OMRON

# Machine Automation Controller NJ Series

## NJ Robotics CPU Unit

**NJ501-4□□□**

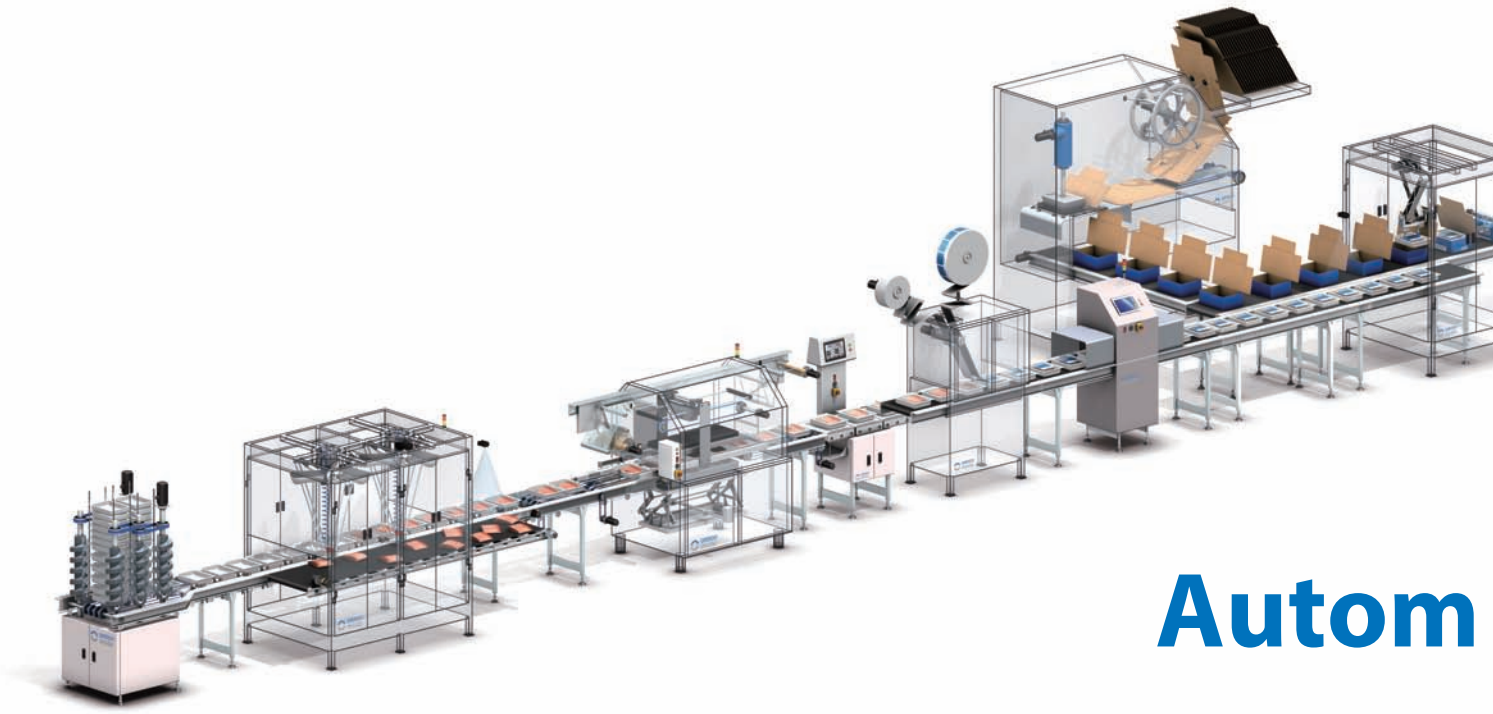

- Parallel, Cartesian and serial robot control functionality
- Increase machine control speed and precision
- Reduce machine development time
- Minimize machine footprint and maximize efficiency

SYSMAC
always in control

# Robot control technology adds flexibility to manufacturing processes: reconfigurable

## Increase control speed and precision

- One machine control to ensure high precision synchronization between conveyor and robot
- High-speed control, from sensor inputs to robot control
- Control of even manipulators synchronized with robot motion via EtherCAT



Autom

## Reduce development time

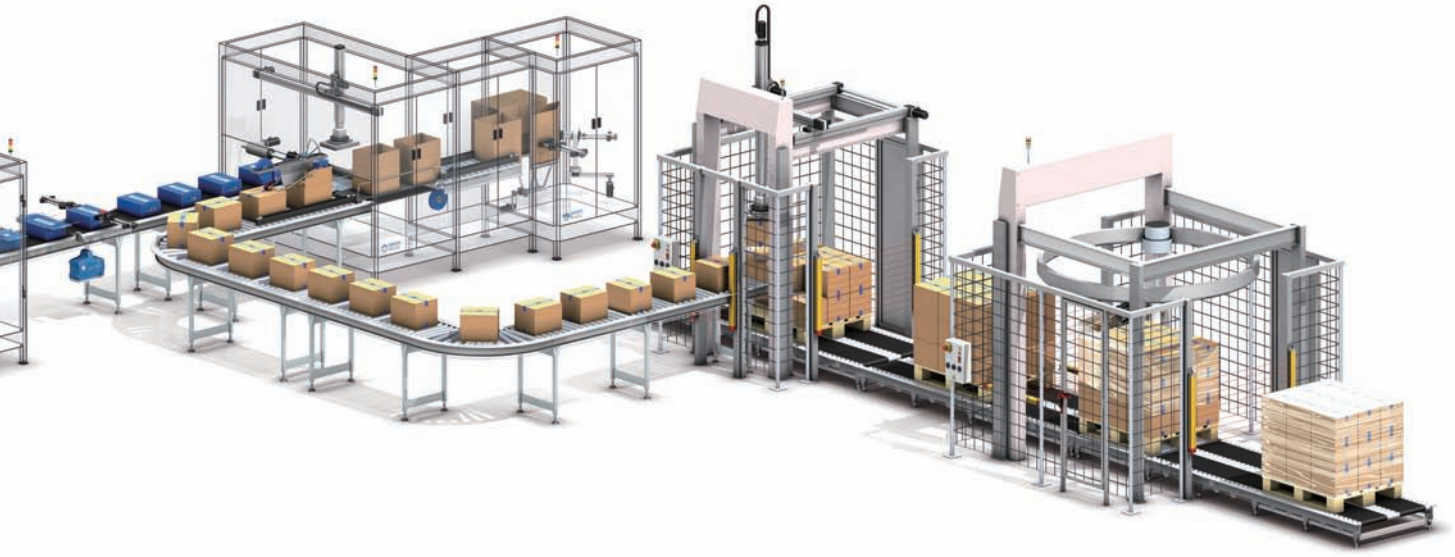
- One language used for programming, from sequence control to robot control
- One software Sysmac Studio to start devices including vision sensors and robots
- Standard IEC 61131-3 based instructions for motion and robot control
- Codes used during integrated simulation can be reused for the real machine
- Easy conveyor tracking by using parallel/Cartesian/SCARA robots

# machines and quick changeovers

## Minimize footprint and maximize efficiency

- One controller to control up to 8* parallel, Cartesian, and serial robots in total
- One network EtherCAT to connect all machine network devices
- One controller system to improve maintenance efficiency

* The number of controlled robots varies according to the number of axes used for the system.



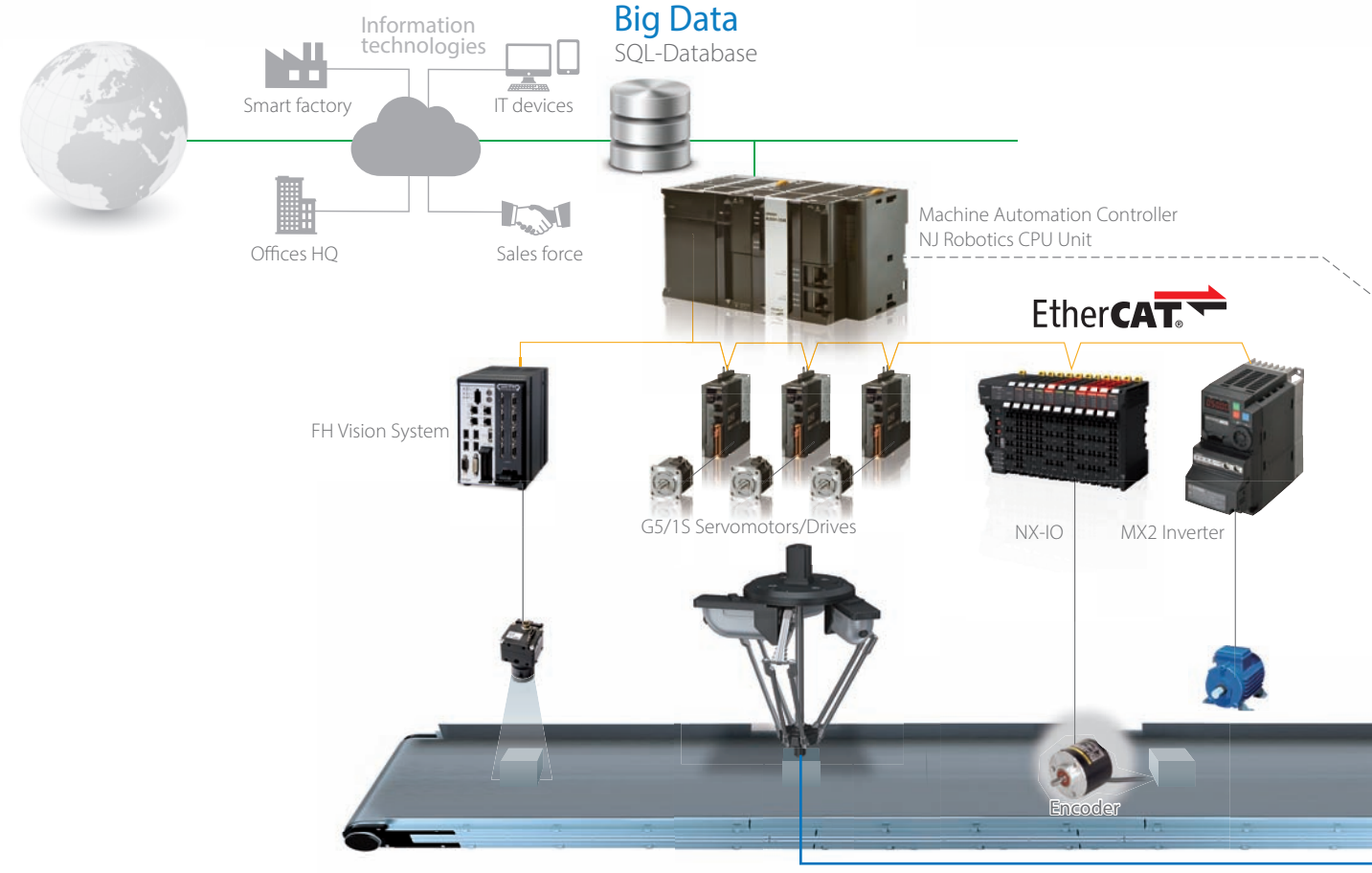
# ation Solution


NJ Robotics CPU Unit
NJ501-4□□□

# The NJ Robotics controller integrates machine bringing new flexibility to build machines

## NJ Robotics controller at the heart of the system

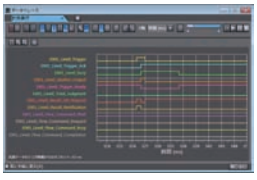
- One controller can connect up to 64 axes including robots
- The control system integrates vision sensors, I/O, safety controllers, and robots within one EtherCAT network
- The database connection model can upload system information to host




## Efficient preliminary verification with integrated simulation

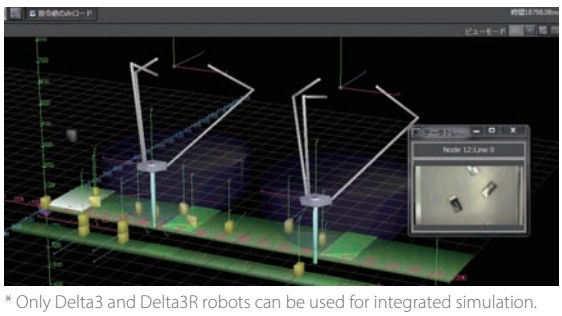
You can perform integrated simulations linked to motion control for robots and inspection and measurement by vision systems.
The virtual environment allows to visualize the machine motion.
The simulation of the synchronization between robots makes complex operation verification easy.

**Vision system simulation**
Inspection and measurement by vision systems can be simulated from the Sysmac Studio.



**Data tracing**
Inputs and outputs of vision systems can be traced as a time series.

**Integrated simulation***
Machine movement can be simulated based on measurement results of vision systems.

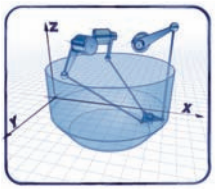


* Only Delta3 and Delta3R robots can be used for integrated simulation.

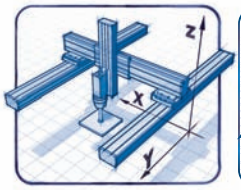
# control and robot control,

## Scalable and easy programming of any type of robots

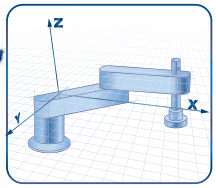
When building conveyor tracking applications, you can program Pick & Place control systems by using the same program structure in the same programming manner regardless of the robot type: parallel, Cartesian , or SCARA robot.



Delta robot 3 axis



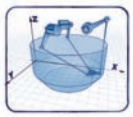
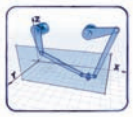
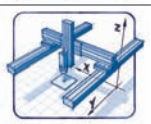
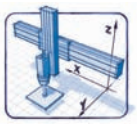
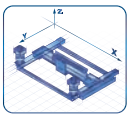
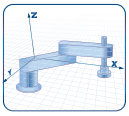
Gantry robot



SCARA robot

### Pick & Place control
### Robot instructions common to all robots

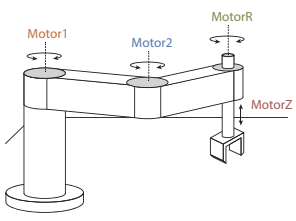
- Set Kinematics Transformation
- Group Monitor
- Inverse Kinematics
- Define Coordinate System

| | | |
|---|---|---|
| Parallel | Delta-3 |  |
| | Delta-3R | |
| | Delta-2 |  |
| Cartesian | Cartesian 3D |  |
| | Cartesian 3D Gantry | |
| | Cartesian 2D (XY) |  |
| | Cartesian 2D (XZ) | |
| | Cartesian 2D (YZ) | |
| | Cartesian 2D Gantry | |
| | H-Bot XY |  |
| Serial | SCARA RRP+R |  |
| | SCARA PRR+R | |
| | 3-AXES |  |

## Multi-axis setup and tuning

### Multi - drive window

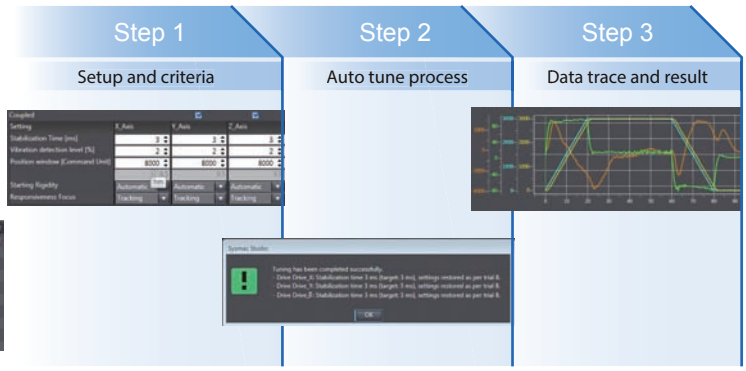
Adjusting, monitoring parameters of the robot's drives is done easily in a single view.





### Multi axis tuning wizard

Several 1S servo drives can be tuned simultaneously in a short amount of time.



# Build a vision-guided robots in 5 steps

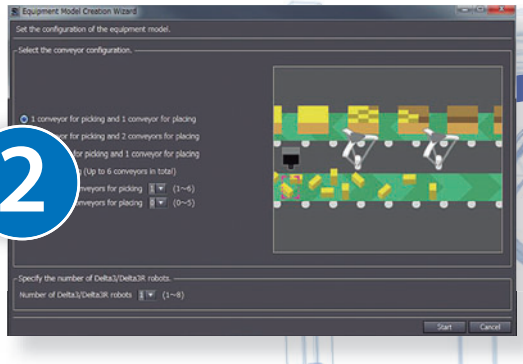
## Since the beginning, our main goal for this new development was very clear: Making Pick & Place machine programming easier.

Far from the old and rigid top-down programming manner our solution is based on Wizards that guide the user through the main steps using a graphical interface to operate with an unique software tool capable to manage Robotics and Vision seamlessly at the same time.

< VIRTUAL

### Import the pictures into Sysmac Studio wizard

- Using the Sysmac Studio wizard you can define the layout of the Pick & Place machine, selecting how many robots and conveyors you have and choose between the most typical layout templates.

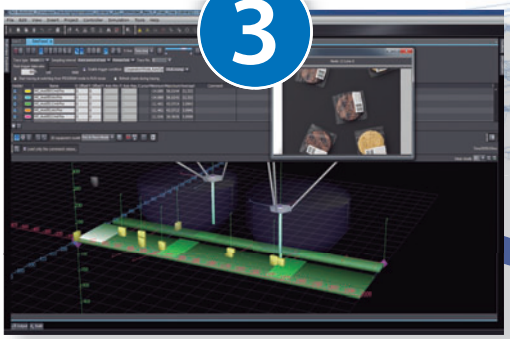



2

PATENTED

PATENTED

3



### 3D Simulation

- Sysmac Studio generates the 3D simulation environment according to the parameters defined in the previous steps.
- The integrated graphical environment enables visualizing the Pick & Place machine and the Vision simulation at the same time.
- Moreover, the images captured in the Step 1 are automatically converted into the corresponding virtual products that run over the picking conveyor.

4

### Reuse of codes

- The 3D simulation is very reliable since it is based on the real system cores so you can reuse the whole programming to control the real machine by signifi cantly shortening the commissioning time.

Virtualize your Pick & Place machine into the integrated 3D Simulator and make it Real in 5 simple steps, guided by intuitive wizards.

REAL >


## Image capturing

- The first step is to take the pictures of the products to handle. Yes just as easy as it sounds!
- The wide portfolio of our FH cameras allows to optimize your choice.

## Easy tuning on site P&P and FH Vision

- The finalization of your project is guided by a Vision system wizard that calibrates the Virtual machine against the Real machine.
- It take just few minutes to place a matrix calibration sheet into the machine and follow the wizard that will align the robots and the vision systems to minimize any kind of measurement error.

**Benefits** include **time optimization** and reduction for the complete project

**Project proposal and Concept**

**30%**

SAVE 70%

**Design, Engineering and Test run**

**50%**

SAVE 50%

**Commissioning and Maintenance**

**60%**

SAVE 40%

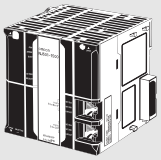
# Ordering Information

**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 and KC: KC Registration.
- Contact your OMRON representative for further details and applicable conditions for these standards.

**Use for robot systems**
Contact your OMRON representive for further details and conditions for robot systems.

## NJ-series CPU Units

| Product Name | Specifications | | | | Number of controlled robots | Database Connection function | Current consumption (A) | | Model | Standards |
|---|---|---|---|---|---|---|---|---|---|---|
| | I/O capacity / maximum number of configuration Units (Expansion Racks) | Program capacity | Memory capacity for variables | Number of motion axes | | | 5 VDC | 24 VDC | | |
| NJ-series CPU Units  | 2,560 points / 40 Units (3 Expansion Racks) | 20 MB | 2 MB: Retained during power interruption 4 MB: Not retained during power interruption | 64 | 8 max. * | No | 1.90 | – | **NJ501-4500** | UC1, N, L, CE, RCM, KC |
| | | | | 32 | | | | | **NJ501-4400** | |
| | | | | 16 | | | | | **NJ501-4300** | |
| | | | | 16 | 1 | | | | **NJ501-4310** | |
| | | | | 16 | 8 max. * | Yes | | | **NJ501-4320** | |

✻ The number of controlled robots varies according to the number of axes used for the system.

### Automation Software Sysmac Studio

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.

For details, refer to your local OMRON website and Sysmac Studio Catalog (Cat. No. P138).

# Accessories

The following accessories come with the CPU Unit.

| Item | Specification |
|---|---|
| **Battery** | CJ1W-BAT01 |
| **End Cover** | CJ1W-TER01 (necessary to be connected to the right end of the CPU Rack.) |
| **End Plate** | PFP-M (2 pcs) |

For details, refer to the data sheet of the Machine Automation Controller NJ-Series (Cat. No. P140).

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**Note: Do not use this document to operate the Unit.**

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