

Configuration Plan for Conveyor Systems in Household & Central Air Conditioning Assembly Lines: Technical Parameters for Speed-Multiplier Chain Assembly Lines and Painting Overhead Chains

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Abstract: This article covers production lines for wall-mounted air conditioners, floor-standing air conditioners, ducted units, VRF (Variable Refrigerant Flow) systems, and central air conditioning units. It provides engineering selection parameters for speed-multiplier chain conveyors, roller conveyor lines, overhead chains, and slat chain lines, targeting indoor/outdoor unit assembly, sheet metal cabinet transfer, painting surface treatment, and high-temperature heavy-duty stations, thereby supporting precise configuration of conveying systems for air conditioning manufacturers.

1. Indoor & Outdoor Unit Assembly: Speed-Multiplier Chain Assembly Lines

Completes component assembly and electrical testing, requiring a balance of flexibility and cycle time.

- **Line Width:** Indoor unit line width: 600-800 mm; outdoor unit line width: 800-1000 mm. Frames adopt reinforced 4040 or 4545 aluminum profiles to prevent long-term vibration loosening.
- **Load Classification:** Indoor unit single-station load: 20-40 kg, use 2.5x speed chain; outdoor unit: 40-80 kg, use 3x speed reinforced chain. Reserve a 20% overload margin.
- **Test Station Integration:** Safety testing, refrigerant charging, and performance testing stations are equipped with independent stoppers and lift

tables. Lift table flatness: ≤ 0.3 mm, ensuring reliable contact of test probes.

- **Changeover Capability:** Tooling pallets adopt a modular quick-change structure with locating pins and magnetic fixation. Target changeover time: 12-15 minutes. RFID tags record model information to automatically call corresponding process programs.
- **Speed Setting:** Indoor unit line speed: 8-15 m/min; outdoor unit line speed: 6-12 m/min. Variable frequency speed regulation with start/stop acceleration/deceleration time of 2-4 seconds to prevent workpiece displacement.

2. Sheet Metal Cabinets & Outdoor Unit Transfer: Roller Conveyors

Responsible for cabinet on-ling and continuous heavy-load conveying of outdoor units.

- **Outdoor Unit Conveying Section:** Heavy-duty powered rollers, diameter 76-89 mm, wall thickness ≥ 2 mm, shaft diameter 15 mm. Single-roller load capacity: 250 kg; spacing: 120 mm.
- **Cabinet On-ling Section:** Light-duty rollers, diameter 50 mm, surface coated with rubber to prevent scratches. Guide rails at the interface with the stamping line discharge port are width-adjustable within ± 100 mm.
- **Curve Section:** Tapered roller curve conveyors with inner diameter 600 mm, outer diameter 1200 mm, and curve angle of 90° or 180° . Curve speed is set 10%-15% lower than the straight section to prevent centrifugal ejection.
- **Buffer Design:** A roller buffer line is installed between the painting line and the assembly line, with length ≥ 15 m and capacity ≥ 2 hours of production volume, balancing the cycle time differences between upstream and downstream sections.

3. Painting & Surface Treatment: Overhead Conveyor Chains

Runs through the entire process of degreasing, phosphating, painting, and drying.

- **Environmental Adaptability:** Track material in the degreasing and phosphating section: 304 stainless steel or hot-dip galvanized steel; painting section: explosion-proof motor + anti-static chain; drying section: high-temperature resistant chain + high-temp lubricant.

- **Hanger Design:** Air conditioner shell hangers adopt multi-point hooks to prevent workpiece shaking caused by hot air turbulence. Hanger spacing: 600-1000 mm, adjusted according to the projected area of the workpiece.
- **Chain Tension:** When the total line length exceeds 200 m, multiple automatic tensioning stations are installed to keep tension fluctuation $\leq 5\%$. Drive station power is calculated based on total resistance + starting inertia, with a safety factor of 1.8-2.0.
- **Cleaning & Maintenance:** Regularly clean paint buildup in the track and check lubrication status every shift. A cooling section is installed at the exit of the drying section to lower the workpiece surface temperature to below 40°C before off-loading.

4. High-Temp or Special Heavy-Duty Stations: Slat Chain Conveyor Auxiliary

Used for high-temperature or irregular-shaped part transfer such as compressor welding and condenser assembly.

- **Temperature Resistance:** Welding station ambient temperature: 60-80°C. Chain plates: heat-resistant steel 1Cr18Ni9Ti, applicable temperature $\leq 600^\circ\text{C}$. For standard stations: Q235 steel plate.
- **Load Specifications:** Compressor station single-point load: 100-200 kg; chain pitch: 63.5 mm; plate thickness: 3 mm. Condenser station width: 1200 mm, dual-chain structure.
- **Transfer Method:** Connected to the main speed-multiplier chain line via a lift-and-transfer machine. Transfer speed: 6-10 m/min, with dual confirmation by positioning blocks and sensors.
- **Protection Design:** A heat shield is installed above the chain plate at the welding station, and a welding slag collection tray below, to prevent chain jamming.

