Value Nano CNC with high reliability and high performance

FANUC
Series Oi/Oi Mate
-MODEL D
Value Nano CNC with high reliability and high

**FANUC Series Oi**
- **MODEL D**

**FANUC Series Oi** Mate
- **MODEL D**

**FANUC Series Oi**-MD
Suitable CNC for Machining center
Max. total number of control axes: 8 axes *1

**FANUC Series Oi**-TD
Suitable CNC for lathe
Max. total number of control axes
in 1 path system: 8 axes *1
in 2 path system: 11 axes *1

**FANUC Series Oi**-PD
Suitable CNC for Punch press
Max. total number of control axes: 7 axes *1

**FANUC Series Oi** Mate-MD
Suitable CNC for Machining center
Max. total number of control axes: 6 axes *1

**FANUC Series Oi** Mate-TD
Suitable CNC for lathe
Max. total number of control axes: 6 axes *1

(*1 : Total number of control axes means the total of the numbers of feed axes and spindle axes. Refer to Specifications about the maximum feed axis number and the maximum spindle axis number of each CNC.)
performance

Value Nano CNC with high reliability

- Excellent cost-performance, arithmetic capacity is further strengthened with advanced technology on hardware
- Leading-edge technology achieves ultra-compact CNC with simplified cables and high-reliability
- Cost-performance oriented configuration with βi series servo

Enriched control functions

- Basically mounted Nano interpolation enhances surface smoothness
- High-Speed, High-Quality machining with AI contour control II and Nano Smoothing
- Suitable for various machines from general machining center / lathe to 2-path lathe

Excellent operation

- Integrated Operation & Programming Guidance with extremely simplified operations
  **FANUC MANUAL GUIDE i**
- Programming Guidance with abundant machining cycles
  **FANUC MANUAL GUIDE 0i**
- Integrated Operation Guidance for NC program-less conventional lathe machining
  **FANUC TURN MATE i**

Plenty of customize functions

- Easy creating machine operation screen
  **FANUC PICTURE**
- Implementing original sequence control based on PMC
  **FANUC LADDER-Ⅲ**

(*) 2 : 0i only

Advanced servo technology

- SERVO HRV3 Control for high speed and high precision
- SPINDLE HRV3 Control for quick acceleration and response
- Quick & smart tuning
  **FANUC SERVO GUIDE**
- Energy saving by power source regeneration, use of latest low loss device
- αi spindle motor can be driven by βiSVSP amplifier and βiSVSP can be connected with αiSV or αiSP amplifier.

βi series SERVO
Cost-performance oriented configuration with βi series servo

αi series SERVO
The latest servo control functions with αi series servo

FANUC Series 0+-MD
FANUC Series 0+-TD
FANUC Series 0+-PD
FANUC Series 0+ Mate-MD
FANUC Series 0+ Mate-TD
FANUC Series 0+ Mate-PD

FANUC Series 0+-MODEL D
FANUC Series 0+ Mate-MODEL D
FANUC Series 0+ Mate
Advanced Technology on Hardware

Ultra-Compact CNC with Simplified Cables, High-reliability

Ultra-compact CNC is realized through LCD display with integrated CNC. A few number cables are provided for ultra high-speed serial communication. The adoption of ECC technology, which corrects an error during data transfer,

Ultra Compact , Ultra Thin CNC [Patent]
The small-size CNC integrated with the LCD display realizes the quite thin CNC control unit in depth of 70mm (in case of no optional slot).

High number-crunching Power
Data processing capability is remarkably improved by the latest high-speed microprocessor. This CNC realizes the state-of-the-art features without additional hardware.

High reliability Hardware [Patent]
Aggressive adoption of ECC (Error Correction Code) technology, which corrects an error generated by the noise, realizes further high reliability.

Embedded Ethernet
Embedded Ethernet enables easy networking in factory. Fast Ethernet is selectable for higher speed data transfer.

PCMCIA interface
Memory card editing/operation can be performed with a compact flash card completely stored in the CNC control unit to prevent unintentional unplugging.

USB memory interface
USB memory easily obtainable in the market can be used to input and output various data in the CNC, and the usability is enhanced.
realizes further high reliability.

**FANUC AC SERVO MOTOR \(\beta i\) series**

High cost-performance AC SERVO MOTOR suited to feed axis of machine tools
- Smooth rotation and quick acc., / dec.
- Compact and high-resolution \(\beta i\) series Pulsecoder

**FANUC AC SPINDLE MOTOR \(\beta i\) series**

High cost-performance AC SPINDLE MOTOR suited to spindle axis of machine tools
- Achieving high power and high torque with compact size
- High efficiency and low heat generation by SPINDLE HRV Control

**FANUC SERVO AMPLIFIER \(\beta i\) SVSP series**

High reliability and high cost-performance SERVO AMPLIFIER
- All-in-one packaged amplifier with 3-axis servo and 1-axis spindle
- Cs contouring control with spindle separated sensor
- Energy saving by power source regeneration, use of latest low loss device

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**FANUC Serial Servo Bus (FSSB) [Patent]**

High-reliability and high-speed communication with ECC technology realizes high-performance and simplified cable connecting.

**FANUC I/O Link**

The serial interface is an I/O network with various I/O devices. General-purpose I/O, I/O module for operator’s panel, SERVO AMPLIFIER \(\beta i\) series for additional axes control and so on can be connected.

**Easy maintenance**

Detachable fan motor and battery realize further easy maintenance.

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**Stand-alone type**

Machine Tool Builder can develop individual and intelligent machine tools by combining with PANEL i featuring personal computer functions.
High performance
High-Speed, High-Quality Machining

NANO Interpolation [Patent]

The NANO interpolation generates position commands for digital servo control in nanometer. This enables smooth path in position commands for digital servo control and enhances surface smoothness.

Tapering at an X:Y ratio of 3:1

Tilted working plane indexing [Patent]

By specifying tilted working plane on guidance screen, the tilted working plane is indexed so that the plane becomes perpendicular to the tool. By assuming that holes, pockets, etc on tilted working plane of workpiece are on XY plane, you can program them easily.
Nano smoothing [Patent]

The desired path is estimated by NURBS curves within a tolerance from minute line command points created by a CAD/CAM system and interpolated in nanometer unit. This gives a smooth machined surface approximate to the designed figure and reduces manual finishing processes. And a minute line segment program is used, so the previously used programs can be executed without modifications.

Enriched CNC functions

Unexpected disturbance torque detection function

The disturbance torque is detected becoming unexpected level by a machine collision etc. and axis stops immediately or returns to the opposite direction. This reduces the machine damage.

Machine State Monitoring Function

When the accident occurs, machine state monitoring function memorizes various CNC information into CNC memory. You can show memorized CNC information on the machine state history screen and utilize it for investigation of the accident.
High performance
Advanced digital servo technology

SERVO Motor System

SERVO AMPLIFIER
\( \alpha \)i series  
AC SPINDLE MOTOR
\( \alpha \)i series  
SERVO AMPLIFIER
\( \beta \)i series  
AC SPINDLE MOTOR
\( \beta \)i series

SERVO HRV3 Control [Patent]

High speed and high precision servo control
By combination of hardware technology and software technology such as the latest servo control HRV3 (as standard), high speed and high precision control with nano-meter level is ensured.
Mechanical resonance can be suppressed by Automatic following HRV filter even though its frequency is changed.

Application example of SERVO HRV3

SPINDLE HRV3 Control [Patent]

Quick acceleration and response spindle control
High response and high precision spindle control is achieved with fast velocity loop processing and high resolution detector circuit.
In rigid tapping, reduced synchronous error and shorter cycle time are expected.
In spindle orientation, the shortest orientation time is expected.

FANUC SERVO GUIDE

Quick & smart tuning of servo and spindle
This software provides the integrated environment for making test programs, setting parameters, and data measurement needed for servo and spindle tuning. It has substantial automatic tuning functions for gains, filters, and others.
With SERVO GUIDE, quick and smart optimization of servo and spindle can be achieved.
Excellent Operation

User friendly operation and assistance

Program Editing

The CNC program can be edited easily by PC like operation such as cut and paste. The operator can edit the CNC program efficiently. The operating CNC program can be confirmed safely by the reference mode of background editing.

Input / Output with USB Memory

CNC data such as NC programs, parameters and so on can be input and output at the USB interface on the front of the CNC display unit easily.

- CNC data necessary to machine workpiece can be easily input and output.
- All CNC data can be saved and restored by one operation. Therefore maintenance can be done surely and effectively.
- USB memory can be used for input/output, the memory card can be used as a large-capacity program memory, storing it in the CNC main unit at all times.

Support of Multiple Languages and Dynamic Display Language Switching

If different operators display in different languages, the display language can be changed to another with a simple operation without turning the power to the CNC off. This function eliminates the need for stopping the machine at the change of operators, which improves work efficiency. The CNC operation screen supports 22 languages.
Excellent Operation

Integrated Operation & Programming Guidance with extremely simplified operations

**FANUC MANUAL GUIDE i**

MANUAL GUIDE i is an integrated operation guidance, which provides handy operation guidance from programming through machine operation on one single screen. It can be applied to lathe, milling machine and machining center.

- Integrated operating screen
- ISO code part programming
- Powerful program editing functions
- Various machining cycles
- Realistic machining simulation
- Set-up guidance
- Multi-path lathe function

Free figure input screen  Machining simulation screen

Programming Guidance with various machining cycles

**FANUC MANUAL GUIDE 0i**

MANUAL GUIDE 0i is a part programming guidance, which is concentrated to the functionality for creating a part program, and it pursues the extreme simple operation. It can be applied to lathe, milling machine and machining center.

- ISO code part programming
- G-code and M-code assistance
- Various machining cycles
- Contour programming

C-axis grooving cycle  Pocketing with island cycle

Integrated Operation Guidance for NC program-less conventional lathe machining

**FANUC TURN MATE i**

TURN MATE i has accomplished NC program-less turning operation for conventional lathe. It is possible to carry out turning easily only by following guidance drawings on screen and inputting data.

- Plain all in one screen
- Application to display with and without touch panel
- Various machining cycles
- Sequential execution of machining cycles (Max. 20)
- NC program conversion function of machining cycles

Cycle selection screen  Cycle data input screen
Network Support Functions
With plenty of network functions, you can construct an optimum system for CNC machine tools

Embedded Ethernet
100 Mbps Ethernet is supported. CNC can be connected to personal computers to transfer NC programs and monitor CNC status.

Fast Ethernet

Fast Data Server
NC programs can be stored in the built-in compact flash card in the Fast Data Server for high-speed machining and program editing.
The other Ethernet functions can be used simultaneously with the operation of Data Server.

Field network
The I/O signals of various peripheral devices can be controlled and monitored by the ladder program.

- FL-net
- PROFIBUS-DP
- DeviceNet
- MODBUS/TCP Server
**Built-in PMC function**

**High-speed and large capacity ladder**
The large capacity built-in PMC is available for complex sequence control of machine and peripheral devices. The PMC and the CNC are connected with high-speed internal bus closely and this enables to transfer various data between PMC and CNC at a high speed.

**Extended PMC Ladder Instruction function**
The enhanced computation instructions enable to program complex sequence control of machine into a simple ladder circuit with high readability. The enhanced PMC function enables to correspond flexibly to an abundant array of machine sequence control requirements and realizes efficient ladder development and maintenance by machine tool builders.

**Function Block function**
This function enables to call up repeatedly used ladder circuit patterns in blocks. Machine tool builders can create complex ladder programs more efficiently with fewer ladder diagram drawings for maintenance.

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**Positive Safety Measures**

**Dual Check Safety**

Dual Check Safety, incorporated into the CNC, is a safety function that conforms to the international safety standard (ISO 13849-1 PL d). This function offers a high level safety by using multiple microprocessors that redundantly monitor the actual servo motor position/speed, the actual spindle speed and safety-related input/output and by providing duplicate paths of breaking power for the servo/spindle amplifier.
Plenty of Customize Functions
Customize the machine tools uniquely

| Customizing operation screens | FANUC PICTURE |
| Implementing original sequence control based on PMC | FANUC LADDER-Ⅲ |

### FANUC PICTURE

FANUC PICTURE enables a machine operation screen to be created only by pasting screen components such as buttons and lamps on the personal computer.

- An easy-to-use user interface that is unique to FANUC.
- A screen usable on a display unit with and without a touch panel can be created.
- Possible to coexist with a C language executor application.

### FANUC LADDER-Ⅲ

For machine customization, a machine tool builder’s own sequence control can be incorporated into the built-in PMC. A PMC sequence program can be created on the personal computer by using FANUC LADDER-Ⅲ, the highly easy-to-use programming tool with many useful functions.

- A program can be created with ladder and function block.
- A program can be coded using signal names instead of signal addresses.
- Online monitoring and editing can be performed by connecting the personal computer with the CNC via Ethernet.
Easy Setup and Maintenance
Powerfully support Startup and Tuning of CNC system

Parameter Setting Support Screen
Parameter Setting Support Screen powerfully supports the necessary parameter setting for start-up and adjustment of CNC, Servo and Spindle. In menu screen, various setting and adjustment screens are selected by the cursor operation, and the parameter is set on each screen.

“One-shot setting” for Servo axes and “One-shot tuning” of Velocity gain
The recommended parameters for high speed and high precision machining can be set only by pressing soft-key once. Practically enough precision can be achieved with only this "One-shot setting". If higher precision is required, stable and optimum velocity gain for each machine can also be set automatically by only pressing soft-key for Parameter Tuning of Velocity Gain.

Menu screen
Velocity gain tuning screen

Command path
Real path
Radius shrinkage 4mm
Before applying Parameter Setting for High Precision
Protrusion 6μm
After applying Parameter Setting for High Precision
Protrusion 3μm
After applying Parameter Tuning of Velocity Gain

“One-shot setting” for Spindle axes
The initial parameters for start-up of spindle can be set by "One-shot setting". The necessary parameters are set automatically by inputting spindle configuration items, such as motor model, maximum speed, sensors. This screen supports the initial setting also for the optimum orientation function and the parameters for high speed rigid tapping.

Spindle parameter setting screen

Spindle sensor
Max. spindle speed
Max. motor speed
Motor sensor
Machine component
Powerful Software Tools

Support development of machine tool builders in a variety of fields such as simulation and data management

### Simulation Tools Supporting Utilization of High-Level CNC Functions

Software tools for CNC operation simulation on the personal computer are provided to fully utilize the ever advancing CNC functions. Two types of packages are available to meet applications:

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<tr>
<th>For CNC operation training</th>
<th>FANUC NCGuide</th>
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</thead>
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<tr>
<td>For application software development</td>
<td>FANUC NCGuidePro</td>
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</table>

#### FANUC NCGuide

(Training tool that enables learning of CNC / MANUAL GUIDE i operations)

The FANUC NCGuide is a software tool that enables training of CNC/MANUAL GUIDE i operations on the personal computer without using an actual CNC. This software tool allows operators to be trained without using an actual machine tool. This software tool can also be used for CNC training in school.

#### FANUC NCGuidePro

(Development tool that supports PMC ladder and customized software debugging)

The FANUC NCGuidePro is a development support tool that enables ladder to be executed on the personal computer. Moreover, the C language executor and macro executor can be executed, so that this development support tool can be used to debug a custom screen created by a machine tool builder.
Maintenance and Customer Support

Worldwide Customer Service and Support

FANUC operates customer service and support network worldwide through subsidiaries and affiliates. FANUC provides the highest quality service with the prompt response at any location nearest you.

FANUC Training Center

FANUC Training Center operates versatile training courses to develop skilled engineers effectively in several days.

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