NX-series EtherCAT Coupler Unit

NX-ECC

CSM_NX-ECC_DS_E_8_9

Combine flexibility in Remote I/O configuration with the speed and determinism of EtherCAT.

- The EtherCAT Coupler Unit is the link between the EtherCAT Machine Control network and the NX-series I/O Units. With I/O Units ranging from basic I/O's to high-speed synchronous models, the NX-series is the perfect match for the Sysmac Machine Automation Controllers.

Features

- Up to 63 NX-IO Units can be connected to one EtherCAT Coupler Unit. Standard and high-performance units can be mixed.*1
- High-speed remote I/O control is possible at the fastest communication cycle of 125 μs.*2
- Each Coupler plus its I/O form just a single EtherCAT node on the network.
- I/O control and safety control can be integrated by connecting Units for safety.
- The Coupler supports the EtherCAT Distributed Clock (DC) and propagates this to synchronous I/O units.
- The node address can be fixed by rotary switches, or set by software. Choose the method that best suits your way of engineering.
- Slave configuration by Sysmac Studio can be done centrally via the controller, or on-the-spot using the Coupler's built-in USB port.

*1 Input per Coupler Unit: Maximum 1024 bytes, Output per Coupler Unit: Maximum 1024 bytes
*2 NX7-□□□□ and NX-ECC203 combined

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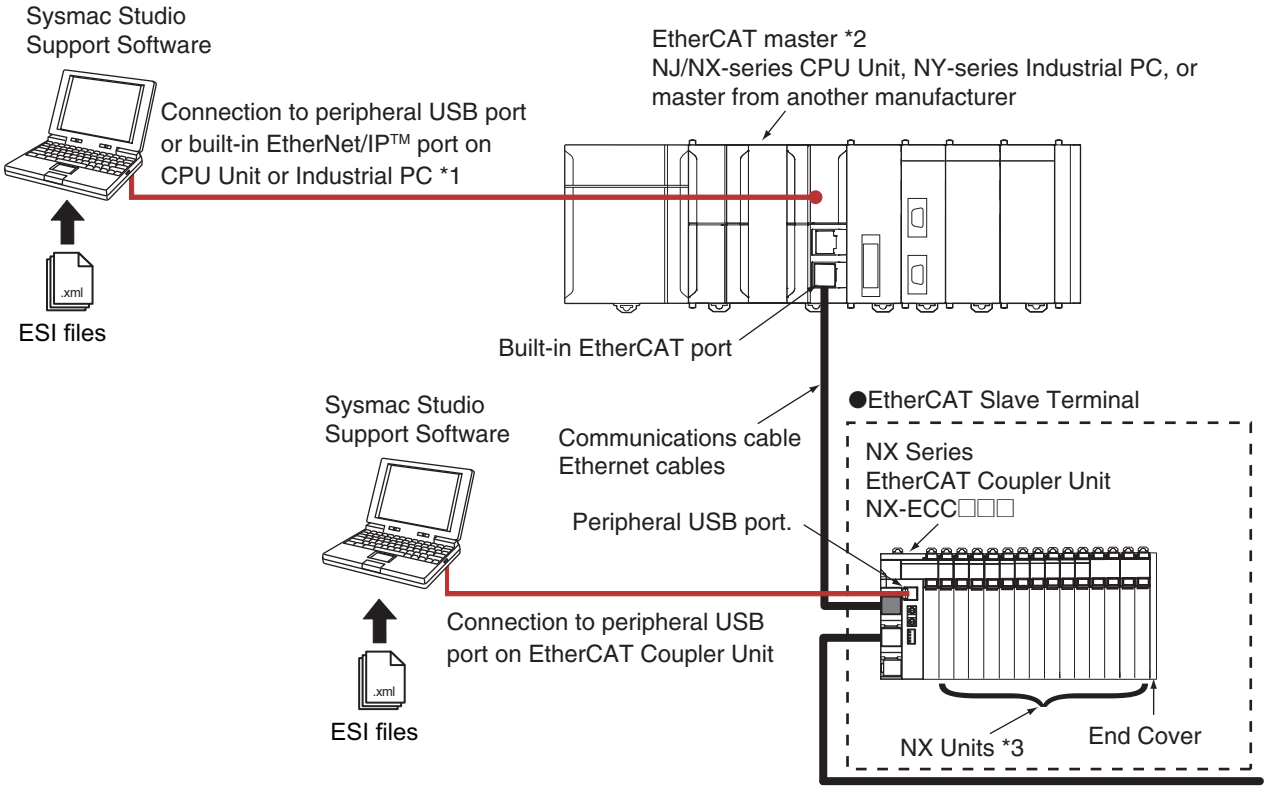
System Configuration

System Configuration of Slave Terminals

The following figure shows an example of the system configuration when an EtherCAT Coupler Unit is used as a Communications Coupler Unit.



*1. The connection method for the Sysmac Studio depends on the model of the CPU Unit or Industrial PC.
*2. An EtherCAT Slave Terminal cannot be connected to any of the OMRON CJ1W-NC□81/□82 Position Control Units even though they can operate as EtherCAT masters.
*3. For whether NX Units can be connected to the CPU Unit or Communications Coupler Unit to be used, refer to the user's manual for the CPU Unit or Communications Coupler Unit to be used.

Ordering Information

Applicable standards
Refer to the OMRON website (www.ia.omron.com) or ask your OMRON representative for the most recent applicable standards for each model.

Product name	Communications cycle in DC Mode *1 *2	Current consumption	Maximum I/O power supply current	Model
EtherCAT Coupler Unit 	250 to 4,000 µs	1.45 W or lower	4 A	**NX-ECC201**
			10 A	**NX-ECC202**
	125 to 10,000 µs	1.25 W or lower		**NX-ECC203**

*1. This depends on the specifications of the EtherCAT master. For example, the values are as follows when the EtherCAT Coupler Unit is connected to the built-in EtherCAT port on an NJ5-series CPU Unit: 500 µs, 1,000 µs, 2,000 µs, and 4,000 µs. Refer to the *NJ/NX-series CPU Unit Built-in EtherCAT Port User's Manual* (Cat. No. W505) for the specifications of the built-in EtherCAT ports on NJ/NX-series CPU Units.
*2. This depends on the Unit configuration.

Recommended EtherCAT Communications Cable

Use a straight STP (shielded twisted-pair) cable of category 5 or higher with double shielding (braiding and aluminum foil tape) for EtherCAT.

Cable with Connectors

Item	Appearance	Recommended manufacturer	Cable length [m] *1	Model
Cable with Connectors on Both Ends (RJ45/RJ45) Standard RJ45 plugs type *1 Wire gauge and number of pairs: AWG26, 4-pair cable Cable sheath material: LSZH *2 Cable color: Yellow *3		OMRON	0.3	XS6W-6LSZH8SS30CM-Y
			0.5	XS6W-6LSZH8SS50CM-Y
			1	XS6W-6LSZH8SS100CM-Y
			2	XS6W-6LSZH8SS200CM-Y
			3	XS6W-6LSZH8SS300CM-Y
			5	XS6W-6LSZH8SS500CM-Y
Cable with Connectors on Both Ends (RJ45/RJ45) Rugged RJ45 plugs type *1 Wire gauge and number of pairs: AWG22, 2-pair cable Cable color: Light blue		OMRON	0.3	XS5W-T421-AMD-K
			0.5	XS5W-T421-BMD-K
			1	XS5W-T421-CMD-K
			2	XS5W-T421-DMD-K
			5	XS5W-T421-GMD-K
			10	XS5W-T421-JMD-K
Cable with Connectors on Both Ends (M12 Straight/M12 Straight) Shield Strengthening Connector cable *4 M12/Smartclick Connectors Wire Gauge and Number of Pairs: AWG22, 2-pair Cable Cable color: Black		OMRON	0.5	XS5W-T421-BM2-SS
			1	XS5W-T421-CM2-SS
			2	XS5W-T421-DM2-SS
			3	XS5W-T421-EM2-SS
			5	XS5W-T421-GM2-SS
			10	XS5W-T421-JM2-SS
Cable with Connectors on Both Ends (M12 Straight/RJ45) Shield Strengthening Connector cable *4 M12/Smartclick Connectors Rugged RJ45 plugs type Wire Gauge and Number of Pairs: AWG22, 2-pair Cable Cable color: Black		OMRON	0.5	XS5W-T421-BMC-SS
			1	XS5W-T421-CMC-SS
			2	XS5W-T421-DMC-SS
			3	XS5W-T421-EMC-SS
			5	XS5W-T421-GMC-SS
			10	XS5W-T421-JMC-SS

*1. Standard type cables length 0.2, 0.3, 0.5, 1, 1.5, 2, 3, 5, 7.5, 10, 15 and 20 m are available.
Rugged type cables length 0.3, 0.5, 1, 2, 3, 5, 10 and 15 m are available.
For details, refer to Cat.No.G019.
*2. The lineup features Low Smoke Zero Halogen cables for in-cabinet use and PUR cables for out-of-cabinet use. Although the LSZH cable is single shielded, its communications and noise characteristics meet the standards.
*3. Cables colors are available in blue, yellow, or Green.
*4. For details, contact your OMRON representative.

Cables / Connectors

Wire Gauge and Number of Pairs: AWG24, 4-pair Cable

Item	Appearance	Recommended manufacturer	Model
Cables	-	Hitachi Metals, Ltd.	**NETSTAR-C5E SAB 0.5 × 4P CP ***
	-	Kuramo Electric Co.	**KETH-SB ***
	-	SWCC Showa Cable Systems Co.	**FAE-5004 ***
RJ45 Connectors	-	Panduit Corporation	**MPS588-C ***

* We recommend you to use above cable and connector together.

Wire Gauge and Number of Pairs: AWG22, 2-pair Cable

Item	Appearance	Recommended manufacturer	Model
Cables	-	Kuramo Electric Co.	**KETH-PSB-OMR ***
	-	JMACS Japan Co., Ltd.	**PNET/B ***
RJ45 Assembly Connector		OMRON	**XS6G-T421-1 ***

* We recommend you to use above cable and connector together.
Note: Connect both ends of cable shielded wires to the connector hoods.

Optional Products

Product name	Specification	Model
Unit/Terminal Block Coding Pins	Pins for 10 Units (30 terminal block pins and 30 Unit pins)	**NX-AUX02**

Product Name	Specification			Model
	No. of terminals	Ground terminal mark	Terminal current capacity	
Terminal Block	8	Present	10 A	**NX-TBC082**

Accessories

End Cover (NX-END01)

An End Cover is connected to the end of the EtherCAT Slave Terminal.
One End Cover is provided together with the EtherCAT Coupler Unit.

General Specification

Item		Specification
Enclosure		Mounted in a panel
Grounding method		Ground to 100 Ω or less
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 (UL 508 or UL61010-2-201), ANSI/ISA 12.12.01, EU: EN 61131-2, C-Tick or RCM, KC Registration, NK, and LR

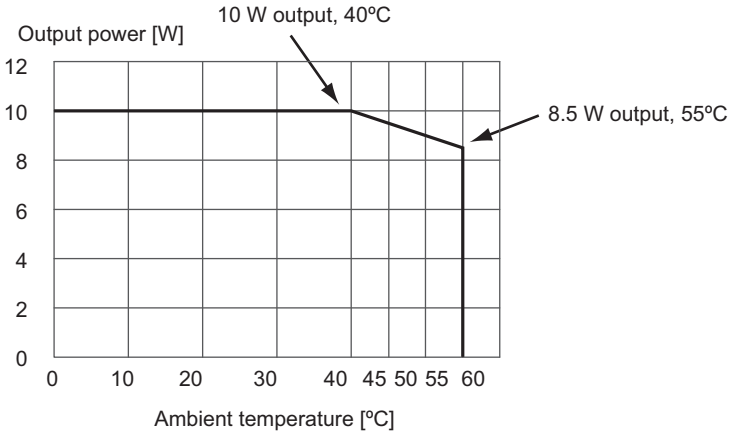
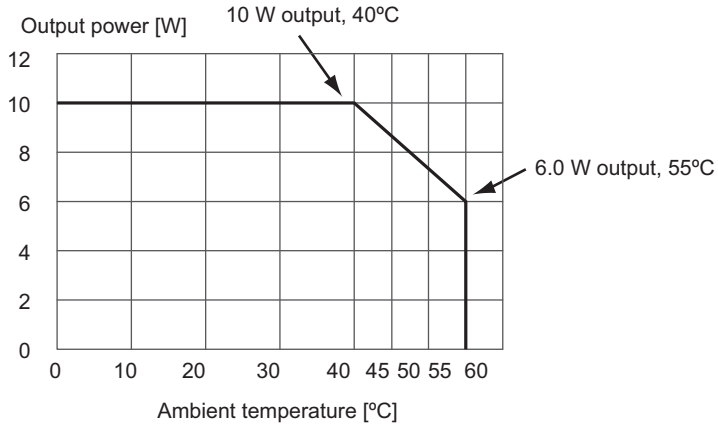
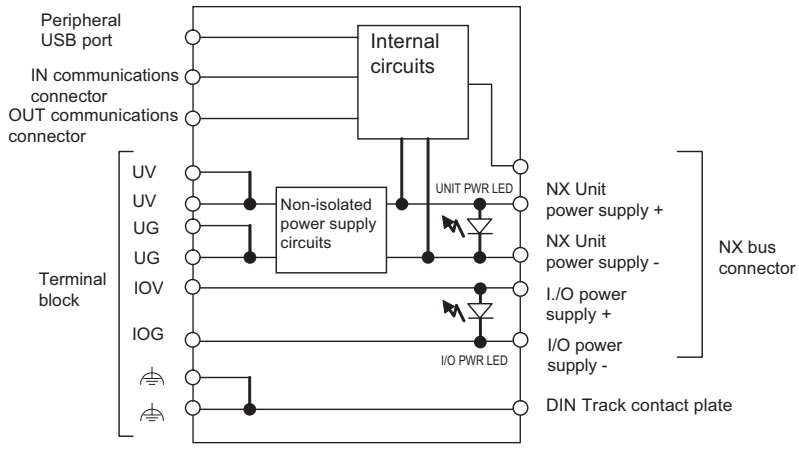
* Refer to the OMRON website (http://www.ia.omron.com/) or consult your OMRON representative for the most recent applicable standards for each model.

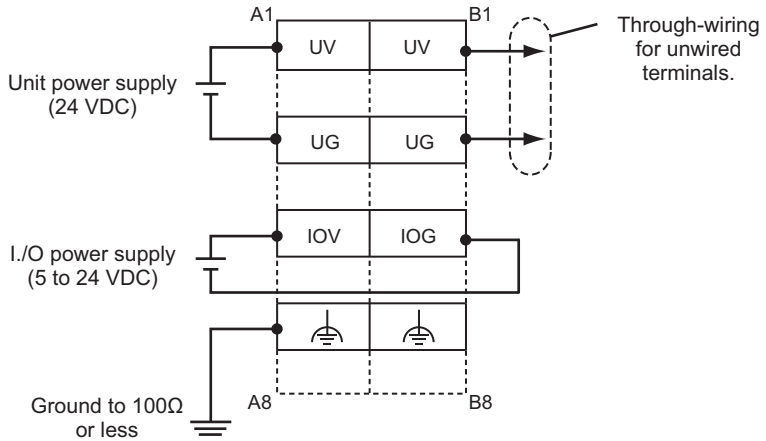
Specifications

EtherCAT Coupler Unit NX-ECC201/NX-ECC202/NX-ECC203

Item		Specification		
		NX-ECC201	NX-ECC202	NX-ECC203
Number of connectable NX Units		63 Units max.*1		
Send/receive PDO data sizes		Input: 1,024 bytes max. (including input data, status, and unused areas) Output: 1,024 bytes max. (including output data and unused areas)		
Mailbox data size		Input: 256 bytes Output: 256 bytes		
Mailbox		Emergency messages and SDO requests		
Refreshing methods *2		• Free-Run refreshing • Synchronous I/O refreshing • Time stamp refreshing		• Free-Run refreshing • Synchronous I/O refreshing • Time stamp refreshing • Task period prioritized refreshing
Node address setting range		When the settable node address range for the built-in EtherCAT port is 1 to 512*3 • Set on switches: 1 to 199 • Set with the Sysmac Studio: 1 to 512		
		When the settable node address range for the built-in EtherCAT port is 1 to 192*3 • Set on switches: 1 to 192 • Set with the Sysmac Studio: 1 to 192		
I/O jitter performance		Inputs: 1 μs max. Outputs: 1 μs max.		
Communications cycle in DC Mode		250 to 4,000 μs*4 *5		125 to 10,000 μs*3 *4 *6
Unit power supply *7	Power supply voltage	24 VDC (20.4 to 28.8 VDC)		
	NX Unit power supply capacity	10 W max. Refer to *Installation orientation and restrictions* for details.		
	NX Unit power supply efficiency	70%		
	Isolation method	No isolation between NX Unit power supply and Unit power supply terminals		
	Current capacity of power supply terminals	4 A max.		
I/O power supply *7	Power supply voltage	5 to 24 VDC (4.5 to 28.8 VDC) *8		
	Maximum I/O power supply current	4 A	10 A	
	Current capacity of power supply terminals	4 A max.	10 A max.	
NX Unit power consumption		1.45 W max.		1.25 W max.
Current consumption from I/O power supply		10 mA max. (for 24 VDC)		
Dielectric strength		510 VAC for 1 min, leakage current: 5 mA max. (between isolated circuits)		
Insulation resistance		100 VDC, 20 MΩ min. (between isolated circuits)		

*1. Refer to the *NX-series Safety Control Units User's Manual* (Cat. No. Z930) for the number of Safety Control Units that can be connected.
*2. This function was added or improved for a version upgrade. Refer to the *NX-series EtherCAT Coupler Unit User's Manual* (Cat. No. W519) for information on version upgrades.
*3. The range of node addresses that can be set depends on the model of the built-in EtherCAT port. For the node address ranges that can be set for a built-in EtherCAT port, refer to the user's manual for the built-in EtherCAT port on the connected CPU Unit or Industrial PC.
*4. This depends on the specifications of the EtherCAT master. For example, the values are as follows when the EtherCAT Coupler Unit is connected to the built-in EtherCAT port on an NJ5-series CPU Unit: 500 μs, 1,000 μs, 2,000 μs, and 4,000 μs. For the specifications of the built-in EtherCAT port, refer to the user's manual for the built-in EtherCAT port on the connected CPU Unit or the Industrial PC.
*5. This depends on the Unit configuration.
*6. There are restrictions in the communications cycles that you can set for some of the NX Units. If you use any of those NX Units, set a communications cycle that will satisfy the specifications for the refresh cycles that can be executed by the NX Unit. Refer to the appendix of the *NX-series Data Reference Manual* (Cat. No. W525-E1-07 or later) to see if there are restrictions on any specific NX Units. For information on the communications cycles that you can set, refer to the user's manuals for the NX Units.
*7. Refer to the *NX-series EtherCAT Coupler Unit User's Manual* (Cat. No. W519) for procedures for designing the Unit power supply system and I/O power supply system.
*8. Use a voltage that is appropriate for the I/O circuits of the NX Units and the connected external devices.

Item	Specification		
	NX-ECC201	NX-ECC202	NX-ECC203
External connection terminals	Communications Connector For EtherCAT communications. • RJ45 × 2 (shielded) • IN: EtherCAT input data, OUT: EtherCAT output data		
	Screwless Clamping Terminal Block For Unit power supply, I/O power supply, and grounding. Removable.		
	Peripheral USB Port For Sysmac Studio connection. • Physical layer: USB 2.0-compliant, B-type connector • Transmission distance: 5 m max.		
Dimensions	46 × 100 × 71 mm (W×H×D)		
Weight	170 g max.		
Installation orientation and restrictions	Installation orientation: 6 possible orientations Restrictions: Used in the upright installation orientation.  Used in another orientation other than the upright installation orientation.  		
Circuit layout	 		

Item	Specification		
	NX-ECC201	NX-ECC202	NX-ECC203
Terminal arrangement			
Accessory	End Cover (NX-END01): 1		

EtherCAT Communications Specifications

Item	Specification
Communications standard	IEC 61158 Type 12
Physical layer	100BASE-TX (IEEE 802.3)
Modulation	Baseband
Baud rate	100 Mbps
Topology	Depends on the specifications of the EtherCAT master. *
Transmission media	Category 5 or higher twisted-pair cable (Recommended cable: double-shielded cable with aluminum tape and braiding)
Transmission distance	Distance between nodes: 100 m or less

* The EtherCAT Coupler Unit conforms to EtherCAT standards. Check the specifications of the EtherCAT master being connected for the configurable topology. However, note that only NX-ECC203 EtherCAT Coupler Units (Ver. 1.5 or later) is compatible with a ring topology.

Version Information

Model number of EtherCAT Coupler Unit	Unit version	Corresponding versions					
		Using an NX-series CPU Unit		Using an NJ-series CPU Unit		Using an NY-series Industrial PC	
		Unit version of CPU Unit	Sysmac Studio version	Unit version of CPU Unit	Sysmac Studio version	Unit version of Industrial PC	Sysmac Studio version
NX-ECC201	Ver. 1.2	Ver. 1.10	Ver. 1.13	Ver. 1.07	Ver. 1.08	Ver. 1.12	Ver. 1.17
	Ver. 1.1			Ver. 1.06	Ver. 1.07		
	Ver. 1.0			Ver. 1.05	Ver. 1.06		
NX-ECC202	Ver. 1.2 *1			Ver. 1.07	Ver. 1.08		
NX-ECC203	Ver. 1.6		Ver. 1.25		Ver. 1.25		Ver. 1.25
	Ver. 1.5		Ver. 1.19		Ver. 1.19		Ver. 1.19
	Ver. 1.4		Ver. 1.16		Ver. 1.16		Ver. 1.17
	Ver. 1.3 *2		Ver. 1.13		Ver. 1.13		

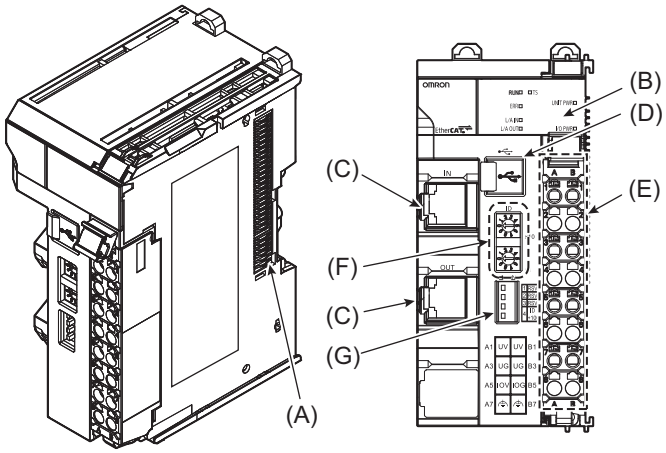
Note: Some Units do not have all of the versions given in the above table. If a Unit does not have the specified version, support is provided by the oldest available version after the specified version. Refer to the user's manuals for the specific Units for the relation between models and versions.

*1 For the NX-ECC202, there is no unit version of 1.1 or earlier.

*2 For the NX-ECC203, there is no unit version of 1.2 or earlier.

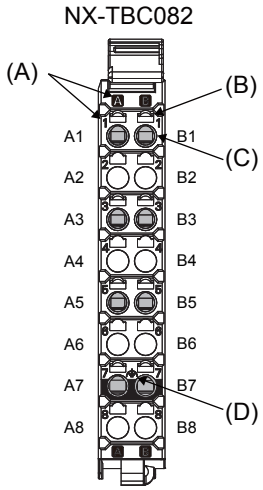
External Interface

EtherCAT Coupler Unit NX-ECC20□



Symbol	Name	Function
(A)	NX bus connector	This connector is used to connect each Unit.
(B)	Indicators	The indicators show the current operating status of the Unit.
(C)	Communications connectors	These connectors are connected to the communications cables of the EtherCAT network. There are two connectors, one for the input port and one for the output port.
(D)	Peripheral USB port	This port is used to connect to the Sysmac Studio Support Software.
(E)	Terminal block	The terminal block is used to connect external devices. The number of terminals depends on the type of Unit.
(F)	Rotary switches	These rotary switches are used to set the 1s digit and 10s digit of the node address of the EtherCAT Coupler Unit as an EtherCAT slave. The address is set in decimal.
(G)	DIP switch	The DIP switch is used to set the 100s digit of the node address of the EtherCAT Coupler Unit as an EtherCAT slave.

Terminal Block



Eight-terminal Block

Symbol	Name	Function
(A)	Terminal number indications	The terminal numbers (A1 to A8 and B1 to B8) are displayed. The terminal number indicators are the same regardless of the number of terminals on the terminal block, as shown above.
(B)	Release holes	Insert a flat-blade screwdriver into these holes to connect and remove the wires.
(C)	Terminal holes	The wires are inserted into these holes.
(D)	Ground terminal mark	This mark indicates the ground terminals. Only the NX-TBC082 has this mark.

Applicable Terminal Blocks for Each Unit Model

Unit model	Current capacity of Unit's power supply terminals		Terminal Blocks			
	Unit power supply	I/O power supply	Model	No. of terminals	Ground terminal mark	Terminal current capacity
NX-ECC201	4 A		NX-TBC082	8	Present	10 A
NX-ECC202 or NX-ECC203	4 A	10 A	NX-TBC082	8	Present	10 A

Applicable Wires

Using Ferrules

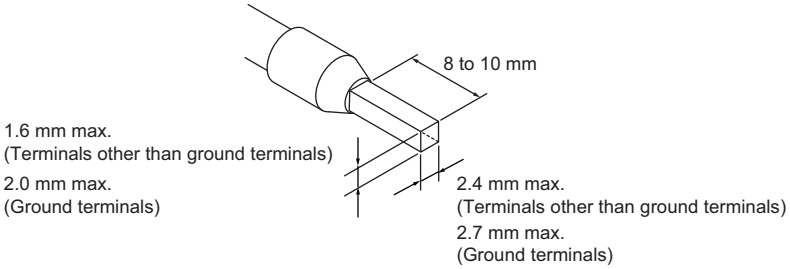
If you use ferrules, attach the twisted wires to them.
Observe the application instructions for your ferrules for the wire stripping length when attaching ferrules.
Always use plated one-pin ferrules. Do not use unplated ferrules or two-pin ferrules.

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.

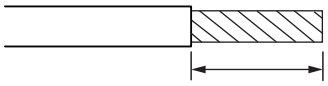


Using Twisted Wires/Solid Wires

If you use the twisted wires or the solid wires, use the following table to determine the correct wire specifications.

Terminals		Wire type				Wire size	Conductor length (stripping length)
		Twisted wires		Solid wire			
Classification	Current capacity	Plated	Unplated	Plated	Unplated		
All terminals except ground terminals	2 A max.	Possible	Possible	Possible	Possible	0.08 to 1.5 mm^2 AWG28 to 16	8 to 10 mm
	Greater than 2 A and 4 A or less		Not Possible	Possible *1	Not Possible		
	Greater than 4 A	Possible *1		Not Possible			
Ground terminals	---	Possible	Possible	Possible *2	Possible *2	2.0 mm^2	9 to 10 mm

*1 Secure wires to the screwless clamping terminal block. Refer to the Securing Wires in the USER'S MANUAL for how to secure wires.
*2 With the NX-TB□□□1 Terminal Block, use twisted wires to connect the ground terminal. Do not use a solid wire.



Conductor length (stripping length)

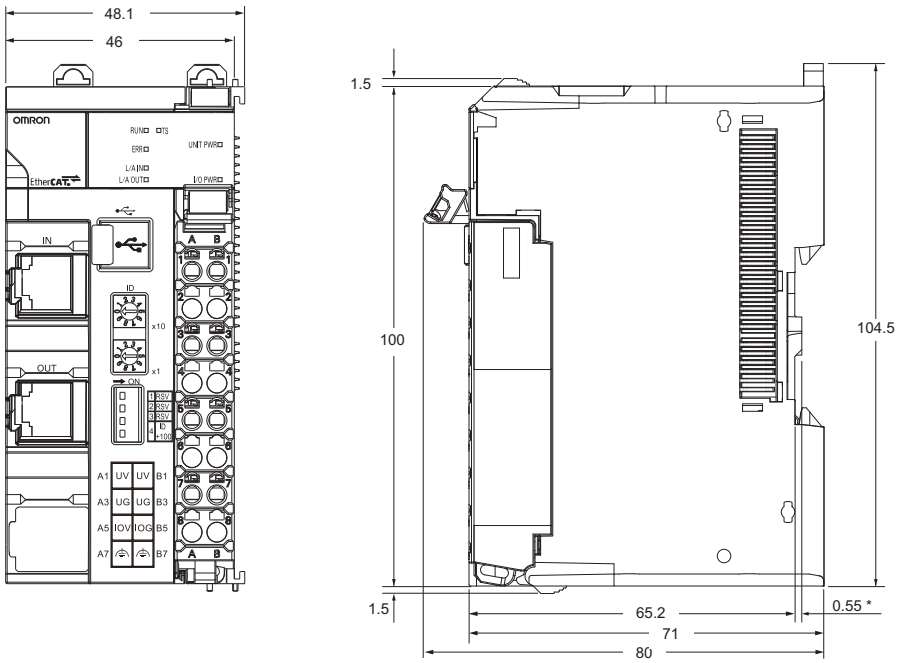
<Additional Information> If more than 2 A will flow on the wires, use plated wires or use ferrules.

Dimensions

(Unit: mm)

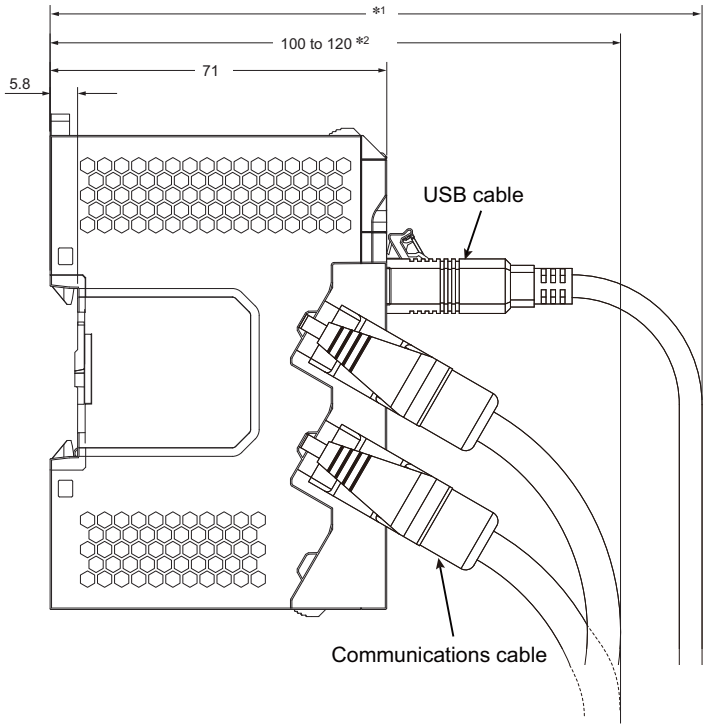
EtherCAT Coupler Unit

● EtherCAT Coupler Unit Only



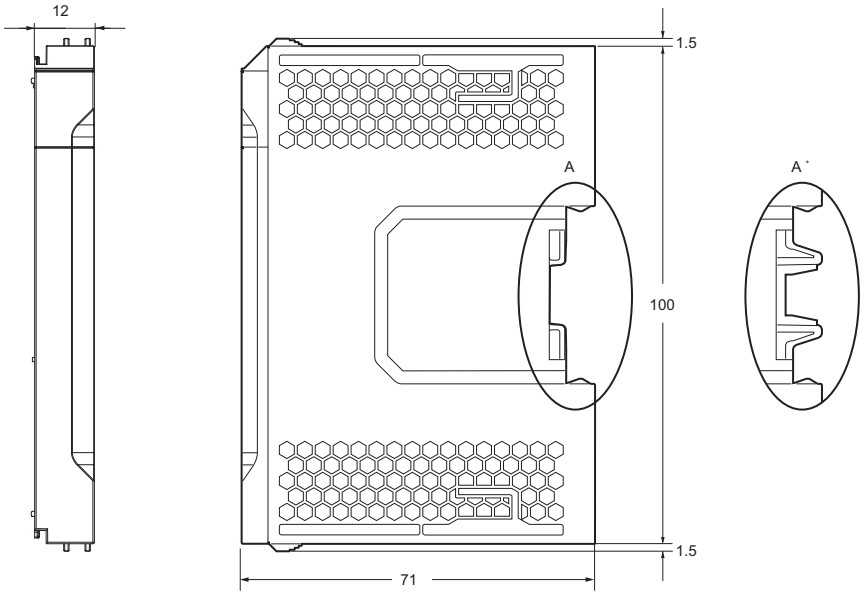
* The dimension is 1.35 mm for Units with lot numbers through December 2014.

● With Cables Connected



*1. This dimension depends on the specifications of the commercially available USB cable. Check the specifications of the USB cable that is used.
*2. This is the dimension from the back of the Unit to the communications cables.
- 100 mm: When an MPS588-C Connector is used.
- 120 mm: When an XS6G-T421-1 Connector is used.

End Cover



* This is the shape for Units with lot numbers through December 2014.

Related Manuals

Man. No	Model	Manual	Application	Description
W519	NX-ECC20□	NX-series EtherCAT Coupler Unit User's Manual	Leaning how to use an NX-series EtherCAT Coupler Unit and Ether-CAT Slave Terminals	The following items are described: the overall system and configuration methods of an EtherCAT Slave Terminal (which consists of an NX-series EtherCAT Coupler Unit and NX Units), and information on hardware, setup, and functions to set up, control, and monitor NX Units through EtherCAT.

Terms and Conditions Agreement

Read and understand this catalog.
Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments.

Warranties.
(a) Exclusive Warranty. Omron's exclusive warranty is that the Products will be free from defects in materials and workmanship for a period of twelve months from the date of sale by Omron (or such other period expressed in writing by Omron). Omron disclaims all other warranties, express or implied.
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