

# Safety Network Controller

## NX Series



Safety over  
EtherCAT®



# Quick, easy and flexible integration of production line safety



Scalable from large automotive production lines to small parts production lines

- Flexible safety system for large-scale production
  - Interlocking between various machines
- » Page 4



Quick and easy safety program design

- Reduce time required for design
  - Reduce time required for verification
- » Page 8



Efficient safety management and maintenance

- Minimize system downtime
  - Reduce maintenance work
- » Page 10

Manufacturers require flexible systems for global production and high-mix production. System designs have become more and more complicated because these flexible systems need safety control according to control programs. However, it is also required to reduce design and maintenance time to efficiently build various systems. In order to meet these needs, we offer a new NX Safety Network Controller.

### Safety control for large systems



Communication Control Unit  
NX-CSG320  
**NEW**

Safety CPU Unit  
NX-SL5500/5700  
**NEW**

### High-speed safety control for mid-size systems



Machine Automation Controller  
NX-102  
**NEW**

Safety CPU Unit  
NX-SL5500/5700  
**NEW**



Safety I/O Terminal  
I/O model GI-SMD1624 **NEW**



Safety I/O Terminal  
Input model GI-SID1224 **NEW**



Automation Software  
Sysmac Studio  
SYSMAC-SE/FE

### EtherNet/IP™

EtherNet/IP™ is a widely used and vendor-independent industrial Ethernet network that is managed by ODVA.



The Common Industrial Protocol (CIP™) is an industry standard open network, enabling seamless communication among CIP networks. CIP Safety™ adds safety functionality to CIP networks.

### EtherCAT®

EtherCAT® is an industrial real-time communication network promoted by EtherCAT Technology Group (ETG).

### Safety over EtherCAT®

Safety over EtherCAT (FSoE) allows a single communication system to be used for both control and safety data.

## Flexible safety system for large-scale production

### EtherNet/IP for safety across the world

Production systems have to meet worldwide standards because of the globalization of production.

CIP Safety is a protocol for transmitting safety data via EtherNet/IP that is adopted by factory automation and robot manufacturers all over the world. Using CIP Safety, you can build globally standardized networks and simplify the global procurement of production systems.

This also makes global procurement of production systems easier.

### One connection using CIP Safety

Safety systems for industrial robots are becoming increasingly used; networks can be easily built with the NX-CSG communications controller and NX-SL5 series Safety CPU Units which support CIP Safety.



### EtherNet/IP brings flexibility

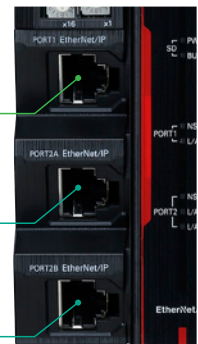
Multiple network ports enable a safety network to be divided into several segments, making it easy to connect many network devices required for a large production line. This allows flexibility to add or remove devices from existing safety systems.

Safety control between lines : Port 1  
Robot control within process : Port 2A, 2B

EtherNet/IP port 1

EtherNet/IP port 2A

EtherNet/IP port 2B



### Fast and fixed response cycle facilitates reconfiguration

The NX-CSG320 communication control unit and NX-SL5\_ series Safety CPU Unit provide safety communications via CIP safety and at the same time provides local high-speed safety I/O control. With a local I/O response time as low as every 50mS, the NX-SL5\_ series safety controller can be used for applications where a high level of responsiveness is required.

\* Calculate the response speed of your system taking the performance of I/O devices into consideration. Refer to the manual for details.

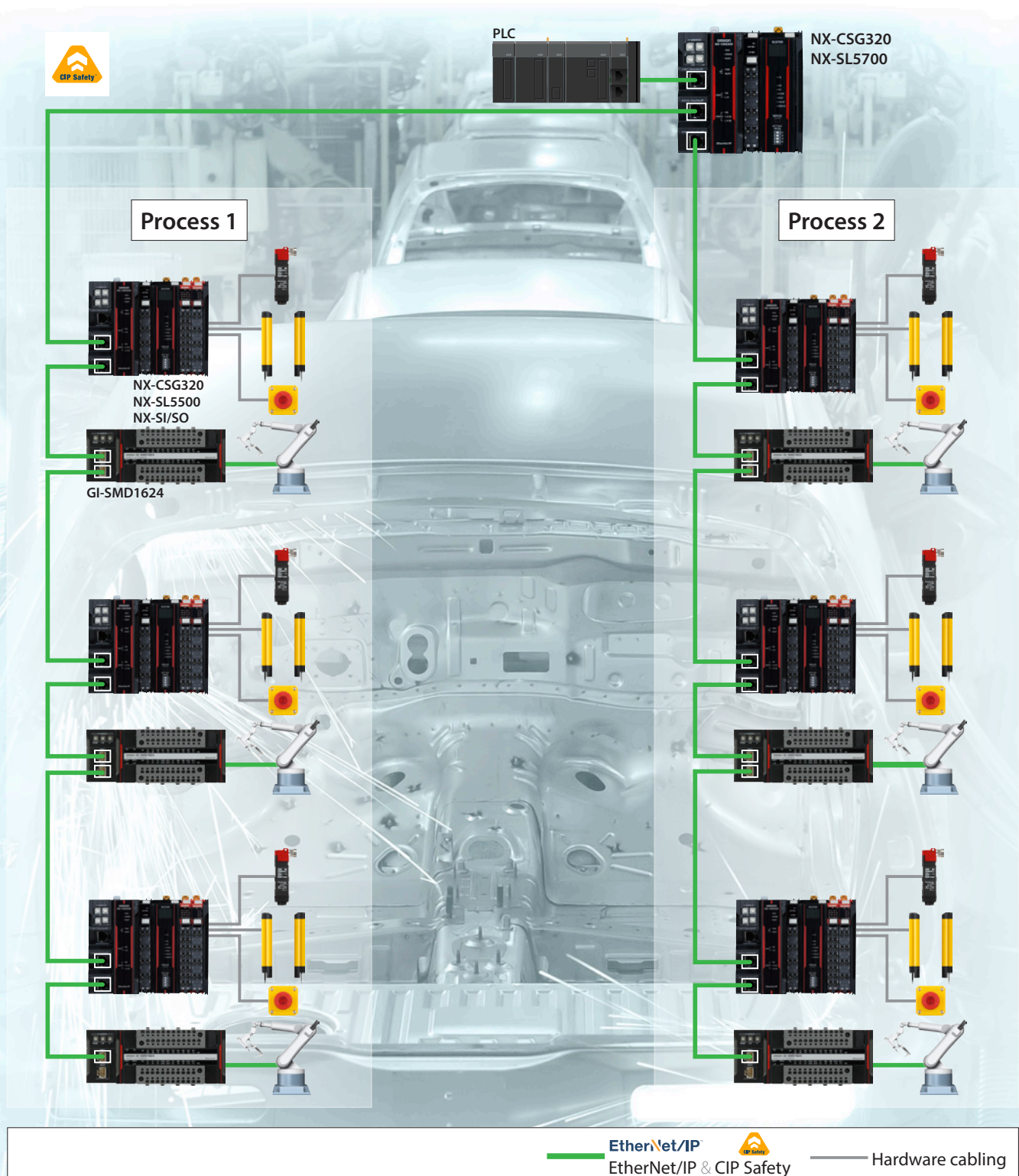


Fastest cycle time:  
50 ms

## Standardize the safety system network for a large robot system

### System configuration

In this example, devices and machines communicate via EtherNet/IP and CIP Safety in this system. Each process includes robots, safety light curtains, emergency stop switches, and other safety components. The NX-CSG and NX-SL5 execute safety control programs in each process. CIP Safety is used for safety interlocking between processes and for building a safety control network across the system.



\* Understand the connection specifications of devices which are used in the system before creating a network.

# Interlocking between various machines

## Simple configuration

CIP Safety allows safety devices and standard devices to be mixed on the same network, providing safety interlock control between machines. CIP Safety robots and remote I/O terminals can be easily connected.

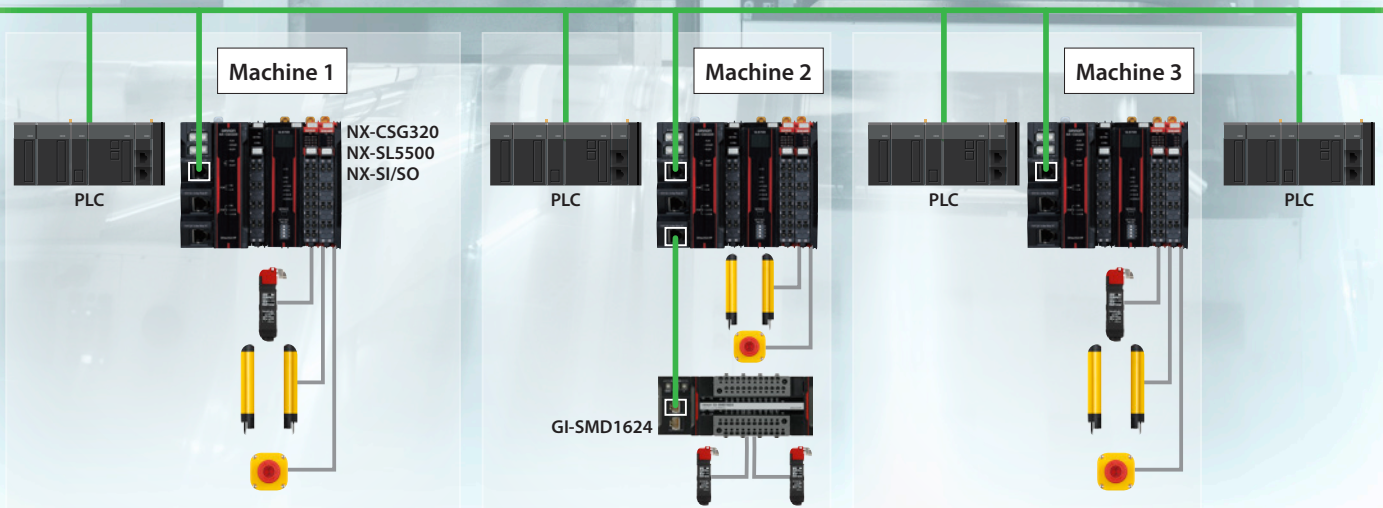
## Modular processes bring flexibility to line layouts

The NX-CSG320 communication control unit and NX-SL5\_ series Safety CPU Unit exchange interlock signals with other machines while implementing safety control within the machine. Programs for machine control and safety control can be created for each machine. This modularized design helps standardize design and improve design efficiency.

## Modular machines with individual CPU units

### System configuration

Machine 1 and 3 are processing machines with the control program and safety control program for each machine. Machine 2 is a material handling machine that transports products processed by Machine 1 and 3 to the next process. The NX-CSG320 communication control unit and NX-SL5\_ series Safety CPU Unit are used for all machines, and CIP Safety is used for safety interlocking between machines.



## Two different networks in a single system

The NX-SL5\_ series Safety CPU Unit connected with the NX102 Machine Automation Controller enables the use of both EtherCAT + FSoE (Safety over EtherCAT) and EtherNet/IP + CIP Safety at the same time.

In addition to interlock control within a machine via FSoE, safety interlock between machines can be implemented using CIP Safety.

### Integrated safety into high-speed machine control

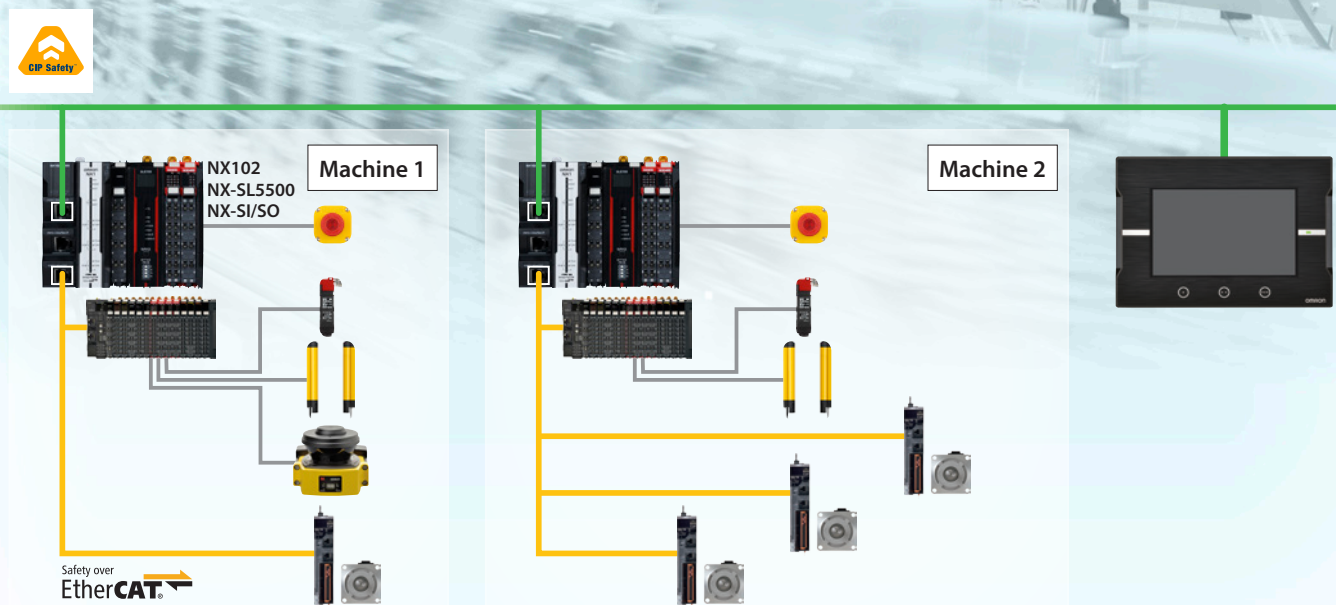
The NX-SL5\_ series Safety CPU Unit combination with the NX102 Machine Automation Controller , provides both safety control and machine control with fast cycle times.

By mounting NX-SL\_ series Safety CPU and safety I/O units to the NX102 and by connecting the servo drives via FSoE on EtherCAT, you can configure a simple motion and safety control system using high-speed networks.

### Line safety control and fast machine control at the same time

#### System configuration

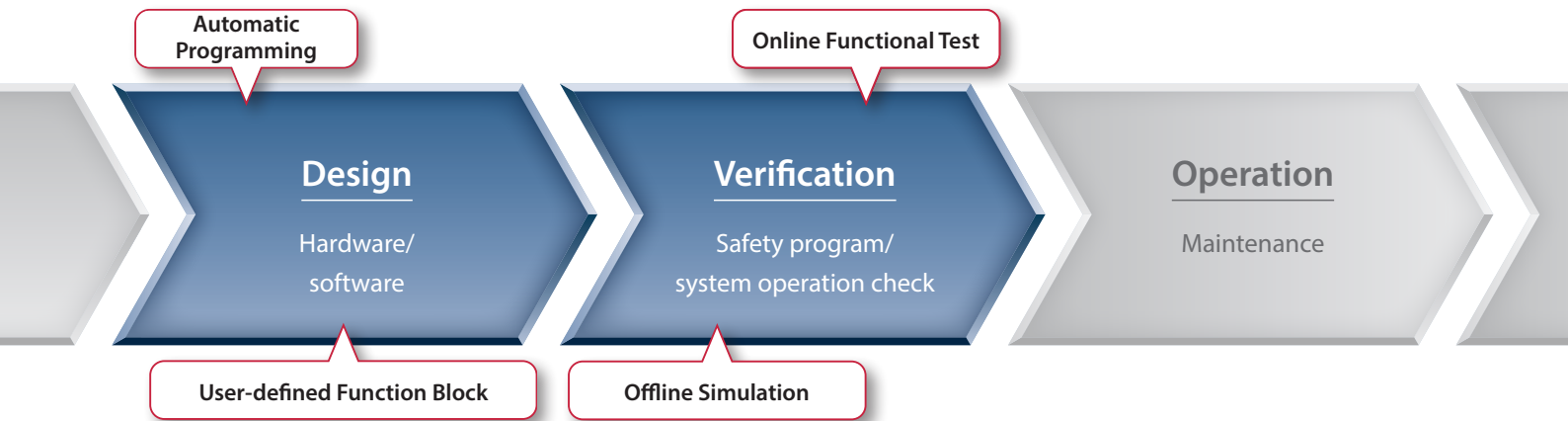
The NX102 Machine Automation Controller and NX-SL\_ series Safety CPU are used in Machine 1 and 2 to build a system with safety network and real-time control capabilities using EtherCAT. The machine status is reported to the host system and displayed on the HMI connected on the same network.



\* Understand the connection specifications of devices which are used in the system before creating a network.

## Improve design productivity

Sysmac Studio-Automation Software provides various functionalities to reduce time required for production system design and safety program verification.

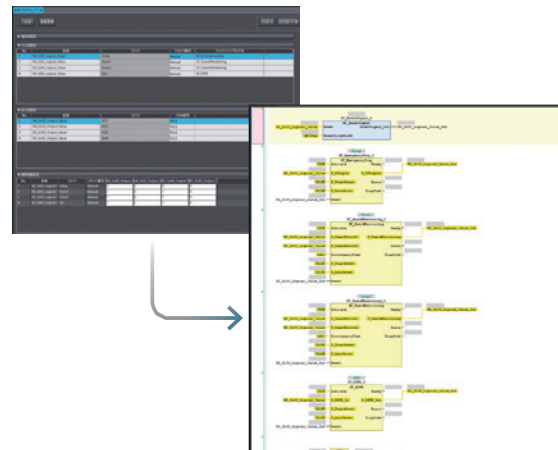


### Design

Reduce time required for production system design

#### Automatic Programming

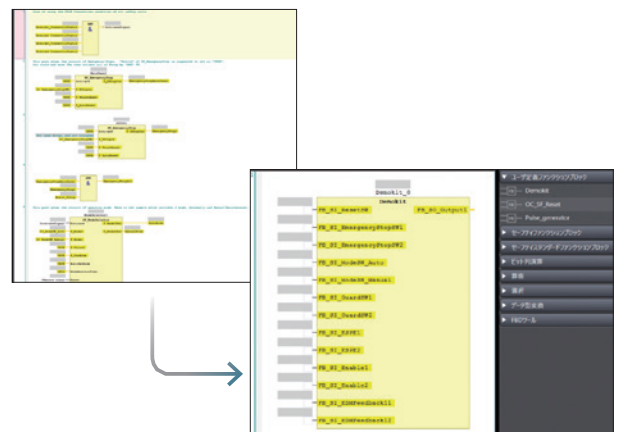
Create a truth table using input, output, and stop conditions of safety devices to automatically create a safety program for a simple machine.



\* Programs created by Automatic Programming will not guarantee functional safety. Refer to the User's Manual (Cat. No. Z395) for details.

#### User-defined Function Block (FB)

Programs can be easily converted into a user-defined function block (FB); help files can be attached to describe input and output conditions as well as the functionality of the program within the function block (FB). Different security levels can be set to protect the function block from viewing and unauthorized modifications.



\* User-defined FBs can be used as modular software components according to the hardware configuration. They help standardize programs and maintain the consistency of design quality.

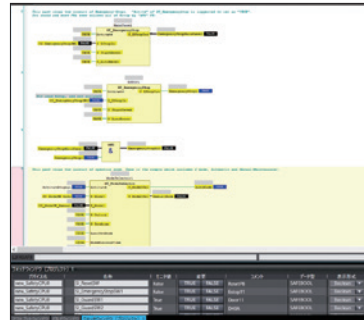


**Verification**

# Implement safety management without experts and global standardization

## Offline Simulation

Programs can be simulated on your PC, Sysmac Studio allows verification of programs without connecting hardware.



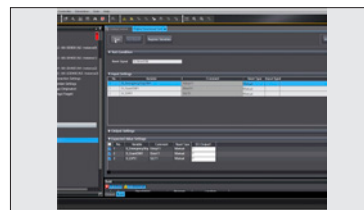
## Online Functional Test World's first\*

Online Functional Test enables operation of safety functions to be checked when the NX-SL5\_ series Safety CPU is online with Sysmac Studio. The test results can be output as a report along with the safety signature; the safety signature is displayed on the seven-segment display of the NX-SL5\_ CPU, and can easily checked if the configuration matches the report after the program has been validated.

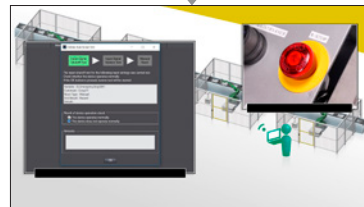
\* Based on Omron investigation in March 2018.



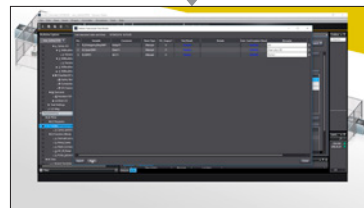
Safety Signature:#BF32



**[Preparation]**  
Start the Sysmac Studio and go online with the NX-SL5. Register the safety devices to test and set the expected values of each signal.



**[Testing]**  
Operate safety devices by following the instructions on the screen. Check if each device operates correctly and input the check results.



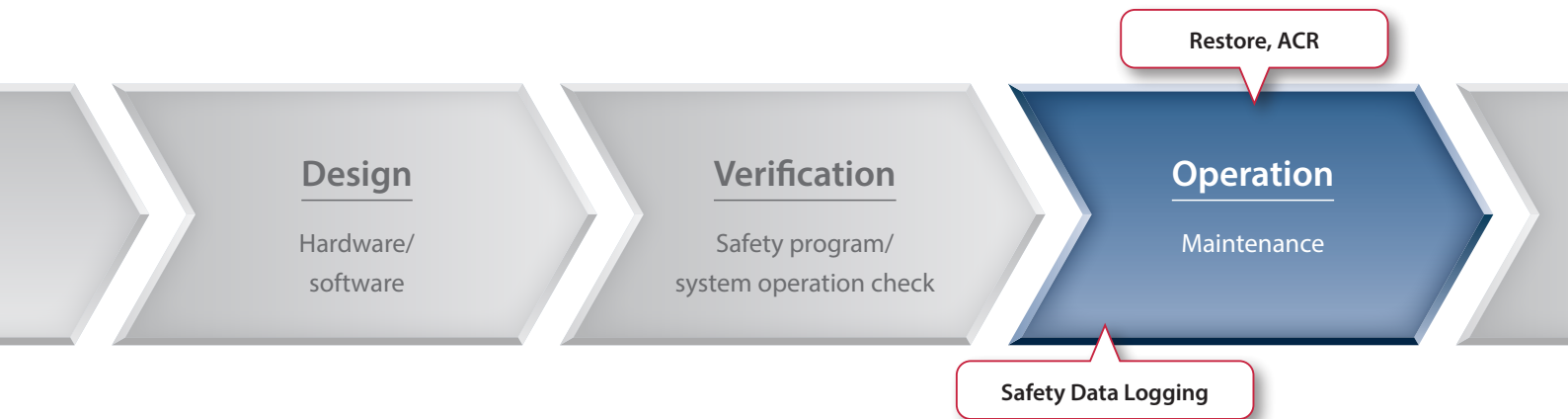
**[Tests completed]**  
The test results are listed after all tests have been completed. The list can be output as a CSV file.



**[Printing test results]**  
The test details, results, and executed date and time can be output as a PDF file. The names of the tester and approver can be added. The safety signature code, which identifies the validated program, is included at the bottom right of the report.

# Maintenance without PC

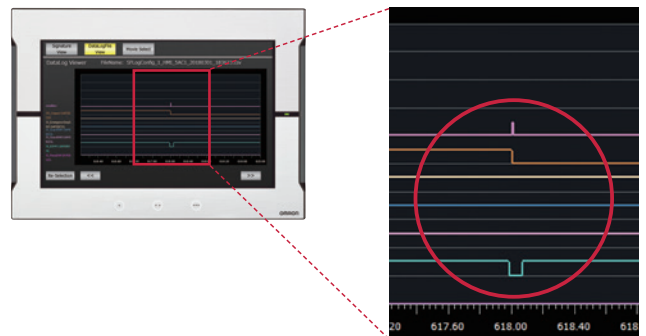
No PC is required for maintenance, which reduces production system maintenance work and minimizes system downtime.



## Operation Minimize system downtime

### Safety Data Logging

An SD card containing logging settings is used for Safety Data Logging. When start trigger conditions are met, the specified device variables and exposed variables can be logged in a chronological order and output to the memory card. This function helps to quickly identify the cause of a sudden stoppage of the system and determine preventive measures.



## Operation Reduce maintenance work

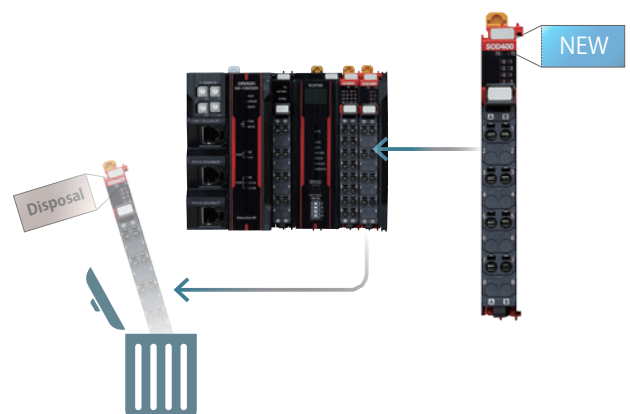
### Safety Unit Restore

Programs and settings can be stored on an SD card inserted into the communication control unit. When the safety CPU unit is replaced, the stored programs and settings can be easily copied to a new unit using the SD card.







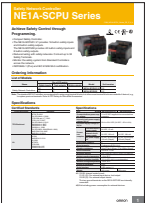






### ACR (Automatic Configuration Restart)

When replacing a safety I/O unit, just remove the old unit and mount a new unit. The setting data is automatically downloaded without using software.






## Existing products

Choose a safety controller to suit your application.

Product name	Features	Catalog
<p>NX Safety Controller Safety Control Unit NX-SL3/SI/SO</p> 	<p><b>Integration of safety into machine automation enables simple, flexible system configuration</b></p> <ul style="list-style-type: none"> <li>● Fully integrate safety and standard control in one network by connecting with an NX EtherCAT Coupler Unit</li> <li>● Safety CPU unit: Up to 128 safety I/O units</li> <li>● Safety input unit: 8 or 4 safety input points per unit 4-channel units can be directly connected with Omron non-contact switches and single-beam sensors</li> <li>● Safety output unit: 2 or 4 safety output points per unit Output breaking current of 2.0 A (2-channel units)</li> <li>● PLCopen® Function Blocks for Safety</li> <li>● Standard IEC 61131-3 programming</li> </ul>	 (Cat. No.) F100  (Cat. No.) F101
<p>Safety Network Controller NE1A-SCPU Series</p> 	<p><b>Acts as a DeviceNet Safety master and slave and hosts the safety application program</b></p> <ul style="list-style-type: none"> <li>● NE1A-SCPU01-V1 with built-in 16 safety inputs and 8 safety outputs</li> <li>● NE1A-SCPU02 with built-in 40 safety inputs and 8 safety outputs</li> <li>● Simplifies safety systems. With safety network master capabilities, up to 32 safety nodes</li> <li>● Safety system can be monitored by standard controller via DeviceNet</li> </ul>	 <p>Refer to your local OMRON website</p>
<p>Safety Network Controller NE1A-SCPU0□-EIP</p> 	<p><b>Acts as a DeviceNet Safety master and slave and monitors safety system via EtherNet/IP</b></p> <ul style="list-style-type: none"> <li>● Connect with Omron PLC via EtherNet/IP for easy maintenance</li> <li>● Simplifies safety systems. With safety network master capabilities, up to 32 safety nodes</li> <li>● No external devices required for connecting to EtherNet/IP</li> </ul>	 <p>Refer to your local OMRON website</p>
<p>Safety Network Controller NE0A-SCPU01</p> 	<p><b>As a standalone controller as well as a DeviceNet Safety slave</b></p> <ul style="list-style-type: none"> <li>● TÜV-certified templates for safety applications with up to 12 inputs</li> <li>● Reusable user-defined safety circuit templates for easy standardization</li> <li>● NE0A operating status can be monitored by standard DeviceNet master</li> </ul>	 <p>Refer to your local OMRON website</p>
<p>Safety Controller G9SP Series</p> 	<p><b>Standalone safety controller</b></p> <ul style="list-style-type: none"> <li>● Easy programming for complex safety control</li> <li>● Unique programming software (G9SP Configurator) to support easy design and verification</li> </ul>	 (Cat. No.) F090

## Related product

Product name	Features	Catalog
<p>Machine Automation Controller NX1</p> 	<p>NX102 CPU Unit NX102-□□□□</p> <p><b>Brings advanced control in miniaturized size</b></p>	 (Cat. No.) P129  (Cat. No.) P130

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