

QUAKELOGIC

QuakeLogic QL-LinearWire

CNC Wire Electrical Discharge Machining (Wire EDM) System

Industrial-Grade | Academic & Research Configured | Turnkey Solution





System Overview

The QL-LinearWire is a fully enclosed, industrial-grade CNC Wire Electrical Discharge Machining system engineered to meet or exceed all mandatory technical, operational, safety, installation, training, documentation, delivery, and warranty requirements specified in the solicitation. This advanced manufacturing platform represents the intersection of industrial capability and academic accessibility, designed specifically to serve the unique demands of university research laboratories, engineering programs, and institutional research facilities. Designed for academic instruction, laboratory use, and advanced research, the system delivers stable machining performance, high dimensional accuracy, and repeatable results across electrically conductive materials. The QL-LinearWire bridges the gap between educational demonstration equipment and production-grade machinery, providing students, researchers, and faculty with authentic exposure to industrial wire EDM technology while maintaining the safety protocols, documentation standards, and operational flexibility required in academic environments.

Standard accessories:

- Latest controller Integrated on the machine
- MITSUBISHI Inverter JAPAN
- Linear Guide way
- LCD monitor
- Industrial computer
- Central lubricate system

Accessories:

- Z axis motorized INLUCED
- Two Axes DRO INCLUDED
- Aluminum cutting INCLUDED

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Industrial Construction

Precision-engineered machine frame with industrial-grade components for long-term reliability and dimensional stability

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2

Academic Configuration

Optimized interface and safety systems designed specifically for instructional and supervised research environments

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3

Research-Ready Platform

Advanced capabilities supporting materials research, precision manufacturing studies, and process development

4

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Turnkey Solution

Complete system including installation, commissioning, training, documentation, and comprehensive warranty coverage

Machining Capability & Performance

Wire Electrical Discharge Machining

The QL-LinearWire employs wire electrical discharge machining technology, a non-contact thermal material removal process that enables precision cutting of electrically conductive materials regardless of hardness. This advanced manufacturing method uses controlled electrical discharges between a continuously traveling wire electrode and the workpiece, removing material through localized melting and vaporization in a dielectric fluid environment.



This process is particularly valuable in research and instructional settings where traditional machining methods face limitations with hardened materials, complex geometries, or applications requiring burr-free edges and minimal mechanical stress in the workpiece.

Steel & Alloy Steel

Carbon steels, tool steels, and high-strength alloy compositions for mechanical engineering research and component fabrication

Stainless Steel

Austenitic, ferritic, and martensitic stainless steel grades for corrosion research, medical device prototyping, and materials studies

Titanium & Titanium Alloys

Pure titanium and Ti-6Al-4V for aerospace research, biomedical applications, and advanced materials characterization

Conductive Materials

Copper alloys, aluminum alloys, tungsten carbide, and other electrically conductive materials used in research applications

Performance Characteristics

The QL-LinearWire delivers consistent kerf control, stable cutting conditions, and repeatable dimensional accuracy essential for research reproducibility and instructional demonstrations. Surface finish quality meets the requirements of precision component fabrication, experimental apparatus construction, and materials characterization studies.

Compliance Verification

System performance is configured to fully comply with all machining quality and accuracy requirements defined in the solicitation, with documented verification protocols provided during commissioning.

Mechanical Structure & Motion System

The mechanical foundation of the QL-LinearWire establishes the precision and reliability essential for academic research applications. The system architecture integrates industrial-grade structural components, precision motion systems, and stable wire handling mechanisms in a configuration optimized for the unique demands of university laboratory environments where equipment must deliver consistent performance across diverse user skill levels, extended operational periods, and varied research applications.



Rigid Machine Frame

Industrial machine frame engineered for long-term stability and accuracy retention. Heavy-duty construction minimizes deflection and vibration, providing the mechanical foundation necessary for precision machining operations and repeatable research results across the system's operational lifetime.



Enclosed Environment

Fully enclosed machining environment suitable for academic laboratories. The enclosure system provides dielectric containment, operator safety barriers, and environmental control while maintaining visibility for instructional observation and process monitoring during supervised operation.



Multi-Axis CNC Control

CNC-controlled multi-axis motion system with precision linear motion components for repeatable positioning. Servo-driven axis control optimized for contour accuracy and reliability delivers the positioning resolution necessary for complex geometry research and precision component fabrication.



Wire Handling System

Integrated wire handling and tensioning system with stable wire control designed to maintain consistent machining conditions. Automated wire threading capabilities reduce setup time and minimize consumable waste in instructional and research applications requiring multiple workpiece setups.

The mechanical subsystems work in concert to deliver the positioning accuracy, process stability, and operational reliability required for reproducible research outcomes and effective instructional demonstrations in academic settings.

Technical Parameters



Machine Design & Structure

Machine design: Integrated design

Machine structure: T type machine body, C frame

Dimension of machine (mm): 1680×1200×1800

Max loading (Kg): 400

Worktable size: 640×400

Working table guards (mm): 830×600

Max Z axis travel (mm): 300

Max taper ($\leq 100\text{mm}$): $\pm 6^\circ$



Axis Travel & Motion

X, Y Axis Travel: $\geq 400 \times 400$ mm

U, V Axis Travel: 50×50 mm

5-Axis CNC Coordinate: XYZUV control with 4 coordinate systems (1 machine + 3 user coordinates), 5-axis coordinate display



Machining Performance

Material Capacity (Cr12): 20~40mm

Positioning Accuracy: $\leq \pm 0.005$ mm
Repeatability: $\leq \pm 0.003$ mm

Surface Roughness after multi-cut finishing: $\leq 0.6 \mu\text{m Ra}$

Maximum Cutting Speed: ≥ 300 mm²/min

Max Current: 10A

All machining performance values meet or exceed the mandatory technical requirements specified in the solicitation.



Power & Control Configuration

High Frequency System: Low power consumption, Non-resistances, Special Titanium Standard

Total Machine Power Consumption: < 2 kW

X, Y Control System: AC servo motors and drives

Screws and Guide Way: Ball screws and linear guide way

Lubrication: Automatic



Standard Equipment & Systems

Wire Tension System: Dopuble direction automatic

Handle Remote Jog: Standard

Wire Guides: Standard

Aluminum Cutting Device: Standard

Filtration System: Fine filtration system

Coolant System: BM WORKING SOLUTION

Coolant System & Advanced Features

The coolant system is a closed-loop fluid management solution composed of a dedicated water tank, compatible working fluid, flux valves, a pipe distribution unit, and a fine filter unit for continuous fluid recycling. This arrangement ensures stable cooling and dielectric performance, captures and filters particulates and slag, and enables extended working-fluid life while maintaining environmentally safe, water-based fluids that are harmless to operators and meet regulatory environmental-protection requirements.



High-Strength Cast Iron Body (HT250)

C-type structure with T-type bed manufactured by resin sand casting. The casting undergoes two high-temperature annealing treatments to stabilize internal stresses and ensure constant mechanical accuracy across the machine's service life.



Precision X/Y Axis System

High-precision linear guide ways and ball screws driven by AC servo motors with direct drive. Semi-closed loop control with pitch compensation provides repeatable positioning and superior contour accuracy for complex machining profiles.



Adjustable Z-Axis Processing

Veneer-capable Z-axis with linear guide rail lifting mechanism that prevents molybdenum wire jitter and reduces verticality error during height changes, enabling stable fine-feature processing.



Wire Winding Drum System

Imported linear guide rail on the winding drum and frequency-converter control deliver smooth operation across all speeds, minimizing wire vibration and ensuring consistent wire pay-off and take-up dynamics.



Bi-Directional Wire Tensioning

Automatic bi-directional tensioning mechanism maintains constant molybdenum wire tension, stabilizing cutting performance and reducing wire consumption and breakage during complex or long-duration cuts.



Non-Resistance High Frequency Power

High-frequency pulse power supply with adaptive control and real-time discharge monitoring for stable EDM machining performance.



Embedded CNC System

Integrated CNC controller with seamless connection to design software (AutoCAD) supporting DWG/DXF formats and network communication for easy program transfer and remote operation.



Intelligent Database Control

Fuzzy-input parameter system with automatic matching to optimal process parameters. Supports DIY configuration for specialized requirements and expands the machine's applicability to diverse research and instructional tasks.

All coolant, motion control, and electrical discharge subsystems are fully compliant with the mandatory technical, operational, and safety requirements specified in the solicitation.



Upgraded High Frequency System

High-frequency pulse EDM power supply with adaptive discharge control and real-time monitoring for stable machining performance.



Reduced Molybdenum Wire Consumption

Optimized process controls achieve approximately 30% increase in wire-use efficiency and a lower wear rate (example metric: 200K MM² per 0.01mm wear unit).



Enhanced Reliability

Redesigned electrical cabinet eliminates resistors, lowers heat generation, and uses a fanless layout to prevent water-mist ingress—improving service life and reducing maintenance.



CoolCut Software Platform

Integrated Windows-based CNC control software with Ethernet connectivity, advanced servo control, pitch compensation, and complex trajectory processing capability.



4-Axis Simultaneous Cutting (X, Y, U, V)

Enables tapered cuts, differing top/bottom profiles, and independent upper/lower contour control with real-time synchronization for high-complexity geometries.



Rotary A-Axis Capability

Rotary A-axis enables multi-sided workpiece machining in a single setup with coordinated linear and rotational motion for reduced setups and improved geometric consistency.

Operational Features

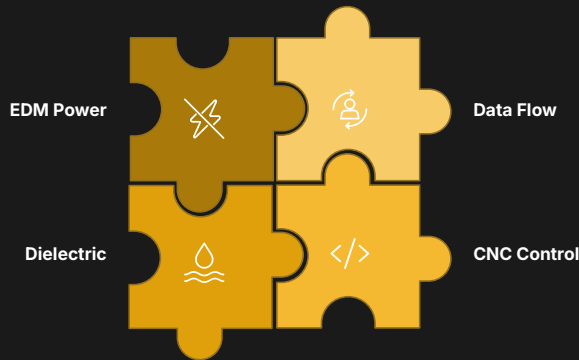
- Agile Z-axis adjustment with temporary lift during cutting and automatic return.
- Mechanical origin with pitch compensation and laser interferometer correction capability.
- Multi-user coordinate system with priority emergency cutting and processing record queries.
- Brass wire cut machine AR alignment.
- Jump/null faster moving for improved efficiency.
- Auto-centering and auto-edging functions.
- One-click back straight function.

Environmental & Filtration

Multi-layer filtered water tank with fine filtration prolongs working-fluid life, improves cleanliness, and enhances slag discharge performance. The system is compatible with water-based working fluids that are non-toxic to operators and environmentally compliant, meeting environmental protection requirements while ensuring consistent dielectric and cooling performance for precision cutting.

All advanced machining, control, and operational features are fully compatible with and do not limit compliance with the mandatory technical requirements defined in the solicitation.

Power Supply, Dielectric & Control System



The integrated control architecture of the QL-LinearWire coordinates three essential subsystems to achieve stable, repeatable machining performance in academic research environments.

System Integration

The QL-LinearWire integrates three critical subsystems—EDM power supply, dielectric management, and CNC control—into a coordinated platform that enables researchers and students to focus on experimental objectives rather than system management. This integration approach provides the operational simplicity required in academic environments while maintaining the parameter flexibility necessary for advanced research applications.

The industrial-grade EDM power supply delivers controlled electrical discharges with configurable machining parameters, enabling users to optimize cutting conditions for specific materials, geometries, and research objectives. Parameter configurability supports both instructional demonstrations of EDM fundamentals and advanced research exploring process-material interactions.

1

EDM Power Supply

Industrial-grade power supply such as configurable discharge parameters pulse duration, discharge current, and pulse interval. Parameter control enables optimization for different material types, cutting speeds, and surface finish requirements encountered in research applications.

2

Dielectric System

Integrated dielectric circulation and filtration system maintains stable cutting conditions and thermal control. The closed-loop dielectric system removes machining debris, controls temperature, and ensures consistent flushing conditions essential for repeatable machining performance and dimensional accuracy.

3

CNC Control

Industrial CNC controller with multi-axis capability and user-friendly operator interface suitable for academic environments. CNC programming and control software included with standard connectivity for file transfer and system integration with CAD/CAM workflows common in research facilities.

- 📄 **Software Compatibility:** The CNC control system supports standard G-code programming and includes file import capabilities compatible with common CAD/CAM software packages used in academic engineering programs, facilitating integration with existing laboratory computational resources and instructional curricula.

Safety, Installation & Training

The QL-LinearWire implementation program encompasses comprehensive safety systems, professional installation services, and structured training protocols designed specifically for academic research environments. This integrated approach ensures that the system operates safely within university laboratory settings while providing the knowledge transfer necessary for faculty, research staff, and advanced students to utilize the equipment effectively for instructional and research purposes.

Enclosed Environment

Fully enclosed machining environment with integrated safety barriers and access controls

Safety Systems

Integrated operator safety systems including emergency stop, controlled operating modes, and interlock protection

Standards Compliance

Electrical and mechanical systems compliant with applicable safety standards for laboratory equipment

Safety Architecture

Multiple layers of safety protection enable supervised operation in academic environments. The fully enclosed machining environment contains dielectric fluid and provides physical barriers between operators and the machining process. Emergency stop functionality provides immediate system shutdown capability accessible from multiple locations.

Controlled operating modes support supervised instructional use, allowing faculty to configure access levels appropriate to user experience and training status.

01

FOB Destination Delivery

System delivered to your receiving facility with coordinated logistics, including advance notification, delivery scheduling, and receiving area requirements documentation to ensure smooth acceptance

02

Installation & Placement

Professional on-site placement, mechanical installation, and utility connections by factory-trained technicians following documented installation procedures and facility coordination protocols

03

System Commissioning

Mechanical, electrical, and functional verification procedures including CNC system calibration, motion accuracy verification, and operational testing to confirm system performance meets specifications

04

Operator Training

Comprehensive on-site training covering safe operation, system control and programming, routine operation and inspection procedures, and basic operator-level maintenance and troubleshooting protocols

Consumables, Warranty & Support

Consumables & Ongoing Operation

The QL-LinearWire is delivered with an initial starter consumables package providing everything necessary to begin operation immediately following installation and training. This package includes wire electrode inventory, dielectric fluid, filtration consumables, and essential replacement components to support initial operation, instructional demonstrations, and early research applications.

A comprehensive recommended consumables list is provided with detailed specifications, reorder information, and estimated usage rates based on typical academic research and instructional usage patterns. This documentation enables laboratory managers to establish procurement procedures and budget for ongoing operational requirements. Spare parts availability is documented with part numbers, sourcing information, and recommended inventory levels for critical replacement components, supporting effective maintenance planning and minimizing operational downtime.

1

One-Year Comprehensive Warranty

Minimum one (1) year parts and labor warranty covering all mechanical, electrical, and control system components. Warranty commences upon successful installation and final acceptance, providing long-term protection for your capital equipment investment. Initial starter consumables required for system commissioning and early operation are included. Routine consumable replenishment after initial use is excluded from warranty coverage in accordance with standard industry practice.

2

Technical Support Services

Telephone and email technical support providing operational assistance, troubleshooting guidance, and application support throughout the warranty period and beyond. Direct access to knowledgeable support engineers familiar with academic research applications and laboratory operational requirements.

3

Warranty Service Coordination

Streamlined warranty service coordination minimizes downtime through rapid response protocols, parts expediting, and direct communication channels. Service management designed to understand and accommodate academic schedules, research deadlines, and instructional commitments.

Warranty support includes remote technical response within one (1) business day and coordinated service actions to restore system operation as quickly as practicable.

Advancing Precision Machining with QuakeLogic

Empowering academic, laboratory, and industrial environments with **high-precision wire electrical discharge machining**, long-term operational reliability, and compliance-driven system integration, the **QuakeLogic QL-LinearWire CNC Wire EDM System** sets a new standard for instructional and research-grade precision cutting.

Connect with QuakeLogic: Your Partner in CNC Wire EDM Systems

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