

# Sysmac: A fully integrated platform

One connection - One software - One machine controller

## FACTORY AUTOMATION

HMI · Programming · DB connection · IT systems



## MACHINE CONTROL

Servo · Inverter · I/O · Safety · Vision · Robotics · Sensing

# Omron provides tailored solutions

## Flexible and integrated production business models

In today's globalized manufacturing environment, diverse and complex challenges arise and need to be overcome. The global market rapidly changes, and manufacturing companies are under increasing pressure to supply products in a timely manner that satisfy a wide variety of consumer needs. Omron industrial automation makes efficient, flexible and cost effective manufacturing possible.



### Innovation

- New technology for smart manufacturing
- Collaboration between humans and machines
- Environmentally safe products



### Productivity

- Integrated systems for optimized manufacturing
- Production data available in real-time
- In-line quality inspection: zero defects



### Flexibility

- Quick product changeovers
- Openness and third party connectivity
- Scalable systems for optimum solutions



### Reliability

- Non-stop processes, 24/7 operation
- Extended product lifecycle

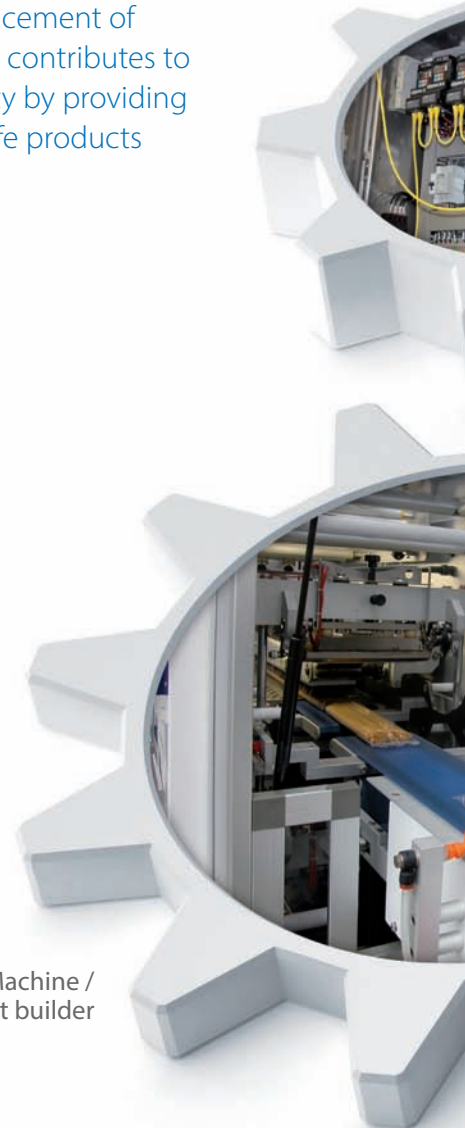


### Globalization

- Products meet global standards
- Local support for training, repairs and spare-parts supply
- Engineering environment compliance with global standards

- ✓ Through automation, **Omron** supports the advancement of manufacturing and contributes to a sustainable society by providing environmentally safe products

Machine /  
Equipment builder



- ✓ The **Sysmac** technology platform ensures a flexible and integrated production business model

Manufacturer

Panel builder /  
System integrator



# Sysmac: A fully integrated platform

## Integration and Functionality

Sysmac is an integrated automation platform dedicated to providing complete control and management of your automation plant. At the core of this platform, the Machine Controller series offers synchronous control of all machine devices and advanced functionality such as motion, robotics and database connectivity. This multidisciplinary concept allows you to simplify solution architecture, reduce programming and optimize productivity.

### ✓ One Machine Controller

Complete integration of motion and logic sequence



FACTORY  
AUTOMATION

MACHINE  
CONTROL

Machine Automation Controller /  
Industrial PC with Sysmac Machine Control

## Motion



Filling line

- Motion Control: Integrated within the IDE, and operating in real-time
- Standard PLCopen Function Blocks plus Omron generated motion FB's
- Direct Synchronous control for Position, Speed and Torque

## Safety

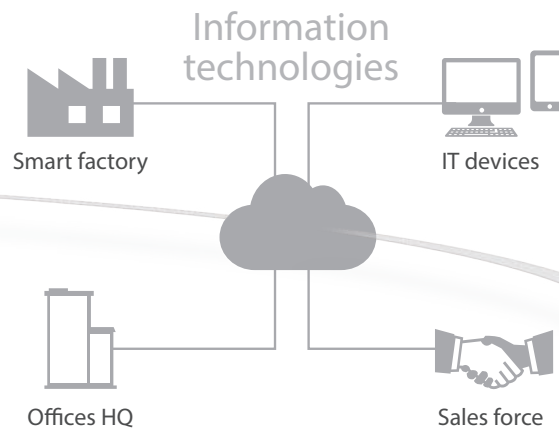


Assembly

### ✓ One Integrated Development Environment software for Configuration, Programming, Simulation and Monitoring

- The simplest way to integrate safety improves productivity and safety
- The PLCopen® safety FB's simplify and accelerate the development process





## Information



- Sysmac communicates in real-time with Databases such as SQL
- Secure Data: In the event of a server going down or losing communications, data is automatically stored in internal memory
- Sysmac operates with Databases at high speed [1000 table element/ 100 ms] ensuring realistic Big Data Processing to improve productivity and aid predictive maintenance etc.

- ✓ **Integrated Automation Control:**  
The Sysmac platform is scalable and provides the performance and functionality for a wide range of solutions from simple machines through to manufacturing cells

## Vision



- Higher resolution images available without increasing the vision processing time
- Shape search technology: Provides more stable and accurate object detection for Pick & Place projects

## Robot



- One controller integrates two different types of engines, one based on cyclic scanning (PLC feature) and another based on procedural programming (robot feature), providing direct control of robots

## Sensing

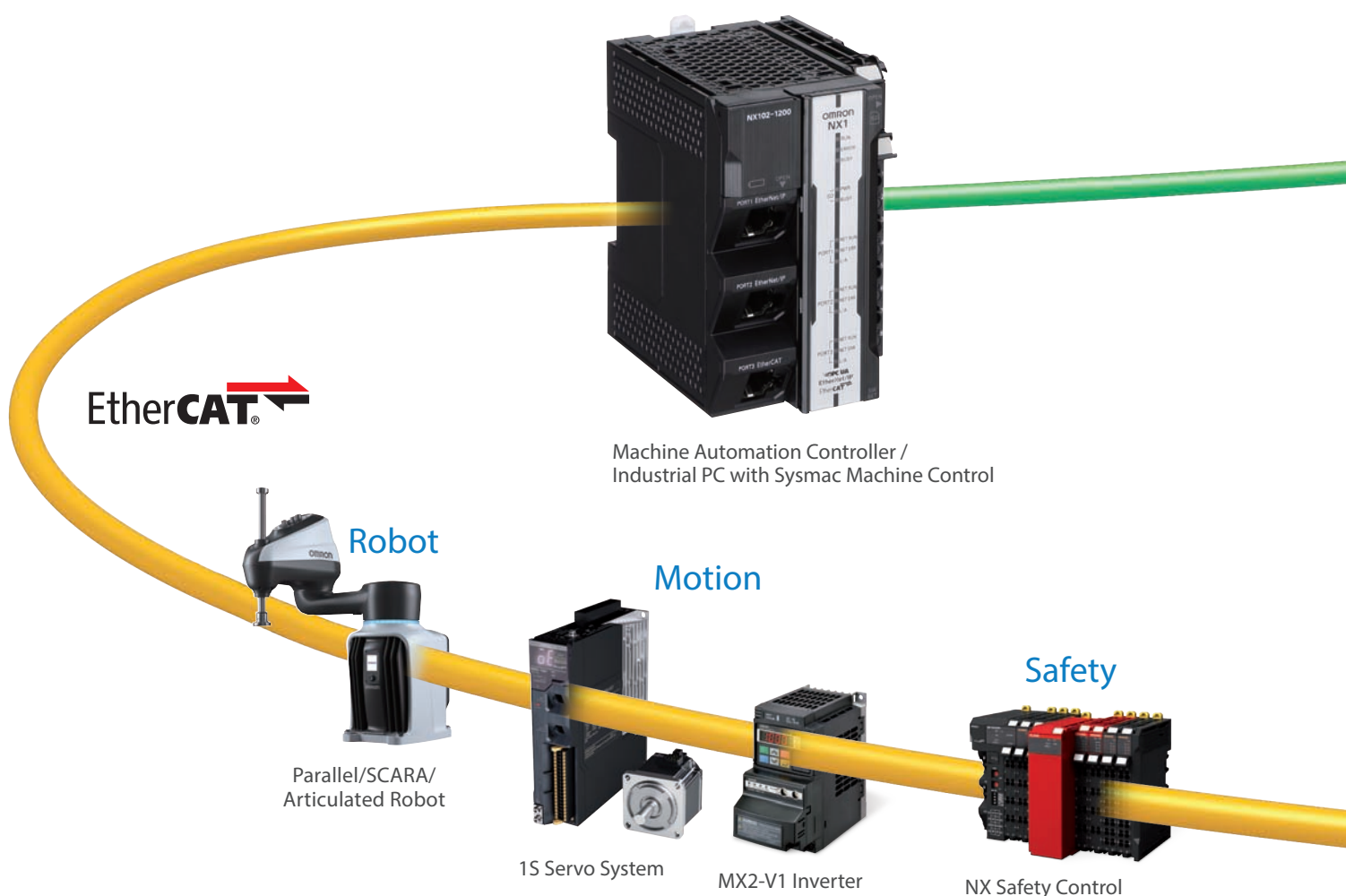


- Full control of the process parameter setting and predictive maintenance functions
- High precision detection and positioning data synchronized on the network

# One Connection

## Seamless machine control and factory automation

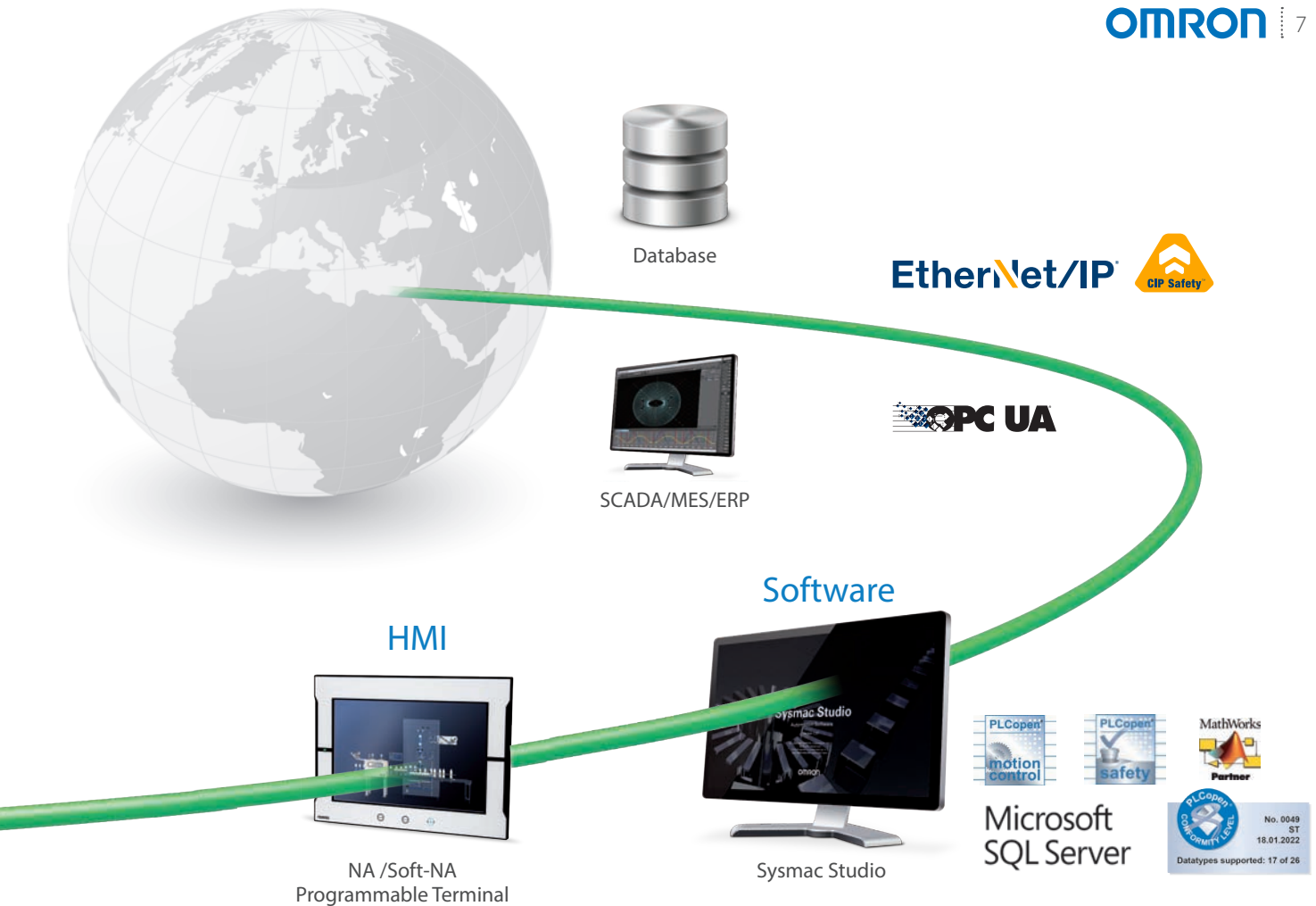
One machine control through one connection and one software is how we define the Sysmac automation platform. The Machine Automation Controller integrates logic, motion, safety, robotics, vision, information, visualization and networking under one software: Sysmac Studio. This one software provides a true Integrated Development Environment (IDE) that also includes a custom 3D motion simulation tool. The machine controller comes standard with built-in EtherCAT and EtherNet/IP. The two networks with one connection purpose and integrated safety are the perfect match between fast real time machine control and data plant management.



### EtherCAT - Machine Control

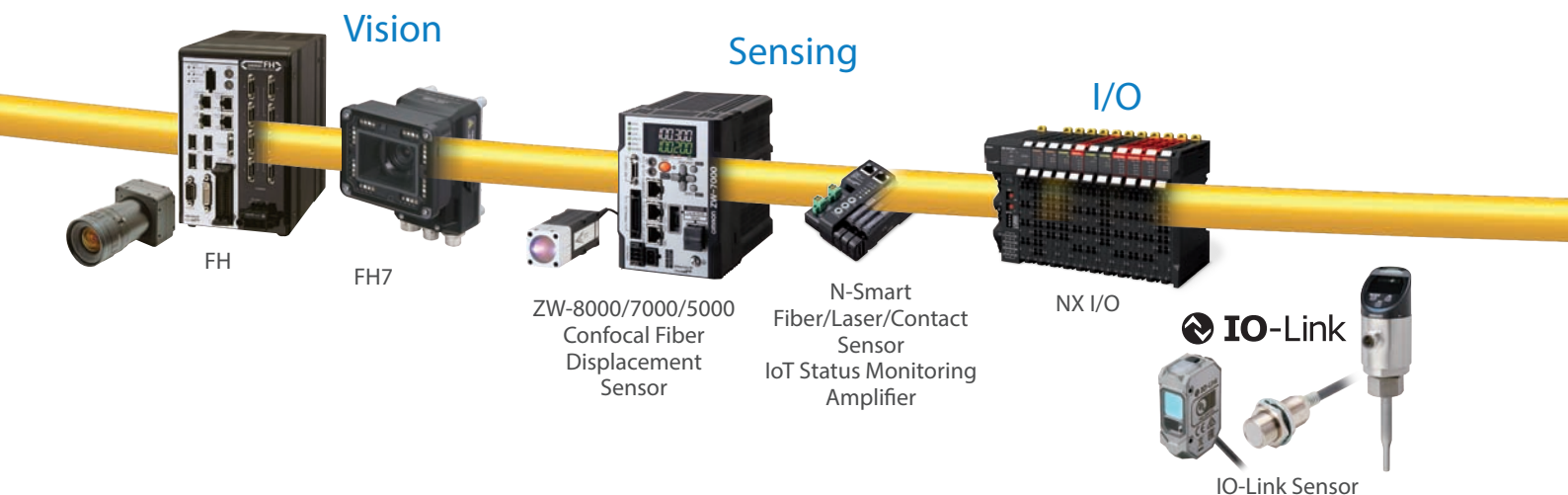
- Redundancy minimizes downtime
- Flexible system configuration using a variety of slaves
- Fast and precise: Fastest cycle time of 125  $\mu$ s, synchronization with 1  $\mu$ s jitter
- 512 slaves
- Embedded in Omron servo drive, inverter, I/O, Safety, Vision and Sensing
- Uses standard STP Ethernet cable with RJ45 connectors
- One connection using Safety over EtherCAT (FSOE) protocol

Safety over  
**EtherCAT**



### Ethernet - Factory Automation

- Peer-to-Peer controller communication
- Interface with Sysmac Studio , NA HMI or SCADA software
- Database connection for Microsoft SQL Server, Oracle, IBM DB2, MySQL and Firebird
- FTP server
- Safety integrated via CIP Safety
- Secure cloud connection by MQTTs communication



# One Software

## One Integrated Development Environment Software

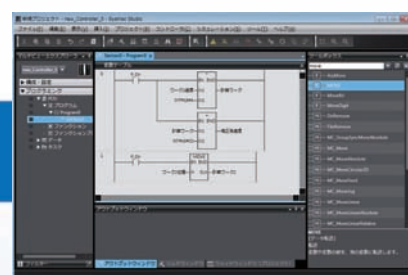
Created to give you complete control over your automation system, Sysmac Studio integrates configuration, programming and monitoring. Graphics-oriented configuration allows quick set-up of the controller, field devices and networks while machine, motion, and safety programming based on IEC standard and PLCopen® Function Blocks for Motion Control and Safety cuts programming time. Smart Editor with On-line debugging helps quick and error free programming. Advanced simulation of sequence and motion control, and data trace reduce machine tuning and set-up.



## Design

### Reusable programs

#### Programming with variables

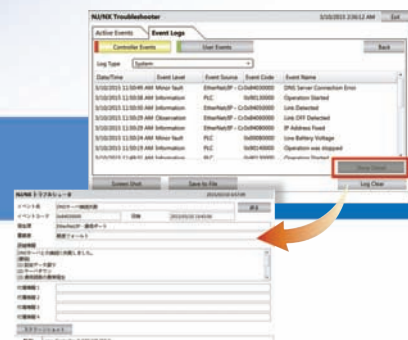


One Integrated Development Environment software Sysmac Studio is fully compliant with the open standard IEC 61131-3. Programming with variables eliminates the need to learn the internal memory map of the PLC and allows the programs to be reused.

## 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.

\*1. 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.

\*2. Available with the Sysmac Studio 64-bit version. 3D CAD data supports STEP/IGES.



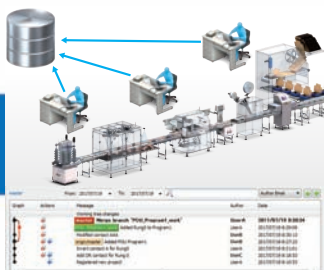


## Collection of software functional components Sysmac Library

Packed with Omron's rich technical know-how, the Function Blocks in the Sysmac Library for advanced applications and motion control cut programming time.

### Development by multiple developers

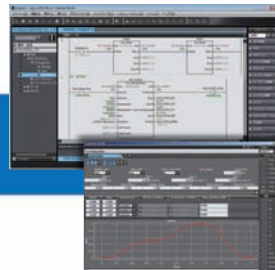
#### Project version control function\*1



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.

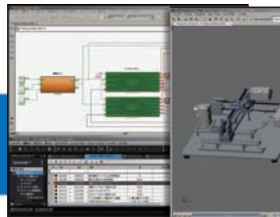
### For advanced machine control

#### Motion programming

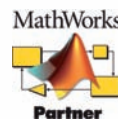


Advanced motion control applications can be created quickly just by combining PLCopen® Function Blocks for Motion Control.

#### Model-Based design

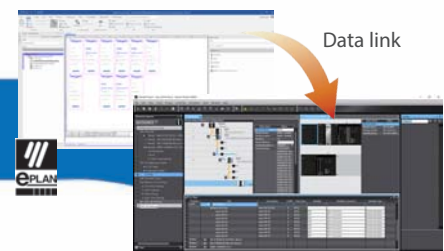


Complex feedback control that is designed with MATLAB®/Simulink® can be imported into programs.



### Efficient designing linked to electrical CAD

#### AutomationML import function **NEW** Electrical CAD



Circuit diagrams designed using electrical CAD data (e.g., unit configurations and signal lines) can be imported to the Sysmac Studio and automatically reflected in unit configurations and settings and allocated variables. Seamless and accurate setup using electrical CAD design data speeds up the engineering process and improves design efficiency.



## Verification

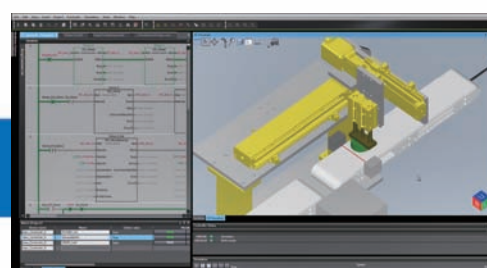
### Fast system debugging

#### 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



Enhanced by 3D simulation option\*2

Use only the Sysmac Studio with loaded 3D CAD data\*2 for 3D simulations. Operation of a control program can be verified in a virtual environment, improving program accuracy during design and reducing rework during verification using physical devices.

For more information, see the video:  
[www.fa.omron.co.jp/3d-simulation\\_e](http://www.fa.omron.co.jp/3d-simulation_e)



Debugging in conjunction with a third-party simulator is possible.



# One Machine Controller

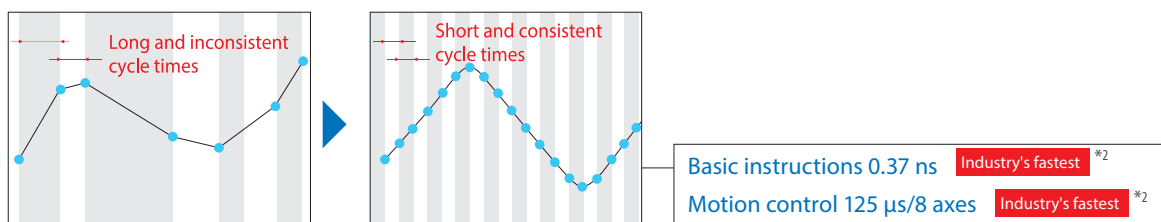
## NJ/NX/NY Machine Automation Controller

### Powerful, yet easy to configure

The NJ/NX/NY Controller is at the heart of the Sysmac platform. One integrated controller is designed to meet extreme requirements in terms of logic sequence and motion control speed and accuracy. Standard programming and open networks make it easy to build your automation system.

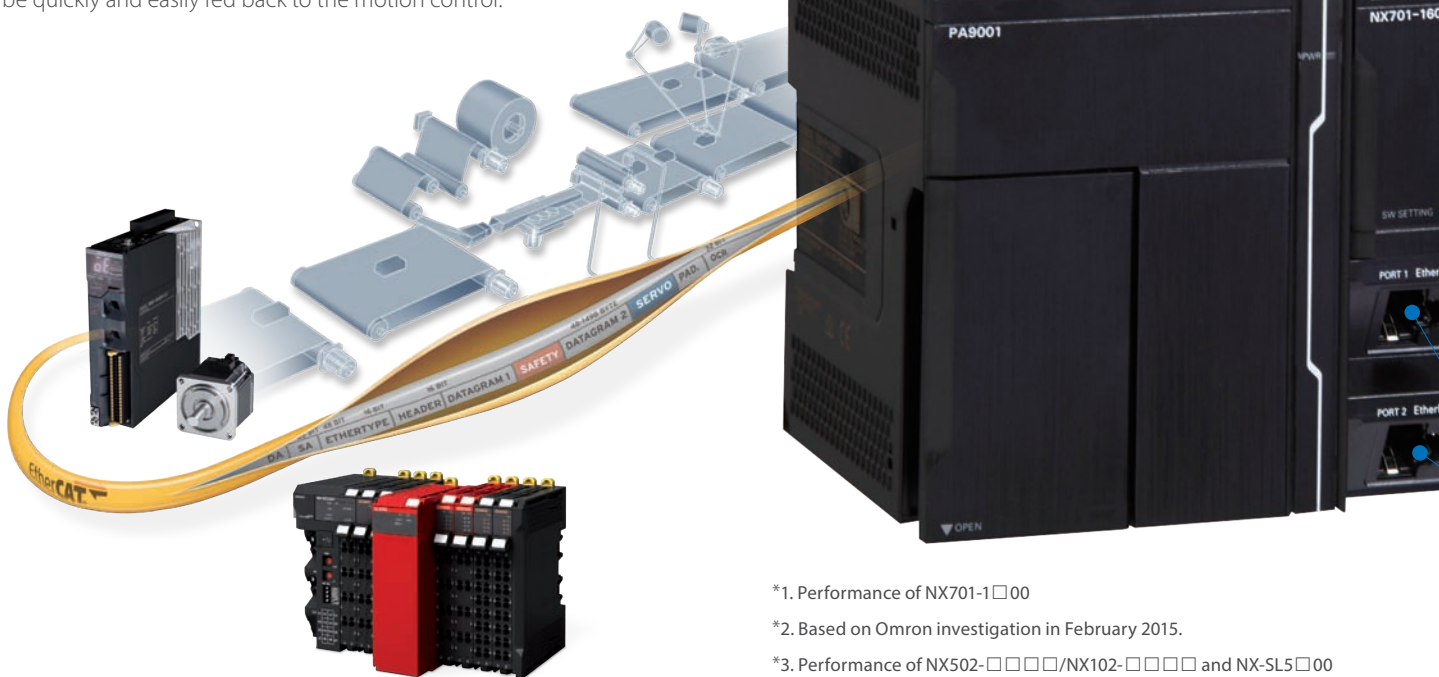
### High-speed, high-precision control<sup>\*1</sup>

Architecture based on Intel® Core™ processor significantly speeds up the execution of instructions (basic instructions 0.37 ns, math instructions for Long Real Data 3.2 ns). Command values to send to servomotors and stepper motors can be updated as fast as every 125 μs. This enables smooth cam motion and high-precision interpolation and phase adjustment between axes.



### 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.



### Integrated safety into machine control<sup>\*3</sup>

The controller integrates safety control into machine control in lines that require fast cycle times. It also integrates two different open networks: EtherNet/IP for safety control in production lines and EtherCAT for safety control in machines.

<sup>\*1</sup>. Performance of NX701-1□□00

<sup>\*2</sup>. Based on Omron investigation in February 2015.

<sup>\*3</sup>. Performance of NX502-1□□□□/NX102-□□□□ and NX-SL5□□00

<sup>\*4</sup>. Database connection CPU unit:  
NX502-1□□00/NX102-□□20/NJ□□01-□□20

<sup>\*5</sup>. Performance of NX701-1□□□/NX502-1□□00/NX102-□□□□/  
NJ501-1□□00

<sup>\*6</sup>. Performance of NX502-1□□00/NX102-□□□□/NX1P2-□□□□

<sup>\*7</sup>. Performance of NX502-1□□00/NX102-□□□□

### Fast machine data storage in database\*4

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.

### Secure host connection

OPC UA is an IEC communication protocol which is listed as a recommendation for Industrie 4.0 and PackML. The controller comes equipped with an OPC UA server interface and provides a secure connection to IT systems such as MES and ERP.\*5

The controllers provides a easily and secure connection to the cloud by using MQTT Communications Library.\*6



#### Supported database

- Microsoft SQL server
- Oracle Database
- IBM DB2
- MySQL
- PostgreSQL
- Firebird

### Standard programming

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



### Global standard networks

**EtherCAT**  
Standard Machine Network

Safety over  
**EtherCAT**

**EtherNet/IP**  
Standard Factory Network



### Collection of software functional components Sysmac Library

- FB library option for advanced applications (vibration suppression, temperature control, motion control...)
- High quality products with reliable global support



# Drive machine innovation by increasing speed

## Case 1: High-speed alignment and vibration-free handling

### Problems

1. Precisely stacking many sheets increases cycle time because retries caused by mechanical errors increase positioning time.
2. Vibration settling time is required when high-speed handling is stopped. Speed must be reduced to suppress vibration.

### 1. High-speed, high-precision alignment system

The FH Vision System provides the Shape Search function for fast and accurate shape recognition and Visual Feedback that feeds back the current position to control the motor in every measurement cycle. These increase alignment speed without sacrificing accuracy.



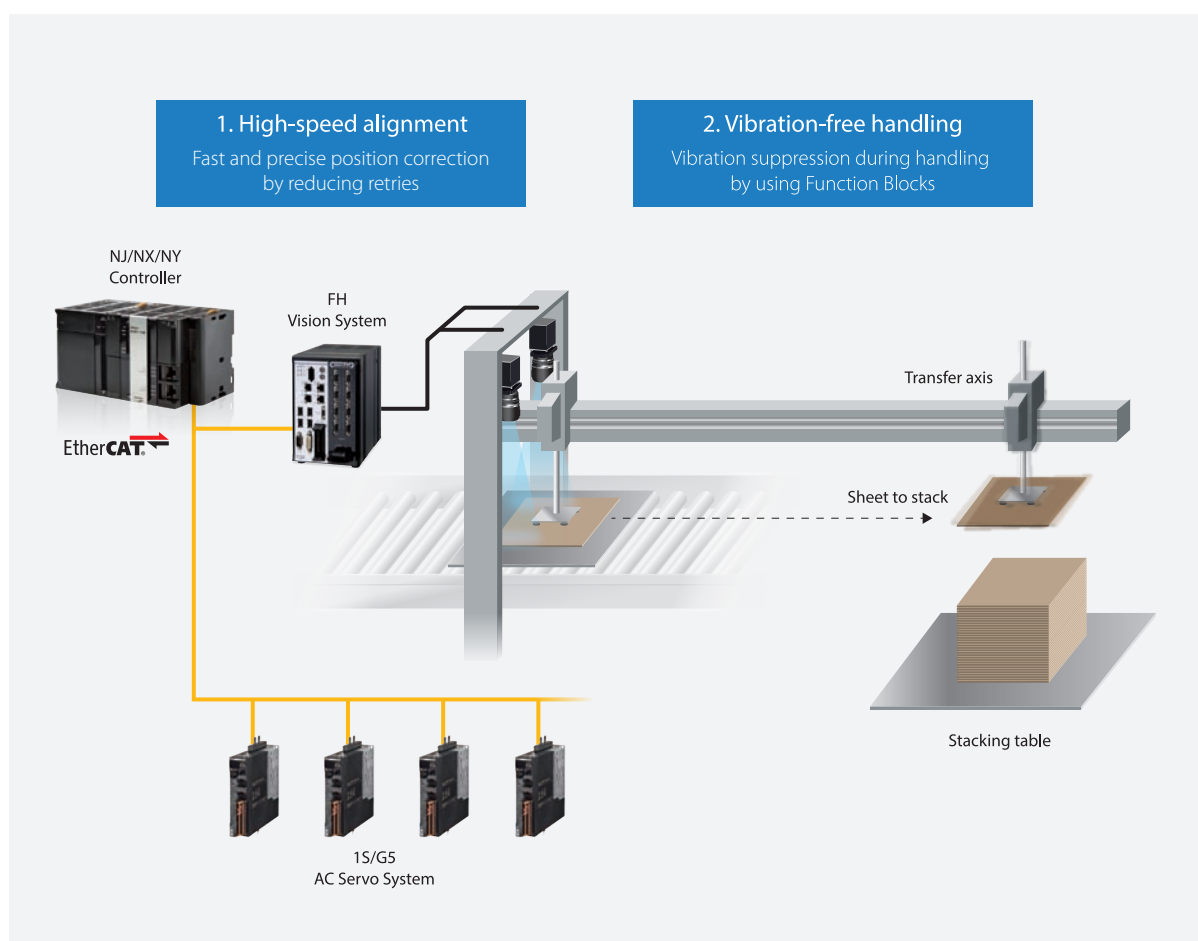
Visual Feedback  
Alignment Library

### 2. Software functional components for vibration suppression

The Vibration Suppression Library facilitate programming for high-speed handling while suppressing vibration. Waiting time is reduced, and positional accuracy is increased.



Vibration  
Suppression  
Library





# and precision and maximizing uptime

## Case 2: Data utilization improves yield

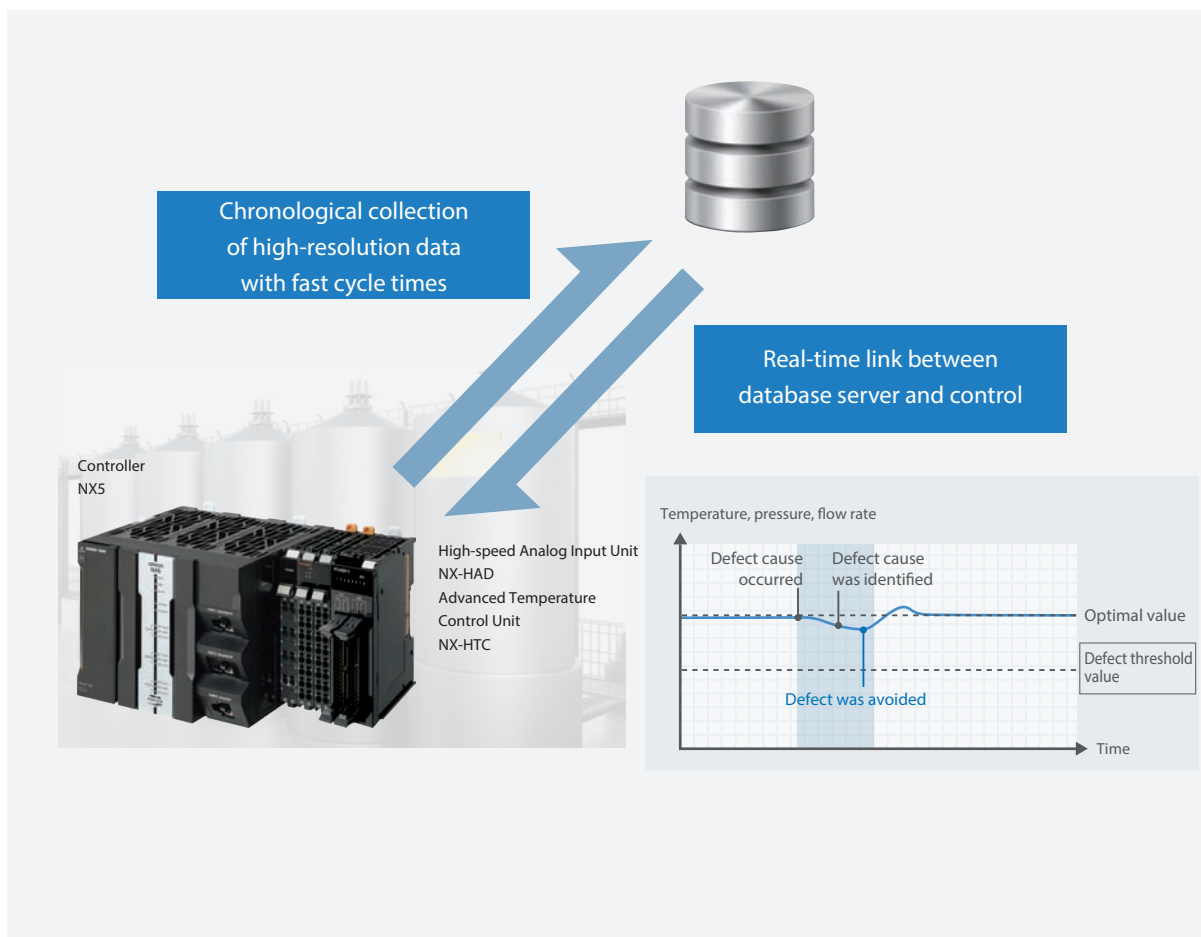
### Problems

The amount of equipment data to find optimal processing conditions is so large that it takes time to transfer data and feed back analysis results. This results in low yield.

### Real-time feedback increases yield

With approximately four times the data transfer capability of the NJ5 Series, NX5 can transfer all of the high-resolution data to a database at high speeds.

NX5 also reflects results of database analysis in processing conditions in real time, contributing to defect prevention and yield improvement.



## Case 3: Increase equipment availability through integrated safety

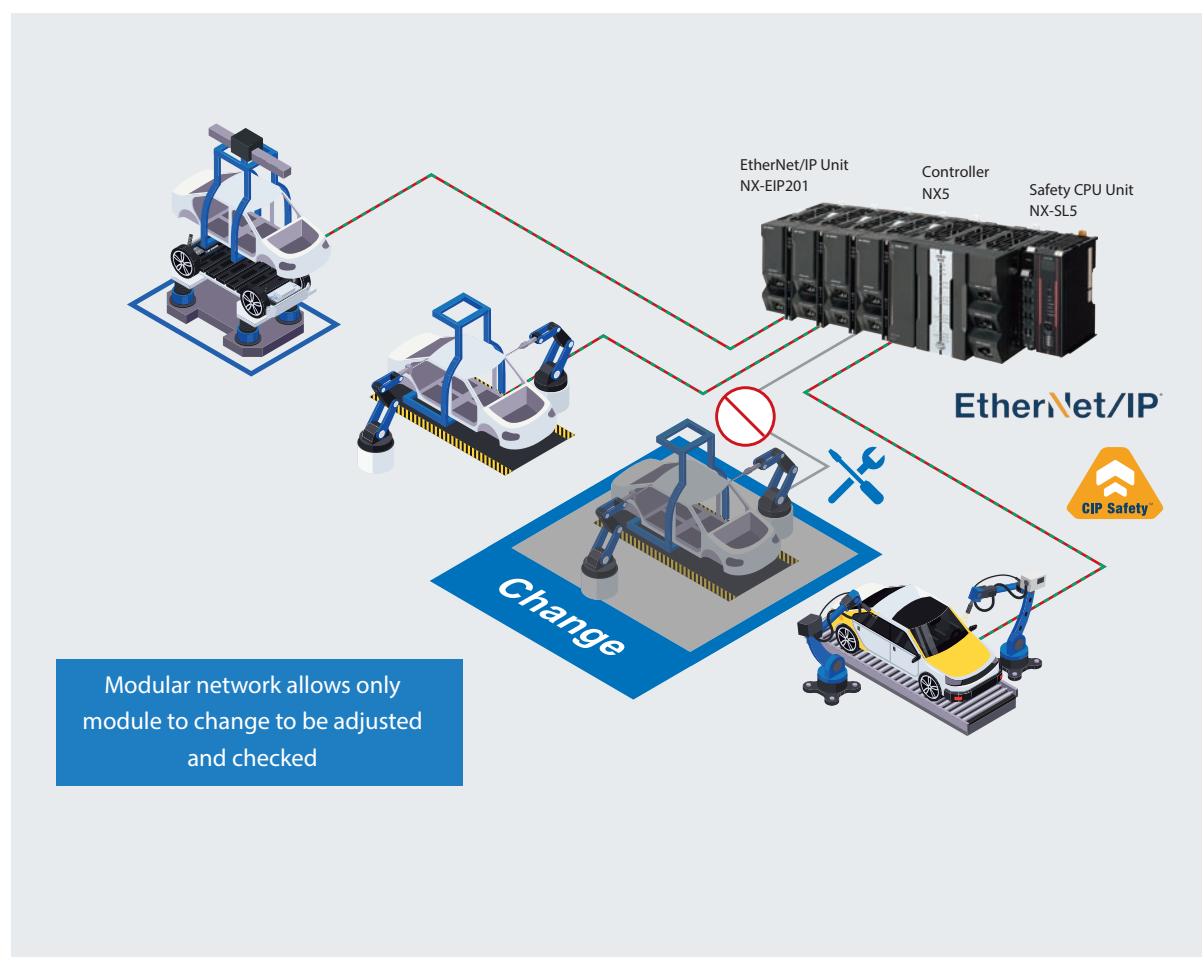
### Problems

1. Manufacturers need to cope with rapid demand changes by building flexible equipment.
2. Network power supply must be turned off for changing a process because safety communications are configured within the same network segment. This results in long lead time.

### Safety integrated controller enables modular safety network configuration

Control and safety integrated controller and up to eight separate CIP Safety networks enable you to modularize network configurations including safety as well as software and hardware.

The localized process to change can be adjusted and checked without stopping the entire production line, significantly reducing lead time for line changes.



## Case 4: Redundancy minimizes downtime

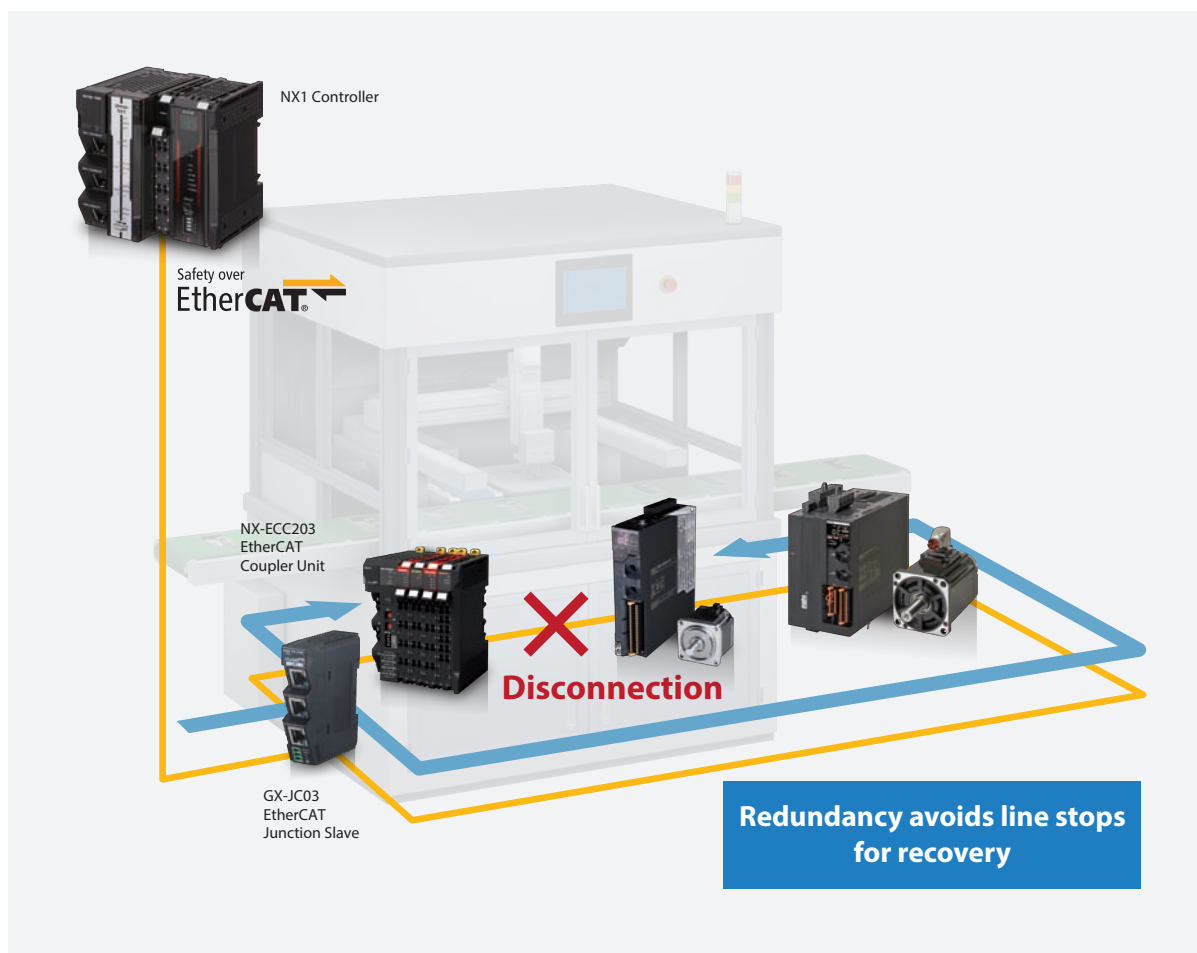
### Problems

1. It takes time to recover from an unexpected production line stop, significantly reducing uptime.
2. The safety system stops the entire line due to disconnection or other causes even when there is no danger.

### Cable Redundancy

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 and safety control.

The line stops only when operators are in danger, which ensures safety.



# Sysmac Family

## Controller

### NX5 Machine Automation Controller CPU Unit

Integrated control, information, and safety brings a new level of speed to manufacturing sites

#### Control for fast-cycle, high-precision processing

- Controls 32 axes with cycle time of 250  $\mu$ s
- Used motion control servo axes: 64, 32, 16 axes
- Program capacity: 80 MB
- Memory capacity for variables: 260 MB\*<sup>1</sup>

#### Diverse information utilization

- SQL functionality for reliable, rapid, and easy direct access to databases
- Use of MQTT for data collection directly to cloud
- OPC UA functionality for secure connection to MES and ERP
- 10 x 1 Gbps ports for high-speed, high-capacity communications\*<sup>2</sup>



#### 2 different open networks for safety control of production lines and machines

Fail Safe over EtherCAT (FSoE)

- High speed and high reliability with redundancy, suitable for safety control in machine
- 254 connections for large and flexible production line

Common Industrial Protocol Safety (CIP Safety)

- High scalability, suitable for safety control across production line
- Up to 8 separate networks for network modularization

\*1. Total value of retain attribute memory and no retain attribute memory

\*2. Four NX-EIP201 EtherNet/IP Units per NX5



## NX1 Machine Automation Controller CPU Unit

Helps improve production efficiency of small systems

### Integration of control and information into a miniaturized housing

- 3 industrial Ethernet ports and a power supply housed in a compact design with a width of 66 mm
- Multicore processor and OPC UA functionality



## NX7 Machine Automation Controller CPU Unit

Offers exceptional speed without compromising on reliability

### High-speed, high-precision control of large-scale systems

- Motion control axes: 256 axes
- Instruction execution times (LD instructions) 0.37 ns
- Controls 8 axes with cycle time of 125 µs



## NJ501-R□□□ Robot integrated CPU unit

Integration of logic, motion, Omron Robot and kinematics in one CPU

### Industry first\*:

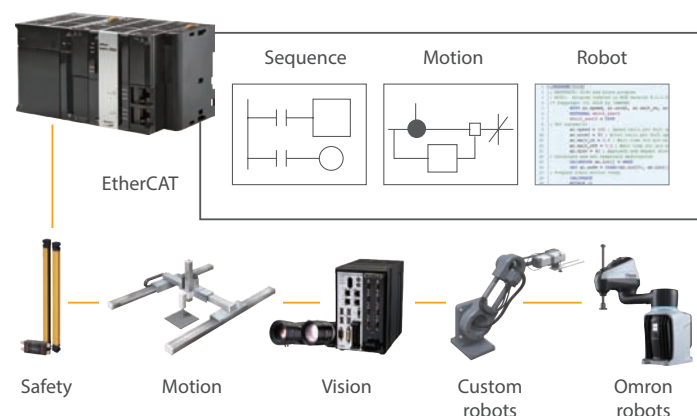
### Integrated control of different engines

- Integrates two different types of engines, one based on cyclic scanning (PLC control) and another based on procedural programming (robot control)

### Collection of trully useful data

- Synchronizes control of robots, motion, vision sensors and other devices on an EtherCAT network, ensuring data concurrency
- Direct access to a database and real-time data collection

Robot integrated  
CPU unit NJ501-R







\* Based on Omron investigation in November 2019

# Sysmac Family

## Controller





### Lineup

| Series                             |  |  | NX Series   |  |   |  |
|------------------------------------|--|--|---|--|---|--|
| Product name                       |  |  | NX701 CPU Units   | NX502 CPU Units  | NX102 CPU Units   | NX1P2 CPU Units  |
| Model                              |  |  | NX701-□□□□  | NX502-□□□□   | NX102-□□□□  | NX1P2-□□□□   |
| Appearance                         |  |  | <br>OPC UA<br>(NX701-1□□□) | <br>OPC UA  | <br>OPC UA |                       |
|                                    |  |  |   |  |   |  |
| Specifications                     | CPU Unit features  |  | Ideal for large-scale, fast, and highly-accurate control with up to 256 axes.                               | Ideal for large-scale, fast, and highly-accurate control with up to 64 axes. Used with NX-EIP201 to configure up to 10 EtherNet/IP networks. | 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   | 0.53 ns or more  | 3.3 ns  | 3.3 ns   |
|                                    |  | Math instructions (for long real data) | 3.2 ns or more  | 3.3 ns or more   | 70 ns or more   | 70 ns or more  |
|                                    | Program capacity   |  | 80 MB   | 80 MB  | 5 MB  | 1.5 MB   |
|                                    | Variable capacity  |  | 4 MB: Retained during power interruptions<br>256 MB: Not retained during power interruptions                | 4 MB: Retain attributes<br>256 MB: No Retain attributes  | 1.5 MB: Retained during power interruptions<br>32 MB: Not retained during power interruptions | 32 KB: Retained during power interruptions<br>2 MB: Not retained during power interruptions              |
|                                    | I/O capacity/maximum number of configuration Units (Expansion Racks) |  | —   | —<br>Up to 63 NX I/O Units connectable   | —<br>Up to 32 NX I/O Units connectable  | Built-in I/O: 40 points max.<br>Up to eight NX I/O Units connectable                                     |
|                                    | Number of motion axes  |  | 128, 256  | 16, 32, 64   | 0, 2, 4, 8 *1   | 0, 2, 4 *1   |
|                                    | EtherCAT slaves  |  | 512   | 256  | 64  | 16   |
|                                    | Number of controlled robots  |  | —   | —  | —   | —  |
| Number of controlled OMRON 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  | Memory Cards   |
| Detailed specification (Datasheet) |  |  | P141  | P159   | 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.

| NJ Series       |  |                     |                     |            |            |                 |   |  |            |
|-----------------|--|---------------------|---------------------|------------|------------|-----------------|---|--|------------|
| NJ501 CPU Units |  |                     |                     |            |            | NJ301 CPU Units |   | NJ101 CPU Units  |            |
|                 | NJ501-1□00   | NJ501-R□□□          | NJ501-4□□□          | NJ501-1□20 | NJ501-1340 | NJ501-5300      | NJ301-1□00  | NJ101-□□00   | NJ101-□□20 |
|                 | <div><br/>(NJ501-1□00)</div> <div></div> |                     |                     |            |            |                 | <div></div> | <div></div> |            |
|                 | 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<br>4 MB: Not retained during power interruptions   |                     |                     |            |            |                 | 0.5 MB: Retained during power interruptions<br>2 MB: Not retained during power interruptions  | 0.5 MB: Retained during power interruptions<br>2 MB: Not retained during power interruptions   |            |
|                 | 2,560 points/40 Units<br>(3 Expansion Racks)   |                     |                     |            |            |                 | 2,560 points/40 Units<br>(3 Expansion Racks)  | 2,560 points/40 Units<br>(3 Expansion Racks)   |            |
|                 | 16, 32, 64   |                     |                     |            | 16         | 16 *3           | 4, 8  | 0, 2   |            |
|                 | 192  |                     |                     |            |            |                 | 192   | 64   |            |
|                 | —  | 8 robots max.<br>*2 | 8 robots max.<br>*2 | —          |            |                 | —   | —  |            |
|                 | —  | 8 robots max.       | —                   | —          |            |                 | —   | —  |            |
|                 | —  | ● NJ501-R□20        | ● NJ501-4320        | ●          | —          |                 | —   | —  | ●          |
|                 | —  |                     |                     |            | ●          | —               | —   | —  |            |
|                 | —  |                     |                     |            |            | ●               | —   | —  |            |
|                 | Memory Cards   |                     |                     |            |            |                 | Memory Cards  | Memory Cards   |            |
|                 | P140   |                     |                     |            |            |                 |   |  |            |

### NY series

NY5□□-1

Instruction execution times: 0.33 ns

Program capacity: 40 MB

Variables capacity (No retain attribute): 64 MB

Number of EtherCAT slaves: 192

Number of motion axes: 16, 32, 64

Catalog: P118



# Sysmac Family

## Software

### SYSMAC-SE2□□□

## Automation Software Sysmac Studio

One software for programming, configuration, simulation and monitoring

- One software for motion, logic sequence, safety, motion, vision and visualization
- Fully compliant with open standard IEC 61131-3
- Supports Ladder, Structured Text, and Function Block programming with a rich instruction set
- Advanced security function with 32 digit security password



### SYSMAC-XR□□□

## Sysmac Library

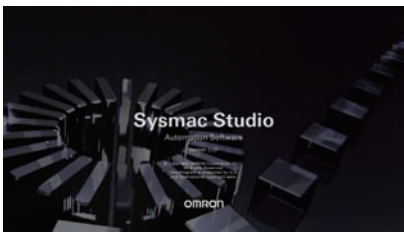

Omron's control expertise changes programming

- Advanced control such as vibration suppression and temperature control
- High-precision control of packaging machines and actuators for servo presses
- Productivity improvement by monitoring device operations and restoring parameters
- Reduction in programming time





## Lineup

| Series                         | Automation Software<br>Sysmac Studio  | Collection of software functional components<br>Sysmac Library  |
|--------------------------------|---|---|
| Model                          | SYSMAC-SE2□□  | SYSMAC-XR□□□  |
| Appearance                     |    |    |
| DVD                            | 32-bit DVD<br>[Supporting OS]<br>Windows 7 (32/64-bit)/8.1 (32/64-bit)/10 (32/64-bit)/11 (64-bit)<br><br>64-bit DVD<br>[Supporting OS]<br>Windows 10 (64-bit)/11 (64-bit)   | Download from<br><a href="http://www.ia.omron.com/sysmac_library/">http://www.ia.omron.com/sysmac_library/</a>  |
| License type /<br>Library type | [Licenses for Editions]<br>Standard Edition<br>Vision Edition<br>Measurement Sensor Edition<br>NX-I/O Edition<br>Drive Edition<br>Safety Edition<br><br>[Licenses for Options]<br>Team Development Option<br>3D Simulation Option | MC Test Run Library<br>MC Command Table Library<br>MC Tool Box Library<br>EtherCAT G5 Series Library<br>EtherCAT N-Smart Series Library<br>Vibration Suppression Library<br>Temperature Control Library<br>Device Operation Monitor Library<br>Adept Robot Control Library<br>Weighing Control Library<br>EtherCAT 1S Series Library<br>Packaging Machine Library<br>Servo Press Library<br>Dimension Measurement Library<br>Safety System Monitor Library<br>High-Speed Analog Inspection Library<br>SLMP Communications Library<br>Visual Feedback Alignment Library<br>MQTT Communications Library |
| Detailed specification         | Refer to your OMRON website.  |   |

# Sysmac Family

## HMI

### NA Programmable Terminal

Make industrial machines more attractive and competitive by bringing technology to life


As part of the Sysmac automation platform, NA transforms machine data into information, shows information and controls devices based on requirements at FA manufacturing sites.


- One connection: Connectable with Sysmac products
- One software: The machine interface brings you a clear view in one integrated project.
- Rich media provide an intuitive and proactive machine management tool
- More than 16 million display colors (24-bit full color)



IAG – Intelligent Application Gadgets  
The graphics collection accelerates the development process.  
You can make your own collections and share them between projects.

# Lineup

| Series                                 |         | NA Series  |                      |                     |                     |
|--|---------|--|----------------------|---------------------|---------------------|
| Feature                                |         | More than 16 million color (24 bit full color) and wide screen for all models      |                      |                     |                     |
| Appearance                             |         |  |                      |                     |                     |
| Display device                         |         | TFT LCD  |                      |                     |                     |
| Screen size                            |         | 15.4-inch widescreen   | 12.1-inch widescreen | 9.0-inch widescreen | 7.0-inch widescreen |
| Number of dots (horizontal × vertical) |         | WXGA 1,280×800 dots  |                      | WVGA 800×480 dots   |                     |
| Colors                                 |         | 16,770,000 colors (24 bit full colors)   |                      |                     |                     |
| Built-in ports                         |         | 2 Ethernet ports, 2 USB host ports, 1 USB slave port                               |                      |                     |                     |
| Allowable power supply voltage range   |         | 19.2 to 28.8 VDC   |                      |                     |                     |
| Degree of protection                   |         | Front-panel controls: IP65 oil-proof type  |                      |                     |                     |
| Memory card                            |         | SD/SDHC memory card  |                      |                     |                     |
| Flame colors                           |         | Black, silver  |                      |                     |                     |
| Detailed specification                 | Catalog | V457   |                      |                     |                     |

| Series                 |         | Soft-NA   |  |  |  |
|------------------------|---------|---|--|--|--|
| Feature                |         | NA functions work on Windows  |  |  |  |
|                        |         |  |  |  |  |
| OS                     |         | Windows 10 Pro Version 1903 or later 64 bit   |  |  |  |
| Processor              |         | Intel Atom® x5-E3940 equivalent or higher processor                                 |  |  |  |
| RAM                    |         | 4 GB or more  |  |  |  |
| Optical disk drive     |         | DVD-ROM drive   |  |  |  |
| Detailed specification | Catalog | V457  |  |  |  |

# Sysmac Family

## Motion

### R88M-1A□/R88D-1SAN□-ECT 1S Series with Safety Functionality

Higher Productivity and Safer Environment

#### Quick Installation : One Cable

- Power, encoder and brake in one pre-assembled cable with IP67 connector
- Pluggable connectors for easy pre-wiring and system maintenance
- Fast and secure screw-less push-in in all connectors

#### 20 bit high resolution encoder

- No battery, no maintenance and compact size

#### Time Reduction: Integrated Programming and Testing

- Auto definition of I/F variables
- Motion safety function blocks
- Graphical GUI
- Integrated Data Trace

#### High adaptability for machine safety

- 8 safety functions according to SIL3/PLe (STO, SS1, SS2, SOS, SLS, SLP, SDI, SBC)
- Safety-over-EtherCAT (FsoE)



EtherCAT®

Safety over  
EtherCAT®

### R88M-1□/R88D-1SN□-ECT 1S AC Servo System

Improved machine design. Increased machine productivity

#### Optimized installation and commissioning tasks

- Cabinet size reduction: Compact servo drive with same height throughout the whole power range
- Fast and secure screw-less push-in in control I/O connector and brake interlock connector

#### 23 bit high resolution encoder

- No battery, no maintenance and compact size

#### Multi-axis setup and tuning

- Configure and monitor multiple axes in one view
- Easy & fast parameter transfer among axes in the machine (up to 256 axes)
- Comprehensive gain tuning

#### Safety control via EtherCAT

- EN ISO 13849-1 (Cat.3 PLd)
- EN61508 (SIL2), EN62061 (SIL2)
- EN61800-5-2 (STO)



EtherCAT®

Safety over  
EtherCAT®

## Lineup

| Series                                  | 1S Series with Safety Functionality  | 1S Series  |   |
|---|--|--|---|
| Model                                   | R88M-1A□/R88D-1SAN□-ECT  | R88M-1A□/R88D-1SAN□-ECT  |   |
| Appearance                              |   |   |   |
| Type                                    | Built-in EtherCAT Communications   | Built-in EtherCAT Communications   |   |
| Linear Type                             | No   | No   |   |
| 100 VAC Applicable motor capacity/force | No   | 50 W to 400 W  |   |
| 200 VAC Applicable motor capacity/force | 200 W to 2.7 kW  | 50 W to 15 kW  |   |
| 400 VAC Applicable motor capacity/force | 750 W to 3 kW  | 600 W to 15 kW   |   |
| Applicable servomotor                   | 1S with Safety Functionality Servomotor  | 1S Servomotor  |   |
| Control mode                            | Position, speed and torque control   | Position, speed and torque control   |   |
| Safety approvals                        | <ul style="list-style-type: none"> <li>· EN ISO 13849-1 (PLe/Cat.3)</li> <li>· EN 61508(SIL3)</li> <li>· EN 62061(SIL CL3)</li> <li>· EN 61800-5-2(SIL3)</li> <li>(STO/SS1/SS2/SOS/SLS/SLP/SDI/SBC)</li> </ul> | <ul style="list-style-type: none"> <li>· ISO 13849-1 (PL-e/PL-d)</li> <li>· EN61508 (SIL3/SIL2)</li> <li>· EN62061 (SIL3/SIL2)</li> <li>· IEC 61800-5-2 (STO)</li> </ul> |   |
| Full closed loop                        | —  | —  |   |
| Appearance                              |   |   |  |
| Rated rotation speed                    | 3,000 r/min  | 3,000 r/min  | 2,000 r/min   |
| Momentary maximum rotation speed        | 5,000 to 6,000 r/min   | 5,000 to 6,000 r/min   | 3,000 r/min   |
| Rated torque                            | 0.637 to 9.55 N·m  | 0.318 to 9.55 N·m  | 4.77 to 14.3 N·m  |
| Capacity                                | 200 W to 3 kW *1   | 50 W to 5 kW *3  | 400 W to 3 kW   |
| Applicable servo drive                  | 1S with Safety Functionality Drive   | 1S Servo Drive   |   |
| Encoder resolution                      | 20-bit absolute  | 23-bit absolute  | 23-bit absolute   |
| Protective structure                    | IP67   | IP67   |   |
| Appearance                              |   |   |  |
| Rated rotation speed                    | 1,500 r/min  | 1,500 r/min  | 1,000 r/min   |
| Momentary maximum rotation speed        | 3,000 r/min  | 2,000 to 3,000 r/min   | 2,000 r/min   |
| Rated torque                            | 9.55 to 19.1 N·m   | 25.5 to 95.5 N·m   | 8.59 to 28.7 N·m  |
| Capacity                                | 1.5 kW to 3 kW *2  | 4 to 15 kW   | 900 W to 3 kW   |
| Applicable servo drive                  | 1S with Safety Functionality Drive   | 1S Servo Drive   |   |
| Encoder resolution                      | 20-bit absolute  | 23-bit absolute  | 23-bit absolute   |
| Protective structure                    | IP67   | IP67   |   |
| Detailed specification                  | Catalog I838/I842  | I821   |   |

\*1. The maximum capacity of the 200 V model is 2.6 kW. \*2. The maximum capacity of the 200 V model is 2.7 kW. \*3. The maximum capacity of the 200 V model is 4.7 kW.



# Sysmac Family

## Motion

### 3G3MX2-A□□□□-V1

## MX2-V1 Multi-function Compact Inverter

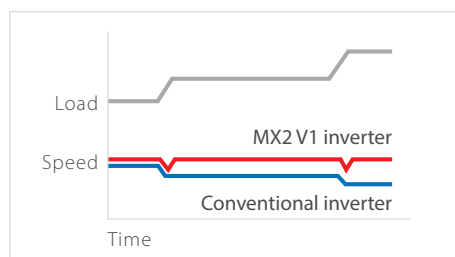
Born to drive machines

### Torque control in open loop

- Ideal for low to medium torque applications
- Can replace a flux vector inverter or servo drive in suitable systems

### Quick response to load fluctuation

- Stable control without decreasing machine speed improves quality and productivity



### Safety inside

- Conforms to safety norm ISO 1384901 Cat. 3 performance level PLd
- 2 Safety inputs
- External device monitoring (EDM)

### Other Features

- Maximum applicable motor capacity: 15 kW
- Double rating (CT: Heavy load/VT: Light load)
- Permanent magnet motors
- Drive Programming
- Built-in brake control function

EtherCAT



### 3G3RX2-□□□□□

## RX2 High-function General-purpose Inverters

Save energy and maximize performance with versatile inverter

- Triple rating: Normal Duty (ND), Low Duty (LD), and Very Low Duty (VLD)
- PM motor control helps save energy
- Safety function IEC 61800-5-2 "Safe Torque Off (STO)" Conforms to machinery directive with ISO13849-1 (Category 4/PLe)
- DriveProgramming allows simple sequence control without a PLC
- EtherCAT communication using an optional communication unit provides high-speed communication for running and stopping, monitoring operating status, and changing various settings

EtherCAT



## Lineup

| Series                    |                                       | MX2 Series V1 type   | RX2 Series   |
|---------------------------|---------------------------------------|--|--|
| Model                     |                                       | 3G3MX2-V1  | 3G3RX2   |
| Appearance                |                                       |   |   |
| Power supply and capacity | Three-phase 200 V                     | 0.1 to 15 kW(CT)   | 0.4 to 55 kW(ND)   |
|                           | Three-phase 400 V                     | 0.4 to 15 kW(CT)   | 0.4 to 132 kW(ND)  |
|                           | Single-phase/three-phase 200 V        | No   | No   |
|                           | Single-phase 200 V                    | 0.1 to 2.2 kW(CT)  | No   |
| Control methods           |                                       | <ul style="list-style-type: none"> <li>· V/F control</li> <li>· Sensorless vector control</li> </ul>   | <ul style="list-style-type: none"> <li>· V/F control</li> <li>· Sensorless vector control</li> <li>· Vector control with a PG</li> </ul>   |
| Input/output              | No. of multi-function I/O points      | <ul style="list-style-type: none"> <li>· 7 inputs</li> <li>· 2 transistor outputs</li> <li>· 1 relay output</li> </ul>   | <ul style="list-style-type: none"> <li>· 11 inputs</li> <li>· 5 transistor outputs</li> <li>· 2 relay outputs</li> </ul>   |
|                           | Analog I/O                            | <ul style="list-style-type: none"> <li>· 2 inputs (0 to 10 V, 4 to 20 mA)</li> <li>· 1 output (0 to 10 V)</li> </ul>   | <ul style="list-style-type: none"> <li>· 3 inputs (1)/(2) 0 to 10 V or 0 to 20 mA (3) -10 to 10 V</li> <li>· 2 outputs 0 to 10 V or 0 to 20 mA</li> <li>· 1 PWM voltage output</li> </ul>  |
| Braking                   |                                       | <ul style="list-style-type: none"> <li>· Braking resistor connection</li> <li>· Regenerative Braking Unit connection</li> <li>· Regenerative Braking Unit + braking resistor connection</li> </ul> | <ul style="list-style-type: none"> <li>· Braking resistor connection 200V (22 kW max.) 400V (37 kW max.)</li> <li>· Regenerative Braking Unit connection</li> <li>· Regenerative Braking Unit + braking resistor connection</li> </ul> |
| Frequency                 | Frequency setting range               | 0.1 to 400 Hz  | 0.1 to 400 Hz  |
|                           | Frequency output method               | Line-to-line sine wave PWM   | Line-to-line sine wave PWM   |
| Installation and wiring   | Side-by-side mounting                 | Yes  | No   |
|                           | Removable terminal block              | No   | Yes  |
|                           | Power supply and motor wiring         | Bottom wiring  | Bottom wiring  |
| Main functions            | Multistep speed control               | 16 steps + jog   | 16 steps + jog   |
|                           | Carrier frequency setting             | 2 to 15 kHz (default setting: 5 kHz)   | 2 to 15 kHz (default setting: 5 kHz)   |
|                           | Torque assist function                | Auto/manual torque assist  | Auto/manual torque assist  |
|                           | PID function                          | Yes  | Yes  |
|                           | Absolute value positioning            | No   | Yes  |
|                           | Emergency shutoff                     | Yes  | Yes  |
|                           | 0-Hz domain sensorless vector control | No   | Yes  |
|                           | Tripless function                     | Yes  | Yes  |
|                           | Momentary power interruption restart  | Yes  | Yes  |
|                           | Multiple rating                       | Double ratings   | Triple ratings   |
|                           | Permanent magnet motor control        | Yes  | —  |
|                           | Starting torque                       | 200% at 0.5 Hz   | <ul style="list-style-type: none"> <li>· 200% at 0.3 Hz in open loop</li> <li>· Full torque at 0 Hz in closed loop</li> </ul>  |
|                           | PLC functionality (Drive Programming) | Provided   | Provided   |
| Communications            |                                       | Optional EtherCAT communication unit   | Optional EtherCAT communication unit   |
| Safety approvals          |                                       | <ul style="list-style-type: none"> <li>· ISO 13849-1 (Cat.3/PLd)</li> <li>· IEC 60204-1 Stop Category 0</li> </ul>   | <ul style="list-style-type: none"> <li>· ISO13849-1 (Cat.4/PLe)</li> <li>· IEC 61800-5-2</li> </ul>  |
| Detailed specification    | Catalog                               | I920   | I921   |

# Sysmac Family

## I/O

## NX I/O-System

### Speed and accuracy for machine performance and information

Based on an internal high-speed bus running in synchronization with the EtherCAT network and using the time-stamp function, the NX I/O can be controlled with microsecond accuracy and with nanosecond resolution. The I/O range consists of over 100 models including position control, temperature inputs, and integrated safety. The EtherNet/IP unit with X Bus\*1 connectivity enables data transfer via EtherNet/IP as fast as 1 Gbps, achieving data utilization between machines or processes.



X Bus\*1 connection

**EtherNet/IP Unit (For NX502)**  
Up to 10 EtherNet/IP networks (using 4 units)

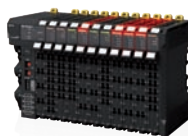
NX bus connection

|  |   |   |   |   |   |
|--|---|---|---|---|---|
| <b>Communications coupler</b> <ul style="list-style-type: none"><li>· EtherCAT</li><li>· EtherNet/IP</li></ul> | <b>IO-Link master</b> <ul style="list-style-type: none"><li>· Up to 4 IO-Link devices with one master</li></ul> <b>Serial communications</b> <ul style="list-style-type: none"><li>· RS-232C or RS-422A/485 interface</li></ul> | <b>EtherCAT slave</b> <ul style="list-style-type: none"><li>· Available as subsystem controller on EtherCAT</li></ul> | <b>RFID</b> <ul style="list-style-type: none"><li>· Direct connection to V680 RFID System</li></ul> | <b>Digital I/O</b> <ul style="list-style-type: none"><li>· 4, 8, 16, or 32 channels per input unit</li><li>· 2, 4, 8, 16, or 32 channels per output unit (8 channels per relay output unit)</li><li>· 16 channels per mixed I/O unit</li><li>· Standard, high-speed, and time-stamp models</li><li>· Units with Push-In Plus/MIL/Fujitsu/M3 Screw connector</li></ul> | <b>Analog I/O</b> <ul style="list-style-type: none"><li>· +/-10V voltage and 4-20 mA current signals</li><li>· 2, 4 or 8 channels per input unit</li><li>· 2 or 4 channels per output unit</li><li>· Standard and high-performance models</li><li>· Single-ended input and differential input models</li></ul> <b>High-speed analog input</b> <ul style="list-style-type: none"><li>· 4 channels per input unit</li><li>· Differential input</li><li>· Sampling as fast as every 5 μs</li></ul> |
|--|---|---|---|---|---|


|  |   |  |   |   |
|--|---|--|---|---|
| <b>Load cell inputs</b> <ul style="list-style-type: none"><li>· One load cell with one unit</li><li>· Fastest conversion cycle of 125 μs</li></ul> | <b>Safety CPU</b> <ul style="list-style-type: none"><li>· EN ISO13849-1 (PLe/Safety Category 4), IEC 61508 (SIL3) certified</li></ul> <b>Safety I/O</b> <ul style="list-style-type: none"><li>· 4 or 8 safety input points per unit</li><li>· 2 or 4 safety output points per unit</li><li>· Free allocation of the safety I/O its on the internal high speed bus</li></ul> | <b>Temperature inputs</b> <ul style="list-style-type: none"><li>· Thermocouple or RTD inputs, 2 or 4 per unit</li><li>· Conversion time of 10 ms, 60 ms or 250 ms</li></ul> <b>Heater burnout detection</b> <ul style="list-style-type: none"><li>· 4 CT sensor inputs and 4 trigger outputs to drive SSRs</li></ul> | <b>Temperature control</b> <ul style="list-style-type: none"><li>· 2 or 4 multi-input (thermocouple and resistance thermometer) channels per unit</li><li>· Conversion time of 50 ms</li><li>· Voltage output (for driving SSR) or linear current output</li><li>· 1 CT input per channel</li></ul> <b>Advanced temperature control</b> <ul style="list-style-type: none"><li>· 4 or 8 universal inputs (thermocouple, platinum resistance thermometer, analog voltage, analog current) channels per unit</li></ul> | <b>Position interface</b> <ul style="list-style-type: none"><li>· Incremental and absolute encoder support</li><li>· Pulse output unit (line driver output model)</li></ul> |
|--|---|--|---|---|

\*1. The X Bus connector is located on the left side of the NX502 CPU Unit.

## Lineup

| Series                      |         | NX Series  |
|-----------------------------|---------|--|
| Features                    |         | <ul style="list-style-type: none"> <li>Over 100 models including digital I/O, analog I/O, position interface, temperature inputs, temperature control, RFID, safety CPU, and safety I/O</li> <li>NsynX technology provides I/O response with less than 1 <math>\mu</math>s jitter</li> <li>Screwless terminal block, connector, and M3 screw types</li> <li>Up to 32 channels per digital input unit or output unit</li> </ul> |
| Appearance                  |         |    |
| Type                        |         | Modular I/O  |
| Communications interface    |         | EtherCAT   |
| Number of connectable units |         | <ul style="list-style-type: none"> <li>63 units max.</li> <li>Input: 1,024 bytes max., output: 1,024 bytes max.</li> </ul>   |
| Unit types                  |         | Communications coupler, IO-Link master, serial communication, RFID, digital I/O, analog I/O, high-speed analog input, load cell input, safety I/O, safety CPU, temperature input, heater burnout detection, temperature control, position interface  |
| Mounting                    |         | DIN track  |
| Detailed specification      | Catalog | R183   |

\* See page 27 for more information on safety I/O.

| Series                      |  | GX Series  |
|-----------------------------|--|--|
| Features                    |  | <ul style="list-style-type: none"> <li>Detachable screw terminal block and e-CON connector types</li> <li>Easy set-up: automatic and manual address setting</li> </ul> |
| Appearance                  |  |    |
| Type                        |  | Block I/O  |
| Communications interface    |  | EtherCAT   |
| Number of connectable units |  | One expansion unit can be connected with one digital I/O terminal (16 inputs + 16 outputs)   |
| I/O types                   |  | Digital I/O, analog I/O, encoder input, IO-Link master, expansion unit   |
| Mounting                    |  | DIN track  |
| Detailed specification      |  | Refer to your OMRON website.   |

# Sysmac Family

## Safety

### NX-SL5/SL3/SI/SO Safety Control Unit

Integrated safety into machine automation

#### Modular machines with individual CPU units

Safety is integrated via EtherNet/IP for safety communication between machines and EtherCAT for high-speed, high-precision fieldbus communication in a machine.

It is easy to set up motion or a robot, which are the key to quality and productivity enhancement, via one cable.



#### Simple and flexible integration of safety

Flexible system lets you freely mix safety I/O units with standard NX I/O.



#### Integration in One software, Sysmac Studio

Safety I/O wiring diagrams, safety circuit programs, and user-defined Function Blocks can be automatically generated, minimizing safety design errors. Simple Automatic Test using Offline Simulation is available. Online Functional Test ensures and maintains safety during machine commissioning and operation.



# Lineup

## Safety Controller

| Product name                        | Safety CPU Unit   |  |
|-------------------------------------|---|--|
| Model                               | NX-SL5500/5700  | NX-SL3300/3500   |
| Features                            | Two different networks, Safety over EtherCAT (FSoE) and EtherNet/IP (CIP Safety), in a single system                      | Integrated safety into machine automation through the use of Safety over EtherCAT (FSoE) protocol.         |
| Appearance                          |    |                         |
| Network                             | Safety over EtherCAT (FSoE), EtherNet/IP (CIP Safety)   | Safety over EtherCAT (FSoE)  |
| Applicable standards                | EN ISO 13849-1 (PLe/Safety Category 4), IEC 61508(SIL3), IEC/EN 62061(SIL CL3), IEC/EN 61131-2, IEC 6132-3-1, IEC 61131-6 | EN ISO 13849-1 (PLe/Safety Category 4), IEC 61508 (SIL3), EN 62061 (SIL CL3), IEC/EN 61131-2, IEC 6132-3-1 |
| Programming                         | <ul style="list-style-type: none"> <li>IEC 61131-3 standard</li> <li>PLCopen Function Blocks for Safety</li> </ul>        |  |
| Program capacity                    | 2048 KB, 4096 KB  | 512 KB, 2048 KB  |
| Safety I/O connection               | 128/254   | 32/128   |
| Maximum number of safety I/O points | 1024, 2032  | 256, 1024  |
| Units that can connect              | NX102 CPU Unit, Communication Control Unit  | NX102 CPU Unit, EtherCAT Coupler Unit, EtherNet/IP Coupler Unit  |
| Detailed specification              | Catalog: F104   | Refer to your OMRON website.   |

| Product name                         | Safety Input Unit  | Safety Output Unit  |
|--------------------------------------|--|---|
| Model                                | NX-SIH400/SID800   | NX-SOH200/SOD400  |
| Appearance                           |                           |  |
| Applicable standards                 | EN ISO 13849-1 (PLe/Safety Category 4), IEC 61508(SIL3), IEC/EN 62061(SIL CL3), IEC/EN 61131-2, IEC 6132-3-1 |   |
| Number of safety input/output points | 4, 8   | 2, 4  |
| Detailed specification               | Refer to your OMRON website.   |   |



# Sysmac Family

## Vision

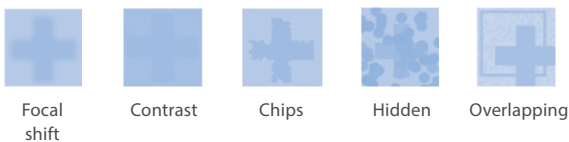
### FH Vision System

#### Flexible solution for machine vision

The FH Vision System is optimized to detect the position and orientation of any object at high speed and with high accuracy. The built-in EtherCAT communications enable reliable and easy networking with motion control, increasing the overall machine performance. A flexible machine vision tailored for quality inspection.

#### Advanced shape search technology

High-precision and robust positioning is possible even under the adverse conditions, such as changes in environments and materials.



### FHV7 Smart Camera

#### Designed for pre-alignment and appearance inspection

The FHV7 Smart Camera is an all-in-one camera with the functionalities of the high-spec FH Vision System packed in its compact, robust body that is easy to deploy. It offers the same operability as the FH Series, allowing for easy integration into even processes where it was previously difficult to install advanced vision systems.

#### IP67 waterproof structure

IP67 protection allows use in wet conditions, such as regular wash-downs at the sites where the cameras are installed.



#### Advanced shape search technology

The shape search technology that provides the same level of performance as the FH Series has been implemented.

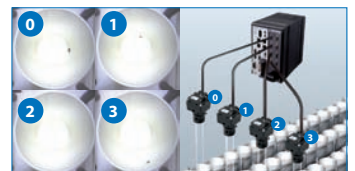
#### Unique lineup

- The camera lineup includes up to 20.4 Mpix camera
- The MDMC light flexibly changes illumination colors and angles according to items to inspect



#### Multiple inspection

- Powerful 4-core i7 parallel processor
- Up to 8 cameras per controller



#### AI Scratch Detect Filter (Software sold separately)

The AI Scratch Defect Filter learns by means of images in which human inspectors noticed defects. Where as previous inspection methods found the unexpected size, shape or color of a particular defect to be a barrier to automation, AI successfully extracts abnormalities.



#### Robust all-in-one camera for easy integration into machines



#### Autofocus lens






The autofocus lens covers a focal length range from 59 to 2,000 mm\*. Even when products in different sizes are produced, the focus range can be changed easily by parameters. This feature eliminates mechanical operation for changeover during product replacement, leading to a simpler system with higher productivity.

Working distance  
90 mm → 100 mm



\* Differs depending on the lens type.

## Lineup

| Product name           |                            | Vision System  |   | Smart Camera  |   |
|------------------------|----------------------------|--|---|---|---|
| Series                 |                            | FH Series  |   | FHV7 Series   |   |
| Appearance             |                            |   |   |                                  |   |
| Hardware               | Processing speed *1        | ★★★  |   | ★★  |   |
|                        | No. of connectable cameras | 8 max.   |   | 1   |   |
|                        | Resolution                 | 0.4 million-pixel/2 million-pixel/4 million-pixel/5 million-pixel/12 million-pixel | 5 million-pixel/20.4 million-pixel  | 0.4 million-pixel/1.6 million-pixel/3.2 million-pixel/5 million-pixel   | 6.3 million-pixel/12 million-pixel  |
|                        | Shutter method             | Global shutter   | Rolling shutter   | Global shutter  | Rolling shutter   |
|                        | Lens                       | Interchangeable (C mount, M42 mount)   |   | Interchangeable (C mount)/autofocus (mechanical, liquid lens)   |   |
|                        | Light                      | External light connectivity/special light connectivity (MDMC *2, PS *3)            |   | Built-in light (white, red, infrared, multi-color)/external light connectivity/special light connectivity (MDMC *2) |   |
| Software               | User interface             | Flexible interface   |  |                                 |  |
|                        |                            |  | Main screen   | Measurement flow setting screen   | Measurement condition setting screen  |
| Detailed specification | Catalog                    | Q197   |   | Q264  |   |

\* 1. The more starts, the higher the performance.

\* 2. Multi-Direction Multi-Color. The MDMC light can be adjusted to defects by freely combining the illumination directions, colors, and light intensities.

\* 3. Photometric Stereo.

# Sysmac Family

## Sensing

### ZW-8000/7000 Confocal Fiber Displacement Sensor

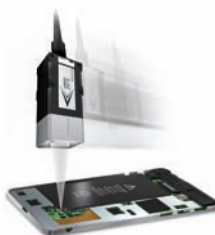
Measure anything from anywhere The most reliable in-line measurements

The ZW-8000 Series provides high-precision in-line measurements of rattling or inclined shiny, thin, or minute parts. The ZW-7000 Series provides ultra-high-speed, stable measurements of diffuse reflective objects during movement. These sensors help increase quality inspection accuracy and reduce inspection time.



#### Reliable measurements for any material and surface types

The white light confocal principle allows a continuous measurement of object in any mixed conditions such as mirror, coarse, transparent, curved, or narrow areas without stopping the sensor head.



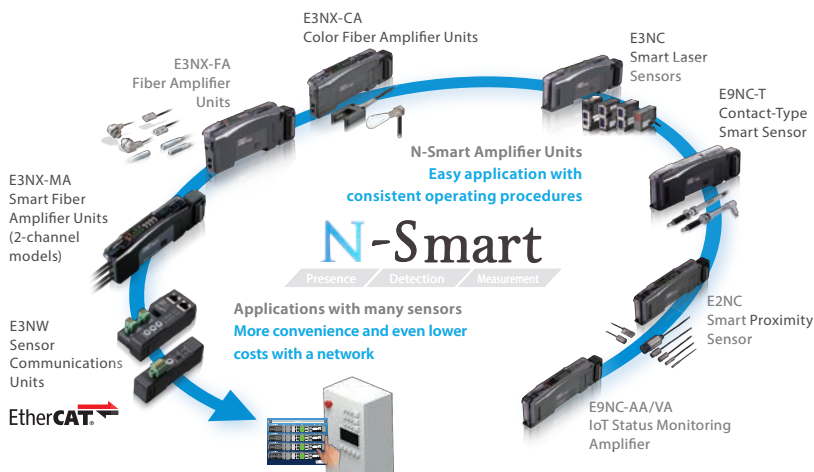
- Angle characteristic:  $\pm 25^\circ$  for shiny surfaces
- Linearity for different materials:  $\pm 0.3 \mu\text{m}$
- Minimum sampling period:  $20 \mu\text{s}$
- Minimum spot diameter:  $4 \mu\text{m}$

Note: Specifications differ among models. Please ask Omron sales representative for details.

### E3NX/E3NC/E9NC Series N-Smart Series

Various sensors connected over EtherCAT

The N-Smart lineup of next-generation fiber sensors, laser sensors and contact sensors will quickly solve your problems and therefore maximize uptime and minimize downtime with optimum cost performance.






#### Features

- Ultra-easy Advanced Smart Tuning with the push of a button
- More stable detection of high-speed workpieces
- Predictive maintenance to reduce downtime
- Highly visible white LED display
- E3NX-FA has 1.5x the sensing distance of conventional amplifiers\*

\* Compared with E3X-HD

## Lineup

| Product name           |         | Confocal Fiber Displacement Sensor  |  |  |
|------------------------|---------|---|--|--|
| Series                 |         | ZW-8000 Series  | ZW-7000 Series   | ZW-5000 Series   |
| Feature                |         | For measurements of rattling or inclined "transparent objects or mirror surfaces" such as thin film sheets or glass | For accurate shape measurements of "coarse surfaces" while the sensor head is moving | Bring the benefits of the white light confocal principle to production lines |
| Appearance             |         |                                   |  |  |
| Measurement method     |         | White light confocal principle  |  |  |
| Measuring range        |         | Min: 7±0.3 mm,<br>Max: 30±2 mm  |  |  |
| Static resolution      |         | 0.002 to 0.016 μm   |  |  |
| Linearity              |         | ±0.3 to ±3.0 μm   |  |  |
| Spot diameter          |         | 4 to 11 μm  | 50 to 190 μm   | 9 to 20 μm   |
| Measurement cycle      |         | 60 to 7500 μs   | 20 to 400 μs   | 80 to 1600 μs  |
| Detailed specification | Catalog | Q250  |  |  |
|                        | Web     | Refer to your OMRON website.  |  |  |

| Product name                          |         | Fiber Sensor/Laser Sensor/Proximity Sensor/Contact Sensor   |   |
|---------------------------------------|---------|---|---|
| Series                                |         | N-Smart Series  | E3X   |
| Feature                               |         | Connect fiber, laser and contact sensors to EtherCAT at low initial cost  | Easily connect fiber sensors to EtherCAT  |
| Appearance                            |         |    |  |
| Network specification                 |         | EtherCAT communication unit   | EtherCAT communication unit   |
| Sensor Communications Units           |         | E3NW-ECT/DS   | E3X-ECT   |
| Connectable sensor amplifier units    |         | Fiber Sensor<br>E3NX-FA0<br>E3NX-CA0<br>Laser Sensor<br>E3NC-LA0<br>E3NC-SA0<br>Contact Sensor<br>E9NC-TA0<br>IoT Status Monitoring Amplifier<br>E9NC-AA0/VA0 | Fiber Sensor<br>E3X-HD0   |
| Maximum number of connectable sensors |         | 30  | 30  |
| Detailed specification                | Catalog | E3NW: E418<br>E3NX-FA: E418<br>E3NX-CA: Y216<br>E9NC-T: E434<br>E9NC-AA/VA: E474  | —   |
|                                       | Web     | Refer to your OMRON website.  |   |

# Sysmac Family

## Robot

### iX3/iX4, eCobra/i4H, Viper Parallel Robot, SCARA Robot, Articulated Robot with EtherCAT (Connectable to NJ501-R)

Robots for flexible production lines

Omron's parallel, SCARA, and articulated robots are designed to be directly controlled by the NJ501-R Robot Integrated Controller that is connected to the robots via EtherCAT.

#### Parallel robots

The Hornet and Quattro are parallel robots ideal for use in the food and beverage, pharmaceutical, and healthcare industries. The iX4 that is a four-axis parallel robot with a high payload capacity achieves high speed and high precision.

- Fast and high-precision conveyance and assembly
- Supports fast Pick & Place on a fast conveyor
- Maximum working range: 1130, 1300, and 1600 mm models



iX3  
iX4

#### SCARA robots

High-performance four-axis SCARA robots are ideal for mechanical assembly, material handling, packaging, machine tending, and screw driving.

Table/floor or Inverted mounting models are available.

- High repeatability suitable for material handling and precision assembly
- Reach: i4H: 650, 750, and 850 mm models  
eCobra: 600 and 800 mm models



eCobra  
i4H

#### Articulated robots

Six-axis articulated robots are ideal for mechanical assembly, material handling, packaging, and palletizing.




- Diagnostics display enables faster trouble shooting
- High accuracy, superior slow-speed following, and easy calibration
- Reach: 653 and 855 mm models



Viper

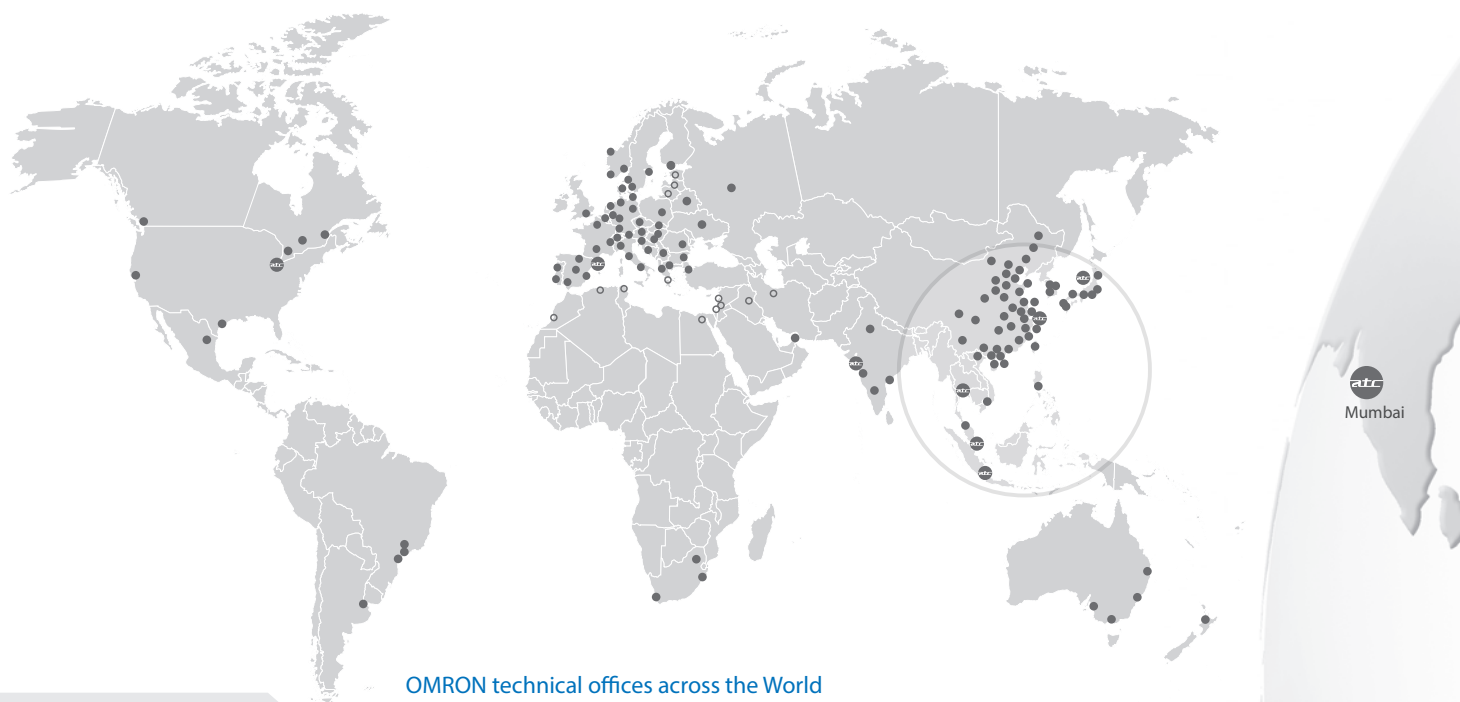


## Lineup

| Series                              |                | iX3  | iX4   | eCobra   |
|-------------------------------------|----------------|--|---|--|
| Feature                             |                | Parallel robot ideal for use in the food and beverage, pharmaceutical, and healthcare industries | Four-axis parallel robot achieves high speed and high precision   | Mid-size/large SCARA robot for precision machining, assembly, and material handling      |
| Appearance                          |                |                 |   |       |
| Robot type                          |                | Parallel robot   | Parallel robot  | SCARA robot  |
| Number of axes                      |                | 3, 4   | 4   | 4  |
| Mounting                            |                | Inverted   | Inverted  | Table/Floor  |
| Payload capacity                    |                | 3 kg (8 kg: without rotation axis)   | · Quattro 650 6 kg (No rotation: 15 kg)<br>· Quattro 800 4 kg (No rotation: 10 kg)  | 5.5 kg   |
| Working volume (radius)             |                | 565 mm   | 650 to 800 mm   | —  |
| Reach                               |                | —  | —   | 600 to 800 mm  |
| Position repeatability              |                | ±0.10 mm   | ±0.10 mm  | ±0.017 mm  |
| Protection/<br>Cleanroom<br>classes | Specifications | IP67: arms and platform<br>IP65: underside of robot<br>IP20: topside of robot                    | · H type<br>IP67: arms and platform<br>IP65: underside of robot<br>IP20: topside of robot<br>· HS type<br>IP67: arms and platform<br>IP66: robot base | IP20   |
|                                     | Option         | IP65: topside of robot<br>(with optional cover)  | H type IP65: topside of robot<br>(with optional cover)  | · eCobra 600<br>Class10 Cleanroom model<br>· eCobra 800<br>IP65, Class10 Cleanroom model |
| Detailed<br>specification           | Catalog        | I822   |   |  |

| Series                              |                | i4H   | i4H Inverted   | Viper   |
|-------------------------------------|----------------|---|--|---|
| Feature                             |                | Mid-size/large SCARA robot for precision machining, assembly, and material handling | Overhead-mount mid-size/large SCARA robot for precision machining, assembly, and material handling | Articulated robot for machining, assembly, and material handling                      |
| Appearance                          |                |  |                 |  |
| Robot type                          |                | SCARA robot   | SCARA robot  | Articulated robot   |
| Number of axes                      |                | 4   | 4  | 6   |
| Mounting                            |                | Table/Floor   | Inverted   | Table/Floor/Inverted  |
| Payload capacity                    |                | 15 kg   | 15 kg  | 5 kg  |
| Working volume (radius)             |                | —   | —  | —   |
| Reach                               |                | 650 to 850 mm   | 650 to 850 mm  | 635 to 855 mm   |
| Position repeatability              |                | XY: i4H 650 ±0.015 mm, i4H 750/850 ±0.025 mm<br>Z: ±0.015 mm<br>θ: ±0.005°          |  | ±0.02 to 0.03 mm  |
| Protection/<br>Cleanroom<br>classes | Specifications | IP20  | IP20   | IP40  |
|                                     | Option         | ISO4, IP65, Class10 Cleanroom model   | ISO4, IP65, Class10 Cleanroom model  | IP54: robot main body<br>IP65: robot joints (J4, J5, J6)<br>Class10 Cleanroom model   |
| Detailed<br>specification           | Catalog        | I822  |  |   |

# Service and support



OMRON technical offices across the World



## Automation Center

Kusatsu (JPN), Kariya (JPN), Shanghai (CHN), Barcelona (ESP), Jakarta (IDN), Mumbai (IND), Hoffman Estates IL (USA), Bangkok (THA), Singapore (SGP), Seoul (KOR)

● Technical office

○ Premium Partner

## PRESENCE

## COMPETENCE

OMRON



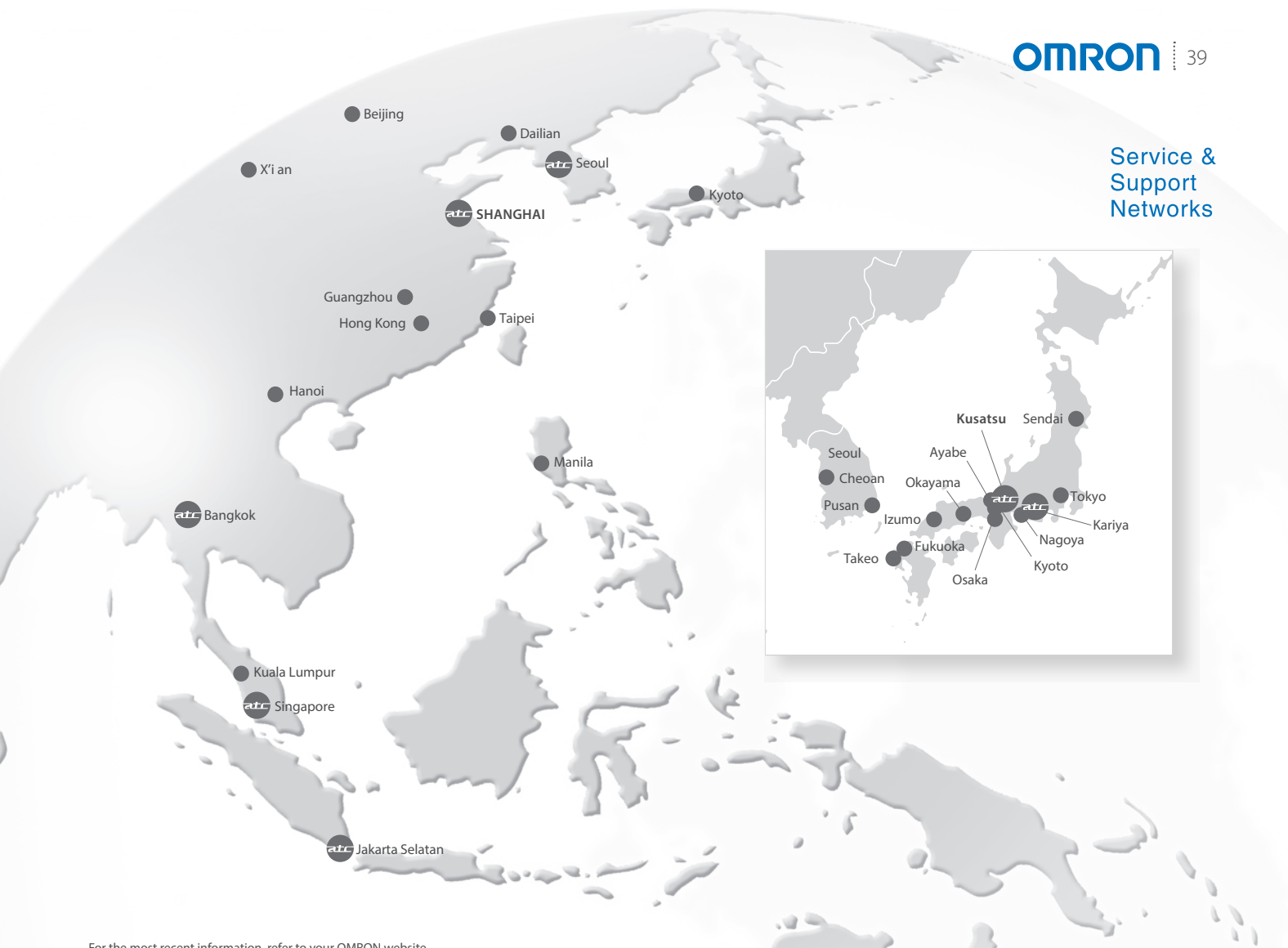
### Design

Our wide network of machine automation specialists will help you to select the right automation architecture and products to meet your requirements. Our flat structure based on expert-to-expert contact ensures that you will have ONE accountable and responsible expert to deal with on your complete project.

### Proof of concept

As your project matures make use of our Automation centers to test and catch-up with technology trends in motion, robotics, networking, safety, quality control etc. and to interface, test and validate your complete system with our new machine network (EtherCAT) and factory network (EtherNet/IP).

We will assign a dedicated application engineer to assist with initial programming and proof testing of the critical aspects of your automation system. Our application engineers have in-depth expertise in and knowledge of networks, PLCs, motion, safety and HMIs when applied to machine automation.



For the most recent information, refer to your OMRON website.

## CONFIDENCE

## ASSURANCE



### Development

During your prototyping phase you will need flexibility in technical support, product supply and exchange. We will assign an inside sales contact to help you source the correct products fast during your prototyping phase.



### Commissioning

With our world-wide network for service and support the export of your product is made simple, we will support you on-site with your customer, anywhere in the world. We can arrange a liaison sales engineer to facilitate training, spare parts supply or even machine commissioning. All this in a localised language with localised documentation - giving you complete peace of mind.



### Serial production

As your production increases we will engage in supplying you within 24hrs and repairing within 3 days. All our products are global products meeting global standards - CE, cULus, NK, LR -

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