# OMRON

# 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

**sysmac**
always in control

# 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
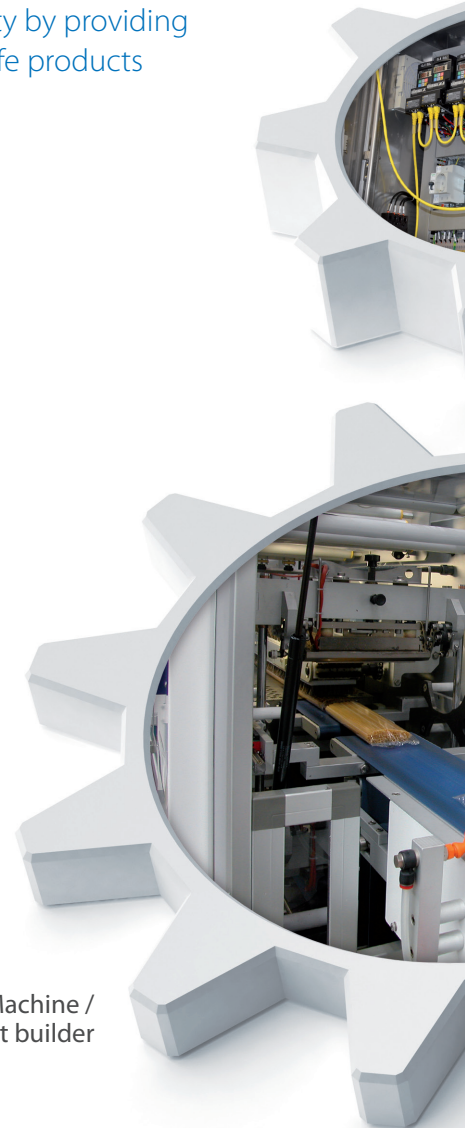
Machine /
Equipment builder

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

Manufacturer

Panel builder / System integrator

sysmac
always in control

Parts manufacturer
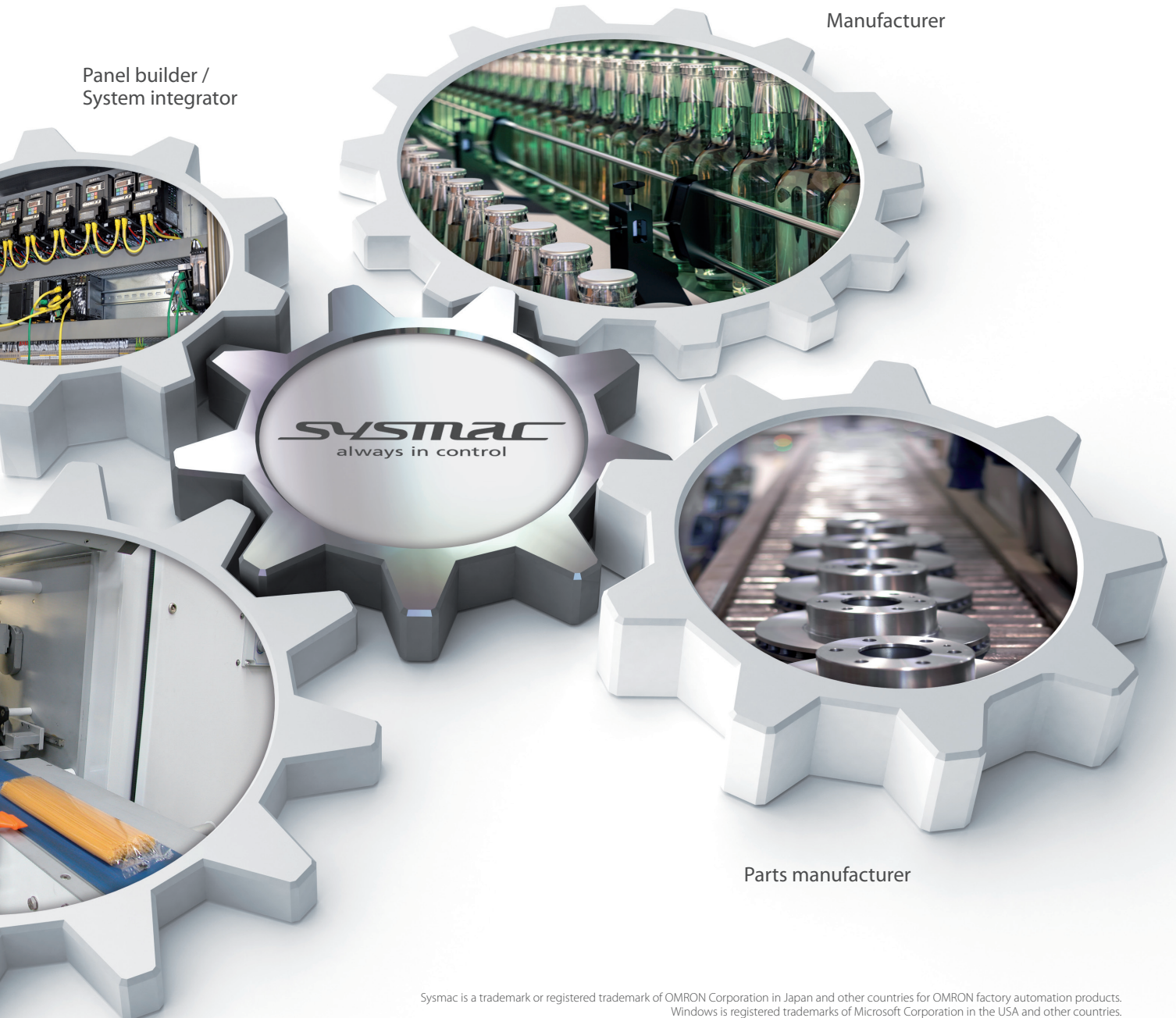
# Sysmac: A fully integrated platform

### 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.
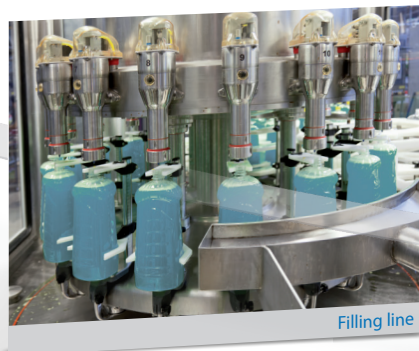


FACTORY AUTOMATION

MACHINE CONTROL

Machine Automation Controller

## ⚙ Motion



Filling line

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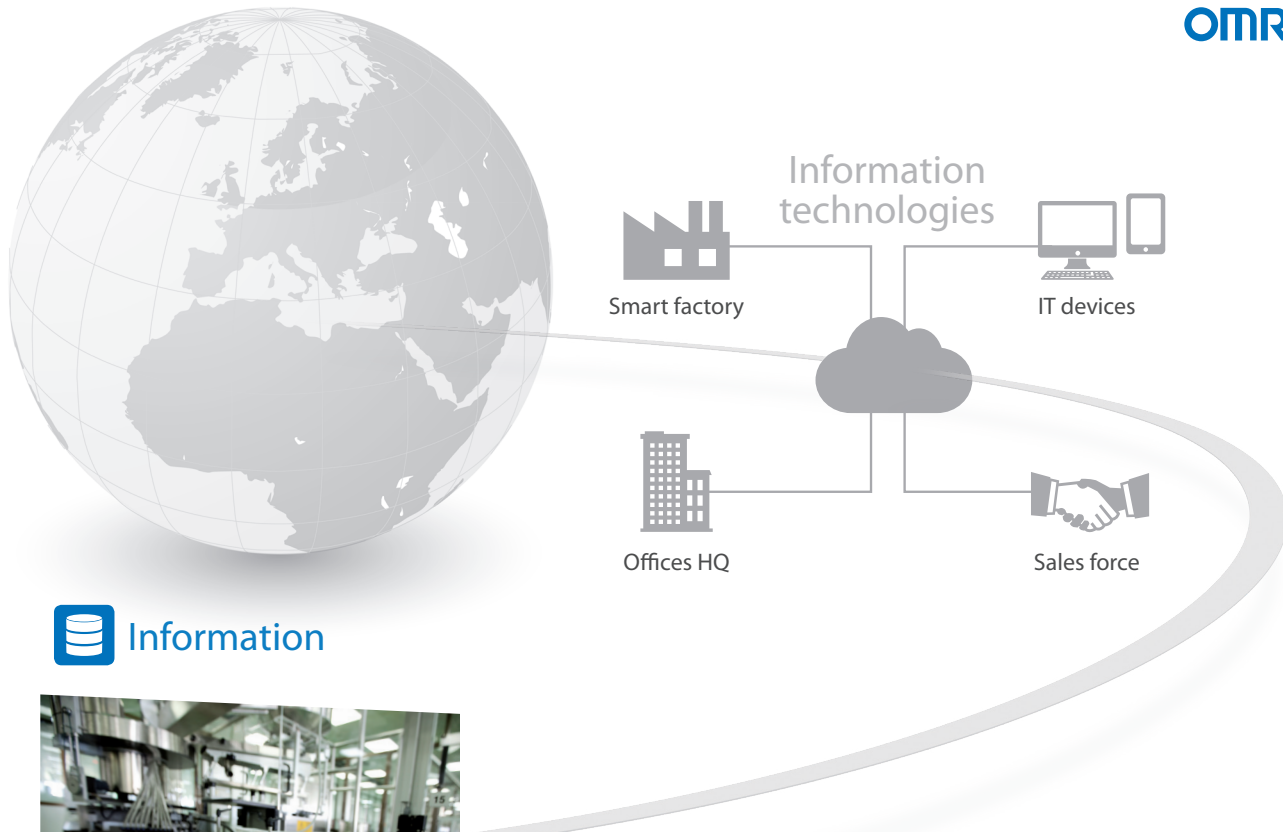· Direct Synchronous control for Position, Speed and Torque

## ⚠ Safety



Assembly

· All safety related data is synchronized with the whole network
· Safety functions such as muting, guard locking, EDM and valve monitoring are simple to manage

☑ **One Integrated Development Environment software** for Configuration, Programming, Simulation and Monitoring

Information technologies

Smart factory

IT devices

Offices HQ

Sales force

## Information


Pills blister packing

- 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

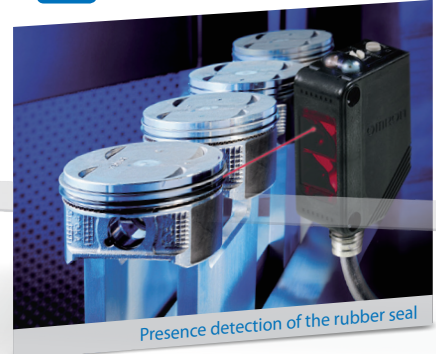## Vision


Quality inspection

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

## Robotics


Pick & Place
© ETR 300

- Up to 8 Delta robots with one controller
- Time-based Robotic Function Blocks make programming easier
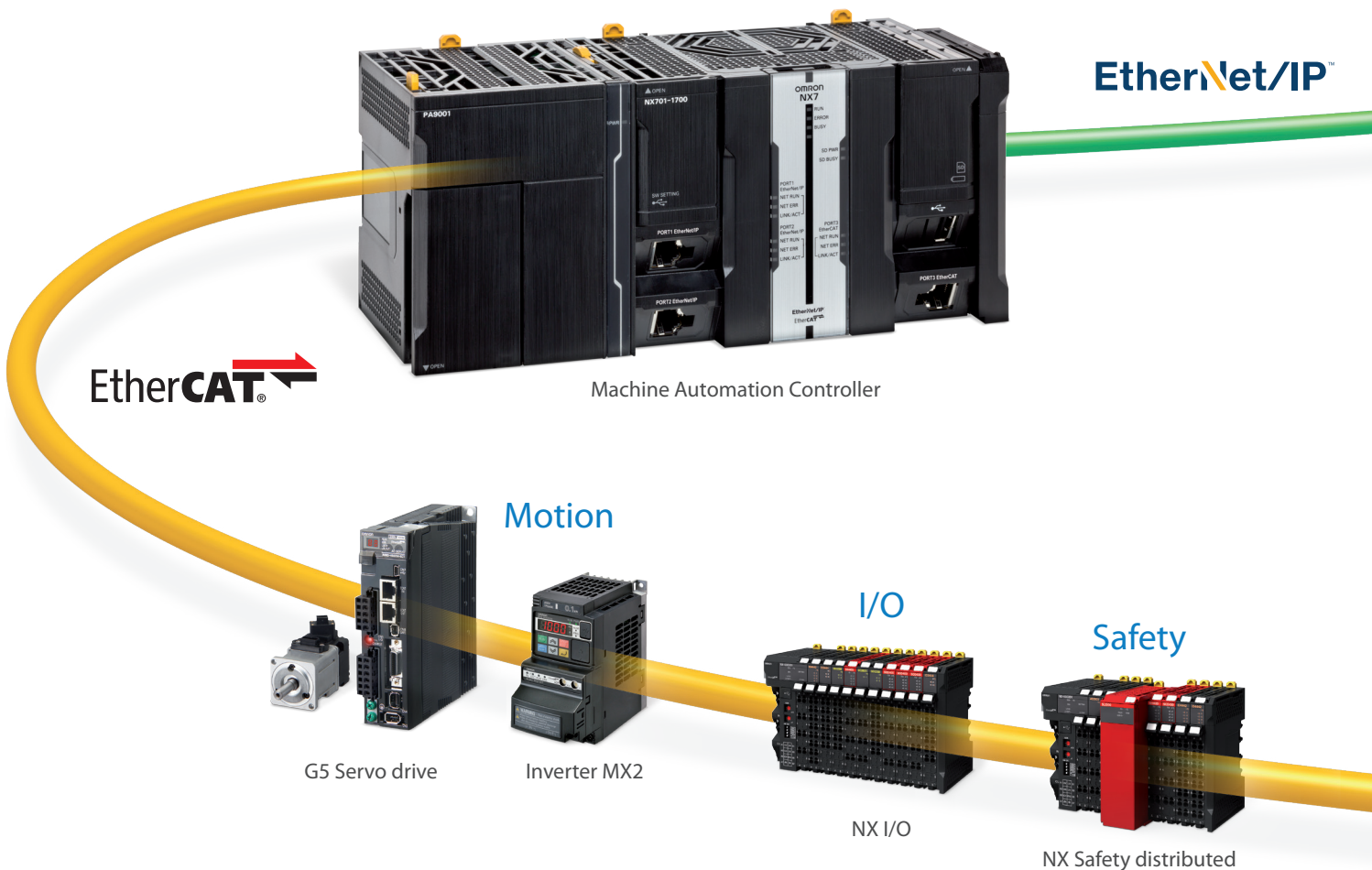
## Sensing


Presence detection of the rubber seal

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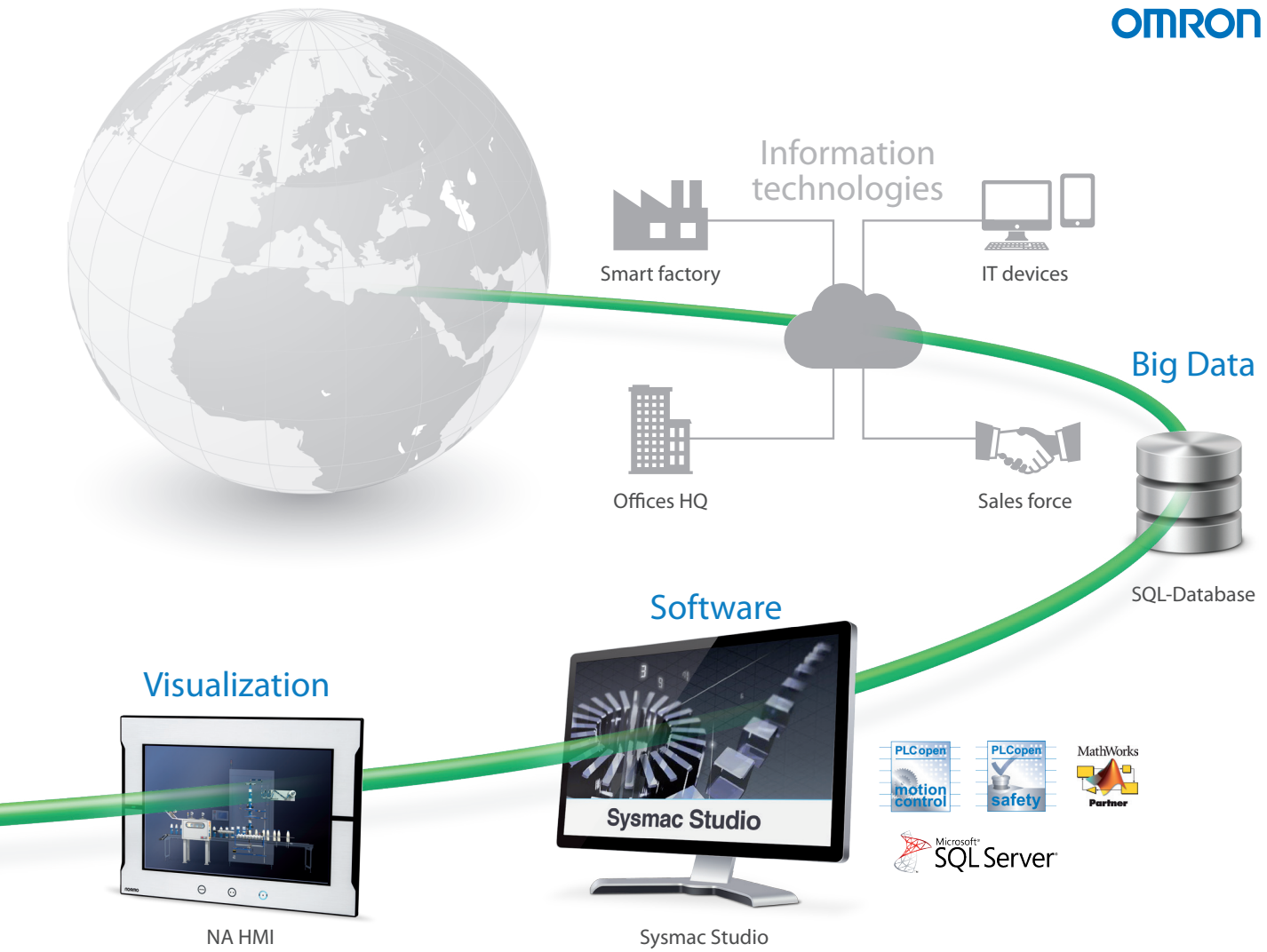
# One Connection

### 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 is the perfect match between fast real time machine control and data plant management.
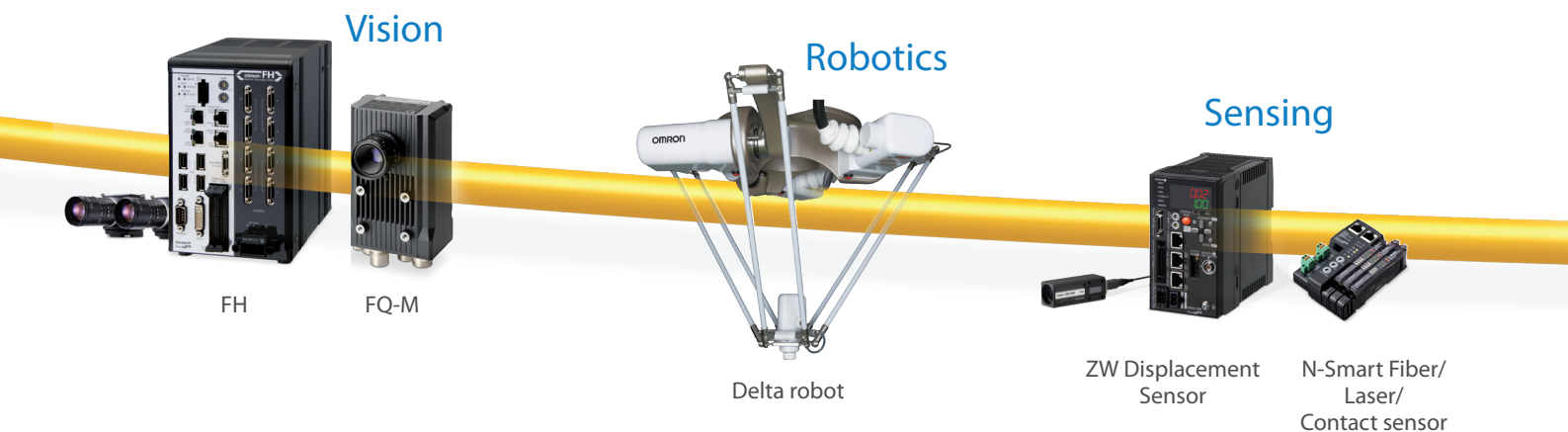
**EtherNet/IP**

Machine Automation Controller

**EtherCAT**

**Motion**

**I/O**

**Safety**

G5 Servo drive

Inverter MX2

NX I/O

NX Safety distributed

### EtherCAT - Machine Control

- Fastest cycle time: 125 μs
- Up to 256 synchronized axes
- 512 slaves
- Embedded in Omron servo drive, inverter, I/O, Safety, Vision and Sensing
- Uses standard STP Ethernet cable with RJ45 connectors

## Information technologies

Smart factory

IT devices

Offices HQ

Sales force

## Big Data

SQL-Database

## Software

Sysmac Studio

PLCopen motion control

PLCopen safety

MathWorks Partner

Microsoft SQL Server

## Visualization

NA HMI

Sysmac Studio

### 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

## Vision

FH

FQ-M

## Robotics

Delta robot

## Sensing

ZW Displacement Sensor

N-Smart Fiber/ Laser/ Contact sensor

# 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 and motion programming based on IEC standard and PLCopen Function Blocks for Motion Control 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.
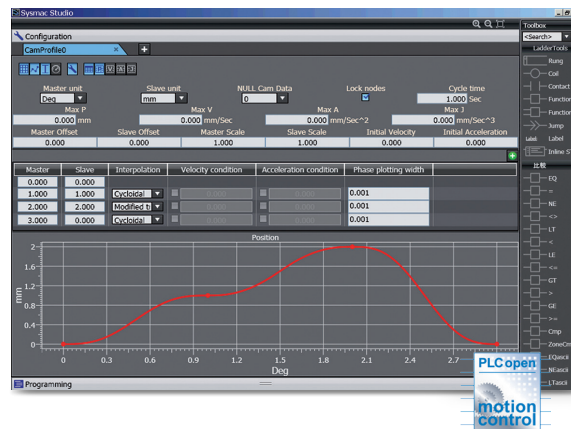
## Programming

Multi-tasking and fully compliant with IEC 61131-3 standard. The program editor includes smart support functions such as syntax error check and clear color segregation of variables and symbols. ST instructions can be directly written in Ladder programs thanks to in-line ST function.
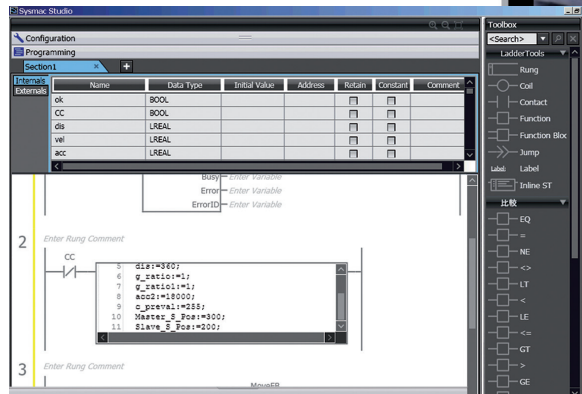
## Motion control

The graphical CAM editor allows quick implementation of complex motion profiles. CAM tables can be modified on the fly. A PLCopen Function Blocks for the Motion Control library are available to implement general purpose motion control.
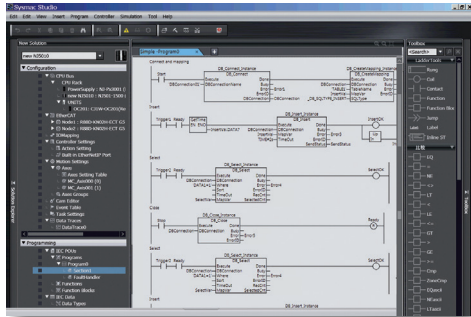
## Safety

The Function Block Diagram editor includes 46 safety FB/FN. Conforms with IEC 61131-3 standard programming and PLCopen Function Blocks for Safety.
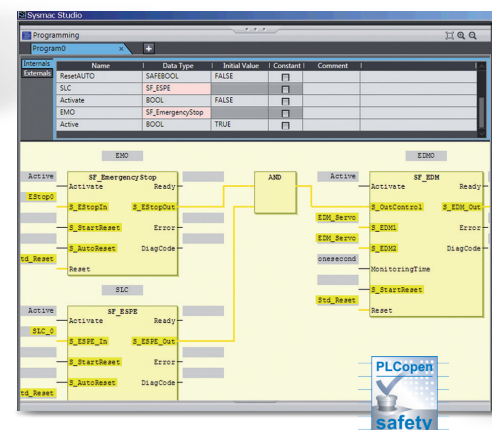
## Information

Projects can generate a huge volume of data, but thanks to the Sysmac Database Connectivity FB library, this data can be analyzed and acted on in real-time.
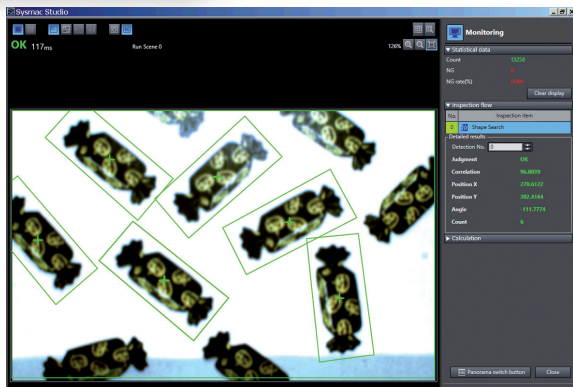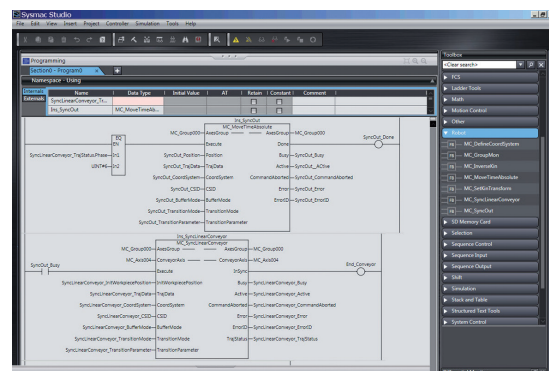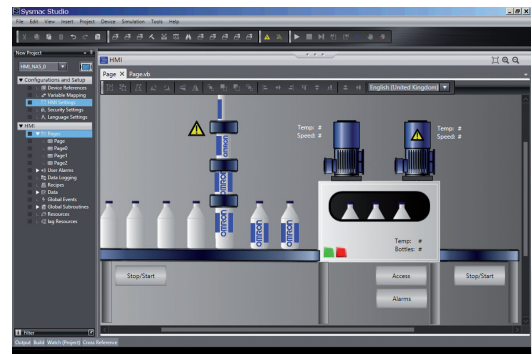


Microsoft®
**SQL Server**

## 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.
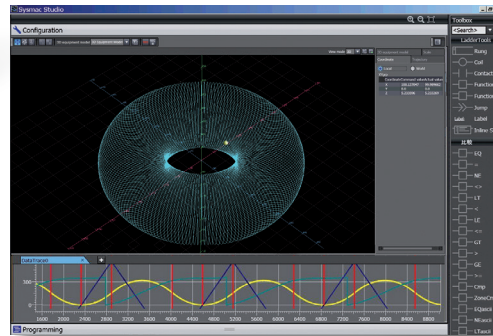


## HMI

Design your own IAG's (Intelligent Application Gadgets) using the machine parts collection. It is also possible to embed code within an IAG using VB.net standard functionality. The Simulator in the Sysmac Studio allows you to test the NA application with the Machine Controller program.



**Studio**



## Robotics

Integrated robotics Function Block library for Delta 2 and Delta 3 control. A 3D simulator is also integrated in the Sysmac Studio, visualizing and reproducing the Delta robot trajectory.

## Vision

Just drag & drop any processing items to build a program for image processing.

**Sysmac Studio**

# One Machine Controller

## Complete and robust machine automation

The Machine Automation Controller is at the heart of the Sysmac platform. One integrated machine controller that offers speed, flexibility and scalability of software centric architecture without compromising on the traditional reliability and robustness that you have come to expect from Omron PLCs. The Machine Controller is designed to meet extreme machine control requirements in terms of motion control speed and accuracy, communication, security and robust system. You just create…

### Application libraries
· FB library option for packaging engineering (Rotary Knife, Winder/Unwinder, Temperature Control...)

### System robustness
· One event log for controller, field devices and networks
· Standard PLC system check: Watch-Dog Timer, memory check, network topology check, etc.

### Machine automation controller features
· Fastest system cycle: 125 µs
· Up to 256 synchronized axes
· Synchronized control of all machine network devices
· Multi-tasking programs
· In-line ST, Structured Text and Ladder mixed in the same program
· Full control of Axes Group Position
· System Backup and Restore
· Built-in EtherCAT and EtherNet/IP ports
· CE and cULus global standards

### Hardware design
· Architecture based on new Intel CPU
· The most compact controller in its class
· Built-in USB port and SD card slot

✔ Scalability, performance, robustness… Choose the most suitable CPU for your application!

|  | NX7 | NJ5 | NJ3 | NJ1 |
|---|---|---|---|---|
| Fastest Cycle Time | 125 µs | 500 µs | 500 µs | 1 ms |
| Real axes | 256 axes | 64 axes | 8 axes | 2 axes |
| EtherCAT slaves | 512 | 192 | 192 | 64 |
| Motion Core | Two synchronized Motion Cores | Synchronized Motion Core | Synchronized Motion Core | Synchronized Motion Core |

## EtherNet/IP™

### Standard Factory network
- Programming
- Other Machine controllers
- HMI / SCADA
- IT systems
- Standard Protocols and Services: TCP/IP, FTP, NTP, SNMP
- CIP protocol
- Database connection FB's for Microsoft SQL Server, Oracle, IBM DB2, MySQL and Firebird
- Built-in SECS/GEM communications functionality

## EtherCAT®

### Standard Machine network
- Servos
- Inverters
- Robotics
- Vision systems
- Distributed I/O
- Integrated Safety
- Sensing

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

# NA HMI Series

## The next generation of machine interface

An HMI that is dynamic, intuitive and predictive makes industrial machines more attractive and competitive. The new Omron HMI enables faster, more efficient control and monitoring - and a more natural, proactive relationship between operator and machine. The design has been based on real applications and customer requirements, a future- proofed, scalable platform that will evolve with their ever-changing needs, allowing real time reaction to events. As part of the system family, the NA Series is fully aware of the total machine.

### Hardware design
· Architecture based on Intel
· Fan-less cooling
· Water and dust proof design – IP65
· SD card slot for transfer/store projects and data logging

### Connectivity
· 3 x USB ports: USB memory and programming
· 2 x Ethernet ports: for machine network / IT systems and programming

### NA machine interface features
· Architecture based on Intel
· Widescreen models: 7, 9, 12 and 15 inches
· 1280 x 800 high resolution display
· One integrated project in the Sysmac Studio: NX7/NJ Controller, Safety, Vision and Machine interface
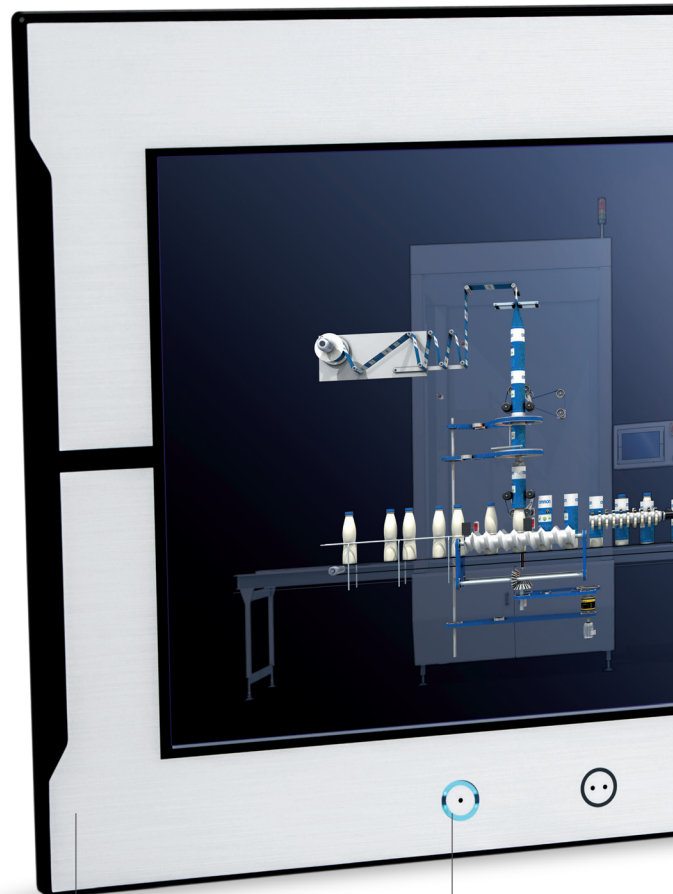
Black and Silver
frame color

Programmable
Function Keys

**Scalable solution**
· Display size from 7-inch up to 15-inch
· Widescreen in all models
· 1280 x 800 resolution for the 12-inch and 15-inch models
· 800 x 480 resolution for the 7-inch and 9-inch models
· Available in black and silver frame colors

7"  9"  15"  12"

**Machine interface**
· Touch screen
· 3 x Programmable Function Keys
· Multimedia including PDF files and video
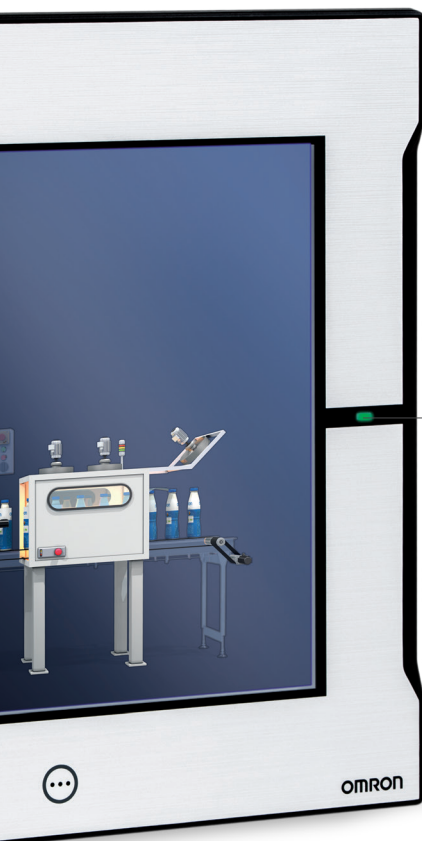
**IAG – Intelligent Application Gadgets**
· Graphics collection from the machine parts
· Embedded code within an IAG with the VB.net standard functionality
· Make your own IAG collection and share them between projects, like a Function Block

RUN/ERR led indicator

myTemperature
mySpeed
RunMotor
(Boolean bStatus)

Temp: #
Speed: #
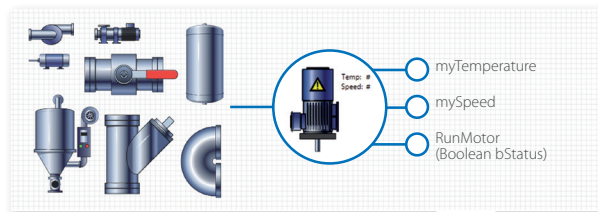
**Sysmac Studio**
· NA HMI programming as a device in the Sysmac Studio
· NX7/NJ controller variables (Tags) in the NA project
· Multiple-access level security with password protection
· Visual Basic programming with VB.net
· NA application testing with the NX7/NJ program via the Simulator in the Sysmac Studio

# NX I/O

## Speed and accuracy for machine performance

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 90 models including position control, temperature inputs and integrated safety.



### EtherCAT connectivity
- Distributed clock to ensure I/O response with less than 1 µs jitter
- Safety over EtherCAT (FSoE)
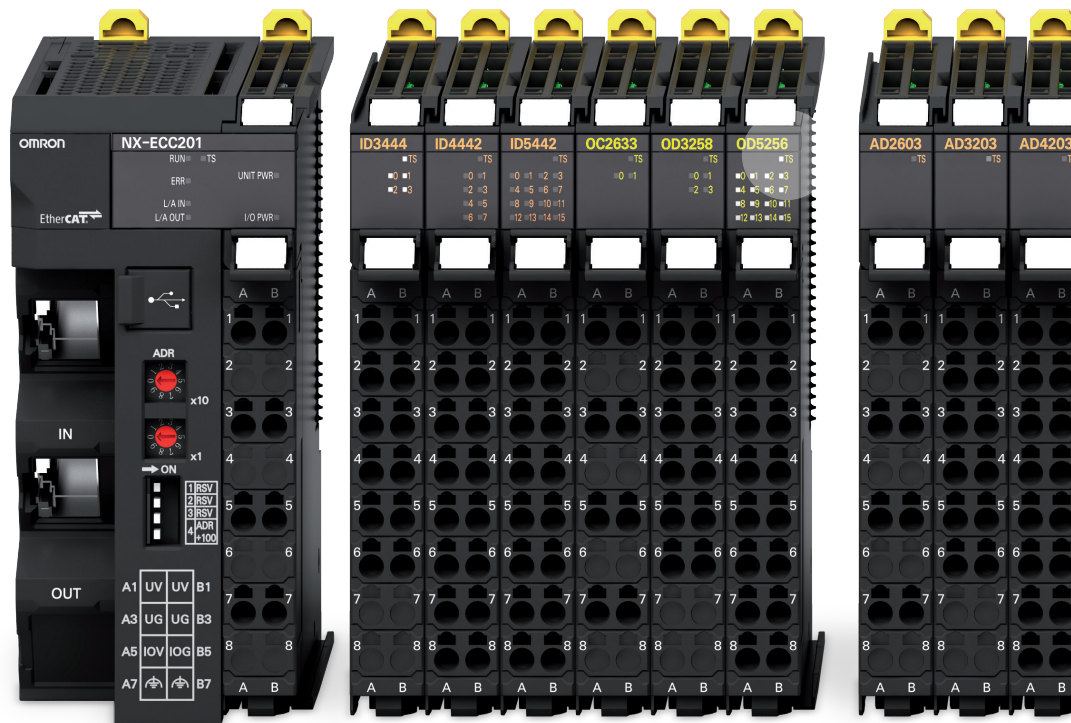
### EtherCAT coupler
- Up to 1024 byte input / 1024 byte output
- Automatic backup/restore of all I/O unit parameters. Except Safety Control unit and Safety I/O units

### Digital I/O
- Units for 4, 8 or 16 points
- Standard, high-speed and time-stamp models
- Relay outputs, NO only or NO+NC
- 240 V AC inputs
- 16- and 32-point units with MIL connector

### NX I/O features
- NsynX technology provides deterministic I/O response with nanosecond resolution
- Digital I/O: high-speed and time-stamp models (NsynX)
- Analogue I/O: high performance models offer 10 µs conversion time per channel and 1:30000 resolution
- Detachable front connector with push-in type screwless terminals on all NX I/O units
- On/Offline configuration, simulation, and unified troubleshooting in the Sysmac Studio software

### Serial communication
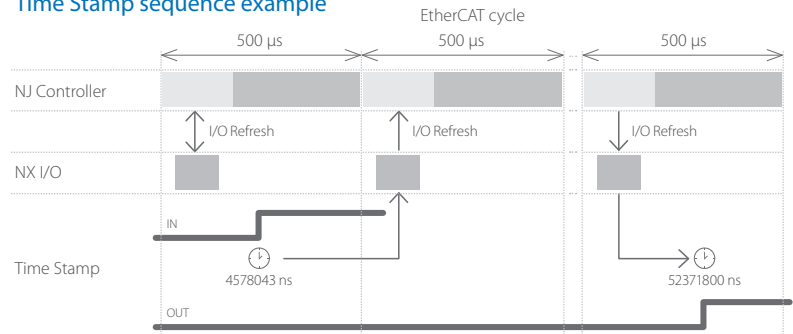- Units for RS232C or RS422A/485 serial communication interface

- High signal density; up to 16 I/O points in 12 mm width

## NsynX technology

- The NsynX technology is provided by the internal high-speed bus synchronized with the EtherCAT network. This technology is designed for machine control and includes:
- I/O units with distributed clock
- High-speed I/O units synchronized with the EtherCAT cycle
- I/O units with Time-Stamp function (accuracy < 1 µs )

### Time Stamp sequence example

EtherCAT cycle

| | 500 µs | 500 µs | 500 µs |

NJ Controller

I/O Refresh     I/O Refresh     I/O Refresh

NX I/O

IN

Time Stamp

4578043 ns     52371800 ns

OUT

Accurate control of input events and perfect control of output with nanosecond resolution
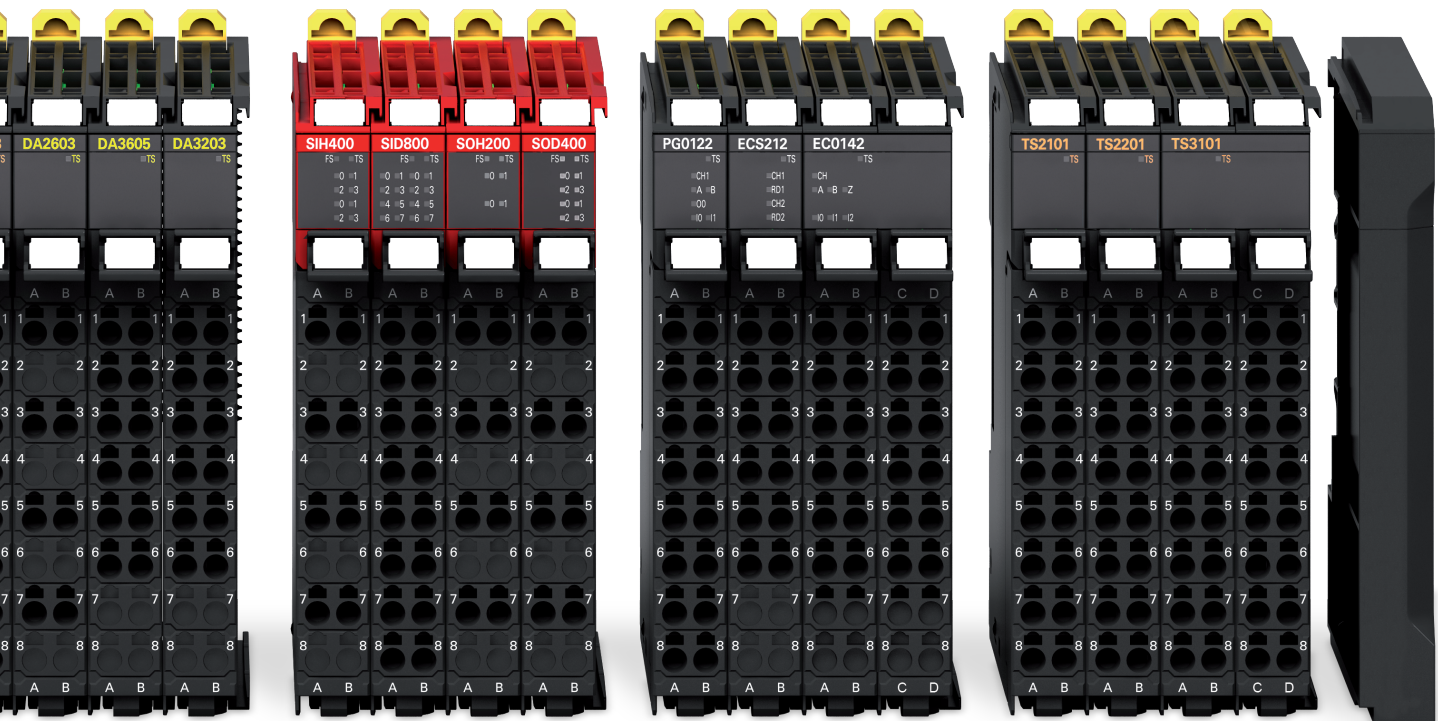
### Analogue I/O
- +/-10V voltage and 4-20 mA current signals
- 2, 4 or 8 channels per input unit
- 2 or 4 channels per output unit
- Standard and high-performance models

### Safety I/O
- Up to 8 safety input points per unit
- Freely allocation of the Safety I/O units on the internal high speed bus.

### Position interface
- Encoder input units for connection of external axes to the Sysmac system
- Incremental and absolute encoder support
- Positioning control unit with pulse train output

### Temperature Inputs
- Thermocouple or RTD inputs, 2 or 4 per unit

### End Cover

- Fast and secure screwless push-in connections
- Removable I/O connectors for easy pre-wiring, testing and system maintenance
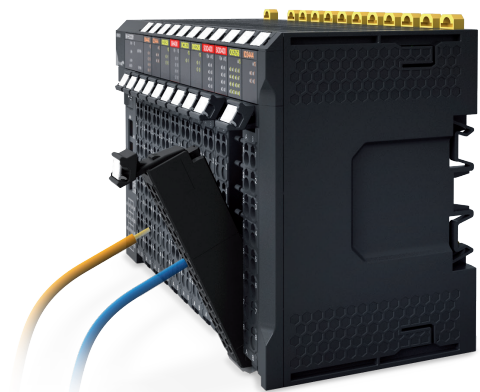
# NX Safety distributed

## Integrated safety into machine automation

The Sysmac platform integrates a safety solution within our one connection and one software concept. One connection is realized through the use of Safety over EtherCAT -FSoE- protocol. The One software is achieved by using the Sysmac Studio for configuration, programming and maintenance. The NX safety system consists of safety controller and safety I/O units. Both the safety controller and safety I/O can be freely distributed in an I/O rack throughout the network, mixing them in any combination with standard NX I/O.

EtherCAT telegram

**NX Safety controller**
· The safety controller variables are part of the NX7/NJ controller project
· Flexibility and reusability of the programming code

Safety over
**EtherCAT**

### NX Safety features
· The safety controller meets PLe according to the ISO 13849-1 and SIL3 according to IEC 61508
· Flexible system lets you freely mix safety controller and safety I/O units with standard NX I/O
· Integration in One software, Sysmac Studio
· Certified programs can be reused, which reduces the amount of verification work

Functional
Safety
Type
Approved

TÜVRheinland®
CERTIFIED
www.tuv.com
ID 0600000000

ISO 13849-1, PLe

IEC 61508, SIL3

## Safety integration in One software

- Integrated Development Environment in Sysmac Studio provides one common software for hardware configuration, programming and maintenance of the Sysmac platform
- 46 safety FB/FN conforming with IEC 61131-3 standard programming
- PLCopen Function Blocks for safety



Machine Automation Controller
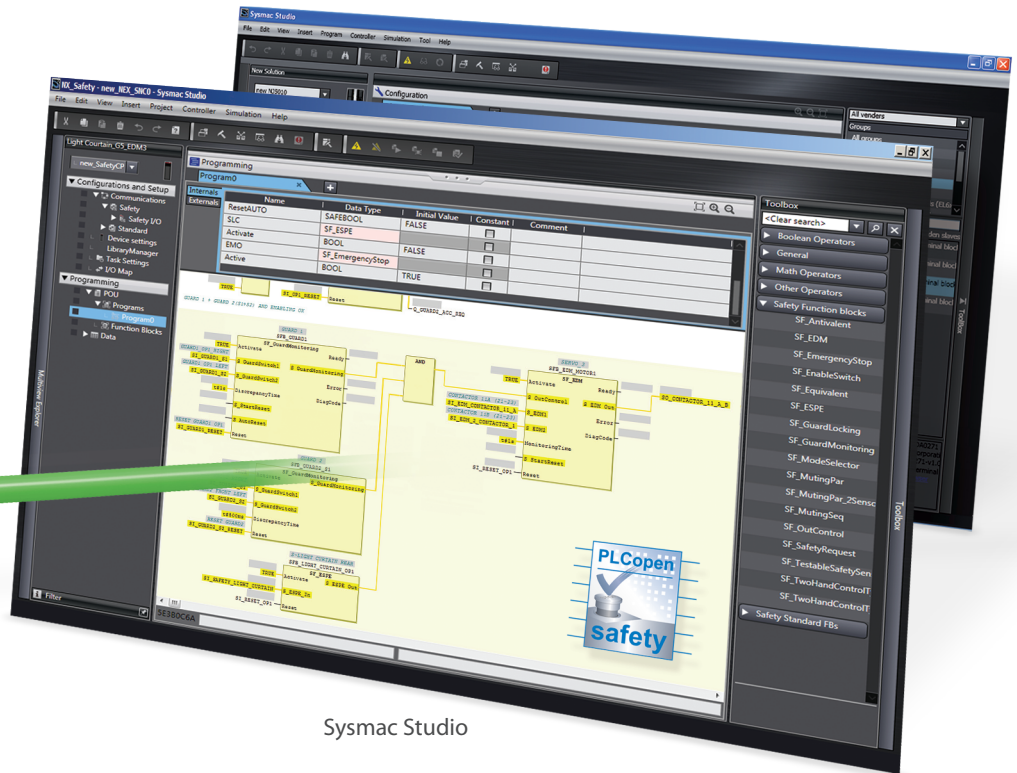
Sysmac Studio

## Safety over EtherCAT frame



CDM | Safe data | CRC_O | Safe data | CRC_1 | ... | Conn ID



## NX Safety I/O

- Up to 8 safety input points per unit
- High connectivity I/O units for direct connection to a variety of devices
- I/O data monitoring in the NX7/NJ controller project

# G5 Servo system

### At the heart of every great machine

Great machines are born from a perfect match between control and mechanics. G5 gives you that extra edge to build more accurate, faster, smaller and safer machines.

**EtherCAT®**

### EtherCAT connectivity
- Compliant with CoE -CiA402 Drive profile-
- Cyclic Synchronous Position, Velocity and Torque modes
- Embedded Gear Ratio, Homing and Profile Position mode
- Distributed clock to ensure high precision synchronization

### Safety conformance
- **PL-d accord**ing ISO 13849-1
- STO: IEC61800-5-2
- SIL2 according to EN61508

### G5 servo system features
- Compact size servo drives with EtherCAT connectivity built-in
- High-response frequency of 2 kHz
- Load vibration suppression
- Embedded Safety conforming ISO 13849-1 Performance Level d
- Advanced tuning algorithms (Anti-vibration function, torque feedforward, disturbance observer)
- Wide range of linear and rotary servo motors

## Improved rotary motors

- Low cogging torque servo motors
- High accuracy provided by 20 bit encoder
- Motors and connectors with IP67
- Large range of motors from 0.16 Nm up to 96 Nm nominal torque (224 Nm peak)
- Standard and high inertia motors
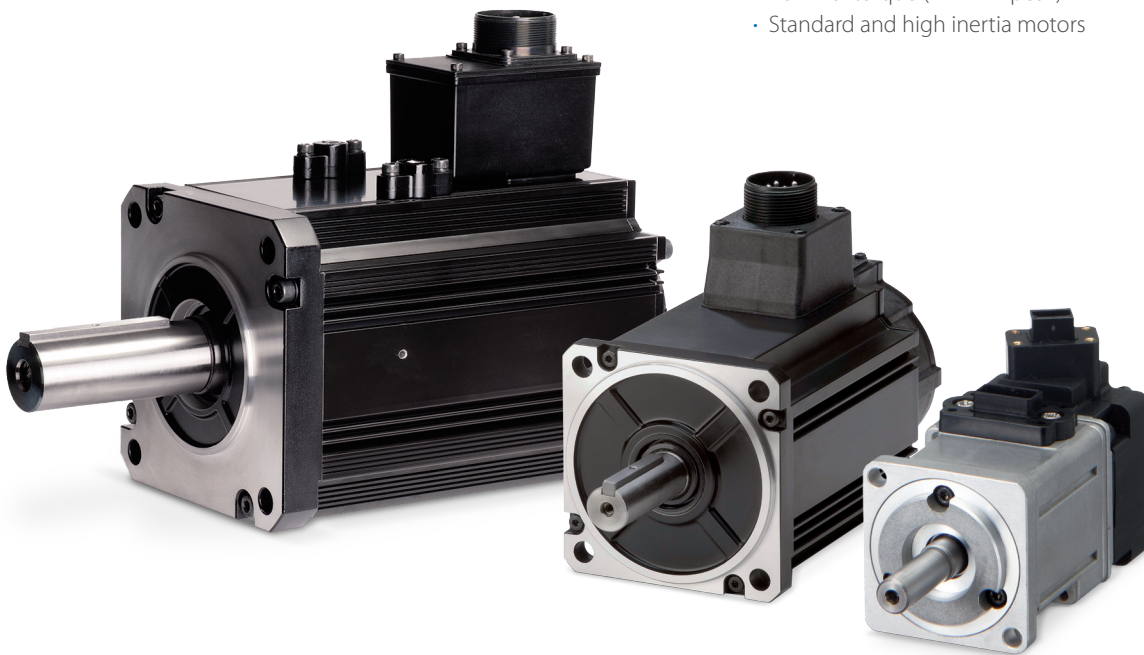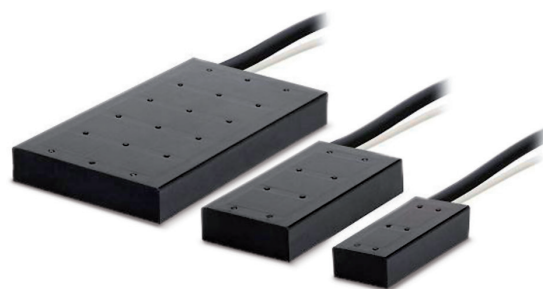
## Ironless linear motors

- Compact, efficient design
- Excellent force-to-weight ratio
- No latching force
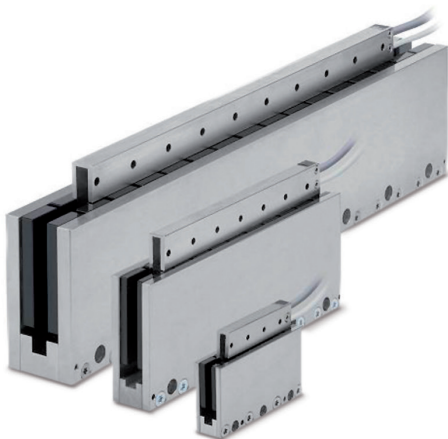
## Iron-core linear motors

- Compact, flat design
- Optimum ratio between force and volume
- Weight-optimized magnetic track

# MX2 and RX Inverter series

## Drive solution for machine automation

Thanks to its advanced design and algorithms, the MX2 inverter provides smooth control down to zero speed, plus precise operation for cyclic operations and torque control capability in open loop. The RX series combines high performance, application functionality and customisation to match the precise requirements. Both, the MX2 and RX inverter series are fully integrated within the Omron Sysmac automation platform.

### 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
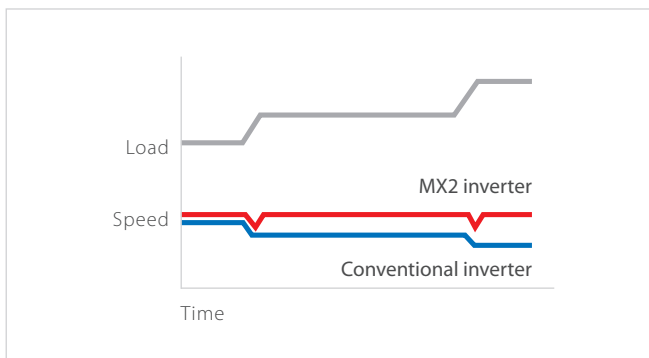
MX2

### MX2 features
· Power range up to 15 kW
· Torque control in open loop, ideal for low to medium torque applications
· 200% starting torque near stand-still operation (0.5 Hz)
· Double rating VT 120%/1 min and CT 150%/1 min
· IM and PM motor control
· Drive Programming software tool
· 24 VDC backup supply for control board and communications
· Built-in application functionality (i.e. Brake control)

**Motor efficiency control**
· Double rating VT 120%/1 min and CT 150%/1 min
· Energy saving function

**200% starting torque**
· Near stand-still operation
· High starting torque in open loop
· Control of fast cyclic loads

**EtherCAT** RX

### (Example of Speed vs. Torque Characteristics: RX series type)



Torque (Percentage of Rating) vs Rotation Speed (rpm)
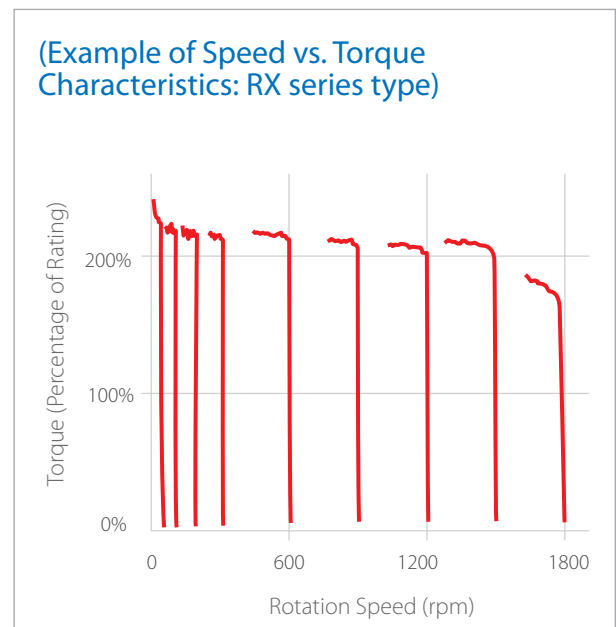
### RX features
· Power range up to 132 kW
· Sensor-less and closed-loop vector control
· High starting torque in open-loop (200% at 0.3 Hz)
· Full torque at 0 Hz in closed-loop
· Double rating VT 120%/1 min and CT 150%/1 min
· Drive Programming software tool
· Built-in application functionality (i.e. ELS - Electronic Line Shaft-)

# FQ-M Vision sensor

## Designed for object tracking

The FQ-M series is a vision sensor designed specifically for pick and place applications. It comes with EtherCAT embedded and can be configured and monitored from Sysmac Studio software. The FQ-M series is compact, fast and includes an incremental encoder input for easy tracking and calibration.

### Advanced shape search technology



Varying material ie. shiny
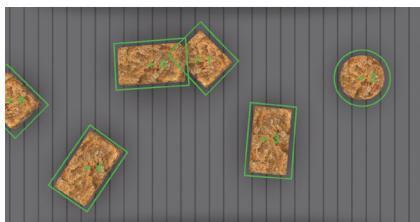


Overlapping products



Product detection:
10 pcs with rotation < 200 ms

### Detection
· Up to 5000 pieces per minute with 360 degree rotation
· Stable and robust detection under changeable environmental conditions

### Design
· Camera and image processing in one
· Standard C-mount lenses; choose the field of view and focus distance you need
· Variety of industrial connector types (angled, straight) for correct mounting
· EtherCAT port for object tracking
· Ethernet port for advanced configuration and monitoring
· Vision sensor with encoder input for tracking function

### Software tool
· Fully integrated within the Sysmac Studio software tool
· Intuitive and icon driven set-up and configuration
· Trending and logging function



75 mm

110 mm

EtherCAT.

# 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.

### Flexible machine vision
· Over 100 processing items including 1D code, 2D code and OCR
· Inspection of scratches and defects
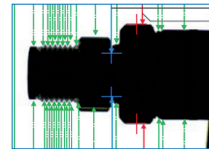
Dimension check

Character and code reading

### Multiple inspection
· Powerful 4-core i7 parallel processor
· Up to 8 camera by one controller

Focal shift    Contrast    Chips

Hidden    Overlapping    Thinning and thickening
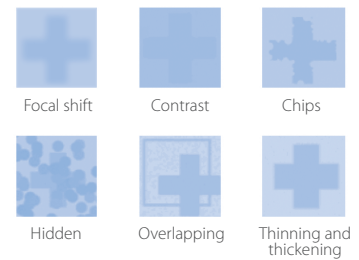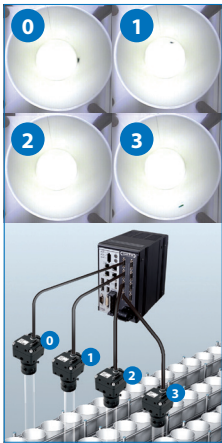
### Advanced shape search technology
· Differences of the work piece
· Dust and dirt conditions
· Detection of overlapping objects
· Changing ambient environment

### Wide camera range
· Up to 12 Mpixel
· High speed CMOS camera
· Use different fields of vision and at any angle

# ZW Measurement Sensor

## Ultra-compact, Lightweight sensor measures any material

The ZW confocal fiber displacement sensor delivers stable, non-contact in-line measurements of height, thickness and other dimensions. It solves the problems of traditional laser triangulation sensors: deviation between different material with inclination tolerance. The compact sensing head has no electronic parts to eliminate problems of installation space and mutual interference, electrical/magnetic noise, temperature rise and mechanical positioning. The EtherCAT interfaces integrates height and position coordinates for profile mapping.

- Ultra-compact sensing head: 24x24mm weighs only 105g
- High flexibility fiber optic cable from sensor to controller - up to 32m
- Mount sensing head one time - no need to re-tune for changing materials
- Separate amplifier provides white LED light source, spectroscope and processor to convert reflected color light to distance
- Stable measurements for any material - glass, stainless steel, mirror, white ceramic and PCB substrates
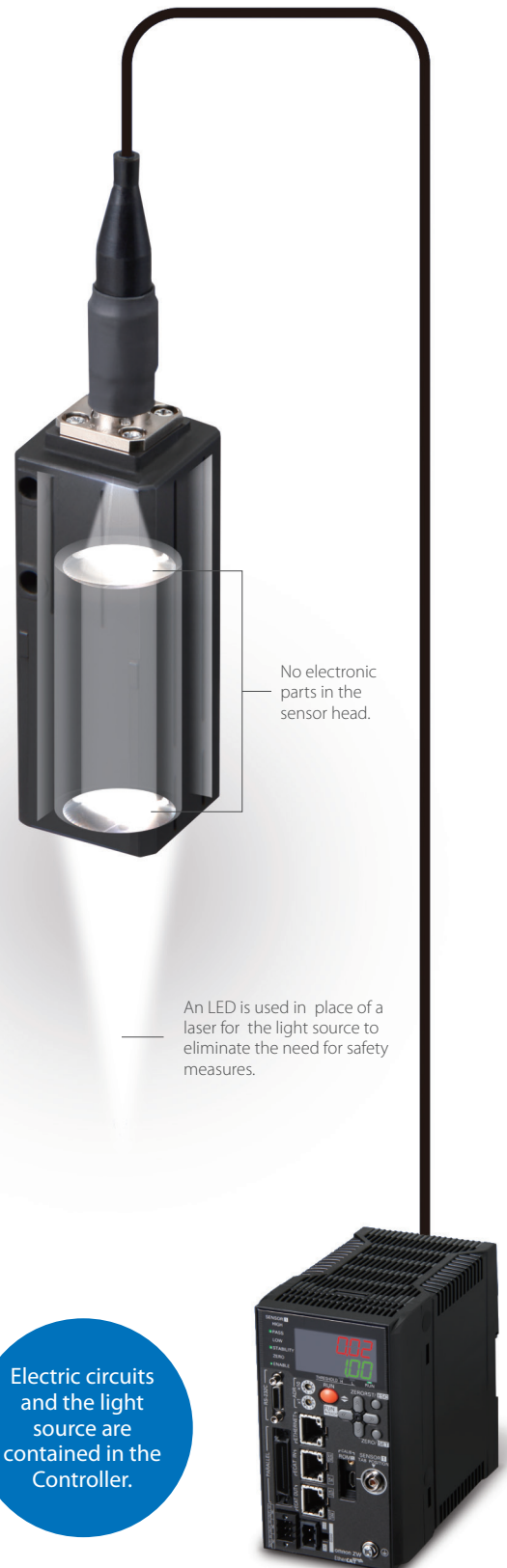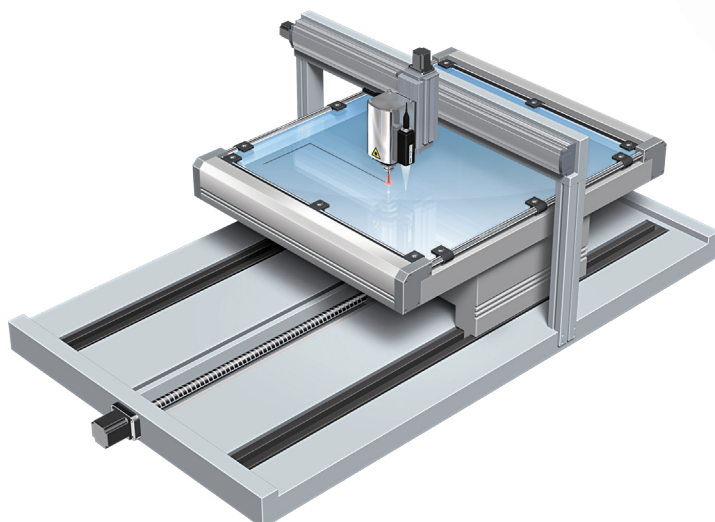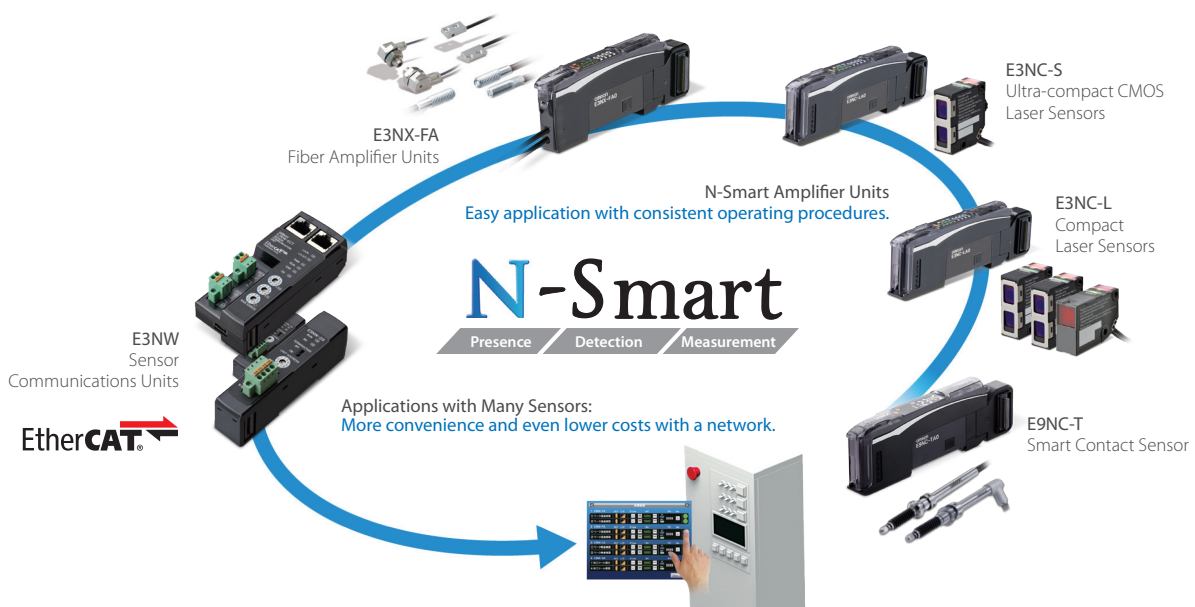
No electronic parts in the sensor head.

An LED is used in place of a laser for the light source to eliminate the need for safety measures.

Electric circuits and the light source are contained in the Controller.
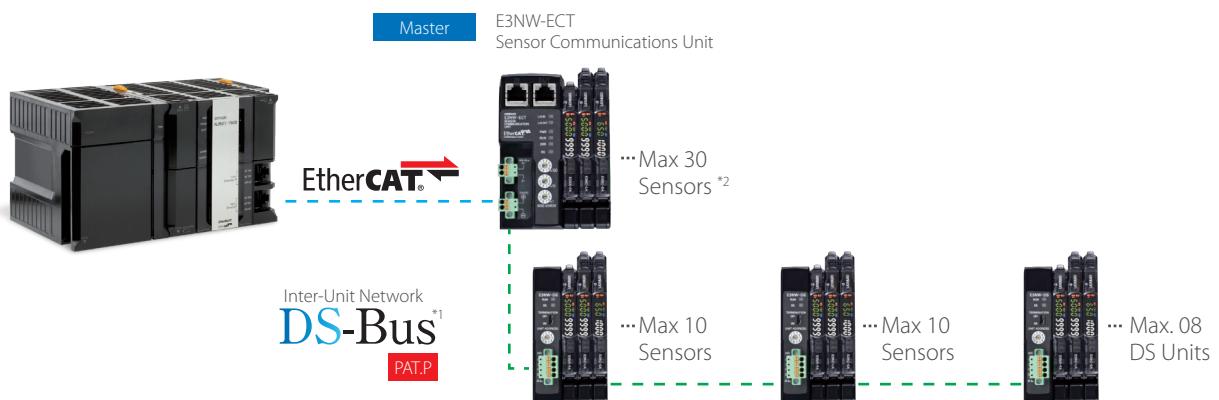
# N-Smart Series

## 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 increase equipment operation rates and minimize downtime with optimum cost performance.

**E3NX-FA**
Fiber Amplifier Units

**E3NC-S**
Ultra-compact CMOS Laser Sensors

**N-Smart Amplifier Units**
Easy application with consistent operating procedures.

**N-Smart**
Presence | Detection | Measurement

**E3NC-L**
Compact Laser Sensors

**E3NW**
Sensor Communications Units

EtherCAT

Applications with Many Sensors:
More convenience and even lower costs with a network.

**E9NC-T**
Smart Contact Sensor

## 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

**Master**

**E3NW-ECT**
Sensor Communications Unit

EtherCAT

···Max 30 Sensors [2]

Inter-Unit Network
**DS-Bus** [1]
PAT.P

···Max 10 Sensors

···Max 10 Sensors

···Max. 08 DS Units

*1 The DS-Bus is an OMRON inter-Unit net-work communications protocol, that connects the E3NW-ECT Sensor Communications Unit and E3NW-DS Distributed Sensor Units.
*2 Each E3NW Node supports a maximum of 30 total sensors, including DS-Bus sensors.

# Service and support



**PRESENCE**

**OMRON technical offices across the World**

**atc** Automation Center
Kusatsu (JPN), Shanghai (CHN), Barcelona (ESP),
Jakarta (IDN), Mumbai (IND), Chicago (USA)

**TS** Tsunagi laboratory
Kusatsu (JPN), Shanghai (CHN),
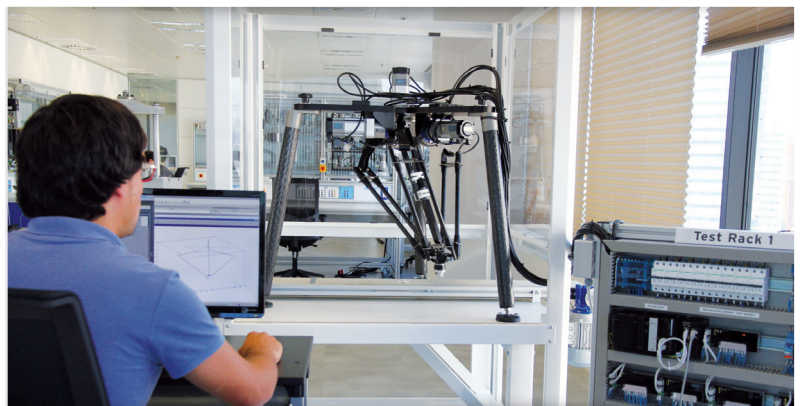Den Bosch (NL), Mumbai (IND)

● Technical office     ○ Premium Partner

**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. Make use of our Tsunagi (connectivity) laboratory 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.

Helsinki
Stockholm
Oslo
Estonia
Latvia
Gothenburg
Århus
Malmö
Lithuania
Moscow
Copenhagen
Hamburg
Amsterdam
Düsseldorf
Milton Keynes
Berlin
Warsaw
**DEN BOSCH** LS
Frankfurt
Brussels
Stuttgart
Munich
Prague
Krakow
Paris
Piestany
Nantes
Vienna
Rotkreuz
Budapest
Lyon
Lausanne
Vitoria
Milan
Velenje
Bucharest
Toulouse
Bologna
Zagreb
Pleven
Porto
Belgrade
atc **BARCELONA**
Terni
Sofia
Istanbul
Lisbon
Madrid
Valencia
Skopje
Sevilla
Athens
Alger
Tunis
Casablanca

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 -
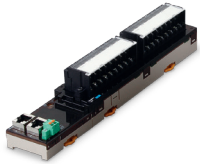
# Sysmac family

| MACHINE CONTROLLER | | | |
|---|---|---|---|
| **Model** | **NX7** | **NJ5** | **NJ3** | **NJ1** |
| Fastest cycle time | 125 µs | 500 µs | 500 µs | 1 ms |
| Number of axes | 256, 128 | 64, 32, 16 | 8, 4 | 2, 0 |
| Task | Multi-tasking program | | | |
| Motion core | 2 synchronized motion cores | Synchronized motion core | | |
| Functions | • Logic sequence<br>• Motion | • Logic sequence<br>• Motion<br>• Robotics<br>• Database Connection<br>• SECS/GEM | • Logic sequence<br>• Motion | • Logic sequence<br>• Motion |
| Software tool | Sysmac Studio | | | |
| Programming languages | • Ladder<br>• Structured Text<br>• In-Line ST | | | |
| Standard programming | • IEC 61131-3<br>• PLCopen Function Blocks for Motion Control | | | |
| Program capacity | 80 MB | 20 MB | 5 MB | 3 MB |
| SD memory card | SD and SDHC memory card | | | |
| Built-in port | • EtherNet/IP<br>• EtherCAT<br>• USB 2.0 | | | |
| EtherCAT slaves | 512 | 192 | 192 | 64 |
| Servo drive | Accurax G5/EtherCAT | | | |
| Motion control | • Axes groups interpolation and single axis moves<br>• Electronic cams and gearboxes<br>• Direct position control for axis and groups | | | |
| Robotics | -- | Up to 8 Delta Robot control | -- | -- |
| Supported SQL servers | -- | • Microsoft SQL Server<br>• Oracle<br>• IBM DB2<br>• MySQL<br>• Firebird | -- | -- |
| Local I/O | - | CJ series units | | |
| Remote I/O | NX I/O units/EtherCAT | | | |
| Mounting | DIN rail | | | |
| Global standards | CE, cULus | CE, cULus, NK, LR | | |
| Ordering information | P072 Sysmac Catalogue - www.industrial.omron.eu/en/products/downloads | | | |

## MACHINE INTERFACE

| Model | NA5-15W | NA5-12W | NA5-9W | NA5-7W |
|---|---|---|---|---|
| Display | TFT colour LCD | | | |
| Display size | 15-inch widescreen | 12-inch widescreen | 9-inch widescreen | 7-inch widescreen |
| Resolution | 1280 x 800 pixels | | 800 x 480 pixels | |
| Display colour | 24 bit full colour | | | |
| Operator input | • Touch screen<br>• 3 programmable function keys | | | |
| Built-in port | • 2 x Ethernet<br>• 3 x USB 2.0 | | | |
| Power requirements | 19.2 to 28.8 VDC | | | |
| Software tool | Sysmac Studio | | | |
| IP ratings | Front panel IP65 | | | |
| Memory card | SD and SDHC memory card | | | |
| Features | • Multiple-access level security with password protection<br>• Visual Basic programming with VB.net<br>• Integrated simulator in the Sysmac Studio | | | |
| Options | Black and silver frame colours | | | |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads | | | |

| I/O | | |
|---|---|---|
| **Model** | **NX Series I/O** | **GX Series I/O** |
| Type | Modular I/O | Block I/O |
| Network specification | EtherCAT coupler unit | EtherCAT built-in |
| Number of units | • Up to 63 I/O units<br>• Max. 1024 bytes in + 1024 bytes out | Block I/O expandable with one digital I/O unit<br>(16 points + 16 points) |
| I/O types | • Digital I/O<br>• Analog I/O<br>• Encoder input<br>• Pulse output<br>• Temperature sensor input<br>• Safety control | • Digital I/O<br>• Analog I/O<br>• Encoder input<br>• Expansion unit |
| I/O connection | • Screwless push-in terminals (All units)<br>• MIL connectors (Option for units with 16 and 32 digital I/O points) | M3 screw terminals (1- or 3- wire DI) |
| Features | • Automatic and manual address setting<br>• Standard and high-speed inputs<br>• Digital input filtering<br>• Removable push-in I/O terminals<br>• Synchronous I/O updates using Distributed Clock<br>• I/O units with Time Stamp function<br>• High signal density: 16 digital or 8 analog signals in 12 mm width | • Automatic and manual address setting<br>• High-speed input<br>• Digital input filtering<br>• Removable I/O terminals<br>• Expandable digital I/O |
| Mounting | DIN rail | |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads | |

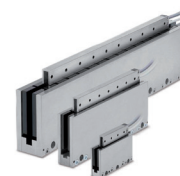| SAFETY | | |
|---|---|---|
| **Model** | **NX safety controller** | **NX safety input unit** | **NX safety output unit** |
| Network specification | FSoE − Safety over EtherCAT | | |
| Performance level | PLe (EN ISO 13849-1) | | |
| Safety integrity level | SIL3 (IEC 61508) | | |
| PFH | 4.4E-10 | 3.80E-10 | 8.80E-10 |
| PFD | 7.0E-06 (20 years) | 6.6E-06 | 7.9E-06 |
| TM (Mission time) | 20 years | | |
| Programming | • IEC 61131-3 standard<br>• 46 Safety FB/FUN | – | – |
| Safety connections | 32 connections (NX-SL3300 safety CPU)<br>128 connections (NX-SL3500 safety CPU) | – | – |
| I /O signal | – | • 4 points<br>• 8 points | • 2 points<br>• 4 points |
| Number of test outputs | – | 2 | – |
| I/O connection | Screwless push-in terminals | | |
| Maximum load current | – | – | • 2 A<br>• 0.5 A |
| Features | • Freely mix with standard NX I/O<br>• Flexibility and reusability of the programming code<br>• Variables are part of the NX7/NJ controller project | • Freely mix with standard NX I/O<br>• High connectivity for direct connection to safety input devices<br>• I/O data monitoring in the NX7/NJ controller project | |
| Mounting | DIN rail | | |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads | | |

## SERVO SYSTEM



| Model | Accurax G5 servo drive | |
|---|---|---|
| Type | Rotary servo drive | Linear servo drive |
| Ratings 230 V single-phase | 100 W to 1.5 kW | 200 W to 1.5 kW |
| Ratings 400 V three-phase | 600 W to 15 kW | 600 W to 5 kW |
| Applicable servomotor | Accurax G5 rotary motors | Accurax linear motors |
| Position, speed and torque control | EtherCAT | |
| Safety approvals | • PLd (EN ISO 13849-1)<br>• SIL2 (IEC 61508) | |
| Safety function | STO | |
| Full closed loop | Built-in | N/A |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads | |



| Model | Accurax G5 rotary motor | | | | Accurax G5 high inertia rotary motor | | |
|---|---|---|---|---|---|---|---|
| Rated speed | 3,000 rpm | 2,000 rpm | 1,500 rpm | 1,000 rpm | 3,000 rpm | 2,000 rpm | 1,500 rpm |
| Maximum speed | 4,500 to 6,000 rpm | 3,000 rpm | 2,000 to 3,000 rpm | 2,000 rpm | 5,000 rpm | 3,000 rpm | 1,500 to 3,000 rpm |
| Rated torque | 0.16 Nm to 15.9 Nm | 1.91 Nm to 23.9 Nm | 47.8 Nm to 95.5 Nm | 8.59 Nm to 57.3 Nm | 0.64 Nm to 2.4 Nm | 4.77 Nm to 23.9 Nm | 47.8 Nm |
| Sizes | 50 W to 5 kW | 400 W to 5 kW | 7,5 kW to 15 kW | 900 W to 6 kW | 200 W to 750 W | 1 kW to 5 kW | 7,5 kW |
| Applicable servo drive | Accurax G5 rotary servo drive | | | | | | |
| Encoder resolution | 20-bit incremental/<br>17-bit absolute | | 17-bit absolute | 20-bit incremental/<br>17-bit absolute | | | 17-bit absolute |
| IP rating | IP67 | | | | IP65 | IP67 | |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads | | | | | | |



| Model | Accurax linear motor | |
|---|---|---|
| Type | Iron-core linear motor | Ironless linear motor |
| Continuous force range | 48 N to 760 N | 29 N to 423 N |
| Peak force range | 105 N to 2000 N | 100 N to 2100 N |
| Maximum speed | 1 to 10 m/s | 1.2 to 16 m/s |
| Magnetic attraction force | 300 N to 4440 N | Zero |
| Applicable servo drive | Accurax G5 linear drive | |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads | |

## SERVO SYSTEM

| Model | Integrated servo motor | | | |
|---|---|---|---|---|
| Rated torque | 25 Nm | 11,7 Nm | 4,3 Nm to 5 Nm | 2,55 Nm to 3,2 Nm |
| Frame size | 190 mm | 142 mm | 100 mm | 80 mm |
| Rated speed | 3,000 rpm | | | |
| Maximum speed | 4,000 rpm | | | |
| Encoder resolution | 15-bit incremental/18-bit absolute | | | |
| IP rating | IP65 | | | |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads | | | |

## FREQUENCY INVERTERS

| Model | RX | MX2 |
|---|---|---|
| 400 V three-phase | 0.4 kW to 132 kW | 0.4 to 15 kW |
| 200 V three-phase | 0.4 kW to 55 kW | 0.1 kW to 15 kW |
| 200 V single-phase | N/A | 0.1 kW to 2.2 kW |
| Control method | Sensor-less and closed-loop vector control | • V/F control<br>• Sensor-less vector control |
| Torque features | • 200% at 0.0 Hz (CLV)<br>• 150% at 0.3 Hz (OLV) | • 200% at 0.5 Hz |
| Connectivity | EtherCAT option board | |
| Logic Programming | Standard Firmware | |
| Customisation options | – | IP54 enclosure |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads | |

## ROBOTS

| Model | Accurax linear motor axis |
|---|---|
| Type | Linear motor axis |
| Continuous force range | 48 N to 760 N |
| Peak force range | 105 N to 2,000 N |
| Maximum speed | 5 m/s |
| Magnetic attraction force | 300 N to 4,440 N |
| Applicable servo drive | Accurax G5 linear drive |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads |

| Model | Delta robot IP69K | Delta robot IP67 | Mini Delta robot IP67 | Mini Delta robot IP65 |
|---|---|---|---|---|
| Type | Washdown Delta robot series | | | |
| Max. Payload | 3 Kg | | 2 Kg | 1 Kg |
| Degrees of freedom | 3 + 1 (rotation optional) | | | |
| Rated working range | Ø 1,100 x 250 mm (Max. 400) | Ø 1,100 x 300 mm (Max. 450) | Ø 650 x 150 mm (Max. 250) | Ø 500 x 155 mm / Ø 450 x 135 mm (with rotational axis) |
| Cycle time | "25/305/25 mm (0 .1 kg): Up to 150 c ycle/ min" | | "25/305/25 mm (0 .1 kg): Up to 200 c ycle/ min" | |
| Position repeatability | ± 0.2 mm (X, Y, Z) | | ± 0.1 mm (X, Y, Z) | ± 0.2 mm (X, Y, Z) |
| Angular repeatability | ± 0.3° (q) | ± 0.1° (q) | | ± 0.3° (q) |
| Protection class | IP69K | IP67 | | IP65 (Stainless steel + Titanium) |
| Rotational axis type | Shaft mounting | Tool Center Point mounting - Low or High inertia - | Tool Center Point mounting - Low or High inertia - | Shaft mounting |
| Option | - | Anti-collision detection | Anti-collision detection | - |
| Machine controller | NJ5 Robotics | | | |
| Servo drive | Accurax G5 rotary servo drive - EtherCAT | | | |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads | | | |

| Model | Delta robot XXL | Delta robot XL | Delta robot | Mini Delta robot |
|---|---|---|---|---|
| Type | Delta robot series | | | |
| Max. Payload | 8 Kg | 2 Kg | | 1 Kg |
| Degrees of freedom | 3 + 1 (rotation optional) | | | |
| Rated working range | Ø 1,600 x 350 mm (Max. 550) | Ø 1,300 x 250 mm (Max. 400) | Ø 1,100 x 250 mm (Max. 400) | Ø 500 x 155 mm / Ø 450 x 135 mm (with rotational axis) |
| Cycle time | "25/300/25 mm (8 kg): Up to 60 c ycle/ min 200/1000/200 mm (8 kg): Up to 35 cycle/ min" | "25/305/25 mm (0 .1 kg): Up to 120 c ycle/ min" | 25/305/25 mm (0 .1 kg): Up to 150 c ycle/ min | 25/305/25 mm (0 .1 kg): Up to 200 c ycle/ min |
| Position repeatability | ± 1 mm (X, Y, Z) | ± 0.2 mm (X, Y, Z) | ± 0.3 mm (X, Y, Z) | ± 0.2 mm (X, Y, Z) |
| Angular repeatability | ± 0.3° (q) | | ± 0.4° (q) | ± 0.3° (q) |
| Protection class | IP65 | | | |
| Rotational axis type | Shaft mounting | | | |
| Machine controller | NJ5 Robotics | | | |
| Servo drive | Accurax G5 rotary servo drive - EtherCAT | | | |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads | | | |

## VISION



| Model | FQ-M | FH |
|---|---|---|
| Description | Designed for object tracking | Flexible machine vision |
| Interface | EtherCAT and Ethernet built-in | EtherCAT, Ethernet, USB and serial ports built-in, SD card |
| Inspection items | Shape search, search labelling, edge position | Over 100 processing items |
| Registered scenes | 32 | |
| Image processing method | Real colour or monochrome | |
| Camera resolution | 752 x 480 | 4096 x 3072 |
| Features | • Fast and powerful object recognition<br>• Encoder input for object tracking and calibration<br>• Contour based object detection<br>• Sysmac Studio software for vision system operation and setting | • Powerful 4-core i7 parallel processor<br>• High speed CMOS camera<br>• Up to 8 camera by one controller<br>• Advanced shape search technology |
| Software | Sysmac Studio | |
| Supply voltage | 24 VDC | |
| Digital I/O | 9 in/5 out | 17 in/37 out |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads | |

## SENSING



| Model | ZW Series | N-Smart series | E3X/E3C/E2C |
|---|---|---|---|
| Type | Displacement sensor | Fiber/Laser/Contact sensor | Fiber/Laser/Proximity sensor |
| Measurement methods | White Light Confocal Fiber Principle | – | – |
| Applications | Height, thickness | – | |
| Surfaces | Diffuse, shiny, mirror, glass, black rubber, metal, ceramics | – | – |
| Measurement range | • Min: 7 ± 0.3 mm,<br>• Max: 40 ± 6 mm | – | – |
| Resolution | 0.01 µm to 0.25 µm | – | – |
| Linearity | ± 0.8 µm to 7 µm | – | – |
| Special features | • Ethernet built-in<br>• EtherCAT built-in<br>• RS-232C<br>• Analog VDC/mA<br>• Sysmac Studio | • High speed transmission of I/O-signals and incident values<br>• Up to 30 amplifiers on one communication unit<br>• Synchronized signal transmission<br>• Slave unit for decentralized machine installation | • High speed transmission of I/O-signals<br>• Up to 30 amplifiers on one communication unit |
| Network specification | – | EtherCAT communication unit | |
| Connectable sensors | – | Up to 30 | |
| Amplifier types | – | • E3NX-FA0<br>• E3NC-LA0<br>• E3NC-SA0<br>• E9NC-TA0 | • E3X-HD0<br>• E3X-DA0-S<br>• E3X-MDA0<br>• E3C-LDA0<br>• E2C-EDA0 |
| Mounting | – | DIN rail | |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads | | |

## SOFTWARE



| Model | Sysmac Studio |
|---|---|
| | • The Sysmac Studio provides one design and operation environment for configuration, programming, simulation and monitoring<br>• One software for motion, logic sequencing, safety, vision and HMI<br>• Fully compliant with open standard IEC 61131-3<br>• Supports Ladder, Structured Text and In-Line ST programming with a rich instruction set<br>• CAM editor for easy programming of complex motion profiles<br>• One simulation tool for sequence and motion in a 3D environment<br>• Advanced security function with 32 digit security password<br>• PLCopen Function Blocks for Motion Control and Safety |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads |

## ETHERNET AND ETHERCAT MEDIA



| Model | Ethernet switch | |
|---|---|---|
| Number of ports | 5 | 3 |
| Functions | • QoS for EtherNet/IP<br>• Auto MDI/MDIX<br>• Failure detection: Broadcast storm and LSI error detection 10/100BASE-TX, Auto-Negotiation | • QoS for EtherNet/IP<br>• Auto MDI/MDIX |
| Power requirements | 24 VDC (±5%) | |
| Dimension | 48 x 78 x 90 mm | 25 x 78 x 90 mm |
| Mounting | DIN rail | |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads | |



| Model | EtherCAT junction slave (Branching unit) | |
|---|---|---|
| Number of ports | 6 | 3 |
| Functions | • Power, Link/Act indicators<br>• Auto MDI/MDIX<br>• Reference clock | |
| Power requirements | 24 VDC (−15% to +20%) | |
| Dimension | 48 x 78 x 90 mm | 25 x 78 x 90 mm |
| Mounting | DIN rail | |
| Ordering information | P072 Sysmac Catalogue · www.industrial.omron.eu/en/products/downloads | |

# OMRON