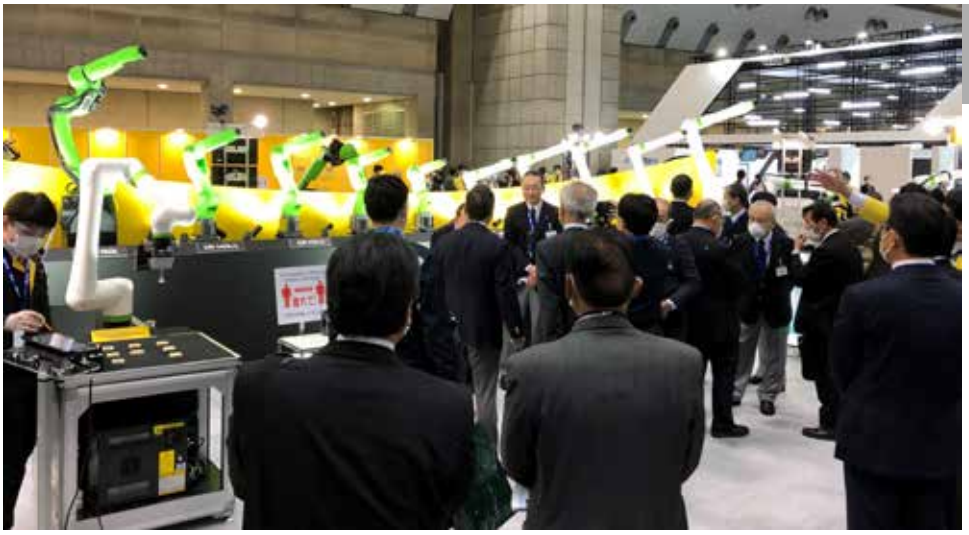
FANUC NEWS 2022– I

CONTENTS

TOPICS

Photo taken April 2022

The International Robot Exhibition 2022



The expanded and enriched lineup of collaborative robots gathered great attention.

The International Robot Exhibition 2022 was held for four days from March 9 (Wed) to March 12 (Sat), at Tokyo Big Sight.
The latest technologies of FANUC robots were introduced to visitors to the exhibition, where due to the ongoing COVID-19 pandemic, infection control measures were implemented thoroughly.
For collaborative robots, three new models have been added to the lineup and were exhibited alongside many other models of the CRX series. These were the center of attention.
Besides the CRX , many robot systems that meet the needs of actual work sites were on display, including a new one-ton payload robot, a 10 kg payload high-speed fully covered robot, a wide variety of SCARA robots, robots for welding and various other applications, and a bin-picking robot using high-speed vision.
Moreover, comprehensive capabilities derived from "one FANUC," such as QSSR, IoT, service, and efforts to achieve energy saving and carbon neutrality were highlighted. Such features include Zero Down Time (ZDT), FIELD system, and robotization of machining by Quick and Simple Start-up of Robotization (QSSR) with which connection between robots and CNCs/ROBOMACHINEs is simplified.

The full lineup of collaborative robots enriched with 11 models received tremendous feedback.

The compact size of the new CRX-5*i*A was highly praised .

The new CRX-20*i*A/L is a high payload robot which has a light-weight arm. Many visitors showed interest in this special combination.

The new CRX-25*i*A is expected to promote automation in logistics, by leveraging its high payload and long reach.

The compact new CR-35*i*B has high potential to support heavy manual work.

Collaborative Robot

The high speed and long reach of the new ceiling-mounted model was popular with visitors.

SCARA Robot

There are high expectations for use in primary food products due to their high IP (Ingress Protection) performance and plating specifications.

Delta Robot

The light weight and high-speed operation of the new LR-10iA/10 amazed visitors .

Fully covered robot

The powerful movement of the super heavy payload robot lifting an electric vehicle was astonishing.

High-speed welding made possible by high-precision synchronization between the robot and laser scanner was noteworthy.

Laser Robot

Visitors showed much interest in the easy teaching of the paint robot by hand guidance.

Paint Robot

Bin picking by high-speed vision of FANUC iPC drew the attention of visitors.

3D vision sensor

The new one-ton payload robot having both a high payload capacity and a compact body was well received by visitors.

Super Heavy Payload Robot

The easy robotization of an existing machine tool had a great impact.

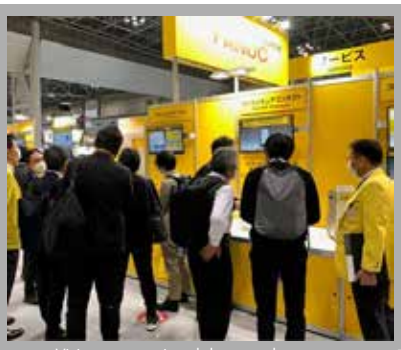
Visitors had a good impression of the easy setup by the CNC-QSSR via G-code and the manual handle.

An AGV equipped with a CRX is expected to promote automation of machining.

Machining

ZDT that supports both on-premise environments and cloud services was popular with visitors.

There were high expectations for FIELD system, which can connect to a wide variety of devices.



Visitors appreciated the speedy response for service requests enabled through FabriQR Contact.

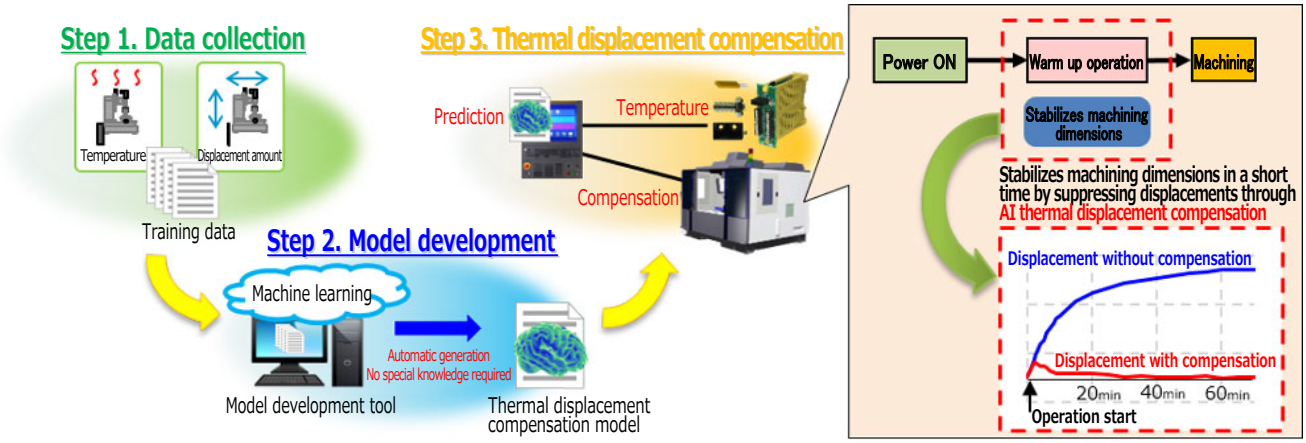
There were high expectations for FANUC's efforts to save energy and achieve carbon neutrality.

IoT, Service, Energy saving

Introduction of New Products and New Functions

FA AI thermal displacement compensation function realizes high precision and stable machining by suppressing the effects of thermal displacement on machines.

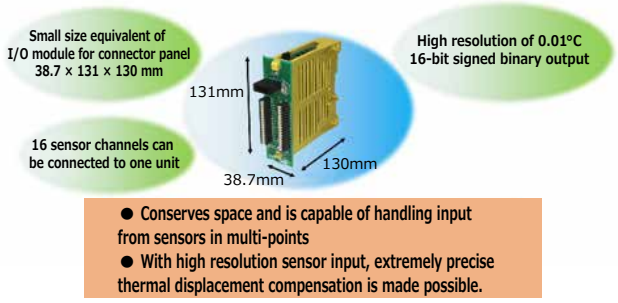
In the mechanical unit of a machine tool that needs to machine with high-precision, even a slight change in temperature will cause thermal displacement, effecting accuracy. FANUC's AI thermal displacement compensation function suppresses the impact of thermal displacement on machining accuracy and stabilizes high-precision machining by predicting thermal displacement at the machining point, using temperature information obtained from multiple temperature sensors to perform compensation. This function can suppress the impact of thermal displacement in a short time, even during the stabilization of the machine temperature, thus enabling the shortening of the warmup time, resulting in improvements in work efficiency and contributing to energy conservation. The thermal displacement compensation model development tool has recently been improved to enable mass production. In addition, a new unit that receives input from the temperature sensors has been added.



New product: Temperature sensor input unit

This is a new unit for receiving input from temperature sensors.
By focusing on temperature sensor input, the design has become compact and the number of channels have increased (16 channels).
With a high resolution of 0.01° C, compensation in miniscule units is possible for high accuracy.

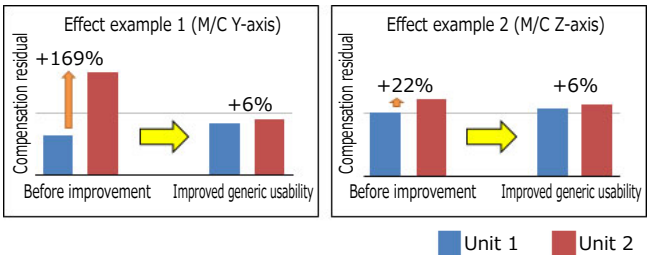
Compact, multi-point input, high-resolution temperature sensor input unit



- Conserves space and is capable of handling input from sensors in multi-points
- With high resolution sensor input, extremely precise thermal displacement compensation is made possible.

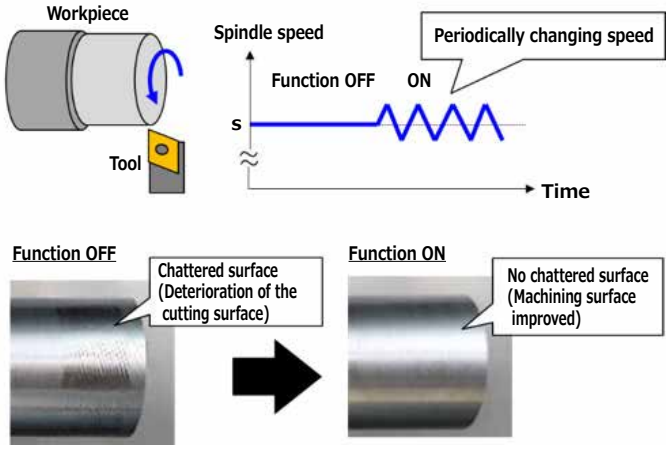
Enhanced specifications - Improvement of generic usability of the thermal displacement compensation model

Generic usability refers to the capability to accurately predict displacement of not only the machine from which the training data has been collected, but also of different machines. The generic usability of the AI thermal displacement compensation model development tool has been improved. This improvement has made it possible to generate models that are not affected by the slight differences of individual units, resulting in stable compensation performance .



New function: Suppressing chatter vibration by the spindle speed variation function

Chatter vibration may occur in turning when changing machining conditions such as increasing the machining speed or cutting depth. This produces resonance between the workpiece and tool, and is an impediment to highly efficient machining.
The spindle speed variation function is a new function that suppresses chatter vibration caused by resonance during machining, by changing the spindle speed periodically.
Compared to common chatter countermeasures, such as decreasing the cutting depth or spindle speed, this function does not affect the machining time, enabling suppression of chatter vibration without sacrificing productivity.
This function is particularly effective for turning long workpieces, in which chatter vibration easily occurs.



ROBOT New Product: FANUC Robot LR-10*i*A/10

FANUC has developed and started distribution of the LR-10*i*A/10, a new fully covered robot that has a long reach and is highly dust/liquid resistant, while being lightweight and compact.

- The LR-10*i*A/10 is a lightweight model featuring a maximum load capacity at the wrist of 10 kg, maximum reach of 1,101 mm, and weighing just 46 kg, which is less than 1/3 of conventional models. It mounts to the floor, upside down, or at an angle.
- The standard dust/liquid protection of the LR-10*i*A/10 has an IP67 rating, which enables it to flexibly accommodate various environments including machine tending applications. In addition, its slim body allows for installation without disturbing the conveyor flow, and can be utilized in a wide range of applications including picking in the logistics industry, for which demand has been growing in recent years.
- The wiring, air piping, and solenoid valves are integrated inside from the robot base to the upper arm. There being no protrusion of the cabling and piping makes it ideal for offline teaching.
- As a teaching device, a tablet TP, which has a large screen that allows for easy, intuitive operation, can be used besides the conventional *i*Pendant.

With its lightweight, compact size and high resistance to harsh environments, as well as ease of use, the LR-10*i*A/10 will contribute to improving the productivity of our customers.

FANUC Robot LR-10*i*A/10

Transportation of workpieces

ROBOT New Function: support of MQTT communication by FANUC robots

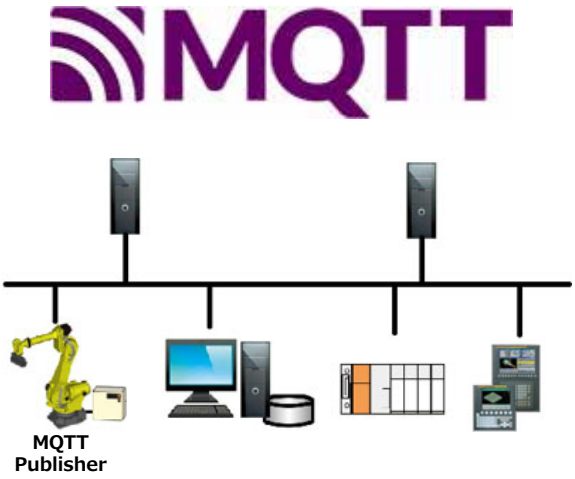
Message Queuing Telemetry Transport (MQTT) is a data communication protocol using the Publish-Subscribe messaging model. FANUC robots now support the MQTT publisher function, as a part of reinforcing IoT functions at production sites.

As a communication function related to IoT, FANUC robots already support MTConnect and OPC-UA communication. The newly introduced MQTT is a communication protocol that is more lightweight than the other communication protocols and is suitable for more customized IoT environments.

When this function compliant with the MQTT protocol is specified as a software option, the FANUC robot becomes the Publisher (data sender) of MQTT, and the position data, names of programs in operation, alarm or signal status , etc. of the robot can be obtained and monitored via a network.

The R-30*i*B Plus/R-30*i*B Mate Plus series robot controllers can send MQTT data independently, without adding a PC or any special hardware.

FANUC will continue to enhance the communication functions of our robots, so as to contribute to the streamlining of production sites using IoT technologies.



A FANUC robot sends data using the MQTT protocol and an external server acquires information on the operation status of the robot.

ROBOMACHINE New Product: ROBOSHOT α-S*i*B series

Roboshots are high-performance, highly reliable electric injection molding machines that adopt the latest CNC and servo technologies. Their highly-rigid and low-friction mechanisms achieve stable precision molding in a wide range of fields, from the production of general purpose parts including automobiles and medical equipment, to ultra-precision parts for mobile phones.

ROBOSHOT α-S50*i*B
Clamping force 500kN

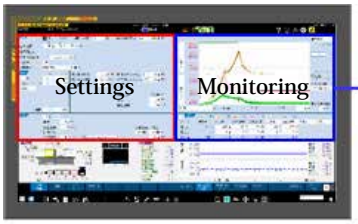
ROBOSHOT α-S100*i*B
Clamping force 1000kN

ROBOSHOT α-S150*i*B
Clamping force 1500kN

21.5" large display unit offers superior operability

Equipped with a 21.5" large display unit PANEL *i*H Pro, operation usability is improved.

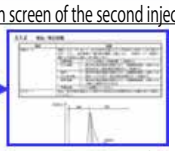
- The dual display of the parameter settings and monitoring screens improves operability. The screen can be switched to display the operation screen of the second injection unit or the instruction manual.
- The operation monitoring software ROBOSHOT-LINK*i*2 can be displayed in full screen mode to support the introduction of IoT in molding plants.
- Swiping and multi-touch operations are supported for intuitive operation.



Dual display (parameter settings + monitoring)

Easy switching

Operation screen of the second injection unit



Instruction manual

Full-screen display (ROBOSHOT-LINK*i*2)

Is able to work with robot systems for automating molding plants

FL-net realizes easy connection with a FANUC robot and superior operability.

- A Roboshot and a FANUC robot can be connected with a single Ethernet cable.
- The robot take-out position can be automatically adjusted in conjunction with the eject position of a Roboshot.
- FANUC robots can be remotely operated from the Roboshot screen.

Robot operation screen on the ROBOSHOT

ROBOSHOT-QSSR

QSSR

※ QSSR is an abbreviation of "Quick and Simple Startup of Robotization," representing the concept of easy connection between a CNC and a robot.

ROBOSHOTs conform to safety standards, enabling their use in molding plants worldwide.

Roboshots conform to ISO 20430 (JIS B 6711 in Japan), which is the international safety standard for injection molding machines. Roboshots can be used safely in manufacturing sites around the world.

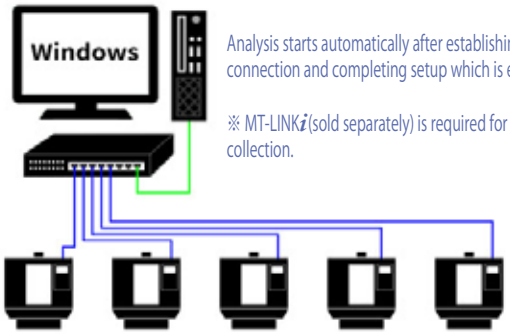
- An electromagnetic lock that prevents the safety door from opening during operation now comes as a standard feature. The electromagnetic lock is effective until the motor completely stops to protect workers.
- The thermal insulation cover that satisfies strict European safety standards is equipped on the cylinder heater part as a standard feature.

ISO 20430:2020 (Issued in April 2020. The international safety standard for injection molding machines)
JIS B 6711:2021 (Issued in March 2021. The Japanese industrial standard based on ISO 20430)

IoT New Product: FANUC AI Servo Monitor

AI Servo Monitor is a software for Windows OS PCs that analyzes waveform data of FANUC servo motors and spindle motors.

- Establishes a mechanism for failure prediction using waveform data of a servo motor or spindle motor built into a machine tool without sensors.
- Setting operations are simple, and only requires making a connection with MT-LINK*i* and selecting the measuring conditions (machine, axes, data collection time).
- Automatically processes the collection and analysis of waveform data and visualizes the long-term condition of the machine tool with the "anomaly score."
- No detailed observation of data is required, since the machine condition is expressed simply by the anomaly score.
- Maintenance and inspection of machine tools can be planned based on changes in the anomaly score.
- Support for software introduction is provided as a supplemental service for the first year (described in the introduction of new services for Japan. For other regions, please consult each local office.)



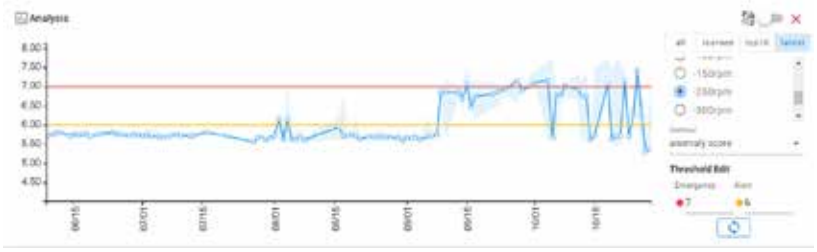
Analysis starts automatically after establishing a LAN connection and completing setup which is easy.

※ MT-LINK*i* (sold separately) is required for data collection.

※PC (hardware) and network connection are to be prepared by the customer.
※Windows is a trademark or registered trademark of Microsoft Corporation in the United States and/or other countries.

Case study: The linear guide in a machine tool was damaged

- The mechanical unit was primarily checked based on the increase in the anomaly score, and damage to the linear guide was found. (No effect was observed in machining at this point.)
- Quality defects, long production downtime and machine damage may have occurred if operation had been continued. This was prevented beforehand.
- The customer praised the product stating that it was helpful in predicting a failure that could not have been detected merely by daily observations or checks, or the built-in measuring system of the machine.



Increase of the anomaly score of AI Servo Monitor

Damage of the linear guide on the feed axis was found upon inspection.
(The retainer and rolling element were scattered.)

IoT FANUC MT-LINK*i*

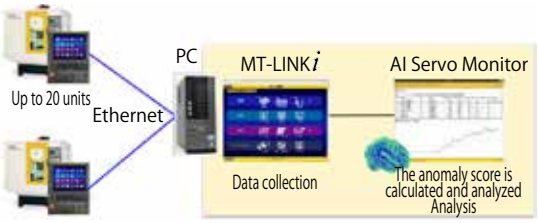
MT-LINK*i* is a software for Windows OS PCs that collects data of various equipment and facilities in a plant, for easy management of operations.

■ New Function

- This function collects CNC data of the "Tool Life Monitoring" function from multiple machine tools, and displays the elapsed percentage of the tool's lifetime in real time. By displaying from the shortest remaining tool life in ascending order, it becomes possible to effectively prepare for tool replacement (option).
- A function for coordinating with AI Servo Monitor (software which is sold separately) has been added. This function has made it possible to collect waveform data that can be utilized in AI Servo Monitor while managing the operation of machine tools.

Centralized monitoring of tool life

Coordination with AI Servo Monitor

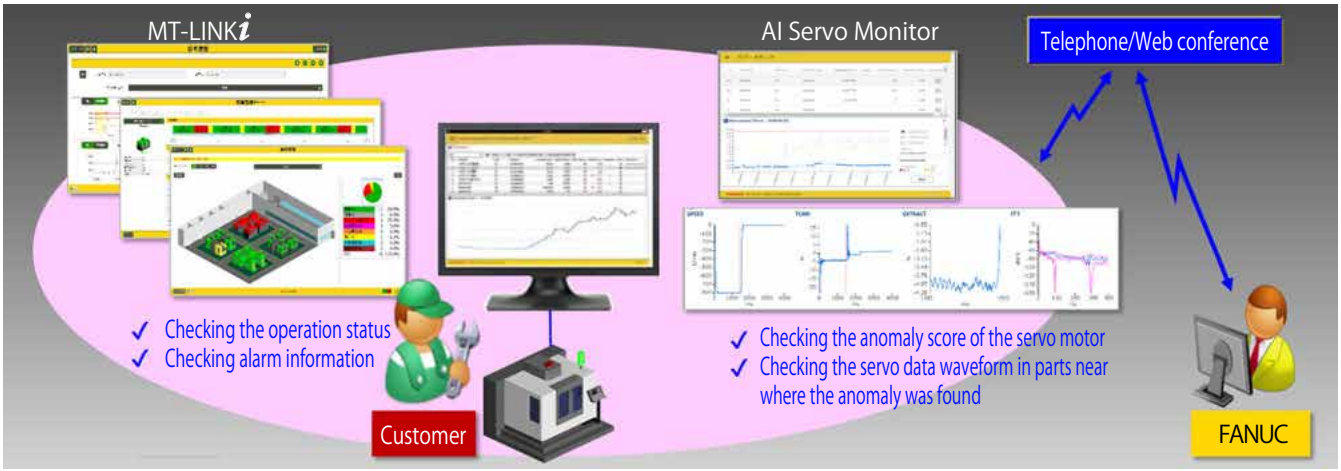


SERVICE New Service: FANUC AI Servo Monitor Maintenance Service

With the launch of AI Servo Monitor, which was described in the introduction of new products, FANUC has started maintenance services of AI Servo Monitor for our customers.
Support is offered for the startup of the software, problems in operation, version upgrades, among others.

In addition to maintenance service, remote waveform check support** is available for AI Servo Monitor (**some services incur charges).
AI Servo Monitor has been developed for the purpose of providing support for detecting signs of failure of the spindle axes and feed axes of a machine tool and thus is a product that is expected to contribute to the prevention of sudden facility downtime.
Through this new service, FANUC will provide support so that our customers can introduce AI Servo Monitor with peace of mind and utilize this software to improve productivity.

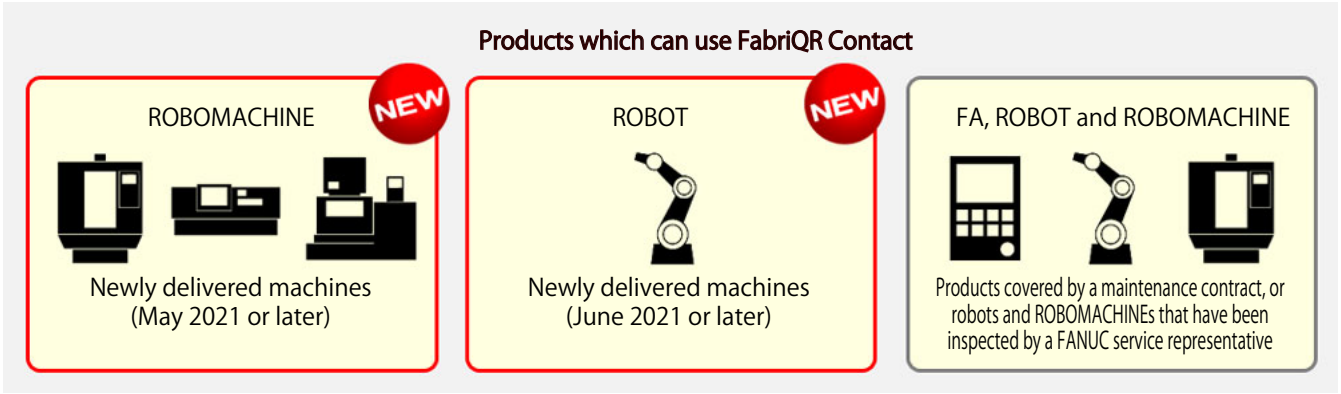
Features of AI Servo Monitor
- Visualization of the anomaly score of the servo/spindle drive system using machine learning
- Relatively easy to introduce (MT-LINK*i* which is necessary for data acquisition is a prerequisite).



■ Expansion of applicable products: FANUC FabriQR Contact

FabriQR Contact is an inquiry service available in Japan, utilizing a smartphone. It enables customers to make inquiries with their smartphones using the FabriQR label on the machines, eliminating the need to search for serial numbers or service phone numbers. In addition, photos can be attached as necessary, to reduce the time required to find a solution. No registration or special application is necessary to use the service.

FabriQR Contact is immediately available for newly delivered robots or Robomachines.
For inquiries about a FANUC product without a FabriQR label, contact our Call Center as usual.



How to use FabriQR Contact

1. Scan the FabriQR label on the machine with a smartphone camera and access the displayed URL.
2. Follow the guidance displayed on the screen and enter your inquiry and necessary information.
3. After examination of the content of your inquiry by FANUC, an appropriate skilled service engineer will contact you by phone.

For more information, scan this code.

The newest machining factory

Machining Factory No. 5 located in the headquarters area at the foot of Mount Fuji in Yamanashi Prefecture, is the newest machining factory and it has been machining parts for robots and Robomachines since April 2019. The factory has eight sets of FANUC Robot Cells, each of which consists of an automated warehouse, six machine tools, and six robots, and performs long-term continuous unmanned operation. In this newest machining factory, automation is more advanced than in the older machining factories.
In the conventional automatic setup system of a FANUC Robot Cell, a robot would pick up workpieces of various sizes with a servo gripper, and vision sensors would measure their positions to enable correct mounting of the workpieces to the fixtures. However, chip removal after machining was heavily dependent on manual work; in particular, for workpieces with complex internal structures, such as robot parts, chip removal took time. In the latest automatic setup system, a washing booth has been provided inside the system, so that now a robot picks up a workpiece and changes the workpiece orientation inside the washing booth to perform chip removal. The robot also has a gripper equipped with a vacuum function. With this function, places where chips and coolant accumulate on the workpieces are vacuumed. In addition, another problem that accompanies long-term unmanned operations is the disposal of chips coming from machine tools.Up to now, manual work using a manned forklift was necessary to replace a bucket filled with chips with an empty bucket. In this factory, the chip bucket replacement has been automated using AGVs that supply materials to the ROBOT Cells and carry out machined parts. For the robot deburring system, the conventional system consisting of two small robots that performed deburring has been changed to a system consisting of one large robot holding the workpiece and one small robot doing the deburring. Having a large robot hold the workpiece and allowing the workpiece orientation to be freely changed has expanded the application range of deburring using robots. For the inspection process, automation of image inspection of scratches and porosity, and tap inspection for machined and deburred parts are being promoted.
Factory monitoring consisting of prediction of defects and intermittent stopping of robot systems is carried out by monitoring the operation of machine tools, robot systems and progress of machining, as well as by visualizing the measurement data of CMM (Coordinate Measuring Machine) and various kinds of robot data. In addition, parameters such as the amount of mist that is a cause of deterioration of the factory environment, tool information (remaining tool life, etc.) that affects factory operation, coolant concentration, and battery levels of AGVs are monitored.

Washing by a robot by dipping in water

Grip-type robot deburring cell

Tool information

AGV battery voltage

FANUC Robot CRX-10*i*A

The 10th Techno-Economics Innovation Award JATES's Chairman Award

The FANUC Robot CRX-10*i*A received the 10th Techno-Economics Innovation Award JATES's Chairman Award. This is the fourth award that the CRX has received, following the METI Minister's Award of the Ninth Robot Award, the Main Prize of the 2020 (63rd) Nikkan Kogyo Shimbun Best Ten New Products Awards, and the Nikkei Business Daily Awards of the 2020 Nikkei Superior Products and Services Awards.

From right: Kenji Yamaguchi (President and CEO, FANUC), Hiroto Ishida (Vice Chairman, Japan Techno-Economics Society), Kiyonori Inaba (General Manager, Robot Business Division, FANUC) Kenichiro Abe (General Manager, Product Development and Research, FANUC)

The CRX is a collaborative robot that is safe, easy to use, and highly reliable that automates manual production sites without safety fences. The CRX robots, which are easy to use even for first-time robot users, make flexible and simple automation a reality.

The Techno-Economics Innovation Award has been granted every year since 2012. It aims to promote innovation by recognizing great innovations that have significantly revolutionized the world and introduce the processes of such innovations to industry members to revitalize the economy. The award ceremony was held on February 15 (Tue), at Josui Kaikan. President Yamaguchi and General Manager Kiyonori Inaba of FANUC received the certificate and trophy from Vice Chairman Ishida of the Japan Techno-Economics Society.

Four Seasons of FANUC

In April, snowfall was followed by days which were as hot as summer. At this time of year, when the change in seasons is acutely felt, flowers and mountain vegetables start to appear. Cherry blossoms, magnolias, and other plants begin to bloom one after another, announcing the late arrival of spring to the forests surrounding FANUC .

Trillium tschonoskii

These small yet dainty white flowers catch the eye as they bloom in clusters against a backdrop of brown after the snow has cleared.

Aralia sprout

Aralia sprouts are also known as the king of mountain vegetables. Sharp thorns protrude in place of leaves or branches on their singular stems which grow straight up to reach the skies.

Japanese royal fern

Japanese royal ferns are one of the most common mountain vegetables. They are edible only when their sprouts are tightly curled and covered in fuzz. After they grow, their leaves spread widely like feathers, changing the scenery into a vivid green forest of ferns.

Highly reliable, high-performance wire electrical-discharge machine

FANUC ROBOCUT α-CiC series

Received the Main Prize of the 2021 (64th) Nikkan Kogyo Shimbun Best Ten New Products Awards

The highly reliable, high-performance wire electrical-discharge machine, the "FANUC ROBOCUT α-CiC series" received the Main Prize of the 2021 (64th) Nikkan Kogyo Shimbun Best Ten New Products Awards.

Received the Main Prize of the 2021 (64th) Nikkan Kogyo Shimbun Best Ten New Products Awards

The award-winning **FANUC ROBOCUT α-CiC series**

In recent years, wire electrical-discharge machines have been required to produce high-precision molds for electric vehicles and semiconductor manufacturing equipment. There has been a growing demand for machines that can satisfy the ever-rising level of precision, while being capable of high-speed and stable production. To meet such demands for high-speed/high-precision machining, FANUC developed the ROBOCUT α-CiC series. This new series features improved basic performance by changing the structure of the mechanical unit, improving electrical components, and developing the discharge control *i*Pulse3. Furthermore, the α-C*i*C series incorporates FANUC's newest display unit, PANEL *i*H Pro, to further improve the operating rate and ease of use.
The mechanical rigidity has been strengthened by the structural change in the mechanical unit, realizing a circularity of 0.9 μm and a pitch accuracy of ±1 μm. The improved electrical components and the new *i*Pulse3 has enhanced corner accuracy and machining surface roughness, enabling high-speed and high-precision machining of fitting surfaces with a clearance of ±2 μm.

The Main Prize of the 2021 (64th) Nikkan Kogyo Shimbun Best Ten New Products Awards

The Best Ten New Products Awards sponsored by Nikkan Kogyo Shimbun are awarded to products selected from new products developed or commercialized that year for their contribution to Japan's manufacturing industry and reinforcement of Japan's international competitiveness.

FANUC's History Series 4

"High Pulse Motor"

A motor in which output in the high-speed range was radically improved by adopting a unique structure using a cut core to significantly reduce eddy current loss. FANUC's NC and high pulse motor greatly promoted the spread of numerically controlled lathes in Japan. The motor was adopted in many NC machines due to its advantage of not using hydraulic pressure. However, there was a limit to its practical application as the amount of noise and vibration increased in the pursuit of greater output. For this reason, it could not replace the electrohydraulic pulse motor.

FANUC CORPORATION

3580 Shibokusa, Oshino-mura, Minamitsuru-gun, Yamanashi 401-0597 Japan

www.fanuc.co.jp