Nidec Machine Tool Corporation

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Nidec Machine Tool Introduces the ZI35A Internal Gear Grinding Machine for High-Volume Production

High-Precision, High-Efficiency Mass Production for Robot Reducers and Large Automotive Ring Gears

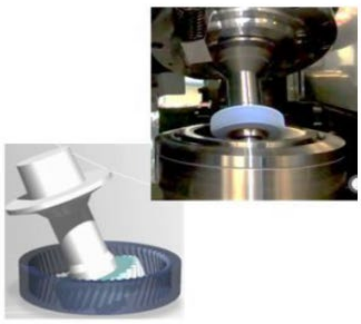
Nidec Machine Tool Corporation has developed the ZI35A, a new grinding machine for mass production designed for high-speed, high-precision grinding of internal gears up to 350 mm in maximum outer diameter. The machine addresses growing demand for greater precision in large ring gears (internal gears) used in industrial robots, automobiles, and other applications.

Based on the existing ZI25A*1 model, which features a world-first machining system patented by Nidec, the ZI35A expands machining capacity to accommodate larger gears. The machine also includes a newly developed “Table Axis Tuning Function” as standard equipment to help maintain consistent machining accuracy. In addition to automation capabilities, including automatic workpiece loading and unloading, the machine features redesigned control panels and interactive software to improve usability.

The ZI35A expands the machining range for large internal gears while helping manufacturers improve efficiency, increase automation, and reduce labor requirements on the production floor.



Internal Gear Grinding Machine「ZI35A」



High-efficiency grinding using a barrel-shaped threaded grinding wheel (Generating grinding process)

Key Features

1. High-Precision, High-Efficiency Machining of Large Internal Gears
    a. Expanded Capacity for Gears up to 350 mm in Outer Diameter

The machine accommodates gear outer diameters up to 350 mm and modules from 1 to 4. The 100 mm increase in maximum outer diameter compared with the existing ZI25A model enables the machine to grind large ring gears used in robot reducers, automobiles, and other machinery.

b. High-Rigidity Structure for Increased Load Mass

The ZI35A features a large, high-rigidity table axis that supports a maximum load of 200 kg. This structure enables stable, high-precision machining even at high rotational speeds, with a maximum table speed of 3,500 min^{-1} and a maximum grinding wheel spindle speed of 15,000 min^{-1}. The machine also supports automated transfer of gears weighing up to 20 kg for high-volume production.

c. High-Precision, High-Efficiency Machining Using Proprietary Generating Grinding Technology

The machine uses generating grinding to precisely synchronize the grinding wheel spindle and table axis. It also features a patented barrel-shaped threaded grinding wheel whose diameter continuously decreases from the center toward both ends. Setting the crossed-axis angle between the grinding wheel spindle and the workpiece axis to 20°–35° increases sliding velocity (grinding speed), enabling high-efficiency machining.

d. Simplified Precision Control of Grinding Wheels and Dressers

Dressing can be performed without removing the grinding wheel from the machine. In addition to the standard dressing gear method, an optional dedicated (rotary) dressing device can be mounted. Increasing the maximum dresser spindle speed to 6,000 min^{-1} (approximately double the conventional rate), combined with high mechanical rigidity, improves dressing precision and extends tool life, facilitating easier precision control of grinding wheels and dressers.

e. Optional Thermal Displacement Compensation for Extended Continuous Operation

A touch-probe thermal displacement compensation system measures the fixture’s outer diameter before machining and compensates for changes in the center distance between the grinding wheel and the gear. This helps limit variations in BBD (between balls diameter)*2 during extended continuous operation, maintaining consistent machining accuracy.

2. Enhanced Operability and Maintainability

a. Newly Developed “Table Axis Tuning Function” Included as Standard Equipment

The newly developed “Table Axis Tuning Function” automatically optimizes table-axis servo parameters and is included as standard equipment. When a fixture or workpiece change alters the moment of inertia, the function makes it easy to optimize servo parameters to a level comparable to expert tuning. This helps suppress table-axis oscillation and prevent deterioration in machining accuracy.

b. Improved Usability with Redesigned Control Panels and Interactive Software

A large 21.5-inch LCD screen provides more display space for interactive software. Softkeys, a continuous display of dressing status, and automatic gear meshing using AE sensors*3 improve visibility and ease of operation. On-screen displays of coolant tank conditions and temperature data for the grinding wheel and table spindles help operators monitor machine status and simplify maintenance.

Main Specifications

Item	ZI35A
Max. Workpiece Outer Diameter	φ350 mm
Machinable Module	1–4 (Module 5 available depending on conditions)
Max. Grinding Wheel Spindle Speed	15,000 min^{-1}
Max. Table Speed	3,500 min^{-1}
Max. Table Load Mass	200 kg
NC Control Unit	FANUC Series 31i-B5 Plus (7 axes / OPT 8 axes)
Machine Installation Dimensions (Standard)	W 5,510 × D 5,450 × H 3,300 mm
Machine Mass	Approx. 15,000 kg

Notes

*1 ZI25A: The successor to the first-generation ZI20A, incorporating the grinding technology described in section 1.

*2 BBD (between balls diameter): A measurement taken by placing two balls in diametrically opposed tooth spaces and measuring the distance between them. It is used to evaluate tooth thickness and gear machining accuracy.

*3 AE Sensor: A sensor that detects minute elastic waves (acoustic emission) generated upon contact between the grinding wheel and the workpiece or dresser.