JXK-21U Voltage Transducer

I. Product Definition

The Qidian JXK-21U AC/DC Voltage Transmitter is an industrial-grade, high-precision electrical signal conversion and isolation device developed by Anhui Qidian Automation. Featuring a blue housing and a standard 35mm DIN rail mounting design, it is primarily intended for applications in industrial automation, power monitoring, and electrical equipment operation and maintenance. It supports the measurement, acquisition, isolation, conversion, and transmission of both AC and DC voltage signals.

Its core functions are comprehensive and precise, as detailed below:

1. AC/DC Voltage Measurement: Capable of directly measuring a wide range of AC/DC voltage signals from 0–1000 V AC and 0–1500 V DC, covering the vast majority of low- and medium-voltage monitoring requirements in industrial settings.
2. Signal Isolation Protection: Utilizes three-terminal isolation (input – output – power supply) technology with an isolation withstand voltage of 2.5 kV at 50 Hz. 1 min, completely severing the electrical connection between high-voltage circuits and low-voltage control systems to protect downstream equipment such as PLCs, DCSs, and instruments from high-voltage breakdown and surge impacts.
3. Standard Signal Conversion: Linearly converts non-standard, high-amplitude AC/DC voltages into industrial standard signals:

Analog Output: 4–20 mA, 0–20 mA, 0–5 V, 0–10 V, 1–5 V;

Digital Output: RS485 (Modbus-RTU protocol), compatible with digital data acquisition and remote transmission.

4. Signal Conditioning and Interference Suppression: Built-in filtering, amplification, linear calibration, and temperature compensation circuits eliminate electromagnetic interference and harmonic noise from industrial environments, ensuring stable, distortion-free output signals.
5. Stable Performance in Industrial Environments: Supports 24 VDC industrial standard power supply, with an operating temperature range of -20°C to +70°C. Features low power consumption and low temperature drift, making it suitable for complex industrial environments such as metallurgy, power generation, chemical processing, and rail transportation.
6. Integrated Design: Combines measurement, isolation, conversion, and transmission into a single unit, eliminating the need for external signal conditioning circuits. This simplifies electrical circuit design and reduces system wiring and commissioning costs. Anhui Qidian Automation Technology Co., Ltd.

II. Operating Principle

The JXK-21U AC/DC Voltage Transmitter employs a closed-loop workflow of “sampling isolation → signal conditioning → linear conversion → isolated output”, with core sensing and processing mechanisms tailored specifically for AC and DC voltages, respectively. A simplified explanation is provided below:

1. Step 1: Signal Sampling and Electrical Isolation (Core Protection Stage)

DC Voltage Input: A high-precision resistive voltage divider network reduces high-amplitude DC voltages (e.g., 0–1500 V DC) by a fixed ratio, converting them into low-voltage, small-signal inputs (e.g., 0–5 V DC) that can be processed by the internal circuitry. This process also provides preliminary isolation between the input side and the internal circuitry.

AC Voltage Input: A combination of a current transformer (CT) and a precision voltage divider is employed. Utilizing the principle of electromagnetic induction, high-voltage AC signals (e.g., 0–1000 V AC) are linearly stepped down to low-voltage AC signals. This simultaneously achieves electrical isolation between high-voltage and low-voltage circuits, eliminating the risk of high-voltage conduction.

Isolation Objective: Completely separate the primary side (high-voltage test signal) from the secondary side (control signal) to prevent common-mode interference and ground potential differences from damaging downstream equipment.

2. Step 2: Signal Conditioning and Precise Processing

Filtering and Noise Reduction: An RC filter circuit removes high-frequency harmonics and electromagnetic interference (such as noise generated by motor start/stop cycles or variable frequency drives) from the signal.

AC Signal Conversion: AC signals pass through a root mean square (RMS) conversion circuit or chip, which converts non-sinusoidal and distorted waveforms into equivalent DC RMS values, thereby preventing measurement errors caused by waveform distortion.

Amplification and Calibration: Operational amplifiers linearly amplify weak signals. Combined with temperature compensation circuits, they offset drift caused by changes in ambient temperature, ensuring measurement accuracy across the entire temperature range (typical accuracy: 0.5%).

3. Step 3: Linear Conversion of Standard Signals

Analog Output: Through V/I (voltage/current) and V/V (voltage/voltage) conversion circuits, the processed signal is converted according to the linear relationship “Input voltage = 0 → Output signal lower limit (e.g., 4 mA/0 V), Input voltage = Full scale → Output signal upper limit (e.g., 20 mA/10 V)”** to produce a standard analog signal.

Digital Output (RS485 Type): An integrated ADC (analog-to-digital converter) and MCU (microcontroller) process the analog signal into a digital format. This digital signal is encoded using the Modbus-RTU protocol and transmitted over the RS485 bus for remote data acquisition, supporting multi-node networked data collection.

4. Step 4: Secondary Isolation Output

The output terminal achieves secondary isolation via optocouplers or magnetic isolation modules. The final standard output signal is completely independent of the input side, further enhancing anti-interference capability and ensuring signal transmission over long distances (up to 1000 meters) without attenuation or distortion.

III. Core Value

3.1 Core Value Positioning

The JXK-21U serves as a “safety translator and stable transmitter” for industrial voltage signals. Its core value lies in **“high-voltage safety, standardization of non-standard solutions, interference shielding, long-distance transmission, and system integration”**, providing precise, reliable, and safe voltage signal support for industrial electrical monitoring and automation control. Anhui Qidian Automation Technology Co., Ltd.

3.2 Core Customer Challenges Addressed

1. Eliminating Safety Hazards in High-Voltage Measurement

Direct connection of high-voltage signals (ranging from hundreds to thousands of volts) from industrial sites to low-voltage equipment such as PLCs and instruments can easily lead to equipment breakdown, short circuits, and electric shock to personnel. The JXK-21U employs 2.5kV three-terminal isolation to achieve “high-voltage measurement and low-voltage transmission,” completely eliminating the safety risks associated with high-voltage intrusion into low-voltage systems.

Resolving the Issue of Non-Standard Signals Being Incompatible with Control Systems

Most industrial controllers (PLCs/DCS) and display instruments only recognize standard signals such as 4–20 mA, 0–10 V, and RS485. The JXK-21U linearly converts a wide range of non-standard AC and DC voltages into standard signals, offering plug-and-play functionality without requiring modifications to the existing control system.

3. Resolves signal interference and distortion issues in industrial environments

Electromagnetic interference generated by motors, variable frequency drives, and high-power equipment can cause voltage signal distortion and significant measurement errors. The product features built-in multi-stage filtering and isolation circuits to ensure signal stability in complex electromagnetic environments, with a measurement error of ≤0.5%.

4. Solving the Problem of Signal Attenuation Over Long Distances

Direct transmission of raw voltage signals results in attenuation and errors beyond 10 meters; 4–20 mA current signals and RS485 digital signals can be transmitted without attenuation over distances ranging from hundreds of meters to kilometers, making them suitable for distributed monitoring and remote centralized data acquisition scenarios.

5. Solving the Problems of Complex System Wiring and High Costs

Replacing the fragmented solution of “voltage-dividing resistors + isolators + signal amplifiers,” this device integrates all functions into a single unit. A single module handles the entire process, reducing connection points and minimizing wiring and debugging time, thereby enhancing system reliability.

6. Resolves the issue of redundant selection in AC/DC scenarios

Traditional transmitters are divided into dedicated AC and DC types, requiring duplicate procurement and wiring when used interchangeably

in the field; the JXK-21U is universal for both AC and DC, covering both signal scenarios with a single product, reducing spare parts inventory, and simplifying selection and maintenance.

3.3 Key Benefits for Customers

1. Safety Assurance: Dual protection for both equipment operation and personnel safety, eliminating high-voltage accidents.

2. Precision and Reliability: High measurement accuracy, minimal temperature drift, and strong stability ensure reliable and valid data acquisition, supporting precise control and operations and maintenance.

3. Cost Reduction: Reduces costs associated with component procurement, wiring, commissioning, and maintenance, while lowering spare parts management costs.

4. Strong Adaptability: Compatible with AC and DC signals, multiple output types, and a wide temperature range, suitable for all scenarios including power, metallurgy, chemical, rail transit, and new energy sectors—Anhui Qidian Automation Technology Co., Ltd.

5. Digital Upgrade: RS485 output supports integration with industrial IoT and SCADA systems, enabling remote monitoring, storage, and analysis of voltage data to facilitate industrial digital transformation.

6. Convenient and User-Friendly: DIN-rail mounting and plug-in terminals ensure efficient installation and maintenance; beginners can get started quickly with no complex operational barriers.

IV: Key Specifications Table

4.1 Basic Electrical Specifications

Product Model: JXK-21U (AC/DC Universal Type)

Input Signal Type: Universal (AC/DC)

AC Input Range: AC 0–10 V/20 V/50 V/100 V/200 V/300 V/500 V/800 V/1000 V (Customizable)

DC Input Range: DC 0–15 V/30 V/50 V/100 V/200 V/300 V/500 V/800 V/1000 V/1500 V (Customizable)

Input Impedance: ≥1 MΩ (High-impedance design to minimize impact on the circuit under test)

Accuracy Class: Class 0.5 (Typical: ±0.5% F.S.)

Linearity: ≤0.5% F.S.

Temperature Drift: ≤500 ppm/°C (≤0.05%/°C F.S.)

Response Time: ≤200 ms

Bandwidth: AC: 45–65 Hz (fundamental frequency); DC: DC

Output Signal Type: Analog: 4–20 mA, 0–20 mA, 0–5 V, 0–10 V, 1–5 V; Digital: RS485 (Modbus-RTU protocol)

Output Load Capacity: Current output: ≤500 Ω; Voltage output: ≥10 kΩ

4.2 Isolation Performance Parameters

Isolation Configuration: Three-terminal full isolation (input-output-power supply)

Isolation Withstand Voltage: 2.5 kV / 50 Hz, sustained for 1 minute (no breakdown, no arcing)

Insulation Resistance: ≥100 MΩ (tested at 500 V DC)

Common-Mode Rejection Ratio: ≥120 dB (50/60 Hz)

Immunity: Complies with industrial-grade EMC standards; resistant to surges, static electricity, and RF interference

4.3 Power Supply & Power Consumption Parameters

Auxiliary Power Supply: Standard 24 V DC (±10%, ripple ≤5%)

Full-Load Power Consumption: ≤0.5 W (typical operating current ≤20 mA)

Power Protection: Features reverse polarity protection, overvoltage protection, and overcurrent protection

Power Distribution Output: No external power distribution output (Passive signal output)

4.4, Environmental Adaptation Parameters

Operating Temperature: -20°C to +70°C

Storage Temperature: -40°C to +85°C

Operating Humidity: 5% RH to 95% RH (non-condensing)

Storage Humidity: 5% RH to 95% RH (non-condensing)

Protection Rating: Enclosure IP30 (protection against accidental contact, suitable for cabinet installation)

Explosion-proof rating: Non-explosion-proof; can be used with Qidian QD-6000 series safety barriers for explosion-hazardous environments

Mean Time Between Failures (MTBF): ≥50,000 hours (industrial-grade standard)

4.5, Physical Parameters

Mounting method: Standard 35 mm DIN rail snap-on mounting

Dimensions: Length 90 mm × Width 35.5 mm × Height 50 mm (excluding terminals)

Weight: Approx. 120 g

Housing Material: Blue flame-retardant ABS engineering plastic (UL94 V-0 rating)

Terminal Type: Green pluggable spring-loaded terminals, compatible with 0.5–2.5 mm² wires

Indicator Definitions: PWR (Green): Power indicator; steady light indicates normal power supply; ALM (Red): Fault/Alarm indicator; steady or flashing light indicates input overvoltage, output overload, or module malfunction

Physical Features: Blue one-piece housing; parameter label on the front; DIN rail clips on the sides; input, output, and power terminals distributed on the left and right sides

V. Application-Based Selection Guide

Core Objective: To address users' pain points of "not knowing how to choose" or "selecting the wrong model," this guide leverages the features of the Qidian JXK-21U product to provide precise selection recommendations based on specific scenarios and requirements. It balances practicality and usability while helping users avoid common pitfalls, covering both standard and customized needs.

5.1 Key Selection Criteria (Essential Reading: Avoid Blind Selection)

Selection must follow a "priority order": Signal Type → Number of Channels → Power Supply Method → Explosion-Proof Requirements → Installation Environment. Cross-reference these with the JXK-21U's core specifications to ensure each criterion aligns with on-site conditions. Detailed analysis follows:

1. Signal Type (Primary Criterion: Determines Product Compatibility)

Key Determinant: Clearly identify whether the measured voltage on-site is AC, DC, or a mixed AC/DC system, as this directly determines whether the JXK-21U (a universal AC/DC model) is suitable.

- Pure AC scenarios (e.g., machine tools in workshops, three-phase power lines): The JXK-21U can be selected without the need for a dedicated AC transmitter; it supports the full AC 0–1000 V range (customizable);
- Pure DC scenarios (e.g., new energy batteries, energy storage systems, DC distribution cabinets): The JXK-21U can be selected, supporting the full DC 0–1500 V range (customizable), eliminating the need to purchase a separate DC transmitter;
- Mixed AC/DC scenarios (e.g., workshops with both AC power supply and DC equipment): Prioritize the JXK-21U, as a single product covers both signal types, reducing spare parts inventory and wiring costs, and eliminating the need for separate model selection.

2. Number of Channels (to meet signal acquisition requirements)

The standard JXK-21U model features a "1-in-1-out" configuration (1 input signal, 1 standard output signal). You can select the appropriate channel configuration based on on-site acquisition needs. Core application scenarios:

- 1-in-1-out (Standard Model): Single-channel voltage acquisition, such as monitoring the voltage of a single distribution cabinet or a single piece of equipment, suitable for the vast majority of standard industrial scenarios;
- 1-in-2-out (Custom Model): Single input, dual outputs (e.g., one 4-20mA output connected to a PLC, one RS485 output connected to an IoT platform), suitable for scenarios requiring both "local control" and "remote monitoring";
- Multi-input/Multi-output (Custom Model): Multi-channel voltage acquisition (e.g., multiple distribution cabinets or devices) and multi-channel output, suitable for distributed centralized monitoring scenarios (e.g., workshop central control, large power plants).

3. Power Supply Method (Matching On-site Power Conditions)

The JXK-21U standard power supply is DC 24V (±10%, ripple ≤5%), compatible with the 24V DC power supply commonly used in industrial environments, eliminating the need for additional modifications to the power circuit. Key considerations:

- Standard industrial scenarios (e.g., factory workshops, power plant control rooms): Directly select the standard model (DC 24V power supply) to align with the power supply of PLC and DCS systems, simplifying wiring;
- Special power supply scenarios (e.g., where only AC 220V power is available): A custom AC 220V power supply version can be selected to avoid the need for additional power converters, thereby reducing system complexity;
- Low-power consumption scenarios (e.g., outdoor photovoltaic power stations, battery-powered equipment): A low-power consumption version (full-load power consumption ≤ 0.3W) can be customized to reduce energy consumption and accommodate long-term unattended operation.

4. Explosion-Proof Requirements (Suitable for Hazardous Environments)

The JXK-21U standard model is a non-explosion-proof version with an IP30 enclosure rating, suitable for standard indoor cabinet installation. Special adaptations are required for explosion-proof environments:
- No explosion-proof requirements (e.g., general workshops, office building power distribution): The standard model is sufficient and meets standard safety requirements;
- With explosion-proof requirements (e.g., chemical workshops, oil storage tank areas, coal mine shafts): The standard model cannot be used directly; it must be paired with the Qidian QD-6000 series safety barrier to achieve explosion-proof protection, or a custom explosion-proof enclosure model (compliant with Ex d II BT4 explosion-proof rating) must be selected to ensure compliance with on-site safety regulations.
5. Installation Environment (Determines Product Lifespan)
Refer to the JXK-21U environmental compatibility parameters and select the model based on on-site conditions such as temperature, humidity, dust, and vibration. Key recommendations:
- Standard environments (temperature -20°C to +70°C, no condensation, no strong interference): Select the standard model (blue flame-retardant ABS housing, IP30 protection), 35mm DIN rail mounting, suitable for standard cabinet installation;
- Harsh Environments (High Temperature, High Humidity, High Dust, Strong Interference):
① High-Temperature Scenarios (e.g., metallurgical workshops, temperature > 70°C): Customize the high-temperature model (operating temperature range extended to -40°C to +85°C);
② High-humidity/dusty environments (e.g., food processing plants, power supply equipment for aquaculture): Custom high-protection model (IP65 rating) to prevent short circuits caused by moisture or dust ingress;
③ High-interference environments (e.g., substations, steel mills): The standard model is sufficient (features built-in triple anti-interference design with a common-mode rejection ratio ≥120dB), eliminating the need for additional anti-interference components.

5.2. Industry Application Selection Table (Precise Matching, Direct Selection)
Based on the operational characteristics of mainstream industries such as chemicals, power, and metallurgy, this table provides recommended JXK-21U models (including configuration suggestions). No complex calculations are required; simply refer to the table for direct selection:
---Chemical Industry
1. Mostly mixed AC/DC power supply (equipment powered by AC 380V/220V, instrument power supply DC 24V); 2. Explosion-proof requirements in certain areas (e.g., reactor zones, raw material storage areas); 3. Presence of strong electromagnetic interference and corrosive gases
----Power Industry (Substations, Distribution Rooms)
1. Primarily pure AC environments (AC 100V/220V/380V); 2. Requires remote centralized monitoring; 3. Strong electromagnetic interference; 4. 24-hour continuous operation
----Metallurgical Industry (Smelting Shops, Rolling Mills)
1. High-temperature environments (temperatures may exceed 70°C); 2. Severe vibration and strong electromagnetic interference; 3. Mixed AC/DC environments (equipment: AC 380V; control circuits: DC 24V)
----Pharmaceutical Industry (Pharmaceutical Production Areas, Cleanrooms)
1. High-humidity environments (no condensation); 2. High cleanliness requirements; 3. Primarily DC scenarios (DC 24V/12V, powering instruments and sterile equipment); 4. No explosion-proof requirements
----Smart Manufacturing (Automated Production Lines, Robot Workstations)
1. Mixed AC/DC power (production lines: AC 220V; robots: DC 24V); 2. Multi-channel data acquisition; 3. Requires integration with IoT platforms; 4. Compact installation within cabinets
-----New Energy Industry (PV Power Plants, Energy Storage Facilities)
1. Pure DC environments (DC 0–1500V, for PV modules and energy storage batteries); 2. Low power consumption requirements; 3. Outdoor installation (in some scenarios); 4. Remote monitoring

5.3 Common Selection Pitfalls (A Guide to Avoiding Mistakes and Preventing Incorrect Choices)
Drawing on practical experience from thousands of industrial projects, we have identified four common selection pitfalls. By clarifying the causes of these errors and outlining the correct approaches, we aim to prevent equipment failure, safety hazards, and wasted costs resulting from incorrect selection:
Pitfall 1: Ignoring Isolation Rating, Leading to Damage to Downstream Equipment
Incorrect Practice: Focusing only on measurement range and output signal while ignoring isolation rating; selecting products with an isolation withstand voltage below 2 kV in high-voltage scenarios (e.g., AC 380 V, DC 1000 V), or failing to select a three-terminal isolated model.
Risks: High-voltage signals penetrate low-voltage equipment such as PLCs and DCS systems through the transmitter, causing breakdowns, short circuits, or even safety incidents; severe common-mode interference leads to signal distortion, affecting monitoring accuracy.
Correct Approach: The JXK-21U features three-terminal full isolation (input-output-power supply) with an isolation withstand voltage of 2.5 kV/50 Hz (1 min), meeting the requirements of the vast majority of industrial high-voltage scenarios. In high-voltage scenarios (input ≥ 220 V), this type of three-terminal isolated model must be selected; simple transmitters without isolation or with only two-terminal isolation must not be used.
Misconception 2: Selecting the wrong signal range, leading to insufficient measurement accuracy or equipment damage
Incorrect practice: Blindly selecting the maximum range (e.g., selecting an AC 0–1000 V range when the actual measured voltage on-site is AC 220 V); or selecting a range that is too small (e.g., selecting a DC 0–300 V range when the actual voltage is DC 500 V).
Consequences: Selecting an excessively large range significantly reduces measurement accuracy (e.g., for a Class 0.5 accuracy transmitter, the larger the range, the greater the absolute error), making it impossible to capture subtle voltage fluctuations; selecting an excessively small range can cause input overvoltage, burning out the transmitter's internal circuitry, while the ALM alarm light remains constantly lit, preventing normal operation.
Correct Approach: Select a range based on "1.2 to 1.5 times the maximum measured voltage." For example, if the actual on-site voltage is 380 V AC, select the 0–500 V AC range; if the actual voltage is 400 V DC, select the 0–500 V DC range. This approach provides a margin of safety, balancing accuracy with equipment safety. The JXK-21U offers fully customizable ranges, allowing precise matching to the actual on-site voltage.
Misconception 3: Neglecting load matching, leading to output signal distortion
Incorrect practice: Focusing only on the output signal type (e.g., 4–20 mA) while ignoring the load resistance of downstream equipment; for example, connecting a 4–20 mA output to a PLC module with a load resistance >500 Ω.
Hazards: Load mismatch causes nonlinear distortion of the output signal, leading to inaccurate data acquisition or even signal transmission failure, which affects the normal operation of the control system; in severe cases, it may burn out the transmitter's output module.
Correct Practice: The JXK-21U has a current output load limit of ≤500Ω and a voltage output load limit of ≥10kΩ. When selecting a model, verify the input load of the downstream equipment (PLC, instruments) to ensure it falls within the specified range; If the load exceeds the range, an additional signal amplifier or matching resistor must be configured to prevent signal distortion.
Misconception 4: Incorrectly selecting the standard model for explosion-proof environments, violating safety regulations
Incorrect practice: In explosion-proof environments such as chemical and petroleum industries, directly selecting the standard JXK-21U model (non-explosion-proof) without pairing it with a safety barrier or a customized explosion-proof model.
Hazards: Violates industrial safety regulations, posing risks of explosion and fire; fails on-site safety inspections, leading to project shutdowns for rectification and resulting in wasted costs.
Correct Practice: In explosion-proof environments, the "standard model + safety barrier" configuration (compatible with Qidian's QD-6000 series) must be used, or a custom explosion-proof enclosure model should be selected directly; in non-explosion-proof environments (such as general workshops), the standard model may be used without the need for an additional safety barrier.

5.4 Customization Recommendations (Adapting to Special Requirements, Solving Non-Standard Challenges)
For requirements that standard models cannot meet—such as special on-site signals, non-standard operating conditions, and multi-channel integration—Qidian offers customization services. Based on the JXK-21U

product,the following customized solutions ensure compatibility with all on-site operating conditions:

1. Special Signal Customization (Adapting to Non-Standard Input/Output Signals)

- Non-standard input signals: The standard model's input range is AC 0–1000 V / DC 0–1500 V. We can customize wider ranges (e.g., AC 0–1500 V, DC 0–2000 V) or narrower ranges (e.g., AC 0–10 V, DC 0–5 V); Support for special AC waveforms (e.g., non-sinusoidal or distorted waveforms), with custom true RMS conversion modules to ensure measurement accuracy.
- Custom Output Signals: Standard models output 4-20mA, 0-10V, or RS485; special output signals (e.g., 0-20mA, 1-5V) can be customized; dual-output combinations (e.g., 4-20mA + 0-10V) can be customized to meet the needs of different downstream equipment; Ethernet output (e.g., Modbus-TCP protocol) can be customized for integration with large-scale IoT platforms.

2. Customization for Non-Standard Operating Conditions (Adapted for Harsh or Special Environments)

- High/Low Temperature Customization: Standard models operate at -20°C to +70°C; high-temperature models (-40°C to +85°C) can be customized for metallurgy and outdoor high-temperature scenarios; low-temperature models (-40°C to +60°C) can be customized for cold storage and northern outdoor scenarios, with optimized temperature compensation circuits to ensure accuracy across the entire temperature range.
- Protection Rating Customization: Standard models feature IP30; IP54 (dust and water resistant) and IP65 (outdoor protection) options are available to suit harsh environments such as high humidity, high dust, and outdoor settings; corrosion-resistant enclosures (for corrosive gas environments, such as chemical corrosion zones) are available, utilizing special corrosion-resistant materials to extend product lifespan.
- Low-Power Customization: Standard models have a full-load power consumption of ≤0.5W; low-power versions (≤0.3W) are available for battery-powered and unattended outdoor applications (e.g., solar power plants, remote power distribution monitoring), reducing energy consumption.

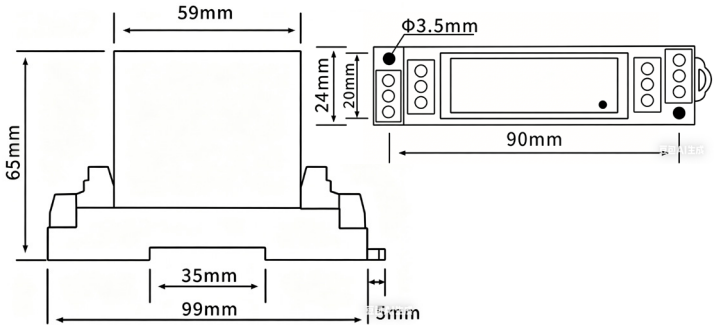
3. Multi-Channel Integration Customization (for centralized monitoring needs)

- Channel Configuration Customization: Standard models feature 1 input and 1 output; multi-input/multi-output configurations (e.g., 2 in/2 out, 4 in/4 out, 8 in/8 out) are available to accommodate multi-point centralized data collection scenarios (e.g., monitoring multiple distribution cabinets in a workshop or the voltage of multiple devices), reducing the number of modules required and saving installation space within the cabinet.
- Customized integration features: Can integrate functions such as signal acquisition, data storage, and alarm output; customize local display modules (e.g., LCD displays for real-time voltage monitoring); integrate alarm functions so that when voltage exceeds the set range, the ALM alarm light flashes and an alarm signal is output to alert staff to take immediate action.

4. Customization Process and Precautions

1. Customization Process: User provides on-site conditions (input signal type, range, number of channels, power supply method, environmental conditions, output requirements) → Qidian technical team evaluates feasibility → Provides customized solution and quotation → Production begins after solution confirmation → Factory testing → Delivery and technical guidance;

2. Notes: For custom models, operating conditions must be confirmed in advance to avoid incompatibility due to omitted parameters; the production cycle for custom models is longer than for standard models (typically 7–15 business days), so procurement schedules should be planned accordingly; free technical commissioning services are available for custom models to ensure smooth deployment.



VI: Installation and Commissioning Guidelines

6.1. Pre-installation Preparation

1. Verification of Accessories

Verify product model: Qidian JXK-21U Blue Enclosure AC/DC Voltage Transmitter

Accessory list: Transmitter unit, pluggable terminal block, DIN rail clips, certificate of conformity, instruction manual

Range verification: Confirm that the input range, output signal, and supply voltage match on-site requirements

2. Environmental Inspection

Installation Location: A dry, well-ventilated area inside an electrical control cabinet, free from severe vibration

Environmental Conditions: Temperature -20°C to +70°C, Humidity 5% to 95% RH (non-condensing)

Keep Away from Interference Sources: Keep away from variable frequency drives, contactors, high-current power cables, and areas with strong electromagnetic interference

3. Tool List

Phillips / flathead screwdrivers, wire strippers, crimping pliers

Multimeter (voltage / current range)

Standard signal source (for accuracy calibration, optional)

4. Safety Precautions

Never perform wiring, disconnection, or debugging while the unit is energized

The high-voltage circuit under test must first be de-energized, tested for voltage, and discharged

Ensure proper insulation protection to prevent direct human contact with high-voltage terminals

6.2 Standard Installation Steps

1. DIN Rail Mounting

Install using a standard 35mm DIN rail

Align the latches on the back of the JXK-21U with the rail and press down to secure

Leave a recommended spacing of 10–15mm between modules to facilitate heat dissipation

2. Wiring Specifications (Strictly Separate Power / Input / Output)

Power Terminals

Standard Power Supply: DC24V

Labeling: +24V / 0V / GND

Reverse connection is strictly prohibited. Although the module features reverse connection protection, prolonged reverse connection may still cause damage.

Voltage Input Terminals

AC Input: AC+ / AC- or L / N

DC Input: DC+ / DC-

Input voltages exceeding the rated range are strictly prohibited.

Output Terminals

Current Output: IO+ / IO-

Voltage Output: VO+ / VO-

RS485 Output: A / B (or DATA+ / DATA-)

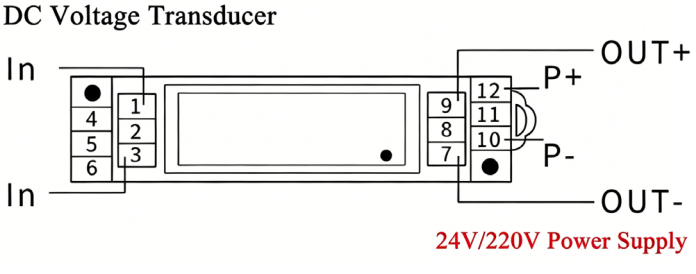
3. Grounding Requirements

The instrument's grounding terminal (PE/GND) must be securely connected to the control cabinet's ground busbar.

Ground resistance ≤ 4Ω

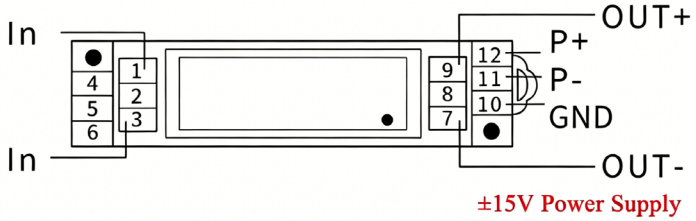
Shielded cables must be grounded at a single point (grounded on the central control room side) to prevent loop currents caused by multiple grounding points.

6.3 Wiring Diagram



DC Voltage Transmitter: Compatible with 24 VDC/220 VAC power supplies. Please follow the wiring diagram exactly.

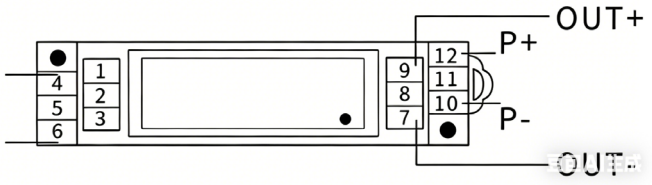
DC Voltage Transducer



±15V Power Supply

DC Voltage Transmitter: Compatible with 15V power supplies. Please follow the wiring diagram exactly.

AC Voltage Transducer



AC Voltage Transmitter: Compatible with 24 VDC/220 VAC power supplies. Please follow the wiring diagram exactly.

1. Shielded Cable Handling
Use shielded cables for analog signals.
Ground the shield only at the control cabinet end.
Leave the shield floating and insulated at the field end; do not ground it.
2. Correct vs. Incorrect
Correct: Run power and signal cables separately; keep analog cables at least 20 cm away from power cables.
Incorrect: Bundling analog signal cables parallel to high-voltage cables, resulting in significant interference and data fluctuations
Correct: Strictly separate power, input, and output lines
Incorrect: Sharing a common ground for input and output, resulting in failed isolation and risk of equipment damage
6.4 Power-On Commissioning Procedure
1. No-Load Test
Connect the DC24V power supply
Observe the green PWR indicator: Steady on = Power supply normal
Red ALM indicator: Off = Normal; Steady on / Flashing = Overvoltage / Overload / Fault
2. Signal Verification
Input 0V signal → Output should be 4mA (or 0V/0%)
Input full-scale voltage → Output should be 20mA (or 10V/100%)
Measure the output value with a multimeter; the error should be within ±0.5% FS
3. Indicator Status Interpretation
PWR Green: Power supply normal
ALM Red:
Constant On: Input overvoltage / Output short circuit
Flashing: Temperature abnormality / Module failure
4. Accuracy Calibration Method
This product is factory-calibrated; on-site adjustment by the user is generally not required.
If calibration is necessary, use a standard voltage source to input two points (0%, 100%) and correct via the internal potentiometer or software configuration.
Non-professionals are strictly prohibited from calibrating the device.
6.5 Installation Prohibitions (Mandatory Prohibitions)
Overvoltage Power Supply Strictly Prohibited
Only DC 24V ±10% is permitted; connecting to AC 220V is strictly prohibited, as it will immediately burn out the module.
Input Over-Range Voltage Strictly Prohibited
Exceeding the rated input voltage will instantly cause the sampling circuit to break down, resulting in permanent damage.
Avoid Wiring with High-Voltage Interference
Analog signal lines must not be routed in the same conduit, cable tray, or run parallel over long distances with 380V/220V power lines.
Never install the unit in a damp or condensing environment.
In high-humidity environments, a waterproof enclosure must be used or the protection rating must be increased to prevent internal short circuits.
Do not short-circuit the output terminals directly.
Prolonged short-circuiting of the current output will cause the output chip to overheat and fail.
Do not install standard models directly in explosion-proof areas.
They must be used in conjunction with a safety barrier; otherwise, they do not comply with safety regulations.
5.6. Quick Troubleshooting Guide
No output, PWR indicator off: Power supply not connected / connected incorrectly / fuse blown
Output fluctuates or is unstable: Excessive interference, poor grounding, unshielded wiring
ALM indicator constantly lit: Input overvoltage, output short circuit, module failure
Significant measurement deviation: Incorrect range selection, load mismatch, zero-point drift

7: Daily Use & Maintenance Recommendations
7.1 Key Points for Daily Inspections (Basic Maintenance, Quick Troubleshooting)
Indicator Light Checks (Daily Inspection)
PWR (Green) Power Indicator: Normally remains lit; if it is off, check whether the DC24V power supply circuit is open, the power supply polarity is reversed, or the power fuse is blown.
ALM (Red) Alarm Indicator: Normally off; if constantly on, check for input overrange or output short circuit; if flashing, check if the ambient temperature exceeds the operating range or if there is an internal module fault.
Signal Stability Monitoring (Weekly Inspection)
View the voltage acquisition data via the PLC/DCS backend to confirm there are no sudden changes, significant fluctuations, or zero drift.
Compare the input voltage with the output signal (e.g., 4–20 mA corresponding voltage values); the error must be stable within ±0.5% F.S. If outside this range, investigate potential interference or calibration issues.
Temperature and Humidity Monitoring (Weekly Inspection)
The temperature inside the electrical control cabinet must be maintained between -20°C and +70°C, with humidity ≤95% RH and no condensation.
If the temperature is too high, check whether the cabinet's cooling fans are functioning properly or if cables or debris are obstructing airflow around the modules.
If condensation appears inside the cabinet, promptly activate the dehumidification system to prevent moisture from entering the modules and causing short circuits or damage.
7.2. Regular Maintenance Schedule (Performed on a cyclical basis to extend service life)
Monthly: Wire Tightness Inspection Use a screwdriver to retighten all terminal screws to ensure there is no looseness; focus on inspecting power, input, and output terminals to prevent loose connections caused by vibration, which can lead to signal instability or arcing.
Quarterly: External Cleaning Use a dry, soft-bristled brush to remove dust from the module surface; do not use damp cloths or organic solvents. Pay special attention to cleaning dust from terminal gaps and heat dissipation slots to prevent reduced insulation due to dust accumulation.
Semi-annually: Accuracy Retest Use a standard voltage source and a multimeter to perform a three-point accuracy calibration on the module at 0%, 50%, and 100%; If the error exceeds ±0.5% F.S., calibrate according to the manual or contact the manufacturer's after-sales service.
Annually: Grounding and Insulation Check Use a megohmmeter to measure the insulation resistance between the module's input, output, and power supply; it must be ≥100 MΩ. Check whether the grounding terminal is securely connected to the cabinet ground; the grounding resistance must be ≤4 Ω.
7.3 Long-Term Maintenance Tips (Targeted Protection to Reduce Failure Rates)
1. Dust and Moisture Prevention Optimization
Install dust filters inside the cabinet and clean them regularly to prevent dust from entering. In humid environments, place desiccants inside the cabinet or install a dehumidification module. When installing the module, avoid placing it directly on the cabinet floor or in areas prone to condensation; it is recommended to install it in the upper or middle

section of the cabinet, away from condensation zones.
2. Measures to Optimize Interference Resistance
Shielded cables must be used for signal lines; the shielding layer should be grounded at only one end in the control room. Grounding at both ends to create a ground loop is prohibited.
Analog signal lines and power cables must be routed in separate cable trays, maintaining a distance of ≥20 cm between them, and must not be bundled together; if they must cross, they must do so at right angles. Install a dedicated grounding busbar inside the cabinet. Connect the grounds of transmitters, PLCs, and instruments to the same busbar to prevent potential differences caused by multiple grounding points.
3. Protection Against Extreme Environments
High-temperature environments (e.g., metallurgical workshops): Custom high-temperature modules can be ordered, or forced-air cooling fans can be installed inside the cabinet to prevent modules from operating continuously at temperatures above 70°C. Outdoor / High-Humidity Environments: Select IP65-rated custom models or install waterproof junction boxes, and ensure cables are properly sealed against water ingress. Highly Corrosive Environments (e.g., chemical processing plants): Use custom corrosion-resistant enclosures or apply anti-corrosion coatings inside the cabinet to prevent corrosive gases from damaging the module housing and terminals.

8: Troubleshooting & Emergency Procedures
8.1 List of Common Faults
No output signal after power-on
Signal drift, fluctuations, or unstable readings
Abnormal indicator lights (not lit, constantly lit, or flashing)
ALM alarm continuously triggered
Signal interference, distortion, or inaccurate readings
8.2 Analysis of Fault Causes
Wiring errors: Reversed polarity, incorrect input/output connections, missing ground, or incorrect grounding
Power supply issues: Voltage too low/too high, high power supply ripple, loose connections
Signal overload: Input out of range, output short circuit, load mismatch
Environmental interference: Co-located high-voltage power lines, inverter interference, ground loop currents
Equipment Damage: Lightning surges, prolonged overheating, moisture/corrosion, aging internal components
8.3, Step-by-Step Troubleshooting
1. Fault: No Output Signal
Troubleshooting Steps
First, check the PWR power indicator:
Not lit → Check if the DC24V power supply is normal, if terminals are loose, or if polarity is reversed
Power indicator is on but no output →
Use a multimeter to measure the output terminals to confirm if there is truly no signal
Check if the output cable is open-circuited or if the PLC/instrument channel is damaged
Still no output →
Check if a prolonged short circuit at the output has triggered protection
Confirm that no out-of-range input has caused internal protection to lock up
Remedial Actions
Re-tighten the power terminals and correct the polarity
Replace the power supply or power cable
Disconnect the output load and test the transmitter output separately
Emergency Solution
Temporarily replace with a spare transmitter of the same model to quickly restore monitoring
If no spare parts are available, temporarily short-circuit the signal (for emergency use only; do not use long-term)
2. Fault: Signal drift, fluctuation, or instability
Troubleshooting Steps
Check for loose or oxidized wiring
Check if the shielded cable is grounded at only one end, or if it shares the same cable tray with power lines
Check the temperature and humidity inside the cabinet for condensation
Check for proper grounding and whether multiple grounding points are causing ground loops
Remedial Measures
Re-tighten all terminal connections
Route analog and power cables in separate cable trays; ensure they cross vertically
Ground the shielding wire only at the control room end; leave the field end floating and insulated
Install desiccant or a dehumidifier inside the cabinet
Emergency Plan
Temporarily add ferrite core filters to suppress interference
Relocate the transmitter away from inverters and contactors
3. Fault: Abnormal Indicator Lights
① PWR green light is off
Causes: Power supply failure, reversed polarity, internal fuse failure
Action: Check DC24V, correct polarity, replace power supply
② ALM red light stays on
Causes: Input overvoltage, output short circuit, module failure
Action: Disconnect input/output, then reconnect gradually; check for out-of-range conditions
③ ALM red light flashes
Causes: Abnormal temperature, unstable power supply, internal malfunction
Action: Improve ventilation and heat dissipation; stabilize power supply
4. Fault: ALM Alarm Continuously Triggered
Troubleshooting Steps
Check if input voltage is out of range
Check for output short circuits
Check for excessive power supply fluctuations
Check if ambient temperature is out of range
Remedial Measures
Reduce input voltage or replace with a wide-range model
Eliminate output short circuits; check load wiring
Replace with a stable 24V power supply
Enhance heat dissipation; lower ambient temperature
Emergency Plan
Temporarily bypass the alarm circuit to prioritize system operation; investigate the root cause as soon as possible
5. Fault: Interference distortion, significant reading deviation
Troubleshooting Steps
Verify transmitter accuracy using a standard signal source
Check for common-mode interference or ground potential differences
Check if isolation has failed (three-terminal isolation compromised)
Remedial Actions
Re-establish single-point grounding and unify the reference ground
Replace shielded cables and move away from interference sources
Confirm use of the three-terminal isolated JXK-21U model; do not use simplified, non-isolated products
Contingency Plan
Install a signal isolator for secondary isolation
Adjust the sampling averaging filter parameters
8.4. After-Sales Repair Guidelines
1. Failure Determination Criteria (Eligible for Direct Repair)
Power supply is normal, wiring is correct, but there is absolutely no output
Accuracy error consistently exceeds ±0.5% FS and cannot be calibrated
Abnormal indicator lights with external causes ruled out
Unusual noises inside the module, burning smell, or burnt terminals
Insulation failure or isolation breakdown occurring under non-abusive conditions
2. Repair Process
Take photos: Product nameplate, indicator light status, overall installation environment
Record: Model, range, power supply, output method, fault symptoms
Contact sales or technical support to submit information
Technical team conducts preliminary remote diagnosis
If return to factory is required, ship back for testing as instructed
Return the unit after repair or replacement, and provide technical support
3. Warranty Coverage
Standard warranty applies to non-human-caused damage under normal use
Warranty covers: component failure, manufacturing defects, and factory calibration issues
Exclusions: damage caused by overpressure/over-range operation, lightning strikes, water ingress, unauthorized disassembly or repair, wiring errors, or non-compliant on-site environments

IX. Common Selection Pitfalls (A Guide to Avoiding Mistakes and Preventing Incorrect Choices)

Drawing on practical experience from thousands of industrial projects, we have identified four common selection pitfalls. By clarifying the causes of these errors and outlining the correct approaches, we aim to prevent equipment malfunctions, safety hazards, and wasted costs resulting from incorrect selection:

Pitfall 1: Ignoring Isolation Rating, Leading to Damage to Downstream Equipment

Incorrect Practice: Focusing only on measurement range and output signal while ignoring isolation rating; selecting products with an isolation withstand voltage below 2 kV in high-voltage scenarios (e.g., AC 380 V, DC 1000 V), or failing to select a three-terminal isolated model.

Risks: High-voltage signals penetrate low-voltage equipment such as PLCs and DCS systems through the transmitter, causing breakdowns, short circuits, or even safety incidents; severe common-mode interference leads to signal distortion, affecting monitoring accuracy.

Correct Approach: The JXK-21U features three-terminal full isolation (input – output – power supply) with an isolation withstand voltage of 2.5 kV at 50 Hz for 1 minute, meeting the requirements of the vast majority of industrial high-voltage scenarios. In high-voltage scenarios (input ≥ 220 V), this type of three-terminal isolated model must be selected; simple transmitters without isolation or with only two-terminal isolation must not be used.

Misconception 2: Selecting the wrong signal range, resulting in insufficient measurement accuracy or equipment damage

Incorrect practice: Blindly selecting the maximum range (e.g., selecting an AC 0–1000 V range when the actual measured voltage on-site is AC 220 V); or selecting a range that is too small (e.g., selecting a DC 0–300 V range when the actual voltage is DC 500 V).

Consequences: Selecting a range that is too large significantly reduces measurement accuracy (e.g., for a Class 0.5 accuracy transmitter, the larger the range, the greater the absolute error), making it impossible to detect subtle voltage fluctuations; selecting a range that is too small can cause input overvoltage, burning out the transmitter's internal circuitry, while the ALM alarm light remains constantly lit, preventing normal operation.

Correct Approach: Select a range based on "1.2 to 1.5 times the maximum measured voltage." For example, if the actual on-site voltage is 380 V AC, select the 0–500 V AC range; if the actual voltage is 400 V DC, select the 0–500 V DC range. This allows for a margin of safety, balancing accuracy with equipment safety. The JXK-21U offers fully customizable ranges, allowing precise matching to the actual on-site voltage.

Misconception 3: Neglecting load matching, leading to output signal distortion

Incorrect practice: Focusing only on the output signal type (e.g., 4–20 mA) while ignoring the load resistance of downstream equipment; for example, connecting a 4–20 mA output to a PLC module with a load resistance >500 Ω.

Hazards: Load mismatch causes non-linear distortion of the output signal, leading to inaccurate data acquisition or even signal transmission failure, which affects the normal operation of the control system; in severe cases, it can burn out the transmitter's output module.

Correct Practice: The JXK-21U has a current output load limit of ≤500Ω and a voltage output load limit of ≥10kΩ. When selecting a model, verify the input load of the downstream equipment (PLC, instruments) to ensure it falls within the specified range; If the load exceeds the range, an additional signal amplifier or matching resistor must be configured to prevent signal distortion.

Misconception 4: Incorrectly selecting the standard model for explosion-proof environments, violating safety regulations

Incorrect practice: In explosion-proof environments such as chemical and petroleum industries, directly selecting the standard JXK-21U model (non-explosion-proof) without pairing it with a safety barrier or a customized explosion-proof model.

Hazards: Violates industrial safety regulations, posing risks of explosion and fire; fails on-site safety inspections, leading to project suspension for rectification and resulting in wasted costs.

Correct Practice: In explosion-proof environments, the "standard model + safety barrier" configuration (compatible with Qidian's QD-6000 series) must be used, or a custom explosion-proof enclosure model should be selected directly; in non-explosion-proof environments (such as general workshops), the standard model may be used without the need for an additional safety barrier.

X. Customization Recommendations (Adapting to Special Requirements, Solving Non-Standard Challenges)

For requirements that standard models cannot meet—such as special on-site signals, non-standard operating conditions, and multi-channel integration—Qidian offers customization services. Based on the JXK-21U product, the following customized solutions ensure compatibility with all on-site operating conditions:

1. Special Signal Customization (Adapting to Non-Standard Input/Output Signals)

Non-standard input signals: The standard model's input range is AC 0–1000 V / DC 0–1500 V. We can customize wider ranges (e.g., AC 0–1500 V, DC 0–2000 V) or narrower ranges (e.g., AC 0–10 V, DC 0–5 V); Support for special AC waveforms (e.g., non-sinusoidal or distorted waveforms), with custom true RMS conversion modules to ensure measurement accuracy.

Custom Output Signals: Standard models output 4–20 mA, 0–10 V, and RS485; special output signals (e.g., 0–20 mA, 1–5 V) can be customized; dual-output combinations (e.g., 4–20 mA + 0–10 V) can be customized to meet the requirements of different downstream devices; Ethernet output (e.g., Modbus-TCP protocol) can be customized for integration with large-scale IoT platforms.

2. Customization for Non-Standard Operating Conditions (Adapted to Harsh or Special Environments)

High/Low Temperature Customization: Standard models operate at -20°C to +70°C. High-temperature models (-40°C to +85°C) can be customized for metallurgy and outdoor high-temperature scenarios; low-temperature models (-40°C to +60°C) can be customized for cold storage and northern outdoor scenarios, with optimized temperature compensation circuits to ensure accuracy across the entire temperature range.

Protection Rating Customization: Standard models feature IP30; IP54 (dust and water resistant) and IP65 (outdoor protection) options are available to suit harsh environments such as high humidity, high dust, and outdoor settings; corrosion-resistant enclosures (for corrosive gas environments, such as chemical corrosion zones) are available, utilizing special corrosion-resistant materials to extend product lifespan.

Low-Power Customization: Standard model full-load power consumption ≤0.5W; low-power models (≤0.3W) available upon request, suitable for battery-powered and unattended outdoor scenarios (e.g., solar power plants, remote power distribution monitoring), reducing energy consumption.

3. Multi-Channel Integration Customization (Suitable for Centralized Monitoring Needs)

Channel Count Customization: Standard model features 1 input and 1 output; multi-input/multi-output configurations are available (e.g., 2 in/2 out, 4 in/4 out, 8 in/8 out), suitable for centralized data collection across multiple locations (e.g., monitoring voltage in multiple distribution cabinets within a workshop or across multiple devices), reducing the number of modules required and saving installation space within cabinets.

Integrated Function Customization: Functions such as signal acquisition, data storage, and alarm output can be integrated. Local display modules (e.g., LCD displays for real-time voltage monitoring) can be customized. Integrated alarm functionality ensures that when voltage exceeds the set range, the ALM alarm light flashes and an alarm signal is output, alerting staff to take immediate action.

4. Customization Process and Notes

Customization Process: User provides on-site conditions (input signal type, range, number of channels, power supply method, environmental conditions, output requirements) → Qidian technical team evaluates feasibility → Provides customized solution and quotation → Production begins after solution confirmation → Factory testing → Delivery and technical guidance;

Important Notes: For custom models, operating conditions must be confirmed in advance to prevent incompatibility due to omitted parameters; the production cycle for custom models is longer than for standard models (typically 7–15 business days), so procurement schedules should be planned accordingly; free technical commissioning services are available for custom models to ensure smooth deployment.