OMRON

Machine Automation Controller

NJ/NX Series

SYSMAC
always in control

A fully integrated platform

One machine control through one connection and one software is how we define the Sysmac automation platform. The Machine Automation Controller integrates logic, motion, safety, robotics, vision, information, visualization and networking under one software: Sysmac Studio. This one software provides a true Integrated Development Environment (IDE). The machine controller comes standard with built-in EtherCAT and EtherNet/IP. The two networks with one connection purpose is the perfect match between fast real time machine control and data plant management.

One Machine Controller

- Complete integration of motion and logic

  A large selection of CPU Units for up to 256 axes
- Safety integration

  Flexible system lets you integrate safety into machine automation through the use of Safety over EtherCAT (FSoE).

One Connection

- Integration of machine control and Information
  - Built-in EtherCAT and EtherNet/IP™ ports : Global standard networks
  - NX102-□□□□/NJ501-1□00 CPU Unit with built-in international standard (IEC 62541) OPC UA communication functionality
  - Database connection: Logs real-time data from production lines directly into SQL Databases. This enables preventive maintenance and quality traceability.

One Software

- One integrated development environment software
  - Fully conforms with IEC 61131-3 standards
  - PLCopen function blocks for motion control
  - Packed with Omron's rich technical know-how. Various software components help reduce programming time.


Sysmac Library
Sysmac Library
Blistar packaging machines
Filling and capping
Delta robot picking system
ZW-7000
Displacement
Sensor
FH
Vision
System
Linear motors
IO-Link
Master
IO-Link
Photoelectric Sensor /
Proximity Sensor
NX-I/O
NX
Safety Control Unit
Servo drives
Inverters
EtherCAT
NJ/NX Machine
Automation
Controller
IEC
No. 0047
ST
18.01.2019
Datatypes supported: 17 of 26
PLCopen
motion control
Delta robot
NA Programmable Terminal
EtherNet/IP
Ethernet
Information technologies
IT devices
Smart factory
Sales force
Offices HQ

Advanced machine control and integrated production /

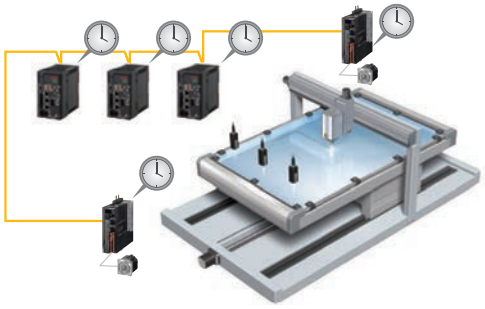
Motion Control

Complete integration of motion and logic

One controller integrates logic, motion, vision and information for complete control and management of machines. Position, displacement, and tension information collected from sensors can be quickly and easily fed back to the motion control.

Accurate feedback control with less than 1 µs jitter

The NJ/NX controller offers synchronous control of all machine devices, from input through to output. Distributed clock-based clock synchronization incorporated into EtherCAT slaves enables the I/O refresh cycle to be synchronized between units such as the FH Vision System, ZW Displacement Sensor, NX I/O, and G5/1S Servo Drive.



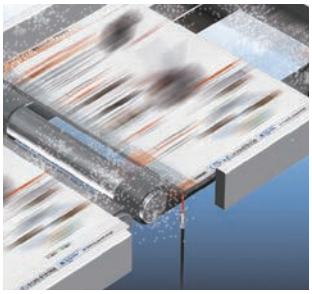
Preventive maintenance

Preventive maintenance of EtherCAT sensor

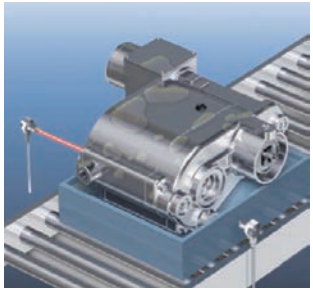
Monitoring the sensor status allows you to maintain before sensors malfunction due to dirt or aged deterioration.* The sensor settings can be saved and loaded, which minimizes downtime when troubles occur.

FROM

In harsh environments, sensors can become dirty, resulting in malfunctions.



Detection in dusty environment



Detection in oily environment

TO

Decreases in light intensity can be detected by monitoring sensors.

Initial display

Trend graph

Preventive maintenance of actuator devices

The NJ/NX controller that integrates EtherCAT and motion control can constantly monitor actuator devices with a fast cycle time.

* When combining the NJ/NX controller with the E3NW EtherCAT Sensor communications unit and creating the programmable terminal screens.
The sample program for Omron NS/NA Programmable Terminal is available. Contact your Omron sales representative for details.

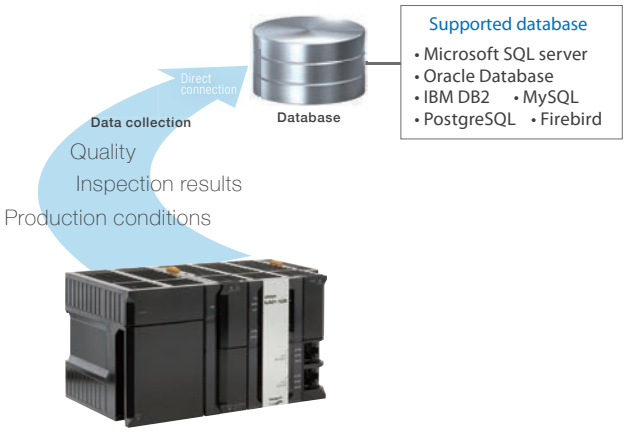
machine data management for a variety of applications

Information

NX102-□□20/NJ101-□020/NJ501-□□20/NX701-1□20

Fast machine data storage in database

The controller connects directly to a database without the need for a gateway. The special instructions allow easy access to the database. Real-time data collection enables productivity improvement, predictive maintenance, and quality traceability.



NX102-□□□□/NJ501-1□00

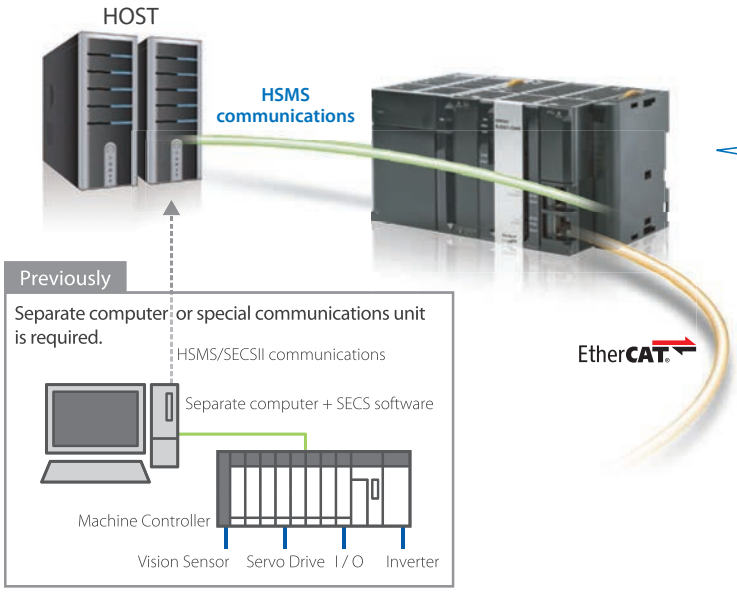
International standard communication protocol OPC UA directly connects automation and IT

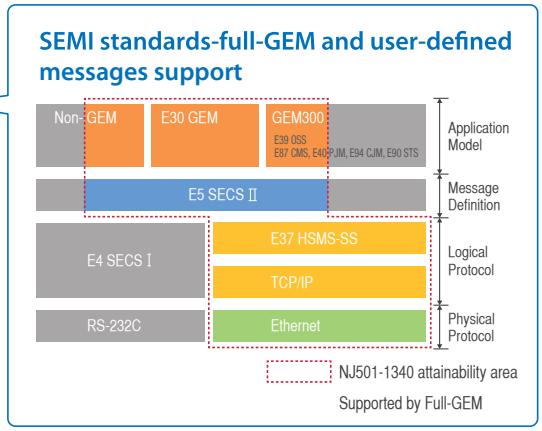
OPC UA with strong security features (e.g., authentication and encryption) is widely used across the world and adopted for Industrie 4.0 and PackML communications. The host system can access production data directly without connecting a gateway computer.

NJ501-1340

Semiconductor industry standard SECS/GEM communications functionality

The SECS/GEM CPU Unit integrates machine control and host communications, reducing time, cost, and complexity to establish SECS/GEM communications.





Processing NJ501-5300

Versatile NC functions

G-Code reduces time required to design and program complex profiling.

Conventional controller

Processing programs are designed based on CAD data. Programming using PLC instructions and debugging are required for each figure

CAD screen (example)

Program design

- Exploding components into lines
- Types of lines: straight line, arc, free curve
- Target positions of lines
- Travel velocities
- Transition path between figures, etc.

NC Integrated Controller

CAD/CAM software makes design easy

CAD/CAM

NC program in G-Code (example)

Parameter setting → Automatic generation → Transferred

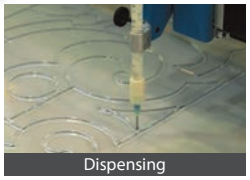
① Parameters are set using CAD/CAM software

② NC program in G-Code is generated

③ Program is transferred to NC integrated controller

Milling

Grinding



Dispensing

Sewing

Cutting

NC functions for complex profiling applications

G-Code
G-Code NC programming language allows manual programming on operation software and use in combination with any CAD/CAM software

High-speed control
Logic sequence, motion control and NC functionality with the fastest cycle time of 500 µs

Cutter compensation 2D
Tool diameter and shape compensation, matching the cutting point exactly as specified in G-Code

Lookahead
Future instructions are analyzed in advance, movements are blended and optimized in speed and acceleration for a better performance

3D interpolation
Helical, spiral and conical interpolation for 3D profiling

Coordinate systems
Various profiling using machine coordinate system, workpiece coordinate system, and local coordinate system

Robotics

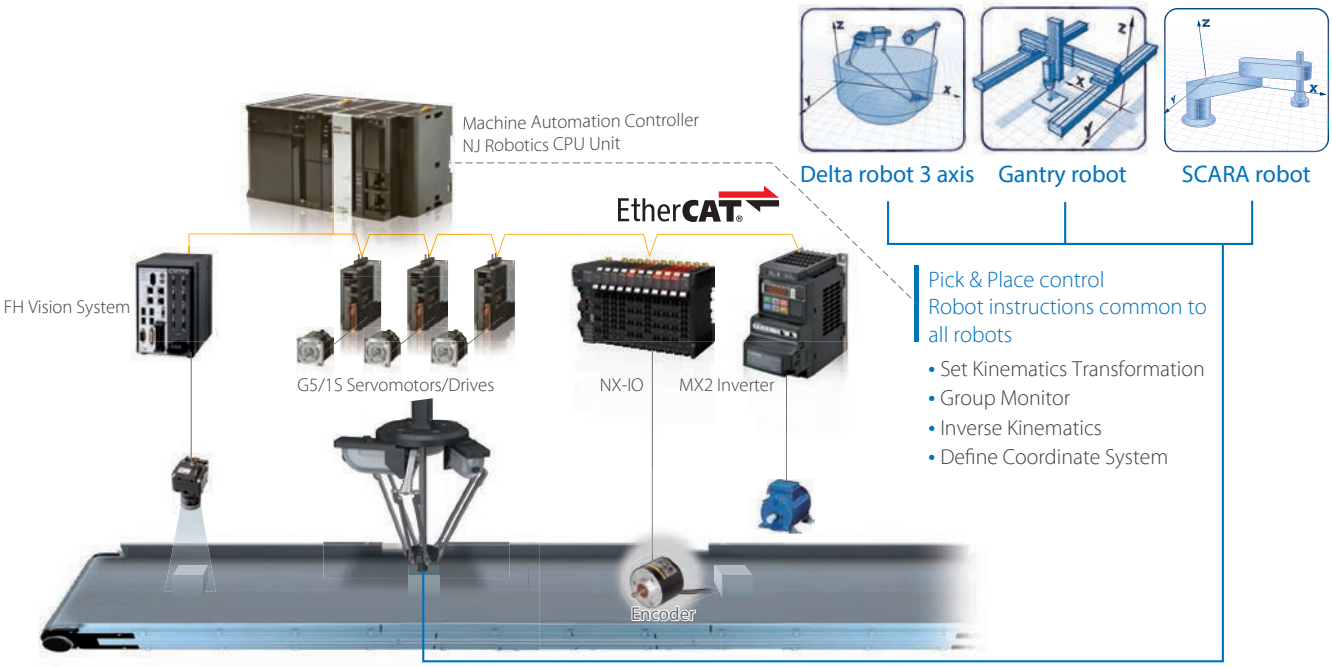
NJ501-4□□□

Integrated machine and robot control brings flexibility to build machines

Integrating machine control and robot control, one controller allows you to build a conveyor tracking application where robots are precisely synchronized with conveyors.

One controller can control up to 64 axes including 8 parallel, Cartesian, or serial robots.

Standard IEC 61131-3 based instructions for motion and robot control reduce programming time.



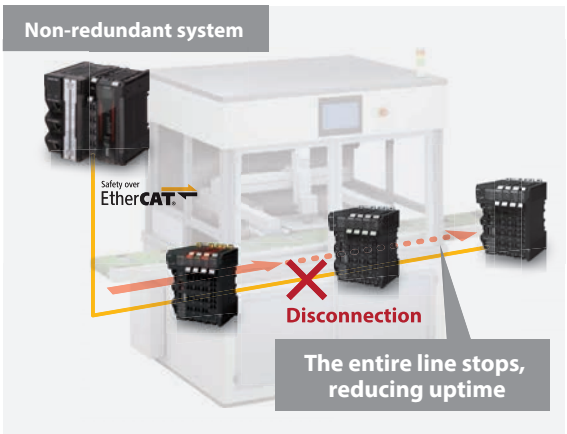
Maximized uptime

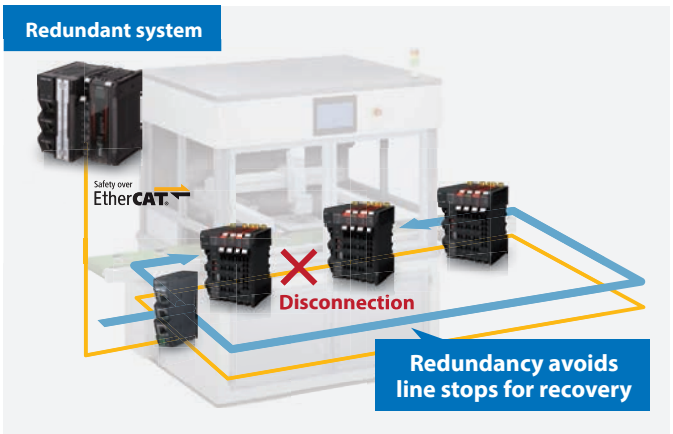
NX102-□□00/NX1P2-□□□□/NJ501-1□00/NJ301-1□00/NJ101-□□00

Redundancy minimizes downtime

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.



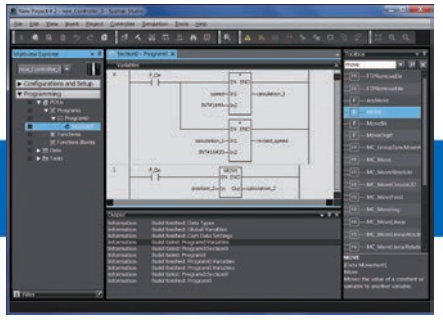


Creative development environment for globalized

Design

Reusable programs

Programming with variables

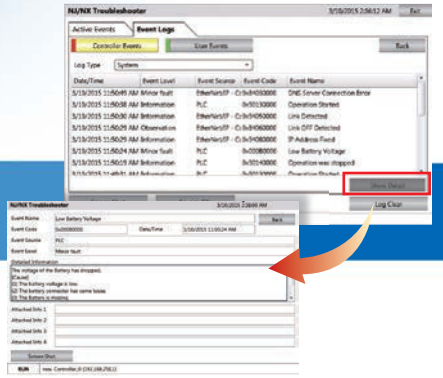


One Integrated Development Environment software Sysmac Studio is fully compliant with the open standard IEC 61131-3. Programming with variables eliminates the need to learn the internal memory map of the PLC and allows the programs to be reused.

Maintenance

Highly efficient maintenance

Troubleshooting



Troubleshooting in the Sysmac Studio and NA Programmable Terminal can manage errors across the entire system including the controller. You can check details of errors and solutions without reading manuals.

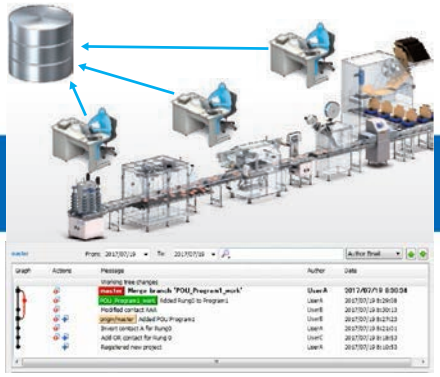
manufacturing

Collection of software functional components Sysmac Library

Packed with Omron's rich technical know-how.
Various software components help reduce programming time.

Development by multiple developers

Project version control function*



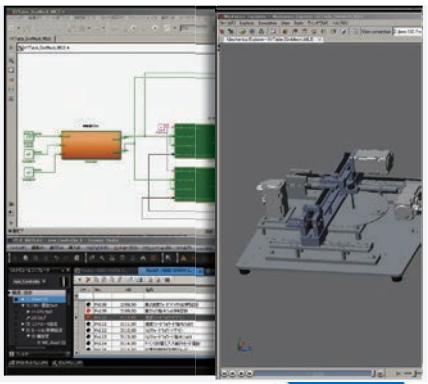
When you develop a project at the same time as your colleagues, the Sysmac Studio combined with the version control system (Git™*) merges changes automatically and resolves conflicting changes. This makes merging easier and faster. You can even revert to the previous revision after graphically comparing the current project with a previous one.

For advanced machine control

Motion programming

Advanced motion control applications can be created quickly just by combining PLCopen® Function Blocks for Motion Control.

Model-Based design



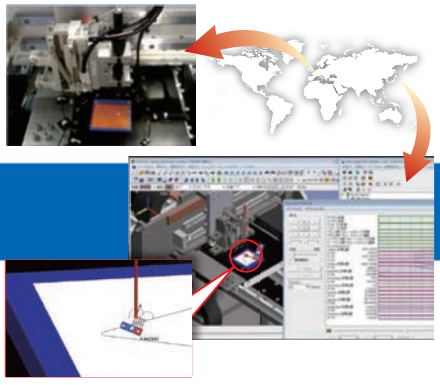
Complex feedback control that is designed with MATLAB®/Simulink® can be imported into programs.

MathWorks Partner

Verification

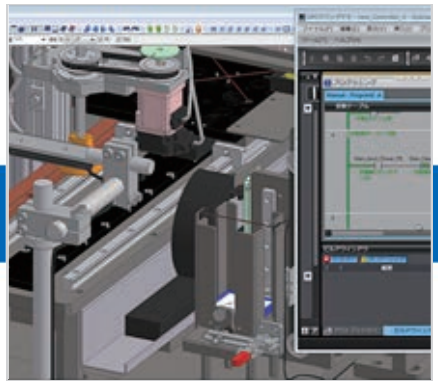
Fast system debugging

Remote maintenance



Movement of the machine connected online can be displayed on the CAD in real time, and movement can also be reproduced from the trace data. Maintenance and troubleshooting can be performed in remote locations.

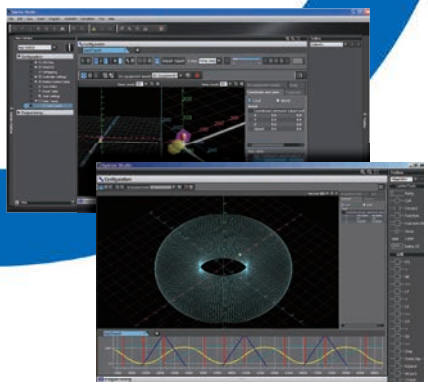
Virtual mechanical debugging



Before the mechanical prototype is completed, motion can be checked and the program can be debugged. This cuts design time.

LATTICE TECHNOLOGY VMECH

3D simulation



Motion trajectories in 3D can be pre-tested with advanced simulation of sequence and motion control. Simulation of single Function Blocks, POU's (Program Organization Unit) or the entire program can be performed. In addition all standard features such as Break & Step are available. Easy tuning and debugging reduce the set-up times of machines and production lines.

* This function can be used by applying the Team Development Option to Sysmac Studio version 1.20 or higher. Project version control function is supported by CPU Unit version 1.16 or later.
Git and the Git logo are either registered trademarks or trademarks of Software Freedom Conservancy, Inc., corporate home of the Git Project, in the United States and/or other countries.

NJ/NX-series Lineup

Series			NX Series		
Product name			NX701 CPU Units	NX102 CPU Units	NX1P2 CPU Units
Model			NX701-□□□□	NX102-□□□□	NX1P2-□□□□
Appearance					
Specifications	CPU Unit features		Ideal for large-scale, fast, and highly-accurate control with up to 256 axes.	Compact controller with up to 8 axes motion control.	Compact controller with up to 4 axes motion control, up to 4 axes single-axis control, and built-in I/O.
	Instruction execution times	LD instructions	0.37 ns or more	3.3 ns	3.3 ns
		Math instructions (for long real data)	3.2 ns or more	70 ns or more	70 ns or more
	Program capacity		80 MB	5 MB	1.5 MB
	Variable capacity		4 MB : Retained during power interruptions 256 MB: Not retained during power interruptions	1.5 MB: Retained during power interruptions 32 MB : Not retained during power interruptions	32 KB: Retained during power interruptions 2 MB : Not retained during power interruptions
	I/O capacity/maximum number of configuration Units (Expansion Racks)		–	– Up to 32 NX I/O Units connectable	Built-in I/O: 40 points max. Up to eight NX I/O Units connectable
	Number of motion axes		128, 256	0, 2, 4, 8 *1	0, 2, 4 *1
	EtherCAT slaves		512	64	16
	Number of controlled robots		–	–	–
Functions	Database connection		● NX701-1□20	● NX102-□□20	–
	SECS/GEM communications functions		–	–	–
	Numerical Control (NC) functions		–	–	–
External memory			Memory Cards	Memory Cards	Memory Cards
Detailed specification (Datasheet)			P141	P130	P116

*1. Motion control axes and 4 single-axis position control axes.
*2. The number of robots that can be controlled depends on the number of axes used in the system.
*3. The number of controlled axes of the MC Control Function Module is included.

Individual Pamphlets

NX1
P129

NX1P
P115

OPC UA
P123

Robotics
P085

	NJ Series							
	NJ501 CPU Units					NJ301 CPU Units	NJ101 CPU Units	
	NJ501-1□00	NJ501-4□□□	NJ501-1□20	NJ501-1340	NJ501-5300	NJ301-1□00	NJ101-□□00	NJ101-□□20
	OPC UA (NJ501-1□00) 							
	Ideal for large-scale, fast, and highly-accurate control with up to 64 axes.					Ideal for small control with up to 8 axes.	Ideal for simple machines.	
	1.1 ns (1.7 ns or less)					1.6 ns (2.5 ns or less)	3.0 ns (4.5 ns or less)	
	24 ns or more					35 ns or more	63 ns or more	
	20 MB					5 MB	3 MB	
	2 MB: Retained during power interruptions 4 MB: Not retained during power interruptions					0.5 MB: Retained during power interruptions 2 MB: Not retained during power interruptions	0.5 MB: Retained during power interruptions 2 MB : Not retained during power interruptions	
	2,560 points/40 Units (3 Expansion Racks)					2,560 points/40 Units (3 Expansion Racks)	2,560 points/40 Units (3 Expansion Racks)	
	16, 32, 64			16	16 *3	4, 8	0, 2	
	192					192	64	
	–	8 robots max. *2	–			–	–	
	–	● NJ501-4320	●	–		–	–	●
	–			●	–	–	–	
	–				●	–	–	
	Memory Cards					Memory Cards	Memory Cards	
	P140							

Database Connection
P088

SECS/GEM
P086

NC integrated
R190

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