

# THE CP1 FAMILY

Compact machine controllers



» Fast programming with Function Blocks

» Flexible Ethernet connectivity

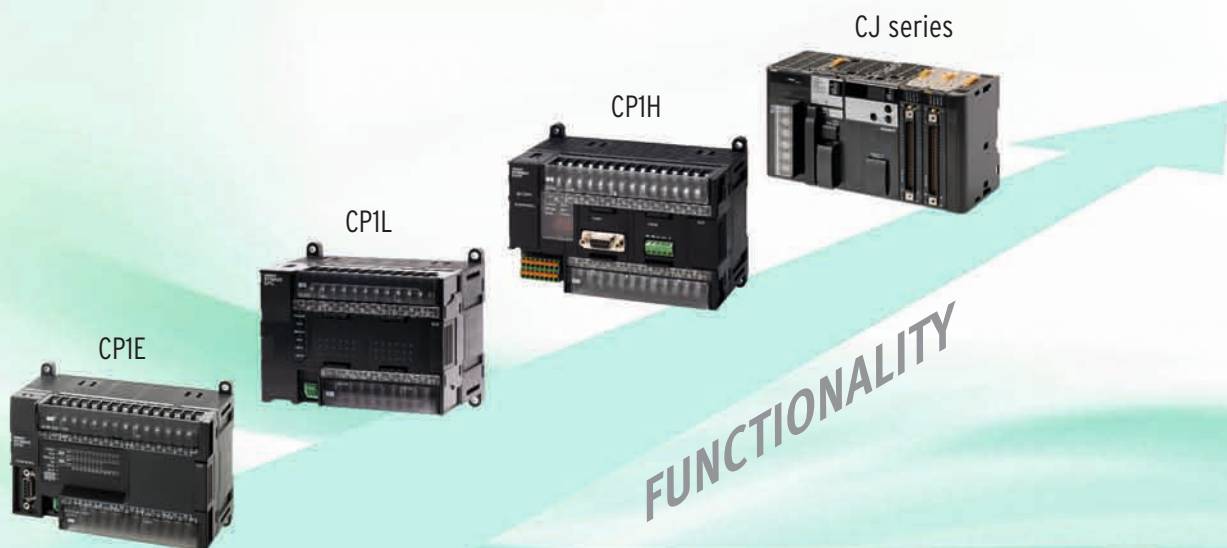
» Easy positioning functionality

# Think big... start small!

*Omron's vast experience in the field of industrial automation has resulted in the creation of the right products for your applications, ranging from simple to more complex automation solutions. The CP1 family of programmable controllers provides you with a complete product line-up to automate compact machines and perform any other simple automation tasks, quickly and easily. Programming and operation are consistent with Omron's other modular Programmable controllers. And you are guaranteed the same high quality and reliability that you expect from any Omron product, ensuring that your equipment keeps on giving continuous dependable performance.*

## Scalable solution

The CP1 family is scalable; this means that you can choose the products with the right level of sophistication to meet your automation needs in terms of functionality, flexibility and pricing. Each of the CP1 family models, the CP1E, CP1L and CP1H, offers the functionality required for complete machine control. Benefits include: easy expansion of I/O, fast and versatile communication, and full positioning capabilities via ready-to-use Function Blocks. The CP1 family uses the same instruction set and professional programming software found in Omron's other modular Programmable controllers.





## Answering your needs... precisely

### Fast and versatile communication

Flexible, fast and yet cost-effective communication is essential in today's competitive market. This applies in particular to compact Programmable controllers, which not only need to connect with devices inside the machine, but also outside the machine for operating, data-logging and remote access. With this in mind, Omron has given the CP1 family excellent communication capabilities for both serial and Ethernet networking. In addition, Omron provides flexible and economical option boards for serial communication.

### Flexible Ethernet connectivity

To meet communication needs over different protocols simultaneously and to easily connect for remote access, our latest CP1L Programmable controller features embedded Ethernet with socket services functionality. This offers, among other things, programmable connectivity to third-party devices and makes this outstanding product the best-in-class machine controller on the market.

### Easy positioning functions

The CP1 family is designed to fulfill position control tasks. Up to four axes of servo-drives can be controlled with high-speed pulse outputs, while high-speed pulse inputs can allow the connection of up to four encoders. Control is easily achieved with Function Block or standard functions without the need of specialist motion boards or expansion units. Furthermore, thanks to its fast serial ports, the CP1 family is also capable of performing simple positioning tasks. With the use of Modbus Function Blocks, up to 31 inverters can be controlled and monitored in real-time.

## Easy positioning, quick results

*The CP1 family is the perfect choice for any application that requires positioning. Whether for conveyor control, point-to-point position control, or non-interpolated pick-and-place systems, the combination of high-speed pulse outputs, variable speed drive control and position feedback will provide all the functionality that you need for your application.*

### **Ideal for position control**

When simplicity and ease of use are essential, there is no better solution for your position applications than combining the CP1 family with servos and inverters from Omron's extensive range. The SmartStep 2 servo drive is a perfect partner and offers high performance while keeping things simple and cost effective. Omron provides standard functions and Function Blocks for SmartStep 2 and other servo drives to create your application with minimal effort.

### **Easy variable speed drive control**

Variable speed drive control is made easy within the CP1 family by using the serial port(s) and the Easy Modbus Master feature for high-speed communication. Omron Function Blocks enable you to control and monitor up to 31 inverters in real-time simply by configuration of parameters. With the encoders connected to the high-speed counter inputs, the CP1 is able to calculate the exact position to perform accurate positioning easily and quickly. In addition, in the MX2 inverter series, all simple positioning is handled within the drive itself.





## Saving you time

For many standard functions Omron provide ready-to-use and tested Function Blocks that allow you to reduce your programming and testing time. With Function Blocks you achieve faster, easier and more structured programming that can also increase machine functionality. Ladder programming still remains the easiest language for many people to use, but for more complex mathematical calculations 'Structured Text' (ST) offers greater flexibility. These languages are supported in the CP1L and CP1H. Omron's software is renowned for its ease of use and intuitive style and CX-One is no exception.

## Flexible Ethernet connectivity

### As simple and quick- as USB!

Thanks to the CP1L-EM's or CP1L-EL's Automatic-Connect function, programming over Ethernet is as simple as using USB on the other models in the CP1 family. This means that you don't need to waste time adjusting the Ethernet settings on the PC, but that you can simply plug and connect, just like USB. The Automatic-Connect function connects instantly over a default IP address to the CP1L, saving you valuable set-up time.

### Versatile communication

Omron's CP1L Ethernet models are equipped as standard with Socket Services. This facilitates the easy exchange of data with other Ethernet devices supporting a dedicated protocol. The Socket Services reduce effort and simplify programming and allow Ethernet protocols to be used directly from your Programmable controller program. Ethernet can also be used for applications that require remote access functionality, such as a secure VPN connection with a standard router.

#### Omron network



Wireless Ethernet



CP1 Programmable controller



Operate and Monitoring



#### Socket Service



Remote access



Data Logging



Modbus/TCP

## More options – greater possibilities!

### More analog I/Os

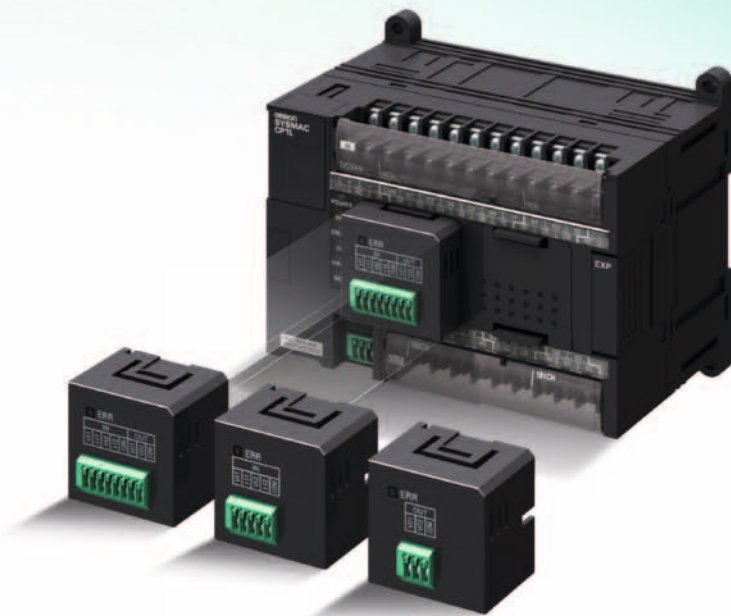
In addition to the two standard embedded analog inputs, Omron's CP1L with embedded Ethernet also supports three new, optional analog I/O boards. These enable you to add extra analog inputs and outputs, and mixed inputs/outputs at minimum cost and without the need for more cabinet space. With its analog I/O modules, auto-tuning PID function, the CP1 is ideal for accurate process control.

Note: Only for CP1L-EM / EL and CP1E N30/40/60 or NA20 CPU Units version 1.2 or later.

### CP1 family features at a glance

- 10to60I/Obasemodels,expandableto320I/Opoints
- Digital, analog and temperature sensor I/O expansion units
- 4 to 6 High-speed encoder inputs and 2 to 4 high-speed pulse outputs
- Modbus Master feature for easy inverter or temperature control
- Analog I/O option boards and auto-tuning PID for accurate process control
- OptionalboardsforRS-232/RS-422/485/Ethernetor LCD display
- Ladder diagram, Function Block or Structured Text programming
- PowerfulinstructionscommonwithinOmron'smodular Programmable controller series
- USB or Ethernet port – no special cables needed
- No-Battery mode operation – retains the program and data

Note: The functions that are supported depend on the model.

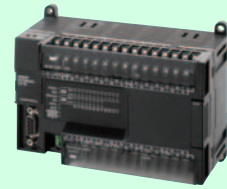


### Expansion units for more flexibility

An analog unit with up to four embedded analog inputs and four outputs achieves a high resolution of 12,000. A wide variety of temperature sensor units are available including: multi-input (thermocouple and analog inputs), platinum-resistance thermometer input, and thermocouple input models. Units with up to 12 embedded thermocouple inputs can be used for multiple temperature input applications, e.g. molding machines.



# Maximize efficiency by selecting the optimum CPU unit for your applications



		CP1E												
		E-type						N-type						NA-type
		10 I/O Points	14 I/O Points	20 I/O Points	30 I/O Points	40 I/O Points	60 I/O Points	14 I/O Points	20 I/O Points	30 I/O Points	40 I/O Points	60 I/O Points	20 I/O Points	
I/O	Digital Inputs	6	8	12	18	24	36	8	12	18	24	36	12	
	Digital Outputs	4	6	8	12	16	24	6	8	12	16	24	8	
	Removable Terminals	No						No						
	Total I/O Capacity	10	14	20	150	160	180	14	20	150	160	180	140	
	CP1W Expansion Units	No						Yes (3 max.)						
	CJ-Series Special I/O and CPU Bus Units	No						No						
	Interrupt/Quick/Counter Inputs	4	6											
	High Speed Counter Inputs	5 (10 kHz max.)	6 (10 kHz max.)					2 (100 kHz max.) and 4 (10 kHz max.)						
	Pulse Outputs (transistor outputs models only)	No						2 axes (100 kHz max.)						
	Analog I/O (embedded)	No						No						2 inputs, 1 output
Analog Adjuster (0-255)	E□□S-type*: No E□□-type:Yes (2)						N□□S(1)-type*:No N/NA□□-type:Yes (2)							
External Analog Settings Input (resolution 1/256)	No						No							
Optional boards	Number of boards supported	0						0						1
	Serial Communications (CP1W-CIF01/11/12)	No						No						N□□S(1)-type*:No N/NA□□-type:Yes
	Ethernet (CP1W-CIF41)	No						No						N□□S(1)-type*:No N/NA□□-type:Yes
	LCD Display (CP1W-DAM01)	No						No						
	Analog I/O boards	No						No						N□□S(1)-type*:No N/NA□□-type:Yes
CPU details	Built-in port	USB						N□□S1-type*: USB, RS-232C, RS-485 N/NA□□(S)-type*:USB, RS-232C						
	Function Blocks support (Ladder diagrams or ST language)	No						No						
	Processing Speed (minimum)	1.19 μs / Basic instruction, 7.9 μs / Special instruction						1.19 μs / Basic instruction, 7.9 μs / Special instruction						
	Program Capacity	2K steps						8K steps						
	Data Memory Capacity	2K words						8K words						
	Memory Cassette (CP1W-ME05M)	No						No						
	Real-Time Clock	No						Yes (with optional battery)						
	Battery	No						Optional (CP1W-BAT01)						
7-Segment Display	No						No							
Relay Outputs	AC Power Supply	Renewal-type	-	CP1E -E14SDR-A	CP1E -E20SDR-A	CP1E -E30SDR-A	CP1E -E40SDR-A	CP1E -E60SDR-A	-	-	CP1E -N30S1DR-A	CP1E -N40S1DR-A	CP1E -N60S1DR-A	-
		Normal-type	CP1E -E10DR-A	CP1E -E14DR-A	CP1E -E20DR-A	CP1E -E30DR-A	CP1E -E40DR-A	-	CP1E -N14DR-A	CP1E -N20DR-A	CP1E -N30DR-A	CP1E -N40DR-A	CP1E -N60DR-A	CP1E -NA20DR-A
	DC Power Supply	Normal-type	CP1E -E10DR-D	-	-	-	-	-	CP1E -N14DR-D	CP1E -N20DR-D	CP1E -N30DR-D	CP1E -N40DR-D	CP1E -N60DR-D	-
		Renewal-type	-	-	-	-	-	-	-	-	CP1E -N30S1DT-D	CP1E -N40S1DT-D	CP1E -N60S1DT-D	-
	AC Power Supply	Normal-type	CP1E -E10DT-A	-	-	-	-	-	CP1E -N14DT-A	CP1E -N20DT-A	CP1E -N30DT-A	CP1E -N40DT-A	CP1E -N60DT-A	-
		Renewal-type	-	-	-	-	-	-	-	-	CP1E -N30S1DT1-D	CP1E -N40S1DT1-D	CP1E -N60S1DT1-D	-
Transistor Outputs	DC Power Supply	Normal-type	CP1E -E10DT-D	-	-	-	-	CP1E -N14DT-D	CP1E -N20DT-D	CP1E -N30DT-D	CP1E -N40DT-D	CP1E -N60DT-D	CP1E -NA20DT-D	
		Renewal-type	-	-	-	-	-	-	-	-	CP1E -N30SDT1-D	CP1E -N40SDT1-D	CP1E -N60SDT1-D	-
	AC Power Supply	Normal-type	CP1E -E10DT1-A	-	-	-	-	-	CP1E -N14DT1-A	CP1E -N20DT1-A	CP1E -N30DT1-A	CP1E -N40DT1-A	CP1E -N60DT1-A	-
		Renewal-type	-	-	-	-	-	-	-	-	CP1E -N30S1DT1-D	CP1E -N40S1DT1-D	CP1E -N60S1DT1-D	-
	DC Power Supply	Normal-type	CP1E -E10DT1-D	-	-	-	-	-	CP1E -N14DT1-D	CP1E -N20DT1-D	CP1E -N30DT1-D	CP1E -N40DT1-D	CP1E -N60DT1-D	CP1E -NA20DT1-D
		Renewal-type	-	-	-	-	-	-	-	-	CP1E -N30SDT1-D	CP1E -N40SDT1-D	CP1E -N60SDT1-D	-

Note: This table is a general overview only. For details, refer to the CP1E datasheet (Cat. No. P061), CP1L datasheet (Cat. No. P081) or CP1H datasheet (Cat. No. P080).

\* E□□-type and N□□S(1)-type are new CP1E.





		CP1L									CP1H		
		L-type			M-type			EL-type	EM-type	Y-type	X-type	XA-type	
		10 I/O Points	14 I/O Points	20 I/O Points	30 I/O Points	40 I/O Points	60 I/O Points	20 I/O Points	30 I/O Points	40 I/O Points	20 I/O Points	40 I/O Points	40 I/O Points
I/O	Digital Inputs	6	8	12	18	24	36	12	18	24	12	24	24
	Digital Outputs	4	6	8	12	16	24	8	12	16	8	16	16
	Removable Terminals	No			Yes			No	Yes	Yes			
	Total I/O Capacity	10	54	60	150	160	180	60	150	160	300	320	320
	CP1W Expansion Units	No	Yes (1 max.)		Yes (3 max.)			Yes (1 max.)	Yes (3 max.)		Yes (7 units or 15 input words / 15 output words max.)		
	CJ-Series Special I/O and CPU Bus Units	No						No			Yes (2 max.)		
	Interrupt/Quick/Counter Inputs	2	4	6				6			6	8	
	High Speed Counter Inputs	4 (100 kHz max.)						4 (100 kHz max.)			2 (100 kHz max.) and 2 Line-driver (1 MHz)	4 (100 kHz max.)	
	Pulse Outputs (transistor outputs models only)	2 axes (100 kHz max.)						2 axes (100 kHz max.)			2 (100 kHz max.) and 2 Line-driver (1 MHz)	4 axes (100 kHz max.)	
	Analog I/O (embedded)	No						2 inputs			No		
Analog Adjuster (0-255)	Yes (1)						No			Yes (1)			
External Analog Settings Input (resolution 1/256)	Yes (0-10V)						No			Yes (0-10V)			
Optional boards	Number of boards supported	0	1	2				1	2			2	
	Serial Communications (CP1W-CIF01/11/12)	No	Yes					Yes		Yes			
	Ethernet (CP1W-CIF41)	No	Yes					No		Yes			
	LCD Display (CP1W-DAM01)	No	Yes					Yes		Yes			
Analog I/O boards	No												
CPU details	Built-in port	USB						Ethernet			USB		
	Function Blocks support (Ladder diagrams or ST language)	Yes						Yes			Yes		
	Processing Speed (minimum)	0.55 µs / Basic instruction, 4.1 µs / Special instruction						0.55 µs / Basic instruction, 4.1 µs / Special instruction			0.10 µs / Basic instruction, 0.15 µs / Special instruction		
	Program Capacity	5K steps			10K steps			5K (+10K FB) steps		10K (+10K FB) steps		20K steps	
	Data Memory Capacity	10K words			32K words			10K words		32K words		32K words	
	Memory Cassette (CP1W-ME05M)	Yes						Yes			Yes		
	Real-Time Clock	Yes						Yes			Yes		
	Battery	Yes (CJ1W-BAT01)						Yes (CJ1W-BAT01)			Yes (CJ1W-BAT01)		
7-Segment Display	No						No			Yes			
Relay Outputs	AC Power Supply	CP1L-L10DR-A	CP1L-L14DR-A	CP1L-L20DR-A	CP1L-M30DR-A	CP1L-M40DR-A	CP1L-M60DR-A	-	-	-	-	CP1H-X40DR-A	CP1H-XA40DR-A
	DC Power Supply	CP1L-L10DR-D	CP1L-L14DR-D	CP1L-L20DR-D	CP1L-M30DR-D	CP1L-M40DR-D	CP1L-M60DR-D	CP1L-EL20DR-D	CP1L-EM30DR-D	CP1L-EM40DR-D	-	-	-
Transistor Outputs	Sink Type	AC Power Supply	CP1L-L10DT-A	CP1L-L14DT-A	CP1L-L20DT-A	CP1L-M30DT-A	CP1L-M40DT-A	CP1L-M60DT-A	-	-	-	-	-
		DC Power Supply	CP1L-L10DT-D	CP1L-L14DT-D	CP1L-L20DT-D	CP1L-M30DT-D	CP1L-M40DT-D	CP1L-M60DT-D	CP1L-EL20DT-D	CP1L-EM30DT-D	CP1L-EM40DT-D	CP1H-Y20DT-D	CP1H-X40DT-D
	Source Type	AC Power Supply	-	-	-	-	-	-	-	-	-	-	-
		DC Power Supply	CP1L-L10DT1-D	CP1L-L14DT1-D	CP1L-L20DT1-D	CP1L-M30DT1-D	CP1L-M40DT1-D	CP1L-M60DT1-D	CP1L-EL20DT1-D	CP1L-EM30DT1-D	CP1L-EM40DT1-D	-	CP1H-X40DT1-D

## Expansion units

### Expansion I/O Units



**CP1W-8ED**  
DC inputs: 8

**CP1W-8ER**  
Relay outputs: 8

**CP1W-8ET**  
Transistor outputs (sinking): 8

**CP1W-8ET1**  
Transistor outputs (sourcing): 8



**CP1W-16ER**  
Relay outputs: 16

**CP1W-16ET**  
Transistor outputs (sinking): 16

**CP1W-16ET1**  
Transistor outputs (sourcing): 16

**CP1W-20EDR1**  
DC inputs: 12  
Relay outputs: 8



**CP1W-20EDT**  
DC inputs: 12  
Transistor outputs (sinking): 8

**CP1W-20EDT1**  
DC inputs: 12  
Transistor outputs (sourcing): 8

**CP1W-32ER**  
Relay outputs: 32

**CP1W-32ET**  
Transistor outputs (sinking): 32

**CP1W-32ET1**  
Transistor outputs (sourcing): 32  
**CP1W-40EDR**  
DC inputs: 24  
Relay outputs: 16

**CP1W-40EDT**  
DC inputs: 24  
Transistor outputs (sinking): 16

**CP1W-40EDT1**  
DC inputs: 24  
Transistor outputs (sourcing): 16

### Analog I/O Units



#### Analog Input Unit

**CP1W-AD041**  
Analog inputs: 4 (resolution: 6,000)  
**CP1W-AD042**  
Analog inputs: 4 (resolution: 12,000)

#### Analog Output Unit

**CP1W-DA021**  
Analog outputs: 2 (resolution: 6,000)  
**CP1W-DA041**  
Analog outputs: 4 (resolution: 6,000)  
**CP1W-DA042**  
Analog outputs: 4 (resolution: 12,000)



#### Analog I/O Unit

**CP1W-MAD11**  
Analog inputs: 2 (resolution: 6,000)  
Analog outputs: 1 (resolution: 6,000)  
**CP1W-MAD42**  
Analog inputs: 4 (resolution: 12,000)  
Analog outputs: 2 (resolution: 12,000)  
**CP1W-MAD44**  
Analog inputs: 4 (resolution: 12,000)  
Analog outputs: 4 (resolution: 12,000)

### Temperature Sensor Unit



**CP1W-TS001**  
Thermocouple inputs: 2

**CP1W-TS002**  
Thermocouple inputs: 4

**CP1W-TS003**  
Thermocouple inputs: 4  
Analog inputs: 2  
(instead of 2 thermocouple inputs)  
12,000 resolution

**CP1W-TS004**  
Thermocouple inputs: 12

**CP1W-TS101**  
Platinum-resistance thermometer inputs: 2

**CP1W-TS102**  
Platinum-resistance thermometer inputs: 4



### CompoBus/S I/O Link Unit



**CP1W-SRT21**  
Inputs: 8 bits  
Outputs: 8 bits

### Optional Boards



**CP1W-CIF01**  
RS-232C  
(15 m max.)



**CP1W-CIF11**  
RS-422A/485  
(50 m max.)



**CP1W-CIF12**  
RS-422A/485  
(Isolated-type)  
(500 m max.)



**CP1W-CIF41**  
Ethernet



**CP1W-DAM01**  
Display 4 rows,  
12 characters



**CP1W-ADB21**  
Analog 2 inputs,  
0-10 V, 0-20 mA



**CP1W-DAB21V**  
Analog  
2 outputs, 0-10 V



**CP1W-MAB221**  
Analog 2 inputs  
0-10 V, 0-20 mA &  
2 outputs 0-10 V

### Memory Cassette



**CP1W-ME05M**  
512K words  
(upload/download program)

### Battery Set



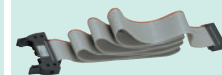
**CP1W-BAT01**  
(for CP1E)

### CJ Unit Adapter



**CP1W-EXT01**  
CJ Unit adapter for use with CP1H. Includes CJ endplate.

### I/O Connecting Cable



**CP1W-CN811**  
Length: 80 cm

CP1W Expansion Units include I/O Connection Cables (in lengths of approx. 6 cm) for side-by-side connection.

Note: This table is a general overview only. For details, refer to the CP1E datasheet (Cat. No. P061), CP1L datasheet (Cat. No. P081) or CP1H datasheet (Cat. No. P080).

## Software

The CX-One is a comprehensive software package that integrates Support Software for OMRON PLCs and components. CX-One Ver. 4.□ includes CX-Programmer Ver. 9.□. CX-One Lite is a subset of the complete CX-One package that provides only the Support Software required for micro PLC applications. CX-One Lite Ver. 4.□ includes Micro PLC (the CP1 family) Edition CX-Programmer Ver. 9.□.

Note 1: The CX-One and CX-One Lite cannot be simultaneously installed on the same computer.

Note 2: This section is a general overview only. For details, refer to the CX-One Catalog (No. R134).

		Media	Order code
FA Integrated Tool Package CX-One Ver.4.□	Single user licence*1	DVD	CXONE-AL01D-V4
FA Integrated Tool Package CX-One Lite Ver.4.□	Single user licence	DVD*2	CXONE-LT01D-V4

\*1 Multi licenses are available for the CX-One (3, 10, 30, or 50 licenses).

\*2 The CX-One Lite is also available on CD (CXONE-LT□□C-V4).

CX-One and CX-One Lite supported OS:

Windows XP (Service Pack 3 or higher, 32-bit version) /  
 Windows Vista (32-bit/64-bit version) / Windows 7 (32-bit/64-bit version) /  
 Windows 8 (32-bit/64-bit version) / Windows 8.1 (32-bit/64-bit version) /  
 Windows 10 (32-bit/64-bit version)

## Using CJ-series units and CP1W units with the CP1H

Up to two CJ-series CPU Bus Units or Special I/O Units can be connected. (CP1H only)

CJ Unit Adaptor CP1W-EXT01

Up to 7 CP1W Expansion Units and Expansion I/O Units can be connected. (Up to 3 units for CP1L and CP1E)

CP1W Expansion Units and Expansion I/O Units and CJ Units can be used simultaneously.  
 CP1W-CN811 I/O Connecting Cable is required.

## CJ-Series Units for use with CP1H

Description	Unit Name	Model	Description	Unit Name	Model		
Analog I/O and Control Units	Analog Input Unit	CJ1W-AD041-V1	Motion/Position Control Units	Position Control Units	CJ1W-NC113		
		CJ1W-AD042			CJ1W-NC133		
		CJ1W-AD081-V1			CJ1W-NC213		
	Analog Output Unit	CJ1W-DA021			CJ1W-NC233		
		CJ1W-DA041			CJ1W-NC413		
		CJ1W-DA042V			CJ1W-NC433		
		CJ1W-DA08V			MECHATROLINK-II Position Control Unit	CJ1W-NCF71	
		CJ1W-DA08C				CJ1W-NCF71-MA	
	Analog Input/Output Unit	CJ1W-MAD42			CJ1W-NC271		
	Isolated-type Units with Universal Inputs	CJ1W-AD04U			CJ1W-NC471		
			CJ1W-PH41U	Communication Units	Serial Communication Units	CJ1W-SCU21-V1	
	Isolated-type DC Input Units	CJ1W-PDC15	CJ1W-SCU22				
	Thermocouple Input Unit	CJ1W-PTS15	CJ1W-SCU31-V1				
		CJ1W-PTS51	CJ1W-SCU32				
	Resistance Thermometer Input Unit	CJ1W-PTS52	CJ1W-SCU41-V1				
		Temperature Control Loops, Thermocouple Unit	CJ1W-TC001			CJ1W-SCU42	
			CJ1W-TC002			Ethernet Unit	CJ1W-ETN21
			CJ1W-TC003			EtherNet/IP Unit	CJ1W-EIP21
	Temperature Control Loops, RTD	CJ1W-TC004	FL-net Ethernet Unit			CJ1W-FLN21	
		CJ1W-TC101	DeviceNet Master Unit			CJ1W-DRM21	
CJ1W-TC102		CompoNet Master Unit	CJ1W-CRM21				
CJ1W-TC103		CompoBus/S Master Unit	CJ1W-SRM21				
CJ1W-TC104		Controller Link Unit	CJ1W-CLK23				
Motion/Position Control Units		High Speed Counter Unit	CJ1W-CT021	High-speed Data Storage Unit	High-speed Data Storage Unit	CJ1W-SPU01-V2	
	CJ Series ID Sensor Unit					CJ Series ID Sensor Unit	CJ1W-V680C11
CJ1W-V680C12							
CJ1W-V600C11							
CJ1W-V600C12							

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**OMRON Corporation    Industrial Automation Company**  
Tokyo, JAPAN

**Contact: [www.ia.omron.com](http://www.ia.omron.com)**

***Regional Headquarters***

**OMRON EUROPE B.V.**

Wegalaan 67-69-2132 JD Hoofddorp  
The Netherlands

Tel: (31)2356-81-300/Fax: (31)2356-81-388

**OMRON ELECTRONICS LLC**

One Commerce Drive Schaumburg,  
IL 60173-5302 U.S.A.

Tel: (1) 847-843-7900/Fax: (1) 847-843-7787

**OMRON ASIA PACIFIC PTE. LTD.**

No. 438A Alexandra Road # 05-05/08 (Lobby 2),  
Alexandra Technopark,  
Singapore 119967

Tel: (65) 6835-3011/Fax: (65) 6835-2711

**OMRON (CHINA) CO., LTD.**

Room 2211, Bank of China Tower,  
200 Yin Cheng Zhong Road,  
PuDong New Area, Shanghai, 200120, China

Tel: (86) 21-5037-2222/Fax: (86) 21-5037-2200

**Authorized Distributor:**



**03 5278 8222**

[sales@factorycontrols.com.au](mailto:sales@factorycontrols.com.au)  
[www.factorycontrols.com.au](http://www.factorycontrols.com.au)  
65 Doura Street, North Geelong Victoria 3215

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**CSM\_6\_3\_0416**

**Cat. No. P082-E1-04**

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