

# OMRON

## Easy Yet Advanced Positioning of Up To Four Axes Windows-based MC Support Software: CX-Motion

CS1 Series

CS1W-MC421/MC221

Motion Control Units

WS02-MCTC1-E

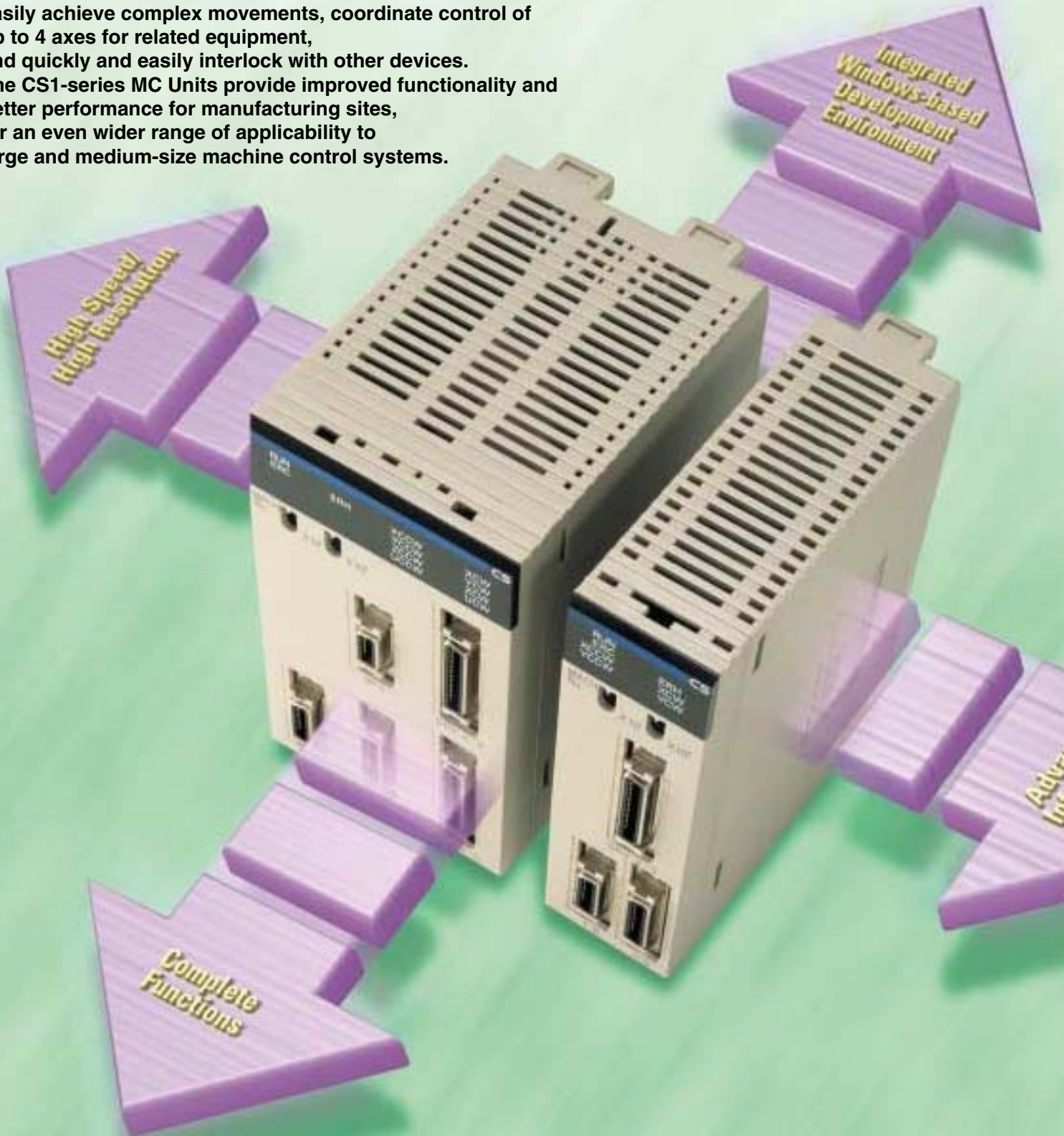
CX-Motion MC Support Software



**SYSMAC**  
**CS1**  
Programmable Controllers  
**UNIT**

# New 2-axis and 4-axis Motion Control Units the SYSMAC CS1 Series for High-speed, Easy

The SYSMAC CS1 Series of advanced programmable controllers (PLCs) already provides improved development efficiency, high-speed information handling, and flexible networking. And now, Motion Control Units (MC Units) join the CS1 Series to help reduce the programming load on the CPU Unit, easily achieve complex movements, coordinate control of up to 4 axes for related equipment, and quickly and easily interlock with other devices. The CS1-series MC Units provide improved functionality and better performance for manufacturing sites, for an even wider range of applicability to large and medium-size machine control systems.



# Join -to-use Motion Control

## Improved G Language Programming

The G language was designed specially for programming motion control and ample capacity has been provided: Up to 100 programs and 2,000 program blocks. Multitasking is also supported, as is specification of the number of turns for circular interpolation and traverse movements. The extra power makes complex motion control easier than ever before.

- Programs can be easily written in G code for up to four axes.
- Multitasking enables independent program execution so that axes can be controlled without interfering with each other.
- Program up to 2,000 blocks to easily achieve the required operations.
- Programming G code is more powerful and easier than ever before with new multitask circular interpolation (G02/G03), traverse control (G32), a parameter change command (G69), and much more.

## Higher Encoder Response Frequency

The encoder response frequency is a maximum of 2 Mpps (with a x4 ratio). Connections to the absolute encoders on OMRON's OMNUC U Series of AC Servomotors and Servo Drivers is easily achieved with special encoder cables.

- Implement highly accurate positioning and high-speed applications.
- Use OMRON's OMNUC U Series of AC Servomotors and Servo Drivers with Absolute Encoders to eliminate the need for origin searches, thus speeding up system startup and recovery.

## Simple, High-speed Interlocks with Other Devices

In addition to M codes, D codes can now be generated to send interrupts to the CPU Unit and execute an interrupt program. Interlocks can thus be easily created with other devices simply by specifying the D codes in the G language program. D codes can even be output during operation.

- Easily and quickly create even complex interlocks with other devices by executing an interrupt program in the CPU Unit from the G language program.
- Interlock signals can be output at any point during operation to provide more flexibility in the timing of interlocks.
- The D code output time is 3.3 ms max from the MC Unit to the CPU Unit.

## Complete Functionality

- Commands can now be used for interrupt feeding and specify stopping even when an interrupt input is not received.
- Connect a manual pulse generator (MPG) and then enable/disable the MPG or change the MPG ratio during manual operation. Simple sync operations are also possible by connecting an encoder signal to the MPG input connector. The MPG ratio is set as a fraction for precise control.

## Windows-based CX-Motion MC Support Software for Easy Programming

- Create, edit, save, or print the system parameters, position data, and G language programs required for the MC Unit. You can also monitor the MC Unit's operating status.
- Control more than one MC Unit as a separate project for integrated data management.
- A special autoloading function can be used to provide essentially infinite memory capacity by using hard disks or floppy disks on a personal computer as a type of extended MC Unit memory. Data transfers can be programmed from the PLC to automatically change data and programs according to machine operating status.

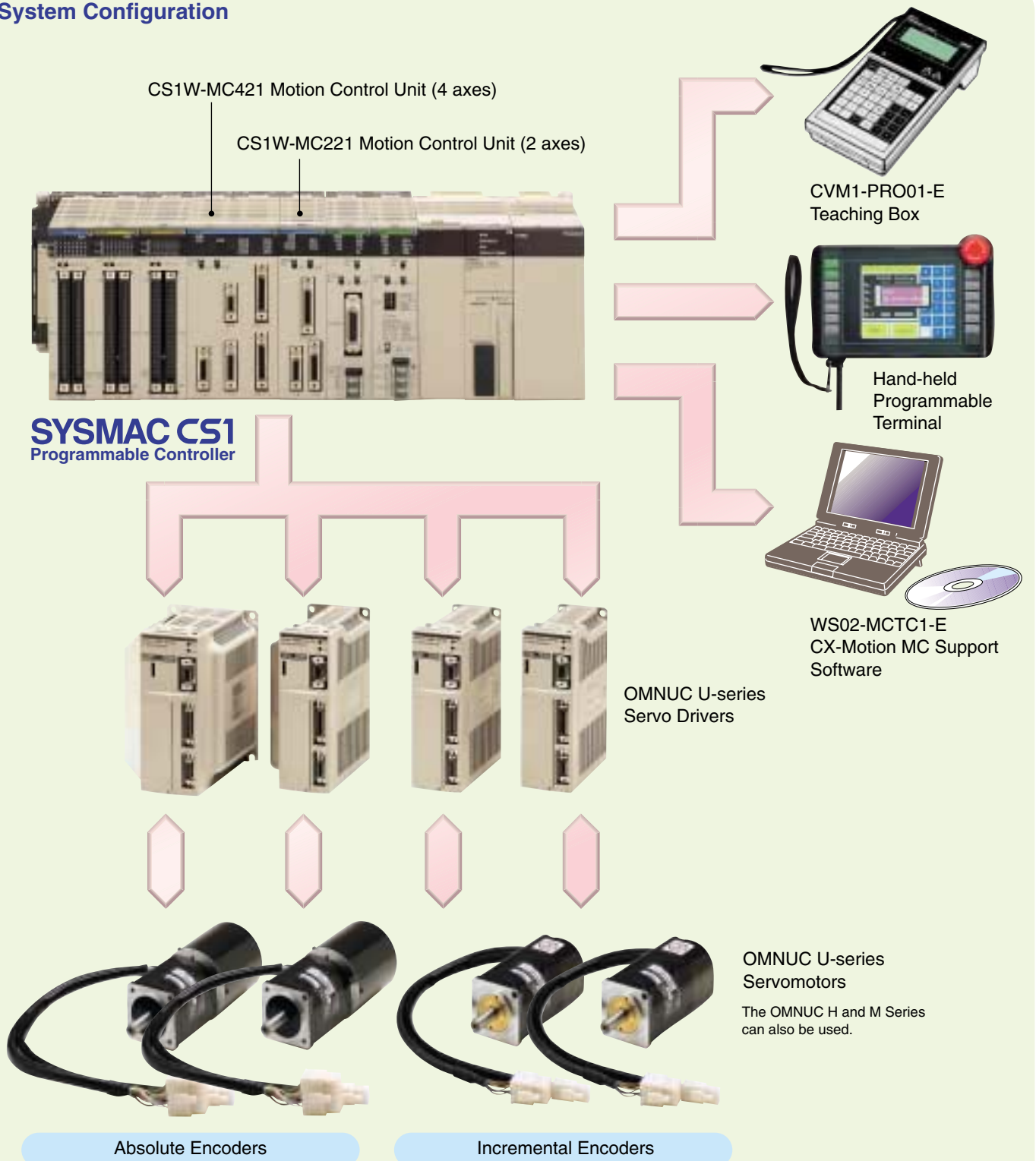




# Handle a Wide Range of Motion Control Applications with the SYSMAC CS1 PLC and MC Unit

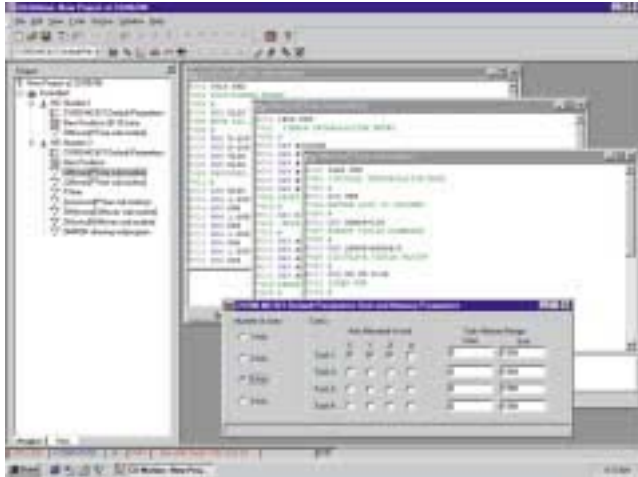
Combine Servomotors and Servo Drivers equipped with Absolute Encoders, Windows-based CX-Motion MC Support Software, and a complete range of peripheral devices to easily achieve a wide range of motion control systems.

## System Configuration



# Windows-based MC Support Software: CX-Motion Program, Setup, and Manage the MC Unit with Easy-to-use Operations

## Basic Window



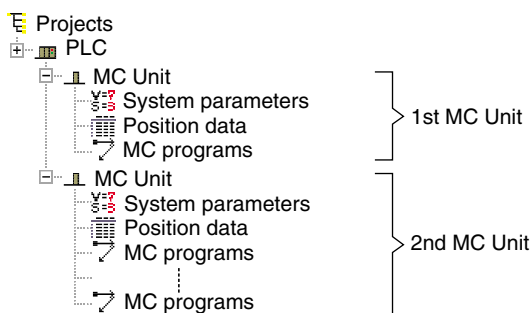
## Displays for Present Positions and Other Coordinates



## MC Programming Window

## Functions

- Create projects containing one or more MC Unit.
- Data is displayed in the following tree in the project work space.



- ⊕ Indicates collapsible portions of the tree.
- ⊖ Indicates expandable portions of the tree.

- The user can define mnemonics to use instead of G codes to make MC programs easier to write and understand.
- A servo tracing function can be used to trace changes in the error counter or axis speeds.
- An autoloading function enables easy downloading of MC programs and position data stored on a personal computer, providing support for systems that require more than 100 programs.
- CX-Motion enables application of parameters, position data, and MC programs created with previous versions of MC Support Software.

## CX-Motion Specifications

Item	Specification
Supported MC Units	CS1W-MC421/221, CV500-MC421/221, C200H-MC221
Applicable computers	IBM PC/AT or compatible
OS	Windows 95, Windows 98, or Windows NT V4.0
CPU	Pentium 100 MHz min.
Memory	32 megabytes minimum
Hard disk drive	10 megabytes minimum
Monitor	SVGA or better
CD-ROM drive	1 drive minimum
Floppy disk drive	1 drive minimum (1.44-megabyte drive)

# More Powerful G Language Programs for Ideal Motion Control

The G language was designed specially for motion control and greatly simplifies programming. And with a capacity of up to 100 programs and up to 2,000 program blocks, you can easily handle applications requiring changeovers for small lot production of different products.

## G Codes

Code	Name	Function
G00	Positioning	Positions at the maximum feed speed.
G01	Linear Interpolation	Performs linear interpolation at the specified interpolation feed speed.
G02	Circular Interpolation (Clockwise)	Performs clockwise circular interpolation at the specified interpolation feed speed.
G03	Circular Interpolation (Counterclockwise)	Performs counterclockwise circular interpolation at the specified interpolation feed speed.
G04	Dwell Timer	Waits for the specified length of time.
G10	Pass Mode	Performs operations one-by-one in sequence without waiting for deceleration to stop.
G11	Stop Mode	Performs the next operation after decelerating to a stop and completing positioning.
G13	IN-POSITION CHECK OFF MODE	Starts the next operation after decelerating without waiting for positioning to be completed.
G17	Circular Plane Specification (X-Y)	Sets the X-Y plane as the plane for circular interpolation.
G18	CIRCULAR PLANE SPECIFICATION (X-Z)	Sets the X-Z plane as the plane for circular interpolation.
G19	CIRCULAR PLANE SPECIFICATION (y-z)	Sets the Y-Z plane as the plane for circular interpolation.
G20	CIRCULAR PLANE SPECIFICATION (x-u)	Sets the X-U plane as the plane for circular interpolation.
G21	CIRCULAR PLANE SPECIFICATION (Y-u)	Sets the Y-U plane as the plane for circular interpolation.
G22	CIRCULAR PLANE SPECIFICATION (z-u)	Sets the Z-U plane as the plane for circular interpolation.
G26	Reference Origin Return	Moves to the reference origin.
G27	Workpiece Origin Return	Moves to the workpiece origin.
G28	Origin Search	Performs an origin search.
G29	Origin UNDEFINED	Sets the origin to an undefined state.
G30	SPEED CONTROL	Feeds at the specified speed.
G31	INTERRUPT FEEDING	Performs an interrupt feeding operation.
G32	Traverse	Executes traverse operation.
G50	Select Reference Coordinate System	Specifies the reference coordinate system.
G51	Select Workpiece Coordinate System	Specifies the workpiece coordinate system.
G53	Change Workpiece Origin Offset	Changes the origin of the workpiece coordinate system.
G54	Change Reference Coordinate System PV	Changes the present value in the reference coordinate system.
G60	Arithmetic Operations	Performs arithmetic operations on numerical values, position data, and registers.
G63	Substitution	Substitutes numerical values, position data, or registers into other position data or registers.
G69	Change Parameter	Changes the specified parameter.
G70	Unconditional Jump	Unconditionally jumps to the specified block.
G71	Conditional Jump	Jumps to the specified block when the condition is met.
G72	Subprogram Jump	Calls the specified subprogram.
G73	Subprogram End	Ends the subprogram.
G74	Optional End	Ends the block currently being executed when the specified optional input is ON.
G75	Optional Skip	Skips the block after this function when the specified optional input is ON.
G76	Optional Program Stop	Pauses the program when the specified optional input turns ON.
G79	Program End	Ends the main program.
G90	Absolute Specification	Positions with absolute coordinates when performing axis operations.
G91	Incremental Specification	Positions with relative coordinates when performing axis operations.

## Performance

Item		Specifications	
		Four-axis MC Unit	Two-axis MC Unit
Applicable PLC		SYSMAC CS1 Series	
Allocated I/O words		Allocated the words for 5 unit numbers.	Allocated the words for 3 unit numbers.
Maximum axes per PLC		Up to 76 axes on one PLC (up to 96 unit numbers available in the CPU Unit) (See note 1)	
Externally connected devices		Teaching Box, manual pulse generator (MPG), or sync encoder	
Controlled driver		Analog input servo driver (Example: OMRON OMNUC H, M, or U Series)	
Absolute encoder	Applicable encoder	OMRON U-series Absolute Encoder	
	Backup method	Battery (A battery is provided in the U-series Servo Driver for this purpose.)	
Control	Control method	Speed command voltage output-type semi-closed loop system using incremental or absolute encoder inputs.	
	Number of controlled axes	4 axes max.	2 axes max.
	Number of simultaneously controlled axes	4 axes max.	2 axes max.
	PTP (independent) control	Execution by independent programs, operating modes for each axis.	
Positioning operations	Linear interpolation	4 axes max.	2 axes max.
	Circular interpolation	Circular interpolation for a maximum of two axes on a plane.	
	Helical circular interpolation	Circular interpolation for a maximum of two axes on a plane + one axis for feed control	---
	Traverse function	Traverse function for two axes	
	Interrupt feeding	Feeding a fixed distance after an interrupt input, for each axis. (See note 2)	
Speed control		Speeds can be set between 1 and 2,000,000 pps (for x4 ratio) when the unit is set to pulses (x1: 1 to 500,000 pps; x2: 1 to 1,000,000 pps)	
MPG/sync encoder		One connector, 500 kpps max. (for 1x ratio)	
Control unit	Minimum setting unit	1, 0.1, 0.01, 0.001, 0.0001	
	Units	mm, inch, degree, pulse (display unit)	
Maximum command value		-39,999,999 to 39,999,999 (Range depends on minimum setting unit.)	
Feed operations	Rapid feed speed	Example: 36.86 m/min max. Conditions Encoder resolution: 2,048 p/r Motor speed: 4,500 r/m Control unit: 0.001 mm/pulse	
	Interpolation feed speed		
	Rapid feed override	0.0% to 100.0% (Setting unit: 0.1%)	
	Interpolation feed override	0.0% to 199.0% (Setting unit: 0.1%)	
	Jog feed override	0.0% to 100.0% (Setting unit: 0.1%)	
Task/program capacity and management	Number of tasks	4 max. (program execution units)	2 max. (program execution units)
	Number of programs	The maximum number of programs depends on the number of tasks. 1 task: 100 programs/task 2 tasks: 50 programs/task 3 tasks: 33 programs/task 4 tasks: 25 programs/task	The maximum number of programs depends on the number of tasks. 1 task: 100 programs/task 2 tasks: 50 programs/task
	Program block capacity	The maximum number of program blocks depends on the number of tasks. 1 task: 2,000 blocks/task 2 tasks: 1,000 blocks/task 3 task: 666 blocks/task 4 tasks: 500 blocks/task The maximum number of blocks in a single program is 800.	The maximum number of program blocks depends on the number of tasks. 1 task: 2,000 blocks/task 2 tasks: 1,000 blocks/task The maximum number of blocks in a single program is 800.
	Number of registers	32 (Mainly used for specifying position data numbers.)	
	Subroutine nesting	5 levels max.	
Position data capacity		2,000 positions max. (when only one axis is used)	
Startup time		12 ms max.	8 ms max.

Note: 1. The maximum number of MC Units that can be mounted to one Backplane may be affected by the current consumption and the capacity of the CS1 Power Supply Unit.  
2. Positioning is also possible even when there is no interrupt input.

## Standard Models

### MC Units and Support Software

Name	Model
Four-axis Motion Control Unit	CS1W-MC421
Two-axis Motion Control Unit	CS1W-MC221
CX-Motion MC Support Software	WS02-MCTC1-E

## Peripheral Devices

Name		Model		
Teaching Box		CVM1-PRO01-E		
ROM Cassette		CVM1-MP702		
Terminal Block for 2 Axes		XW2B-20J6-6		
Terminal Block for 4 Axes		XW2B-40J6-7		
Terminal Block Cable		XW2Z-100J-F1		
Servo Driver Cables	H Series	Cable for 1 axis	1 m	R88A-CPH001M1
			2 m	R88A-CPH002M1
		Cable for 2 axes	1 m	R88A-CPH001M2
			2 m	R88A-CPH002M2
	M Series	Cable for 1 axis	1 m	R88A-CPM001M1
			2 m	R88A-CPM002M1
		Cable for 2 axes	1 m	R88A-CPM001M2
			2 m	R88A-CPM002M2
	U Series up to 750 W	Cable for 1 axis	1 m	R88A-CPU001M1
			2 m	R88A-CPU002M1
		Cable for 2 axes	1 m	R88A-CPU001M2
			2 m	R88A-CPU002M2
	U Series from 1 to 5 kW	Cable for 1 axis	1 m	R88A-CPUB001M1
			2 m	R88A-CPUB002M1
Cable for 2 axes		1 m	R88A-CPUB001M2	
		2 m	R88A-CPUB002M2	
Personal computer cables* (for CX-Motion)	Peripheral port	0.1 m	CS1W-CN118	
		2 m	CS1W-CN226	
		6 m	CS1W-CN626	
	RS-232C port	2 m	XW2Z-200S-V	
		5 m	XW2Z-500S-V	

\* To connect to a CS1-series CPU Unit.

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Note: Specifications subject to change without notice.

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