



Solution Overview for Fully Automatic and Semi-Automatic Lithium Battery PACK Production Lines-8PPM

www.xiaoweitop.com

Overview of the Production Line

Description of 8PPM Fully Automated Module PACK Line

Cell Handling Section:

Foam box bulk pallet incoming cells → Six-axis robot cell loading → Automatic barcode scanning → OCV testing and sorting → Automatic polarity detection and flipping → Manual adhesive application → Manual cell stacking → Manual steel strap compression → Automatic module transfer onto the line.

Module Handling Section:

Terminal positioning & laser cleaning → Manual CCS installation → Busbar laser welding → Manual inspection and post-weld cleaning → Module insulation and voltage-withstand testing → Module off-line transfer.

PACK Section:

Lower case loading and cleaning → Liquid cooling plate airtightness testing → Automatic liquid cooling plate gluing → Module insertion into case → Module fixing → Copper busbar installation → BMU and MSD harness installation → Upper cover installation → PACK airtightness testing → EOL testing → Complete PACK off-line.

Overview of the Production Line

Full Line Capacity: **≥8 PPM**

Production Line Dimensions: Main line: Length ≤65 m, Width ≤10 m, Height ≤3.5 m (subject to customer product layout)

Product Yield: ≥99.8%; Final yield ≥99.9%

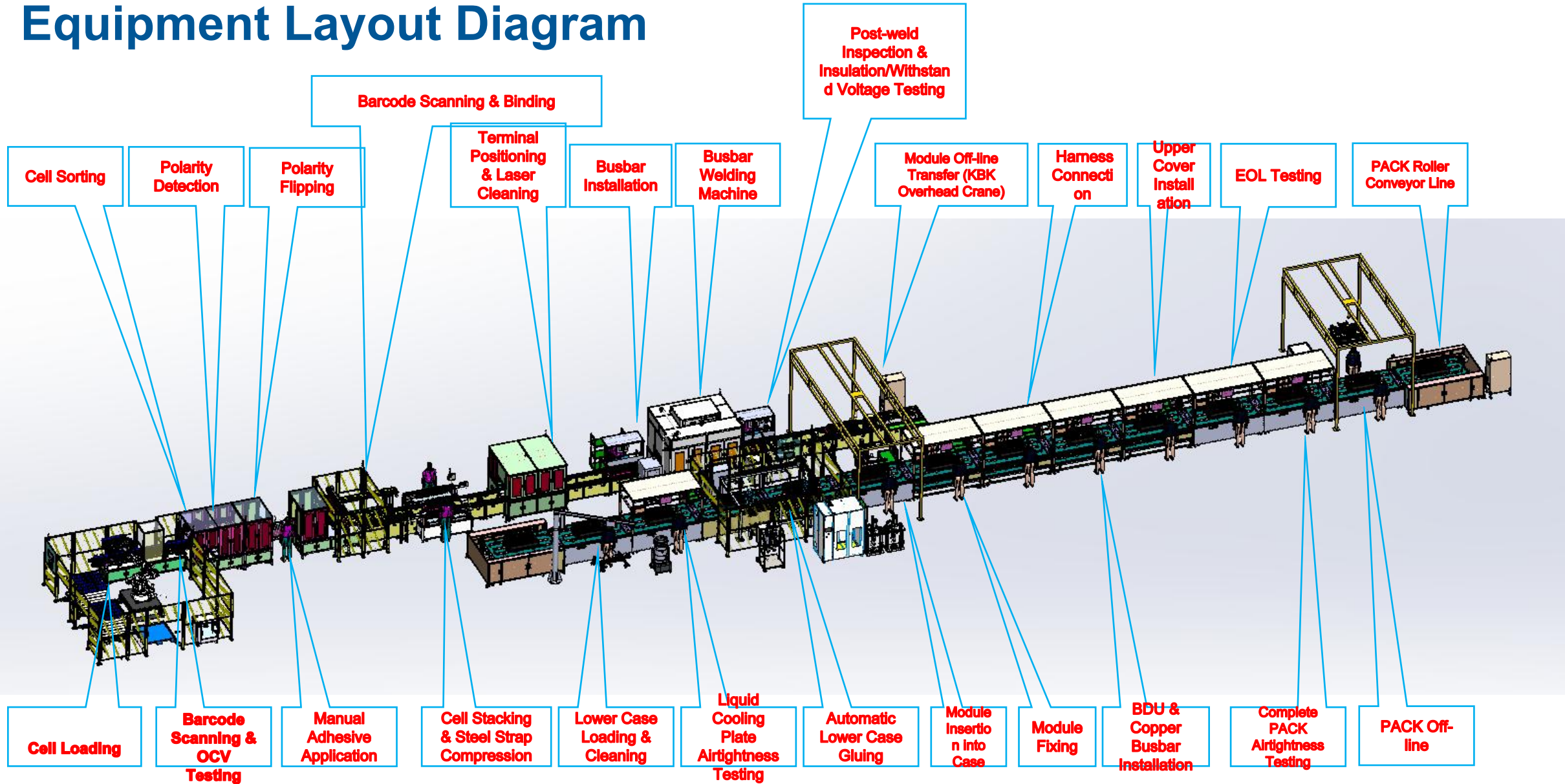
Equipment Failure Rate: Single machine failure ≤2%; Whole line failure ≤3%

Compatible Products:

Component	Base Product	Compatible Product
Cell	314Ah / 280Ah / 100Ah	587Ah / 628Ah (EVE, Haichen, CATL)
Cell Dimensions (mm)	173.7 ± 0.8 × 71.7 ± 0.8 × 207.2 ± 0.8	352.3 ± 0.8 × 71.7 ± 0.8 × 207.2 ± 0.8
Module Compatibility	1P12S / 1P13S / 1P16S / 2P13S	1P13S
Module Dimensions (mm)	984 × 175.2 × 208	984 × 353 × 208
PACK Configuration	1P52S	—
PACK Dimensions (mm)	1140 × 820 × 250	—
Maximum Compatible PACK Size	2250 × 900 × 245 mm (PACK case / 1P104S)	

PRODUCT

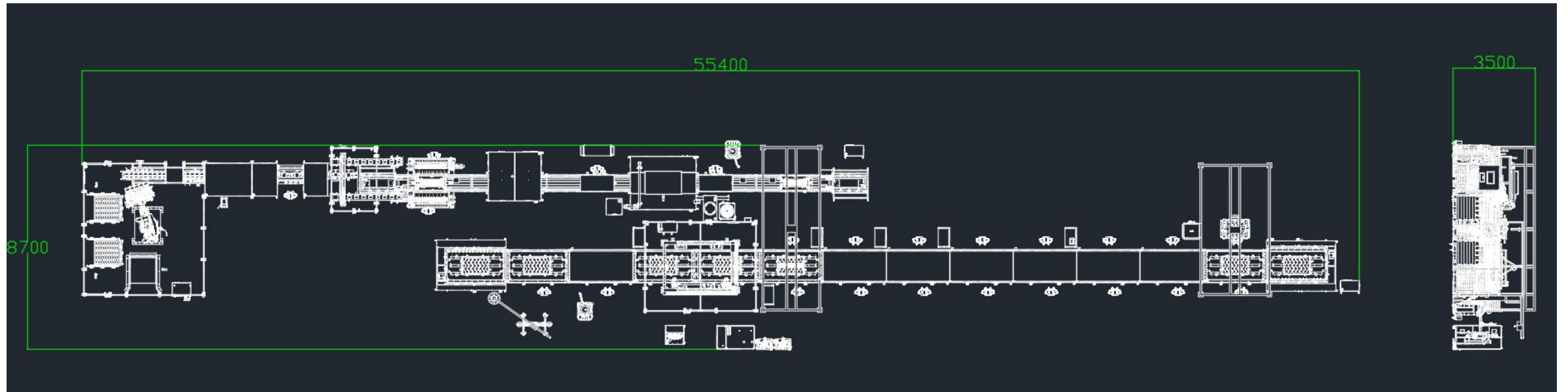
Equipment Layout Diagram



PRODUCT

Equipment Layout Plan

Equipment Layout Plan



PRODUCT

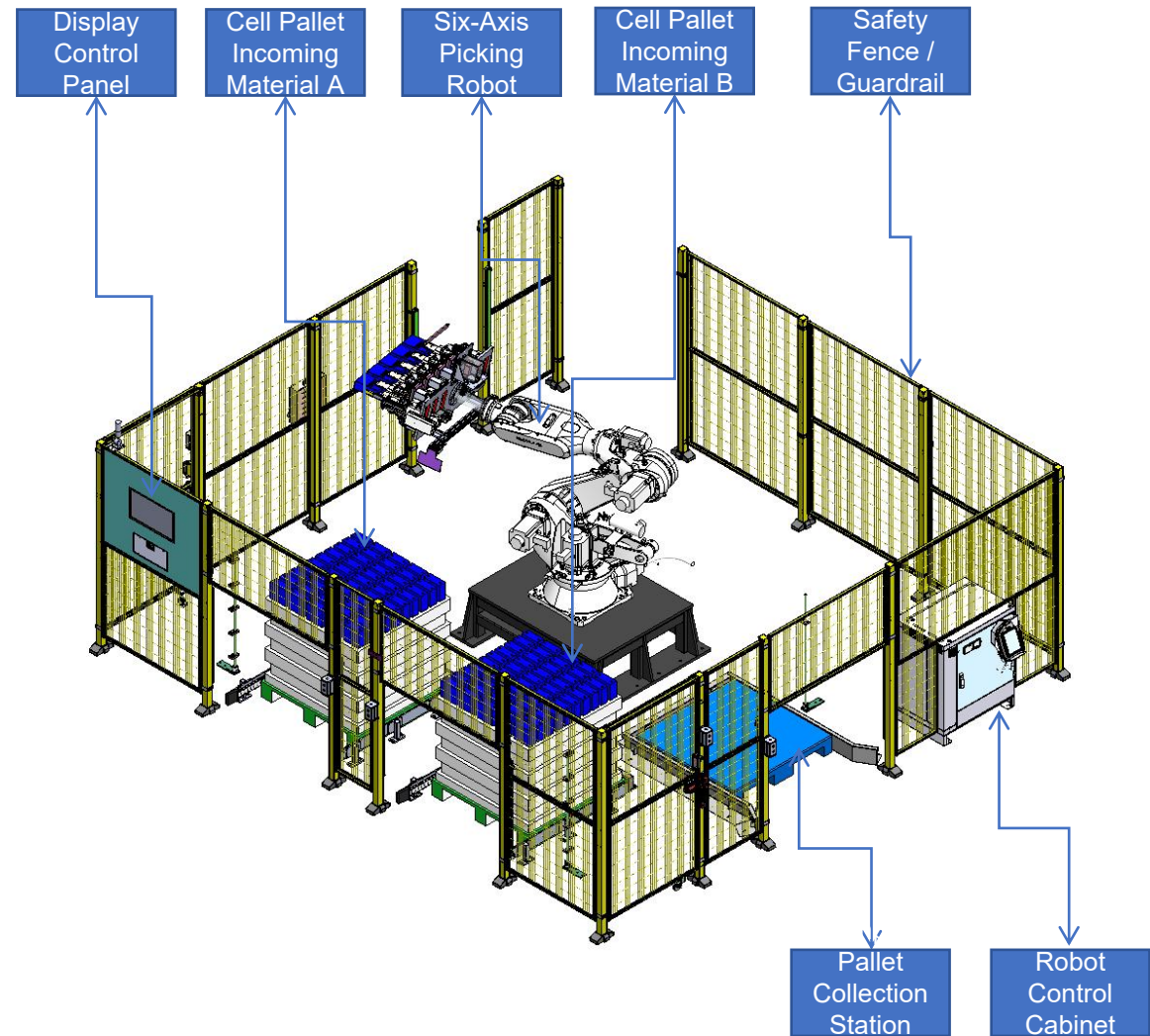
Cell Loading

Function Description:

1. Incoming cell pallets are manually placed at the designated pallet position using a forklift. The cell feeding position is designed as one active and one standby to allow material replacement without stopping the line.

2. After the robot picks all cells from the pallet, it removes the empty foam pallet and places it at the empty pallet collection position for stacking. Once the stack reaches the preset height, operators pull out the empty pallet and replace it with a new empty pallet for subsequent collection.

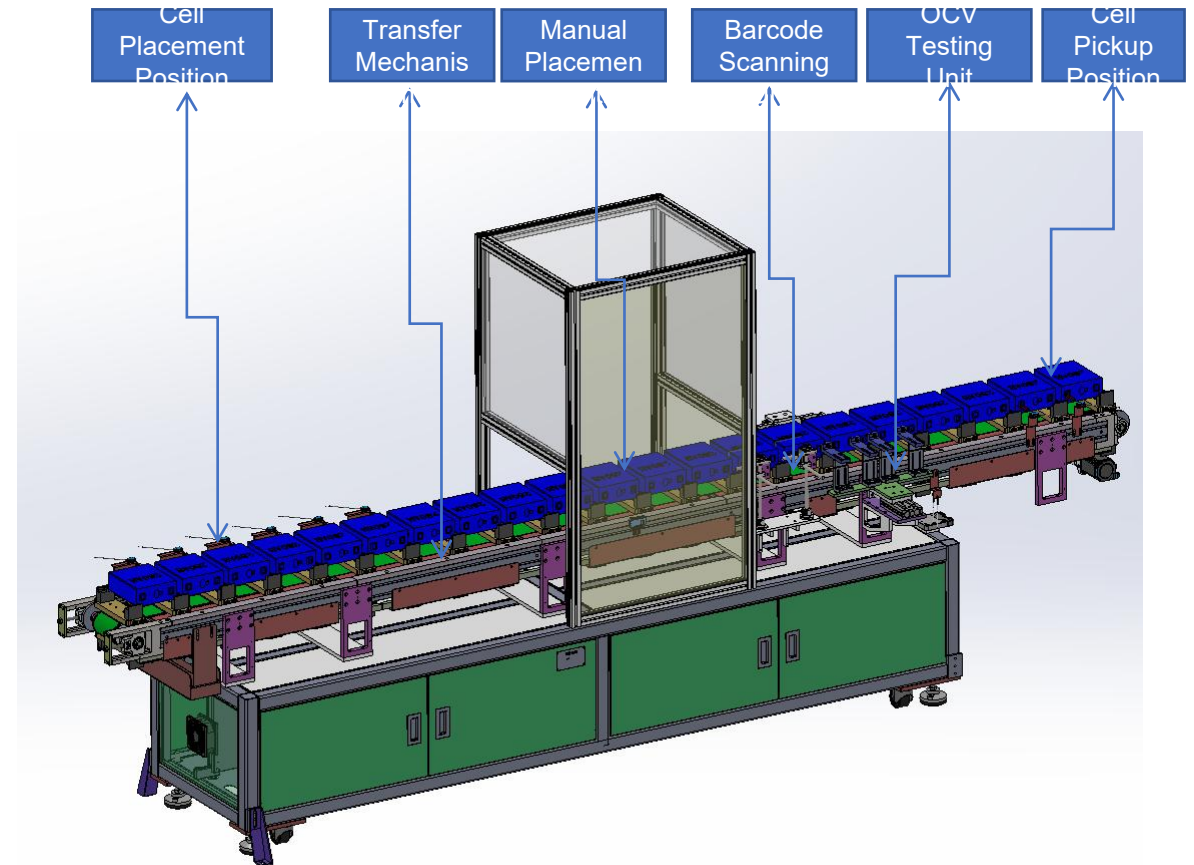
3. The robot gripper is equipped with a CCD detection system to locate the incoming cells on the pallet. After confirming the precise coordinates, the robot picks cells according to the absolute coordinates, with the gripper handling 5 cells at a time.



Cell Barcode Scanning and Testing

Function Description:

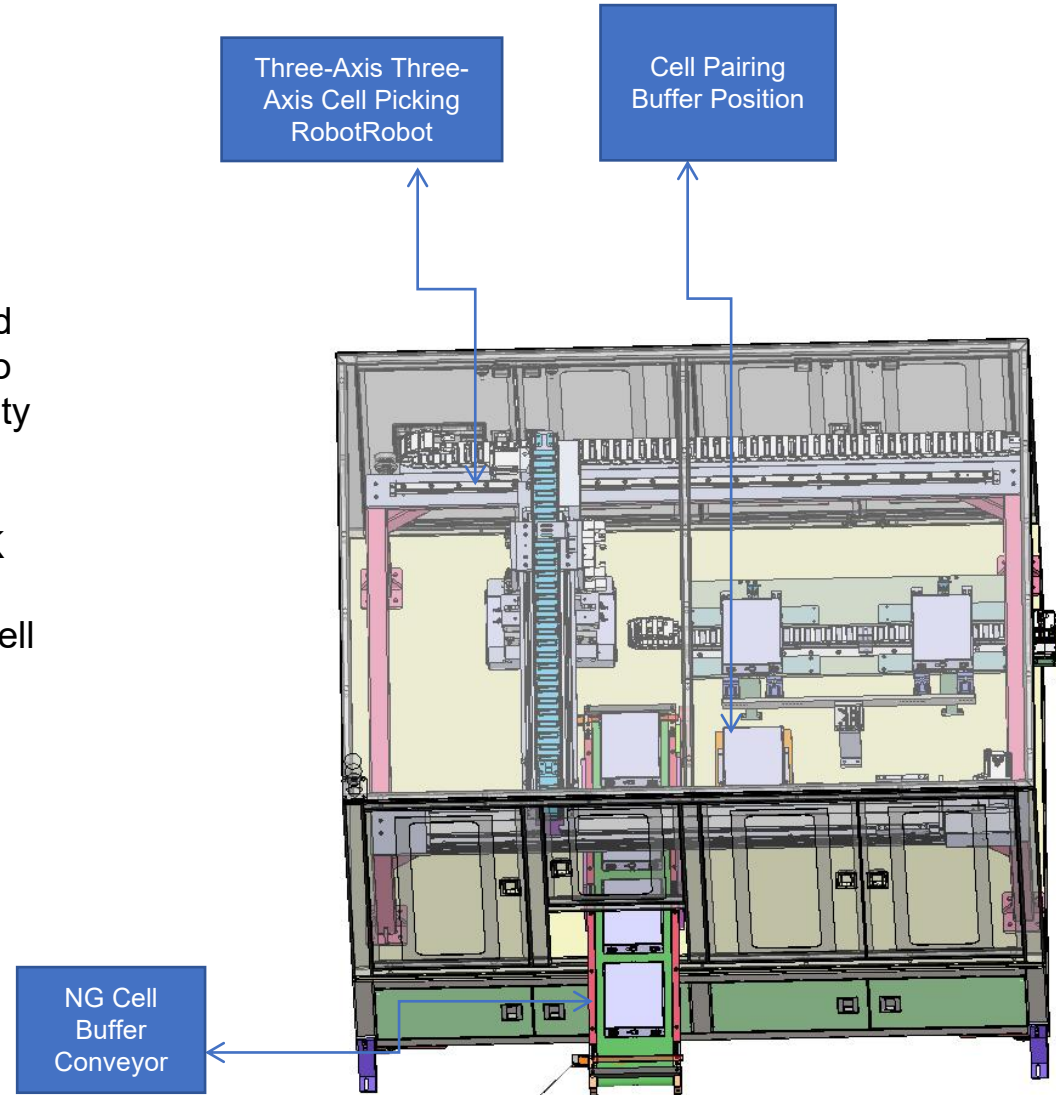
1. Cells are placed at this station by the robot from the previous process. A material-in-place sensor is installed to detect correct placement of cells.
2. The cell transfer mechanism is driven by a servo motor. Cells are conveyed via carriers attached to a synchronous belt.
3. A manual placement position is reserved to accommodate customer-submitted re-inspection or small-batch products.
4. The cell barcode scanning unit has the scanner fixed at a designated position along the cell conveyor. When cells arrive at this position, they are scanned and bound to their IDs.
5. The cell OCV (Open Circuit Voltage) testing unit has the tester and probes fixed on the testing mechanism. When a cell reaches the designated position, the testing cylinder extends the probe-equipped mechanism to test the cell and bind the results.
6. The end of the station is the cell pickup position, where cells await transfer to the next process.



Cell Sorting

Function Description:

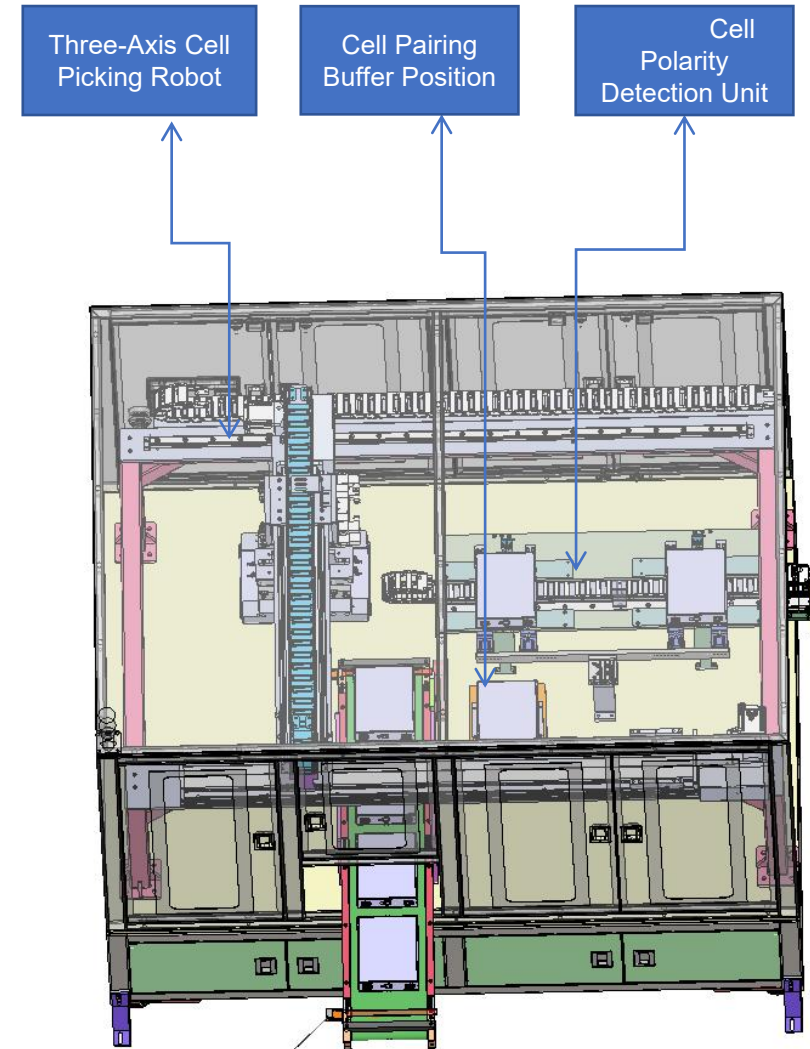
1. The three-axis cell picking robot retrieves cells that have completed OCV testing from the previous process. The robot obtains the test results from the upper-level control system and sorts the cells accordingly. NG (defective) cells are placed onto the NG buffer conveyor, while OK cells are placed at the polarity detection station.
2. If the incoming cells from the previous process consist of 1 OK cell and 1 NG cell, the robot places the NG cell onto the NG buffer conveyor, and the remaining OK cell is placed into the cell pairing buffer. When the next set of cells with the same test results arrives, the robot completes placement of the NG cell, retrieves the cell from the pairing buffer, and places the 2 OK cells at the polarity detection station.



Polarity Detection

Function Description:

1. The three-axis cell picking robot retrieves cells that have completed OCV testing from the previous process. The robot obtains the test results from the upper-level control system and sorts the cells accordingly. NG (defective) cells are placed onto the NG buffer conveyor, while OK cells are placed at the polarity detection position.
2. If the incoming cells consist of 1 OK cell and 1 NG cell, the robot places the NG cell onto the NG buffer conveyor, and the remaining OK cell is placed into the cell pairing buffer. When the next set of cells with the same test results arrives, the robot completes placement of the NG cell, retrieves the cell from the pairing buffer, and places the 2 OK cells at the polarity detection position.
3. The cell polarity detection unit has the tester and probes fixed on the testing mechanism. When a cell is placed at this station, the testing cylinder extends the probe-equipped mechanism to test the cell and bind the results.

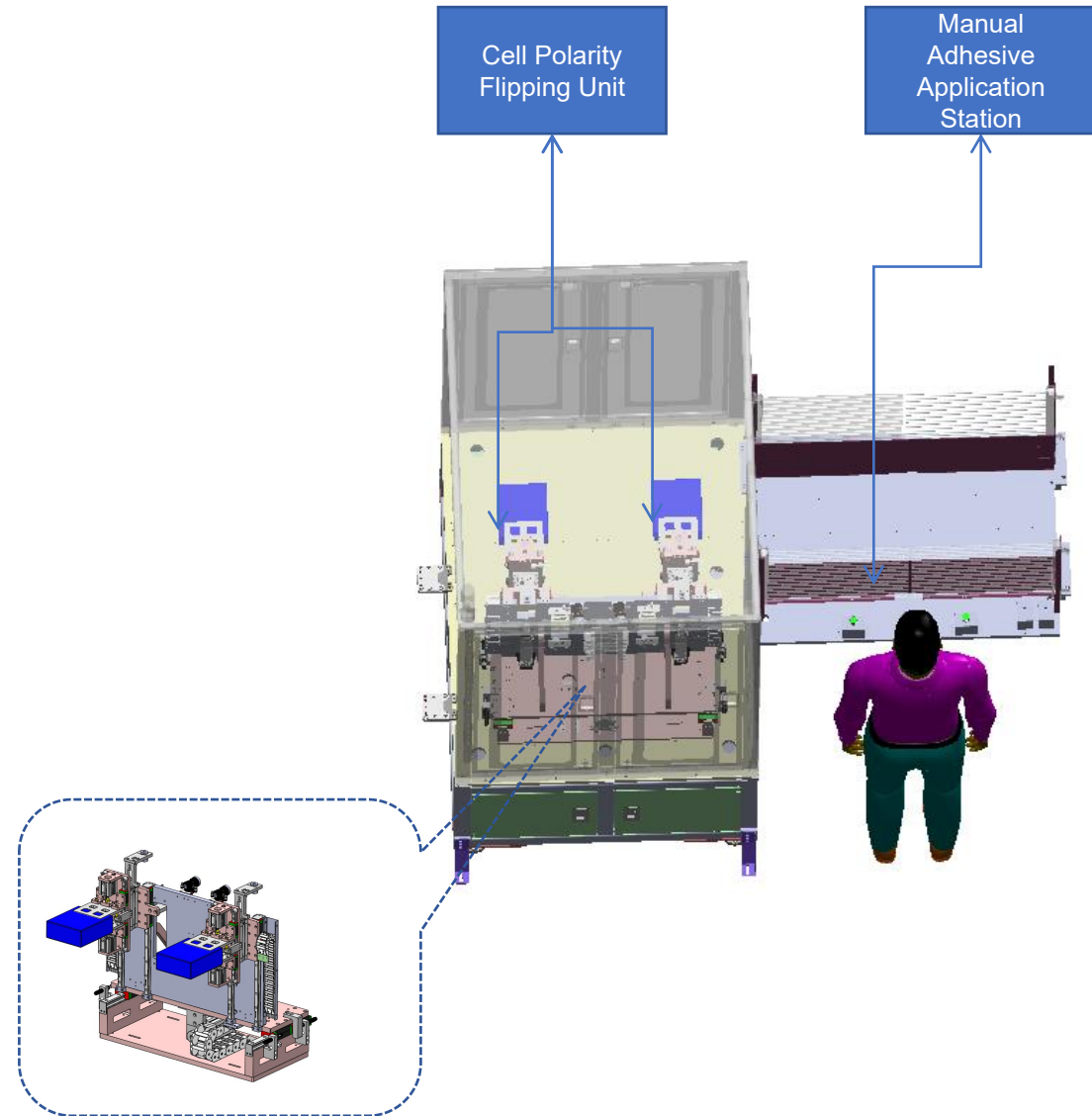


PRODUCT

Polarity Flipping

Function Description:

1. When a cell enters the flipping station, a sensor detects its position. The forward/backward transfer mechanism moves forward, and the gripper cylinder clamps the cell. The lifting cylinder then raises the cell to the designated position for flipping.
2. The cell flipping process aligns the cell's mechanical polarity uniformly, preparing it for stacking.
3. After flipping is completed and the cell flows to the next process, operators manually apply adhesive to the cell.

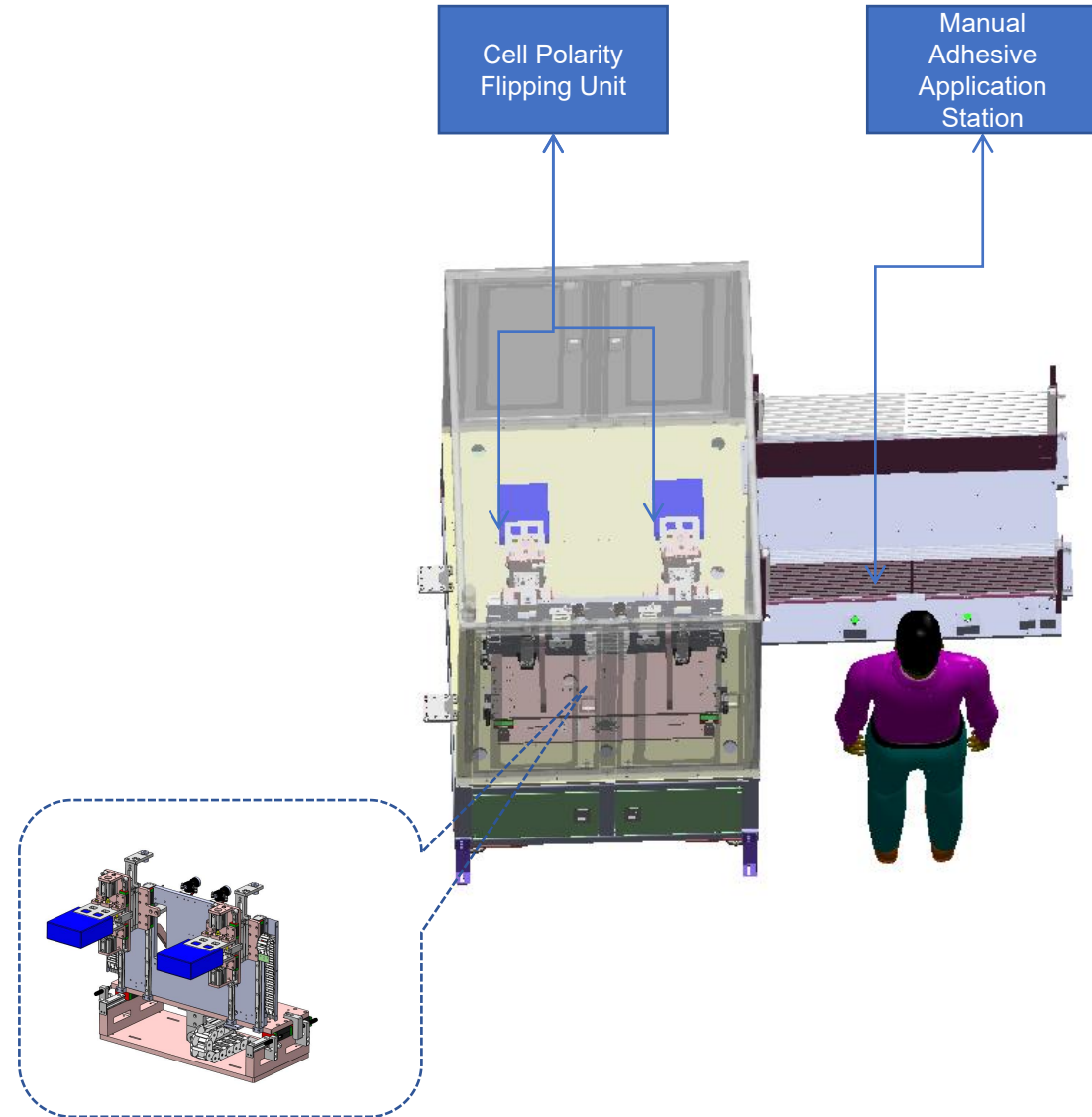


PRODUCT

Manual Adhesive Application

Function Description:

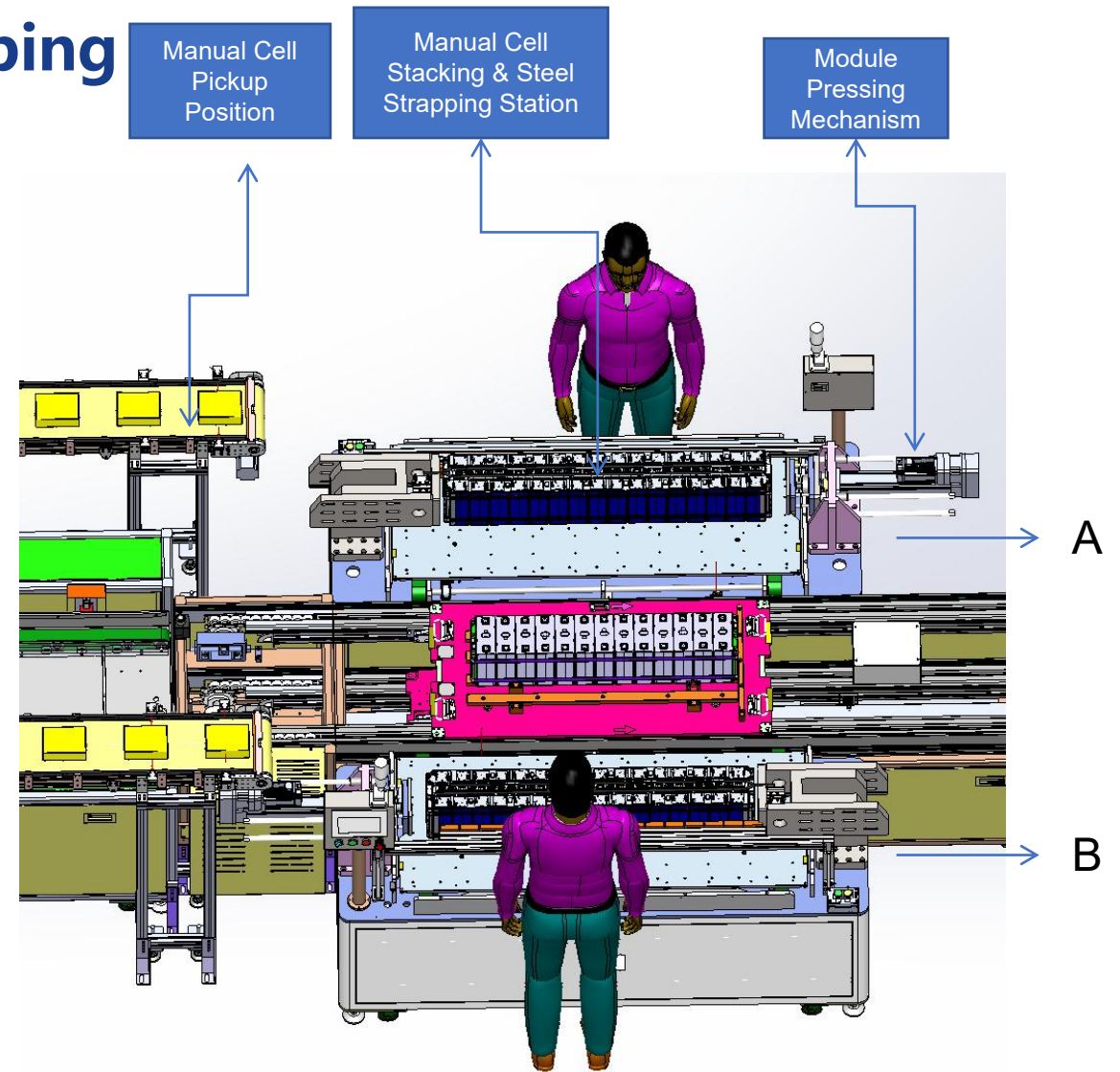
1. After the cells are conveyed into position, operators apply adhesive manually. The operator takes double-sided tape from the material rack, removes the backing paper, and applies the tape onto the cell. Once completed, the cell is transferred to the next station.
2. This station is a manual operation workstation.



Cell Stacking & Module Steel Strapping

Function Description:

1. To meet production capacity requirements, a dual-station (A/B side) manual cell stacking and module steel strapping mechanism is designed.
2. Operators take cells from the previous process and arrange them in the correct sequence to complete stacking.
3. The stacked cell module is then pressed using the module pressing mechanism. Once the module reaches the designated position, operators apply a steel strap around the module and tighten the lower section with cable ties. After releasing the pressing mechanism, the steel strapping process for the module is completed.

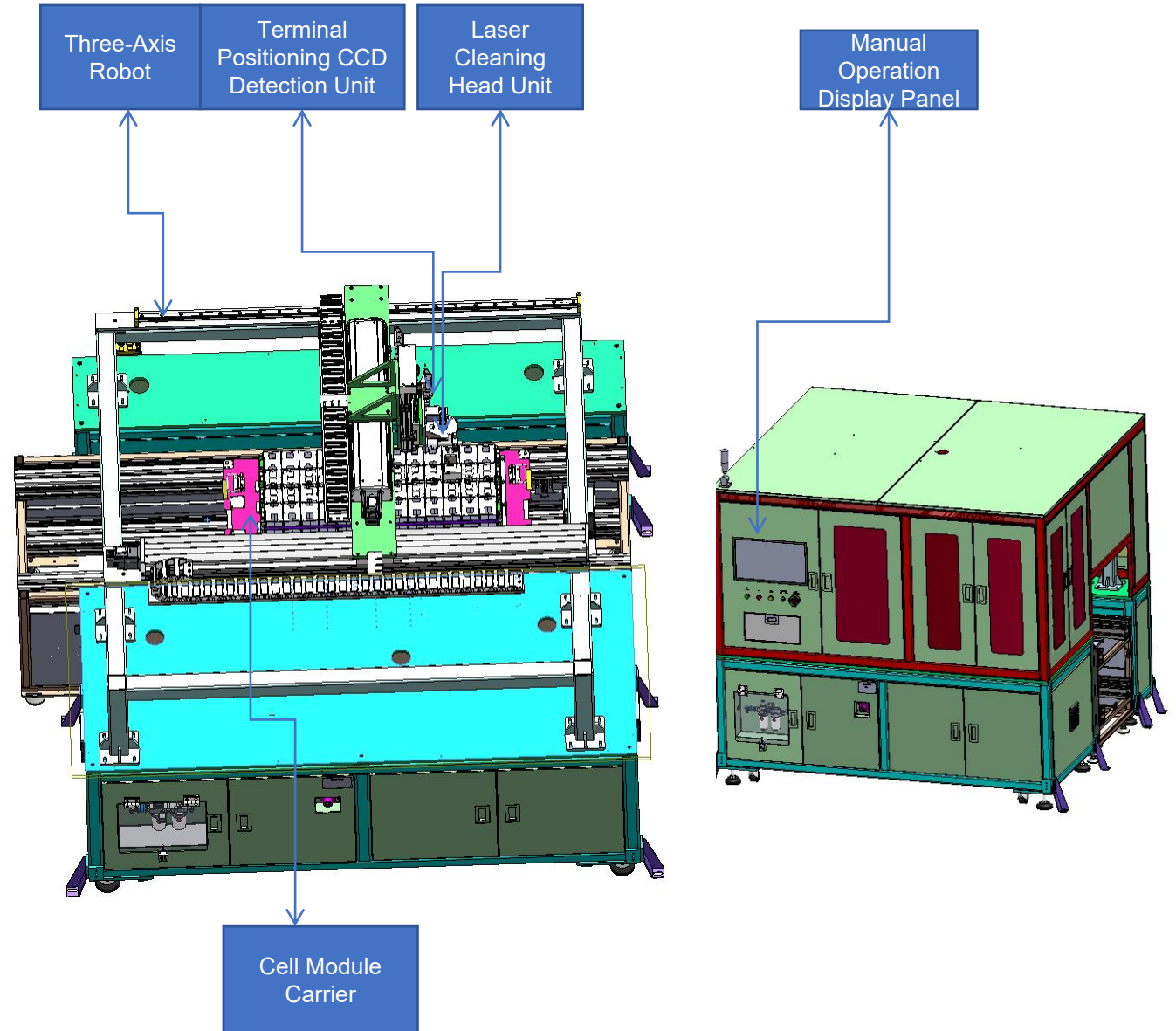


PRODUCT

• Terminal & Laser Cleaning

Function Description:

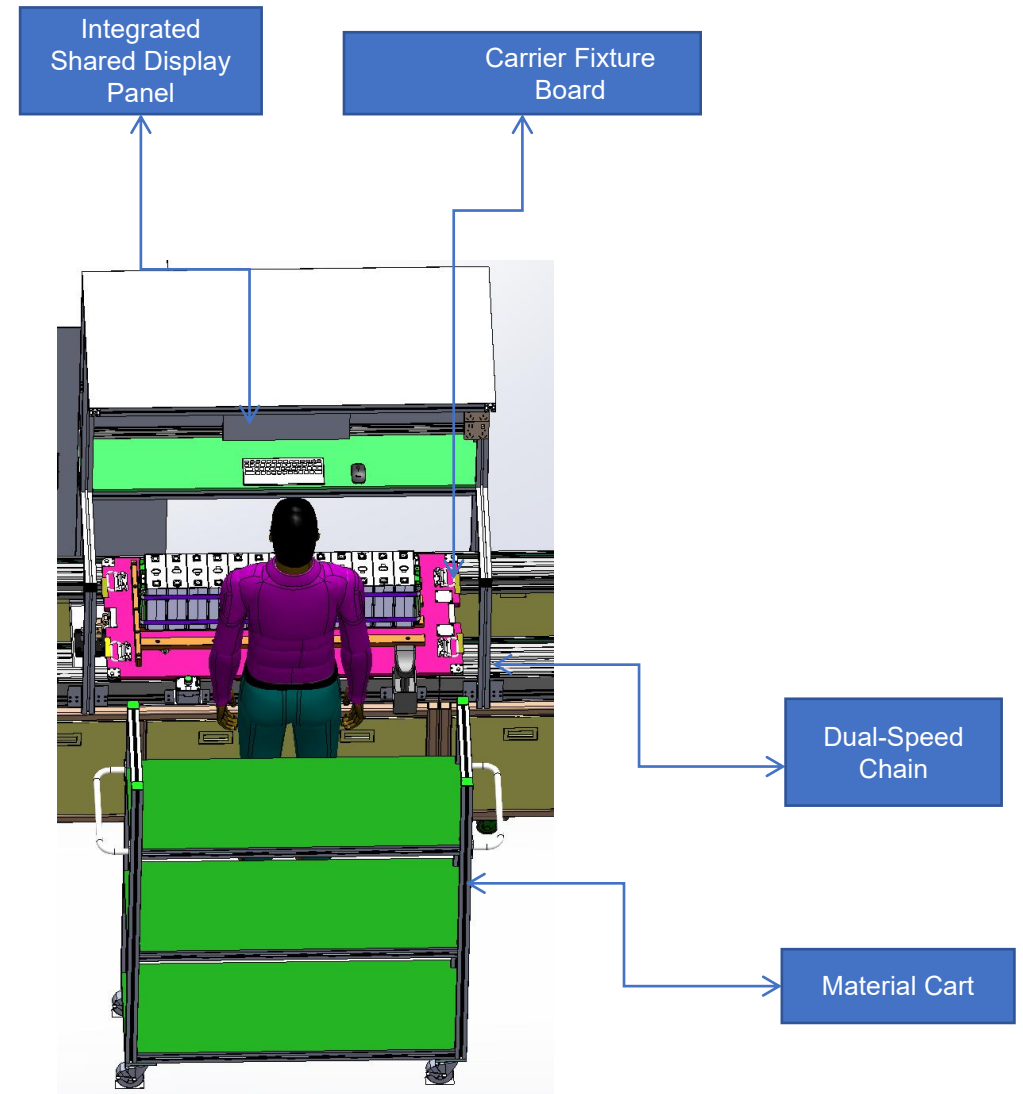
1. When modules from the previous process enter the equipment via the carrier on the dual-speed chain, a three-axis robot equipped with a Z-axis terminal detection unit and laser cleaning unit performs operations on the modules.
2. The CCD system detects and locates the terminals on the module and uploads the data to the control system.
3. The laser cleaning unit cleans the terminals (spines) on the module, completing the module positioning and cleaning process.



Manual Busbar Installation

Function Description:

1. Modules from the previous process arrive at this station via carriers on the dual-speed chain. Operators install the busbars onto the cell modules in the specified sequence.
2. After busbar installation, operators use a handheld barcode scanner to scan the module and upload the data to the system.
3. Once the above operations are completed, operators press the start button on the dual-speed chain to transfer the modules on the carrier to the next process.

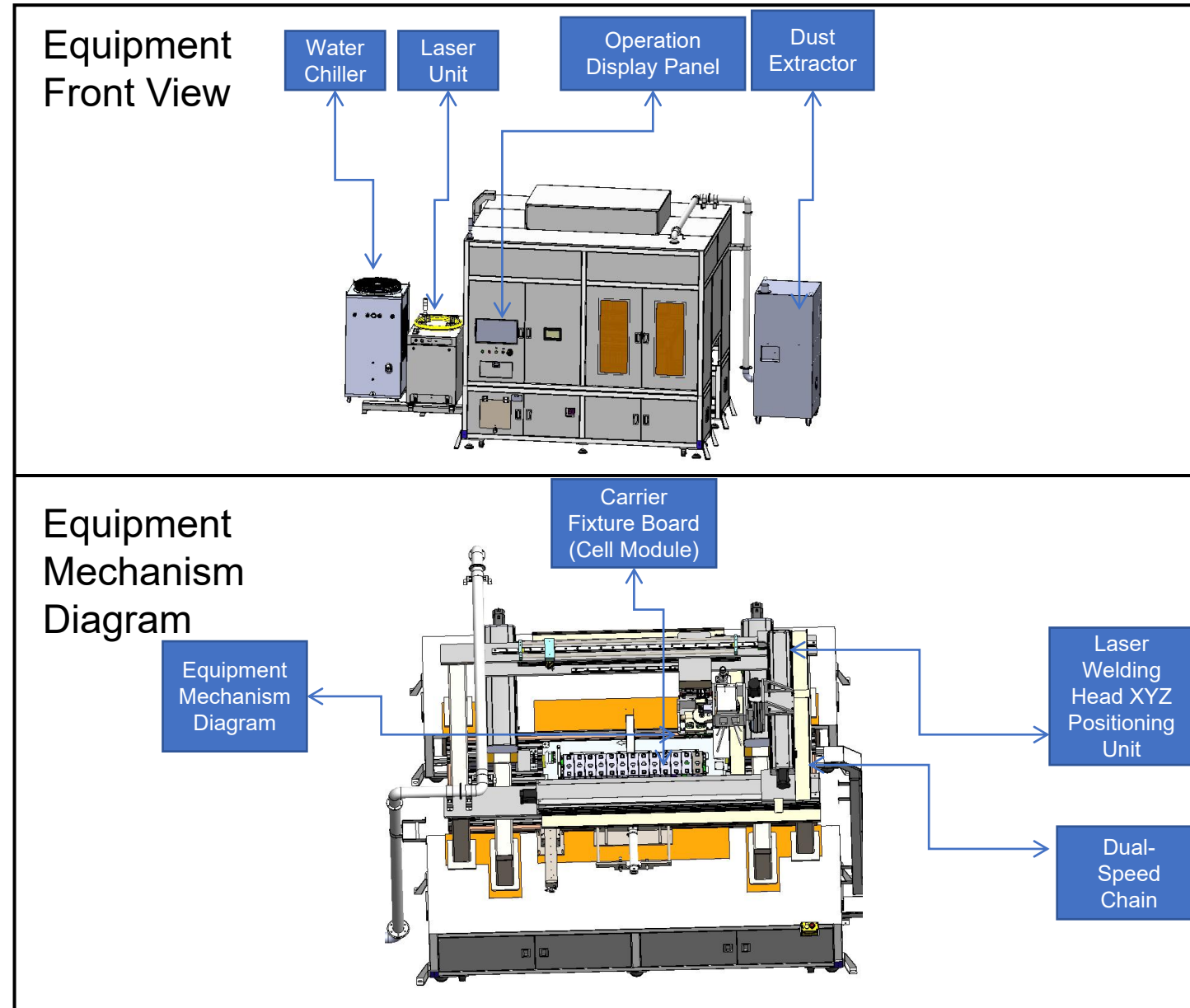


PRODUCT

Busbar Laser Welding

Function Description:

1. Modules from the previous process arrive at this station via carriers on the dual-speed chain. Upon reaching the positioning point, the CCD detection system moves along the XY axes to inspect the welding positions on the module and collect coordinate data.
2. The CCD-collected coordinate data are uploaded to the control system. The system synchronizes the movement of the laser welding unit and the copper nozzle pressing unit to perform laser welding on the module's busbar tabs.
3. The copper nozzle pressing unit is equipped with a dust extraction port. Smoke generated during welding is removed by the dust extraction system, ensuring a clean welding environment.
4. The laser generates high temperatures during operation. A water-cooling system cools the laser, ensuring it operates within the normal temperature range, maintaining welding stability and prolonging equipment life.

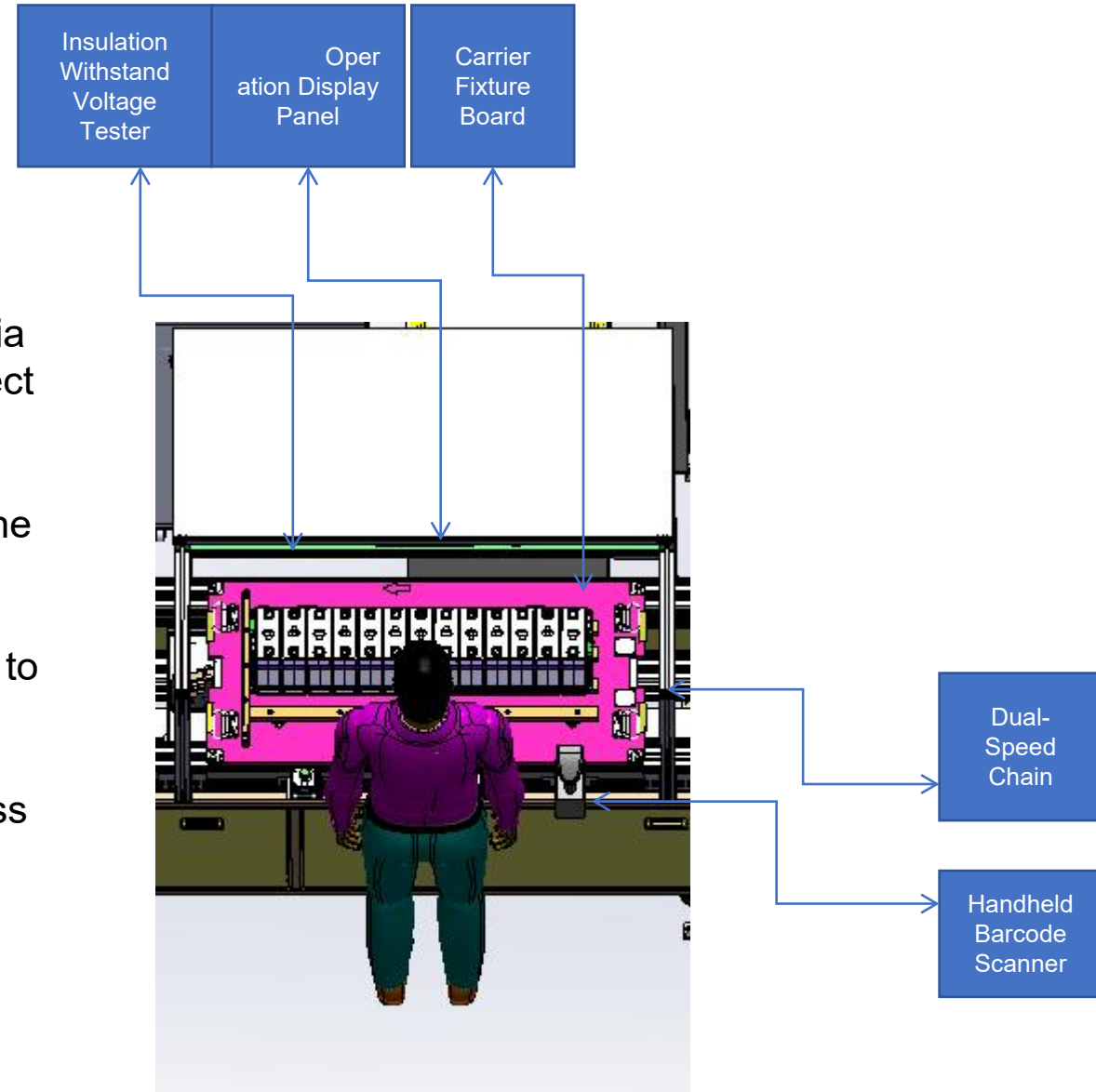


PRODUCT

Post-Weld Inspection & Insulation Withstand Voltage Testing

Function Description:

1. Modules from the previous process arrive at this station via carriers on the dual-speed chain. Operators visually inspect the welded busbars on the module for quality.
2. For modules with inspected busbars, operators connect the module to the insulation withstand voltage tester and perform the test. After testing, operators use a handheld barcode scanner to scan the module and upload the data to the system.
3. Once the above operations are completed, operators press the start button on the dual-speed chain to transfer the modules on the carrier to the next process.

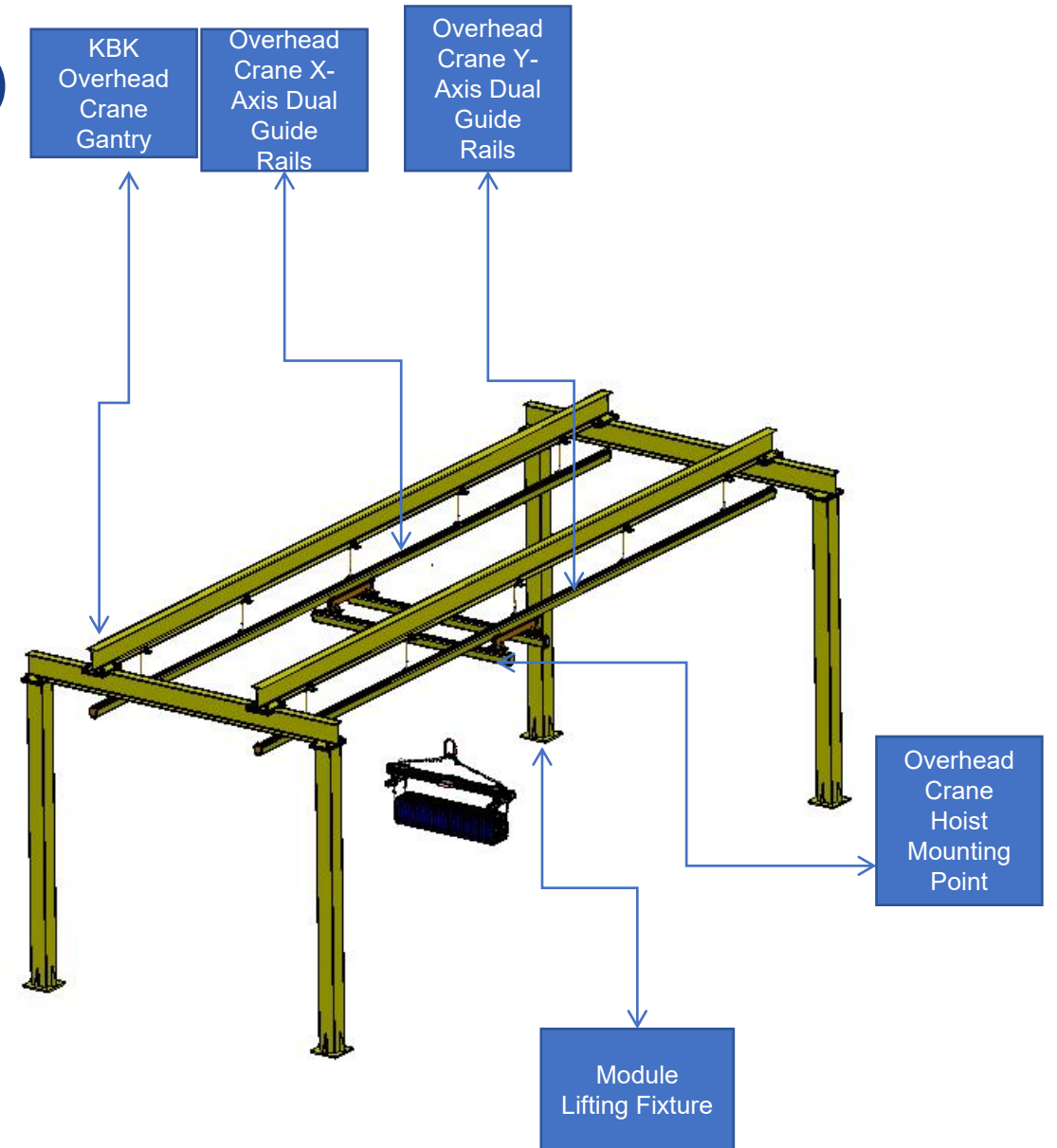


PRODUCT

Module Off-Line (KBK Overhead Crane)

Function Description:

1. The KBK overhead crane gantry is constructed using 150×150 mm square tubes and channel steel welded together. In the XY directions, specialized guide rails are used for positioning. The overall dimensions (length, width, height) are customized based on the production line layout.
2. The module lifting fixtures are custom-made according to the customer's module specifications to ensure easy and efficient module handling.

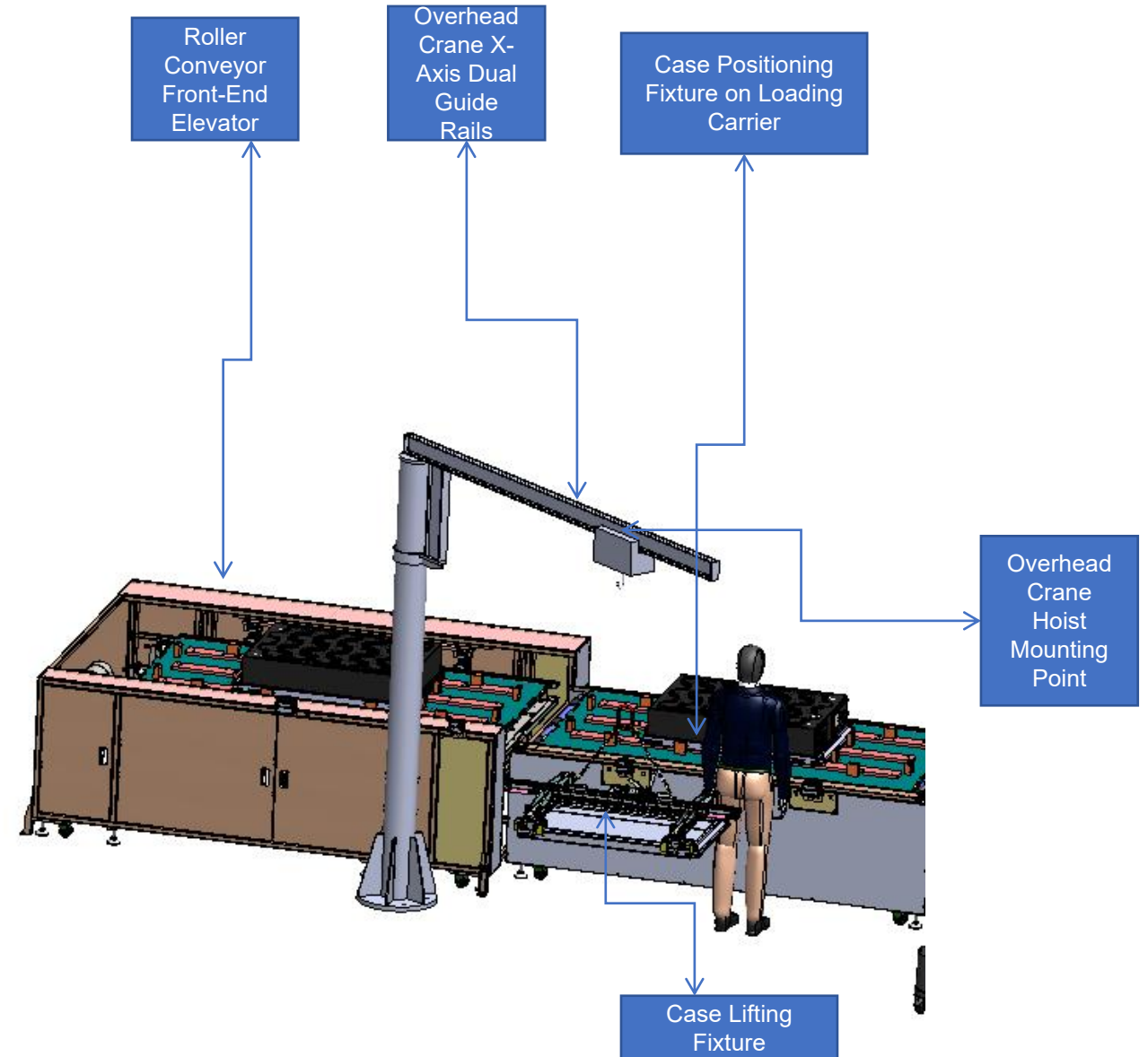


PRODUCT

Case Overhead Jib Crane

Function Description:

1. The jib crane is constructed using 220 mm square tubes and channel steel welded together. In the Y-axis direction, specialized guide rails are used for positioning. The overall dimensions (length, width, height) are customized according to the production line layout.
2. The case lifting fixtures are custom-made according to the customer's module specifications to ensure easy and efficient handling.
3. After completing the above operations, operators scan the unit with a handheld barcode scanner to record data, then press both start buttons on the roller conveyor to transfer the module on the carrier fixture board to the next process.

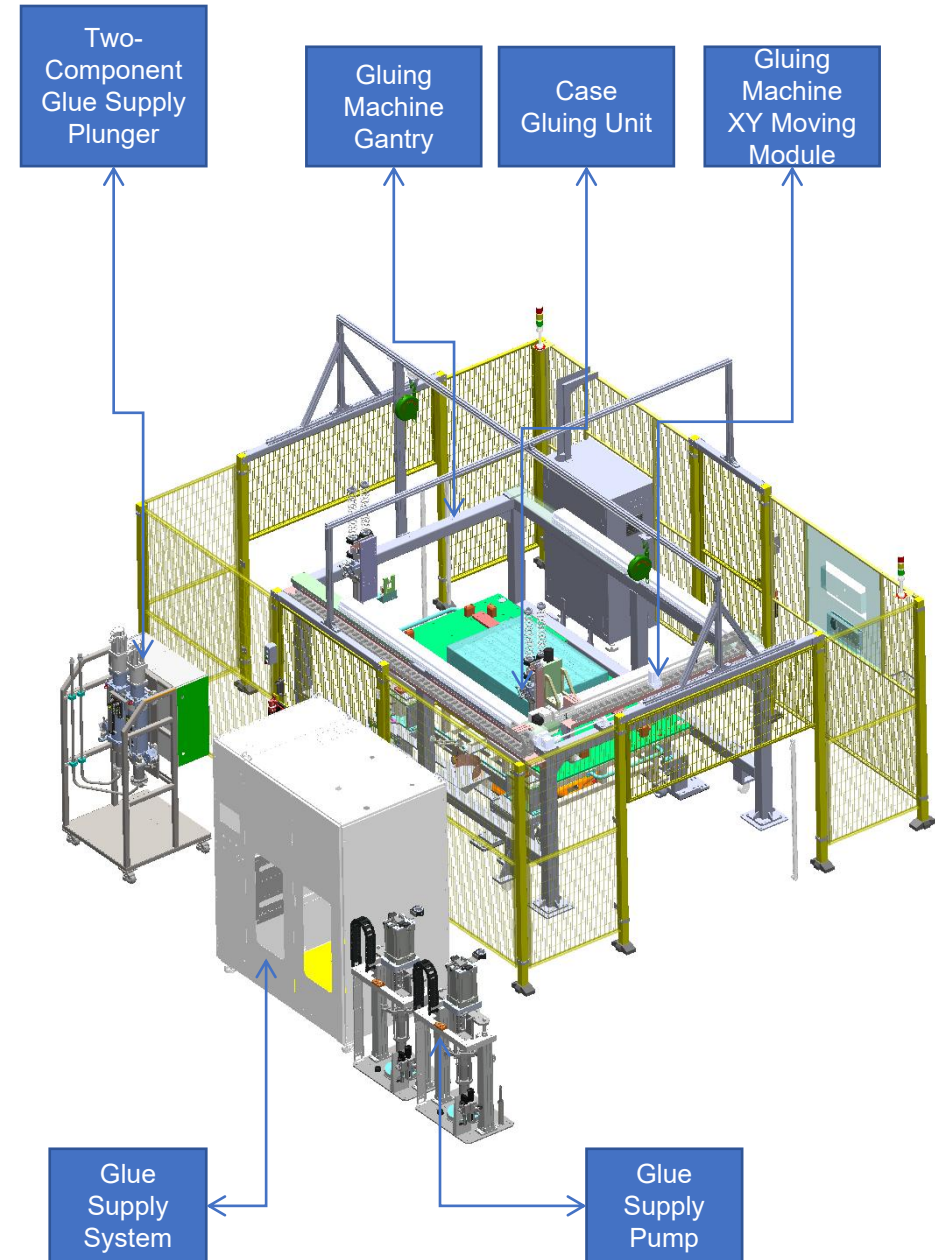


PRODUCT

Automatic Case Gluing

Function Description:

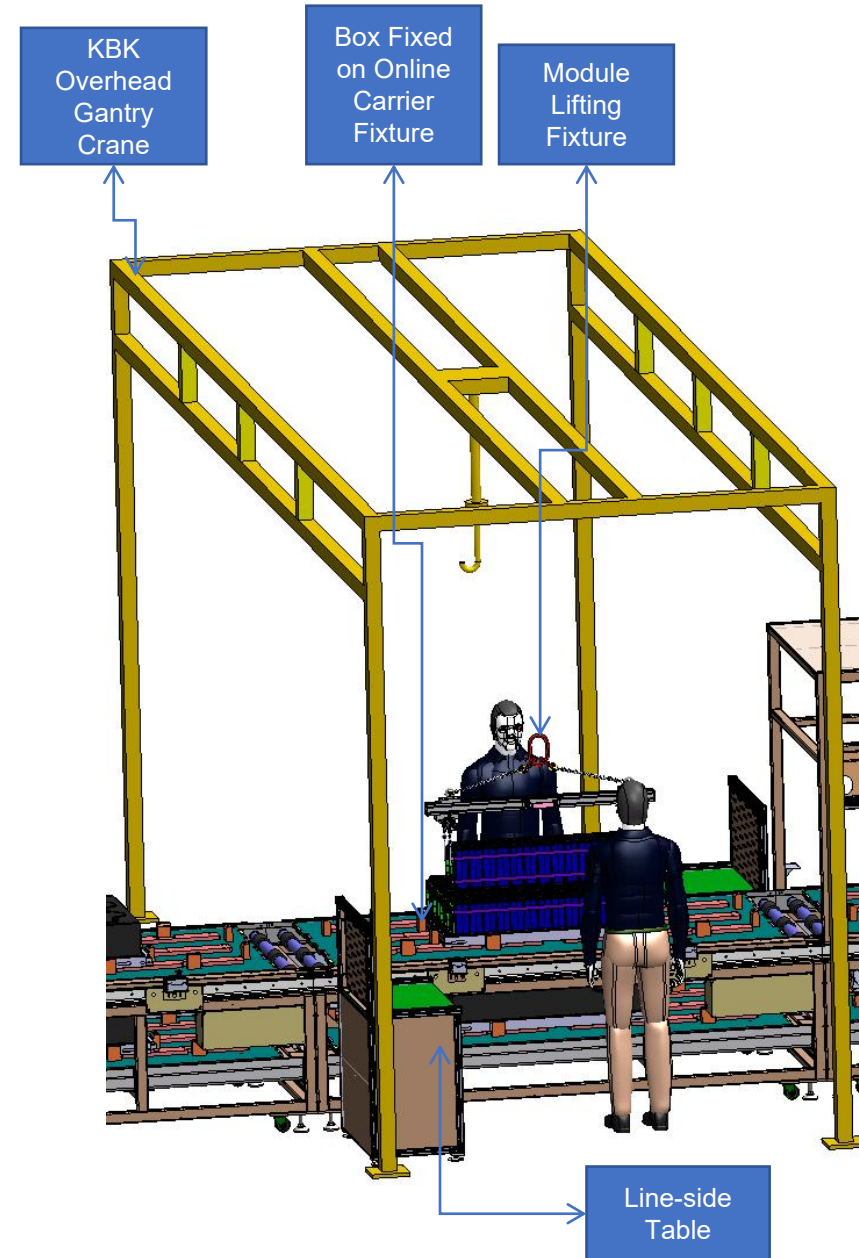
1. When the carrier fixture board reaches this station, the stopper mechanism holds it in place. The automatic gluing machine then begins gluing the case on the fixture board.
2. The XY axes first move the Z-axis gluing head to the designated gluing position. The glue supply system starts, and the three-axis gantry robot moves to perform the gluing operation on the case.
3. After completing the gluing process, the glue supply system stops, the three-axis gantry robot returns to its home position, and the stopper mechanism releases the fixture board to transfer it to the next process.



Module Loading into Box

Function Description:

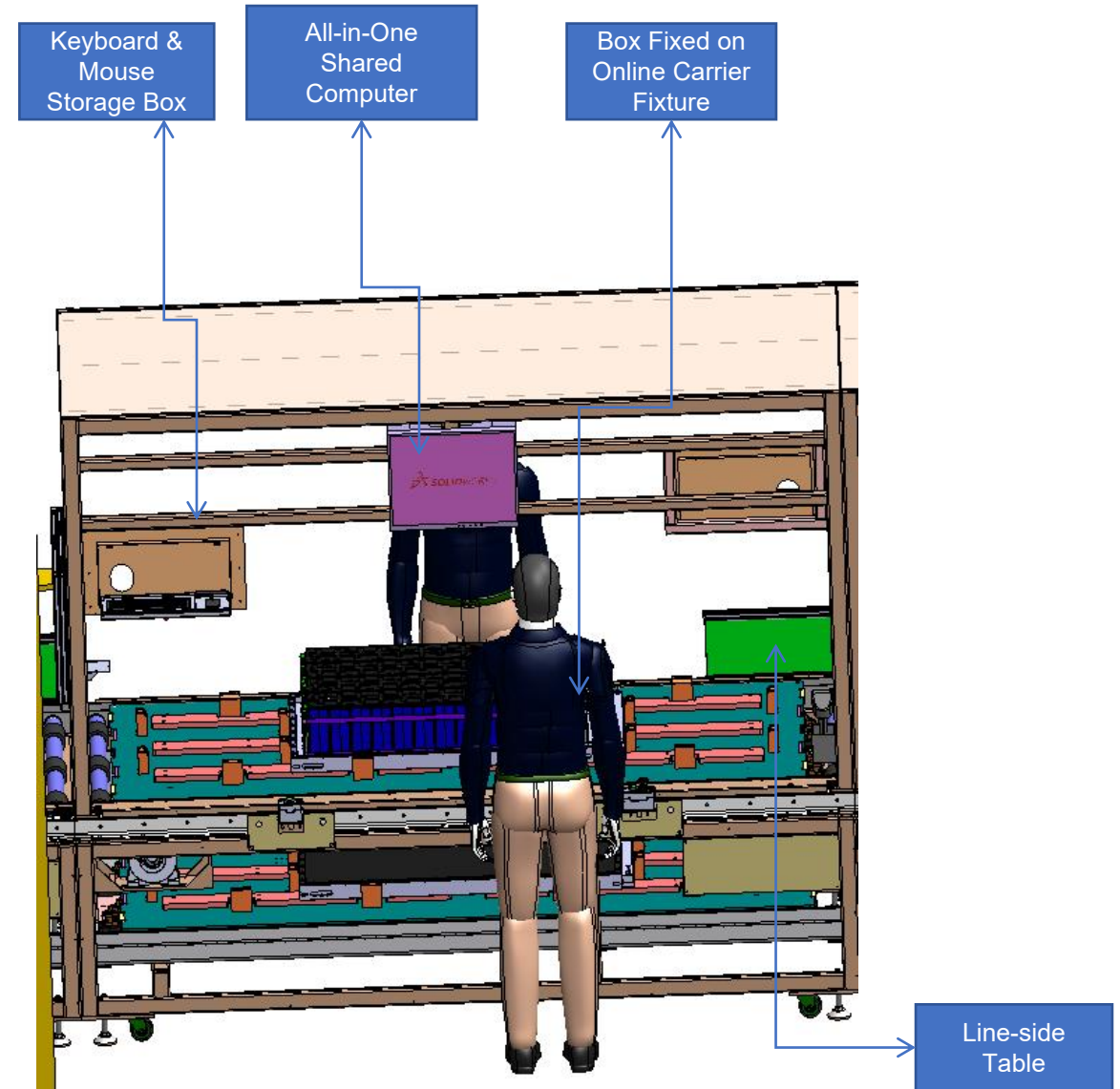
1. When the carrier tooling board reaches this station, the stopper mechanism will hold the board in place. Operators manually lift the modules into the box and begin assembly operations on the box mounted on the tooling board.
2. According to the box and PACK specifications, place all modules into the box to complete the module loading process.
3. After completing the above steps, operators use a handheld barcode scanner to scan the modules and upload the data. Then, by pressing the start buttons on both sides of the upper roller conveyor, the carrier tooling board is moved to the next process.



Harness Connection

Function Description:

1. When the carrier tooling board reaches this station, the stopper mechanism holds the board in place. Operators manually connect and secure harnesses between modules.
2. According to the box and PACK specifications, install and fix all module harnesses to complete the harness connection process.
3. After completing the above steps, operators press the start buttons on the upper roller conveyor to move the carrier tooling board to the next process.

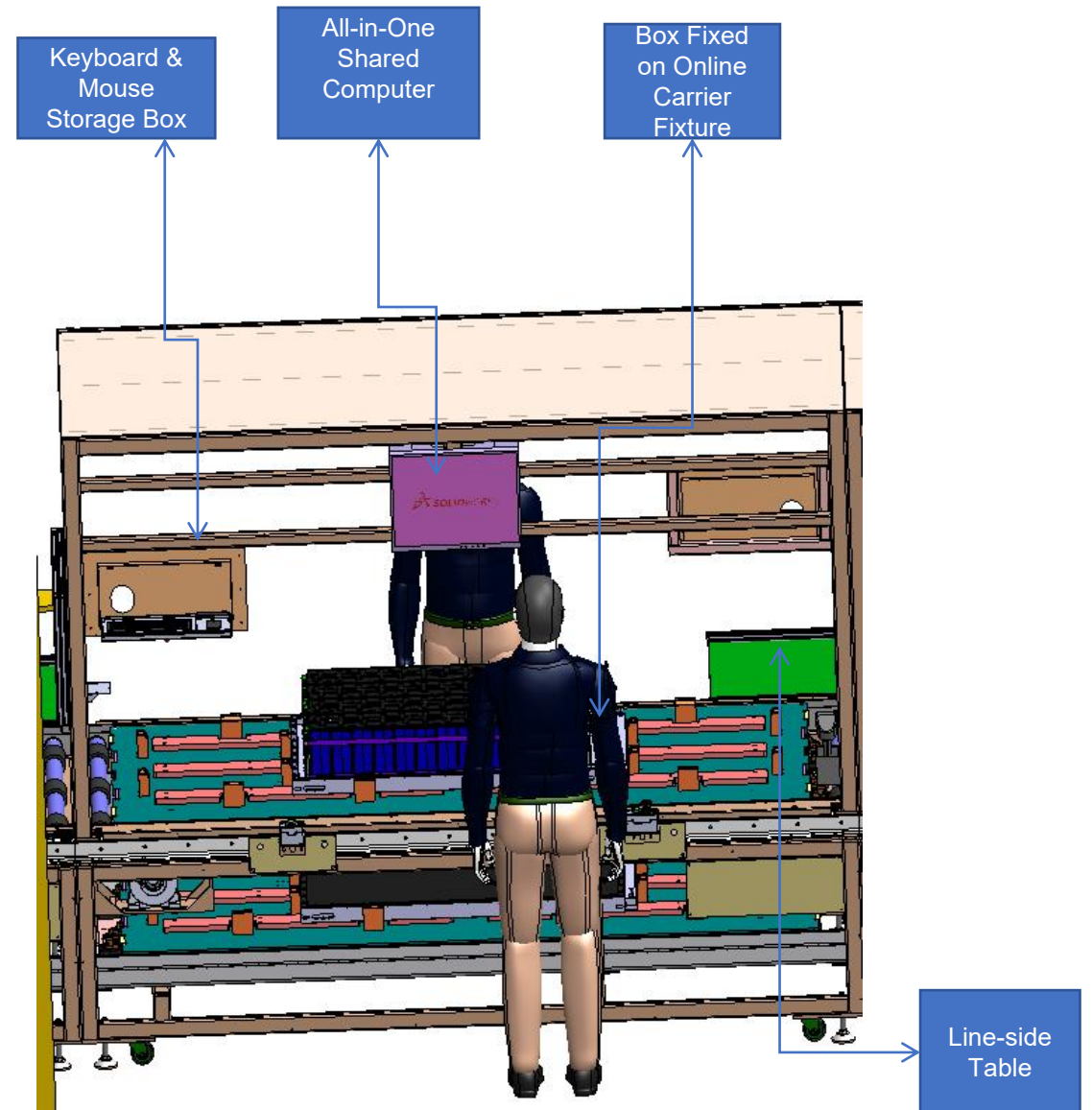


PRODUCT

BDU Busbar Installation

Function Description:

1. When the carrier tooling board reaches this station, the stopper mechanism holds the board in place. Operators manually fix and install BDU busbars between the modules and the PACK.
2. According to the box and PACK specifications, install and secure all module BDU busbars to complete the installation process.
3. After completing the above steps, operators use a handheld barcode scanner to scan the items and upload the data. Then, by pressing the start buttons on both sides of the upper roller conveyor, the carrier tooling board is moved to the next process.

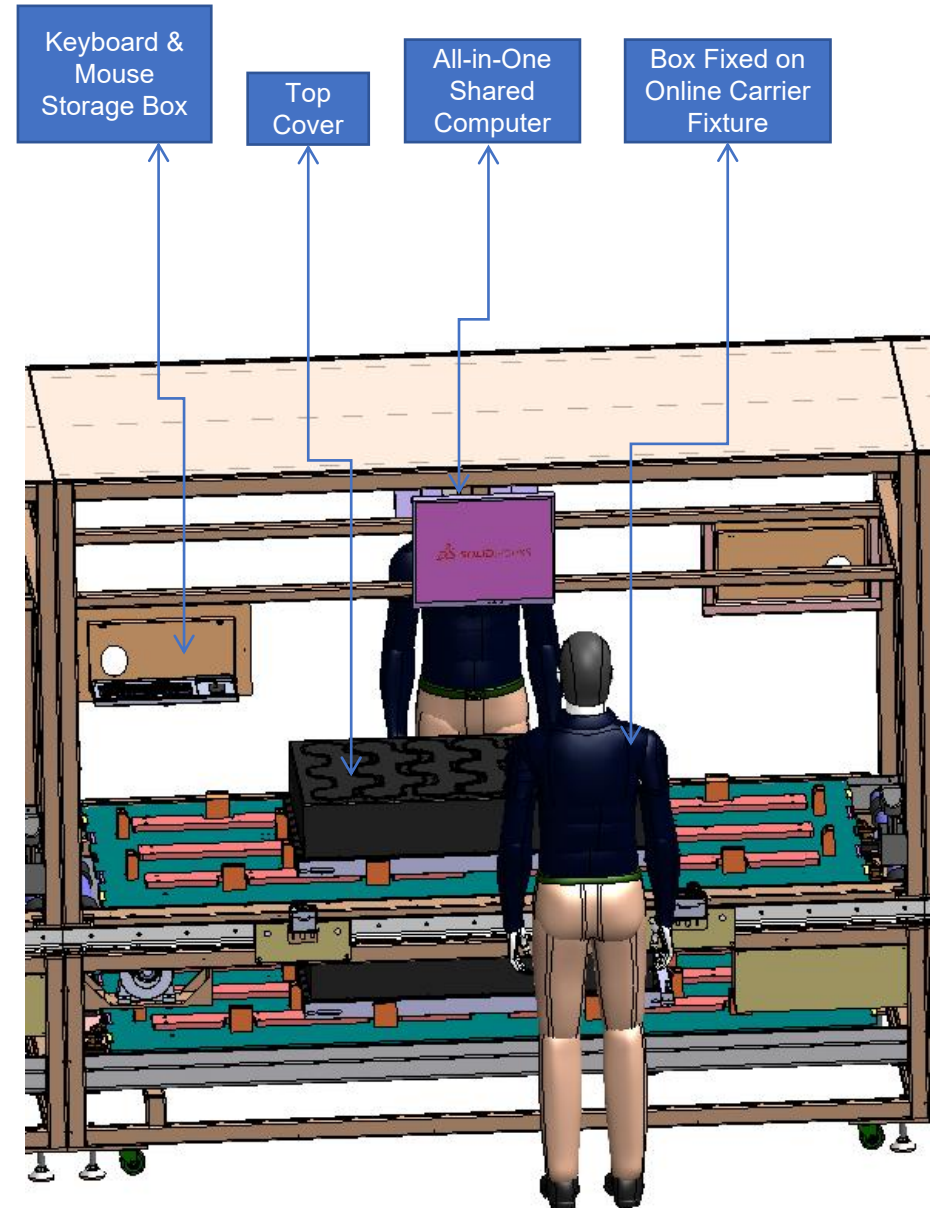


PRODUCT

Top Cover Installation

Function Description:

1. When the carrier tooling board reaches this station, the stopper mechanism holds the board in place. Operators manually install the top cover on the modules and PACK.
2. After positioning the top cover, operators secure it to the bottom box using screws.
3. After completing the above steps, operators use a handheld barcode scanner to scan the items and upload the data. Then, by pressing the start buttons on both sides of the upper roller conveyor, the carrier tooling board is moved to the next process.

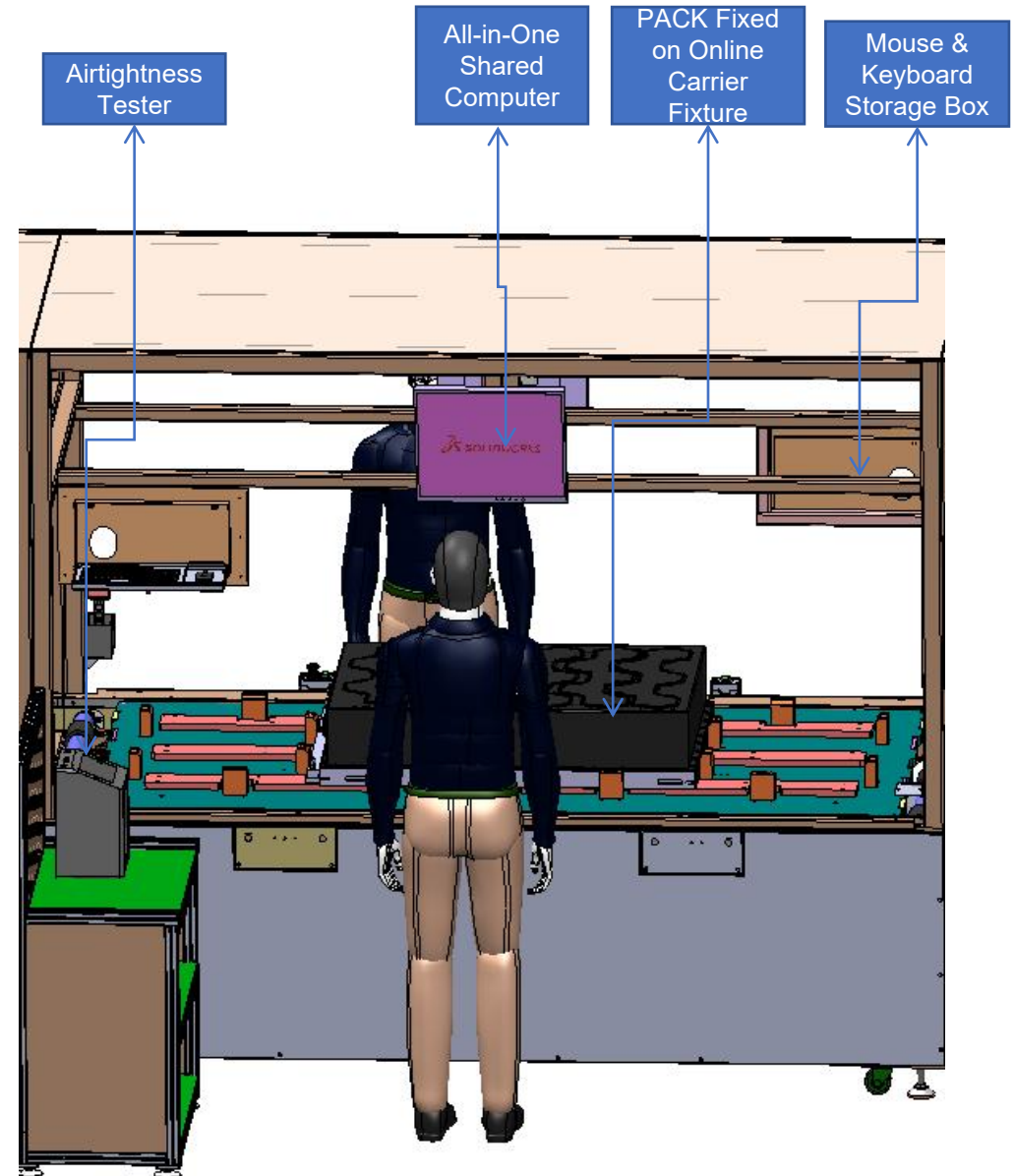


PRODUCT

PACK Airtightness Testing

Function Description:

1. When the carrier tooling board reaches this station, the stopper mechanism holds the board in place. Operators connect the airtightness test interface to the PACK and start the test.
2. After completing all test items, disconnect the test lines to complete the testing process.
3. After completing the above steps, operators use a handheld barcode scanner to scan the items and upload the data. Then, by pressing the start buttons on both sides of the upper roller conveyor, the carrier tooling board is moved to the next process.

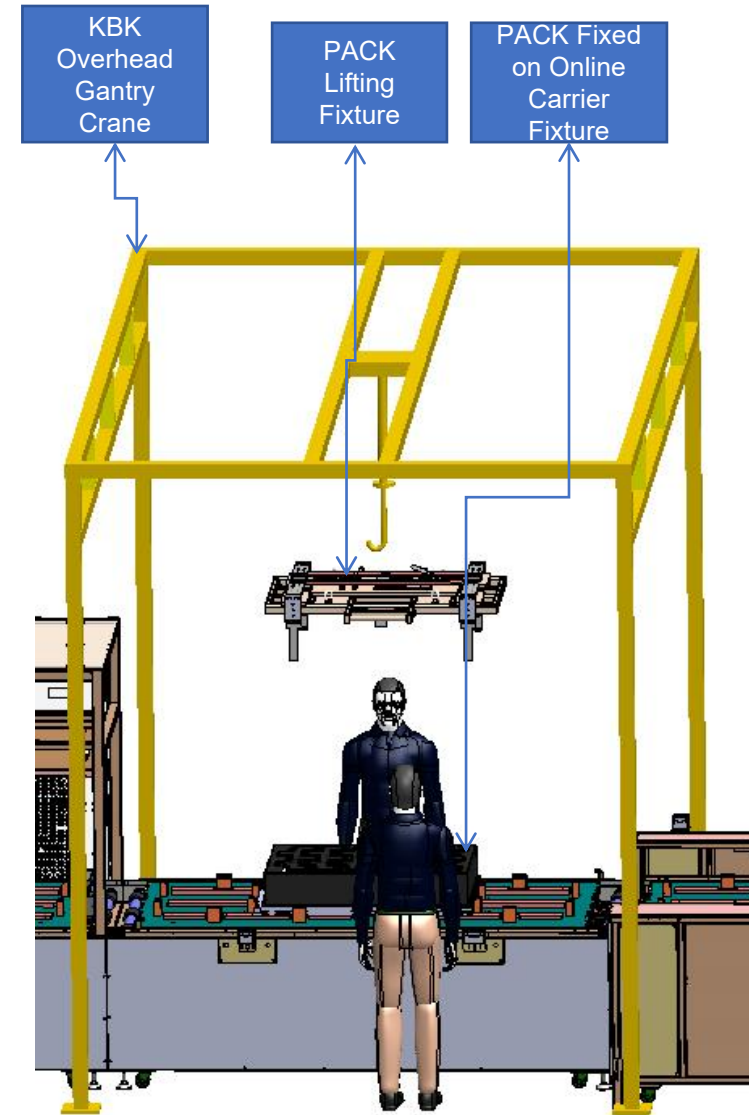


PRODUCT

PACK Unloading

Function Description:

1. According to different PACK specifications and models, the lifting fixture is custom-designed (non-standard) based on the PACK box lifting points to safely and efficiently lift the PACK from the tooling board.
2. After completing the above steps, operators press the start buttons on the upper roller conveyor to move the carrier tooling board to the next process.





Thanks

CONTACT US

www.xiaoweitop.com

Factory Address: 1st floor Factory, Shahu Avenue North and Shaxin Road, Tangxia Town, Dongguan City, Guangdong Province, China.

Office Address: Floor 4 Factory, NO.1 Julong South, Xiabei, Guicheng Street, Nanhai District, Foshan City, Guangdong, China.