

SMT

Horizontal Machining Center

SX 4000



**This high-speed machine features
the strongest structural rigidity
in its class and attains a rapid feed rate of
63m/min (2480ipm)
with a 1G acceleration.**



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SX 4000



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Machine design enables high-speed movement


The column mass is optimized to allow movement of 63m/min (2480ipm) rapid feed rate with acceleration of 1G. This combined with a servo driven ATC realizes a C-to-C time of 2.8 seconds and large reduction of non-cutting time.



Specifications

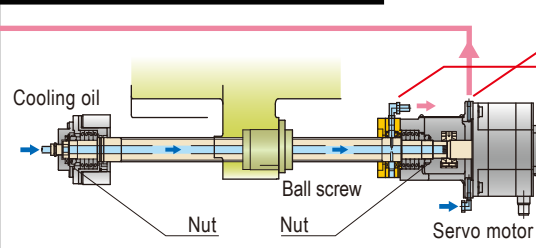
- Travel distance: 560×560×690mm (22.05"×22.05"×27.17")
- Pallet size: 400×400mm (15.75"×15.75")
- Maximum workpiece size: $\phi 630 \times 920$ mm ($\phi 24.80" \times 36.22"$)
- Rapid traverse rate: 63m/min (2480ipm)
- Maximum tool diameter: $\phi 170$ mm (6.69")
- Maximum tool length: 450mm (17.72")

Core cooling ball screws and Double-anchor pre-tension system



Lubrication oil cooler unit

HMC400 uses core cooling ball screws on the X, Y and Z axes. Circulation of cooling oil through the ball screws, around ball screw support housings and motor mounting surfaces reduces the thermal displacement and maintains accuracy during long machining time.



The double-anchoring method limits elongation of the ball screws and improves the minute-feed characteristics and the lowers lost-motion characteristics. Accuracy in round cutting has also been improved largely.



The spindle nose reaches close to the pallet center

Providing a minimum distance of 50mm (1.97") from the spindle nose to the pallet center makes it possible to use tools with short overhangs and allowing highly-rigid machining.



Highly rigid structure

The NX4000 utilizes a wide column and highly rigid roller guides. This produces great aluminum machining performance and also the machining of a wider range of workpieces, including cast iron.



Highly rigid roller guides

Improved reliability

The X-axis and Z-axis shutters are of single-plate construction.

This design eliminates the risk of binding during cutting and achieves an improvement in the reliability.



Shutters of single-plate construction (X-axis and Z-axis)

User-friendly construction

The operation panel is located on the left-hand side, which enables the operator to see the whole interior of the machine, thus increasing the operator's work efficiency.

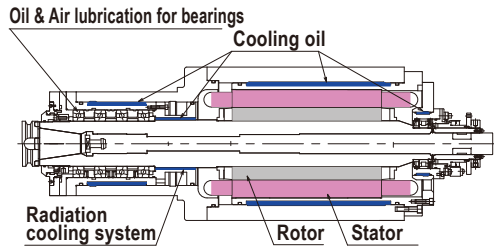


Photograph of operation panel and interior

Spindle

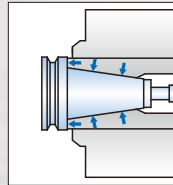
The spindle bearings are oil-air lubricated. Circulating temperature controlled oil is in the groove around the spindle housing suppressing the growth of the spindle. Furthermore, SMT's unique radiant cooling system prevents the conduction of heat generated from the motor into the spindle.

Standard spindle 15000min⁻¹

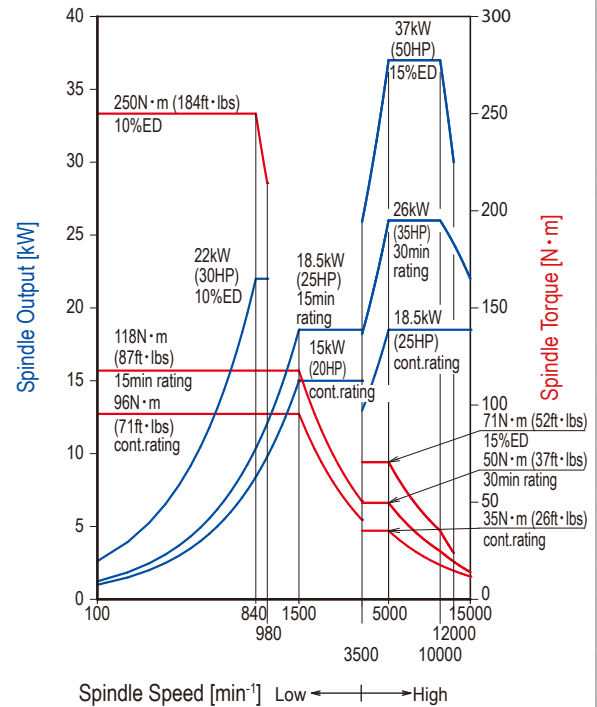


Dual contact tool BT type (Standard)

Improvements in rigidity of tools have been achieved by contact faces of spindle-nose and tool holders flange. This has a great effect not only for heavy load machining but also high speed machining. (The performance is different due to the cutting tools and cutting conditions.)



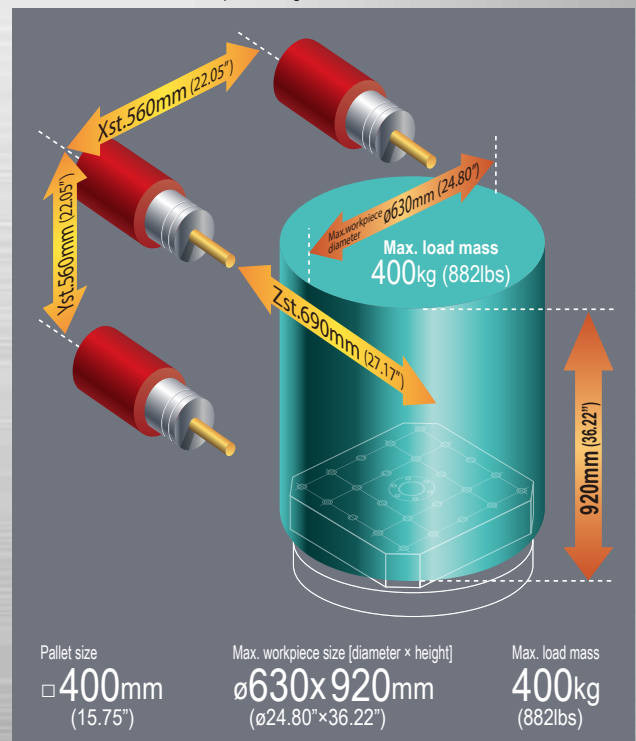
15000min⁻¹ [37/18.5kW (50/25HP) MS]



Table

The SX4000 adopts a table with a multi-clamp pallet system for a maximum workpiece height of 920mm (36.22"), thus easily accommodating automatic fixture interfaces.

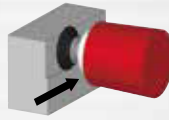
* The available workpiece height will become lower when a fixture is used.



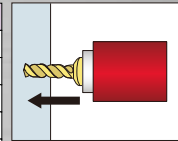
Machining capabilities

Cutting data

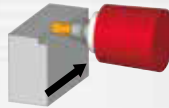
Type of machining	Face milling $\phi 100\text{mm}$ (3.94") $\times 6\text{T}$
Spindle speed	800min ⁻¹
Width of cut	80mm (3.15")
Depth of cut	4mm (0.16")
Feed rate	1100mm/min (43 ipm)
Cutting amount	352cm ³ /min (21.5in ³ /min)
Spindle motor load	95%
Workpiece material	S45C



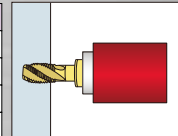
Type of machining	Drill Milling $\phi 26.5\text{mm}$ (1.04")
Spindle speed	300min ⁻¹
Width of cut	26.5mm (1.04")
Feed rate	50mm/min (2ipm)
Cutting amount	27.5cm ³ /min (1.7in ³ /min)
Spindle motor load	30%
Workpiece material	S45C



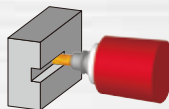
Type of machining	Side milling with End mill $\phi 32\text{mm}$ (1.26") $\times 6\text{T}$
Spindle speed	250min ⁻¹
Width of cut	25mm (0.98")
Depth of cut	20mm (0.79")
Feed rate	100mm/min (4 ipm)
Cutting amount	50cm ³ /min (3.1 in ³ /min)
Spindle motor load	42%
Workpiece material	S45C



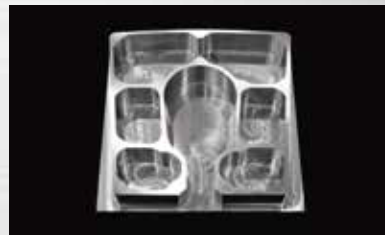
Type of machining	Tap Milling M30 \times P3.5
Spindle speed	100min ⁻¹
Feed rate	350mm/min (14 ipm)
Spindle motor load	61%
Workpiece material	S45C



Type of machining	Slotting with End mill $\phi 32\text{mm}$ (1.26") $\times 6\text{T}$
Spindle speed	250min ⁻¹
Width of cut	32mm (1.26")
Depth of cut	12mm (0.47")
Feed rate	140mm/min (6ipm)
Cutting amount	54cm ³ /min (3.3in ³ /min)
Spindle motor load	45%
Workpiece material	S45C



Workpiece material: A7075



Workpiece material: S50C

Values shown here are for reference to provide an indication of cutting capability.

High-precision Machining in a Shorter Cutting Time

The maximum tool length of 450mm (17.72") allows a tool longer than a pallet size of 400mm (15.75"). The SX4000 performs deep boring operations without rotating the pallet. This allows high-precision machining in a shorter cutting time.

* There is a limit on the diameter of a tool with a length of 350mm (13.78") or larger.



ATC [Automatic Tool Changer]

The machine uses a servomotor-driven ATC and magazine, thus providing a stable tool change with excellent durability. The standard includes a variable-speed ATC function that automatically slows down the ATC turning speed for a heavy tool. This allows the tool to be changed smoothly by simply selecting the slow turning speed during tool registration.

Max. tool diameter
Ø170mm (6.69")

Max. tool length
450mm (17.72")

Max. tool mass
12kg (26 lbs)



APC [Automatic Pallet Changer]

APC units use the straight forward direct-turn lifting and turning mechanism. The units have been designed to take into consideration their expansion for systematization (to 6-pallet APC, 8-pallet APC or automatic pallet transfer system) which can be integrated flexibly into the machining line.

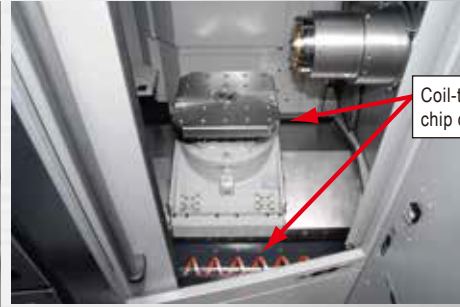


Chip disposal measures

The standard ceiling shower and two coil-type conveyors on the left- and right-hand side thoroughly remove cutting chips from the machine. The troughs of the coil conveyors shield heat transfer to the bed from cutting chips and coolant.



Ceiling shower [Standard]



Coil-type chip conveyors

Coil-type chip conveyors [Standard]

Environmental measures

LED lamps [Standard]

The machine incorporates LED lamps due to their low heat generation and power consumption savings. Furthermore, the LED lamps have a long life to save replacement money and maintenance.



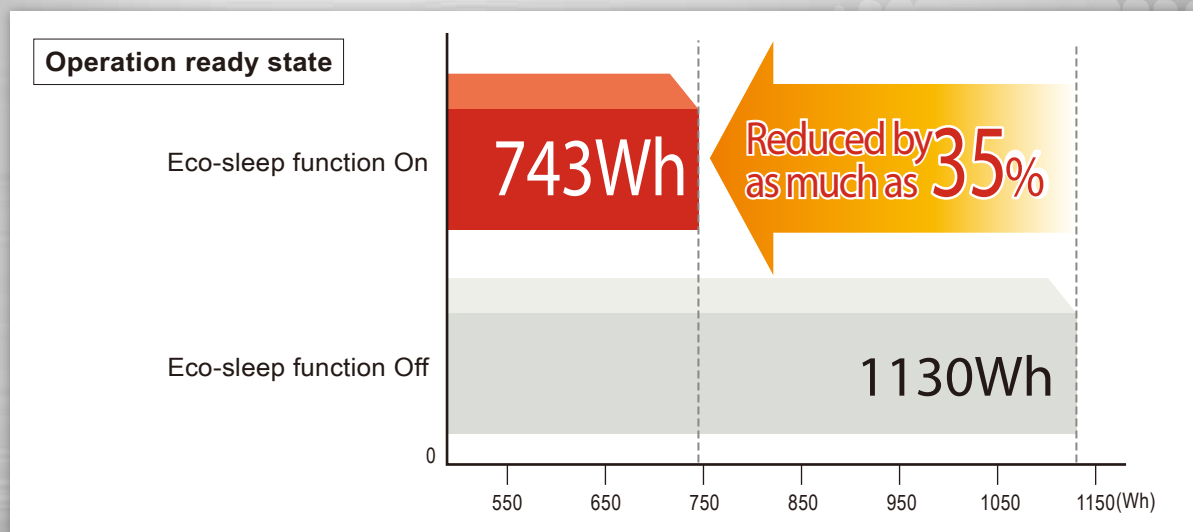
LED lamps [Standard]

ECO sleep function [Standard]

If the machine remains idle longer than the specified time period, the machine's present mode is switched to a power-saving mode to reduce wasteful consumption of power, air and so on. When the power-saving mode is active, the equipment such as servos and chip conveyors are turned off. It is cancelled automatically when the setup operation is completed i.e. when the doors are closed.

Power consumption comparison

A power consumption of 1130Wh under normal standby condition is reduced to 743Wh with the eco-sleep function, a reduction of 35%.















Maintenance

All of the maintenance devices are centrally located on operator door side for simple daily inspection.



Lift-up chip conveyor [Option]

Suitable lift up chip conveyor according to type of chips ◎ Most suitable ○ Usable △ Usable under condition × Not usable - Not applicable

Type of chip conveyors		Hinge type		Scraper type		Magnet Scraper type		Scraper type with drum filter		Magnet scraper type with drum filter					
		Use	Not use	Use	Not use	Use	Not use	Use	Not use	Use	Not use				
Use or not use coolant oil															
Type of chips	Magnetizable chips	Steel	Short curl 							-	-				
			Spiral 			*2	*2	*2	*2	×	-	×	-		
			Long 			×	×	×	×	×	-	×	-		
			Needle shape 	×	*1	×		*3			-		-		
			Powder and small lump 	×	*1	×		*3			-		-		
	Non-magnetizable chips	Aluminum	Cast iron	Needle shape 	×	*1	×		*3		-		-		
				Powder and small lump 	×	*1	×		*3		*3	-		-	
				Short curl 	×			*4		-	-		-	-	
				Spiral 						-	-	*5	-	*5	-
				Long 						-	-	*5	-	*5	-
Non-magnetizable chips	Aluminum	Cast iron	Needle shape 	×	*1	×			-	-		-			
			Powder and small lump 	×	*1	×			-	-	-		-		

*1 Minute chips can enter the conveyor through a gap on the hinged plate. So, inside of the conveyor needs frequent cleaning.

*2 Scraper can easily catch long chips. So, shortening the chips (for example by using the step feed) or removing such chips is required.

*3 When flow rate of the coolant is large, filters can be clogged with chips flowed out of the conveyor case. Therefore, combined use with a magnet plate is recommendable.

*4 When flow rate of the coolant is large, filters can be clogged with chips flowed out of the conveyor case. Therefore, filters require frequent cleaning.

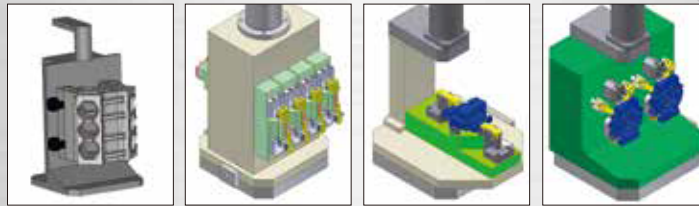
*5 Scraper can easily catch long chips. Therefore, periodical removal of chips is needed. If they remain, a drum filter may be damaged.

Optional accessories

Automatic fixture interface (Rotary joint on pallet system) [Option]



Fixture example



Mist collector [Option]

Mist collector suctions mist from the splash guards and is recommended when high-pressure coolant is used.



Air blow nozzle [Option]

For dry cutting applications.

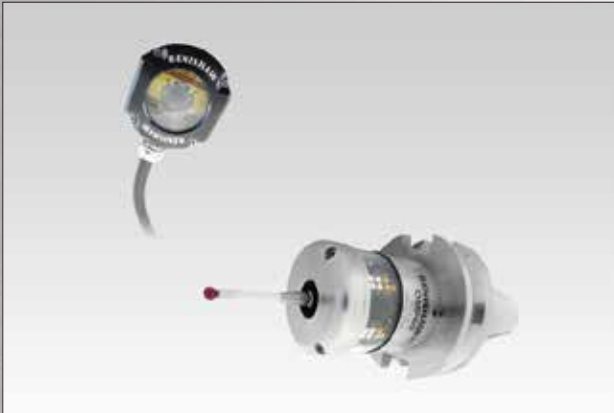
Option check sheet

Item	Description
<input type="checkbox"/> Changing the type of pull stud	<input type="checkbox"/> MAS 60°
<input type="checkbox"/> Dual-contact tool	<input type="checkbox"/> HSK-A63
<input type="checkbox"/> Tool magazine	<input type="checkbox"/> 60 tools <input type="checkbox"/> 116 tools
<input type="checkbox"/> Multi-pallet APC	<input type="checkbox"/> 6APC <input type="checkbox"/> 8APC
<input type="checkbox"/> Pallet top surface	<input type="checkbox"/> T-slot
<input type="checkbox"/> Additional pallet	
<input type="checkbox"/> APC safety door automatic open / close	
<input type="checkbox"/> Oil skimmer	
<input type="checkbox"/> Signal lamp	<input type="checkbox"/> 3-lamps type without buzzer <input type="checkbox"/> 3-lamps type with buzzer
<input type="checkbox"/> Coolant-through-spindle	<input type="checkbox"/> Center through
<input type="checkbox"/> Coolant unit	<input type="checkbox"/> 2 MPa (290psi) <input type="checkbox"/> 7 MPa (1015psi) <input type="checkbox"/> With coolant cooler <input type="checkbox"/> Without coolant cooler
<input type="checkbox"/> Air blow nozzle	<input type="checkbox"/> 1 nozzle
<input type="checkbox"/> Swirl stopper block	<input type="checkbox"/> For angle attachment
<input type="checkbox"/> Workpiece flushing equipment	<input type="checkbox"/> Shower gun type
<input type="checkbox"/> Mist collector	<input type="checkbox"/> Hinged type <input type="checkbox"/> Scraper type <input type="checkbox"/> Magnet scraper type
<input type="checkbox"/> Lift-up chip conveyor	<input type="checkbox"/> Scraper type with drum filter (for aluminum + iron)
	<input type="checkbox"/> Magnet scraper type with drum filter (for aluminum + casting)
<input type="checkbox"/> Chip bucket	<input type="checkbox"/> Fixed type <input type="checkbox"/> Swing type
<input type="checkbox"/> Standard tool set	<input type="checkbox"/> Including a tool box
<input type="checkbox"/> Mass block	
<input type="checkbox"/> Angle plate	
<input type="checkbox"/> 2-face angle plate	
<input type="checkbox"/> Fixture interface	<input type="checkbox"/> 3 ports <input type="checkbox"/> 6 ports
<input type="checkbox"/> Touch sensor system T1	<input type="checkbox"/> Workpiece measurement <input type="checkbox"/> Tool length measurement / Tool break detection
<input type="checkbox"/> Tool break detection inside the magazine	
<input type="checkbox"/> Automatic restart at tool damage	

Setup support function

T1-A: Automatic workpiece measurement/compensation [Option]

The touch sensor attached to the spindle is moved to a workpiece in the automatic operation until it contacts the workpiece then based on the travel distance at that time, the required compensation amount is calculated and set as the data for the workpiece coordinate system. The measurement and compensation program is created according to the specified format and then executed.



T0 Software [Option]

This screen enables the simple manual measurement using the touch sensor (option: T1-A or T1-B). You can move the sensor to the desired measuring point by handle mode then the machine starts the automatic measurement after the sensor contacts the workpiece. You can set the results of the measurement as the data for the desired workpiece coordinate system and tool offset number through the single key operation.

Reference plane

Width

Diameter

Coordinate rotation

Distance

Workpiece measurement screen (FAi)

Tool length measurement screen (FAi)

High-efficiency control technologies

Hyper HQ control [Option]

High-speed processing is enabled by improved capability of processing fine line segment toolpaths.

<FAi Capability of look-ahead processing>

Type	Look-ahead processing	Command method
without Hyper HQ control (HQ control)	Max.20 blocks	ON : G5.1Q1 OFF : G5.1Q0
Hyper HQ control A mode	Max.200 blocks	

HQ tuner [Option]

The HQ tuner provides the programmer a 10-step adjustment of parameters for hyper HQ control in accordance with processing conditions. It adjusts the hyper HQ control in accordance with the current process. For example, during roughing routines the programmer can place a higher priority on speed and in finishing routines a higher priority on dimensional accuracy at corners and circular arcs.



Technologies for reduced setup and unmanned operation

Soft AC [Option]

The soft AC function applies the feed rate override control automatically so that the value of the spindle load meter does not change significantly. This helps to prevent damages of tools caused by overload and improves cutting efficiency.

Adaptive control function

Feed override control range: 10 to 200%.
(Changeable with parameters)
Alarms are output at the lower limit override value.

Air-cut reduction function

Feed rates during non-cutting operation can be increased up to 200%.
(Changeable with parameters)

Tool failure monitoring function

Specifications similar to the soft CCM.

Continuous unmanned processing at the time of tool failure
Combined operation with the automatic restart function (Another option) is possible.

Soft CCM [Option]

The Soft CCM monitors the spindle load meter, and stops operation when the meter value exceeds the preset value (set by M signal or set for each of the T numbers through setting screen) and generation of abnormal tool load is determined which is convenient for unmanned operation at night.

Network function

Data server [Option]

Large machining programs can be transferred to the data server through the network connected to the host computer at high speed. The transferred machining programs are executed as the main program or the sub program called up with the M198.



Specifications

Specifications

Item		HMC400
Travel on X axis (Column : right/left)		mm 560 (22.05")
Travel on Y axis (Spindle head : up/down)		mm 560 (22.05")
Travel on Z axis (Pallet : back/forth)		mm 690 (27.17")
Distance from table top surface to spindle center		mm 80~640 (3.15"~25.20")
Distance from table center to spindle nose		mm 50~740 (1.97"~29.13")
Table (Pallet) work surface area		mm □400 (15.75")
Max. workpiece weight loadable on table (pallet)		kg 400 (882lbs) [Uniformly distributed load]
Max. workpiece size loadable on table (pallet)		mm ø630×920 (ø24.80"×36.22")
Table (Pallet) top surface configuration		24×M16 tap
Max. indexable angle of table (pallet)		deg 0.001°
Table (Pallet) index time (for indexing 90°)		sec 0.7
Spindle speed		min ⁻¹ 100~15000
Number of spindle speeds		2-step (Winding change system)
Spindle nose (nominal number)		7/24 taper No.40 Dual-contact type
Spindle bearing bore diameter		mm ø70 (2.76")
Rapid traverse rate	X × Y × Z	m/min 63 (2480ipm)
	B	min ⁻¹ 33.3
Cutting feed rate *1	X × Y × Z	mm/min 1~40000 (0.04~1575ipm)
Tool shank (nominal number)		JIS B 6339 BT40
Pull stud (nominal number)		MAS (45°)
Number of storable tools		tool 40 *2
Max. tool diameter		mm ø95 (3.74") [ø170 (6.69") with no tools in adjacent pots]
Max. tool length (from the gauge line)		mm 450 (17.72") *3
Max. tool weight		kg 5 (11lbs) [12 (26lbs) with slow ATC cycle]
Max. tool moment		N·m 9.8 (7.2 ft·lbs)
Tool selection method		Address fixed random method
Tool exchange time (cut-to-cut)		sec 2.8
Pallet exchange method		Direct turn method
Pallet exchange time (JIS evaluation time)		sec 9.0
Spindle motor (15%ED/Continuous rating)		kW 37/18.5 (50HP/25HP)
Feed motors		kW X, Y, Z : 5.5 (7.4HP) B : 2.7 (3.6HP)
Coolant pump motor		kW 60Hz : 1.2 (1.6HP) 50Hz : 0.7 (0.9HP)
Hydraulic pump motor		kW 1.5 (2HP)
Spindle and feed system cooling oil pump motor (oil cooler)		kW 1/0.75 (1.3HP/1HP) [compression/discharge]
Spindle lubrication oil pump motor (oil air lubrication)		kW 0.017 (0.02HP)
ATC motor		kW 1.2 (1.6HP)
Tool Magazine motor		kW 1.4 (1.9HP)
APC motor		kW 1.8 (2.4HP)
Power supply AC200V±10% 50/60Hz±1Hz AC220V±10% 60Hz±1Hz		kVA 51
Compressed air supply		Mpa, l/min[ANR] 0.4~0.6 (58~87psi) *4, Min.500 (132gpm) *4 *5
Coolant tank capacity		L 530 (140gal)
Spindle and feed system cooling oil tank capacity (oil cooler)		L 24 (6gal)
Spindle lubrication oil tank capacity (oil air lubrication)		L 2 (0.5gal)
Lubrication oil tank capacity		L 20 (5gal)
Machine height (from floor surface)		mm 2640 (103.94")
Required floor space		mm 2605×4480 (102.56"×176.38")
Machine weight		kg 8500 (19000lbs)
Operating environment temperature		°C 5~40

Standard accessories

Item	Q'ty	Remarks
Dual-contact tool	1set	BT type
LED lamp	1set	
Coolant tank (installed separately)	1set	Tank capacity 530L (140gal)
Splash guard/APC safety guard	1set	
Slide way protection sliding covers for X, Y and Z axes	1set	
Earth leakage breaker	1set	
Automatic power off	1set	
Edge locator	1set	
Signal lamp	1set	2-lamps type without buzzer
Direct-turn APC unit	1set	
Coil-type chip conveyor	1set	1 set for each of right and left

Item	Q'ty	Remarks
Hydraulic unit (installed separately)	1set	
Ceiling shower	1set	
Spindle head and ball screw cooling oil temperature controller (installed separately)	1set	
Ball screw and tool magazine automatic grease lubrication unit	1set	
Oil air lubrication unit	1set	
Foundation parts for machine anchoring (Bond anchoring method)	1set	with bond
Magazine tool holder remove device	1set	Foot pedal type
Instruction manual	1set	
Electrical instruction manual (including electrical diagrams)	1set	

*1: Under the HQ or Hyper HQ control

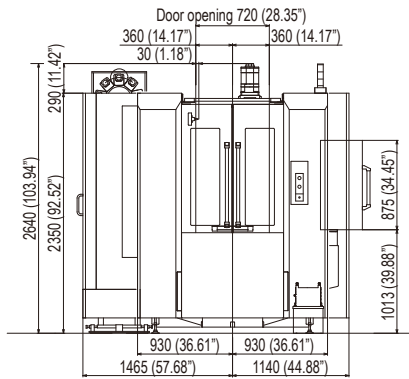
*2: The number of storable tools refers the total number of tools including the one attached to the spindle i.e. subtract one from the above for the number of tools storable in the tool magazine.

*3: Conditional. For details, refer to tool limits drawing.

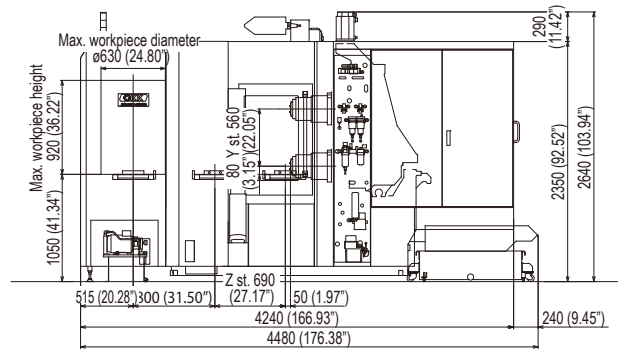
*4: Purity of the supplied air should be equivalent to or higher than Class 3.5.4 specified in ISO 8573-1/JIS B8392-1.

*5: The flow rate for the standard specification machine is specified in the above. When optional specifications such as an air blower is added, add the corresponding air supply according to the operating frequency.

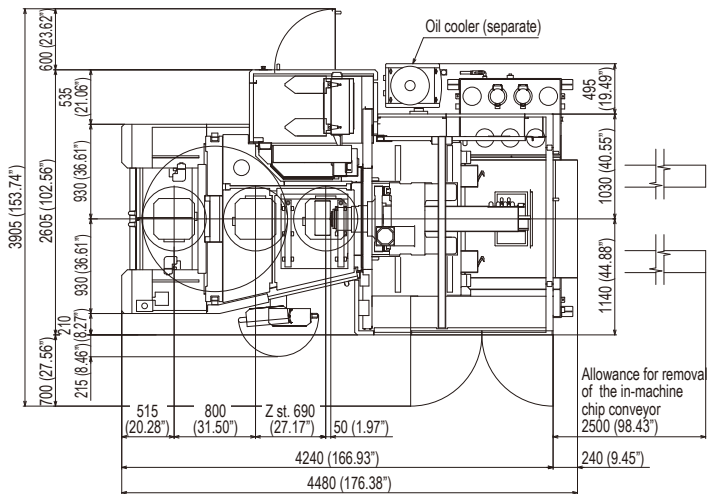
Front view



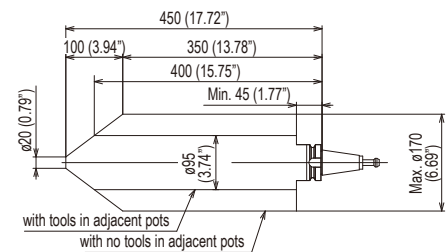
Side view



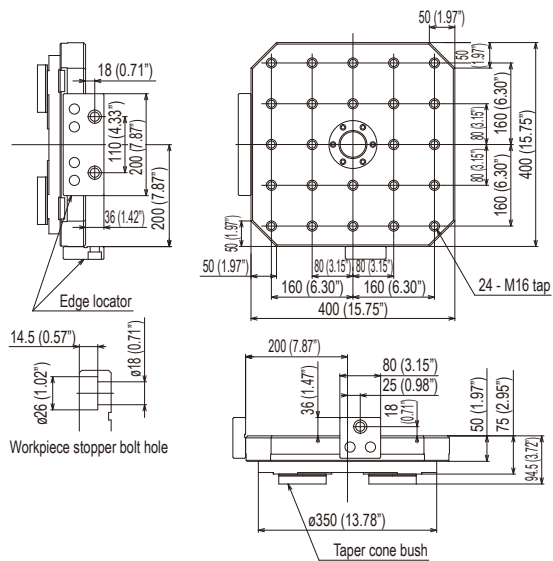
Floor space



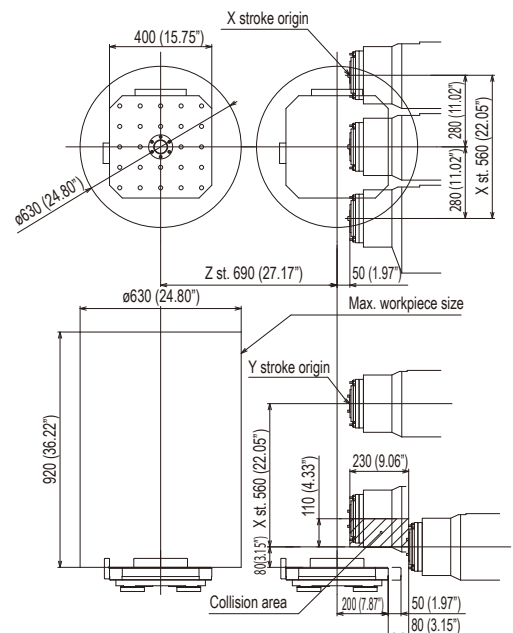
Restrictions on tool



Pallet



Stroke diagram



Controller

FANUC Controller 31i

Standard Specification

No. of controlled axes: 4 axes (X, Y, Z, B)
No. of simultaneously controlled axes: 4 axes
Least input increment: 0.001mm/0.0001"
Max. programmable dimension: ±999999.999mm/±39370.0787"
Absolute/Incremental command: G90/G91
Decimal point input/Pocket calculator type decimal point input
Inch/Metric conversion: G20/G21
Program code: ISO/EIA automatic discriminaton
Program format: FANUC standard format
Nano interpolation(internal)
Positioning: G00
Linear interpolation: G01
Circular interpolation: G02/G03 (CW/CCW), including radius designation
Unidirectional positioning: G60
Helical interpolation
Cylindrical interpolation
Cutting feed rate: 6.3-digit F-code, direct command
Dwell: G04
Manual handle feed: manual pulse generator 1 set (0.001, 0.01, 0.1mm)
Rapid traverse override: 0/1/10/25/50/100%
Cutting feed rate override: 0 to 200% (every 10%)
Feed rate override cancel: M49/M48
Rigid tapping: G84, G74 (Mode designation: M29)
One-digit F code feed
Part program storage capacity: 1280m [512KB]
No. of registered programs: 400
Background editing
Extended part program editing
10.4" color LCD
Clock function
MDI (Manual Data Input) operation
Run hour and parts count display
Memory card/USB interface
Spindle function: 5-digit S-code direct command
Spindle speed override: 50 to 150% (every 5%)
Tool function: 4-digit T-code direct command
ATC tool registration
Auxiliary function: 3-digit M-code programming
Multiple M-codes in 1 block: 3 codes (Max. 20 settings)
Tool length offset: G43, G44/G49
Tool diameter and cutting edge R compensation: G41, G42/G40
Tool offset sets: 400 sets in total
Tool offset memory C
Tool position offset
Manual reference position return
Automatic reference position return: G28/G29
2nd reference position return: G30
Reference position return check: G27
Automatic coordinate system setting
Coordinate system setting: G92
Machine coordinate system: G53
Workpiece coordinate system: G54 to G59
Addition of workpiece coordinate system (48 sets in total): G54.1 P1 to P48
Local coordinate system: G52
Program stop: M00
Optional stop: M01
Optional block skip: /

Standard Specification

Addition of optional block skip: 9 in total
Dry run
Machine lock
Z-axis feed cancel
Auxiliary function lock
Graphic display
Program number search
Sequence number search
Program restart
Cycle start
Auto restart
Single block
Feed hold
Manual absolute on/off: parameter
Sequence number comparison and stop
Manual handle interruption
Sub program control
Canned cycle: G73, G74, G76, G80 to G89
Mirror image function: parameter
Automatic corner override
Exact stop check/mode
Programmable data input: G10
Programmable mirror image
Optional chamfering/corner R
Custom macro
Interruption type custom macro
Addition of custom macro common variables: 600
Coordinate system rotation: G68, G69
Scaling: G50, G51
Backlash compensation for each rapid traverse and cutting feed
Memory pitch error compensation
Skip function
Tool length manual measurement
Automatic tool length measurement: G37/G37.1
Tool life management: 128 sets in total
Emergency stop
Data protection key
NC alarm display/alarm history display
Machine alarm display
Stored stroke check 1
Stored stroke check 2, 3
Load monitor
Self-diagnosis
Absolute position detection
Manual guide i (Basic)

Optional Specification

Least input increment: 0.0001mm/0.00001"
FS10/11 tape format
Part program storage capacity: 5120m [2MB] (400 in total)
RS232C interface: RS232C-1CH
Data server: ATA card (1GB)
Spindle contour control (Cs contour control)
Chopping
High-speed skip
Manual guide i (Milling cycle)

Original SMK Software

HQ control	STD
Hyper HQ control mode A	OP
Special canned cycle (including circular cutting)	OP
Cycle mate F	OP
Soft scale m	STD
Touch sensor T0 software	OP
Tool failure detection system (Soft CCM)	OP
Adaptive control (Soft AC)	OP
Automatic restart at tool damage	OP

STD: Standard



Imported by SMT Group

N25 W23287 Paul Road,
Pewaukee, WI 53072
TEL : 1-262-521-1100
FAX : 1-262-521-1244

DISTRIBUTOR



Hillary Machinery LLC
5415 S 101st E Ave
Tulsa, OK 74146
918-236-4843
www.hillaryllc.com