

MMH-500

High Production Horizontal Machining Center

Machine Serial No. T.3200723.21

MAG Proposal No. MAG-000160



■ STANDARD SPECIFICATIONS

	Imperial		Metric	
Work Area				
X-Axis	in	30	mm	762
Y-Axis	in	28	mm	710
Z-Axis	in	31.5	mm	800
Work piece max. swing diameter	in	Ø 27.5	mm	Ø 700
Work piece max. load (including pallet)	lb	1,323	kg	600
Work piece max. height (w/o fixture hydraulics)	in	39.4	mm	1000
Work piece max. height (w/ fixture hydraulics)	in	29.4	mm	710
Table surface to floor	in	41.3	mm	1050
Axis Speed				
X-, Y-, Z-Axis	in/min	2,362	m/min	60
Axis Acceleration				
X-, Y-, Z-Axis max.	in/s ²	197	m/s ²	5
Positioning: ISO-230-2				
Position accuracy (w/o absolute scale)	10 ⁻³ in	0.4 / ± 0.08	µm	10 / ± 2
Position accuracy (w/absolute scale)	10 ⁻³ in	0.4 / ± 0.08	µm	10 / ± 2
Position repeatability (w/o absolute scale)	10 ⁻³ in	0.24 / ± 0.06	µm	6 / ± 1.5
Position repeatability (w/ absolute scale)	10 ⁻³ in	0.2 / ± 0.04	µm	5 / ± 1
Direct Drive Spindle				
Tool taper (optional)	type	CAT40 [HSK63]	type	CAT40 [HSK63]
Speed max. (optional)	rpm	12,000 (15,000)	rpm	12,000 (15,000)
Power max. (15 min rating)	HP	29.5	kW	22
Torque max. (15 min rating)	ft-lbs	111	Nm	150
B-Axis (NC Table) (ISO-230-2)				
Position accuracy w/absolute scale	arc s	± 7.5 / ± 5.0	arc s	± 7.5 / ± 5.0
Index B-Axis min.	deg	360 x 0.001°	deg	360 x 0.001°
Rotary speed (B-Axis)	rpm	22	rpm	22

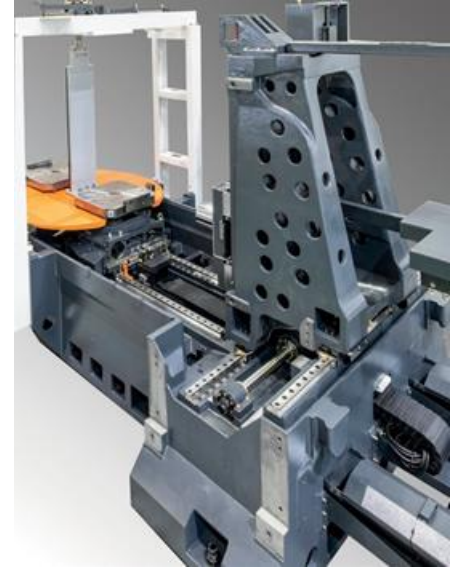
	Imperial		Metric	
Tool Magazine				
CAT40 / HSK63	no.	Chain 40 / 60	no.	Chain 40 / 60
Tool length max.	in	21.6	mm	550
Tool-Ø without empty positions max.	in	3.7	mm	95
Tool-Ø with empty positions max.	in	7.5	mm	190
Tool weight max.	lb	26.5	kg	12
Tool-to-tool	s	1.5	s	1.5
Tool change time	s	2.4	s	2.4
Pallet Changer				
Pallet change time	s	8.5	s	8.5
Pallet size	in	19.7 x 19.7	mm	500 x 500
Machine Dimensions (Doors Closed)				
Machine width	in	124	mm	3,150
Machine length	in	209	mm	5,300
Machine height	in	110	mm	2,800
Machine weight	lb	37,479	kg	17,000
Electrical System CNC Control: Fanuc 31iB				
Connection load (average base machine)	kVA	60	kVA	60

■ MACHINE CONSTRUCTION & FEATURES

Machine Structure:

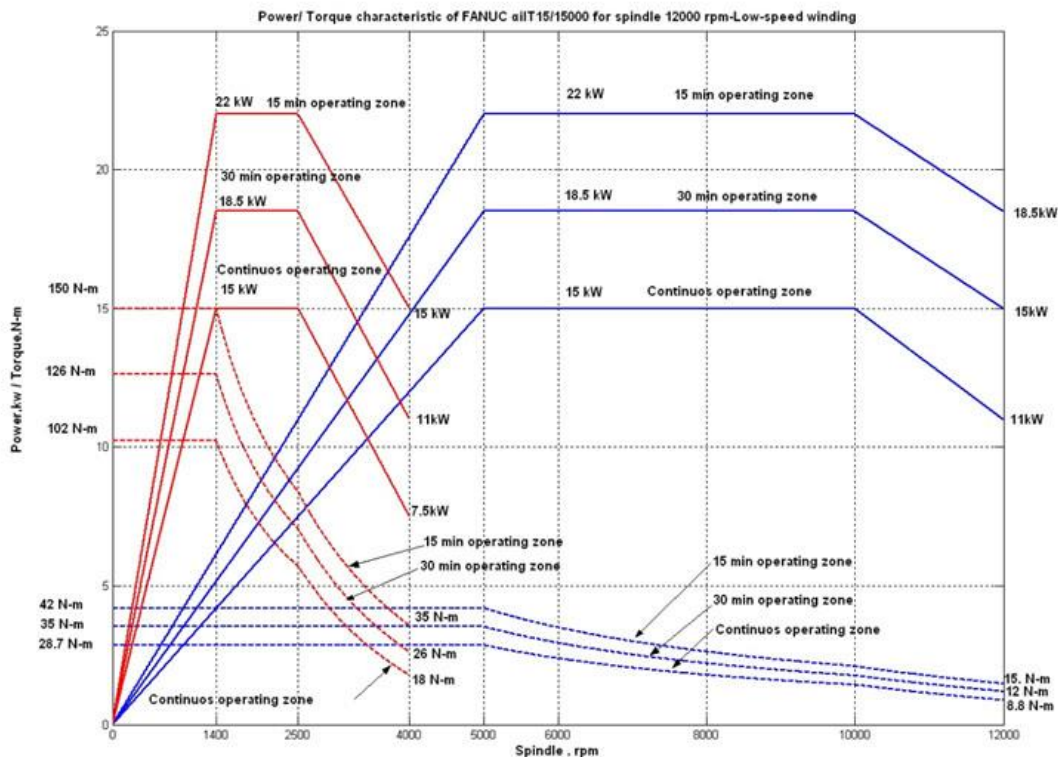
Machine base and travelling column are made from high strength cast iron to maximize machine stiffness and damping.

- Machine is designed using Finite Element Method (FEM) software for rigidity and FEM analysis. The end result is an optimum combination of structure, accuracy, reliability and price / performance ratio.
- One-piece T-shaped base with box-type construction and rib reinforcement, to maximize rigidity and stability.
- Base has three-point leveling, with four secondary supporting pads, for ease of installation and maintenance.
- Travelling column with double-wall design and stepped X axis linear guides, to improve rigidity and machining stability.
- Main base includes twin chip augers to direct the chips to the rear of the machine.
- Thermal stabilization by coolant flushing of lower base.



Direct Drive 15,000 rpm Main Spindle:

The MMH-500 utilizes a precision ground 15,000 rpm, 40 taper Direct Drive Spindle, which utilizes an oil & air lubrication system to maintain and extend the spindle bearing performance throughout the entire RPM range.



Linear X, Y and Z axis:

- All linear axes are equipped with generously sized precision THK linear guides and preloaded linear bearing packages, providing fast 60 m/min traverse speeds.
- Automatic oil-air lubrication system for ball screws.
- Automatic central lubrication system for linear guides.
- Single ball screw drive in the X, Y, and Z axis.
- Servo motors are direct coupled to the ball screw drive to eliminate the risk of drive failures.
- Y axis ball screw saddles are secured during a power-off condition by a servo motor / brake combination.
- Available options:
 - Absolute linear glass scales to eliminate the effects of temperature variation and minimize the need for start of shift warm-up cycles or to re-calibrate the axis home position after the return of power. Linear scales are provided with an air purge circuit to protect the scales from coolant contamination.

Tool Storage and Automatic Tool Changers:

The MMH 500 machine is available with a standard 40 tool, chain style magazine with floor level tool load.

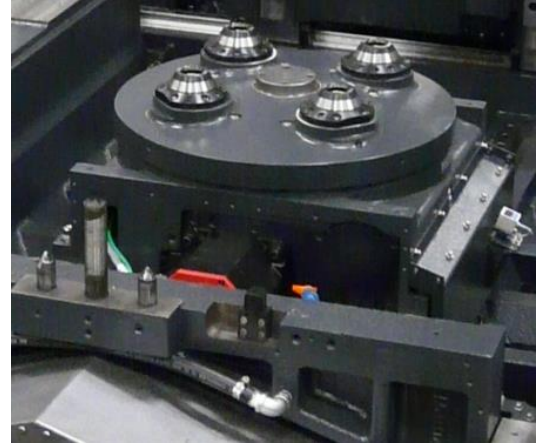
- CAT 40 tool taper
- Tool capacity: 190 mm (7.48 inch) diameter, 550 mm (21.65 inch) mm length, 12 kg (26.4 pounds) weight.
- Indexing of the chain is accomplished via a servo motor-driven, rotating cylindrical cam. The chain is guided by a series of roller followers mounted to the chain, which follow a solid track.
- Pneumatic cylinder releases the chain gripper from the cutting tool flange at tool exchange position.
- Pneumatic tool shuttle mechanism to remove the tool from the tool magazine and place it in position for pickup by the swapper arm.
- Pneumatic cylinder opens and closes the vertical tool change door.
- The new tool is unloaded from the tool shuttle mechanism via a servo motor-driven, cam operated swapper arm, which removes the new tool from the tool shuttle and rotates 180° to position the new tool in front of the machining spindle, before inserting the new tool into the spindle. The “old” tool is simultaneously removed from the spindle and placed in the tool shuttle mechanism with the other end of the swapper arm.
- Pneumatic mechanism to disengage tool from tool magazine so operator can remove and replace cutting tools.



Rotary Table for Pallets:

The machine includes an infinite B-axis rotary table.

- 22 RPM direct drive contouring table.
- Worm gear drive with zero backlash.
- Hydraulic table clamping in cutting position.
- Pallet clamping to the table provided by (4) cones that provide high clamping forces without distortion of the pallet.
- Air blow off thru the tapered cones.
- Air switch to confirm pallet seating.
- 600 kg (1,322 lb.) fixture payload on pallet.
- Index times without fixture: 90° = 2.0 Sec. / 180° = 3.0 Sec.



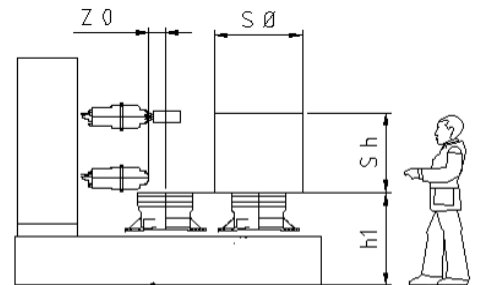
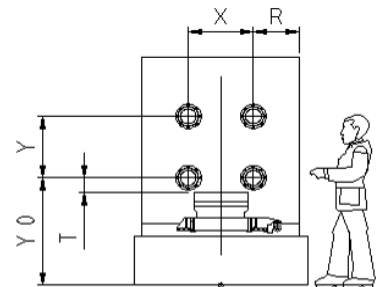
Rotary Table for Pallets:

- The machine includes a (2) position rotary pallet changer.
- The pallet changer mechanism provides 8.5 second pallet change time via an overhead hydraulically driven rotary index unit and hydraulic lift and lower mechanism.
- Seal plate is provided to isolate the work area from the work piece load / unload area of the machine.
- Manual pallet indexing at the load station to provide access to four sides of the work holding fixture.



Machine Work Zone Dimensions:

			MMH 500 HMC
X	Stroke	mm	762
Y	Stroke	mm	710
Z	Stroke	mm	800
Z0	Spindle Face to CL of B Axis Table	mm	100-900
h1	Bottom of Machine to Top of Pallet	mm	1,050
SØ	Fixture Ø	mm	700
Sh	Fixture Height (With Hydraulic Connections)	mm	710
Sh	Fixture Height (No Hydraulic Connections)	mm	1,000
T	Top of Pallet to CL of Spindle Lowest Position	mm	50-760
Y0	Bottom of Machine to CL of Spindle Lowest Position	mm	1,100



Electrical System:

- Designed and built to North American controls standards.
- The machine is provided with a power distribution panel to house the CNC, servo drives and associated I/O, motor starters and fuses.
- Panel assembly is NEC, NFPA 79 and UL compliant, 508 A/SB Designed to 65 KA.
- Dual-check safety system included (Dual-channel guard safety lock switches provided).
- Electrical Connection 400 / 460 V Wye AC 3 Phase \pm 10%, 50 / 60 Hz \pm 10%.
- Direct connect 480V electrical power to machine, eliminating the need for an isolation transformer
- Cooling via a panel-mounted air conditioner.
- Main electrical cabinet provided with door interlock.
- The electrical system will operate with an ambient temperature between 41°F (5°C) and 104°F (40°C) with a maximum average temperature of 93°F (34°C) during a 24-hour period and a maximum relative humidity of 95% at 104°F (40°C) according to EN60204.
- Connection load 60 kVA.



Operator Panel:

Operator controls and HMI mounted on a swiveling bracket for convenient operation adjacent to the pallet load station. Operator control pendant includes:

- 31i-MB CNC Series Control
- 10.4" color LCD
- NC Power ON/OFF
- Emergency Stop Push-button
- NC Program Start/Stop
- Mode Selector buttons
- NC Function buttons
- Coolant Control buttons
- Machine Control buttons
- Spindle Start/Stop
- Spindle Tool Unclamp
- Clear Alarm Button
- Memory Protect Unlock Key Switch
- Guard Gate Access Button
- Jog Buttons
- Rapid Feed Override Function
- Rotary Switch Feedrate Override
- Rotary Switch Spindle Speed Override



Hydraulic System

The machine is provided with a self-contained 80 L (21 Gal) floor-mounted hydraulic tank. MAG standard components include the following:

- MAG hydraulic power unit.
- Hydraulic system design is based on 70 bar (1,015 PSI) operating pressure.
- Power unit includes IFM electronic pressure switches and IFM analog pressure gages.
- Ermeto EO2 fittings (ISO 8434-1 / DIN 2353) with BSPP threads (ISO 1179).
- Hydraulic oil recommended: Mobil DTE 25 (ISO 46).
- Hard pipes are trivalent zinc plated (Chrome free).

Pneumatic System

The pneumatic components are mounted inside a fluids panel mounted to the rear of the machine for convenient maintenance access. The main air drop includes:

- Manual shutoff valve
- 5 micron filter, 99.97% efficient for main air drop and 0.01 micron coalescing filter for spindle barrier air and tool blow off.
- Adjustable air pressure regulator.

Customer plant air supply to meet the following requirements:

- 6-8 bar (87-116 PSI).
- Must meet ISO 8573-1: 2010 Class 4,4,4,3.
- No liquid water or oil.

Festo valves and regulators.

Pneumatic air consumption range is 55 Nm³/hour (34 SCFM).

Lubrication System

The linear guides are connected to an automatic central lubrication system 2.7 L (0.71 Gal.). The ball screws are lubricated by an automatic air-oil lubrication system. All other bearings are sealed and lubricated for life. MAG standard components include the following:

- Electric pumping system provides 100 /120 cc/min (3.4/ 4.0 oz./Min) at 15 bar (217 PSI).
- SKF lubrication unit.
- Lubrication fluid recommended: Mobil Vactra #2 (ISO 68).
- Polyamide piping after distributors.

Machine Cooling System

The standard machine is equipped with a panel-mounted air conditioner to remove heat from the electrical cabinet. A closed loop circulating oil chiller system is used to remove heat from the motorized spindle. The oil chiller system is mounted adjacent to the machine, above the hydraulic power unit.

Control Specifications – FANUC 31i-MB CNC

- FANUC HMI - 10.4" Color LCD Unit A, with Touch Panel, USB Port
- FANUC Manual Data Input Unit (MDI), QWERTY Type A Keypad
- FANUC Machine Operator's Panel (MOP) – Main Panel B (55 Keys)
- FANUC Machine Operator's Panel - Sub Panel A (E-stop, Protection Key, 2 Overrides)
- FANUC Portable Manual Pulse Generator (MPG)



Machine Information Only – Not Configurable by Customer

- 30i/31i/32i-B CPU Card B2, DRAM 128 MB
- FROM/SRAM Memory P, 128 MB / 2 MB
- Custom Software Size Main CPU, 8 MB
- 30i/31i/32i-B Servo Card B Select
- Basic Function - Max. 4 Paths, Max. 20 Axes, Max 6 Spindles
- High-Speed HRV3 Function
- External Deceleration
- Simultaneously Controlled Axes Expansion (Max. 4)
- Position Switch
- Spindle Serial Output
- Spindle Orientation for One Spindle
- Macro Executor
- External Data Input
- FANUC Dual Check Safety (DCS)
- FANUC PICTURE Executor
- PMC Symbol, Comment and Message Capacity Expansion (2 MB)
- Extended PMC Ladder Instruction Function
- Custom Macro
- Real Time Custom Macro
- Tool Management Function – Tool Attach / Detach Function
- Designation of Control Paths, 1 Path
- Designation of Control Paths; 2 Paths (1= Machine, 2=Tool Prepare) (Required if fixture is provided) **(Optional)**
- Run Hour & Parts Count Display
- Embedded Ethernet (Programming)
- High-Speed Skip (Required for Spindle Probe or Tool Probe) **(Optional)**

Machine Configuration

- Fast Ethernet/Data Server PCB (External Port) (Required for DNC Operation) **(Optional)**
- Fast Ethernet/Data Server Function Software **(Optional)**
- Automatic Data Back-up (Fast Ethernet/Data Server Option Required) **(Optional)**
- Reader / Puncher Interface for 1 Channel

NC Control Functions

- Canned Cycles for Drilling
- Part Program Memory, 2 MB
- Part Program Memory, 4 MB (Upgrade from 2 MB to 4 MB) **(Optional)**
- Part Program Memory, 8 MB (Upgrade from 2 MB to 8 MB) **(Optional)**
- Registered Program Expansion 1, Max. 1,000 Programs
- Registered Program Expansion 2, Max. 2,000 Programs (2 MB Part Program Memory Required) **(Optional)**
- Registered Program Expansion 2, Max. 4,000 Programs (4 MB Part Program Memory Required) **(Optional)**
- Inch / Metric Conversion
- Workpiece Coordinate System (G52-G59)
- Workpiece Coordinate, 48 Pairs
- Additional Workpiece Coordinate, 300 Pairs (Upgrade from 48 Pairs) **(Optional)**
- Coordinate System Rotation
- Workpiece Coordinate Preset
- Rotary Table Dynamic Fixture Offset **(Optional)**
- Custom Macro Variables (#100- #199)
- Addition of Custom Macro Variables 1, 500 Variables (#500- #999)
- Addition of Custom Macro Variables 2, 1,000 Variables (#100- #999) **(Optional)**
- Embedded Macro (Required for Additional Custom Macro Variables 2, 1,000) **(Optional)**
- Single Direction Positioning **(Optional)**

Positioning Control Functions

- Pitch Error Compensation
- Interpolation Type Pitch Error Compensation **(Optional)**
- Bell-Shaped Acceleration/Deceleration after Cutting Feed Interpolation
- Speed Control with Acceleration in Circular Interpolation
- AI Contour Control I - Includes 30 Look-Ahead Blocks
- AI Contour Control II - Includes 200 Look-Ahead Blocks (Adder to AI Contour Control I) **(Optional)**
- Jerk Control (Requires AI Contour Control II Option) **(Optional)**
- Simultaneously Commanded Paths for AI Contour Control I, 1 Path
- Cylindrical Interpolation (G7.1)
- Polar Coordinate Command (G15, G16) **(Optional)**
- Polar Coordinate Interpolation (G12.1, G13.1) **(Optional)**
- Helical Interpolation **(Optional)**
- Rigid Tapping (Including, Bell Acc/Dec and Rigid Tapping Retract)

- Thread Cutting, Synchronous Cutting
- Programmable Mirror Image (G50.1, G51.1) **(Optional)**
- Scaling (G51, G50) **(Optional)**
- Automatic Corner Override (G62)

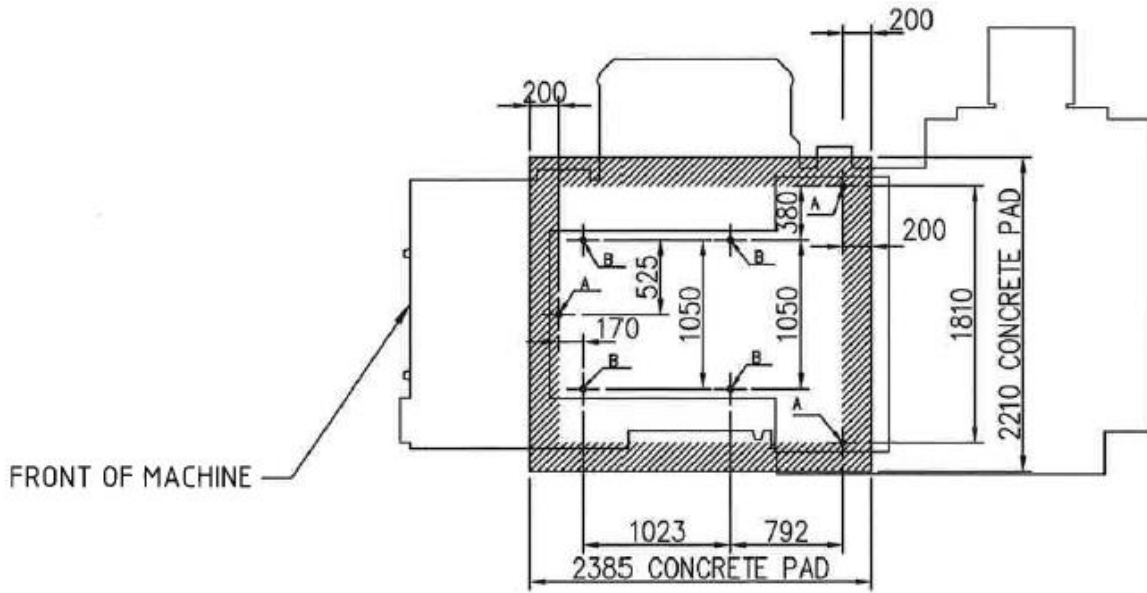
NC Operator Support Functions

- Multi Part Program Editing (Background Editing)
- Sequence Number Comparison and Stop **(Optional)**
- Tool Retract and Recover **(Optional)**
- Machining Time Stamp **(Optional)**
- High Speed Program Check **(Optional)**
- Stroke Limit Check before Move
- Block Skip (Total 9) **(Optional)**
- Program Restart **(Optional)**
- Quick Program Restart **(Optional)**
- MANUAL GUIDE i **(Optional)**
- MANUAL GUIDE i - System Software for MG-i Enhanced **(Optional)**
- Graphic Display **(Optional)**
- Manual Handle Interruption **(Optional)**

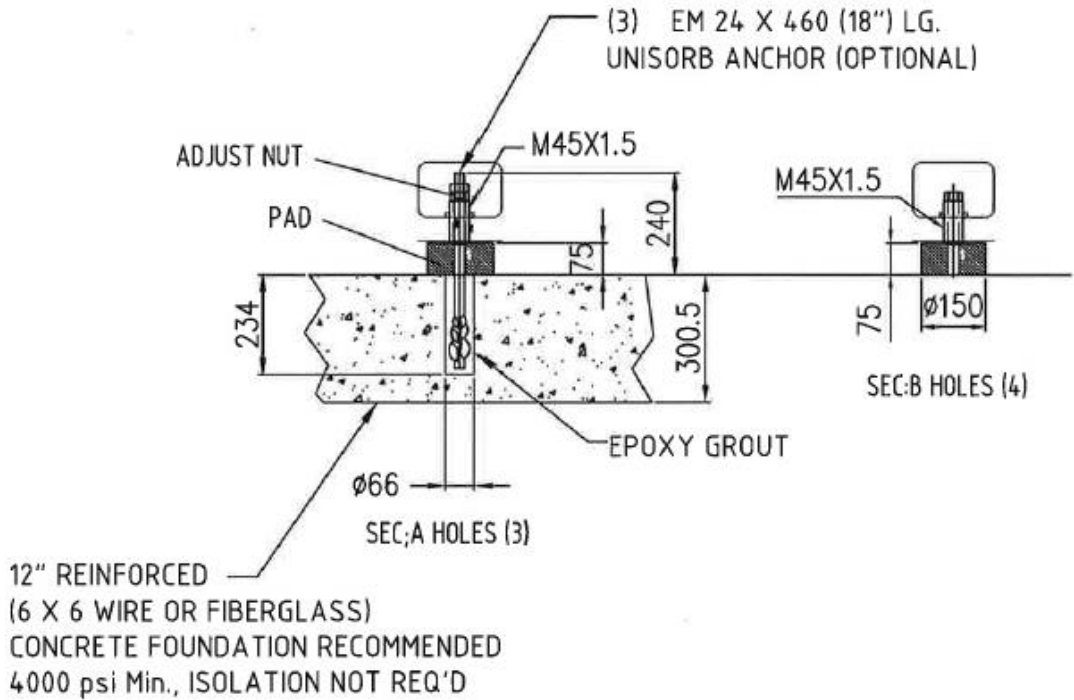
Tool Management Control Functions

- Tool Management Expansion B (with Customized Data Expansion (5 - 40)
- Tool Management Function – 64 Tool Pairs
- Tool Management Function – 240 Tool Pairs **(Optional)**
- Tool Offset Memory C (D/H code, geometry/wear memory)
- Tool Radius (Cutter) Compensation and Tool Nose Radius Compensation
- Tool Offset, 64 Pairs
- Tool Offset, 200 Pairs (Upgrade from 64 Pairs) **(Optional)**
- Tool Offset, 400 Pairs (Upgrade from 64 Pairs) **(Optional)**
- Automatic Tool Length Measurement (CNC for Milling) **(Optional)**

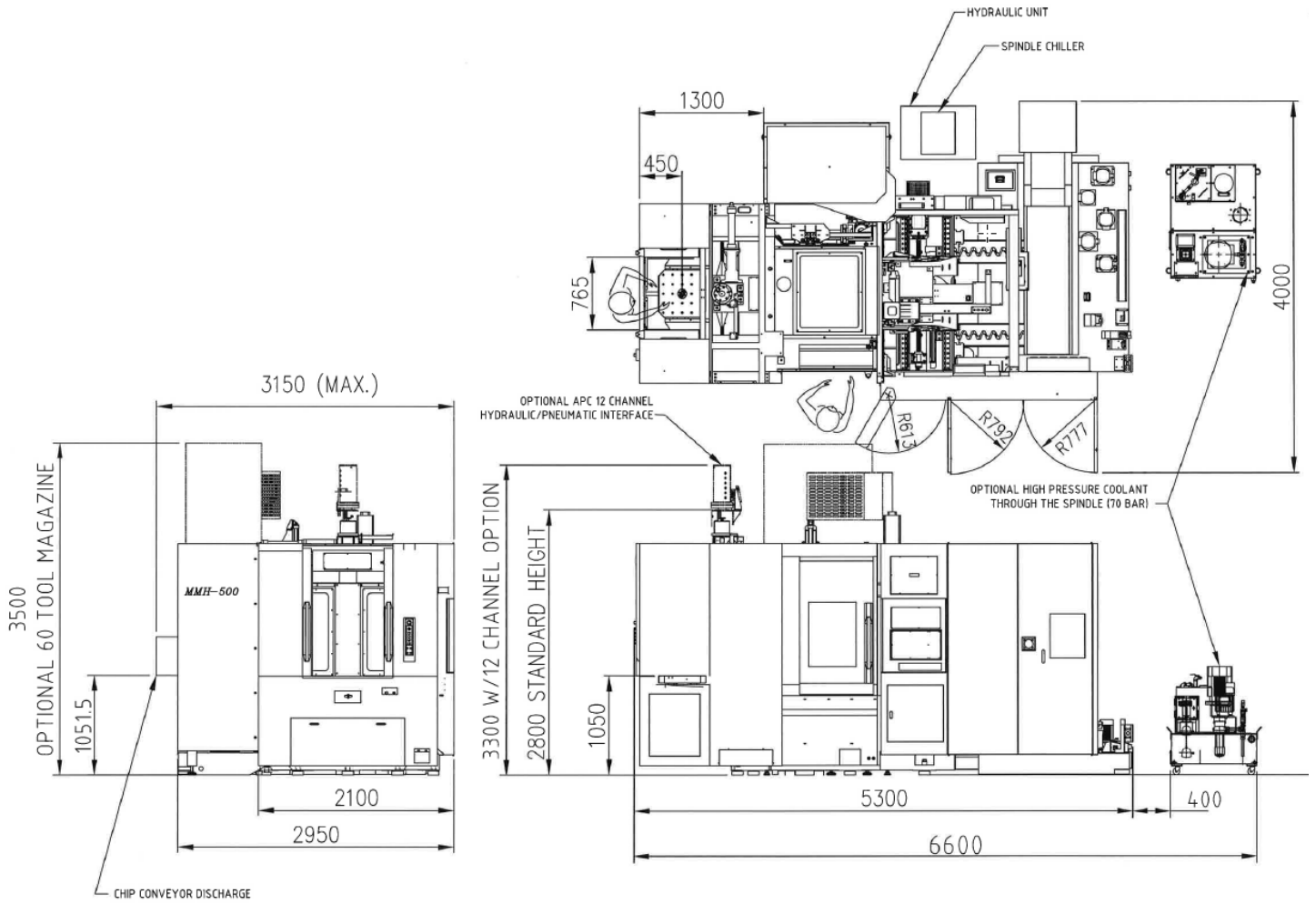
Machine Foundation



PLAN VIEW



MMH 500 Machine Layout



■ MMH-500 STOCK Machine Configuration – Serial No. T.3200723.21

- Fanuc 31i-MB Control with 10.4" Color LCD
- CAT 40
- 15,000 RPM Direct Drive Spindle (Greased for Life)
- 30 HP [22KW]
- 40 Tool ATC
- Manual Load Pallet at Load Station
- Pallet Changer - Two Position
- Rotary Table - B-Axis 22 RPM Direct Drive, Infinite Contouring (0.001 degree)
- Table Load Capacity - 700kg Payload B-Axis
- Table Pallets - (2) 500mm x 500mm with Tapped Holes
- Coolant Flushing Chip Flume (Rear Discharge)
- Chip Augers (Rear Discharge)
- Self-Contained Coolant System/Chip Conveyor
- Coolant Spray Gun at Load Position
- Air Blow Off Gun at Load Position
- Machine Documentation - (Operator Manuals) Electronic Format (CD)