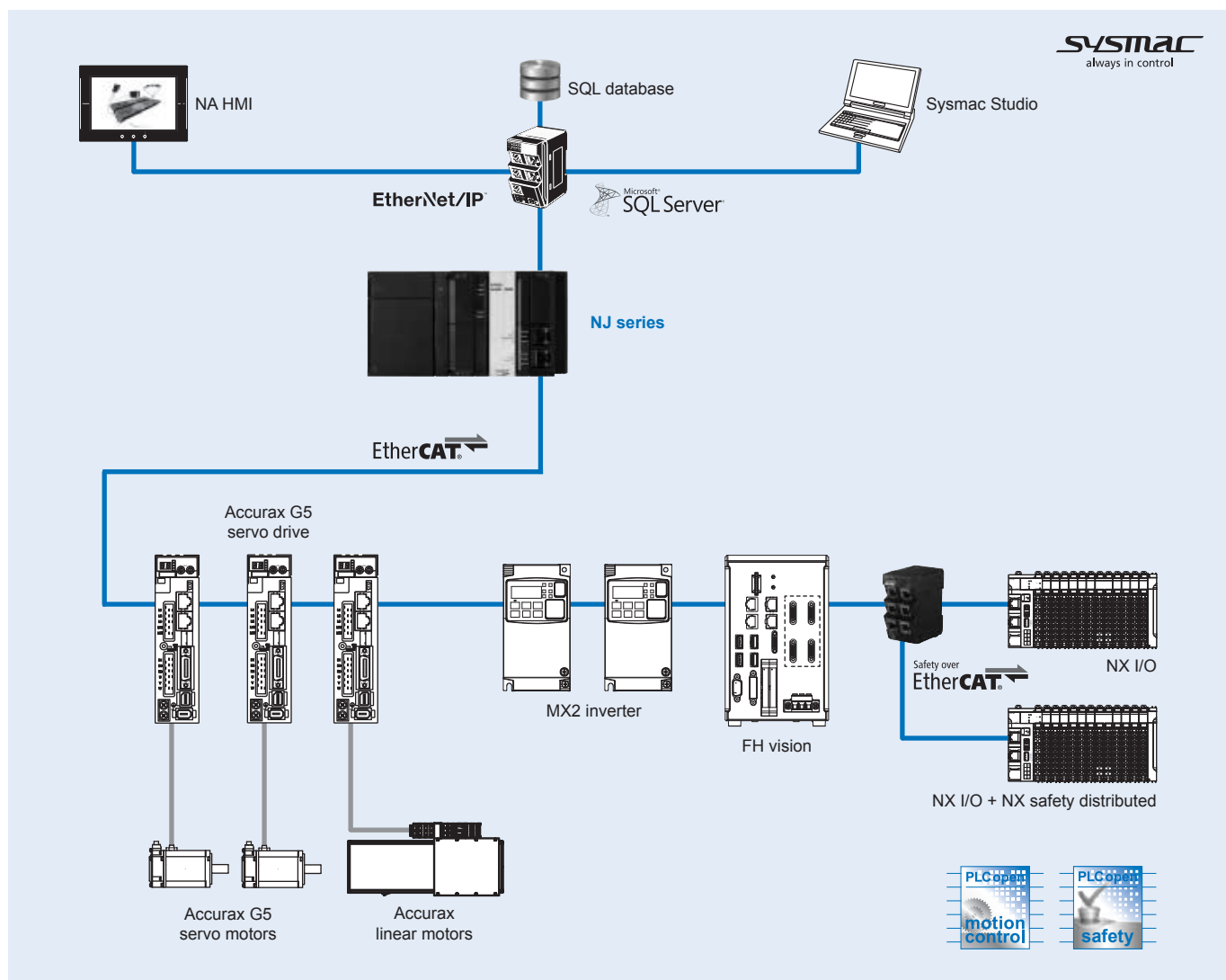**NJ5□, NJ3□, NJ1□**

NJ series machine controller

Sysmac controller - NJ series

The NJ series is an scalable machine controller for logic sequence and motion control that includes options for advanced functions such as robotics and database connection.

- Fastest cycle time: 500 μs
- Number of axes: 64, 32, 16, 8, 4, 2
- Synchronized motion core
- Functions: Logic sequence, Motion, Robotics, Database connection and SECS/GEM
- Up to 8 Delta robot control
- DB connection: SQL client for Microsoft SQL server, Oracle, IBM DB2, MySQL, Firebird
- Multi-tasking
- Built-in EtherCAT and EtherNet/IP ports

System configuration

NA HMI

SQL database

Sysmac Studio

sysmac always in control

EtherNet/IP

Microsoft SQL Server

NJ series

EtherCAT

Accurax G5 servo drive

MX2 inverter

FH vision

Safety over EtherCAT

NX I/O

NX I/O + NX safety distributed

Accurax G5 servo motors

Accurax linear motors

PLCopen motion control

PLCopen safety

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Specifications

General specifications

Item		NJ☐ CPU Unit
Enclosure		Mounted in a panel
Grounding		Less than 100 Ω
CPU unit dimensions (H × D × W)		90 mm × 90 mm × 90 mm
Weight		550 g (including end cover)
Current consumption		5 VDC, 1.90 A (including SD Memory card and end cover)
Operation environment	Ambient operating temperature	0 to 55°C
	Ambient operating humidity	10% to 90% (with non condensation)
	Atmosphere	Must be free from corrosive gases
	Ambient storage temperature	–20 to 75°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 5 to 8.4 Hz with 3.5 mm amplitude, 8.4 to 150 Hz. 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 60068-2-27 147 m/s^2, 3 times in X, Y and Z directions (100 m/s^2 for relay output units)
Battery	Life	5 years at 25°C
	Model	CJ1W-BAT01
Applicable standards		Conforms to cULus, NK, LR, EC directives, C-Tick and KC registration[1].

[1]. Supported only by the CPUs with unit version 1.01 or higher.

Performance specifications

Common performance specifications

Item			NJ5☐ CPU Unit	NJ3☐ CPU Unit	NJ1☐ CPU Unit
Processing time	Instruction execution time	LD instruction	1.2 ns (1.9 ns max.)	2.0 ns (3.0 ns max.)	3.3 ns (5.0 ns max.)
		Math instructions (for long real data)	26 ns or more	42 ns or more	70 ns or more
Programming	Program capacity[1]	Size	20 MB	5 MB	3 MB
		POU definition	3,000	750	450
		POU instance	9,000 (Sysmac Studio v.1.06 or higher) / 6,000 (Sysmac Studio v.1.05 or lower)	3,000 (Sysmac Studio v.1.05 or higher) / 1,500 (Sysmac Studio v.1.04 or lower)	1,800
	Variables capacity	No retain attribute[2]	Size: 4 MB Number: 90,000	Size: 2 MB Number: 22,500	
		Retain attribute[3]	Size: 2 MB Number: 10,000	Size: 0.5 MB Number: 5,000 (Sysmac Studio v.1.05 or higher) / 2,500 (Sysmac Studio v.1.04 or lower)	Size: 0.5 MB Number: 5,000
	Data type	Number	2,000	1,000	
	Memory for CJ-Series units (can be specified with AT specifications for variables.)	CIO area	6,144 words (CIO 0 to CIO 6143)		
		Work area	512 words (W0 to W511)		
		Holding area	1,536 words (H0 to H1535)		
		DM area	32,768 words (D0 to D32767)		
		EM area	32,768 words × 25 banks (E0_00000 to E18_32767)	32,768 words × 4 banks (E0_00000 to E3_32767)	
Unit configuration	Maximum number of CJ/NX unit per CPU rack or expansion rack		10 units		
	Maximum number of CJ unit on the system		40 units		
	Maximum number of NX unit on the system		4,096 (on NX EtherCAT communication coupler unit)		400 (on NX EtherCAT communication coupler unit)
	Number of expansion racks		3 max.		
	I/O Capacity (CJ units)		2,560 points max.		
	Power supply to CPU rack and expansion racks	Model	NJ-P☐3001		
		Power OFF detection time — AC power supply	30 to 45 ms		
		Power OFF detection time — DC power supply	22 to 25 ms		
Motion control	Number of controlled axes	Number of real axes[4]	NJ501-☐5☐0: 64 axes max. NJ501-☐4☐0: 32 axes max. NJ501-☐3☐0: 16 axes max.	NJ301-1200: 8 axes max. NJ301-1100: 4 axes max.	NJ101-10☐0: 2 axes max. NJ101-90☐0: 0
		Number of total axes[5]	NJ501-☐5☐0: 64 axes max. NJ501-☐4☐0: 32 axes max. NJ501-☐3☐0: 16 axes max.	NJ301-1200: 15 axes max. NJ301-1100: 15 axes max.	NJ101-10☐0: 6 axes max. NJ101-90☐0: 0
		Linear interpolation control	4 axes max. per axes group		
		Circular interpolation control	2 axes per axes group		
	Number of axes groups		32 groups max.		
	Position units		Pulses, millimeters, micrometers, nanometers, degrees or inches		

Machine automation controller

Item			NJ5☐ CPU Unit	NJ3☐ CPU Unit	NJ1☐ CPU Unit
Motion control	Override factors		0.00% or 0.01% to 500.00%		
	Motion control period		Same as process data communications period of EtherCAT communications		
	Cams	Number of cam data points	65,535 points max. per cam table / 1,048,560 points max. for all cam tables	65,535 points max. per cam table / 262,140 points max. for all cam tables	
		Number of cam tables	640 tables max.	160 tables max.	
Communications	Peripheral USB port	Supported services	Sysmac Studio connection		
		Physical layer	USB 2.0-compliant B-type connector		
		Transmission distance	5 m max.		
	Built-in EtherNet/IP port	Number of ports	1		
		Physical layer	10Base-T or 100Base-TX		
		Frame length	1514 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[6]	1 to 10,000 ms in 1.0-ms increments.[7] Can be set for each connection. (Data will be refreshed at the set interval, regardless of the number of nodes.)		
		Permissible communications band	3,000 pps[8][9] (including heartbeat)		
		Number of tag sets	32		
		Tag types	Network variables, CIO, Work, Holding, DM and EM Areas		
		Number of tags	8 (7 tags if controller status is included in the tag set.)		
		Link data size per node	256 max. (total size for all tags.)		
		Number of tag	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[10]	Supported.		
		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. Number of servers that can communicate at one time: 32 max.		
		Number of TCP socket service	30 max.[11]		
	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	192 max.		64 max.
		Process data size	Inputs/Outputs: 5,736 bytes max. (However, the maximum number of process data frames is 4)		
		Process data size per slave	Inputs/Outputs: 1,434 bytes max.		
		Communications cycle	500/1,000/2,000/4,000 μs[12]		1,000/2,000/4,000 μs
		Sync jitter	1 μs max.		
Internal clock			At ambient temperature of 55°C: –3.5 to +0.5 min error per month At ambient temperature of 25°C: –1.5 to +1.5 min error per month At ambient temperature of 0°C: –3 to +1 min error per month		

[1]. This is the capacity for the execution objects and variable tables (including variable names).
[2]. Words for CJ-series units in the holding, DM and EM areas are not included.
[3]. Words for CJ-series units in the CIO and work areas are not included.
[4]. This is the total number of axes that are set as servo axes or encoder axes and are also set as used axes.
[5]. This is the total for all axis types. The maximum number of axes of the CPU unit version 1.05 or lower is 8 axes (NJ301-1200), 4 axes (NJ301-1100).
[6]. Data is updated on the line in the specified interval regardless of the number of nodes.
[7]. The packet interval of the CPU unit version 1.02 or lower is 10 to 10,000 ms in 1.0 ms increments.
[8]. Means packets per second, i.e., the number of communication packets that can be sent or received in one second.
[9]. The permissible communications band of the CPU unit version 1.02 or lower is 1,000 pps.
[10]. An IGMP client is mounted for the EtherNet/IP port. If an Ethernet switch that supports IGMP snooping is used, filtering of unnecessary multicast packets is performed.
[11]. The maximum number of TCP socket service of the CPU unit version 1.02 or lower is 16.
[12]. The maximum communications cycle of the NJ301 CPU unit version 1.02 or lower is 1,000/2,000/4,000 μs.

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Performance specifications for CPU units with robotics functionality

Item			NJ501-4□□0 CPU Unit				
			NJ501-4320	NJ501-4500	NJ501-4400	NJ501-4300	NJ501-4310
Motion control	Robotics	Delta robot	3 + 1 (optional rotational axis) axes per robot				
		Number of Delta robots	8 Delta robots max. (depending on the number of axes supported by the CPU)				Control of one Delta robot

Note: For robot control by NJ501-4□□0, use the Accurax G5 servo drive with built-in EtherCAT communications, absolute encoder and brake.

Performance specifications for CPU units with database connection

Item			NJ501-□□20 CPU Unit	NJ101-□□20 CPU Unit
Programming	Memory for CJ-series units (can be specified with AT specifications for variables)	EM area	32,768 words × 25 banks (E0_00000 to E18_32767)[*1]	32,768 words × 4 banks (E0_00000 to E3_32767)[*2]

[*1]. When the spool function of the NJ501-□□20 is enabled, the DB connection service uses E9_0 to E18_32767.
[*2]. When the spool function of the NJ101-□□20 is enabled, the DB connection service uses E1_0 to E3_32767.

Function specifications

Common function specifications

Item				NJ□ CPU Unit
Tasks	Function	Function		I/O refreshing and the user program are executed in units that are called tasks. Tasks are used to specify execution conditions and execution priority.
		Periodically executed tasks		Maximum number of primary periodic tasks: 1 Maximum number of periodic tasks: 3
		Conditionally executed tasks[*1]		Maximum number of even tasks: 32 When active even task instruction is executed or when condition expression for variable is met.
	Setup	System service monitoring settings		The execution interval and the percentage of the total user program execution time are monitored for the system services (processes that are executed by the CPU Unit separate from task execution).
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[*2] and structured text (ST).
	Namespaces[*3]			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. Number of members: 2,048 max. 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.[*3]
		Unions	Function	A derivative data type that groups together data with different variable types. 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. Number of dimensions: 3 max. 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.
Motion control[*4]	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 synchronous absolute positioning[*1]	The function which output command positions in every control period in the position control mode.

Item				NJ☐ CPU Unit
Motion control[*4]	Single-axis	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 parameter[*1]	Specifying the parameter, a 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[*5]	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[*6]	The function which compensate the position for the axis in operation.
			Start velocity[*7]	You can set the initial velocity when axis motion starts.
	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.[*3]
		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.

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Item				NJ☐ CPU Unit
Motion control[4]	Axes groups	Auxiliary functions for multi-axes coordinated control	Reading axes group positions	The command current positions and actual current positions of an axes group can be read.[3]
			Changing the axes in a group	The composition axes parameter in the axes group parameters can be overwritten temporarily.[3]
	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[8]	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[8]	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 warning values for each axis and each axes group.
		Absolute encoder support		You can use an OMRON Accurax-G5 series servomotor with an absolute encoder to eliminate the need to perform homing at startup.
		Input signal logic inversion[7]		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 on below are used. 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		NJ5/NJ3: 192 max. NJ1: 64 max.
	CJ-series units	Maximum number of units		40
		Basic I/O units	Load short-circuit protection and I/O disconnection detection	Alarm information for basic I/O units is read.
Communications	Peripheral USB port			A port for communications with various kinds of support software running on a personal computer.
	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[8]	File can be read from or written to computers to other Ethernet nodes from the CPU unit. 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.

Item				NJ☐ CPU Unit
Communica-tions	EtherCAT port	Supported services	Process data communications	Control information is exchanged in cyclic communications between EtherCAT master and slaves.
			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[9]		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		SDO messages of the CAN application can be sent to slaves via EtherCAT.
		Supported application protocol	CoE	SDO messages that conform to the CANopen standard can be sent to slaves via EtherCAT.
	Communications instructions			The following instructions are supported: CIP communications instructions, socket communications instructions, SDO message instruc-tions, no-protocol communications instructions, protocol macro instructions and FTP client in-structions[8].
Operation management	RUN output contacts			The output on the power supply unit turns ON in RUN mode.
System management	Event logs	Function		Events are recorded in the logs.
		Number of events per event log		• System event log: NJ5: 1,024 max., NJ3/NJ1: 512 max. • Access event log: NJ5: 1,024 max., NJ3/NJ1: 512 max. • User-defined event log: NJ5: 1,024 max., NJ3/NJ1: 512 max.
Debugging	Online editing			Programs, function blocks, functions and global variables can be changed online. Different op-erators can change different POUs across a 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 units	64 max.
	MC test Run[10]			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[1]	Differentiation monitoring[1]		Rising/falling edge of contacts can be monitored.
		Number of contacts[1]		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		NJ5: 4 max[11]. NJ3/NJ1: 2 max.
		Number of records		10,000 max.
		Sampling	Number of sam-pled variables	NJ5: 192 variables max. NJ3/NJ1: 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 condi-tions	When BOOL variable changes to TRUE or FALSE. Comparison of non-BOOL variable with a constant. 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 error levels		Major fault, partial fault, minor fault, observation and information.
		User-defined errors	User-defined errors	User-defined errors are registered in advance and then records are created by executing in-structions.
			Levels	8 levels
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.[3]
		Verification of operation authority	Verification of operation authority	Online operations can be restricted by operation rights to prevent damage to equipment or in-juries that may be caused by operating mistakes.
			Number of groups	5[12]
		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).

Item				NJ☐ CPU Unit
SD memory card	Storage type			SD memory card, SDHC memory card
	Application	Automatic transfer from SD memory card[1]		The data in the autoload folder on an SD memory card is automatically loaded when the power supply to the controller is turned ON.
		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[1]	SD memory card backup functions	Operation	Using front switch	You can use front switch to backup, compare or restore data.
			Using system-defined variable	You can use system-defined variables to backup or compare data.
			Memory card operations dialog box	Backup and verification operations can be performed from the SD memory card operations dialog box on the Sysmac Studio.
			Using instruction[8]	Backup operation can be performed by using instruction.
		Protection	Backing up data to the SD memory card	Prohibit SD memory card backup functions.
	Sysmac Studio controller backup functions			Backup, restore and verification operations for units can be performed from the Sysmac Studio.

[1]. Supported only by the CPU units with unit version 1.03 or higher.
[2]. Inline ST is supported (Inline ST is ST that is written as an element in a ladder diagram).
[3]. Supported only by the CPU units with unit version 1.01 or higher.
[4]. The NJ101-90☐0 CPU unit doesn't support motion control.
[5]. Supported only by the CPU units with unit version 1.06 or higher.
[6]. Supported only by the CPU units with unit version 1.10 or higher.
[7]. Supported only by the CPU units with unit version 1.05 or higher.
[8]. Supported only by the CPU units with unit version 1.08 or higher.
[9]. For NJ301 CPU, supported only by the CPU units with unit version 1.10 or higher.
[10]. Cannot be used with the NJ101-90☐0 CPU unit.
[11]. Maximum number of simultaneous data trace of the NJ501-☐☐20 CPU unit version 1.08 or higher is 2.
[12]. When the NJ501 CPU units with unit version 1.00 is used, this value becomes two.

Function specifications for CPU units with robotics functionality

Item				NJ501-4☐☐0 CPU Unit
Robot control functions	Axes group	Multi-axes coordinated control	Robot parameter settings	Sets the parameters (such as kinematics type and link length) for the robot.
			Time-specified absolute positioning command	Moves the robot to a specified position in a specified time.
			Synchronization with conveyor	Makes the active TCP follow a workpiece on the conveyor performing the conveyor tracking function.
			Robot jog	Jogs a robot defined by an axes group according the selected target velocity, coordinate system and TCP.
			Transition mode and buffering	Select the method to use between robot instructions to perform smooth trajectories.
	Auxiliary functions	Multi-axes coordinated control	User coordinate system	Two types of coordinate systems, Machine Coordinate System (MCS) and User Coordinate System (UCS) can be used for robots.
			Robot tool	Defines multiple TCP's (Tool Center Point) for the robots.
			Inverse kinematics	Transforms the coordinate values (X, Y, Z) of the robot's TCP to the coordinate values of each axis.
		Monitoring functions	Monitor	Reads the current position and current velocity of the robot.
			Workspace check	Checks if the robot is moving within the definable working volume.

Function specifications for CPU units with database connection

Item		NJ501-□□20 CPU Unit	NJ101-□□20 CPU Unit
Supported port		Built-in EtherNet/IP port	
Supported DB		Microsoft Corporation: SQL Server 2008/2008 R2/2012/2014[1] Oracle Corporation: Oracle Database 10g/11g/12c[1] Oracle Corporation: MySQL Community Edition 5.1/5.5/5.6[2] International Business Machines Corporation (IBM): DB2 for Linux, UNIX and Windows 9.5/9.7/10.1/10.5 Firebird Foundation Incorporated: Firebird 2.1/2.5 The PostgreSQL Global Development Group: PostgreSQL 9.2/9.3/9.4[1]	
Number of DB connections (number of databases that can be connected at the same time)		3 connections max.[3]	
Instruction	Supported operations	The following operations can be performed by executing DB connection instructions in the NJ series CPU units. Inserting records (INSERT), updating records (UPDATE), retrieving records (SELECT) and deleting records (DELETE)	
	Number of columns in an INSERT/UPDATE/SELECT operations	SQL server: 1,024 columns max. Oracle: 1,000 columns max.	
	Number of records in the output of a SELECT operation	65,535 elements max. 4 MB max.	
Run mode of the DB connection service		Operation mode or Test mode: • Operation mode: When each instruction is executed, the service actually accesses the DB. • Test mode: When each instruction is executed, the service ends the instruction normally without accessing the DB actually.	
Spool function	Spool function	Used to store SQL statements when an error occurred and resend the statements when the communications are recovered from the error.	
	Spool capacity	1 MB[4]	192 KB[4]
Operation log function		The following three types of logs can be recorded: • Execution log: Log for tracing the executions of the DB connection service. • Debug log: Detailed log for SQL statement executions of the DB connection service. • SQL execution failure log: Log for execution failures of SQL statements in the DB.	
DB connection service shutdown function		Used to shut down the DB connection service after automatically saving the operation log files into the SD memory card.	

[1]. SQL Server 2014, Oracle Database 12c and PostgreSQL 9.2/9.3/9.4 are supported by DBCon version 1.02 or higher.
[2]. The supported storage engines of the DB are InnoDB and MyISAM.
[3]. When two or more DB connections are established, the operation cannot be guaranteed if you set different database types for the connections.
[4]. Refer to "NJ-Series database connection CPU units user's manual (W527)" for more information.

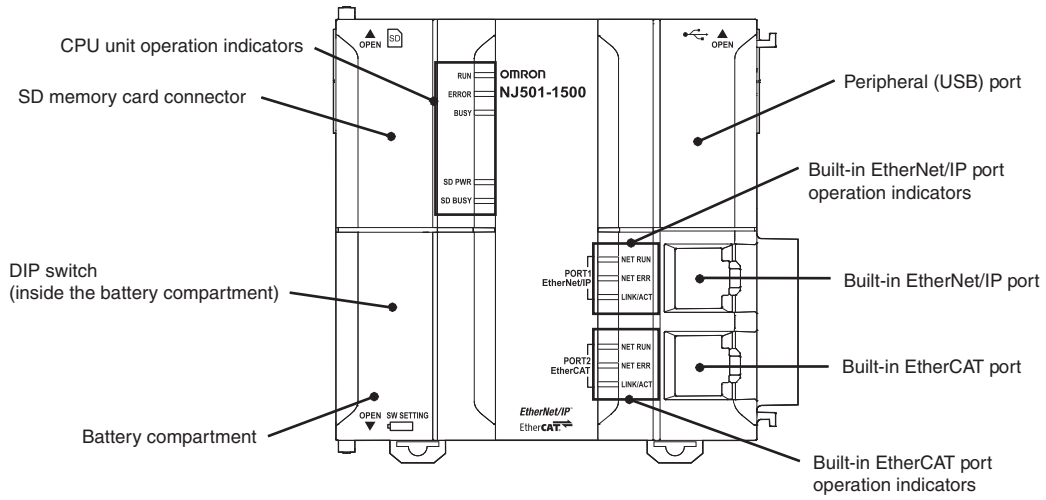## Function specifications for CPU units with SECS/GEM communications

Item	NJ501-1340 CPU Unit
Supported port	Built-in EtherNet/IP port
Supported standard[1]	The unit conforms to the following SEMI standards: E37-0303, E37.1-0702, E5-0707 and E30-0307
Fundamental GEM requirement	State model, equipment processing state, host-initiated S1, F13/F14 scenario, event notification, on-line identification, error message, control (operator initiated), documentation
Additional GEM capability	Establish communications, dynamic event report configuration, variable data collection, trace data collection, status data collection, alarm management, remote control, equipment constant, process recipe management[1], material movement, equipment terminal service, clock, limit monitoring, spooling[2], control (host initiated)
User defined message	You can create non-GEM compliant communication messages and have host communications
GEM specific instruction	The unit supports 29 instructions to perform the following: • Changing the GEM service status • Setting HSMS communications • Reporting events and alarms • Acknowledging host commands and enhanced remote commands • Changing equipment constants • Uploading and downloading process programs • Sending and acknowledging equipment terminal messages • Requesting to change time • Sending user-defined messages • Getting SECS communications log
GEM service log	Can record the following information: • HSMS communication log: Keeps log of HSMS communication operations • SECS message log: Keeps log of SECS-II communication messages • Execution log: Keeps log of executions of GEM instructions[2]
Shutting down the GEM service	Saves the spool data and GEM service log records into an SD memory card and ends the GEM service

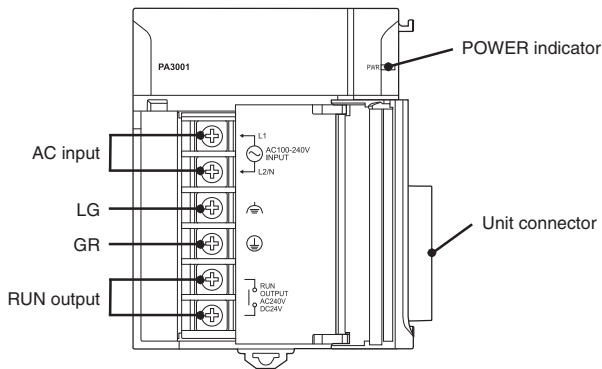[1]. E42 recipes, large process programs and E139 recipes are not supported.
[2]. The capability is not available when no SD memory card is mounted.

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NJ CPU unit

CPU unit operation indicators

SD memory card connector

DIP switch
(inside the battery compartment)

Battery compartment

Peripheral (USB) port

Built-in EtherNet/IP port
operation indicators

Built-in EtherNet/IP port

Built-in EtherCAT port

Built-in EtherCAT port
operation indicators

100 to 240 VAC power supply unit (NJ-PA3001)

POWER indicator

AC input

LG

GR

RUN output

Unit connector

24 VDC power supply unit (NJ-PD3001)

POWER indicator

+ (DC input)

– (DC input)

LG

GR

RUN output

Unit connector
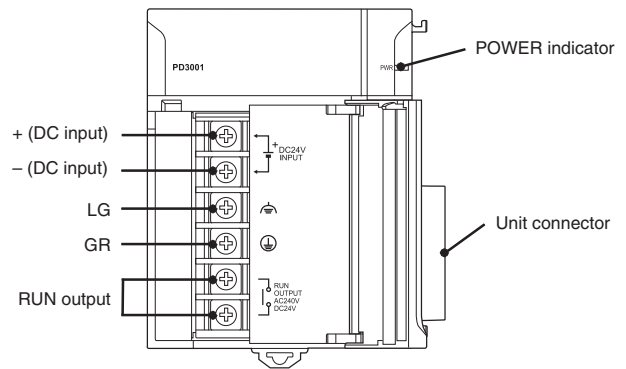
Dimensions

NJ-Series system (NJ-P□3001 + NJ□01-□□□□ + one I/O unit + CJ1W-TER01)
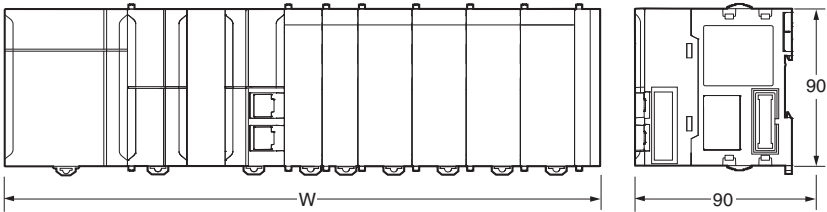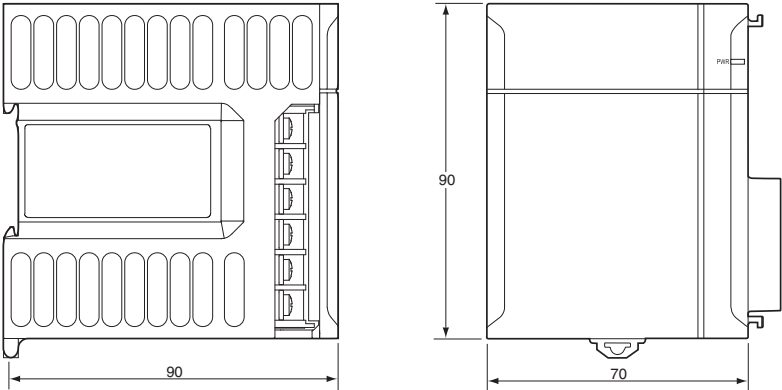
No. of units mounted with 31-mm width	Rack width (mm)
	With NJ CPU
1	205.7
2	236.7
3	267.7
4	298.7
5	329.7
6	360.7
7	391.7
8	422.7
9	453.7
10	484.7

Power supply unit (NJ-PA3001/PD3001)

NJ CPU unit   **End cover (CJ1W-TER01)**

CJ units

I/O connector   Fujitsu connector   MIL connector   M3 screw and screwless type connector
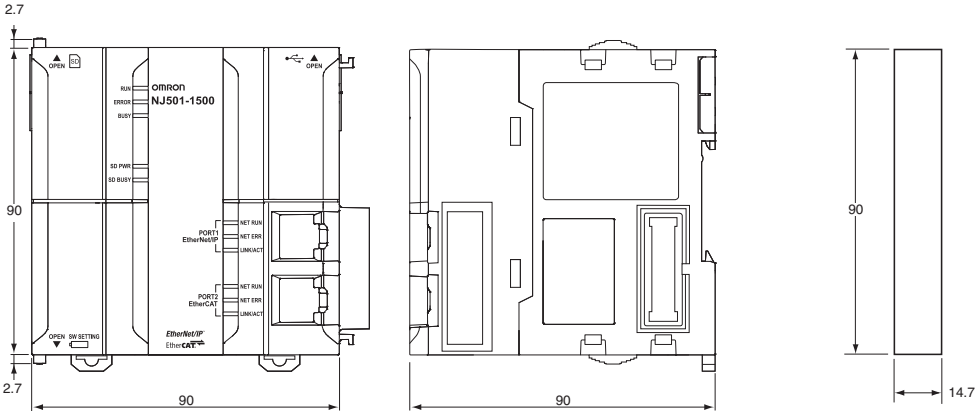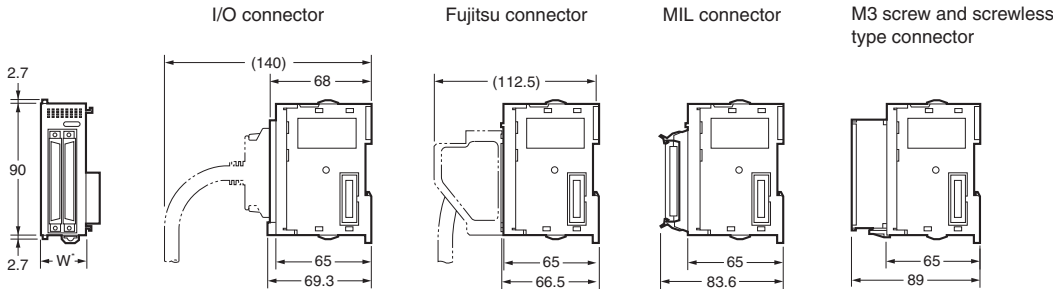
* Refer to the CJ unit tables in the ordering information section for the specific unit width.

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Mounting dimensions

(Units: mm)

DIN track model number	A
PFP-100N2	16 mm
PFP-100N	7.3 mm
PFP-50N	7.3 mm

Mounting height

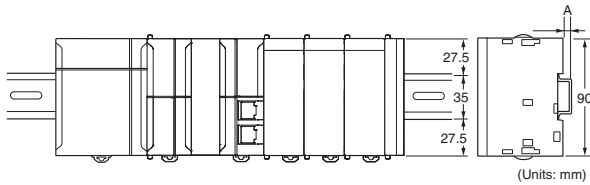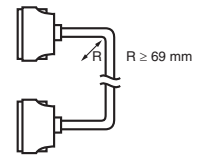Approx. 100 to 150 mm

90 mm

Expansion cable

R ≥ 69 mm

Note:
1. Consider the following points when expanding the configuration:
   - The total length of I/O connecting cable must not be exceed 12 m.
   - I/O Connecting cables require the bending radius indicates below.
2. Outer diameter of expansion cable: 8.6 mm.
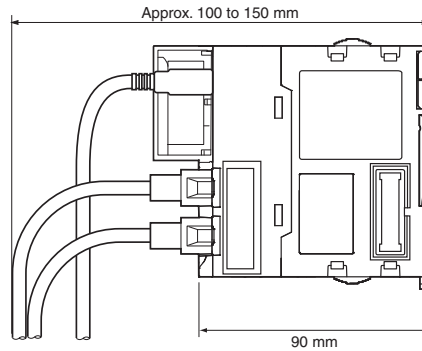
Power supply units current consumption

Checking current and power consumption

After selecting a power supply unit based on considerations such as the power supply voltage, calculate the current and power requirements for each rack.

Condition 1: Current requirements

There are two voltage groups for internal power consumption: 5 V and 24 V.
Current consumption at 5 V (internal logic power supply)
Current consumption at 24 V (relay driving power supply)

Condition 2: Power requirements

For each rack, the upper limits are determined for the current and power that can be provided to the mounted units. Design the system so that the total current consumption for all the mounted units does not exceed the maximum total power or the maximum current supplied for the voltage groups shown in the following tables.

The maximum current and total power supplied for CPU racks and expansion racks according to the power supply unit model are shown below.

Power supply units	Max. current supplied			(C) Max. total power supplied
	(A) 5 VDC CPU racks[*1]	(A) 5 VDC expansion rack	(B) 24 VDC	
NJ-PA3001	6.0 A	6.0 A	1.0 A	30 W
NJ-PD3001	6.0 A	6.0 A	1.0 A	30 W

[*1]. Including supply to the CPU unit.

Note:
1. For CPU racks, include the CPU unit current and power consumption in the calculations. When expanding, also include the current and power consumption of the I/O control unit in the calculations.
2. For expansion racks, include the I/O interface unit current and power consumption in the calculations.

Conditions 1 and 2 are below must be satisfied.

Condition 1: Maximum current
(1) Total unit current consumption at 5 V ≤ (A) value
(2) Total unit current consumption at 24 V ≤ (B) value

Condition 2: Maximum power
(1) × 5 V + (2) × 24 V ≤ (C) value

Example: Calculating total current and power consumption

When the following units are mounted to a NJ series CPU rack using a NJ-PA3001 power supply unit.

Unit type	Model	Quantity	Voltage group	
			5 V	24 V
CPU unit	NJ501-1500	1	1.90 A	–
I/O control unit	CJ1W-IC101	1	0.02 A	–
Basic I/O units (input units)	CJ1W-ID211	2	0.08 A	–
	CJ1W-ID231	2	0.09 A	–
Basic I/O units (output units)	CJ1W-OC201	2	0.09 A	0.048 A
Special I/O unit	CJ1W-DA041	1	0.12 A	–
CPU bus unit	CJ1W-SCU22	1	0.29 A	–
Current consumption	Total		1.90 A + 0.02 A + 0.08 A × 2 + 0.09 A × 2 + 0.09 A × 2 + 0.12 A + 0.29 A	0.048 A × 2
	Result		2.85 A (≤ 6.0 A)	0.096 A (≤ 1.0 A)
Power consumption	Total		2.85 A × 5 V = 14.25 W	0.096 A × 24 V = 2.3 W
	Result		14.25 W + 2.3 W = 16.55 W (≤ 30 W)	

Note: For details on unit current consumption, refer to ordering information.

Ordering information

NJ series system

NA HMI

SQL database

⑩ Sysmac Studio

Industrial switching hubs ⑧

⑨ Ethernet cable

EtherNet/IP

Microsoft SQL Server

NJ series

End cover
(included
with the CPU)

① NJ series power supply unit

② NJ series CPU unit

③ CJ series units

⑨ EtherCAT cable

EtherCAT

Accurax G5 servo drive

Safety over EtherCAT

NX I/O + NX safety distributed

⑦ EtherCAT junction Slave

MX2 inverter

FH vision

Accurax G5 servo motors

Accurax linear motors

NJ series expansion racks

NJ series CPU unit

④ I/O control unit

NJ series power supply unit

CPU rack

⑤ I/O interface unit

Units: 10 max.

⑥ I/O connecting cable

NJ series power supply unit

Expansion rack

⑤ I/O interface unit

Units: 10 max.

⑥ I/O connecting cable

NJ series power supply unit

Expansion rack

Up to 3 expansion racks

⑤ I/O interface unit

Units: 10 max.

⑥ I/O connecting cable

Total cable length ≤12 m

NJ series power supply unit

Expansion rack

Units: 10 max

NJ series machine controller

OMRON

Power supply units

Symbol	Name	Output capacity			RUN output	Model
		5 VDC	24 VDC	Total		
①	100 to 240 VAC power supply unit for NJ CPU	6.0 A	1.0 A	30 W	Supported	NJ-PA3001
	24 VDC power supply unit for NJ CPU					NJ-PD3001

Note: Power supply units for the CJ Series cannot be used as a power supply for a CPU rack of the NJ System or as a power supply for an expansion rack.

NJ series CPU units

Symbol	CPU	Program capacity	Variables capacity	Specifications	Functionalities					Number of axes	Model
					Sequence	Motion	DB connection	Robotics	SECS/ GEM		
②	NJ501	20 MB	2 MB: Retained 4 MB: Not retained	I/O capacity: 2,560 points	●	●	●			64	NJ501-1520
					●	●	●			32	NJ501-1420
				CPU rack: 10 units max.	●	●	●			16	NJ501-1320
				Expansion rack:	●	●	●	●		16	NJ501-4320
				10 units max.	●	●		●		64	NJ501-4500
				(Up to 3 expansion racks)	●	●		●		32	NJ501-4400
					●	●		●		16	NJ501-4300
				40 units max. per system (CPU rack + 3 expansion racks)	●	●		●		16	NJ501-4310[1]
					●	●			●	16	NJ501-1340
				Current consumption: 1.90 A at 5 VDC	●	●				64	NJ501-1500
					●	●				32	NJ501-1400
					●	●				16	NJ501-1300
	NJ301	5 MB	0.5 MB: Retained 2 MB: Not retained		●	●				8	NJ301-1200
					●	●				4	NJ301-1100
	NJ101	3 MB			●	●	●			2	NJ101-1020
					●		●			0	NJ101-9020
					●	●				2	NJ101-1000
					●					0	NJ101-9000

[1]. The NJ501-4310 CPU unit only supports one Delta robot.

Note: The end cover unit CJ1W-TER01 is included with the CPU unit.

CJ series digital I/O units

Symbol	Points	Type	Rated voltage	Rated current	Width	Remarks	Current consumption (A)		Connection type	Model
							5 VDC	24 VDC		
③	8	AC input	240 VAC	10 mA	31 mm	–	0.08	–	M3	CJ1W-IA201
	16		120 VAC	7 mA	31 mm	–	0.09	–	M3	CJ1W-IA111
	8	DC input	24 VDC	10 mA	31 mm	–	0.08	–	M3	CJ1W-ID201
	16		24 VDC	7 mA	31 mm	–	0.08	–	M3	CJ1W-ID211
					31 mm				Screwless	CJ1W-ID211(SL)
	16		24 VDC	7 mA	31 mm	Fast-response (15 μs is ON, 90 μs is OFF)	0.13	–	M3	CJ1W-ID212
	16		24 VDC	7 mA	31 mm	Inputs start interrupt tasks in PLC program	0.08	–	M3	CJ1W-INT01
	16		24 VDC	7 mA	31 mm	Latches pulses down to 50 μs pulse width	0.08	–	M3	CJ1W-IDP01
	32		24 VDC	4.1 mA	20 mm	–	0.09	–	Fujitsu	CJ1W-ID231
	32		24 VDC	4.1 mA	20 mm	–	0.09	–	MIL	CJ1W-ID232
	32		24 VDC	4.1 mA	20 mm	Fast-response (15 μs is ON, 90 μs is OFF)	0.20	–	MIL	CJ1W-ID233
	64		24 VDC	4.1 mA	31 mm	–	0.09	–	Fujitsu	CJ1W-ID261
	64		24 VDC	4.1 mA	31 mm	–	0.09	–	MIL	CJ1W-ID262
	8	Triac output	250 VAC	0.6 mA	31 mm	–	0.22	–	M3	CJ1W-OA201
	8	Relay contact output	250 VAC	2 A	31 mm	–	0.09	0.048	M3	CJ1W-OC201
					31 mm				Screwless	CJ1W-OC201(SL)
	16		250 VAC	2 A	31 mm	–	0.11	0.096	M3	CJ1W-OC211
					31 mm				Screwless	CJ1W-OC211(SL)
	8	DC output (sink)	12 to 24 VDC	2 A	31 mm	–	0.09	–	M3	CJ1W-OD201
	8		12 to 24 VDC	0.5 A	31 mm	–	0.10	–	M3	CJ1W-OD203
	16		12 to 24 VDC	0.5 A	31 mm	–	0.10	–	M3	CJ1W-OD211
					31 mm				Screwless	CJ1W-OD211(SL)
	16		24 VDC	0.5 A	31 mm	Fast-response (15 μs is ON, 80 μs is OFF)	0.15	–	M3	CJ1W-OD213
	32		12 to 24 VDC	0.5 A	20 mm	–	0.14	–	Fujitsu	CJ1W-OD231
	32		12 to 24 VDC	0.5 A	20 mm	–	0.14	–	MIL	CJ1W-OD233
	32		24 VDC	0.5 A	20 mm	Fast-response (15 μs is ON, 80 μs is OFF)	0.22	–	MIL	CJ1W-OD234
	64		12 to 24 VDC	0.3 A	31 mm	–	0.17	–	Fujitsu	CJ1W-OD261
	64		12 to 24 VDC	0.3 A	31 mm	–	0.17	–	MIL	CJ1W-OD263
	8	DC output (source)	24 VDC	2 A	31 mm	Short-circuit protection	0.11	–	M3	CJ1W-OD202
	8		24 VDC	0.5 A	31 mm	Short-circuit protection	0.10	–	M3	CJ1W-OD204
	16		24 VDC	0.5 A	31 mm	Short-circuit protection	0.10	–	M3	CJ1W-OD212
					31 mm				Screwless	CJ1W-OD212(SL)
	32		24 VDC	0.5 A	20 mm	Short-circuit protection	0.15	–	MIL	CJ1W-OD232
	64		12 to 24 VDC	0.3 A	31 mm	–	0.17	–	MIL	CJ1W-OD262
	16 + 16	DC in + out (sink)	24 VDC	0.5 A	31 mm	–	0.13	–	Fujitsu	CJ1W-MD231
	16 + 16		24 VDC	0.5 A	31 mm	–	0.13	–	MIL	CJ1W-MD233
	32 + 32		24 VDC	0.3 A	31 mm	–	0.14	–	Fujitsu	CJ1W-MD261
	32 + 32		24 VDC	0.3 A	31 mm	–	0.14	–	MIL	CJ1W-MD263

Symbol	Points	Type	Rated voltage	Rated current	Width	Remarks	Current consumption (A) 5 VDC	24 VDC	Connection type	Model
③	16 + 16	DC in + out (source)	24 VDC	0.5 A	31 mm	–	0.13	–	MIL	CJ1W-MD232
	32 + 32	DC in + out (TTL)	5 VDC	35 mA	31 mm	–	0.19	–	MIL	CJ1W-MD563

Note: MIL = Connector according to MIL-C-83503 (compatible with DIN 41651/IEC 60603-1).

CJ series analogue I/O and control units

Symbol	Points	Type	Ranges	Resolution	Accuracy[*1]	Conversion time	Width	Remarks	Current (A) 5 V	24 V	Connection type	Model
③	4	Universal analogue input	0 to 5 V, 1 to 5 V, 0 to 10 V, 0 to 20 mA, 4 to 20 mA, K, J, T, L, R, S, B, Pt100, Pt1000, JPt100	V/I: 1/12,000 T/C: 0.1°C RTD: 0.1°C	V: 0.3% I: 0.3% T/C: 0.3% RTD: 0.3%	250 ms/ 4 points	31 mm	Universal inputs, with zero/span adjustment, configurable alarms, scaling, sensor error detection	0.32	–	M3	CJ1W-AD04U
											Screwless	CJ1W-AD04U(SL)
	4	Analogue input	0 to 5 V, 0 to 10 V, –10 to 10 V, 1 to 5 V, 4 to 20 mA	1/8,000	V: 0.2% I: 0.4%	250 μs/point	31 mm	Offset/gain adjustment, peak hold, moving average, alarms	0.42	–	M3	CJ1W-AD041-V1
											Screwless	CJ1W-AD041-V1(SL)
	4	High-speed analogue input	1 to 5 V, 0 to 10 V, –5 to 5 V, –10 to 10 V, 4 to 20 mA	1/40,000	V: 0.2% I: 0.4%	35 μs/4 points	31 mm	Direct conversion (CJ2H special instruction)	0.52	–	M3	CJ1W-AD042
	8	Analogue input	1 to 5 V, 0 to 10 V, –10 to 10 V, 1 to 5 V, 4 to 20 mA	1/8,000	V: 0.2% I: 0.4%	250 μs/point	31 mm	Offset/gain adjustment, peak hold, moving average, alarms	0.42	–	M3	CJ1W-AD081-V1
											Screwless	CJ1W-AD081-V1(SL)
	2	Analogue output	0 to 5 V, 0 to 10 V, –10 to 10 V, 1 to 5 V, 4 to 20 mA	1/4,000	V: 0.3% I: 0.5%	1 ms/point	31 mm	Offset/gain adjustment, output hold	0.12	0.14	M3	CJ1W-DA021
											Screwless	CJ1W-DA021(SL)
	4	Analogue output	1 to 5 V, 0 to 10 V, –10 to 10 V, 1 to 5 V, 4 to 20 mA	1/4,000	V: 0.3% I: 0.5%	1 ms/point	31 mm	Offset/gain adjustment, output hold	0.12	0.2	M3	CJ1W-DA041
											Screwless	CJ1W-DA041(SL)
	4	High-speed analogue output	1 to 5 V, 0 to 10 V, –10 to 10 V	1/40,000	0.3%	35 μs/4 points	31 mm	Direct conversion (CJ2H special instruction)	0.40	–	M3	CJ1W-DA042V
	8	Voltage output	1 to 5 V, 0 to 10 V, –10 to 10 V, 1 to 5 V	1/8,000	0.3%	250 μs/point	31 mm	Offset/gain adjustment, output hold	0.14	0.14	M3	CJ1W-DA08V
											Screwless	CJ1W-DA08V(SL)
	8	Current output	4 to 20 mA	1/8,000	0.5%	250 μs/point	31 mm	Offset/gain adjustment, output hold	0.14	0.17	M3	CJ1W-DA08C
											Screwless	CJ1W-DA08C(SL)
	4 + 2	Analogue in + out	1 to 5 V, 0 to 10 V, –10 to 10 V, 1 to 5 V, 4 to 20 mA	1/8,000	in: 0.2% out: 0.3%	1 ms/point	31 mm	Offset/gain adjustment, scaling, peak hold, moving average, alarms, output hold	0.58	–	M3	CJ1W-MAD42
											Screwless	CJ1W-MAD42(SL)
	4	Universal analogue input	DC voltage, DC current, thermocouple, Pt100/Pt1000, potentiometer	1/256,000	0.05%	60 ms/4 points	31 mm	All inputs individually isolated, configurable alarms, maintenance functions, user-defined scaling, zero/span adjustment	0.30	–	M3	CJ1W-PH41U
	2	Process input	4 to 20 mA, 0 to 20 mA, 0 to 10 V, –10 to 10 V, 0 to 5 V, –5 to 5 V, 1 to 5 V, 0 to 1.25 V, 1.25 to 1.25 V	1/64,000	0.05%	5 ms/point	31 mm	Configurable alarms, maintenance functions, user-defined scaling, zero/span adjustment, square root, totaliser	0.18	0.09	M3	CJ1W-PDC15
	6	Temperature control loops, thermocouple	K-type (–200 to 1,300°C) J-type (–100 to 850°C)	0.1°C	0.5%	40 ms/point	31 mm	Basic I/O unit, setup by DIP switches, adjustable filtering 10/50/60 Hz	0.22	–	M3	CJ1W-TS561
											Screwless	CJ1W-TS561(SL)
	6	Temperature control loops	Pt100 (–200 to 650°C) Pt1000 (–200 to 650°C)	0.1°C	0.5%	40 ms/point	31 mm	Basic I/O unit, setup by DIP switches, adjustable filtering 10/50/60 Hz	0.25	–	M3	CJ1W-TS562
											Screwless	CJ1W-TS562(SL)
	2	Temperature control loops, thermocouple	B, J, K, L, R, S, T	0.1°C	0.3%	500 ms total	31 mm	Open collector NPN outputs	0.25	–	M3	CJ1W-TC003

Symbol	Points	Type	Ranges	Resolution	Accuracy[1]	Conversion time	Width	Remarks	Current (A) 5 V	24 V	Connection type	Model
③	2	Temperature control loops, thermocouple	B, J, K, L, R, S, T	0.1°C	0.3%	500 ms total	31 mm	Open collector PNP outputs	0.25	–	M3	CJ1W-TC004
	2	Temperature control loops	Pt100, JPt100	0.1°C	0.3%	500 ms total	31 mm	Open collector NPN outputs	0.25	–	M3	CJ1W-TC103
	2	Temperature control loops	Pt100, JPt100	0.1°C	0.3%	500 ms total	31 mm	Open collector PNP outputs	0.25	–	M3	CJ1W-TC104

[1]. Accuracy for voltage and current inputs/outputs as percentage of full scale and typical value at 25°C ambient temperature (consult the operation manual for details)
Accuracy for temperature inputs/outputs as percentage of process value and typical value at 25°C ambient temperature (consult the operation manual for details)

CJ series special I/O units

Symbol	Channels	Type	Signal type	Width	Remarks	Current consumption (A) 5 V	24 V	Connection type	Model
③	2	500 kHz Counter	24 V, line driver	31 mm	2 configurable digital inputs + outputs	0.28	–	Fujitsu	CJ1W-CT021
	4	100 kHz Counter	Line driver, 24 V via terminal block		Target values trigger interrupt to CPU	0.32	–	1 × MIL (40 pt)	CJ1W-CTL41-E

CJ series communication units

Symbol	Type	Ports	Data transfer	Protocols	Width	Current consumption (A) 5 V	24 V	Connection type	Model
③	Serial communications units	2 × RS-232C	High-speed	CompoWay/F, host link, NT link, Modbus, user-defined	31 mm	0.29	–	9 pin D-Sub	CJ1W-SCU22
		2 × RS-422A/RS-485			31 mm	0.46	–	9 pin D-Sub	CJ1W-SCU32
		1 × RS-232C + 1 × RS-422A/RS-485			31 mm	0.38	–	9 pin D-Sub	CJ1W-SCU42
	EtherNet/IP	1 × 100 Base-Tx	–	EtherNet/IP, UDP, TCP/IP, FTP server, SNTP, SNMP	31 mm	0.41	–	RJ45	CJ1W-EIP21[1]
	EtherCAT	2 × 100 Base-Tx	–	EtherCAT	31 mm	0.34	–	RJ45	CJ1W-ECT21[2]
	DeviceNet	1 × CAN	–	DeviceNet	31 mm	0.29	–	5-p detachable	CJ1W-DRM21
	CompoNet	4-wire, data + power to slaves (Master)	–	CompoNet (CIP-based)	31 mm	0.4	–	4-p detachable IDC or screw	CJ1W-CRM21[3]
	PROFIBUS-DP	1 × RS-485 (Master)	–	DP, DPV1	31 mm	0.40	–	9 pin D-Sub	CJ1W-PRM21
		1 × RS-485 (Slave)	–	DP	31 mm	0.40	–		CJ1W-PRT21
	PROFINET-IO	1 × 100 Base-Tx	–	PROFINET-IO controller, FINS/UDP	31 mm	0.42	–	RJ45	CJ1W-PNT21
	RS-422A converter accessory	RS-232C to RS-422A/RS-485 signal converter. Mounts directly on serial port						9 pin D-Sub to screw clamp terminals	CJ1W-CIF11

[1]. Supported only by the EtherNet/IP units with unit version 2.1 or higher, CPU units with unit version 1.01 or higher and the Sysmac Studio version 1.02 or higher.
[2]. Supported only by the CPU units with unit version 1.10 or higher and the Sysmac Studio version 1.13 or higher.
[3]. Supported only by the CPU units with unit version 1.01 or higher and the Sysmac Studio version 1.02 or higher.

CJ series ID sensor units

Symbol	Type	Specifications				Current consumption (A)		Model
		Connected ID systems	No. of connected R/W heads	External power supply	No. of unit numbers allocated	5 V	24 V	
③	ID sensor units	V680-Series RFID system	1	Not required	1	0.26[1]	0.13[1]	CJ1W-V680C11
			2		2	0.32	0.26	CJ1W-V680C12

[1]. To use a V680-H01 antenna, refer to the V680 Series RFID system catalog (Cat. No. Q151)
Note: The data transfer function using intelligent I/O commands can not be used.

Expansion racks

CJ series I/O control unit (mounted on CPU rack when connecting expansion racks)

Symbol	Name	Connecting cable	Connected Unit	Width	Current consumption (A) 5 V	24 V	Model
④	CJ-Series I/O control unit	CS1W-CN☐☐3	CJ1W-II101	20 mm	0.02 A	–	CJ1W-IC101

Note: Mount to the right of the power supply unit.

CJ series I/O interface unit (mounted on expansion rack)

Symbol	Name	Connecting cable	Width	Current consumption (A) 5 V	24 V	Model
⑤	CJ-Series I/O interface unit	CS1W-CN☐☐3	31 mm	0.13 A	-	CJ1W-II101

Note: Mount to the right of the power supply unit.

I/O connecting cables

Symbol	Name	Specifications		Model
⑥	I/O connecting cable	• Connects an I/O control unit on NJ series CPU rack to an I/O interface unit on a NJ series expansion rack. or • Connects an I/O interface unit on NJ series expansion rack to an I/O interface unit on another NJ series expansion rack.	Cable length: 0.3 m	CS1W-CN313
			Cable length: 0.7 m	CS1W-CN713
			Cable length: 2 m	CS1W-CN223
			Cable length: 3 m	CS1W-CN323
			Cable length: 5 m	CS1W-CN523
			Cable length: 10 m	CS1W-CN133
			Cable length: 12 m	CS1W-CN133-B2

EtherCAT junction slave

Symbol	Name	No. of ports	Power supply voltage	Current consumption (A)	Dimensions (W × D × H)	Weight	Model	Appearance
⑦	EtherCAT junction slave	3	20.4 to 28.8 VDC (24 VDC −15 to 20%)	0.08	25 mm × 78 mm × 90 mm	165 g	GX-JC03	
		6		0.17	48 mm × 78 mm × 90 mm	220 g	GX-JC06	

Note: 1. Please do not connect EtherCAT junction slave with OMRON position control unit, Model CJ1W-NC☐81/☐82.
2. EtherCAT junction slave cannot be used for Ethernet/IP and Ethernet.

Industrial switching hubs

Symbol	Specifications			Accessories	Current consumption (A)	Model	Appearance
	Functions	No. of ports	Failure detection				
⑧	Quality of Service (QoS): EtherNet/IP control data priority. Failure detection: Broadcast storm and LSI error detection 10/100 BASE-TX, Auto-Negotiation	3	No	Power supply connector	0.22	W4S1-03B	
		5	No			W4S1-05B	
		5	Yes	Power supply connector and connector for informing error		W4S1-05C	

Recommended EtherCAT and EtherNet/IP communication cables
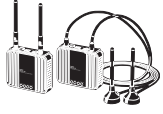
Symbol	Item			Manufacturer	Colour	Cable length (m)	Model
⑨	Ethernet patch cable	Cat 6a, AWG27, 4-pair cable Cable sheath material: LSZH[*1] **Note:** This cable is available in yellow, green and blue colours.	Standard type Cable with connectors on both ends (RJ45/RJ45)	OMRON	Yellow	0.2	XS6W-6LSZH8SS20CM-Y
						0.3	XS6W-6LSZH8SS30CM-Y
						0.5	XS6W-6LSZH8SS50CM-Y
						1	XS6W-6LSZH8SS100CM-Y
						1.5	XS6W-6LSZH8SS150CM-Y
						2	XS6W-6LSZH8SS200CM-Y
						3	XS6W-6LSZH8SS300CM-Y
						5	XS6W-6LSZH8SS500CM-Y
						7.5	XS6W-6LSZH8SS750CM-Y
						10	XS6W-6LSZH8SS1000CM-Y
						15	XS6W-6LSZH8SS1500CM-Y
						20	XS6W-6LSZH8SS2000CM-Y
					Green	0.2	XS6W-6LSZH8SS20CM-G
						0.3	XS6W-6LSZH8SS30CM-G
						0.5	XS6W-6LSZH8SS50CM-G
						1	XS6W-6LSZH8SS100CM-G
						1.5	XS6W-6LSZH8SS150CM-G
						2	XS6W-6LSZH8SS200CM-G
						3	XS6W-6LSZH8SS300CM-G
						5	XS6W-6LSZH8SS500CM-G
						7.5	XS6W-6LSZH8SS750CM-G
						10	XS6W-6LSZH8SS1000CM-G
						15	XS6W-6LSZH8SS1500CM-G
						20	XS6W-6LSZH8SS2000CM-G
		Cat 5, AWG26, 4-pair cable Cable sheath material: PUR[*1]	Standard type Cable with connectors on both ends (RJ45/RJ45)		Green	0.5	XS6W-5PUR8SS50CM-G
						1	XS6W-5PUR8SS100CM-G
						1.5	XS6W-5PUR8SS150CM-G
						2	XS6W-5PUR8SS200CM-G
						3	XS6W-5PUR8SS300CM-G
						5	XS6W-5PUR8SS500CM-G
						7.5	XS6W-5PUR8SS750CM-G
						10	XS6W-5PUR8SS1000CM-G
						15	XS6W-5PUR8SS1500CM-G
						20	XS6W-5PUR8SS2000CM-G

Symbol	Item			Manufacturer	Colour	Cable length (m)	Model
⑨	Ethernet patch cable	Cat5, AWG22, 2-pair cable	Rugged type Cable with connectors on both ends (RJ45/RJ45)	OMRON	Grey	0.3	XS5W-T421-AMD-K
						0.5	XS5W-T421-BMD-K
						1	XS5W-T421-CMD-K
						2	XS5W-T421-DMD-K
						3	XS5W-T421-EMD-K
						5	XS5W-T421-GMD-K
						10	XS5W-T421-JMD-K
						15	XS5W-T421-KMD-K
			Rugged type Cable with connectors on both ends (M12 straight/RJ45)		Grey	0.3	XS5W-T421-AMC-K
						0.5	XS5W-T421-BMC-K
						1	XS5W-T421-CMC-K
						2	XS5W-T421-DMC-K
						3	XS5W-T421-EMC-K
						5	XS5W-T421-GMC-K
						10	XS5W-T421-JMC-K
						15	XS5W-T421-KMC-K
			Rugged type Cable with connectors on both ends (M12 L right angle/RJ45)		Grey	0.3	XS5W-T422-AMC-K
						0.5	XS5W-T422-BMC-K
						1	XS5W-T422-CMC-K
						2	XS5W-T422-DMC-K
						3	XS5W-T422-EMC-K
						5	XS5W-T422-GMC-K
						10	XS5W-T422-JMC-K
						15	XS5W-T422-KMC-K
	Ethernet installation cable	Cat 5, SF/UTP, 4 × 2 × AWG 24/1 (solid core), Polyurethane (PUR)		Weidmüller	Green	100	WM IE-5IC4x2xAWG24/1-PUR
		Cat 5, SF/UTP, 4 × 2 × AWG 26/7 (stranded core), Polyurethane (PUR)			Green	100	WM IE-5IC4x2xAWG26/7-PUR
	Connectors	RJ45 metallic connector For AWG22 to AWG26			–	–	WM IE-T0-RJ45-FH-BK
		RJ45 plastic connector For AWG22 to AWG24		OMRON	–	–	XS6G-T421-1
	RJ45 socket	DIN-rail mount socket to terminate installation cable in the cabinet		Weidmüller	–	–	WM IE-T0-RJ45-FJ-B

*1. The lineup features low smoke zero halogen cables for in-cabinet use and PUR cables for out-of-cabinet use.

Note: Please be careful while cable processing, for EtherCAT, connectors on both ends should be shield connected and for EtherNet/IP, connectors on only one end should be shield connected.

WE70 FA wireless LAN units

Name	Area	Type	Model	Appearance
WE70 FA wireless LAN units	Europe	Access point (Master)	WE70-AP-EU	
		Client (Slave)	WE70-CL-EU	
Directional magnetic-base antenna		1 set with two antennas, 2.4 GHz/5 GHz Dual-band compatible	WE70-AT001H	
DIN rail mounting bracket		For TH35 7.5	WT30-FT001	
		For TH35 15	WT30-FT002	
Antenna extension cable		5 m	WE70-CA5M	

Note: Special versions are available for USA, Canada, China and Japan.

NJ series options and accessories

Specifications		Model	Appearance
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 track (2 pieces are included with the CPU unit and I/O interface unit)		PFP-M (2 pcs)	
Battery for NX7/NJ CPU unit (The battery is included with the CPU unit)		CJ1W-BAT01	
End cover (The end cover is included with each CPU unit and I/O interface unit)		CJ1W-TER01	

Computer software

Symbol	Specifications		Model
⑩	Sysmac Studio[*1][*2]		SYSMAC-SE2☐☐[*3]
	License for the SECS/GEM configurator[*4]	Software to make HSMS, SECSII and GEM settings for the NJ501 CPU units with SECS/GEM communications	WS02-GCTL1

[*1]. For the NJ101-☐000 CPU units, Sysmac Studio version 1.13 or higher is needed.
[*2]. For the NJ101-☐020 CPU units (with database connection), Sysmac Studio version 1.14 or higher is needed.
[*3]. Refer to the Sysmac Studio datasheet (Cat. No. SysCat_I181E) for detailed information or contact your OMRON representative.
[*4]. SECS/GEM configurator files are included in the Sysmac Studio standard edition DVD.

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