NX-series Incremental Encoder Input Unit

NX-EC0□□□

CSM_NX-EC0□□□_DS_E_1_1

Read position information from incremental encoders, synchronised with the control cycle and EtherCAT Distributed Clock.

- Process encoder input data using the MC Function Modules of the NJ -series Machine Automation Controller.
- The time when the encoder input value is changed can be read. This enables high-precision timing control in combination with time-stamp outputs.*

* Available soon

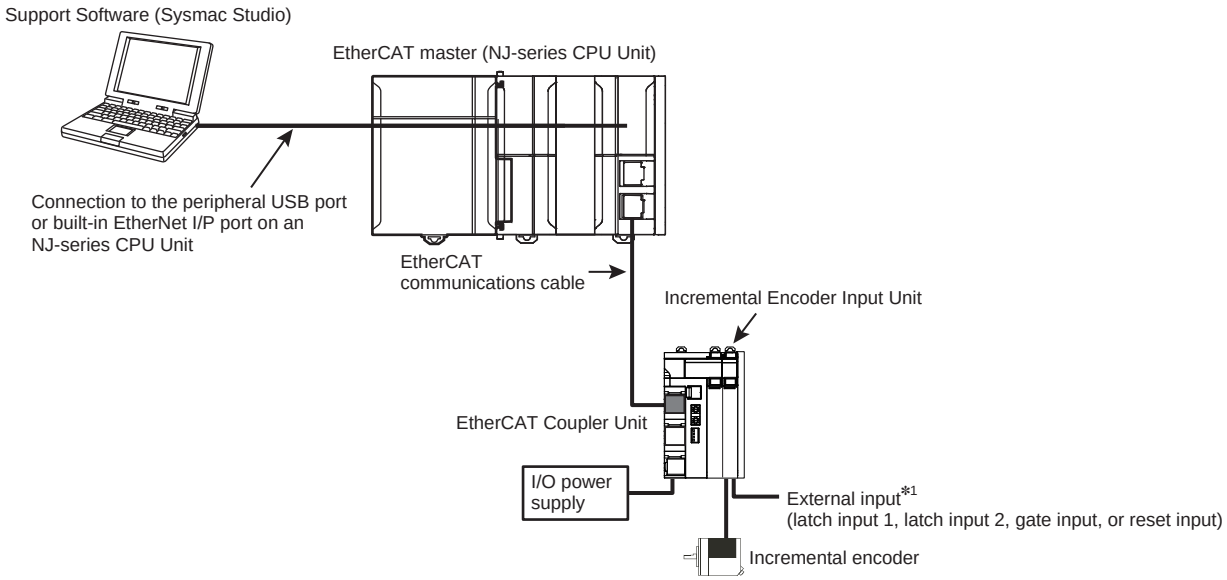
NX-EC0122

NX-EC0142

Features

- Open collector output type and line driver output type Incremental Encoders can be connected.
- Free-Run refreshing or Synchronous I/O refreshing can be selected for refreshing with the NX-series EtherCAT Coupler.
- When the MC Function Modules of the NJ-series Machine Automation Controller are used, the encoder input can be used for motion control instructions as an “axis”.
- Latch function (1 internal signal and 2 input signals from external devices)
- Pulse Period Measurement
- 32 bit counters (80000000 to 7FFFFFFF HEX)
- Maximum counting rate: 4 MHz (Line receiver: 4 MHz, Open collector: 500 kHz)
- Input edge time stamps
- The maximum and minimum counter values can be set.

System Configuration



*1. You can specify functions for up to two external inputs to a One-input Incremental Encoder Input Unit. You cannot use external inputs for a Two-input Unit.

Ordering Information

International Standards

- The standards are abbreviated as follows: U: UL, U1: UL(Class I Division 2 Products for Hazardous Locations), C: CSA, UC: cULus, UC1: cULus (Class I Division 2 Products for Hazardous Locations), CU: cUL, N: NK, L: Lloyd, CE: EC Directives, and KC: KC Registration.
- Contact your OMRON representative for further details and applicable conditions for these standards.

Unit type	Product Name	Specification						Model	Standards
		Number of channels	Input form	Maximum response frequency	External Inputs	Encoder power supply	Type of external connections		
NX Series Position Interface Unit	Incremental Encoder Input Units 	1	Voltage input (24 V)	Phases A and B: Single-phase 500 kHz (phase difference pulse input x4: 125 kHz), Phase Z: 125 kHz	3	DC24V, 0.3A/CH	Screwless push-in terminal block (16 terminals)	**NX-EC0122**	UC1, CE, KC
		2	Voltage input (24 V)	Phases A and B: Single-phase 500 kHz (phase difference pulse input x4: 125 kHz), Phase Z: 125 kHz	-	DC24V, 0.3A/CH	Screwless push-in terminal block (12 terminals)	**NX-EC0222**	UC1, CE, KC
		1	Line receiver input	Phases A and B: Single-phase 4 MHz (phase difference pulse input x4: 1 MHz), Phase Z: 1 MHz	3	DC24V, 0.3A/CH	Screwless push-in terminal block (24 terminals)	**NX-EC0142**	UC1, CE, KC

Option

Product Name	Specification	Model	Standards
Unit/Terminal Block Coding Pins	For 10 Units (Terminal Block: 30 pins, Unit: 30 pins)	**NX-AUX02**	–

Accessories

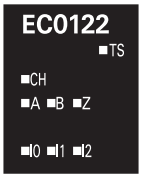
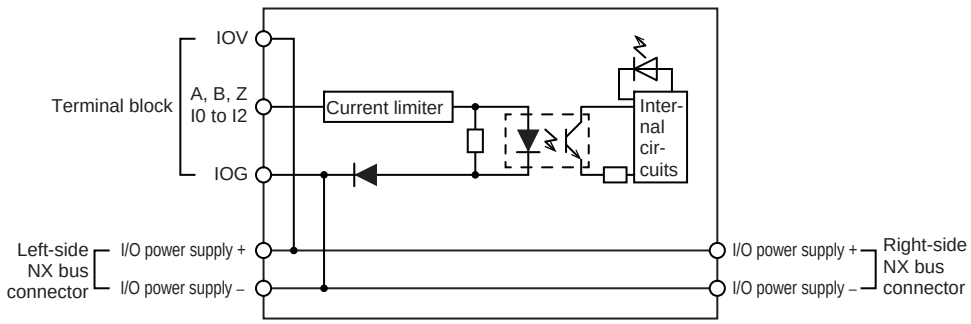
Not included.

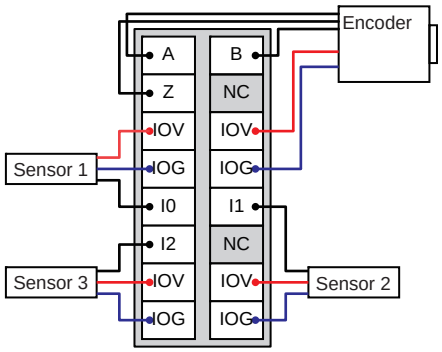
General Specification

Item		Specification
Enclosure		Mounted in a panel
Grounding method		Ground to less than 100 Ω
Operating environment	Ambient operating temperature	0 to 55°C
	Ambient operating humidity	10% to 95% (with no condensation or icing)
	Atmosphere	Must be free from corrosive gases.
	Ambient storage temperature	-25 to 70°C (with no condensation or icing)
	Altitude	2,000 m max.
	Pollution degree	Pollution degree 2 or less: Conforms to JIS B3502 and IEC 61131-2.
	Noise immunity	Conforms to IEC61000-4-4, 2 kV (power supply line)
	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. 5 to 8.4 Hz with 3.5-mm amplitude, 8.4 to 150 Hz, acceleration of 9.8 m/s^2, 100 min each in X, Y, and Z directions (10 sweeps of 10 min each = 100 min total)
	Shock resistance	Conforms to IEC 60068-2-27. 147 m/s^2, 3 times each in X, Y, and Z directions
Applicable standards		cULus: Listed UL508 and ANSI/ISA 12.12.01 EC: EN 61131-2 and C-Tick, KC Registration

Specification

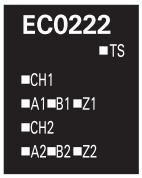
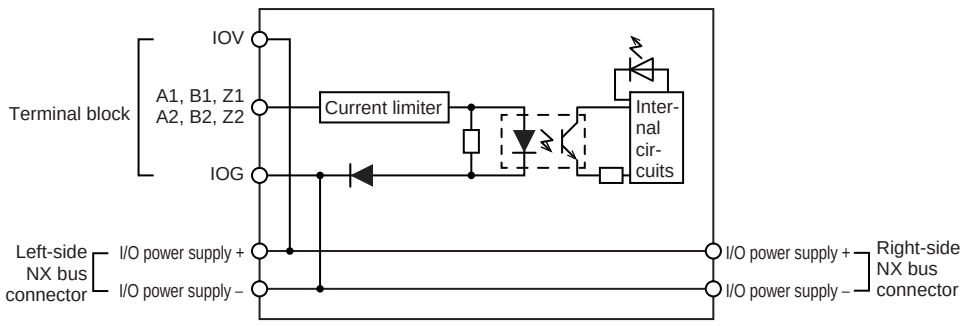
Incremental Encoder Input Units 1 channel NX-EC0122

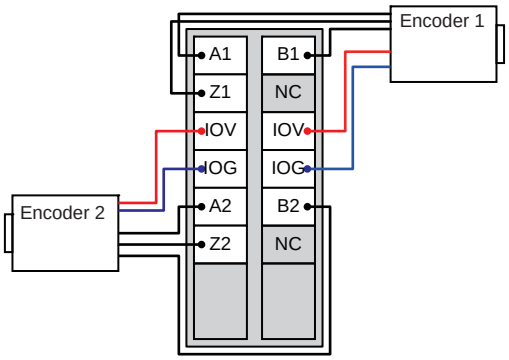
Unit name	Incremental Encoder Input Units	**Model**	NX-EC0122
Number of channels	1 channel	**Type of external connections**	Screwless clamping terminal block (16 terminals)
I/O refreshing method	Free-Run refreshing or synchronous I/O refreshing *1		
Indicators		**Input signals**	Counter: Phases A, B, and Z External Inputs: 3
Input form	Voltage input (24 V)		
Counting unit	Pulses		
Pulse input method	Phase difference pulse (multiplication x1/2/4), pulse + direction inputs, or up and down pulse inputs		
Counter range	–2,147,483,648 to 2,147,483,647 pulses		
Counter functions			
Counter type	Ring counter or linear counter		
Counter controls	Gate control, counter reset, and counter preset		
Latch function	Two external input latches and one internal latch		
Measurements	Pulse rate measurement and pulse period measurement		
Voltage input specifications			
Input voltage	20.4 to 28.8 VDC (24 VDC +20%/–15%)	**ON voltage**	19.6 VDC min./3 mA min.
Input current	4.2 mA typical (24 VDC)	**OFF voltage**	4.0 VDC max./1 mA max.
Maximum response frequency	Phases A and B: Single-phase 500 kHz (phase difference pulse input x4: 125 kHz), Phase Z: 125 kHz		
Internal I/O common processing	PNP		
External input specifications			
Input voltage	20.4 to 28.8 VDC (24 VDC +20%/–15%)	**ON voltage/ON current**	15 VDC min./3 mA min.
Input current	4.6 mA typical (24 VDC)	**OFF voltage/OFF current**	4.0 VDC max./1 mA max.
ON/OFF response time	1 µs max./2 µs max.		
Internal I/O common processing	PNP		
Dimensions	12 × 100 × 71 mm (W×H×D)	**Isolation method**	Photocoupler isolation
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	**Dielectric strength**	510 VAC between isolated circuits for 1 minute with leakage current of 5 mA max.
I/O power supply source	Supplied from the NX bus. 20.4 to 28.8 VDC (24 VDC +20%/–15%)	**Current capacity of I/O power supply terminals**	IOV: 0.3 A max. per terminal for encoder supply section and 0.1 A max. per terminal for other sections IOG: 0.3 A max. per terminal for encoder supply section and 0.1 A max. per terminal for other sections
NX Unit power consumption	0.95 W	**Current consumption from I/O power supply**	None
Weight	70 g		
Circuit layout	Encoder Input and External Inputs 		
Installation orientation and restrictions	Installation orientation: 6 possible orientations Restrictions: There are no restrictions.		

Terminal connection diagram			
Failure detection	None	**Protection**	None

*1. The I/O refreshing method is automatically set according to the connected Communications Coupler Unit and CPU Unit.

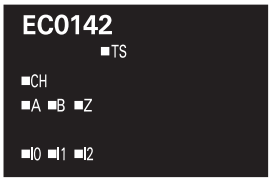
Incremental Encoder Input Units 2 channel NX-EC0222

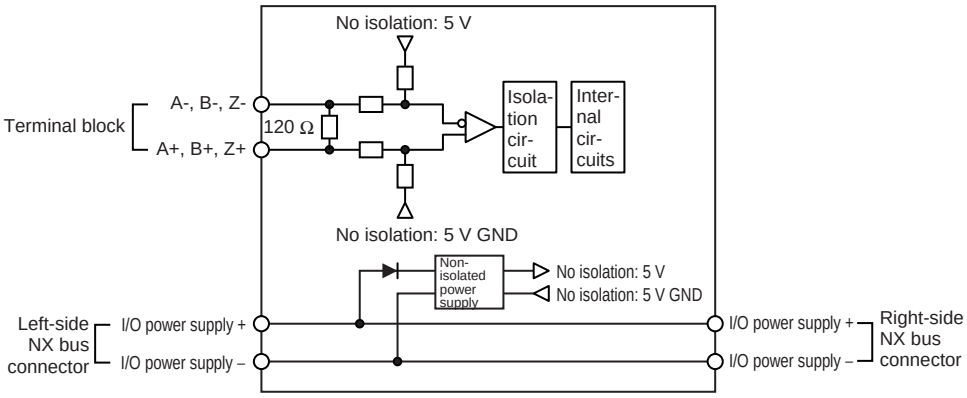
Unit name	Incremental Encoder Input Units	**Model**	NX-EC0222
Number of channels	2 channels	**Type of external connections**	Screwless clamping terminal block (12 terminals)
I/O refreshing method	Free-Run refreshing or synchronous I/O refreshing *1		
Indicators		**Input signals**	Counter: Phases A, B, and Z External Inputs: None
Input form	Voltage input (24 V)		
Counting unit	Pulses		
Pulse input method	Phase difference pulse (multiplication x1/2/4), pulse + direction inputs, or up and down pulse inputs		
Counter range	–2,147,483,648 to 2,147,483,647 pulses		
Counter functions			
Counter type	Ring counter or linear counter		
Counter controls	Gate control, counter reset, and counter preset		
Latch function	Two external input latches and one internal latch		
Measurements	Pulse rate measurement and pulse period measurement		
Voltage input specifications			
Input voltage	20.4 to 28.8 VDC (24 VDC +20%/–15%)	**ON voltage**	19.6 VDC min./3 mA min.
Input current	4.2 mA typical (24 VDC)	**OFF voltage**	4.0 VDC max./1 mA max.
Maximum response frequency	Phases A and B: Single-phase 500 kHz (phase difference pulse input x4: 125 kHz), Phase Z: 125 kHz		
Internal I/O common processing	PNP		
External input specifications			
Input voltage	–––	**ON voltage/ON current**	–––
Input current	–––	**OFF voltage/OFF current**	–––
ON/OFF response time	–––		
Internal I/O common processing	–––		
Dimensions	12 × 100 × 71 mm (W×H×D)	**Isolation method**	Photocoupler isolation
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	**Dielectric strength**	510 VAC between isolated circuits for 1 minute with leakage current of 5 mA max.
I/O power supply source	Supplied from the NX bus. 20.4 to 28.8 VDC (24 VDC +20%/–15%)	**Current capacity of I/O power supply terminals**	IOV: 0.3 A max. per terminal IOG: 0.3 A max. per terminal
NX Unit power consumption	0.95 W	**Current consumption from I/O power supply**	None
Weight	65 g		
Circuit layout	Encoder Input 		
Installation orientation and restrictions	Installation orientation: 6 possible orientations Restrictions: There are no restrictions.		

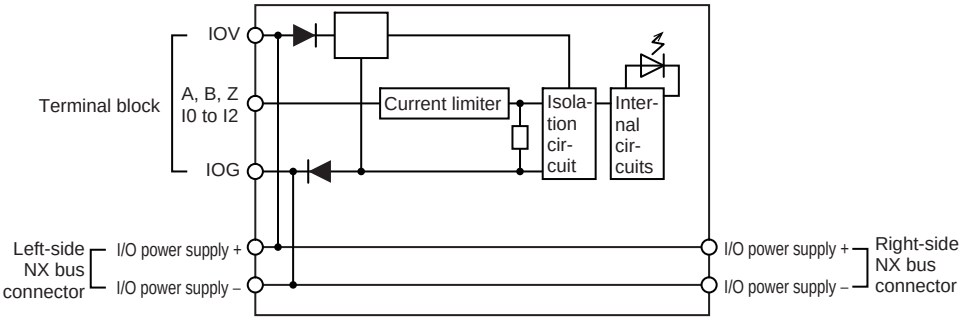
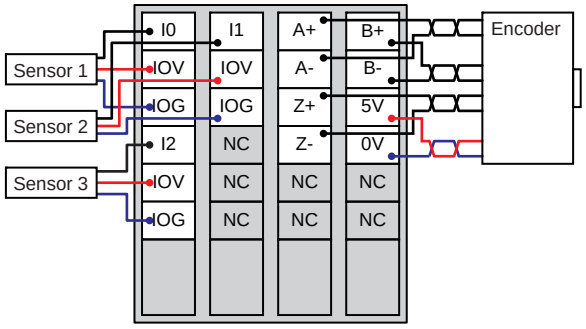
Terminal connection diagram			
Failure detection	None	**Protection**	None

*1. The I/O refreshing method is automatically set according to the connected Communications Coupler Unit and CPU Unit.

Incremental Encoder Input Units 1 channel NX-EC0142

Unit name	Incremental Encoder Input Units	**Model**	NX-EC0142
Number of channels	1 channel	**Type of external connections**	Screwless clamping terminal block (12 terminals × 2)
I/O refreshing method	Free-Run refreshing or synchronous I/O refreshing *1		
Indicators		**Input signals**	Counter: Phases A, B, and Z External Inputs: 3
Input form	Line receiver input		
Counting unit	Pulses		
Pulse input method	Phase difference pulse (multiplication x1/2/4), pulse + direction inputs, or up and down pulse inputs		
Counter range	–2,147,483,648 to 2,147,483,647 pulses		
Counter functions			
Counter type	Ring counter or linear counter		
Counter controls	Gate control, counter reset, and counter preset		
Latch function	Two external input latches and one internal latch		
Measurements	Pulse rate measurement and pulse period measurement		
Line driver specifications			
Input voltage	EIA standard RS-422-A line driver levels	**High level input voltage**	V_{IT+}: 0.1 V min.
Input impedance	120 Ω ± 5%	**Low level input voltage**	V_{IT-}: –0.1 V min.
Hysteresis voltage	Vhys ($V_{IT+} – V_{IT-}$): 60 Mv		
Maximum response frequency	Phases A and B: Single-phase 4 MHz (phase difference pulse input x4: 1 MHz), Phase Z: 1 MHz		
5-V power supply for encoder	Output voltage: 5 VDC Output current: 500 mA max.		
External input specifications			
Input voltage	20.4 to 28.8 VDC (24 VDC +20%/.15%)	**ON voltage/ON current**	15 VDC min./3 mA min.
Input current	3.5 mA typical (24 VDC)	**OFF voltage/OFF current**	4.0 VDC max./1 mA max.
ON/OFF response time	1 µs max./2 µs max.		
Internal I/O common processing	PNP		
Dimensions	12 × 100 × 71 mm (W×H×D)	**Isolation method**	Photocoupler isolation
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	**Dielectric strength**	510 VAC between isolated circuits for 1 minute with leakage current of 5 mA max.
I/O power supply source	Supplied from the NX bus. 20.4 to 28.8 VDC (24 VDC +20%/–15%)	**Current capacity of I/O power supply terminals**	IOV: 0.1 A max. per terminal IOG: 0.1 A max. per terminal
NX Unit power consumption	1.05W	**Current consumption from I/O power supply**	30 mA
Weight	130 g		

<table>
<tr><td>Circuit layout</td><td>Encoder Input
 

External Inputs
 
</td></tr>
<tr><td>Installation orientation and restrictions</td><td>Installation orientation: 6 possible orientations
Restrictions: There are no restrictions.</td></tr>
<tr><td>Terminal connection diagram</td><td> 
</td></tr>
<tr><td>Failure detection</td><td>None</td><td>Protection</td><td>None</td></tr>
</table>

*1. The I/O refreshing method is automatically set according to the connected Communications Coupler Unit and CPU Unit.

Version Information

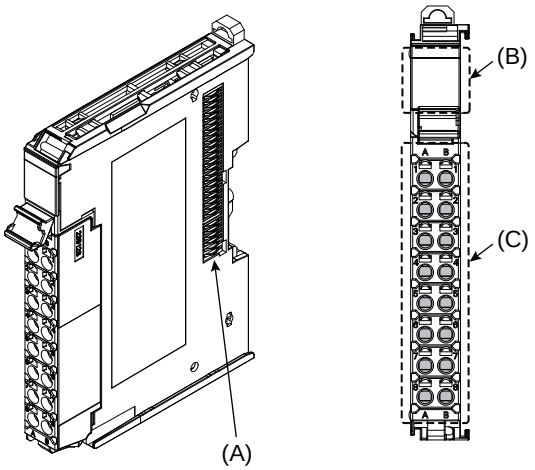
Incremental Encoder Input Unit NX Series and Sysmac Studio

Unit NX Series	Sysmac Studio	
	Version 1.05 or lower	Version 1.06 or higher
NX-EC0122	Not supported	Supported
NX-EC0222	Not supported	Supported
NX-EC0142	Not supported	Supported

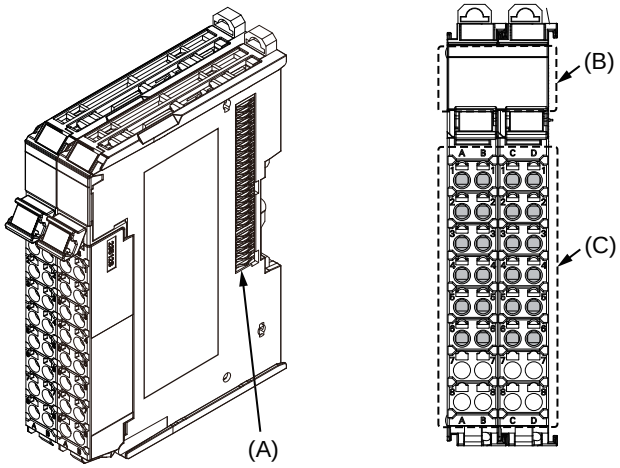
External Interface

Incremental Encoder Input Unit

NX-EC0122/0222

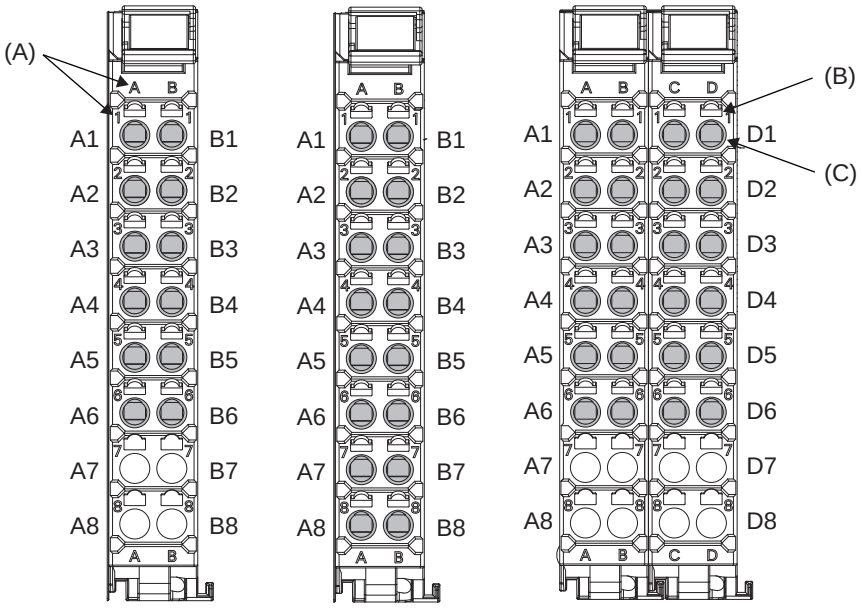


NX-EC0142



Letter	Item	Specification
(A)	NX bus connector	This connector is used to connect to another Unit.
(B)	Indicators	The indicators show the current operating status of the Unit.
(C)	Terminal block	The terminal block is used to connect to external devices. The number of terminals depends on the Unit.

Terminal Blocks



12 mm wide
12 terminals

12 mm wide
16 terminals

24 mm wide
12 terminals × 2

Letter	Item	Specification
(A)	Terminal number indication	The terminal number is identified by a column (A through D) and a row (1 through 8). Therefore, terminal numbers are written as a combination of columns and rows, A1 through A8 and B1 through B8. For a 24-mm-wide terminal block, the left side contains terminals A1 through A8 and B1 through B8. The right side contains terminals C1 through C8 and D1 through D8. The terminal number indication is the same regardless of the number of terminals on the terminal block, as shown above.
(B)	Release hole	A flat-blade screwdriver is inserted here to attach and remove the wiring.
(C)	Terminal hole	The wires are inserted into these holes.

Applicable Wires

Using Ferrules

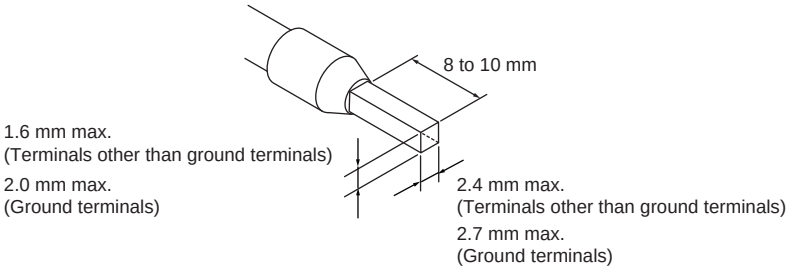
If you use ferrules, attach the twisted wires to them.
Observe the application instructions for your ferrules for the wire stripping length when attaching ferrules.
Always use one-pin ferrules. Do not use two-pin ferrules.

The applicable ferrules, wires, and crimping tool are given in the following table.

Terminal types	Manufacturer	Ferrule model	Applicable wire (mm^2 (AWG))	Crimping tool
Terminals other than ground terminals	Phoenix Contact	AI0,34-8	0.34 (#22)	Phoenix Contact (The figure in parentheses is the applicable wire size.) CRIMPFOX 6 (0.25 to 6 mm^2, AWG 24 to 10)
		AI0,5-8	0.5 (#20)	
		AI0,5-10		
		AI0,75-8	0.75 (#18)	
		AI0,75-10		
		AI1,0-8	1.0 (#18)	
		AI1,0-10		
		AI1,5-8	1.5 (#16)	
		AI1,5-10		
Ground terminals		AI2,5-10	2.0 *1	
Terminals other than ground terminals	Weidmuller	H0.14/12	0.14 (#26)	Weidmueller (The figure in parentheses is the applicable wire size.) PZ6 Roto (0.14 to 6 mm^2, AWG 26 to 10)
		H0.25/12	0.25 (#24)	
		H0.34/12	0.34 (#22)	
		H0.5/14	0.5 (#20)	
		H0.5/16		
		H0.75/14	0.75 (#18)	
		H0.75/16		
		H1.0/14	1.0 (#18)	
		H1.0/16		
		H1.5/14	1.5 (#16)	
		H1.5/16		

*1. Some AWG 14 wires exceed 2.0 mm^2 and cannot be used in the screwless clamping terminal block.

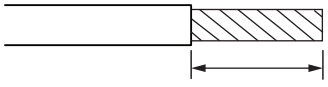
When you use any ferrules other than those in the above table, crimp them to the twisted wires so that the following processed dimensions are achieved.



Using Twisted Wires/Solid Wires

If you use the twisted wires or the solid wires, the applicable wire range and conductor length (stripping length) are as follows.
Use the twisted wires to connect the ground wire to a ground of 100 Ω or less. Do not use the solid wires.

Terminal types	Applicable wires range	Conductor length (stripping length)
Ground terminals	2.0 mm^2	9 to 10 mm
Terminals other than ground terminals	0.08 to 1.5 mm^2 AWG28 to 16	8 to 10 mm

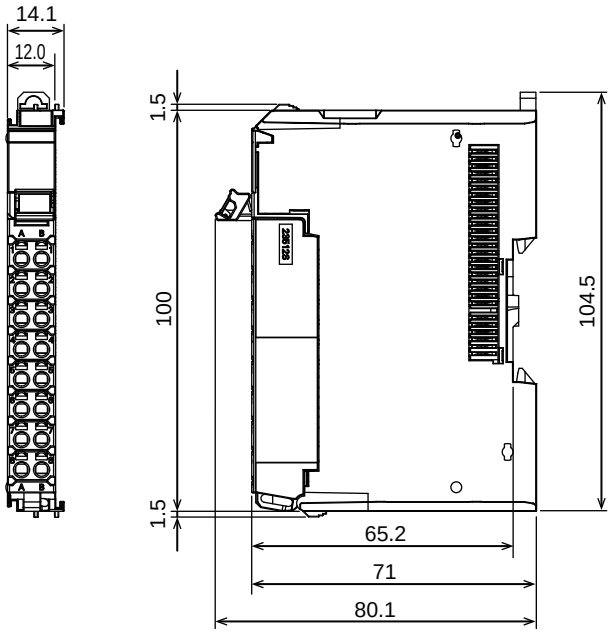


Conductor length (stripping length)

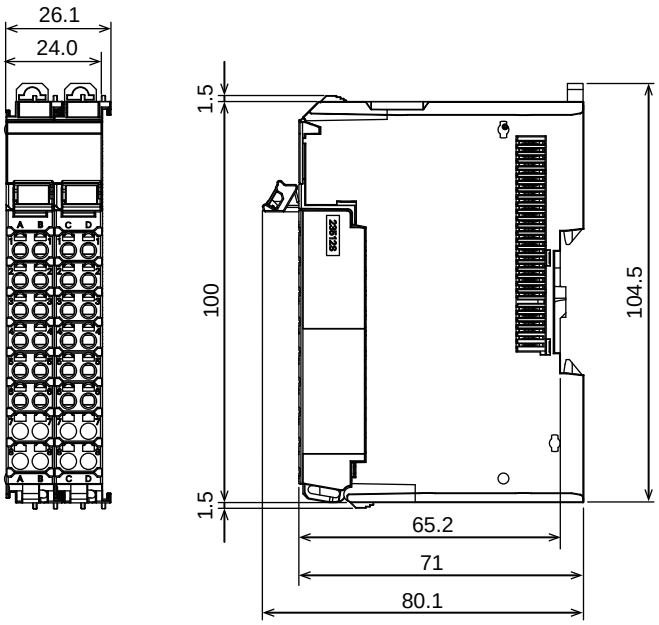
Dimensions

(Unit: mm)

Incremental Encoder Input Unit
NX-EC0122/0222



NX-EC0142



Related Manuals

Man. No	Model	Manual	Application	Description
W524	NX-EC0□□□ NX-ECS□□□ NX-PG0□□□	NX-series Position Interface Units User's Manual	Learning how to use NX-series Position Interface Units	The hardware, setup methods, and functions of the NX-series Incremental Encoder Input Units, SSI Input Units, and Pulse Output Unit are described.

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In the interest of product improvement, specifications are subject to change without notice.

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