NX-series I/O System
Universal I/O for EtherCAT and Ethernet/IP Systems

Control system independent
Over 100 function modules
2 to 32 points in a single I/O unit
## NX Series I/O System

### Create, Save Space, Add Functionality

The I/O system that maximizes system design options

#### Application example

<table>
<thead>
<tr>
<th>IoT</th>
<th>I/O-Link master</th>
<th>Weighing</th>
<th>Servo press</th>
<th>Safety control</th>
<th>Temperature control</th>
<th>Motion</th>
</tr>
</thead>
<tbody>
<tr>
<td>IO-Link makes communication down to the sensor level visible</td>
<td>Applicable units: NX-ECC205, NX-EJ4400</td>
<td>High-accuracy weighing using load cells</td>
<td>High-speed, high-precision press fits using load cells</td>
<td>Simplify safety control systems using temperature sensors</td>
<td>Simplify temperature control systems using temperature sensors</td>
<td>Simplify position control systems using pulse-train input type motors</td>
</tr>
<tr>
<td>Weighing</td>
<td>Applicable units: NX-RS101, NX-SIH200, NX-SOD400</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Servo press</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital I/O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Up to 4 IO-Link devices with one master</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serial communications</td>
<td>- RS-232C or RS-422/485 interface</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analog I/O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- ±10V voltage and 4-20 mA current signals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 2, 4, 8, 16, or 32 channels per input/control unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 16 channels per mixed I/O unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Standard, high-speed, and time-stamp models</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Units with Push-In/Plus/Mini/Multi/Mini3 Screw connector</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load cell inputs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- One load cell with one unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Fastest conversion cycle of 125 µs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety I/O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 4 or 8 safety input points per unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 2 or 4 safety output points per unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Free allocation of the safety I/O units on the internal high speed bus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analog Input Units</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 4-channel per input/control unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Differential input</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Sampling as fast as every 5 µs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety CPU</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Safety I/O (IEC61508 Safety Category 0, IEC61508 SIL3 certified)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Controls up to 128 safety I/O units</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature inputs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Thermocouple or RTD inputs, 2 or 4 per unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Conversion time of 10 ms, 40 ms or 250 ms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature Control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 2 or 4 multi-input (Thermocouple and Resistance thermometer) point per channel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Conversion time of 50 ms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Voltage output (for driving SSR) or Linear current output</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 4 CT input points per</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Position interface</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Incremental and absolute encoder support</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Pulse output unit (line driver output model)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>End cover</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Commendations**

- EtherCAT® and EtherCAT® are the registered trademarks and patented technology licensed by Beckhoff Automation GmbH, Germany. EtherCAT® is the trademark of ODVA.
- EtherCat® and Safety over EtherCAT® are the registered trademarks of Beckhoff Automation GmbH, Germany.
- SQL Server and Visual Basic are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries. Other company names and product names in this document are the trademarks or registered trademarks of their respective companies.
- The product photographs and figures that are used in this catalog may vary somewhat from the actual products.

Microsoft product screen shots reprinted with permission from Microsoft Corporation.
NX Series I/O System

Simplicity for advanced control

A fully integrated platform

The NX I/O is used to integrate sequence, motion, analog, vision, and safety control, previously done by PLC and dedicated controllers, and visualization of previously invisible sensor data within the Sysmac automation platform.

Sequence control

Multi-tasking and fully compliant with IEC 61131-3 standard programming and PLCopen® Function Blocks.

Motion control

PLCopen® Function Blocks for the motion control library are available to implement advanced motion control.

Analog control

The Sysmac Library* and instructions make temperature, weighing, and load control easier.

Weighing Control Library
Servo Press Library

Safety control

Conforms with PLCopen® Function Blocks for safety.

Feature of Sysmac

One Control through
One Software and
One Network simplifies control system configuration

Visualized sensor data

IO-Link makes communication down to the sensor level visible

IO-Link master

Interfaces for sequence, motion, safety, and analog control and communications required for machines

Connecting directly to most sensors, actuators, and safety components

Note: Functionality provided by the EtherCAT coupler unit

Datatypes supported: 17 of 26

* The Sysmac Library is a collection of software functional components that can be used in programs for the NJ/NX/NY Controllers. Sample programs and HMI templates are also available. Download from Omron website and install to use in the Automation Software Sysmac Studio. http://www.ia.omron.com/sysmac_library/
Synchronized control for high-speed performance

Production data collection synchronized at high speed

Based on an internal high-speed bus running in synchronization with the EtherCAT network and CPU cycle, the NX I/O can be controlled and used for position, analog, and digital data collection with microsecond accuracy and with nanosecond resolution.

Feature

High-speed I/O units accurately synchronized with the CPU cycle*1

- Digital I/O: High-speed and time-stamp models (NsynX)
- Analog I/O: 10 μs conversion time per channel and 1:30000 resolution
- Load cell inputs: 125 μs conversion time per channel and 24-bit resolution

*1 Fastest cycle time: NX7=125 μs, NX5=288 μs

Distributed clock

The EtherCAT node slave measures the time difference between incoming and returning frame - Time-Stamp function. With this Time-Stamp function the master can determine the propagation delay offset to the individual slave accurately. This mechanism ensures accurate synchronization between devices with less than 1 μs jitter.

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

Time Stamp sequence example

Accurate control of input events and perfect control of output with nanosecond resolution

Note: Functionality provided by the EtherCAT coupler unit

* Industrial PC Platform NY-series PC Machine Controller only.
The I/O System of Choice for EtherCAT and Ethernet/IP Networks

NX I/O is the premier I/O system for Omron’s NX and NJ series of Machine Automation Controllers. NX I/O network interfaces are designed to the industry standards for EtherCAT and Ethernet/IP. This ensures the quality of interface to other control systems that use EtherCAT and Ethernet/IP.

Types of NX I/O Units
- Digital Input/Output Units
- Analog Input/Output Units
- Temperature Input Units
- Encoder/Positioning Units
- System Units
- Serial communication Units

Quick connections
- Detachable screwless terminal block for easy commissioning and maintenance
- Push-In Plus connections speed up installation
- MIL/Fujitsu connectors for high-density I/O

Safety integrated
The NX Safety CPU Unit and Safety I/O Units can be mixed with standard I/O units to create a complete modular safety control system.

EtherCAT specification is governed by the EtherCAT Technology Group (ETG). EtherCAT is suitable for motion control and other applications that require high speed and high precision because of no need of handshaking and high bandwidth utilization.

EtherNet/IP specification is governed by the Open DeviceNet Vendors Association (ODVA). Based on standardized Ethernet protocols (TCP/IP, UDP/IP), EtherNet/IP devices can be mixed with standard Ethernet devices.

Note: 1. Communications coupler units vary depending on the connected network.
2. Connectable units vary depending on the communications coupler unit.
3. The number of connectable nodes varies depending on the master.
Downsize machines and control panels

Reduce wiring time and save space

Push-In Plus connections reduce the work and time required for wiring. Modular design saves space. Also designed for installation in any orientation, the NX I/O can be freely allocated in machines.

Up to 63 units per communication coupler

Greatly reduce wiring work with Push-In Plus terminal blocks

Push-In Plus terminal blocks make wiring work easy - just insert wires.

Save space in control panels

V and G terminals are provided for each input signal (NX-PC0030). No relay terminal block is required, which saves space in control panels.

对应到我们所倡导的价值设计（Value Design）概念，确保产品的规格符合此概念。规格表如下:

| Feature          | Compact design: Up to 16 digital signals in 12 mm width | 12 mm |
-- | -- | -- |

Corresponding to our shared Value Design for Panel concept for the specifications of products.

Wiring time

Approx. 60% reduction!*1

*1 Information for Push-In Plus and screw terminal blocks is based on Omron’s actual measurement data.
Take NX I/O Everywhere

One I/O system for various controllers

While different machines may require different levels of controller performance, the NX I/O is the only remote I/O system you will need. This will unify wiring and installation techniques, and simplify spare parts stock.

Features

• Multivendor compatibility
  The NX I/O can be connected with PLC from other vendors as well as Omron PLC

• Start a small-scale IO-Link
  IO-Link and other unique I/O systems can be easily integrated into existing machine configurations

Easy configuration with NX-IO Configurator

The NX-IO Configurator is software to set up and maintain EtherNet/IP coupler units and NX I/O Units on an EtherNet/IP coupler.

*1. Dedicated software is required to use the CK3E Series.
*2. Dedicated software is required to use the CJ PLC or other vendor’s PLC with the NX Safety Units.
*3. Connect the NX I/O system to a PLC from another vendor via a switching hub and set up with the CX-One.
The Sysmac Library is a collection of software functional components that can be used in programs for the NJ/NX Machine Automation Controllers or Industrial PC Platform NY IPC Machine Controllers. Packed with Omron’s rich technical know-how on control programs, the Sysmac Library makes advanced control easy.

Function Library Speeds Development Time

Easy-to-obtain Library

The Sysmac Library is freely available to download from Omron website. These software components specially designed for the NJ/NX/NY Controller can be used in your programs without the need for additional work.

Application example (1) Load cells

Press fit using servo press

Improve both speed and quality of the press-fit process

Load data is collected in synchronization with the CPU cycle for high-speed measurement, high-speed servo press control, and precision improvement.

Previous issues

- Wait time must be considered to operate the dedicated press controller together with the main PLC.
- Load, position, and torque data collected at the same time cannot be checked from the host device.

Solution using Sysmac

- One CPU system capable of switching between position, velocity, and torque control without stopping
- Fastest control cycle of 125 μs and servo press function using software for required control
- High-speed measurement and control by collecting load data synchronized with servo data (position and torque data).

Download from

http://www.ia.omron.com/product/tool/sysmac-library/

Note: Ask your Omron representative to obtain Libraries that are not provided on the above website.
Application example (2)  Temperature control
Packaging machines and molding machines (Temperature/motion/weighing)

Reduce material and design costs to implement temperature control

TO: NJ/NX/NY Controller + NX I/O + 15 Servo
- Integrate control elements (temperature/motion/weighing/safety control)
- Ladder program and memory configuration for communications are required.

Solution using Sysmac

- Dedicated controllers, dedicated software, separate networks, and separate programs are no longer required.

Application example (3)  Photoelectric sensors and proximity sensors
Improving system commissioning and changeover efficiency

Reduce work by individual identification

IO-Link sensors allow you to check individual sensor identifications in batches without going to the site, which results in a significant reduction of commissioning time.

Previous issues

- During system commissioning or changeover, operators have to perform the I/O check for each of the thousands of sensors installed on the line, and it took an enormous amount of time.
- Incorrect sensor installation creates unnecessary extra work.

Solution using Sysmac

- Communications networks are selected for each device, and dedicated software for each component is used.
- Ladder program and memory configuration for communications are required.

TCO can be reduced by eliminating the need for the dedicated temperature controller and reducing inventory control work and communications programming work.

Identification checks with HMI

Check sensor installation before commissioning to prevent installation mistakes

Setting all sensors from a host device at the same time
Reduce setting time and inconsistent settings

Setting I/O checks

Identification checks with HMI
Check sensor installation before commissioning to prevent installation mistakes

* The graph above is a conceptual illustration.
Unique I/O increases application quality and range

Standardization of control system
Quality improvement by synchronizing data collection
Flexible system configuration

Controllers & I/O
- Machine Automation Controllers (MAC) • Motion Controllers
- Programmable Logic Controllers (PLC) • Temperature Controllers • Remote I/O

Robotics
- Industrial Robots • Mobile Robots

Operator Interfaces
- Human Machine Interface (HMI)

Motion & Drives
- Machine Automation Controllers (MAC) • Motion Controllers • Servo Systems
- Frequency Inverters

Vision, Measurement & Identification
- Vision Sensors & Systems • Measurement Sensors • Auto Identification Systems

Sensing
- Photoelectric Sensors • Fiber-Optic Sensors • Proximity Sensors
- Rotary Encoders • Ultrasonic Sensors

Safety
- Safety Light Curtains • Safety Laser Scanners • Programmable Safety Systems
- Safety Mats and Edges • Safety Door Switches • Emergency Stop Devices
- Safety Switches & Operator Controls • Safety Monitoring/Force-guided Relays

Control Components
- Power Supplies • Timers • Counters • Programmable Relays
- Digital Panel Meters • Monitoring Products

Switches & Relays
- Limit Switches • Pushbutton Switches • Electromechanical Relays
- Solid State Relays

Software
- Programming & Configuration • Runtime