FRA series

Product Take-out Robots

Yushin Company

⚠	Safety Warnings	● The products within this catalog are defined as industrial robots and parts per Japan's Ordinance on Industrial Safety and Health. ● The photographs and illustrations appearing in this catalog were taken without safety enclosures and other safety devices and equipment required by the Ordinance, in order to more clearly illustrate the products. Please have safety devices and equipment installed and/or available before using the products. ● Before using the products described in this catalog, please carefully read all instruction manuals and other documentation provided, to ensure proper use.

* The content of this catalog is subject to change without notice, for improvement purposes.
* "PAT." and "PAT.P" notations in this catalog are in accordance with Japan's Patent Act. Patent application/registration status outside Japan may differ from that noted in this catalog.

Yushin, through all of our business activities and the application of earth-friendly, ergonomic technologies, promotes a healthy coexistence with the planet.

Contact us

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Plastic Injection Molding today has given today's world the opportunity and benefits for innovative technology solutions and has continued to make better products with higher speed and quality.

Take-out robots are crucial tools for manufacturing quality products with high speed precision in the plastic injection molding industry.

Like any other industry, the plastic injection molding industry continues to face its own challenges: the difficulty of molding intricate parts, high-mix, short-run production, and factory floor hazards.

Our ultimate goal was to create a robot that directly addressed these universal challenges and anticipates injection molding's future needs.

The FRA was engineered with this mindset.

Awards History

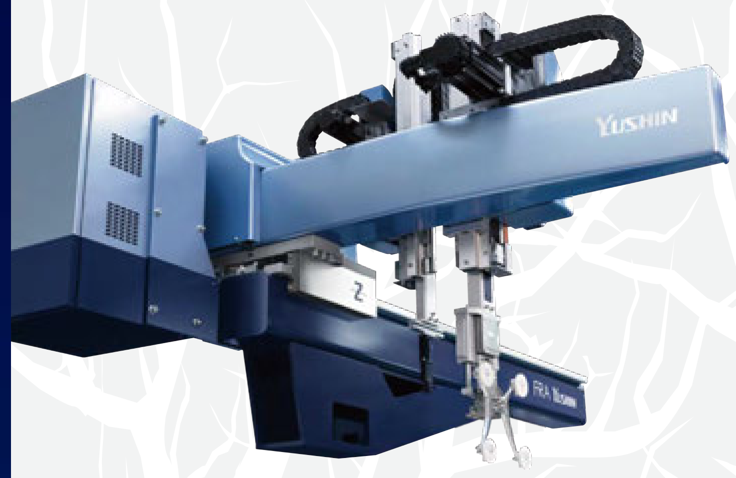
The Japan Society of Mechanical Engineers Medal for New Technology

MACHINE DESIGN AWARD

The JMF's Energy-Efficient Machinery Award

reddot award 2019 winner

Design Optimization DESIGN



In pursuit of ideal design, the FRA's structure was conceived and refined with topology optimization technology.

The FRA's slender extremities resemble naturally-selected structures like tree limbs or bird wings;
Proof that its design evolution is aligned with the necessities of nature.

Shortening Cycle Times

3D-Optimized Kick Frame PAT.

The FRA's new kick frame design was developed through Yushin's generations of use of design optimization techniques. It retains the excellent repeatability of older frame designs, but with reduced weight for even better performance during high-speed operation.

Lightweight Body

Utilizing design optimization reduced the mass of the FRA's moving components 16% compared to previous robots. That weight reduction succeeded in making the FRA's production cycle time up to 10% faster and its take-out cycle time up to 29% faster than its predecessors.
Also, lighter weight reduced the FRA's power consumption from 620W to 408W - a 34% improvement over older, heavier robots.

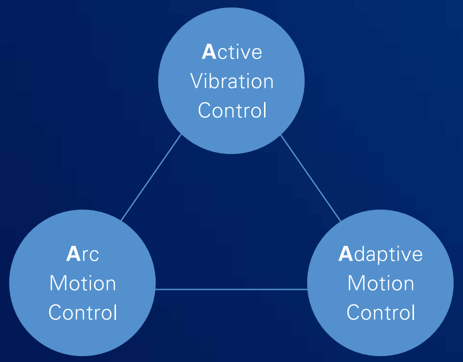
What Is Design Optimization?

Design Optimization is what Yushin calls the practice of applying CAE (computer-aided engineering) to seek the most theoretically optimal form for a robot based on its mechanism and motions. This advanced approach is used to design lighter weight and increased reliability into such things as automobiles and aircraft. Yushin adopted the technique early for robot development.

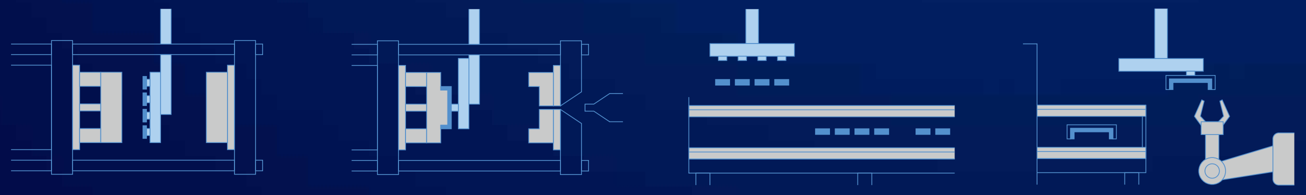
High Precision Take-out CONTROL

A take-out robot varies its arm length as required by application.
Exchanging a robot's end-of-arm tool alters the mass of the robot's load.
To operate with high precision regardless of the arm position or end-of-arm tool,
a robot must be aware of the degree of its own vibration.
The FRA senses its own vibrations and eliminates them automatically.

Our goal was to deliver peace of mind for high-precision applications such as insert molding, which demand repeatability.
The FRA is equipped with the world's most advanced vibration control technology that enables it to perform a variety of operations with speed and accuracy.



The FRA's industry-best features support top-quality molding.



Intricate molding and take-out with undercut motion

Placing insert work into the mold

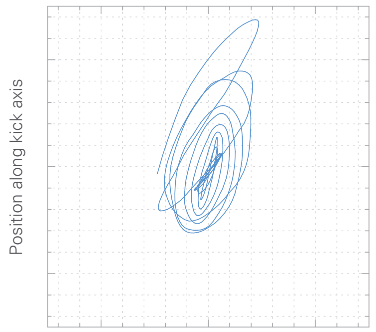
Release motion

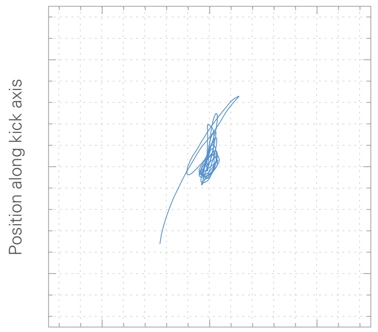
Interfacing with downstream equipment

Vibration Control Results in Shorter Timers

Active Vibration Control PAT.

With this feature, the robot senses and analyzes end-of-arm vibration and works actively to neutralize it. It unlocks new levels of high-speed molding without take-out failures by actively eliminating vibration that previous technologies could not touch. It is especially effective on robots with heavy end-of-arm tools or long arm strokes, where it shortens stops pauses needed for vibrations to subside and thereby greatly reduces cycle times.



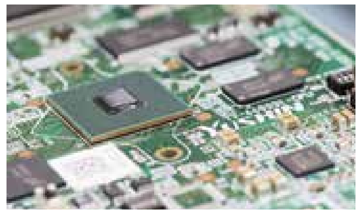


Arc Motion Control PAT.

This feature conducts curved motions along robot axes to produce smooth, high-speed movement beyond previous traverse robots. Traditionally, robots would trace "L-shaped" motions where one axis of motion would accelerate and decelerate, followed by acceleration and deceleration of the 2nd axis. But with Arc Motion Control, the robot starts acceleration on the 2nd axis while the 1st axis is still decelerating, to generate less vibration and shorten cycle times.

Adaptive Motion Control

A means for higher speeds where the robot accounts for its position and optimizes its movements. During approach to take-out, gate cut, insert, or other positions in the cycle, the robot automatically manages its motion for optimal smoothness and best possible conditions for molded parts.



The FRA's CPU has more than 2x the processing power of older robots

On-board Jerk Filter

This vibration control method works by reducing jerky, irregular stops and starts, or variability in acceleration speed. The robot regulates jerks to smooth out abrupt deceleration and suppress vibration. It operates on the same principle as an automobile coming to a stop, when the driver eases pressure on the brake just before the vehicle stops to lessen the impact.

Increased Productivity YUSHIN IoT

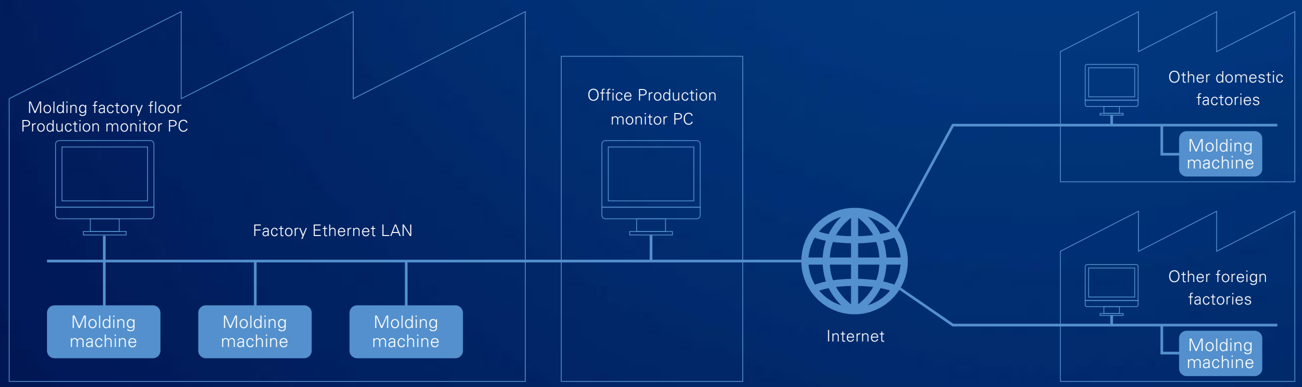
Gaining Full Knowledge of your Production Floor Status

Monitoring production status was always a troublesome, expensive endeavor, requiring investment in infrastructure, expertise in networks and security, or even hiring a system integrator.

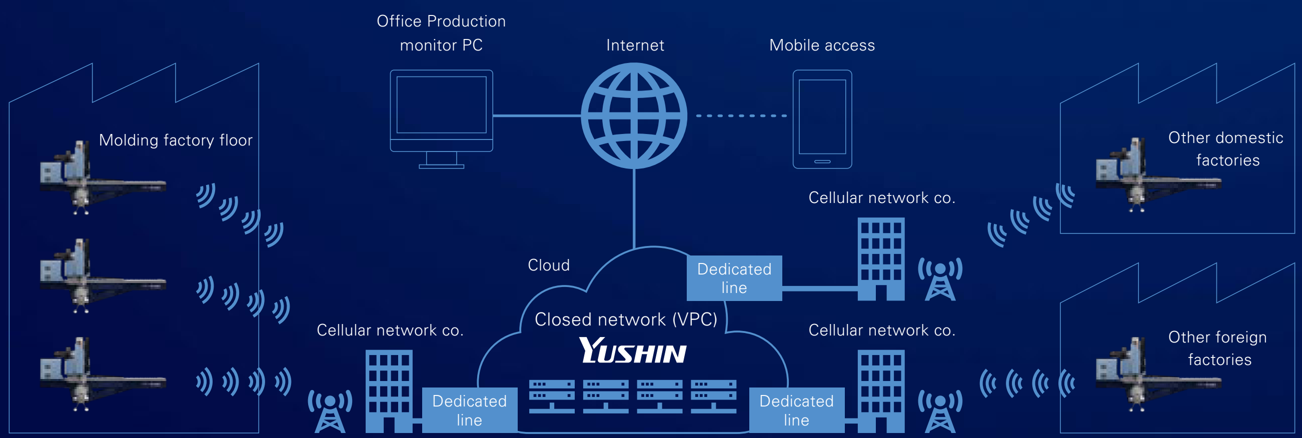
"INTU LINE," however, is designed to enlighten simply by activating IoT service, with zero initial investment needed for installing systems or LAN cables in your facility.
INTU LINE operates completely outside of your company network, so with only a small annual cost, you can easily get the live production information you need to help reduce downtime, raise yields, and improve quality.

Available upon installation of your FRA robot, INTU LINE gives users easy access to production status, from anywhere and at any time.
When production must go on and robots need to keep running, INTU LINE provides answers for a long-held demand.

Traditional System Mainly relies on your company's IT network.



INTU™ LINE Fully independent of your company's IT network, and ready for immediate use.

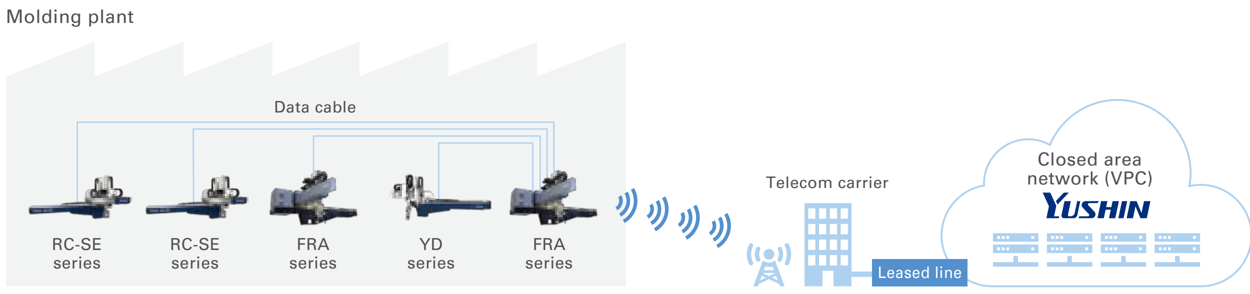


One FRA series model transforms the plant into a smart system

INTU™ LINE PAT.

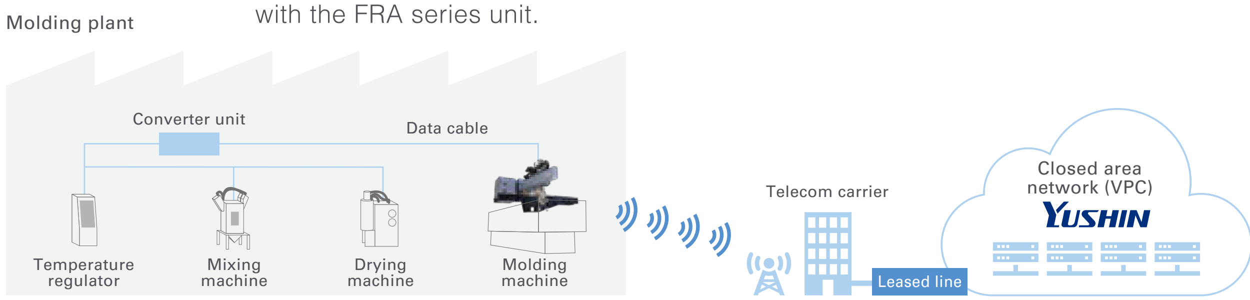
Using the FRA series as an IoT hub, up to five devices can be centrally managed.

Use example 1 Production data can be visualized by connecting up to a total of five Yushin take-out robots to the FRA series unit.



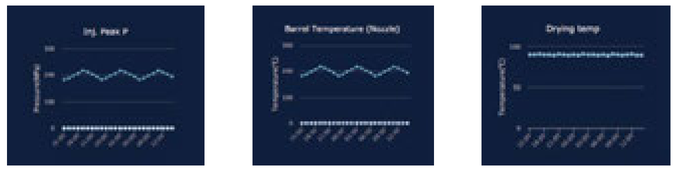
* The applicable Yushin take-out robots are the FRA, RC-SE and YD series.
* Certain versions of equipment along with the details of custom-made programs may not allow for connection or may need modifications (with charge), additional parts, or replacement (with charge).

Use example 2 Molding conditions can be managed by connecting a total of up to five molding machines and peripheral equipment, such as temperature regulators, with the FRA series unit.



NISSEI, Sumitomo Heavy Industries, Ltd., JSW, Sodick, FANUC, TOYO, UBE, Shibaura Machine, NIIGATA, KAWATA, MATSUI, HORAI, USHIO, Futaba, ASKA

Of the various pieces of information recommended by the manufacturers, up to six items can be checked.



* As of January 2025
* Some molding machines and/or peripheral devices may not be connectible. Predictive Maintenance, troubleshooting, and other functions depend on each supplier's services.

⚠ Check with Yushin's sales representative regarding the connectivity of Yushin's products and other products beforehand.

* A separate application is needed to use this service.
* This service will be available in the future in countries and regions outside of Japan.
* The company names, system names, and product names used here are, in general, trademarks or registered trademarks of their respective companies.

INTU™ LINE

Check your Robot's Status with Ease - Any Time, Any Place

Check production status anywhere, anytime

Production count and cycle time available on smartphones and other devices

- Production status can be seen anywhere, anytime
- Real-time understanding of on-site issues
- Helps improve productivity and quality

Check the on-site situation at a glance remotely or during business trips

Find out the operation status on the spot at night, during holidays, or in times of disasters

No need for handwritten daily journals, count-ups, or data retrieval from molding machine internal memory—No more manual data collection

No stress from missing data due to manual input

Achieve quality control and build set-up knowledge by combining data from molding machines and peripheral device

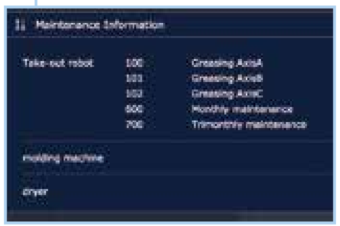
Consolidate various information on a single screen and easily access detailed information with manageable operations

Check production counts, average molding cycle times, uptime ratio, operation status, and stoppage log in graphs and images on the display

Retrieve the latest still image using the image import button

Release position

Wait position

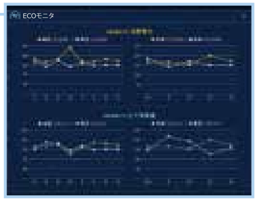


Maintenance information, error information

Cycle can be remotely stopped to stop take-out robots during off-hours production in case of a defect.

PDF reports and CSV raw data can be retrieved on a daily, weekly, or yearly basis.

Eco-friendly plant management can be achieved by displaying robot power and air consumption.



ECO monitor

PAT.

Reduce downtime

Robot operation status is monitored via cloud service.
Smoothly resolve any problems using an AI-based problem cause prediction system directly connected to the service.

Predictive Maintenance

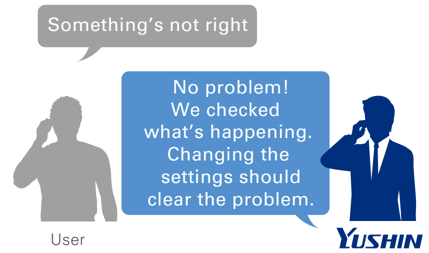
Problems are prevented by anomaly detection in belt tension, capacitor life, and air pressure in addition to AI-based failure prediction.

Automatic issuance of maintenance reports

INTU LINE automatically issues periodic maintenance and inspection information for use in maintenance activities.

Troubleshooting

Sharing information with Yushin in the event of a problem helps bring early resolution.



Reduce defects

Useful for ensuring molding quality and building molding set-up knowledge by combining data from molding machines and peripheral devices.

Cycle can be remotely stopped to stop take-out robots during off-hours production in case of a defect.

Data and images stored in the cloud are saved for three years as a log and are usable as traceability data.

Messaging function

Production Complete messages

Changeover time can be short-ened by e-mail notification of the completion or pre-completion of produc-tion (selectable by setting).

Failure Alert messages

Receive e-mails in case of production stoppages (con-ditions can be specified).

Periodic Notice messages

Receive weekly journals by e-mail.

Heat-up Complete messages

Lead time can be shortened and standby power can be reduced by receiving notification at the completion of cylinders heat-up of molding machines.

※Some molding machines may not be connect-ible. For more information, please contact your local Yushin sales representative.

Greater Ease of Use COMFORT

In high-mix, short-run production, the need for meticulous robot teaching is greater than ever. Fortunately, the FRA controller was built to please anyone who has wanted to concentrate on robot teaching without constant distractions from a clunky user interface. The FRA's controller and software were shaped by the unending pursuit of ever simpler, ever more effective controllers.

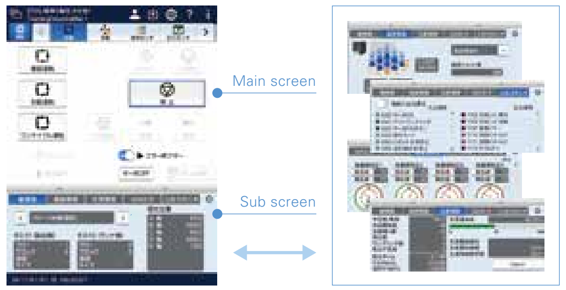
Those ideals lie at the core of Yushin's "Heartful Technology" design philosophy.

E-touch V®

Faster, More Accurate Robot Teaching and Mold Changes

Dual Screen Convenience

The E-touch V retains the effective control interface of previous E-touch II and E-touch Compact controllers, but presented in a vertical, dual screen format with main and sub screens. Information formerly shown on separate screens can now be shown simultaneously on the split screens. This convenient layout improves robot teaching efficiency and accuracy by eliminating back & forth screen switching.



Ergonomic Design

With ambidextrous hand grips located in the case's corners, the E-Touch V centers its weight over the user's arm, reducing fatigue. The enable switches on the grips are positioned diagonally, keeping the operator's wrist in neutral posture and lessening strain during long robot teaching sessions. The controller screen can be tapped and swiped in a familiar, smartphone-like fashion.

Custom Monitor

Operators can freely assign the I/O signals or input buttons of their choice to the sub screen. Grouping these most frequently used functions together helps to raise productivity.

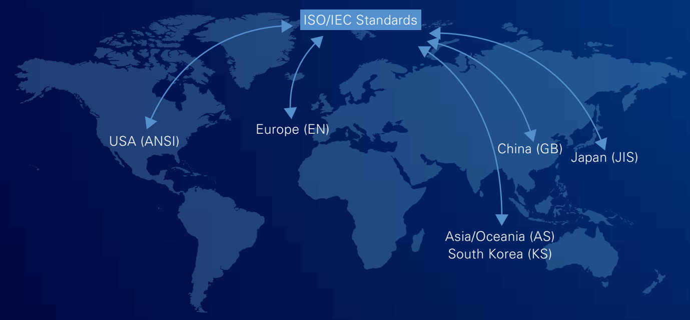
Lead Through Teaching

The Lead Through Teaching programming application allows users to add positions and timers and adjust speeds to robot programs using the handheld controller's touchscreen. The Lead Through Teaching interface on the E-touch V is improved, with larger displays and easier-to-read text.

Global Standard SAFETY

Safety must be the absolute highest priority of any production facility. Yushin built the FRA in strict accord with this belief, incorporating international safety standards into the robot features to maintain workplace safety.

Building safer workplaces is a core concept for the FRA.



The Origins of International Safety Standards

The WTO integrated the independent safety standards of several countries and into their new ISO/IEC International Safety Standards. WTO member nations are now mutually obligated to adopt the international standards as their own.

Standard-Equipped for the World's Highest Safety Standards

1) Safety Circuit

By doubling the safety circuit, no loss of function occurs even if one safety circuit is damaged. This redundancy is a fundamental way of preventing robot-related accidents.

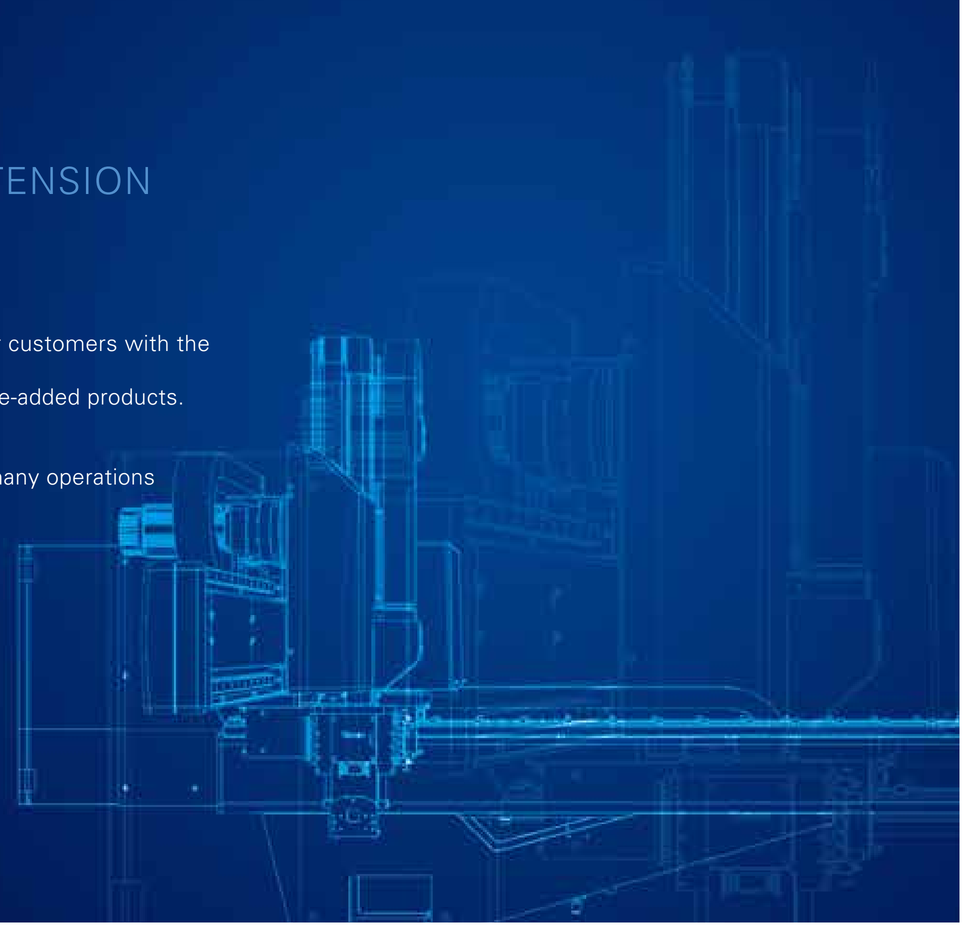
2) Safe Speed Monitoring

This feature governs the run speed of motors to ensure it does not exceed set values. Operators can safely perform robot teaching without risk of exceeding recommended speeds.

3) International Safety Standard Compliance

The FRA Series is compliant with EN ISO 12100, EN 60204, EN ISO 10218, and is a Safety Category 3 device. It also complies with the CE, GB, and KCs regional standards.

FRA Model Type		C2	C1
Molding Machine Interface		Euromap 67	Euromap 67 Euromap 12 Selectable Japan Spec Interface
Safety Category	1) Safety Circuit	Category 3 PL=d	Redundancy Provided by Safety Relay
	2) Safe Speed Monitoring	Category 3 PL=d	–
3) Compliant Standards		EN ISO 12100 EN 60204 EN ISO 10218	–



Expandability EXTENSION

"High-mix, Short-run Production"

Yushin knows the importance of providing our customers with the versatile equipment needed to mold high value-added products.

Designing robots with the ability to perform many operations beyond just pick and place makes integration with downstream equipment an easy task.

A Robot Prepared for the Changes of the Future

Includes Robot Language

To satisfy growing demand around the world, Yushin has added robot language as FRA standard equipment together with the usual Lead Through Teaching and Flexible Teaching programming tools. This is one way Yushin is prioritizing versatility and longevity of our products in our customers' service.

Integrates Downstream Equipment

Equipped with such protocols as DeviceNet, EtherCAT, and EtherNet/IP, the FRA can interface with and control most downstream equipment. The FRA accommodates ever more common post-mold processes like inspection and assembly to help users in their value-added manufacturing. It also has PNP/NPN switching, to make connecting with western brands of downstream equipment easier for users.

DeviceNet
EtherCAT
EtherNet/IP

Flexible Teaching

This software allows users to create robot motion programs and make detailed edits (interlocks & error processing) in a flowchart style quickly and easily on their PC, without need for complex programming language. Flexible Teaching helps users quickly access past applications and manage future equipment.

We offer training classes for Flexible Teaching. For more information, please contact your local Yushin sales representative.

Options

Servo Wrist Unit PAT.

End-of-arm units which add servo-powered flip and rotation axes, allowing the robot to rotate end-of-arm-tools vertically or horizontally as needed. Servo Wrist Units greatly enhance automation and production efficiency.

Axes Controlled	Type
3-axis	Vertical rotation + wrist flip + horizontal rotation
2-axis	Vertical rotation + wrist flip
	Wrist flip + horizontal rotation
1-axis	Horizontal rotation + pneumatic wrist flip
	Wrist flip

Up to 50% Slimmer

Yushin redesigned the wrist units with major structural enhancements which reduced unit width by up to 50% compared to previous units.

Adjustments Made Easy

With a Servo Wrist Unit, undercut motions or stationary side take-out can be accomplished simply by teaching.

Unrestricted Control

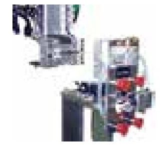
The FRA combined with a Servo Wrist Unit provides up to 8 axes of motion, enabling freedom of motion comparable to articulated robots.

External Beam-Mounted Nipper Unit

Installed on the traverse beam end, this unit works with the end-of-arm tool to automatically separate gates from molded products.

EOAT Quick-change Unit

Enables instant, press-on attachment/detachment of end-of-arm tool and its pneumatic and wiring connections. Allows fully automatic tool changes.

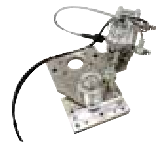


Horizontal Wrist Rotation Unit (incl. detection)

Adding this pneumatic unit allows the main arm wrist to be rotated horizontally, enabling the robot to change the orientation of molded products before releasing them.

Vertical Wrist Rotation Unit (incl. detection)

Adding this pneumatic unit to the wrist-flip mechanism allows the orientation of released products to be changed.



Other Options

* Installing some options may affect standard specifications such as stroke length and maximum payload. Please consult your local Yushin sales representative.

Option Name	Description
Additional Vacuum Circuits/ Product Release Points	Standard-equipped with 1 vacuum circuit (1 release position), additional circuits may be added up to a maximum total of 8 circuits (8 release positions).
Additional Product Grip Circuits	1 or 3 additional gripper circuits may be added to the single, standard-equipped circuit for a total of 2 or 4 product grip circuits.
Additional Sprue Grip Circuits (Sprue Intermediate Drop)	Allows sprue release timing to be set via mode selection. 1 or more additional circuits may be added to the single, standard-equipped circuit.
Soft Grip Circuit	Adds a pressure reducing valve to soften gripper power and prevent deformation of molded products.
Pitch Revise Circuit	Allows operator to change the orientation of parts gripped by the end-of-arm tool.
Sprue Cut Circuit	Allows nippers aboard the EOAT to cut sprues. May not be equipped together with the EOAT Gate Cut Circuit option.
EOAT Gate Cut Circuit	Allows nippers aboard the EOAT to approach and cut gates. May not be equipped together with the Sprue Cut Circuit option.
Gate Cut Multiplier	This option allows operator to set up to 4 gate cut motions per cycle, with up to 3 wait positions per gate cut.
EOAT Quick-Release Fitting	Allows fast and easy manual attachment/detachment of end-of-arm tool (used in a set: robot half and tool half).
Controller Screen Protector Sheet	A cover sheet which helps protects the controller touchscreen (replacement for the standard-equipped sheet).
Ascent Limit Product Verification	After product take-out, a remote-mounted limit switch at the robot's ascent limit verifies product presence in the end-of-arm tool.
Dropped Product Detection	After extracting from the mold, the robot continuously verifies its hold on molded products until it finally releases them.
Stop/Pause at Ascent Limit after Take-out Failure	If a take-out failure occurs during automatic operation, the robot error-stops when it ascends from the mold after take-out. Without this option, the robot completes one full cycle before error-stopping.
Low Air Pressure Detection	The robot error-stops if the air supply's pressure drops below a set value.
Increased Maximum Payload	Power along the vertical axis is increased, enabling the robot to handle heavier payloads.
Increased Wrist Flip Torque	Increases the wrist flip/holding power to better handle large end-of-arm tools or those mounted with a large offset from center.
High-Speed Traverse	Equips the traverse axis with a more powerful motor to speed up cycle times.
Signal Light	Colored lights indicate the status of the robot. Available in 3 models: single tier yellow, single tier red, or 3-tier red + yellow + green.
8-pin Connector for Stocker Unit Interface	A metal connector which allows robot to interface with Yushin-made stocker units.
Pause for Mold Open	Used to allow time for mechanical ejection of molded parts.
Centralized Manual Lubrication System	Delivers lubricant from a manual pump to necessary areas.
Centralized Automatic Lubrication System (per shot count)	Automatically lubricates important areas of the robot every set number of shots (designated by operator).
Cleanroom-Grade Grease (customer-specified)	Equips robot with cleanroom-grade grease for sensitive applications.
Communication with Molding Machine	The robot exchanges information such as mold numbers with the molding machine to automatically synchronize data.
Downstream Device Control	Enables communication with downstream equipment via DeviceNet, EtherCAT, or EtherNet/IP protocols.
Multilingual Display	3 user-selectable display languages are installed in the controller (standard-equipped English and Japanese plus one alternate language of choice).

FRA

Common specifications

Power supply	Drive method	Working air pressure	Wrist flip angle
3-phase 200 VAC/ 220 VAC/ 230VAC (50 Hz/60 Hz)	Digital servo motor(3/5 axes)	0.49 MPa	90°

Model **FRA - 3060D - 17 - C2V**

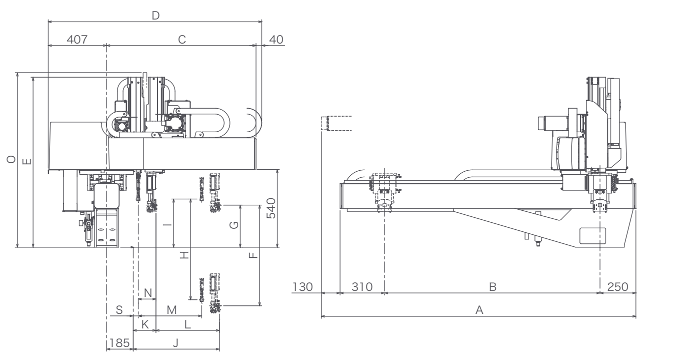
- Series name: FRA
- Clamp force of compatible molding machines: 0515 (50～150 tf), 1530 (150～300 tf), 3060 (300～600 tf)
- Arm type: S Main arm only; D Main arm and sub arm; DS Double main arms
- Traverse stroke: Ex) 17(×100 mm)
- Safety Std Compliance: C2 International std compliant; C1 —
- Smart function: V IoT equipped; _(blank) IoT not equipped

CE

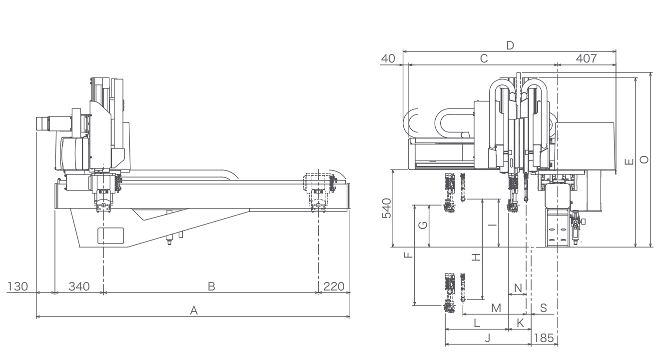
For CE supported languages,
please contact our sales department.

FRA-0515

■ Rear (non-operator) Side Discharge Direction

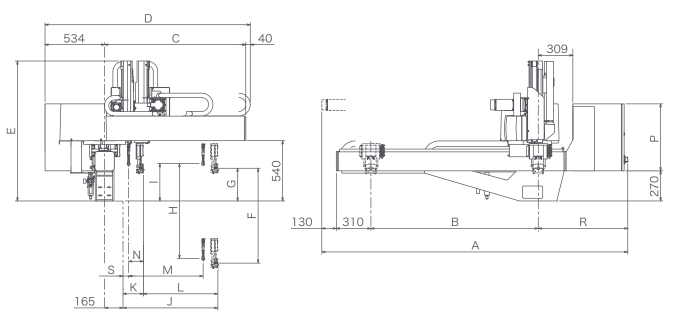


■ Operator Side Discharge Direction

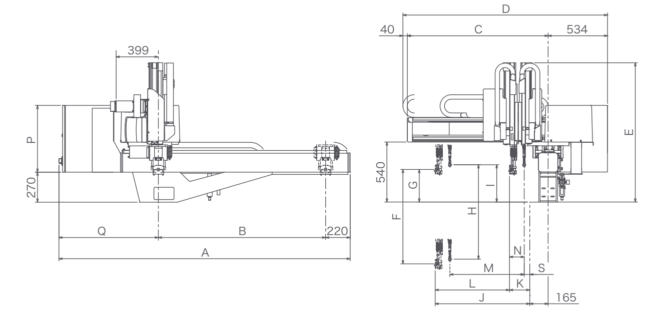


FRA-1530

■ Rear (non-operator) Side Discharge Direction

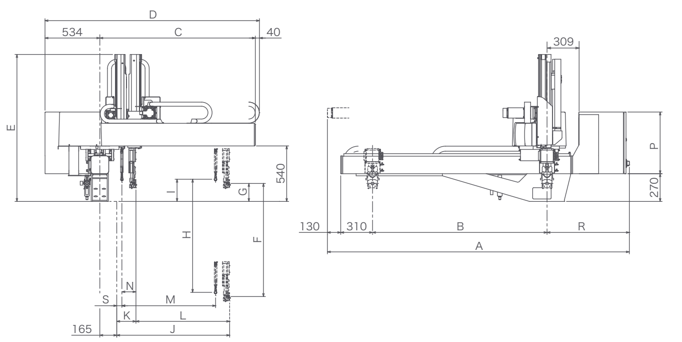


■ Operator Side Discharge Direction

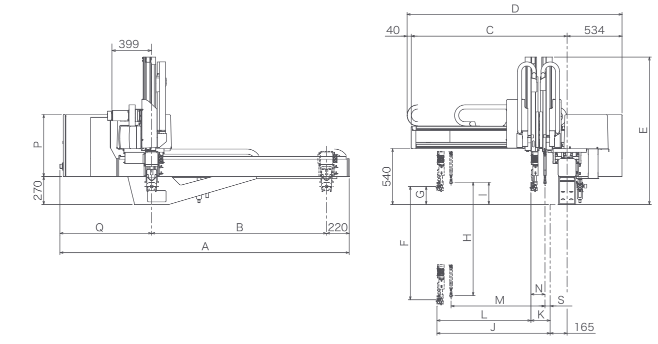


FRA-3060

■ Rear (non-operator) Side Discharge Direction



■ Operator Side Discharge Direction



FRA-0515

Model specifications

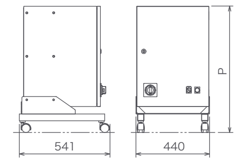
Model	Power consumption	Traverse stroke [mm]	Kick stroke[mm] Main arm	Kick stroke[mm] Sub arm	Vertical stroke[mm] Main arm	Vertical stroke[mm] Sub arm	Air consumption [NL/cycle]	Payload [kg]	Noise [dBA]	Clamp force of compatible molding machines[tf]
FRA-0515S	2.3 kVA 200 VAC 6.5 A	(1100) 1500 (1700) (1900) (2200) (2500)	500	—	700 (850)	—	5.5 ECO Vacuum OFF 1.9 ECO Vacuum ON	5 《11》	74.7	50～150
FRA-0515D			442	442		700 (850)				
FRA-0515DS	3.8 kVA 200 VAC 10.8 A		318	318			10.8 ECO Vacuum OFF 3.6 ECO Vacuum ON			

S type: Main arm only
D type: Main arm and sub arm
DS type: Two main arms
( ): Modified stroke
《 》: Increased maximum payload
Payload includes weight of end-of-arm tool.
Traverse beam stanchion is standard equipmentfor traverse stroke over 1900 mm.

Model	A	B	C	D	E	F	G	H	I	J	K	L	M	N	S
FRA-0515S	(1790) 2190 (2390) (2590) (2890) (3190)	(1100) 1500 (1700) (1900) (2200) (2500)	1040	1487	1182 (1254)	700 (850)	293	—	—	600	100	500	—	—	35
FRA-0515D								700 (850)	335		158	442	442	123	
FRA-0515DS									293		282	318	318	170	112

G	J	K	L	M	N	O	S
〈175〉 {175}	〈604〉 {604}	〈104〉 {167} 《104》	〈500〉 {437} 《500》	—	—	《1218》 700 st only	35
		〈162〉 {225} 《191》	〈442〉 {379} 《409》	〈442〉 {379} 《409》	〈127〉 {190} 《156》		
		〈268〉 {397} 《314》	〈318〉 {208} 《286》	〈318〉 {208} 《286》	〈178〉 {289} 《202》		〈108〉 {108} 《112》

■ Control box



	P
C2 Type	600
C1 Type	500

* For more detail on C2 and C1 safety specifications, please see p. 10

( ) Modified stroke
〈 〉 With increased wrist flip torque
{ } With horizontal wrist rotation unit
《 》 With centralized manual lubrication system

FRA-1530

Model specifications

Model	Power consumption	Traverse stroke [mm]	Kick stroke[mm] Main arm	Kick stroke[mm] Sub arm	Vertical stroke[mm] Main arm	Vertical stroke[mm] Sub arm	Air consumption [NL/cycle]	Payload [kg]	Noise [dBA]	Clamp force of compatible molding machines[tf]
FRA-1530S	2.3 kVA 200 VAC 6.5 A	(1100) 1500 (1700) (1900) (2200) (2500)	728	—	850 (1100) (1300) (1550)	—	5.9 ECO Vacuum OFF 1.9 ECO Vacuum ON	5 《11》	72.7	150～300
FRA-1530D			668	668		850 (1100) (1300) (1550)				
FRA-1530DS	3.8 kVA 200 VAC 10.8 A		544	544			11.6 ECO Vacuum OFF 3.6 ECO Vacuum ON			

S type: Main arm only
D type: Main arm and sub arm
DS type: Two main arms
( ): Modified stroke
《 》: Increased maximum payload
Payload includes weight of end-of-arm tool.
Traverse beam stanchion is standard equipment for traverse stroke over 1900 mm.

Model	A (Rear (non-operator) Discharge Direction) C2 Type	A (Rear (non-operator) Discharge Direction) C1 Type	B	C	D	E	F	G	H	I	J	K	L	M	N	S
FRA-1530S	(2342) 2742 (2942) (3142) (3442) (3742)	(2310) 2710 (2910) (3110) (3410) (3710)	(1100) 1500 (1700) (1900) (2200) (2500)	1265	1839	1254 (1430) (1534) (1662)	850 (1100) (1300) (1550)	293	—	—	850	122	728	—	—	50
FRA-1530D									850 (1100) (1300) (1550)	335		182	668	668	132	
FRA-1530DS										293		306	544	544	178	128

A (Operator Discharge Direction) C2 Type	A (Operator Discharge Direction) C1 Type	G	I	K	L	M	N
(2212) 2612 (2812) (3012) (3312) (3612)	(2180) 2580 (2780) (2980) (3280) (3580)	〈175〉 {175}	〈175〉 {175}	〈122〉 {185} 《122》	〈728〉 {665} 《728》	—	—
				〈182〉 {245} 《215》	〈668〉 {605} 《635》	〈668〉 {605} 《635》	〈132〉 {195} 《165》
				〈306〉 {417} 《338》	〈554〉 {434} 《512》	〈554〉 {434} 《512》	〈178〉 {289} 《210》

	P	Q	R
C2 Type	600	892	802
C1 Type	500	860	770

* For more detail on C2 and C1 safety specifications, please see p. 10

( ) Modified stroke
〈 〉 With increased wrist flip torque
{ } With horizontal wrist rotation unit
《 》 With centralized manual lubrication system

FRA-3060

Model specifications

Model	Power consumption	Traverse stroke [mm]	Kick stroke[mm] Main arm	Kick stroke[mm] Sub arm	Vertical stroke[mm] Main arm	Vertical stroke[mm] Sub arm	Air consumption [NL/cycle]	Payload [kg]	Noise [dBA]	Clamp force of compatible molding machines[tf]
FRA-3060S	2.3 kVA 200 VAC 6.5 A	1700 (1900) (2200) (2500)	973	—	1100 (1300) (1550) (1800 : during release)	—	8.3 ECO Vacuum OFF 3.1 ECO Vacuum ON	10 《13》	73.7	300～600
FRA-3060D			913	913		1100 (1300) (1550) (1800 : during release)				
FRA-3060DS	3.8 kVA 200 VAC 10.8 A		794	794			16.4 ECO Vacuum OFF 6.0 ECO Vacuum ON			

S type: Main arm only
D type: Main arm and sub arm
DS type: Two main arms
( ): Modified stroke
《 》: Increased maximum payload
Payload includes weight of end-of-arm tool.
Traverse beam stanchion is standard equipment for traverse stroke over 1900 mm.

Model	A (Rear (non-operator) Discharge Direction) C2 Type	A (Rear (non-operator) Discharge Direction) C1 Type	B	C	D	E	F	G	H	I	J	K	L	M	N	S
FRA-3060S	2942 (3142) (3442) (3742)	2910 (3110) (3410) (3710)	1700 (1900) (2200) (2500)	1515	2089	1430 (1534) (1662) (1782)	1100 (1300) (1550) (1800 : during release)	175	—	—	1100	127	973	—	—	50
FRA-3060D									1100 (1300) (1550) (1800 : during release)	216		187	913	913	137	
FRA-3060DS										175		306	794	794	178	128

A (Operator Discharge Direction) C2 Type	A (Operator Discharge Direction) C1 Type	G	K	L	M	N
2812 (3012) (3312) (3612)	2780 (2980) (3280) (3580)	〈169〉 {149}	〈127〉 {185} 《127》	〈973〉 {915} 《973》	—	—
			〈187〉 {245} 《215》	〈913〉 {855} 《885》	〈913〉 {855} 《885》	〈137〉 {195} 《165》
			〈306〉 {417} 《338》	〈794〉 {684} 《762》	〈794〉 {684} 《762》	〈178〉 {289} 《210》

	P	Q	R
C2 Type	600	892	802
C1 Type	500	860	770

* For more detail on C2 and C1 safety specifications, please see p. 10

( ) Modified stroke
〈 〉 With increased wrist flip torque
{ } With horizontal wrist rotation unit
《 》 With centralized manual lubrication system