F5

F5
MACHINING CENTER
MACHINE SPECIFICATIONS

MAKINO

7680 Innovation Way
Mason Ohio 45040
(800) 552-3288 / (513) 573-7200
Fax (513) 573-7456
www.makino.com

GENERAL SPECIFICATIONS:

	METRIC	ENGLISH
X-Axis Travel, Programmable:	900 mm	35.4"
Y-Axis Travel, Programmable:	500 mm	19.7"
Z-Axis Travel, Programmable:	450 mm	17.7"
Type of Axis Drives	AC Digital Servo Motors	
Bed Construction	Meehanite Cast Iron	
Axis Design (X, Y, & Z)	Linear Guide (45 mm width) x 2	
Ballscrew: (pitch) 8 mm	0.315"	
X and Y diameter	40 mm	1.57"
Z diameter	45 mm	1.77"
Origin Position: X, Y and Z Axes	(+) End of Stroke	
Origin Detection	Grid Detecting System	
Linear Positioning Accuracy - (with proper foundation and environmental control):		
With Moiré Scales (Standard)	± 0.0015 mm	± 0.000060"
Repeatability:		
With Moiré Scales (Standard)	± 0.001 mm	± 0.000040"
Scales:	0.05 micron	

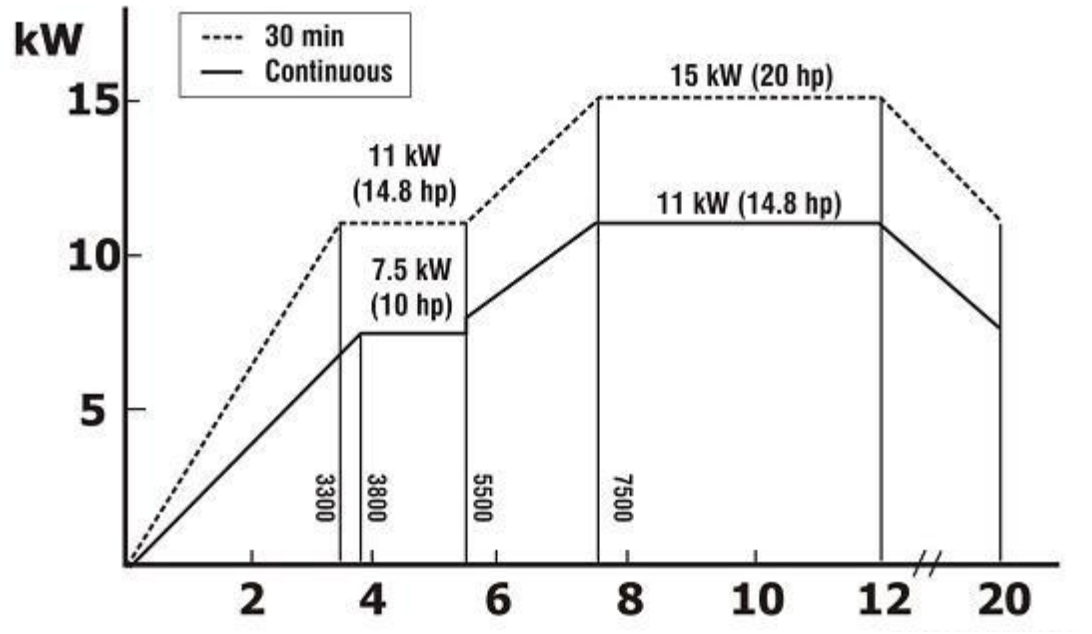
FEEDS:

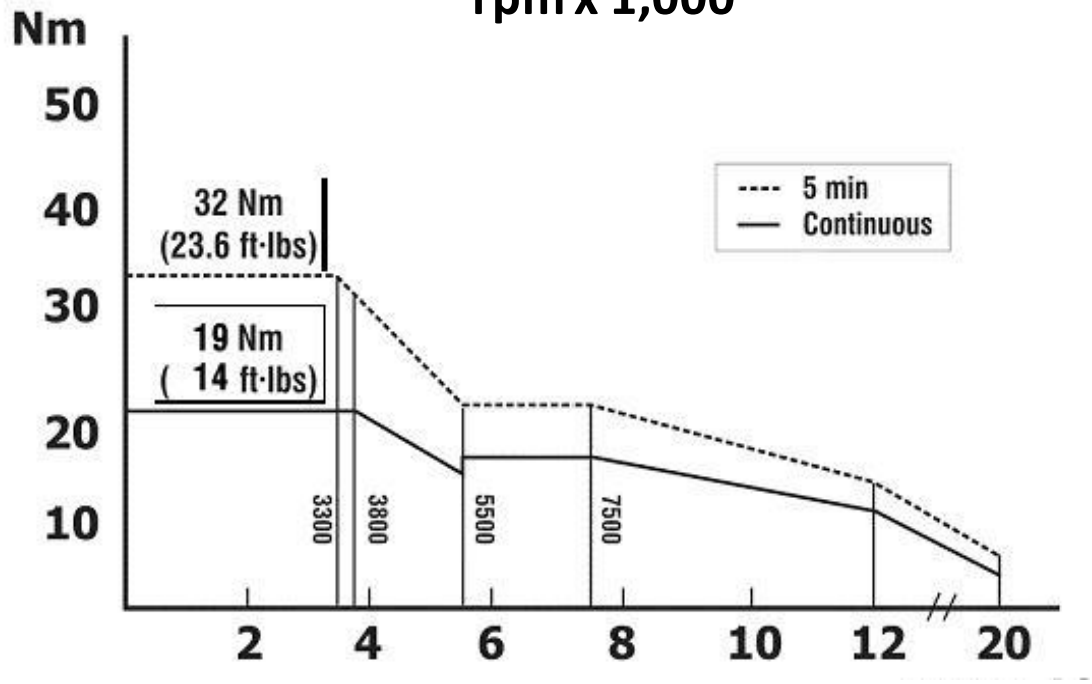
Rapid Traverse Rates:		
X, Y & Z Axes	20,000 mm/min.	787 ipm
Feed Rate - X, Y & Z Axes	0 to 20,000 mm/min.	0 to 787 ipm
Jog Feed - X, Y & Z Axes	0 to 8,000 mm/min.	0 to 315 ipm
CNC Command Feedback -		
X, Y, Z Axes	Absolute Pulse Encoder Feedback System	
Rapid Traverse Override	Min. to 100%	
Cutting Feed Override	0 to 200%	

SPINDLE (standard):

Spindle Nose Interface	HSK – A63	
Tool Shank Types	HSK – A63	
Tool Clamping Force	17,652 N	3,968 lbs.
Tool Clamping Method	Disc spring clamp/hydraulic unclamp	
Spindle Drive Motor - AC:		
30 Minute Rating	15 kW	20 hp
Continuous Rating	11 kW	14.75 hp
Spindle Torque Characteristics (200 to 3,300 rpm):		
5 Minute Rating	32 Nm	23.6 ft. lbs.
Continuous Rating	19 Nm	14 ft. lbs.
Spindle Speed Range	200 to 20,000 rpm	
Spindle Speed Increment	1 rpm	
Number of Spindle Speed Ranges	2	
Obtain Full Horsepower	7,500 rpm	
Constant Torque Range	200 to 3,300 rpm	
Bearing Lubrication	Core cooled, under-race, jacket cooling	
Spindle Temperature Controller	Oilmatic (spindle and motor jacket)	
Spindle Front Bearing Type	Angular Contact, Ceramic Ball Type	
Spindle Front Bearing ID/OD.	65 mm / 100 mm	2.56" / 3.94"
Spindle Orientation System	Electric Servo Control (built-in sensor)	
Spindle Speed Override	50% to 120% (limit to max. spindle speed)	
Spindle Nose to Table	150 to 600 mm	5.9" to 23.6"

20,000 rpm Spindle Performance (standard):

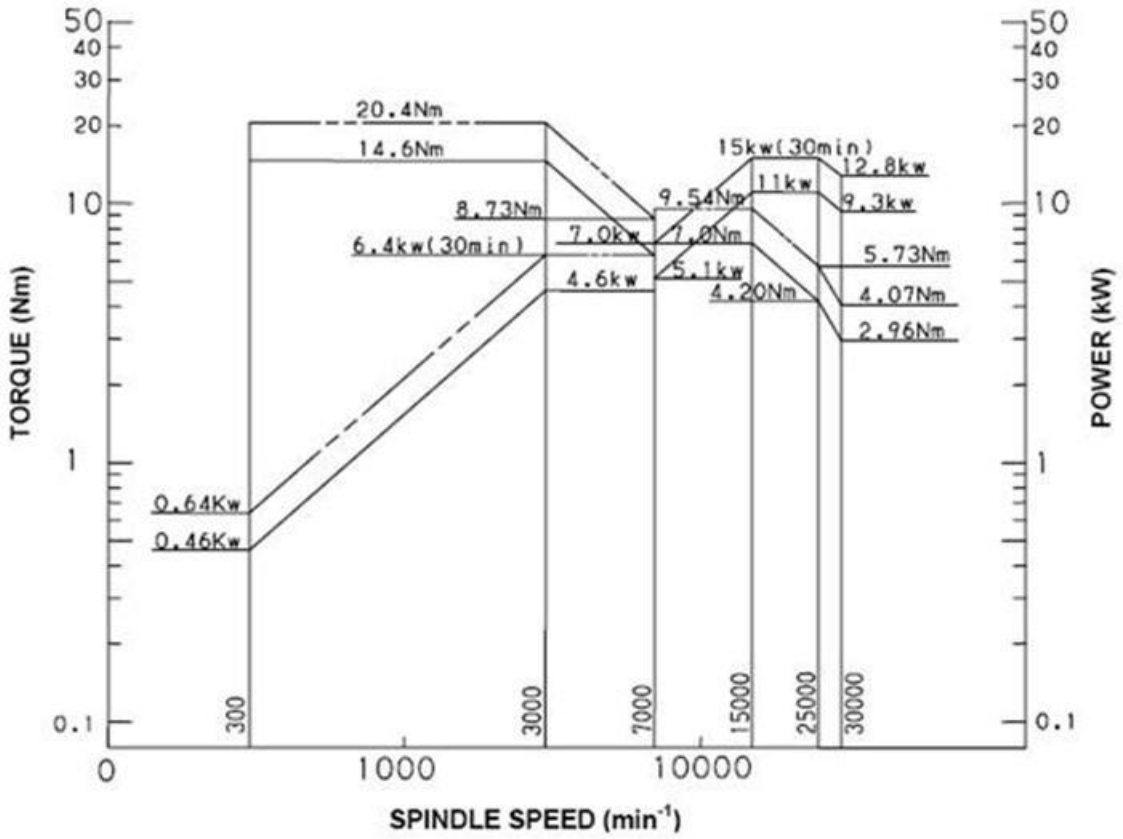




SPINDLE (optional 30,000):

Spindle Nose Interface	HSK – F63	
Tool Shank Types	HSK – F63	
Tool Clamping Force	10,787 N	2,425 lbs.
Tool Clamping Method	Disc spring clamp/hydraulic unclamp	
Spindle Drive Motor - AC:		
30 Minute Rating	15 kW	20 hp
Continuous Rating	11 kW	14.75 hp
Spindle Torque Characteristics (300 to 3,000 rpm):		
30 Minute Rating	20.4 Nm	15.1 ft. lbs.
Continuous Rating	14.6 Nm	10.7 ft. lbs.
Spindle Speed Range	300 to 30,000 rpm	
Spindle Speed Increment	1 rpm	
Number of Spindle Speed Ranges	2	
Obtain Full Horsepower	15,000 rpm	
Constant Torque Range	300 to 3,000 rpm	
Bearing Lubrication	Core cooled, under-race, jacket cooling	
Spindle Temperature Controller	Oilmatic (spindle and motor jacket)	
Spindle Front Bearing Type	Angular Contact, Ceramic Ball Type	
Spindle Front Bearing ID/OD.	55 mm / 90 mm	2.16" / 3.54"
Spindle Orientation System	Electric Servo Control (built-in sensor)	
Spindle Speed Override	50% to 120% (limit to max. spindle speed)	
Spindle Nose to Table	150 to 600 mm	5.9" to 23.6"

30,000 rpm Spindle Performance (option):



SPINDLE (optional 13,000):

Spindle Nose Taper	7/24 No. 40 Taper	
Tool Shank Types	Cat V-Flange #40	
Tool Clamping Force	8,826 N	1,984 lbs.
Tool Clamping Method	Retention Stud, disc spring clamp	
Spindle Drive Motor - AC:		
15 Minute Rating	22 kW	29.5 hp
Continuous Rating	18 kW	24.2 hp
Spindle Torque Characteristics (120-1,060 rpm):		
15 Minute Rating	117 Nm	86.4 ft. lbs.
Continuous Rating	95 Nm	70.1 ft. lbs.
Spindle Speed Range	130 to 13,000 rpm	
Spindle Speed Increment	1 rpm	
Number of Spindle Speed Ranges	2	
Obtain Full Horsepower	5,000 rpm	
Constant Torque Range	130 to 1,500 rpm	
Spindle Temperature Controller	Oilmatic (spindle and motor jacket)	
Spindle Front Bearing Type	Angular Contact, Ceramic Ball Type	
Spindle Front Bearing I.D.	70 mm / 100 mm	2.76" / 3.94"
Spindle Orientation System	Electric Servo Type	
Spindle Speed Override	50% to 120% (8 steps, 10% increments)	
Spindle Nose to Table	150 mm to 600 mm	5.9" to 23.6"

13,000 rpm Spindle Performance (option):

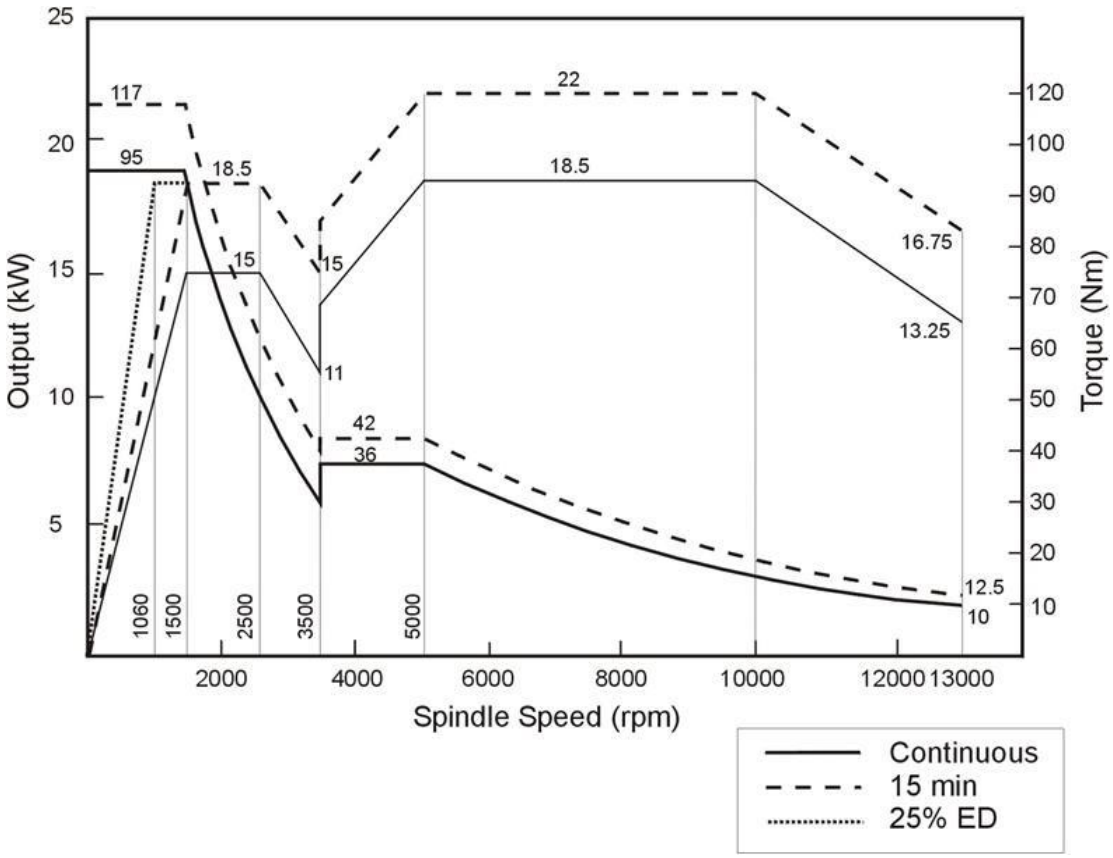


TABLE:

Type of Table	Rectangular Type	
Work Area on Table	1,000 x 500 mm	39.4" x 19.7"
Table Load Capacity	1,000 kg	2,204 lbs.
Maximum Workpiece Size:		
Length of Workpiece	1,000 mm	39.4"
Depth of Workpiece	500 mm	19.7"
Height of Workpiece	450 mm	17.7"
Table Top Configuration		
Size of T-Slot/Number	18H8 x 5	
Height of Table Top from Floor	900 mm	35.4"

AUTOMATIC TOOL CHANGER:

Capacity: Standard	30 Tools	
Maximum Tool Size Diameter:		
All Pockets Full (30 Tools)	76.2 mm	3"
Adjacent Pockets Empty	120 mm	4.72"
Maximum Tool Length	300 mm	11.8"
Maximum Tool Weight	8 kg	17.6 lbs.
Tool Selection Method	Random Selection (fixed address method)	
Tool Change Time:		
Tool-to-Tool	1.8 seconds (20K)	
Chip-to-Chip	6.0 seconds (20K @ 10,000 rpm)	
	stroke center, spool, exchange, return	

UTILITIES:

Air Supply for Use on Machine:		
Pressure	0.5 to 0.8 Mpa	72.5 to 116 psi
Volume	400 l/min.	14.13 ft^3/min.
Electrical Specifications:		
Volts	200	
Phase	3	
Hertz	60	
KVA	40	
Air Dryer Specifications	Inlet Air Temperature of 35 degree C or below.	

MOTORS:

For 20K Spindle	15/11 kW	20/14.75 hp
For X, Y, and Z Axes	4.2 kW	5.63 hp
For ATC Magazine	.0.5 kW	0.67 hp
Spindle Temperature Controller	1.6 kW	2.15 hp
Coolant Pump (Nozzle Coolant)	0.925 kW	1.24 hp
Coolant Pump (Coolant Flush)	0.925 kW	1.24 hp
Coolant Pump (Through Spindle Coolant 1.5 Mpa)	2.2 kW	2.95 hp
Coolant Pump (Through Spindle Coolant 3.0 Mpa)	3.7 kW	5 hp
Coolant Pump (Work Washing Gun)	0.925 kW	1.24 hp
Chip Conveyor (Lift-up Type)	1.1 kW	1.47 hp
Chip Conveyor (Trough Screw Type)	0.25 kW	0.33 hp
Oil Skimmer	0.015 kW	0.02 hp
Air Dryer	0.18 kW	0.24 hp

CUTTING CHIP DISPOSAL OPTIONS:

Coolant System (Nozzle Coolant):		
Pressure	0.2 Mpa	29 psi
Volume	80 l/min.	21 gal/min.
Coolant System (Coolant Flush):		
Pressure	0.2 Mpa	29 psi
Volume	80 l/min.	21 gal/min.
Coolant System (Through Spindle 20K HSK):		
Pressure	1.5 Mpa (at the pump)	217 psi
Volume	13 l/min.	3.4 gal/min.
Coolant System (Through Spindle 20K HSK):		
Pressure	3 Mpa (at the pump)	435 psi
Volume	15 l/min.	4 gal/min
Through Spindle Air (20K):		
Pressure	0.5 Mpa	72.5 psi
Through Spindle Filtration	In-line filter x 2, 50 micron filtration (1.0 Mpa system)	
	In-line filter x 2, 20 micron filtration (2.5 Mpa system)	
Reservoir Capacity:		
Standard System	420 liters	110.9 gal.
Chip Pan Filtration	1 mm mesh plate	

SIZE OF MACHINE:

Machine Height:	3,065 mm	120.7"
Size of Required Floor Space (Rear Tank):		
Standard (W x D)	2,572 mm x 4,935 mm	101.3" x 194.7"
Depth includes rear tank, stand alone oilmatic and maintenance space		
Machine Weight:		
Standard	7,500 kg	16,534 lbs.

Standard Machine Color: ..... Raptor Silver and Dark Grey

Operator Control Panel

Located conveniently next to the work area. This panel includes the following:

· **Makino Professional 5 Control**
· 12" Color LCD
· Touch sensitive, on-screen selection
· Windows CE platform, capability, flexibility and integration
· Menu driven
· Screen configurability
· Data Center Type A (160 MB)
· Full Ethernet network capability
· Manage multiple data storage locations simultaneously
· Windows type file tree
· Background editing function
· Cut, paste, and replace function
· NC Power ON/OFF
· Emergency Stop Push-button
· NC Program Start/Stop
· Mode Selector Switches
· NC Function Switches
· Coolant Control Switches
· Machine Control Switch
· Spindle Start/Stop
· Spindle Tool Unclamp
· Machine Monitoring Indicator
· Over Travel Release Switch
· Alarm Release Switch
· Memory Protect Unlock Key Switch
· Splash Guard Door Interlock Key Switch
· Routine Function Switches
· Jog Switch
· Rotary Switch Manual Feedrate
· Rotary Switch Rapid Feed Override
· Rotary Switch Feedrate Override
· Rotary Switch Spindle Speed Override
· Control mounted MPG

Control Specifications – Makino Professional 5

Controlled Axes

3 simultaneous controllable axes (up to 5 axes optional – but, ONLY 4 simultaneous)

Programming Method

Inch/metric Selection (G20, G21);
Custom Macro B Common Variables: 82;
Minimum increment: 0.0001 mm, 0.001 deg, 0.00001 inch;
Maximum programmable dimension: ±8 digits (±99999.999);
Absolute/incremental programming (G90/G91);
Decimal point Programming/Calculator type decimal point input;
Automatic recognition of EIA/ISO code;

Interpolation

Positioning (G00);
Linear interpolation (G01);
Circular interpolation (G02, G03);
Helical Interpolation (G02, G03));

Feeds

Cutting feedrate:
F direct command;
Dwell (G04);
Cutting feedrate override (0-200%);
Feedrate override cancel (M49/M48);

Part Program Storage & Editing

Part program storage (320 m or 1,050 feet tape or 128 K);
Registerable programs (250);
Program number search;
Sequence number search;
Address, word search;
Part program collation/comparison and stop;

I/O Devices

Data Center;
- File management functions (NC programs, various data files)
- DNC simple schedule function (multiple programs executable)
- Program review function
- Cut, paste, and replace function
- Background edit function
- 2 program simultaneous edit function
- G code insert function
- M code insert function
- Fixed-form statement insert function
- Final MDI program insert function
- Other program insert function

I/O interface (RS232C);
PCMCIA slot;

STM Functions

S-function direct command (direct spindle programming) (S5);
T-function (T4);
M-function;

Tool Offsets

Tool length offsets (64 total) (G43, G44/G49) (MM STD);
Tool radius offset C (G41, G42/G40);
Tool offset memory Type C;
Cutter Compensation C;

Coordinate Systems

Manual return to reference point;
Automatic return to reference point (G28);
Reference point return check (G27);
Return from reference point (G29);
Coordinate system setting (G92);
Machine coordinate system setting (G53);
Work coordinate system selection (G54-G59);
Local coordinate system setting (G52);

Operation Support Functions

Label skip:
Control in/out;
Single block;
Program stop (M00);
Optional stop (M01);
Optional block skip (/);
Dry run;
Machine lock;
Z-axis feed cancel;
Ignore M/S/T functions;
Mirror image (M21, M22/M23);
Manual absolute;
Tool length measurement (manual);
Data protection key;
Follow-up;
Help function;

Programming Support Functions

FS-15M format;
Circular interpolation radius programming;
Canned cycles (G73, G74, G76, G80 to G89);
Rigid Synchronous Tapping (G84)
Sub-program call (4 fold nested);
Custom macro
Exact stop check (G09);
Exact stop check mode (G61);
Tapping mode (G63);
Cutting mode (G64);
Programming data input (G10) (offset value, parameter) (MM STD);

Machine Error Compensation

Stored pitch error compensation;
Backlash compensation;

Maintenance & Safety

Emergency stop;
Over travel;
Stored stroke limit 1;
Self-diagnostics;
Interlock;

Makino Professional 5 Operation Specification

Geometric Intelligence [SM] Control;
Clock Function;
MDI Function;
Operation History Display;
Spindle Load Display;
Spindle Load Monitoring Function;
Tool Life Management;
Direct Spare Tool Selection Function;
Parts Count Function (run hour & parts quantity)
Machining Record Function (machining time stamp function)
Registered tool automatic selection and changing function;
All axes automatic return to reference point;
Automatic return to work setting position;
Automatic Z-axis retraction
Self-diagnostics and instruction display;
Number and position of limit switches and solenoids display for alarm;
Alarm history function;
Automatic display for regular maintenance advice;
User Create Function for regular maintenance;

Installation

Environmental conditions for machine run-off at Makino are controlled to the following level:

Temperature	Warm	28±2°C	82.4±3.6°F
	Cool	18±2°C	64.4±3.6°F
Fluctuation	≤ 1°C/30 min.		≤ 1.8°F/30 min.
Humidity	65% or less		
Dust	Not applicable		
Air Supply	72-116 psi and 21.2 cfm of DRY air supplied through a minimum supply pipe of 3/4" diameter with no reducers or nozzles.		

NOTE: The quoted accuracies are attained through proper application of environmental conditions and suitable industrial floor for machine stability.

Specifications may be changed without prior notice to incorporate improvements resulting from ongoing R&D programs. Cover machine photo is equipped with optional features.