

Machine Automation Controller

NJ/NX Series



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 architecture is the perfect match of real time machine control and plant data management.

One Machine Controller

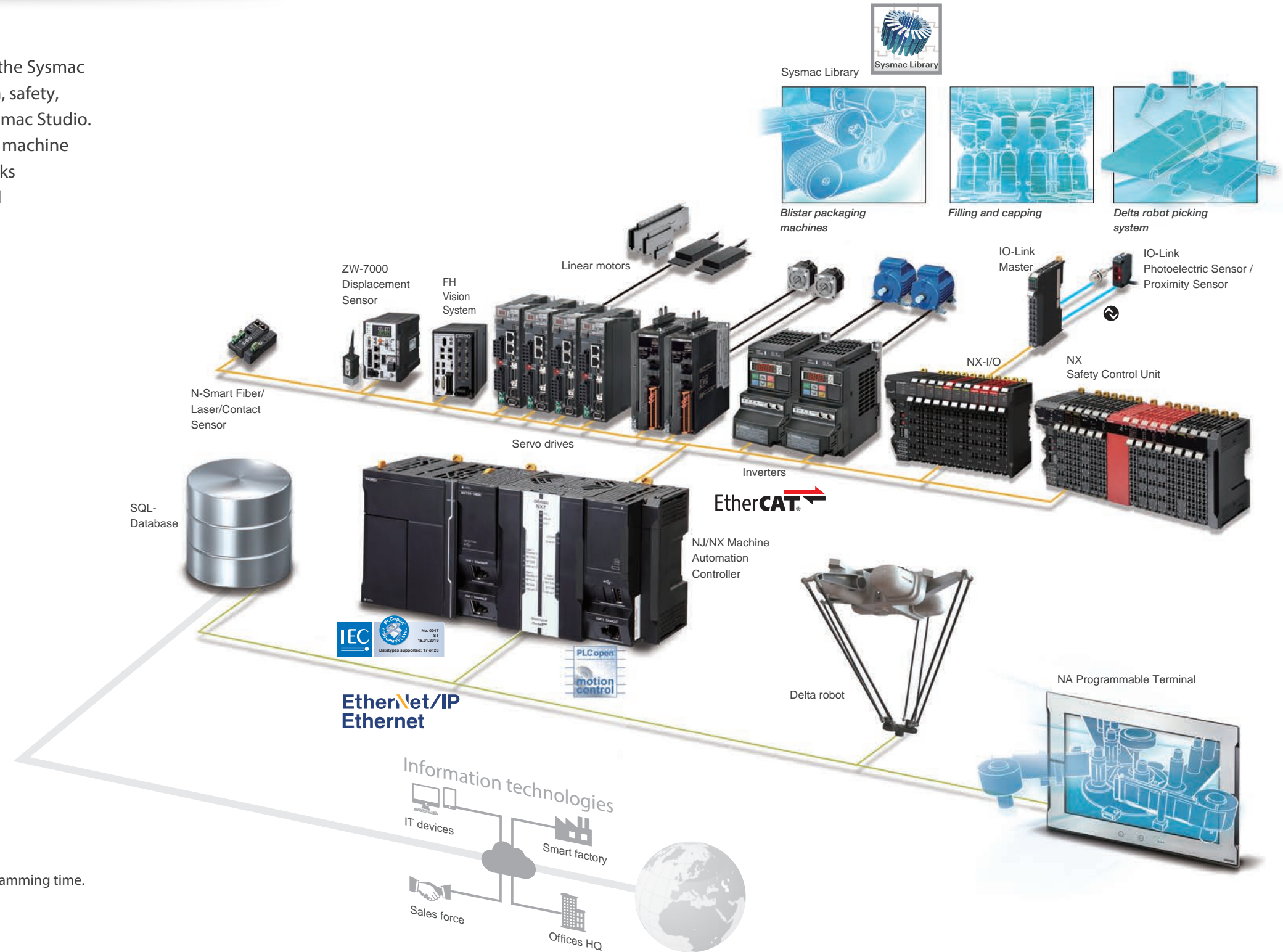
- Complete integration of motion and logic
 - A large selection of CPU Units for up to 256 axes
- Safety integration
 - Flexible system lets you integrate safety into machine automation through the use of Safety over EtherCAT (FSoE).

One Connection

- Integration of machine control and Information Systems
 - 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.

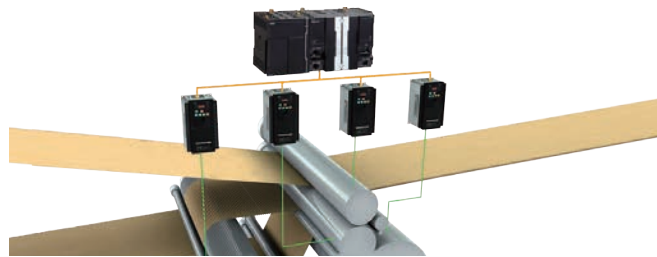


Advanced machine control and integrated production / machine data management for a variety of applications

Motion Control

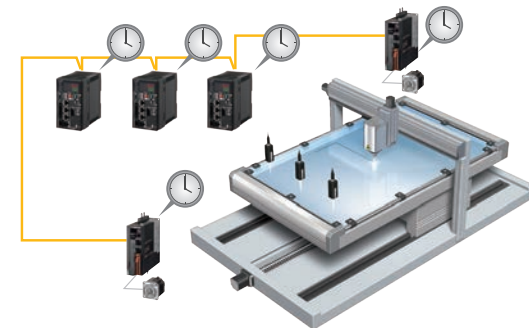
Complete integration of motion and logic

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

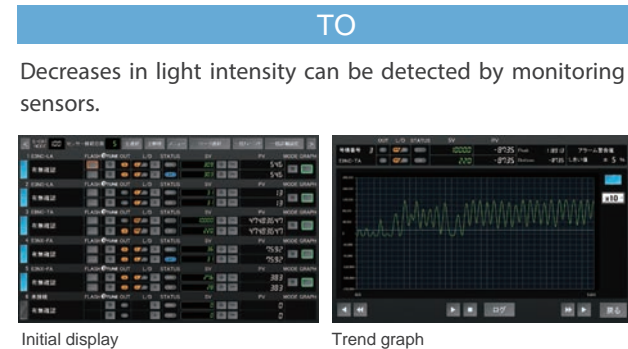
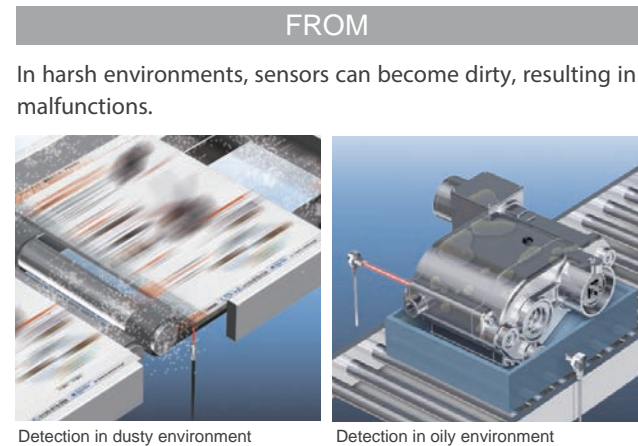
The NJ/NX controller offers synchronous control of all machine devices, from input to output. Distributed clock-based synchronization incorporated into EtherCAT slaves enables the I/O refresh cycle to be synchronized between units such as the FH Vision System, ZW Displacement Sensor, NX I/O, and G5/1S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



Preventive maintenance

Preventive maintenance with EtherCAT sensors.

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



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.



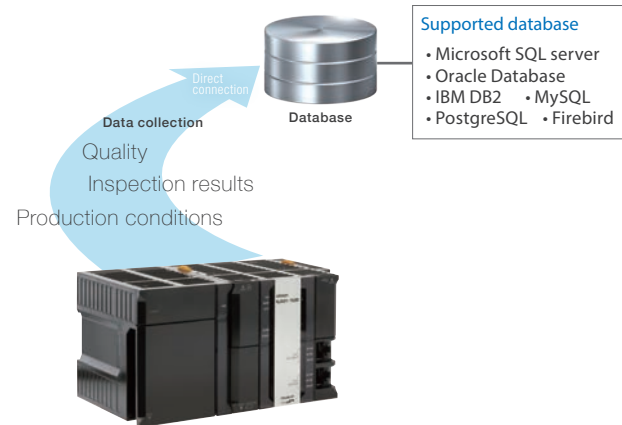
* When combining the NJ/NX controller with the E3NW EtherCAT Sensor communications unit and creating the programmable terminal screens. The sample program for Omron NS/NA Programmable Terminal is available. Contact your Omron sales representative for details.

Information

NX102-□□20/NJ101-□□20/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 the plant floor to enterprise systems.

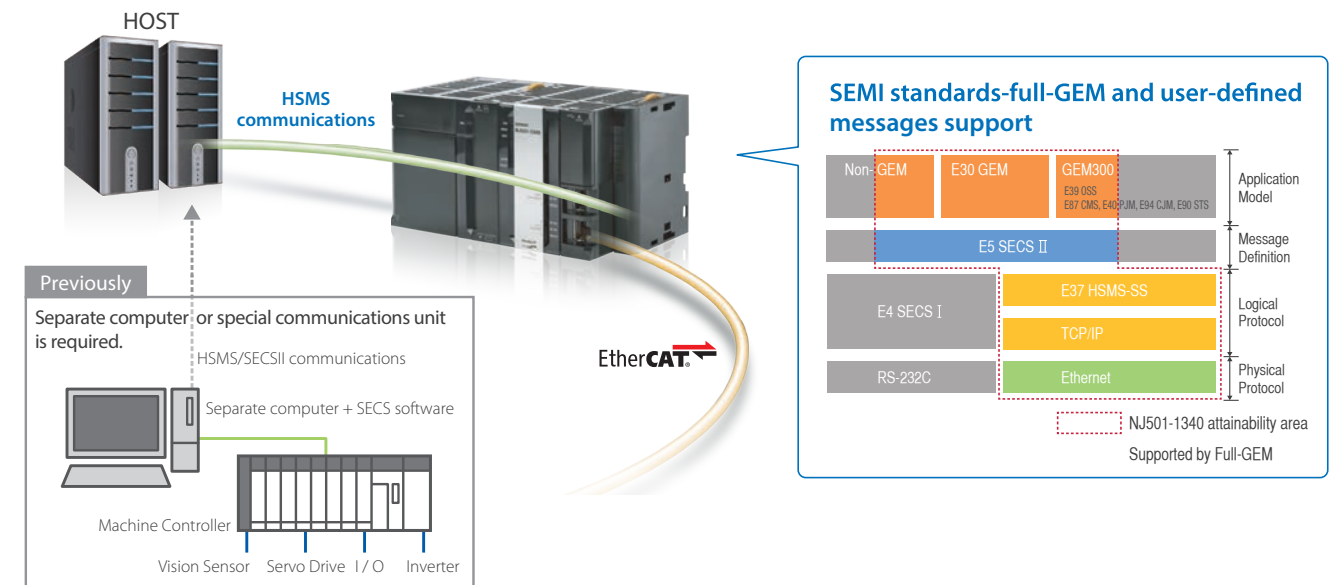
OPC UA with strong security features (e.g., authentication and encryption) is widely used across the world and adopted for Industrie 4.0 and PackML communications. The host system can access production data directly without connecting a gateway computer.



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

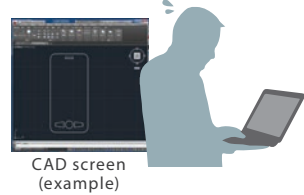
NJ501-5300

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

- Interpret CAD file into a series of motion commands
 - Linear Interpolation
 - Circular Interpolation
- Evaluate blending of movements
 - Velocities
 - Acceleration/ Deceleration
- Interpret movements between profiles
- Adjust tool offsets to modify motion commands.

NC Integrated Controller

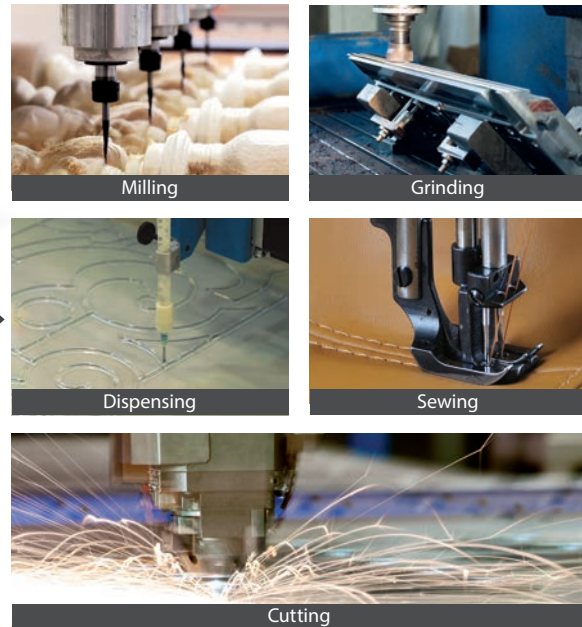
CAD/CAM software makes design easy



CAD/CAM



NC program in G-Code (example)



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

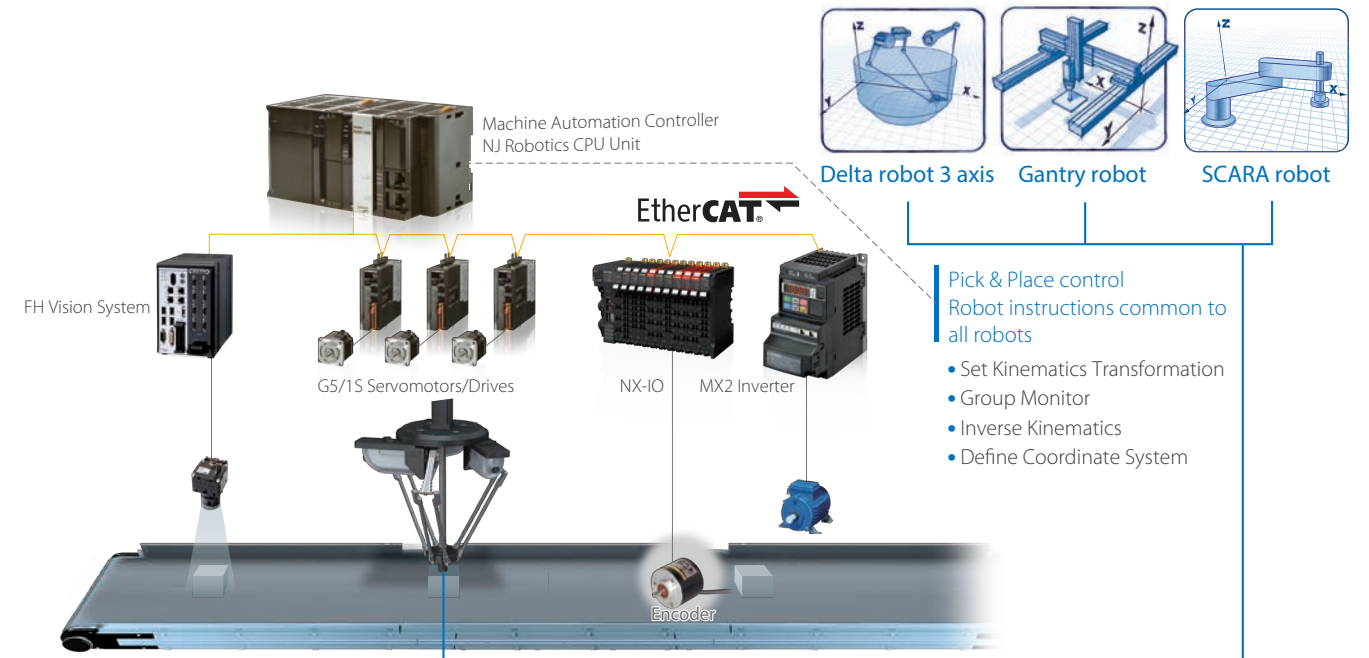
NJ501-4000

Integrated machine and robot control brings flexibility to build machines

Integrating machine control and robot control, 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.



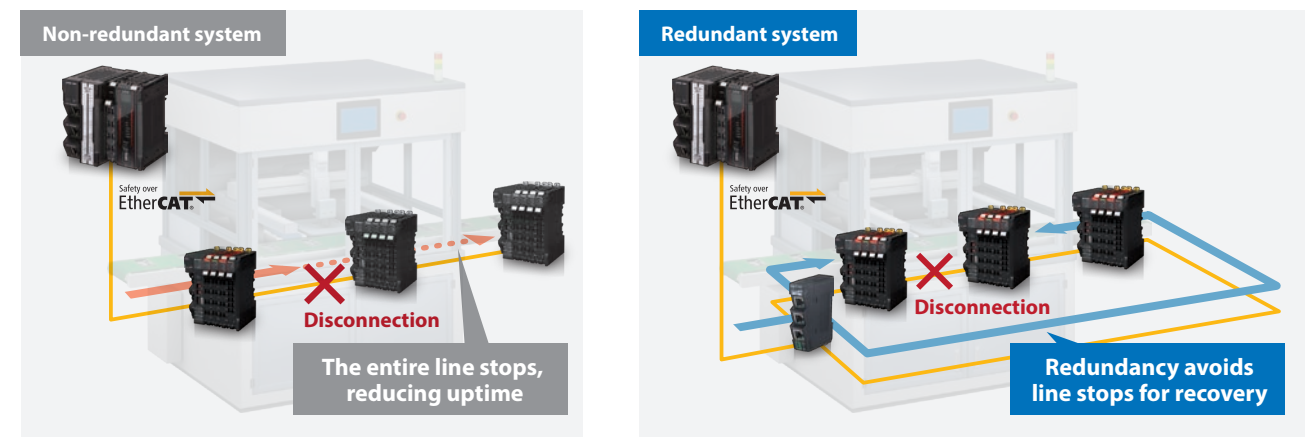
Maximized uptime

NX102-0000/NX1P2-0000/NJ501-1000/NJ301-1000/NJ101-0000

Redundancy minimizes downtime

Cable Redundancy provides continuous connectivity even if a part of the EtherCAT network is disconnected.

This function allows you to fix disconnection without stopping production.



Creative development environment for globalized manufacturing



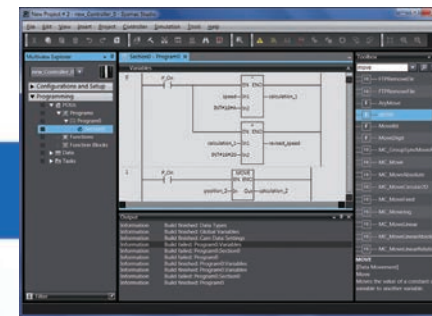
**Collection of Pre-written Function Blocks
Sysmac Library**

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

Design

Reusable programs

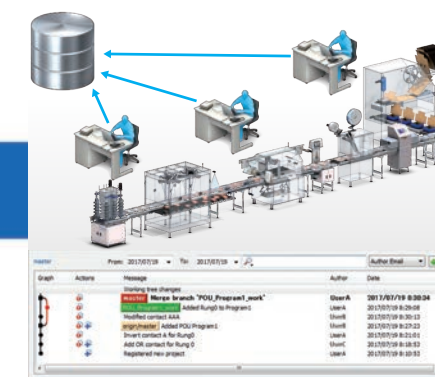
Programming with variables



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.

Development by multiple developers

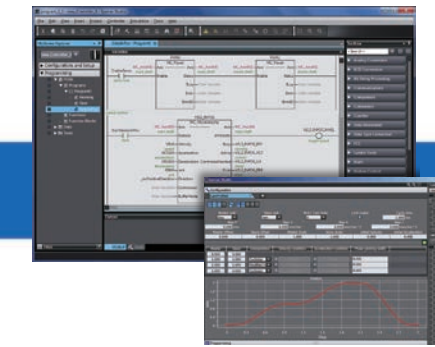
Project version control function*



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.

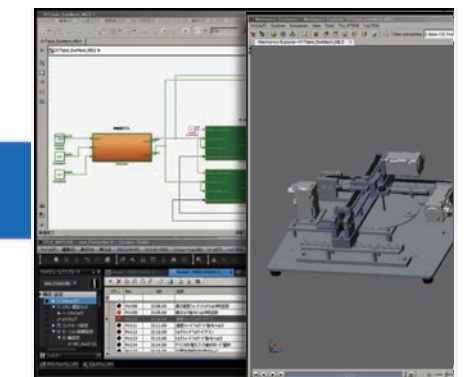
For advanced machine control

Motion programming



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

Model-Based design



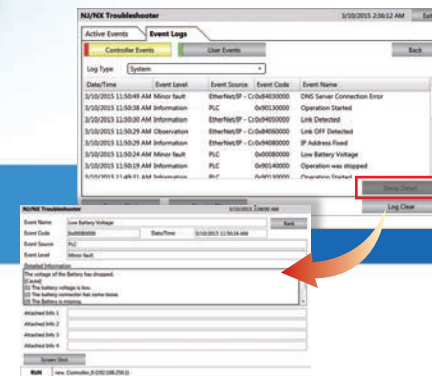
Complex feedback control that is designed with MATLAB®/Simulink® can be imported into programs.



Maintenance

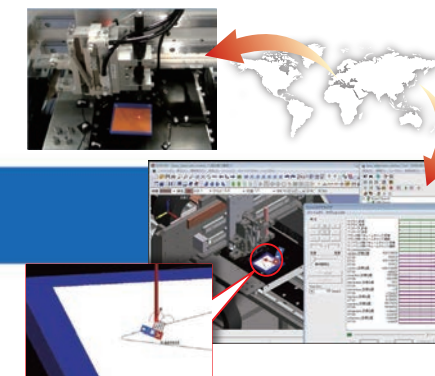
Highly efficient maintenance

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.

Remote maintenance

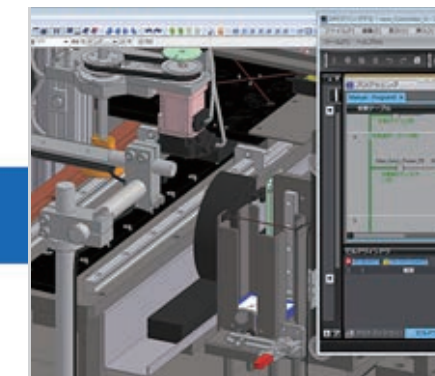


Movement of the machine connected online can be displayed on the CAD in real time, and movement can also be reproduced from the trace data. Maintenance and troubleshooting can be performed in remote locations.

Verification

Fast system debugging

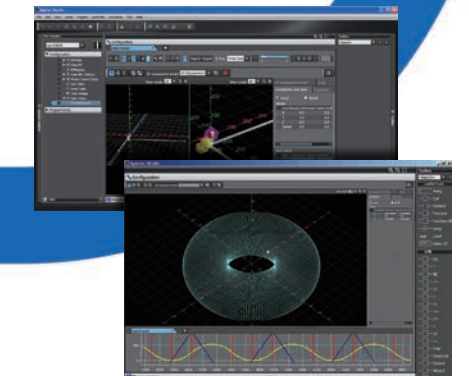
Virtual mechanical debugging



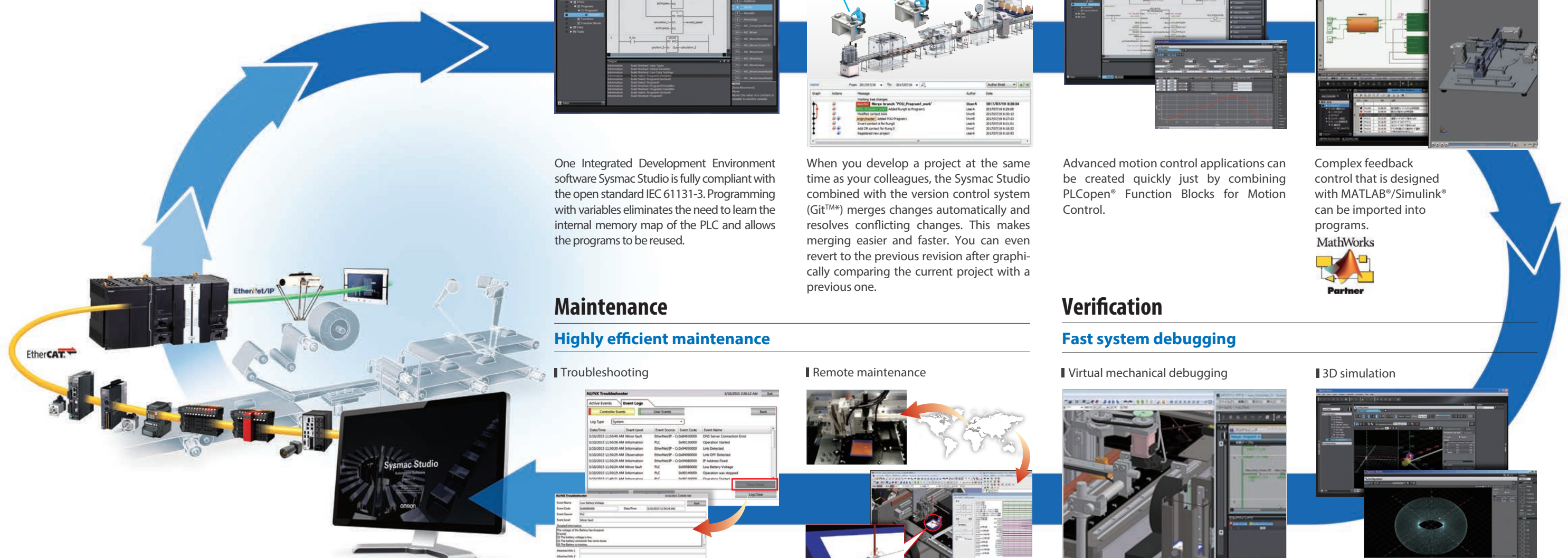
Before the mechanical prototype is completed, motion can be checked and the program can be debugged. This cuts design time.



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.



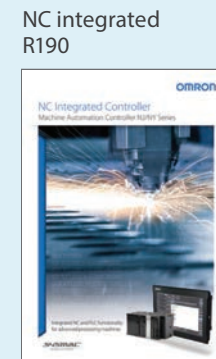
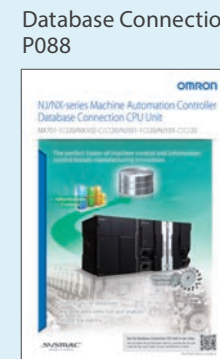
* This function can be used by applying the Team Development Option to Sysmac Studio version 1.20 or higher. Project version control function is supported by CPU Unit version 1.16 or later. Git and the Git logo are either registered trademarks or trademarks of Software Freedom Conservancy, Inc., corporate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

NJ/NX-series Lineup

Series		NX Series			NJ Series								
Product name		NX701 CPU Units	NX102 CPU Units	NX1P2 CPU Units	NJ501 CPU Units				NJ301 CPU Units	NJ101 CPU Units			
Model		NX701-□□□□	NX102-□□□□	NX1P2-□□□□	NJ501-1□□0	NJ501-4□□□	NJ501-1□□20	NJ501-1340	NJ501-5300	NJ301-1□□0	NJ101-□□□0	NJ101-□□□20	
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.	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.			
	Instruction execution times	LD instructions	0.37 ns or more	3.3 ns	3.3 ns	1.1 ns (1.7 ns or less)				1.6 ns (2.5 ns or less)	3.0 ns (4.5 ns or less)		
		Math instructions (for long real data)	3.2 ns or more	70 ns or more	70 ns or more	24 ns or more				35 ns or more	63 ns or more		
	Program capacity	80 MB	5 MB	1.5 MB	20 MB				5 MB	3 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	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			
	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	2,560 points/40 Units (3 Expansion Racks)				2,560 points/40 Units (3 Expansion Racks)	2,560 points/40 Units (3 Expansion Racks)			
	Number of motion axes	128, 256	0, 2, 4, 8 *1	0, 2, 4 *1	16, 32, 64			16	16 *3	4, 8	0, 2		
	EtherCAT slaves	512	64	16	192				192	64			
Number of controlled robots	—	—	—	—	8 robots max. *2	—	—	—	—	—			
Functions	Database connection	● NX701-1□□20	● NX102-□□□20	—	—	● NJ501-4320	●	—	—	—	—	●	
	SECS/GEM communications functions	—	—	—	—	—	—	●	—	—	—		
	Numerical Control (NC) functions	—	—	—	—	—	—	●	—	—	—		
External memory		Memory Cards	Memory Cards	Memory Cards	Memory Cards				Memory Cards	Memory Cards			
Detailed specification (Datasheet)		P141	P130	P116	P140								

*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



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