



NIDEC OKK CORPORATION

8-10, KITA-ITAMI, ITAMI
HYOGO 664-0831 JAPAN
International Sales Department
TEL: (81)72-771-1143
www.nidec.com/en/nidec-okk/
E-mail: nokk.ovsd@nidec.com

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

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NIDEC OKK USA CORPORATION
100 REGENCY DRIVE, GLENDALE HEIGHTS, IL 60139 U.S.A.
TEL: (1)630-924-9000
FAX: (1)630-924-9010

NIDEC OKK Europe GmbH
HANSEMANNSTR 33 41468 NEUSS, GERMANY
TEL: (49)2131-29868-0
FAX: (49)2131-29868-41

NIDEC OKK Machinery (THAILAND) Co., Ltd.
KUMTHORN HOLDING BUILDING 2nd FLOOR 897-897/1 Rama 3
Road, Bangpongpan, YANNAWA, BANGKOK 10120 THAILAND
TEL: (66)2-683-2160-2
FAX: (66)2-683-2163

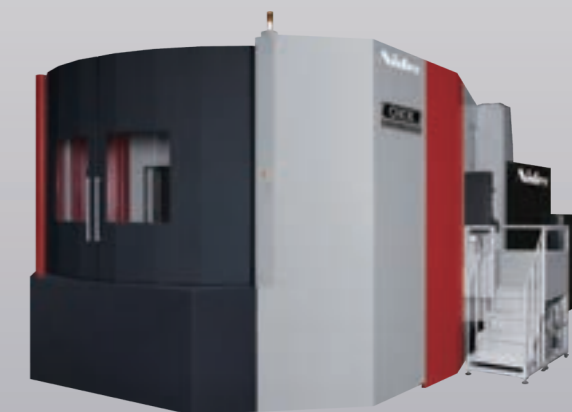
NIDEC OKK (SHANGHAI) CO., LTD.
12F, TOWER B, 100 ZUNYI ROAD, CHANG NING DISTRICT,
SHANGHAI, CHINA
TEL: (86)21-62700930
FAX: (86)21-62700931



Horizontal Machining Center

HM1600

HM1600



Printed in Japan
22.06.FE(T)

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

NIDEC OKK CORPORATION

Large Capacity, High-Speed Horizontal Machining Center

HM1600

Combining exceptional cutting capability with high-speed and accuracy to optimize the machining of wind-power amplifier gear boxes, large-size dies and molds, diesel engine blocks and other large products.

Travel Distance

2400(94.49") X **1650**(64.96") X **1750**(68.90") mm

Pallet Size

1600 (62.99") X **1250**(49.21") mm

Maximum Workpiece Size (Diameter x Height)

Ø**2500** (98.43") X **1850**(72.83") mm

Rapid Traverse Rate (X/Y/Z axes)

42m/min(1654ipm)

Maximum Tool Mass

30kg(66.1lbs)

Maximum Tool Diameter

Ø**300**mm(11.81")

Maximum Tool Length

600mm(23.62")

Number of Stored Tools

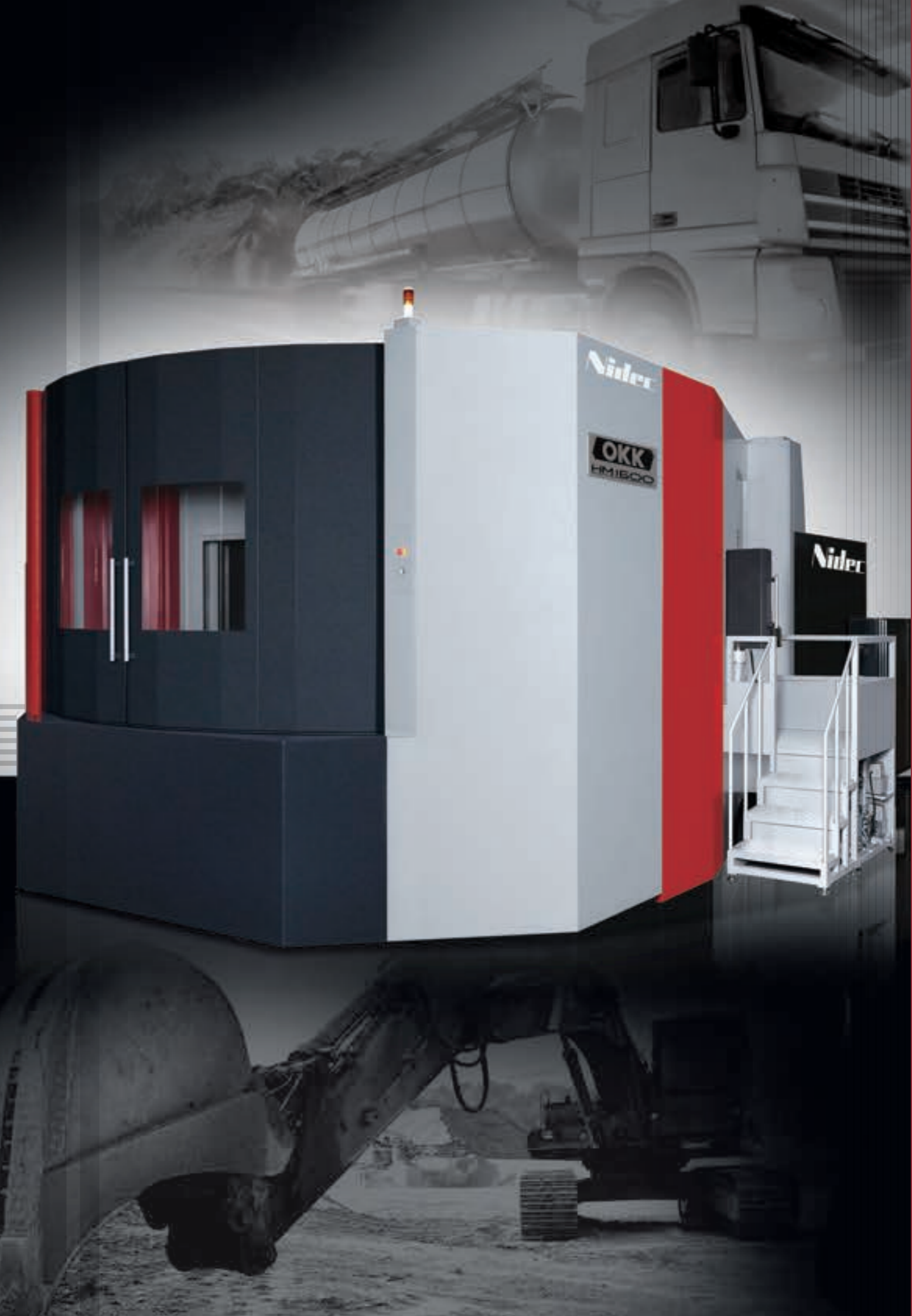
60tools

*116, 176 or 236 tools can be stored optionally.

Maximum Load Mass

5000kg(11013lbs)

*8000 kg (17621lbs) or 10000 kg (22026lbs) can be loaded optionally.



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 various types of spindles to respond to any users' demands

Three types of spindle specification.

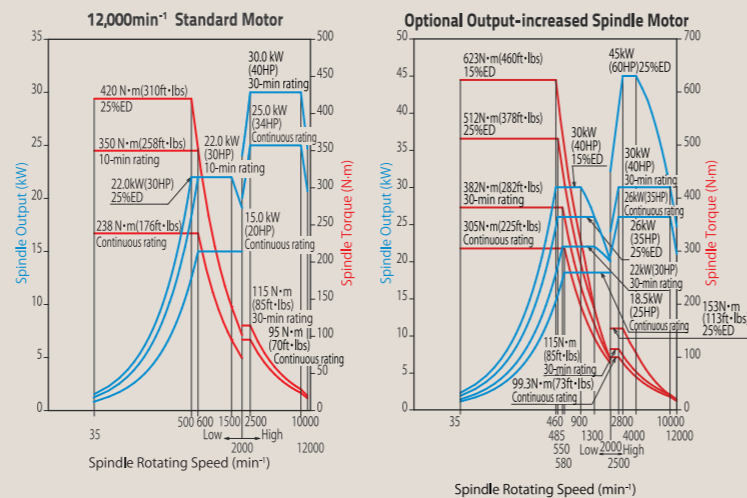
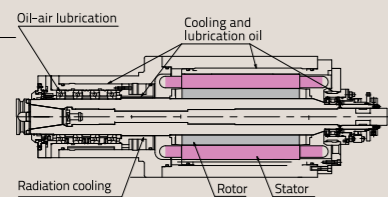
High-speed Spindle (MS)

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)



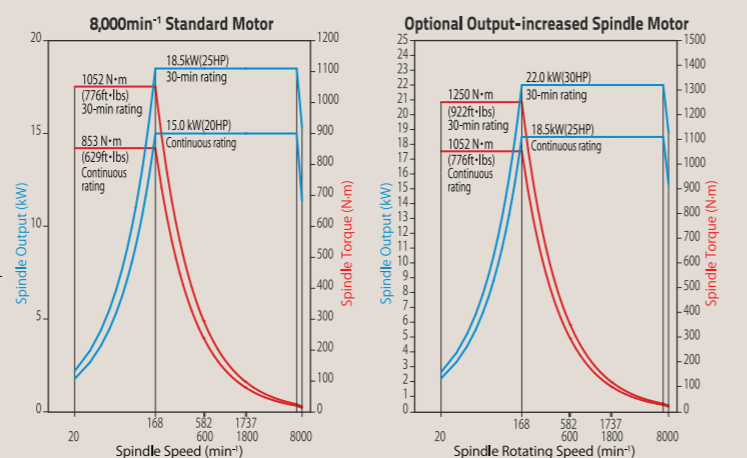
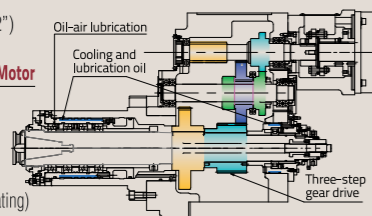
Gear-drive Spindle (Three-step Gear Drive)

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: 1250 N·m (922ft·lbs) (30-min rating) / 1052 N·m (776ft·lbs) (continuous rating)
Spindle bearing bore diameter: ø120mm (4.72")



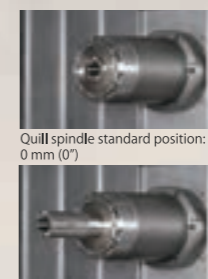
Two Position Locking Quill Style Spindle (Three-step Gear Drive)

The two position locking quill spindle can realize with a single chucking operation the machining that required two processes using the machining center and the boring machine. It allows a drastic reduction in the total machining time by reducing both the processes and the setup work that can take hours for the large-size parts.

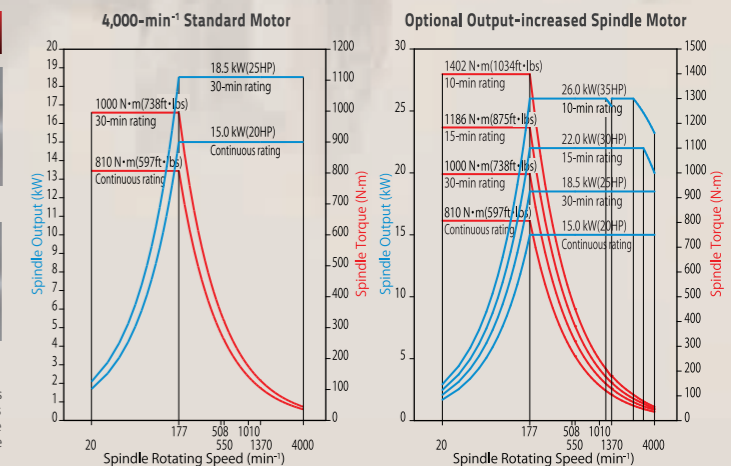
Spindle rotating speed: 20 through 4000 min⁻¹
Spindle motor: 18.5 kW (25HP) (30-min rating) / 15 kW (20HP) (continuous rating)
Maximum spindle torque:
1000 N·m (738ft·lbs) (30-min rating) / 810 N·m (597ft·lbs) (continuous rating)
Spindle bearing bore diameter: ø150 mm (5.91")
Quill spindle outside diameter: ø110 mm (4.33")

Optional Output-increased Spindle Motor

Spindle motor: 26.0 kW (35HP) (10-min rating) / 22.0 kW (30HP) (15-min rating) / 18.5 kW (25HP) (30-min rating) / 15 kW (20HP) (continuous rating)
Maximum spindle torque: 1402 N·m (1034ft·lbs) (30-min rating) / 1186 N·m (875ft·lbs) (30-min rating) / 1000 N·m (738ft·lbs) (30-min rating) / 810 N·m (597ft·lbs) (continuous rating)



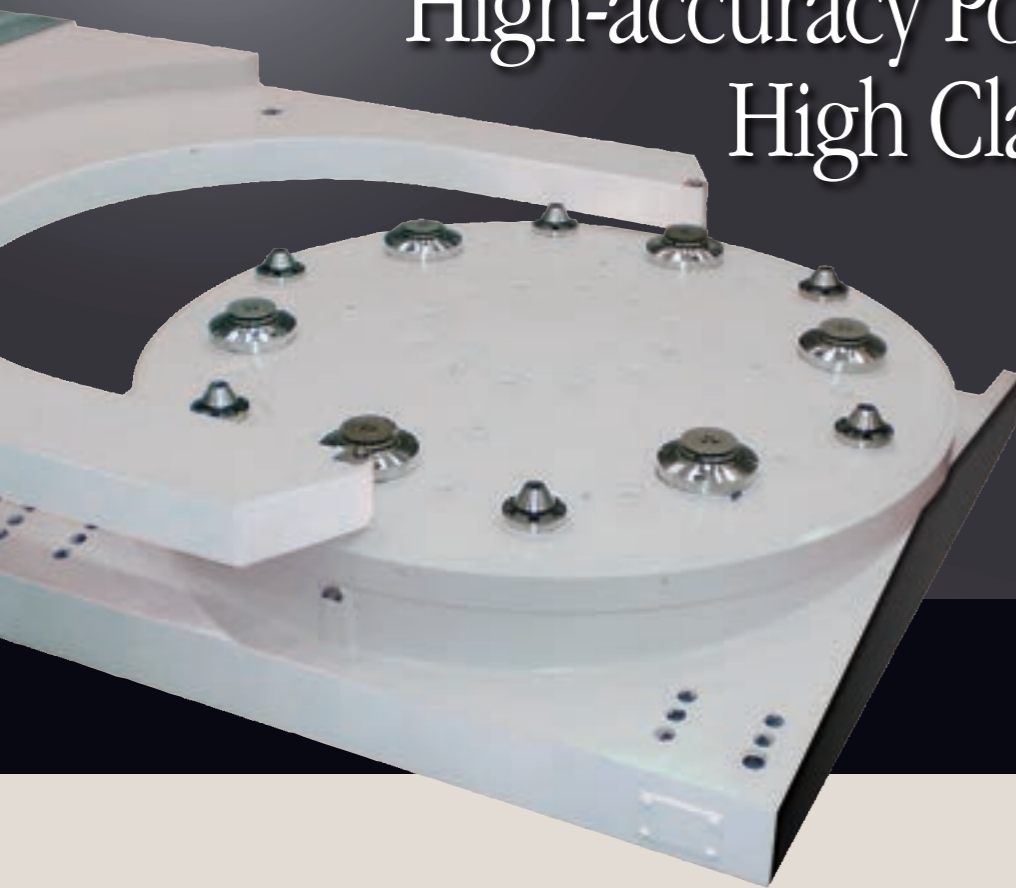
Quill spindle positioning in two positions (0/300 mm) (0"/11.81") Nidec OKK's original clamp device minimizes the drop in machining capability when the spindle is extended. (Patent pending)



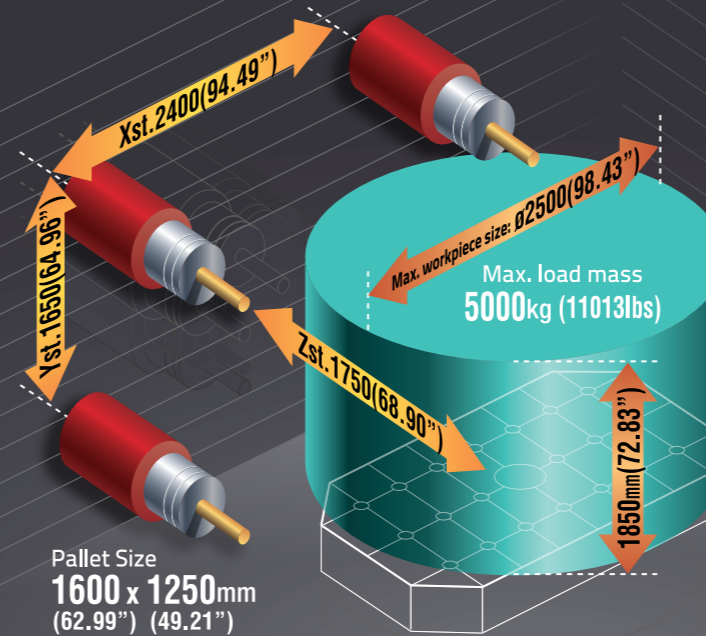
The twin-lead ball screws on the Y and Z axes dampen vibrations. Focused efforts have resulted in the decrease in machining time, improving the machining accuracy, machined surface quality, contouring accuracy and extending the tool life.



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.

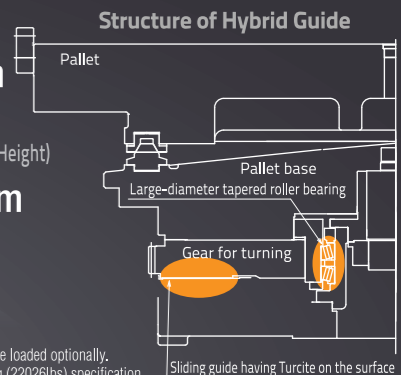
The built-in rotary table (BRT) is ideal for machining complicated workpieces and is included in the standard specification. It enables the 0.0001-degree minimum index angle.

Pallet Size
1600 x 1250mm
(62.99'') (49.21'')

Maximum Workpiece Size (Diameter x Height)
Ø2500 x 1850mm
(98.43'') (72.83'')

Maximum Load Mass
5000kg (11013lbs)

*8000 kg (17621lbs) or 10000 kg (22026lbs) can be loaded optionally. Note that the APC cannot be used for the 10000-kg (22026lbs) specification.

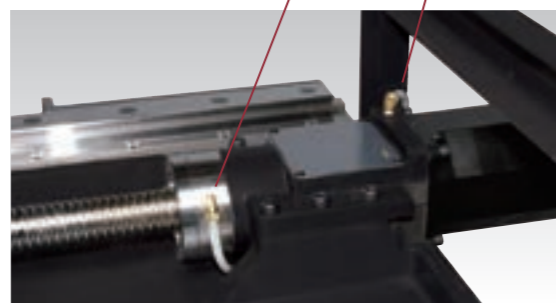
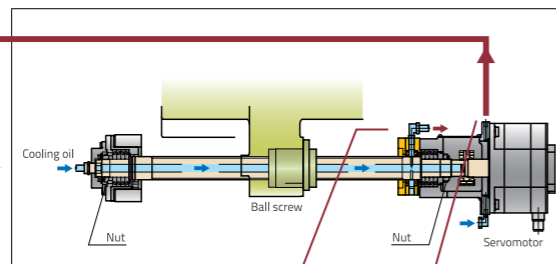


Wide Machining Area available for Large Workpieces

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

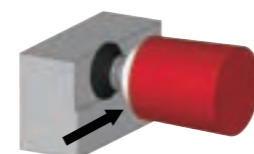


The forced core cooled ball screws are used on the X, Y and Z axes. Circulation of the temperature-controlled cooling oil on the surfaces of the ball screws, ball screw supports and motor mounting section minimizes the thermal displacement and provides continued accuracy over a long period of time.

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.

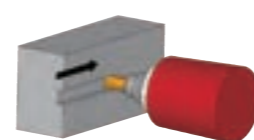
Cutting Data

Face Milling



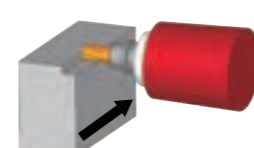
Type of machining	Face milling (ø125(5'')x6T)	
Quill spindle position	Standard position (0 mm)(0'')	Extended position (300 mm)(11.81'')
Spindle rotating speed	300min ⁻¹	300min ⁻¹
Width of cut	100mm (3.94'')	100mm (3.94'')
Depth of cut	6mm (0.24'')	2.5mm (0.098'')
Feed rate	1000mm/min (39.37ipm)	600mm/min (23.62ipm)
Cutting rate	600cm ³ /min (36in ³ /min)	150cm ³ /min (9in ³ /min)
Workpiece material	S45C	S45C

Grooving



Type of machining	Grooving (ø50(2'')x6T)	
Quill spindle position	Standard position (0 mm)(0'')	
Spindle rotating speed	160 min ⁻¹	
Width of cut	50mm (1.97'')	
Depth of cut	25mm (0.98'')	
Feed rate	200mm/min (7.87ipm)	
Cutting rate	250cm ³ /min (15in ³ /min)	
Workpiece material	S45C	

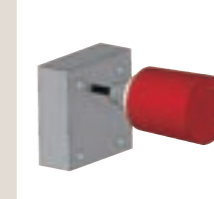
Side Milling



Type of machining	Side milling (ø50(2'')x6T)	
Quill spindle position	Standard position (0 mm)(0'')	
Spindle rotating speed	160 min ⁻¹	
Width of cut	25mm (0.98'')	
Depth of cut	50mm (1.97'')	
Feed rate	200mm/min (7.87ipm)	
Cutting rate	250cm ³ /min (15in ³ /min)	
Workpiece material	S45C	

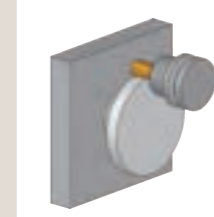
The above values are reference values and consider them only as a guide for the cutting capability.

Accuracy



A	200,000 (7.87'')
B	282,843 (11.13555'')

Positioning Machining Accuracy (mm)		
Item	Tolerance	Example record
Axial direction	0.015 (0.00059'')	-0.004 (-0.00016'')
	0.015 (0.00059'')	-0.001 (-0.00004'')
	0.010 (0.00039'')	0.003 (0.00012'')



Circular Cutting Accuracy (mm)		
Item	Tolerance	Example record
Circularity	0.015 (0.00059'')	0.00413 (0.00016'')

Positioning Accuracy (mm)		
Item	When linear scale is not used	When linear scale is used
Positioning accuracy	X:±0.0035(0.00014'') / full length Y:±0.0030(0.00012'') / full length Z:±0.0030(0.00012'') / full length	X:±0.0030(0.00012'') / full length Y:±0.0025(0.00010'') / full length Z:±0.0025(0.00010'') / full length
	X/Y/Z:±0.0020(0.00008'') / full length	
Repeated positioning accuracy	X/Y/Z:±0.0015(0.00006'') / full length	

Remarks
1. The data shown above as an example are based on the short-time machining. The values may vary in the continuous machining.
2. 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.

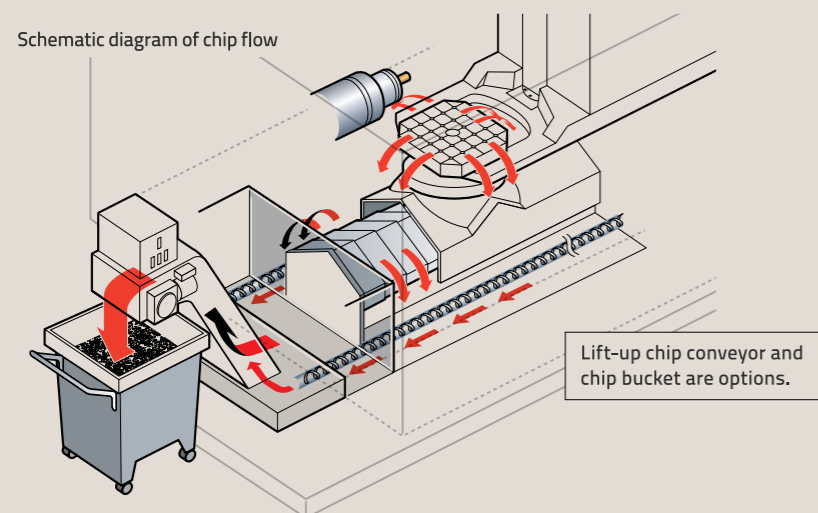
Design structure in consideration of safety, operability and even the environmental measures

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

Thorough Chip Processing Measures

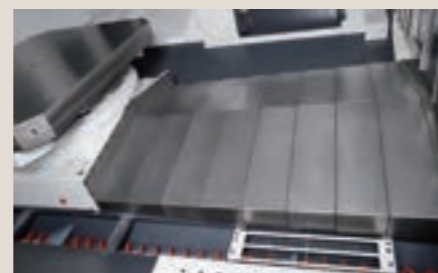
The shutter slots have been eliminated from the Y-axis upper and lower covers. Both the table main body and the Z-axis shutter have been steepened to avoid chips accumulation and improve the continuous machining reliability.

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 [Option]

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
ø115mm(4.53")
*ø300 mm (11.81") when the adjoining tool pots are empty.

Tool Exchange Time (tool-to-tool)
3.8s

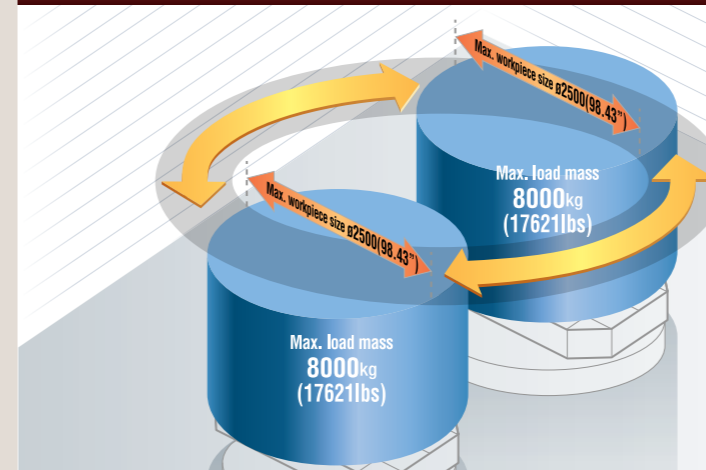
Maximum Tool Length
600mm(23.62")
*For the multi-magazine that can store 176 or more tools, the maximum tool length for the tools stored in the 3rd or later magazines is restricted to 500 mm.

Tool Exchange Time (cut-to-cut)
11.0s

Maximum Tool Mass
30kg(66.1lbs)

Maximum Tool Moment
29.4N·m (21.7ft·lbs)

APC [Automatic Pallet Changer]

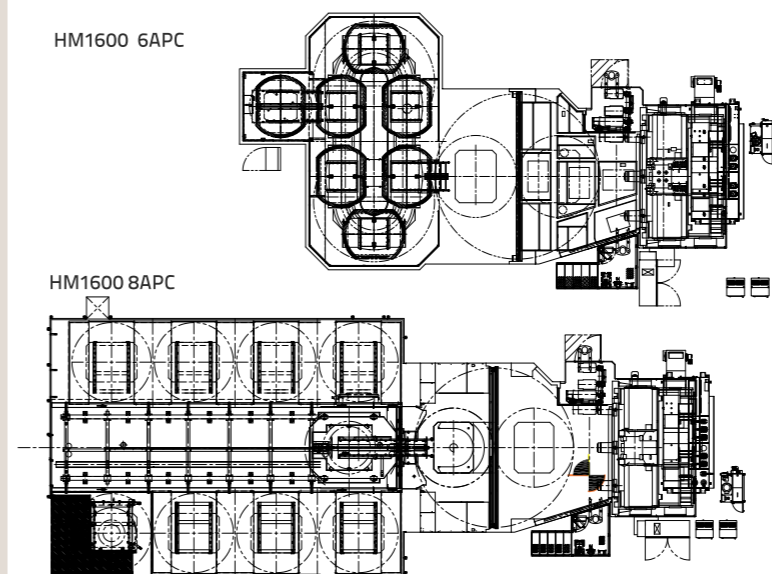


APC [Automatic Pallet Changer]

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.

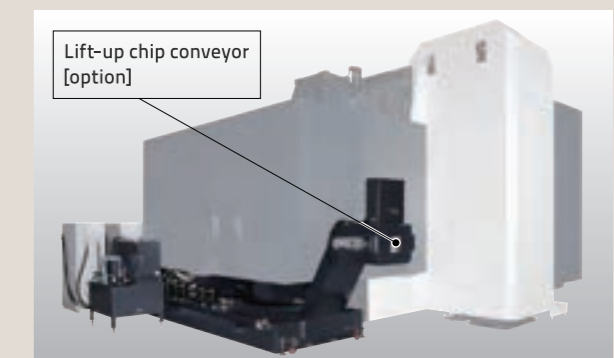
Configuration examples 6APC/8APC

Figure is a conceptual diagram. Actual specifications may differ.



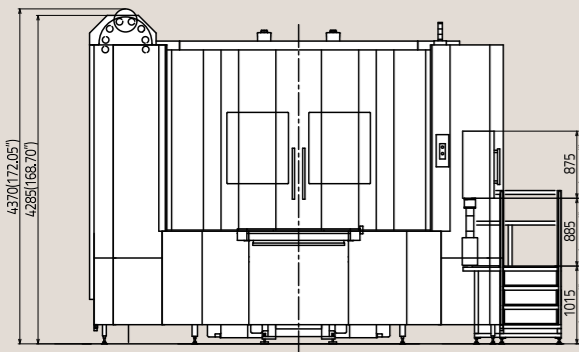
Lift-up Chip Conveyor [Option]

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

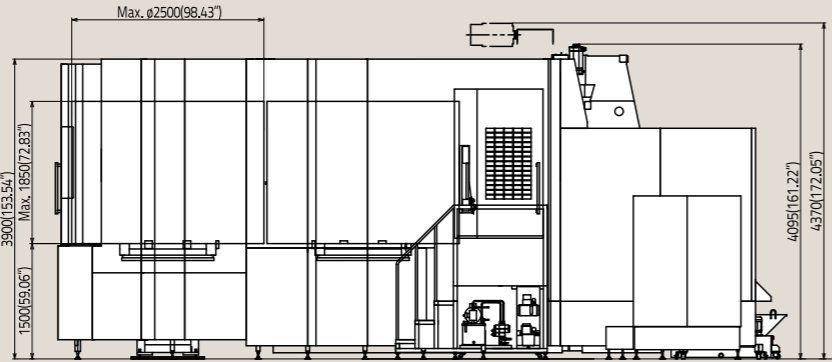


Machine Dimensions

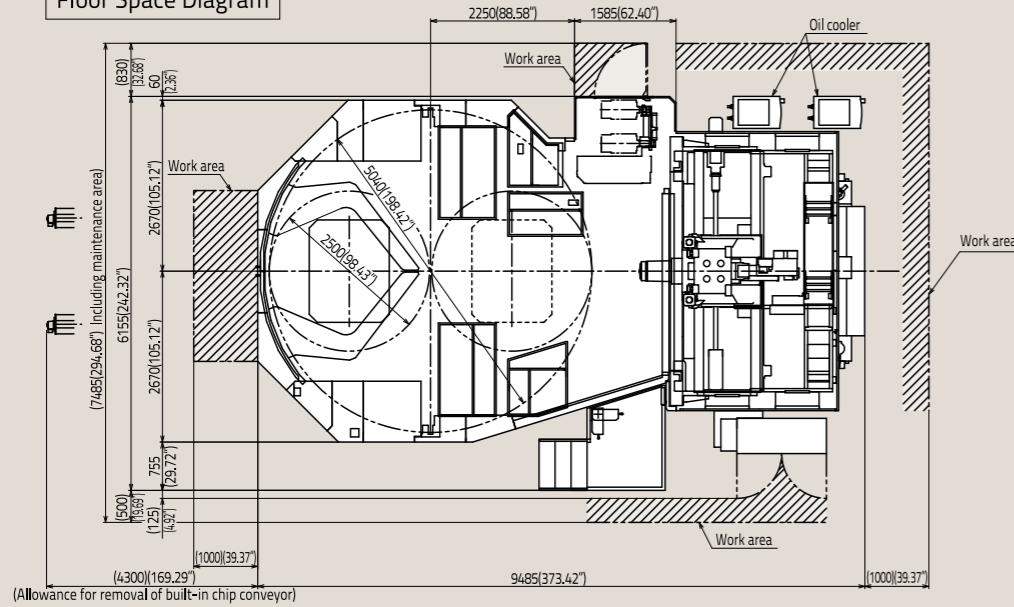
Front View



Side View

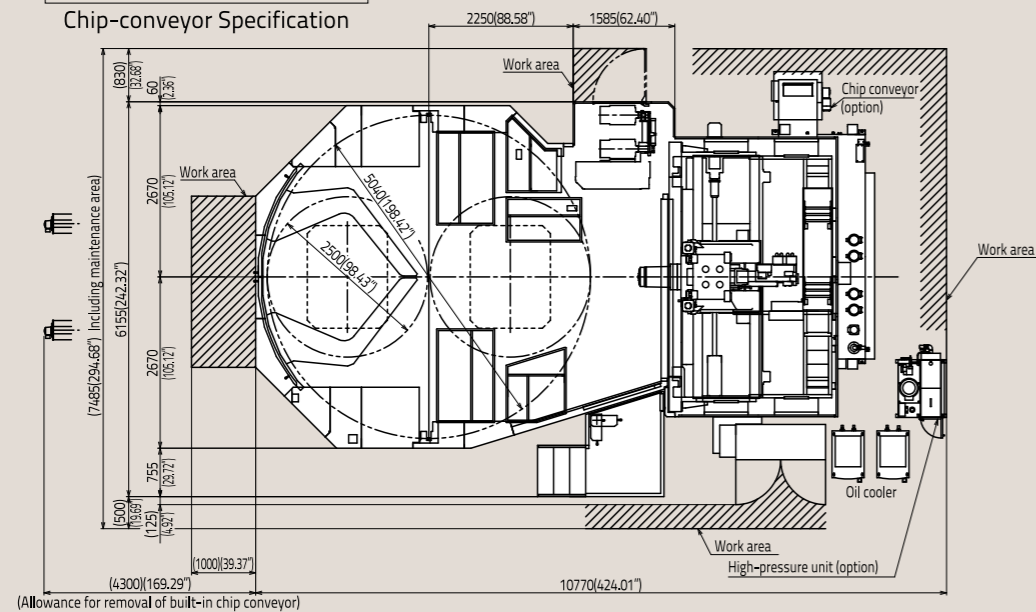


Floor Space Diagram

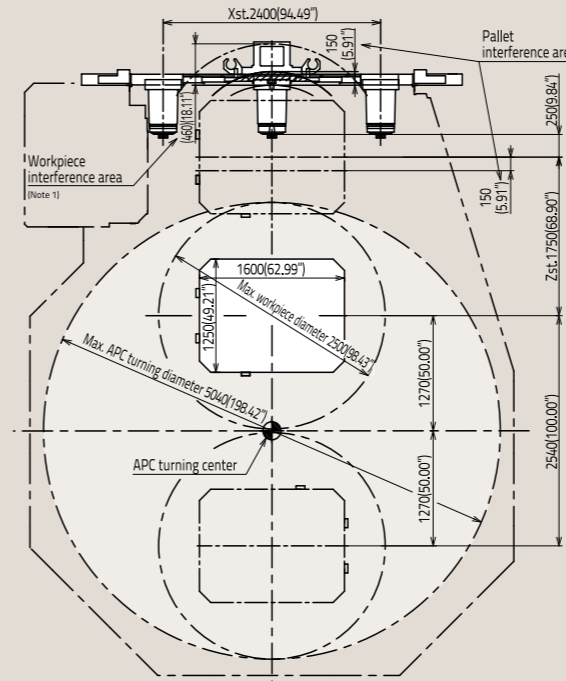


Floor Space Diagram [Option]

Chip-conveyor Specification

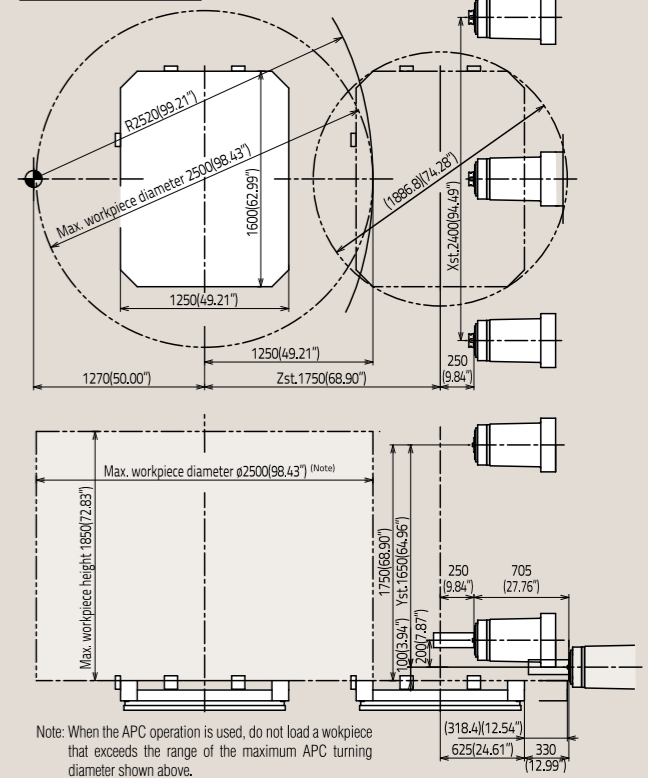


Restrictions on Workpiece



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

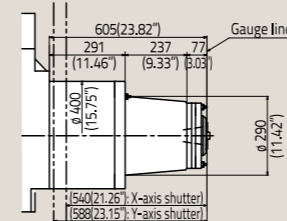
Stroke Diagram



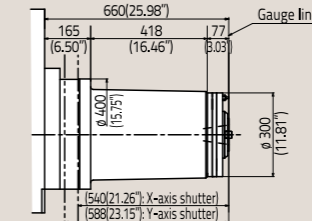
Note: When the APC operation is used, do not load a workpiece that exceeds the range of the maximum APC turning diameter shown above.

Spindle Shape and Dimensions

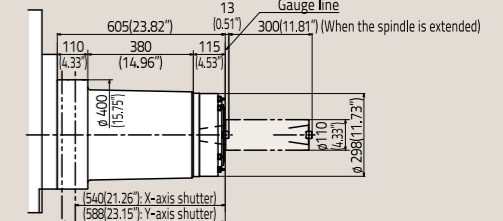
12000-min⁻¹ MS Specification



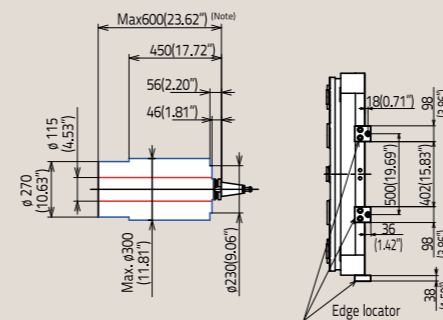
8000-min⁻¹ Gear Spindle Specification



4000-min⁻¹ Two Position Spindle Specification

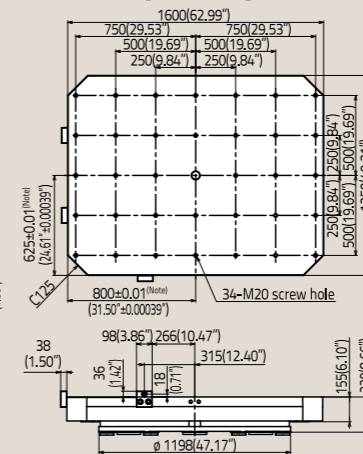


Restrictions on Tool



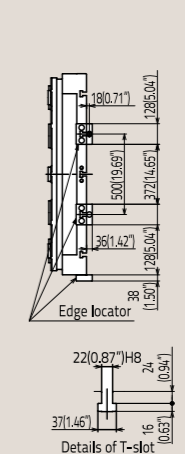
Note: For the multi-magazine that can store 176 or more tools, the maximum tool length for the tools stored in the 3rd or later magazines is restricted to 500 mm (19.69").

Screw Hole Specification [Standard]

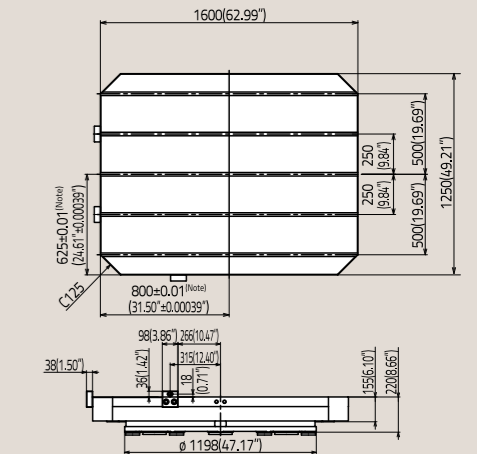


Note: This dimension is the dimension between the center of rotation and the edge locator. Please also note that the pallet center hole does not always correspond to the center of rotation.

Pallet Dimensions



T-slot Specification [Option]



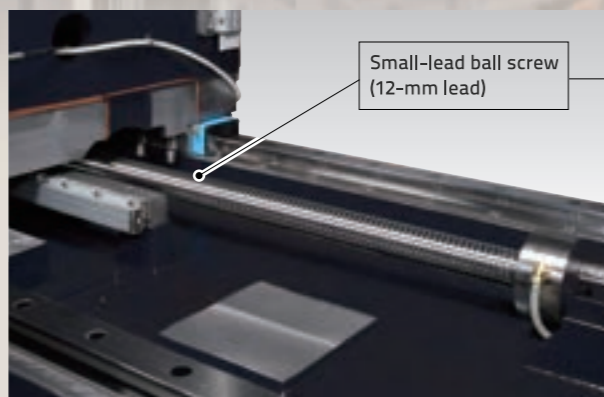
Note: This dimension is the dimension between the center of rotation and the edge locator.



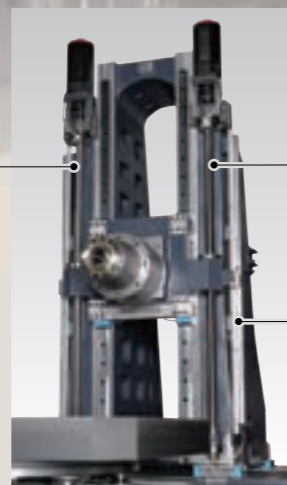
HM1600/10t

10000-kg(22026lbs) Maximum Load Mass Specification

The 10000-kg(22026lbs) maximum load mass specification machine can be provided for machining dies and molds and large and heavy parts.
(APC unit is not available. Rapid traverse rate: 20000 mm/min(787.40ipm) for X, Y and Z axes and 2.5 min⁻¹ for B axis)



Small-lead ball screw (12-mm lead)



Small-lead ball screw (12-mm lead)

Linear scale [option]

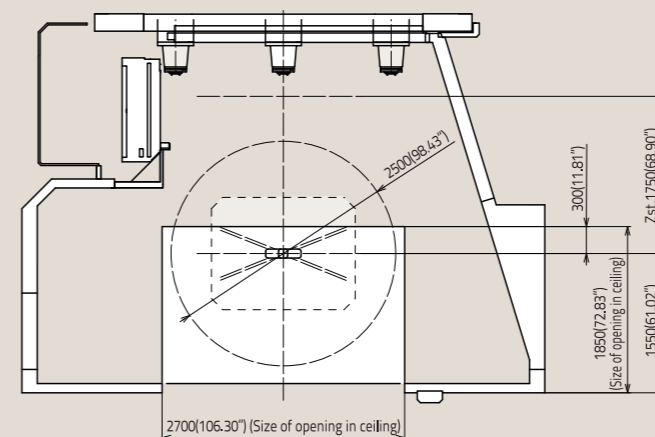
Main Specification

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	∅2500(98.43")×1850(72.83")

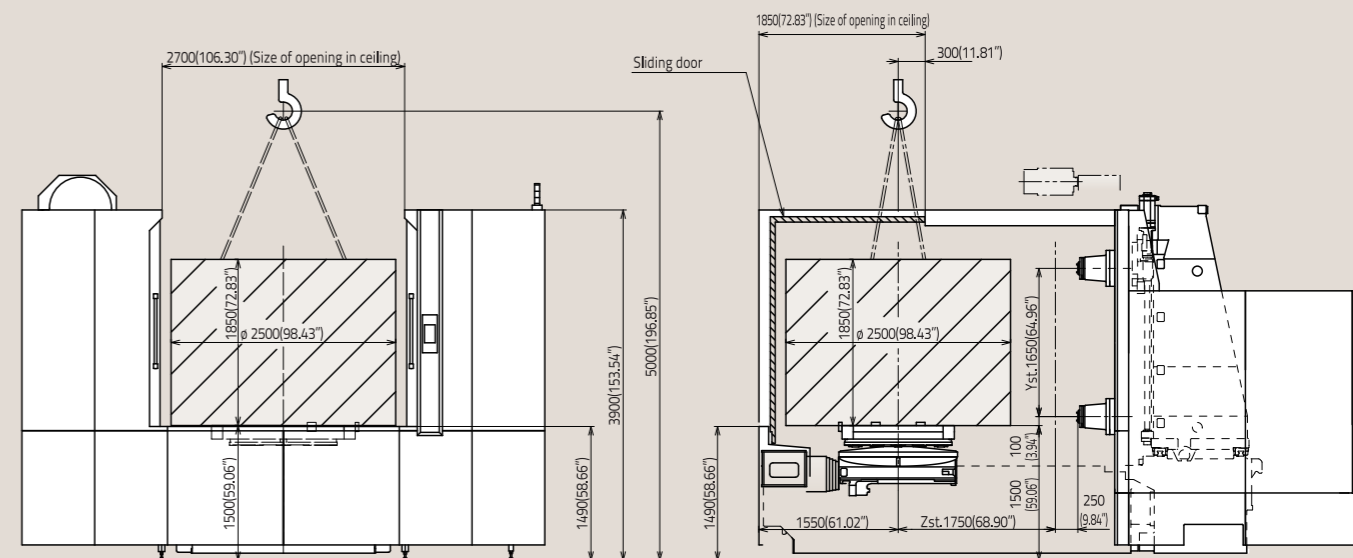
Item	Unit	10000-kg(22026lbs) Specification
Rapid traverse rate	mm/min	X/Y/Z: 20000(787.40ipm)
Number of stored tools	tools	60
Maximum tool diameter	mm	∅115(4.53") (∅300 mm(11.81") when the adjoining tool pots are empty.)
Maximum tool length (from gauge line)	mm	600(23.62")
Maximum tool mass	kg	30(66.1lbs)
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

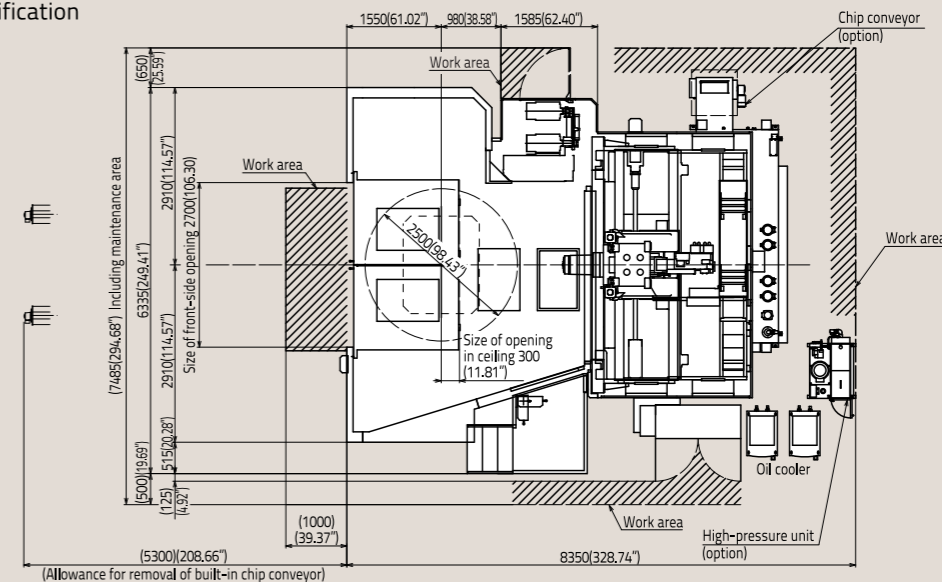
Workpiece Loading Diagram



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



Floor Space Diagram [Option]
Chip-conveyor Specification



(Allowance for removal of built-in chip conveyor)