

The Innovator of Aluminum



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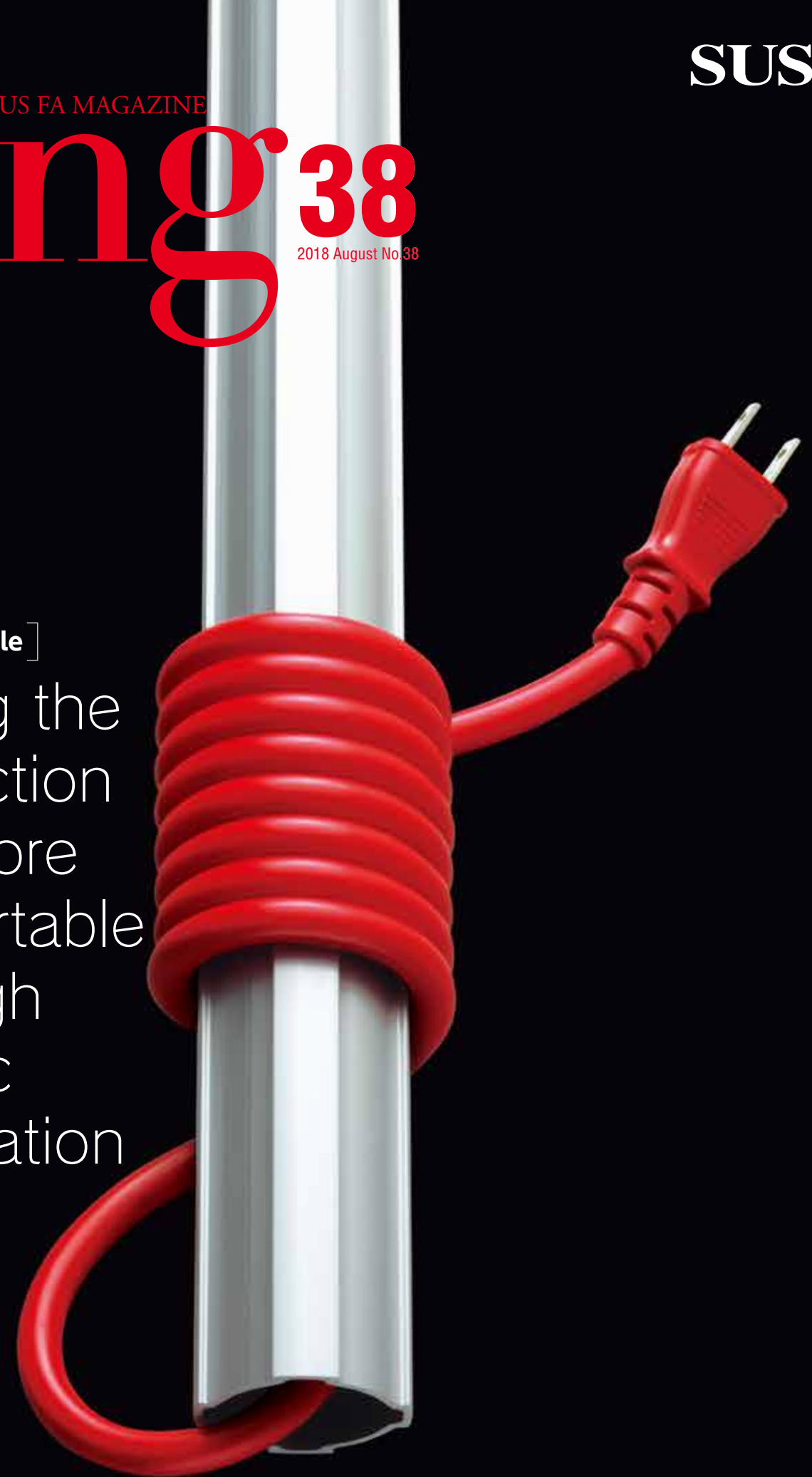
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[Featured article]

Making the
Production
Site More
Comfortable
Through
Electric
Automation



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17 Production Site INNOVATION
Fukui Murata Manufacturing Co., Ltd.
SHIMA SEIKI MFG., LTD.
PIONEER CORPORATION
KAWAGOE PLANT

A multi-directional approach to improvement

Yasuo Ishida,
Representative Director of
SUS Corporation

Aluminum Pipe Structural Material GF is highly valued as a material that can tackle production site improvements without having to spend too much in time and money. Due to its high degree of freedom and expandability, its configuration can change into the equipment and devices that people imagine using. And as the number of situations where its implementation increases, GF is expected to fulfil a variety of demands. The electric items introduced in this featured article are products that we have developed based on our customers' input. Today, markets for items such as machine tools and semiconductor manufacturing equipment are experiencing an unprecedented boom, and incoming orders for the entire manufacturing industry are likewise expanding. Therefore, labor shortages have become a major problem. While demand for automation and labor saving are rising, production cannot be shut down and of course the time that can be spared on improvements is limited. For that

reason, SUS Corporation emphasizes a "simplicity" that can be managed without expert knowledge of controls. By using this together with GF, we have been promoting the development of electric parts and controllers that can easily achieve the desired movements. Recently, we have also started selling "Electric Modules" that turn typical Karakuri movements into packages that utilize electric products. The idea behind this is that there are many common tasks and actions even across different industries and products, and that the labor and time required for improvement can be reduced by standardizing this section. Fine adjustment and assembly are not required with these electric plug-and-play modules, so we sincerely hope that they can become a new option for making improvements.

Currently, electric parts and modules are not individual devices, but are only one part of larger apparatuses. While a variety of studies can be conducted and prototypes can be made by combining these parts and modules (and specifications adjusted for each unit), these parts are not suitable for

mass production. Therefore, in the future we will develop and provide more universal units and more customization. In addition, when dealing with multiple electric parts, we will continue to develop "SiO Controllers" which are commercialized control devices that operate more simply and inexpensively than a PLC. We also plan to launch a type of controller that can achieve group control, linking multiple SiO Controllers. As we actively seek out the opinions of our customers, we also seek to continue expanding the product lineups required by the production site.

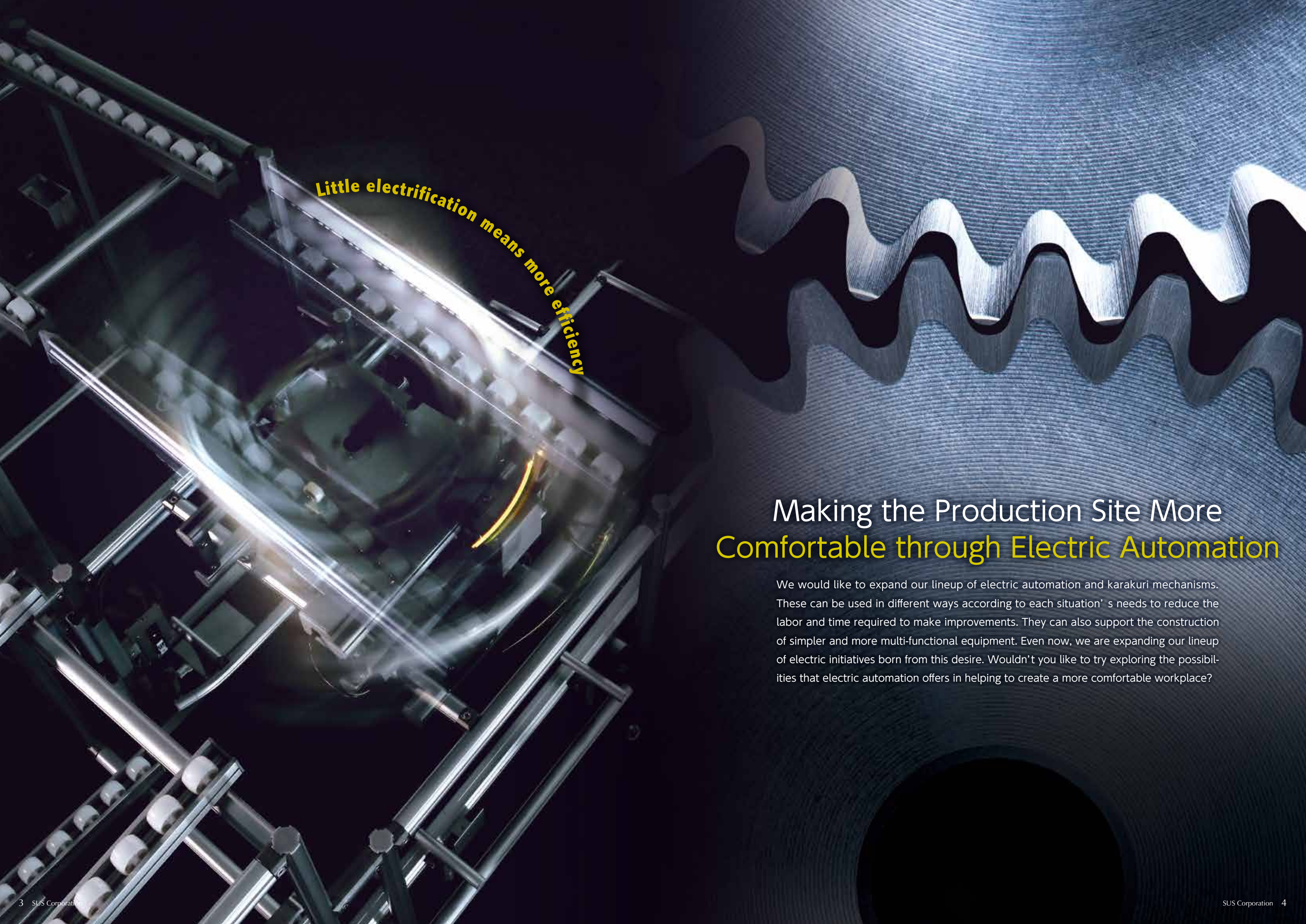
What is Karakuri?



"Karakuri," a word coined in 17th century Japan, is a term used to describe mechanical devices. The most common example is the "Karakuri puppet" – a doll which utilizes the principles of gravity, gears, and levers to move. "Karakuri Kaizen" is a movement which is gaining ground in the Japanese automotive industry. It aims to utilize the principles of Karakuri to make improvements to the production site without the need for electricity. Real-life factory workers are working together to create "Karakuri" mechanisms that improve production efficiency and create worker-friendly stations at minimal cost.

Karakuri Kaizen is a registered trademark of the Japan Institute of Plant Maintenance (JIPM).





Little electrification means more efficiency

Making the Production Site More Comfortable through Electric Automation

We would like to expand our lineup of electric automation and karakuri mechanisms. These can be used in different ways according to each situation's needs to reduce the labor and time required to make improvements. They can also support the construction of simpler and more multi-functional equipment. Even now, we are expanding our lineup of electric initiatives born from this desire. Wouldn't you like to try exploring the possibilities that electric automation offers in helping to create a more comfortable workplace?



Concepts for Electric Parts and Modules

"Karakuri" that factory workers create on their own using their combined knowledge. SUS's Electric Parts/-Modules development was started as an extension of this concept. Our main focus is to make sure it's "easy to do" and accessible to "anyone." Some of the features are introduced here.

01 Providing the "mechanism" and "controller" together in one package

When handling driving devices such as actuators and motors, control is an obstacle. SUS delivers integrated and customized controllers as a set starting with our Power Unit, the first GF Electric Part. These units are designed to be intuitive, so you can operate one even if you don't have any expertise in electricity or control.

[Mechanism]

Supporting Karakuri with simple movements that involve the extension and retraction of a rod at one end

The operating range of the rod can be changed simply by shifting the position of the Limit Switch. No electrical knowledge is required

[Controller]

Dedicated controller included standard

Select your desired motion from a list of pre-registered operating modes

+

Example: Power Unit (Rod Type)

If the motions are simple, no programming is necessary. Just connect to a power supply and switch; you can start using it right away.

02 Achieving the desired motion with a simple combination of parts and modules

In order to accommodate a variety of situations we offer various electric parts with different payloads, strokes and drive methods. We also offer a lineup of modules packaged as "90 Degree Turn," "Flip-flop," etc. These modules allow you to concentrate on making improvements by reducing design and labor, and by allowing you to achieve your goals through a simple combination of functions.

[Electric Parts]

Electric Stopper
Stop at a determined stroke

Electric Winch
Long stroke lifting by winding the wire

[Electric Module]

Electric 90° Turn Table
No need for fine adjustment. Just attach the module and the turning mechanism is ready to use.

03 One machine supports a variety of situations

Totes and items used on-site vary in size and weight. Unlike simple automation karakuri using parts such as springs, etc., electric units have an advantage: they can handle totes of different weights. Furthermore, our karakuri electric module packages are equipped with functions to adjust the size according to the totes.

The flagship electric module, an electric Flip-flop Chuter including a drive or Power Unit, stand, and more, is ready for immediate use.

Turn the wrench

Width changes

The table width can be changed according to the tote size making detailed designs unnecessary.

Simply fasten with a standard connector

Since the base is made from GF, you can quickly install the mechanism at the required location using standard connectors.

04 Easily connect to GF

Ease of installation is also an important point in the development of various electric mechanisms. Fitted with the same profiles as Aluminum Pipe Structural Material GF, these products are designed so that you can clearly imagine how to implement them.

05 Compatible with more advanced uses!

To make step-by-step improvements possible, SiO Controllers come into play as control devices with simple inputs and outputs! Parts and modules that move individually can be linked together with sensors and other devices. Our SiO Controllers can be configured by choosing from a multiple-choice menu in English, requiring no programming or control expertise. With SiO, the focus is on making the devices easy for users of all levels.

Conveyor has six operating modes

With input from a sensor or switch, you can detect an object and determine the movements of the conveyor.

Connect

Photoelectric Sensor (Reflective Type)

Limit Switch

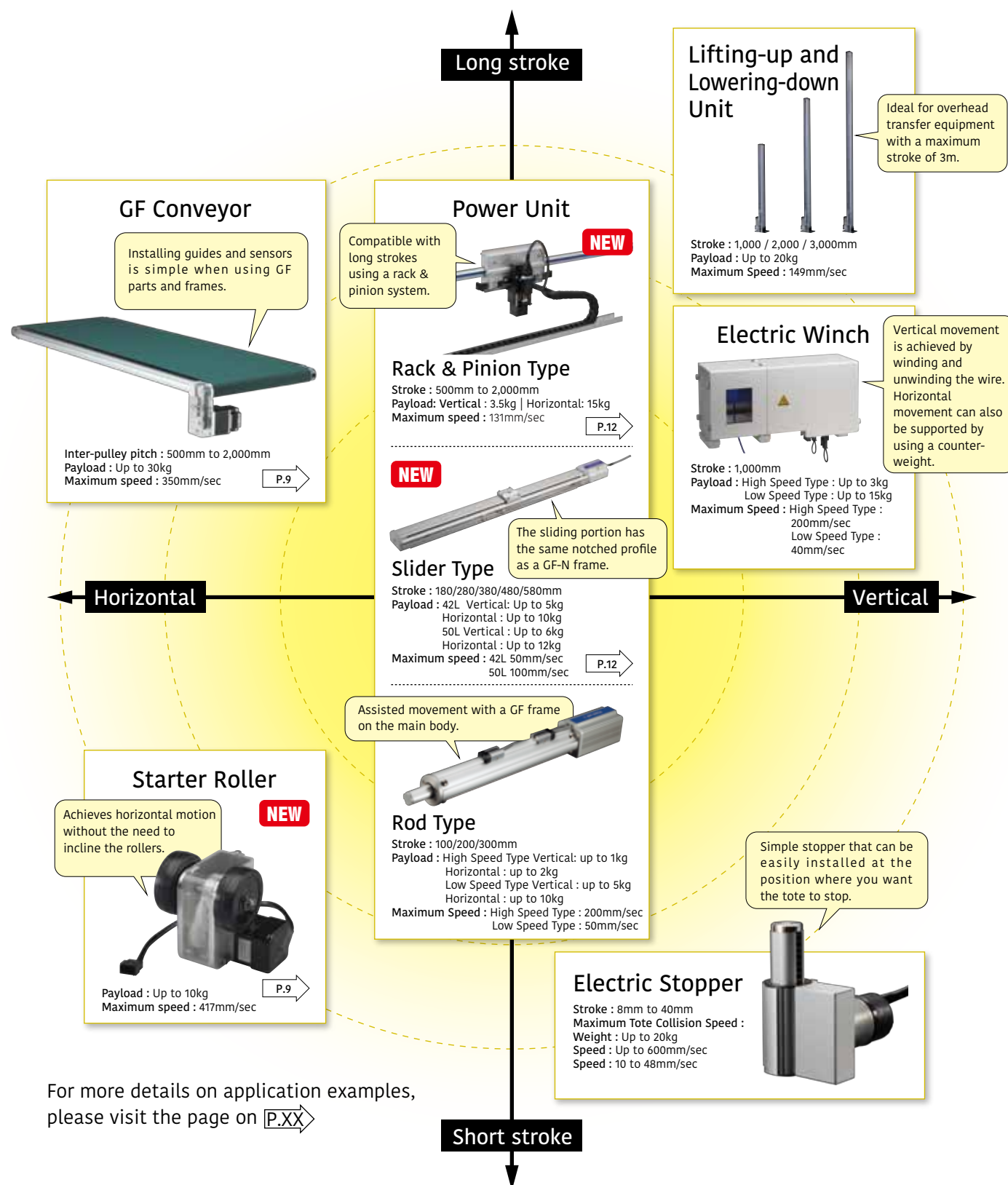
SiO Controller

Expanding variety in electric automation

We have been developing these products one after another since we began making electric karakuri in 2012. Choose products according to their size, power, and application.

Electric Parts

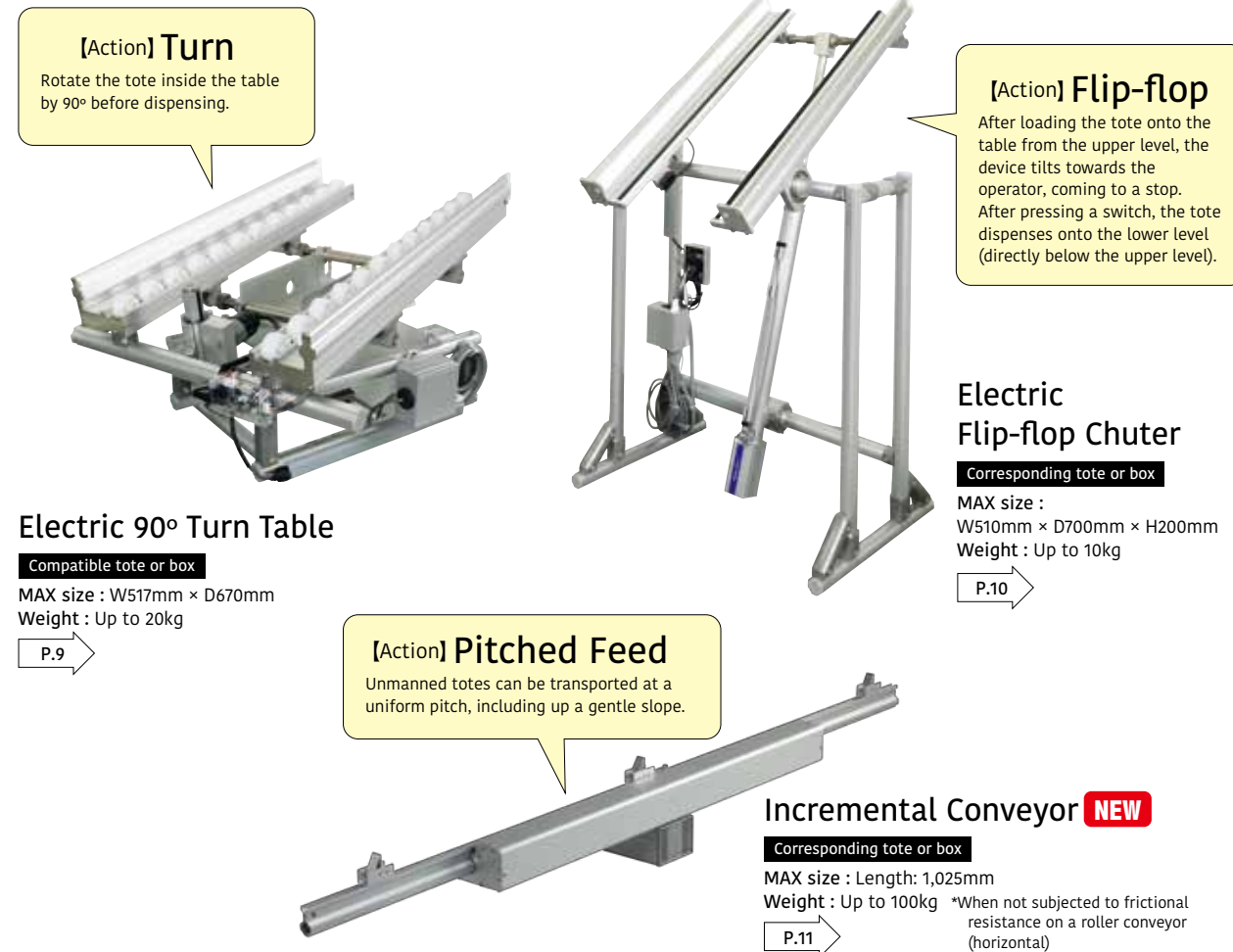
Use these to achieve the automation goals you have in mind with "pushing," "pulling," and "lifting."



For more details on application examples, please visit the page on [P.XX](#)

Electric Module

Incorporating typical simple automation karakuri movements into an electrical package, Electric Modules can be easily introduced.



Control and Power Supply

SiO Controller

Link Electric Mechanisms Together



An input/output control device that issues an ON/OFF command to the output device based on the ON/OFF status of the input device. Use it when you want to link multiple electric mechanisms together, such as a stopper and a starter roller.

Power Supply Box / Power Supply Unit

Power cables for several units are bound together for a neater appearance.



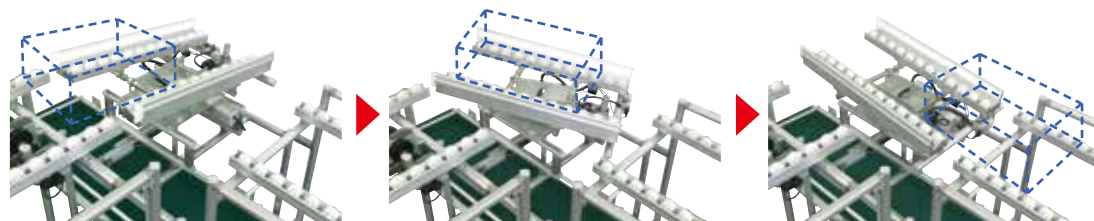
The Power Supply Box can output a total current of up to 4 A for six circuits. In addition, four out of the six ports with circuits are designed to shut off with an emergency stop, making for a safety-conscious configuration. The Power Supply Unit is also equipped with 6 output ports capable of supporting multiple devices with a single unit. You can choose your required capacity from three types of maximum output currents – 2 A, 4 A, 6 A.

Let's Combine Parts and Modules

Since autumn 2017, SUS has launched one electric module / mechanism after another. A variety of features are introduced here with a unified structure combining multiple new items.

STEP 2 Rotate the tote by 90° and dispense

Released in March, 2018 **Electric 90° Turn Table**



Check the video!



<http://fa.sus.co.jp/jump/E03>

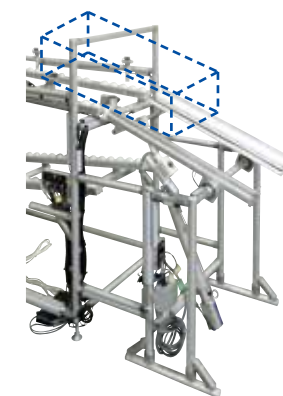
This module incorporates a rotating and dispensing mechanism to achieve a 90° turn. When a tote comes onto the table, it rotates by 90°. At the end of the rotation, an Electric Stopper lowers, dispensing the tote onto the next roller. The table has a function that allows you to adjust its width and pitch to suit your totes or boxes.

STEP 3 The tote is loaded onto the table and then the table tilts towards the operator, coming to a stop. When the operator is ready, turning on a switch dispenses the tote onto the lower lane of rollers.

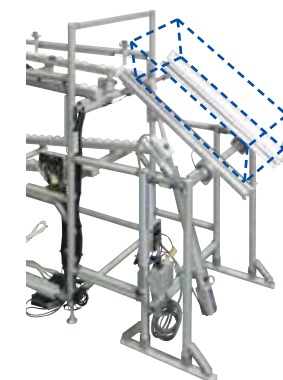
Launched in October, 2017

Electric Flip-flop Chuter

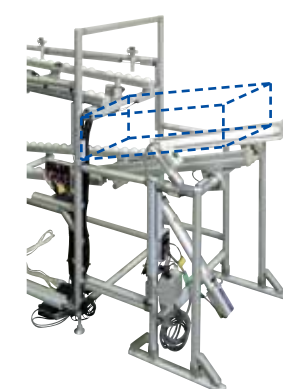
- Table + drive unit only
- SiO + rack set



A tote flows onto the table located at the transfer position.



When the tote is loaded, the table tilts towards the operator, stopping at a position where it is easy to load and unload the contents.



When the operator is finished, turn on the switch. The table will tilt automatically to dispense the tote, thus reducing operator effort.

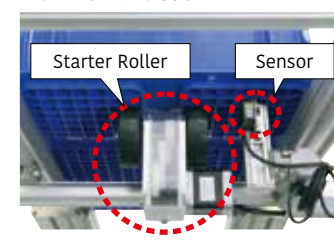
The Electric Flip-flop Chuter is a popular exchange mechanism. Here it is available in a set* with a Power Unit and SiO Controller. The SiO program needed for this function comes preprogrammed into the controller. *You can also choose to use your own controller and power supply in place of the SiO Controller.

STEP 1 Horizontally transfer the tote placed on the rollers

Released in October, 2018

Starter Roller **NEW**

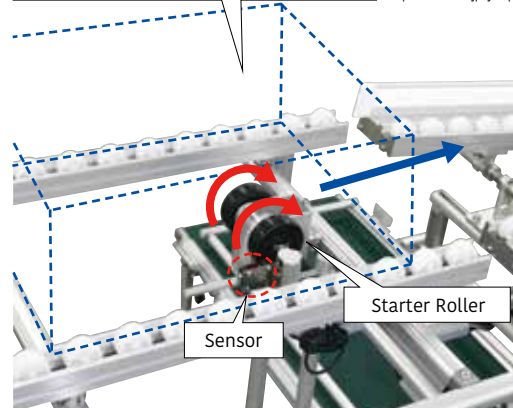
View from the back...



Check the video!



<http://fa.sus.co.jp/jump/E02>



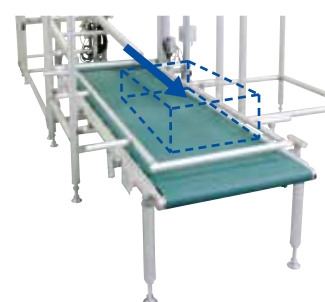
When the sensor* detects a tote, the Starter Roller rotates and moves it on the rollers, stopping when the sensor turns off. With a compact body of only 120mm, the Starter Roller is ideal for small equipment. By adjusting the mounting height, it can be adapted to any kind of roller. Maintenance is also easy because the Starter Roller unit and gear unit are "cassette" types which can be easily replaced.

* Sensor prepared separately

STEP 4 Transfer tote to the end of the structure

Released in September, 2017

GF Conveyor



When the sensor* at the entrance of the conveyor detects a tote, the GF Conveyor activates, transporting the tote to the end of the structure. The GF Conveyor has the same extrusion profile as the 28mm GF-N at both the sides and at each end of the main body. This ensures compatibility with other GF products. The GF Conveyor is easy to incorporate into a simple automation karakuri mechanism. It connects easily, achieving horizontal transport without the need for manual labor.

* Sensor prepared separately

Link functions with SiO



Supporting improvements with a wide range of **movements and mechanisms**

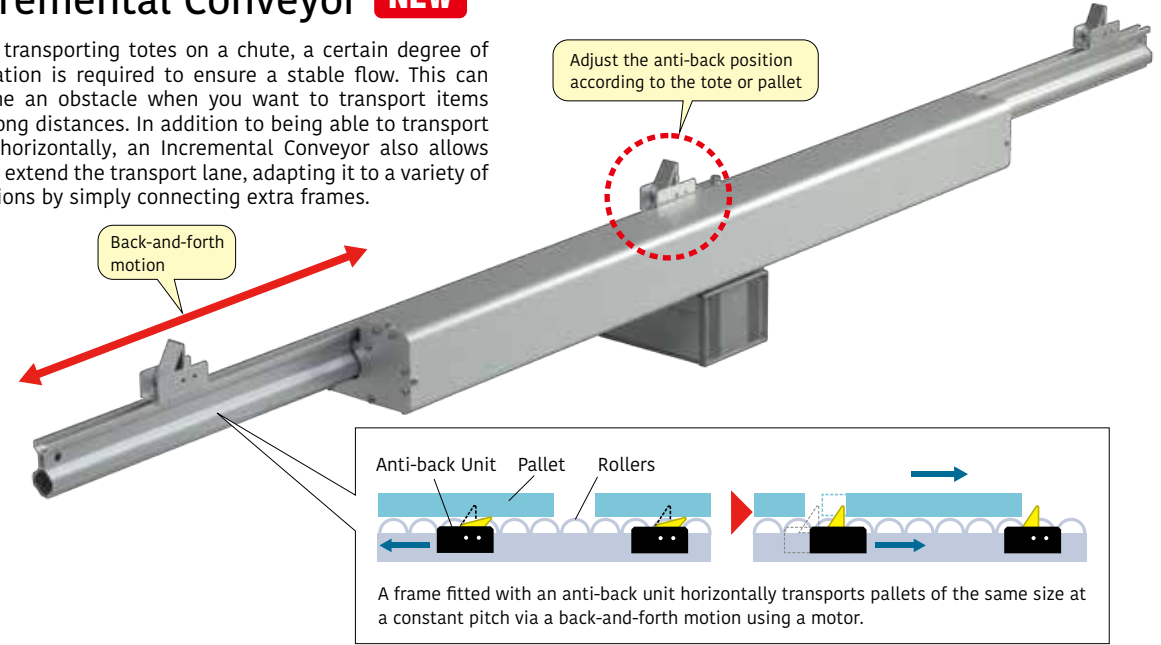
In production site improvement, there are various kinds of necessary movements. One major issue is deciding the style that you are going to adopt. SUS helps you to carry out improvements by offering both a comprehensive line-up of parts that can be used for generic purposes and packaged modules that can achieve standard movements.

Incremental Conveyor that supports both horizontal and uphill transfer.

Released in June, 2018

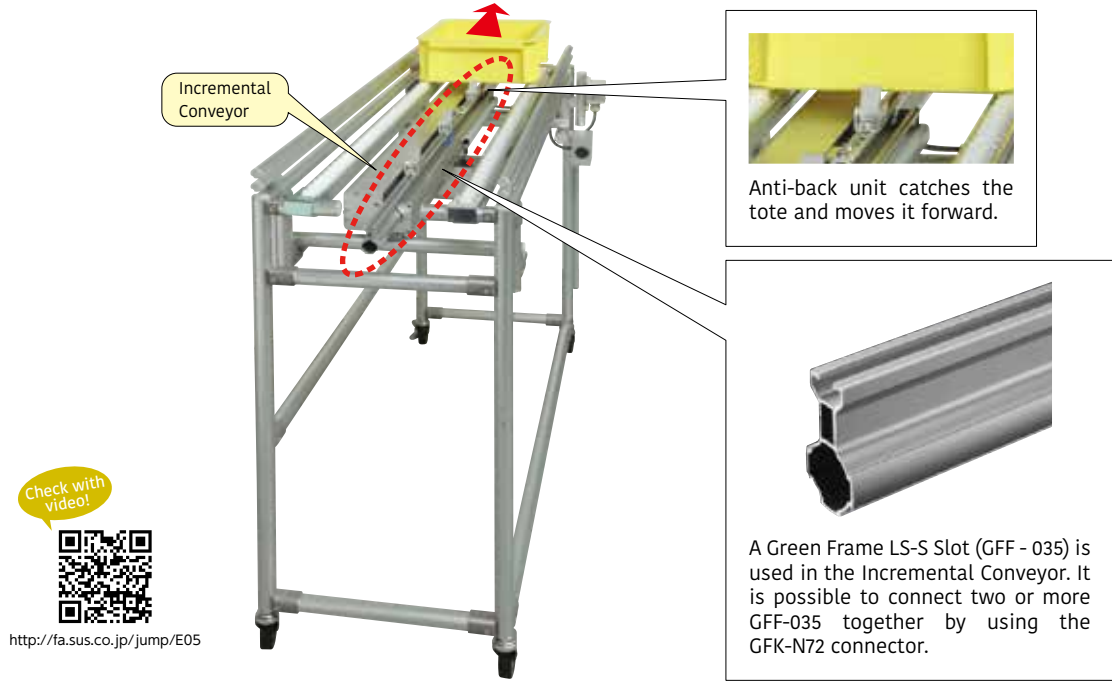
Incremental Conveyor **NEW**

When transporting totes on a chute, a certain degree of inclination is required to ensure a stable flow. This can become an obstacle when you want to transport items over long distances. In addition to being able to transport totes horizontally, an Incremental Conveyor also allows you to extend the transport lane, adapting it to a variety of situations by simply connecting extra frames.



【Application Example】Mounted on a Horizontal Chuter

When the switch is pressed, the Incremental Conveyor moves back and forth once, carrying the work to the far side.

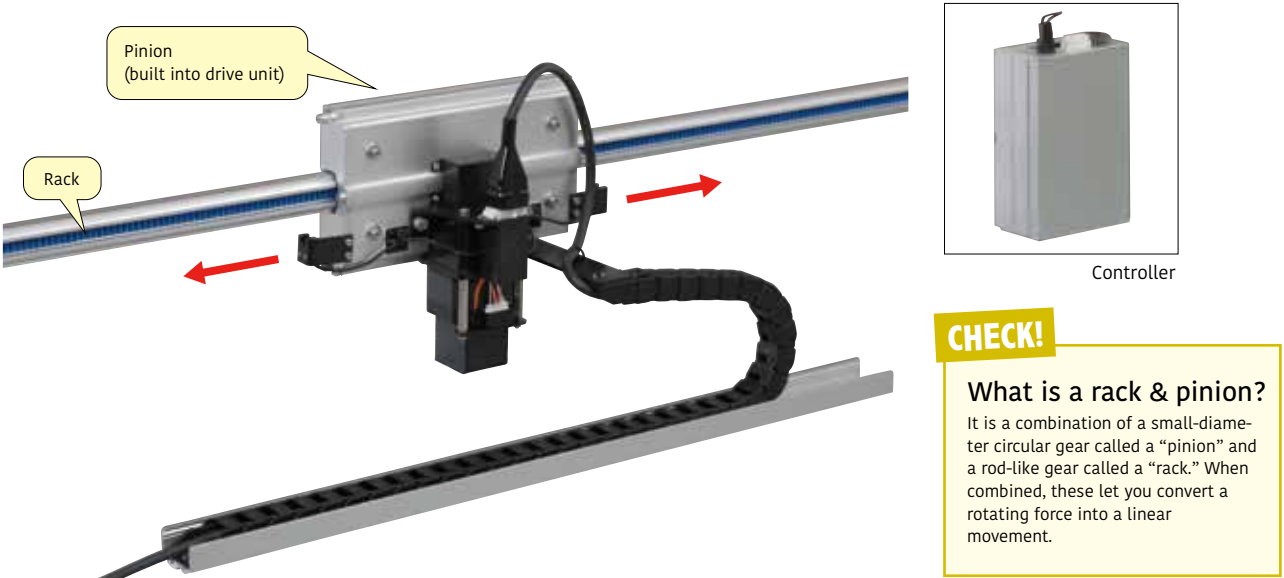


Implement a stroke up to 2,000mm!

Released in July, 2018

Power Unit Rack & Pinion Type **NEW**

An electric mechanism that enables a stroke of up to 2,000mm. These can be used both horizontally and vertically. If you want to use it vertically, choose the unit with a brake and you won't have to worry about the mechanism falling down when the power is turned off. Similar to other electric mechanisms, the Power Unit Rack & Pinion comes with a controller, letting you select from eight different operating patterns. You can also control it using the SiO Controller.

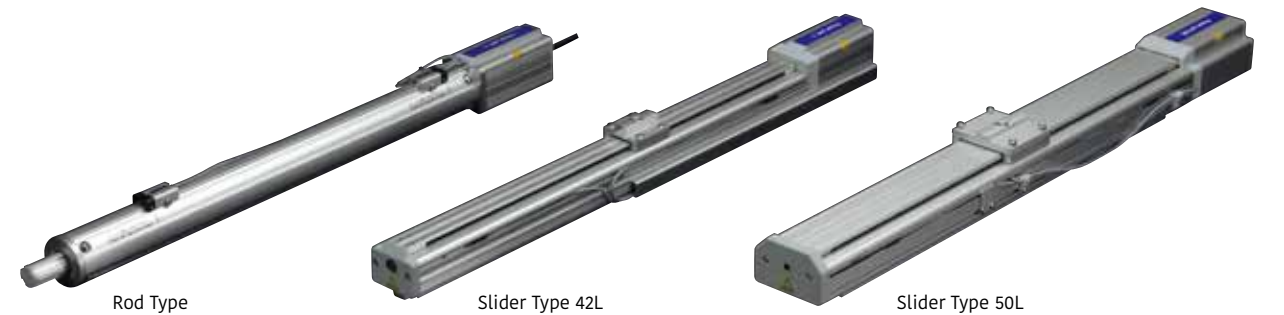


Our Power Unit options are expanding to become easier and easier to utilize!

Released at the end of August, 2018

Power Unit Slider Type 42L **NEW**

The Power Unit was the first electric mechanism released by SUS. Originally, only rod types were available, but since that time the variety has steadily increased. The next product to be released will be the 42L type with a performance that is between the Rod Type and Slider Type 50L. As choices and applications expand side-by-side, you will be able to choose the Power Unit that is ideal for your situation.



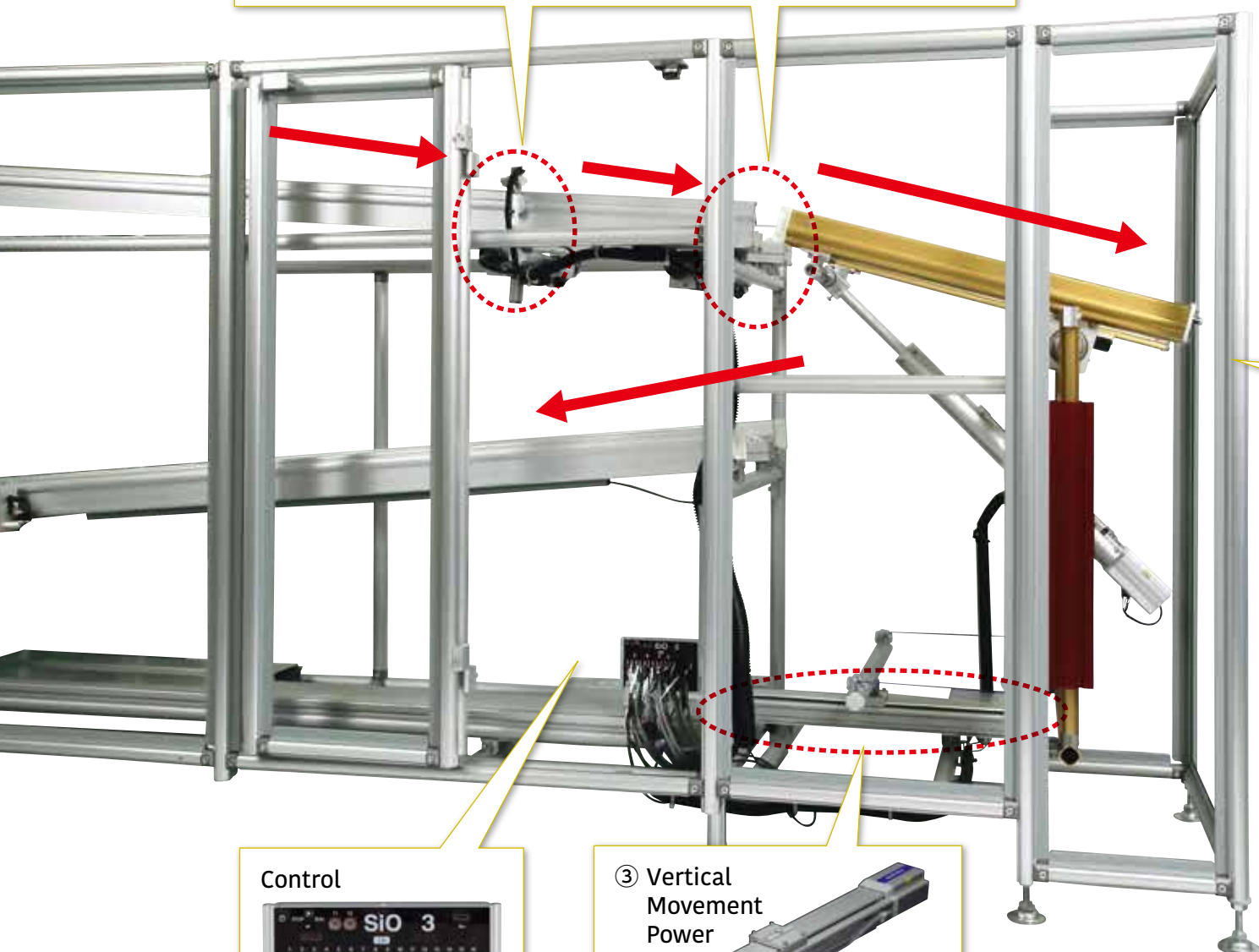
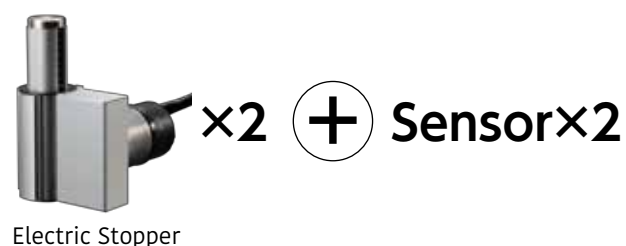
Model	Speed (mm/sec)	Payload (kg)		Stroke (mm)					
		Horizontal	Vertical	100	200 (180)	300 (280)	(380)	(480)	(580)
Rod Type H	200	2	1	○	○	○			
Rod Type L	50	10	5	○	○	○			
Slider Type 42L	50	10	5		○	○	○		
Slider Type 50L	100	12	6				○	○	○
Slider Type 50L (with brake)	100	12	6				○	○	○

Figure within parentheses () refers to the stroke of the Slider Type.

Intermittent stopper + flip-flop + vertical movement for totes

Here we introduce examples using electric parts, modules, and SiO Controllers. While individually they achieve simple movements, combining them allows you to achieve a wide variety of forms and functions. Use these examples as a reference when you are considering introducing these kinds of parts and modules to your work place.

① Intermittent Stopper Mechanism for Totes

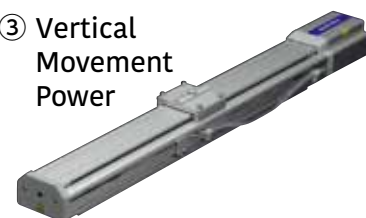


Control



SiO3

③ Vertical Movement Power



Power Unit Slider Type 50L

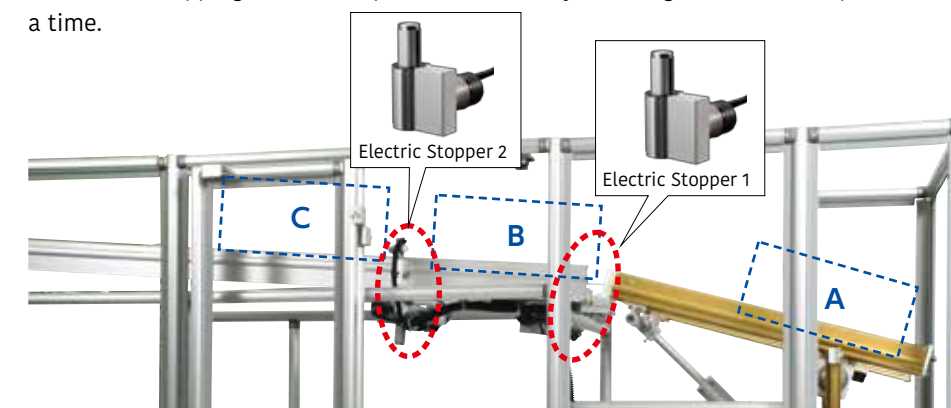
② Flip-flop Mechanism



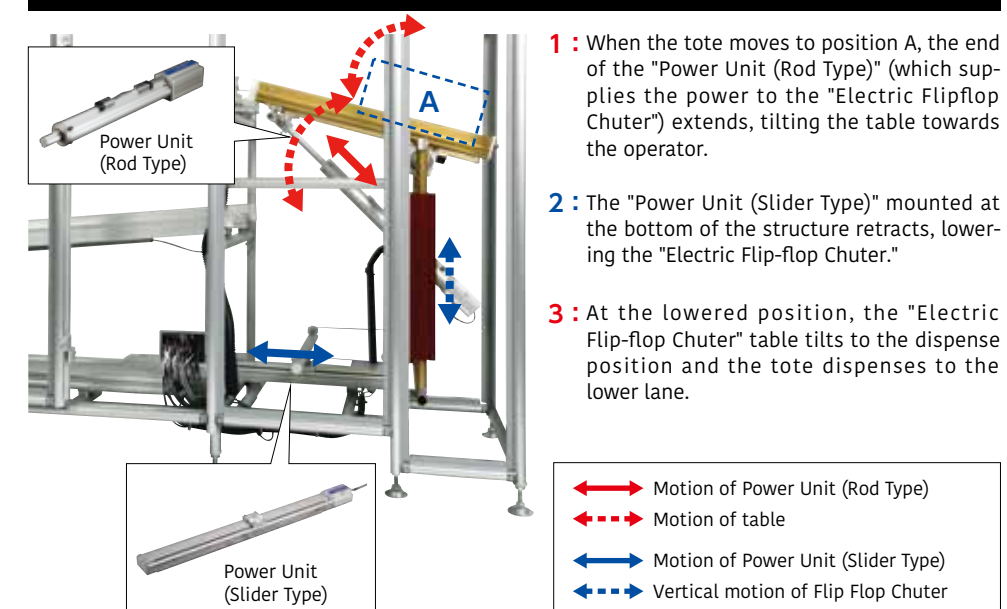
Electric Flip-flop Chuter

① Intermittent Stopper Mechanism with Electric Stopper and Sensor

When the tote enters position A and the Flip-flop Mechanism is in operation, "Electric Stopper 1" extends so that the next tote does not move forward. "Electric Stopper 1" retracts and while the work in position B moves onto the Flip-flop table, "Electric Stopper 2" extends, stopping the tote in position C, thereby ensuring that the totes proceed one at a time.



②+③ Linking the Flip-flop Mechanism and the Vertical Movement



CHECK! The SiO lineup is also expanding

SiO



Input : 8terminals
Output : 8terminals
Connector : Flat cable

Released in June 2018
SiO-N1 **NEW**



Input:8points
Output : 8points
Connector : e-CON

SiO2



Input:6points
Output : 4points
Connector : e-CON

SiO3



Input:16points
Output : 16points
Connector : e-CON

Currently there are four types of SiO Controllers differentiated by the number of I/O terminals and connection method. Choose a type according to your required specifications. SUS is also expanding our line-up of input/output devices (options) which can be connected simply by inserting an e-CON connector.



e-CON connector

Horizontal transport + lifting action + pitch conveyance along a rising slope

The second example is a case involving lifting a tote from the lower lane to the upper lane, a specialized field of simple automation karakuri. It incorporates horizontal transport and a rising slope, configurations that are only possible when driven by electricity.

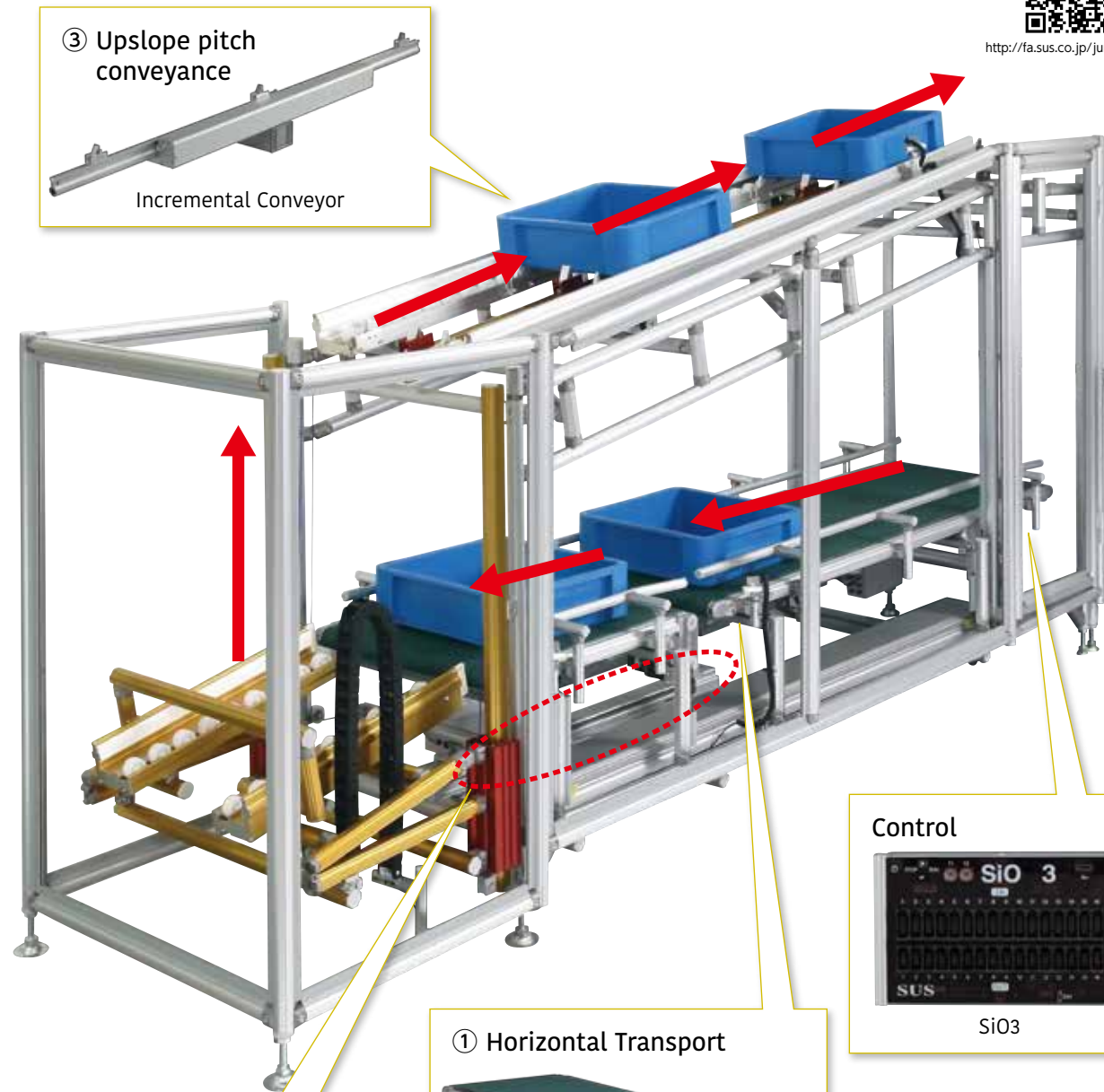
Check with video!



<http://fa.sus.co.jp/jump/E07>

③ Upslope pitch conveyance

Incremental Conveyor



Control



SiO3

① Horizontal Transport



GF Conveyor

×2



Sensor×3

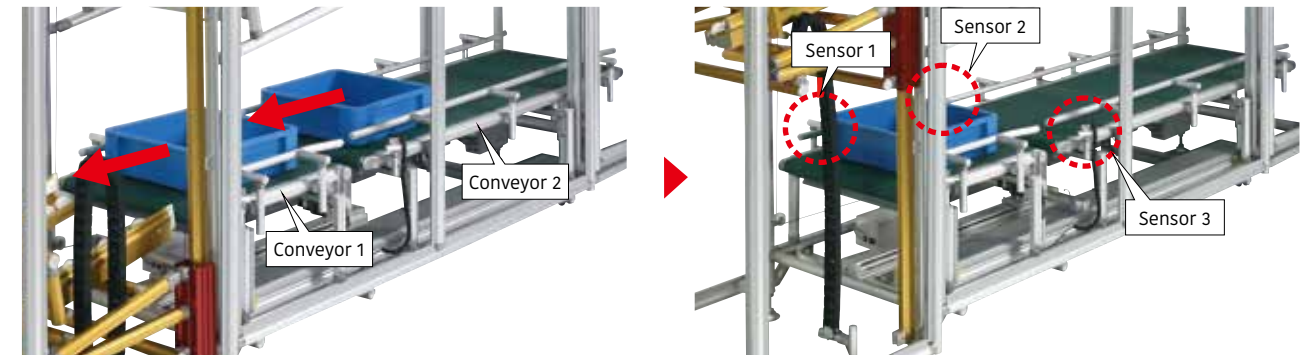
② Lifting Motion Power



Power Unit Slider Type 50L

① Separation + Horizontal Transport Using GF Conveyor and Sensor

When conveyor 1 is in operation and the tote is loaded onto the table, conveyor 2 moves the next tote to conveyor 1. When sensor 2 detects the tote, conveyor 1 stops and the second tote stops at the edge. By linking the movements of the two conveyors, the totes are unloaded one at a time.



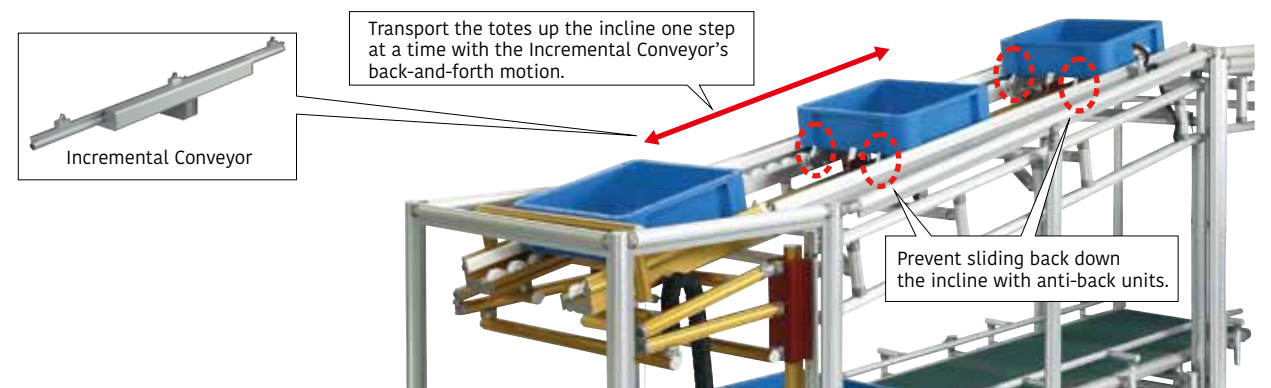
② Lifting Against Gravity Via Power Unit

When the tote is loaded onto the table from conveyor 1, the Power Unit lifts the table to the upper lane by pulling the wire.



③ The Incremental Conveyor Allows Pitched Transport Up an Incline

The Incremental Conveyor is mounted at the same inclined angle as the chuter, transporting the totes at a constant pitch with its back-and-forth motion. To prevent the totes from sliding back down the slope, anti-back units are fixed to the chuter at intervals matching the size of the totes.



**Fukui Murata
Manufacturing Co., Ltd.**

Connecting the hearts and skills of craftsmen to the future with “The next processes are our customers.”

Fukui Murata Manufacturing Co., Ltd. plays the role of “mother factory” in the Murata Group. It is the largest “production base” in the group and is the closest “development base” to the facility. A number of improvements were made by prioritizing communication with the people using the equipment and by paying close attention to the details.



Production Department 1,
Production Section 1
Senior Manager
Mr. Hiroyuki Hiroshima



Production Department 1,
Production Section 1
Improvement Team
Mr. Shinichi Tokunaga



Production Department 1,
Production Section 3
Production Department 1,
EHS Promotion Secretariat
Mr. Yoshikuni Kurauchi



Materials Section
Senior Manager
Mr. Masayuki Tatsumi



Materials Section
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COMPANY DATA

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13-1 Okamoto-cho, Echizen-shi, Fukui 915-8601 Japan
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Interviewed on January 16, 2018

Mother factory in the Murata Group
essential to the electrical and
electronic industries

**Fukui Murata Manufacturing seems to be the
largest plant in the Murata Group, is that right?**

The history of Fukui Murata Manufacturing dates back to the Murata Research Center. It was established by Murata Manufacturing at a ceramic test center in Fukui Prefecture in 1951. Currently, it consists of two bases: the Takefu Plant and the Miyazaki Factory, where a total of around 4,100 employees are working. For this interview, we will introduce the improvement activities undertaken by the Takefu Plant.

Laminated ceramic capacitors, the main products of the Takefu Plant, are essential parts used in equipment handling electricity and radio waves. Approximately 750 of these devices are being used in smartphones and approximately 800 are being used in laptop computers. Recently, the use of such devices in automotive-related applications has increased, and demand is expected to grow in the future. The Murata Group's laminated ceramic capacitors occupy a very high market share of 40%. As the world's No. 1 manufacturer, we supply products of various sizes and capacities to the world. As our products are very small, ingenious automation equipment is often used for inspection and other purposes, from the refining of raw materials to the completion of the product via several processes. However, operators also play an active part in many areas. Therefore, we produce equipment such as work benches, racks, trolleys, etc. that are customized for each process at the worksite, all while continuing to make improvements to these items.

When did you start using SUS products, and how did you end up using them?

We bought the SUS products through a trading

company at first and after we started using them a little bit at a time we began to buy them directly in December 2012. Sabae Murata Manufacturing Co., Ltd. was the first company in the Murata Group to use SUS products, but actually it was the Materials Department of Fukui Murata Manufacturing that served as the contact point at that time. Because I felt the products were fascinating, I introduced SUS to the other bases. Exhibitions and training courses on things like the SUS 3D CAD Modeler Unit Design software were conducted by the sales staff at SUS. The SUS staff also attended to our ad-hoc requests regarding delivery, assembly, ordering, and the like. The amount that we used gradually increased, leading to the active transactions at present. The fact that SUS deferred raising prices just when another company was raising the price of its aluminum frames also played a big part in my opinion. Comments from the production site rate SUS products as being highly resistant to rust because they are made from aluminum. They also have a high aesthetic appeal and are easy to position and assemble. Compared to materials such as iron pipes, the cost is somewhat higher, but I think the advantages that SUS' s products offer outweigh that cost.

SUS products are used in many areas, including work tables and trolleys in the production site, as well as coat hangers used by contractors and umbrella stands at the entrance. As the design of the products is very clever, there are even some things I wish I could take home. I think it' s great when you can turn what you imagine into something real.



The umbrella stand is designed to be easy to use; it is fitted with hooks for foldable umbrellas. After Mr. Tokunaga made the first one, the umbrella stand was expanded to other sections of the company.

Please tell me about your improvement efforts.

In recent years, we have been focusing our efforts on quality control circle activities (small group improvement activities). In 2010, Fukui Murata Manufacturing was the first electronic component manufacturer to win a gold prize at a national competition. In addition, Fukui Murata Manufacturing has an improvement reporting system, which the quality assurance department uses to compile the number of improvements and publish the results every month. The target improvements are not "suggested" improvements but those that were actually executed.

Furthermore, these improvements are ranked and grouped into different classes, with prizes being awarded as well.

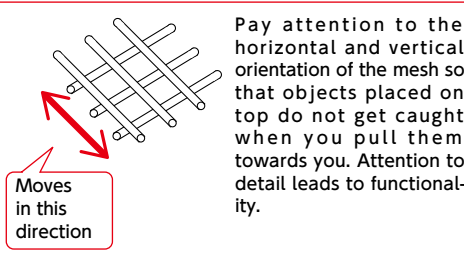
Not only that, but in 2017 we started a study group to teach the fundamentals of equipment production. The group aims to raise efficiency and quality by teaching the trainees the basics from square one: how to make drawings by hand, how to measure dimensions, how to calculate the strength when assembled, and how to check the finished product. Although we first started with the idea that it'd be good if about 30 people joined the group, the number of people attending has already reached close to 300.



The work table for the inspection process is mesh so that the operator can drop products which do not pass inspection down in-between the bars. This can prevent products left on the table from being mixed with other products when changing the setup.



Dropped products are attracted to a removeable magnet sheet.



Pay attention to the horizontal and vertical orientation of the mesh so that objects placed on top do not get caught when you pull them towards you. Attention to detail leads to functionality.

Moves in this direction

A strong awareness of the idea that "Customers = Production Site" Improvements constantly continue even after the installation

How about the accomplishments of the study group?

The reaction from the production site has changed greatly. First of all, although we are getting primari-

ly management staff to participate in the study group, we have received many comments like "I'm glad I could learn again." This makes me feel strongly about the importance of learning. A compilation of case studies is also useful for encouraging improvement proposals from the production site. Recently, more people understand that they can create their ideal equipment out of GF. On the other hand, there are also many people who are trapped by the mindset that "they have no choice but to accept equipment as it is," even if they feel that the equipment is

hard to work with on a day-to-day basis. If you let people voice their opinion, you will be able to think of a solution. But if you give up from the beginning, you will not be able to move on from that basic, entry level.

For example, it would be good if examples featured in Sing magazine were seen on the Internet. The number of people who can pick up the magazine are limited, and operators on the production site don't have enough time to read them thoroughly, either. If you have a place where you can get hints more freely, I think it would be useful to many people. Also, since it's a wonderful feeling to see your ideas in action making the work easier, you can also expect a positive cycle that leads to a higher level of improvement based on the successful experiences that you made into reality. Presently, many members who face challenges every day visit the improvement rooms where pieces of equipment are created in order to discuss their issues. This is a wonderful thing, but as there is a limit to the amount of work that one person can handle. Therefore, we are currently discussing how to proceed further.

What kinds of improvements are currently being tackled?

One of our new initiatives now is the implementation of a WIP shelf incorporating the Pick To Light System. Previously, if you were using a machine for processing multiple products, then when one lot was finished the operator would have to check the next product to make and search for the necessary materials. In the new system, by registering each individual lot in advance, you can instantly know the type of the product currently being made, the time taken for completion, the order of priority, and more. When you mark the process as complete in the system, it automatically informs you of the next product that needs to be worked on. At the same time, the system also shows you which rack the required materials are on, thereby improving efficiency and reducing works-in-process (WIP). This system is being implemented in several areas, starting with where it is needed most.

By far, No. 1 in number of improvement proposals! Here's the person at the heart of kaizen!

Mr. Shinichi Tokunaga of the Improvement Team is a figure who is indispensable to improvement efforts in Fukui Murata Manufacturing. Before joining the company, he worked as a craftsman in Echizen lacquerware for about 16 or 17 years, gaining experience in various side jobs when orders for lacquerware were low. One of these side jobs was site work and design related to machinery and construction, such as the installation of partitions in factories. He may even have been responsible for some of the projects in Fukui Murata Manufacturing.

After joining the company, he worked in the manufacturing process, becoming a member of the improvement team which was just then launched over ten years ago. But he was completely lost at the beginning. Mr. Tokunaga started from a place where he did not even understand how to use the parts and gradually mastered them while asking for help and studying by himself. Based on these experiences, he realized the importance of acquiring basic knowledge and thus he suggested that a study group be formed. Seeing this become reality in 2017, he is now a lecturer for that study group. The main feature of equipment made by Mr. Tokunaga is that the working space and ease of use are taken into consideration. Furthermore, the design and manufacturing are carried out with millimeter precision. Mr. Tokunaga said that his experience and commitment when working as a craftsman are being put to good use.



Group Leader,
Production Department 1,
Production Section 1
Mr. Akio Hirai

As seen by junior employees: The way Mr. Tokunaga works

I was impressed the first time I saw the equipment created with work design in mind and the efforts being taken to meet the needs of the worksite. Not only in ease of use, but in things like the calculation of payloads, manufacture was done without compromise for the sake of the operators. Moreover, Mr. Tokunaga also goes to the site after installation, listening intently to the opinions of others who would like to do more, and even carrying out the improvements. He is highly trusted due to his earnest work style ensuring safety and security in the workplace, even as many people bustle around the improvement area.

Please tell us about your future goals and your requests for SUS.

For example, the pen stand for the work bench is fixed with 45 Degree Connectors, but in reality, it feels easier to use if it leans a little closer to the operator. Although there are connectors that can be set at any angle, those connectors somehow lack a sense of stability. It would be good to have a greater variation of angles. Furthermore, although we are currently using tape on the frames for identification purposes, it might peel, leading to dirt and contamination. I think it will be easier to use if the Frame Guard was available in more colors such as purple or dark green.

Since our requests are immediately conveyed to the person-in-charge, I would expect easy-to-use items to become available. Brand new GF products would probably be checked out right away.

Because of the shortage of labor these days, from here on out the most important resource is the "human resource." That's why we must continue to promote labor-saving activities. Although we have

not actively worked on low cost automation karakuri initiatives in the past because of the nature of the products we handle, going forward I think we need to examine and study suitable scenarios for its implementation. In the future, I would like to create an environment where technology can be passed on to the next generation while utilizing SUS parts. Last year, with the establishment of the study group, I felt that I had taken the first step towards achieving that goal. First of all starting with grassroots activities, I would like to promote human resource development and environment building in the medium to long term.



Frame Guard fitted for use on the GF extrusion notches. The orange color released in 2017 was released in response to a request made by the Murata Group.



Another version of the work station introduced on page 19. Besides drawers in the lowest section, it is also equipped with a pen stand.



Trolley for storing rectangular fireproof containers. It is extremely lightweight compared to iron, making it easier to handle.



The Board Holder (GFJ-A22) used for anchoring panels is attached after machining because its diameter does not match the anchoring holes in the display.

Fixtures fit perfectly into the drawers of this trolley. It is also used for storing items such as works still in progress and materials to be handed off. There is also a plan to attach a CPU to the side for the display.

Flower clock The Symbol of Fukui Murata Manufacturing

A flower clock made with colorful blooms catches your eye when you pass through the main gate of the Takefu Plant. It is a historical clock installed in conjunction with the visit of Emperor Showa and the Empress in 1962. It serves as a visual symbol of Fukui Murata Manufacturing for visitors.



Learn from Mr. Tokunaga's passion for improvement

Since things will never get moving if it is just an idea on the design side, I place emphasis on communications with the people in the production site over anything else. I also believe that "drawings" are indispensable tools for that purpose, and I'm trying to convey their importance to students in the study group. Since I was put in charge of improvements, about 2,000 drawings have been created. In addition, the date, manufacturer, and control number are clearly marked on the equipment we have made using a label-maker. For SUS, it's good that SUS 3D CAD Modeler Unit Design software is available free of charge. I think the software could be used with more confidence if it included functions for load calculation, etc.

Actually, since I am able to create whatever I am imagining no matter what parts are available, I'm not very picky about the kinds of parts I use. I am always looking for cheap, good materials. However, since the SUS Aluminum Pipe Structural Material GF has a reputation for high functionality and is rated highly by manufacturing staff, its use has been increasing. There are many GF work benches and trolleys that are being expanded to other sections. I am busy assembling them. (Mr. Tokunaga).



Mr. Tokunaga looking at the PC in the improvement room. Drawing data is organized so that it can be referred to immediately.

Importance of drawing / parts list

- With drawings, briefings can be conducted for the client, modifications can be made before production starts, and satisfactory manufacture can be carried out.
- These can be used when orders for the second and third units are received and will be useful for upgrading.
- By offering the client two proposals by different makers, the options increase, expanding the range of possible choices.
- By maintaining communications with the client / operator, the client / operator can participate in the design, leading to increased motivation on the worksite.
- When a parts list is created, you can check it to see whether suitable items have been selected.
- You can calculate the product price from the costs of materials and choose one with a higher cost effectiveness.

* Created based on Mr. Tokunaga's study group materials

Ensuring ease of work with equipment tailored to a variety of production sites—from precision machining to final assembly

Shima Seiki Manufacturing is highly acclaimed throughout the world as a top manufacturer of “computerized flat knitting machines” for making knitted products. Improvement efforts are accelerating at the company’s head office factory which possesses diverse precision machining and electronics technologies. It also carries out integrated production of its own products from software to hardware. We visited a factory that is working on creating a conducive workplace with ideas tailored towards alleviating the burden on operators,



Production Headquarters
Production Manager
Mr. Akihiro Otani



Production Engineering
Department, Group 4
Deputy manager
Mr. Hideki Sowa



Production Engineering
Department, Group 7
Deputy manager
Mr. Takeshi Hashimoto



Production Headquarters
Production Vice Manager
Mr. Seiki Kimura



System Manufacturing
Technology Div. Secretary
Mr. Hiroyuki Ohno



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Mr. Shinobu Kawashima

COMPANY DATA

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Interviewed on February 20, 2018

Boasting high technical capabilities of its own integrated production system, Shima Seiki is the world's largest flat knitting machine manufacturer

You develop and manufacture computerized flat knitting machines that have been adopted all over the world. What kind of history did you have?

Shima Seiki Mfg. was established in 1962 with the goal of developing fully automatic glove knitting machines. After successfully developing the world’s first automated glove knitting machine in 1964, we entered the flat knitting machine industry in 1967. In 1995, under the mission of “to create on our own what no one else can” we developed the world’s first “WHOLEGARMENT® flat knitting machine” to create a knit with no stitching, earning the accolade “Oriental Magic.” Twenty years later in 2015, we developed a 4-needlebed “WHOLEGARMENT® flat knitting machine” equipped with a moveable full sinker system. This used to be difficult to achieve technically, and brought about revolutionary changes to the global knitting industry.

Currently, we offer a wide range of products and services, not only including our mainstay flat knitting machines, but also our design systems that support 3D virtual samples, our automatic cutting machines, our non-lithographic-plate-type printing machines, and so on. In addition, we carry out all design, development, and production activities in Wakayama, the place of our founding. Our head office factory has a variety of processes to fully exploit our own technologies, from the processing and manufacturing of precision parts to the assembly of final products.

It seems that you have adopted the use of the Aluminum Pipe Structural Material GF around 2016.

We like the fact that GF is beautiful in appearance, lightweight yet strong, and can be used in a variety of ways for diverse parts. Although we had been interested in it for a long time, we had the impression that aluminum was expensive and thus we were unable to take the plunge in using it. However, upon inquiring further, we found out that

the price difference with iron was not as large as we had imagined, so we decided to try it once. After actually producing a prototype of an AGV transport trolley, we felt that the material was easy to work with and we were able to produce the prototype easily. Compared to the iron pipe we used before, the fact that fine adjustments and extensions can be done easily after completion is also an attractive point. From there on, we introduced GF to other members, gradually spreading its use in line with the company’s policy of focusing on improvement.

Not only that, but there are not many members on the production site who can produce drawings. In the case of SUS, I think one of the reasons why GF became widely adopted is because things could be implemented speedily. You created the drawings for us, helping up to turn our ideas into reality after we told you what we wanted to make with just ideas and simple, hand-drawn sketches

There are many buildings and a variety of processes at the head office factory. How are improvement activities being implemented?

At Shima Seiki Manufacturing, we insist on in-house production, and we carry out integrated production of our own products from hardware to software. There are lines that handle fine electrical parts such as boards, cables, and switches. On the other hand, there are also factories that complete the final knitting machine by assembling various parts. The latter also handles heavy items which require the use of a crane. There are many parts and types, and our processes are very diverse. Against this backdrop, instead of a centralized organization to manage our production technologies and equipment, each department has developed its own wisdom to create its own lines. Even now, personnel in charge of the workplace come up with their own ideas on how to create a conducive workplace.

Although there were advantages in working separately, we faced other problems such as a lack of standards concerning the height and depth of the work benches. Standardization was not maintained. Therefore, in switching to GF, we are also working on aligning these points.

Case 1 Work bench customized for each process while still adhering to standardizations



Work bench for soldering. To ensure that the operator does not inhale the smoke, the bench is designed to pull the nearby air away through a duct on the top.



The fully GF work bench was constructed alongside the new factory. It is customized to fit the work while maintaining uniformity through pre-determined depths and other basic specifications.



Air is blown out from holes in the frame



Terminals are provided to individual operators, making use of the unique operational management system. The work bench has a dedicated stand for the monitor, the placement of which may be altered depending on the process.

Case 2 Dedicated step stool of just the right size



The GF-G series is used for the step stool which helps operators reach the wire work on the equipment. The width, height, etc. are customized to the design.

Case 3 Parts storage rack designed to accommodate loading and unloading



This is a storage rack for heavy parts which weigh about 20 kg per box. By fixing the direction for replenishment and removal, parts can be loaded and unloaded on a first-in first-out basis without the need to restack. By using a three-tiered trolley, parts can be removed by simply sliding the trolley into place, thereby reducing the work load.



Showroom where various kinds of knitwear with different materials, uses, and forms are lined up.

Creating an operator-friendly workplace with the high degree of freedom that can only be achieved with GF

What are the things that you strive for when producing a piece of equipment?

I already talked about the standardization of equipment earlier, but at the new factory completed at the end of 2017, we actually defined a design standard stipulating that all work benches have to be made with GF. In addition to making it easier to review and change the layout, I have also heard comments from the production site saying that "GF made it easier for us to move from one work bench to the next, creating a sense of uniformity and neatness." We plan to systematically implement this system for the other processes as well.

The most important thing that I strive for when making any kind of equipment is how I can reduce the workload and make it easier for operators. Even on a single type of workbench, the best set up for ease-of-use varies depending on the nature of the work being done and the type / size of the tools being used. Therefore, we pan out each and every workbench by listening to the feedback from the operators while keeping to the basic design. When arranged in a row, there is a sense of uniformity even though each work bench has been properly customized according to its specific use. Even though there is this sense of unity, that does not mean operators are forced to use standardized products. These kinds of installations are growing in number one after another.

How about the ease of using GF?

The parts are diverse with a high degree of freedom so I like the fact that I can create equipment that is

suitable for each process. Right angles and parallel lines can be created by simply tightening the connector and assembly is easy too. When building equipment like work benches and trolleys, it's rare to make it right on the first try, but I think improvements can be made immediately even after installation. This raises the level of satisfaction in the workplace.

In addition, although there are not many yet, simple automation karakuri mechanisms have also been produced. Creating something with that high a degree of potential is honestly interesting. With regard to karakuri, I also went to the Karakuri Improvement® Initiative Exhibition with the intention of actively incorporating these ideas in order to save labor and energy in the future. The other day I bought a miniature karakuri made of GF to study the mechanism and actually assembled it. I hope to give shape to the structures I am imagining by using the miniature as a kind of hint.

Please tell us your requests for SUS.

There are parts that we have not fully utilized because of the diversity of our products. It would be good to have some guidance on how to use them with examples, etc. Also, we handle a variety of parts / products from small to large. Even if a single item is light, the unit to be transported is kind of large. I think that we can widen the range of applications if these parts can cope with heavier loads. Likewise, for electric parts, if there was a product with a larger payload, it would be useful for raising and lowering heavy loads that impose a large burden. Since the power supply is also an issue, it would be great to have a battery available as well. In the future, I would like to work on automation using electric mechanisms and the SiO Controller, so I'd appreciate any advice I can get from SUS on these applications.



A trolley with a handle cut into the worktop makes loading and unloading easier. A variety of measures have been established to improve each individual process.

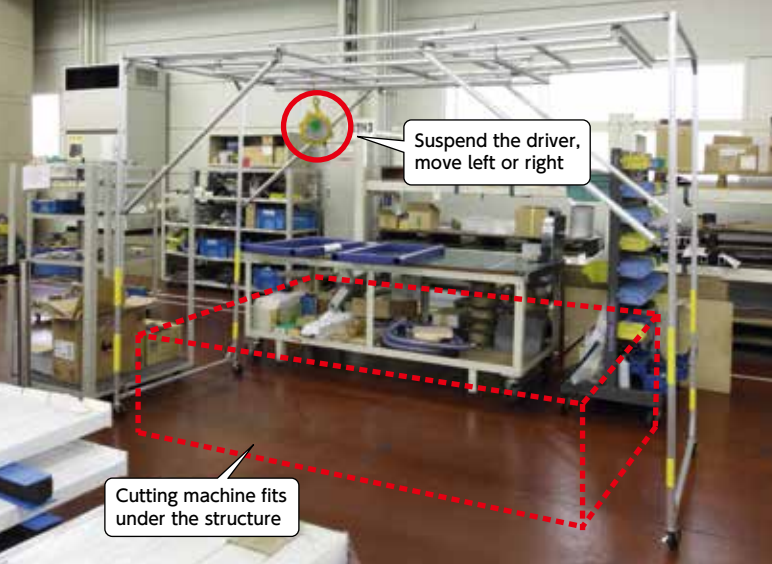
Case 4 Reducing the strain of assembly work by suspending an extendable impact driver to the frame

Retracted Structure



In this stage of assembling an automatic cutting machine, hundreds of screws are tightened with an impact driver weighing about 7 kg. The strain was reduced by suspending the driver to a gate-type frame using a tool balancer.

Extended Structure

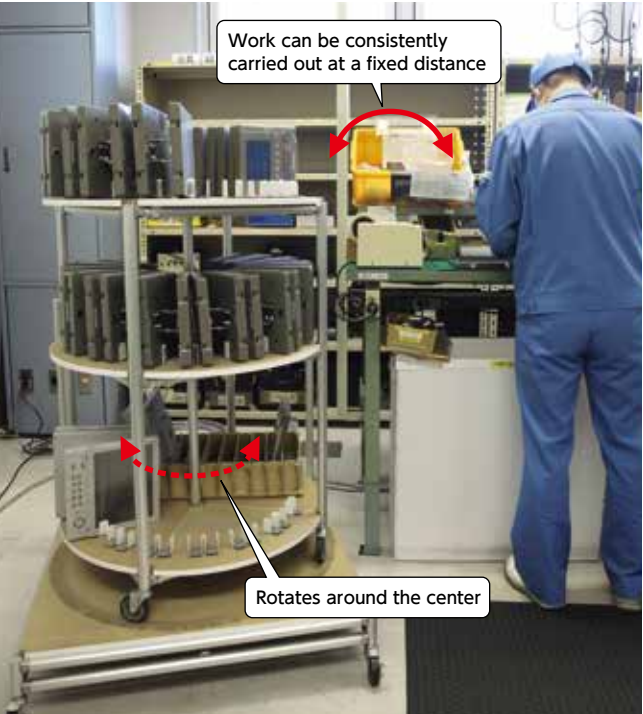


Case 5 The tool is kept at a convenient height, allowing well-balanced lifting and lowering.



This ascending / descending cart stores two different types of parts on the top and bottom. The frame section containing the cardboard box and the outer framework of the cart are connected by Slide Connectors, allowing it to slide up and down.

Case 6 Reduce movement loss with a rotary table



This trolley allows items to be loaded and unloaded without the operator moving from their station by rotating the loading surface. When the trolley is full, it can also be transported as-is.

Case 7 Efficient garbage bin installation

Garbage bins are stacked on two levels to save floor-space. Since the bins contain metal trash and other heavy objects, the stand's strength was enhanced with GF-G frames.



Case 8 Customized trolleys for chairs.

Customized trolleys are produced together with the purchase of chairs used in morning meetings and lunch breaks. These can be taken out and returned easily, exactly when you need to use them.

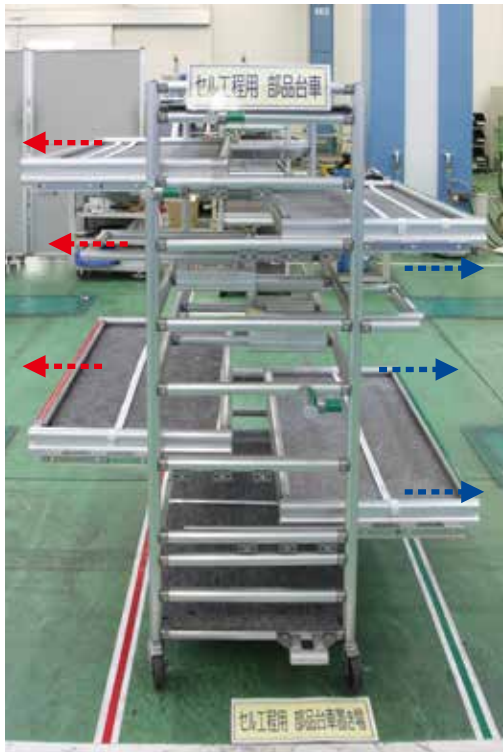


Case 9 Parts trolleys that can be used from both sides

In storage



In use



A parts trolley that makes effective use of the space available and can support processes on both sides with a single unit. Drawers are color-coded to distinguish the direction they are pulled out.

Case 10 Linking AGV trolley



With the cover removed

A prototype trolley connected to an AGV for carrying items. Three units can be linked up. They will be covered in order to protect them from rain and dust when moving between factories.

Use the joy to turning your ideas into reality as motivation to gain experience and improve yourself!

What challenges are you currently working on?

As production booms, limits will also appear in the factory space, and the problem of how to use existing space efficiently is a big issue. Therefore, we are currently working on an initiative to optimize the size of things like racks and work benches to make them as small and slim as possible. At the same time, since it is necessary to secure sufficient working space to ensure reasonable working conditions, we would like to create measures that take into consideration things like the position of the rack, how things are going to be placed, etc. We plan to use AGVs to save on labor and energy, and we will also incorporate simple automation karakuri mechanisms to item-transfers. Currently, production is still carried out with a view on how to lighten the burden on operators, but in future we would like to pursue ways to increase productivity while developing and expanding the use of karakuri mechanisms.



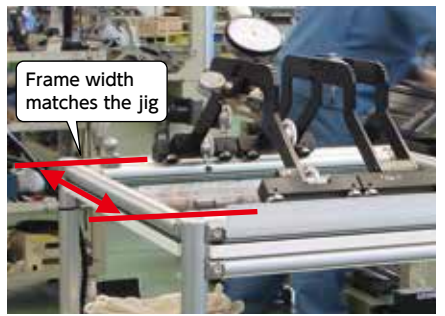
This partition was constructed to contain foreign matter generated in the adjacent process. In the past, it used an iron plate, but the visibility was poor and the height was insufficient. Using GF, installation was carried out without the need for large-scale construction and material flow was also improved.

What does the future hold for you?

Members at the work site will have to come up with ideas within a limited amount of time and work on improvements. After switching to GF (although it took a while before it became widely used), we started to hear positive comments like “Can’t we do this kind of thing, too?” I think the reason for this change is because of the versatility of GF and the support of SUS, allowing us to experience the joy of turning what we were imagining into something real on our own. Even if it’s just something small, it’s nice to see your idea taking shape and playing a part in creating the workplace. This sentiment was probably the driving force that led to revitalizing improvements. Without this, I don’t think the use of GF would have spread so rapidly, even if instructions had been given from the manager. Even though we still rely on SUS for detailed designs very often, in the meantime, we want a system which allows many members to create equipment from square one using the available parts. To that end, there is still the issue on the management side of how to secure the time required. We believe it will be good if the workforce and management work together towards the same goal.

Case 11

Work trolley customized with the “3 Tei” in mind



Jig area

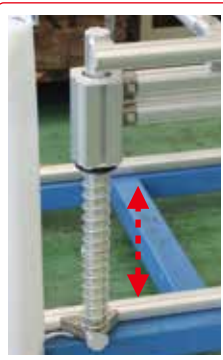


Monitor stand

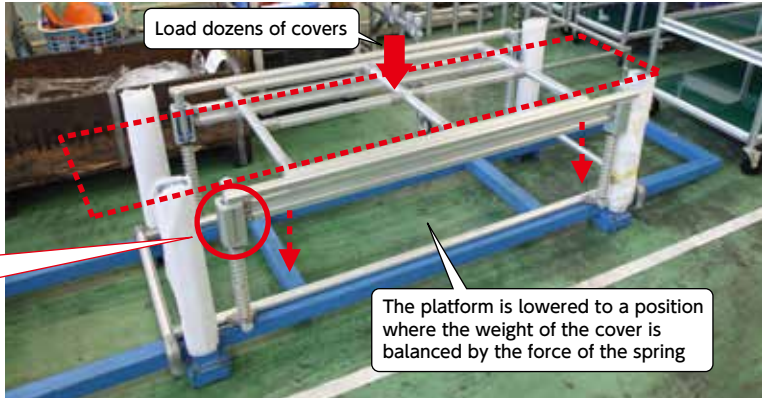
Work trolleys are made with the “3 Tei” (Fixing Three “Tei” in placing or storage, i.e. “where”, “what” and “How many”). This way, anyone can do the same process. The normal positions of jigs and tools are fixed by partitioning the top of the table with a frame, and a monitor stand for the terminal is also provided.

Case 12

Cover loading platform allows loading and unloading at a fixed height



Linear Slider



The “cover loading platform” enables loading and unloading at a fixed height by using springs. It was retrofitted to a reusable blue rack used with partner companies to save money. Preparations for full-scale operation are in progress while the optimum strength of the spring, etc. is being verified.

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WHOLEGARMENT

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Add Plus One to your everyday routine! Get excited about improvements with a variety of techniques

Founded in 1938, Pioneer Corporation was the first company in Japan to successfully develop dynamic speakers. The Kawagoe Plant we visited on this occasion was established in 1970. It is the key production base responsible for the development, design, and production of mainly car navigation and car audio systems. We interviewed members of the production site where improvement activities are promoted by a variety of approaches not limited to equipment alone.



Production Management Division
Manufacturing Innovation Division
Global Production Department
Mr. Hideki Matsue, Manager



Production Management Division
Manufacturing Innovation Division
Global Production Department,
Production Engineering Section 1
Mr. Keiichi Ishizuka, Manager



Production Management Division
Manufacturing Innovation Division
Global Production Department,
Production Engineering Section 2
Mr. Takeshi Akutsu, Manager



Production Management Division
Manufacturing Innovation Division
Global Production Department,
Production Engineering Section 2
Mr. Kousuke Kamada

COMPANY DATA

PIONEER CORPORATION KAWAGOE PLANT

25-1 Yamada Kawagoe-shi, Saitama 350 - 8555
<http://pioneer.jp/>

Interviewed on April 27, 2018

Revitalize the site with unique systems where operators are integral to evaluations

The company celebrated its 80th anniversary in 2018. First of all, please tell me about your company profile, including your current business focus and so on.

The history of Pioneer started with dynamic speakers. Since its founding until the present, as "pioneers" we value the spirit of manufacturing in inspiring people. Our corporate culture as the first to launch many leading products in the world and industry is a defining feature of our company. Currently, our main business is focused on car electronics, especially car navigation and audio systems. In addition to our own brands, we also supply OEM products to car makers. We have been promoting the development of technologies that leverage upon our knowledge of optical technology and car-mounted products we have cultivated up to today. We are focused on the dawn of self-driving vehicles.

I heard that a lot of the Aluminum Pipe Structural Material GF is being adopted in your workplace.

Iron pipes were used in the past. We handle precision instruments, so when we were looking for products that are easy to use, we paid attention to products that prevented static electricity and foreign contamination. That's when we came across GF. We started using GF because it is easy to handle, e.g. horizontal and vertical portions can be produced

simply. Also, besides the joints being simple and stain-resistant, the fact that GF is easy to clean without paint peeling off is also an important point. GF looks good, making the workplace seem brighter after it was introduced. Because it's an aluminum material, it's great that it can be recycled. After it was officially adopted [as a construction material], we replaced our equipment. Now, new facilities are made up almost entirely of SUS parts.

When making equipment, what points do you insist on?

Recently, car safety devices such as hazard buttons are often incorporated into car audio products. As they are directly linked to the safety of the car, we have to take greater care than before in dealing with foreign contaminants and defects. For that reason, cleaning has to be carried out thoroughly, so ease of cleaning and maintainability are also important. In addition, workplace safety is a key point, so user friendliness is considered from the perspective of the operator.



The results of various activities are posted at the entrance to the production site, and we are working together as one to create a vibrant workplace.

Product guide

High-end audio car navigation system **Cyber Navi x Series**

Carrozzeria "Cyber Navi x Series" is a high-end audio car navigation system jointly developed with the elite audio "Carrozzeria x" and home audio "TAD" systems. Based on the technology and expertise that Pioneer has cultivated, and in addition to reviewing the design concept, we have adopted the very best high-quality sound components never before used in car-mounted devices, thereby exceeding the standard for car navigation and achieving an overwhelming audio performance.



"AVIC-CZ902XS" Recommended retail price: 248,000 yen (excluding tax)

How do you gather your operators' viewpoints?

"Operator's Voice" is an initiative we are undertaking to reflect the views of operators in the workplace. This is an activity to get the workplace to highlight places where improvements are deemed necessary. After clearly stating what action needs to be taken and when, the real-life results are evaluated. The measures don't necessarily need to be related to the equipment. We are aiming for a workplace that is easy to work in, including mechanism development. During implementation, instead of a vague question like "Do you have anything to comment on?" a different theme is set each month. For example, we ask questions like "Are there any places where you are likely to get hurt?" or "Are there any places where the procedures are confusing and you are likely to make a mistake?" Evaluation after implementation is carried out in four levels: S, A, B, and C. We seek out feedback to ensure that this is not a one-way process. A high rating motivates the line manager, and having a chance to quantify the outcome of the improvement is beneficial, too. On the other hand, if the result is not what you expected, management will provide advice on how to improve the situation further.

Are there other activities that you are conducting to encourage improvements?

We have a variety of initiatives such as an awards system, small-group activities, an improvement proposal system, and more. We are also conducting our own Plus One activities in the Global Manufacturing Department. In addition to improvements, we have an initiative known as "Plus." Staff are encouraged to use pleasant greetings to create "a workplace that is more cheerful, brighter, and vibrant." A morning greeting campaign was also conducted by the manufacturing department. In addition, there is a system to send a "Plus One Card" and rate Plus One actions. Previously it was only paper-based, but now submissions can also be made on the computer system. The number of cards are counted, and those at the top of the "Sent" and

"Received" list are commended. In this way, team members develop a habit of mutually rating actions and sending one another cards. A real awareness of the "Plus One" initiative has taken root in the Global Production Department. Improvement activities also fall under the Plus One initiative. Since the idea is to constantly add something positive to the current situation, products that can quickly take shape from an idea (like GF) are also a very good match. As GF products can be easily corrected even after completion, I feel that we can make improvements with a sense of speed and without fearing failure.

I heard that in recent years you've become enthusiastic about simple automation karakuri initiatives.

The reason why we first introduced karakuri was because of a TV program broadcasted in 2015. An executive officer in the production management division saw the efforts being made by other companies and issued a directive to incorporate karakuri automation. It's been said recently that manufacturing is on the decline in Japan. There was an aim to empower the work floor by focusing on improvements using karakuri and by training people in creative thinking. With data collection as the starting point. We visited the karakuri improvement initiative exhibition organized by the Japan Institute of Plant Maintenance and built up our knowledge by reading books and watching DVDs issued by the institute. In addition, we visited the SUS showroom and participated in seminars, continuing on from simple imitation to gradually accelerating our initiatives. Having said that, although we started with much enthusiasm, the equipment that we initially made was criticized as being "large, stiff, and heavy." From that point on, we returned to the needs of the workplace and gradually began to make improvements with the aim of creating something that is truly easy to use.

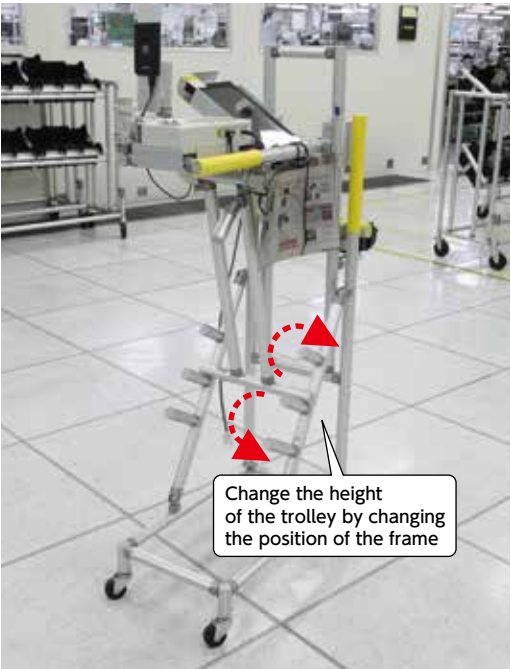
Case 1 Unified materials and standards make a bright and orderly production line

A row of work benches lined up from the far side of the picture. Assembled products are sent toward the near side in sequence, going through the final inspection process on the frontmost work bench before completion.



Case 2 Customized trolley for checking torque strength

The height of the trolley carrying the torque-checking machine can be adjusted in three steps. Previously, the results of each test were written on paper, but the mechanism was changed. Now, the machine is connected to the tablet terminal which automatically accumulates data.

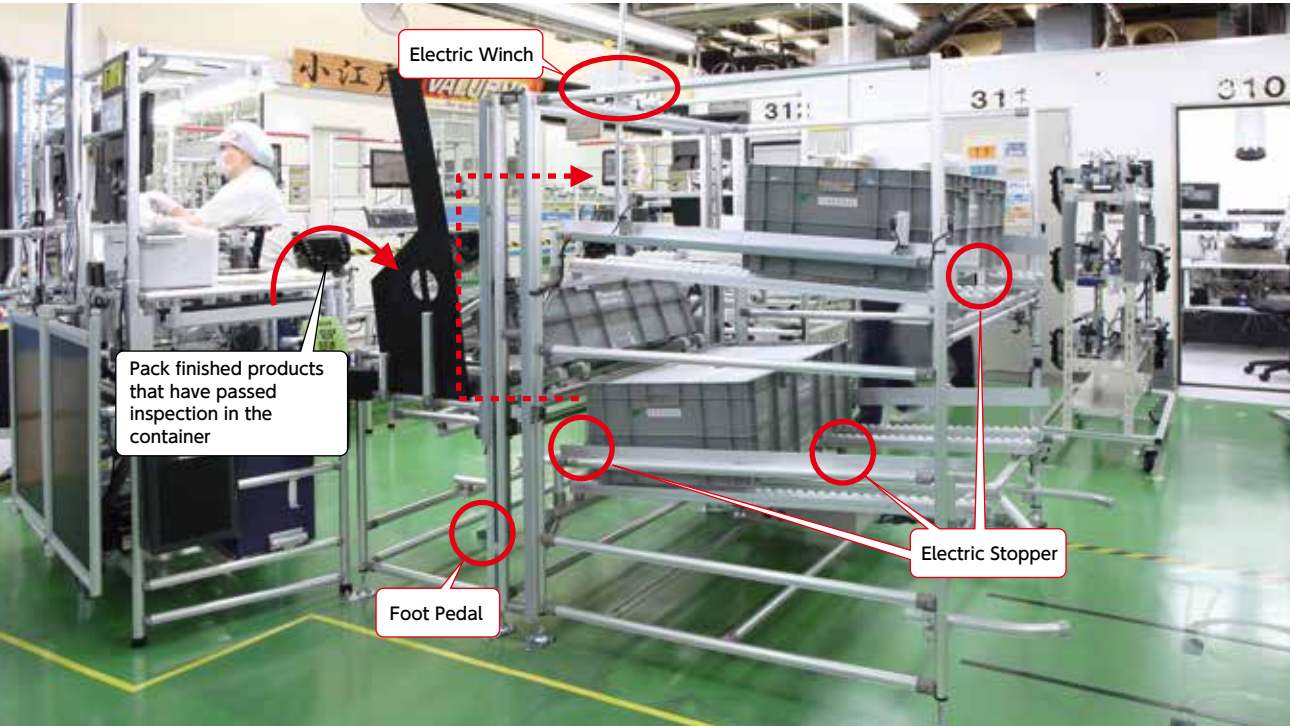


Case 3 Transport trolley between processes

This trolley carries items set up at a remote location to the necessary processes. Previously, when the production model changed, the drawers on the trolley were changed, too. But because this meant a drop in loading efficiency, the place where the items were set were given numbers and arranged in a way so that they could be used in order. This reduced the number of transfers.



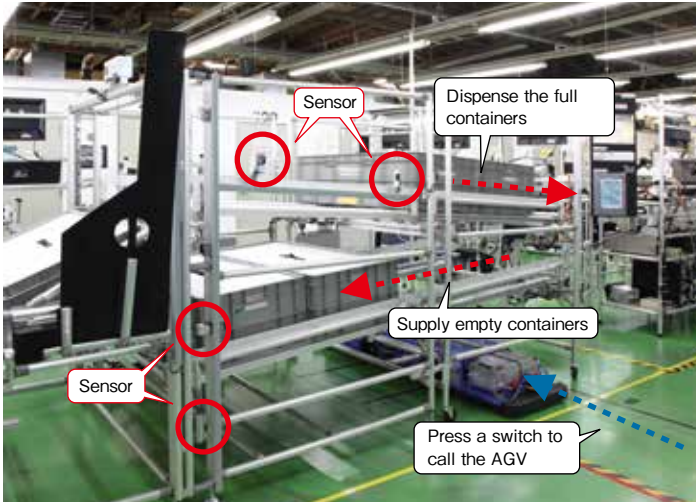
Case 4 Automatic supply / dispense chuter incorporating an electric mechanism



When the container is full, the operator steps on the pedal to dispense it to the upper section. The empty table receives an empty container from the lower section and stops at a position where it is easy to use.



An electric winch is used to raise and lower the table.



Automatic supply and dispensation are achieved with various sensors that detect the position of the containers and the table.

This is an example of an improvement in automating the supply and dispensation of containers. It eliminates the work of restacking the wide, difficult-to-handle containers, decreasing the workload and raising efficiency. The separation of the containers is achieved with electric stoppers on the chuter side and karakuri mechanisms on the AGV side. Initially, the separation of the containers on the chuter side was also done with a karakuri mechanism, but because it underwent hundreds of repetitions, malfunctions were unavoidable. Therefore, we changed the model to an electric one so we could focus on reliability. The chuter sensor is linked with the AGV for control purposes so that the AGV does not move away when containers are still in the upper section.

We hear that electric mechanisms have also been adopted recently.

Integrating electric mechanisms is an extension of the idea of using “equipment that meet the needs of the workplace.” For example, when trying to lift a heavy object using the principle of a lever, a certain length is required. This creates a new problem: the equipment has to become larger to accommodate the lever. But, if the walking distance of the operator is extended by insisting on Karakuri, this is like putting the cart before the horse. Furthermore, in a place handling heavy loads, there will inevitably be a lot of breakdowns necessitating a lot of maintenance work. In order to solve these problems, we adopted products such as electric winches, lifting-up and pulling-down units, electric stoppers and the like. At present, gravity-powered karakuri mechanisms and electric automation parts are both used on the production site. We feel that these are practical applications matching each need. Pioneer aims to improve space efficiency. We are promoting the creation of compact equipment that I believe will be easier to use if it incorporates electric automation that can carry small, heavy items.



Two members of the Customer Satisfaction Committee assist with a factory visit. They give customers (mainly auto manufacturers) an introduction of the initiatives being undertaken by the work-force.



Miniatures that allow workers to learn simple automation karakuri mechanisms are displayed in a common area.

Challenges continue as we strive for greater heights

There are many group companies overseas. How are information and ideas being shared?

Information about the Kawagoe Plant’s improvement activities are being shared on a global level. Through our intranet, we have made it possible to see site maps and videos / drawings of equipment, even by people overseas. We believe that anyone who can introduce these ideas to their own work place should please use them. Our stance is that these materials should be used wherever implementation is possible. Some of our members who have visited Japan on business trips have also returned home with this information. In addition to preparing materials that summarize basic karakuri knowledge, we are also conducting production presentations. Actually, the person who started the “Plus One” activities used to be the manager of the Global Production Department. Now, he is the president of a subsidiary in Thailand. In that sense, I think that “Plus One” activities are not only meant for Japan, but for the whole world to revitalize the workplace.

Finally, please tell me more about the ideal workplace you are aiming for.

Ideally we want to create an environment where operators can concentrate on their work without excessive movement, but we have not reached that goal yet. This may go without saying, but reducing the transportation process and creating a compact production line are continuing challenges. Also, in order to raise the efficiency in limited spaces, it may be necessary to utilize overhead spaces and other dead areas. On the other hand, cleaning may take more effort if the height is increased. I think it’s necessary to implement this in a well-balanced way, taking into consideration contamination by foreign matter and other problems. By taking on simple automation karakuri initiatives, I feel that ideas for this kind of improvement have developed more rapidly than before. Going forward, we aim to create an environment where operators can work comfortably.

Case 5 Elevator chuter using two electric winches



Similar to Case 4, this is a chuter automatically interchanges full and empty containers. Because the products being handled are heavy, two electric winches are used to provide the power necessary.

Case 6 Reduces set-up labor by using a rotating storage rack

This rotating material storage rack uses rotary connectors in the center. Containers can be placed on three sides.



Case 7 A sliding inspection table that supports both left-hand and right-hand models in a single unit

When the product is set on the table and the cables are connected, the camera automatically distinguishes the model and inspection starts. As the shape of the product is different for left-hand and right-hand models, the table is designed to slide to the left or right to accommodate the correct one.

Check it out!

Equipment with simple automation karakuri or other mechanisms is distinguished by a yellow ping-pong ball so that even people who are not familiar with the manufacturing site can quickly identify it when they visit the site. Name cards are also attached to help attract the attention of visitors.

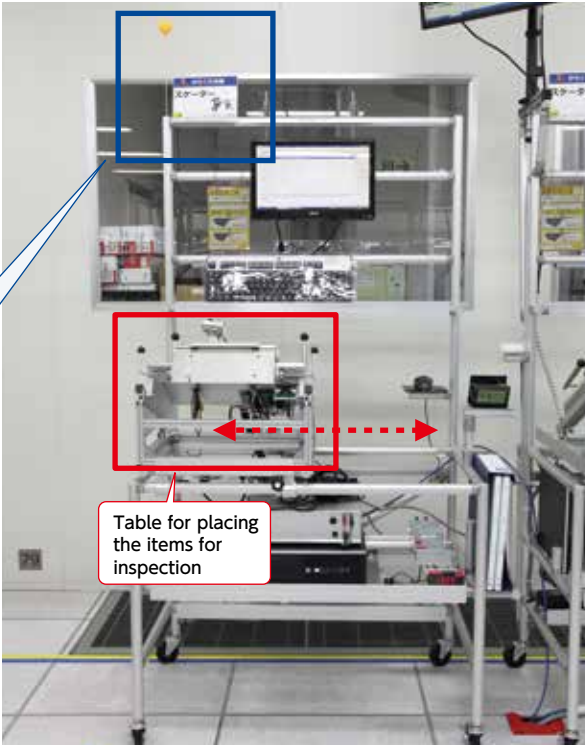
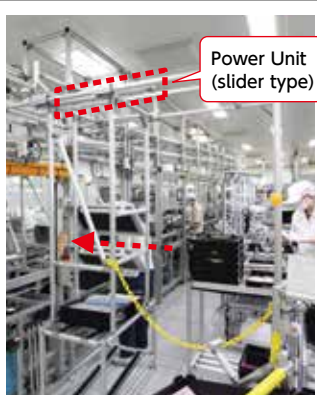
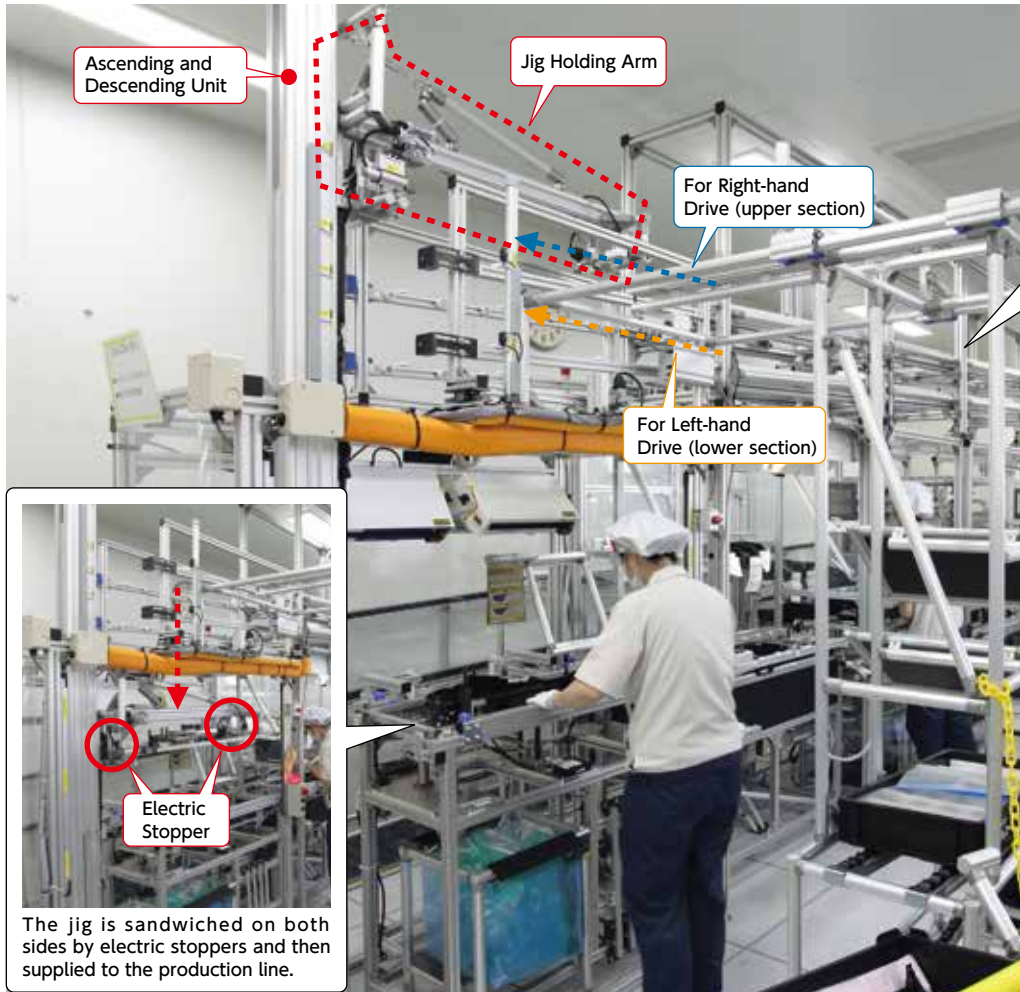


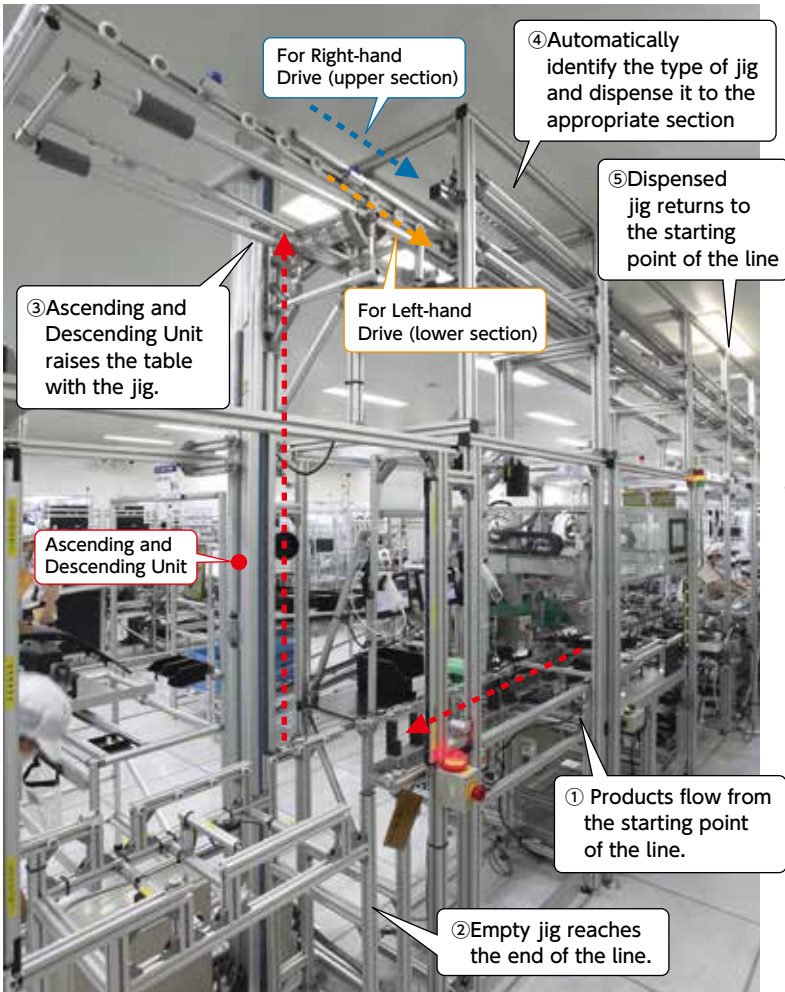
Table for placing the items for inspection

Case 8 Production line starting point
Automatic supply of necessary jigs with one switch + reduced walking thanks to portable racks



When the switch is pushed, the power unit activates and the rack moves to the operator side. When not in use, the rack is put to the side to create a passageway.

Production line ending point
Overhead transfer unit to return the jig automatically and effortlessly



This line produces products for right-hand and left-hand products using different jigs for each. The jigs are stored separately in the upper and lower sections in the Overhead Transfer Unit composed of two sections at the top of the line.

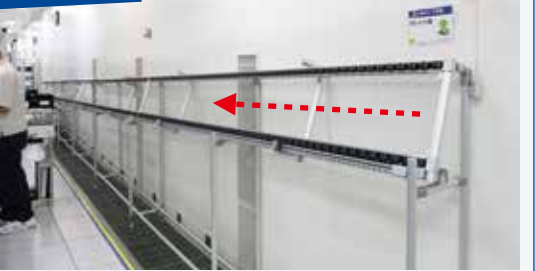
Movement at the start of the line

When the switch is pressed for to the item being produced, the jig for the right-hand model or the left-hand model is dispensed and supplied to the line via an arm attached to Ascending and Descending Unit.

Movement at the end of the line

When the process is complete, the empty jig is lifted up by the Ascending and Descending Unit until it is overhead, then dispensed. Next, the jig returns to the start of the line.

Before



Prior to the introduction of Overhead Transfer Unit, operators carried jigs along the wall up to the chuter. This resulted in an annual loss of 2 million yen due to unnecessary walking. Even now, the old transfer line remains installed, just in case it's needed in an emergency.