

NIDEC OKK CORPORATION

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NIDEC OKK A DIVERSIFIED MANUFACTURER OF **MACHINE TOOLS**

Specializes In:

Machining centers Graphite cutting machining centers Grinding centers **CNC** Milling machines Conventional milling machines Total die and mold making systems Flexible manufacturing cells and systems

NOTE:

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Printed in Japan

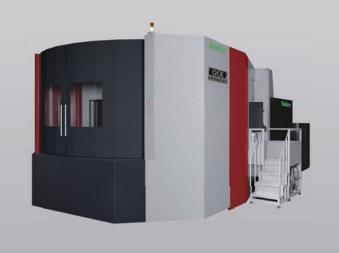
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Horizontal Machining Center

HM1600



www.nidec.com/en/nidec-okk/

NIDEC OKK CORPORATION

Printed with eco-friendly vegetable ink.





Consistent machining performance is received by the precise synchronization of the control and the drives.

Synchronized control of the Y and Z axes drives and the large-diameter twin-lead ball screws

Provision of spindles to respond to any users' demands

High-speed Spindle (MS)

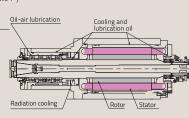
For high-speed and high efficient machining of general parts

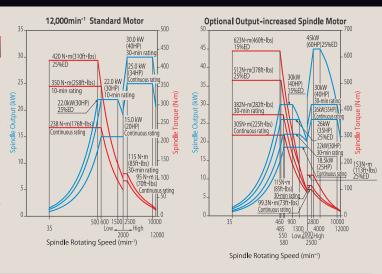
Spindle rotating speed: 35 through 12000 min⁻¹
Spindle motor: 30 kW (40HP) (30-min rating) / 25 kW (34HP)(continuous rating)
Maximum spindle torque: 420 N·m (310ft-lbs)(25% ED rating) / 238 N·m (176ft-lbs)(continuous rating)
Spindle bearing bore diameter: ø100 mm (3.94")

Optional Output-increased Spindle Motor

Spindle motor: 45kW (60HP)(25% ED rating) / 26kW (35HP)(continuous rating) Maximum spindle torque: 623 N-m (460ft-lbs)(15% ED rating) /

305 N·m (225ft-lbs)(continuous rating)





Gear-drive Spindle (Three-step Gear Drive)

For smoothly machining the hard-to-cut materials for heavy-duty parts

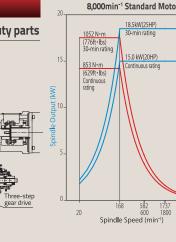
8000min⁻¹

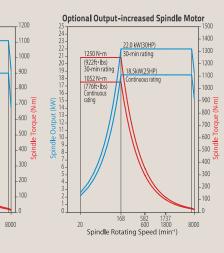
Spindle rotating speed: 20 through 8000 min⁻¹
Spindle motor: 18.5kW (25HP)(30-min rating) / 15kW(20HP)(continuous rating)
Maximum spindle torque: 1052 N·m (776ft-lbs)(30-min rating) /

853 N·m (629ft·lbs)(continuous rating)
Spindle bearing bore diameter: ø120mm (4.72")

8000min⁻¹ Optional Output-increased Spindle Motor Spindle rotating speed: 20 through 8000 min⁻¹

Spindle motor: 22kW(30HP)(30-min rating)/
18.5kW(25HP)(continuous rating)
Maximum spindle torque: 1250N-m(922ft-lbs)
(30-min rating)/1052N-m(776ft-lbs)(continuous rating)
Spindle bearing bore diameter: ø120mm (4.72")





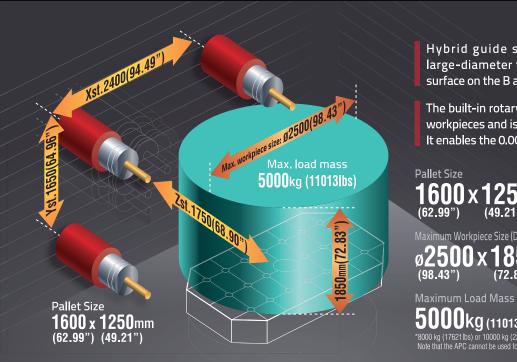




High-accuracy Positioning and High Clamping Force

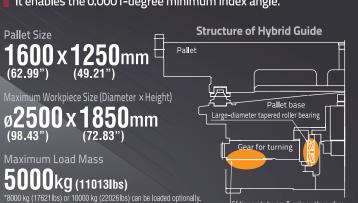
Nidec OKK's original six cylinder pallet clamping holds with a force of 284 kN and six taper cones produce high-accuracy positioning.

The balanced clamping method and high clamping force delivers high cutting capability that is necessary for machining the large and heavy workpieces.



Hybrid guide supporting heavy workpiece Utilizing a large-diameter tapered roller bearing and the sliding guide surface on the B axis has produced a highly rigid table.

The built-in rotary table (BRT) is ideal for machining complicated workpieces and is included in the standard specification. It enables the 0.0001-degree minimum index angle.



Wide Machining Area available for Large Workpieces

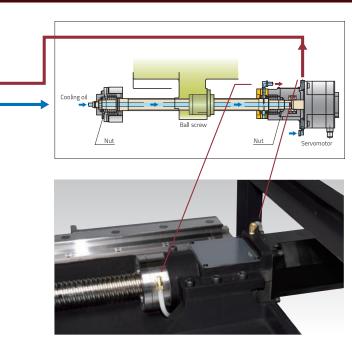
OKK pursued the ultimate superior accuracy, accessibility and operability by a thorough study of the heavy-duty cutting environment.

Forced Core Cooled Ball Screw and Double-anchoring Method

Lubrication Oil Temperature Controller



The forced core cooled ball screws are used on the X, Y and Z $\,$ axes. Circulation of the temperature-controlled cooling oil on the surfaces of the ball screws, ball screw supports and motor mounting section minimizes the thermal displacement and provides continued accuracy over a long period of time.



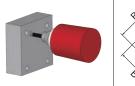
The double-anchoring method is effective for improving the feed mechanism's rigidity and accuracy. Use of the method for the X, Y and Z axes improves the fine-feed and lost-motion characteristics and drastically increases the circular cutting accuracy.

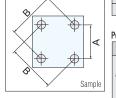
Cutting Data

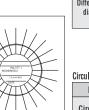


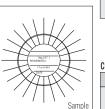
Type of machining	Face milling (ø125×6T)
Spindle speed	300min ⁻¹
Width of cut	100mm
Depth of cut	5mm
Feed rate	700mm/min
Cutting amount	350cm³/min
Workplece material	S45C

Accuracy









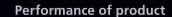
-			
_	Circular Cutting	Accuracy	(
	Item	Tolerance	Exam
ole	Circularity	0.015 (0.00059")	0.00

	D1111 A		
	Positioning Accuracy		
	Item		
		When linear scale is not used	X:±0.0035(0.00014") / full length Y:±0.0030(0.00012") / full
Positioning accuracy	WHEIT IIITEAL SCALE IS HOLUSEU	Z:±0.0030(0.00012") / full length	
	When linear scale is used	X:±0.0030(0.00012") / full length Y:±0.0025(0.00010") / full	
	Wileli lilledi Scale IS useu	Z:±0.0025(0.00010") / full length	
	Repeated positioning	When linear scale is not used	X/Y/Z:±0.0020(0.00008") / full length

(Nidec OKK tolerance)

X/Y/7:+0.0015(0.00006") / full length

- 1. The data shown above as an example were obtained under the Nidec OKK's in-house cutting test conditions. The values may vary with the condition of the cutting tools and fixtures.
- 3. The above accuracy data are the laboratory data obtained by installing the machine according to the Nidec OKK's foundation drawing and carrying out the inspection based on the Nidec OKK's inspection standard in the environment with constant temperature.



Improved Reliability and Durability

We have considered the measures for chip removal, ease of maintenance, etc. and thoroughly pursued the production efficiency in the long hours of operation.

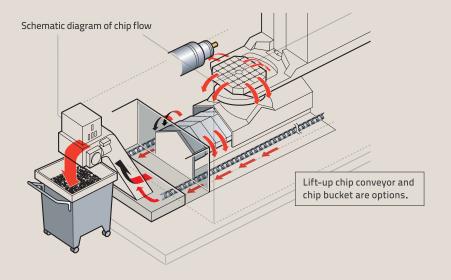
Design structure in consideration of safety, operability and even the environmental measures

We have improved largely the operability- and chip-processing-related problems that are specific to the large-size machines.

Thorough Chip Processing Measures

The shutter slots have been eliminated from the Y-axis upper and lower covers. Both the table main body and the Z-axis shutter have been steepened to avoid chips accumulation and improve the continuous machining reliability.

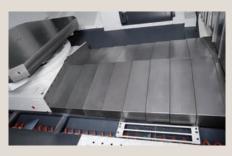
The wide troughs on both sides of the table can receive a large amount of chips. The chips and coolant in the troughs are completely transferred and ejected from the machine by means of the coil-type conveyors. The troughs also help to suppress the thermal displacement by sheltering the transfer of heat from chips and coolant to the bed.



Ceiling Shower Optio

A large amount of coolant can be jetted and sprayed evenly over the machine inside by using four pumps dedicated to the ceiling shower. The high-capacity ceiling shower washes away chips from fixtures and workpieces and prevents chips from accumulating.





ATC [Automatic Tool Changer]



Consistent tool change operation and superior durability are ensured by use of the acknowledged Nidec OKK's original cam-controlled high-speed synchronizing tool changer (Nidec OKK patent).

The variable-speed ATC function included in the standard specification allows setting at the time of tool registration for the heavy tools and large-diameter tools so that the ATC turning speed slows down automatically to change those tools smoothly.

Maximum Tool Diameter ø 115 mm (4.53")

*ø300 mm (11.81") when the adjoinin tool pots are empty.

Maximum Tool Length

*For the multi-magazine that can store 176 or more tools, the maximum tool length for the tools stored in the 3rd or later magazines is restricted to 500 mm.

Maximum Tool Mass **30**kg (66.1lbs)

Tool Exchange Time (tool-to-tool)

3.8s

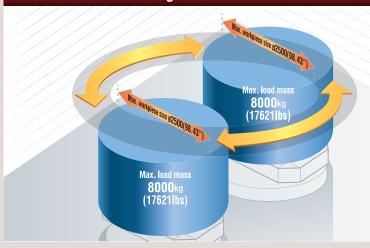
Tool Exchange Time (cut-to-cut)

11.0s

Maximum Tool Moment

29.4N·m (21.7ft·lbs)

APC [Automatic Pallet Changer]



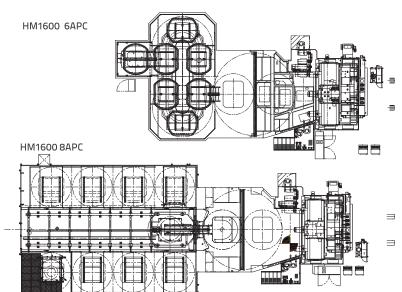
APC [Automatic Pallet Changer]

The APC mechanism of HM1600 uses the direct-turn method consisting only of the pallet lift and turning mechanism so that the pallet exchange time is reduced and space-saving is realized. It can handle the table's maximum load mass of 8000 kg (17621lbs) [option].

Since its design has taken into consideration the expansion for automation (6APC with automatically transferred pallet), it is easily compatible with the line configuration.

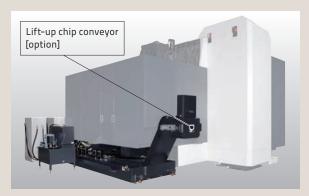
Configuration examples 6APC/8APC

Figure is a conceptual diagram. Actual specifications may differ.



Lift-up Chip Conveyor [Option]

We can provide various types of lift-up chip conveyors.





Machine Specification

Main Specification

Main Specification			
Item		12000-min ⁻¹ MS	8000-min ⁻¹ gear spindle
Travel on X axis (Column's longitudinal direction)	mm	2400(9	94.49")
Travel on Y axis (Spindle head's vertical direction)	mm	1650(6	64.96")
Travel on Z axis (Pallet's cross direction)	mm	1750(6	68.90")
Distance from table top surface to spindle center	mm	100(3.94")~	1750(68.90")
Distance from table center to spindle nose	mm	250(9.84")~	2000(78.74")
Table (pallet) work surface area	mm	1600(62.99"):	×1250(49.21")
Max. mass of load on table (pallet)	kg	(Uniformly distributed load) (OP:8000kg	(17621lbs) OP:10000kg(22026lbs) *1 Uniformly distributed load
Table (pallet) top surface specification		34 × M20 screw hole at in	ntervals of 250 mm(9.84")
Minimum indexable angle of table (pallet)	0	0.0	001
Table (pallet) indexing time per 90°	sec	3.5 (Optional 10000-kg(220	26lbs) specification: 6.5 sec)
Spindle rotating speed	min ⁻¹	35~12000	20~8000
Number of spindle speeds		2-speed electrical shift (MS)	3-speed gearshift
Spindle taper hole		7/24 tapa	er No. 50
Spindle bearing bore diameter		ø100(3.94")	ø120(4.72")
Rapid traverse rate	mm	42000(1653.54") (Optional 10000-kg(22026lt	os) specification: 20000 mm/min (787.40ipm))
Cutting feed rate	mm/min	1~20000 (0.04	1~787.40ipm) *2
Type of tool shank	mm/min		39 BT50
Type of pull stud		OKK or	nly 90°
Number of stored tools	tool) *3
Maximum tool diameter	mm	ø115(4.53") (ø300 mm (11.81") with no tools in adjacent pots)
Maximum tool length (from gauge line)	mm	600(2	, , , ,
Maximum tool mass	kg		5.1 bs)
Maximum tool memont	N·m	,	.7ft·lbs)
Tool selection method		Address fixed r	
Tool exchange time (tool-to-tool)	sec		eable for heavy tools.)
Tool exchange time (cut-to-cut)	sec		26lbs) specification: 15 sec)
Pallet exchange method		Direct tur	
Pallet exchange time (JIS B 6336-9)	sec		21lbs) specification: 65 sec)
Spindle motor (30-min rating/continuous rating)	AC, kW	30/25(40HP/34HP)	18.5/15(25HP/20HP)
Motor for ATC	kW	0.75	(1HP)
Feed motors	AC, kW		Z:5.0(6.7HP)×2 B:4.5(6.0HP)
Hydraulic pump motor	kW		3HP)
Spindle and feed system cooling oil pump motor (compression/discharge)	kW	2.48/0.75×2 (3.3HP/1HP×2)
Coolant pump motor	kW	1.1(1	.5HP)
Motor for APC	AC, kW	7.0(9	.4HP)
Power supply AC200V±10% 50/60Hz±1Hz AC220V±10% 60Hz±1Hz *4	kVA	86	70
Compressed air supply	MPa, I/min[ANR]	0.4(57.1psi)~0.6(85.7psi)	, Min500(132.2gpm) *4 *5
Hydraulic unit tank capacity	I		.3gal)
Spindle and feed system cooling oil tank capacity	I		5gal)×2
B axis and magazine lubrication oil tank capacity		4.0(1	.1gal)
Coolant tank capacity	I		1.4gal)
Machine height	mm	,	72.05")
Required floor space	mm		2")(Opt. lift up chip conveyor)
Machine mass	kg		026lbs) specification: 40000 kg(88105lbs))
Operating environment temperature	°C		-40
Operating environment humidity	%		condensation)

Note 1: The APC cannot be used for the 10000-kg(22026lbs) specification.

Note 2: Feed rate under the HQ or Hyper HQ control.

Note 3: The number of stored tools refers to the total number of tools including the one installed on the spindle i.e. subtract one from the above for the actual number of tools stored in the tool magazine.

Note 4: The values for the standard specification machines are described above. They are subject to change because of the added options. $Note \ 5: Purity \ of the \ supplied \ air \ should \ be \ equivalent \ to \ or \ higher \ than \ Class \ 3.5.4 \ specified \ in \ ISO \ 8573-1/JIS \ B8392-1.$

Standard Accessories

Item	Qty	Remarks
Separate coolant tank	1 set	
Slideway protection covers for X, Y and Z axes	1 set	
Top cover / APC safety guard	1 set	
Earth leakage breaker	1 set	
Automatic power off	1 set	
Lighting system (Two lamps inside the machine)	1 set	
Signal lamp (2-lamp type)	1 set	
Edge locator	1 set	
Direct-turn APC unit	1 set	
Chip conveyors (Two for table both sides)	1 set	Coil type inside the machine for chip discharge from rear side
Hydraulic unit	1 set	
Guide and ball screw automatic greasing		Lubricating the linear guides and ball screws
Spindle and feed system cooling oil temperature controller	1 set	
Oil-air unit	1 set	
B axis and magazine automatic lubrication	1 set	
Steps inside the machine	1 set	
Work platform for the operator	1 set	Shared with the equipment box
Foundation parts (for the bond anchoring method)	1 set	Including the bond for foundation
Instruction manual	1 copies	
Electrical instruction manual (including electrical diagrams)	1 сору	

Special Accessories	
ltem	Specification
Increased spindle motor output	45/30/26kW(60/40/35HP) (12000-min ⁻¹ MS specification) 22/18,5kW(30/25HP) (8000-min ⁻¹ gear-spindle specification)
Two-surface locking tool	BT type
Tool removing device	
Changing the type of pull stud	MASI 45° MASII 60°
Number of stored tools	116 / 176 / 236 tools
Multi-pallet APC	
Pallet top face specification	T-slot specification / Special specification
Addition of pallets	
Maximum mass of load on the table	8000 kg(17621lbs) (uniformly distributed load) 10000 kg(22026lbs) (uniformly distributed load without APC
APC safety door automatic operation	
Oil skimmer	
Addition of lighting system	
Signal lamp	3-lamp type with buzzer / 3-lamp type without buzzer
Linear scale	For X, Y and Z axes / For X and Y axes
Coolant-through-spindle	2-MPa(285psi) coolant / 7-MPa(1000psi) coolant / Air mist
Coolant cooler	
Spare Thickener bag filter	6 pieces (1 set)
Air blow nozzle	1 nozzle
Oil mist blower	1.100010
Minimal quantity lubrication system	External nozzle specification / Spindle-through specification
Swirl stopper block	For oil hole / For angle attachment
Piping for the oil-hole block	Normal pressure (1.2 kW)(1.6HP) / High pressure (2 MPa)(285psi)
Ceiling shower	Homai prosouro (1.2 km)(1.6m) // mgn prosouro (2 km a)(266por)
Workpiece cleaning equipment	Shower gun type
Mist collector	Shower guil type
Lift-up chip conveyor	Hinged-pan type / Scraper type / For aluminum chips Scraper type with floor magnet / For aluminum/Fc chips with magnet separat
Conveyor chip bucket	Fixed type / Swing type
Machine coating color	Color specified by customer
Standard tool set	Including a tool box
Air dryer	
Fire extinguishing appliance	
Sub table	T-slot / Hole / Special specification
Mass block	T-slot / Hole / Special specification
Angle plate	T-slot / Hole / Special specification
2-face angle plate	T-slot / Hole / Special specification
Fixture	
Tooling	
Rotary table, tail stock	
Vice	
Touch sensor system T1	Workpiece measurement (T1-A) / Tool length measurement, Tool break detection (T1-
Tool break detection inside the magazine	,(3,
Tool presence/absence detection	
Tool produitor/abduitor actualion	

Controller

FANUC Controller F31i-B Plus

Standard Specification

No. of controlled axes: 4 axes (X, Y, Z, B)

No. of simultaneously controlled axes: 3 axes(BRT specification is 4 axis)

Least input increment: 0.001mm / 0.0001"(X,Y,Z) 0.0001deg(B[BRT]) Max. programmable dimension:±999999.999mm/±39370.0787"

Absolute / Incremental programming: G90 / G91

Decimal point input/Pocket calculator type decimal point input

Inch/ Metric conversion: G20 / G21

Program code: ISO / EIA automatic discrimination

Program format: FANUC standard format

FS15 tape format

Nano interpolation (internal)

Positioning: G00

Linear interpolation: G01

Circular interpolation: G02 / G03 (CW/CCW)(Including radius designation)

Helical interpolation

Unidirectional positioning: G60

Cutting feed rate: 6.3-digit F-code, direct designation

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 tanning: G84-G74 (Mode designation: M29)

Manual handle feed: Least input increment ×1, ×10, ×100 / graduation Dwell: G04

One-digit F code feed

inverse time feed

Part program storage capacity: total 10240m [4MB] (total 1000 programs)

Part program editing

 $Background\ editing: Possible\ to\ program\ or\ edit\ the\ machining\ program\ while\ NC\ machining\ is\ executed.$ Extended part program editing

15-inch color LCD/QWERTY key MDI Clock function

MDI (manual data input) operation

Run hour and parts count display

Memory card / USB interface

Spindle function: Direct designation of spindle speed with 5-digit S-code Spindle speed override: 50 to 150% (every 5%)

Tool function: Direct designation of called tool number with 4-digit T-code

ATC tool registration Auxiliary function: Designation with 3-digit M-code

Multiple M-codes in 1 block: Maximum 3 codes in 1 block (Maximum 20 settings)

Tool length offset: G43, G44 / G49 Tool diameter and cutting edge R compensation:G41, G42 / G40

Tool offset sets: total 400 sets

Tool offset memory C

Tool position offset

Automatic reference position return: G28 / G29

2nd reference position return: G30

Machine coordinate system: G53

Coordinate system setting: G92

Automatic coordinate system setting Workpiece coordinate system: G54 to G59 G54.1 P1∼P48

Local coordinate system: G52

Polar coordinate command: G15, G16

Manual reference position return Reference position return check: G27

Optional block skip:/

Single block

Dry run

Machine lock

Standard Specification

Z-axis feed cancel

Auxiliary function lock

Graphic function

Program number search Sequence number search

Program restart

Cycle start

Feed hold

Manual absolute (ON/OFF with PMC parameter)

Auto restart

Program stop: M00

Optional stop: M01

Sequence number collation and stop

Sub program control

Canned cycle: G73, G74, G76, G80 to G89

Mirror image function parameter

Custom macro

Programmable mirror image Programmable data input: G10

Manual Guide i (Basic)

Exact stop check / mode

Scaling: G50, G51

Additional custom macro common variables: 1000

Coordinate system rotation: G68, G69

Optional chamfering / corner R

Memory pitch error compensation (interpolation type)

Backlash compensation for each rapid traverse and cutting feed

Smooth backlash

Skip function Tool life management: total 256 sets

Tool length manual measurement

Data protection key NC alarm display / alarm history display

Machine alarm display

Stored stroke check 1 Stored stroke check 2

Load monitor

Self-diagnosis

Absolute position detection

Optional Specification

Additional one axes control:name of axis (A. C. U. V. W) *1 Additional two axes control:name of axis (A, C, U, V, W) \star_1

No. of simultaneously controlled axes: 5 axes *1 Least input increment: 0.0001mm / 0.00001"

Spiral / Conical interpolation

Cylindrical interpolation

Hypothetical axis interpolation Involute interpolation

NURBS interpolation

Smooth interpolation (Hyper HQ control B mode is required) Handle feed 3 axes:Standard pulse handle is removed

Part program storage capacity:total 20480m [8MB] (1000 in total)

Machining time stamp

Data server: ATA card (1GB) Data server: ATA card (4GB)

Optional Specification

RS232C interface: RS232C-1CH

Spindle contour control (Cs contour control)

Tool offset sets: total 499 sets Tool offset sets: total 999 sets

Addition of workpiece coordinate system (total 300 sets): G54.1 P1 to P300

Optional block skip: Total 9 Manual handle interruption

Tool retract and return

Figure copy

Interruption type custom macro

Instruction of inclined plane indexing

Manual Guide i (Milling cycle) Addition of tool life management sets: total 1024 sets

High-speed skip

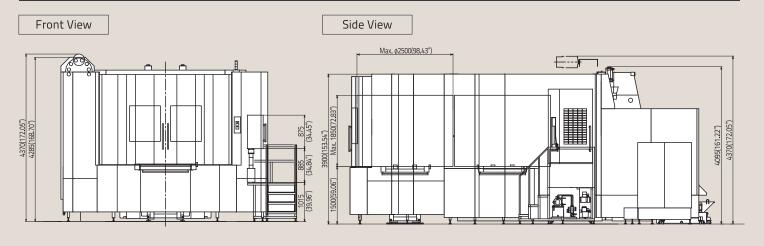
Original Nidec OKK Software

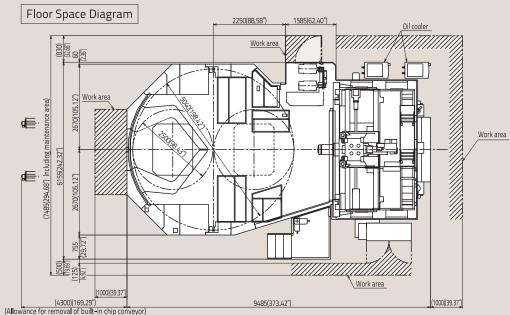
Integrated machining support software (incl. help guidance, etc.)	STD
Tool support	STD
Program Editor	STD
EasyPRO	STD
Work Manager	[Opt]
HQ control	STD
Hyper HQ control mode A	[Opt]
Hyper HQ control mode B	[Opt]
Hyper HQ varue kit *2	[Opt]
Special canned cycle (including circular cutting)	[Opt]
Cycle Mate F	[Opt]
Soft Scale II m	STD
Touch sensor TO software	[Opt]
Soft CCM (Tool failure detection system)	[Opt]
Soft AC (Adaptive control unit)	[Opt]
Automatic restart at tool damage	[Opt]

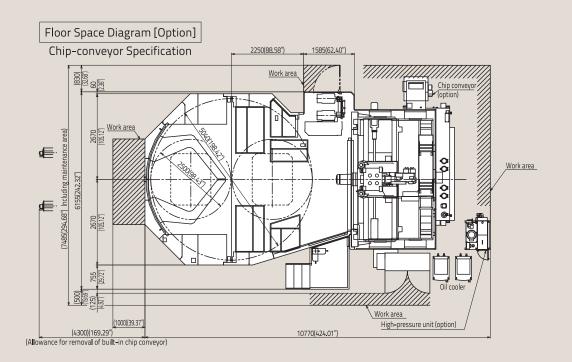
Note 1: F31i-B5 Plus (WindowsCE-installed Open CNC) Note 2: Includes Data server: ATA card (1GB) and Hyper HQ control mode B STD: Standard [Opt]: Option



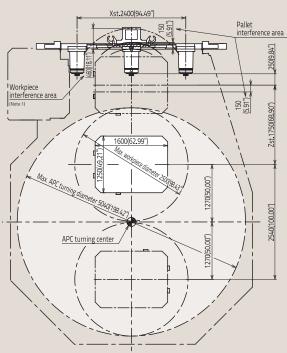
Machine Dimensions







Restrictions on Workpiece

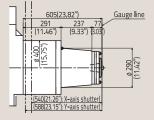


Note 1: When the APC operation is used, do not load a wokpiece that exceeds the range of the maximum APC turning diameter shown above.

Note1: When the APC is used, workpiece on the pallet should not exceed the APC's maximum turning diameter. Note2: The NC's three-dimensional interference check function prevents the pallet from colliding with the head or the X- or Y-axis shutter.

Spindle Shape and Dimensions

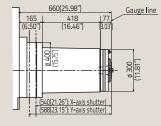
■ 12000-min⁻¹ MS Specification

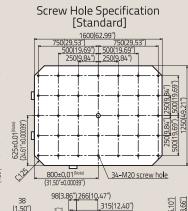


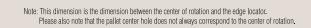
Restrictions on Tool Max600(23.627) (Note) 450(17.727) 56(2.207) 46(1.817) 90(6.817) 18(0.717) 8888 8888 1888

Note: For the multi-magazine that can store 176 or more tools, the maximum tool length for the tools stored in the 3rd or later magazines is restricted to 500 mm(19.69").

■ 8000-min⁻¹ Gear Spindle Specification

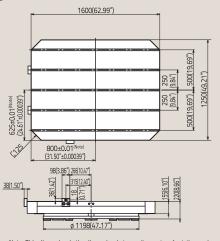






Details of T-slot

Pallet Dimensions T-slot Specification [Option]



Note: This dimension is the dimension between the center of rotation and the edge locator.





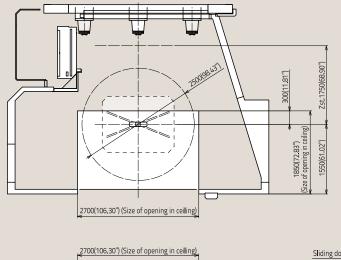
Main Specification

Item	Unit	10000-kg(22026lbs) Specification
Travel on X axis (Column's longitudinal direction)	mm	2400(94.49")
Travel on Y axis (Spindle head's vertical direction)	mm	1650(64.96")
Travel on Z axis (Pallet's cross direction)	mm	1750(68.90")
Distance from table top surface to spindle center	mm	100(3.94")~1750(68.90")
Distance from table center to spindle nose	mm	250(9.84") ~ 2000(78.74")
Table (pallet) work surface area	mm	1600(62.99")×1250(49.21")
Max. mass of load on table (pallet)	kg	10000(22026lbs)
Max. workpiece size (diameter × height)	mm	ø2500(98.43")×1850(72.83")

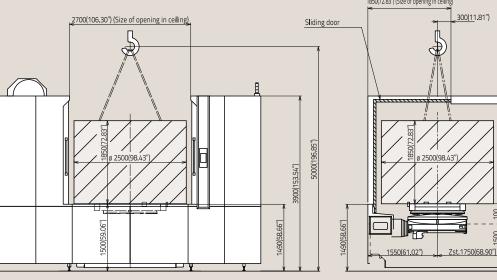
İtem	Unit	10000-kg(22026lbs) Specification
Rapid traverse rate	mm/min	X/Y/Z: 20000(787.40ipm)
Number of stored tools	tools	60
Maximum tool diameter	mm	ø115(4.53") (ø300 mm(11.81") when the adjoining tool pots are empty.)
Maximum tool length (from gauge line)	mm	600(23.62")
Maximum tool mass	kg	30(66.1lbs)
Required floor space	mm	6625(260.83")×7230(284.65")
Machine height	mm	4370(172.05")
Machine mass	kg	40000(88105lbs)

10000-kg(22026lbs) Specification Machine Main Dimensions

Workpiece Loading Diagram



*Pallets have the same dimensions as the ones for the standard machine.



Floor Space Diagram [Option]

Chip-conveyor Specification

Work area

Work