Electric Platform Truck Technical White Paper

Electric platform trucks are core short-distance transportation equipment in industrial logistics, warehousing and transfer, workshop production, and port scenarios. Powered by electricity, they offer zero emissions, low noise, high efficiency, and safety and reliability as their core advantages, replacing traditional fuel forklifts and manual trailers to become standard equipment for modern intelligent manufacturing, green factories, and smart warehousing. With the continuous advancement of Industry 4.0, green manufacturing, and logistics automation, electric platform trucks have evolved from simple handling tools into key units of intelligent logistics systems, and their performance directly determines production efficiency, operating costs, safety levels, and environmental compliance.

This white paper systematically elaborates on the technical principles, structural composition, core performance, power systems, safety design, product classifications, selection logic, application scenarios, operation and maintenance standards, and industry trends of electric platform trucks. Combined with national and industry standards such as JB/T 3811-2013 Electric Fixed Platform Handling Vehicle and GB/T 3766-2015 Hydraulic Fluid Power — General Rules and Safety Requirements for Systems and Their Components, this document provides professional, precise, and actionable technical references for enterprises in equipment selection, system design, safe operation, and cost optimization, helping enterprises achieve efficient transfer, safe operations, cost reduction, and green production.

I. Technical Principles and Core Value

Working Principle

Electric platform trucks use storage batteries as their power source, driving wheels through controllers, motors, and transmission systems to achieve driving, steering, lifting (for lifting-type models), and braking. The controller converts battery DC power into the drive current required by the motor, regulating speed and direction; the motor converts electrical energy into mechanical energy to drive the wheels; the transmission system decelerates and increases torque to ensure the equipment has sufficient traction. The overall working process is clean, efficient, and low-noise, suitable for various indoor and outdoor industrial scenarios.

Core Value

In terms of environmental protection and energy saving, the equipment uses electric drive with zero tailpipe emissions, in compliance with green manufacturing and environmental regulations, suitable for food, pharmaceutical, precision manufacturing, and other scenarios with strict environmental requirements. In terms of low operating costs, electricity costs are significantly lower than fuel costs, and the maintenance-free or low-maintenance design (especially lithium batteries) further reduces operating expenses, with a comprehensive use cost 40%–60% lower than fuel-powered vehicles. In terms of safety and reliability, electric platform trucks adopt multiple safety protection mechanisms,including overload protection, emergency stop, anti-tip design, and anti-rollback braking.

low failure rate and long service life, effectively reducing operational safety risks. In terms of flexible adaptability, the equipment has a small footprint and small turning radius, enabling operation in confined spaces. Load capacity covers 1 to 100 tons, and platform dimensions can be customized to adapt to various industrial conditions. With intelligent upgrades, electric platform trucks now support remote control, Automated Guided Vehicle (AGV) functionality, data monitoring, and intelligent dispatching, seamlessly integrating into industrial internet and intelligent manufacturing systems to support enterprises in upgrading logistics automation.

II. Structural Composition and Core Components

Overall Structure

The electric platform truck consists of eight core parts: chassis frame, carrying platform, power system, transmission system, steering system, braking system, electrical control system, and safety protection system. The overall structure is compact, high-strength, and stable, with all components working in coordination to ensure efficient, safe, and stable equipment operation.

Core Component Analysis

The **chassis frame** serves as the fundamental support of the equipment. It is welded from high-strength carbon steel or alloy steel, providing excellent rigidity, load-bearing capacity, deformation resistance, and impact resistance. The chassis design

features a low center of gravity, effectively improving operational stability and adapting to heavy loads and complex road surfaces.

The **carrying platform** is the core component for placing cargo. Material selection depends on the application: high-strength steel plate, anti-slip tread plate, or stainless steel (for food and pharmaceutical industries). Standard dimensions include 1,500×1,000 mm, 2,000×1,200 mm, and 3,000×1,500 mm, with custom sizes available. Edge guard rails and load-securing devices can be configured as needed to ensure cargo safety.

The **power system** consists of batteries and motors. Battery types include lead-acid, maintenance-free lead-acid, and lithium batteries (lithium iron phosphate / ternary lithium). Lead-acid batteries have lower cost and are suitable for fixed-shift operations; lithium batteries have higher energy density, longer life, and faster charging, and are the mainstream choice. Voltage is typically 24V / 36V / 48V / 72V / 80V / 96V, and capacity is selected based on load and range requirements.

Motor types include DC motors, AC motors, and permanent magnet synchronous motors (PMSM). Among these, PMSM features high efficiency, energy saving, and low noise, and is currently the mainstream selection. Transmission components include gears, chains, drive shafts, and reduction gearboxes, whose core function is speed reduction and torque increase to ensure smooth equipment operation.

The **steering system** is divided into manual steering and electric steering. Manual steering is operated via a steering wheel, joystick, or handle, suitable for light to medium load equipment. Electric steering is motor-driven with power-assisted functionality, providing light and precise steering, suitable for heavy-load equipment. Turning radius varies by model: narrow-body models ≤1.5 m, standard models ≤2.5 m, and heavy-load models ≤4 m, flexibly adapting to different spatial scenarios.

The braking system ensures safe operation and is divided into service braking and parking braking. Service braking includes electromagnetic, hydraulic, and mechanical braking, providing smooth, reliable, and responsive performance. Parking braking includes manual and electromagnetic types, enabling slope braking to prevent rollback. Under full-load, braking distance is ≤3 m; under no-load, ≤2 m.

The electrical control system is the "brain" of the equipment, consisting of a controller, operating components, and protection devices. The controller supports DC and AC types, enabling variable-frequency speed regulation and stepless speed

variation, with overload, overcurrent, and undervoltage protection. Operating modes include handle, button, remote control, touchscreen, and remote operation. Protection devices implement automatic power-off in abnormal conditions to safeguard equipment and personnel safety.

The safety protection system includes warning lights, buzzers, emergency stop buttons, safety bumpers, overload alarms, and anti-tip mechanisms. Some models are equipped with cameras, LiDAR, obstacle avoidance sensors, and intelligent safety systems to ensure safe operation in complex environments. Safety protection design complies with national standards, effectively preventing safety accidents.

III. Core Performance Indicators

Load capacity is the primary performance indicator. Depending on the model, carrying capacity ranges from 0.5 tons (light small models) to 100 tons (heavy large models). Load capacity is closely related to the chassis frame material, structural design, transmission system, and power system. Enterprises should select appropriate models based on actual load requirements to avoid overloading, which affects safety and service life.

Maximum speed varies by model and load condition. General models have a full-load maximum speed of 6–10 km/h; heavy-load models have a full-load maximum speed of 3–6 km/h; AGV models have an operating speed of 1–3 km/h. Speed control adopts stepless speed regulation, which can be adjusted according to actual working conditions to balance efficiency and safety.

The driving range varies depending on the battery type: lead-acid batteries provide a full-load range of 30–50 km, while lithium batteries provide 80–120 km. Charging can be conventional or fast charging, selectable based on usage requirements.

In terms of climbing ability, standard models can climb 15%–20% grades under full load, and heavy-load models can climb 10%–15%. Parking slope braking capacity is ≥20%, adaptable to mild slopes in factory environments. Turning radius varies by model: narrow-body ≤1.5 m, standard ≤2.5 m, and heavy-load ≤4 m.

In terms of braking performance, full-load braking distance is ≤3 m, parking brake holds stably on slopes ≥20%, and brake response time is ≤0.5 s, ensuring the equipment

can stop quickly in emergencies. In terms of noise control, operating noise is ≤65 dB and idle noise is≤55 dB, suitable for indoor and precision manufacturing environments.

Regarding service life, overall machine service life is ≥8,000–15,000 hours. Lead-acid batteries have a cycle life of 300–500 cycles; lithium batteries have 1,000–2,000 cycles. Motor service life is ≥20,000 hours, making the equipment highly reliable and effectively reducing operation and maintenance costs.

IV. Product Classification and Application Scenarios

The fixed platform truck (non-lifting) is the most basic model. The platform height is fixed and the structure is simple, with high load capacity and reliability. It is suitable for flat ground transfer scenarios, widely used in workshops, warehouses, and logistics centers, and is the most cost-effective option.

The scissor-lift platform truck is equipped with a hydraulic scissor-lift mechanism. The platform can be raised and lowered to achieve height adjustment, making loading, unloading, and docking of cargo at different heights convenient. It is suitable for warehousing, assembly lines, and dock operations, significantly improving work efficiency.

The narrow-body platform truck features a compact body design with a small turning radius, enabling flexible operation in confined spaces such as narrow corridors and small workshops. It is suitable for scenarios with strict space requirements while ensuring adequate load capacity.

The heavy-duty platform truck is designed for heavy loads of 20 tons and above, featuring a reinforced frame, dual-axle multi-wheel design, and high-power motor. It is suitable for heavy industrial scenarios such as metallurgy, shipbuilding, ports, and large equipment manufacturing.

The AGV intelligent platform truck integrates an automatic navigation system, enabling autonomous path planning, obstacle avoidance, and intelligent dispatching. It is suitable for unmanned workshops and smart logistics scenarios, supporting 24-hour uninterrupted automated operations.

The stainless steel platform truck adopts stainless steel material for the platform and frame. It is easy to clean, corrosion-resistant, and meets food and pharmaceutical

industry hygiene standards. Zero emissions and low noise make it suitable for clean environments.

The **explosion-proof platform truck** adopts explosion-proof electrical components and anti-static design, suitable for hazardous environments with flammable and explosive gases or dust, such as chemical plants, oil depots, and coal mines, ensuring safe operations.

Application Scenarios

Automotive manufacturing plants mainly use electric platform trucks for transferring large components such as engines, gearboxes, and body panels between assembly lines, adapting to medium and heavy-load (5–30 tons) standard and heavy-duty models. They are characterized by high-frequency operations, stable routes, and high precision requirements. AGV models are used to replace manual transfer, enabling precise docking with assembly lines.

Warehousing and logistics centers need to handle goods of various specifications, adapting to light and medium-load (0.5–10 tons) fixed platform and scissor-lift models. Key requirements include high operational flexibility, wide coverage, sufficient range, fast charging support, and adaptability to flat, large-area warehouse environments.

Electronic and precision manufacturing facilities have strict requirements for environmental cleanliness and operational precision, adapting to light-load (0.5–3 tons) small and narrow-body models. These are zero-emission, ultra-low noise, and can be equipped with anti-static devices to prevent static damage to electronic components, suitable for clean workshops and electronics assembly lines.

In human-machine collaboration workshops and intelligent logistics scenarios, electric platform trucks help enterprises achieve upgrades in logistics automation and intelligence.

V. Selection Logic and Adaptation Principles

The selection of electric platform trucks requires comprehensive consideration of load requirements, operating conditions, space size, environmental requirements, and cost budget. The principle of "precise adaptation, economic rationality, safety and

reliability, and high efficiency and energy saving" should be followed to avoid low utilization, high operating costs, and safety hazards caused by selection errors.

Load-based selection is the core principle. For light-load scenarios (0.5–3 tons), narrow-body, small, and lifting-type models are recommended, with lithium batteries preferred. For medium-load scenarios (3–20 tons), standard and fixed platform models are recommended; lead-acid or lithium batteries selected based on usage frequency and range requirements. For heavy-load scenarios (over 20 tons), heavy-duty, dual-axle, and reinforced-chassis models are recommended with lead-acid batteries.

Condition-based selection must consider the operating surface, environment, and requirements. For flat surfaces in workshops and warehouses, standard or fixed platform models are selected. For narrow corridors, narrow-body and small models are selected. For outdoor and complex road surfaces, models with reinforced chassis and anti-slip tires are selected. For the food and pharmaceutical

industries, stainless steel platform trucks meeting hygiene standards are selected. For hazardous environments, explosion-proof models must be selected to meet safety requirements.

Environment-based selection adapts to different workplace requirements. Indoor flat environments select standard models; cold storage environments require low-temperature battery protection and anti-freeze design; outdoor environments require weatherproof protection and anti-slip tire design; food and pharmaceutical clean environments require stainless steel and zero-emission models; hazardous chemical environments require explosion-proof certified models.

Battery selection advice: For fixed-shift operations with regular charging, lead-acid batteries are recommended (lower cost); for multi-shift operations requiring fast charging and long range, lithium batteries are recommended (comprehensive cost advantage within 3–5 years); for scenarios with strict requirements on weight and space, lithium batteries are preferred.

VI. Safety Design and Compliance Standards

Safety Protection Mechanisms

Electric platform trucks integrate multiple safety protection systems. Overload protection detects load status in real time and automatically limits speed or alarms when overloaded. The emergency stop system is equipped with emergency stop buttons at easily accessible locations; pressing the button immediately cuts off the power drive. Anti-tip design uses a low-center-of-gravity chassis structure combined with a four-wheel stable support to prevent tipping. Anti-rollback braking activates the parking brake automatically when stopped on a slope to prevent sliding. The speed limit protection system limits maximum speed based on load and terrain to ensure safe operation.

Active safety features include obstacle avoidance sensors (ultrasonic or LiDAR), warning lights and buzzers, rearview cameras, and safety bumpers. Some models support collision warning and automatic braking to significantly improve safety in complex environments.

VII. Installation, Commissioning, and Operation & Maintenance

Installation Phase

Electric platform trucks should be transported and unpacked carefully to avoid damage. After unpacking, check whether all components are complete and undamaged according to the packing list; verify that the equipment model and specifications match the order requirements. Installation location should be level and firm, with sufficient space reserved for operation and maintenance passages. The equipment should be placed stably with no shaking; check whether all components are intact, connections are secure, electrical lines are properly routed, and the battery is properly installed. For lifting-type platform trucks, check whether the scissor mechanism and hydraulic system are functioning properly with no leakage or jamming. After installation, clear the site of debris to ensure a safe working area.

Commissioning Phase

First conduct a no-load trial run to verify normal driving, steering, and braking functions, and ensure the motor and controller operate smoothly without abnormal noise

or electrical leakage. For lifting-type platform trucks, test the lifting function to ensure smooth lifting, accurate positioning, with no jamming or leakage. After successful no-load trial operation, conduct a full-load commissioning to test load capacity, driving stability, and braking performance. During commissioning, adjust parameters timely, troubleshoot abnormal issues, and ensure the equipment reaches its optimal operating state.

Daily Operation and Maintenance

Establish a comprehensive maintenance log to record equipment operating status, maintenance content, and fault conditions. Before daily operations, check the battery charge level, tire pressure, braking system, steering system, and safety protection devices. After operations, clean the platform and equipment surface, inspect all component connections, and promptly tighten any loose parts. Regularly check the battery status: lead-acid batteries require periodic addition of distilled water; lithium batteries should avoid overcharging and over-discharging, with regular charger calibration. Regularly check the hydraulic system, replenish hydraulic oil, and investigate leakage issues. Regularly check the motor, controller, and electrical

systems, clean dust and debris from electrical components, check for aging and damaged wiring, and replace worn components in a timely manner. Keep maintenance records. Establish periodic maintenance plans (monthly / quarterly / annual), conduct comprehensive inspections of mechanical structures, electrical systems, hydraulic systems, and safety protection devices, and contact the manufacturer's technical team for major repairs or replacements.

Fault Handling

Common faults include: insufficient power (check battery capacity and charging status), abnormal noise (check drive, transmission, and wheel components), brake failure (check brake system, fluid level, and friction pads), steering difficulty (check steering motor and hydraulic system), and lifting failure (check hydraulic pump, oil level, and solenoid valve). When a fault is encountered, stop operation immediately, investigate the cause, and resolve it. Do not operate the equipment forcibly when a fault occurs to prevent escalation and safety accidents.

Application Scenario Deep Dive

Automotive manufacturing scenarios require medium to heavy-load (5–30 tons) standard and heavy-duty platform trucks. AGV models are used for automatic transfer between assembly lines, with precise docking and 24-hour uninterrupted operation, significantly improving production efficiency and reducing labor intensity.

Warehousing and logistics centers require light to medium-load (0.5–10 tons) fixed platform and scissor-lift models with high flexibility and fast charging support, adapting to large-area warehouse high-frequency transfer operations.

Electronic and precision manufacturing requires light-load (0.5–3 tons) small, narrow-body models with zero emissions, ultra-low noise, and optional anti-static devices, suitable for clean workshop and electronics assembly line environments.

In heavy industrial scenarios such as metallurgy, shipbuilding, and ports, heavy-load (20–100 tons) heavy-duty platform trucks with reinforced frames, dual-axle, and multi-wheel designs are used. They have strong load capacity and good stability, capable of traveling smoothly on complex road surfaces to ensure safe transfer of heavy cargo and improve operational efficiency.

The food and pharmaceutical industry has strict environmental and hygiene requirements, adapting to light-load (0.5–3 tons) small stainless steel platform trucks. Zero-emission, low-noise, and pollution-free with stainless steel platforms that are easy to clean and corrosion-resistant, enabling safe transfer of food and pharmaceutical products in compliance with hygiene standards.

In **smart factory scenarios**, integrated into intelligent logistics systems, intelligent/AGV platform trucks achieve automated transfer and intelligent dispatching of raw materials, semi-finished products, and finished goods without manual operation. They can be linked with production lines and warehousing systems to improve production logistics automation, suitable for intelligent manufacturing and unmanned workshop scenarios.

VIII. Technology Development Trends

High efficiency and energy conservation is the core development trend. As battery and motor technologies advance, lithium batteries will gradually replace lead-acid batteries, with further improvements in energy density, extending driving range to over

150 km and reducing charging time to within one hour. The widespread adoption of PMSM and high-efficiency controllers will further improve energy efficiency and reduce consumption.Intelligent and automated levels continue to improve. AGV, unattended operation, intelligent dispatching,remote monitoring, and predictive maintenance will become standard configurations. The deep integration of IoT, big data, and AI technologies will enable electric platform trucks to achieve autonomous navigation, intelligent scheduling, fault prediction, and remote diagnostics, significantly reducing manual intervention and improving overall logistics system efficiency.

Lightweight and customization will be further strengthened. The application of new materials (high-strength alloy steel, carbon fiber composite materials) will reduce equipment weight while maintaining load capacity, improving maneuverability and energy efficiency. Modular design and customized production will better adapt to diversified industry needs, meeting users' personalized requirements for platform size, battery capacity, control methods, and functional configurations.

Safety standards continue to upgrade. With the improvement of industrial safety regulations, electric platform trucks will incorporate more advanced active safety technologies: multi-sensor fusion obstacle avoidance, automatic emergency braking, electronic stability control, and driver fatigue detection. Safety performance will be significantly improved to adapt to more complex operating environments.

Green environmental compliance will become a hard requirement. Under the dual-carbon policy and green manufacturing requirements, zero-emission electric platform trucks will completely replace fuel-powered vehicles in more scenarios. Renewable energy charging (solar charging stations), energy recovery braking, and battery recycling systems will further reduce the full life-cycle carbon footprint of equipment, eliminating energy waste and promoting green production and green operations.

IX. Conclusion

As core short-distance transportation equipment for industrial logistics and intelligent manufacturing, the performance of electric platform trucks directly affects production efficiency, operating costs, safety levels, and environmental compliance. They are a key support for advancing green factories and intelligent logistics. As Industry 4.0, green manufacturing, and logistics automation continue to advance, electric platform trucks will continue to develop toward high efficiency and energy conservation, intelligent

automation, lightweight customization, and safety and reliability, adapting to more industry scenarios and providing strong support for enterprises to reduce costs, increase efficiency, and achieve green production.

This white paper systematically elaborates on the technical principles, structural composition, performance indicators, selection logic, operation and maintenance standards, and industry applications of electric platform trucks. Combined with the latest national standards and industry trends, it provides enterprises with comprehensive technical references throughout the entire process.