

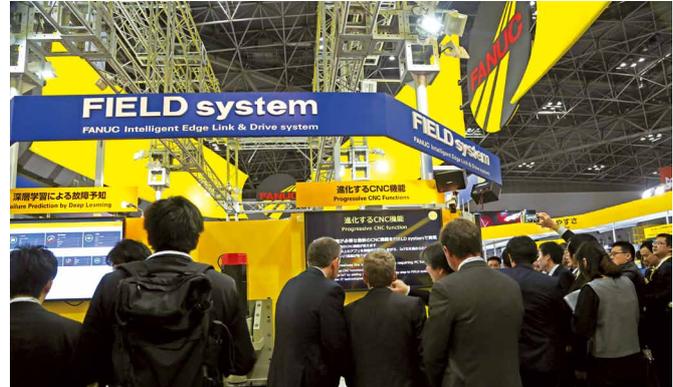
FANUC

NEWS



2017-I

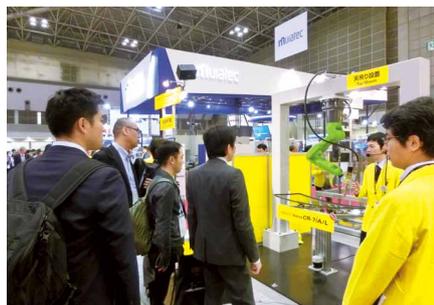
The 28th Japan International Machine Tool Fair (JIMTOF 2016) was held from November 17 to 22, 2016 at Tokyo Big Sight. This year, 969 companies from 21 countries participated in the exhibition and the total number of visitors for the six days reached a record high of 147,602. FANUC's three business divisions worked together to pitch our products to visitors. The FANUC booth was very busy with people throughout the exhibition period. In particular, in the FIELD system demonstration, in which we actually connected 250 machine tools from 80 companies that displayed at the exhibition to show how machine operations are visualized, FANUC's IoT initiative aroused amazement and expectations among visitors.



In the FA area, the latest smooth tolerance control mechanism, which supports high-grade mold processing, and the wide lineup of α I-B/ β I-B series SERVO were highly rated by customers. The demonstration of processing performed by effectively synchronizing fiber laser and CNC was also popular.



In the robot area, in addition to 35-kg payload collaborative robots, we also demonstrated the operation of three types of small collaborative robots to allow people to experience for themselves that humans and robots can work together in various work environments. The demonstration of precision handling of large works by the world's largest, 2.3-t payload robot also attracted many visitors' attention throughout the exhibition.

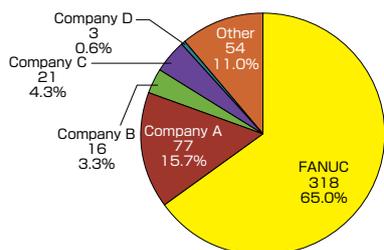


In the ROBOMACHINE area, visitors paid close attention to the following demonstrations: ROBODRILL, which cuts iron and aluminum blocks at a high speed; ROBOCUT, which processes key grooves of large parts with high precision; and ROBOSHOT, which realizes full automation of precision connector molding in coordination with a Genkotsu robot. The audiences were also greatly impressed with the demonstration of mirror-finish processing by the new ROBONANO model, which is designed to be easier to use compared to the previous model.

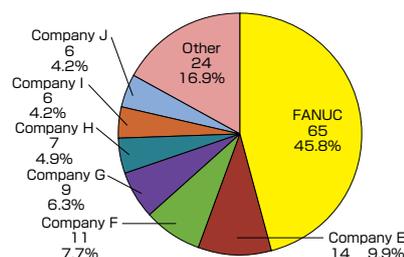


There were many visitors from abroad at the exhibition, who spoke highly of FANUC's service system that offers support for customers through 252 business sites in 46 countries around the world (as of the time of the exhibition) to boost operation rates and provide lifetime maintenance based on the "Service First" slogan.

FANUC's CNC technology, which continues to evolve, and FANUC robots, which drive manufacturing automation by their intelligent functions, were supported by many exhibiting companies at this year's JIMTOF and made up a large share of the number of machines exhibited.



CNC share Total number of units: 489



Robot share Total number of units: 142

FANUC CNC and the Share of Robots of the Total Number of Machines Exhibited at JIMTOF 2016 [by internal investigation]

FANUC held its networking party on the first night of JIMTOF 2016. Congratulatory addresses were delivered by guests and many visitors had an enjoyable time, talking with each other with plates filled with food in their hands.



Dr. Yoshiharu Inaba, Chairman and CEO, FANUC Corporation



Kenji Yamaguchi, President and COO, FANUC Corporation



Toshihide Kasutani, Director-General, Manufacturing Industries Bureau, METI



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

Exhibition Information

- **Interphex Osaka 2017** (research and manufacturing exhibition of pharmaceutical, cosmetic, and detergent)

Period: February 15 (Wednesday) to 17 (Friday)

Venue: Intex Osaka

Key exhibits:

- Collaborative robot system with human operators
- FANUC Robot CR-35iA, iRVision
- Small collaborative robot hands-on experience area
- FANUC Robot CR-7iA/L
- High-speed cosmetic sample alignment system
- FANUC Robot M-1iA/0.5S, iRPickTool
- High-speed pharmaceutical product alignment system
- FANUC Robot M-2iA/3S, iRPickTool
- Container alignment system
- FANUC Robot LR Mate 200iD, bin-picking sensor, iRPickTool
- FIELD system

- **nanotech 2017** (International Nanotechnology Exhibition)

Period: February 15 (Wednesday) to 17 (Friday)

Venue: Tokyo Big Sight

Key exhibits:

- New ROBONANO model display
- Demonstration of collaboration between ROBONANO and ROBOSHOT



FANUC Awarded the 59th Best 10 New Product Awards Main Award

The FANUC FIBER LASER series received the Main Prize at the Nikkan Kogyo Shimbun's 2016 (59th) Best 10 New Product Awards.

The FANUC FIBER LASER series consists of high-power, compact fiber laser oscillators that fulfill the demand for high-speed, high-precision processing of various materials through advanced coordinated motion with FANUC CNC systems and robots.

The FANUC FIBER LASER series is designed so that simply connecting the oscillator to a CNC system or robot can control a fiber laser. A high degree of synchronicity between the axis control of the CNC or robot and the laser output command allows accurate irradiation of the target area with a laser beam, realizing unprecedentedly accurate shape cutting.

In addition, the series has achieved significantly-improved laser processing speed, accuracy, quality, and ease of use by adopting various laser processing functions that FANUC has developed over many years, including laser power control according to the processing speed.

We provide a one-stop solution combining a CNC, servo motor, robot, and fiber laser oscillator to satisfy the needs of our customers for a wide range of laser processing applications.

Fiber laser that contributes to manufacturing
FANUC FIBER LASER series



FIBER LASER FF6000i-MODEL A

FIBER LASER FF3000i-MODEL A

The awards ceremony was held on January 26 (Thursday) at Hotel Grand Palace in Kudan, Tokyo, where President Imizu of THE NIKKAN KOGYO SHIMBUN, LTD. awarded an award certificate and a plaque.



Left: Haruhiro Imizu, President, THE NIKKAN KOGYO SHIMBUN, LTD.
Right: Kenji Yamaguchi, President and COO, FANUC Corporation



FANUC Obtaining the Japan Machinery Federation (JMF) Chairman's Award in the Robot Grand Prize Competition

Our company's collaborative robot FANUC Robot CR-35*i*A was awarded the Japan Machinery Federation Chairman's Award at the 7th Robot Grand Prize Competition sponsored by the Ministry of Economy, Trade and Industry. This award is awarded to robots that made particularly important contributions to promoting the robot industry.

Our company's collaborative robot FANUC Robot CR-35*i*A was rated highly for its unique and outstanding capability to transport heavy objects over a long distance without safety fences while also ensuring safety with a high degree of sensitivity, as well as for its great contribution to developing a new market.

At the awards ceremony held on October 19, 2016, an award certificate and a trophy were awarded to Dr. Inaba, General Manager, ROBOT Business Division.

Award-winning product

FANUC Robot CR-35*i*A is the world's first 35-kg high-payload collaborative robot. It can share space with humans safely without safety fences and enables creating semi-automatic facilities that allow humans and robots to work together in various processes, such as transporting heavy objects and assembling parts. This robot will contribute to manufacturing automation in a new era, including improving production efficiency and saving human labor in manufacturing work that has been difficult to robotize.



Awards ceremony



Collaborative robot CR-35*i*A

FA Foundation Research Paper Award Ceremony

On December 9 (Friday), the 2016 FA Foundation Research Paper Award Ceremony was held at the Kazan Kaikan Conference Center.

The FA Foundation (established in March 1989) is a general incorporated association funded by FANUC Corporation. It aims to improve engineering and industrial machine technologies and to contribute to Japan's economic and industrial development by recognizing outstanding research papers on FA and industrial robot technologies.

At this year's award ceremony, a total of eight research papers were chosen for Research Paper Awards based on a thorough review.



Dr. Kenichi Matsuno
President, FA Foundation



Dr. Yoshiharu Inaba
Chairman and CEO, FANUC Corporation

Introduction of New Products and New Features (FA)

■ New I/O Unit for I/O Unit-MODEL B with Dust/Water Proof Specifications (IP67 Specification)

We have developed a new I/O unit with dust/water proof specifications (IP67 specification) that can be separately arranged outside the control panel enclosure of machine tool.

The unit can be installed near sensors or actuators of machine tools and eliminates the need for extending each wiring into the control panel enclosure, which contributes to reducing wiring and improving maintainability.

The collected sensor information can be utilized for machine control in the integrated PMC or C language application, or sent to operation management devices such as FANUC MT-LINK 1 and utilized for quality management or preventive management.

- Can be separately arranged near sensors or actuators installed outside the control panel enclosure.
- Contributes to reducing wiring for connection between the control panel enclosure and sensors/actuators and improving maintainability.
- Equipped with an IEC-compliant M12 connector, which enables easy connection with each I/O device.
- Connected with other I/O units by a cable combining I/O communication and control power cables.
- To be provided with various units including temperature input (thermocouple, resistance temperature detector) units in the future.



DI/DO (8 points each) unit

Analog input (4-ch) unit

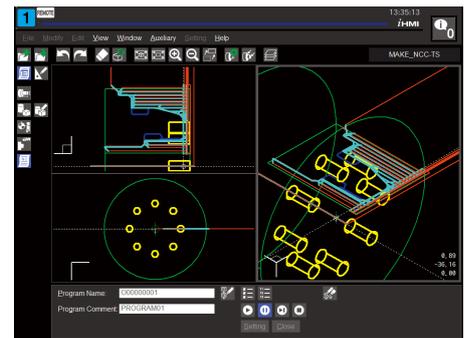
■ Interactive Programming for Multitasking Lathe

We have developed an interactive programming function that support multitasking lathes and two-turret lathes that can perform milling.

This function enables the user to create an NC program easily by inputting the geometry and entering necessary information along the operation flow.

This function requires FANUC iHMI and FANUC iH Pro.

- Geometry can be input by a simple screen operation.
- Work time can be significantly reduced by loading data created with CAD and using it as the geometry.
- All the machining process and conditions are automatically determined based on the work-piece form, created part shape, tools selected in advance, and cutting conditions.
- This function also supports editing of machining process for two-turret lathes.
- This function supports not only cutting (X and Y axes) but also milling (C and Y axes) including tilted plane machining (B axis).



Interactive programming for multi-tasking lathes

■ FANUC LINEAR MOTOR L_{IS}-B series that Achieves High Speed and Precision

Since a linear motor does not use elastically deformable elements or wearing parts such as ball screws for power transmission, it achieves high speed and high precision due to high gain of the servo system, while eliminating the need for maintenance.

In addition, it also contributes to a more rigid and longer stroke axis.

We have developed the FANUC LINEAR MOTOR L_{IS}-B series, which has the following features.

- Contributes to reducing machine size by realizing smaller size with equivalent output force to that of conventional models.
- Available in various product lineups with the maximum forces ranging from 300 N to 16000 N.
- Contributes to higher precision through suppression of heat and enhanced feed smoothness.
- Driving by 200 V and 400 V input supported in all models.
- SERVO HRV⁺ Control supported as a standard specification to achieve higher precision.



FANUC LINEAR MOTOR L_{IS}-B series

Introduction of New Products and New Features (ROBOT)

FANUC Robot M-20iB/25C

FANUC Robot M-20iB/25 has been well-received by our customers as a robot with an enclosed structure, in which the motor or cables are not exposed. We have developed and started distributing M-20iB/25C as a variation of M-20iB/25, which supports both clean environments and food environments.

M-20iB/25C features an improved rust prevention property, while maintaining the slim body, high transfer capacity, and IP67 dust/water proofing performance of M-20iB/25.

- Fully covered robot with a payload of 25 kg.
- Has a smooth arm surface that is resistant to contamination and adopts bolts that prevent water from accumulating, which keeps bacteria from developing and makes cleaning easy.
- Has a stainless wrist flange and bolts and adopts epoxy coating that improves the rust proof performance.
- Uses food grade grease at the drive unit, so that it can be used safely in food environments.
- Integrates a solenoid valve and discharges exhaust air outside through the hose inside the mechanical unit, which enables the use of pneumatic equipment without contaminating clean environments.
- Has a cable connection port for driving the hand inside the arm, which prevents protrusion of connectors to the outside and realizes neat wiring.



M-20iB/25C

FANUC Fiber Laser Interface Function

We have added a new FANUC fiber laser interface function that allows for easy connection between FANUC fiber laser oscillators and robots through EtherNet/IP connections.

This function can realize a laser robot system that offers even more ease of use and higher quality machining through a high degree of integration between a fiber laser oscillator and robot.

- Allows the user to perform teaching of laser machining commands for welding, cutting, and brazing and input of machining conditions in the robot program.
- Equipped with the laser oscillator monitor screen that allows the user to check the laser oscillator condition or machining status on the teach pendant of the robot, eliminating the need for a display for the oscillator.
- Realizes high-quality laser machining through high-precision synchronized control of the robot operation and laser output.
- Automatically configures the connection between the robot and oscillator when the user selects the oscillator model, making the setting operation at start-up very simple.
- Allows for sharing of one oscillator for up to six robots, which makes it possible to reduce costs for the laser system.

FANUC will continue improving its fiber laser application technologies, so as to contribute to the expansion of laser machining applications in manufacturing.



Laser robot system offered by one FANUC



Laser oscillator monitor screen

Introduction of New Products and New Features (ROBOMACHINE)

■ ROBOMACHINE Easy Startup Package QSSP

We have developed and started distribution of an easy startup package QSSP (Quick & Simple Startup Package), in which ROBODRILL, ROBOSHOT, ROBOCUT, and a robot are combined into one package. Combining these products into one package has reduced the man-hours for system design or system upgrade, which used to be an issue when incorporating a robot into ROBOMACHINE, and has made automation at manufacturing sites even easier.

● ROBODRILL QSSP

The QSSP combining ROBODRILL α -D1B series and LR Mate 200iD is a robot system that is optimal for automatic workpiece replacement in ROBODRILL. The package includes a robot pedestal, collective connector connection, easy setup and a robot sample program, and enables easy configuration of a robot system.

● Reduction of workpiece loading/unloading time by the servo door

The side servo door is driven by a servo motor controlled by the controller of ROBODRILL or the robot. The door open/close time has been reduced to approximately 40% that of cylinder-driven doors, contributing to reducing the workpiece loading/unloading time.



ROBODRILL α -D14S1B5
+ Robot LR Mate 200iD

● ROBOSHOT QSSP

The QSSP combining ROBOSHOT α -S1A series and Genkotsu-Robot M-1iA is a robot system that is optimal for automatic inspection and alignment of small parts molded by ROBOSHOT.

The package includes a robot pedestal, conveyor, safety fence, easy setup and a robot sample program, and enables easy configuration of a robot system.

● Recording of molding images through linkage with ROBOSHOT-LINKi

Images of moldings captured by the vision system can be recorded in the ROBOSHOT-LINKi production/quality information management tool in the molding facility.

Collective management of molding data and molding image data can achieve sophisticated traceability.



ROBOSHOT α -S30iA + Robot M-1iA

● ROBOCUT QSSP

The QSSP combining ROBOCUT α -C1B series and M-20iA is a robot system that is optimal for automatic workpiece replacement in ROBOCUT.

The package includes a robot pedestal, stocker, safety fence, easy setup and a robot sample program, and enables easy configuration of a robot system.

● Automatic mold core processing by Core Stich

The Core Stich function makes chips (mold cores) that need to be removed after roughing temporarily adhere to the workpiece by adhesion of the wire component.

Cores are automatically removed by the robot before finishing, which enables long-time continuous unmanned operation in combination with automatic workpiece replacement.



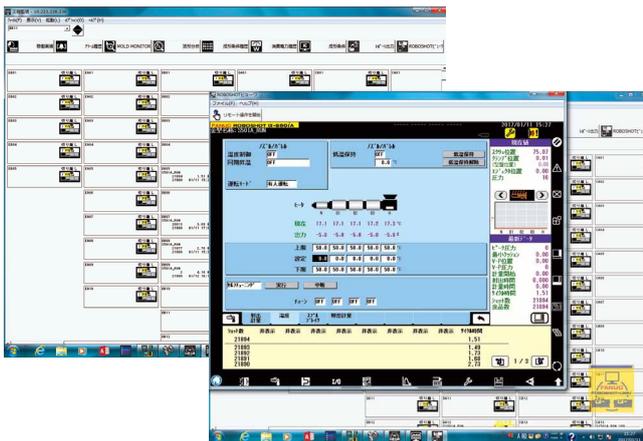
ROBOCUT α -C600iB + Robot M-20iA

Introduction to FANUC Factory ROBOSHOT Factory

ROBOSHOTS are assembled and tested in FANUC's ROBOSHOT factory, which has a production capacity of 400 ROBOSHOTS per month. In the assembly process, work progress is monitored by a process management system and running test status by ROBOSHOT-LINK *i* for the purpose of sharing information by visualizing data to deliver products on time and to improve product reliability. The collaborative robot CR-35*iA*, which requires no safety fences, is installed to support the handling of heavy parts. This helps create a workplace environment where women and senior people can work safely.



Assembly process



ROBOSHOT-LINK *i* Centrally controlling the conditions of products subjected to a running test



Collaboration between a human and a robot (ball screw assembly)

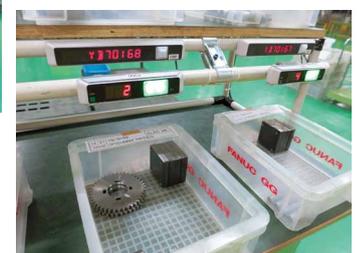
Parts that are delivered to the factory are managed in an automated warehouse and taken out to where they are needed when they are needed according to a delivery schedule based on manufacturing plans and order information. In kit operations that require a unique set of parts for each order, a digital picking system is used to show where to deliver the parts taken out by turning on relevant lights. Therefore, an automated system is developed to support accurate and efficient logistics inside the facility.



Machine assembly delivery station



Kit delivery station and digital picking system





Toyota Industries Corporation, a company that contributes to a comfortable society and enriched lifestyles

We visited Toyota Industries Corporation's Kariya head office factory in Kariya, Aichi to interview Mr. Ikuse, General Manager, Production Engineering Dept., Compressor Div., Mr. Ito, Assistant General Manager, and Mr. Inoue, Group Manager.

Last year was the 90th anniversary of your company's founding. Could you tell us about the history and business operations of your company?

Mr. Ikuse, General Manager: In accordance with the spirit of "Research and Creation" espoused by Sakichi Toyoda, our company's founder, Toyota Industries Corporation was founded in 1926 as Toyoda Automatic Loom Works, Ltd. to manufacture and sell the G-model automatic loom invented by Sakichi (company name was changed to Toyota Industries Corporation in 2001). Subsequently, the company diversified its business, expanding it to automobile-related products (vehicles, engines, and car air conditioner compressors), industrial vehicles (forklifts, etc.), as well as electronics. We are developing business activities not only in Japan, but also throughout the entire world. Today, we are the global market leader for air jet looms, forklifts, and car air conditioner compressors. Last November, we celebrated the 90th anniversary of our company's founding. The company's development was far from easy. We owe today's presence of the company to our predecessors' efforts to overcome numerous challenges and failures. The spirit of being studious and creative, which is stated in our company motto, has been passed down from generation to generation to this day.



(From the left) Mr. Ito, Assistant General Manager; Mr. Ikuse, General Manager; and Mr. Inoue, Group Manager. Photo taken against the background of Japanese-style paper sliding doors designed after the words of Sakichi Toyoda, "Open the window. It's a big world out there."

Could you tell us about the Compressor Division?

Mr. Ikuse, General Manager: The Compressor Division manufactures major car air-conditioning equipment, which is installed in cars around the world. Our global market share is 43% and we have produced a total of more than 400 million units in the past. We have developed high-speed, high-precision production lines that are used in 10 factories in Japan and in 7 factories overseas.

Approximately how many ROBODRILLs are you using in your factory?

Mr. Ito, Assistant General Manager: Some 900 ROBODRILLs are working worldwide as standard processing machines for aluminum die-cast parts. In aluminum processing, ROBODRILLs are used in almost all production lines as major units for rough processing, intermediate processing, and drilling. In finish processing, we use devices we manufacture in-house that are equipped with a FANUC CNC system. In processes that require high-precision processing, we also ask FANUC's SERVO Laboratory staff to participate in processing tests.

What made you decide to use ROBODRILLs in your factory?

Mr. Ito, Assistant General Manager: As compressor output capacity changed, an increasing number of manufacturers started producing vehicles compatible with our products. As a result, we were faced with the need to manufacture an enormous number of different types of compressors due to differences between engines in the position of coolant gas outlets, mounting feet, control valves, and other parts. To respond to the increasing number of different types of compressors as well as with frequent short-term changes in production, we decided to develop small-scale, general-purpose production lines instead of conventional dedicated facilities centered on mini transfer machines. Just at that time, FANUC released the high-speed ROBODRILL to replace the conventional Drillmate. Also, integrating multi-faceted processing processes by using ROBODRILL in combination with a compact five-sided table released by YUKIWA SEIKO enabled us to realize investment effects close to using dedicated facilities.

Without holding back, how do you evaluate ROBODRILL?

Mr. Ito, Assistant General Manager: We produce

Toyoda Precepts

Staying true to the spirit of the late Sakichi Toyoda, observe the following precepts:

- Always be faithful to your duties, thereby contributing to the Company and to the overall good.
- Always be studious and creative, striving to stay ahead of the times.
- Always be practical and avoid frivolousness.
- Always strive to build a homelike atmosphere at work that is warm and friendly.
- Always have respect for God and remember to be grateful at all times.



From Toyota Industries Report 2016



products mainly by automatic lines, so we would be pleased if you could provide a cover that makes it easier to coordinate ROBODRILL's operations with automated processes.

Also, when we perform high-precision operations in one-chuck processing, processing and rotation directions are sometimes restricted due to thermal displacement. ROBODRILL has functions to control thermal displacement. However, it would be more desirable if we could mechanically eliminate displacement. We would also be pleased if you could mitigate the restrictions on tool weights.

Do you have any requests to FANUC?

Mr. Inoue, Group Manager: Robot controllers are too large. Some makers are manufacturing controllers the size of a PC. Also, we hope to continue to collaborate with FANUC to develop the world's No. 1 high-speed, high-precision production process.

Mr. Ikuse, General Manager: Going forward, we are eager to collaborate with FANUC in developing AI and IoT technologies as well as establishing standard production processes at our manufacturing sites around the world, so we would like to ask for your cooperation.



Kariya head office factory



Inside the Kariya factory

(Interviewer: Naoki Yukisada, Vice Manager, Public Relations Department)

Toyota Industries Corporation (<https://www.toyota-shokki.co.jp>)

- ▶ **President:** Akira Onishi ▶ **Capital:** 80.4 billion yen
 - ▶ **Sales:** 2.2289 trillion yen (fiscal year ended March 2016)
 - ▶ **Number of employees:** 51,458 (as of March 31, 2016)
- Head office:
- ▶ **Address:** 2-1, Toyoda-cho, Kariya-shi, Aichi 448-8671, Japan
 - ▶ **Phone:** 0566-22-2511 ▶ **Fax:** 0566-27-5650



Four Seasons of FANUC



An Adonis flower, the harbinger of spring, was found basking in the sun.

It looks like a little sun that brings warmth to the spring Oshino forest, which is still cold.

FIELD system

FANUC Intelligent Edge Link & Drive system



The FIELD system is a platform open to everyone, and was developed for edge-heavy computing by bringing together the latest IoT and cutting-edge AI technologies.

By using this system, FANUC aims to work with partners around the world to innovate manufacturing.



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