OMRON

Innovation in Semiconductor Manufacturing

Advanced Technologies to Improve Efficiency, Reliability, and Redundancy

INTEGRATED | INTELLIGENT | INTERACTIVE

New value for semiconductor manufacturing

Simple, eligant, innovative design

Control Panels: The Heart of Semiconductor Manufacturing

Recent evolutions in control panel design and manufacturing are benefiting panel builders as well as semiconductor customers resulting in an evolution within semiconductor production facilities that reduces total cost of ownership. With the goal of making panel manufacturing simpler and more efficient, we have developed new techniques and technologies for panel design, panel manufacturing and wiring. Our Value Design for Panel concept guides the development of control panel products that reduce time and labor costs, power consumption, and control cabinet size.

Value Design for Panel Concept Advantages

Specifications for Value Design products focus on predictive maintenance technologies, uniform mounting height and depth, reduced overall volume, improved airflow and heat dissipation, vibration resistance, improvements in design and wiring process, and energy efficiency to help achieve carbon neutrality. Wiring capabilities without tools using front access Push-In Plus wiring terminals decreases installation time.

A panel built around Value Design Concept products provides competitive advantages for the semiconductor industry. Combining multiple products that share the Value Design Concept increases the value to all stakeholders involved with control panel design and use.

Reduce downtime and labor costs with Predictive Maintenance

Components with embedded Ethernet can monitor and predict equipment failure before it happens. This allows semiconductor customers to schedule maintenance and repair during planned downtime.

Cut carbon emissions and move closer to carbon neutrality

Predictive Maintenance helps improve energy efficiency by reducing unplanned downtime and premature replacement of equipment.

Unscheduled downtime and premature replacement creates excess waste and contributes to inefficient use of energy as idle resources still consume energy. Predictive Maintenance is the key to reducing downtime, making semiconductor production more efficient.

Optimized airflow prevents excessive heat build up

Unified component dimensions improves airflow & heat dissipation, keeping components operating within specifications.

Optimized airflow to dissipate heat prevents unexpected component failure and costly shutdown of equipment for customers.

Extensive line-up that innovates control panel manufacturing

Uniform component dimensions

Value Design for control panels makes component size and footprint uniform which optimizes the use of space inside the cabinet and uses up to 20% less space, allowing for additional devices to be installed.

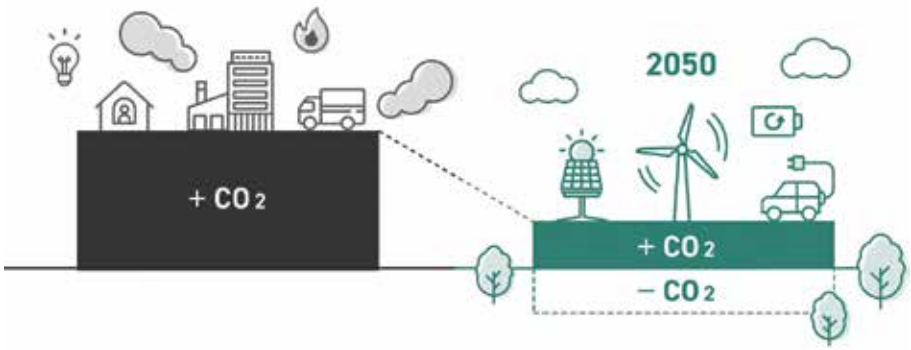
ZERO EMISSIONS 2050

The global pursuit of carbon neutrality

Achieving Carbon Neutrality Through Efficient Facility Maintenance

According to investigation by Japan's National Institute for Environmental Studies, manufacturing accounts for 23 % of the world's energy-related CO2 emissions. This is a sizable share, indicating carbon neutrality efforts in the manufacturing sector can greatly impact total CO2 emission levels. Semiconductor manufacturing facilities in particular, with their massive power consumption and industrial waste, are a major source of CO2 emissions, and in urgent need of improvement.

To hit the very ambitious target of achieving carbon neutrality by 2050 requires action across all industries and departments. In doing so, it is crucial that each company balance the three main aspects of emission reduction—energy conservation, renewable energy, and electrification—to implement the right measures for its business.



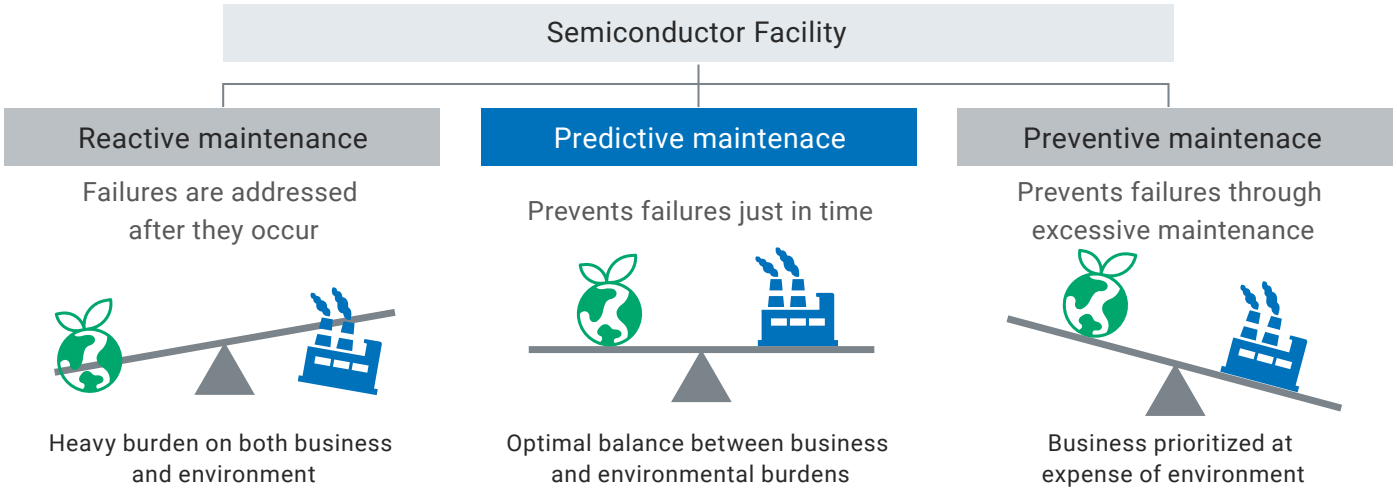
Why the semiconductor manufacturing sector should work toward carbon neutrality

In the past, businesses often sacrificed the environment for the sake of their business goals. Today, however, they are faced with the daunting task of achieving both business and environmental goals. This is thought to be particularly difficult in semiconductor manufacturing, which impacts both business and the environment. Fortunately, technological advances have given rise to solutions that can simultaneously resolve environmental and business issues.

Omron Predictive Maintenance

Site-specific solutions to help obtain carbon neutrality

Omron site-contained predictive maintenance solutions enable a wide range of processes—from collecting data from relevant devices, visualizing and analyzing this data, all the way to making assessments and judgments based on this analysis—to be conducted using on-site condition monitoring devices, letting you start small as at the department level. The solutions monitor the conditions of the following 5 components.



Preventing failure by switching to Predictive Maintenance

There are three main styles of maintenance: reactive maintenance, preventive maintenance, and predictive maintenance. In reactive maintenance, failures are addressed after they occur, which is environmentally costly. In preventive maintenance, failures can be prevented through regular manual inspections; however, this method requires outage of facilities during inspection and can lead to premature part replacement, both of which can be taxing on the environment. This has led many organizations to look to a third option: technology-driven predictive maintenance.

The cost of stopping production in manufacturing semiconductors is significant, especially if the process is halted by an unexpected failure that causes extended downtime. While the loss of silicon wafers significantly impacts operating expenses, many of the machines used in the manufacturing process also require extensive takedown and setup time before production can commence. Predictive Maintenance products from Omron augment existing machinery with condition-based monitoring capabilities to provide real-time data and analysis on the condition of equipment. With built-in algorithms, these products analyze the collected machine data to identify issues and predict failures before they occur. Through the collection and analyzation of data, plant managers can significantly reduce the risk of unplanned downtime and the loss of wafers by performing maintenance only when needed.

Conserving Energy Through Predictive Maintenance

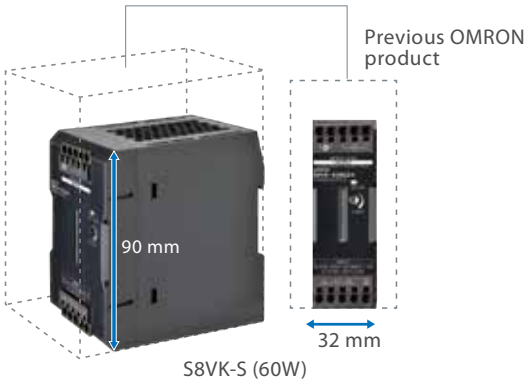
Predictive maintenance allows you to effectively cut energy use by reducing the frequency of failures and inspections. According to "Economics of Manufacturing Machinery Maintenance" (June 2020) by Douglas S. Thomas and Brian A. Weiss, adopting predicitive maintenance would be effective in reducing 0.8 billion USD of defects and 18.1 billion USD of downtime.*1 This is friendly to the environment and the losses should be eliminated.

Saving space with advanced Control Panels

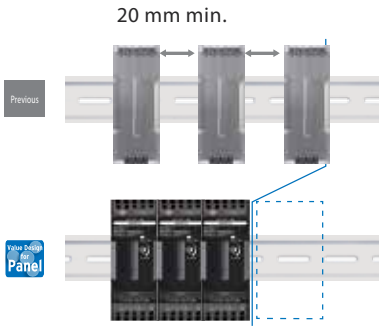
Unified dimensions and side-by-side mounting help delivering more compact control panels with additional functionality.

Semiconductor manufacturing requires a significant amount of space, both on the fab and sub-fab floor where much of the critical equipment and control panels are located. But with many plants experiencing limitations due to space constraints, downsizing equipment and panels is becoming essential for the sake of increased manufacturing density on the fab floor. An ideal method for maximizing floor space is by incorporating Value Design for Control Panels by Omron. Helping to decrease control cabinets sizes by up to 50%, Value Design for Control Panels make better use of the cabinet by allowing the same number of devices to occupy a much smaller space.

Unified height & slim size[1]

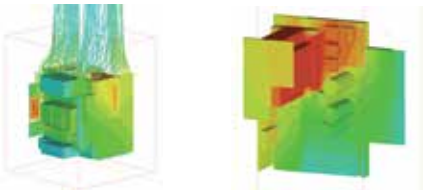


Side by side mounting at (55°C) ambient temperature[2]



Heat Control Technology that allows side-by-side mounting

OMRON's unique heat modeling know-how let you understand the accurate heat flow and thereby achieve a device layout with high heat dissipation.



1. Expect for some products 2. Side-by-side mounting is possible in the same series

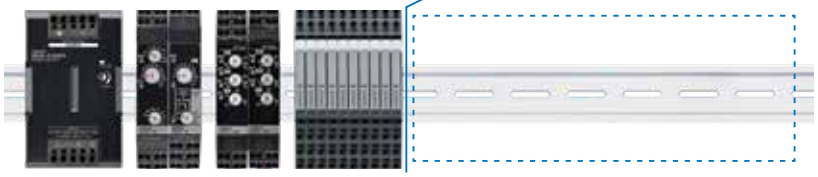
Slim + Side-by-side mounting technology saves space, and makes more advanced Control Panels

Non-uniform component design leads to an inefficient use of space, and requires a larger panel to accommodate.

Previous

Reduction of approx. 50%

Value Design for Panel

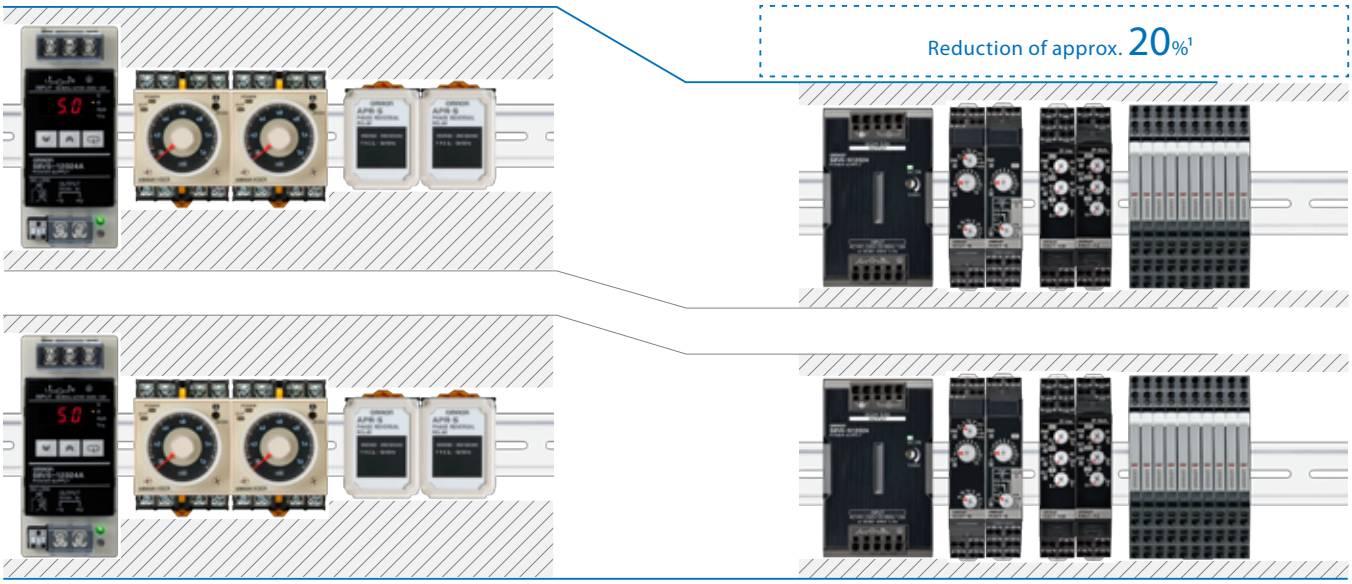


The saved space can be used for implementing additional functions such as safety or IoT.

Safety Controllers | Condition Monitoring Devices | Networks

Unified height reduces dead space and downsizes control panels

When designing a new panel, you can reduce the overall height by approximately 20% with Omron's control panel solutions.



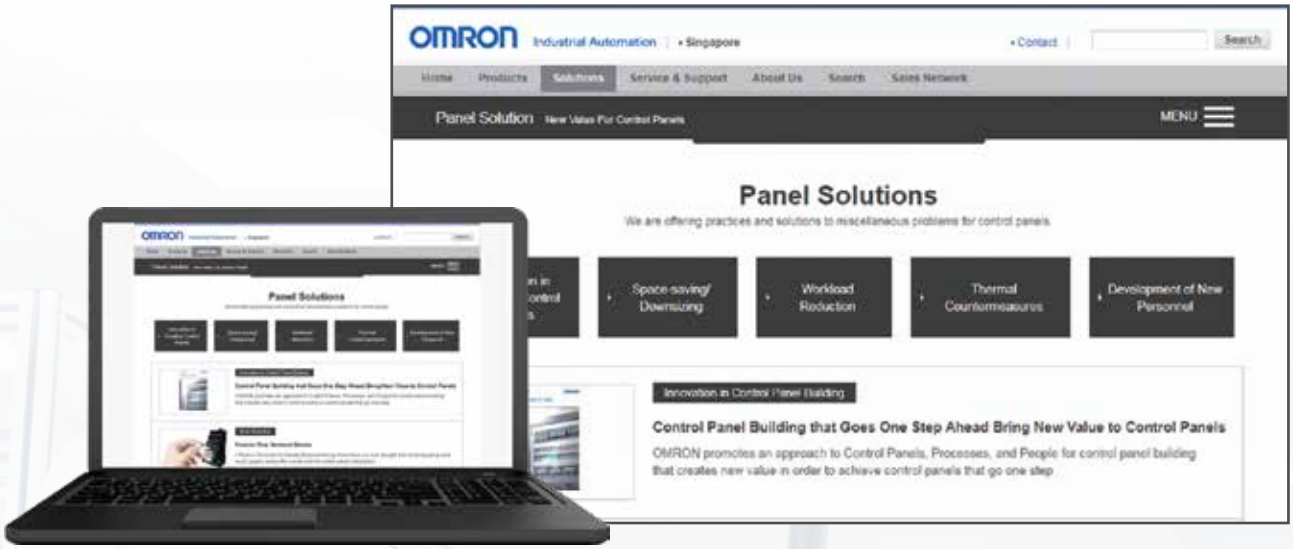
Previous — The different heights create a lot of dead space.

Value Design for Panel — Dead space is reduced and the width between wiring ducts is optimized.

1. A space of 10 mm is allowed above and below the products (This is in comparison with previous OMRON products.).

Simplify and accelerate panel designs with our Panel Solution site

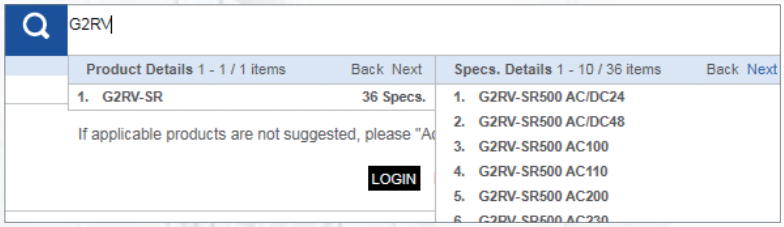
The Omron Panel Solution Site Supports Your Control Panel Manufacturing from Selection to Design.



You can select the best product by searching models, categories and solutions

Select based on model

Entering a model name with a first few letters will show you a list of model candidates where you can review the product specifications.



Select based on categories

Select a category, and you can narrow model selection by the specifications.

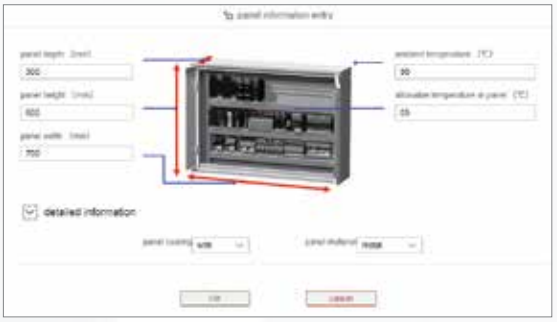
Select based on solutions

Select a solution for your specific application.

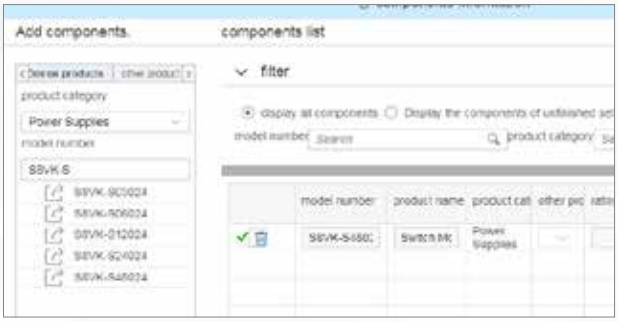
Thermal Simulation Tool

For customers who need to understand heat risks in advance, Thermal Simulation Tool supports the heat design from a simple calculation of heat inside the control panel to selection of fans.

Input control panel information

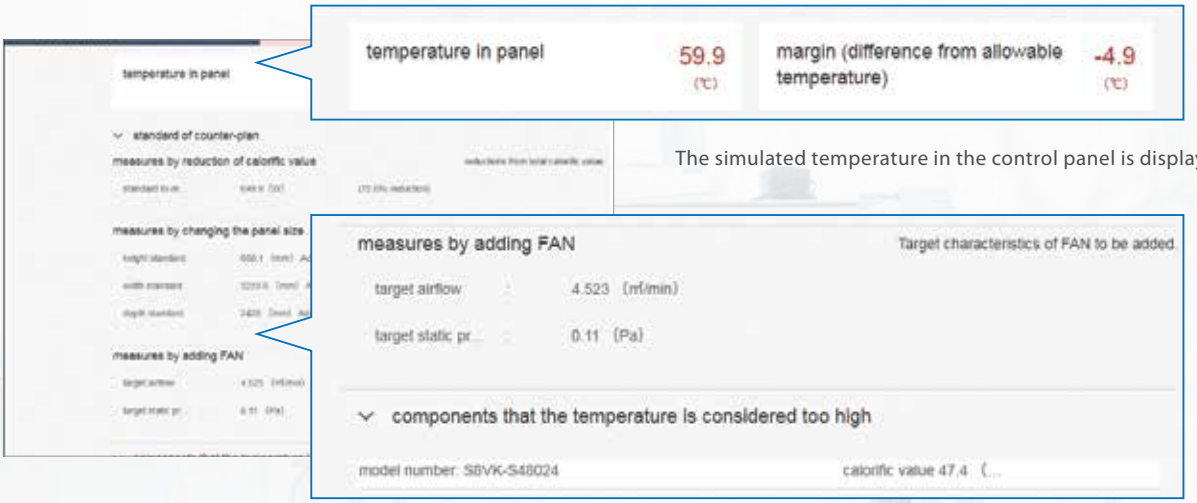


Input the specification of your control panel.



Input product information. For OMRON products, selecting a type will automatically display its heat value.

Simulation results



The simulated temperature in the control panel is displayed.

Provides proposed measures for bringing temperature to a target value and information about the parts with a risk of being overheated.

Customer's voice

Our Value Design products help solve issues with many customers.

Panel size reduction of 30% and wiring time cut in half

Semiconductor / FPD manufacturing equipment manufacturer

[Issues] Reducing wiring work at site was necessary to shorten the electric construction period. To achieve it, smaller, simpler control panels are required. He adds that smaller control panels can be incorporated into equipment, thus saving space.

[Effect] Not only downsized components, but also terminal holes on the front helped a lot to reduce wiring lead time. Terminal holes on the front eliminate the need for maintaining work space, thus downsizing the control panels and reducing wiring work drastically.

Reduction of 30 % for both control panel footprint and lead time

Transferring machine manufacturer

[Issues] Our existing transferring line systems are mostly driven by mechanical structures. Advancing them to meet customer needs will result in increase in control I/Os and size of the control panels.
On the other hand, needs for saving space are growing at the customers' factories. Further, the demand for built-in control panel in line system is also increasing to operate and maintain system close, not at the standalone control panel installed on the wall.

[Effect] The effect was obvious, because the maintenance work completed in three days earlier than planned, where 10 days are allowed in the beginning.
We will promote adoption of the Value Design products in our systems in order to reduce the cost and lead time of existing products as well as to accelerate space-saving.

Streamline control panel manufacturing with improved reliability

Control panel builder

[Issues] As demand increases for quality assurance, one of most possible errors with switchboards and control panels is a screw loosening error. All control panel and switchboard manufacturers perform the inspection of course; however, a possibility of human error still exists.

[Effect] Once the devices in control panel are unified to Push-In Plus technology and engineers get used to the wiring work, we can expect workability greatly improves. In addition, we expect for the reliability enhancement in the future by reducing workload of engineers who check for loose screws and recheck for recurrence prevention.

Improved maintainability for equipment by saving space

Confectionery equipment manufacturer

[Issues] The control panel for existing oven line is engineered with a basic design of 20 years ago. The electrical control devices for the panel are large and so the control panel itself should be, as those devices also need much space for mounting with screws.
It was in a situation that many devices are mounted on the door of the control panel due to no space inside.

[Effect] I am fully convinced that a wide variety of OMRON lineups help downsize our control panels.
Replacing the existing devices mounted in the control panel are with OMRON panel solution devices will save space by approx. 40%. We achieved zero-cabinet by utilizing those devices, and now the control panels are not conspicuous. Further, we have changed the connection method for input cables coming from the machine body to the Push-In Plus technology. This allows us to complete the wiring work in about one and a half hours, which used to take a half day before.

Needless of retightening allows wiring time reduction to one-fourth

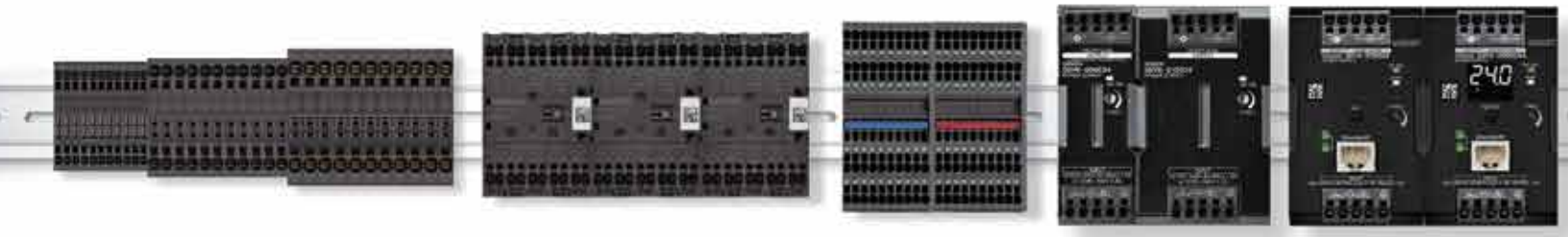
Packaging machine manufacturer

[Issues] To achieve space-saving on machines, the needs for downsizing control panels has increased year by year.
The devices can be forcibly mounted in the machine when considering only design aspect. However, workability at the manufacturing process and maintainability at the after-sales service will need a hassle. We were thinking if the devices in the control panels would become more compact.

[Effect] For the conventional screw terminal, we provided the works relating to screws such as check and retightening to have three times, though, for the Push-In Plus technology, retightening is needless, resulting in the work reduction. Considering it as a work time, it is reduced to about a quarter.

All the information is as of the time of interview, and those articles are quoted from the interview articles created by ITmedia Inc.

Our value design products increase the value of your Control Panels



DIN Track
Terminal Blocks

Magnetic Contactors

Common
Terminal Blocks

Switch mode power supplies /
Related equipment

I/O Relay Terminals

Timers
Motor Protective Relays

Power Monitors

Wireless Push
button Switches

Condition Monitoring Devices
Temperature Controllers

Switch mode power supplies / Related equipment

Manual Motor Starters

Relays, Solid-state Relays

Uninterruptible Power Supplys

Machine Automation Controllers

Safety Relays

Push Button Switches

Power Monitors

Temperature Controllers

Product Lineup

Predictive Maintenance		
	Product Description	**Product Name**
	Motor Condition Monitor – Vibration & Temperature	K6CM-VBM
	Motor Condition Monitor – Current Analysis	K6CM-Ci
	Motor Condition Monitor – Insulation Resistance	K6CM-ISM
	Thermal Condition Monitor	K6PM-TH
	Liquid Leakage Sensor Amplifiers	K7L-99B
	Motor Insulation Resistance Monitor	K7GE-MG
	Power Monitoring	KM-N2
	Liquid Leakage Sensor Amplifiers	K7L-99B
	Ethernet Connected Power Supply	S8VK-X

Omron Value Design Panel Components		
	Product Description	**Product Name**
	Measuring and Monitoring Relays	K8DT
	Switch Mode Power Supplies	S8VK-S, S8VK-WA, S8VK-WB, S8V-CP Noise Filter S8V-NF
	Low Voltage Switch Gear Magnetic Contactor	J7KC
	Common Terminal Block	XW6T
	Machine Safety Emergency Stop	A22NE-P

Omron Value Design Panel Components		
	Product Description	**Product Name**
	Temperature Controllers	NX-TC
	Terminal Relay Bank	G6D-F4
	Solid-state Timers	H3DT
	Sockets for MY Relays	H3Y-X-B , H3YN-B PYF-XX-PU
	Sockets for G2R-S	H3RN-X-B K7L-XXB
	Slim I/O Relays	G2RV-ST / G3RV-ST
	I/O Relay Terminals	G70V
	DIN Track Terminal Blocks	XW5T
	Digital Temperature Controllers	E5XC
	Solid State Relays for Heaters	G3PJ
	Solid State Timers	H3Y-X-B H3YN-X-B
	EtherCAT Slave Terminals NX series	NX-10
	Uninterruptible Power Supply (UPS)	S8BA

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• Safety Switches & Operator Controls • Safety Monitoring/Force-guided Relays

Control Components
• Power Supplies • Timers • Counters • Programmable Relays
• Digital Panel Meters • Monitoring Products

Switches & Relays
• Limit Switches • Pushbutton Switches • Electromechanical Relays
• Solid State Relays

Software
• Programming & Configuration • Runtime

Note: Specifications are subject to change.