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NX1P2-□

# NX1P series machine controller

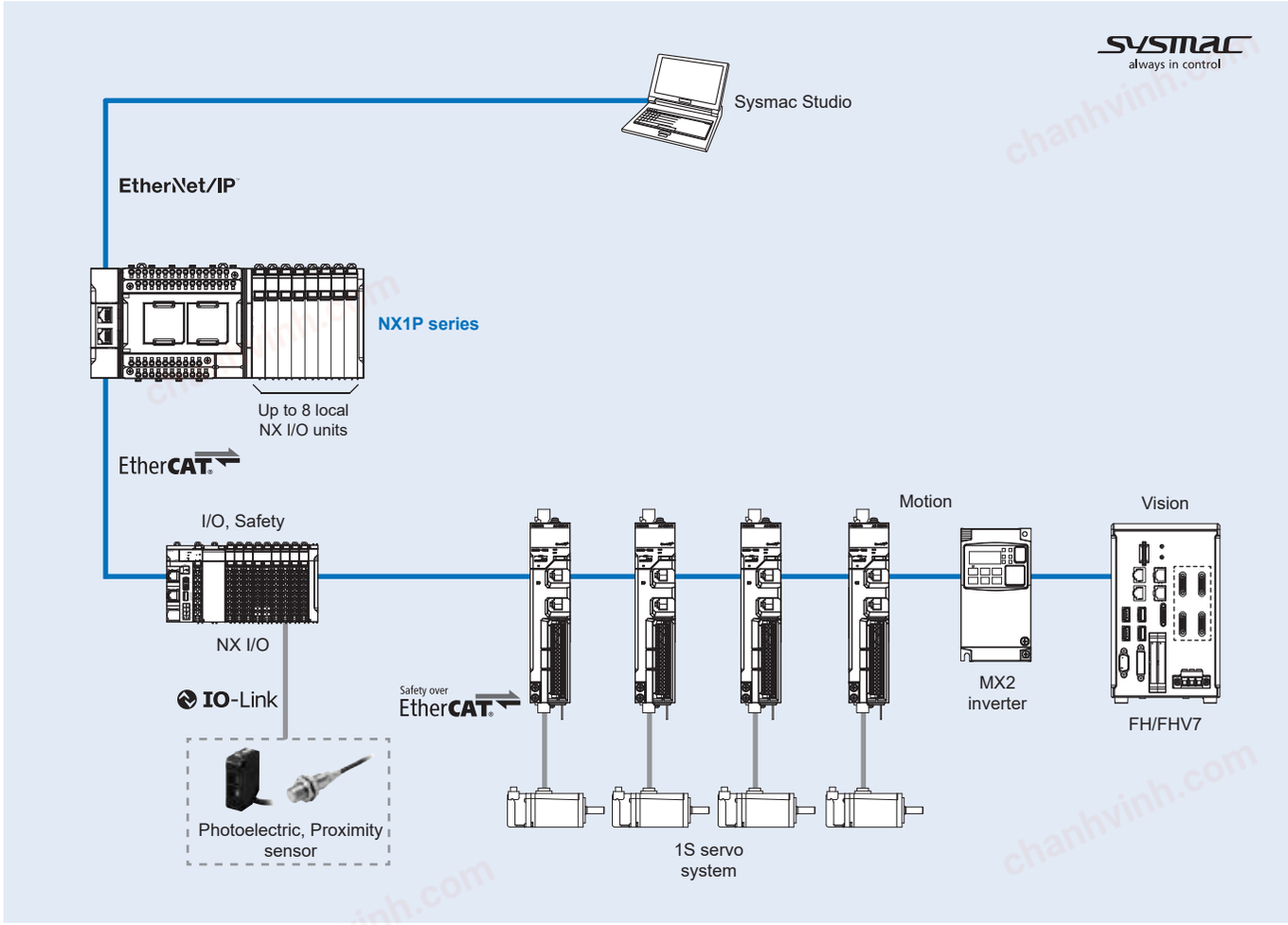


## Compact in size, powerful in functionality

The NX1P completes the NX/NJ machine controllers family offering same functionality in a compact design. The NX1P provides synchronized control of all machine devices such as motion, I/O, safety and vision under one Integrated Development Environment.

- Fastest cycle time: 2 ms
- Functions: Logic sequence and Motion control
- Up to 8 axes (4 synchronized axes)
- Built-in I/O: 40 or 24 I/O points
- Up to 8 local NX I/O units
- Built-in EtherCAT and EtherNet/IP ports
- Up to 16 EtherCAT slaves
- Up to 2 option boards can be connected to add serial communications or analog I/O functionality

## System configuration



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## Specifications

### General specifications

| Item | | NX1P2-□ CPU Unit |
|---|---|---|
| Enclosure | | Mounted in a panel |
| Grounding | | Less than 100 Ω |
| Operation environment | Ambient operating temperature | 0 to 55°C |
| | Ambient operating humidity | 10% to 95% (with non condensation) |
| | Atmosphere | Must be free from corrosive gases |
| | Ambient storage temperature | –25 to 70°C (excluding battery) |
| | Altitude | 2,000 m or less |
| | Pollution degree | 2 or less: Conforms to JIS B3502 and IEC 61131-2. |
| | Noise immunity | 2 kV on power supply line (conforms to IEC 61000-4-4.) |
| | Overvoltage category | Category II: Conforms to JIS B3502 and IEC 61131-2 |
| | EMC immunity level | Zone B |
| | Vibration resistance | Conforms to IEC 60068-2-6<br>5 to 8.4 Hz with 3.5 mm amplitude, 8.4 to 150 Hz.<br>Acceleration of 9.8 $m/s^2$ for 100 min in X, Y and Z directions (10 sweeps of 10 min each = 100 min total) |
| | Shock resistance | Conforms to IEC 60068-2-27<br>147 $m/s^2$, 3 times in X, Y and Z directions |
| Battery | Life | 5 years at 25°C |
| | Model | CJ1W-BAT01 (sold separately) |
| Applicable standards | EU Directives | EN 61131-2 |
| | cULus | Listed UL 61010-2-201 and ANSI/ISA 12.12.01 |
| | Others | KC |

### Electrical and mechanical specifications

| Item | | NX1P2-□□40DT□ | NX1P2-□□24DT□ |
|---|---|---|---|
| CPU unit dimensions (H × D × W) | | 100 mm × 71 mm × 154 mm | 100 mm × 71 mm × 130 mm |
| Weight | | 660 g (including end cover) | 590 g (including end cover) |
| CPU unit power supply | Power supply voltage | 24 VDC (20.4 to 28.8 VDC) | |
| | Unit power consumption | NX1P2-□□40DT: 7.05 W<br>NX1P2-□□40DT1: 6.85 W | NX1P2-□□24DT: 6.70 W<br>NX1P2-□□24DT1: 6.40 W |
| | Inrush current*1 | For cold start at room temperature: 10 A max./0.1 ms max. and 2.5 A max./150 ms max. | |
| | Current capacity of power supply terminal*2 | 4 A max. | |
| | Isolation method | No isolation between the unit power supply terminal and internal circuit | |
| NX unit power supply | Capacity | 10 W max. | |
| | Efficiency | 80% | |
| | Isolation method | No isolation between the unit power supply terminal and NX unit power supply | |
| I/O power supply to NX units | | Not provided*3 | |
| External connection terminals | Communications connector | RJ45 for EtherNet/IP communications x 1<br>RJ45 for EtherCAT communications x 1 | |
| | Screwless push-in terminal block | For unit power supply input, grounding and input signal x 1 (removable)<br>For output signal x 1 (removable) | |
| | Output terminal (service supply) | Not provided | |
| | Run output terminal | Not provided | |
| | NX bus connector | 8 NX I/O units can be connected | |
| | No. of option board slots | 2 | 1 |

*1. The inrush current may vary depending on the operating conditions and other conditions. Therefore, select fuses, breakers and external power supply devices that have enough margin in characteristic and capacity, considering the condition under which the devices are used.

*2. The amount of current that can be passed constantly through the terminal. Do not exceed this current value when you use a through-wiring for the unit power supply.

*3. When the type of the I/O power supply to NX units you use is the supply from NX bus, an additional I/O power supply unit is required. The maximum I/O power supply current from an additional I/O power supply unit is 4 A.

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## Performance specifications

| Item | | | | NX1P2-1140DT□ | NX1P2-1040DT□ | NX1P2-9024DT□ | NX1P2-9B40DT□ | NX1P2-9B24DT□ |
|---|---|---|---|---|---|---|---|---|
| Processing time | Instruction execution time | LD instruction | | 3.3 ns | | | | |
| | | Math instructions (for long real data) | | 70 ns or more | | | | |
| Programming | Program capacity*1 | Size | | 1.5 MB | | | 1 MB | |
| | | POU definitions | | 450 | | | | |
| | | POU instances | | 1,800 | | | | |
| | Memory capacity for variables*2 | No retain attribute | | Size: 2 MB<br>Number of variables: 90,000 | | | | |
| | | Retain attribute | | Size: 32 KB<br>Number of variables: 5,000 | | | | |
| | Data type | Number | | 1,000 | | | | |
| | Memory for CJ-Series units (can be specified with AT specifications for variables.) | CIO area | | 0 to 6,144 channel (0 to 6,143)*3 | | | | |
| | | Work area | | 0 to 512 channel (W0 to W511)*3 | | | | |
| | | Holding area | | 0 to 1,536 channel (H0 to H1,535)*4 | | | | |
| | | DM area | | 0 to 16,000 channel (D0 to F15,999)*4 | | | | |
| | | EM area | | - | | | | |
| Unit configuration | Maximum number of connectable units | Maximum number of NX I/O units that can be mounted to the NX1P CPU unit | | 8 units | | | | |
| | | Maximum number of NX I/O units for entire controller | | 24 units<br>(8 units on CPU rack + 16 units on EtherCAT slave terminals) | | | | |
| | Power supply | Model | | A non-isolated power supply for DC input is built into the CPU unit | | | | |
| | | Power OFF detection time | | 2 to 8 ms | | | | |
| Motion control | Number of controlled axes | Number of controlled axes | | 12 axes<br>(8 motion control axes + 4 single-axis position control axes) | 10 axes<br>(6 motion control axes + 4 single-axis position control axes) | 4 axes<br>(4 single-axis position control axes) | 2 axes<br>(Single-axis position control servo axes) | |
| | | Number of used real axes | | 8 axes<br>(4 motion control servo axes + 4 single-axis position control servo axes) | 6 axes<br>(2 motion control servo axes + 4 single-axis position control servo axes) | 4 axes<br>(4 single-axis position control servo axes) | 2 axes<br>(Single-axis position control servo axes) | |
| | | Linear interpolation control | | 4 axes max. per axes group | | - | | |
| | | Circular interpolation control | | 2 axes per axes group | | - | | |
| | Number of axes groups | | | 8 groups max. | | - | | |
| | Position units | | | Pulses, millimeters, micrometers, nanometers, degrees or inches | | | | |
| | Override factors | | | 0.00% or 0.01% to 500.00% | | | | |
| | Motion control period | | | Same as the period for primary periodic task | | | | |
| | Cams | Number of cam data points | | 65,535 points max. per cam table / 262,140 points max. for all cam tables | | - | | |
| | | Number of cam tables | | 80 tables max. | | - | | |
| Communications | Built-in EtherNet/IP port | Number of ports | | 1 | | | | |
| | | Physical layer | | 10BASE-T, 100BASE-TX | | | | |
| | | Frame length | | 1,514 bytes max. | | | | |
| | | Media access method | | CSMA/CD | | | | |
| | | Modulation | | Baseband | | | | |
| | | Topology | | Star | | | | |
| | | Baud rate | | 100 Mbps (100BASE-TX) | | | | |
| | | Transmission media | | STP (shielded, twisted-pair) cable of Ethernet category 5, 5e or higher | | | | |
| | | Transmission distance | | 100 m max. (distance between Ethernet switch and node) | | | | |
| | | Cascade connections number | | There are no restrictions if an switching hub is used | | | | |
| | | CIP service: Tag data links (cyclic communications) | Number of connections | 32 | | | | |
| | | | Packet Interval*5 | 2 to 10,000 ms in 1-ms increments<br>Can be set for each connection. | | | | |
| | | | Permissible communications band | 3,000 pps*6 (including heartbeat) | | | | |
| | | | Number of tag sets | 32 max. | | | | |
| | | | Tag types | Network variables, CIO/WR/HR/DM | | | | |
| | | | Number of tags per connection (i.e., per tag set) | 8 (7 tags if controller status is included in the tag set.) | | | | |
| | | | Number of tags | 256 max. | | | | |
| | | | Link data size per node (total size for all tags) | 19,200 bytes max. | | | | |
| | | | Data size per connection | 600 bytes max. | | | | |
| | | | Number of registrable tag sets | 32 max. (1 connection = 1 tag set) | | | | |
| | | | Tag set size | 600 bytes max. (two bytes are used if controller status is included in the tag set.) | | | | |
| | | | Multi-cast packet filter*7 | Supported. | | | | |

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| Item | | | | NX1P2-1140DT□ | NX1P2-1040DT□ | NX1P2-9024DT□ | NX1P2-9B40DT□ | NX1P2-9B24DT□ |
|---|---|---|---|---|---|---|---|---|
| Communications | Built-in EtherNet/IP port | CIP message service: Explicit messages | Class 3 (number of connections) | 32 (clients plus server) | | | | |
| | | | UCMM (non-connection type) | Number of clients that can communicate at one time: 32 max.<br>Number of servers that can communicate at one time: 32 max. | | | | |
| | | Number of TCP socket service | | 30 max. | | | | |
| | Built-in EtherCAT port | Communications standard | | IEC 61158, Type 12 | | | | |
| | | EtherCAT master specifications | | Class B (feature pack motion control compliant) | | | | |
| | | Physical layer | | 100BASE-TX | | | | |
| | | Modulation | | Baseband | | | | |
| | | Baud rate | | 100 Mbps (100BASE-TX) | | | | |
| | | Duplex mode | | Automatic | | | | |
| | | Topology | | Line, daisy chain and branching | | | | |
| | | Transmission media | | Twisted-pair cable of category 5 or higher (double-shielded straight cable with aluminum tape and braiding) | | | | |
| | | Transmission distance | | Distance between nodes: 100 m max. | | | | |
| | | Number of slaves | | 16 max. | | | 8 max. | |
| | | Range of node addresses | | 1 to 192 | | | | |
| | | Process data size | | Inputs/Outputs: 1,434 bytes max. (However, the maximum number of process data frames is 1) | | | | |
| | | Process data size per slave | | Inputs/Outputs: 1,434 bytes max. | | | | |
| | | Communications cycle | | 2,000 µs to 8,000 µs in 250-µs increments | | | 4,000 µs to 8,000 µs in 250-µs increments | |
| | | Sync jitter | | 1 µs max. | | | | |
| | Serial communications*8 | Communications method | | Half duplex | | | | |
| | | Synchronization | | Start-stop | | | | |
| | | Baud rate | | 1.2/2.4/4.8/9.6/19.2/38.4/57.6/115.2 kbps | | | | |
| | | Transmission distance | | Depends on the option board | | | | |
| | | Supported protocol | | Host link, Modbus-RTU master and no-protocol | | | | |
| Option board | Number of slots | | | 2 | | 1 | 2 | 1 |
| Built-in I/O | Input | Number of inputs | | 24 | | 14 | 24 | 14 |
| | Output | Number of outputs | | 16 | | 10 | 16 | 10 |
| | | Load short-circuit protection | | NPN models: Not provided<br>PNP models: Provided | | | | |
| Internal clock | Accuracy | | | At ambient temperature of 55°C: –3.5 to +0.5 min error per month<br>At ambient temperature of 25°C: –1.5 to +1.5 min error per month<br>At ambient temperature of 0°C: –3 to +1 min error per month | | | | |
| | Retention time of built-in capacitor | | | At ambient temperature of 40ºC: 10 days | | | | |

*1. This is the capacity for the execution objects and variable tables (including variable names).
*2. Memory used for CJ series units is included.
*3. The value can be set in 1 ch increments. The value is included in the total size of variables without a retain attribute.
*4. The value can be set in 1 ch increments. The value is included in the total size of variables with a retain attribute.
*5. Data will be refreshed at the set interval, regardless of the number of nodes.
*6. Means packets per second, i.e., the number of communication packets that can be sent or received in one second.
*7. As the EtherNet/IP port implements the IGMP client, unnecessary multi-cast packets can be filtered by using an Ethernet switch that supports IGMP Snooping.
*8. Supported only with the Serial communications option board.

## Serial communications option board specifications

| Item | NX1W-CIF01 | NX1W-CIF11 | NX1W-CIF12 |
|---|---|---|---|
| Communications port | 1 x RS-232C | 1 x RS-422A/485 | 1 x RS-422A/485 (isolated) |
| Communications method | Half-duplex | | |
| Synchronization method | Start-stop synchronization | | |
| Baud rate | 1.2/2.4/4.8/9.6/19.2/38.4/57.6/115.2 kbps | | |
| Transmission distance | 15 m | 50 m | 500 m |
| Supported protocol | Host link, Modbus-RTU master and no-protocol | | |
| Terminal block type | Screwless push-in terminals<br>9 terminals | Screwless push-in terminals<br>5 terminals | |
| Applicable wire size | AWG28 to 20 | AWG24 to 20 | |
| Dimensions (H × D × W) | 35.9 mm x 13.5 mm x 35.9 mm | | |
| Weight | 16 g | 13 g | 14 g |
| Power consumption | The option board power consumption is included in the CPU unit power consumption. | | |
| Isolation method | No isolation | | Isolation*1 |

*1. The terminals are isolated from the internal circuits of the CPU unit.

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## Analog I/O option board specifications

| Item | | NX1W-ADB21 | NX1W-DAB21V | NX1W-MAB221 |
|---|---|---|---|---|
| I/O | Type | Analog input | Analog output | Analog I/O |
| | Voltage/current input | 0 to 10 V<br>0 to 20 mA<br>2 words total | - | 0 to 10 V<br>0 to 20 mA<br>2 words total |
| | Voltage output | - | 0 to 10 V<br>2 words | 0 to 10 V<br>2 words |
| Terminal block type | | Screwless push-in terminals<br>5 terminals | Screwless push-in terminals<br>3 terminals | Screwless push-in terminals<br>8 terminals |
| Applicable wire size | | AWG24 to 20 | | |
| Dimensions (H × D × W) | | 35.9 mm x 28.2 mm x 35.9 mm | | |
| Weight | | 24 g | | 26 g |
| Power consumption | | The option board power consumption is included in the CPU unit power consumption. | | |
| Isolation method | | No isolation | | |

## Function specifications

| Item | | | | NX1P2-□ CPU Unit |
|---|---|---|---|---|
| Tasks | Function | Function | | I/O refreshing and the user program are executed in units that are called tasks.<br>Tasks are used to specify execution conditions and execution priority. |
| | | Periodically executed tasks | | Maximum number of primary periodic tasks: 1<br>Maximum number of periodic tasks: 2 |
| | | Conditionally executed tasks | | Maximum number of even tasks: 32<br>When active even task instruction is executed or when condition expression for variable is met. |
| | Setup | System service monitoring settings | | Not supported |
| Programming | POUs (program organization units) | Programs | | POUs that are assigned to tasks. |
| | | Function blocks | | POUs that are used to create objects with specific conditions. |
| | | Functions | | POUs that are used to create an object that determine unique outputs for the inputs, such as for data processing. |
| | Programming languages | Types | | Ladder diagrams[*1] and structured text (ST). |
| | Namespaces | | | A concept that is used to group identifiers for POU definitions. |
| | Variables | External access of variables | | Network variables (the function which allows access from the HMI, host computers or other controllers) |
| | Data types | Basic data types | | BOOL, BYTE, WORD, DWORD, LWORD, INT, SINT, DINT, LINT, UINT, USINT, UDINT, ULINT, REAL, LREAL, TIME (durations), DATE, TIME_OF_DAY, DATE_AND_TIME and STRING (text strings) |
| | | Derivative data types | | Structures, unions, enumerations |
| | | Structures | Function | A derivative data type that groups together data with different variable types.<br>Number of members: 2,048 max.<br>Nesting levels: 8 max. |
| | | | Member data types | Basic data types, structures, unions, enumerations, array variables |
| | | | Specifying member offsets | You can use member offsets to place structure members at any memory locations. |
| | | Unions | Function | A derivative data type that groups together data with different variable types.<br>Number of members: 4 max. |
| | | | Member data types | BOOL, BYTE, WORD, DWORD and LWORD. |
| | | Enumerations | Function | A derivative data type that uses text strings called enumerators to express variable values. |
| | Data type attributes | Array specifications | Function | An array is a group of elements with the same data type. You specify the number (subscript) of the element from the first element to specify the element.<br>Number of dimensions: 3 max.<br>Number of elements: 65,535 max. |
| | | | Array specifications for FB instances | Supported. |
| | | Range specifications | | You can specify a range for a data type in advance. The data type can take only values that are in the specified range. |
| | | Libraries | | User libraries. |

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| Item | | | | NX1P2-□ CPU Unit |
|---|---|---|---|---|
| Motion control*2 | Control modes | | | Position control, velocity control, torque control |
| | Axis types | | | Servo axes, virtual servo axes, encoder axes and virtual encoder axes |
| | Positions that can be managed | | | Command positions and actual positions |
| | Single-axis | Single-axis position contol | Absolute positioning | Positioning is performed for a target position that is specified with an absolute value. |
| | | | Relative positioning | Positioning is performed for a specified travel distance from the command current position. |
| | | | Interrupt feeding | Positioning is performed for a specified travel distance from the position where an interrupt input was received from an external input. |
| | | | Cyclic synchro-nous absolute positioning | A positioning command is output each control period in the position control mode. |
| | | Single-axis velocity control | Velocity control | Velocity control is performed in position control mode. |
| | | | Cyclic synchronous velocity control | A velocity command is output each control period in the velocity control mode. |
| | | Single-axis torque control | Torque control | The torque of the motor is controlled. |
| | | Single-axis synchronized control | Starting cam operation | A cam motion is performed using the specified cam table. |
| | | | Ending cam operation | The cam motion for the axis that is specified with the input parameter is ended. |
| | | | Starting gear operation | A gear motion with the specified gear ratio is performed between a master axis and slave axis. |
| | | | Positioning gear operation | A gear motion with the specified gear ratio and sync position is performed between a master axis and slave axis. |
| | | | Ending gear operation | The specified gear motion or positioning gear motion is ended. |
| | | | Synchronous positioning | Positioning is performed in sync with a specified master axis. |
| | | | Master axis phase shift | The phase of a master axis in synchronized control is shifted. |
| | | | Combining axes | The command positions of two axes are added or subtracted and the result is output as the command position. |
| | | Single-axis manual operation | Powering the servo | The servo in the servo drive is turned ON to enable axis motion. |
| | | | Jogging | An axis is jogged at a specified target velocity. |
| | | Auxiliary functions for single-axis control | Resetting axis errors | Axes errors are cleared. |
| | | | Homing | A motor is operated and the limit signals, home proximity signal, and home signal are used to define home. |
| | | | Homing with parameters | The parameters are specified, the motor is operated and the limit signals, home proximity signal and home signal are used to define home. |
| | | | High-speed homing | Positioning is performed for an absolute target position of 0 to return to home. |
| | | | Stopping | An axis is decelerated to a stop at the specified rate. |
| | | | Immediately stopping | An axis is stopped immediately. |
| | | | Override factors | The target velocity of an axis can be changed. |
| | | | Changing the current position | The command current position or actual current position of an axis can be changed to any position. |
| | | | Enabling external latches | The position of an axis is recorded when a trigger occurs. |
| | | | Disabling external latches | The current latch is disabled. |
| | | | Zone monitoring | You can monitor the command position or actual position of an axis to see when it is within a specified range (zone). |
| | | | Enabling digital cam switches | You can turn a digital output ON and OFF according to the position of an axis. |
| | | | Monitoring axis following error | You can monitor whether the difference between the command positions or actual positions of two specified axes exceeds a threshold value. |
| | | | Resetting the following error | The error between the command current position and actual current position is set to 0. |
| | | | Torque limit | The torque control function of the servo drive can be enabled or disabled and the torque limits can be set to control the output torque. |
| | | | Position compensation | The function which compensate the position for the axis in operation. |
| | | | Start velocity | You can set the initial velocity when axis motion starts. |

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| Item | | | | NX1P2-□ CPU Unit |
|---|---|---|---|---|
| Motion control*2 | Axes groups | Multi-axes coordinated control | Absolute linear interpolation | Linear interpolation is performed to a specified absolute position. |
| | | | Relative linear interpolation | Linear interpolation is performed to a specified relative position. |
| | | | Circular 2D interpolation | Circular interpolation is performed for two axes. |
| | | | Axes group cyclic synchronous absolute positioning | A positioning command is output each control period in Position control mode. |
| | | Auxiliary functions for multi-axes coordinated control | Resetting axes group errors | Axes group errors and axis errors are cleared. |
| | | | Enabling axes groups | Motion of an axes group is enabled. |
| | | | Disabling axes groups | Motion of an axes group is disabled. |
| | | | Stopping axes groups | All axes in interpolated motion are decelerated to a stop. |
| | | | Immediately stopping axes groups | All axes in interpolated motion are stopped immediately. |
| | | | Setting axes group override factors | The blended target velocity is changed during interpolated motion. |
| | | | Reading axes group positions | The command current positions and actual current positions of an axes group can be read. |
| | | | Changing the axes in a group | The composition axes parameter in the axes group parameters can be overwritten temporarily. |
| | Common items | Cams | Setting cam table properties | The end point index of the cam table that is specified in the input parameter is changed. |
| | | | Saving cam tables | The cam table that is specified with the input parameter is saved in non-volatile memory in the CPU unit. |
| | | | Generating cam tables | The cam table that is specified with the input parameter is generated from the cam property and cam mode. |
| | | Parameters | Writing MC settings | Some of the axis parameters or axes group parameters are overwritten temporarily. |
| | | | Changing axis parameters | You can access and change the axis parameters from the user program. |
| | Auxiliary functions | Count modes | | You can select either linear mode (finite length) or rotary mode (infinite length). |
| | | Unit conversions | | You can set the display unit for each axis according to the machine. |
| | | Acceleration/deceleration control | Automatic acceleration/deceleration control | Jerk is set for the acceleration/deceleration curve for an axis motion or axes group motion. |
| | | | Changing the acceleration and deceleration rates | You can change the acceleration or deceleration rate even during acceleration or deceleration. |
| | | In-position check | | You can set an in-position range and in-position check time to confirm when positioning is completed. |
| | | Stop method | | You can set the stop method to the immediate stop input signal or limit input signal. |
| | | Re-execution of motion control instructions | | You can change the input variables for a motion control instruction during execution and execute the instruction again to change the target values during operation. |
| | | Multi-execution of motion control instructions (buffer mode) | | You can specify when to start execution and how to connect the velocities between operations when another motion control instruction is executed during operation. |
| | | Continuous axes group motions (transition mode) | | You can specify the transition mode for multi-execution of instructions for axes group operation. |
| | | Monitoring functions | Software limits | Software limits are set for each axis. |
| | | | Following error | The error between the command current value and the actual current value is monitored for an axis. |
| | | | Velocity, acceleration/deceleration rate, torque, interpolation velocity and interpolation acceleration/deceleration rate | You can set and monitor warning values for each axis and each axes group. |
| | | Absolute encoder support | | You can use an OMRON 1S series servomotor or Accurax-G5 series servomotor with an absolute encoder to eliminate the need to perform homing at startup. |
| | | Input signal logic inversion | | You can inverse the logic of immediate stop input signal, positive limit input signal, negative limit input signal or home proximity input signal. |
| | External interface signals | | | The servo drive input signals listed below are used:<br>Home signal, home proximity signal, positive limit signal, negative limit signal, immediate stop signal and interrupt input signal. |
| Unit (I/O) management | EtherCAT slaves | Number of slaves | | 16 max. |
| | CJ-series units | Number of units | | Not supported |

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| Item | | | | NX1P2-□ CPU Unit |
|---|---|---|---|---|
| Communications | EtherNet/IP port | Communication protocol | | TCP/IP, UDP/IP |
| | | CIP communications service | Tag data links | Programless cyclic data exchange is performed with the devices on the EtherNet/IP network. |
| | | | Message communications | CIP commands are sent to or received from the devices on the EtherNet/IP network. |
| | | TCP/IP applications | Socket services | Data is sent to and received from any node on Ethernet using the UDP or TCP protocol. Socket communications instructions are used. |
| | | | FTP client | Files are transferred via FTP from the CPU unit to computers or controllers at other Ethernet nodes. FTP client communications instructions are used. |
| | | | FTP server | Files can be read from or written to the SD memory card in the CPU unit from computers at other Ethernet nodes. |
| | | | Automatic clock adjustment | Clock information is read from the NTP server at the specified time or at specified interval after the power supply to the CPU unit is turned ON. The internal clock time in the CPU unit is updated with the read time. |
| | | | SNMP agent | Built-in EtherNet/IP port internal status information is provided to network management software that uses an SNMP manager. |
| | EtherCAT port | Supported services | Process data communications | A communication method to exchange control information in cyclic communications between the EtherCAT master and slaves. This communications method is defined by CoE. |
| | | | SDO communications | A communication method to exchange control information in noncyclic event communications between the EtherCAT master and slaves. This communications method is defined by CoE. |
| | | Network scanning | | Information is read from connected slave devices and the slave configuration is automatically generated. |
| | | DC (distributed clock) | | Time is synchronized by sharing the EtherCAT system time between all EtherCAT devices (including the master). |
| | | Packet monitoring | | The frames that are sent by the master and the frames that are received by the master can be saved. The data that is saved can be viewed with WireShark or other applications. |
| | | Enable/disable settings for slaves | | The slaves can be enabled or disabled as communications targets. |
| | | Disconnecting/connecting slaves | | Temporarily disconnects a slave from the EtherCAT network for maintenance, such as for replacement of the slave and then connects the slave again. |
| | | Supported application protocol | CoE | SDO messages of the CAN application can be sent to slaves via EtherCAT. |
| | Serial communication | Protocol | | Host link (FINS), no-protocol and Modbus-RTU master (when connected to the Serial communications option board) |
| | Communications instructions | | | The following instructions are supported:<br>FTP client instructions, CIP communications instructions, socket communications instructions, SDO message instructions, no-protocol communications instructions and Modbus RTU protocol instructions. |
| Operation management | RUN output contacts | | | Not supported. |
| System management | Event logs | Function | | Events are recorded in the logs. |
| | | Number of events per event log | | System event log: 576 max.*3<br>Access event log: 528 max.*4<br>User-defined event log: 512 max. |
| Debugging | Online editing | | | Programs, function blocks, functions and global variables can be changed online. More than one operator can change POUs individually via network. |
| | Forced refreshing | Forced refreshing | | The user can force specific variables to TRUE or FALSE. |
| | | Number of forced variables | For EtherCAT slaves | 64 max. |
| | | | For CJ-series | Not supported. |
| | MC test Run | | | Motor operation and wiring can be checked from the Sysmac Studio. |
| | Synchronization | | | The project file in the Sysmac Studio and the data in the CPU unit can be made the same when online. |
| | Differentiation monitoring | Differentiation monitoring | | You can monitor when a variable changes to TRUE or changes to FALSE. |
| | | Number of contacts | | 8 max. |
| | Data tracing | Types | Single triggered trace | When the trigger condition is met, the specified number of samples are taken and then tracing stops automatically. |
| | | | Continuous trace | Data tracing is executed continuously and the trace data is collected by the Sysmac Studio. |
| | | Number of simultaneous data trace | | 2 max. |
| | | Number of records | | 10,000 max. |
| | | Sampling | Number of sampled variables | 48 variables max. |
| | | Timing of sampling | | Sampling is performed for the specified task period, at the specified time or when a sampling instruction is executed. |
| | | Triggered traces | Triggered traces | Trigger conditions are set to record data before and after an event. |
| | | | Trigger conditions | When BOOL variable changes to TRUE or FALSE.<br>Comparison of non-BOOL variable with a constant.<br>Comparison method: Equals (=), greater than (>), greater than or equals (≥), less than (<), less than or equals (≤), not equal (≠). |
| | | | Delay | Trigger position setting: A slider is used to set the percentage of sampling before and after the trigger condition is met. |
| | Simulation | | | The operation of the CPU unit is emulated in the Sysmac Studio. |
| Reliability | Self-diagnosis | Controller errors | Levels | Major faults, partial faults, minor faults, observation and information. |
| | | | Number of message languages | 9 max. (Sysmac Studio)<br>2 max. (NS-series PT |
| | | User-defined errors | Function | User-defined errors are registered in advance and then records are created by executing instructions. |
| | | | Levels | 8 levels |
| | | | Number of message languages | 9 max. |

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| Item | | | | NX1P2-□ CPU Unit |
|---|---|---|---|---|
| Security | Protecting software assets and preventing operating mistakes | CPU unit names and serial IDs | | When going online to a CPU unit from the Sysmac Studio, the CPU unit name in the project is compared to the name of the CPU unit being connected to. |
| | | Protection | User program transfer with no restoration information | You can prevent reading data in the CPU unit from the Sysmac Studio. |
| | | | CPU unit write protection | You can prevent writing data to the CPU unit from the Sysmac Studio or SD memory card. |
| | | | Overall project file protection | You can use passwords to protect .smc files from unauthorized opening on the Sysmac Studio. |
| | | | Data protection | You can use passwords to protect POUs on the Sysmac Studio. |
| | | Verification of operation authority | Verification of operation authority | Online operations can be restricted by operation rights to prevent damage to equipment or injuries that may be caused by operating mistakes. |
| | | | Number of groups | 5 |
| | | Verification of user program execution ID | | The user program cannot be executed without entering a user program execution ID from the Sysmac Studio for the specific hardware (CPU unit). |
| SD memory card | Storage type | | | SD memory card, SDHC memory card |
| | Application | Automatic transfer from SD memory card | | When the power supply to the controller is turned ON, the data that is stored in the autoload directory of the SD memory card is transferred to the controller. |
| | | Program transfer from SD memory card | | With the specification of the system-defined variable, you can transfer a program that is stored in the SD memory card to the controller. |
| | | SD memory card operation instructions | | You can access SD memory cards from instructions in the user program. |
| | | File operations from the Sysmac Studio | | You can perform file operations for Controller files in the SD memory card and read/write standard document files on the computer. |
| | | SD memory card life expiration detection | | Notification of the expiration of the life of the SD memory card is provided in a system-defined variable and event log. |
| Backup | SD memory card backup | Operating methods | CPU unit front panel DIP switch | Backup, verification and restoration operations are performed by manipulating the front-panel DIP switch on the CPU unit. |
| | | | Specification with system-defined variables | Backup and verification operations are performed by manipulating system-defined variables. |
| | | | SD memory card Window in Sysmac Studio | Backup and verification operations are performed from the SD memory card Window of the Sysmac Studio. |
| | | | Special instruction | The special instruction is used to backup data. |
| | | Protection | Disabling backups to SD memory cards | Backing up data to a SD memory card is prohibited. |
| | Sysmac Studio controller backups | | | The Sysmac Studio is used to backup, restore and verify controller data. |

*1. Inline ST is supported (Inline ST is ST that is written as an element in a ladder diagram).
*2. The NX1P2-9□ CPU unit doesn't support motion control.
*3. This is the total of 512 events for the CPU unit and 64 events for the NX unit.
*4. This is the total of 512 events for the CPU unit and 16 events for the NX unit.

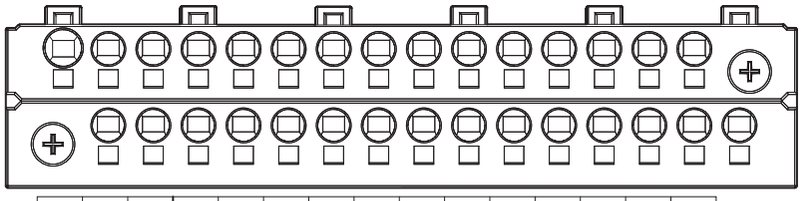
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## Terminal block

### Input terminal block

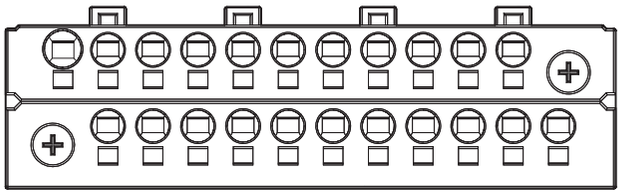
#### NX1P2-□□40DT□



| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ⏚ | + | - | COM | 01 | 03 | 05 | 07 | 09 | 11 | 13 | 15 | 17 | 19 | 21 |
| | + | - | 00 | 02 | 04 | 06 | 08 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 23 |

| Symbol | Name | Description |
|---|---|---|
| ⏚ | Functional ground terminal | Connect the ground wire to the terminal |
| +/- | Unit power supply terminals | These terminals are connected to the unit power supply<br>The + and - terminals are internally connected to each other |
| COM | Common terminal | Common terminal for the input circuits |
| 00 to 15 | Input terminals | General-purpose input A |
| 16 to 23 | | General-purpose input B |

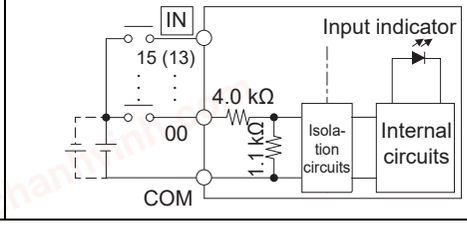
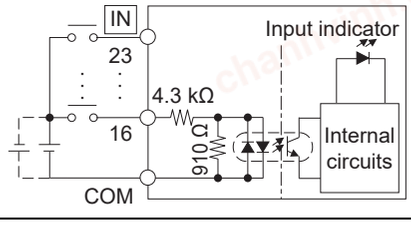
#### NX1P2-□□24DT□



| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ⏚ | + | - | COM | 01 | 03 | 05 | 07 | 09 | 11 | 13 |
| | + | - | 00 | 02 | 04 | 06 | 08 | 10 | 12 | NC | NC |

| Symbol | Name | Description |
|---|---|---|
| ⏚ | Functional ground terminal | Connect the ground wire to the terminal |
| +/- | Unit power supply terminals | These terminals are connected to the unit power supply<br>The + and - terminals are internally connected to each other |
| COM | Common terminal | Common terminal for the input circuits |
| 00 to 13 | Input terminals | General-purpose input A |
| NC | NC | Do not connect anything |

### Input specifications

| Item | General-purpose input A<br>NX1P2-□□40DT□: 00 to 15<br>NX1P2-□□24DT□: 00 to 13 | General-purpose input B<br>NX1P2-□□40DT□: 16 to 23 |
|---|---|---|
| Internal I/O common | For both NPN/PNP | |
| Input voltage | 24 VDC (15 to 28.8 VDC) | |
| Input current | 5.8 mA typical | 5.3 mA typical |
| Input impedance | 4.0 kΩ | 4.3 kΩ |
| Connected sensor | Two-wire or three-wire sensors | |
| ON voltage | 15 VDC min. | |
| OFF voltage/current | 5 VDC max./1 mA max. | |
| ON/OFF response time*1 | 2.5 μs max. | 1 ms max. |
| ON/OFF filter time*2 | No filter, 0.25 ms, 0.5 ms, 1 ms (default), 2 ms, 4 ms, 8 ms, 16 ms, 32 ms, 64 ms, 128 ms, 256 ms | |
| Circuit configuration |  |  |

*1. These values are the fixed response time needed by the hardware. A value from 0 to 32 ms (default: 1 ms) that is set on the Support Software is added to these values.
*2. Set the filter time for every 4 points.

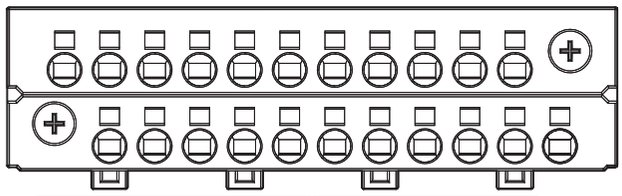
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### Output terminal block

The appearance of the output terminal block is the same for all the NX1P CPU models.

#### NX1P2-□□40DT



| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| NC | NC | 00 | 02 | 04 | 06 | NC | 08 | 10 | 12 | 14 | |
| | C0 (0V) | 01 | 03 | 05 | 07 | C1 (0V) | 09 | 11 | 13 | 15 | NC |

| Symbol | Name | Description |
|---|---|---|
| C0 (0 V), C1 (0 V) | Common terminal | Connected to the 0 V side of the I/O power supply<br>C0 (0 V) and C1 (0 V) are independent from each other inside the CPU unit |
| 00 to 15 | Output terminals | NPN (sinking) type output |
| NC | NC | Do not connect anything |

#### NX1P2-□□40DT1

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| NC | C0 (+V) | 00 | 02 | 04 | 06 | C1 (+V) | 08 | 10 | 12 | 14 | |
| | 0V0 | 01 | 03 | 05 | 07 | 0V1 | 09 | 11 | 13 | 15 | NC |

| Symbol | Name | Description |
|---|---|---|
| C0 (+V), C1 (+V) | Common terminal | Connected to the 24 V side of the I/O power supply<br>C0 (+V) and C1 (+V) are independent from each other inside the CPU unit |
| 0V0, 0V1 | 0 V terminal | Supplies 0 V for the internal circuits for driving<br>0V0 and 0V1 are independent from each other inside the CPU unit |
| 00 to 15 | Output terminals | PNP (sourcing) type output with the load short-circuit protection function |
| NC | NC | Do not connect anything |

#### NX1P2-□□24DT

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| NC | NC | 00 | 02 | 04 | 06 | 08 | NC | NC | NC | NC | |
| | C0 (0V) | 01 | 03 | 05 | 07 | 09 | NC | NC | NC | NC | NC |

| Symbol | Name | Description |
|---|---|---|
| C0 (0 V) | Common terminal | Connected to the 0 V side of the I/O power supply |
| 00 to 09 | Output terminals | NPN (sinking) type output |
| NC | NC | Do not connect anything |

#### NX1P2-□□24DT1

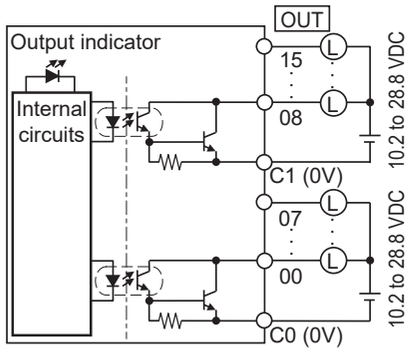
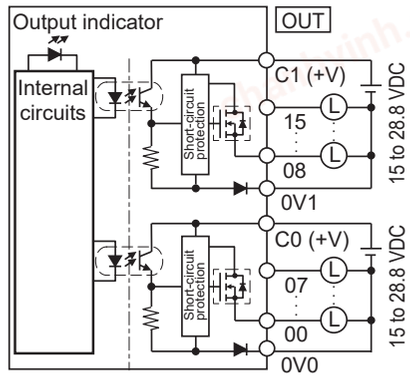
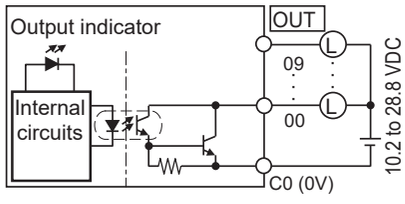
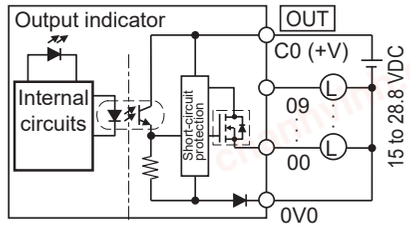
| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| NC | C0 (+V) | 00 | 02 | 04 | 06 | 08 | NC | NC | NC | NC | |
| | 0V0 | 01 | 03 | 05 | 07 | 09 | NC | NC | NC | NC | NC |

| Symbol | Name | Description |
|---|---|---|
| C0 (+V) | Common terminal | Connected to the 24 V side of the I/O power supply |
| 0V0 | 0 V terminal | Supplies 0 V for the internal circuits for driving |
| 00 to 09 | Output terminals | PNP (sourcing) type output with the load short-circuit protection function |
| NC | NC | Do not connect anything |

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## Output specifications

| Item | NX1P2-□□□□DT | NX1P2-□□□□DT1 |
|---|---|---|
| Internal I/O common | NPN (sinking) | PNP (sourcing) |
| Maximum switching capacity | 12 to 24 VDC (10.2 to 28.8 VDC), 300 mA per point | 24 VDC (15 to 28.8 VDC), 300 mA per point |
| | NX1P2-□□40DT□: 1.8 A/common (3.6 A/unit)<br>NX1P2-□□24DT□: 2.4 A/common (2.4 A/unit) | |
| Minimum switching capacity | 12 to 24 VDC (10.2 to 28.8 VDC), 1 mA | 24 VDC (15 to 28.8 VDC), 1 mA |
| Leakage current | 0.1 mA max. | |
| Residual voltage | 1.5 V max. | |
| ON response time | 0.1 ms max. | 0.5 ms max. |
| OFF response time | 0.8 ms max. | 1.0 ms max. |
| Current consumption from I/O power supply*1 | - | NX1P2-1□40DT1: 40 mA/common<br>NX1P2-9024DT1: 50 mA/common |
| Load short-circuit protection | Not provided | Provided*2 |
| Circuit configuration | NX1P2-□□40DT<br> | NX1P2-□□40DT1<br> |
| | NX1P2-□□24DT<br> | NX1P2-□□24DT1<br> |

*1. The internally consumed current from I/O power supply. The current flows from the common terminal Cn (+V) to the 0Vn terminal. The current consumption of any external load is excluded.

*2. The load short-circuit protection is provided for each point of the PNP (sourcing) type output terminal. It protects the output circuits when a load short circuit occurs.

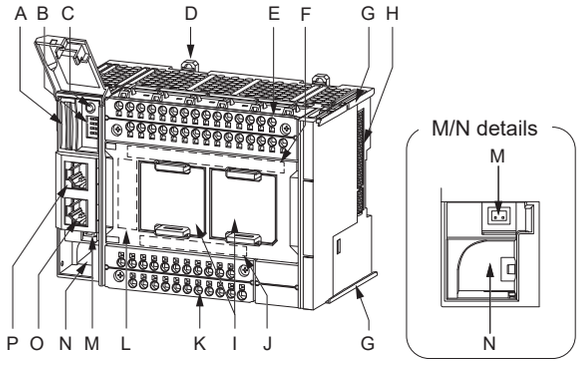
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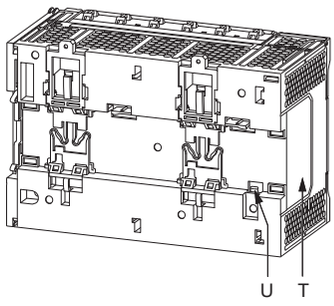


## Nomenclature

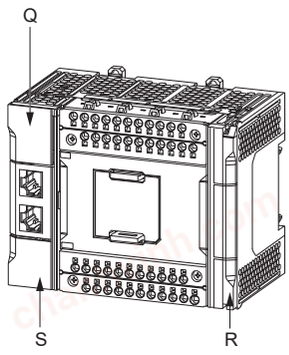
### NX1P CPU unit

**NX1P2-□□40DT□**



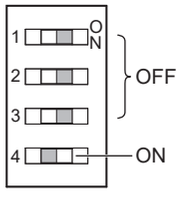




**NX1P2-□□24DT□**




| Symbol | Name | Description |
|---|---|---|
| A | SD memory card connector | Connects the SD memory card to the CPU unit. |
| B | DIP switch | Use in Safe Mode[*1] or when backing up data. Normally, turn OFF all the pins. |
| C | SD memory card power supply switch | Turns OFF the power supply so that you can remove the SD memory card. |
| D | DIN track mounting hook | These hooks are used to mount the unit to a DIN track. |
| E | Input terminal block | This terminal block is used for wiring for the unit power supply, grounding and build-in input. |
| F | Input indicator | Shows the operation status of the built-in input. |
| G | Unit hookup guides | These guides are used to mount an NX unit or End cover. |
| H | NX bus connector | This connector is used to connect the CPU unit to the NX unit on the right of the CPU unit. |
| I | Option board slot 1 (left)<br>Option board slot 2 (right) | Remove the covers of the slots and mount option boards. For the models with 24 built-in I/O points, only one slot is provided. Keep the removed covers in a safe place. |
| J | Output indicator | Shows the operation status of the built-in output. |
| K | Output terminal block | This terminal block is used to wire the build-in output. |
| L | CPU unit operation status indicator | Shows the operation status of the CPU unit. |
| M | Battery connector | Connector to mount the backup battery that is sold separately. |
| N | Battery slot | Used to mount the backup battery that is sold separately. |
| O | Built-in EtherCAT port | Connects the built-in EtherCAT with an Ethernet cable. |
| P | Built-in EtherNet/IP port | Connects the built-in EtherNet/IP with an Ethernet cable. |
| Q | SD memory card cover | Cover for the SD memory card and DIP switch. The cover swings upward. |
| R | End cover | Cover to protect the CPU unit and NX I/O units. |
| S | Battery cover | Cover for battery slot. Remove this cover when you mount/remove the battery. |
| T | ID information indication | Shows the ID information of the CPU unit. |
| U | DIN track contact plate | This plate is connected internally to the functional ground terminal on the terminal block. |

*1. To use Safe Mode, set the DIP switch as shown in the below picture and then turn ON the power supply to the controller. If the power supply to the controller is turned ON with the CPU unit in Safe Mode, the CPU unit will start in PROGRAM mode. Use the Safe Mode if you do not want to execute the user program when the power supply is turned ON or if it is difficult to connect the Sysmac Studio.

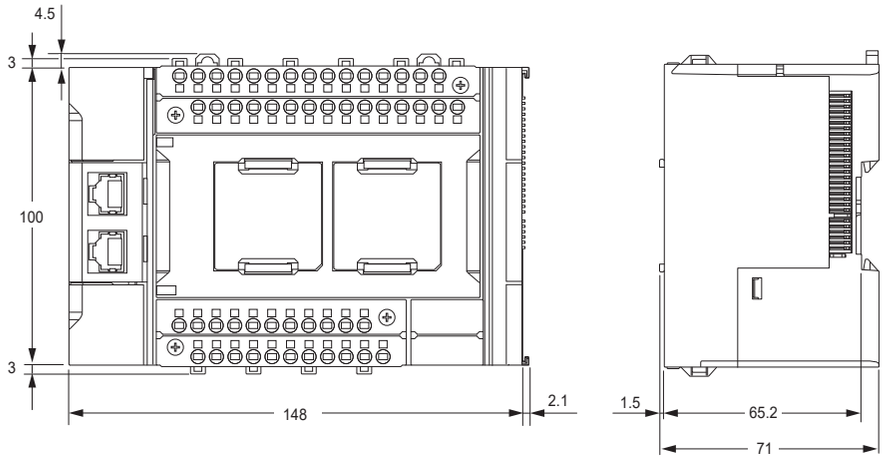


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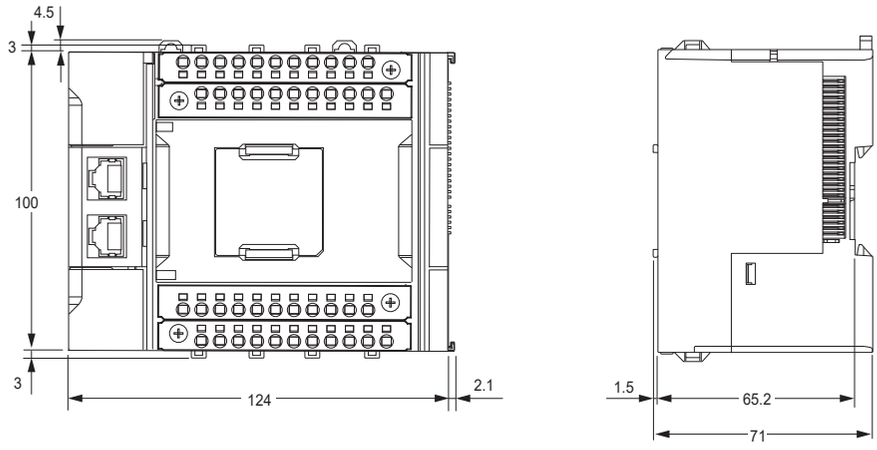
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## Dimensions

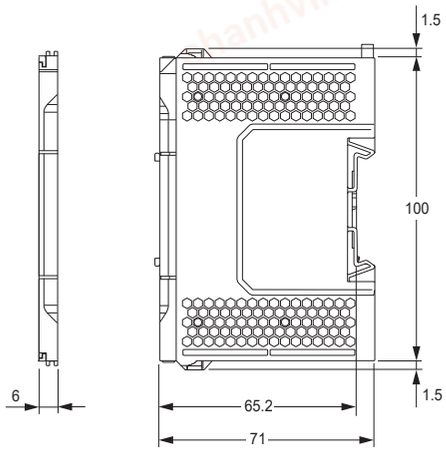
### NX1P2-□□40DT□




### NX1P2-□□24DT□




### End cover (NX-END02)



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## Ordering information

### NX1P series CPU units

| Type | Program capacity | Memory capacity for variables | Number of axes | | | Built-in I/O points | | | Model | Appearance |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Real axes | Motion control servo axes | Single-axis position control servo axes | I/O points | Input points | Output points | | |
| NX1P | 1.5 MB | 32 KB (retained during power interruptions) or 2 MB (not retained during power interruptions) | 8 axes | 4 axes | 4 axes | 40 points | 24 points | 16 points NPN transistor | NX1P2-1140DT |  |
| | | | | | | | | 16 points PNP transistor*1 | NX1P2-1140DT1 | |
| | | | 6 axes | 2 axes | | | | 16 points NPN transistor | NX1P2-1040DT | |
| | | | | | | | | 16 points PNP transistor*1 | NX1P2-1040DT1 | |
| | 1 MB | | 2 axes | 0 axes | 2 axes | | | 16 points NPN transistor | NX1P2-9B40DT | |
| | | | | | | | | 16 points PNP transistor*1 | NX1P2-9B40DT1 | |
| | 1.5 MB | | 4 axes | | 4 axes | 24 points | 14 points | 10 points NPN transistor | NX1P2-9024DT |  |
| | | | | | | | | 10 points PNP transistor*1 | NX1P2-9024DT1 | |
| | 1 MB | | 2 axes | | 2 axes | | | 10 points NPN transistor | NX1P2-9B24DT | |
| | | | | | | | | 10 points PNP transistor*1 | NX1P2-9B24DT1 | |

*1. With the load short-circuit protection.

**Note:** The end cover unit NX-END02 is included with the CPU unit.

### Option boards

| Type | Specifications | Supported protocol | Model | Appearance |
|---|---|---|---|---|
| Serial communications | 1 x RS-232C port<br>Transmission distance: 15 m<br>Connection type: Screwless push-in terminal block (9 terminals) | Host link, Modbus-RTU master and no-protocol | NX1W-CIF01 |  |
| | 1 x RS-422A/485 port<br>Transmission distance: 50 m<br>Connection type: Screwless push-in terminal block (5 terminals) | | NX1W-CIF11 |  |
| | 1 x RS-422A/485 port (isolated)<br>Transmission distance: 500 m<br>Connection type: Screwless push-in terminal block (5 terminals) | | NX1W-CIF12 | |
| Analog I/O | 2 x Analog input<br>Voltage input: 0 to 10 V (Resolution: 1/4,000)<br>Current input: 0 to 20 mA (1/2,000)<br>Connection type: Screwless push-in terminal block (5 terminals) | | NX1W-ADB21 |  |
| | 2 x Analog output<br>Voltage output: 0 to 10 V (Resolution: 1/4,000)<br>Connection type: Screwless push-in terminal block (3 terminals) | | NX1W-DAB21V |  |
| | 2 x Analog input / 2 x Analog output<br>Voltage input: 0 to 10 V (Resolution: 1/4,000)<br>Current input: 0 to 20 mA (1/2,000)<br>Voltage output: 0 to 10 V (Resolution: 1/4,000)<br>Connection type: Screwless push-in terminal block (8 terminals) | | NX1W-MAB221 |  |

### NX I/O units (local and remote I/O)

Up to 8 local NX I/O units can be connected to an NX1P CPU unit. The NX-Safety units must be used in combination with the EtherCAT communication coupler unit.

### EtherCAT communication coupler

| Type | Protocol | Communications cycle in DC mode*1 | Specifications | Connection | I/O power supply | Width | Model |
|---|---|---|---|---|---|---|---|
| Communication coupler | EtherCAT slave | 125 to 10,000 µs | Up to 63 I/O units<br>Max. 1024 bytes in + 1024 bytes out<br>Supports distributed clock | 2 RJ45 ports (in + out) | 10.0 A max. | 46 mm | NX-ECC203 |

*1. This depends on the specifications of the EtherCAT master and the unit configuration.

### IO-Link master unit

| Type | No. of ports | I/O refresh method | Connection type*1 | Width | Model |
|---|---|---|---|---|---|
| IO-Link master | 4 | Free run | Screwless push-in (NX-TBA162) | 12 mm | NX-ILM400 |

*1. Units with Screwless push-in connections are supplied with the appropriate terminal connector.

**Note:** For more detailed information about IO-Link master unit, refer to “IO-Link master datasheet (I191E-EN)”.

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## RFID units

| Type | No. of channels | Amplifier/Antenna | I/O refresh mode | Connection type | Width | Model |
|---|---|---|---|---|---|---|
| RFID unit | 1 | V680 series | Free Run | FG terminal block | 30 mm | NX-V680C1 |
| | 2 | | | | | NX-V680C2 |

## Digital I/O units

| Type | Channels, signal type | Performance[*1], I/O refresh method | Connection type[*2] | Width | Model | NPN type[*3] |
|---|---|---|---|---|---|---|
| DC digital input | 4 inputs, 3-wire connection | High-speed synchronous time stamp | Screwless push-in (NX-TBA122) | 12 mm | NX-ID3444 | NX-ID3344 |
| | | High-speed synchronous/free run | Screwless push-in (NX-TBA122) | 12 mm | NX-ID3443 | NX-ID3343 |
| | | Synchronous/free run | Screwless push-in (NX-TBA122) | 12 mm | NX-ID3417 | NX-ID3317 |
| | 8 inputs, 2-wire connection | | Screwless push-in (NX-TBA162) | 12 mm | NX-ID4442 | NX-ID4342 |
| | 16 inputs, 1-wire connection | | Screwless push-in (NX-TBA162) | 12 mm | NX-ID5442 | NX-ID5342 |
| | | | M3 screw terminal block | 30 mm | NX-ID5142-1 | NX-ID5142-1 |
| | | | 1 x 20-pin MIL connector | 30 mm | NX-ID5142-5 | NX-ID5142-5 |
| | 32 inputs, 1-wire connection | | 1 x 40-pin MIL connector | 30 mm | NX-ID6142-5 | NX-ID6142-5 |
| | | | 1 x 40-pin Fujitsu connector | 30 mm | NX-ID6142-6 | NX-ID6142-6 |
| AC digital input | 4 inputs, 200-240 VAC, 50/60 Hz | Free run | Screwless push-in (NX-TBA082) | 12 mm | NX-IA3117 | - |
| DC digital output | 2 outputs 0.5 A, 3-wire connection | High-speed synchronous time stamp | Screwless push-in (NX-TBA082) | 12 mm | NX-OD2258 | NX-OD2154 |
| | 4 outputs 0.5 A, 3-wire connection | High-speed synchronous/free run | Screwless push-in (NX-TBA122) | 12 mm | NX-OD3257 | NX-OD3153 |
| | | Synchronous/free run | Screwless push-in (NX-TBA122) | 12 mm | NX-OD3256 | NX-OD3121 |
| | 4 outputs 2 A, 3-wire connection | | Screwless push-in (NX-TBA162) | 12 mm | NX-OD3268 | - |
| | 8 outputs 0.5 A, 2-wire connection | | Screwless push-in (NX-TBA162) | 12 mm | NX-OD4256 | NX-OD4121 |
| | 16 outputs 0.5 A, 1-wire connection | | Screwless push-in (NX-TBA162) | 12 mm | NX-OD5256 | NX-OD5121 |
| | | | M3 screw terminal block | 30 mm | NX-OD5256-1 | NX-OD5121-1 |
| | | | 1 x 20-pin MIL connector | 30 mm | NX-OD5256-5 | NX-OD5121-5 |
| | 32 outputs 0.5 A, 1-wire connection | | 1 x 40-pin MIL connector | 30 mm | NX-OD6256-5 | NX-OD6121-5 |
| | | | 1 x 40-pin Fujitsu connector | 30 mm | - | NX-OD6121-6 |
| Relay digital output | 2 outputs, N.O., 2.0 A | Free run | Screwless push-in (NX-TBA082) | 12 mm | NX-OC2633 | - |
| | 2 outputs, N.O. + N.C., 2.0 A | | Screwless push-in (NX-TBA082) | 12 mm | NX-OC2733 | - |
| | 8 outputs, N.O., 2.0 A | | Screwless push-in (NX-TBA082 x 2) | 24 mm | NX-OC4633 | - |
| DC Digital I/O | 16 inputs + 16 outputs, 1-wire connection + common | Synchronous/free run | 2 x 20-pin MIL connector | 30 mm | NX-MD6256-5 | NX-MD6121-5 |
| | | | 2 x 24-pin Fujitsu connector | 30 mm | - | NX-MD6121-6 |

*1. Digital I/O performance, ON/OFF delay:
**High speed PNP/NPN input:** 100 ns/100 ns
**Standard PNP/NPN input:** 0.02 ms/0.4 ms
**AC input:** 10 ms/40 ms
**High speed PNP/NPN output:** 300 ns/300 ns
**Standard PNP output:** 0.5 ms/1.0 ms
**Standard NPN output:** 0.1 ms/0.8 ms
**Relay output:** 15 ms/15 ms

*2. Units with Screwless push-in connections are supplied with the appropriate terminal connector. Units with MIL connectors are supplied without matching plugs.

*3. Model codes are for PNP type signals (positive switching, 0 V common). Most models are also available as NPN type (negative switching, 24 V common). Inputs of MIL connector versions can be used as NPN or PNP.

## Analog I/O units

| Type | Signal type | Performance, I/O refresh method | Channels | Connection type[*1] | Width | Model |
|---|---|---|---|---|---|---|
| Analog input | 4 to 20 mA single ended | 1/8,000 resolution, 250 µs/channel Free run | 2 | Screwless push-in (NX-TBA082) | 12 mm | NX-AD2203 |
| | | | 4 | Screwless push-in (NX-TBA122) | 12 mm | NX-AD3203 |
| | | | 8 | Screwless push-in (NX-TBA162) | 12 mm | NX-AD4203 |
| | 4 to 20 mA differential | 1/8,000 resolution, 250 µs/channel Free run | 2 | Screwless push-in (NX-TBA082) | 12 mm | NX-AD2204 |
| | | | 4 | Screwless push-in (NX-TBA122) | 12 mm | NX-AD3204 |
| | | | 8 | Screwless push-in (NX-TBA162) | 12 mm | NX-AD4204 |
| | | 1/30,000 resolution, 10 µs/channel Synchronous/free run | 2 | Screwless push-in (NX-TBA082) | 12 mm | NX-AD2208 |
| | | | 4 | Screwless push-in (NX-TBA122) | 12 mm | NX-AD3208 |
| | | | 8 | Screwless push-in (NX-TBA162) | 12 mm | NX-AD4208 |
| | ±10 V single ended | 1/8,000 resolution, 250 µs/channel Free run | 2 | Screwless push-in (NX-TBA082) | 12 mm | NX-AD2603 |
| | | | 4 | Screwless push-in (NX-TBA122) | 12 mm | NX-AD3603 |
| | | | 8 | Screwless push-in (NX-TBA162) | 12 mm | NX-AD4603 |
| | ±10 V differential | 1/8,000 resolution, 250 µs/channel Free run | 2 | Screwless push-in (NX-TBA082) | 12 mm | NX-AD2604 |
| | | | 4 | Screwless push-in (NX-TBA122) | 12 mm | NX-AD3604 |
| | | | 8 | Screwless push-in (NX-TBA162) | 12 mm | NX-AD4604 |
| | | 1/30,000 resolution, 10 µs/channel Synchronous/free run | 2 | Screwless push-in (NX-TBA082) | 12 mm | NX-AD2608 |
| | | | 4 | Screwless push-in (NX-TBA122) | 12 mm | NX-AD3608 |
| | | | 8 | Screwless push-in (NX-TBA162) | 12 mm | NX-AD4608 |
| High-Speed Analog Input | –10 to 10 V, –5 to 5 V, 0 to 10 V, 0 to 5 V, 1 to 5 V, 0 to 20 mA, 4 to 20 mA differential | –10 to 10 V or –5 to 5 V: 1/64000 Other input range: 1/32000 5 µs/channel Synchronous | 4 (NPN) | Screwless push-in (NX-TBA162 + NX-TBB162) | 24 mm | NX-HAD401 |
| | | | 4 (PNP) | | | NX-HAD402 |

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| Type | Signal type | Performance, I/O refresh method | Channels | Connection type*1 | Width | Model |
|---|---|---|---|---|---|---|
| Analog output | 4 to 20 mA | 1/8,000 resolution, 250 µs/channel Free run | 2 | Screwless push-in (NX-TBA082) | 12 mm | NX-DA2203 |
| | | | 4 | Screwless push-in (NX-TBA122) | 12 mm | NX-DA3203 |
| | | 1/30,000 resolution, 10 µs/channel Synchronous/free run | 2 | Screwless push-in (NX-TBA082) | 12 mm | NX-DA2205 |
| | | | 4 | Screwless push-in (NX-TBA122) | 12 mm | NX-DA3205 |
| | ±10 V | 1/8,000 resolution, 250 µs/channel Free run | 2 | Screwless push-in (NX-TBA082) | 12 mm | NX-DA2603 |
| | | | 4 | Screwless push-in (NX-TBA122) | 12 mm | NX-DA3603 |
| | | 1/30,000 resolution, 10 µs/channel Synchronous/free run | 2 | Screwless push-in (NX-TBA082) | 12 mm | NX-DA2605 |
| | | | 4 | Screwless push-in (NX-TBA122) | 12 mm | NX-DA3605 |

*1. Units with Screwless push-in connections are supplied with the appropriate terminal connector.

## Temperature control units

| Type | Conversion time, I/O Refresh Mode | Channels | Input type | Output type | Output capacity | CT Input capacity | Control type | Connection type | Width | Model |
|---|---|---|---|---|---|---|---|---|---|---|
| Temperature control | 50 ms Free run | 2 | Multi-input (Thermocouple and Resistance thermometer) | Voltage output (for driving SSR) | 2 points | 2 points | Standard | Screwless push-in (NX-TBA162) | 12 mm | NX-TC2405 |
| | | | | | | – | | | | NX-TC2406 |
| | | | | | 4 points | | Heating and Cooling | | | NX-TC2407 |
| | | | | Linear current output | 2 points | | Standard | | | NX-TC2408 |
| | | 4 | | Voltage output (for driving SSR) | 4 points | 4 points | Standard | Screwless push-in (NX-TBA162 + NX-TBB162) | 24 mm | NX-TC3405 |
| | | | | | | – | | | | NX-TC3406 |
| | | | | | 8 points | | Heating and Cooling | | | NX-TC3407 |
| | | | | Linear current output | 4 points | | Standard | | | NX-TC3408 |

## Temperature input units

| Type | Signal type | Performance, I/O refresh method | Channels | Connection type*1 | Width | Model |
|---|---|---|---|---|---|---|
| Temperature sensor input | Thermocouple type B/E/J/K/L/N/R/S/T/U/WRe5-26/PLII | 0.1°C resolution, 200 ms/unit Free run | 2 | Screwless push-in terminal block(s), with cold junction sensor, calibrated individually at the factory | 12 mm | NX-TS2101 |
| | | | 4 | | 24 mm | NX-TS3101 |
| | | 0.01°C resolution, 10 ms/unit Free run | 2 | | 12 mm | NX-TS2102 |
| | | | 4 | | 24 mm | NX-TS3102 |
| | | 0.001°C resolution, 60 ms/unit Free run | 2 | | 12 mm | NX-TS2104 |
| | | | 4 | | 24 mm | NX-TS3104 |
| | RTD type Pt100 (3wire)/Pt1000/Ni508.4 | 0.1°C resolution, 200 ms/unit Free run | 2 | Screwless push-in (NX-TBA162) | 12 mm | NX-TS2201 |
| | | | 4 | Screwless push-in (NX-TBA162 + NX-TBB162) | 24 mm | NX-TS3201 |
| | | 0.01°C resolution, 10 ms/unit Free run | 2 | Screwless push-in (NX-TBA162) | 12 mm | NX-TS2202 |
| | | | 4 | Screwless push-in (NX-TBA162 + NX-TBB162) | 24 mm | NX-TS3202 |
| | | 0.001°C resolution, 60 ms/unit Free run | 2 | Screwless push-in (NX-TBA162) | 12 mm | NX-TS2204 |
| | | | 4 | Screwless push-in (NX-TBA162 + NX-TBB162) | 24 mm | NX-TS3204 |

*1. Units with Screwless push-in connections are supplied with the appropriate terminal connector.

## Load cell input unit

| Type | Specifications | I/O refresh method | Excitation voltage/Input range | Connection type*1 | Width | Model |
|---|---|---|---|---|---|---|
| Load cell input | 1 load cell input, 125 µs conversion cycle | Synchronous/free run | 5 VDC ±10%/-5 to 5 mV/V | Screwless push-in (NX-TBC162) | 12 mm | NX-RS1201 |

*1. Units with Screwless push-in connections are supplied with the appropriate terminal connector.

## Heater burnout detection units

| Type | Channels, signal type | Control output | I/O refresh method | Connection type*1 | Width | Model |
|---|---|---|---|---|---|---|
| Heater burnout detection | 4 CT inputs 4 control outputs | NPN, 12 to 24 VDC 0.1 A/point, 0.4 A/unit | Free run | Screwless push-in (NX-TBA162) | 12 mm | NX-HB3101 |
| | | PNP, 24 VDC 0.1 A/point, 0.4 A/unit | | Screwless push-in (NX-TBA162) | 12 mm | NX-HB3201 |

*1. Units with Screwless push-in connections are supplied with the appropriate terminal connector.

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## Position control units

| Type | Channels, signal type | I/O refresh method | Connection type*1 | Width | Model | NPN type*2 |
|---|---|---|---|---|---|---|
| Encoder input | 1 SSI encoder, 2 MHz | Synchronous/free run | Screwless push-in (NX-TBA122) | 12 mm | NX-ECS112 | - |
| | 2 SSI encoders, 2 MHz | | Screwless push-in (NX-TBA122) | 12 mm | NX-ECS212 | - |
| | 1 incremental encoder line driver 4 MHz + 3 digital inputs (1 µs) | | Screwless push-in (NX-TBA122 + NX-TBB122) | 24 mm | NX-EC0142 | NX-EC0132 |
| | 1 incremental encoder open collector 500 kHz + 3 digital inputs (1 µs) | | Screwless push-in (NX-TBA162) | 12 mm | NX-EC0122 | NX-EC0112 |
| | 2 incremental encoders open collector 500 kHz | | Screwless push-in (NX-TBA122) | 12 mm | NX-EC0222 | NX-EC0212 |
| Pulse output | 1 pulse open collector 500 kHz + 2 digital inputs + 1 digital output | Synchronous | Screwless push-in (NX-TBA162) | 12 mm | NX-PG0122 | NX-PG0112 |
| | 2 pulse line driver 4 MHz + 5 digital inputs per channel + 3 digital outputs per channel | | 1 x 34-pin MIL connector | 30 mm | NX-PG0242-5 | NX-PG0232-5 |
| | 4 pulse line driver 4 MHz + 5 digital inputs per channel + 3 digital outputs per channel | | 2 x 34-pin MIL connector | 30 mm | NX-PG0342-5 | NX-PG0332-5 |

*1. Units with Screwless push-in connections are supplied with the appropriate terminal connector. Units with MIL connectors are supplied without matching plugs.
*2. Model codes are for PNP type signals (positive switching, 0 V common). Most models are also available as NPN type (negative switching, 24 V common). Inputs of MIL connector versions can be used as NPN or PNP.

## Safety (the NX-Safety units must be used in combination with the EtherCAT communication coupler)

| Type | Specifications | Performance, I/O refresh method | Connection type*1 | Width | Model |
|---|---|---|---|---|---|
| Safety controller | FSoE protocol | For up to 1,024 safety I/O points | 128 safety connections | 30 mm | NX-SL3500 |
| | | For up to 256 safety I/O points | 32 safety connections | 30 mm | NX-SL3300 |
| Safety input | 4 inputs + 2 test outputs | Free run | Screwless push-in (NX-TBA082) | 12 mm | NX-SIH400 |
| | 8 inputs + 2 test outputs | | Screwless push-in (NX-TBA162) | 12 mm | NX-SID800 |
| Safety output | 2 outputs, 2.0 A | | Screwless push-in (NX-TBA082) | 12 mm | NX-SOH200 |
| | 4 outputs, 0.5 A | | Screwless push-in (NX-TBA082) | 12 mm | NX-SOD400 |

*1. Units with Screwless push-in connections are supplied with the appropriate terminal connector.

## Serial communications interface units

| Type | Serial interface | No. of serial ports | Connection type*1 | Width | Model |
|---|---|---|---|---|---|
| Serial Communication | RS-232C | 1 | Screwless push-in (NX-TBC162) | 12 mm | NX-CIF101 |
| | | 2 | D-Sub 9pin connector | 30 mm | NX-CIF210 |
| | RS-422A/485 | 1 | Screwless push-in (NX-TBC162) | 12 mm | NX-CIF105 |

*1. Units with Screwless push-in connections are supplied with the appropriate terminal connector.

## Other units

| Type | Description | Connection type*1 | Width | Model |
|---|---|---|---|---|
| NX bus power supply unit | 24 VDC input, non-isolated | Screwless push-in (NX-TBC082) | 12 mm | NX-PD1000 |
| I/O power feed unit | For separation of groups, up to 4 A | Screwless push-in (NX-TBA082) | 12 mm | NX-PF0630 |
| | For separation of groups, up to 10 A | Screwless push-in (NX-TBA082) | 12 mm | NX-PF0730 |
| I/O power supply connection unit | 16 × IOV | Screwless push-in (NX-TBA162) | 12 mm | NX-PC0020 |
| | 16 × IOG | Screwless push-in (NX-TBA162) | 12 mm | NX-PC0010 |
| | 8 × IOV + 8 × IOG | Screwless push-in (NX-TBA162) | 12 mm | NX-PC0030 |
| Shield connection unit | Grounding terminal, 16 points | Screwless push-in (NX-TBC162) | 12 mm | NX-TBX01 |

*1. Units with Screwless push-in connections are supplied with the appropriate terminal connector.

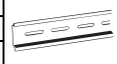
### Recommended EtherCAT and EtherNet/IP communication cables

Refer to “Recommended EtherCAT and EtherNet/IP communication cables” in the NJ-series machine controller datasheet Cat. No. I180E-EN (www.industrial.omron.eu/en/products/downloads) for the recommended cables.

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## Accessories

| Specifications | | | Model | Appearance |
|---|---|---|---|---|
| EtherCAT junction slaves | 3 ports<br>Power supply voltage: 20.4 to 28.8 VDC (24 VDC –15 to 20%)<br>Current consumption: 0.08 A | | GX-JC03 |  |
| | 6 ports<br>Power supply voltage: 20.4 to 28.8 VDC (24 VDC –15 to 20%)<br>Current consumption: 0.17 A | | GX-JC06 |  |
| Industrial switching hubs (for EtherNet/IP and Ethernet) | Quality of Service (QoS):<br>EtherNet/IP control data priority.<br>Failure detection:<br>Broadcast storm and LSI error detection<br>10/100 BASE-TX, Auto-Negotiation<br>Current consumption: 0.22 A | 3 ports<br>Power supply connector included | W4S1-03B |  |
| | | 5 ports<br>Power supply connector included | W4S1-05B | |
| | | 5 ports<br>Power supply connector and connector for informing error included | W4S1-05C | |
| SD memory card | 2 GB | | HMC-SD291 |  |
| | 4 GB | | HMC-SD491 | |
| DIN track | Length: 0.5 m; height: 7.3 mm | | PFP-50N |  |
| | Length: 1 m; height: 7.3 mm | | PFP-100N | |
| | Length: 1 m; height: 16 mm | | PFP-100N2 | |
| End plate to secure the units on the DIN rail | | | PFP-M (2 pcs) |  |
| Battery for NX/NJ CPU unit | | | CJ1W-BAT01 |  |
| End cover | End cover for NX1P CPU unit<br>(Provided with the CPU unit) | | NX-END02 |  |
| | End cover for EtherCAT communication coupler unit<br>(Provided with the EtherCAT communication coupler unit) | | NX-END01 | |

## Computer software

| Specifications | Model |
|---|---|
| Sysmac Studio Lite Edition*1 version 1.17 or higher | SYSMAC-LE□□□□*2 |

*1. Same functionality and supported devices than Sysmac Studio Standard Edition except for controller. The Lite Edition only supports the NJ1 and NX1P machine controllers.

*2. Refer to the Sysmac Studio datasheet (Cat. No. SysCat_I181E) for detailed information or contact your OMRON representative.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. SysCat_I179E-EN-02 In the interest of product improvement, specifications are subject to change without notice.