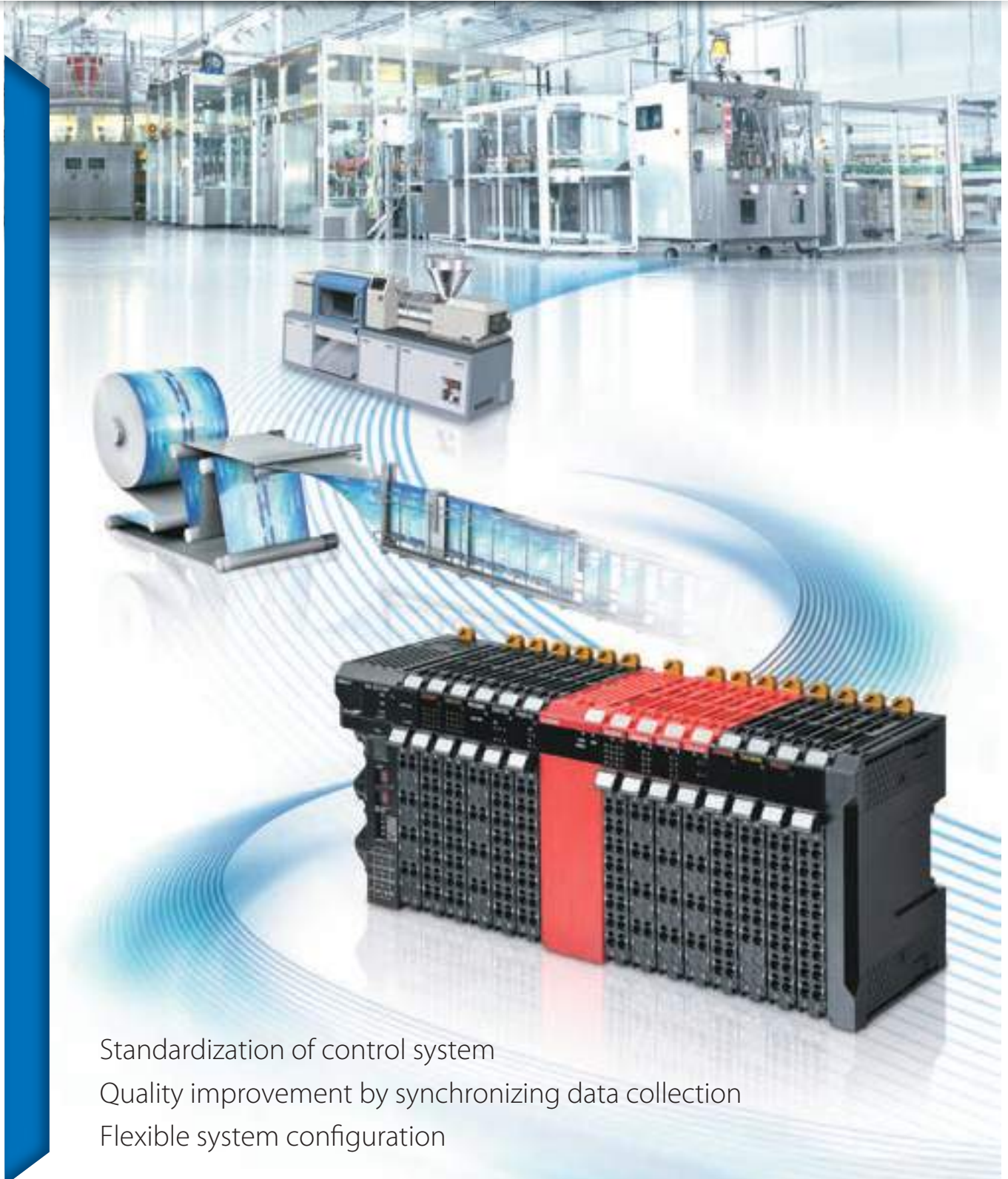# OMRON

NX-series I/O System

Unique I/O increases application quality and range

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

Unique I/O increases application quality and

The NX I/O connects sensors and actuators on production lines to optimize applications

Application example	IoT	Traceability	Measuring	Weighing
Value Design for Panel Corresponding to our shared **Value Design for Panel** concept for the specifications of products	IO-Link makes communication down to the sensor level visible	Easy and quick set-up for traceability using RFID	PLC systems can measure analog signals at high speeds for inspections	High-accuracy weighing using load cells
	Applicable units: NX-ECC203 NX-ILM400	**Applicable units:** NX-V680C1 NX-V680C2	**Applicable units:** NX-HAD401	**Applicable units:** NX-RS1201

Communications coupler
· EtherCAT®
· EtherNet/IP™

IO-Link master
· Up to 4 IO-Link devices with one master

Serial communications
· RS-232C or RS-422A/485 interface

EtherCAT Slave Unit
· NX Series available as subsystem controller on EtherCAT

RFID
· Direct connection to V680 amplifiers and antennas
· 1 or 2 channels

Digital I/O
· 4, 8, 16, or 32 channels per input unit
· 2, 4, 8, 16, or 32 channels per output unit (8 channels per relay output unit)
· 16 channels per mixed I/O unit
· Standard, high-speed, and time-stamp models
· Units with Push-In Plus/MIL/Fujitsu/OTAX/M3 Screw connector

Analog 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
· Single-ended input and differential input models

High-speed analog inputs
· 4 channels per input unit
· Differential input
· Sampling as fast as every 5 µs

Load cell inputs
· One load cell with one unit
· Fastest conversion cycle of 125 µs

range

Servo press

High-speed,
high-precision press
fit using load cells

Applicable units:
NX-RS1201
NX-SID800
NX-SOD400

Safety control

Simplify safety control
systems

Applicable units:
NX-SL3300
NX-SID800
NX-SOD400

Temperature control

Simplify temperature control
systems using temperature
sensors

Applicable units:
NX-TS3101
NX-HB3101
NX-TC3405
NX-HTC4505-5

Motion

Simplify position control systems
using pulse-train input type
motors

Applicable units:
NX-ECS212
NX-PG0342-5

Safety I/O
· 4 or 8 safety input points per unit
· 2 or 4 safety output points per unit
· Free allocation of the safety I/O units on the internal high speed bus

Safety CPU
· EN ISO13849-1 (PLe/Safety Category 4), IEC 61508 (SIL3) certified
· Controls up to 128 safety I/O units

Temperature inputs
· Thermocouple or RTD inputs, 2 or 4 per unit
· Conversion time of 10 ms, 60 ms or 250 ms

Heater burnout detection
· 4 CT sensor inputs and 4 trigger outputs to drive SSRs

Temperature control
· 2 or 4 multi-input (thermocouple and resistance thermometer) channels per unit
· Conversion time of 50 ms
· Voltage output (for driving SSR) or linear current output
· Number of CT inputs 1 point per channel

Advanced temperature control *NEW*
· 4 or 8 universal inputs (thermocouple, platinum resistance thermometer, analog voltage, analog current) channels per unit

Position interface
· Incremental and absolute encoder support
· Pulse output unit (line driver output model)

End cover

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.

EtherNet/IP®

Analog control

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

Weighing Control Library
Servo Press Library

Sysmac Library

* 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/

Safety control

Conforms with PLCopen® Function Blocks for Safety.

Feature of Sysmac

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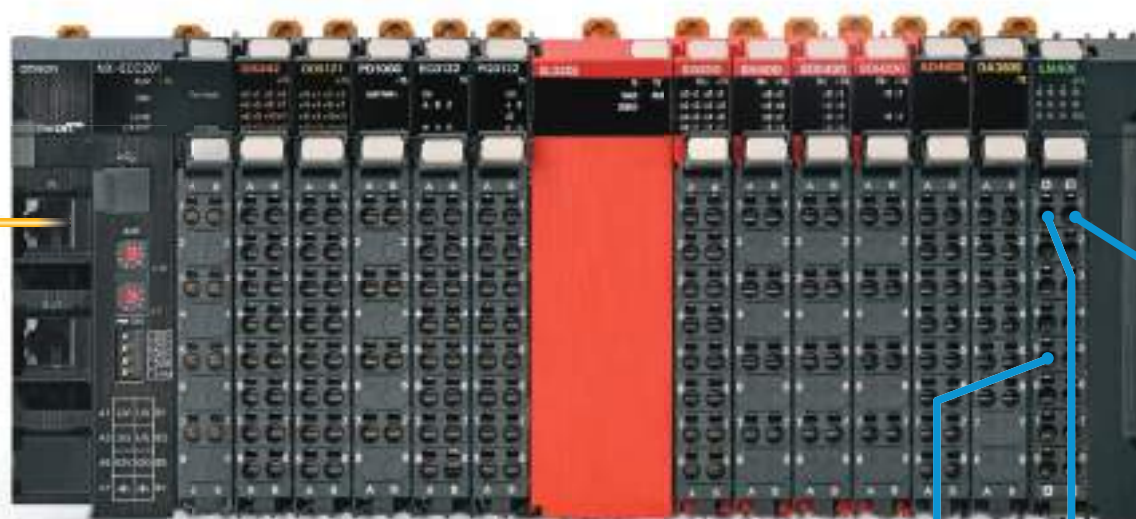simplifies control system configuration

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

EtherCAT.

Connecting directly to most sensors, actuators,
and safety components

IO-Link sensors

IO-Link

Note: Functionality provided by the EtherCAT coupler unit

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

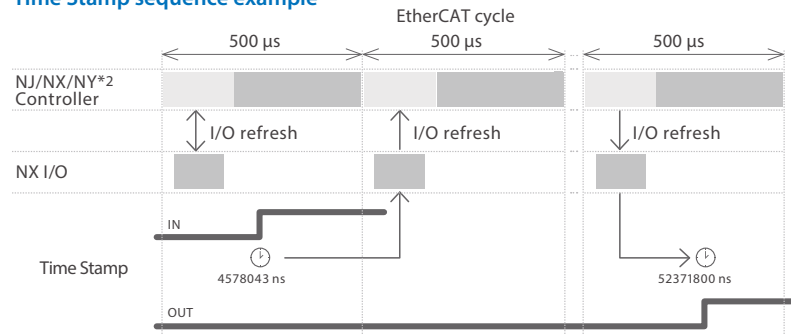*1.Fastest cycle time: NX7=125 µs, NJ5=500 µs
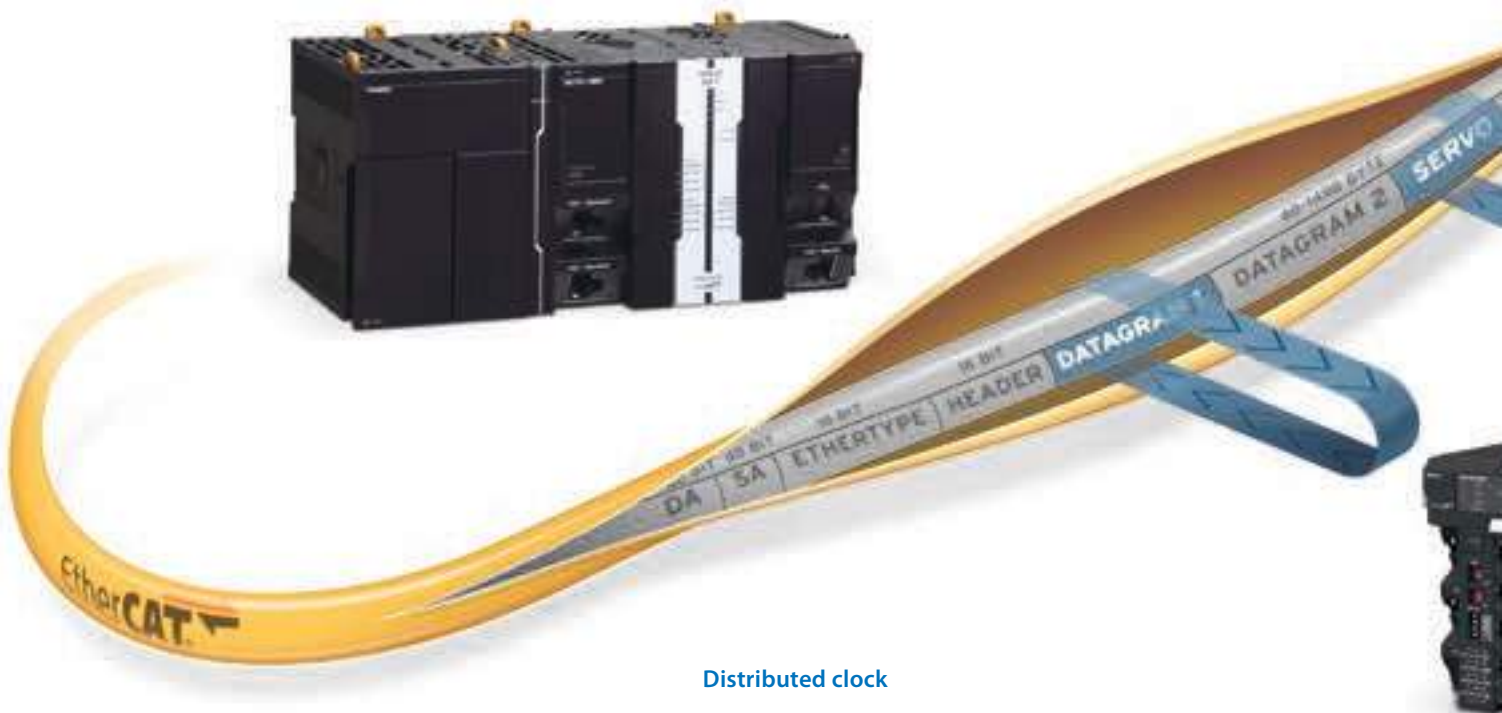
Distributed clock

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.
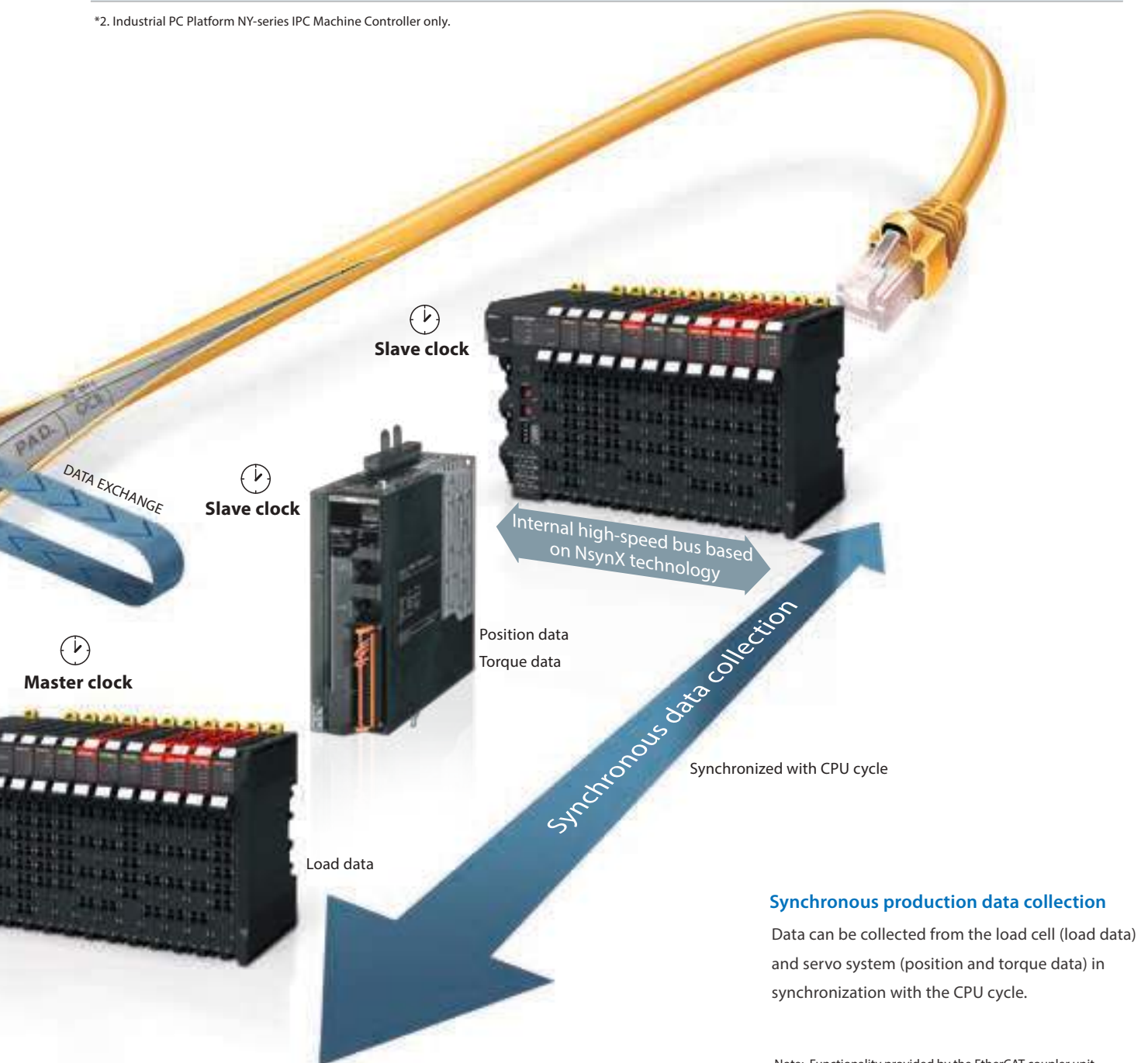
NsynX technology

- 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

EtherCAT cycle

500 μs   500 μs   500 μs

NJ/NX/NY*2 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

*2. Industrial PC Platform NY-series IPC Machine Controller only.

Slave clock

Slave clock

DATA EXCHANGE

Master clock

Internal high-speed bus based on NsynX technology

Position data
Torque data

Synchronous data collection

Synchronized with CPU cycle

Load data

Synchronous production data collection

Data can be collected from the load cell (load data) and servo system (position and torque data) in synchronization with the CPU cycle.

Note: Functionality provided by the EtherCAT coupler unit

Simplify system configurations

The choice is yours

The modern control system demands increasing levels of flexibility.
The NX I/O enables connection with various controllers through the global standard network, which expands system configuration possibilities.
Modular remote I/O systems offer flexibility in I/O configuration and a wide choice of signal types and performance levels so that every I/O station can be assembled with just the right combination without changing the control architecture.

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.

NJ/NX/NY Series or EtherCAT master from other vendors

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.

CJ Series or PLC from other vendors

Feature

Wide choice: More than 100 types of I/O unit, from 2 to 32 points in one unit

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/OTAX 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

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

Feature

**Compact design:** Up to 16 digital signals in 12 mm width

12mm

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

Greatly reduce wiring work with Push-In Plus terminal blocks

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

Wiring time

Approx. **60%** reduction!*1

Conventional screw terminal block

Push-In Plus terminal block
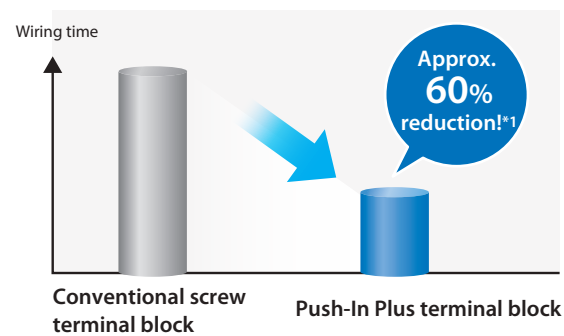
*1. Information for Push-In Plus and screw terminal blocks is based on Omron's actual measurement data.

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.

I/O Power Supply Connection Unit NX-PC0030		DC input unit or Transistor output unit	
IOV	IOV	0	1
IOG	IOG	2	3
IOV	IOV	4	5
IOG	IOG	6	7
IOV	IOV	8	9
IOG	IOG	10	11
IOV	IOV	12	13
IOG	IOG	14	15

3-wire type

Reduced nodes and wiring work

Saved space