Electronics Company —Technology and Strengths

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1. Introduction

Electronics Company develops and manufactures two product brands: SANUPS and SANMOTION. Although these brands cover different products, both are based on energy conversion technologies. SANUPS products, such as, uninterruptible power supplies (UPSs) and renewable energy inverters, convert electrical energy into higher-quality electrical energy. SANMOTION servo system products convert electrical energy into mechanical energy. SANMOTION consists of motors and control units, and Electronics Company is responsible for developing and manufacturing the control units, including servo amplifiers and controllers.

We have three core technologies: energy conversion, production, and customization. Building on these strengths, we carry out five team activities to create new value.

This article introduces both our three core technologies and the five team activities. First, we explain our areas of core technologies and team activities, and then we present specific examples of the team activities.

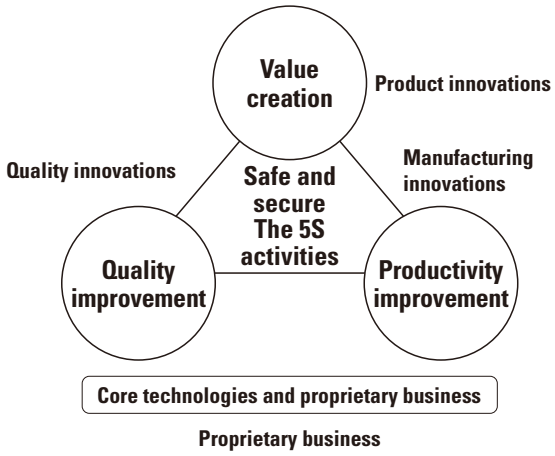
2. Core Technologies and Five Team Activities

We are committed to create products that customers can use with confidence. We commit to creating value for customers and society (value creation), ensuring quality that enables safe and reliable use (quality improvement), and manufacturing products efficiently (productivity improvement)—the three pillars that represent the essence of manufacturing.

All of these are supported by a safe, secure, and fulfilling workplace. At the Electronics Company, each employee keeps the customers in mind and leverages their strengths to develop products while working as one team to create a fulfilling workplace.

We have also cultivated our core technologies to date, which sourced to create our proprietary businesses.

As shown in Figure 1, we carry out five team activities: value creation, quality improvement, productivity improvement, safe and secure workplaces, and proprietary business development. All of our employees participate in these team activities through “all-hands engagement.”



Five team activities

1. Product Innovation: Create value through products and technology
2. Quality Innovation: Ensure safe and reliable product quality
3. Manufacturing Innovation: Maximize value while minimizing production cost
4. 5S Activities: Create a safe, secure, and fulfilling workplace and develop human resources
5. Proprietary Business: Develop unique businesses leveraging our core technologies

Fig. 1 Five team activities

The Product Innovation Team creates value for customers and society through our products and services. The Quality Innovation Team enhances the quality of our products and services to ensure safe and reliable use. The Manufacturing Innovation Team improves production efficiency, pursuing

manufacturing that delivers maximum value at minimal cost.

The 5S (Sort, Set in Order, Shine, Standardize, and Sustain) Workplace Organization Team works to create a safe, secure, and fulfilling workplace. This workplace development is positioned as the foundation not only for value creation, quality enhancement, and manufacturing capability, but also for human resource development.

Lastly, the Proprietary Business Team applies our core technologies to develop unique businesses within the Electronics Company, contributing to solving customer challenges.

At SANYO DENKI, we have built extensive expertise in product design and production through years of experience. We specialize in power conversion technology that cleanly converts and controls power, and servo technology that starts and stops motors as intended—both of which involve converting energy. We also excel in production technology that enables efficient production of high-quality products, as well as in customization technology developed over many years in collaboration with our customers. This customization technology enables optimal, tailor-made designs for each customer. These three areas—energy conversion, production, and customization—are our core technological strengths. By combining these core technologies with the activities of our five teams, we deliver products and services that create value for our customers and society.

3. Product Innovation Team

Both *SANUPS* and *SANMOTION* products are energy conversion devices, whose essential qualities are compact size, light weight, high efficiency, and low noise. We work to deepen each brand's expertise and develop new products and services centered on energy conversion.

First, we introduce products that leverage our energy conversion expertise. Next, we highlight our efforts to deepen this expertise and create new value.

3.1 Energy conversion devices by brands

3.1.1 *SANUPS* products

Figure 2 shows the *SANUPS W83A* renewable energy inverter. A single unit of this product supports a wide range of renewable energy sources. By optimizing power control to match each customer's generation system, it maximizes the use of renewable energy and boosts energy conversion efficiency by 2% over our current products.

Fig. 2 The *SANUPS W83A* renewable energy inverter

Figure 3 shows the *SANUPS A13A*. This product uses a modular UPS system, enabling parallel configurations of up to four modules. Even if one UPS module stops operating, the remaining modules continue to supply power, demonstrating the high reliability of the product. In addition, the use of a next-generation power conversion device and optimized control has improved the energy conversion efficiency by 8% over our current products.

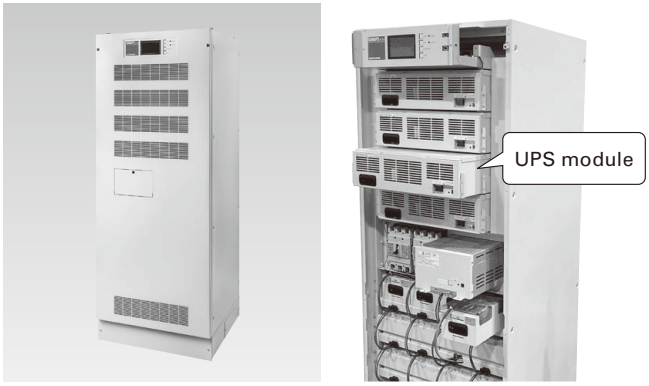


Fig. 3 The *SANUPS A13A*

3.1.2 *SANMOTION* products

Figure 4 shows the *SANMOTION G* 48 VDC servo amplifier. This servo amplifier operates on 48 VDC, which is increasingly demanding in applications such as semiconductor manufacturing equipment and battery-powered applications. With a low-loss design and enhanced heat dissipation, the product reduces energy loss by 12.8% over our current products.

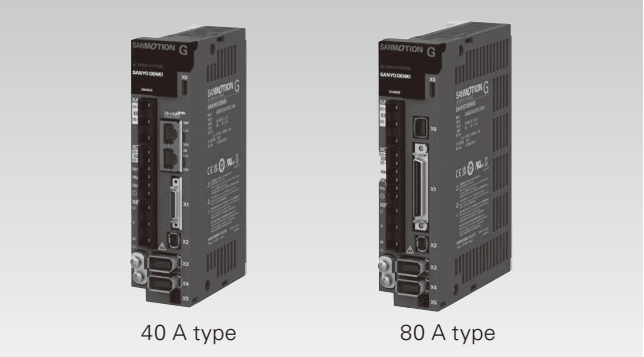


Fig. 4 The *SANMOTION G* 48 VDC Servo Amplifier

Figure 5 shows the *SANMOTION G* 2-axis integrated AC servo amplifier. This product offers a compact, lightweight design and contributes to energy savings. Compared to using two single-axis servo amplifiers, it reduces the installation footprint by 38% and the weight by 19%, achieving a significant reduction in size and weight. By efficiently utilizing regenerative energy across both axes, it also cuts energy loss by 18%.

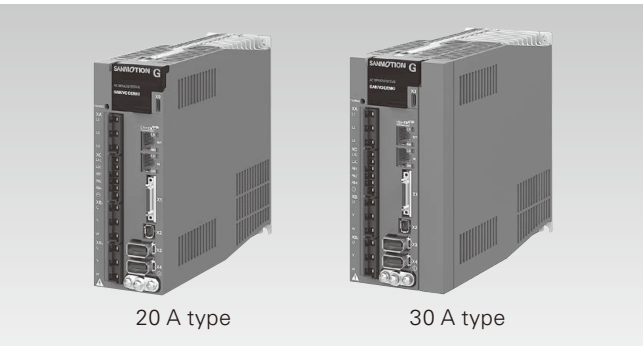


Fig. 5 The *SANMOTION G* 2-Axis Integrated AC Servo Amplifier

3.2 Team activities with core technologies

Our strength lies in our core technologies that enable compact, lightweight, efficient, and low-noise products, which are applied to both *SANUPS* and *SANMOTION* products.

With the Co-Creation Matrix shown in Table 1, the Product Innovations Team is working to further enhance the core technologies behind *SANUPS* and *SANMOTION* products, creating new value.

Table 1 Co-Creation Matrix

Electronics Company		***SANUPS***	
		Technology, product, service	Factory, Equipment, Markets, Customer
SANMOTION	Technology, product, service	**Combine core technologies Strengthen shared expertise**	**Offer *SANMOTION* products** to *SANUPS* market
	Factory, Equipment, Markets, Customer	**Offer SANUPS products** to *SANMOTION* market	To new customer/ market **Innovate new technology Develop co-created products**

3.2.1 Deepen core technologies

(1) Compact, lightweight, high-efficiency, low-noise

The technologies that enable compact, lightweight, high-efficiency, and low-noise products are the essence of energy conversion devices. They deliver technological, economic, and environmental benefits, such as reduced size and power consumption for both customer equipment and our products. This is the core capability we continue to pursue. For example, we have developed an optimized control for gallium nitride (GaN) and silicon carbide (SiC) devices—the latest power conversion devices—to produce more compact, lightweight, higher-efficiency, and lower-noise products.

(2) High-response motion control with disturbance rejection

For *SANMOTION* products, we are developing high-speed control technologies to achieve higher-response control resistant to disturbances. This technology helps reduce cycle times, improve accuracy, and stabilize the power supply for customer equipment.

(3) Eco-friendly production

To reduce power consumption in the component mounting process of PCB boards used in both product lines, we are developing a technology that enables mounting with low-melt solder. This approach reduces environmental impact during production while maintaining the high-quality of PCB boards.

3.2.2 Value creation

(1) Product failure prevention

For *SANUPS* products, we are developing a technology that monitors temperature and humidity in the installation environment and uses the data via the cloud for predictive

maintenance and failure diagnosis. By monitoring the operating environment and detecting early signs of failure, maintenance can be performed appropriately based on the deterioration levels and service life predictions.

(2) Control technology using external sensors

For *SANMOTION* products, we are pursuing more advanced, precise motor control by using data from accelerometers, force sensors, and pressure sensors alongside existing position and speed feedback control. Through these efforts, we aim to achieve smooth, high-precision motion and enhanced stability in customer equipment.

(3) Co-Creation products

Servo systems face issues such as high energy consumption during acceleration and heat generation due to regenerative energy resistance during deceleration. To solve these issues, we are developing energy-saving products that combine the core technologies of the *SANUPS* and *SANMOTION* brands. This is one of our initiatives for improving energy efficiency across servo systems.

4. Quality Innovation Team

We leverage our core technologies to improve product quality and ensure safe, reliable use for our customers.

This chapter presents our efforts to use production guidance systems and to prevent failures through automated testing.

4.1 Production guidance system

We employ production guidance systems in our manufacturing processes. As shown in Figure 6, the system displays digitized work procedures on a PC screen or LEDs to accurately guide operators through their tasks. This system has improved manufacturing quality by enabling consistent performance, regardless of workers' skill.

Fig. 6 Production guidance system

4.2 Initiatives to prevent defects

We have established an automatic evaluation system that automates test condition setting, measurement, and judgment processes, eliminating accidental omissions. By automatically performing evaluation tests that comprehensively cover customer operating conditions, product quality is significantly improved.

Figure 7 shows an automatic measurement system for temperature-rise tests on *SANUPS* renewable energy inverters. A PC automatically sets test conditions, collects measurement data, and determines pass/fail results.

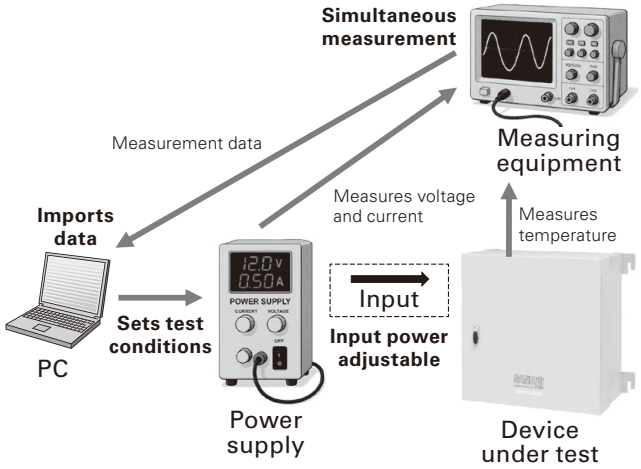


Fig. 7 Auto evaluation system

Design or component changes are a common source of defects. We address these changes early in the design phase to prevent defects before they occur.

5. Manufacturing Innovation Team

In addition to equipment automation and production guidance systems, we implement four key activities to improve productivity: awareness initiatives, digital technology utilization, co-creation, and human resource development. These activities enhance productivity while also increasing employee motivation.

5.1 Awareness initiative

During daily production operations, workers often encounter moments when something feels off or prompts them to question the cause. Our awareness initiative allows workers to record any irregularities or concerns on an Awareness Card, enabling issues to be shared and used as a basis for improvements at the production site.

Figure 8 illustrates the workflow of the digital Awareness Card system. Entries are automatically uploaded to a shared cloud-based Excel file, allowing relevant personnel to

monitor improvement progress in real time. We have also built a system that uses the *SanBI* business intelligence tool to automatically compile and analyze the stored data to visualize the improvement status by workplace and process, supporting tracking of the PDCA cycle.

Through this initiative, we have successfully shortened the time required to identify and improve problems at production sites. This encourages proactive employee development, further improving productivity and strengthening problem-solving capabilities.

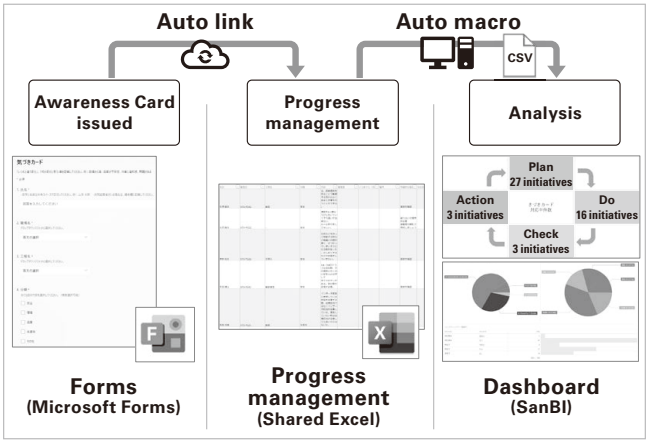


Fig. 8 Workflow of the digital Awareness Card

5.2 Use of digital technology

At production sites, factors that affect productivity and quality change on a daily basis, making continuous issue identification and improvement essential. Leveraging digital technology, we visualize productivity, quality, and electricity usage data using the *SanBI* business intelligence tool, while automating administrative and routine tasks with robotic process automation (RPA).

5.2.1 Visualization of productivity, equipment, and quality data

Production results and progress, equipment operating rates, quality data, and error information are automatically collected from PLCs, various sensors (current, voltage, and temperature), and related systems. *SanBI* is used to visualize overall production-site conditions. As shown in Figure 9, the accumulated data is displayed in graphs and dashboards, providing an instant view of operating conditions and production progress. This enables analysis of productivity and quality trends and allows for early detection of equipment abnormalities, helping workers and managers quickly understand site conditions and make timely decisions and improvements.

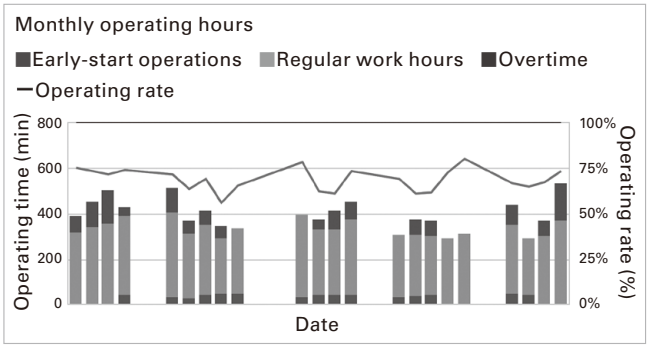


Fig. 9 Visualization of operating rate

5.2.2 Visualization of electricity usage

As shown in Figure 10, we have successfully used *SanBI* to visualize electricity usage for each building at our Fujiyama Works.

In the past, data obtained from the electricity monitoring equipment had to be manually edited, but we have now built a system that automatically collects, converts, and uploads the electricity data to *SanBI*. This allows us to detect abnormal electricity usage at an early stage and take prompt action to optimize electricity usage. Going forward, we plan to visualize electricity usage in greater detail, such as by floor and by distribution board, to further optimize energy consumption across the entire complex.

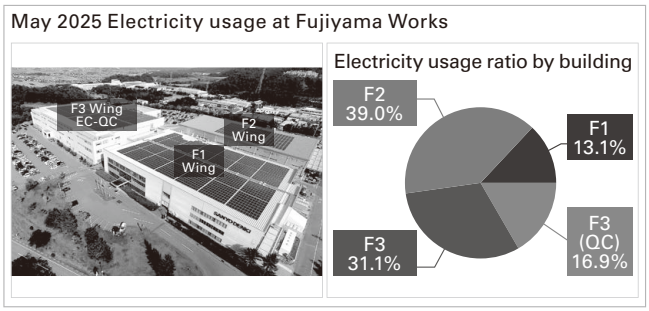


Fig. 10 Visualization of electricity usage at Fujiyama Works

5.2.3 Use of Robotic Process Automation (RPA)

As illustrated in Figure 11, RPA records routine PC-based tasks performed by workers as RPA software project files, allowing robots to execute those tasks automatically. This reduces labor hours and prevents human error.

We have introduced RPA to various preparation tasks in our production processes, cutting working hours by up to 50%. Going forward, we plan to reinvest the time saved through automation into higher-value-added tasks and new value creation.

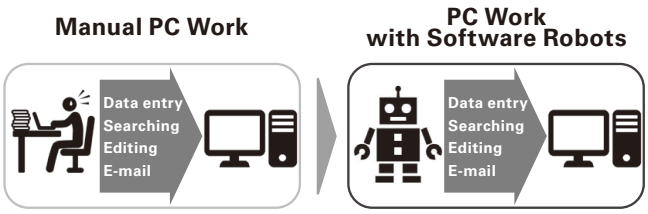


Fig. 11 Use of RPA

5.3 Co-creation

As a co-creation initiative between *SANUPS* and *SANMOTION*, we have integrated the board production processes of the two brands to improve production efficiency and make more effective use of the equipment and factory space.

By sharing and leveraging automation equipment and a production guidance system, one of our core technologies, we have established a highly efficient production framework. In addition, we are promoting flexible work styles to make the most of the diverse skill sets of our production staff, helping to boost motivation and support employee development.

We are also actively working with partner companies on co-creation activities centered on our core technologies. By combining the core technologies of the Electronics Company with those of our partners, we are driving value creation for both parties through initiatives such as new product and service development and productivity improvements.

5.4 Human resource development

To further improve productivity and high-quality manufacturing, the Electronics Company is strengthening employee skills with the aim of developing the world's best soldering technicians.

Meeting international soldering standards requires broad knowledge and advanced skills. To cultivate the required expertise, we are developing a proprietary training system to promote efficient human resource development. This system visualizes learning progress, analyzes proficiency, and provides individualized learning plans, enabling us to systematically train world-class soldering technicians.

For *SANUPS* products, many processes—such as the manufacturing and inspection of engine generators—require the advanced techniques and skills of highly experienced workers. By utilizing this new training system in these areas, we can ensure effective transfer of skills and strengthen the training of personnel involved in product manufacturing and inspection.

6. 5S Workplace Organization Team

The 5S activities (Sort, Set in Order, Shine, Standardize, and Sustain) form the foundation of manufacturing and are directly tied to safety, productivity, and quality. We are working to create a safe, secure, and fulfilling workplace and nurture our employees, while continuously advancing the 5S activities. Table 2 lists the major initiatives.

Table 2 Workplace improvement and employee development

Category	Initiatives	Effect
Workplace Improvement	5S inspection	Maintain and sustain workplace organization Reduce safety and quality risks
	Sorting	Identify and remove unnecessary items
	Labeling and placement	Standardize item locations and quantities
	Cleaning	Detect equipment abnormalities early Improve workplace environment and safety
Employee Development	Company-wide 5S training New employee training	Foster autonomy and engagement Increase motivation Support employee development
	5S manual training	
	Team reports	
	5S recognition	

(1) Workplace improvement

We carry out workplace improvement activities—including 5S inspection, item sorting, clear placement and labeling, and regular cleaning—to improve the work environment, enhance safety, ensure quality, and enable early detection of equipment abnormalities.

(2) Employee development

Through company-wide 5S training, 5S manual training, and team reporting activities, we foster employee autonomy and engagement while supporting individual growth and skill development.

7. Proprietary Business Team

The Proprietary Business Team develops new businesses by leveraging the Electronics Company's core strength—customization technology.

As part of these efforts, their production engineering services apply customized design and manufacturing technologies—including robot integration and automation—

to help customers address challenges in their production operations.

7.1 Production engineering services

(1) Production guidance system

We employ production guidance systems in our manufacturing processes as presented in Section 4.1.

Since its development 20 years ago, the system has been used across a wide range of products—from compact devices to large control panels. Its strengths lie in its flexibility and high degree of customization. The system continues to evolve through the integration of digital technologies.

In recent years, growing needs related to labor shortages, high-mix/low-volume production, and the digitalization of manufacturing have led to an increase in inquiries about adopting this system from companies facing similar challenges. In response, we have been providing customized versions of the system for each customer.

We will continue to support improvements in productivity and quality by solving our customers' manufacturing challenges and delivering user-friendly products tailored to their needs, while creating new value together with our customers.

(2) Example of a cardboard palletizing system

This subsection presents an example of a customized cardboard palletizing system incorporating *SANMOTION* products.

Figure 12 shows the cardboard palletizing system. The system automatically stacks cardboard boxes containing products onto pallets.

Fig. 12 Cardboard palletizing system

To develop this system, we used robotic technology and structured the implementation process into phases, as shown in Table 3, to ensure stable operation of the conveyor and the robot. By clarifying each work phase and its tasks, anticipating potential issues in each phase, and preventing omissions in the workflow, we have successfully shortened the development lead time and stabilized equipment operation.

Table 3 Implementation of the cardboard palletizing system

Phase	Description
(1) Site survey, requirement definition	• Survey workspace, line layout, and operations • Identify box types, sizes, weights, and daily throughput
(2) System/ Specification design	• Determine stacking patterns, robot type, and payload • Verify communication with PLCs, conveyors, and pallet feeders
(3) Design, fabrication, in-house testing	• Configure servo amplifiers and design motion sequences • Verify robot operation using 3D simulation
(4) Installation, on-site adjustment	• Schedule installation and perform site tests • Verify operation with actual boxes
(5) Operation check, trial run	• Share information with operators and maintenance staff • Fine-tune performance and confirm stable operation
(6) Full operation, evaluation, and improvement	• Start full-scale production and address initial issues • Collect operating data and implement improvements

7.2 Automation and labor-saving technologies

The cardboard palletizing system was built by customizing our *SANMOTION C S500* Motion Controller. We automated the process by enabling control of the robot arm, conveyor, and image recognition equipment, improving work efficiency and reducing labor requirements.

Figure 13 shows an image of the teaching procedure for the palletizing robot. The controller program has been customized to flexibly accommodate variations in box size, weight, and stacking patterns simply by teaching the positional relationship between the robot hand and pallet.

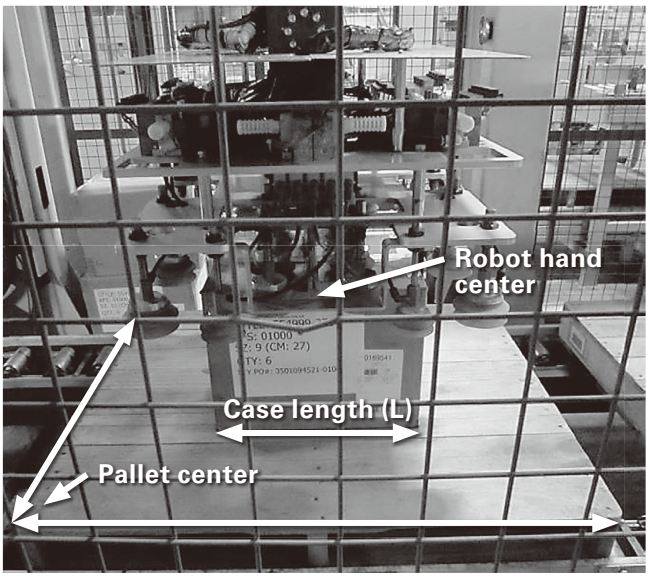


Fig. 13 Teaching procedure for the palletizing robot

8. Conclusion

This article has presented three core technologies and five team activities of the Electronics Company.

Our three core technologies are:

(1) Energy conversion technology (compact, lightweight, highly efficient, and low-noise)

(2) Production technology (enabling proper and efficient use by anyone)

(3) Customization technology (customer-oriented optimized design)

We excel in manufacturing energy conversion devices that are compact, lightweight, highly efficient, and low-noise. We are also highly skilled in providing optimized custom designs tailored to each customer.

These three core technologies are rooted in our five team activities. Through our team activities, we will continue to further improve product and service quality, strengthen productivity, and combine our core technologies with complementary capabilities to create new value for customers and society.

Reference

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