MORI SEIKI
THE MACHINE TOOL COMPANY

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News Release

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Release of the NT Series Integrated Mill Turn Center, Fully Combining a Lathe and Machining Center

Integrated Mill Turn Center utilizing DCG™ (Driven at the Center of Gravity) and a turret with a built-in milling motor

Mori Seiki Co., Ltd. is set to release the NT Series Integrated Mill Turn Center, which fully combines a lathe with a machining center.

To draw out the maximum potential of basic machining abilities such as the turning ability of a lathe and the cutting ability of a machining center, the nature of the machine's construction has been rethought, and production completed on an Integrated Mill Turn Center employing a new construction that will significantly change general notions about these types of machines.

Employing the DCG™ (Driven at the Center of Gravity) theory and Box-in-Box construction of NH Series horizontal machining centers, and the turret with a built in milling motor of NL Series CNC lathes, the abilities of both these elements have been successfully combined, without compromising anything in terms of performance.

Within the Integrated Mill Turn Center market, a great variety of applications exist for simultaneous 5-axis machining, including machining of complex shapes, grinding and gear machining, however turning and drilling using the lathe function, and cutting comprised of end milling actually encompass the most common types of machining conducted, and by drawing out the maximum potential of these basic machining abilities, all types of machining ability have been dramatically improved including 5-axis machining, and machining time has been significantly shortened.

In the field of integrated machining, Mori Seiki Co., Ltd. now offers an Integrated Mill Turn Center based upon an entirely new concept that doubles productivity.

Machine	Integrated Mill Turn Center
Machine Model	NT Series (9 models in all, 66 variations)
Customers and Markets	Complex shape machining for aircraft parts, automobile test model parts, etc., and machining of long shafts for dies and molds, construction equipment and printing presses, etc.
Order Start	14 September 2005
Production	50 units monthly across the series

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Main Features

1. All 9 models and 66 variations to be released for sale sequentially
2. Stroke equivalent to a machining center (X-, Y-, Z-axis: 750, ± 210, 1120 mm for the NT4200 DCG/1000)
3. Max. spindle speed of 5,000 min^{-1}, max. tool spindle speed of 12,000 min^{-1} (for NT4200 DCG)
4. Tool-to-Tool 1.0 sec., Chip-to-Chip 4 sec., fastest in its class (for NT4200 DCG)
5. A DD motor is employed for the B-axis, reaching a max. spindle speed of 100 min^{-1} (optional)
6. Max acceleration rates for the X-, Y-, Z-axes respectively are 0.8 G, 0.4 G, and 0.6 G (for the NT4200 DCG)
7. Uses a thermal symmetry design that limits thermal displacement
8. Comes standard-equipped with ball screw cooling, motor jacket cooling
9. Features the high performance operation system MAPPS III, equipped with a collision prevention function that monitors the machine's movements in real time
10. Equipped with a post processor that is compatible with all types of CAM

Features

1. All 9 models and 66 variations to be released for sale sequentially

Based upon the 9 models NT3100 DCG, NT3150 DCG, NT3200 DCG, NT4200 DCG, NT4250 DCG, NT4300 DCG, NT5400 DCG, NT5500 DCG and NT5600 DCG, headstock 2 spindle specifications (S), lower turret specifications (Z), and specifications for no center support (C) have all been made available as options, handling all types of workpiece machining.

In terms of distance between centers, the NT3000 Series has 500 mm and 1000 mm, the NT4000 Series has 700 mm, 1000 mm and 1500 mm, and the NT5000 Series has 1200 mm and 1800 mm.

Example: NT4200 DCG/1000SZ (Headstock 2 spindle, lower turret attached, distance between centers of 1000 mm)

2. Stroke equivalent to a machining center (X-, Y-axis: 750, ± 210 mm for the NT4200 DCG)

A wide stroke, the largest in its class, has been utilized, enabling hole machining in 4 locations over a distance of 250 mm with respect to the center of the chuck without using a C-axis. Rotation of the C-axis allows effects on machining precision to be ignored, making high machining precision possible. Machining can be conducted as if the model was a normal machining center.

3. Max. spindle speed of 5000 min^{-1}, max. tool spindle speed of 12,000 min^{-1} (for NT4200 DCG)

The spindle used is the same as that used in the highly successful NL Series. Additionally, the headstock 2 spindle uses a spindle of the same ability, meaning that a chuck of the same size can be used for both headstock 1 and 2 spindles.

The tool spindle used produces equivalent performance to that used in the NH Series.

4. Tool-to-Tool 1.0 sec., Chip-to-Chip 3.4 sec., fastest in its class (for NT4200 DCG)

An ATC using a high-speed cam has been utilized, and increased speed of feedrates allows Chip-to-Chip times equivalent to those of machining centers.

Reduced Chip-to-Chip times play a large role in shortening non-cutting time. Times that are half that or less of those required by conventional models have been successfully achieved with this Series.

5. A DD motor is employed for the B-axis, reaching a max. spindle speed of 100 min^{-1} (optional)

For the B-axis, which rotates the tool spindle, 1 degree indexing (standard) and arbitrary indexing (optional) have been made available.

For one degree indexing specifications, the number of parts in comparison with conventional models has been reduced, improving reliability. Additionally, arbitrary indexing specifications are able to handle high precision machining requirements, allowing input by units of 0.0001 degrees. Further, the drive method uses a DD motor, meaning there is no backlash and high speed rotation is possible. Used in conjunction with simultaneous 5 axes control, this system displays high speed when implementing complex simultaneous 5 axes control.

6. Max acceleration rates for the X-, Y- and Z-axes respectively are 0.8 G, 0.4 G and 0.6 G (for the NT2000 DCG)

By utilizing DCG™ (Driven at the Center of Gravity), vibration is reduced, and acceleration performance has been improved. Improved acceleration rates are particularly effective in shortening non-cutting times, and increases productivity.

7. Uses a thermal symmetry design that limits thermal displacement

The lower turret is located below the spindle. It is located symmetrically in relation to the center of the spindle, forming a construction that is resistant to the effects of heat. Naturally, sources of heat - the electrical cabinet and the spindle coolant oil temperature controller - are kept separated from the main unit, making a construction that is resistant to heat effects.

8. Comes standard-equipped with ball screw cooling, motor jacket cooling

As integrated mill turn centers have many feed axes and rotating axes, there are heat sources everywhere. To completely shield against these sources of heat, ball screw cooling and motor jacket cooling have been implemented.

Even from a cold start, when electricity has just been turned on, there is no need for concern about variations in precision.

9. Features the high performance operation system MAPPS III, equipped with a collision prevention function that monitors the machine's movements in real time

As integrated mill turn centers possess many functions and their movements are complex, machine interference is a major element of concern for operators. MAPPS III allows fast processing and is equipped with a collision prevention function that monitors machine movements in real time, relieving operators of this concern. Additionally, with the ease and convenience of the conversational input function, high-speed canned cycles have been strengthened, creating dramatic increases in programming speed. The series is loaded with features that meet demands of the new era, in terms of graphics capacity and safety, in addition to serviceability.

10. Equipped with a post processor

A post processor, a function that allows customer to make NC programs from the CAM systems they possess, will be made available sequentially. By making post processors available, Mori Seiki aids the swift launch of production, and offers highly reliable after-sales service.

■ Main Specifications (for NT4200 DCG/1000SZ)

Max. machining diameter	φ 660 mm
Max. machining length	1,061 mm
Axis travel (X, Y, Z and B)	750, ± 210, 1120 mm, ± 120 deg.
Max. spindle speed for headstock 1 spindle	5,000 min^{-1}
Max. spindle speed for tool spindle	12,000 min^{-1}
Rapid traverse rate (X,Y, Z, B,C)	50, 30, 50 m/min, 40 [100] min^{-1}, 400 min^{-1}
Tool storage capacity	20, [40], [100]
Tool change time (Tool-to-Tool)	1.0 sec.
Tool shank type	BT-40, CAPTO C6, HSK63
Spindle drive motor (30 min/cont)	15/11 [22/15] kW
Tool spindle drive motor (30 min/cont)	18.5/11 kW
Machine size	(W) 4,150 mm x (D) 3,230 mm x (H) 2,756 mm
Mass of machine	13,800 kg

[ ] indicates options

■ Main Options Provided

Through-spindle coolant system
Hydraulic steady rest
Parts catcher
In-machine workpiece measuring system
Automatic in-machine tool presetter
Gantry loader

■ Other Information

From 14 to 17 September 2005, an exhibition marking the release of the NT Series will be held at the Chiba Campus and Iga Campus, and from 14 to 21 September, the Series will be exhibited at EMO SHOW 2005 in Hanover, Germany.

NT4200 DCG/1000SZ

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