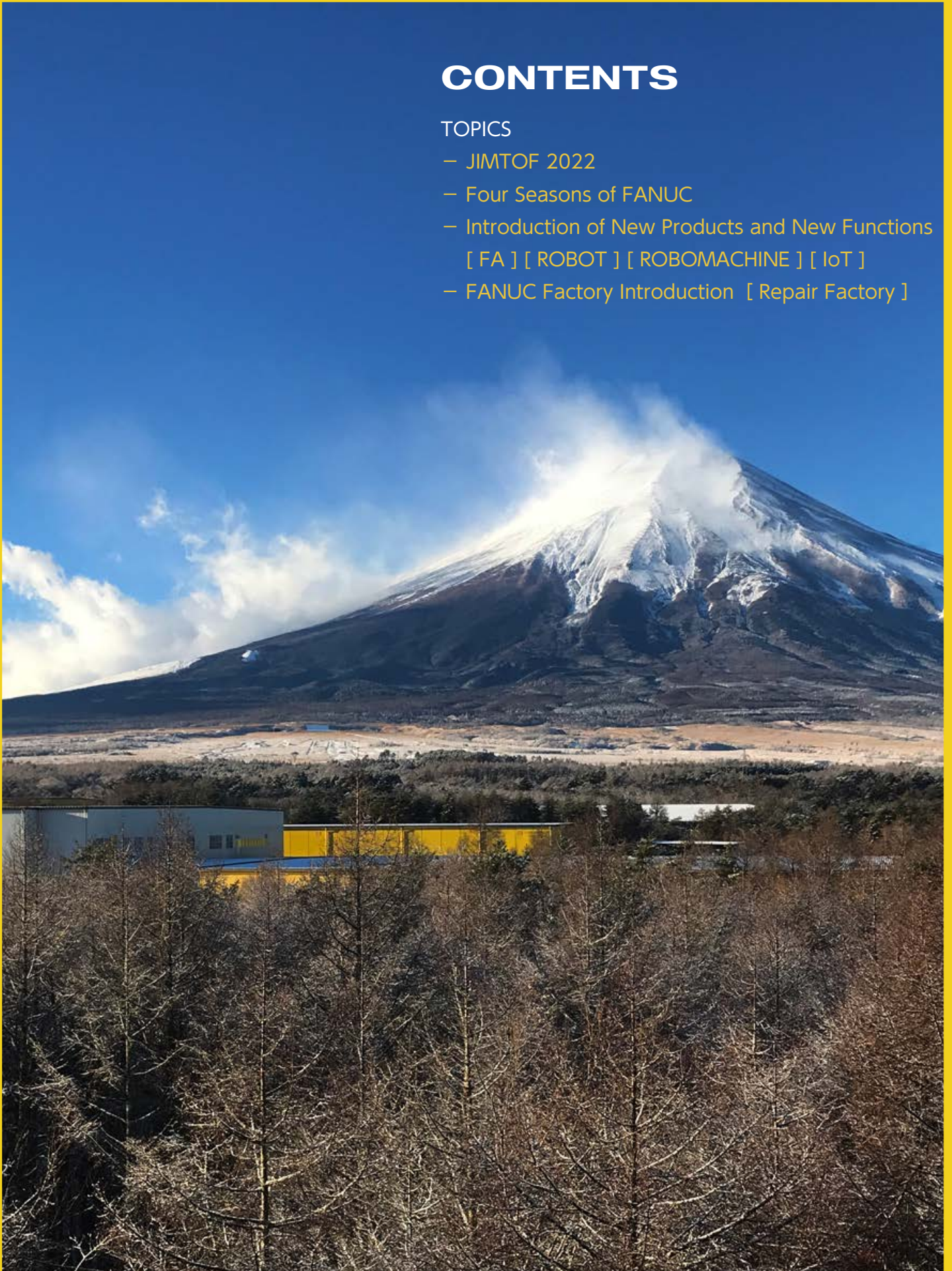


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JIMTOF 2022

For six days from November 8 (Tue) to 13 (Sun), 2022, JIMTOF 2022 (the 31st Japan International Machine Tool Fair) was held in Tokyo Big Sight.

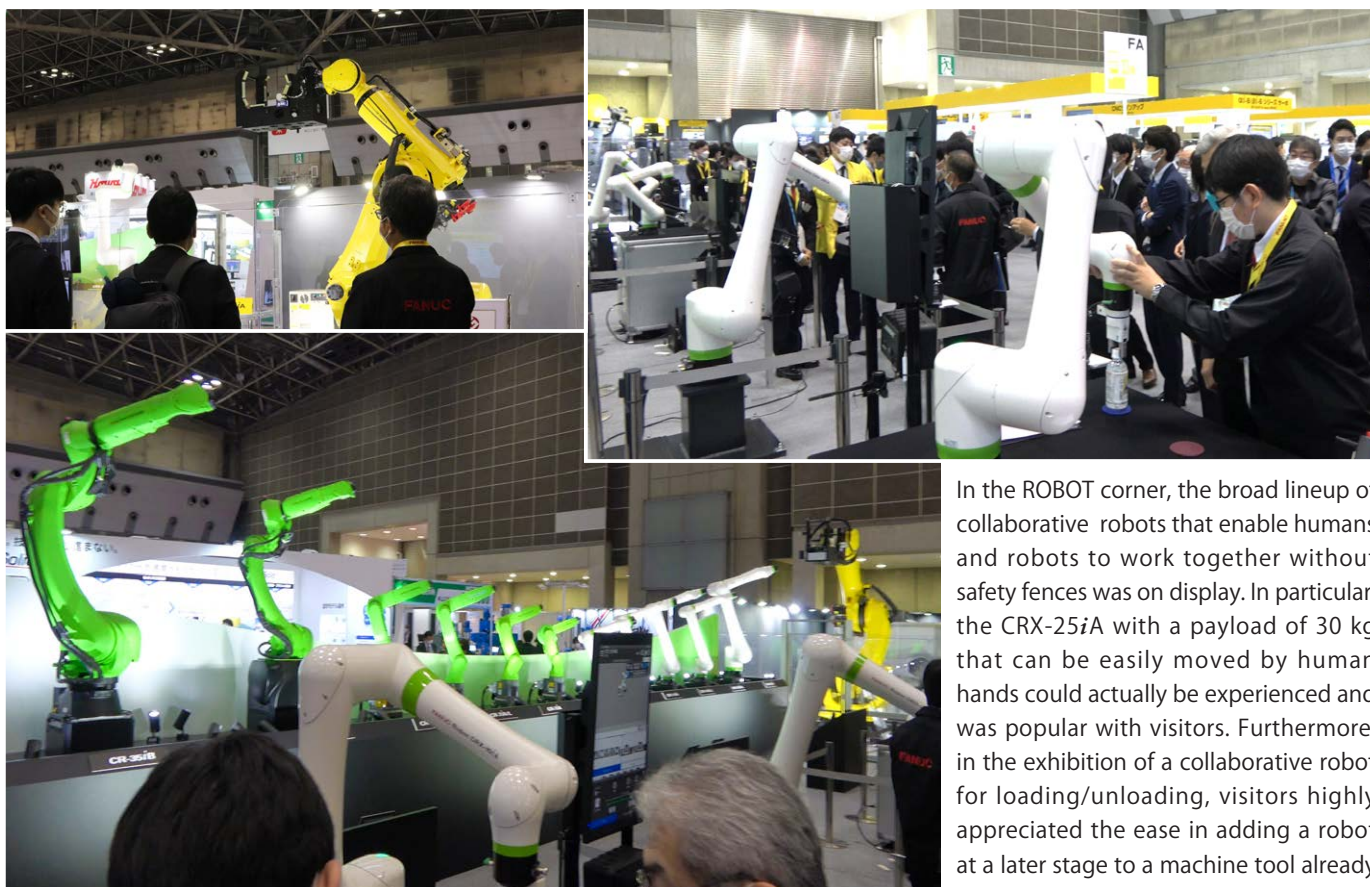
The event was held as a physical exhibition for the first time in four years, and every hall of Tokyo Big Sight was used as the exhibition space, making the 2022 event the largest in scale in its history. The venue was vibrant with many visitors from Japan and abroad, with a total of 114,000 visitors.



The FANUC booth welcomed many visitors, where many latest technologies of FANUC were introduced. These included displays of the newest CNCs, a corner to actually experience the use of collaborative robots, and live demonstrations of ROBOMACHINES. Much positive feedback was received.



In the FA corner, the latest lineup of CNCs, such as the Series 30i-B Plus and Series 0i-F Plus with improved machining capabilities, along with Digital Twin and FIELD system Basic Package for enhancing the efficiency of manufacturing sites were exhibited. These were praised by visitors. In addition, functions that contribute to energy conservation of machine tools attracted much attention. These included the benefits of space conservation and durability in harsh environments of FANUC Slice I/O, FANUC TOUGH TOUCH of FANUC iPC with improved operability, and AI Servo Tuning for easy and reliable servo settings.



In the ROBOT corner, the broad lineup of collaborative robots that enable humans and robots to work together without safety fences was on display. In particular, the CRX-25iA with a payload of 30 kg that can be easily moved by human hands could actually be experienced and was popular with visitors. Furthermore, in the exhibition of a collaborative robot for loading/unloading, visitors highly appreciated the ease in adding a robot at a later stage to a machine tool already in use.

In the ROBODRILL corner, 5-axis indexing machining of large workpieces drew attention, and machining techniques transformed into easily usable functions, received good feedback.

In the ROBOCUT corner, features such as high precision die cutting and support for automation attracted much attention. Also, the improvement of the automatic wire feeding function "AWF3" impressed visitors.

In the ROBOSHOT corner, metal powder injection molding of medical parts using a mold machined by a ROBOCUT received good reviews.



In the SERVICE corner, AI Servo Monitor, ZDT (zero down time), FabriQR Contact, and FANUC's approach to lifetime maintenance made a very good impression.

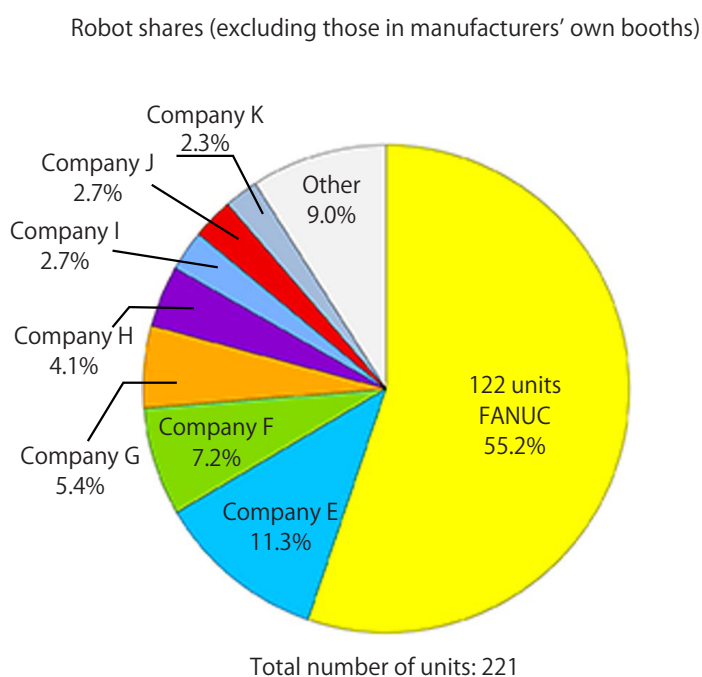
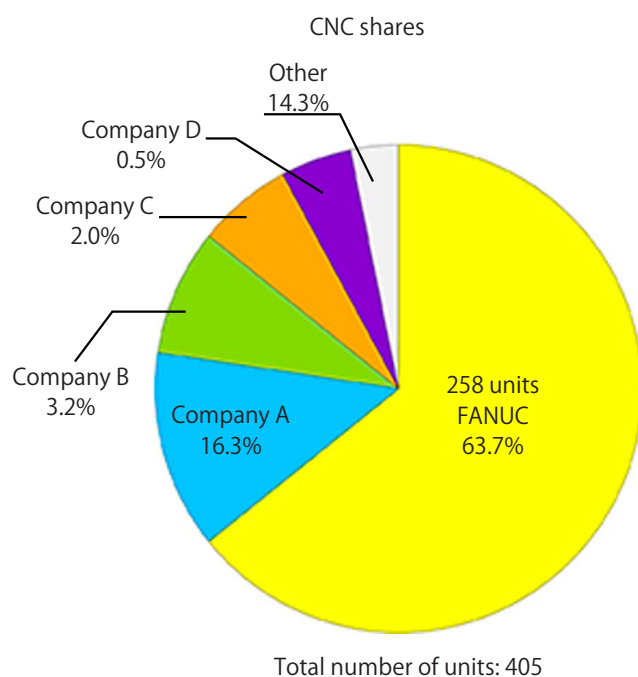
In the FANUC ACADEMY corner, three styles of learning; physically attending a course and the two forms of eACADEMY trainings - live seminars, and on-demand seminars were introduced and drew much interest.



Displays in the SUSTAINABILITY corner were based on two perspectives; ① energy conservation/carbon neutrality, and ② FANUC's achievement of SDGs. In this manner, FANUC's friendly approach to the environment was highlighted.



FANUC's latest CNCs and FANUC ROBOTS could be seen in the booths of many exhibitors at JIMTOF 2022. We would like to express our deepest gratitude to the exhibitors that displayed our products.



Shares of FANUC CNCs and FANUC ROBOTS of all displayed units at JIMTOF 2022 [based on FANUC's data]

On the night of the first day of JIMTOF 2022, FANUC's party for customers was held for the first time in four years and was attended by invitees from Japan and overseas. The party started with congratulatory speeches by esteemed guests, and customers spent time in a friendly atmosphere, enjoying conversations.



Ryuichi Yamashita,
Director-General, Manufacturing Industries Bureau,
METI



Akihiro Teramachi,
President and CEO,
THK CO., LTD.



Kenji Yamaguchi,
President and CEO,
FANUC CORPORATION

Four Seasons of FANUC

In December, the forests surrounding FANUC were covered with snow for the first time this winter. With temperatures dropping below zero every day, the waterfall and pond have all frozen. While enduring the cold of the blanket of ice, the forests depict a harsh yet beautiful view.



Waterfall



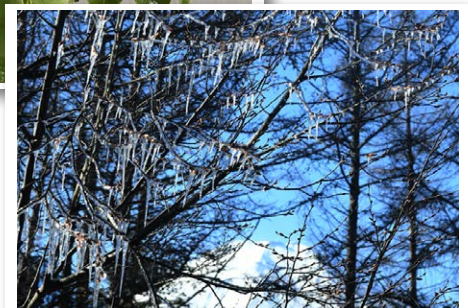
Magnolia kobus



Longstalk holly



Japanese andromeda



Freezing rain

Introduction of New Products and New Functions

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

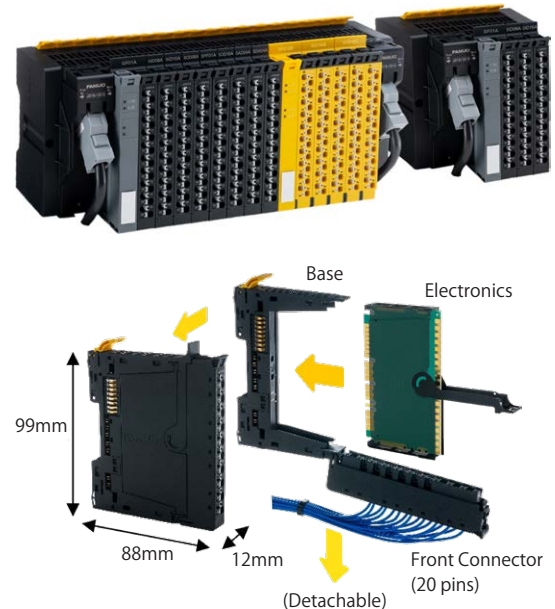
FA New Product: FANUC Slice I/O

FANUC Slice I/O is a new I/O unit developed based on the concept of compactness, high expandability, along with superior workability and maintainability.

The module is 12 mm wide and 99 mm high. With this compact size, the space for mounting can be conserved compared to conventional I/O units. In addition, the structure enables only the required number of modules to be connected horizontally, eliminating wasted space.

The broad range of modules offers high expandability, to flexibly accommodate various I/O configurations depending on the specifications of machines. Furthermore, by setting parameters using FANUC LADDER-III, it is possible to customize module specifications. As such, maintenance parts for multiple specifications can be commonly used and the number reduced.

Not only compactness, but also workability and maintainability have been improved. FANUC Slice I/O has a three-piece structure, in which the module consists of three parts; the Front Connector, Electronics, and Base. The push-in type Front Connector can be wired without tools. Furthermore, the detachable structure makes it possible to apply the Front Connector with preassembled cables, contributing to reducing machine assembly man-hours. When a failure occurs due to electrical stress, recovery is possible just by replacing the Electronics. There is no need to detach the wiring, thus shortening of machine downtime.



■ Digital Twin for FANUC CNC

FA New Function: Support of Servo Model in CNC GUIDE 2

CNC GUIDE 2 is a software tool that precisely reproduces CNC operations such as acceleration/deceleration and smoothing functions on a PC.

It is possible to run extremely accurate simulations, which are ten times faster than actual operations.

As a Servo Model is integrated which virtually reproduces servo control and features of each machine axis, simulations more closely resemble actual movements. It is also possible to obtain servo waveform data using SERVO GUIDE / SERVO VIEWER, which digitally supports the optimization of CNC control parameters or investigation of problems which occur during actual machining.

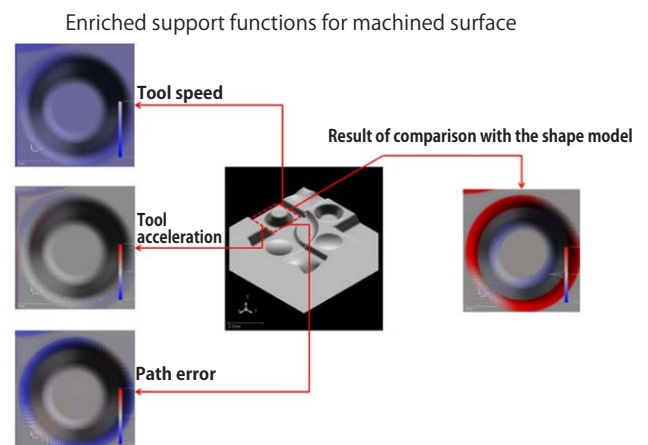


FA New Function: Comparison function for Surface Estimation

The Surface Estimation function of SERVO VIEWER can estimate the machining surface that is close to actual machining results, on a PC.

By running the machining program with CNC GUIDE 2 which supports the Servo Model mentioned above, and entering the obtained position data of each axis into the machining surface estimation, the machined surface can be estimated without using an actual machine. This has made it possible to investigate causes merely by digitally reproducing the machined surface, eliminating the need of the conventional method of making adjustments by repeating trial machining. Thus efficiency in terms of both time and cost is enhanced.

In addition, the surface estimation result can be compared with other surface estimation results with different machining conditions or the target shape model (CAD model). Moreover, information that affects surface quality, such as tool speed, tool acceleration, and path errors, can be displayed on the machined surface. This helps in finding the cause of machining problems, and contributes to the improvement of machined surfaces.



ROBOT New Products: FANUC Robot CRX-5iA, CRX-20iA/L, CRX-25iA

FANUC has added three new models (CRX-5iA, CRX-20iA/L, CRX-25iA) to the CRX series of the collaborative robots that are very well-received by our customers. These new models will broaden the options for the FANUC collaborative robots that focus on ease of use.

- CRX-5iA is a small, lightweight collaborative robot with a wrist payload of 5 kg and a max. reach of 994 mm. While being compact, it has a wide range of motion; it can be placed in the space of one person and can perform operations covering the range reached by human arms.
- CRX-20iA/L is a collaborative robot with a wrist payload of 20 kg and a max. reach of 1,418 mm. It doubles the max. payload of CRX-10iA/L with the same body size and is capable of handling heavy loads that cannot be handled by CRX-10iA/L.
- CRX-25iA features a wrist payload of 25 kg (max. 30 kg) and a max. reach of 1,889 mm. It can support palletizing of large workpieces or handling of heavy loads by taking advantage of its high payload and large reach.
- These models adopt a tablet TP as the standard user interface. It allows for intuitive operations and is easy to use even for those who are using a robot for the first time, as in the case of CRX-10iA.



Workpiece loading/unloading

The enhancement of the CRX series lineup will expand the application range and contribute to further improvement of productivity.

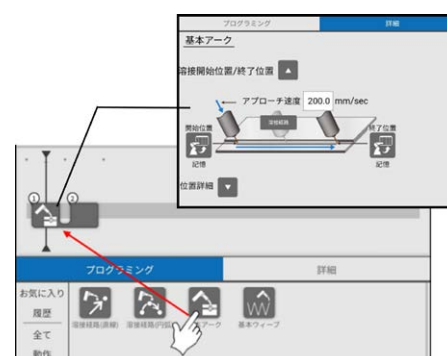
ROBOT New Function: CRX arc welding package

FANUC has started distribution of the CRX arc welding package, which enables even customers who have never used robots to easily introduce a robot, in order to cope with the shortage of welding engineers in the arc welding field.

- An arc welding program can be easily created by manually moving the robot arm to the location to be welded directly. In addition, the welding start position and welding start/end commands can be taught to the robot using the buttons provided around the torch.
- Teaching of welding commands is performed by allocating icons with arc welding symbols like blocks. Setting of detailed welding conditions, such as the welding current/voltage and weaving frequency, can be easily performed using icons.
- More advanced arc welding including multi-layer welding, TIG welding, and Auto Path Generation using a tracking sensor can be easily specified using icons.
- Arc welding can be automated compactly, as CRX does not take up lots of space on site, as it requires no safety fences. If CRX is mounted on a cart, the robot can be transferred to a location where it is needed on an as-needed basis, which realizes high-mix low-volume production.



CRX arc welding package



Easy teaching by arc welding icons

FANUC contributes to an increased rate of automation in welding sites through the CRX arc welding package.

ROBOMACHINE New Function: Functionalization of machining technique for ROBODRILL α -DiB Plus Series

On the latest compact machining center series, ROBODRILL α -DiB Plus, the know-how of skilled workers was converted into G-code programs, allowing anyone to easily produce programs to attain the fastest movement of a ROBODRILL, thus improving productivity.

- The entire cycle for changing tools, from the operation of changing the tool up till positioning to the next location to be machined, can be performed as a single block command. The order and timing for each operation are optimized, simplifying programs and reducing cycle time simultaneously.
- The circle machining cycle is a machining program for contours using an end mill in the form of a G code program. It includes optimized approach movements to enable high-speed machining of high-quality holes and screws.
- In a deburring cycle, the complex deburring of the intersection with a cylindrical surface can easily be conducted with a single block command. Three-dimensional machining paths at ridge sections are automatically generated within the G code program, making high-speed chamfering with uniform width possible. It also extends the tool life.



FANUC ROBODRILL α -DiB Plus series



Deburring cycle

ROBOMACHINE New Product: ROBOSHOT α -S250iB, α -S300iB

The α -S250iB with a clamping force of 250 tons and the α -S300iB with a clamping force of 300 tons have been added to the latest electric injection molding machine series, ROBOSHOT α -SiB.

- Compared to former models, these new models feature approximately 14% higher maximum injection speed and approximately 17% higher maximum injection pressure, expanding the range of injection molding applications. For the α -S300iB, a screw with a maximum diameter of 80 mm can be fitted to produce a new specification for large-capacity injection, enhancing support for large moldings.
- The clamping force sensor is equipped as a standard feature. This has increased the clamping force adjustment accuracy during mold change. In addition, gradual transition of the clamping force during molding is suppressed by the clamping force automatic adjustment function, improving stability in molding.
- A 21.5-inch large display unit, PANEL i H Pro is equipped to improve ease of use. Swiping and multi-touch operations can be used for intuitive operation.



FANUC ROBOSHOT α -S250iB



FANUC ROBOSHOT α -S300iB

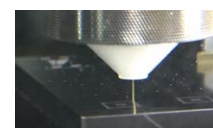
ROBOMACHINE New Product: Improvement of AWF3 of the ROBOCUT α -CiC series

For the ROBOCUT α -CiC series, which is the latest wire electrical discharge machine, the automatic wire feeding function "AWF3" has been upgraded to improve wire feeding performance. With the upgraded AWF3, the time to thread a wire to a 0.3 mm diameter hole at the start of machining, and to continue feeding a wire when a wire is cut off can be significantly reduced.

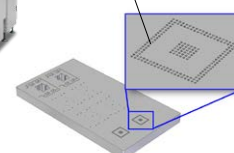
- The time to thread a wire to a small hole has been reduced to approximately 1/2 compared to former models with automatic wire feeding. This was made possible by investigating the wire cutting conditions, the wire feeding speed when threading, retry operations, and making improvements.
- The applicable wire diameters have been expanded from "0.2 mm to 0.3 mm" to "0.1 mm to 0.3 mm." What is more, the improved AWF3 can be used even when there is a distance between the upper nozzle and workpiece.
- The ability to feed wires reliably and in a stable manner for a wide range of applications, such as micro machining to machining of large workpieces, contributes immensely to the improvement of productivity.



FANUC ROBOCUT α -CiC series



Start hole (diameter of 0.3



■ The latest IoT data platform that improves and optimizes manufacturing sites immediately after introduction

IoT New Product: FIELD system Basic Package (released in Japan in February 2023)

The successful use of IoT technology to process data in manufacturing sites for continuous optimization and improvement depends on the quality of the collected data and the data platform that handles the collected data. The FIELD system Basic Package is a new data platform that converts various types of data in manufacturing sites into an easy to use well organized form, and reconstructs the data on the computer. The data is reconstructed as a virtual factory inside FIELD system Basic Package that is a twin of the physical factory. Analyzing a virtual factory can replace the analysis of a real factory, and with digitalization, analysis becomes much easier. Compared to conventional data platforms, data analyses is significantly easier. Furthermore, finding problems, performing analysis, and taking measures in the manufacturing site can be done immediately.

FIELD system Basic Package connects not only to machine tools with FANUC CNCs, or FANUC robots, but also to various equipment of other manufacturers for the collection of data.

Equipment data that differs by manufacturer or model is converted into a standardized data structure and managed in the database; therefore, data of all equipment can be handled in the same manner.

Collected and organized equipment data can be immediately visualized and analyzed with just a few clicks in Factory Visualizer which is pre-installed in FIELD system Basic Package.

For machine tools with FANUC CNCs, the operating status of the machine tools can be sorted into more detailed categories compared to the past.

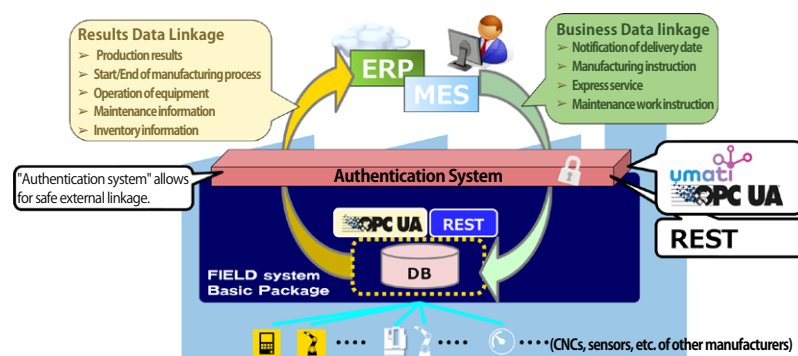
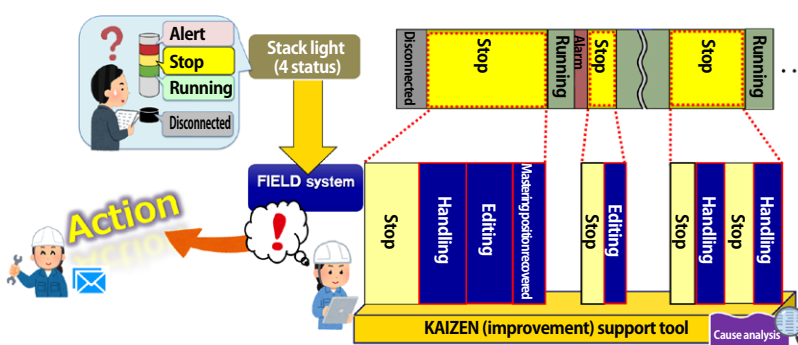
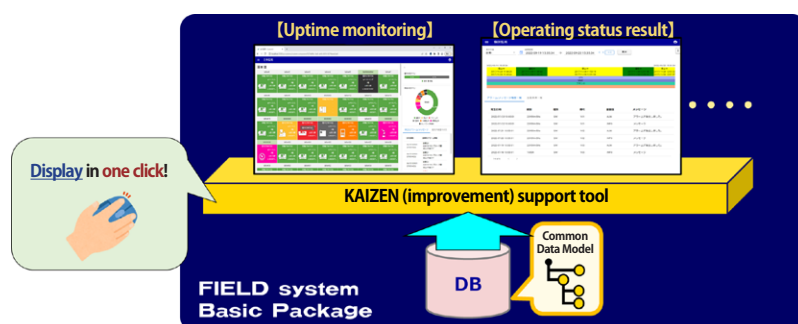
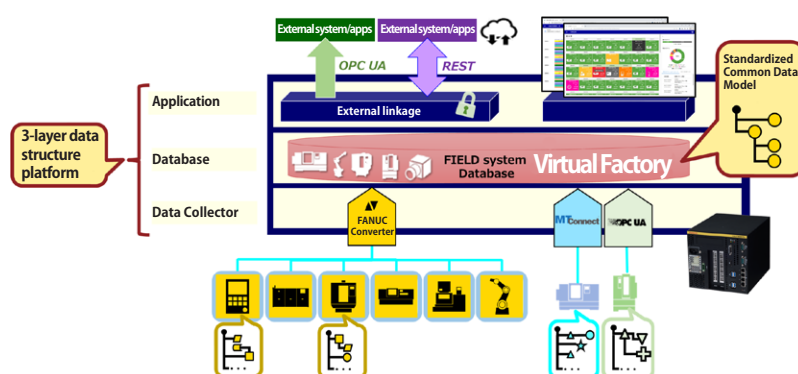
Differentiating between an intended downtime and an unwanted idle waiting time can bring about the next "Kaizen" or action for improvement.

Collected data can be offered to external systems using the industrial standards, OPC UA and REST API.

This makes linkage possible with the production management system being used, so that data on production results and others, can be utilized commonly.

An authentication system prevents fraudulent data access, enabling safe utilization of the data on site.

FIELD system Basic Package, with such features, is a convenient product that promotes improvements in manufacturing sites.



FANUC Factory Introduction

Repair Factory

In the Repair Factory located in the Headquarters area, CNCs that control machine tools and robots, servo amplifiers, servo motors, and robot wrists are repaired.

The Repair Factory supports "lifetime maintenance," which is one of FANUC's basic policies, meaning that FANUC provides maintenance for its products as long as they are used by customers.

Since the period of maintenance exceeds 40 years, procurement



Test equipment in the Repair Factory

Products to be repaired that are received from customers are cleaned by robots in the washing line and slowly dried in the drying furnace. After this process, the cause of failure is investigated and



Two collaborative robots that load and collect repair products and an automatic washing machine

In the Repair Factory, the relationship between the failure content and defective component(s) is registered as "know-how" based on the data of approximately 2,100,000 repairs. This repair know-how includes parts replacement instructions and check lists. By performing



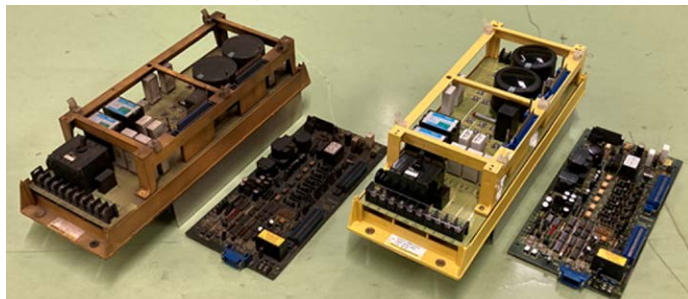
Repair using know-how

of electronic components used for repairs is a major challenge. When a manufacturer notifies FANUC of the discontinuation of a component, the required quantity for the future is estimated, and the component is purchased in a bulk and stocked. If there is a shortage of a component even after such measures are taken, the Research and Development Department re-designs the printed circuit board, etc., for repairs.



CNC test equipment from more than 40 years ago (made in 1980)

necessary repairs such as exchanging parts are performed. When this is completed, the repaired product undergoes standard function tests and continuous operation tests.



Before repair (left) and after repair (right)

repairs by referencing such information, even old products can be repaired appropriately. This repair know-how is shared with overseas Repair Centers in eight other countries and contributes to retaining the high repair quality that is not affected by region or workers.



Repair know-how is shared with overseas Repair Centers



FANUC's History Series (7)
"DC Servo Motor"

In response to the oil crisis of 1973, this motor with significantly improved energy efficiency was developed to promote the shift from electro-hydraulic pulse motors.

The technology of Gettys Manufacturing in the U.S. was introduced, and the motor was exhibited in the Japan International Machine Tool Fair in 1974. Even though the dimensions were different from the conventional Japanese standard, this motor was widely accepted. Since then, its dimensions have become the standard of servo motors for machine tools.



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