

# NX-series Digital Mixed I/O Units

# NX-MD

CSM\_NX-MD\_DS\_E\_3\_1

## Digital Mixed I/O Units for High speed Synchronous Control

- DC Input/Transistor Output Units for the NX-series modular I/O system.
- Connect to other NX-series I/O Units and EtherCAT Coupler units using the high-speed NX-bus.
- One Unit enables synchronous Units to update the status of input devices to the controller and the output status of synchronous Units according to the controller's instructions every EtherCAT cycle.



## Features

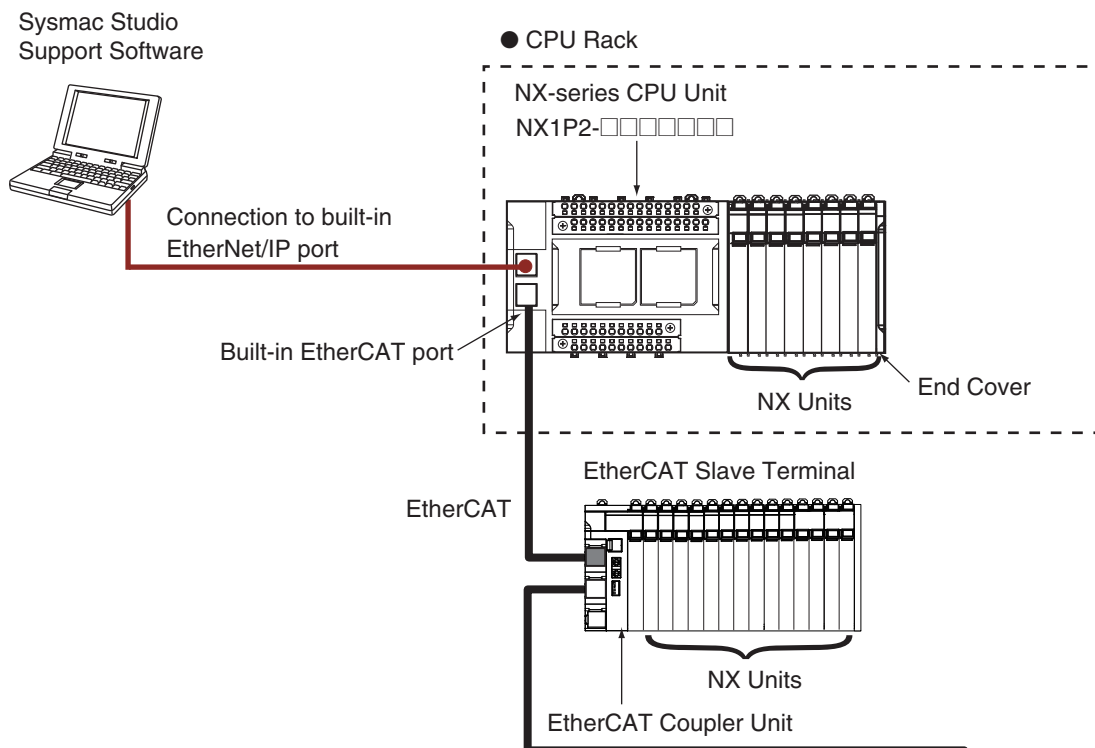
- High-speed I/O refreshing is possible by connecting with the NX-series EtherCAT Coupler.
- Output refreshing can be synchronized with the control cycle of the Controller. (Synchronous refreshing)
- Connector Types significantly reduces wiring work.
- Connection to the CJ-series is possible by connecting with the EtherNet/IP™ Coupler.

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## System Configuration

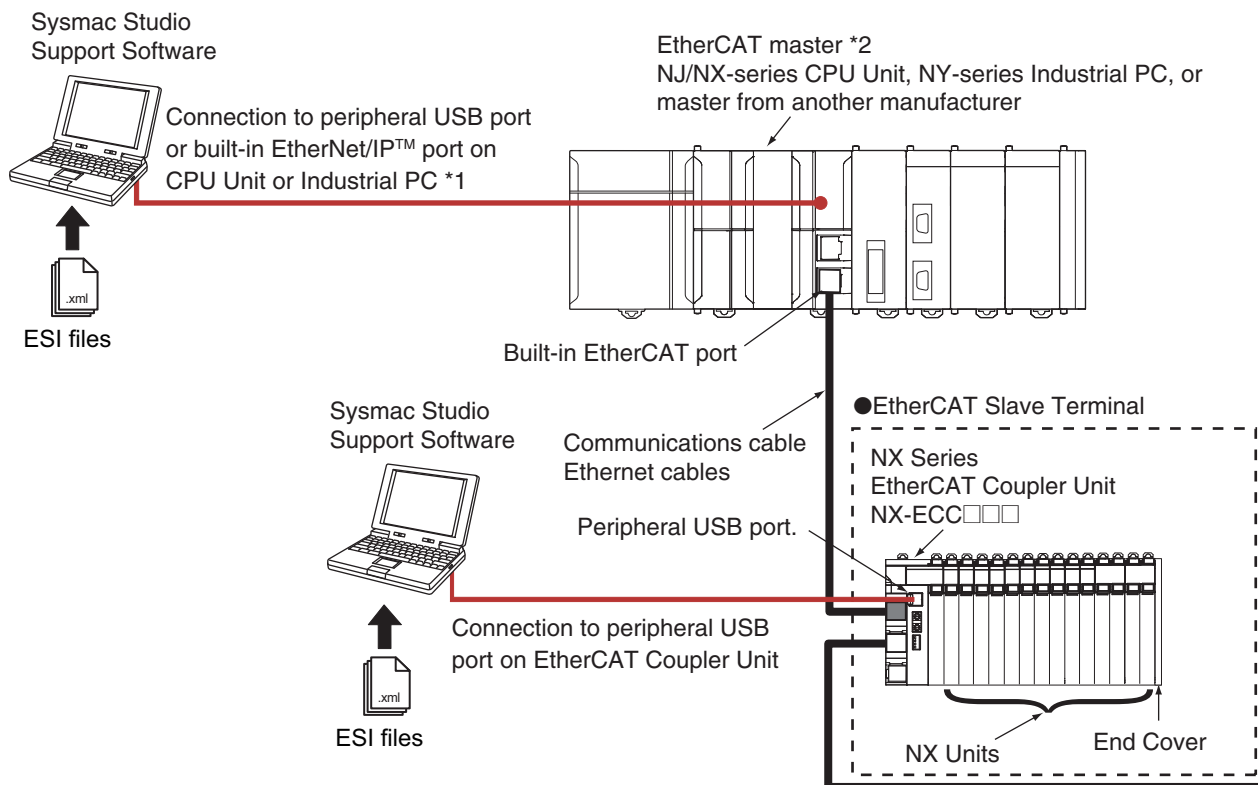
### System Configuration in the Case of a CPU Unit

The following figure shows a system configuration when a group of NX Units is connected to an NX-series CPU Unit.



### 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.

**Note:** 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

### 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: EU Directives, RCM: Regulatory Compliance Mark, and KC: KC Registration.
- Contact your OMRON representative for further details and applicable conditions for these standards.

### Digital Mixed I/O Units

#### ● DC Input/Transistor Output Units (MIL Connector, 30 mm Width)

Unit type	Product name	Specification					Model	Standards
		Number of points	Internal I/O common	Rated voltage	I/O refreshing method	ON/OFF response time		
NX-series Digital Mixed I/O Unit	DC Input/ Transistor Output Unit  	Outputs: 16 points Inputs: 16 points	Outputs: NPN Inputs: For both NPN/PNP	Outputs: 12 to 24 VDC Inputs: 24 VDC	Switching Synchronous I/O refreshing and Free-Run refreshing	Outputs: 0.1 ms max./0.8 ms max. Inputs: 20 μs max./400 μs max.	NX-MD6121-5	UC1, CE, RCM, KC
			Outputs: PNP Inputs: For both NPN/PNP	Outputs: 24 VDC Inputs: 24 VDC		Outputs: 0.5 ms max./1.0 ms max. Inputs: 20 μs max./400 μs max.		

#### ● DC Input/Transistor Output Unit (Fujitsu Connector, 30 mm Width)

Unit type	Product name	Specification					Model	Standards
		Number of points	Internal I/O common	Rated voltage	I/O refreshing method	ON/OFF response time		
NX-series Digital Output Unit	DC Input/ Transistor Output Unit  	Outputs: 16 points Inputs: 16 points	Outputs: NPN Inputs: For both NPN/PNP	Outputs: 12 to 24 VDC Inputs: 24 VDC	Switching Synchronous I/O refreshing and Free-Run refreshing	Outputs: 0.1 ms max./0.8 ms max. Inputs: 20 μs max./400 μs max.	NX-MD6121-6	UC1, CE, RCM, KC

### Accessories

Not included.

### Connection Patterns for Connector-Terminal Block Conversion Units

Pattern	Configuration	Number of connectors	Branching
C	<p>The diagram illustrates a central Connector-Terminal Block Conversion Unit connected to two separate 20-terminal blocks. A Connecting Cable is used to link the unit to the terminals.</p>	2	None

### Connections to Connector-Terminal Block Conversion Units

Unit	I/O capacity	Number of connectors	Polarity	Connection pattern	Number of branches	Connecting Cable	Connector-Terminal Block Conversion Unit	Common terminal
NX-MD6121-5	16 inputs	1 MIL connector	NPN/ PNP	C	None	XW2Z-□□□X	XW2B-20G4	None
				C	None	XW2Z-□□□X	XW2B-20G5	None
				C	None	XW2Z-□□□X	XW2D-20G6	None
				C	None	XW2Z-□□□X	XW2R-J20G-T	None
	16 outputs	1 MIL connector	NPN	C	None	XW2Z-□□□X	XW2B-20G4	None
				C	None	XW2Z-□□□X	XW2B-20G5	None
				C	None	XW2Z-□□□X	XW2D-20G6	None
				C	None	XW2Z-□□□X	XW2R-J20G-T	None
NX-MD6121-6	16 inputs	1 Fujitsu connector	NPN/ PNP	C	None	XW2Z-□□□A	XW2B-20G4	None
				C	None	XW2Z-□□□A	XW2B-20G5	None
				C	None	XW2Z-□□□A	XW2C-20G5-IN16 *	Yes
				C	None	XW2Z-□□□A	XW2C-20G6-IO16	Yes
				C	None	XW2Z-□□□A	XW2D-20G6	None
				C	None	XW2Z-□□□A	XW2E-20G5-IN16 *	Yes
				C	None	XW2Z-□□□A	XW2F-20G7-IN16 *	Yes
				C	None	XW2Z-□□□A	XW2N-20G8-IN16 *	Yes
	16 outputs	1 Fujitsu connector	NPN	C	None	XW2Z-□□□A	XW2R-J20G-T	None
				C	None	XW2Z-□□□A	XW2B-20G4	None
				C	None	XW2Z-□□□A	XW2B-20G5	None
				C	None	XW2Z-□□□A	XW2C-20G6-IO16	Yes
				C	None	XW2Z-□□□A	XW2D-20G6	None
				C	None	XW2Z-□□□A	XW2F-20G7-OUT16	Yes
NX-MD6256-5	16 inputs	1 MIL connector	NPN/ PNP	C	None	XW2Z-□□□X	XW2B-20G4	None
				C	None	XW2Z-□□□X	XW2B-20G5	None
				C	None	XW2Z-□□□X	XW2D-20G6	None
				C	None	XW2Z-□□□X	XW2R-J20G-T	None
	16 outputs	1 MIL connector	PNP	C	None	XW2Z-□□□X	XW2B-20G4	None
				C	None	XW2Z-□□□X	XW2B-20G5	None
				C	None	XW2Z-□□□X	XW2D-20G6	None
				C	None	XW2Z-□□□X	XW2R-J20G-T	None

\* The inputs are NPN. For PNP inputs, reverse the polarity of the external power supply connections to the power supply terminals on the Connector-Terminal Block Conversion Unit.

**Note:** For details of connection patterns for I/O relay terminals, refer to the *NX-series Digital I/O Units User's Manual* (Cat. No. W521).

## 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	2 or less: Conforms to JIS B3502 and IEC 61131-2.
	Noise immunity	2 kV on power supply line (Conforms to IEC61000-4-4.)
	Overvoltage category	Category II: Conforms to JIS B3502 and IEC 61131-2.
	EMC immunity level	Zone B
	Vibration resistance *1	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 <sup>2</sup> , 100 min each in X, Y, and Z directions (10 sweeps of 10 min each = 100 min total)
Shock resistance *1	Conforms to IEC 60068-2-27. 147 m/s <sup>2</sup> , 3 times each in X, Y, and Z directions	
Applicable standards *2	cULus: Listed (UL508) or Listed (UL 61010-2-201), ANSI/ISA 12.12.01, EU: EN 61131-2 or EN 61010-2-201, C-Tick or RCM, KC: KC Registration, NK, LR	

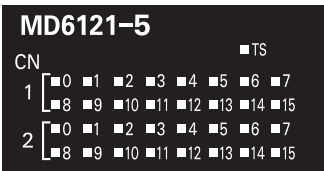
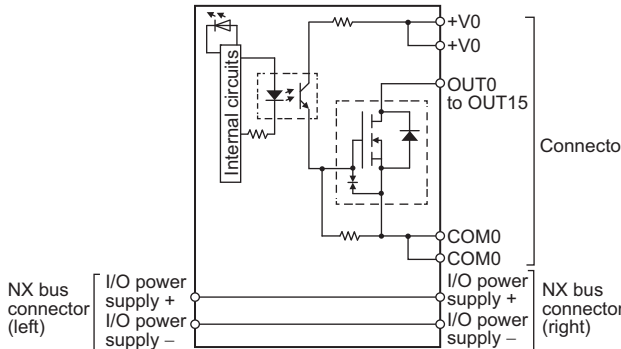
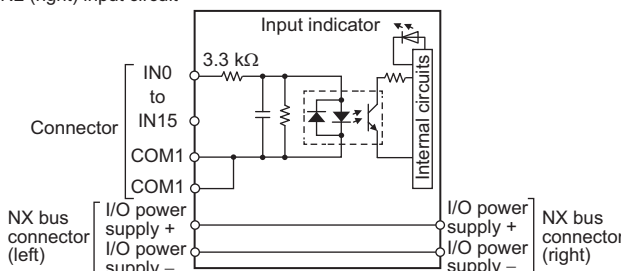
\*1. For the Relay Output Unit, refer to the Digital Input Unit Specifications.

\*2. Refer to the OMRON website (<http://www.ia.omron.com/>) or consult your OMRON representative for the most recent applicable standards for each model.

# Digital Mixed I/O Unit Specifications

## ● DC Input/Transistor Output Units (MIL Connector, 30 mm Width)

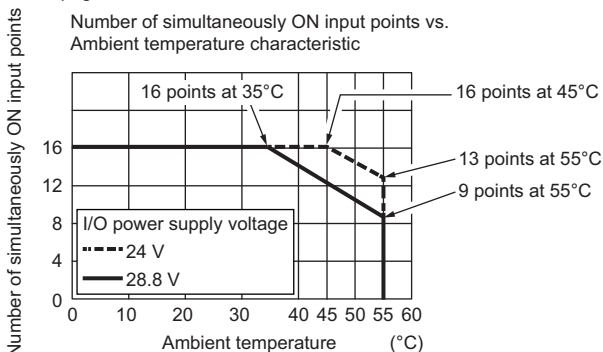
### NX-MD6121-5

<b>Unit name</b>		DC Input/Transistor Output Unit	<b>Model</b>	NX-MD6121-5	
<b>Number of points</b>		16 inputs/16 outputs	<b>External connection terminals</b>	2 MIL connectors (20 terminals)	
<b>I/O refreshing method</b>		Switching Synchronous I/O refreshing and Free-Run refreshing			
<b>Output section (CN1)</b>	<b>Internal I/O common</b>	NPN	<b>Input section (CN2)</b>	<b>Internal I/O common</b>	For both NPN/PNP
	<b>Rated voltage</b>	12 to 24 VDC		<b>Rated input voltage</b>	24 VDC (15 to 28.8 VDC)
	<b>Operating load voltage range</b>	10.2 to 28.8 VDC		<b>Input current</b>	7 mA typical (at 24 VDC)
	<b>Maximum value of load current</b>	0.5 A/point, 2 A/Unit		<b>ON voltage/ON current</b>	15 VDC min./3 mA min. (between COM and each signal)
	<b>Maximum inrush current</b>	4.0 A/point, 10 ms max.		<b>OFF voltage/OFF current</b>	5 VDC max./1 mA max. (between COM and each signal)
	<b>Leakage current</b>	0.1 mA max.		<b>ON/OFF response time</b>	20 μs max./400 μs max.
	<b>Residual voltage</b>	1.5 V max.		<b>Input filter time</b>	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
<b>Indicators</b>	TS indicator, I/O indicators		<b>Dimensions</b>	30 (W) x 100 (H) x 71 (D)	
			<b>Isolation method</b>	Photocoupler isolation	
			<b>Insulation resistance</b>	20 MΩ min. between isolated circuits (at 100 VDC)	
			<b>Dielectric strength</b>	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.	
			<b>I/O power supply method</b>	Supply from external source	
			<b>Current capacity of I/O power supply terminal</b>	Without I/O power supply terminals	
			<b>NX Unit power consumption</b>	<ul style="list-style-type: none"> <li>Connected to a CPU Unit 1.00 W max.</li> <li>Connected to a Communications Coupler Unit 0.70 W max.</li> </ul>	
		<b>Current consumption from I/O power supply</b>	30 mA max.		
		<b>Weight</b>	105 g max.		
<b>Circuit layout</b>	CN1 (left) output circuit				
					
<b>Circuit layout</b>	CN2 (right) input circuit				
					

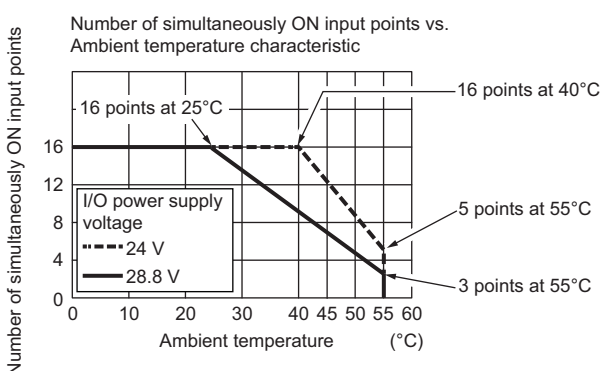
**Installation orientation and restrictions**

Installation orientation:  
 • Connected to a CPU Unit: Possible in upright installation.  
 • Connected to a Communications Coupler Unit: Possible in 6 orientations.  
 Restrictions: As shown in the following.

• For upright installation

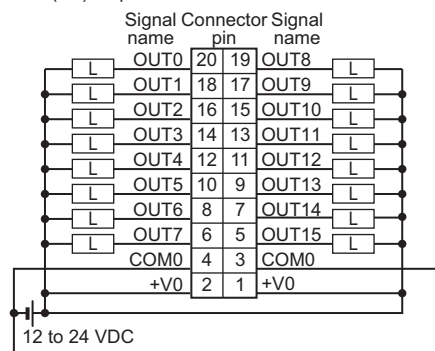


• For any installation other than upright



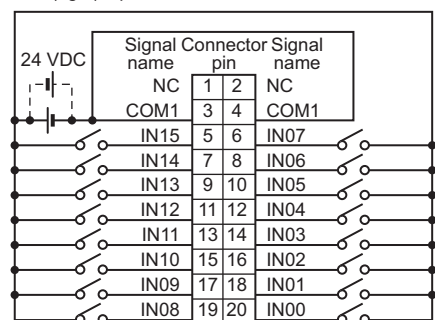
**Terminal connection diagram**

CN1 (left) output terminal



- Be sure to wire both pins 3 and 4 (COM0) of CN1.
- Be sure to wire both pins 1 and 2 (+V0) of CN1.

CN2 (right) input terminal



- The polarity of the input power supply of CN2 can be connected in either direction.
- Be sure to wire both pins 3 and 4 (COM1) of CN2, and set the same polarity for both pins.

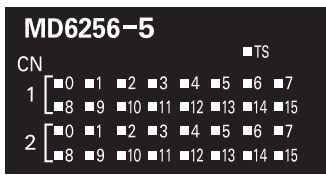
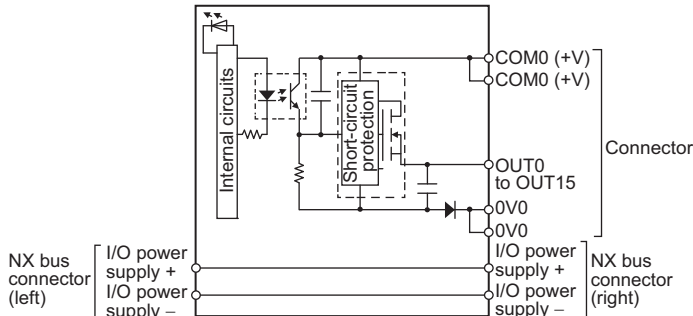
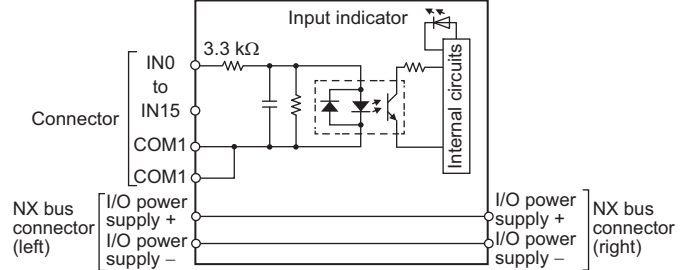
**Disconnection/Short-circuit detection**

Not supported.

**Protective function**

Not supported.

# NX-MD6256-5

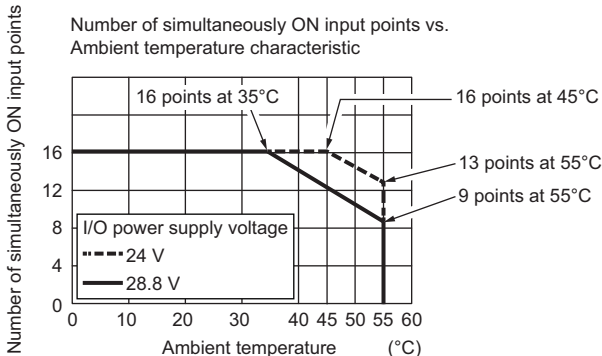
<b>Unit name</b>		DC Input/Transistor Output Unit	<b>Model</b>	NX-MD6256-5	
<b>Number of points</b>		16 inputs/16 outputs	<b>External connection terminals</b>	2 MIL connectors (20 terminals)	
<b>I/O refreshing method</b>		Switching Synchronous I/O refreshing and Free-Run refreshing			
<b>Output section (CN1)</b>	<b>Internal I/O common</b>	PNP	<b>Input section (CN2)</b>	<b>Internal I/O common</b>	For both NPN/PNP
	<b>Rated voltage</b>	24 VDC		<b>Rated input voltage</b>	24 VDC (15 to 28.8 VDC)
	<b>Operating load voltage range</b>	20.4 to 28.8 VDC		<b>Input current</b>	7 mA typical (at 24 VDC)
	<b>Maximum value of load current</b>	0.5 A/point, 2 A/Unit		<b>ON voltage/ON current</b>	15 VDC min./3 mA min. (between COM and each signal)
	<b>Maximum inrush current</b>	4.0 A/point, 10 ms max.		<b>OFF voltage/OFF current</b>	5 VDC max./1 mA max. (between COM and each signal)
	<b>Leakage current</b>	0.1 mA max.		<b>ON/OFF response time</b>	20 μs max./400 μs max.
	<b>Residual voltage</b>	1.5 V max.		<b>Input filter time</b>	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
<b>Indicators</b>	TS indicator, I/O indicators		<b>Dimensions</b>	30 (W) x 100 (H) x 71 (D)	
			<b>Isolation method</b>	Photocoupler isolation	
<b>Circuit layout</b>	<p>CN1 (left) output circuit</p> 		<b>Insulation resistance</b>	20 MΩ min. between isolated circuits (at 100 VDC)	
	<p>CN2 (right) input circuit</p> 		<b>Dielectric strength</b>	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.	
			<b>I/O power supply method</b>	Supply from external source	
			<b>Current capacity of I/O power supply terminal</b>	Without I/O power supply terminals	
			<b>NX Unit power consumption</b>	<ul style="list-style-type: none"> <li>Connected to a CPU Unit: 1.10 W max.</li> <li>Connected to a Communications Coupler Unit: 0.75 W max.</li> </ul>	
			<b>Current consumption from I/O power supply</b>	40 mA max.	
			<b>Weight</b>	110 g max.	



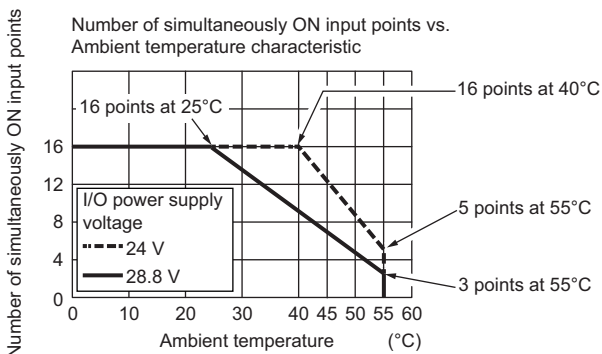
**Installation orientation and restrictions**

- Installation orientation:
- Connected to a CPU Unit: Possible in upright installation.
  - Connected to a Communications Coupler Unit: Possible in 6 orientations.
- Restrictions: As shown in the following.

- For upright installation

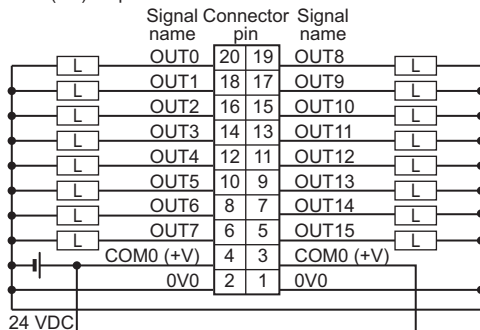


- For any installation other than upright



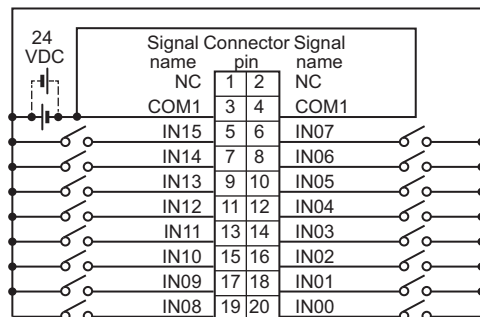
**Terminal connection diagram**

CN1 (left) output terminal



- Be sure to wire both pins 3 and 4 (COM0 (+V)) of CN1.
- Be sure to wire both pins 1 and 2 (0V0) of CN1.

CN2 (right) input terminal



- The polarity of the input power supply of CN2 can be connected in either direction.
- Be sure to wire both pins 3 and 4 (COM1) of CN2, and set the same polarity for both pins.

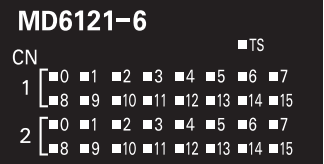
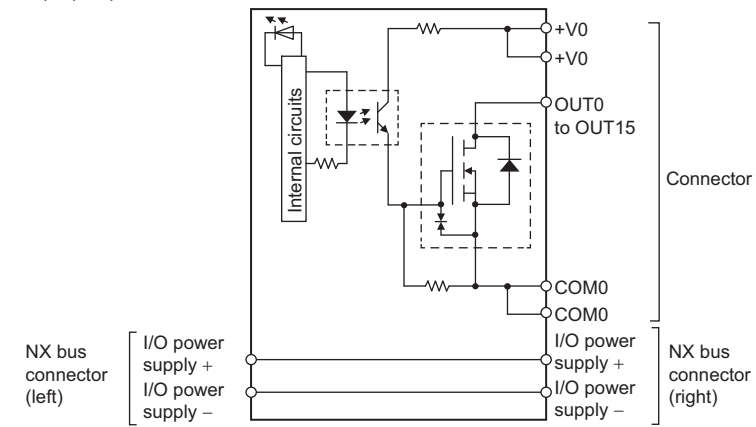
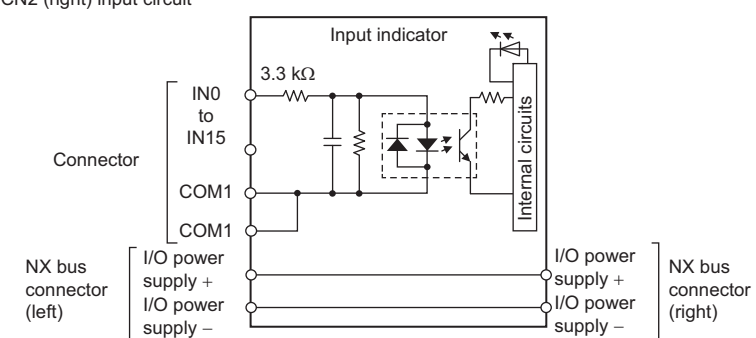
**Disconnection/Short-circuit detection**

Not supported.

**Protective function**

With load short-circuit protection.

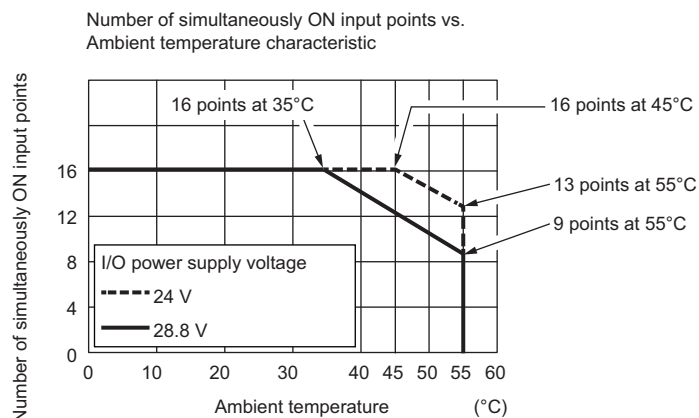
## ● DC Input/Transistor Output Units (Fujitsu Connector, 30 mm Width) NX-MD6121-6

<b>Unit name</b>		DC Input/Transistor Output Unit	<b>Model</b>	NX-MD6121-6	
<b>Number of points</b>		16 inputs/16 outputs	<b>External connection terminals</b>	2 Fujitsu connectors (24 terminals)	
<b>I/O refreshing method</b>		Switching Synchronous I/O refreshing and Free-Run refreshing			
<b>Output section (CN1)</b>	<b>Internal I/O common</b>	NPN	<b>Input section (CN2)</b>	<b>Internal I/O common</b>	For both NPN/PNP
	<b>Rated voltage</b>	12 to 24 VDC		<b>Rated input voltage</b>	24 VDC (15 to 28.8 VDC)
	<b>Operating load voltage range</b>	10.2 to 28.8 VDC		<b>Input current</b>	7 mA typical (at 24 VDC)
	<b>Maximum value of load current</b>	0.5 A/point, 2 A/Unit		<b>ON voltage/ON current</b>	15 VDC min./3 mA min. (between COM and each signal)
	<b>Maximum inrush current</b>	4.0 A/point, 10 ms max.		<b>OFF voltage/OFF current</b>	5 VDC max./1 mA max. (between COM and each signal)
	<b>Leakage current</b>	0.1 mA max.		<b>ON/OFF response time</b>	20 μs max./400 μs max.
	<b>Residual voltage</b>	1.5 V max.		<b>Input filter time</b>	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
<b>Indicators</b>	TS indicator, I/O indicators		<b>Dimensions</b>	30 (W) x 100 (H) x 71 (D)	
			<b>Isolation method</b>	Photocoupler isolation	
			<b>Insulation resistance</b>	20 MΩ min. between isolated circuits (at 100 VDC)	
			<b>Dielectric strength</b>	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.	
			<b>I/O power supply method</b>	Supply from external source	
			<b>Current capacity of I/O power supply terminal</b>	Without I/O power supply terminals	
			<b>NX Unit power consumption</b>	<ul style="list-style-type: none"> <li>Connected to a CPU Unit 1.00 W max.</li> <li>Connected to a Communications Coupler Unit 0.70 W max.</li> </ul>	
			<b>Current consumption from I/O power supply</b>	30 mA max.	
			<b>Weight</b>	95 g max.	
	<b>Circuit layout</b>	CN1 (left) output circuit			
					
<b>Circuit layout</b>	CN2 (right) input circuit				
					

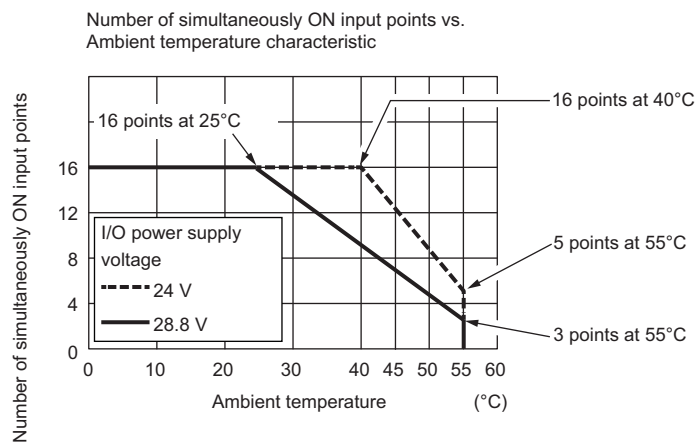
**Installation orientation and restrictions**

Installation orientation:  
 • Connected to a CPU Unit: Possible in upright installation.  
 • Connected to a Communications Coupler Unit: Possible in 6 orientations.  
 Restrictions: As shown in the following.

• For upright installation

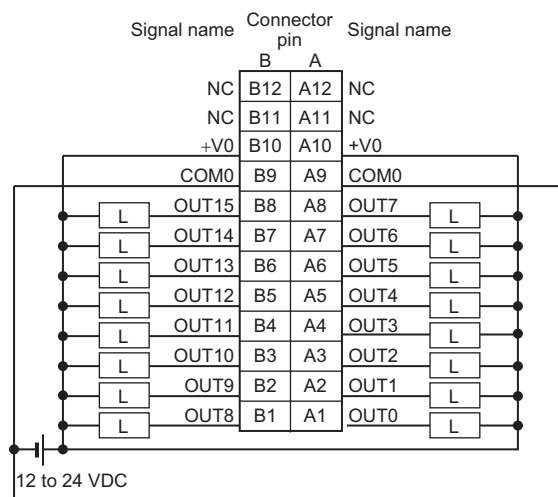


• For any installation other than upright



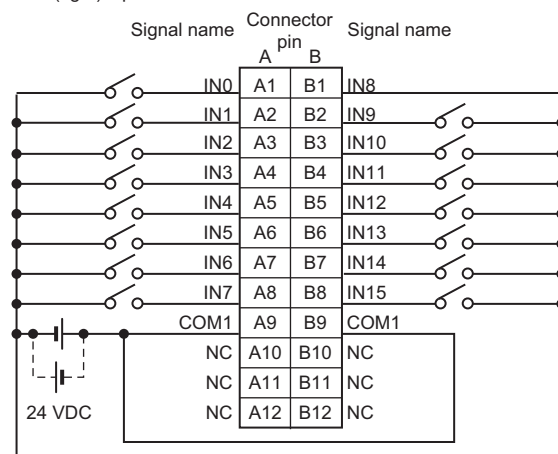
**Terminal connection diagram**

CN1 (left) output terminal



- Be sure to wire both pins A9 and B9 (COM0) of CN1.
- Be sure to wire both pins A10 and B10 (+V0) of CN1.

CN2 (right) input terminal



- The polarity of the input power supply of CN2 can be connected in either direction.
- Be sure to wire both pins A9 and B9 (COM1) of CN2, and set the same polarity for both pins.

**Disconnection/Short-circuit detection**

Not supported.

**Protective function**

Not supported.

## Version Information

### Connecting with CPU Units

Refer to the user's manual for the CPU Unit for the CPU Unit to which NX Units can be connected.

NX Unit		Corresponding versions *	
Model	Unit version	CPU Unit	Sysmac Studio
NX-MD6121-5	Ver.1.0	Ver.1.13 or later	Ver.1.17 or higher
NX-MD6121-6			
NX-MD6256-5			

\* 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.

### Connecting with Coupler Units

NX Unit		Corresponding versions *				
Model	Unit version	EtherCAT			EtherNet/IP	
		Communications Coupler Unit	NJ/NX-series CPU Units or NY-series Industrial PCs	Sysmac Studio	Communications Coupler Unit	Sysmac Studio
NX-MD6121-5	Ver.1.0	Ver.1.0 or later	Ver.1.05 or later	Ver.1.10 or higher	Ver.1.0 or later	Ver.1.10 or higher
NX-MD6121-6				Ver.1.13 or higher		Ver.1.13 or higher
NX-MD6256-5				Ver.1.10 or higher		Ver.1.10 or higher

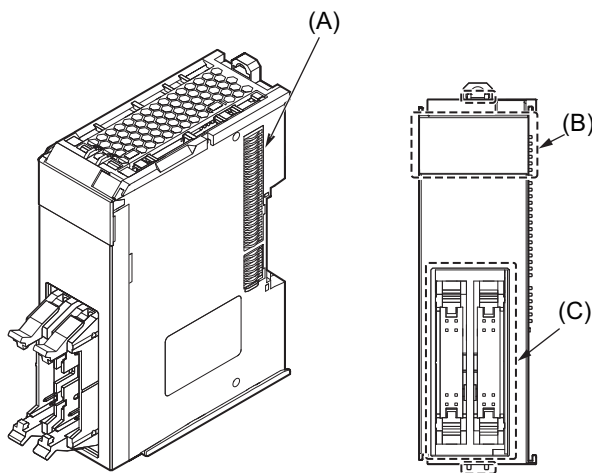
\* Some Units do not have all of the versions given in the above table. If a Unit does not have the specified version, support is provided by the oldest available version after the specified version. Refer to the user's manuals for the specific Units for the relation between models and versions.

## External Interface

### Connector Types

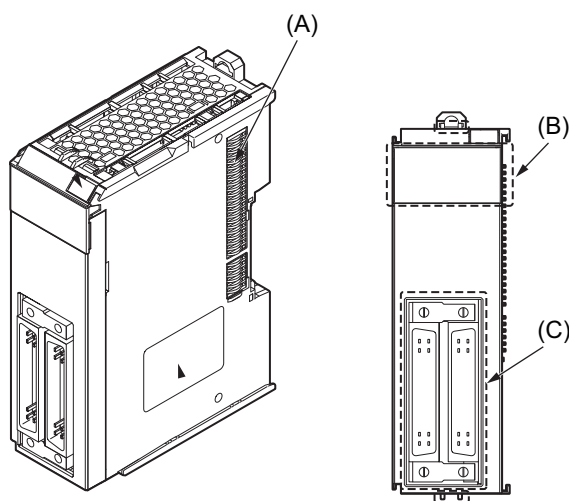
#### NX Units (30 mm Width)

##### ● Units with MIL Connectors (2 Connectors with 20 Terminals)



Letter	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)	Connectors	The connectors are used to connect to external devices. The number of terminals depends on the type of Unit.

##### ● Units with Fujitsu Connectors (2 Connectors with 24 Terminals)



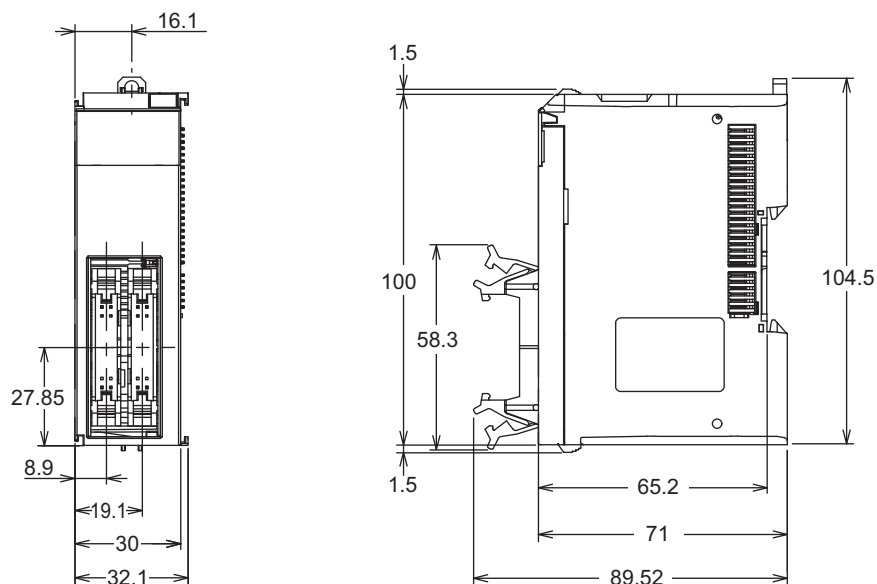
Letter	Name	Function
(A)	NX bus connector	This connector is used to connect each Unit.
(B)	Indicators	The indicators show the current operating status of the Unit.
(C)	Connectors	The connectors are used to connect to external devices.

## Dimensions

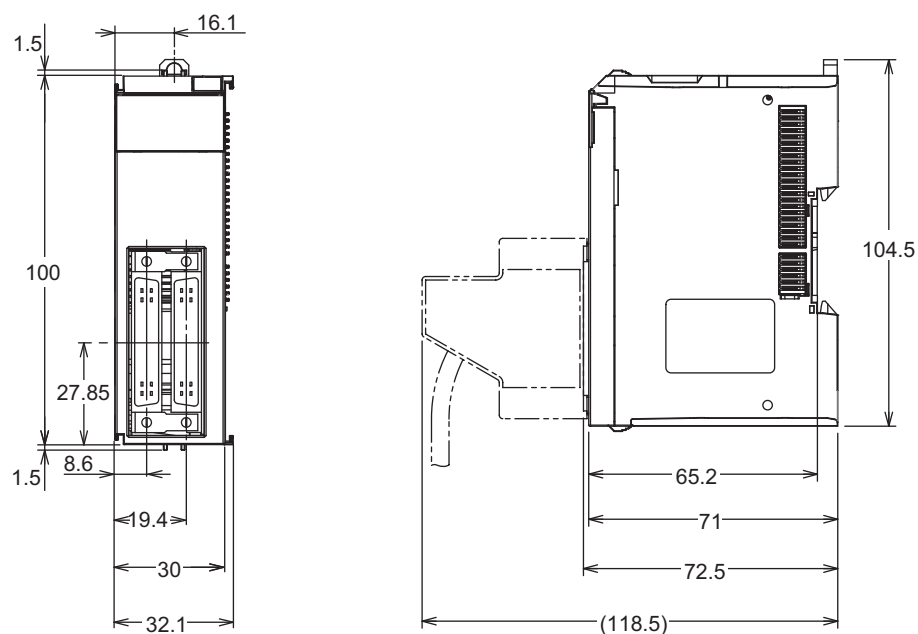
### Connector Types

30 mm Width

#### ● Units with MIL Connectors (2 Connectors with 20 Terminals)



#### ● Units with Fujitsu Connectors (2 Connectors with 24 Terminals)



## Related Manuals

Cat. No.	Model number	Manual name	Application	Description
W521	NX-IA□□□□ NX-ID□□□□ NX-OD□□□□ NX-OC□□□□ NX-MD□□□□	NX-series Digital I/O Units User's Manual	Learning how to use NX-series Digital I/O Units	The hardware, setup methods, and functions of the NX-series Digital I/O Units are described.

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