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EMO2023

EMO Hannover 2023 was held in Hannover, Germany, for six days from September 18 (Mon.) to September 23 (Sat.), 2023. Approximately 92,000 people from all over the world attended the exhibition.

At the FANUC booth, new products and new functions along with solutions that can be provided as “one FANUC” in manufacturing sites were introduced. Many live demonstrations were performed, including automation by combining machine tools with robots.



In the FA (Factory Automation) area, new products, such as the FANUC Series 500i-A and the α i-D series SERVO, were displayed, stimulating much interest among visitors. The various Digital Twin applications and FANUC's IoT product, FIELD system Basic Package, were well received, being in line with the recent trend toward digital transformation.

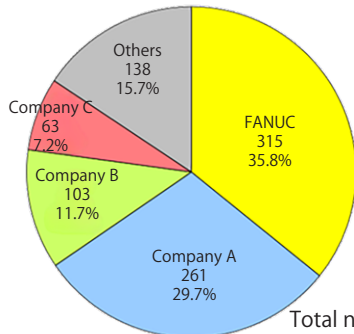
In the Robot area, machining, assembly, handling and other applications were exhibited, proposing the diverse automation methods using FANUC robots. The exhibits consisted of milling by an R-2000iC/190S, a CRX-20iA/L collaborative robot screwing with high-torque, and heavy cast handling by an M-2000iA/2300. Such exhibits attracted much attention.

In the Robomachine area, the high machining and molding performances of Robodrill, Roboshot, and Robocut were highlighted, earning high praise. In addition, a FANUC robot, a measuring instrument and an AGV (Automated Guided Vehicle) were integrated into a system which automated machining, unloading, transporting, and measuring of workpieces. This exhibit also captivated visitors.

In the Service area, the manner in which lifetime maintenance ensures safe and reliable use of FANUC products worldwide was explained, and a video of customers' feedback regarding FANUC's services was shown.

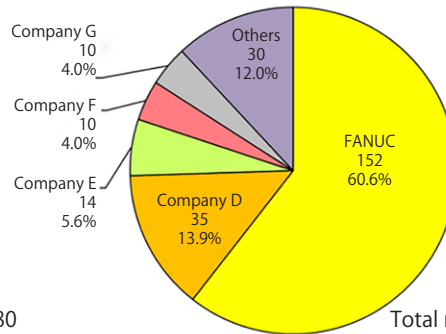


The shares of machines and robots exhibited at EMO are shown below. We would like to express our deepest gratitude to our customers who exhibited our products in their booths.



Total number of units: 880

CNC shares



Total number of units: 251

Robot shares (excluding robots at FANUC's booth)

Shares of FANUC CNCs and FANUC robots at EMO [based on FANUC's data]



On the evening of Monday, September 18, FANUC hosted an event for customers, who came not only from Europe, but also from the U.S., Japan, and other Asian countries. Speeches by President Yamaguchi of FANUC CORPORATION in Japan and President Ghirardello of FANUC Europe were followed by a toast by Chairman Dr. Y. Inaba. Guests enjoyed food and wine while pleasantly chatting with one another.



Four Seasons of FANUC

When mornings and evenings start to become chilly, autumn flowers bloom one after another, inviting insects to compete and gather in the forests surrounding FANUC.

Lychnis miqueliana Rohrb



Cimicifuga simplex



Inula britannica

Introduction of New Products and New Functions

FA New Product FANUC Series 500i-A

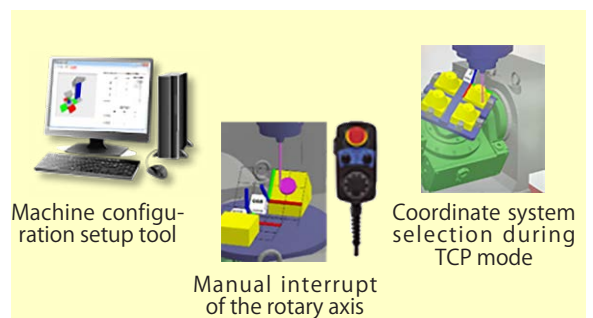
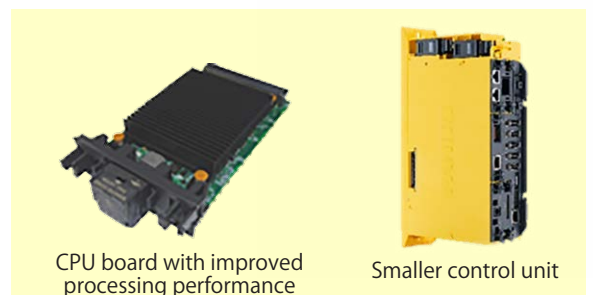
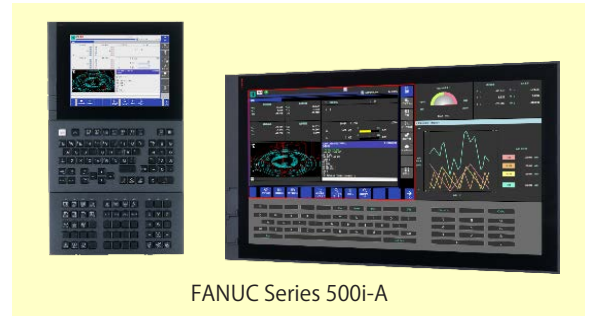
In recent years, the business environment of machine tools has been changing more than ever before. Examples can be seen in labor shortages in the manufacturing industry, the old generation of skilled engineers being replaced by a new generation, changes in machine tools and machining technology to adapt to the transformation of the industry structure, and strong demands to reduce energy costs. The FANUC Series 500i-A is the latest CNC developed with a completely redesigned platform to address such changes. To cope with the ongoing labor shortage problem and generational changes of skilled engineers, implementing functions required for machine tools and using a new IDE (Integrated Development Environment) to design original operation screens has been made extremely easy and also in a natural form. Various challenges can be overcome by integrating CNC technology with digital technology to expand the platform to include machine tools in digital space (digital machines), and using this platform in combination with the entire factory system, including a networked group of machine tools (edge) and use of a cloud. In addition, by combining this CNC with the α i-D series SERVO, enhancements of the high-speed and high-precision of servo control as well as energy cost reduction can be accelerated in machine tools.

- New Hardware

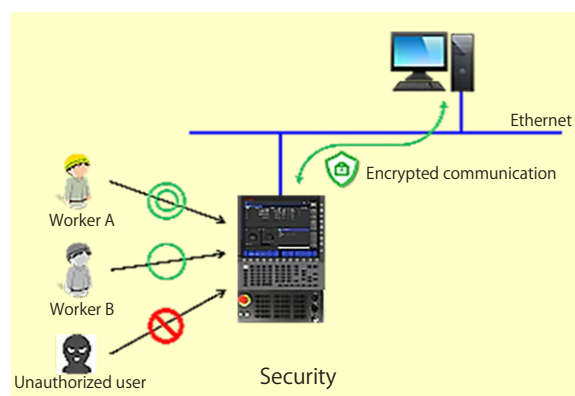
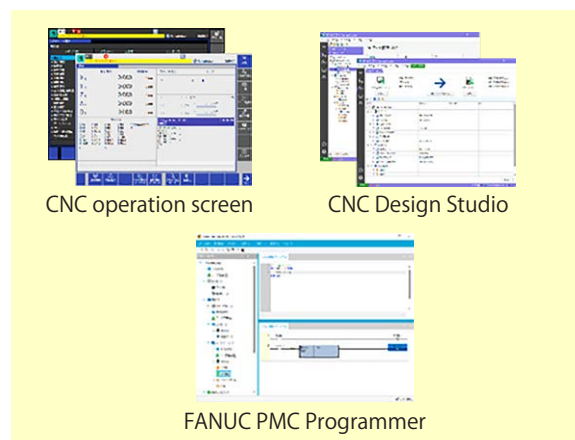
The control engine of the FANUC Series 500i-A uses parallel processing for all CNC software, resulting in 2.7 times higher performance compared to conventional models. This is the first case of adopting a dual-engine architecture consisting of a control engine and a UI engine. This configuration maximizes the performance of the engine dedicated to control, a key feature of FANUC CNCs. The structure of the control unit has been totally redesigned to decrease the size and enable even better maintainability. The latest battery-less memory technology is also adopted, greatly reducing the risk of unexpected CNC data loss. A battery-less CNC system can be configured by combining this memory technology with the battery-less pulsecoder. Moreover, the reliability that FANUC has continuously been refining has been further improved.

- Advanced 5-Axis Machining Function

Simultaneous 5-axis control technology will become increasingly important in the future not only for machining complex shapes such as impellers and blades, but also for process integration and productivity improvement. Examples are multi-face machining without requiring setup changes, and highly efficient tool side milling. The software for 5-axis control of the FANUC Series 500i-A has been completely redesigned to make 5-axis milling machines easier to use. There is more freedom in program command description, and setup for manual operation has become easier. Also, a wide variety of machine configurations can easily be adapted to.



- Redesigned CNC Operation Screen**
 A new operation screen designed to improve usability in machining sites is included as a standard feature. The screens for setup and machining have been unified to greatly improve workability. Also, intuitive touch operation makes the screen easy to use by improving the display procedure and operating methods of the operation screen.
- Brand New Development Environment**
 The environment for developing the functions and screens required for each machine has been renewed. FANUC's custom CNC screen design software, FANUC PICTURE2, facilitates the development of customized operator screens or HMI screens that can easily be imported and exported in a format directly executable by the CNC. The HMI is easy-to-understand and a rich variety of tools is available. FANUC PMC Programmer streamlines machine logic design with the easy-to-use ST (Structured Text) programming language. In addition, CNC Design Studio centralizes data necessary for electrical design by cooperating and integrating with several setting tools and simulation software such as CNC GUIDE 2.
- Security and Safety**
 The concept of networking machine tools to optimize the entire factory in order to increase productivity is rapidly becoming widespread alongside digital and IoT technologies. This makes security measures to prevent unauthorized access and information from leaking extremely important. For this reason, the FANUC Series 500i-A encrypts Ethernet communication, implements user authentication and means for protecting access to data. To achieve a higher level of machine safety, the international safety standard IEC61508/ISO13849-1 safety category 4, SIL3, and PLe certifications have been obtained.

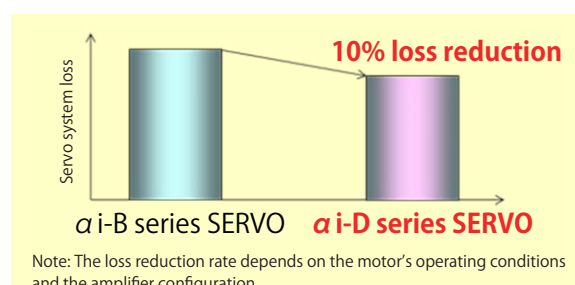


FA New Product *α* i-D series SERVO

To respond to changes in the business environment of machine tools, the *α* i-D series SERVO, which features completely new motors, amplifiers, and servo control software, has been released. In addition to higher performance as a servo system that can respond to changes in machining technology, the FANUC *α* i-D series SERVO is a new generation of servo systems that is easier to use with its compact size and less wiring, as well as saving machine energy by reducing loss.

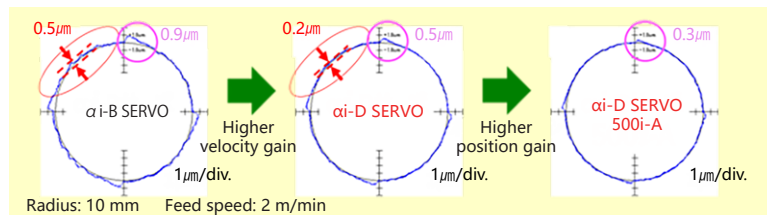


- Energy Efficiency of the Entire System**
 The *α* i-D series SERVO system reduces overall losses by approximately 10% compared to our conventional systems. This is made possible through its highly efficient motors and current control, state-of-the-art power devices, and unique low-loss AC reactor. As for large servo motors, which are used in servo presses among others, motor power loss is approximately 30% less than before.



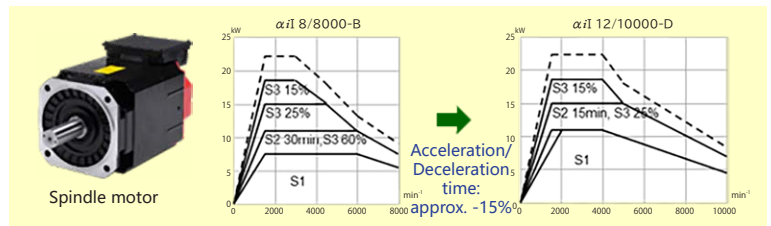
- Servo Motor

The α i-D series SERVO motor has better maximum torque features and maximum rotational speed which reduce the machine's cycle time. A battery-less pulsecoder can be selected for all models, and the standard protection rating has been upgraded to IP67. Thus, maintainability and reliability are enhanced. Cogging torque (uneven torque created by the magnetic attractive force between magnets on the rotor and the iron core) has been further reduced, resulting in smoother feeding. In addition, the faster communication speed of the pulsecoder (motor speed detector) allows for higher gain control (control with high responsiveness). In the example on the right, by using the α i-D series SERVO motor, the velocity gain has gone up, and shape errors and position deviation when the motor's direction is reversed have decreased by about half. Precision and machining quality is even higher when used in combination with the FANUC Series 500i-A.



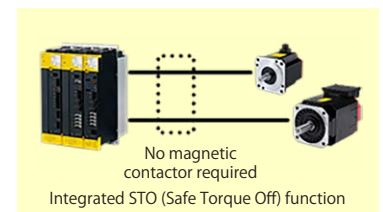
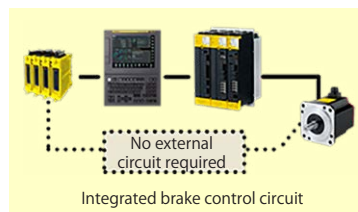
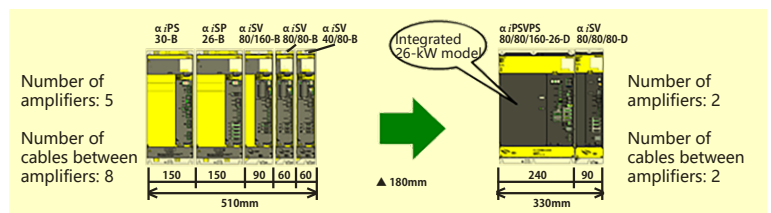
- Spindle Motor

The improved acceleration/deceleration output features shorten the cycle time, and enhancements in the continuous output feature and higher maximum rotation speed boosts machining performance. The vibration level of the standard model has been improved, making machining more accurate.



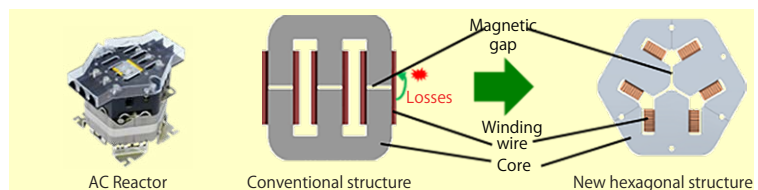
- Servo Amplifier

The width of the servo amplifiers has been decreased by a maximum of 30%, allowing control cabinets to become smaller. The all-in-one type amplifier lineup has been expanded to include a 26kW model in order to support a variety of configurations. Besides the brake control circuit being embedded, the STO (Safe Torque Off) function, which requires no external wiring, is available when used in combination with the FANUC Series 500i-A. This reduces the amount of wiring and improves ease of use. For failure prediction, all models, including all-in-one type amplifiers, have an insulation deterioration detection function which enables preventative maintenance. For maintainability, the configuration has been designed to allow the fan motor to be replaced without removing the DC link short bars, while the amplifier is kept mounted on the control panel, thus reducing replacement time.



- AC Reactor

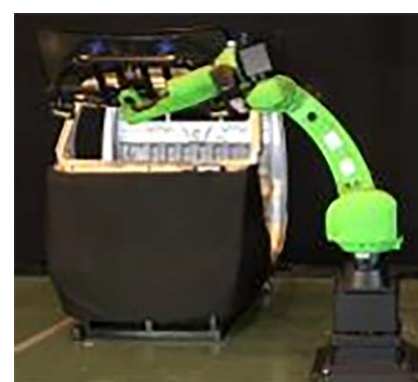
The AC reactor's unique new hexagonal structure reduces losses due to leakage flux across the coil, thereby saving energy.



ROBOT New Product FANUC Robot CR-35iB and CRX-25iA with High Payload Capacities

FANUC has introduced two new high payload models to its much praised CR and CRX series collaborative robots.

- With no changes in the mechanical unit, the high payload type CR-35iB is capable of handling 50 kg, which is 1.4 times more than the former 35 kg. The wrist inertia has been increased by about three times. The reach is 1,643 mm, while the wrist can freely move in any direction without restriction, such as being limited to a downward position.
- Though no safety fences are required when using a collaborative robot, its high payload capacity and high inertia makes it capable of being used in handling and assembly applications of large workpieces, such as automobile windshields.
- The high payload type CRX-25iA has also been enhanced without changing the mechanical unit. Payload has been increased by 1.2 times from 25 kg to 30 kg. The reach is 1,756 mm, and the posture of the wrist can be adjusted freely without limitation, such as only being downward.
- In addition, the CRX series can now be used for palletizing large workpieces, handling heavy workpieces, and double-handed gripper, none of which were possible with the previous CRX series.
- Both models can be converted to the high payload type by updating the software. Therefore, robots currently in use can also be turned into a high payload type without changing the mechanical unit.



Transporting a high inertia workpiece (windshield)

The introduction of the high payload type expands the application range of collaborative robots and contributes to further improvements in productivity.

ROBOT New Function Palletizing Mode

FANUC has launched a robot palletizing mode function to promote automation of logistics systems.

- When palletizing and depalletizing cardboard boxes using a robot, the robot is often moved from a high position to a low position. In conventional systems, attention had to be paid in programming to avoid passing through a point in which the robot's wrist was fully extended and prohibited linear motion (singular point).
- With the new palletizing mode function, control can be switched by each program in order to keep the robot's wrist facing up or down at all times. This allows for linear motion while maintaining the box posture even when the motion passes through a singular point as mentioned above.
- This eliminates the burden of inclining the hand mounting posture to avoid the singular point. With the hand mounted straight on the wrist and with a natural linear motion, palletizing and depalletizing systems can be built more easily.
- This function is a standard feature of the CRX series and is also available as an option on other models such as the M-710iD/50M.

FANUC promotes robotization of palletizing to support improvements in customers' productivity.



Palletizing by a CRX-25iA
(The photo shows the area around the singular point when the wrist is fully extended.)



Palletizing by a M-710iD/50M
(The photo shows the area around the singular point when the wrist is fully extended.)

ROBOMACHINE New Product ROBODRILL α -D28LiB5_{ADV} Plus Y500

The α -D28LiB5_{ADV} Plus Y500 with a Y-axis stroke of 500 mm and a tool storage capacity of 28 tools has been added to the compact machining center ROBODRILL α -DiB Plus series.

- The Y-axis stroke has been extended by 100 mm from previous specifications to accommodate large workpieces such as EV components, which has been increasing in volume in recent years. The work space of the table has also been extended to a depth of 500 mm to enable mounting of larger fixtures. Also, in response to demands to merge processes, a larger turret with a tool storage capacity of 28 tools has been newly developed.
- By enhancing the rapid traverse rate and acceleration of the Z-axis as well as applying automatic table loading capacity setting function and the latest FA functions, the cycle time has been further reduced compared to previous models.
- Also, to facilitate the replacement of existing equipment, the depth of the machine has only been increased by 65mm compared to previous specifications. The front of the machine is closer to the table, thus reducing the operator's burden during setup.
- The DDR-T, a trunnion unit with an additional 1-axis rotary table dedicated to ROBODRILL, is also available with a 540 mm diameter turning plate for optimal use of the Y-axis stroke.



FANUC ROBODRILL α -D28LiB5_{ADV} Plus Y500



Turret with a tool storage capacity of 28 tools

The expansion of the scope of applications of the α -DiB Plus series will contribute to improving the productivity of our customers.

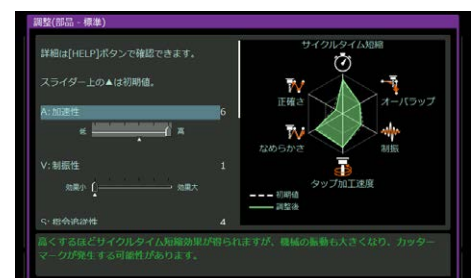
ROBOMACHINE New Function ROBODRILL α -DiB Plus series Machining Mode Setting Function 2

The machining mode setting function enables users to select the machine's operating parameters according to the purpose, such as cycle time reduction, high-precision machining, or fine surface machining. The Machining Mode Setting Function 2, which offers improved performance and ease of use, has now been released.

- The number of parameters that can be adjusted in machining mode has been greatly expanded, and many new machining modes (parameter sets) that incorporate the latest FA functions are available. This further reduces the cycle time, and improves the performance of high-precision machining and fine surface machining, compared to conventional machining modes.
- The newly developed intuitive and easy-to-use screen simplifies and accurately selects the most suitable machining mode for the machining purpose.
- An adjustment screen is also available for users who want to fine-tune the machining mode based on the machining results. Adjustment is made easy by a guidance menu that eliminates concerns about making operational mistakes, along with a radar chart that shows the effects of adjustment at a glance.



Machining mode selection screen



Machining mode adjustment screen

Machining Mode Setting Function 2 facilitates cycle time reduction, high-precision machining, and fine surface machining, thereby contributing to the improvement in productivity of our customers.

FANUC Factory Introduction

Increasing the Capacities of the Tsukuba ROBOT Factories

The Tsukuba Robot Factory #1 began operation in August 2018 and has significantly increased its production capacity in order to meet strong demands for robots. FANUC has succeeded in increasing the number of units that can be produced by approximately 50% compared to what was initially planned, by making a series of revisions in the manufacturing process. This has resulted in a production capacity of more than 15,000 robots per month when combined with the production in the Headquarters' Factories.

At Tsukuba Robot Factory #1, the automated warehouse and transport lines have been expanded, assembly cells automated by robots have been set up, and the collaborative robot CRX has been introduced to the manual assembly process to improve the quality of bolt tightening and reduce the number of workers required. To ensure high reliability, assembled robots undergo rigorous testing, including continuous operation tests at a test site. By analyzing data on quality collected from the past, the operating conditions for the continuous operation tests have been revised, which has enabled the operating time to be shortened. This has significantly reduced test lead time

and has improved the turnover rate. In recent years, demand has been rapidly growing for robots with high payloads, such as those for transferring battery units of electric vehicles. To meet this demand, FANUC has more than doubled the production capacity of the M-1000iA and M-2000iA robots with payloads exceeding 1-ton.

In November 2022, the finished products warehouse was expanded. Prior to this, robots to be shipped overseas were transported by truck to a logistics company near the port, where export packaging and vaning into containers were performed. With the new finished products warehouse, export packaging and vaning of small robots can be handled in-house, and truck transport has been replaced by transport of containers by trailers which has improved loading efficiency. The reduction in the number of trucks helps to promote carbon neutrality and solve the "2024 driver problem" where there will be a shortage of truck drivers.

The Tsukuba ROBOT Factories will continue to improve their supply capacities by increasing efficiency, and will stably supply the high quality robots that customers desire.



Automated assembly cells



Collaborative robot in a manual process



Tsukuba Robot Factory #1/Finished products warehouse

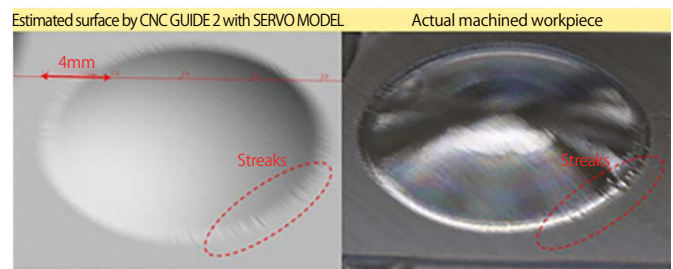
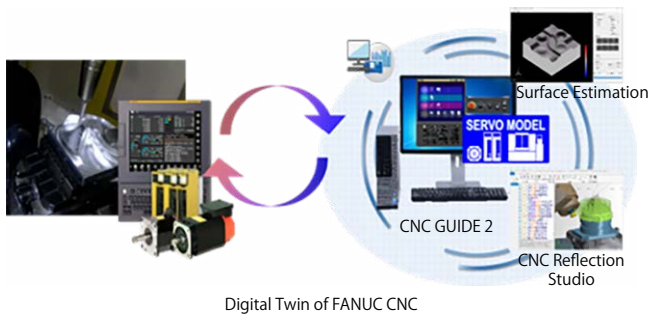


M-1000iA and M-2000iA production line

Digital Twin of FANUC CNC Won the “Japan Society for Precision Engineering Technology Award 2023”

Digital Twin of FANUC CNC was highly appraised and received the “Japan Society for Precision Engineering Technology Award 2023” for its “highly accurate simulation technology that takes into consideration the dynamics of machine tools.” Machining simulation quality improved dramatically by using Servo Model that simulates servo control and machine characteristics in CNC GUIDE 2, a CNC simulator. This has brought about higher productivity in machining sites and reduces the number of test cuts, resulting in lesser materials, tools, oil, and electricity that are used, contributing to reducing the environmental footprint.

“High-Speed Simulator of a Numerical Controller Considering Axis Dynamics for Realizing High Precision Digital Twin of Machine Tools”



* The Japan Society for Precision Engineering Technology Award is presented to researchers and engineers from companies who have made innovative achievements in the field of precision engineering to honor their dedication and efforts, along with expectations for future developments related to precision devices and research and development on production and processing technologies.

The 19th All Japan Student’s Indoor Flying Robot Contest —

The 19th All Japan Student’s Indoor Flying Robot Contest was held at Katayanagi Arena on the Kamata Campus of Nihon Kogakuin College from September 22 (Fri.) to September 24 (Sun.), 2023.

The contest instills manufacturing spirit among students of universities, colleges of technology, high schools and others, and serves as a good occasion for developing their manufacturing skills, especially in the areas of aircraft design and control.

It is also a valuable opportunity for students to think about their own careers and make contact with companies which are sponsors. This year’s event was a huge success, with a record-breaking 76 teams from 35 schools participating.

Participants competed in the categories of flight performance, flight control, and autopiloting of aircrafts by completing missions such as transporting goods and automated flights.

FANUC has been a special sponsor for this contest, which brings together skilled students who can immediately take on professional work. This year, the FANUC Award was presented to the Kanazawa Institute of Technology, the winner in the autopilot category.



Scene from the contest



Awards ceremony



Robot on display

2023 FANUC Global Service Conference

The 10th FANUC Global Service Conference (FS Conference) was held for the first time in four years for three days from July 19 (Wed.) to July 21 (Fri.) at FANUC Headquarters. More than 450 employees, including 127 from overseas group companies, gathered to exchange many ideas and enthusiastically discuss how to improve services.



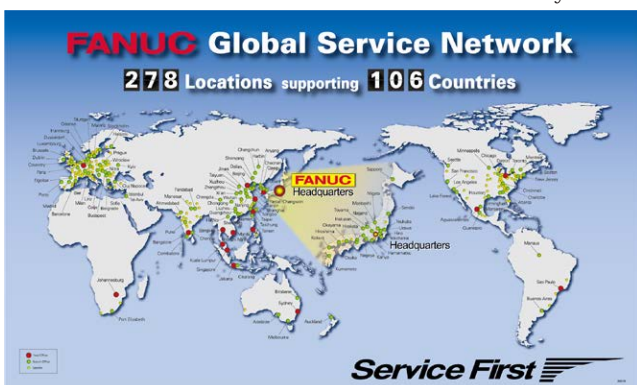
After the opening speech by President Yamaguchi, the award for the top service person of the year was presented. This was followed by discussions on keyword topics, such as “design considering maintainability,” “knowledge,” “preventative maintenance,” “traceability,” “remote maintenance,” and “sustainability.”

On the first day of the Conference, each of the three business divisions consisting of FA, Robot, and Robomachine held their own discussions. A lively exchange of opinions took place during product explanations while viewing the actual latest models.

On the second day, after reviewing the service direction and keywords in the service business session, participants were separated into working groups to actively discuss topics such as digital transformation in service, maintenance parts, training, safety, maintenance tools, maintenance parts repair, after sales, and global maintenance performance.

On the final day, a plenary session was held with all participants in attendance, including Dr. Y. Inaba, President Yamaguchi, and relevant executives. Here, the service status and improvement activities of each company along with the results of the meetings of the previous two days were reported.

FANUC will keep on challenging without fear of change, based on the company’s fundamental policy of “Strict Preciseness and Transparency,” and by promoting the key slogans of “one FANUC,” “Reliable, Predictable, and Easy to Repair,” and “Service First.” FANUC further aims to deliver a sense of security to customers worldwide that their factories will not stop.

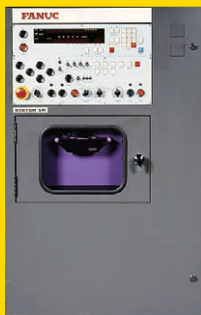


Service First

Conforming to the spirit of “Service First,” FANUC provides lifetime maintenance for its products through more than 270 service locations in over 100 countries throughout the world.

one FANUC
fe-robot-robomachine

The three businesses of FA, ROBOT and ROBOMACHINE are unified with SERVICE as “one FANUC,” to provide innovation and reassurance to manufacturing sites around the world.



FANUC's History Series 10
FANUC SYSTEM 5

Developed in 1976, the FANUC SYSTEM 5 was the first general-purpose CNC to use a microprocessor.

This CNC was made smaller by using a single-chip CPU and integrating components to a great extent.

EPROM, with which the memory data can be erased and rewritten, was adopted to store the control program. Conventionally, machine manufacturers used relays for sequential circuits on the machine side. By incorporating a sequential circuit as part of a CNC function, the FANUC SYSTEM 5 increased the reliability of the machine tool in addition to reducing costs.



FANUC CORPORATION

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