QUAKELOGIC

QL-Fortis 850-5X Integrated 5-Axis CNC Milling Station

QL-Fortis 850-5X represents the pinnacle of industrial-grade 5-axis CNC machining technology, engineered specifically for post-processing of additively manufactured components, precision surface finishing, and high-accuracy machining applications. This fully integrated machining system combines advanced kinematics with robust structural design to deliver exceptional dimensional accuracy and surface quality across the most demanding manufacturing environments.

CUSTOMER SATISFACTION 100% GUARANTEED

MADE IN USA WITH GLOBAL MATERIALS SOURCED

Axis Travel & Machining Envelope

Machine Configuration

The QL-Fortis 850-5X utilizes a cradle/trunnion-type kinematic architecture for the A and C rotary axes, providing optimal rigidity and thermal stability during 5-axis operations. This configuration delivers superior chip evacuation and tool accessibility compared to swivel-head designs, while maintaining the structural stiffness required for high-accuracy machining of hardened materials and complex aerospace components.

Machine Type: 5-Axis CNC Machining Center

Kinematics: Cradle/Trunnion Type (A & C Axes)

Linear Axis Specifications

The linear axis travel envelope has been specifically dimensioned to accommodate large additive manufacturing build volumes while maintaining the precision required for post-processing operations. All three linear axes utilize preloaded linear guide systems with integrated distance-coded absolute encoders, ensuring positional accuracy of ±0.0002 inches throughout the entire travel range. Temperature-compensated ball screws driven by high-torque servo motors provide smooth motion control and exceptional contouring accuracy during simultaneous 5-axis operations.

X-Axis Travel

≥ 33.5 inches

Longitudinal table travel with absolute position encoding and thermal compensation

Y-Axis Travel

≥ 27.6 inches

Transverse saddle travel providing optimal workpiece accessibility and tool clearance

Z-Axis Travel

≥ 19.7 inches

Vertical spindle travel with integrated counterbalance system for consistent accuracy

Rotary Axis Capabilities

The rotary table system features a massive 25.6-inch diameter platform with integrated direct-drive torque motor technology, eliminating mechanical backlash and providing infinite C-axis rotation capability. The trunnion-mounted A-axis delivers the tilting motion required for true 5-axis machining, with both rotary axes supporting full RTCP (Rotational Tool Center Point) functionality. This advanced kinematic compensation maintains programmed tool path accuracy regardless of rotary axis positioning, enabling complex sculptured surface machining without manual coordinate system transformations.

Spindle System, Coolant Delivery & Thermal Stability

High-Performance Spindle System

The QL-Fortis 850-5X incorporates a direct-driven motorized spindle system engineered for continuous high-speed operation and exceptional tool-holding accuracy. The spindle achieves maximum rotational speeds exceeding 16,000 RPM while maintaining radial runout of less than 0.0001 inches at the spindle nose. This precision is achieved through advanced bearing preload systems, oil-air lubrication, and integrated temperature monitoring that adjusts cooling flow based on spindle load and thermal conditions.

The dual-contact HSK toolholder interface provides superior tool-holding stiffness compared to traditional taper systems, with both HSK-A63 and HSK-A100 configurations available to match specific tooling requirements. The short, rigid toolholder geometry minimizes tool deflection during heavy roughing operations while maintaining the high-speed balance characteristics required for finish machining at elevated spindle speeds. Automatic pneumatic tool clamping and unclamping ensures consistent retention force across the entire tool magazine capacity.

16K

Maximum Spindle Speed

RPM capability for high-speed finishing operations with balanced tooling assemblies

68

Peak Coolant Pressure

Bar (1000 psi) through-spindle delivery for deep-hole drilling and chip evacuation

0.0001

Spindle Runout

Inches TIR at spindle nose ensuring precision surface finish and dimensional accuracy

Advanced Coolant System

The integrated coolant system delivers high-pressure cutting fluid directly to the cutting zone through both through-spindle and external nozzle configurations. The through-spindle coolant system operates at 1000 psi (68 bar), providing the penetrating force required for effective chip breaking and heat removal during deep-hole drilling, tapping, and high-feed milling operations. This high-pressure delivery is particularly critical when machining aerospace alloys and hardened tool steels where conventional flood coolant proves inadequate.

A programmable external coolant manifold supplements the through-spindle system, featuring multiple independently controlled nozzles that can be positioned and activated based on specific machining operations. The flood coolant capacity of 132 gallons supports extended production runs, with integrated filtration systems maintaining fluid cleanliness to 25 microns. Coolant temperature regulation prevents thermal variation that could affect dimensional accuracy during extended machining cycles.

Thermal Compensation Technology

Maintaining dimensional accuracy during extended machining operations requires active compensation for thermal growth in both the machine structure and spindle assembly. The QL-Fortis 850-5X incorporates a comprehensive network of temperature sensors throughout the machine structure, with real-time compensation algorithms adjusting axis positioning to counteract thermal expansion effects.

- Linear axis compensation on X, Y, and Z travels
- Rotary axis thermal drift correction
- Spindle growth compensation for consistent tool length
- Structural temperature stabilization systems
- Environmental temperature monitoring and logging

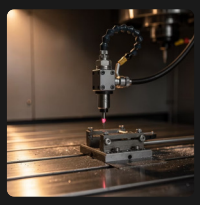
The spindle thermal compensation system continuously monitors bearing temperatures and adjusts coolant flow to maintain consistent thermal conditions. During warm-up cycles, the control system applies predictive compensation based on learned thermal behavior patterns, significantly reducing the stabilization time required before precision machining can commence. This advanced thermal management ensures that dimensional accuracy remains within tolerance bands throughout multi-hour production runs, even in facilities where ambient temperature control may be limited.

Tooling Systems, Probing Technology & Chip Management

Automatic Tool Changer System

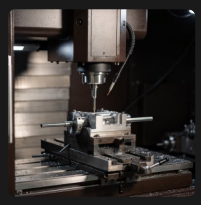
The QL-Fortis 850-5X features a high-capacity arm-type automatic tool changer (ATC) with storage for 38 or more tool assemblies, enabling extended unattended production runs and comprehensive tool strategies without manual intervention. The arm-type mechanism provides chip-to-chip tool change times of less than 8 seconds, minimizing non-productive time while maintaining precise tool positioning repeatability.

The tool magazine design incorporates individual tool identification via RFID technology, enabling automatic tool life tracking and preventing the use of worn or damaged tools. Heavy tooling capability supports tool assemblies up to 26 pounds and 10 inches in diameter, accommodating the large-diameter face mills and indexable boring heads commonly required for post-processing additive manufacturing components.



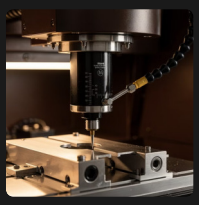
Tool Length & Diameter Probing

Integrated laser-based measurement system automatically captures tool geometry data during tool changes, compensating for tool wear and manufacturing variations



Workpiece Touch Probe System

Radio-transmission touch probe enables in-process measurement, datum establishment, and feature verification without removal from the machine



Automated Offset Calculation

Control system automatically processes probe data to update tool offsets and work coordinate systems, eliminating manual data entry errors

Integrated Probing Systems

Both tool and workpiece probing systems are included as standard equipment with the QL-Fortis 850-5X, providing automated measurement capabilities essential for lights-out manufacturing and quality assurance. The tool measurement system uses a non-contact laser transmitter positioned within the machining envelope to capture length and diameter data for each tool as it enters the spindle. This automated verification ensures that tool offsets remain accurate throughout production runs, detecting broken tools or excessive wear before they can affect part quality.

The workpiece touch probe system employs strain-gauge trigger technology with omnidirectional repeatability of 0.0001 inches, enabling precise measurement of part features, alignment datums, and reference surfaces. Wireless signal transmission eliminates the reliability concerns associated with traditional hard-wired probe systems, while infrared battery charging maintains operational readiness without manual intervention. The probe automatically returns to its storage position when not in use, protecting the sensitive trigger mechanism from chip impact and coolant contamination.

Pre-programmed probe cycles simplify common measurement tasks including bore diameter verification, pocket depth measurement, and surface location detection. The control system can automatically adjust work coordinate systems based on probe results, compensating for fixturing variations and thermal movement of workpieces. This adaptive capability is particularly valuable when post-processing additive manufacturing components where as-built geometry may vary from nominal CAD dimensions.

Chip Evacuation & Mist Extraction

Effective chip removal is critical for maintaining dimensional accuracy and preventing tool damage during automated production operations. The QL-Fortis 850-5X incorporates a generous chip tray with steep wall angles and strategically positioned coolant wash-down nozzles that guide swarf toward the integrated chain-type chip conveyor. The conveyor system automatically transports chips out of the machining envelope to an external collection container, enabling extended unattended operation without chip accumulation that could interfere with rotary axis movement or workpiece loading.

Chip Management Features

- Large-capacity chip tray with easy access panels
- Chain-type chip conveyor with magnetic separator
- Hinged conveyor discharge for flexible container placement
- Programmable chip wash-down cycles
- Chip-level monitoring and alarm systems

Mist Extraction System

- High-efficiency HEPA filtration for coolant mist removal
- Maintains visibility through observation windows
- Protects operators from airborne particulates
- Reduces facility contamination and cleaning requirements
- Meets OSHA requirements for metalworking fluid exposure

Structural Design, Loading Configuration & Physical Dimensions

High-Rigidity Structural Design

The QL-Fortis 850-5X foundation consists of a monolithic cast-iron base structure engineered to provide exceptional static and dynamic rigidity under the asymmetric loading conditions inherent in 5-axis machining operations. The base casting incorporates strategically positioned ribbing and internal cavities filled with polymer concrete composite material, creating a hybrid structure that combines the damping characteristics of polymer concrete with the dimensional stability of cast iron. This design approach significantly attenuates vibration amplitudes across the frequency spectrum most commonly excited during heavy interrupted cutting operations.

All linear axis guideways mount directly to thermally stabilized surfaces within the base casting, eliminating intermediate structural elements that could introduce compliance or thermal variation. The column structure supporting the Z-axis and spindle assembly utilizes box-section geometry with internal ribbing to maximize torsional stiffness while minimizing mass. This optimized mass distribution reduces the inertial forces that must be overcome during rapid traverse movements, enabling faster cycle times without sacrificing positioning accuracy or surface finish quality.

Cast Iron Base Structure

Monolithic casting with optimized ribbing provides stable foundation for all machine axes

Polymer Concrete Damping

Internal composite fill absorbs vibration energy, improving surface finish during interrupted cutting

Fully Enclosed Design

Complete guarding with safety interlocks ensures operator protection and environmental compliance

Overhead Loading Capability

The machining envelope features large access openings and reinforced structural elements specifically designed to support overhead loading of workpieces and fixtures via facility crane or hoist systems. This capability is essential when handling the large, complex additive manufacturing components that represent the primary application for the QL-Fortis 850-5X. The rotary table surface incorporates a comprehensive grid of precision-ground T-slots and threaded mounting locations, enabling secure fixturing of components with irregular geometry or non-standard mounting interfaces.

Access door openings measure over 40 inches in width and height, providing clearance for workpieces that approach the maximum rotary table diameter. Hydraulic assist mechanisms support the substantial door mass, enabling single-operator access without manual lifting strain. All access panels incorporate multiple safety interlocks that immediately halt spindle rotation and axis motion when opened, while still permitting manual pulse generator (MPG) control for setup and fixture alignment operations when appropriate safety key switches are activated.

Facility Installation Footprint

The QL-Fortis 850-5X has been specifically dimensioned to accommodate installation within facilities that may have existing infrastructure constraints or limited overhead clearance. The complete installed envelope, including all access clearances and service requirements, remains within the following maximum dimensions:

- **Maximum Width:** 221 inches
- **Maximum Depth:** 164 inches
- **Maximum Height:** 192 inches

These dimensions account for all electrical cabinet positioning, coolant system placement, and chip conveyor discharge orientations. Site planning documentation includes detailed clearance requirements for maintenance access to all consumable components including way lubrication reservoirs, hydraulic fluid tanks, and electrical service panels.

Modular Shipping Configuration

A critical design requirement for the QL-Fortis 850-5X was the ability to ship the system in modular sections that would fit through standard industrial doorways and freight elevators without requiring building modifications. The machine is delivered in multiple sub-assemblies with maximum individual component dimensions not exceeding 132 inches in any direction, ensuring compatibility with standard freight elevators, doorway widths, and truck bed dimensions.

The modular architecture employs precision-ground mounting interfaces and dowel-pin location systems that enable field reassembly without compromising the geometric accuracy established during factory alignment procedures. All critical datum surfaces are protected by custom-fabricated shipping covers that prevent damage during transport and storage. Comprehensive reassembly documentation guides installation technicians through the alignment verification process, with specified tolerances for all mechanical interfaces.

01

Component Delivery

Individual modules arrive on dedicated shipping pallets with protective crating

02

Precision Reassembly

Trained technicians position and secure modules using factory-established datums

03

Geometric Verification

Laser interferometry confirms axis alignment and positioning accuracy

04

Operational Acceptance

Complete functional testing validates performance against all specifications

Shipping Compliance Verification: The modular shipping configuration fully satisfies the solicitation requirement that no individual shipping component exceed 132 inches in maximum dimension. Complete shipping manifests and component dimension verification data are provided during the quotation process.

Control Systems, Electrical Infrastructure & Compliance Verification

Advanced CNC Control System

The QL-Fortis 850-5X operates under the command of a Siemens ONE or equivalent high-performance CNC control platform, providing the computational power and advanced algorithmic capabilities required for true simultaneous 5-axis machining operations. The control system processes up to 1000 program blocks per second, ensuring smooth contouring even when executing complex sculptured surface toolpaths with high data density.

Native RTCP (Rotational Tool Center Point) functionality automatically compensates for changes in tool orientation relative to the workpiece as rotary axes move during simultaneous 5-axis operations. This advanced kinematic transformation eliminates the need for post-processor-generated linearization, resulting in more accurate surface reproduction, smoother tool motion, and simpler CAM programming workflows.

Digital Manufacturing Connectivity

Ethernet network interface enables integration with MES systems, remote monitoring platforms, and centralized tool management databases. Support for industry-standard protocols including MTConnect, OPC-UA, and Siemens SINUMERIK Integrate facilitates Industry 4.0 initiatives.

Adaptive Control Technology

Real-time monitoring of spindle load, axis following error, and vibration characteristics enables adaptive feed rate optimization. The control system automatically reduces feed rates when detecting excessive cutting forces, preventing tool breakage and maintaining dimensional accuracy.

Advanced Interpolation Modes

Support for spline interpolation, compressed program blocks, and look-ahead buffering ensures smooth motion during complex 3D surface machining. High-performance position loop processing maintains contour accuracy during simultaneous 5-axis operations at elevated feed rates.

Electrical System Architecture

The electrical system is configured for standard North American industrial power distribution infrastructure, operating from 480V, 60Hz, 3-phase electrical service. All electrical components meet UL508A industrial control panel standards, with CE marking for international compliance where applicable. The main electrical enclosure incorporates independent cooling systems to maintain internal component temperatures within manufacturer-specified ranges, even in facilities where ambient temperatures may approach upper operational limits.

Servo drive modules utilize regenerative braking technology, returning kinetic energy to the DC bus during deceleration rather than dissipating it as heat through braking resistors. This energy recovery approach reduces overall power consumption while simultaneously decreasing the cooling load on the electrical cabinet ventilation system. Individual servo axis modules employ plug-in architecture, enabling rapid replacement in the event of component failure and minimizing unplanned downtime.

Installation & Training Support

Complete installation services are included with the QL-Fortis 850-5X procurement, encompassing all activities required to bring the machine from delivered components to fully operational production equipment. Factory-trained installation technicians manage the reassembly process, perform geometric verification measurements using laser interferometry equipment, and conduct comprehensive functional

Advancing Precision with QuakeLogic

Empowering government manufacturing facilities, advanced engineering laboratories, and applied research environments, **QuakeLogic Inc.** delivers industrial-grade CNC machining solutions engineered for **precision, reliability, and long-term operational stability**.

Connect with QuakeLogic — Your Partner in Advanced Multi-Axis CNC Manufacturing Solutions

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