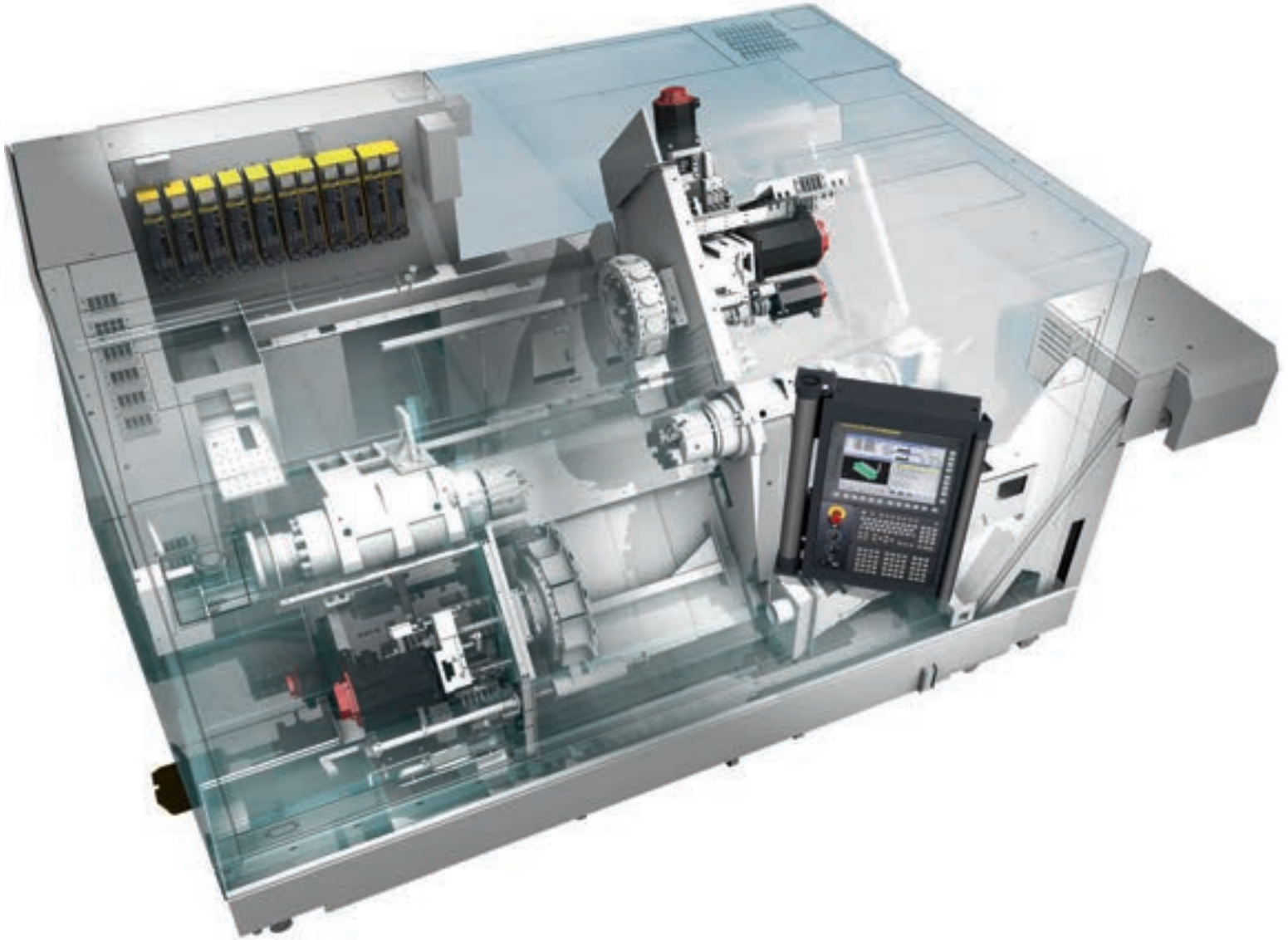




## Series 0i - MODEL F



# Series 0i MODEL F



FANUC controls have a world-class reputation for performance, precision, reliability and familiar operation. This reputation makes them popular with the most demanding production managers, operators and maintenance engineers. FANUC is the world's leading CNC manufacturer, with more than 3.7 million controls installed worldwide.

The FANUC Series 0i - MODEL F is the newest generation in the Series 0i control systems. The Series 0i brings faster, more accurate performance to a wide range of milling, turning, punching and grinding applications with more standard features, more advanced capabilities and faster communications than ever before. The Series 0i control is the industry's most reliable system with a Mean Time Between Failure rate of 52 years.

## The first choice for tool room and production turning applications



The Series 0i - MODEL F is the next generation in the highly popular Series 0i and integrates many features found on the Series 30i-MODEL B. The Series 0i-F offers more axes, ladders and paths, as well as high-speed auxiliary machine functions and an expanded list of standard features. Additional features available on the Series 0i - MODEL F include 15" display, QWERTY keyboard, I/O Link *i*, high-speed rigid tapping, tolerance control, axis name expansion, program folder management, quick program restart, flexible path axis assignment, multi-path PMC function, ladder dividing management, EtherNet/IP and PROFINET.

- » Support for up to 12 servo axes, 4 simultaneous interpolated axes, 4 spindles and 3 independent PMC machine ladders as well as multiple part-program paths and high-speed auxiliary machine functions
- » Standard features include many advanced features typically associated with higher-end control systems
- » Available with 8.4", 10.4", or 15" display and QWERTY or ONG keyboard
- » The optional FANUC Data Server offers high-response Ethernet, up to 16 GB part program storage and large transfer buffers for Direct Numerical Control (DNC)
- » Operator-friendly set-up guidance with FANUC's powerful and intuitive conversational programming or the industry standard G-Code programming for fast and easy job changeovers
- » Teach-and-playback mode makes use of electronic hand wheels and intuitive conversational programming to program parts without learning G-Code
- » Available web-based software applications for monitoring machine and job status with a smartphone or tablet
- » Type 3 and Type 5 versions of the Series 0i - MODEL F are available in milling and turning configurations. These basic versions are a cost-effective option for straight-forward, commodity type production or for machine tool builders who want to add their own functions. See the table on page 14 for specifications.



### **Optimized Speed**

The Series Oi-F features a suite of advanced motion control software functions to reduce cycle times while enhancing part accuracy and extending machine life. Examples include High Response Vector Control (HRV 3), an advanced form of field oriented control that uses high-speed DSPs and nano interpolation to improve surface finish, cycle times and accuracy.

### **Bell-Shaped Acc/Dec**

Bell-shaped acc/dec minimizes machine shock and while reducing the time it takes to accelerate and decelerate. This can be applied to rapid contouring and tapping motions.

### **AI Contour Control**

AI Contour Control (AICC I/AICC II) uses advanced look-ahead algorithms to determine optimal feedrates and acceleration. This can reduce cycle times and improve accuracy, which is especially beneficial when machining complex, curved surfaces such as aerospace or automotive parts or metal dies.

### **Tool Retract & Recover**

Tool retract and recover simplifies tool inspection and replacement while machining. When activated, the tool safely retracts from the part and then can be manually moved to an inspection position. When released, the tool moves back along the path created by the manual moves.

### **Path Synchronization**

M-codes are used to make one path wait for the other path to complete an operation before proceeding. One path can also be commanded to wait until another path reaches a specified absolute coordinate position before continuing.

### **High-Speed Ethernet**

The 100-MBit Ethernet interface allows the CNC to be integrated into a network for high-speed part program transfers and the collection of process related data. It also supports remote troubleshooting from the maintenance department or a machine tool builder anywhere around the world. Because the Ethernet port does not use a public oper-

ating system, it is practically “hacker-free” and virus immune.

### Part Program Management

The Series 0i - MODEL F provides up to 2MB of nonvolatile internal memory for part program storage. Additional part program storage using ATA or CompactFlash memory cards is available. The optional FANUC FAST Data provides up to 16GB of flash memory. Part programs stored in external memory cards or in the FAST Data Server can be edited and executed just like internal memory.

### 32-Alphanumeric Character Program Names

The Series 0i-F now allows program names with up to 32 alpha-numeric characters so it is compatible with Series 30i-B.

### Part Program Folders

Organize part programs and macros by categories such as libraries, customers or jobs. Copy, move and input/output

operations can be performed on a program or a complete folder. Machine tool builder files are separated from user programs and macros to avoid accidental modification or deletion.

### Program Restart

Program Restart allows mid-program startup when the program was interrupted for a tool inspection or if the machine is stopped for a prolonged break.

### Multiple Part Program View

The enhanced part program display provides more insight into the part program calling structure and simplifies verification and debugging. It displays the active part program/subprogram blocks in detail with interpreted values replacing items such as macro variables statements. If a subprogram is active, it also displays the name of the calling parent program. A second window displays the original part program with the macro variable statements.

## Productivity Advantages

- Compatibility with all previous versions of the Series 0 and 0i-MODELS A, B, C and D, as well as hardware and programming compatibility with the FANUC Series 30i/31i/32i-MODEL B.
- Consistent operations minimizes or eliminates the need for additional training
- Existing part programs run without modification
- Simple part programming and operation
- Operator-friendly graphic display for visual part program verification
- Comprehensive help functions
- Nano precision interpolation for the highest quality surface finish during contouring
- High-speed machining for faster, better quality parts
- Cutter Compensation for direct input from part drawings and increased tooling flexibility
- Canned cycles and custom macros for simplified part programming
- Skip cycle interface for probe measurements
- Tool management for maximum machine utilization
- Ethernet connectivity

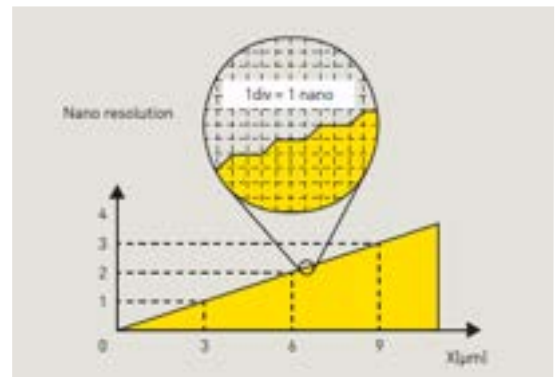
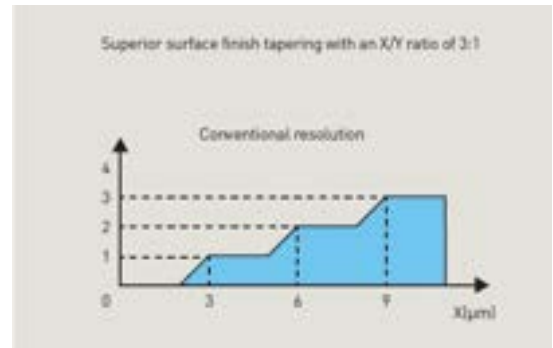
## CNC System-Wide Nanometer Precision

The FANUC Nano CNC System achieves high-quality machining by coordinating high-precision operation in nanometers and state-of-the-art servo technology. With nano interpolation, position commands for the digital servo control unit are computed at the nanometer level, while the SERVO HRV and SPINDLE HRV controls provide incredibly fast control cycle times. The high-resolution pulse coders on the FANUC  $\alpha$ -B series AC SERVO MOTOR supplies highly accurate feedback to ensure the highest quality machining is achieved.

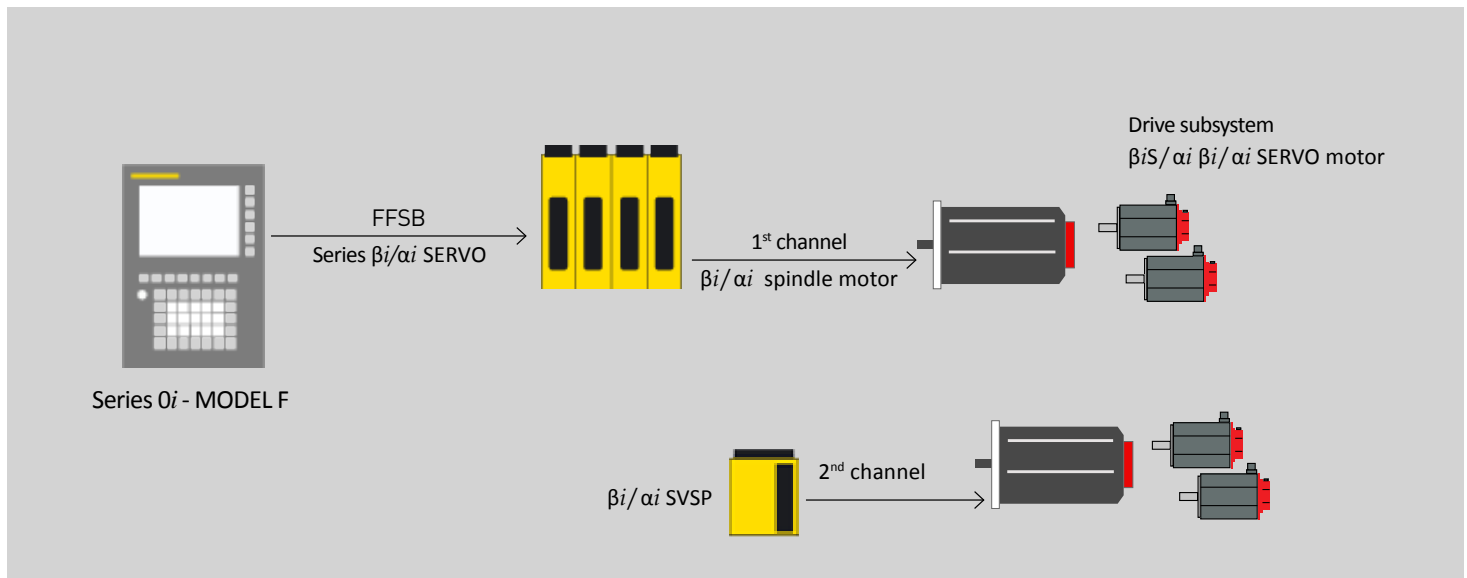
## iPendant

The FANUC *i*Pendant is a factory hardened, portable display and operation panel with an available touch-panel interface. The *i*Pendant can be used as the primary display for simple applications or as an additional display to allow the operator to get closer to the workpiece.

The *i*Pendant supports all standard Series 0i-F screens for operation, programming and maintenance. Customized machine operation keys are available with a transparent key sheet. Keyboard functions can be switched between Manual Data Input (MDI) mode for data entry/program editing or machine operation mode where the keys are used for manual axis motion, miscellaneous operational functions and automatic machine operation. *i*Pendant can also be equipped with a small manual pulse generator device for manual axis operation and a USB port for file I/O.



# Control, Drives & Software- A Perfect Combination



A great CNC system is the perfect combination between control, drives, I/O and connectivity. That's what FANUC gives you for optimum machine tool performance.

The Series 0i-F is compatible with both Alpha *i* and Beta *i* amplifiers and motors to achieve optimal performance.

Display screens can be customized to suit the requirements of the operator using C-Executer or FANUC Picture that simplifies the construction of custom screens with icon-driven graphic elements.

With Dual Check Safety, the Series 0i - MODEL F has all the required safety functions integrated into the CNC to comply with European safety standards.

High quality and reliability coupled with simple maintenance are key factors in drive components from FANUC. Modern bus-systems and connector technology simplifies interconnections and maximizes operational reliability.

High-efficiency drive systems pump energy back into the power line when the machine is decelerating, and when combined with cycle time reductions, they can significantly reduce electrical power consumption. Small motor outlines and minimum footprint amplifier designs reduce the floor space required for the machine tool and electrical cabinets.

# NCGuide - Effective Training Environment

NCGuide is an authentic simulation of a FANUC CNC that runs on a PC, providing a realistic operation and part programming environment at a fraction of the cost of using a production machine tool. This translates into lower training costs, as comprehension and retention is enhanced. Students can perform hands-on exercises in an ergonomically friendly environment - away from the noise of the factory floor. Operators, programmers and maintenance engineers can all practice common procedures or develop optimized processes without risks to people, tooling or machines.

## Operational Training

NCGuide is ideal for operational training. All standard CNC operational screens can be selected and all standard procedures can be practiced. NCGuide also supports custom screens developed by the machine tool builder. Users can create and edit part programs, search for words and safe start blocks, upload and download part programs and test for syntax and tool path geometry errors. Workpiece, tool geometry and tool wear offsets can all be edited and their effects visualized to enhance understanding. Users can

expand their knowledge by learning the features available with newer controls - even before they are installed.

For the most realistic and effective learning environment, each user can quickly setup a configuration to emulate a particular machine's CNC.

## Part Programming Training

NCGuide supports both conventional G-Code part programming with tool path simulation, and the powerful, easy-to-use, MANUAL GUIDE *i* conversational part programming with 3D tool path and part geometry visualization.

Users can create and edit machining center, lathe and compound machining part programs, generate cycle time estimates and create and test Custom Macro subroutines.

The tool path simulation lets users visually verify a part program, to see the effect of workpiece and tool offsets and to observe the effects of canned cycles and advanced interpolation modes. MANUAL GUIDE *i* conversational part programs can be developed on the simulator and then converted to conventional G-Code to run on any FANUC CNC.

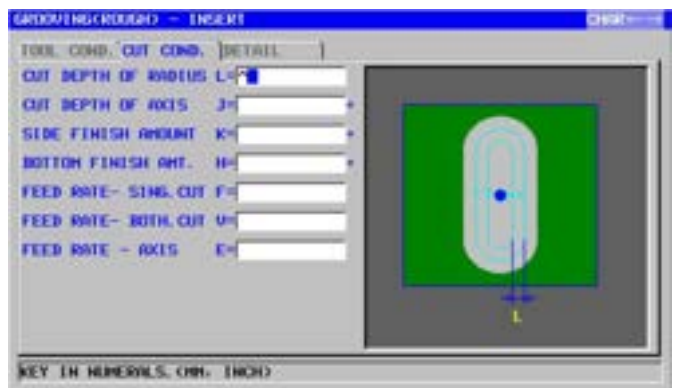




## MANUAL GUIDE *i*

MANUAL GUIDE *i* conversational programming is available for the Series *0i* controls with 10.4" or 15" LCD displays. It provides fast and efficient programming for milling, turning and mill-turn centers. The screens and menus are intuitive and the 3D verification graphics are clear, providing a comfortable part programming environment – even for complex parts.

A part program can be generated in a few simple steps. Graphical, user-friendly symbols and pop-up menus overlay a single main screen, which includes all the machine information needed to create and execute a part program. This ensures that the operator is always in control. MANUAL GUIDE *i* can also be used off the shop floor with the NCGuide simulation package. Part programs can be moved freely between the PC and a wide range of machines.



## Powerful G-Code Editor

The Series *0i* – MODEL F supports both traditional CNC word editor mode and flexible character editing. Character editing mode provides a quick and easy way to modify complex word structures such as custom macros, mathematical statements and part program comments. The background editor can display multiple programs side-by-side on the screen so that one part program can be downloaded and modified while another part program is executing in the foreground.

## Integrated safety

The Series Oi-F is available with Dual Check Safety. This integrated Category 3 safety system offers a high level of safety through redundant monitoring and duplicate paths of breaking power to the servo/spindle amplifier using a single cable. Using built-in redundancy, a special processor for monitoring safety-related parameters, Dual Check Safety guarantees the safety of the system by following the actual position and speed of the servo motors, spindle motors and the I/O interfaces.

### Basic Functions of Dual Check Safety:

- Brake Monitoring
- Safe Spindle Speed (4 ranges)
- Safe Servo Axis Speed (4 Ranges, Velocity & Positioning)
- Safe Machine Axis Position (4 ranges)
- Safe Stop
- Safe I/O's
- Safety I/O Signal History Function
- Safety Spindle Speed Limit Override Function
- Test Mode Function for Acceptance Test

## Safety I/O Unit

The safety I/O unit is a single module interface that provides redundant input and output safety signals when Dual Check Safety is used, requiring only a single I/O Link *i* channel.



## Chuck and Tailstock Barriers

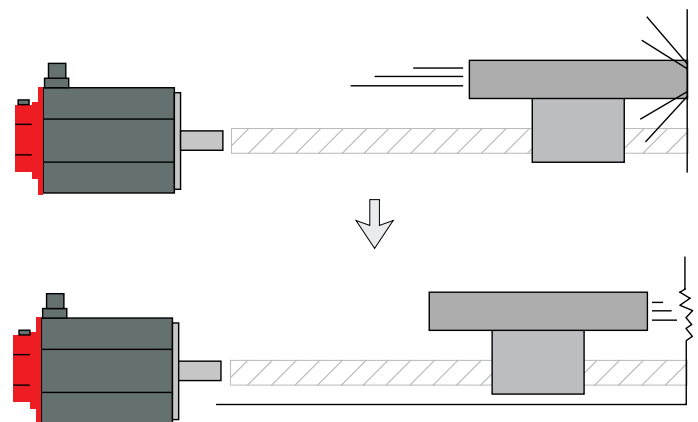
The Chuck and Tailstock Barrier function prevents damage to the machine by checking whether the tool tip interferes with either the chuck or tail stock. Setting screens define the no-entry zones which the tool may not enter. Settings may be entered quickly by jogging the tool to the barrier limit and using soft keys to record the positions. If the tool nose enters the barrier during machining, the axes are stopped and an error message displayed.

## Interference Check

When tools from two independent paths machine the same workpiece simultaneously they can machine in close proximity to each other. If the tools make contact with each other due to a programming error or a setup error, serious damage to the tool and machine can result. Interference Check detects any potential collision before it occurs and stops the machine.

## Crash Protection

Unexpected torque disturbance control allows torque limits to be set so that the axis will stop or retract when a collision is detected, reducing damage to the machine.





### **Unmatched Reliability**

Downtime on your CNC machine is very expensive, especially when you add up the cost of repairs, the lost production capacity, and the potential revenue and goodwill lost if you miss customers' deliveries. FANUC's continuous improvement culture ensures that our CNC systems are the most reliable available. Statistically, a hardware fault occurs only once for every 52 years of productive service.

Through our commitment to our Service First philosophy, we offer lifetime parts and maintenance support for all of our products as long they are in use. We provide convenient local parts inventories and economical repair and return services to help ensure our customers' machines are available for production when they need them.

### **Maintenance Friendly**

The modular design of the batteries and fans means they can be replaced quickly and easily without tools. A comprehensive package of maintenance tools is integrated into the CNC to help keep your machine running and making parts. A snapshot of any CNC screen can be captured to a memory card to be used in trouble-

shooting. FANUC experts provide fast local onsite service and free over-the-phone technical support.

### **Prevention of Operational Errors**

Unintentional mistakes can be reduced by requiring operators to confirm actions like deleting part programs or starting programs in the middle. Limits can be placed on the tool and workpiece offset values entered to prevent machine crashes due to simple data entry errors.

### **Built-In Backup**

The Built-In Backup feature regularly backs up important data to flash memory to minimize downtime from lost machine tool builder or user files. This saves time when experimenting or troubleshooting by saving a snapshot of all the existing user files and settings before making any modifications.

### **Simplified Servo & Spindle Tuning**

Quickly and easily determine the recommended servo and spindle servo tuning parameters by simply pressing a softkey on a built-in screen. This eliminates the need for costly specialized resources. If higher precision is required, optimum velocity gain for each servo axis can be adjusted automatically using the more advanced Parameter Tuning of Velocity Gain tool.

**Extreme Reliability -  
Maintenance Friendly**



### Energy Saving

Studies have shown that approximately 20% of a machine's running costs can be attributed to electrical energy consumption, primarily for hydraulic and pneumatic pumps, and the servo and spindle drive systems.

The servo motors in a motion system are continuously accelerating and decelerating as they change speed and direction. The state-of-the-art FANUC AC drive systems use high-speed, high-efficiency switching circuits to direct the energy back into the main electrical supply when an axis is decelerating, reducing the net energy used.

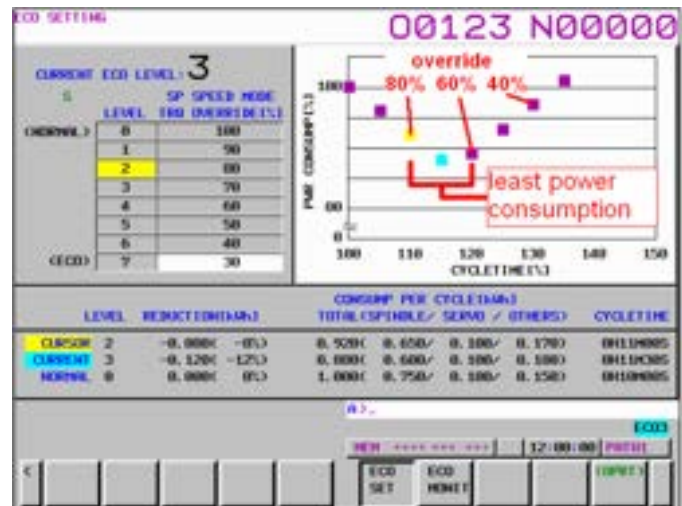
The FANUC energy saving level selecting function allows the user to optimize the balance between the fastest (normal) machining speed and the lowest energy consumption. When the ECO level is set above level 0, the torque of the spindle

drive is limited during acceleration to reduce energy usage. The CNC's PMC interface can also be used to turn off power-hungry peripherals when the machine is not in cycle. The energy usage of peripheral devices can be monitored by entering their average power consumption and controlling PMC addresses.

### Energy Monitoring & Optimization

The CNC monitors and displays the real-time energy usage and savings allowing part programs to be optimized for maximum efficiency. The data can also be collected via Ethernet and saved for analysis.

The ECO monitoring screen displays a comprehensive analysis of power consumption and the benefits achieved with eco machining.



The ECO setting screen provides visualization of energy consumption to enable the selection of the best eco-machining setting.

# Modernized FANUC Series 0i-F Design

Conventional operating system can easily transition from the standard 8.4"LCD/MDI unit to the new 10.4 inch screen display unit with flat and sophisticated design.

10.4"LCD/MDI Unit (Vertical)



290mm wide



260mm wide

8.4"LCD/MDI Unit (Vertical)

300mm tall (same as 8.4")

400 mm wide



10.4"LCD/MDI Unit (Horizontal)

220mm tall



8.4"LCD/MDI Unit (Horizontal)

200mm tall



# Series 0i Technical Guide

ITEM	Series 0i-F Type 1			Series 0i-F Type 3		Series 0i-F Type 5	
	Milling (M)	Turning (T)	Punching (P)	M	T	M	T
<b>Control Axis</b>							
Controlled paths	2	2	1	1	1	1	1
Max. total number of control axes per path	11 / 9	12 / 9	7	6	6	6	6
Max. simultaneously controlled axes per path	4	4	4	4	4	4	4
Loader control paths	2	2	0	1	1	1	1
LCD	8.4"/10.4"/15"	8.4"/10.4"/15"	8.4"/10.4"/15"	8.4"/10.4"	8.4"/10.4"	8.4"/10.4"	8.4"/10.4"
Touch Screen	*	*	*	*	*	*	*
PANEL <i>i</i>	*	*	*	-	-	-	-
Nano interpolation	*	*	*	*	*	*	*
Part program storage	512K-2MB	512K-2MB	512K-2MB	512K-2MB	512K-2MB	512K-2MB	512K-2MB
PMC system	PMC/L function	-	-	-	5K-24K	5K-24K	5K-24K
		24K-100K	24K-100K	24K	-	-	-
	I/O Link <i>i</i> DI/DO points	2048/2048	2048/2048	2048/2048	1024/1024	1024/1024	1024/1024
Embedded Ethernet	*	*	*	*	*	*	*
Fast Ethernet	*	*	*	-	-	-	-
Memory card program edit & operation	*	*	*	*	*	*	*
Data server editing/ operation	*	*	*	-	-	-	-
MANUAL GUIDE <i>i</i>	*	*	*	*	*	*	*
TURN MATE <i>i</i>	-	*	-	-	*	-	*
AI contour control I & II	(I/II)	*(I/II)	*(I)	*(I/II)	*(I/II)	*(I)	*(I)
Nano smoothing	*	-	-	*	-	-	-
Jerk control	*	-	-	*	-	-	-
Spindle control with servo motor	*	*	-	*	*	*	*
Protection of data at eight levels	*	*	*	*	*	*	*
Dynamic display language switching	*	*	*	*	*	*	*
Macro executor + C Language executor	*	*	*	*	*	*	*
FANUC PICTURE executor	*	*	*	*	*	*	*
NCGuide	*	*	-	-	-	-	-
Program transfer tool	*	*	*	*	*	*	*
CNC setting tool	*	*	*	*	*	*	*
Tool management function: 1000 pairs	*	*	-	-	-	-	-

## Top 10 Reasons To Choose FANUC

1. FANUC's world class reliability and 52-year MTBF rates maximize machine uptime and minimize TCO.
2. Lifetime support of FANUC products and parts.
3. Increase your competitive edge with state-of-the-art technologies that increase quality, efficiency, reliability and reduction of cycle times.
4. Minimize training and support costs with continuity of operation and upward compatibility of existing programs on new CNC controls.
5. At-the-machine programming with MANUAL GUIDE *i* conversational programming.
6. CNC Systems are ready to go in less than 30 seconds for increased daily production time.
7. Boost efficiency with Ethernet-enabled data and remote diagnostics.
8. Minimize downtime by separating CNC control and PC technologies.
9. Rely on a world-class partner.
10. The standard interface of FANUC simplifies integration with robots.





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