

Nidec
All for dreams

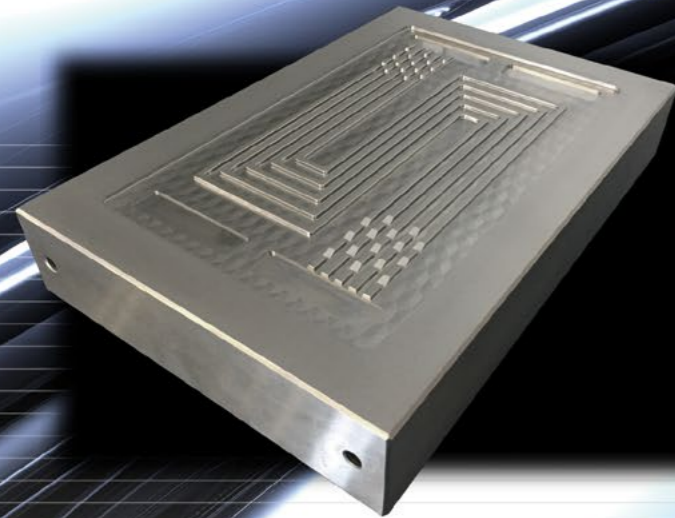
Precision Machine

μV5
micro

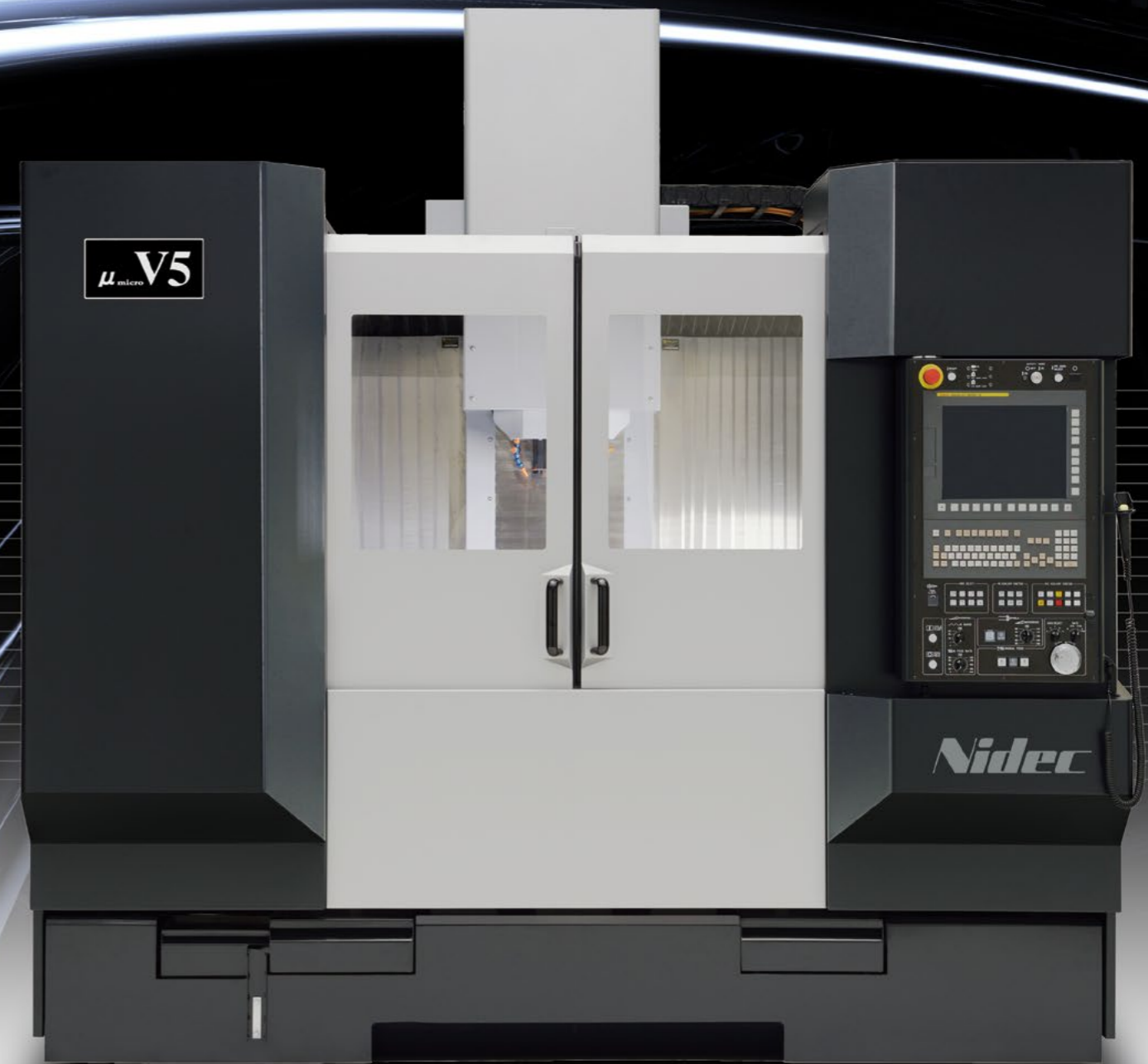


NIDEC MACHINE TOOL CORPORATION
www.nidec.com/en/nidec-machinetool/

Expanding the ideal technology



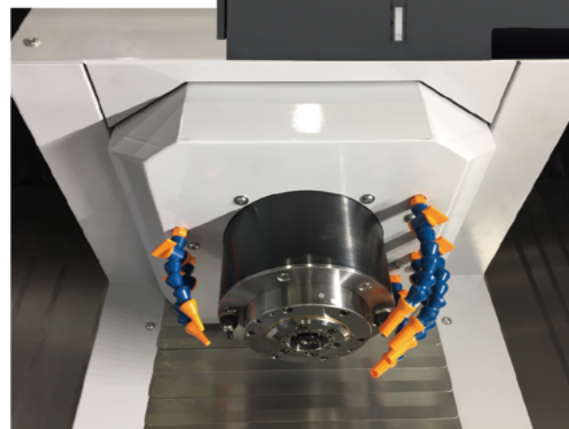
We developed precise machine μ V1 in 2006 as cutting machine which answer to demands of fining and increasing precision of parts or molds for IT, Optical and Medical instruments together with Semi-conductor devices etc. Due to expand the work size and answer to recent demands of increasing precision of large parts which configure the automobile lamp or the fuel battery and so on, μ V5 was born as advanced frontier machine taking over technology behind μ V1.



Precision Machine

μ micro **V5**

High Performance Spindle

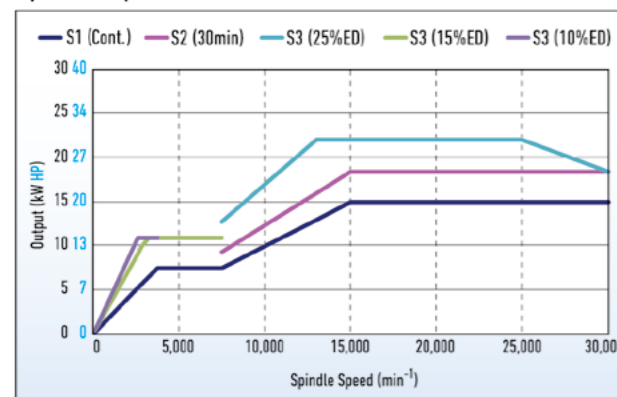


30,000min⁻¹ Spindle is standard

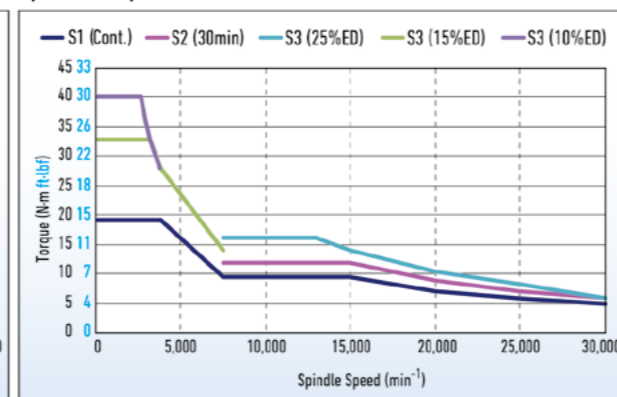
Spindle speed: 300–30,000 min⁻¹
 Output/Torque: 15 kw/19 N·m 20 HP/14 ft·lbf (Cont.)
 Spindle taper: HSK-E50
 Inner diameter of Bearing: $\phi 55$ mm $\phi 2.2$ in
 Cooling/Lubrication: Spindle is internally cooled and has jacket cooling/Special Oil Lubrication

High Output Spindle Motor with 30,000 min⁻¹ RPMs

Spindle Output



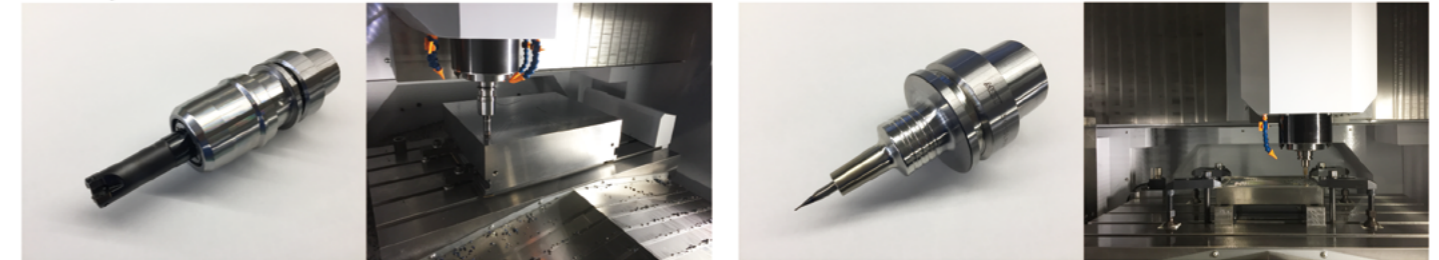
Spindle Torque



HSK Spindle for Higher Rotation Capability

HSK is a Dihedral constraint system which contacts both the end face of flange and the hollow 1/10 taper part to spindle.

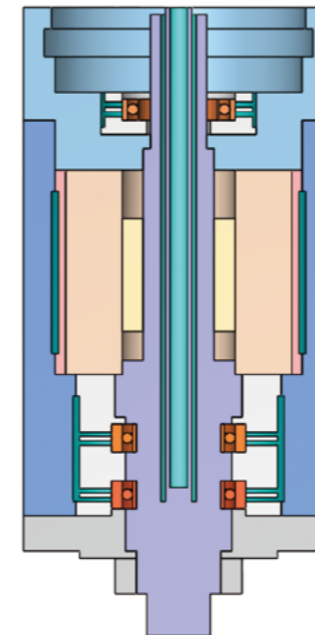
Harmony with HSK-E50



High efficiency machining with High feed cutting tool of $\phi 20$ mm $\phi 0.8$ in Shank.

Precision Finishing machining with R0.3 Ball Endmill

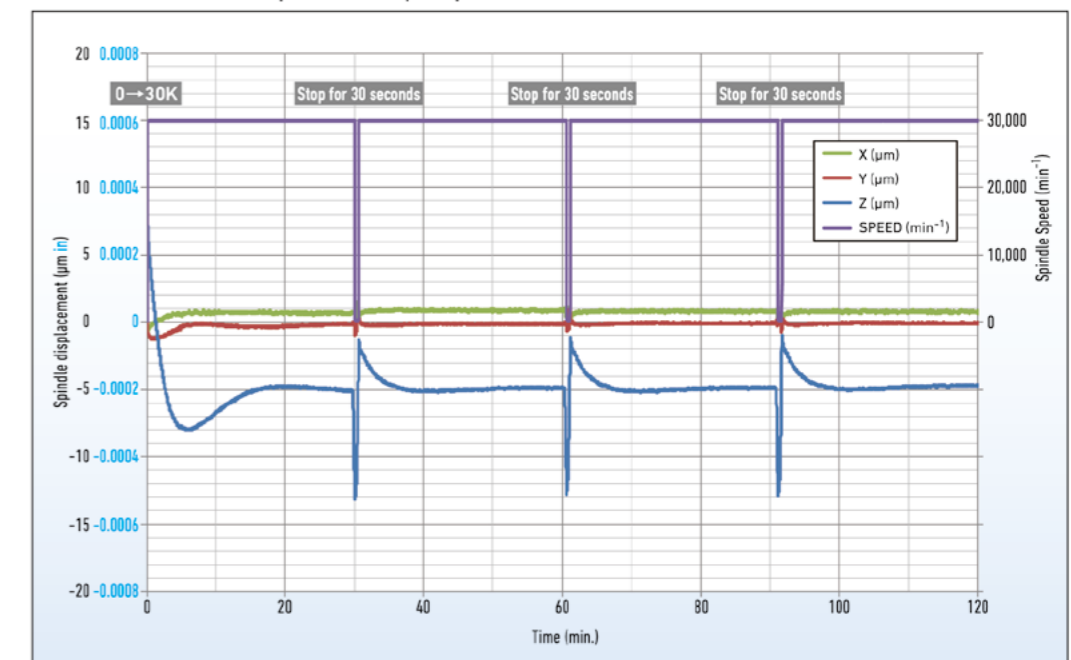
Method of Spindle Cooling/Lubrication



Individual cooling technology of high speed spindle makes the displacement saturated without thermal displacement correction realizing a higher repeatability of machining position even, if there is repeated starting and stop. This also prevents vibration and spindle run out which inhibits precision machining and enables to machine in practical condition with a wider rotation range.

Lubricating Oil is controlled at the optimum temperature and supplied directly to the Jacket part but also internal part of rotating spindle. Oil is used to cool the inside and outside of the spindle. In addition, oil is supplied to bearings. It minimizes temperature differences between inner and outer ring and fluctuation of preload. This method enables high rigidity, high rotation accuracy and certain lubrication even if the spindle is rotating continuously for a long time, which enhances reliability.

Result value of thermal displacement of $\mu V5$ spindle



Basic Structure



Sliding surfaces are adopted for all axes. The guideways for X-axis in which the spindle moves a long distance and Y-axis in which the table moves with a work loaded are not attached but integrated with the columns or the bed. They are composed of sliding guide surfaces which are tempered and precisely ground to maintain accuracy over a long period of time.

X-axis guide way is layout near the machining point and configured to enhance the performance of newly developed spindle which has a shortened projecting length.



Y-axis guide way is layout near the center of gravity to prevent yawing and supported just below it by the rigid box-shaped bed and leveling jacks. This allows for straighter movement of the table, which helps with various load on the table.

Basic Accuracy

High rigidity structure realizes high straightness which is the basis for accuracy of each axis.

Result of Straightness*

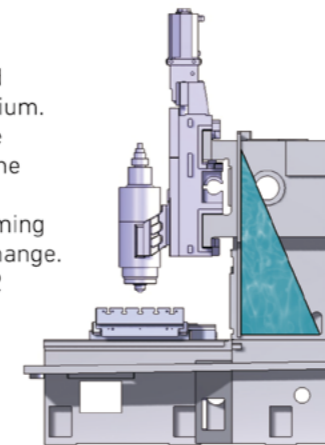
Examination item	in Vertical Plane		in Horizontal Plane	
	Tolerance (mm in)	0.004/500		0.004/500
Measured Value (mm in)	0.0003/500		0.0002/500	
Movement of X-axis	Measured Data		Measured Data	
Movement of Y-axis	Measured Data		Measured Data	
Examination item	in X-Z Plane		in Y-Z Plane	
	Tolerance (mm in)	0.004/300		0.004/300
Measured Value (mm in)	0.0004/300		0.0006/300	
Movement of Z-axis	Measured Data		Measured Data	

*Measured values in this brochure are provided as an example. The result indicated in this brochure might not be achieved due to differences in cutting conditions as well as environmental conditions during measurement.

Functional Equipment

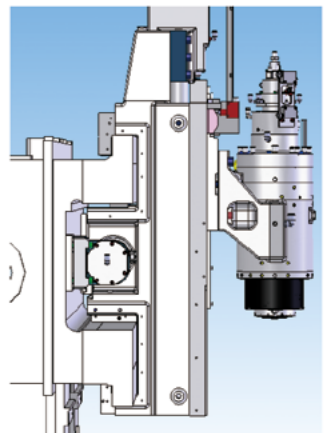
W-1 Thermal Stabilizer

Column is filled with dedicated temperature control fluid medium. It reduces the sensitivity of the columns to temperature and the attitude deforming delayed. It is effective to restrain deforming due to a short-time thermal change. There is also an option for W-2 Thermal Stabilizer which circulates the fluid medium keeping its temperature controlled optimal.



Air Backup Mechanism

Frictional resistance of X-axis sliding surface which is applied with a concentrated load of movable body is reduced by compressed air. Thus it is possible to move the spindle smoothly and quickly.

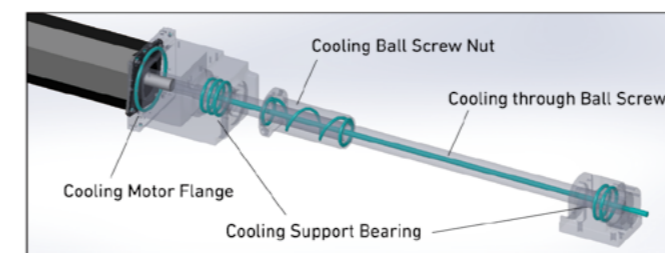


Cooled Sliding Surface

Cooling function prevents heat generation of sliding surface due to friction caused by long hours of high speed movement in X-axis.

Cooling Ball Screw

Heat generation from feeding axis is removed by circulating temperature controlled cooling oil through them. In addition cooled motor flanges prevent the transmission of heat from motors of the feeding axis to the main machine.

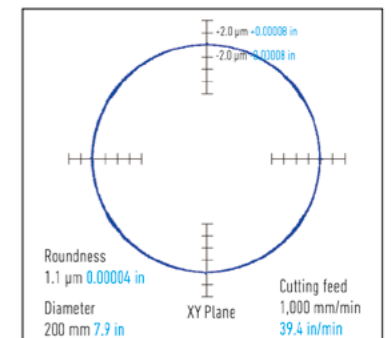


HGP3 Control* (included in Upgrade plans of Package option)

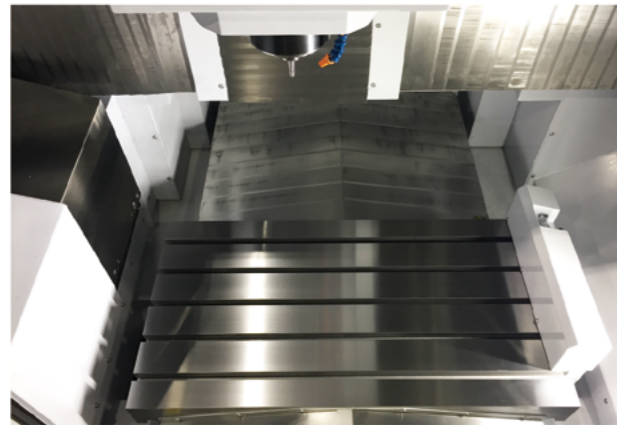
HGP3 is high-speed and high-precision machining processing software used to achieve a high quality machining surface. It reflects the machining program to surface faithfully.

*HGP: High Gain Processor

Measured Roundness



Optional Image Type Automatic Tool Measurement System



Measuring unit is layouted on the right side of the table.

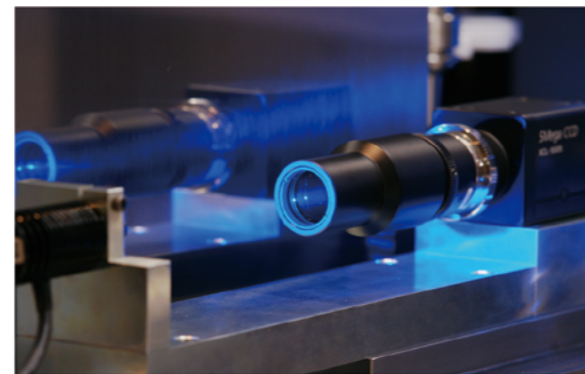
(included in Upgrade plans of Package option)



Tools can be visually recognized on 15" Monitor.

Non-contact Measurement System

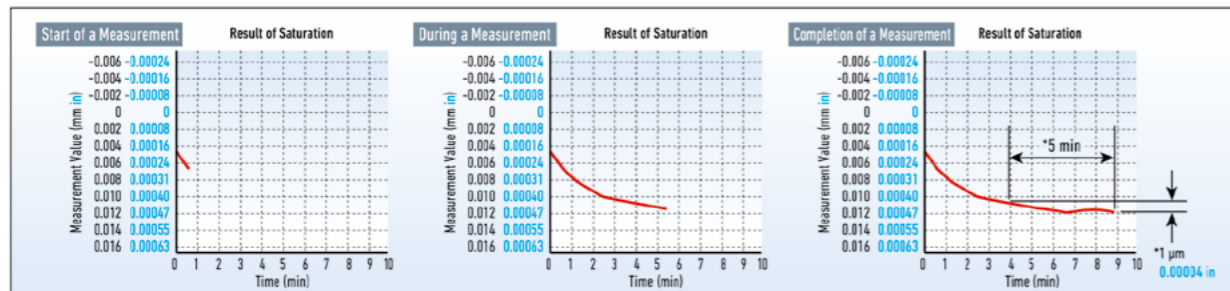
The rotating tool approaches the area of the high-resolution CCD camera. The camera captures a silhouette of the tool with LED light and records the contour accurately without making contact. This system continuously measures the detected cutting edge and can keep checking the behavior of lowest point of the tool in real time. It determines independently if the machine, holder and tool are thermally stabilized and performs tool length correction automatically.



Automatic Saturation Determination Function

This system determines stability of the machine and tool while continuously keeping a record of position information of the detected cutting edge. The information is viewed on display the operator's panel.

Judgment condition of saturation can be set arbitrarily with displacement tolerance and duration.



*Setting example of permissible errors: When displacement amount of the lowest point of the tool is within 1 μm 0.00034 in for a continuance for 5 minutes, saturation completion is decided.

Automatic Tool Cleaning

Original tool washing system can perform washing and measurement repeatedly in order to prevent measurement error caused by coolant or chip adhering to tool. A condition to start machining of "automatic confirmation of stabilization of measurement value" can be set.



Tank for cleaning liquid is layouted in maintenance area.



Shrink-fit tool holder is recommended for machining requiring high precise measurement.

Application Example in Respond to User's Needs

*Example of Precise machine with μV1 and High-Precision Double Column Machining Center LH250

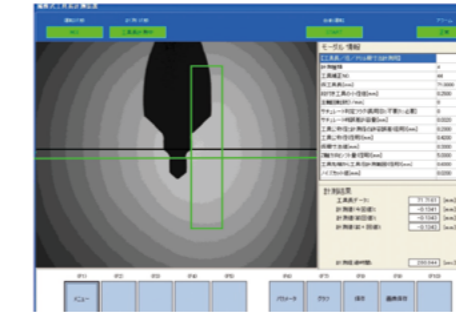
Automatic phase selection of Spring-necked turning tool

The phase of cutting face is set automatically.



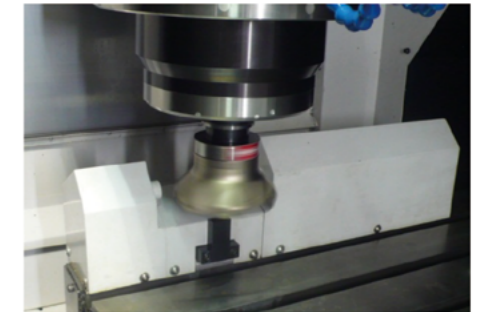
Measurement of the drill's shoulder

The Size of the shoulder portion of drill is measured on machine automatically.



Measurement of large diameter tool

Length of milling tool is measured precisely.



Calibration of the touch probe

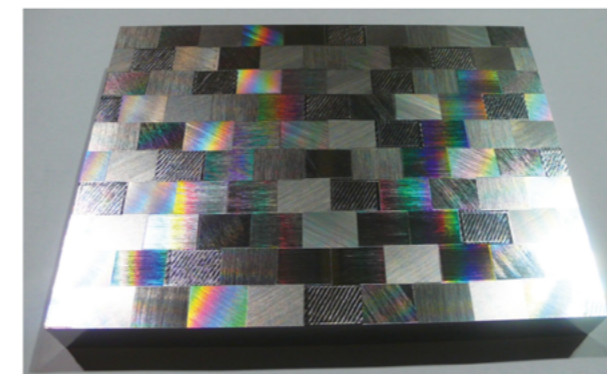
Example: Machined square shape is randomly checked with every tool and Confirmed steps.

Tools

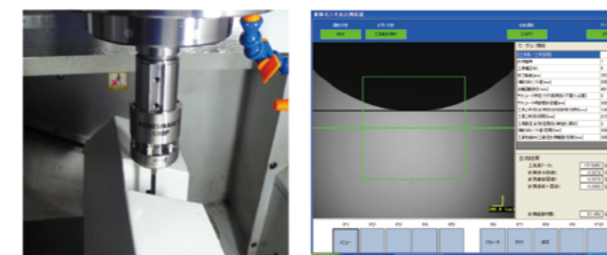
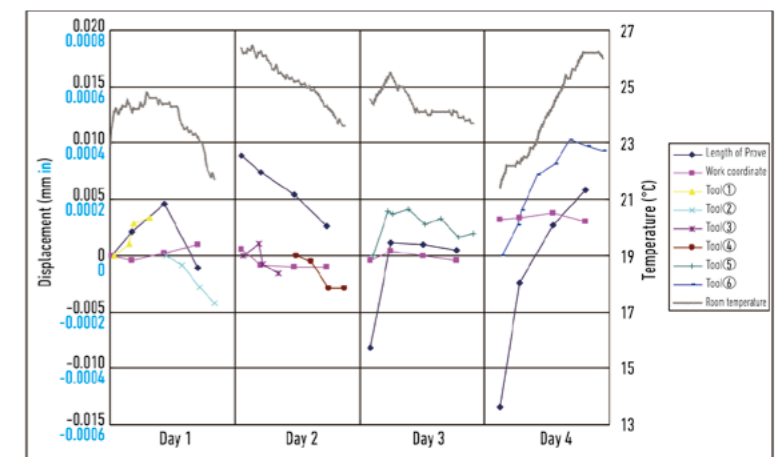
No.	Kind of tools	Spindle speed (min ⁻¹)
①	R3 Ball Endmill	16,000
②	φ2 Flat Endmill	20,000
③	R2 Ball Endmill	26,000
④	φ1 Flat Endmill	32,000
⑤	R0.5 Ball Endmill	40,000
⑥	φ0.3 Flat Endmill	40,000

Operation condition

- Day 1: Power ON, R3BEM, φ2EM, Power OFF after completion
- Day 2: Power ON, R2BEM, φ1EM, Power OFF after completion
- Day 3: Power ON, R0.5BEM, Power OFF after completion
- Day 4: Power ON, φ0.3EM, Power OFF after completion



Size: 200 mm 7.9 in x 150 mm 5.9 in Material: Stainless SUS304
Total number of machining hours : 30 hours



The work height is set automatically with the measured results from the touch probe system. Machining starts after aligning the height of the work and the length of the tool correctly and automatically.

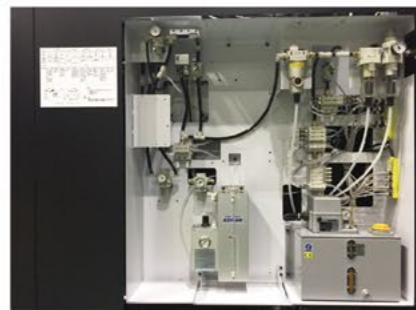
Achieved within ±2 μm ±0.0008 in of all steps between tools linking the high performance main machine and measurement technology on machine.

Operation and Maintenance

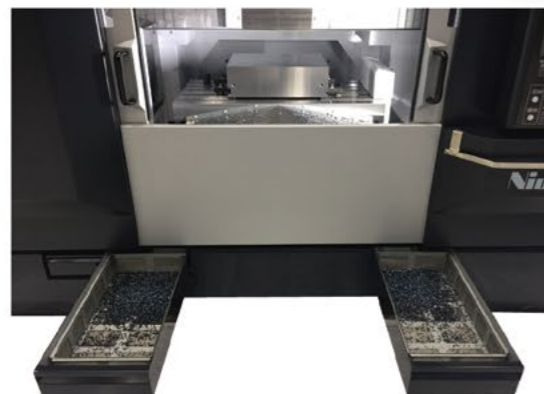


ATC Magazine door ATC Magazine
Auto Tool Changer is located on the left side of the machine.

Storage capacity of ATC Magazine
- Std. 18 tools
- Opt. 30, 40 tools



Air pressure unit and Automatic lubrication unit for each axis box guide are arranged on right side.



Chip collection
- Std. Chip bucket
- Opt. Chip conveyor (Elevating type)

Specification

Machine Specification

Item		μ V5
Travels	X x Y x Z axes	900×550×450 mm 35.4×21.7×17.7 in
	Distance from spindle end to table top	150–600 mm 5.9–23.6 in
Table	Working surface	1,050×550 mm 41.3×21.7 in
	Max. workpiece size	1,050×750×450 mm 41.3×29.5×17.7 in (An interference limit to be confirmed)
	Max. loading capacity	800 kg 1,760 lb
	Distance from floor level to table top	900 mm 35.4 in
	Table top shape	Five T-slots of 18 mm 0.7 in
Spindle	Spindle speed	300–30,000 min ⁻¹
	Output/Torque	15 kW/19 N·m 20 HP/14 ft·lb
	Taper size, Tool shank	HSK-E50
	Cooling/Lubrication	Inner & outer cooling/Special oil lib.
Feedrate	Rapid traverse rate	15,000 mm/min 590.6 ipm
	Cutting feedrate	1–15,000 mm/min 0.04–590.6 ipm
Automatic Tool Changer (ATC)	Tool storage capacity	18 tools
	Max. Tool Diameter/Length/Mass	φ50 mm/200 mm/3 kg φ2.0 in/7.9 in/6.6 lb
Power source	Elec.	40 kVA (std.)
	Air	600 NL/min (std.)
Machine size & mass	Height	2,790 mm 109.8 in
	Floor space	2,760×2,600 mm 108.7×102.4 in (Without operator's panel & peripheral equipment)
	Mass	12,300 kg 27,100 lb
NC Controller	FANUC	31iMB

Standard Equipment

- Spindle speed 30,000 min⁻¹
- ATC 18 tools
- Flood coolant system (6 Nozzles)
- Total enclosure
- Spindle temperature controller
- W-1 Thermal stabilizer
- Cooling system for all axis ball screws & motor flange
- LED work light x1
- Auto. lubrication for box way guides
- Chip buckets x2
- Electric door interlock system
- Portable manual pulse
- Automatic power off
- Earth leakage breakers
- Leveling jacks and plates

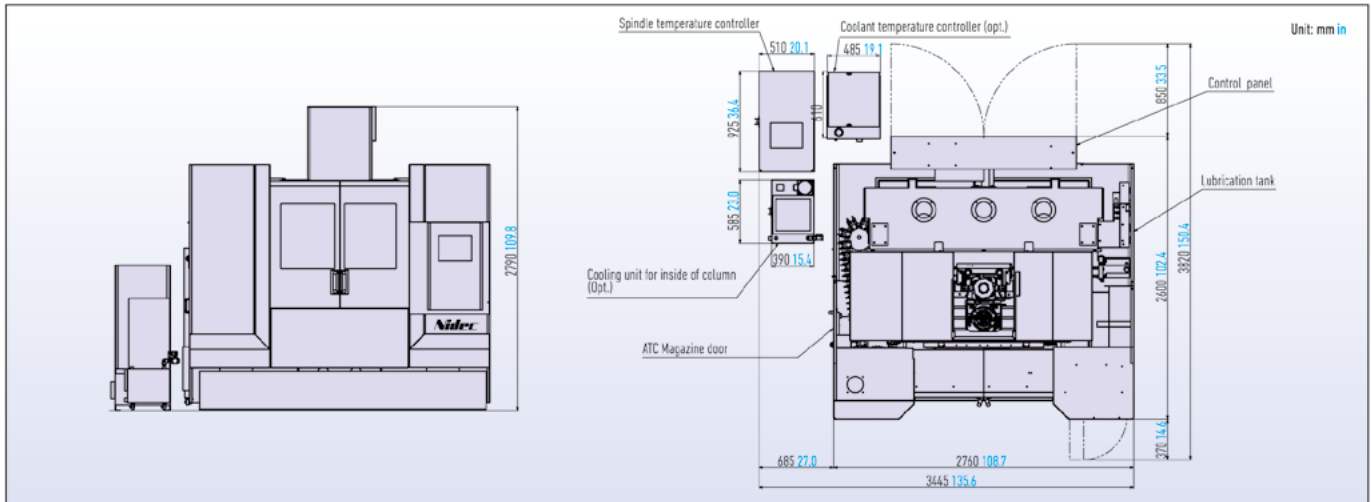
Package Option

- Upgrade plan 1**
 - Automatic tool length measurement, contact sensor type
 - Coolant temperature controller
 - Scale feedback system 0.01μm **0.0000004 in** resolution
 - Connecting hole prep. for mist collector
 - HGP3 control
 - Program memory 128 kbyte (320 m **1,050 ft**) & Number of program registration 250 sets
- Upgrade plan 2**
 - Automatic tool length measurement, Non contact laser type instead of Contact sensor type
 - Automatic tool length measurement, Optical image type instead of Contact sensor type
- Custom macro common variables 600 sets
 - High speed skip
 - Helical interpolation
 - Data server 2GB
 - Tool offset memory C

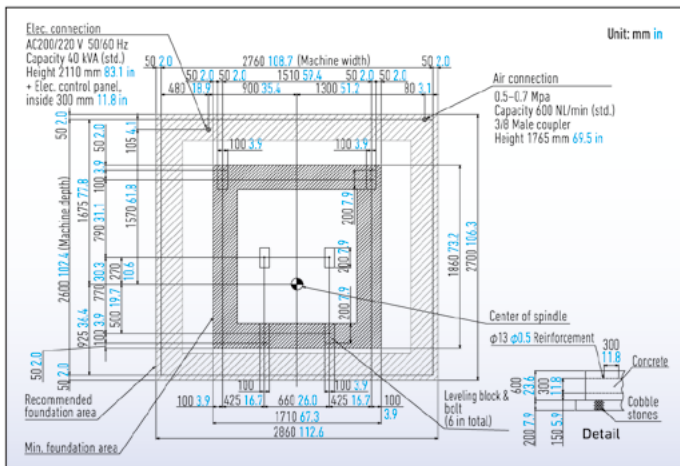
Other Options Available

- Spindle speed 40,000 min⁻¹ (HSK-E32)
- Spindle speed 20,000 min⁻¹ (HSK-A63)
- ATC 30 tools
- ATC 40 tools
- 2 Air blow nozzles
- Air through spindle
- Coolant through spindle (1.5Mpa) *1
- Coolant through spindle (1.5Mpa) & Air *1
- MQL, outside the spindle *2
- Workpiece flushing gun
- Oil skimmer
- Chip conveyor (Elevating type)
- Automatic workpiece (RENISHAW touch probe) *3
- W-2 Thermal stabilizer
- Air dryer
- Mist collector for oil-based coolant mist
- Mist collector for water-based coolant mist
- Thickener bag filter Specification
- 3-color status light
- Additional LED work light

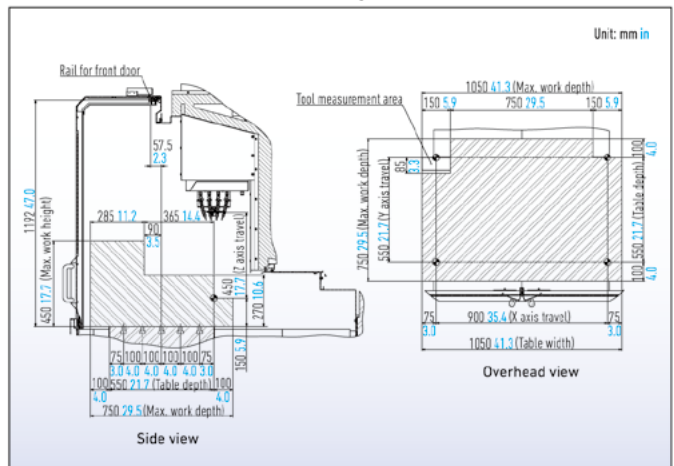
*NOTE 1: Not selectable in case of Oil-based coolant
*NOTE 2: Need to select Air blow nozzle simultaneously
*NOTE 3: Need to select Coordinate rotation



Foundation



Limit of The Size of The Workpiece



Inquiry

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