Machining Center for Mass Production Parts

【 NX-Series 】
Voices from Automotive Parts Production Sites

- Machines are too big for the workpiece sizes. Palm-sized workpieces are currently processed on a machine which is over 1000mm in width.
- Workpiece life is getting shorter, and lines are now often changed. However, lines based on specialized machines are often inflexible, more expensive and take a long time to convert.
Line-up for Mass Production Lines

NX2000 SERIES
- Horizontal MC
- NXH2000 SERIES
- Vertical MC
- NXV2000 SERIES
- Turning Center
- NXT2000 SERIES

NX3000 SERIES
- Horizontal MC
- NXH3000 SERIES
- Vertical MC
- NXV3000 SERIES

NX4000 SERIES
- Horizontal MC
- NXH4000 SERIES

Pallet Size

680 mm

955 mm

1,550 mm
Target Workpieces

NX2000 SERIES
Φ140×100 mm

NX3000 SERIES
Φ400×400 mm

NX4000 SERIES
Φ700×700 mm
NX Series Design

Modular concept with unified size

Horizontal MC
NXH3000 DCG

Vertical MC
NXV3000 DCG

955 mm

1,000 mm

955 mm
NX2000 Axis Configuration

• By making heaviest axis the vertical axis, machine is stabilized and vibration reduced

- Column fixed
- Y-axis saddle: vertical motion
- X-axis saddle: side-to-side motion
- Z-axis spindle head: front-to-back motion
Flexibility by Removing one axis

from 3 axis to 2 axis moving unit
Reconfigurable Capability

3AX Column
Vertical Bed
Vertical Spindle
2AX Table
Turning Spindle
Horizontal Bed
Horizontal Spindle

VMC
VMC/5AX
VT
HMC
Flexible Changes to Production Line Layout

Reconfiguration

Meets changes in workpieces by changing the line formation

Meets changes in production amount by changing the number of machines in the line
Unlike conventional machines, DCG™ quickly eliminates vibration during positioning. Rotational vibration, which occurs at all acceleration start points, is reduced to an amount equal to the distance between the drive point and the center of gravity. This prevents the deterioration of the machined surface.

**Box-in-Box Construction**

- For compact design

**Pushing moving parts at the center of gravity with twin ball screws**

**Residual vibration after positioning**

![Without DCG](image1)

![With DCG](image2)
High Precision

Roundness

With S5000, F1000 and diameter 40mm, roundness is 2.9μm

(Material: A5052)

Because it is small, rigidity is increased, allowing high precision.

Because it is light, it is very responsive, so its contouring accuracy is good.

Because the moving parts are light, there is almost no vibration.

Thermal Distortion

Less than ½ that of conventional machines

Because energy consumption is low, little heat is generated. Thermal expansion is small.
Accessibility to Workpieces

- Spindle 3-axis travel → Simple fixture layout, etc.
- Workpieces can be transferred from right, left, top or front
Small is an advantage

Ideal functions and size for small workpieces.

A small machine has big advantages.

- **High Precision**
- **High Speed**
- **High Efficiency**

**NX3000 floor size comparison**

With the NH4000 DCG horizontal MC

- **NX3000 Series**
  - Work Size Max. Φ 4 0 0
- **NX2000 Series**
  - Work Size Max. Φ 1 4 0

Dimensions:
- 2,610 mm
- 2,500 mm
- 955 mm
- 3,000 mm
- 2,300 mm
- 3,755 mm
Operability, Maintenance

There is excellent access to the table. Parts which need daily maintenance are gathered at the front and rear.

Chip Disposal

Chips do not accumulate behind the protector because they are discharged by pit or conveyor to the front or rear.

Chip chuter directly below the table.

Center trough conveyor

Side disposal chip conveyor
NX2000 Series Examples

13-Second Piston Line

Total 11 NX2000 Machines

- Horizontal MC → 4
- Vertical MC → 4
- Vertical Lathe → 3

Workpiece travel distance is 30% less than previous models
NX2000 Series Examples

1 robot can transfer workpieces between 6 machines

Productivity per floor space → 40% UP
New Model Pick-up Turn
【NP】
Development Aim/Concept

- **Compact**
  - Small floor space: Space-saving production line
  - Low: good visibility over factory
- **Improving speed**
  - Reduced feed acceleration time constant
  - Reduced spindle acceleration time
  - Reduced tool indexing time
- **Improving flexibility of systems**
  - Construct line transfer systems
Compact
The height which allows the operator to see the next line

Machine volume
※ 85% of competitor’s machine
※ Floor space
97% of competitor’s machine
※

Cover-line height
55% of competitor’s machine

2807

1550

1700

1200

1235

2350

3288

Red frame・Red figures: Mori Seiki machine

Competitor’s machine

Mori Seiki

Competitor’s machine
Characteristics

Because the moving parts (spindle) have a low center of gravity, there is little vibration during high-speed feed.

High-speed X-axis feed
110m/min
1G

High-output spindle (30/22kW)
1.6sec/5000min⁻¹

Turning gang type turret (12 tools)
We are also preparing a turret with a built-in motor

Gun drill

Z-axis slideway
42m/min
The aim is to improve cutting

Workpiece loading path
Stand-Alone Type

- X-direction feed
- X-axis stroke
- Acceleration 1.0G
- Spindle-core cooling
- 8-station
- Built-in turret
- Rear-ejection conveyor
- Gun drill
- Workpiece loading path
- Spindle (15/11kW)
- Slideway

X-direction
Z-axis direction
Z-方向
8-station
turret
Rear-ejection
conveyor
Gun drill
Workpiece loading path

MORI SEIKI
THE MACHINE TOOL COMPANY
Robot Transfer
Appearance (Line Spec.)

Red figures: Mori Seiki
6 Months From the Start of Development to Completion of Test Machine

- **Started development on August 4, 2005**
  - Initial model
- **Design model September 28, 2005**
- **Test machine basic model October 31, 2005**
- **Mock-up model December 7, 2005**
- **Test machine No.1 February 3, 2006**
- **Mass production machine completed on April 21, 2006**

Evaluation period: 2.5 months 4 test machines were made.