

(All pictures provided in this quotation are for illustration purposes only)





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The 800A Series machine configuration is optimized for creep feed grinding processes which require (3) linear axis. Specifically, it is a traveling column design with a Y-axis ram traveling on the Z-axis, and a stationary work-piece. This configuration allows for a very small machine footprint while allowing all three structural guideway rail mating components to have a large closed box cross section; maximizing grinding stiffness and geometric accuracy. This configuration also allows for easy implementation of common creep-feed grinding options such as CDCF grinding, indexing table part loading and robotic part loading.

The 800A Series design benefits extensively from Campbell Grinders expertise in the 1000 series modular traveling column machines, with which it shares many common and similar components. Campbell Grinder utilizes the latest structural design technology, including assembly based FEA and modal analysis software, allowing complex constraints to very accurately predict central as well as localized deformations in components and connections. Extensive analysis ensures maximum geometric and positioning precision through all three axis, taking into consideration every aspect of machine motion; structures, guideway spacing and preload, servo drive and position measurement locations, etc. Through years of grinding research, special projects, and close work with vendors, Campbell Grinder has gained an advanced understanding of the loads (static and dynamic) involved in grinding processes, and has continually incorporated this knowledge into the machines design.

The use of thermally stress relieved steel weldments in the 800A Series components allows the design of structures to benefit from hollow box sections, eliminating many of the design constraints imposed on iron castings. It's large cross section structures allow for stiffer, lighter components. This "efficient" stiffness has the benefits of higher servo performance and increased dynamic stiffness (the effectiveness of the system's dampening increases).

X-Axis (Longitudinal Axis):

The X-axis is located directly on the machine base structure. Guideway mating surfaces are ground into the base itself, capitalizing on the structures large cross section and thick-wall construction.

The X-axis guideways are a highly preloaded recirculating roller system. Each rail is aligned onto the machine base directly on the carriages using the latest laser measurement technology; eliminating the stackup errors involved in simply matching the rail to a machined surface (all the machines guideways are aligned this way). Our Linear drives utilize the latest in AC digital servo technology and are designed for optimal performance. They provide zero backlash, high stiffness and precise positioning accuracy.

Position feedback to the servo system is measured through an air-purged absolute glass linear encoder. All (3) axis use this type of encoder.

Z-Axis (Cross-Axis):

The Z-axis is a horizontal axis which is mounted between the vertical column and the X-axis way system. On the top of the large box section fabrication are the linear ways that support the vertical axis column and make up the Z axis slide. On the bottom of the box section the X axis bearing trucks are positioned.

Similarly to the X-axis, the Z-axis drive servo is located at the center of gravity of the Y and Z axis, the servo is mounted outside of the slide system allowing the position of the drive to be as close as possible to the grinding spindle centerline, and eliminating any thermal growth caused by the servo. The axis shares the same type of guideways, drive, and position measurement as the X and Y-axis.

Y-Axis (Vertical Axis):

The Y-axis is a closed box section vertical column. The column's structure is highly optimized to accept the loads placed on it through the Z-axis during creep feed grinding. The Y-axis slide plate functions as the connection between the Y and Z-guideway carriages and both drives. The axis shares the same type of guideways, drive, and position measurement as the X and Z-axis.

The Y-axis servo is located above the column. This allows for the slide plate to be located as close to the centerline of the drive as possible, and minimizes the servo's thermal influences on the structure. The guideways used on the Y-axis are a highly preloaded roller system, similar if not identical (depending on options) to the X and Z-axis. Y-Axis is also counter balanced.

Grinding Spindle:

Features of this spindle include an in-line motorized block style and belt driven for extreme stiffness and durability. The motor and spindle is liquid cooled to insure dimensional stability. The nose of the spindle is equipped with a special air shield insuring zero coolant ingress in even the most extreme conditions. The tool connection is through a HSK style connection. <u>Two</u> HSK wheel mount provided, additional mounts are sold separately.

Table Exchanger

So that part loading can be done outside of cycle time Campbell Grinder is offering a 180 degree Table Indexer option. The 180 degree indexer is constructed of a non-lifting hirth-coupled indexer that will rotate the heavy duty weldment that on top sits two fixture assemblies. The indexer will allow the fixtures to rotate clockwise and counterclockwise in and out of the grind zone. This indexer and fixture configuration will allow the operator to load a fixture and indicate parts while the other fixture is in the grind zone machining. This system is completely integrated with all of the safety devices in place. The enclosure is designed to allow operator full access to the loading station with an overhead crane.

Table Tops:

The table tops is directly mounted to the Table exchanger. They are machined with Tee slots or bolt holes for fixture mounting as standard, but can be customized to the customer's specifications for specific fixturing requirements.

Dual Supported Plunge Dresser:

Available for this machine is a precision combination disk / form roll and single point dresser system. The dressing spindle is a direct motorized version insuring extreme smooth operation. The spindle is sealed for operation in a high coolant flow environment. The roll is dual supported with quick release. On the top of the dresser is a shaft extension to mount a single point disk.

Coolant Nozzle:

A single axis coolant nozzle system is included with the machine. It is powered by a servo motor and programmable through the CNC control. This enables coolant to be delivered at the part / wheel interface for optimal cooling. Part specific nozzles are quickly exchanged manually by changing the nozzle / manifold block.

Wheel Balancer System:

The wheel balance system operates on a principle of mass compensation for wheel imbalance. The balance head contains two movable eccentric weights; each weight is driven by electric motors through a precision gear train. These weights can be repositioned to offset any imbalance in a grinding wheel. Imbalance or vibration is picked up by the sensor. The signal is fed to the controller, which filters the signal by RPM. The controller then drives the two balance head weights in the direction that reduces the amplitude of the vibration signal. When the weights are positioned so the lowest vibration is reached, the balance cycle is complete.

Specifications:

- One (2) wheel balancer heads
- One (1) Transducer
- One (1) Remote Display Unit
- All sensors, cables, sending units, and mounting hardware necessary for installation

Single Machine Water Based Coolant (MVF) System:

The coolant System Option is comprised of a Vacuum Coolant system with Coolant / Spindle Chiller system and Mist Control system as detailed below.

Coolant System (MVF):

A paper band vacuum filtration unit and reservoir will be supplied with this option. This filter is very efficient for applications requiring fine filtration and high stock removal rate. The complete filter system operates automatically and requires little operator intervention.

Specifications:

- 1830mm x 4270mm (72 inches x 168 inches) dimensions
- Approx. 3220 liters (850 gallons) capacity
- 230 l/min (60 gpm) max flow rate
- Programmable coolant pressure
- 15-20 Micron Clarity

Spindle, Coolant and Table Chiller:

A chiller system that cools the main clean coolant reservoir and the grinding spindle is supplied with this option in order to provide constant grinding conditions, and to make the machine more stable. Chilling these components allows the machine to run for long periods of time without offsets or size adjustments.

Specifications:

- Air Cooled
- single circuit style
- Chiller is sized properly for the application

Coolant Sump System:

This system is supplied with a coolant sump. The sump pump returns the coolant to the coolant/filtration system. The system is comprised of a sump coolant pump, switches and valves as necessary.

Mist Removal System:

A mist removal system sized for water based coolant is supplied.

Fixture Design:

A part specific fixture will be agreed upon and designed to accommodate a Kraft Tool Trowel. This price includes the design only and does not include the actual fixture. A final agreed upon fixture design will be provided should Kraft desire to move to the next phase of quoting.

Enclosure:

The entire machine is sealed from leaks and mist in a steel enclosure. Large front doors are designed with polycarbonate windows, providing excellent visibility of the part and dressing system. When open they provide ample space for part loading and tool changing. Interior lighting is designed with the latest bulb technology and positioned to provide the clearest view of the grind zone while being easy on the operator's eyes. Door interlocks are standard on all Campbell Grinder machines. A wash down hose is also provided for machine clean-up.

Labeling:

All wires, all electrical components, all settings All hydraulic hoses, all components, all gage settings, all replacement part numbers All pneumatic hoses, all components, all gage settings, all replacement part numbers All coolant lines, all components, all gage settings, all replacement part numbers Machine lifting locations and component weights All allowable fluid and grease types Others as required

Campbell Grinder Standard Run-off:

Campbell Grinder Standard runoff includes the following, a full review of the machines geometries and accuracy's and a test grind on Campbell Grinder's standard test part checking size and repeatability, ID, OD and face features are included. Duration of this runoff normally takes 4 days to complete. As an alternative to the standard Campbell grinder test part. Customers can also choose to supply their own part. Part drawings and parts must be supplied several weeks in advance to make sure all preparations for a successful test are completed before the customers visit. Either version of the Campbell Standard testing is included in the base price of the machine. Machine operators are encouraged to visit during this test period.

Another Option to the Campbell Standard run-off, is a full turnkey process development which includes:

- 1) Fixture development, Fixture Manufacturing and fixture prove -out
- 2) Program development and prove out
- 3) Wheel development, manufacturing and prove out using the latest technology in wheels by Norton St Gobain.
- 4) Process optimization- making sure this complete process is ready for the customer when the machine hits the shop floor.

Turnkey processes are to be quoted separately and not included as a part of the "Campbell Grinder Standard Run-off"

Machine Control:

The machine is supplied with the Fanuc CNC control. This control combines speed, precision, and userfriendliness to better satisfy multiple user needs. The world's most advanced CNC, with its performance and functionality, is an optimum system for the latest high-end machines requiring multi-axis, multi-path, complex and ultra high-speed features.

This control features simplified servo control and I/O connectivity. Servos are controlled through a single fiber optic called the Fanuc Serial Servo Bus (FSSB), which runs between the control and Servo rack. The servos are digitally controlled; further adding to reliability. A built in ladder control display allows for easy maintenance.

Universally accepted CNC control modes and operations along with industry accepted G-Code part programming is a standard feature on this machine. It also includes an on-board PCMCIA slot and USB port on the front of the control to further ease programming and backup. A remote hand pendant is supplied.

Campbell Grinder Standard Control Includes:

Axis Control:

- Advanced High Resolution Vector Control (HRV3)
- Simultaneously control of Multi Axis
- Least command increment of 0.00001 inch, 0.0001 mm, 0.0001 degrees
- Hardware and software over travel protection
- Absolute position detection
- Quick Stop function upon E-Stop

Part Programming Features:

- 2*Mb* part program storage
- Extended part program editing
- Part program protection
- Custom Macro with expanded variables
- Inch/metric conversion
- Memory card or Ethernet input/output of programs

Display:

- Custom display for compact viewing of all data
- Alarm history display
- Servo adjustment display

Feed Function:

- Rapid traverse bell shaped acceleration / deceleration
- Separate, more precise acc/dec ramps for grinding
- Federate overrides
- Separate, more precise acc/dec ramps for grinding
- Feedrate overrides

Specifications for 800A800x600 Series Machine

Approximate Floor Space	Left To Right	2.89M (9.5 Feet)
Requirements (Machine Only):		
	Front To Back	3.66M (12 Feet)
	Height	3.20M (10.5 Feet)
Approximate Weight:		24,947Kg (55,000 pounds) (estimate)
Work Envelope:	Long	812mm (32 inches)
	Width	609mm (24 inches)
	Height	609mm (24 inches)
Axis:	X-Axis Travel	812mm (32 inches) plus 200mm (8 inches)
		beyond table edge
	Z-Axis Travel	500mm (20 inches)
	Y-Axis Travel	609mm (24 inches)
	Rapid Traverse Speed	7620mm (300 inches) per minute
	Positioning Accuracy	5 Microns (0.0002 inch)
Linear Scales:	Scales	Absolute Scales
Table Top:	Long	812mm (32 inches)
	Width	600mm (24 inches)
	Tee Slots Standard	16mm (5/8 inches)
Grinding Spindle:	Power	44.7 kW (60hp) from 1,200 to 3,200 RPM
Grinding Spindle:	Power RPM Speed Range	44.7 kW (60hp) from 1,200 to 3,200 RPM 0 – 5,000 RPM
Grinding Spindle:	Power RPM Speed Range Run Out Both Radially And	44.7 kW (60hp) from 1,200 to 3,200 RPM 0 - 5,000 RPM 2.5 Microns (0.0001 inch)
Grinding Spindle:	Power RPM Speed Range Run Out Both Radially And Axially	44.7 kW (60hp) from 1,200 to 3,200 RPM 0 – 5,000 RPM 2.5 Microns (0.0001 inch)
Grinding Spindle:	Power RPM Speed Range Run Out Both Radially And Axially Wheel Size	44.7 kW (60hp) from 1,200 to 3,200 RPM 0 – 5,000 RPM 2.5 Microns (0.0001 inch) Max 20 inch x 6 inch wide
Grinding Spindle:	Power RPM Speed Range Run Out Both Radially And Axially Wheel Size Tool Connection	44.7 kW (60hp) from 1,200 to 3,200 RPM 0 – 5,000 RPM 2.5 Microns (0.0001 inch) Max 20 inch x 6 inch wide HSK 100
Grinding Spindle:	Power RPM Speed Range Run Out Both Radially And Axially Wheel Size Tool Connection Power & RPM Range	44.7 kW (60hp) from 1,200 to 3,200 RPM 0 – 5,000 RPM 2.5 Microns (0.0001 inch) Max 20 inch x 6 inch wide HSK 100 3.75Kw (5Hp) @ 0-5500rpm
Grinding Spindle: Table Mounted Plunge Dresser:	Power RPM Speed Range Run Out Both Radially And Axially Wheel Size Tool Connection Power & RPM Range	44.7 kW (60hp) from 1,200 to 3,200 RPM 0 - 5,000 RPM 2.5 Microns (0.0001 inch) Max 20 inch x 6 inch wide HSK 100 3.75Kw (5Hp) @ 0-5500rpm 2.5 Microns (0.0001 inch)
Grinding Spindle: Table Mounted Plunge Dresser:	Power RPM Speed Range Run Out Both Radially And Axially Wheel Size Tool Connection Power & RPM Range Run Out Both Radially And Axially	44.7 kW (60hp) from 1,200 to 3,200 RPM 0 – 5,000 RPM 2.5 Microns (0.0001 inch) Max 20 inch x 6 inch wide HSK 100 3.75Kw (5Hp) @ 0-5500rpm 2.5 Microns (0.0001 inch)
Grinding Spindle: Table Mounted Plunge Dresser:	Power RPM Speed Range Run Out Both Radially And Axially Wheel Size Tool Connection Power & RPM Range Run Out Both Radially And Axially Bore Diameter	44.7 kW (60hp) from 1,200 to 3,200 RPM 0 - 5,000 RPM 2.5 Microns (0.0001 inch) Max 20 inch x 6 inch wide HSK 100 3.75Kw (5Hp) @ 0-5500rpm 2.5 Microns (0.0001 inch) 52 mm (2.05 inches)
Grinding Spindle: Table Mounted Plunge Dresser:	PowerRPM Speed RangeRun Out Both Radially AndAxiallyWheel SizeTool ConnectionPower & RPM RangeRun Out Both Radially AndAxiallyBore DiameterDia Max Roll	44.7 kW (60hp) from 1,200 to 3,200 RPM 0 - 5,000 RPM 2.5 Microns (0.0001 inch) Max 20 inch x 6 inch wide HSK 100 3.75Kw (5Hp) @ 0-5500rpm 2.5 Microns (0.0001 inch) 52 mm (2.05 inches) 152mm (6 inches)
Grinding Spindle: Table Mounted Plunge Dresser:	PowerRPM Speed RangeRun Out Both Radially AndAxiallyWheel SizeTool ConnectionPower & RPM RangeRun Out Both Radially AndAxiallyBore DiameterDia. Max. RollMax Roll Width	44.7 kW (60hp) from 1,200 to 3,200 RPM 0 - 5,000 RPM 2.5 Microns (0.0001 inch) Max 20 inch x 6 inch wide HSK 100 3.75Kw (5Hp) @ 0-5500rpm 2.5 Microns (0.0001 inch) 52 mm (2.05 inches) 152mm (6 inches) 158.75 (6-1/4")
Grinding Spindle: Table Mounted Plunge Dresser:	PowerRPM Speed RangeRun Out Both Radially AndAxiallyWheel SizeTool ConnectionPower & RPM RangeRun Out Both Radially AndAxiallyBore DiameterDia. Max. RollMax Roll WidthDress Arbor	44.7 kW (60hp) from 1,200 to 3,200 RPM 0 - 5,000 RPM 2.5 Microns (0.0001 inch) Max 20 inch x 6 inch wide HSK 100 3.75Kw (5Hp) @ 0-5500rpm 2.5 Microns (0.0001 inch) 52 mm (2.05 inches) 152mm (6 inches) 158.75 (6-1/4") 1 provided
Grinding Spindle: Table Mounted Plunge Dresser:	PowerRPM Speed RangeRun Out Both Radially AndAxiallyWheel SizeTool ConnectionPower & RPM RangeRun Out Both Radially AndAxiallyBore DiameterDia. Max. RollMax Roll WidthDress ArborDress Roll	44.7 kW (60hp) from 1,200 to 3,200 RPM 0 – 5,000 RPM 2.5 Microns (0.0001 inch) Max 20 inch x 6 inch wide HSK 100 3.75Kw (5Hp) @ 0-5500rpm 2.5 Microns (0.0001 inch) 52 mm (2.05 inches) 152mm (6 inches) 158.75 (6-1/4") 1 provided 1 provided
Grinding Spindle:	PowerRPM Speed RangeRun Out Both Radially AndAxiallyWheel SizeTool ConnectionPower & RPM RangeRun Out Both Radially AndAxiallyBore DiameterDia. Max. RollMax Roll WidthDress ArborDress RollMachine Only	44.7 kW (60hp) from 1,200 to 3,200 RPM 0 – 5,000 RPM 2.5 Microns (0.0001 inch) Max 20 inch x 6 inch wide HSK 100 3.75Kw (5Hp) @ 0-5500rpm 2.5 Microns (0.0001 inch) 52 mm (2.05 inches) 152mm (6 inches) 158.75 (6-1/4") 1 provided 1 provided 460 V – 60Hz – 3 phase – Wye configuration –
Grinding Spindle: Grinding Spindle: Table Mounted Plunge Dresser: Electrical Requirements:	PowerRPM Speed RangeRun Out Both Radially AndAxiallyWheel SizeTool ConnectionPower & RPM RangeRun Out Both Radially AndAxiallyBore DiameterDia. Max. RollMax Roll WidthDress ArborDress RollMachine Only	44.7 kW (60hp) from 1,200 to 3,200 RPM 0 – 5,000 RPM 2.5 Microns (0.0001 inch) Max 20 inch x 6 inch wide HSK 100 3.75Kw (5Hp) @ 0-5500rpm 2.5 Microns (0.0001 inch) 52 mm (2.05 inches) 152mm (6 inches) 158.75 (6-1/4") 1 provided 1 provided 460 V – 60Hz – 3 phase – Wye configuration – 200-225 amps (approximate)
Grinding Spindle: Grinding Spi	PowerRPM Speed RangeRun Out Both Radially AndAxiallyWheel SizeTool ConnectionPower & RPM RangeRun Out Both Radially AndAxiallyBore DiameterDia. Max. RollMax Roll WidthDress ArborDress RollMachine Only	44.7 kW (60hp) from 1,200 to 3,200 RPM 0 – 5,000 RPM 2.5 Microns (0.0001 inch) Max 20 inch x 6 inch wide HSK 100 3.75Kw (5Hp) @ 0-5500rpm 2.5 Microns (0.0001 inch) 52 mm (2.05 inches) 152mm (6 inches) 158.75 (6-1/4") 1 provided 1 provided 460 V – 60Hz – 3 phase – Wye configuration – 200-225 amps (approximate) 560 l/min @ 5.5 bar (20 cfm @ 80 psi)