-time inventory. It seamlessly connects with MES, ERP, WMS and SMT placement machines, greatly shortening material searching time and eliminating manual picking errors.

The product includes two main series:

1. Fixed Sensor Smart Material Rack (SSHHKC-B Series): Large-capacity static storage for long-term inventory storage in warehouses. Single layer load capacity: 150kg, maximum 200 reels of 7-inch material per layer.
2. Mobile Sensor Smart Material Rack: Built-in large-capacity lithium iron phosphate battery, supporting 48 hours of continuous operation without external power supply. Compatible with AGV transportation; materials can be loaded in the warehouse and transported to production lines for flexible on-site work order preparation.

2.2 Core Product Features

1. Multi-color RGB storage position lights guide material picking; sound and light dual alarms for wrong picking to prevent operational mistakes.
2. Infrared sensors real-time detect presence/absence of material reels and automatically update material locations and inventory data.
3. CAN bus internal signal transmission, industrial Raspberry Pi main controller and automotive-grade MCU chips for stable operation.
4. Dual communication modes: independent wired network port + WiFi, ensuring stable network and real-time data synchronization.
5. Mobile models equipped with lithium iron phosphate battery, supporting offline continuous operation for 48 hours during power outages.
6. Open standard communication interfaces compatible with all mainstream MES, ERP, WMS and placement machine equipment.
7. Supports First-In First-Out (FIFO) strategy; configurable outbound priority by production DateCode and batch LotCode.
8. Whole machine made of 201/304 stainless steel with laser-cut sheet metal and anti-static plastic spraying, anti-rust performance guaranteed for 5 years.
9. Modular sensors allow separate replacement for single faulty storage positions

for easy maintenance.

10. Supports PDA scanning operation; voice broadcast "Success" upon completion of each operation; empty positions light up; one-click full rack stocktaking available.

11. Built-in electrostatic protective cover to protect circuit board chips from dust and scratch damage.

2.3 Applicable Scenarios

Raw material warehouses of SMT electronics factories, production line material preparation areas, IC Tray material storage, storage management of 7/13/15-inch reel electronic components and tubular electronic materials.

3. Hardware Structure & Technical Specifications

3.1 Whole Machine Hardware Components

1. Rack Main Frame: 4545×1.5mm square tubes, 2.0mm laser-cut grid sheet metal with 201/304 stainless steel substrate and sandblasted anti-static plastic spraying. Smooth grid cuts without burrs, resistant to deformation and fuzzing.

2. Storage Laminates & Sensor Modules: Matching width circuit boards for reels of different thicknesses, each storage position equipped with independent infrared through-beam sensor.

3. RGB Indicator Light + Voice Broadcast Module: Independent indicator light for each storage position, built-in loudspeaker for the whole rack.

4. Main Control System: Industrial Raspberry Pi mainboard, automotive-grade MCU, gold-plated circuit boards with dust-proof and anti-static protective cover.

5. Communication Module: Internal CAN bus transmission, external dual network via WiFi + independent RJ45 wired port.

6. Power Supply System: Fixed type powered by AC110V alternating current; mobile type with built-in large-capacity lithium iron phosphate battery.

7. Mobile Exclusive Accessories: MF60S integrated caster with wheel and foot cup integrated, shock-absorbing, silent and anti-static.

8. Anti-static Accessories: Anti-static grounding chain, anti-static grid laminates.

3.2 Model Storage Specification Comparison Table

Model	Compatible Materials	Max Reel Capacity	Single Layer Load Capacity	Type
SSHHKC1400 B	7-inch electronic	1400 reels	150kg	Fixed

	reels			
SSHHKC1120 B	7-inch electronic reels	1120 reels	150kg	Fixed
SSHHKC500 B	7-inch electronic reels	500 reels	150kg	Fixed
SSHHKC250 B	13-inch electronic reels	250 reels	150kg	Fixed
SSHHKC175 B	13-inch electronic reels	175 reels	150kg	Fixed
SSHHKC125 B	13-inch electronic reels	125 reels	150kg	Fixed
SSHHKC400 B	15-inch electronic reels	400 reels	150kg	Fixed
SSHHKC200 B	15-inch electronic reels	200 reels	150kg	Fixed
SSHHKC140 B	15-inch electronic reels	140 reels	150kg	Fixed
SSHHKC100 B	15-inch electronic reels	100 reels	150kg	Fixed
General Capacity for Mobile Racks: 6 layers in total. Upper 5 layers store	—	—	—	Mobile

600 reels of 7-inch materials (120 reels per layer), bottom layer stores 32 reels of 13/15-inch large reels, total 632 reels.				
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3.3 General Technical Parameters

1. Power Supply: Fixed model AC110V 60Hz; Mobile model built-in lithium iron phosphate battery with 48-hour endurance
2. Communication: WiFi, wired RJ45, CAN bus
3. Anti-static Standard: Surface impedance $10^9\Omega$, compliant with international ESD standards
4. Operating Temperature: $0^{\circ}\text{C}\sim 45^{\circ}\text{C}$; Operating Humidity: 10%~85% RH (no condensation)
5. Rated Single Layer Load Capacity: 150kg
6. Response Speed: $\leq 0.5\text{s}$ for material pick/place sensor recognition, indicator lights turn on/off synchronously
7. Shell Technology: Stainless steel + anti-static plastic spraying, zero formaldehyde, low VOC, moisture-proof and scratch-resistant
8. Casters (Mobile Model): MF60S integrated shock-absorbing, noise-reducing and anti-static casters

4. Unpacking, Installation & Commissioning Procedures

4.1 Installation Environment Requirements

1. Flat and solid ground; reserve fixing points for expansion bolts for fixed racks.
2. Keep away from high-power frequency converters, welding machines and other strong electromagnetic equipment to avoid interference with infrared sensors and network signals.
3. Warehouses and production lines shall be equipped with complete ESD grounding systems and reserved connection points for grounding chains.
4. Reserve space for material access, AGV passage and equipment maintenance; keep environment ventilated and dry.

4.2 Whole Machine Installation Process

1. Frame Assembly: Splice uprights, crossbeams and base according to assembly drawings, fasten all screws, level the machine body without shaking; install casters first for mobile models.
2. Laminates & Sensor Module Installation: Fix grid laminates, plug in infrared sensor circuit boards, arrange wiring neatly without extrusion or bending.
3. Main Control & Peripheral Wiring: Connect main control power supply, indicator light harnesses, CAN bus, network cable/WiFi antenna; distinguish power supply wiring from signal wiring to prevent misconnection and loose contact.
4. Anti-static Grounding: Install anti-static grounding chain, connect one end to the metal frame of the rack and the other end to the factory ESD ground wire.
5. Power-on Self-check: Turn on power after confirming correct wiring. The equipment automatically starts self-check; all indicator lights, infrared sensors and voice modules are tested sequentially. Hardware is normal if no error prompts appear.
6. Network Configuration: Log in to the background to set IP address, connect to factory LAN/WiFi and complete rack device activation.
7. System Calibration: Pair PDA with the equipment, input basic warehouse material data, test functions including stock-in, stock-out light guidance, alarm and voice broadcast. The equipment can be put into formal use after all functions work normally.

5. Full System Operation Process

5.1 Receipt & Putaway Management

1. Operation Tool: PDA barcode scanner, supporting barcode and QR code recognition.
2. Process: Scan rack code → scan material reel barcode → place reel on any empty storage position.
3. The system automatically binds materials to storage positions, the corresponding storage position indicator light turns on, and the equipment broadcasts "Success" by voice.
4. Supports multiple modes including receiving putaway, returned material putaway and container batch putaway; the system can automatically recommend optimal storage positions according to material attributes.
5. Inventory data is synchronized to WMS/ERP background in real time after putaway completion.

5.2 Material Issuance & Picking Management

1. Work Order Picking: Scan work order barcode; the system lights up

corresponding storage positions sequentially according to the bill of materials. Operators pick materials following the light guide; each reel removed will be detected by the sensor and the corresponding light turns off automatically.

2. Non-work Order Batch Picking: All material storage positions in the document light up simultaneously for on-demand picking.
3. Error-proof Mechanism: Picking materials from wrong storage positions triggers continuous sound and light alarms. Return the material to the original position and scan the storage position barcode to clear the alarm.
4. The system automatically records operator, picking time and material quantity, and deducts inventory in real time.

5.3 First-set Material Issuance & Work Order Material Supplement

(1) First-set Material Preparation

1. Select the corresponding production work order in the system and click [Pick First Set Materials].
2. The system lights up storage positions sequentially according to the placement machine feeder sequence. After picking and verifying the first reel (light off), the next material position lights up automatically until all first-set materials of the work order are prepared.

(2) Work Order Material Supplement

1. The production line submits a material supplement request when materials run out.
2. Select the work order in the system and customize the light color for supplementary materials. Scan the old reel barcode, and the corresponding spare material storage position lights up with the specified color.
3. Remove the spare reel to complete material replacement; the light turns off upon sensor detection and inventory data updates synchronously.

5.4 Production Material Return Management

Scheme 1 (High Precision Recommended)

After work order completion, use an automatic reel counter to calculate remaining quantity of reels, and synchronize data to the smart rack system. Operators scan reel barcodes via PDA for re-stock putaway, achieving accurate inventory without errors.

Scheme 2 (Simple & Fast)

Estimate remaining material quantity by measuring reel outer diameter, easy to

operate but with minor counting deviation, suitable for production lines with low precision requirements.

5.5 Inventory Stocktaking Management

Four stocktaking modes supported:

1. Single Material Stocktaking: Scan storage position/material barcode to verify physical goods against system inventory.
2. Part Number Search Stocktaking: Input material PN in PC background to query inventory of all storage positions of this material across the warehouse.
3. ERP Reconciliation Stocktaking: Connect with ERP system for automatic inventory comparison on both sides and generate discrepancy reports.
4. Empty Position Light Stocktaking: One-click light-up of all empty storage positions to quickly identify missing or misplaced materials.

5.6 Outbound Strategy Configuration

Outbound priority rules can be customized in the background:

1. First-In First-Out: Prioritize production DateCode and production batch LotCode.
2. Material Form: Prioritize full reels or loose materials.

Independent picking strategies can be configured separately for different part numbers and warehouse areas.

6. Software System & MES/ERP/WMS Integration Guide

6.1 Core Software Functional Modules

Material Management, Storage Position Management, Receipt Order, Picking Order, Material Preparation Details, Material Return Management, Feeder List, Barcode Management, Interface Log, System Configuration, Permission Management, Rack Management, Inventory Report, Data Export & Printing.

6.2 System Integration Capabilities

1. Open standardized API communication interfaces for seamless integration with MES, SAP, ERP, WMS and SMT placement machines.
2. Two-way data synchronization of work orders, material picking, material supplement and material return; inventory quantity automatically updated after material consumption.
3. Support real-time push of shortage, wrong picking and low inventory early warning information to upper-level systems.

4. Complete operation logs generated for all material pick/place actions, permanently stored for traceability.

6.3 User Permission Management

1. User Management: Add, edit and delete accounts; set employee ID, position and contact information.
2. Role Permissions: Customize roles including administrators, warehouse operators and production line operators, with separate access to stock-in, stock-out, stocktaking, system configuration and data export functions for hierarchical control to prevent misoperation.

7. Daily Maintenance & ESD Anti-static Management

7.1 Daily Maintenance

1. After power cut-off, wipe laminates, sensors and indicator lights with dry dust-free soft cloth to remove dust and tin slag. Do not flush circuits and mainboards with water.
2. Check whether anti-static grounding chain is intact and in contact with ground to ensure normal static discharge.
3. Check caster locks and frame screws for looseness; verify battery power of mobile racks.

7.2 Weekly Maintenance

1. Fully tighten all welding and splicing screws of the rack, check laminates for deformation.
2. Test all infrared sensors, indicator lights and voice broadcast modules to locate faulty storage positions.
3. Check network cable and WiFi signal to ensure zero delay in data synchronization.

7.3 Monthly Maintenance

1. Export full warehouse inventory report for backup and clean redundant system operation logs.
2. Inspect wiring for aging or skin damage, rearrange messy wire harnesses.
3. Perform a full charge and discharge cycle for mobile racks to extend lithium battery service life.
4. Re-test surface anti-static impedance to ensure compliance with ESD standards.

7.4 Long-term Shutdown Maintenance

If the equipment is out of service for more than 15 days, disconnect the main power supply, empty all materials and cover with dust-proof covers. Power on for 30 minutes every month to avoid battery over-discharge and circuit dampness.

8. Troubleshooting for Common Malfunctions

Malfunction Phenomenon	Troubleshooting Steps	Solutions
Whole machine no power, no indicator lights on	1. Check 110V power socket; 2. Check loose power cord plug; 3. Check battery level for mobile models	Replace socket, re-plug wiring; fully charge battery if depleted; contact after-sales for wiring replacement if damaged
Storage position light off, cannot detect material reels	1. Reel blocks infrared sensor; 2. Loose sensor wiring; 3. Single module damage	Clear debris in storage position, re-plug wiring; replace sensor circuit board for single faulty storage position
No alarm for wrong picking, error-proof function invalid	1. Alarm function disabled in background; 2. Loudspeaker malfunction; 3. CAN bus signal interruption	Log in system to enable sound-light alarm; restart equipment; inspect bus harnesses
WiFi/network cable disconnected, inventory unsynchronized	1. Loose network cable, switch failure; 2. Weak WiFi signal; 3. IP address conflict	Re-plug network cable, adjust rack network position; reconfigure IP in background
Short endurance of mobile rack	1. No regular full charge-discharge cycle; 2. Battery aging	Perform full charge-discharge cycle monthly; contact after-sales to replace lithium iron phosphate battery if degraded
Static alarm triggered, ESD test fails	1. Broken grounding chain or no grounding; 2. Excessive dust on laminates causing insulation	Replace grounding chain and connect reliably to ground wire; clean dust on laminates

Indicator light stays on permanently	Infrared sensor blocked by tin slag or foreign objects	Clear debris in sensor area of storage position, restart equipment for reset
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Note: The above are only self-inspection solutions. Do not disassemble main control boards, chips and circuit boards by yourself in case of hardware damage; contact manufacturer after-sales service for remote or on-site maintenance directly.

9. Standard Accessory List

1. 1 set of sensor smart material rack main unit
2. 1 set of independent power cord, network cable and CAN communication harness
3. 1 accessory package including mounting screws, expansion bolts and grounding chain
4. MF60S casters (exclusive for mobile models)
5. 1 copy of operation manual and warranty card
6. Supporting PDA scanning operation guide
7. Spare infrared sensor modules (optional)

10. Warranty & After-sales Service

1. Warranty Period: 1-year free warranty for the whole machine; 2-year warranty for core components including infrared sensors, main control boards and lithium batteries; 5-year anti-rust warranty for stainless steel frames.
2. Warranty Scope: Only covers factory quality defects. Damage caused by artificial impact, unauthorized disassembly/modification, water ingress, dampness, non-compliant power supply, electrostatic breakdown and overload external force is excluded from free warranty.
3. After-sales Support:
 - ① Online Remote Support: Video-guided troubleshooting, remote system debugging and free software upgrade.
 - ② Hardware Malfunction: Overseas customers can receive spare parts via express delivery with replacement guidance provided.
 - ③ Lifetime Technical Support: Operation training, process optimization and system integration debugging.
4. Contact Channel: Mr. Wang, Tel: +86 18676786353

11. Disclaimer

1. All parameters and appearance shown in this manual are for reference only. No

separate notification will be given for product hardware and software iteration and upgrade.

2. The manufacturer shall not bear any liability for equipment damage, material scrap and production losses caused by users failing to install, operate anti-static measures, store overloaded materials or disassemble/modify the equipment without authorization in accordance with this manual.
3. Equipment failures caused by force majeure (lightning strike, flood, fire, transportation damage, abnormal factory power supply) are not covered by the warranty.
4. The final interpretation right of this product manual belongs to Honghui Fast Warehouse Technology (Shenzhen) Co., Ltd.

FCC Warning:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Caution: Any changes or modifications to this device not explicitly approved by manufacturer could void your authority to operate this equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.