Brand Name Makino or Equivalent – December 2, 2021

STANDARD EQUIPMENT

1	01000	12,000 RPM Spindle 20-12,000 RPM 143 HP duty rated, 75 HP continuous. 739 ft lb duty rated, 387 ft lb continuous.
1	01013	Spindle Temperature Controller
1	01010	Rigid Tapping
1	01011	Spindle Tool Seating Confirmation Function
1	04003	HSK-A100 Spindle Interface
1	13000	NC Rotary Table
1	13003	Maximum Payload on Pallet 3000kg
1	13005	B-Axis Motor Cooling Function
1	13006	Pallet Seating Confirmation Function
1	13801	Scale Feedback X, Y, Z-axis 0.01 Micron
1	13802	Automatic Lubricant Supply Device
1	14002	137 Tool ATC (with Tool unload function/Tool loading station)
1	14024	Tool Magazine Access Door Lock
1	14030	Lighting Inside Tool Magazine
1	16000	Navy Blue Two-Tone (White Standard Color/Luster)
1	19000	Pallet Changer
1	19520	Vacuum Piping (Table side)
1	22601	Collision Safeguard Software Machine comes equipped with collision safeguard software (Level 1) loaded into the Pro6 control configured for collision avoidance of primitive tool shape and internal work envelope machine components (spindle housing, pallet, table, trunnion, etc.). NOTE: Collision Safeguard also has the ability to import customer provided part, tools, and fixture data (Level 2) for enhanced collision detection. Should the customer want to take advantage of these enhanced capabilities, additional training costs may apply. Cost for the additional training can be determined after an Application Engineering review with the customer.
1	27012	Tapped Hole Pallet For Vacuum Specification 1000mm Square (2 pallets)
1	29001	Nozzle Coolant-Top Of Spindle Head
1	29002	Overhead Shower Coolant
1	29003	Terrace Washing Coolant
1	29017	High Pressure and High Volume Coolant Package (1800L LUCC + 1000L Tank)
1	29030	Water-Soluble Coolant
1	30004	Lift Up Chip Conveyor (Left Discharge, with Drum Filter LDW1800)
1	30001	Coolant Lower Limit Detection
1	30002	Internal Chip Conveyor
1	31000	Splash Guard (with door lock) (Manual Type, with Lighting)
1	31001	Operator Door Lock (with Operation Mode)
1	31007	Mist Collector Joint Dia. 250mm
1	32000	Air Dryer

1	37004	Automatic Tool Measuring Device (Non-contact type, Blum)
1	37008	Automatic workpiece measuring device (Radio type, Renishaw)
1	37005	Spindle Condition Monitoring
1	42000	Automatic Fire Extinguisher Interface
1	42004	Door Interlock for Machine Tool Controller
1	42007	Internal Step
1	42008	Rear Step for Maintenance
1	42010	External Step at the Main Operation Panel (Pallet Changer Specification)
1	47000	Portable Manual Pulse Generator With Tool Position Display And Handle Enable Button
1	47002	Warm-Up Timer (with automatic machine running function)
1	47003	Signal Light 3-Layer
1	L6077	Thermal Stabilizer Fluid
1	47005	Makino Thermal Stabilizer (Column)
1	47007	Air Conditioner For Machine Tool Controller
1	47018	Automatic Power Shut-Off
1	L6419	Nitrogen Charging (3) Accumulator Tanks
1	47201	Language (English)
1	47250	Screen Language Type A
1	47550	Manuals Language Type A Machine manuals/documentation are provided on a USB drive that includes; Instruction, Periodic Maintenance, Peripheral Device, PRO6 Operation, Parts Manual & PRO6 M-Code List.
1	47560	FANUC Manuals Language Type A Includes FANUC Instruction Manual, Parameter Manual, and Maintenance Manual in CD media only.
1	47570	Maintenance / Installation Manual Maintenance / Installation Manuals provided in electronic format (USB key). Note: These manuals are available free of charge on MyMakino portal.
1	47801	Legend Plate (English)
1	48001	Unit: Inch
1	48027	Inspection Reports in Metric (only for MM)
1	48007	FANUC Guarantee (2 years)
1	L6192	FOB Port/Source (Customer) The trucking company will invoice customer directly and customer assumes ownership at POE.
1	48500	Export Packing
1	L6200	Leveling Block and Retainer
1	51001	60Hz
1	52005	460V
1	53010	FS31i-B5
1	53003	UL Specification
1	57007	Number of primary control axes : 5 axes
1	59010	Linear Interpolation Type Positioning Linear interpolation type positioning is a positioning system in which the respective axis movements are synchronized so that the tool path of the feed axes is linear at all times. The path is a simple line even when multiple axes are moved simultaneously.
1	59000	Helical Interpolation (G02,G03) Allows circular interpolation of any two (2) axes while also interpolating a linear axis.
1	61000	User Memory 2GB+1GB 2 GB Program Memory for NC program and sub program storage. This memory is fully functional with macros and logical statements. Also includes 1 GB Data Center capable of storing image files and machine data files.
1	L6616	Increase Fanuc Program Storage to 16,800ft (5120m) (2MB)
1	64000	External Setting Type Spindle Orientation Orient the spindle to any angle via M-code, increment amount is 0.1 degrees.
1	65015	Tool Offset Memory C Fanuc Tool Offset Screen includes H, H (wear), D & D (wear).
1	65005	Tool Offset 400 Pairs Fanuc Tool Offset Screen contains registers for 400 tools.
1	66003	Workpiece Coordinate System Pairs 54 (6+48) In addition to the default six workpiece coordinate systems (G54 to G59) 48 additional workpiece coordinate systems can be used. When a P code is specified together with G54.1, the corresponding coordinate system is selected from the additional workpiece coordinate systems (P1 to P48).

1	67001	Optional Block Skip: Total 9 Allows the operator to select certain program blocks to be skipped or not, depending on switch selection.
1	67006	Program Quick Restart Function The Quick Program Restart function includes the conventional Program Restart functionality and provides additionally multiple ways of efficient program restart based on program restart memory.
1	67005	Retraction for Rigid Tapping Provides a method for retracting a tap in case of power outage, E-stop, etc.
1	68012	Custom Macro Variables 1100 Includes Common Variables #100 to #199 (non-holding type) & #500 to #1599 (holding type).
1	L6635	Scaling (G51/G50) Generates a percent multiplier of X and Y axis dimensional moves to increase or decrease size of output geometry.
1	68018	Macro Variable File Output Function Macro Variable File Output Function is a function to output macro variables to the Data Center by M code. Registered values on macro values such as measurement results are available to be seen on a personal computer screen. Macro variable file, which output to data center, is available to customize such as display on PC screen, print out, and saving in PC by customers.
1	69000	High Speed Skip Increases accuracy of the probe by increasing the frequency which the CNC control monitors the probe for the touch trigger. (The standard skip function setting is 0-2.0 msec., the high speed skip function setting is 0-0.1 msec.) the end user can benefit by decreasing probing time through increasing probe feedrates at the standard accuracy, or increase probing accuracy at the standard probe feedrates.
1	72000	Super GI .5 Control Latest generation of Super Geometric Intelligence. Makino's proprietary control algorithm accounting for machine dynamic characteristics in conjunction with desired program cutter path. SGI maintains the highest possible feedrates while maintaining precise workpiece geometry.
1	74533	High Speed Smooth TCP This function includes Tool Center Point Control which is intended to perform 4 and 5 axis machining by accomplishing tool length compensation while changing the attitude of the tool. It enables the tool center point to move along the specified path even if the tool's direction changes with respect to the workpiece. High Speed Smooth TCP helps detect any sharp discontinuities in the tool orientation generated from the CAM system, and smooth's the motion to reduce machine shock. The results can be smoother surfaces and shorter cycle times.
1	74514	3-Dimensional Cutter Compensation 3-Dimensional Radius Compensation allows tool radius or diameter to be specified and adjusted at machining time, eliminating the need to re-post the part program when tooling changes, and to ensure part accuracy as tools wear.
1	74517	Tilted Working Plane Indexing Command By specifying a tilted plane as a working plane and programming on the working plane (X, Y), machining can be automatically carried out on the specified tilted plane. Rotary axis motion is automatically controlled in such a manner that the tool axis is perpendicular to the tilted working plane. With this function, it is easy to make a part program even on a tilted plane.
1	74516	3-Dimensional Manual Feed Used for manually feeding the machine in multiple axes, in cases such as when the tool breaks and simply retracing Z axis will not work. With this function, the operator can retract the tool along its machining axis, or move parallel to the working plane.
1	76000	Energy Saving Function Functions provided to reduce the amount of electric power used by the machining center. Includes Eco Mode functions for standby mode and Spindle Peak Power Control.
1	L6609	Eight Digit Tool Codes
1	M1000	Machine Set-up & Installation
1	M1001	Training Two (2) training credits are included with each machine purchased. Each training credit is valid for students to attend any scheduled class at a Makino training facility. These credits are valid for one year after the installation of the machine. Any training after this year will be on a tuition basis. Training credits are not valid for onsite training.
1	M1002	Machine Warranty A two (2) year CNC warranty with a full one (1) year machine warranty from the date of shipment excluding perishable items (e.g.: wipers, filters, covers, etc.) This standard warranty from Makino to the original buyer is from date of shipment from Mason, OH or port of entry.

1 L6006 Pre-Applications Assistance
Makino will provide one to two days of manufacturing consultation conducted by Makino aerospace applications engineer. Key topics include technical review of machine specification, customer purchased option content, 5-axis control functions and next steps required by customer/Makino for startup assistance.

1 L6007 Startup Applications Assistance
Makino will provide up to two weeks on site applications assistance. This valuable hands-on manufacturing consultation is targeted toward startup of the machine and cutting of first part. Makino aerospace applications engineer will provide machine operator training, controller training and assistance debugging first part to be cut on machine. Customer to be ready with first part fixtures, tooling, material and NC programs prior to Makino AE arrival. A follow up session can be scheduled after gaining experience with the machine.

1 L6350 Laser Alignment of Linear Axis

1 L6526 Machine Standard Supplies
Includes 14oz of Lube, 5oz of Liquid Gasket, and Glossy Touchup Paint.

MACHINE Options For Machine: T1_B

Pallet

1 27002 Additional Pallet (Tapped Hole) 1000mm Square

Splash guard

1 31003 Rotary Wiper for Splash Guard Window

1 L6175 Mist Collector WSO25-1
Donaldson Torit Model WSO-25-1 mist collector painted Makino Blue-Gray. Unit has Polypropylene 1st stage filter and Donaldson XP-W 2nd stage filter for water based coolant filtration. Donaldson Model WSO-25-1 comes complete with the following: High performance system blower powered by a 3.0 HP continuous duty motor, external junction box, wired for 3 phase, 208 volt input, P-trap drain assembly, floor stand and inlet plenum assembly, designed for full 4-leg floor support and providing clearance under the inlet plenum, Nordfab ductwork to connect mist collector to machine. Includes Makino electrical interface to machine for fully automatic operation. Option will increase floor space for machine installation.

Machine safety & maintenance

1 L6537 Makino Supplied APC Area and Operator Platform
This platform spans the front of the T1 providing access to the APC area and part loading area. The platform also wraps around the side of the T1 to provide access to the Fanuc control panel and operator door. The platform can be accessed by stairs on the right side of the machine. Operator area and APC area are separated by a safety gate with interlock switch. This provides safe access to the APC platform area. Platform and stairs include yellow safety rail. Platform pictures are available upon request. Estimated option delivery is 12 weeks ARO.

CONTROL Options For Machine: T1_B

Interpolation

1 59003 Cylindrical Interpolation (G07.1)
The Cylindrical Interpolation function allows the programmer to program a shape on the surface of a cylinder, using linear and circular interpolation commands. The programmer can visualize the surface of the cylinder being worked as if it had been rolled out on a flat plane.

1 59005 Conical / Spiral Interpolation (G02, G03)
The Conical/Spiral Interpolation function allows the CNC programmer to command, in a single block, a spiral move in a plane (two axes) or a conical move in three dimensions.

I/O device

1 63017 Custom I/O M-Codes
8 Input/ 8 Output (I/O) codes can be turned on and off using M-code commands. The I/O signal contact points, located at the terminal board in the electrical control cabinet, are connected with external equipment such as control actuators, production counters and other peripheral devices provided by the user. With a machine parameter set, it is also possible to operate external devices by the function screen of the control.

1 63016 Fast Ethernet Interface
Necessary for the Pro6 control to interface with the Fixture Hydraulic Unit (FHU) and Robot Ethernet I/P.

1 L6771 MTConnect Interface
MTConnect is a communications protocol for machine tools established by the MTConnect Institute. This option includes an adapter within the Pro6 control to collect machine information and periodically send the data to an agent. The agent retains the data and sends it in XML format when requested by the client. Note: the "client" is an external PC not included with this option, it would need to be provided by the customer. Customer must also supply Ethernet cabling to the machine and up to (3) IP addresses for each machine depending on model.

Tool compensation

1 65020 3-Dimensional Tool Compensation
Normally, tool offset is executed for one axis or two axes on a plane. With this function, compensation of the tool can be performed three-dimensionally by programming in the three-dimensional offset direction.

Operation support function

1 67002 Handle Interruption
During automatic operation, tool can be adjusted by the manual pulse generator without changing the mode. The pulse from the manual pulse generator is added to the automatic operation command and the tool is moved for the recommended pulses.

Model data

1 78000 3D Model Data of Machining Chamber