

DNM350/5AX 0i-M

High Precision, 5 Axis (4+1) Vertical Machining Center

The DNM 350 5 axis, equipped with the FANUC 0i-M control, is designed for a wide range of applications, especially prismatic type work pieces. It is capable of 4+1 axes simultaneous machining, greatly reducing the need for multiple setups and increasing the precision of the finished work piece. The powerful, 12,000 rpm high speed spindle provides superior performance in virtually any machining application.





Main Features

- Fanuc 0i-M Control with USB Port and 10.4" Color LCD Display
- 4 + 1 Controlled axes (X,Y,Z,A,C)
- High precision, direct coupled spindle design with (11 kW / 18.5 kW \ 15 / 25 hp motor, 12,000 rpm)
- Spindle oil chiller
- Spindle orientation, load meter, override and rigid tapping
- Cam Type, Double Arm ATC (30 tools)
- Large Linear Roller Guides (X - 45 mm \ 1.772", Y - 45 mm \ 1.772", Z - 45 mm \ 1.772")
- Servo motors mounted directly to the oversized, double pre-tensioned ball screws (X - 45 mm \ 1.771", Y - 45 mm \ 1.771", Z - 45 mm \ 1.771")
- Fast rapid traverse rate (X - 36 m/min \ 1,417 ipm, Y - 36 m/min \ 1,417 ipm, Z - 30 m/min \ 1,181 ipm)
- Ball nut cooling for increased accuracy during long cycle times
- AICC II (200 block look ahead)
- Renishaw probe ready (RMI-Q radio receiver, RTS tool setter and GUI software)
- Doosan Tool Load Monitoring and Adaptive Feedrate Control

Standard Equipment and Warranty

- 20 bar (290 psi) Through spindle coolant, Air through spindle
- Flood coolant with large separate coolant tank and way oil skimmer (380 liter \ 100 gallon)
- Screw conveyors on both troughs for chip disposal
- Full enclosure splash guard
- Telescopic covers
- Metered piston distributor lubrication
- Portable Manual pulse generator
- Program and data protection key
- Work light and 3 color tower signal light
- Two year machine parts warranty, one year labor warranty. See warranty pages for details.
- Two year control warranty: Parts and Labor
- Instruction manual, parts list, and electrical drawings
- Operation and maintenance manuals



AUTOMATIC TOOL CHANGER:

Number of Tools	60
Tool Shank	CAT 40
Pull Stud (Supply Company #)	711-23
Max. Tool Dia. \ Adjacent pots are empty	80 mm \ 125 mm (3.1" \ 4.9")
Max. Tool Length	270 mm (10.6")
Max. Tool Weight	8 kg (17.6 lbs)

MOTION:

X axis rapid traverse rate	36 m/min (1,417 ipm)
Y axis rapid traverse rate	36 m/min (1,417 ipm)
Z axis rapid traverse rate	30 m/min (1,181 ipm)
Cutting feed rate	1 - 15,000 mm/min (.04 - 590 ipm)
Least command increment	.001 mm (.0001")
Positioning accuracy (Full Stroke)*	+/- .005 mm (+/- .0002")
Repeatability	+/- .002 mm (+/- .000080")
A axis motion	+30 deg \ -120 deg
A axis accuracy (encoder)	+/- 40 sec (+/- 10 sec with optional absolute)
A axis max feed rate	7,200 deg\min
C axis motion	360 deg
C axis accuracy (encoder)	+/- 20 sec (+/- 6 sec with optional absolute)
C axis max feed rate	7,200 deg\min

GENERAL:

Machine Height	3,146 mm (124")
Floor Space Required (L x W)	2,990 mm x 2,975 mm (118" x 117")
Machine Weight	8,500 kg (18,739 lbs)

UTILITY:

Power required	41 kVA / 112 amps @ 220v
Voltage required - Fanuc	205-235 Volts / 3 Phase

TANK CAPACITY:

Coolant tank capacity	380 liters (100 gallons)
Lubrication tank capacity	3.1 liters (.81 gallons)
Air Required	.54 mpa (80 psi) * 8.83 cfm

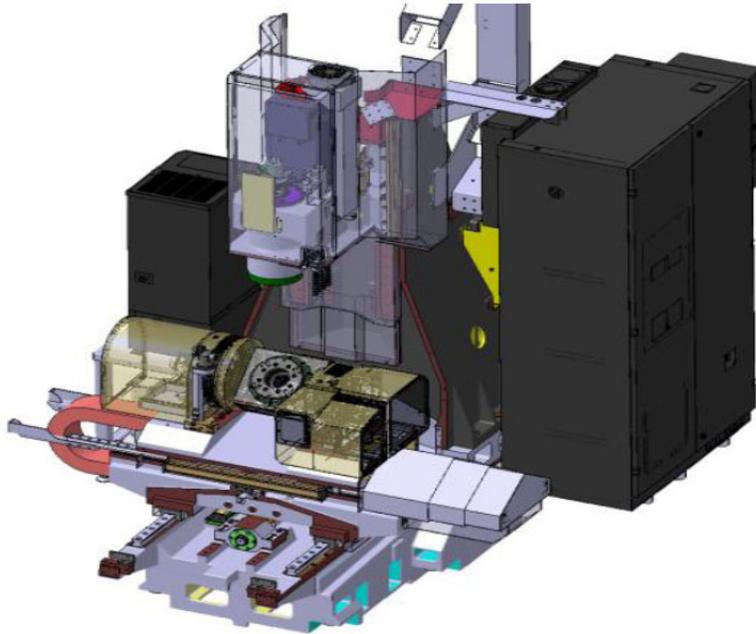
*Accuracy data in the specifications are measured using KSB 4404/4408

* Geometric accuracies are guaranteed only if machine is installed on a foundation meeting the minimum requirements of Doosan Machine Tools America. Please see your dealer for the current machine requirements.

Construction:

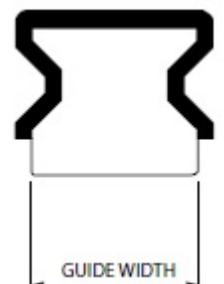
BED, COLUMN AND SADDLE:

The bed is a rigid, one-piece casting made from fine grain Meehanite cast iron with heavy ribbing to help prevent vibration and deformation during heavy cutting. Extra wide spacing of the roller guide ways provides for excellent support of the saddle, regardless of the load distribution on the table. The table is fully supported by the saddle in all positions with no overhang. The rigid box type column casting is heavily ribbed to help prevent twisting or distortion as well as helping to dampen vibration during high speed or heavy machining.



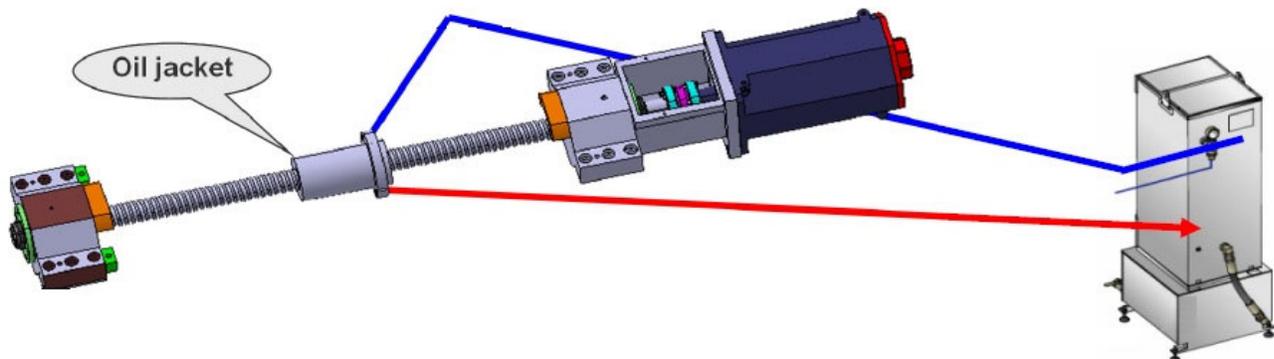
GUIDEWAYS:

All axes are of a Roller Linear Motion Guide type for higher stiffness, accuracy, and surface finish than more common Ball Bearing Guide types. They are of a heavy duty (X - 45 mm \ 1.772", Y - 45 mm \ 1.772", Z - 45 mm \ 1.772") design to help insure stable machining under all conditions. Roller guide ways are 3 times more rigid with 2 times more life than ball bearing guide ways and provide for optimal weight and force distribution.



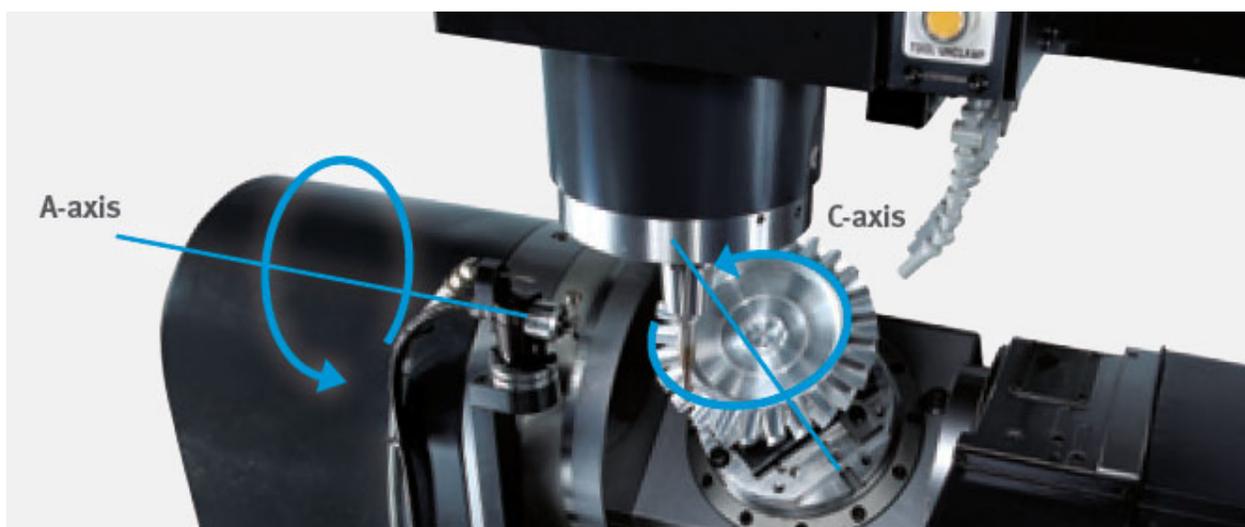
BALL SCREWS AND AXIS DRIVES:

Each axis is driven by a high precision ball screw which also features cooling at the ball nut to help insure greater accuracy. Ball nut cooling offers excellent performance characteristics and maximizes price to benefit advantages. The ball screws are centered between the guide ways and are supported on both ends by angular contact thrust bearings. This double pretension design provides outstanding positioning repeatability with virtually no thermal growth. All axes have large diameter ball screws (X - 45 mm \ 1.771", Y - 45 mm \ 1.771", Z - 45 mm \ 1.771") that are directly connected to oversize A.C. servo drive motors by a rigid coupling, further increasing accuracy.



ROTARY TABLE:

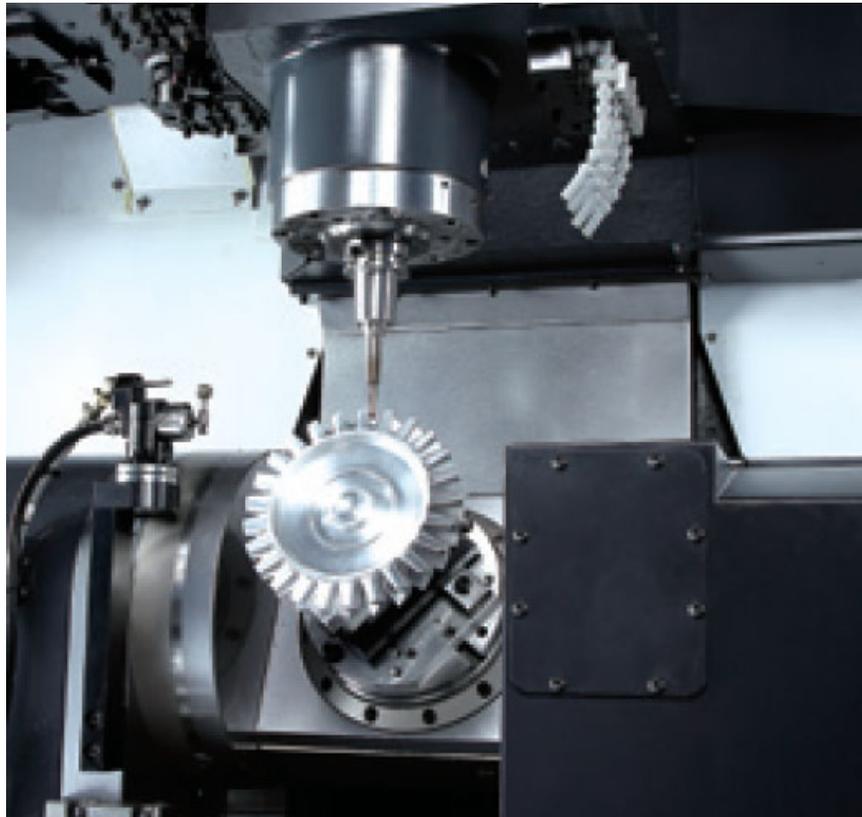
The integral rotary table allows for machining on multiple faces of the work piece without having to re-fixture. This allows for reduced number of setups and much higher precision of the finished component. Please note: with the FANUC Oi-M control, only 4 axes of simultaneous machining is possible.



(Graphic shown is representative only and may differ from actual machine)

12K SPINDLE & HEADSTOCK:

The direct coupled spindle drive system is a true cartridge type unit supported by high precision bearings that offers minimized noise, vibration and thermal growth of the spindle owing to the fact that there are no gears or belts inside of the spindle head body. The powerful 12,000 rpm, 11 kW / 18.5 kW (15 / 25 hp) motor has 117 nm (86 ft-lbs) of torque with a spindle Acceleration \ Deceleration time of 0 - 12k (2.16 sec) \ 12k - 0 (2.21 sec). The CAT 40, Big Plus spindle also features rigid tapping, further increasing productivity.





Big Plus Spindle System by Big Daishowa LTD:



The Big Plus spindle system and tooling surpasses all other spindle concepts due to simultaneous taper and flange contact between the machine spindle and tool holder as well as complete interchangeability with existing machines and tools. Upon mounting the tool holder into the machine spindle, contact occurs prior to clamping. Due to the retention force, the taper of the tool holder expands the machine spindle in its elastic range. The tool is pulled further in until the tool flange touches the spindle face for maximum rigidity.

Please note: The Spindle Warranty will be **VOID** if **NON LICENSED DUAL CONTACT** tooling is used.

Visit www.bigkaiser.com for more information.

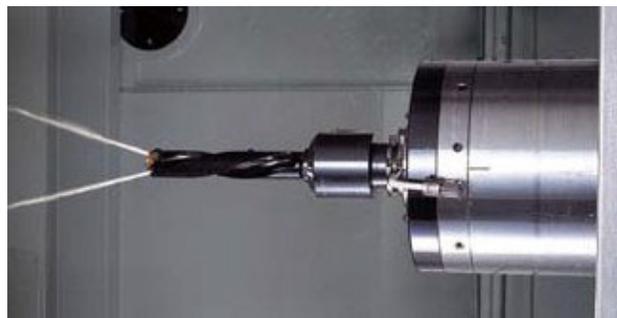
KENNAMETAL CVKV TOOLING SYSTEM:

KENNAMETAL® CVKV tooling has been thoroughly tested by Doosan and has been approved for use on all Doosan Machining Centers equipped with a Big Plus Spindle System®.

Visit www.kennametal.com for more information.

20 bar (290 psi) THROUGH SPINDLE COOLANT SYSTEM (TSC):

A dedicated positive displacement pump delivers the coolant directly to the tool tip. The immediate benefit is more aggressive feeds and speeds can be maintained throughout the cutting process. There is also no need to stop and adjust coolant nozzles which increases both in cut time and operator safety. Protecting the spindle and the vital rotary union from contamination is a Cyclone filter that does not require the use of bags helping to reduce maintenance cost. The 380 liter (100 gallon) tank stores an ample supply of coolant and is isolated from the machine bed to help prevent heat transfer.



THROUGH SPINDLE AIR (TSA):

Air is supplied to the back of the pull stud and then forced through the tool using the same technique as through spindle coolant by use of M-code. The spindle air blow is commonly used on pre-hardened steel, die and mold cutting, cutting of plastics and anytime coolant would contaminate the work piece such as during the machining of certain medical components.



AUTOMATIC TOOL CHANGER:

The 60 tool Double Arm, Chain Type ATC provides reliable exchange of tools with a tool to tool time of 1.3 second.

PORTABLE MANUAL PULSE GENERATOR:

The hand held Manual Pulse Generator lets each axis move in increments of x1, x10 or x100 making fixture or part alignment quick and easy. The 10-foot cord gives full access to the machine and the magnetic back allows for one handed operation with the MPG being conveniently held in place on the machine table or guarding.

PROGRAM AND DATA PROTECTION KEY SWITCH:

The keyed switch enables the protection mode for both the program and offset data. Removing the key limits access to only authorized personnel. In the unprotected position the key cannot be removed and all data is available for edit.

RENISHAW® RADIO PROBE READY AND RTS TOOL SETTER:

The DNM350/5AX 0i-M comes equipped with the Renishaw® RMI-Q radio receiver, RTS tool setter and Renishaw GUI software. Touching off tools with the RTS tool setter makes setup quick, simple and accurate. You can also choose to add a spindle probe which offers many advantages over traditional methods of finding part features such as indicators and edge finders. Talk to your dealer for more information on how probing and tool setting can help ke and increase your profits.



PCMCIA/USB CARD SLOT:

The FANUC 0i-M series control is equipped with a slot for a PCMCIA and USB port on the control next to the display. A PCMCIA memory card can be used to upload and download programs as well as drip feed directly from the card. Programs running from the card will take the same time to run as a program that is stored in the control memory. It is possible to search through and restart anywhere in a program as long as it contains line numbers. The USB Port does not allow you to drip feed; it is only for uploading and back up of programs & parameters.

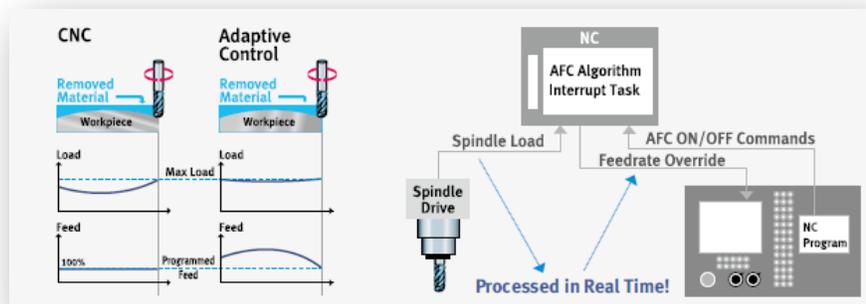
FANUC EMBEDDED ETHERNET FUNCTION:

The Fanuc Embedded Ethernet Function allows convenient exchange of NC programs; tool offset data, and system parameters between the Fanuc control and either a PC with a network card or through a Local Area Network. A directory page on the Fanuc control displays all the files in an assigned folder located on a PC or network server. Data transfer can only be started at the Fanuc control and cannot be started at the PC or server. An RJ45 Ethernet/Network port is provided on the side of the operator's panel (necessary cables not included).

DOOSAN ADAPTIVE FEEDRATE CONTROL:

Doosan Adaptive Feedrate Control enables the Machining Center to monitor the amount of spindle load a tool is generating during a cut, and either increase or decrease the programmed feedrate to compensate. It can control the amount of axial feedrate by the amount designated by the operator. In the event of catastrophic tool failure or severe axis overload, AFC will put the machine into a "Feed Hold" condition and an alarm state will be indicated. Both minimum and maximum feedrate percentages can be controlled as well as the gain, or rate, of acceleration and deceleration. Air-cutting can also be detected and given its own percentage of feedrate override which can help to minimize wasted cycle time and keep the tool in the cut.

Doosan Adaptive Feedrate Control is not recommended for use in finishing operations, hole making operations, tapping, engraving or anywhere else where it is more desirable to keep a constant, established feedrate, otherwise tool breakage and part damage will or may occur.





DOOSAN TOOL LOAD MONITORING SYSTEM:

The Doosan Tool Load Monitoring System continually checks the load on all axes motors as well as the spindle motor. Overload and under-load (useful for detecting a broken or missing tool) conditions can be monitored, and high/low limits can be set for each tool. There are wear and breakage settings that, when triggered, will cause the machine to generate an alarm and stop operation. This helps protect the machine, tooling and the part or fixture from damage caused by abnormal loads caused by worn or broken tooling. If used in conjunction with Tool Life Management, the machine can be set to switch to a redundant tool when the wear signal is output. Normal load, wear, and breakage values can all be independently changed to customize or fine tune the operation according to need.

There are limits to the function of the system, for instance, a very small drill may not register enough load on a high torque, geared head spindle, and therefore will not be able to be properly monitored. For most common applications such as milling cutters and Indexable insert drills, the Doosan Tool Load Monitoring System can provide some measure of protection against damage to your expensive parts, tooling and machine if used properly.



FULLY ENCLOSED GUARDING:

The fully enclosed guarding is made of heavy gauge sheet metal designed to contain both chips and coolant. Telescopic covers help protect vital slide way areas from contamination and damage.

CHIP DISPOSAL AND FLOOD COOLANT SYSTEM:

Screw Conveyors in both chip troughs pull the chips into the front mounted basket or optional conveyor. A separate pump provides flood coolant at the spindle face through adjustable spindle mounted nozzles.

LUBRICATION:

Automatic lubrication is provided to the guide ways and ball screws by way of a metered piston distribution system which precisely controls the volume of oil to these critical components. A low level alarm prevents the machine from being restarted if there is inadequate oil in the tank preventing possible damage. In order to prevent clogging of these precise nozzles (and possibly damaging the machine), please be sure to use only the recommended oil that is specified in the machine maintenance manual.