

# NX1 Machine Automation Controller

Continue to pursue productivity



The solution in your hand

# Improve productivity, improve your business

The manufacturing industry is under pressure to keep boosting productivity without compromising on quality. Global production and flexible production are required to satisfy diverse consumer needs.

In addition, manufacturers need to control quality and safety to provide the same level of quality and meet rising quality and safety standards.

In order to fulfill these requirements, it is crucial to utilize information, take safety measures, control quality, and at the same time improve production efficiency.

## Common issues

### Compromise between production efficiency and information utilization/safety measures/quality control



#### Production cycle time is increased due to traceability data processing

Full traceability is required to meet high-level quality standards. As it takes a long time to process all traceability data, the production cycle time increases.



#### Safety measures make setup and troubleshooting difficult

Separate safety control for machines and lines and separate controllers for machine control and safety are required. Line and machine design is time-consuming, and safety measures have to be redesigned when the layout is changed.



#### Production lead time is increased due to additional inspections and tight quality control

Adding inspections to maintain quality increases production lead time. When special machines with built-in PC that collect and process data at high speeds are used for inspections, maintenance becomes difficult. Instead, acceptance sampling is conducted offline.

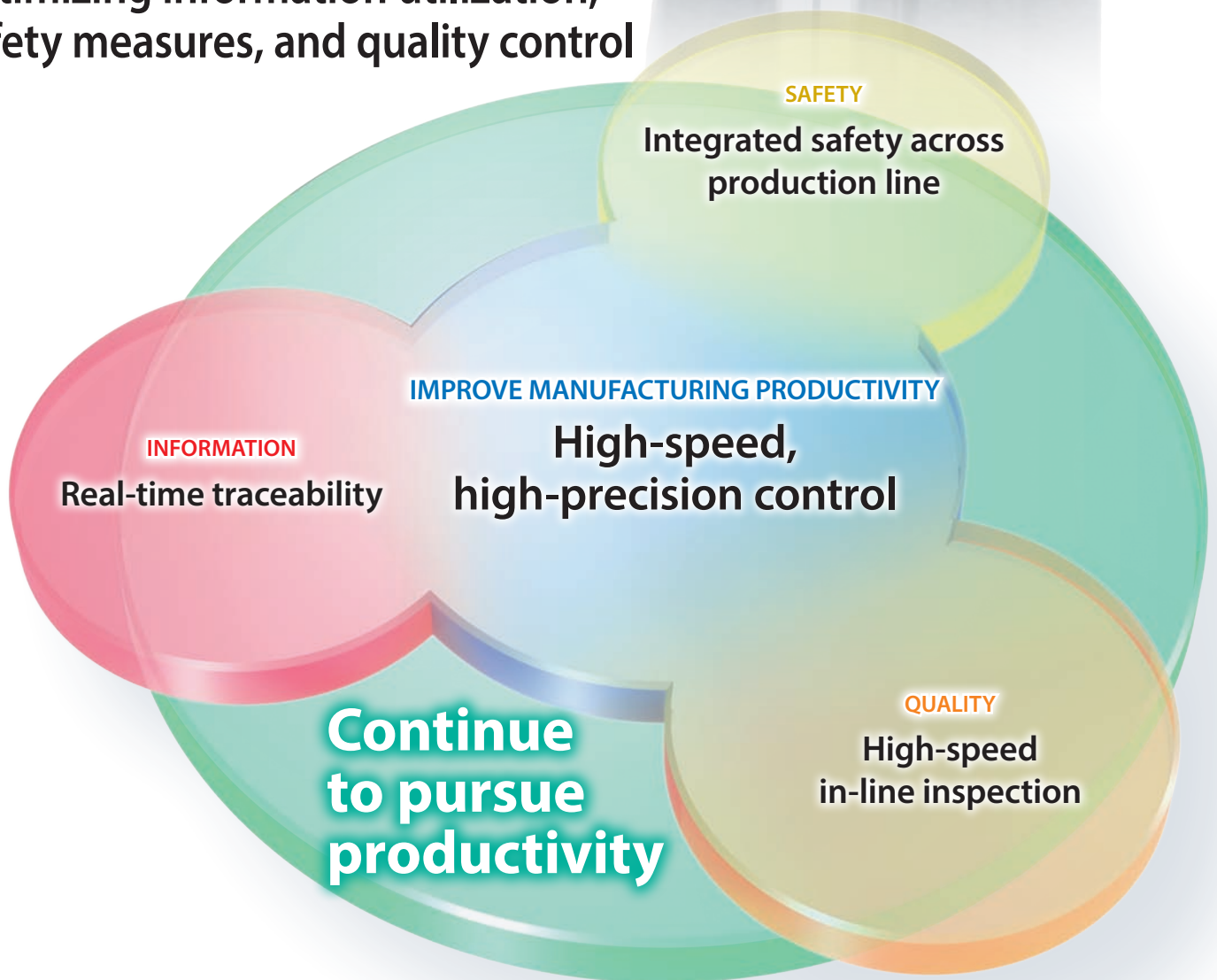


# NX1

The Next Standard

NX1

Improves production efficiency while optimizing information utilization, safety measures, and quality control





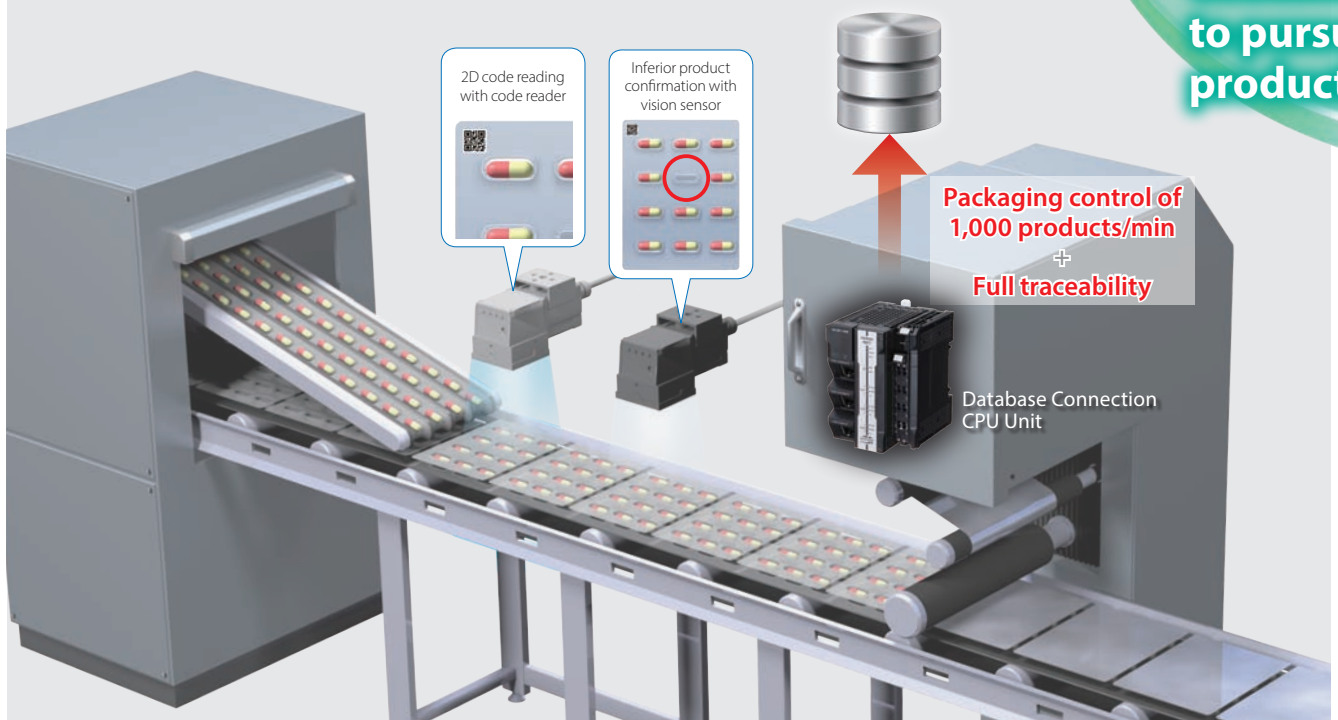
# Produce faster without compromising on quality

The NX1 can utilize information, take safety measures, and control quality while at the same time improving production efficiency through high-speed, high-precision control. This contributes to continuous improvement in productivity.



## Real-time traceability

The NX1 provides high-speed control while utilizing information. For example, the NX1 used for a packaging machine with the capability of handling 1,000 products per minute can collect all traceability data in synchronization with the production cycle while performing motion control.



# Integrated safety across production line



The NX1 is the first in the world\* to integrate two different open networks: EtherNet/IP™ for scalable safety control in production lines and EtherCAT® for fast and reliable redundant safety control in machines. Furthermore, it integrates safety control into machine control in lines that require fast cycle times. This integration allows you to standardize machines and build flexible lines.

\* Based on Omron investigation in March 2018.

**SAFETY**

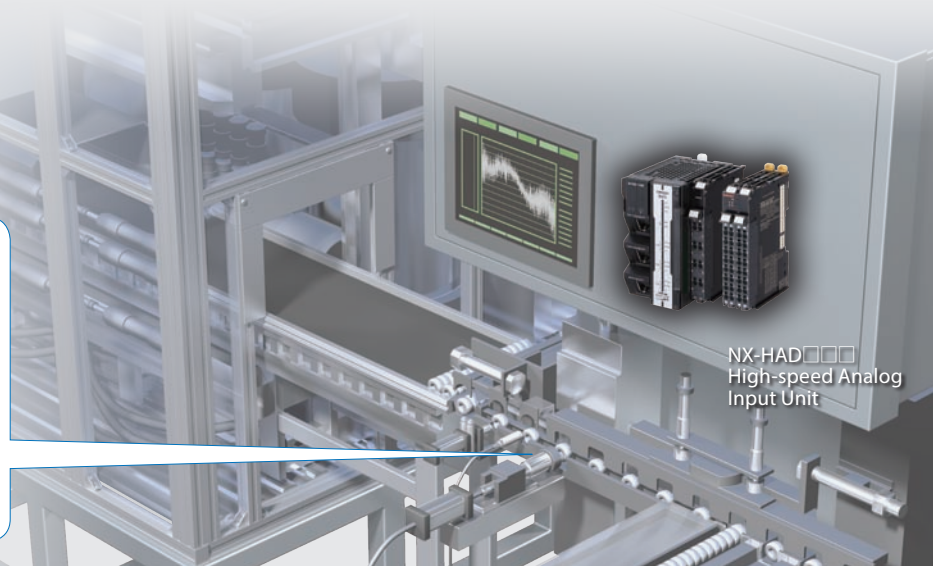
**IMPROVE  
MANUFACTURING  
PRODUCTIVITY**

**QUALITY**

# High-speed in-line inspection

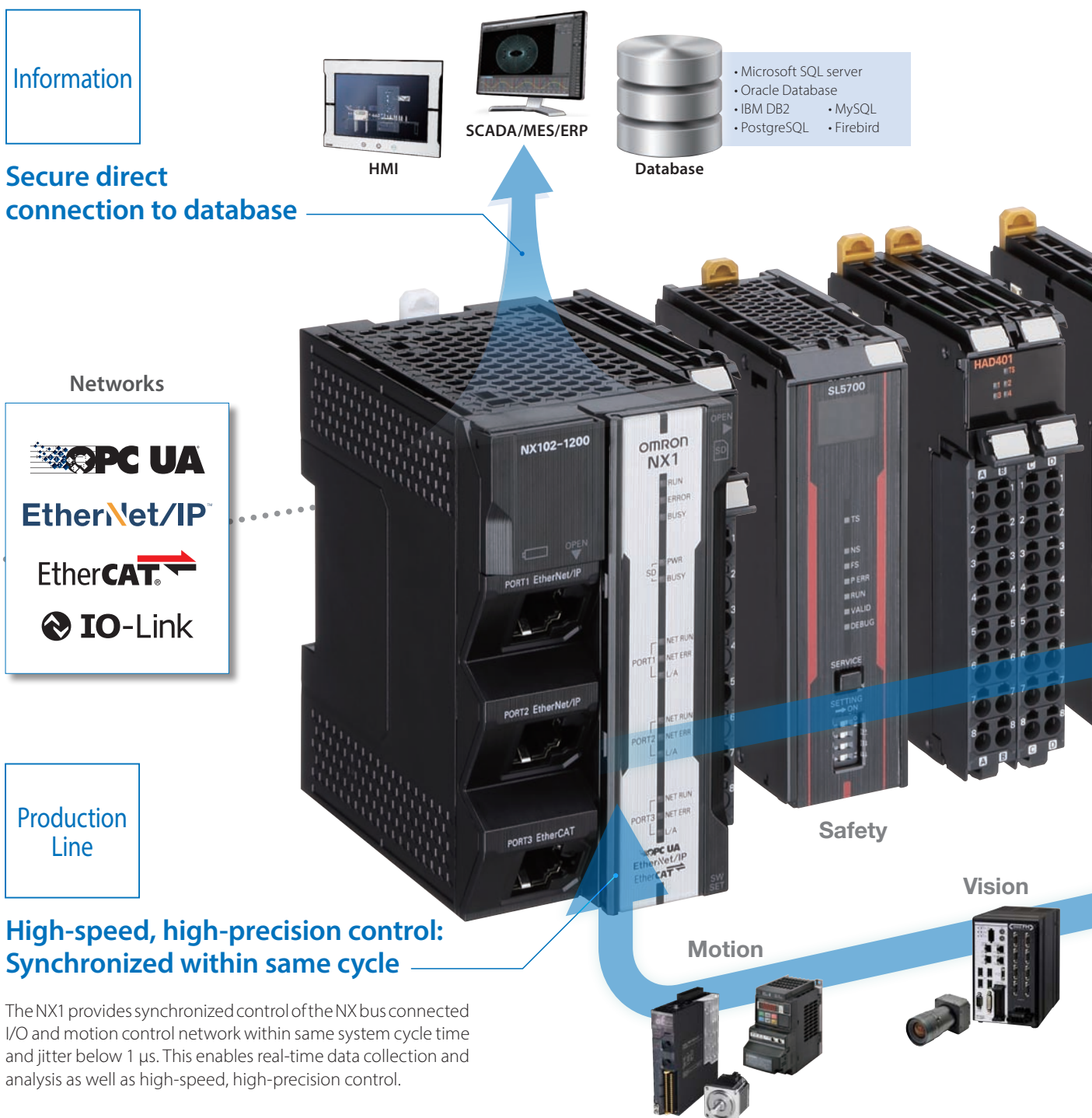
Although special inspection machines with built-in PC are widely used for high-speed inspections, they require special maintenance skills. Therefore, acceptance sampling is often carried out offline to prevent line stoppages. The NX1 can be used in conjunction with the High-speed Analog Input Unit to collect measurement data within a fixed cycle time of 5 μs. This standard controller eliminates the need for special machines with PC and can be maintained by on-site engineers. In-line inspections of all products can also be conducted easily.

**High-speed in-line inspection of all products with standard inspection machine**



# Seamless Integration: Production Line & IT sys

The NX1 Controller integrates inputs, logic, outputs, safety, and robotics, offering a wide variety of applications that leverage information to boost productivity and measures for quality and safety.




The NX1 provides synchronized control of the NX bus connected I/O and motion control network within same system cycle time and jitter below 1  $\mu$ s. This enables real-time data collection and analysis as well as high-speed, high-precision control.




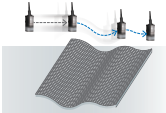
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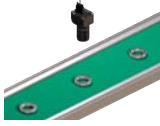
**Information Utilization Application**

Application	NX1 functionality + product
All traceability data storage 	NX1 Database Connection CPU Unit Code reader RFID
Direct connection of machine to MES/SCADA Data utilization to prevent manipulation	NX1 OPC UA server (standard functionality)
Linkage between image and data	FH Vision System
Data collection by utilizing the cloud	NX1 MQTT Communication MQTT Communications Library

**Production Efficiency Improvement Application**

Application	NX1 + product
Predictive maintenance	<b>NX-ILM400</b> IO-Link Master Unit IO-Link sensor
Automatically optimized temperature control	<b>NX-TC</b> Temperature Control Unit E5 Digital Temperature Controller
Position and load control for servo press	1S Servo System 
Weighing control	<b>NX-RS</b> Load Cell Input Unit
Tracer control	ZW-7000/5000 Confocal Fiber Displacement Sensor 

**Quality Control Application**

Rotator inspection	<b>NX-HAD</b> High-speed Analog Input Unit
Welding quality inspection	
Appearance inspection	FH Vision System 

**Safety Measures Application**


High-speed safety control in machine	<b>NX-SL5</b> Safety CPU Unit
Safety control in line	
Intrusion detection	F3SG-R Safety Light Curtain 

# NX1 brings advanced control in miniaturized

Three industrial Ethernet ports and a power supply are housed in a compact design with a width of 66 mm. The NX1 provides key functionality to integrate control and information for advanced manufacturing applications. The new controller contributes to the pursuit of productivity improvements.


**Information**

- Two built-in ports
- OPC UA functionality
- Modbus/TCP, FINS
- Enhanced security




**Production Line**

- Motion control of 4/6/8/12 axes\*
- Up to 64 slaves



**Actual size**



**Embedded Power Supply**

DC power supply without battery backup

**NX bus**

Up to 32 local NX I/O units



\* Including single axis position control axes



size

## High-speed, high-precision control

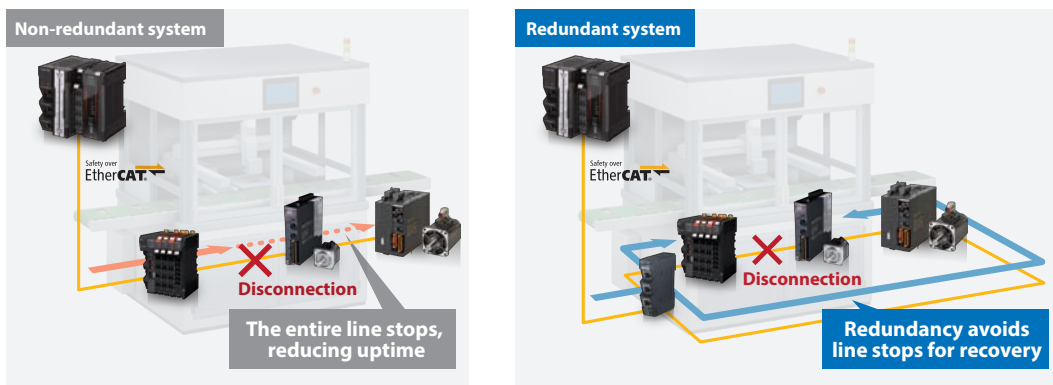
Synchronized control of I/O and motion within 1 ms cycle time

Jitter : 1  $\mu$ s

Memory capacity for variables : 33.5 MB\*1

## Redundancy to minimize downtime (NX102-□□00)

Even if a part of the EtherCAT network is disconnected, Cable Redundancy provides continuous connectivity. This function allows you to fix disconnection without stopping the machines and production line where one controller provides both machine control and safety control.



## Multicore microprocessor for control and data handling

The multicore microprocessor enables information utilization including communications and traceability without compromising control performance.

### Secure host connection

OPC UA is an IEC communication protocol which is listed as a recommendation for Industrie 4.0 and PackML. The NX1 comes equipped with an OPC UA server interface and provides a secure connection to IT systems such as MES and ERP.



The NX1 provides a easily and secure connection to the cloud by using MQTT Communications Library.



### Enhanced Ethernet functionality

Connectivity to existing devices (e.g., Modbus/TCP\*2, FINS communications, and connection to other vendor PLC\*3) and EtherNet/IP™ performance (increased to 12,000 pps\*4) are improved. Packet Filter enhances security, and visualization of EtherCAT® slave errors makes troubleshooting easier.

\*1. The total number of bytes of retained and non-retained variables.  
 \*2. Clients instructions are supported.  
 \*3. SLMP commands are included in the Sysmac Library.  
 \*4. The total pps of two ports.

# One software to get things done...

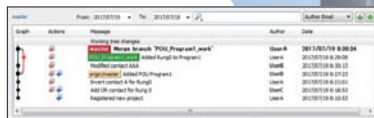
Sysmac Studio – Integrated Development Environment integrates programming, configuration, information, and safety.

The project version control system in the Sysmac Studio Team Development Option ensures smooth development across the team. The Sysmac Studio includes Function Blocks for motion control and database connection, and collections of software functional components Sysmac Libraries can be downloaded from our website. These allow you to minimize time to build systems that boost productivity.

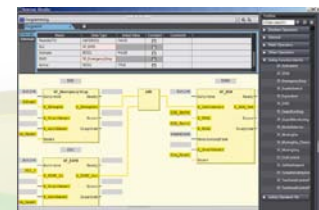
## Sysmac Studio



- Fully conforms with IEC 61131-3 standards
- PLCopen Function Blocks for Motion Control



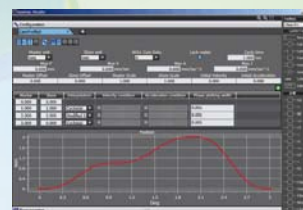
Project version control function



Safety



Safety Function Blocks



Motion control



Information utilization



DB connection Function Blocks



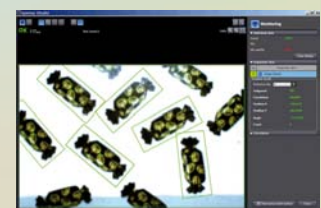
Programming



HMI



Motion Function Blocks



Vision





High-speed Analog Inspection Library

## Ordering Information

### International Standards

The standards are abbreviated as follows: U: UL, U1: UL(Class I Division 2 Products for Hazardous Locations), C: CSA, UC: cULus, UC1: cULus(Class I Division 2 Products for Hazardous Locations), CU: cUL, N: NK, L: Lloyd, CE: EU Directives, RCM: Regulatory Compliance Mark, KC: KC Registration, and EAC: EAC mark. Contact your OMRON representative for further details and applicable conditions for these standards.

### NX-Series NX102 CPU Units

Product Name	Specifications					Model	Standards
	Program capacity	Memory capacity for variables	Maximum number of used real axes				
			Motion control axes	Single-axis position control axes			
NX102 CPU Unit 	5 MB	1.5 MB (Retained during power interruption)/ 32 MB (Not retained during power interruption)	12	8	4	NX102-1200	UC1, N,L CE, RCM, KC, EAC
			8	4	4	NX102-1100	
			6	2	4	NX102-1000	
			4	0	4	NX102-9000	
NX102 Database Connection CPU Unit 			12	8	4	NX102-1220	
			8	4	4	NX102-1120	
			6	2	4	NX102-1020	
			4	0	4	NX102-9020	

### Automation Software Sysmac Studio

Please purchase a DVD and required number of licenses the first time you purchase the Sysmac Studio. DVDs and licenses are available individually. Each model of licenses does not include any DVD.

Product Name	Specifications	Number of licenses	Media	Model
Sysmac Studio Standard Edition Ver.1.□□	The Sysmac Studio is the software that provides an integrated environment for setting, programming, debugging and maintenance of machine automation controllers including the NJ/NX-series CPU Units, NY-series Industrial PC, EtherCAT Slave, and the HMI.  The Sysmac Studio Standard Edition DVD includes Support Software to set up EtherNet/IP Units, DeviceNet slaves, Serial Communications Units, and Support Software for creating screens on HMIs (CXDesigner).	---	Sysmac Studio (32-bit) DVD	SYSMAC-SE200D
		---	Sysmac Studio (64-bit) DVD	SYSMAC-SE200D-64
		1 license *1	---	SYSMAC-SE201L

Note1: For details, refer to the Sysmac Studio Ver.1.□□ datasheet, visit your local OMRON website.

Note2: For Sysmac Studio Team Development Option, refer to your local OMRON website.

\*1. Multi licenses are available for the Sysmac Studio (3, 10, 30, or 50 licenses).

### Collection of software functional components Sysmac Library


Please download the Sysmac Library from the following URL and add it to the Sysmac Studio.

[http://www.ia.omron.com/sysmac\\_library/](http://www.ia.omron.com/sysmac_library/)


Product name	Specifications	Model
MQTT Communications Library *1	The MQTT communication library is a collection of software functional objects for exchanging Pub / Sub type messages through the MQTT server (MQTT broker).	SYSMAC-XR020
High-Speed Analog Inspection Library	The High-speed Analog Inspection Library records analog input values acquired by the High-speed Analog Input Units in time.	SYSMAC-XR016

\*1. This Library is not available for NX102-□□20-DH (products equipped with time series data collection system).

### High-speed Analog Input Unit

Product name	Specifications					Model
	Number of points	Input range	Conversion time	Trigger input section		
				Number of points	Internal I/O common	
High-speed Analog Input Unit 	4 points	-10 to +10 V 1 to 5 V -5 to +5 V 0 to 20 mA 0 to 10 V 4 to 20 mA 0 to 5 V	5 μs/4 Ch	4 points	NPN	NX-HAD401
					PNP	NX-HAD402

### Safety CPU Unit

Product name	Specifications				Model
	Maximum number of safety I/O points	Program capacity	Number of safety I/O connections	I/O refreshing method	
Safety CPU Unit 	1024 points	2048 KB	128	Free-Run refreshing	NX-SL5500
	2032 points	4096 KB	254		NX-SL5700

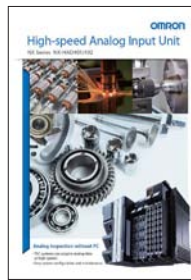


## Related catalogs



### Machine Automation Controller NX1 Datasheet

Cat. No. P130



### High-speed Analog Input Unit NX-HAD401/402 Catalog

Cat. No. P128



### Safety Network Controller NX-series Catalog

Cat. No. F104

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- This product includes cryptographic software written by Eric Young (eay@cryptsoft.com).
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**Note: Do not use this document to operate the Unit.**

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