Next Platform for Machine Tools

FANUC

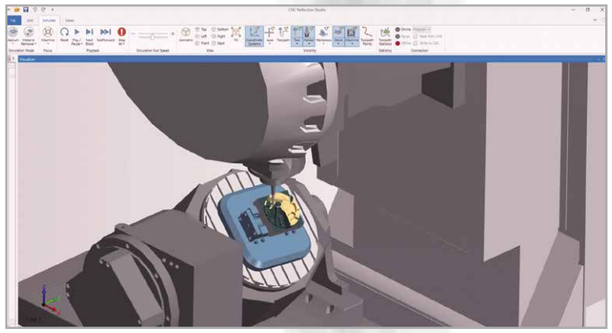
Series 500*i*-A

New CNC System for the Changing World

FANUC Series 500*i*-A

Process

High machining performance by integrated development of CNC hardware, software, and servo system
User-friendly 5-axis functions
Various machine configuration support



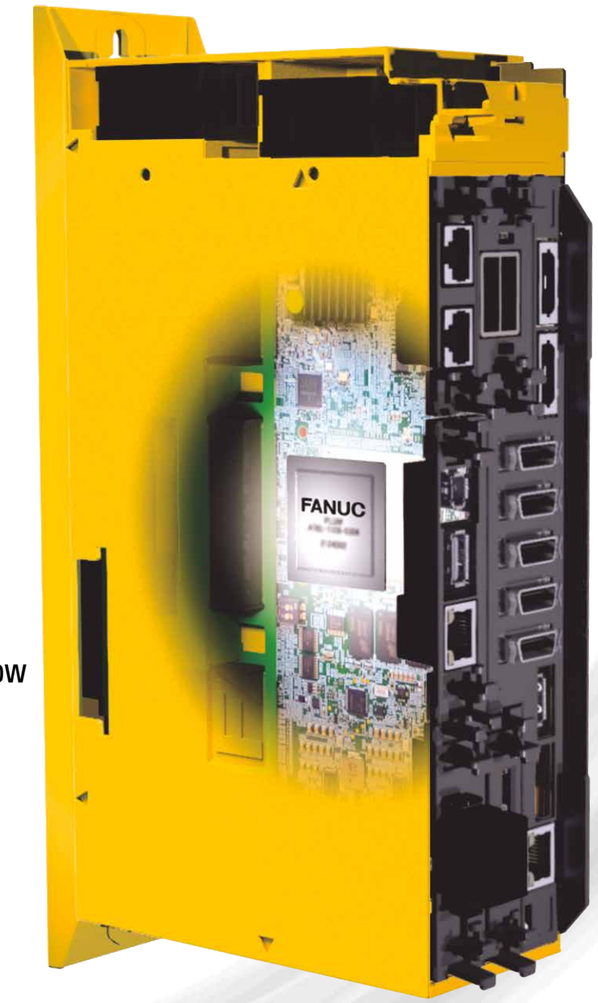
Digital Twin

Cut with Confidence
Transform the Workflow

Digital

Integration with digital technology
Reproduction of real world in digital space
Improvement in on-machine simulation

Newly Redesigned Hardware and Software



UI

Intuitive operation
Easy accessibility via network using Web technology
Flexible customization to meet various applications

FANUC *i*HMI 2

New operation screen with utmost operability

Network

Secure data management with user authentication and access protection

Flagship CNC with 24 contour controlled axis	Ultra multi-axis, ultra multi-path control CNC	High-end CNC with 5 contour controlled axis	High-end CNC pursuing superior machining performance	Enhances productivity across all types of machine tools
FANUC Series 501*i*S-A	**FANUC Series 501*i*-A**	**FANUC Series 502*i*S-A**	**FANUC Series 502*i*-A**	**FANUC Series 503*i*-A**
Max. number of paths: 15 paths Max. number of controlled axes : 96 axes (72 feed axes, 24 spindles (Cs axes)) Max. number of contour controlled axes: 24 axes	Max. number of paths: 15 paths Max. number of controlled axes : 96 axes (72 feed axes, 24 spindles (Cs axes)) Max. number of contour controlled axes: 4 axes	Max. number of paths: 4 paths Max. number of controlled axes: 26 axes Max. number of contour controlled axes: 5 axes	Max. number of paths: 4 paths Max. number of controlled axes: 26 axes Max. number of contour controlled axes: 4 axes	Max. number of paths: 2 paths Max. number of controlled axes: 12 axes Max. number of contour controlled axes: 4 axes

System Configuration

Control Unit

- Equipped with the latest interfaces in a compact body, offering both the LCD-mounted type and the stand-alone type to suit various machine tool configurations

LCD-mounted type

Stand-alone type

- Utilizes non-volatile memory, eliminating the need for batteries to retain memory data, thereby reducing maintenance costs

Battery-less CNC system configuration example

Achieve a battery-less CNC system by combining it with battery-less pulsecoders

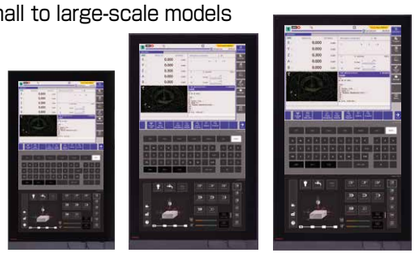
Battery-less control unit

Battery-less Pulsecoders

LCD Unit

- Features a capacitive touch panel that functions accurately even in FA environments. A lineup of LCD units is available to accommodate a wide range of machinery, from small to large-scale models

10.4″/15″ LCD unit



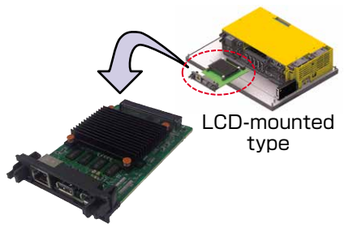
18.5″/21.5″/24″ LCD unit

FANUC *i*PC

- Employs the FANUC *i*PC for display functions and other user interface features. It achieves smooth operability through its dual-engine architecture where the control unit and the user interface are completely independent

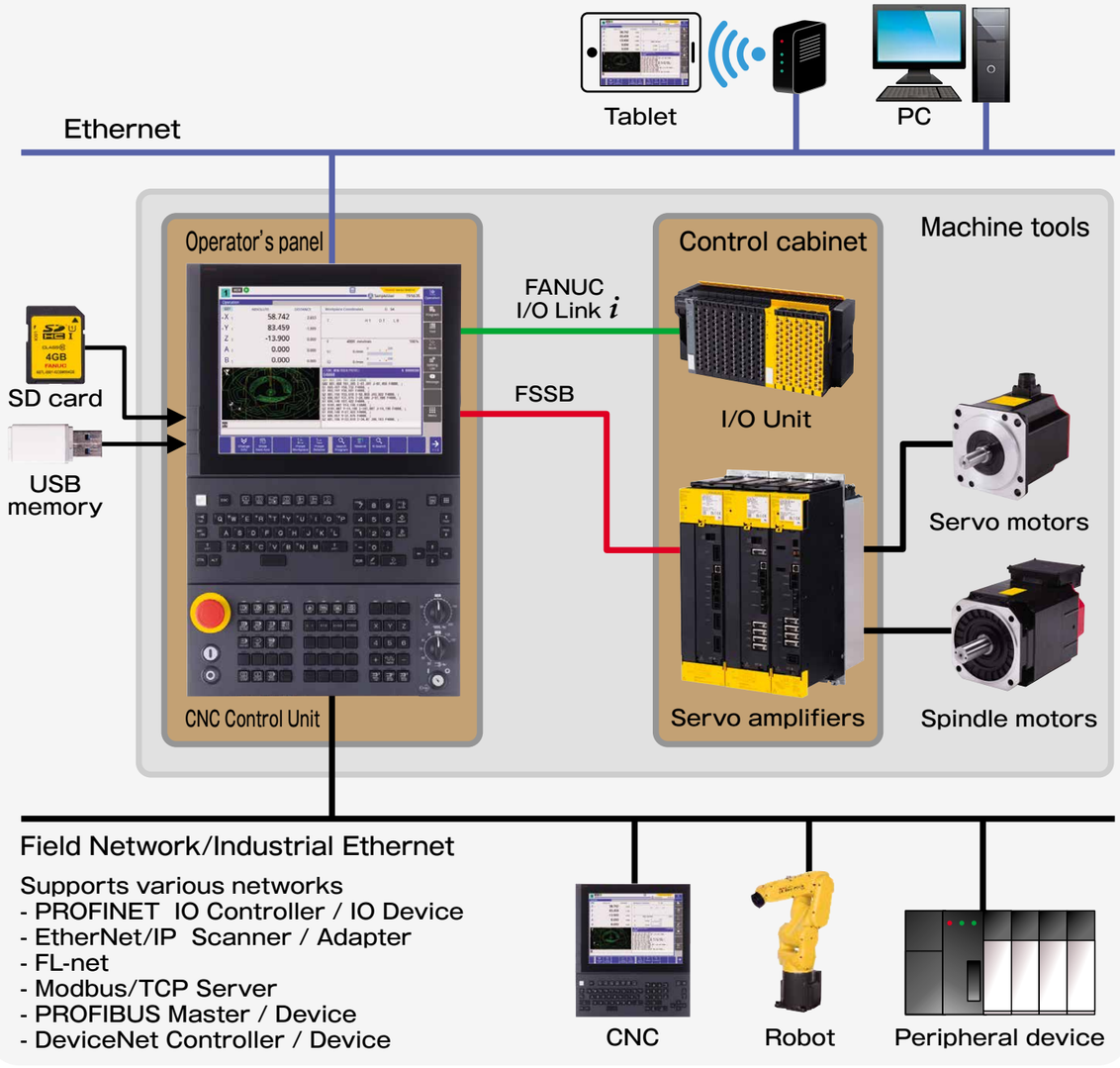
FANUC *i*PC FIP1000

FANUC *i*PC FIP1100



LCD-mounted type

FANUC *i*PC graphic board FIP1110



Servo Motor

- Line-up to meet the various needs of machine tools and contribute to the performance improvement of feed axes

SERVO MOTOR αi-D series

DD MOTOR DiS-D series

LINEAR MOTOR LiS-D series

Spindle Motor

- Line-up to meet the various needs of machine tools and contribute to the performance improvement of spindles

SPINDLE MOTOR αi-D series

BUILT-IN SPINDLE MOTOR Bi-D series

Servo Amplifier

- Line-up to be flexibly available for a variety of machine tools and contribute to the downsizing of cabinets

SERVO AMPLIFIER αi-D series

I/O Unit

- Wide range of I/O units compatible with various installation locations and I/O devices.

Optimized for operator's panels with its thin and space-saving design

Standard operator's panel with key input duplication

Safety Machine operator's panel

Compatible with original operator's panels

I/O module for operator's panel

Optimized for control cabinets with high scalability and extensive modules such as the multi-point output/input type and the analog/digital output/input module

Small size I/O unit with improved expandability, workability and maintainability

FANUC Slice I/O

Excellent cost performance with multi-point output/input

I/O unit for power magnetics cabinet

Compact and with reduced wiring

I/O unit for connector panel

Optimized for reduced wiring by enabling distributed setup

Can be positioned near sensors scattered inside and outside the machine cabinet

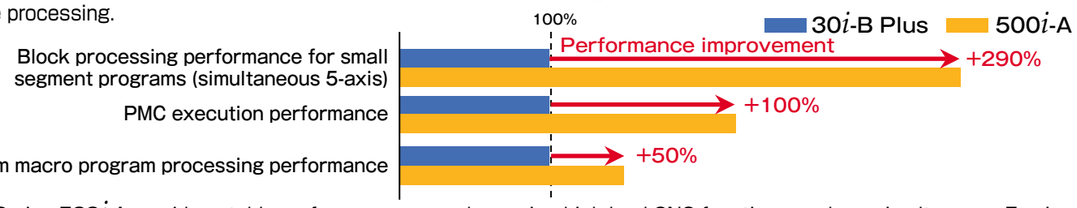
IP67 type

I/O Unit-MODEL B

High Performance

Improved Basic Performance

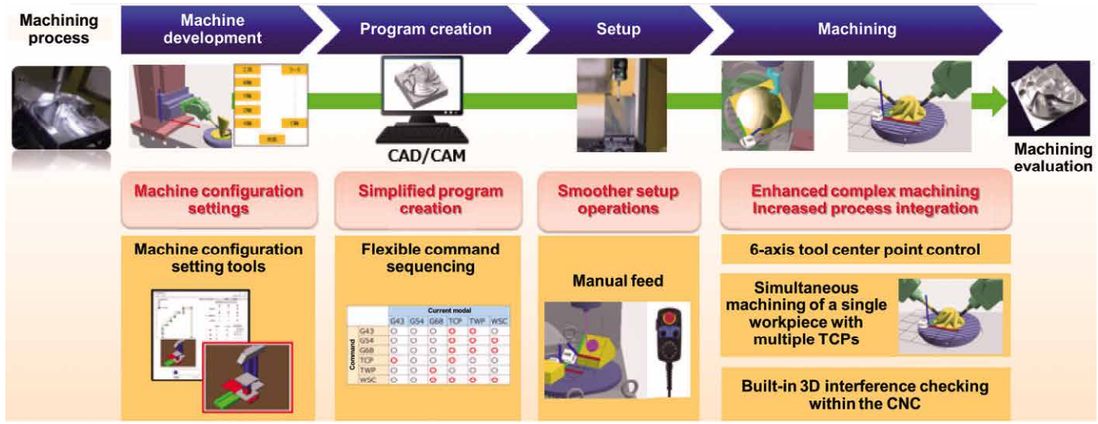
FANUC Series 500*i*-A achieves enhanced basic CNC performance through improved hardware capabilities and optimized software processing.



FANUC Series 500*i*-A provides stable performance even when using high-load CNC functions such as simultaneous 5-axis machining or multi-axis, multi-path functions.

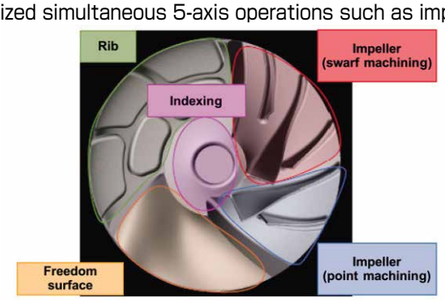
User-Friendly 5-Axis Machining Function Without Limitations

FANUC Series 500*i*-A is a completely new, future-oriented CNC system featuring a software architecture optimized for 5-axis machining. Its 5-axis machining capabilities are designed to meet the increasing market demand for 5-axis machining systems by providing exceptional ease of use throughout the entire machining process, including machine development, program creation, setup, and machining.



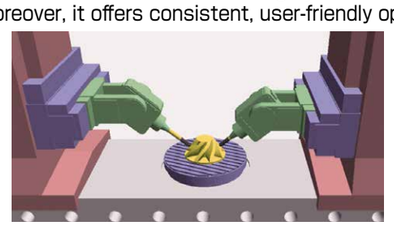
Enhanced 5-axis machining performance

FANUC Series 500*i*-A's 5-axis machining capabilities not only offer greater ease of use but also further improve machining performance. In particular, simultaneous 5-axis control has been further optimized, enabling shorter cycle times for specialized simultaneous 5-axis operations such as impeller machining.



Compatibility with various machine configurations

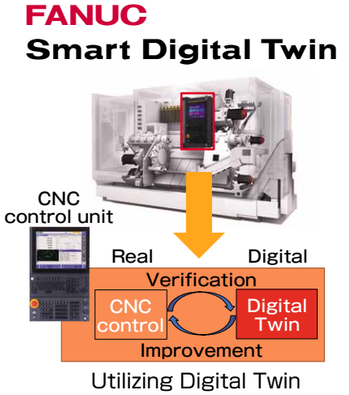
FANUC Series 500*i*-A supports unprecedented, high-value-added machine tools, such as simultaneous 6-axis machining systems and simultaneous 9-axis machining systems that can perform two simultaneous 5-axis operations on a single workpiece. Moreover, it offers consistent, user-friendly operability regardless of the machine's axis configuration.



Utilization of Digital Twin on Machine Tools

Promoting DX in machining sites with Digital Twin

FANUC Smart Digital Twin is the collective name for software that enables Digital Twin of FANUC CNC. This digital technology, featuring Servo Model derived from FANUC's CNC technology, enables simulations with unprecedented accuracy and program optimization functions, enhancing efficiency in machining operations.



Utilizing Digital Twin

Implementing Digital Twin on machine tools with built-in *i*PCs

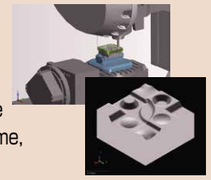
By utilizing the Digital Twin functions on an *i*PC integrated within the control unit, machining programs and CNC settings can be efficiently verified at the machining site.

Ability to install custom applications

Various features enabling FANUC's Digital Twin applications are provided as Library. Using information such as machining time and machine position, you can develop custom applications and install them on machine tools.

Examples of Digital Twin function applications

- Checking machining completion time by Cycle Time Estimation
- Verifying program operation and checking for interference
- Optimizing machining programs (shortening machining time, improving surface quality)



- You can optimize machining programs by using Digital Twin functions on your machine tools.
- By checking programs digitally before actual machining and sending the corrected programs back to the real CNC control unit, trial cutting can be minimized.

Motion Script

Motion Script is a feature that allows you to clearly describe motion commands for peripheral axes, such as loaders or part catchers, that operate according to specific conditions within a CNC program. Motion Script commands can be executed concurrently with control commands from CNC programs. Therefore, peripheral axis operations can be performed independently based on machine conditions, separate from CNC machining operations.

- Since commands can be registered and executed through CNC programs (macro programs), program creation and operation verification are simplified.
- Depending on the machining target or the machine operation being performed, Motion Script commands can be switched accordingly.

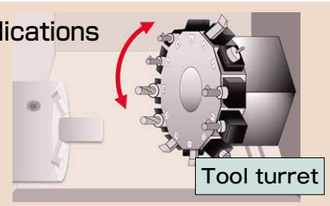
Cycle time reduction through efficient peripheral axis control

For example, in part catcher control, by moving axes using Motion Script triggered by specified conditions separate from the machining sequence, cycle time reduction can be achieved. Additionally, during CNC axis movement, further cycle time reduction can be achieved by modifying speed or compensation values according to conditions.

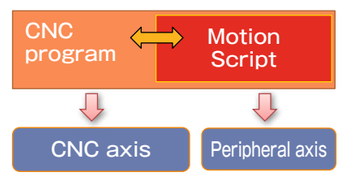
A variety of commands are available, and by combining them to create programs, Motion Script can be applied to various machine operations.

Examples of motion script applications

- Loader (transfer axes)
- Part catcher
- Rotary table
- Tool turret



Motion Script operation concept diagram



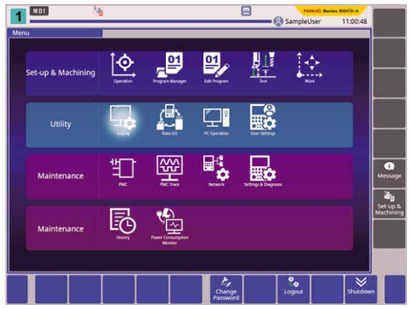
- Machine operations can be executed in coordination through synchronization between CNC programs and Motion Script.
- Real-time performance of peripheral axis operations is ensured, allowing precise synchronization with CNC axes.

Efficient Screen Operation

Ease of Use

FANUC *i*HMI2

FANUC *i*HMI2 is a platform designed for both machine tool users and machine tool manufacturers, providing applications and the environment in which to run them.
It offers high scalability, allowing CNC operation applications and custom applications developed by machine tool manufacturers to be displayed on various sizes of displays with any layout. Additionally, by incorporating web technology, it supports various display formats, including those for mobile devices.
While maintaining continuity with traditional CNC screen operations, it provides an intuitive touch panel interface aimed at the digital-native generation. This operation system is designed to offer ease of use for both existing users and new users of FANUC CNCs alike.

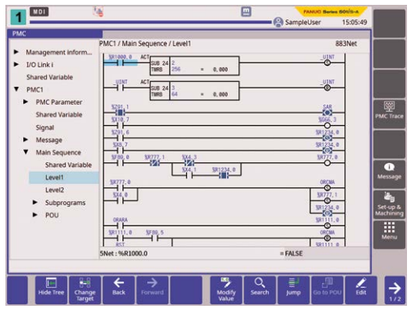


Menu screen

Simple and consistent usability

The setup/machining screen integrates the required displays and operations for each task—Programming, Setup, and Machining—into a single screen, making it easy to switch between them using soft keys and MDI keys. This streamlined approach reduces the number of steps needed for operation and helps shorten work time.
Screens intended for machine tool manufacturers, such as those for FSSB, PMC, and DCS settings, are also consolidated according to their purpose. This consistent operation system allows users to make various settings without confusion, with minimal steps required.

Setup/machining screen

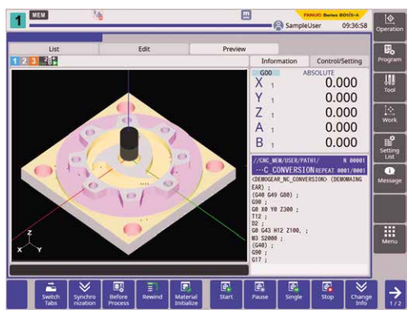


PMC screen

Streamlined setup and machining operations through intuitive control

With intuitive touch panel operation and extensive support functions, setup and machining tasks can be carried out efficiently.

- For programming tasks, the adoption of a new program format (FANUC2022 Program Format) has improved program maintainability and debugging efficiency. Various program input support features make editing programs simpler and more efficient. For example, you can insert preset phrases or M codes from a list, or set cutting conditions to insert servo learning oscillation (G8.5) commands. Reducing manual input of commands shortens program creation time and minimizes input errors.
- For setup tasks, quick manual measurement functions, which enable even inexperienced users to perform measurements easily without confusion, and MDI history functions, which allow reuse of previously executed programs, have simplified and streamlined setup operations.
- Before running programs, you can verify them with Machining Program Preview. Additionally, 3D simulation allows you to check the shape of the workpiece after machining, helping to save time and reduce costs.
- Help functions and diagnostic features assist with problem-solving directly on the machine.



Machining Program Preview

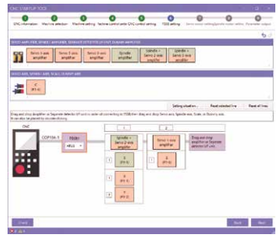
Many Customizable Functions

Ease of Use

Customizable functions are available, which allow machine tool builders to customize their own machine tools

FANUC CNC Design Studio

FANUC CNC Design Studio is PC software that provides powerful support for CNC design and enables efficient development. It offers an integrated environment for CNC configuration and customization by centrally managing CNC design data such as parameters, programs, and customization settings. It also includes essential functions for data creation, editing, and configuration.



Simple machine setup

Simple machine setup

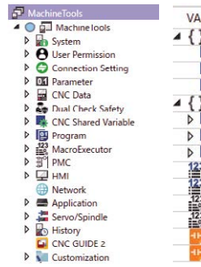
- Equipped with a CNC startup tool that automatically generates parameters from machine configurations, supporting easy machine setup.
- During parameter editing, descriptions are displayed simultaneously. You can also search descriptions, making it quick and easy to edit the desired parameters.

Data migration from FANUC Series 30*i*-B Plus

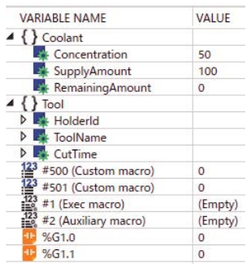
- Data from the 30*i*-B Plus can be batch-converted to data for the 500*i*-A, eliminating the need for manual conversion. The converted data can also be edited as needed.

Integration with customization tools

- Projects from FANUC PICTURE2 and FANUC PMC Programmer can be centrally managed along with various design data.
- Multiple customization functions can be debugged simultaneously on a single screen, providing robust support for the development of advanced customization features that utilize various functions.



Centralized data management



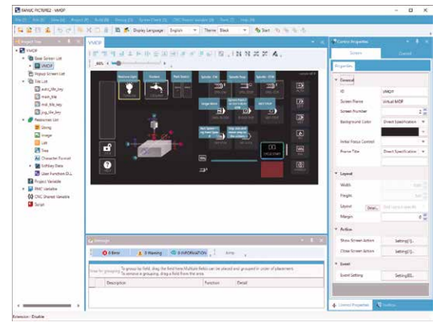
Design data debugging

FANUC PICTURE2

FANUC PICTURE2 is a screen creation tool with redesigned UI that significantly improves the efficiency of developing machine operation screens.
Although the operating system of the FANUC *i*PC, on which the machine operation screens run, is continuously updated to enhance security, the execution engine of FANUC PICTURE2 maintains compatibility, allowing for long-term reliable use.

User-friendly screen creation tool

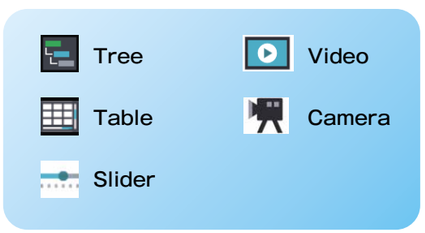
- Resource information such as screen data, variable data, strings, text formatting, images, and styles are centrally managed in a tree structure, making access to each resource simple.
- Enhanced operability for arranging screen components and setting properties. Created screens can be immediately previewed, allowing for quick screen design.
- Improved mruby script editing capabilities, including syntax checking and function insertion features, provide robust support for creating advanced control logic.



FANUC PICTURE2

Extensive screen components

- In addition to traditional components like labels, buttons, and meters, new components such as tree, table, slider, video, and camera components have been added. All components support touch operations, enabling the creation of machine operation screens that offer rich, intuitive interactions.
- Elements from the 500*i*-A operation screens can also be used as screen components. Functions such as displaying current position or editing machining programs can be easily implemented by simply placing the relevant components.



Extensive screen components

Powerful debugging features

- Online debugging is now possible by connecting to CNC or CNC GUIDE 2. Development is further supported by mruby script step-in execution and variable watch functions.

Many Customizable Functions

Ease of Use

Customizable functions are available, which allow machine tool builders to customize their own machine tools

Incorporating Custom Sequence Control with PMC Supporting ST Language

Built-in PMC

Equipped with a powerful dedicated processor and the latest custom LSI, the built-in PMC of the CNC offers approximately double the program execution speed and about three times the memory capacity compared to the 30*i*-B. This allows for sequence control tailored to various machine configurations.

Multi-unit PMC function that replaces external PLCs

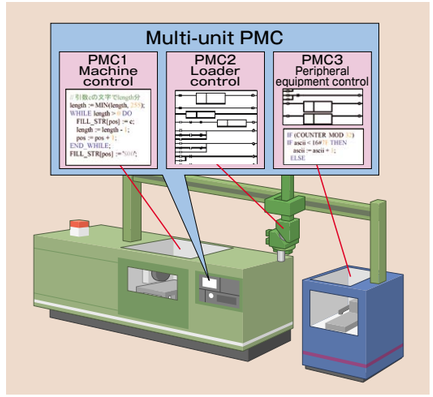
The PMC can execute up to five independent sequence programs, making it applicable for controlling peripheral devices such as loaders. There is no need to prepare an additional PLC for peripheral device control.

Multi-sequence program function supporting modular programming

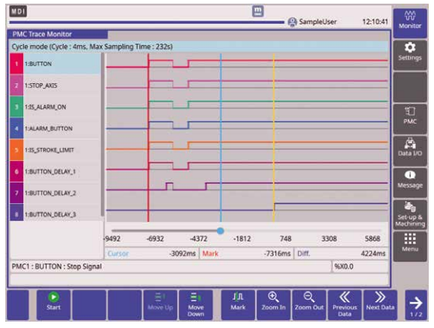
A single PMC system can execute multiple sequence programs. Control for optional machine functions or user-specific functions can be added as separate programs, enhancing flexibility.

Built-in diagnostic functions that significantly improve development efficiency

The status of various PMC data and the execution state of sequence programs can be verified on the CNC display. You can diagnose signal transitions and modify ladder programs without using a PC.



Multi-unit PMC



Built-in diagnostic functions

FANUC PMC Programmer

FANUC PMC Programmer is a programming tool with rich features and excellent usability, providing an efficient development environment for creating sequence programs.

Supports ST (structured text) in addition to ladder language

Provides a programming environment compatible with IEC 61131-3 for ST language. By using the appropriate language for the task, such as ladder language for I/O control and ST language for numerical calculations, you can optimize the programming process.

Variable programming without address management

Programming with variables allows for powerful data type checking and optimized memory allocation, making it easy to create robust programs. By defining the optimal scope for each variable, the tool strongly supports program structuring and data localization.

Versatile data types enabling flexible programming

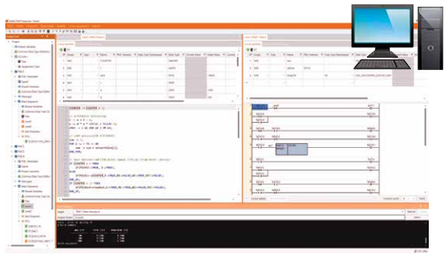
A variety of data types compliant with IEC 61131-3 (e.g., integer, real, string, date, and time types) are available. Additionally, you can define custom data types such as arrays and structures.

Modular programming with functions and function blocks

Programs can be modularized using functions and function blocks, enhancing readability and facilitating reuse. Functions and function blocks can be created using either a ladder language or ST language, and it is possible to call an ST language from a ladder language or vice versa.

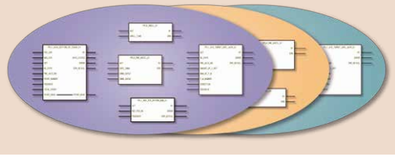
Extensive PMC library collection providing rich functionality

Efficient development can be achieved by utilizing the PMC library collection provided by FANUC PMC Programmer. Not only can you use standard functions and function blocks compliant with IEC 61131-3, but CNC control-specific functions and function blocks, such as PMC axis control, are also available.



FANUC PMC Programmer

- PMC axis control
- CNC functions
- Operations
- Others



PMC library collection

Enhanced Safety Features

Ease of Use

Compliance with High Safety Standards

The safety level has been improved to comply with the following standards:
- IEC 62061: Supports up to maximum SIL 3 (some functions support maximum SIL 2)
- IEC 61508: Supports up to SIL 3 (some functions support SIL 2)
- ISO 13849-1: Supports up to Category 4, PL e (some functions support Category 3, PL d)

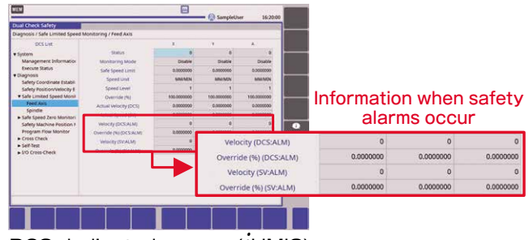
Expanded Scope of Application and Cost Reduction in Machine Safety Design Through Dual Check Safety (DCS)

Dual Check Safety (DCS)

FANUC CNC's safety functions comply with international standards for machine safety.

Expanding applicable machine configurations through safety specification enhancements

- Increased the maximum size of safety ladders to 24,000 steps.
- Expanded safety-limited speeds to 8 levels and safety machine positions to 8 points.
- Increased the number of safety position switch operating ranges to 192.



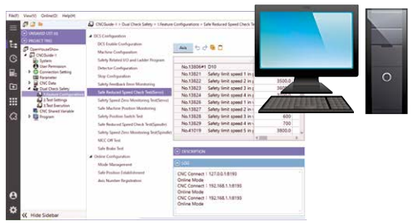
DCS-dedicated screen (*i*HMI2)

Improved DCS-dedicated screens for reduced design and maintenance workload

- Enhanced operability by consolidating information for all safety functions into a single screen.
- Supports investigation of causes by retaining information when a safety alarm occurs.

Shortened machine startup process through enhanced PC tools

Safety functions can be designed and verified on a PC before actual machine startup.
- The Safety Parameter Setting Support Tool enables easy DCS setup.
- Safety functions can be verified using CNC Guide 2.



Safety Parameter Setting Support Tool (Runs on CNC Design Studio)

Network Support

Ease of Use

Various Networks Promoting IoT for CNC Machine Tools

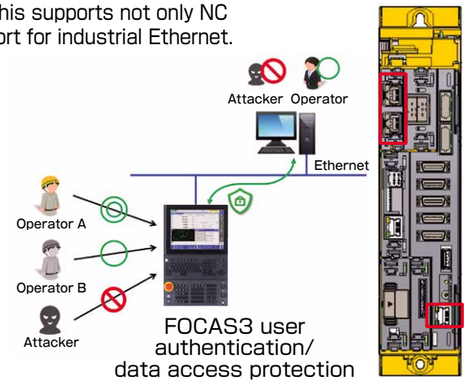
Standard support for Gigabit Ethernet with up to 1 Gbps across 3 ports. This supports not only NC program transfer and communication via FOCAS3, but also standard support for industrial Ethernet.

FOCAS3

Allows reading and writing of internal CNC data.
- Supports user authentication and data access protection, preventing access from attackers and protecting against unapproved user access.
- Also supports encrypted communication.

SMB

Supports SMB (Server Message Block) communication, enabling file sharing with Windows PCs.
- File input and output can be performed using Explorer on Windows PCs.

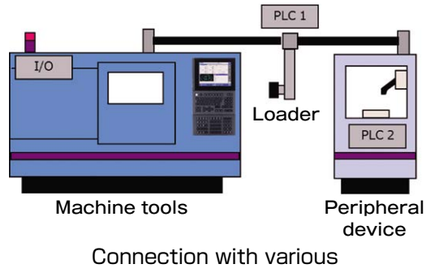


FOCAS3 user authentication/ data access protection

Industrial Ethernet/Field network

Supports the following industrial Ethernet communication and field network communication:
- PROFINET IO Controller/IO Device
- EtherNet/IP Scanner/Adapter
- FL-net
- Modbus/TCP Server
- PROFIBUS Master/Device
- DeviceNet Controller/Device

These networks allow controlling various peripheral devices such as waterproof I/O devices, collecting sensor information, and connecting with loaders and other peripheral equipment.



Connection with various communication devices

Service & Support

Excellent Maintenance Services

FANUC service team delivers customer trust and confidence based on direction of service “Maximizing Uptime”, “Global Service” and “Lifetime maintenance”.

Service First

Conforming to the spirit of “Service First”, FANUC provides lifetime maintenance to its products for as long as they are used by customers, through more than 270 service locations supporting more than 100 countries and regions throughout the world.

Maximizing Uptime

Global Service

Lifetime Maintenance

FANUC ACADEMY

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

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