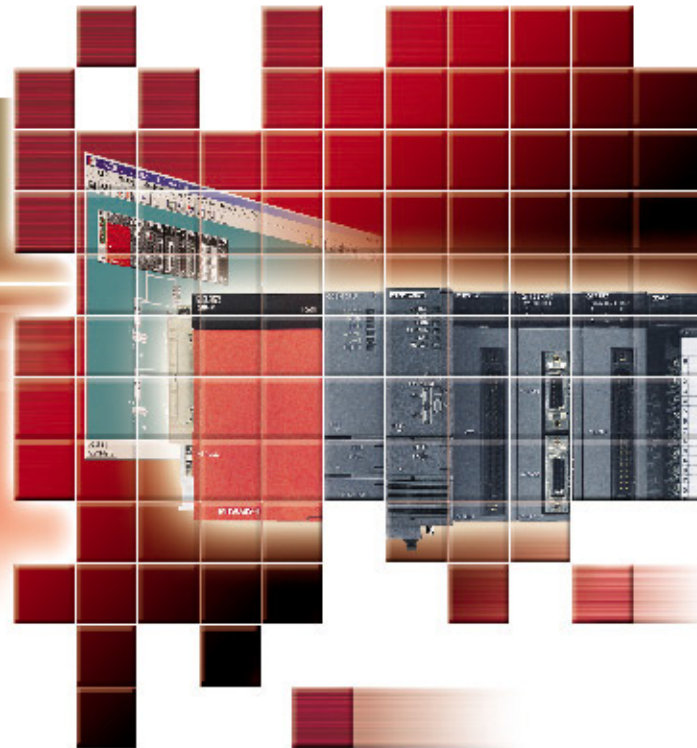


*Changes for the Better*

SSCNETIII Compatible  
MOTION CONTROLLER Q series

Taking motion control to the age of optics

# MOTION CONTROLLER



# Taking Motion Control to Higher Performance Standards by Incorporating *Optics!*

## Taking motion control to new ranges with the high-speed synchronous network SSCNETIII!

### MOTION CONTROLLER Qseries SSCNETIII compatible

Introducing the SSCNETIII compatible Q173HCPU/Q172HCPU to the Motion controller Q Series! High speeds and high accuracies are attained to comply with the MELSERVO-J3 servo amplifier. The conventional Q Series Motion controller's functions and programming environment are incorporated.

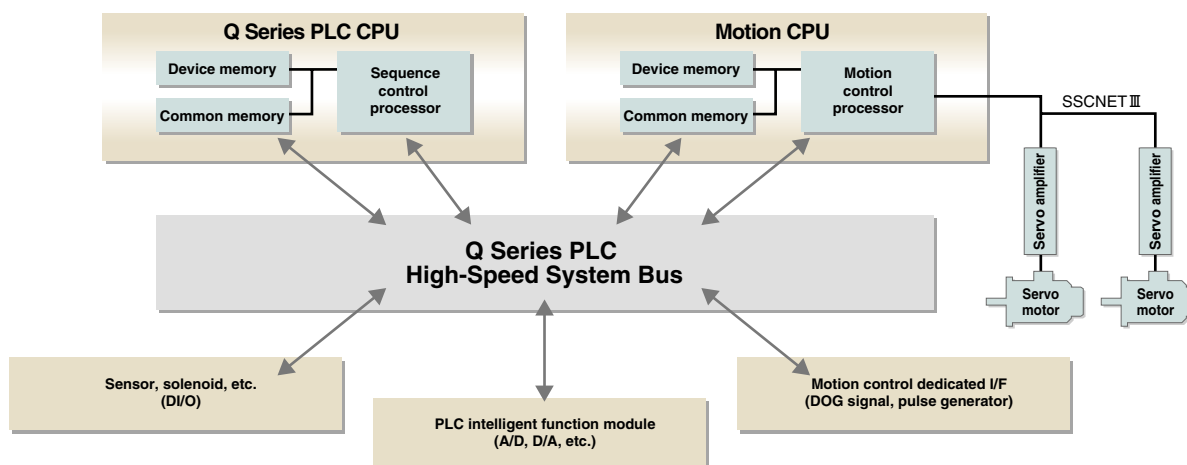
(Note) • Q173HCPU/Q172HCPU can be connected only to the SSCNETIII compatible MR-J3-B.  
• SSCNET(Servo System Controller NETwork)

### Attain High Speeds and High Accuracies with Motion Control

- Operation tact time is shortened with a motion operation cycle of min. 0.44ms (2 times the conventional cycle).
- Accuracy for the synchronous and speed/position control is improved by reducing the command communication cycle to the servo amplifier to min. 0.44ms (2 times the conventional cycle).
- Motion CPU module contains a 64-bit RISC processor for motion control and event processing. Large volumes of data can be communicated with a personal computer without affecting motion control performance.
- Compatible with the high-speed sequence processing of the MELSEC-Q Series PLC CPU (Platform). (Basic command scan time of 34ns using the Q25HCPU)
- Various motion functions are included, such as multi-axis interpolation functions, speed control, electronic cam profiles and locus control.
- Control with suppressed variation in response time is realized using the Motion SFC programming method as a flowchart.

### Multiple CPU System with the Q Series PLC (Platform)

- The power supply module, base unit, and I/O modules of the MELSEC-Q Series PLC can be shared.
- Control processing is distributed to each CPU module among the Multiple CPU system, and it also corresponds to the intelligent control system.
- Personal computer technology is utilized using a PC (Personal Computer) CPU module.  
\* A personal computer CPU is the product of CONTEC, Ltd.



## System Formation Complying with Demands

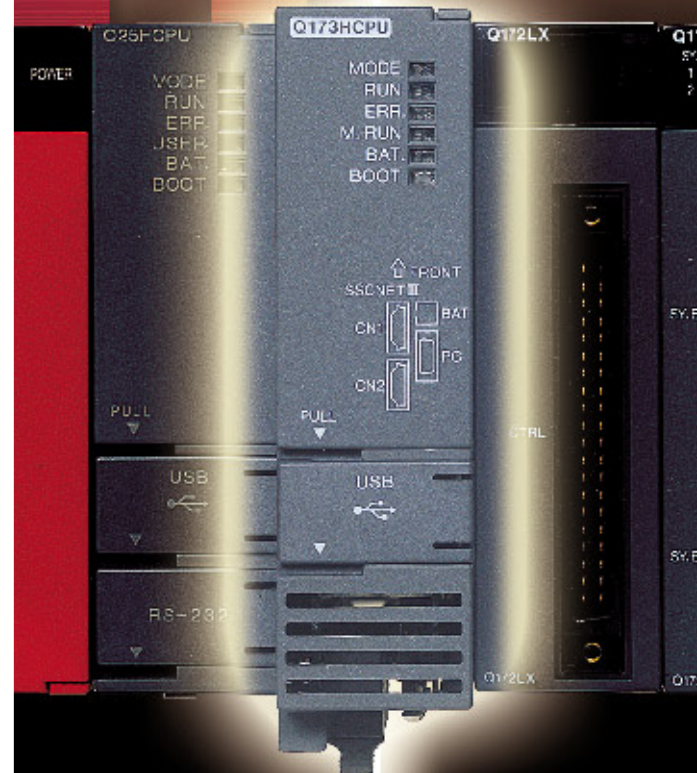
- Individual CPU modules for PLC control and motion control allow for the economical selection of optimized CPU's for the system.
- Up to 4 CPU modules can be freely selected in the Multiple CPU system. (1 PLC CPU must be used.)
- Up to 96 axes can be controlled per 1 system in the Multiple CPU system. (When using 3 modules of Q173HCPU(-T).)

## Overall Control with SSCNET III

- A synchronous and absolute system for the servomotor can be easily composed using the high-speed serial communication method.
- Simple wiring by quick release connection using connectors between the Motion controller and servo amplifiers.
- Servo amplifiers for up to 32 axes can be batch controlled with 1 CPU.
- Motor information such as torque, speed, and position can be batch monitored with the controller using the digital oscilloscope function.

## Compact Size and Savings in Space of Controller

- The controller's miniaturization is realized by using the same hardware architecture as the MELSEC-Q Series PLC CPU.
- Additional savings in space and cost may be realized using a 12-slot base.



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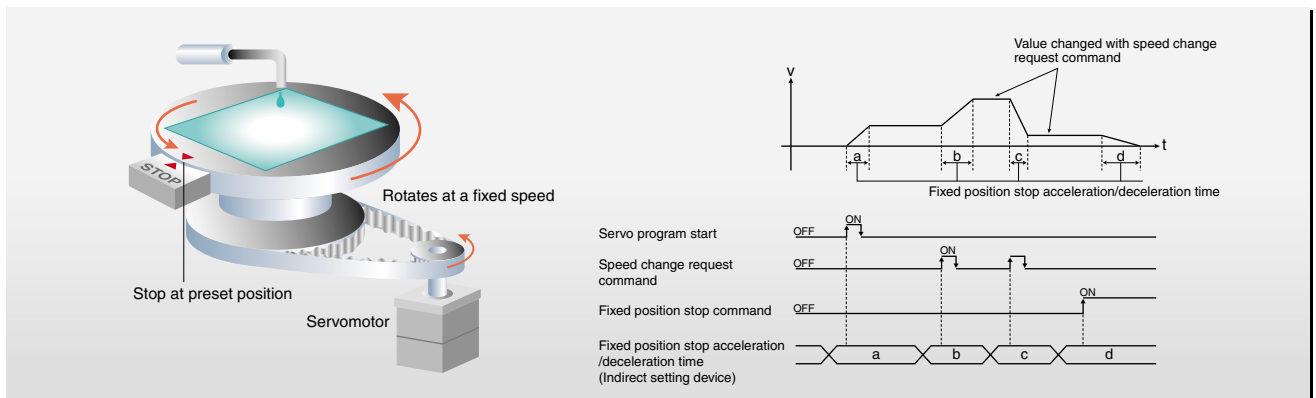


# Powered Up Motion Control

- Security function to protect user's know-how incorporated
  - A function to protect user programs with a password has been added.
- Integration with MR Configurator
- Suitable for devices, such as spinners, with the speed control function with fixed position stop (Orientation function)
- Improved synchronization accuracy between multiple axes
  - Errors caused by synchronous encoder's processing time or servo's droop pulses is automatically compensated with the phase compensation function.
- 262,144 pulse synchronous encoder (18-bit) is available
  - The synchronous operation accuracy at low speeds is tremendously improved (16-fold compared to conventional model).
- Synchronous control and PTP positioning are simultaneously controlled
  - Mixed function of virtual mode with real mode.
- Smoothing clutch linear acceleration/deceleration function

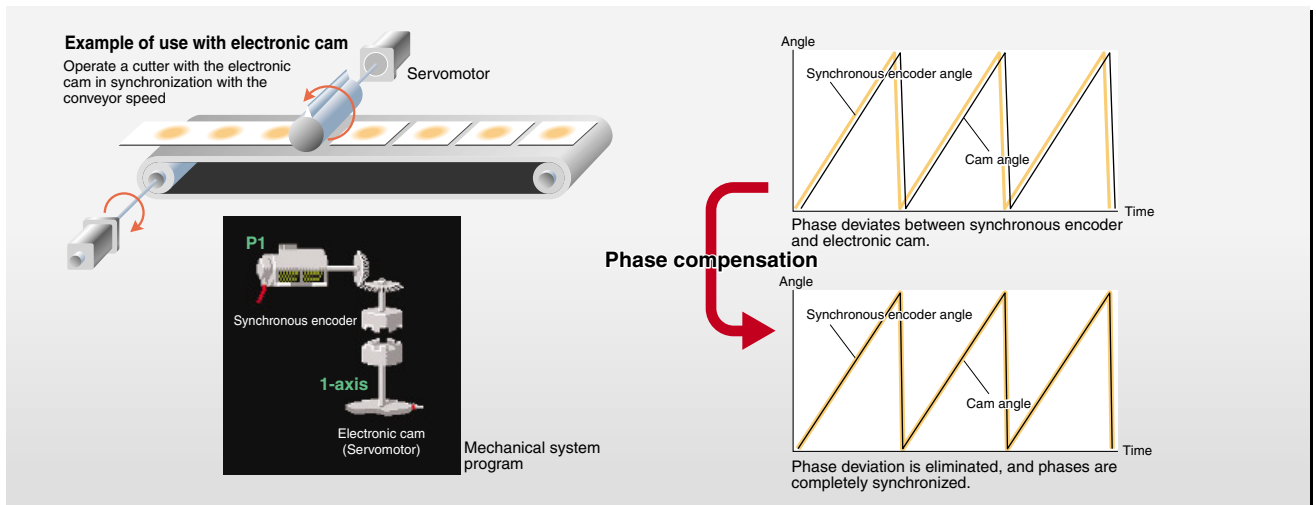
## Speed Control Function with Fixed Position Stop (Orientation Function)

The servomotor can be rotated at preset speed and then stopped at preset position after the fixed position stop command ON. Not only the speed but also acceleration/deceleration time can be changed to an optional value while operating.



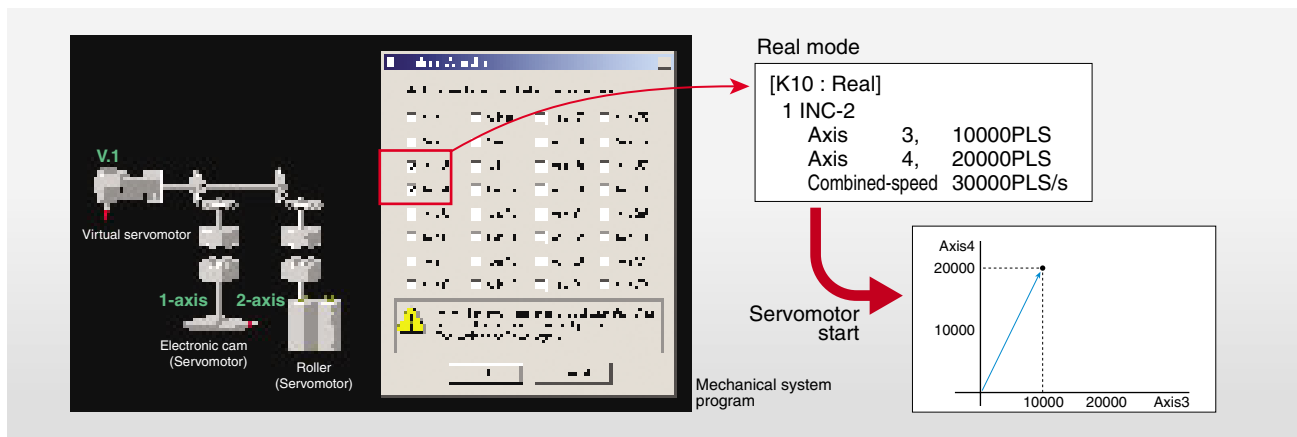
## Phase Compensation Function

When carrying out tracking synchronization with the synchronous encoder, delays in the processes, etc., cause the phase to deviate at servomotor shaft end in respect to the synchronous encoder. The phase compensation function compensates in this case so that the phase does not deviate. The phase deviation between the synchronous encoder and cam angle can be eliminated by using this for the electronic cam.



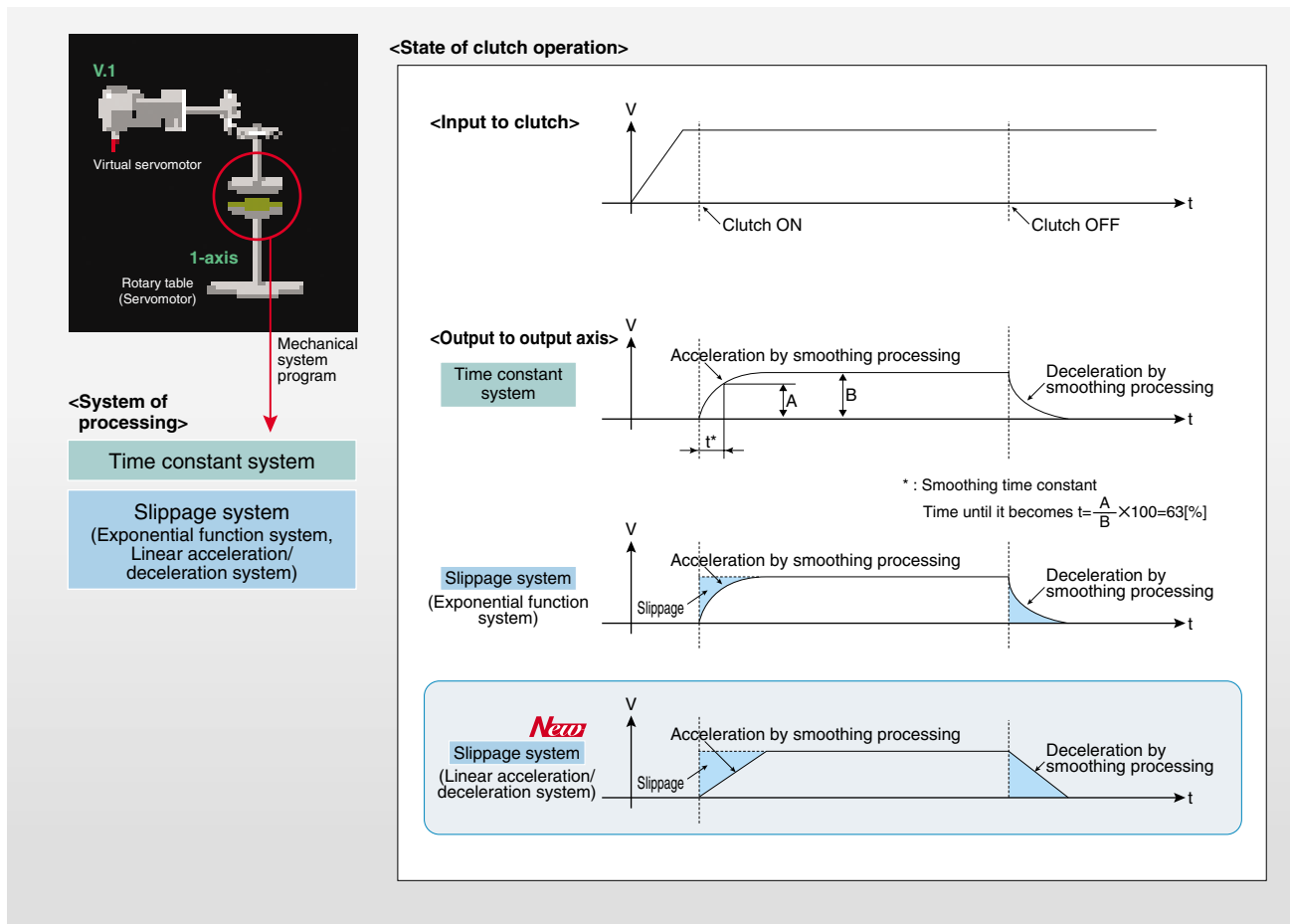
## Mixed Function of Virtual Mode with Real Mode

The positioning control can be executed for the axis set to the real mode axis at the mechanical system editor monitor in the virtual mode.

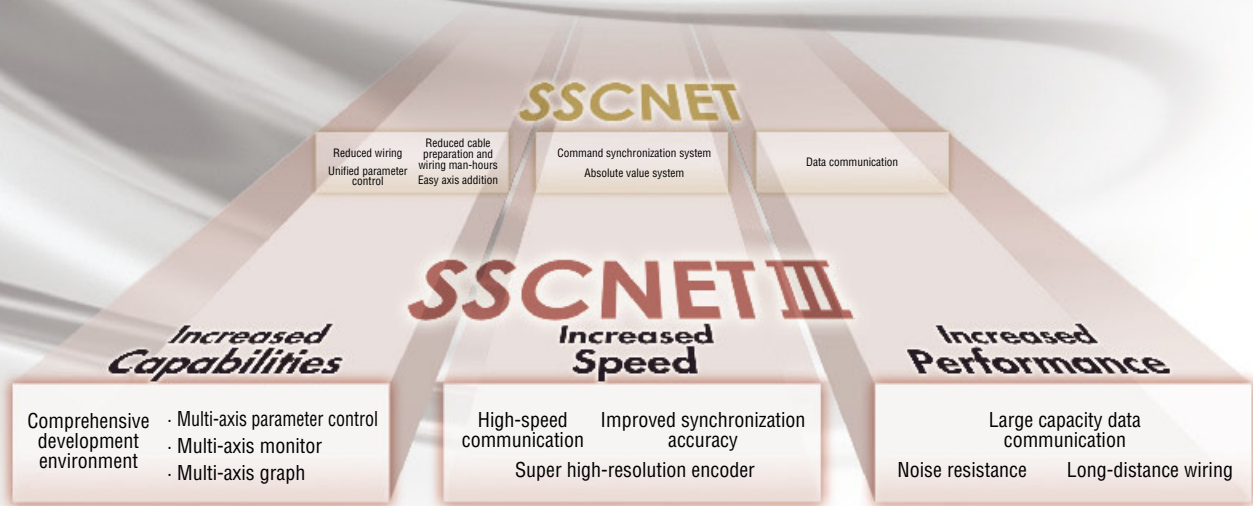


## Smoothing Clutch Linear Acceleration/Deceleration Function

The linear acceleration/deceleration system can be selected in the smoothing clutch.



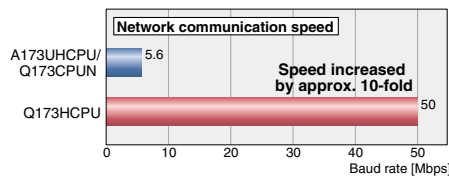
# The High-Speed Synchronous Network SSCNET III



## Attain 50Mbps High-speed Communication with Optical Communication

### ■ Improved system responsiveness

— The speed of exchanging data between the controller and servo amplifier has been greatly increased thereby shortening the cycle time.



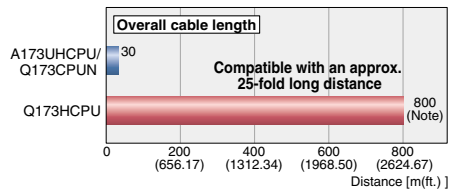
### ■ Enhanced communication reliability

— The optical fiber cable was adopted.

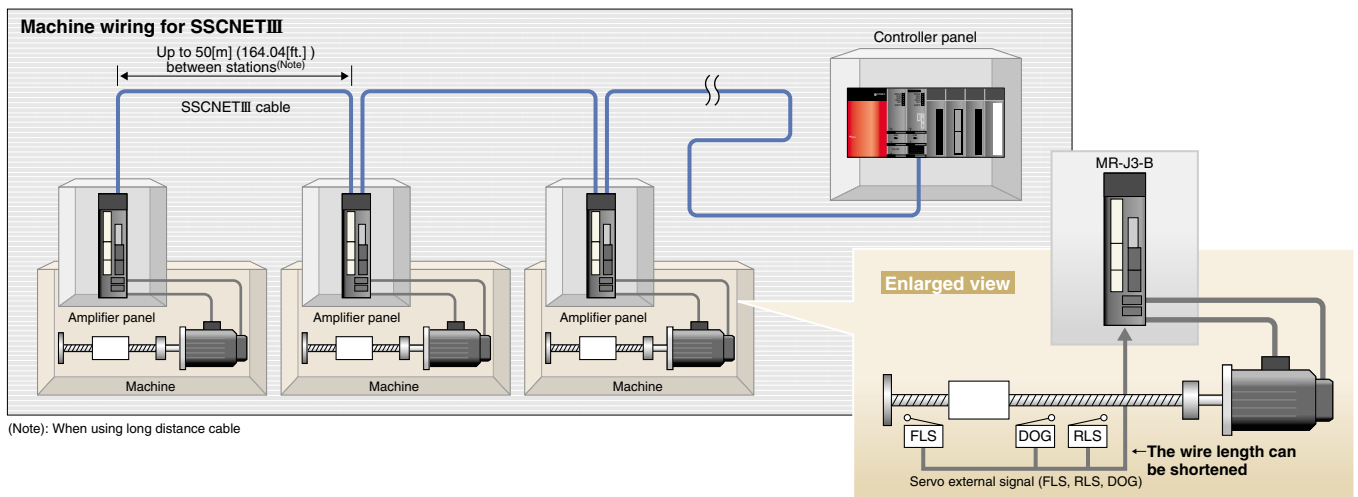
### ■ Improved freedom to device layout

— This model is compatible with long-distance wiring (Maximum overall distance: up to 50[m] (164.04[ft.]) between stations (Note) × number of axes).

(Note): When using long distance cable: 50[m] (164.04[ft.]) between stations × 16 axes = 800[m] (2624.67[ft.])



— Wiring is reduced by issuing the stroke limit signal and proximity dog signal via the servo amplifier.

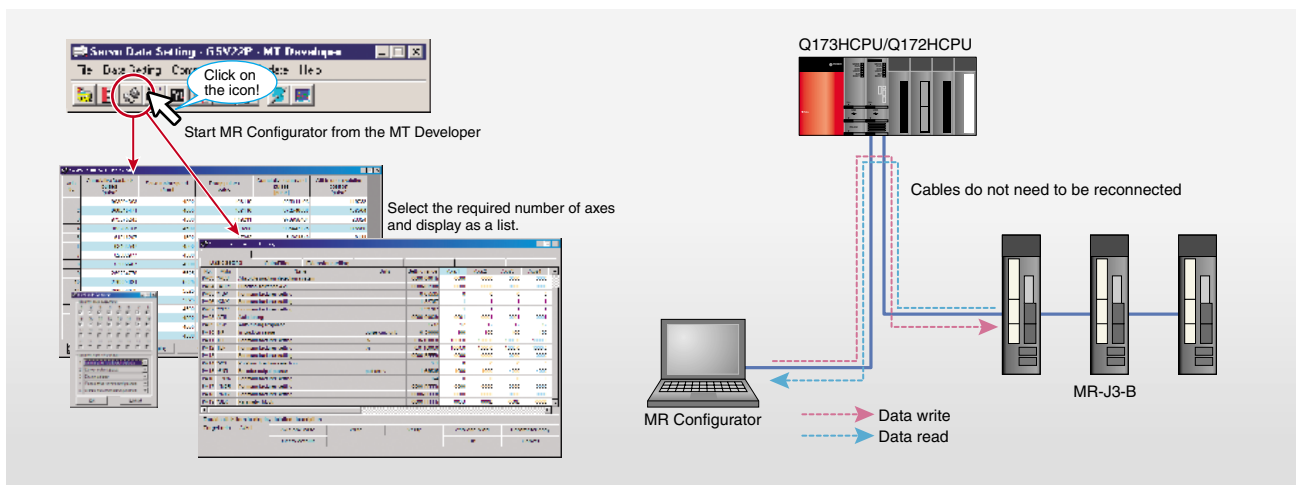


## High Speed and Accuracy with Synergic Effect with MR-J3

Combined with MR-J3, SSCNET III realizes faster and smoother operations for higher speed (HF-KP maximum motor speed: 6000r/min) and higher accuracy (HF-KP motor resolution: 262144PLS/rev).

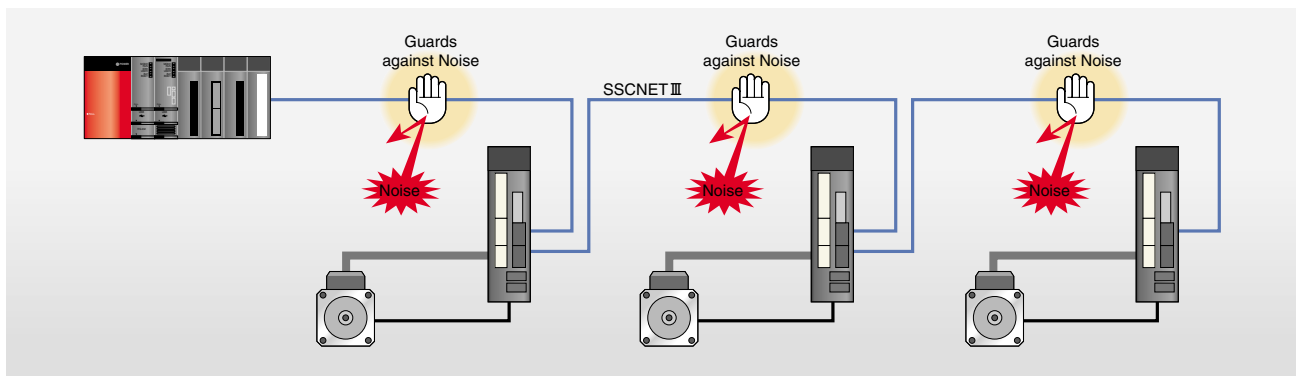
### Shorter Adjustment Time with Servo Adjustment and Multiple Monitor

Communication between the MR Configurator (setup software) and servo amplifier via Motion controller is possible. Multiple servo amplifiers can be adjusted just by connecting between the personal computer and Motion controller with a cable.



### Improved Noise Resistance

The optical fiber cables used for SSCNET III dramatically improve the resistance against noise which enters from the power cable or external devices.



### SSCNET Specifications

Item	SSCNET III		SSCNET
	Optical Fiber Cable		
Communication Medium	Standard Cord for Inside Panel	Long-Distance Cable <sup>(Note-1)</sup>	Metal Cable
	Standard Cable for Outside Panel		
Communication Speed	50Mbps		5.6Mbps
Communication Cycle <sup>(Note-2)</sup>	Send	0.44ms/0.88ms	0.88ms/1.77ms/3.55ms
	Receive	0.44ms/0.88ms	
Maximum Control Axes per System	Communication Cycle 0.44ms : 8 axes/system Communication Cycle 0.88ms : 16 axes/system		8 axes/system
Transmission Distance	Maximum 20m between Stations Maximum Overall Distance 320m (20m X 16 axes)	Maximum 50m between Stations Maximum Overall Distance 800m (50m X 16 axes)	Overall Distance 30m
Noise Resistance	◎		○

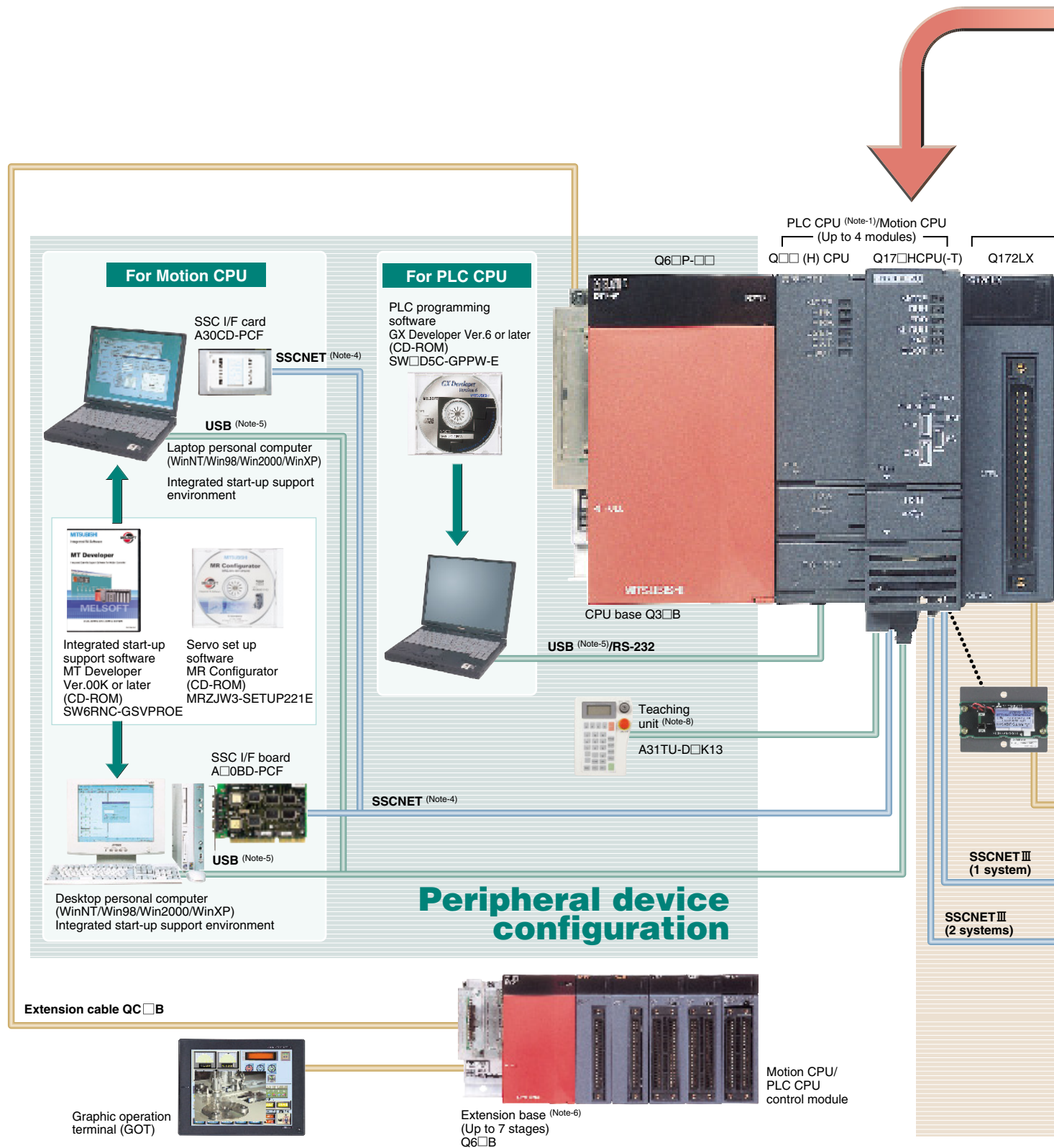
(Note-1) : Special-order product.

(Note-2) : Communication cycle differs according to the setting of operation cycle.

# System Configuration

## Flexible High-Speed Motion Control System Achieved with Multiple CPU

- Compatible with the Q Series PLC (Platform) in the Multiple CPU system.
- The appropriate CPU modules for PLC control and Motion control can be selected to meet the application requirements.
- The Multiple CPU configuration allows up to 4 CPU modules to be selected. (1 PLC CPU must be used.)
- Up to 96 axes of servomotors per system can be controlled by using 3 modules of Q173HCPU(-T).
- Each unit installed in the CPU base and the extension base is controlled by control CPU specified by the parameter.





## Operating system software packages

Operating system software (FD)  
SW6RN-SV□□Q□

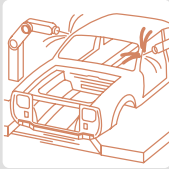


Conveyor assembly use

Motion SFC compatible

# SV13

Dedicated language



[Applications]

Electronic component assembly, Inserter, Feeder, Molder, Conveying equipment, Paint applicator, Chip mounting, Wafer slicer, Loader/Unloader, Bonding machine, X-Y table

Linear interpolation (1 to 4 axes), Circular interpolation, Constant-speed, Fixed-pitch feed, Speed control with fixed position stop, Speed switching, Speed control, Speed/position switching, Teaching

Automatic machinery use

Motion SFC compatible

# SV22

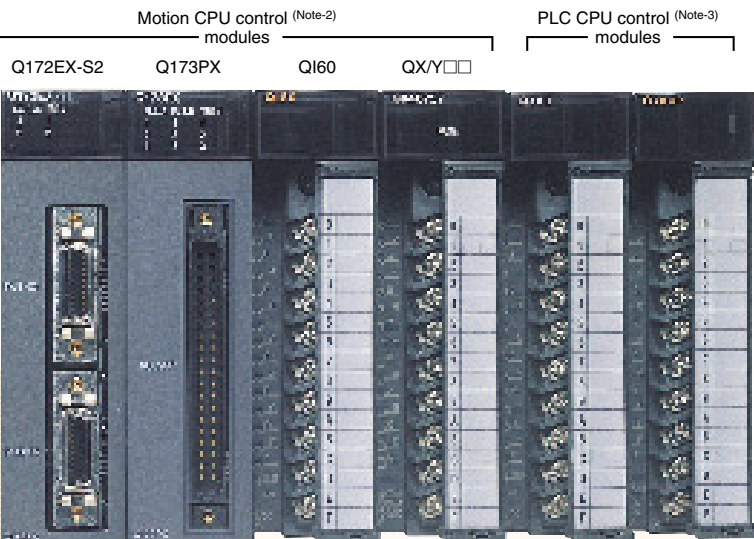
Mechanical support language



[Applications]

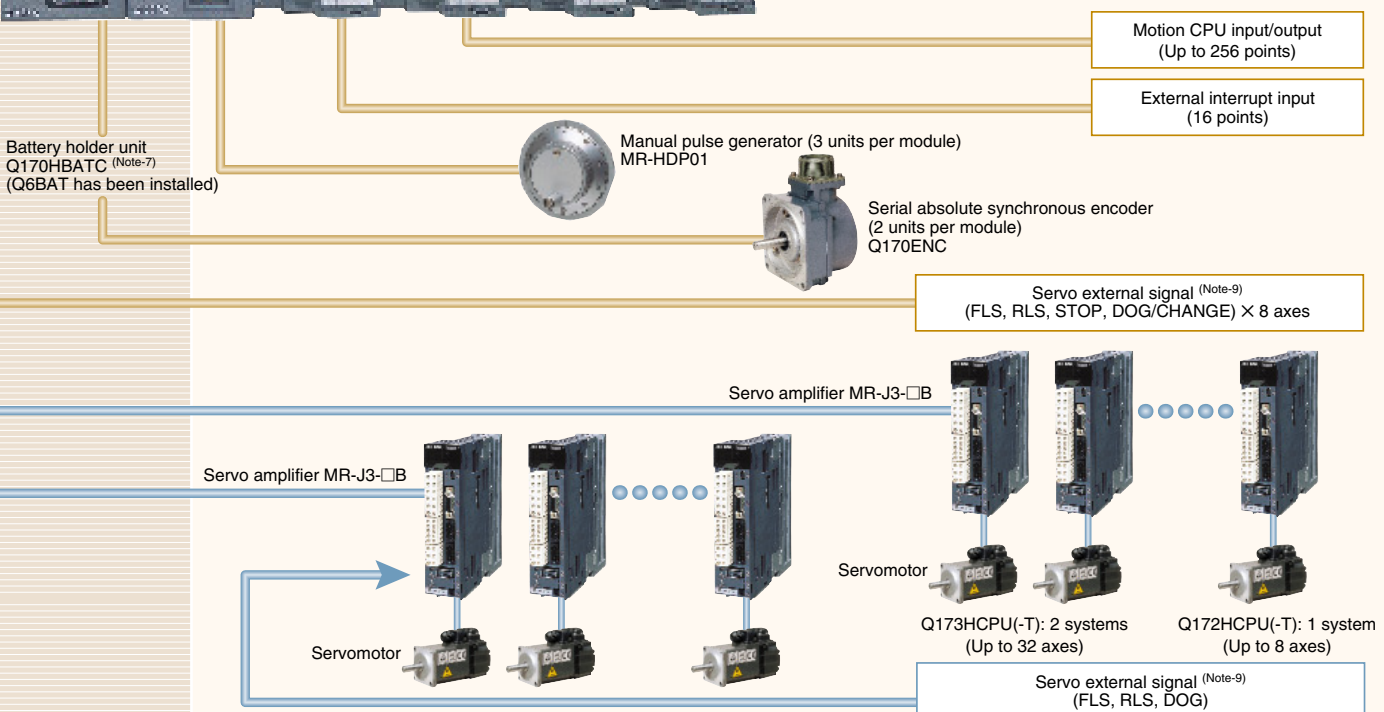
Press feeder, Food processing, Food packaging, Winding machine, Spinning machine, Textile machine, Printing machine, Book binder, Tire molder, Paper-making machine

Synchronous control, Electronic shaft, Electronic clutch, Electronic cam, Draw control



- Notes :
1. PLC CPU for Multiple CPU can be used in Q-mode.
  2. Only input module among Motion CPU control modules can be accessed from PLC CPU.
  3. Other CPU modules cannot be accessed from Motion CPU.
  4. Only 1 PC can be connected via SSCNET.
  5. USB cannot be used in WindowsNT® 4.0.
  6. Motion CPU cannot control the module installed to the QA1S6□B.
  7. The external battery for backup of parameter/program is required at the time of continuous power failure for 1000 hours or more. (Q6BAT is not supplied with Q170HBATC).
  8. In planning stages. When using the teaching unit A31TU-D□K13, please use Motion CPU for teaching unit.
  9. Connecting target can be selected for each axis from general-purpose input of servo amplifier or Q172LX.

## Device configuration



# Product-Line-up

## Motion CPU module

**Q173HCPU**  
**Q173HCPU-T**  
(Up to 32 axes control)



Items		Specifications	
		Q173HCPU	Q173HCPU-T
Number of control axes		Up to 32 axes	
Operation cycle (default)	SV13	0.44ms : 1 to 3 axes 0.88ms : 4 to 10 axes 1.77ms : 11 to 20 axes 3.55ms : 21 to 32 axes	
	SV22	0.88ms : 1 to 5 axes 1.77ms : 6 to 14 axes 3.55ms : 15 to 28 axes 7.11ms : 29 to 32 axes	
Servo amplifier		Servo amplifiers are connected via SSCNET III (2 systems)	
Peripheral I/F		USB/SSCNET	
Teaching operation function		None	Provided (SV13 use)
Manual pulse generator operation function		Possible to connect 3 modules	
Synchronous encoder operation function		Possible to connect 12 modules (Note-1) (SV22 use)	
Controllable modules	Q172LX	Up to 4 modules per CPU	
	Q172EX-S2	Up to 6 modules per CPU (SV22 use)	
	Q173PX	Up to 4 modules per CPU (Incremental synchronous encoder use in SV22)	
	QX <input type="checkbox"/>	Total : Up to 256 points per CPU	
	QY <input type="checkbox"/>		
	QH <input type="checkbox"/>		
	QX <input type="checkbox"/> Y <input type="checkbox"/>		
Q64AD/Q68ADV/Q68ADI/ Q62DA/Q64DA/Q68DAV/ Q68DAI			
QI60	Up to 1 module per CPU		
PLC extensions		Up to 7 base units	
5VDC current consumption [A]		1.25	1.56 (Note-2)
Mass [kg]		0.23	0.24
Exterior dimensions [mm(inch)]		H 104.6(4.11) × W 27.4(1.08) × D 114.3(4.50)	

(Note-1) : Up to 12 modules can be used in the sum total with the manual pulse generator.  
(Note-2) : Current consumption 0.26 [A] of the teaching unit is included.

## Motion CPU module

**Q172HCPU**  
**Q172HCPU-T**  
(Up to 8 axes control)



Items		Specifications	
		Q172HCPU	Q172HCPU-T
Number of control axes		Up to 8 axes	
Operation cycle (default)	SV13	0.44ms : 1 to 3 axes 0.88ms : 4 to 8 axes	
	SV22	0.88ms : 1 to 5 axes 1.77ms : 6 to 8 axes	
Servo amplifier		Servo amplifiers are connected via SSCNET III (1 system)	
Peripheral I/F		USB/SSCNET	
Teaching operation function		None	Provided (SV13 use)
Manual pulse generator operation function		Possible to connect 3 modules	
Synchronous encoder operation function		Possible to connect 8 modules (Note-1) (SV22 use)	
Controllable modules	Q172LX	Up to 1 module per CPU	
	Q172EX-S2	Up to 4 modules per CPU (SV22 use)	
	Q173PX	Up to 3 modules per CPU (Incremental synchronous encoder use in SV22)	
	QX <input type="checkbox"/>	Total : Up to 256 points per CPU	
	QY <input type="checkbox"/>		
	QH <input type="checkbox"/>		
	QX <input type="checkbox"/> Y <input type="checkbox"/>		
Q64AD/Q68ADV/Q68ADI/ Q62DA/Q64DA/Q68DAV/ Q68DAI			
QI60	Up to 1 module per CPU		
PLC extensions		Up to 7 base units	
5VDC current consumption [A]		1.14	1.45 (Note-2)
Mass [kg]		0.22	0.23
Exterior dimensions [mm(inch)]		H104.6(4.11) × W27.4(1.08) × D114.3(4.50)	

(Note-1) : Up to 8 modules can be used in the sum total with the manual pulse generator.  
(Note-2) : Current consumption 0.26 [A] of the teaching unit is included.

## Servo external signals interface module

# Q172LX



Items		Specifications
Upper stroke limit input, Lower stroke limit input, Stop signal input, Proximity dog/ speed-position switching input	Number of input points	Servo external control signals : 32 points, 8 axes
	Input method	Sink/Source type (Photocoupler)
	Rated input voltage/current	12VDC 2mA, 24VDC 4mA
	Operating voltage range	10.2 to 26.4VDC (Ripple ratio 5% or less)
	ON voltage/current	10VDC or more/2.0mA or more
	OFF voltage/current	1.8VDC or less/0.18mA or less
Response time	Upper/lower stroke limit and STOP signal	1ms (OFF → ON, ON → OFF)
	Proximity dog/ speed-position switching signal	0.4ms/0.6ms/1ms (OFF → ON, ON → OFF) * CPU parameter setting, default 0.4ms
Number of I/O occupying points		32 points (I/O allocation: Intelligent, 32 points)
5VDC current consumption [A]		0.05
Mass [kg]		0.15
Exterior dimensions [mm(inch)]		H98(3.86) × W27.4(1.08) × D90(3.54)

## Synchronous encoder interface module

# Q172EX-S2



Items		Specifications
Serial absolute synchronous encoder input	Number of modules	2 per module
	Applicable encoder	Q170ENC
	Position detection method	Absolute (ABS) data method
	Transmission method	Serial communications (2.5Mbps)
	Back up battery	A6BAT/MR-BAT
	Maximum cable length	50m
Tracking enable input	Number of input points	2 points
	Input method	Sink/Source type (Photocoupler)
	Rated input voltage/current	12VDC 2mA, 24VDC 4mA
	Operating voltage range	10.2 to 26.4VDC (Ripple ratio 5% or less)
	ON voltage/current	10VDC or more/2.0mA or more
	OFF voltage/current	1.8VDC or less/0.18mA or less
Response time		0.4ms/0.6ms/1ms (OFF → ON, ON → OFF) * CPU parameter setting, default 0.4ms
Number of I/O occupying points		32 points (I/O allocation: Intelligent, 32 points)
5VDC current consumption [A]		0.07
Mass [kg]		0.15
Exterior dimensions [mm(inch)]		H98(3.86) × W27.4(1.08) × D90(3.54)

## Manual pulse generator interface module

# Q173PX



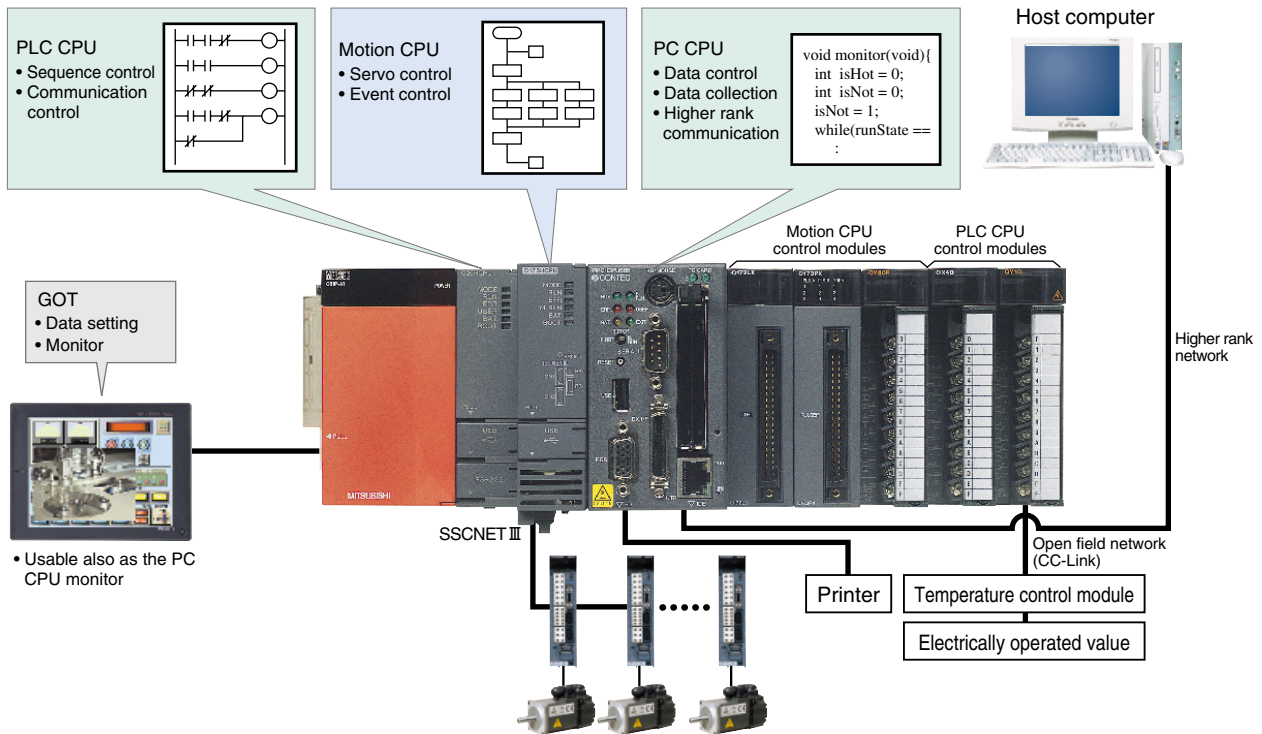
Items		Specifications	
Manual pulse generator/ incremental synchronous encoder input	Number of modules	3 per module	
	Voltage-output/ Open-collector type	High-voltage	3.0 to 5.25VDC
		Low-voltage	0 to 1.0VDC
	Differential-output type	High-voltage	2.0 to 5.25VDC
		Low-voltage	0 to 0.8VDC
	Input frequency	Up to 200kpps (After magnification by 4)	
	Applicable types	Voltage-output/Open-collector type (5VDC), (Recommended product: MR-HDP01) Differential-output type (26LS31 or equivalent)	
	Maximum cable length	Voltage-output/Open-collector type: 10m(32.79ft.) Differential-output type: 30m(98.36ft.)	
Tracking enable input	Number of input points	3 points	
	Input method	Sink/Source type (Photocoupler)	
	Rated input voltage/current	12VDC 2mA, 24VDC 4mA	
	Operating voltage range	10.2 to 26.4VDC (Ripple ratio 5% or less)	
	ON voltage/current	10VDC or more/2.0mA or more	
	OFF voltage/current	1.8VDC or less/0.18mA or less	
Response time		0.4ms/0.6ms/1ms (OFF → ON, ON → OFF) * CPU parameter setting, default 0.4ms	
Number of I/O occupying points		32 points (I/O allocation: Intelligent, 32 points)	
5VDC current consumption [A]		0.11	
Mass [kg]		0.15	
Exterior dimensions [mm(inch)]		H98(3.86) × W27.4(1.08) × D90(3.54)	

# Multiple CPU System

## An Innovative Multiple CPU System Providing Advanced Performance and Control

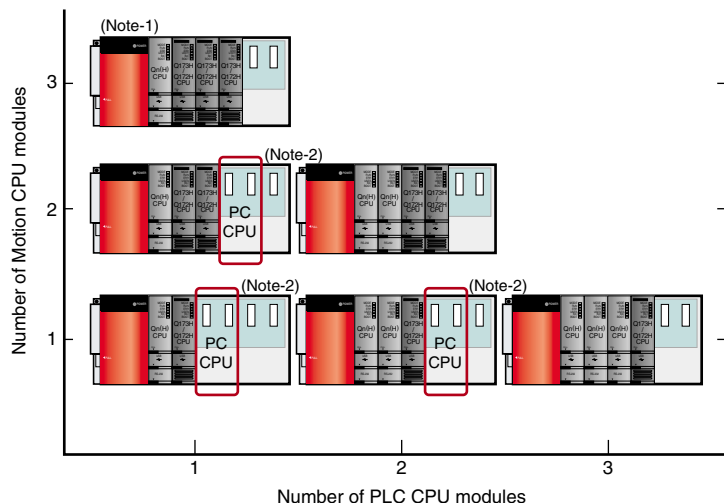
### Distribution of control processing

- By distributing such tasks as machine control, communication control, servo control, and information control among multiple processors, CPU load is dramatically reduced, allowing extremely fast and efficient processing of complex applications.
- Various I/O modules are assigned to their respective CPU module and can be used on the same base unit simultaneously.

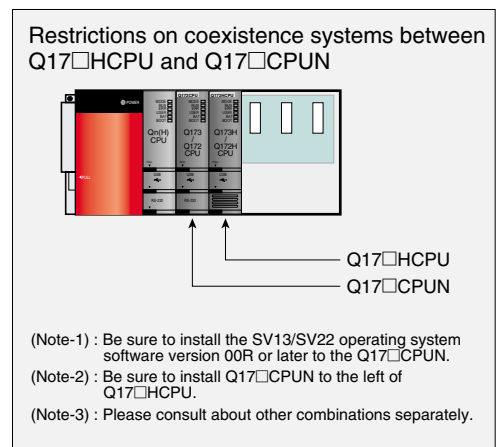


### Flexible Multiple CPU system configuration

- Multiple CPU configuration allows up to 4 CPU modules to be selected for the systems and control axes.



(Note-1) : Be careful of a 5VDC power supply capacity. Select the Q64P (5VDC 8.5A) as required.  
 (Note-2) : The PC CPU can be installed to the right-hand side of Motion CPU.





## Communication between the Motion CPU and PLC CPU

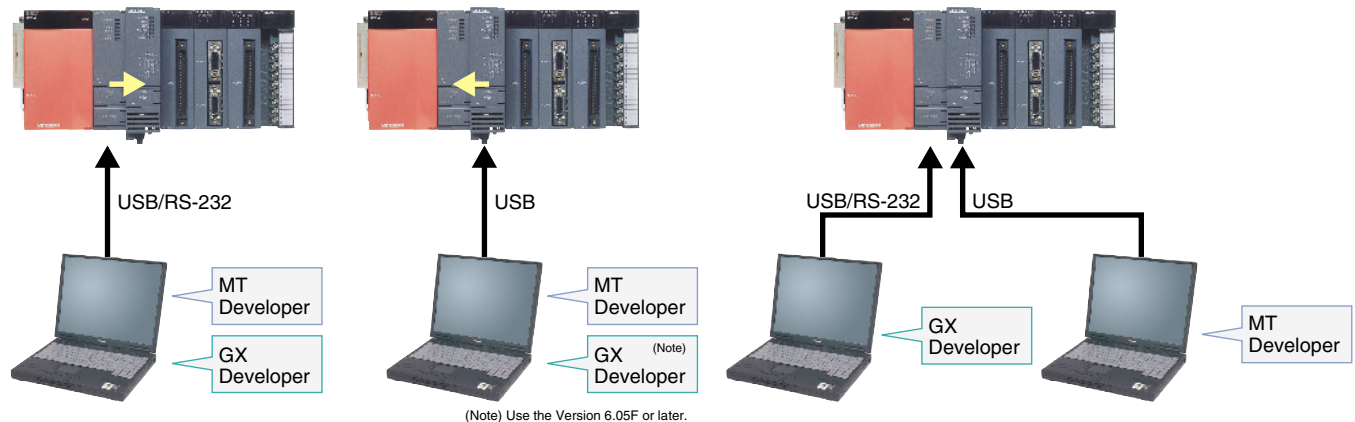
■ The optimum functions for your application needs are provided to exchange data between CPU modules.

Communication method	Communication processing timing	Data amount	Function	Application
Automatic refresh	Scan processing	Several hundred words to several kilo words	Data exchange (Area-fixed) (Parameter-fixed)	<p><b>Regular communication for control device data</b></p>
Motion dedicated PLC instruction (S(P).DDRD) (S(P).DDWR)	Direct processing (At the command execution) * Interrupt request to the Motion CPU	1 to 16 words	Data exchange (Random access)	<p><b>Re-writing of the position follow-up control data, etc.</b></p>
PLC instruction (FROM) (S(P).TO) Motion SFC instruction (MULTR) (MULTW)	Direct processing (At the command execution)	1 to 256 words	Data exchange (Shared memory batch)	<p><b>Batch data communication</b></p>
Motion dedicated PLC instruction (S(P).SFCS) (S(P).GINT) (S(P).SVST) (S(P).CHGA) (S(P).CHGV) (S(P).CHGT)	Direct processing (At the command execution) * Interrupt request to the Motion CPU	-	Execution of Motion SFC program/ Event task/ Servo program/ Current value change/ Speed change/ Torque limit value change	<p><b>Program start, event execute control</b></p>

## Access to the other CPU via USB/RS-232 connecting

■ Access to the Motion CPU and PLC CPU on the same base unit is possible using one personal computer.

The programming/monitor of other CPU modules on the same base unit is possible by only connecting a personal computer installed the programming software to one CPU module. A personal computer can also be connected with each CPU module.



# Motion SFC Program

## Powerful Programming Environment with Event Processing

- The Motion control program is described in flowchart form using the Motion SFC (Sequential Function Chart) format. By describing the Motion CPU program using the suitable Motion SFC function blocks, the Motion CPU can control the machine operation and aid in the event processing.
- Easy programming for the entire system operation is possible by using the available icons such as **[F]** (Arithmetic Operation, I/O Control), **[G]** (Transition Conditional Judgement) and **[K]** (Motion Control) arranged in a sequential process.

## Motion SFC description

### Flowchart description are easy to read and understand

- The machine operation procedure can be visualized in the program by using the flowchart descriptions.
- A process control program can be created easily, and control details can be visualized.

### A logical layered structure program

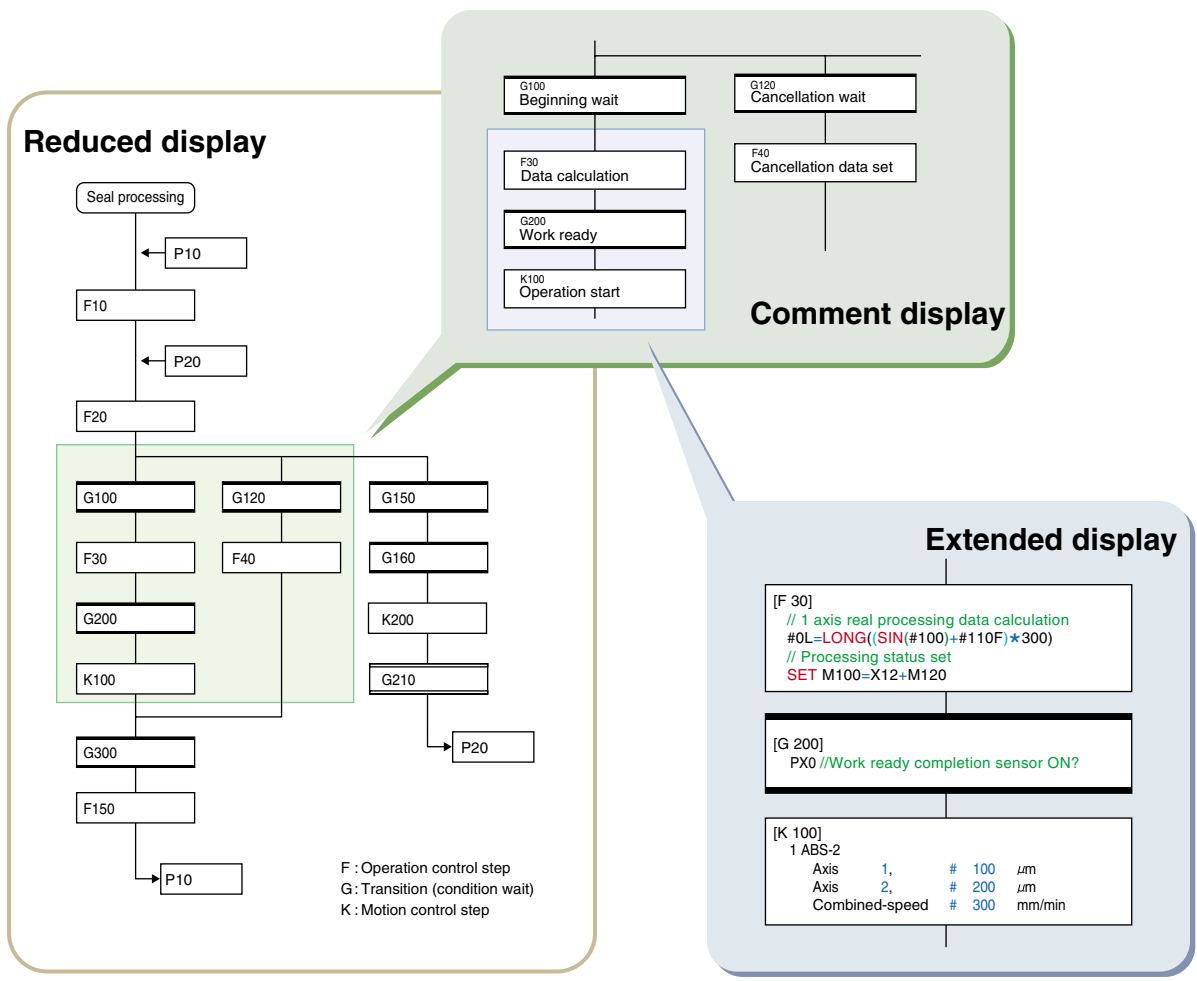
- Operation commands are easily described by creating comments.
- Operation commands are detailed in a step by step format in a layered structure program.

### Controlling sequential machine operation using the Motion CPU

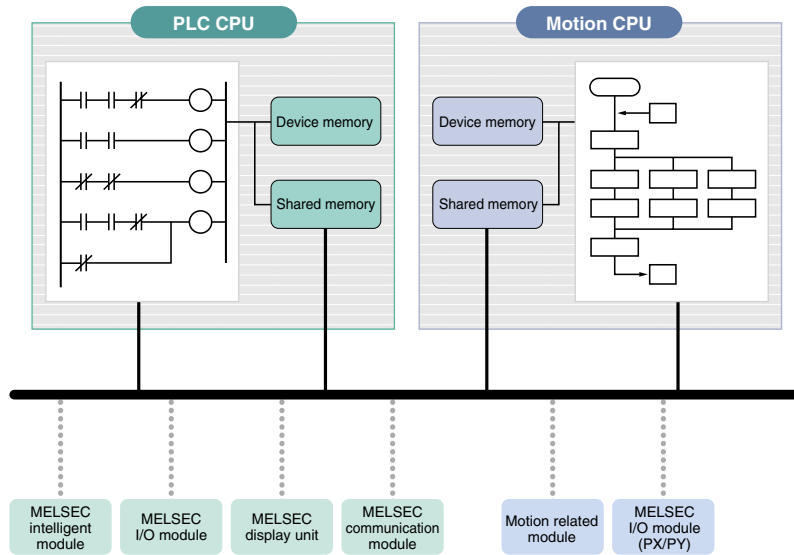
- Servo control, I/O control, and operation commands can be combined in the Motion SFC program.
- Servo control can be accomplished without the need for a PLC program.

### Enhanced operation functions

- Commands can be described with arithmetic and logic operation expressions.
- Compatible with 64-bit floating-point operations.
- Arithmetic functions include trigonometric functions, square root, natural logarithm, etc.



## Multiple CPU control using PLC CPU and Motion CPU



By distributing such tasks as servo control, machine control, and information control among multiple processors, the flexible system configuration can be realized.

The program of Motion CPU is described in the Motion SFC program.

### ■Event processing

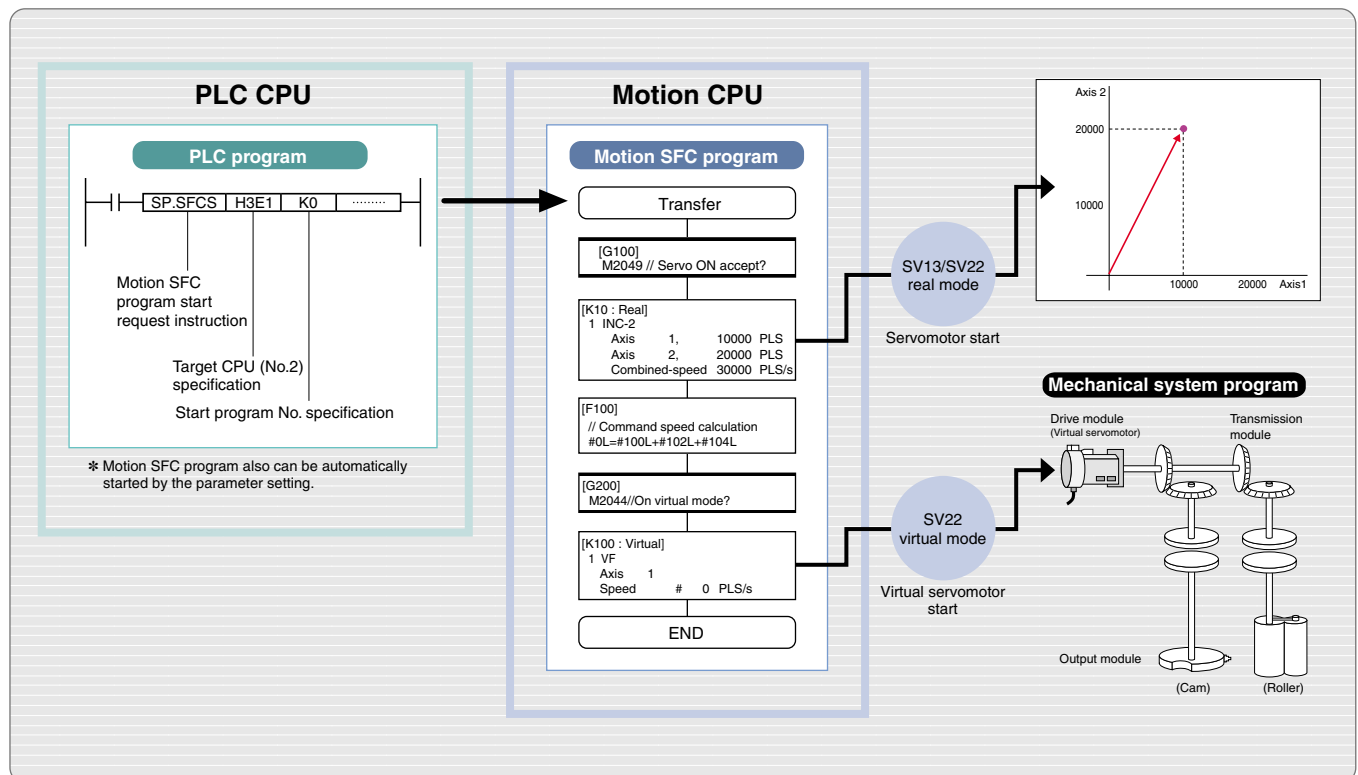
The high-speed response (control for the signal output, servomotor start, speed change, etc.) is executed by waiting for the condition completion (event occurrence) according to the change of input signal state and device value change in this processing.

### ■Event examples

- Input signal turned on
- Operation results reached constant-value
- Constant-time passed
- Positioning completed

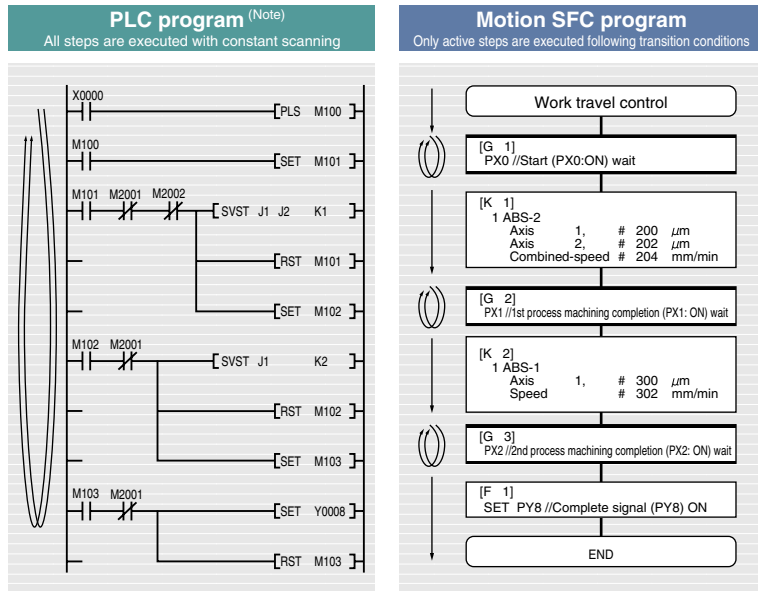
- Ladder description suitable for scan process (Importance laid on condition control)
- Motion SFC description suitable for event process (Importance laid on sequential control, pursuit of event responsiveness)
- Sequence control (Compatible with multiple I/O points, multiple operations)
- Servo high-speed response (Start)
- System stop processing at error detection
- Positioning address, speed data operation, speed change
- High functionality with multitasking and branching

## Control flow



# Motion SFC Program

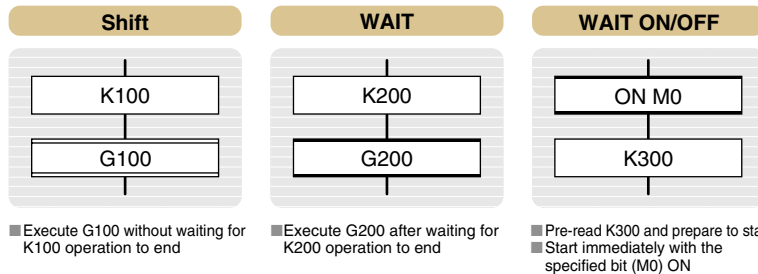
## Motion SFC operation



(Note): A172SHCPUN, SV13 use

### High-speed response using step execute method

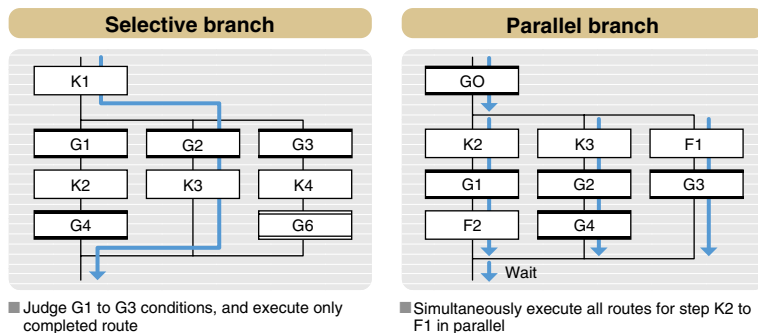
■ The PLC program uses a scan execute method to execute all steps with constant scanning. However, since the step execute method which executes only the active steps following the transition conditions is used in the Motion SFC program, the operation processing can be reduced, and processing or response control can be realized.



- Execute G100 without waiting for K100 operation to end
- Execute G200 after waiting for K200 operation to end
- Pre-read K300 and prepare to start
- Start immediately with the specified bit (M0) ON

### Dedicated description unique to motion control

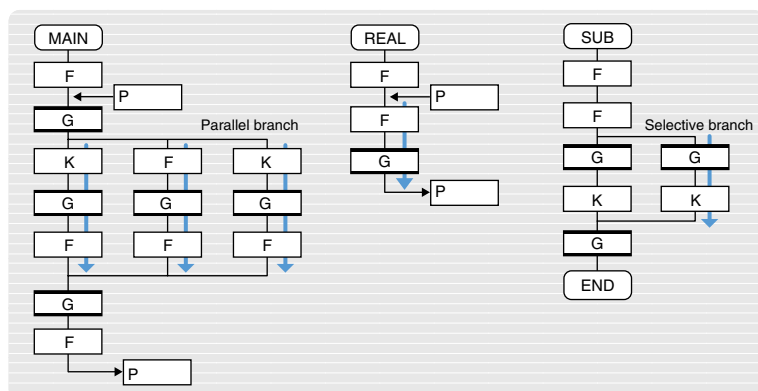
- If shift is executed immediately after the motion control step, the shift is executed without waiting for the motion control operation to end.
- If WAIT is executed immediately after the motion control step, WAIT will be executed after waiting for the motion control operation to end.
- If WAIT ON/WAIT OFF is executed just before the motion control step, the details of the motion control will be pre-read, and preparations for start are made. The operation starts immediately with the specified bit device ON/OFF.



- Judge G1 to G3 conditions, and execute only completed route
- Simultaneously execute all routes for step K2 to F1 in parallel

### Selective branch and parallel branch

- When all routes after branch are shift or WAIT, selective branch is used. Parallel branch is used in all other cases.
- The route for which the transition conditions are completed first are executed in the selective branch.
- The routes connected in parallel are executed simultaneously, the processing waits at the connection point, and shifts to the next process after execution of all routes is completed in the parallel branch.



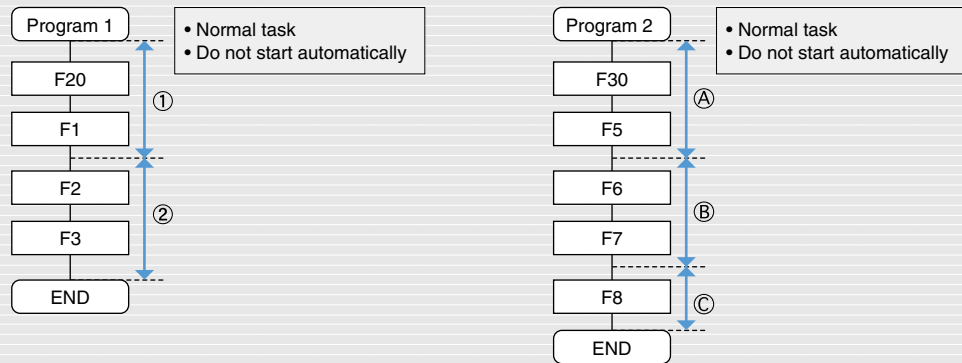
### Multi-task processing

- When the multiple programs are started, the processing is executed with multi-task operation in the Motion SFC program.
- Multiple steps can be simultaneously executed with parallel branching even in one program.
- A program that executes the multiple processing simultaneously or makes the independent movement by grouping the control axes can be created easily.
- A highly independent programming is possible according to the processing details, so a simple program can be created.

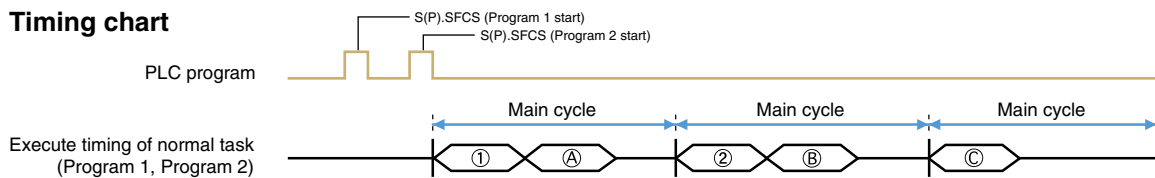


## Task operation examples of Motion SFC program

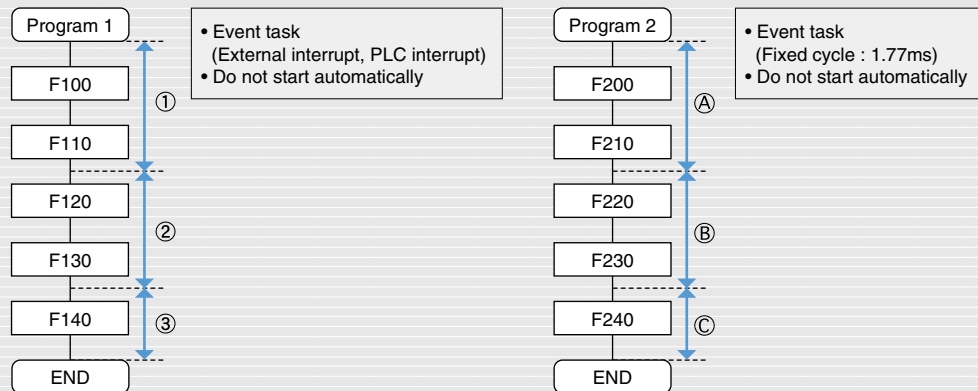
### Normal task



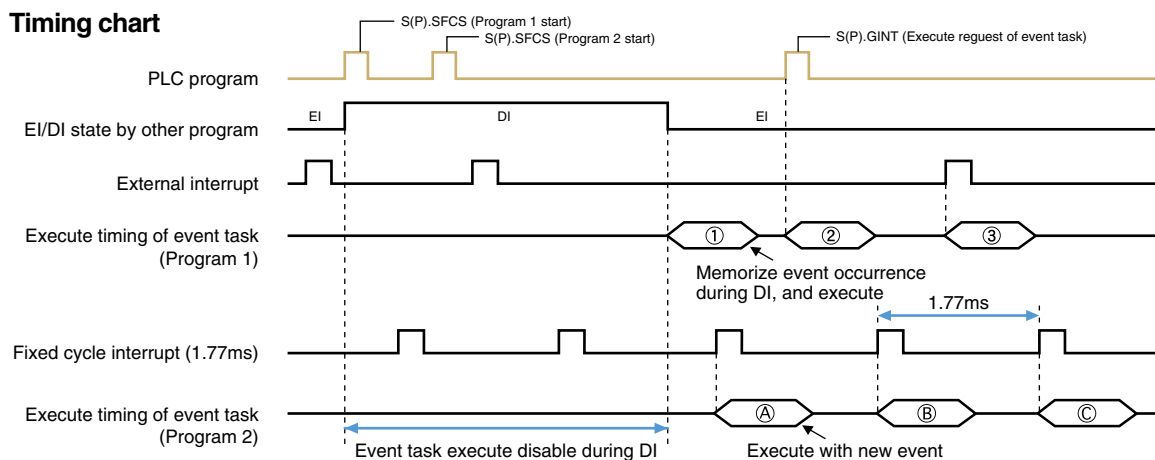
### Timing chart



### Event task/NMI task



### Timing chart

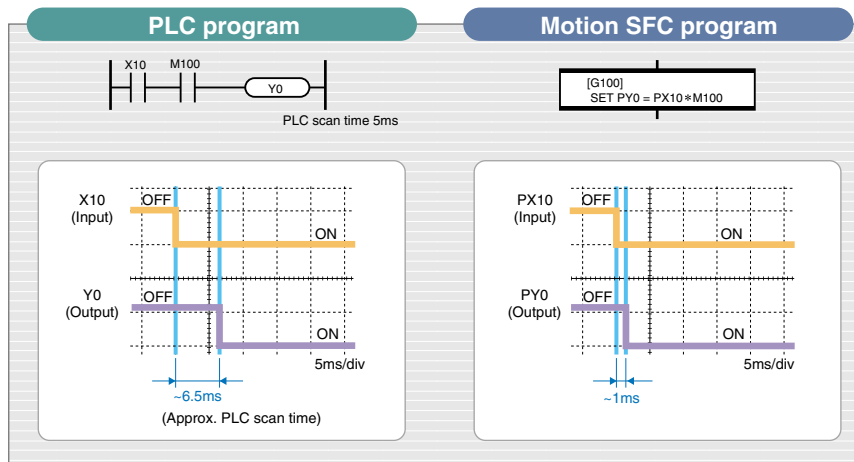


(Note): Number of steps executed in 1 time of processing cycle are set in the parameters.

# Motion SFC Program

## Motion SFC high-speed response control

### High-speed response to external inputs



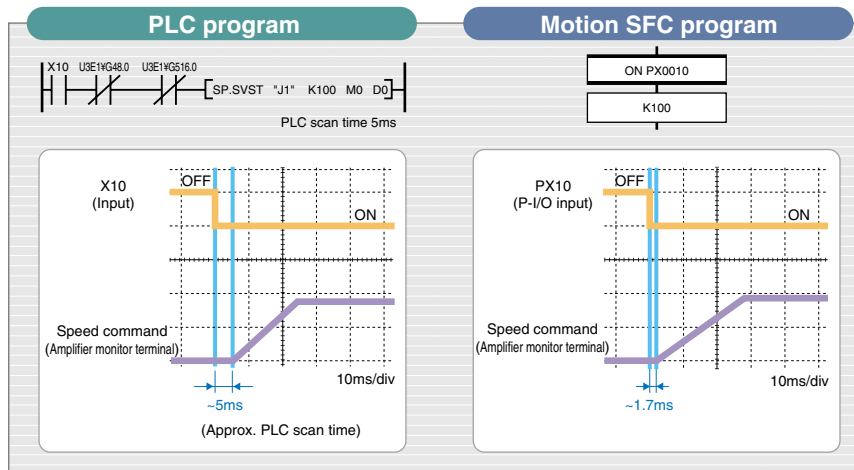
#### I/O output

- The response time of output signal for the input signal from an external source is measured in this program.
- The response time and dispersion affected by the scan time are approx. 6.5ms in the PLC program.
- There are neither the response nor dispersion in the Motion SFC program.

Measurement machine used

PLC CPU module	:Q02HCPU
Motion CPU module	:Q173HCPU(-T)
Input module	:QX40-S1(OFF→ON response:~0.1ms)
Output module	:QY40P(OFF→ON response:~1ms)

### Powerful reduction in servo program start time

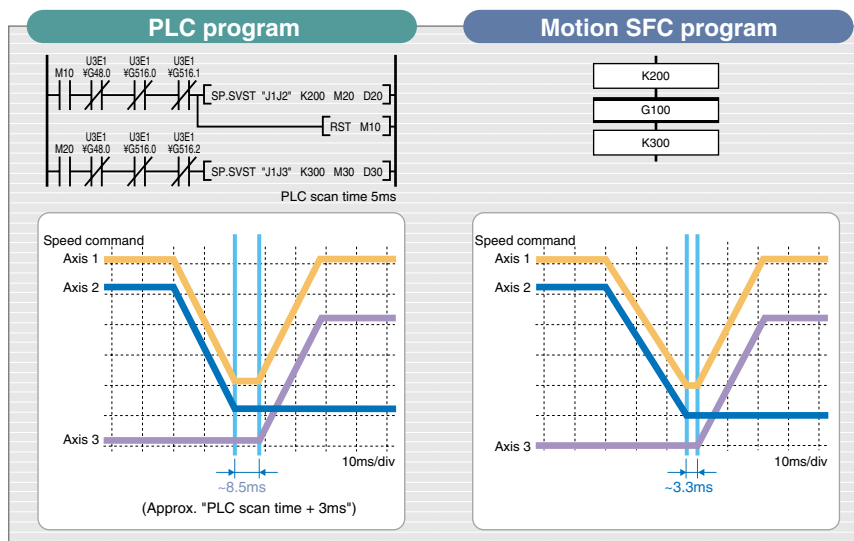


#### Servo program start

- The servo program is started using the input signal from an external source as a trigger in this example.
- The response time and dispersion are affected by the scan time from the external signal input to starting of speed command are approx. 5ms in the start using the PLC program.
- The speed command is started with the response time "dispersion approx. 1.7ms" in the Motion SFC program.

Measurement machine used

PLC CPU module	:Q02HCPU
Motion CPU module	:Q173HCPU(-T)
Input module	:QX40-S1(OFF→ON response:~0.1ms)



#### Servo program continuous start

- 1 axis, 3 axes linear interpolation program "K300" is started following 1 axis, 2 axes linear interpolation program "K200" in this example.
- The response time and dispersion are approx. 8.5ms in the servo program continuous start using the PLC program. This is because the PLC scan time is 5ms and the refresh cycle of start accept flag used as the interlock is approx. 3ms.
- An interlock is not required and the start delay is approx. 3.3ms in the Motion SFC program.

Measurement machine used

PLC CPU module	:Q02HCPU
Motion CPU module	:Q173HCPU(-T)
Input module	:QX40-S1(OFF→ON response:~0.1ms)

## Motion SFC specifications

### Motion SFC chart symbols

Class	Name	Symbol	Function
Program start/end	START		Indicates the program start (entrance) .
	END		Indicates the program end (exit) .
Step	Motion control step		Starts the servo program Kn. (Refer to page 22 for the servo instructions.)
	Once execution type operation control step		Executes the operation control program Fn once.
	Scan execution type operation control step		Repeats an operation control program FSn until the completion of next transition condition.
	Subroutine call/start step		Calls or starts a subroutine.
	Clear step		Cancels and ends the execution of specified program.
Transition	Shift (Pre-read transition)		Shifts to the next step with the completion of condition without waiting for the previous motion control step or subroutine to end.
	WAIT		Shifts to the next step with the completion of condition after the previous motion control step or subroutine end.
	WAIT ON		Prepares to start the next motion control step, and immediately commands the completion of condition.
	WAIT OFF		
Jump	Jump		Jumps to the specified pointer Pn of the self program.
Pointer	Pointer		Indicates the jump destination pointer (label).

### Motion SFC program parameters

The Motion SFC program start method and execute timing are set with the program parameters.

Item	Setting range	Details	
Start setting	Start automatically	• Starts at the turning PLC ready (M2000) off to on.	
	Do not start automatically	• Starts with the Motion SFC program start instruction $[S(P).SFCS]$ . • Starts with the "Subroutine call/start" $[GSUB]$ from the Motion SFC program.	
Execute task	Normal task	• Executes in the motion main cycle (free time).	
	Event task	Fixed cycle	• Executes in the fixed cycle (0.88ms, 1.77ms, 3.55ms, 7.11ms, 14.2ms).
		External interrupt	• Executes when input ON is set among the input 16 points of the interrupt module QI60.
		PLC interrupt	• Executes with interrupt instruction from PLC.
NMI task	• Executes when input ON is set among the input 16 points of the interrupt module QI60.		

### Operation control steps and transition commands

Class	Symbol	Function	Class	Symbol	Function	Class	Symbol	Function		
Binary operation	=	Substitution	Standard function	SIN	Sine	Logical operation	(none)	Logical acknowledgement		
	+	Addition		COS	Cosine		!	Logical negation		
	-	Subtraction		TAN	Tangent		*	Logical AND		
	*	Multiplication		ASIN	Arcsine		+	Logical OR		
	/	Division		ACOS	Arccosine		==	Equal to		
	%	Remainder		ATAN	Arctangent		!=	Not equal to		
Bit operation	~	Bit inversion (complement)		SQRT	Square root	Comparison operation	<	Less than		
	&	Bit logical AND		LN	Natural logarithm		<=	Less than or equal to		
		Bit logical OR		EXP	Exponential operation		>	More than		
	^	Bit exclusive logical OR		ABS	Absolute value		>=	More than or equal to		
	>>	Bit right shift		RND	Round-off		Motion dedicated function	CHGV	Speed change request	
	<<	Bit left shift		FIX	Round-down			CHGT	Torque limit value change request	
Sign	-	Sign inversion (complement of 2)		FUP	Round-up	EI		Event task enable		
	SHORT	Signed 16-bit integer value conversion		BIN	BCD → BIN conversion	DI		Event task disable		
	USHORT	Unsigned 16-bit integer value conversion	BCD	BIN → BCD conversion	NOP	No operation				
	LONG	Signed 32-bit integer value conversion	(none)	ON (normally open contact)	BMOV	Block transfer				
	ULONG	Unsigned 32-bit integer value conversion	!	OFF (normally closed contact)	FMOV	Same date block transfer				
	FLOAT	Signed 64-bit floating-point value conversion	Bit device control	SET	Device set	TIME		Time to wait		
Type conversion	UFLOAT	Unsigned 64-bit floating-point value conversion		RST	Device reset	Others		MULTW	Write device data to shared CPU memory	
	Bit device status	(none)		ON (normally open contact)	DOUT			Device output	MULTR	Read device data from shared CPU memory of the other CPU
		!		OFF (normally closed contact)	DIN			Device input	TO	Write device data to intelligent function module/special function module
		SET		Device set	OUT			Bit device output	FROM	Read device data from intelligent function module/special function module
RST		Device reset								
DOUT		Device output								
DIN		Device input								
OUT	Bit device output									

### Motion dedicated PLC instructions

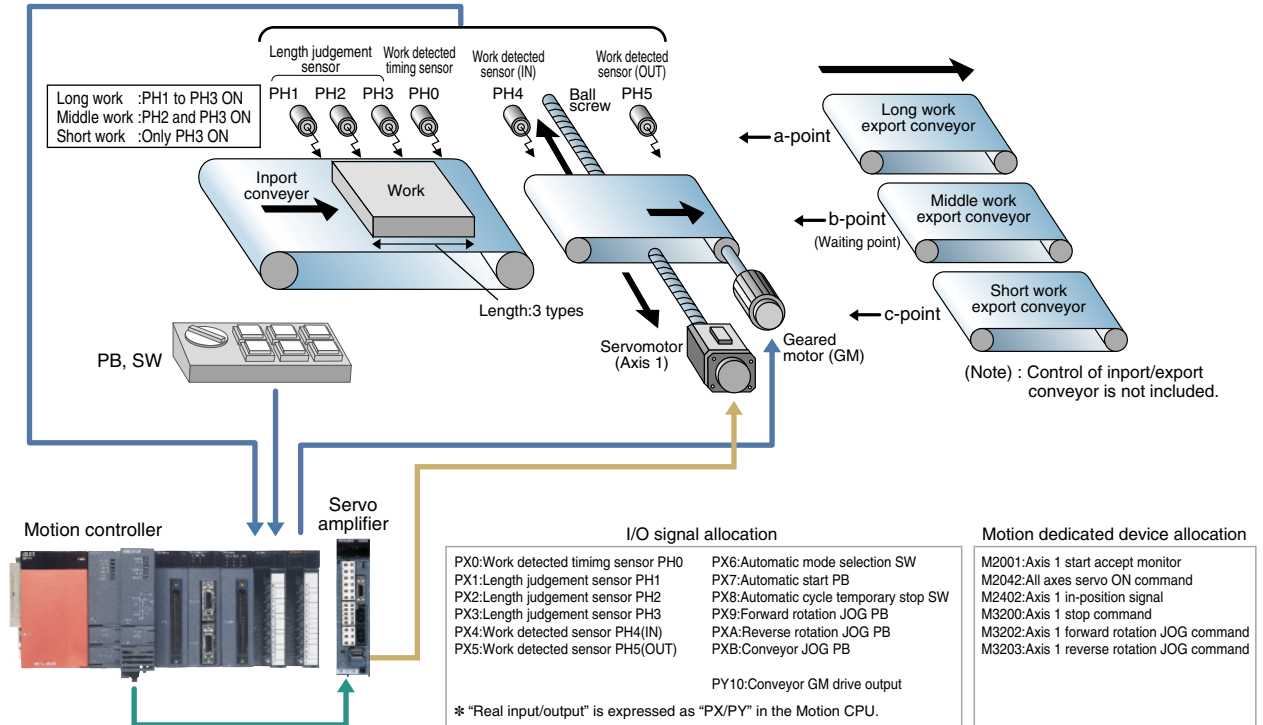
Instructions	Control details
S(P).SFCS	Start request of the Motion SFC program (Program No. may be specified.)
S(P).GINT	Execute request of an event task of Motion SFC program
S(P).SVST	Start request of the specified servo program
S(P).CHGA	Current value change request of the specified axis
S(P).CHGV	Speed change request of the specified axis
S(P).CHGT	Torque control value change request of the specified axis
S(P).DDWR	Write from the PLC CPU to the Motion CPU
S(P).DDRD	Read from the devices of the Motion CPU

# Motion SFC Program

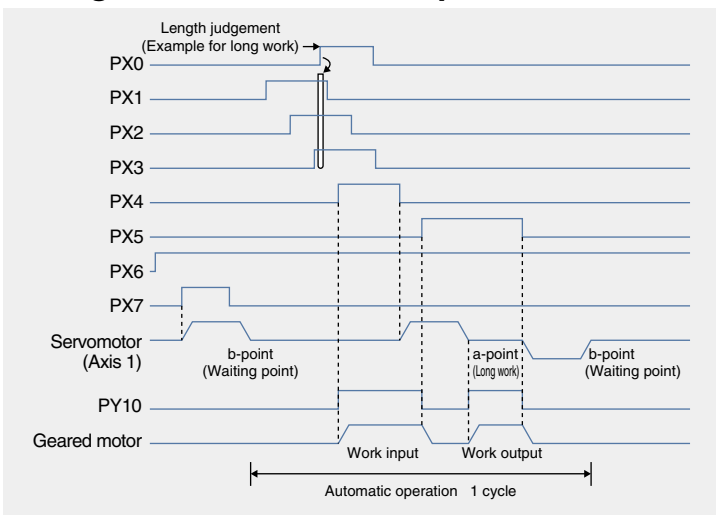
## Example of Motion SFC program

■ This is a control example of assortment equipment which judges 3 types work and performs assortment conveyance on 3 lines.

### Machine composition



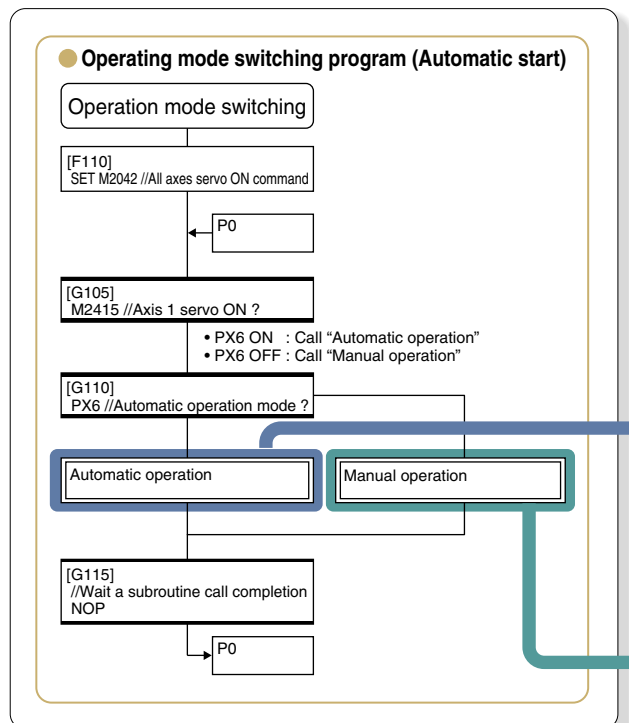
### Timing chart of automatic operation



#### Operation specifications

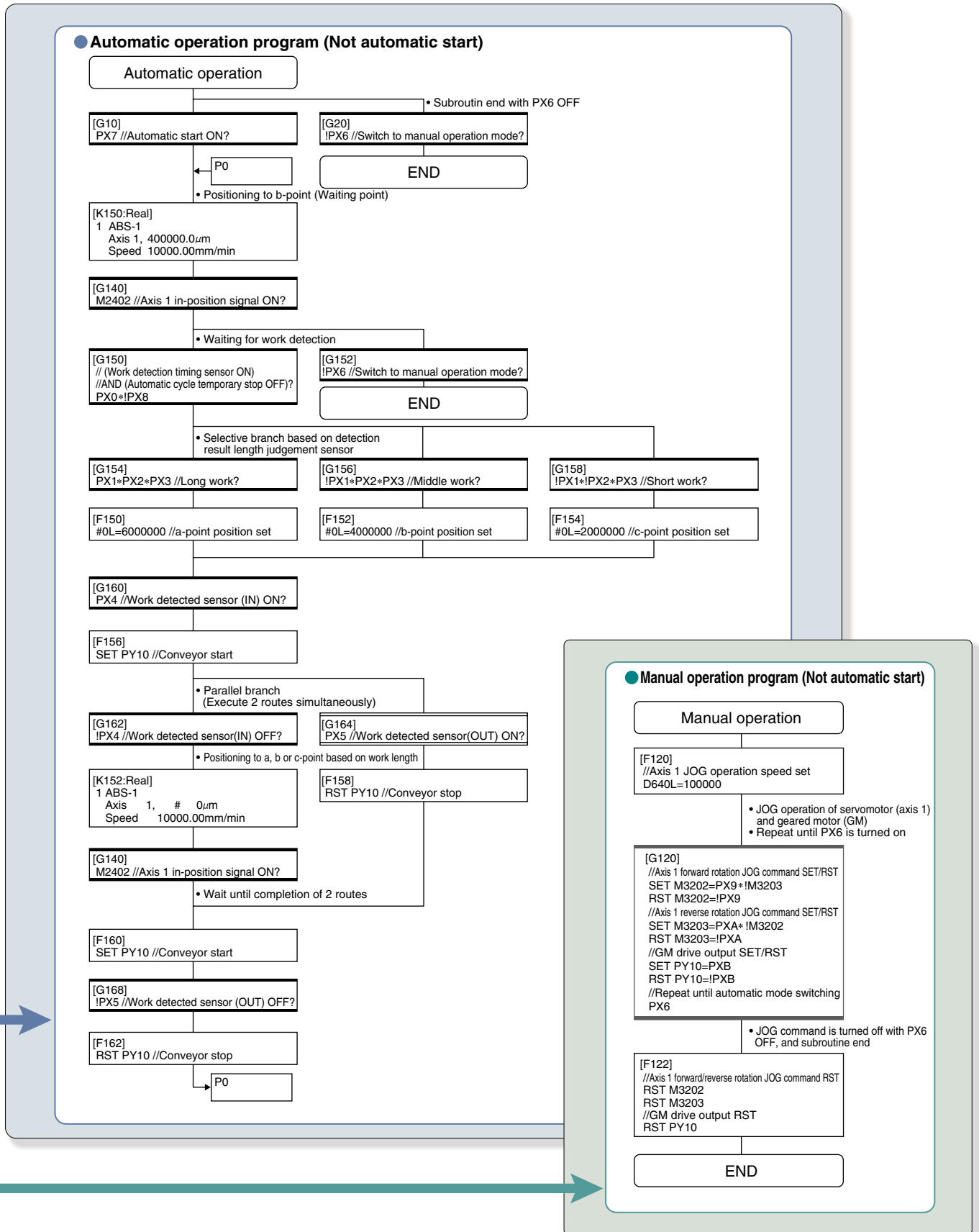
- Automatic operation mode is set by turning the automatic mode selection SW (PX6) ON, and manual operation mode is set by OFF.
- Manual operation mode
  - JOG operation of servomotor is executed with the forward rotation JOG (PX9)/reverse rotation JOG (PXA).
  - JOG operation (export direction only) of geared motor is executed with the conveyor JOG PB (PXB).
- Automatic operation mode
  - Automatic operation cycle (assortment conveyance) shown in a chart is started by turning the automatic start PB (PX7) ON.
  - Automatic operation cycle is stopped temporarily by turning the automatic cycle temporary stop SW (PX8) ON, and it is resumed by OFF.
  - Automatic operation cycle is stopped by turning the automatic mode selection SW (PX6) OFF, and it shifts to the manual operation mode.

### Main Motion SFC program





## Sub Motion SFC program

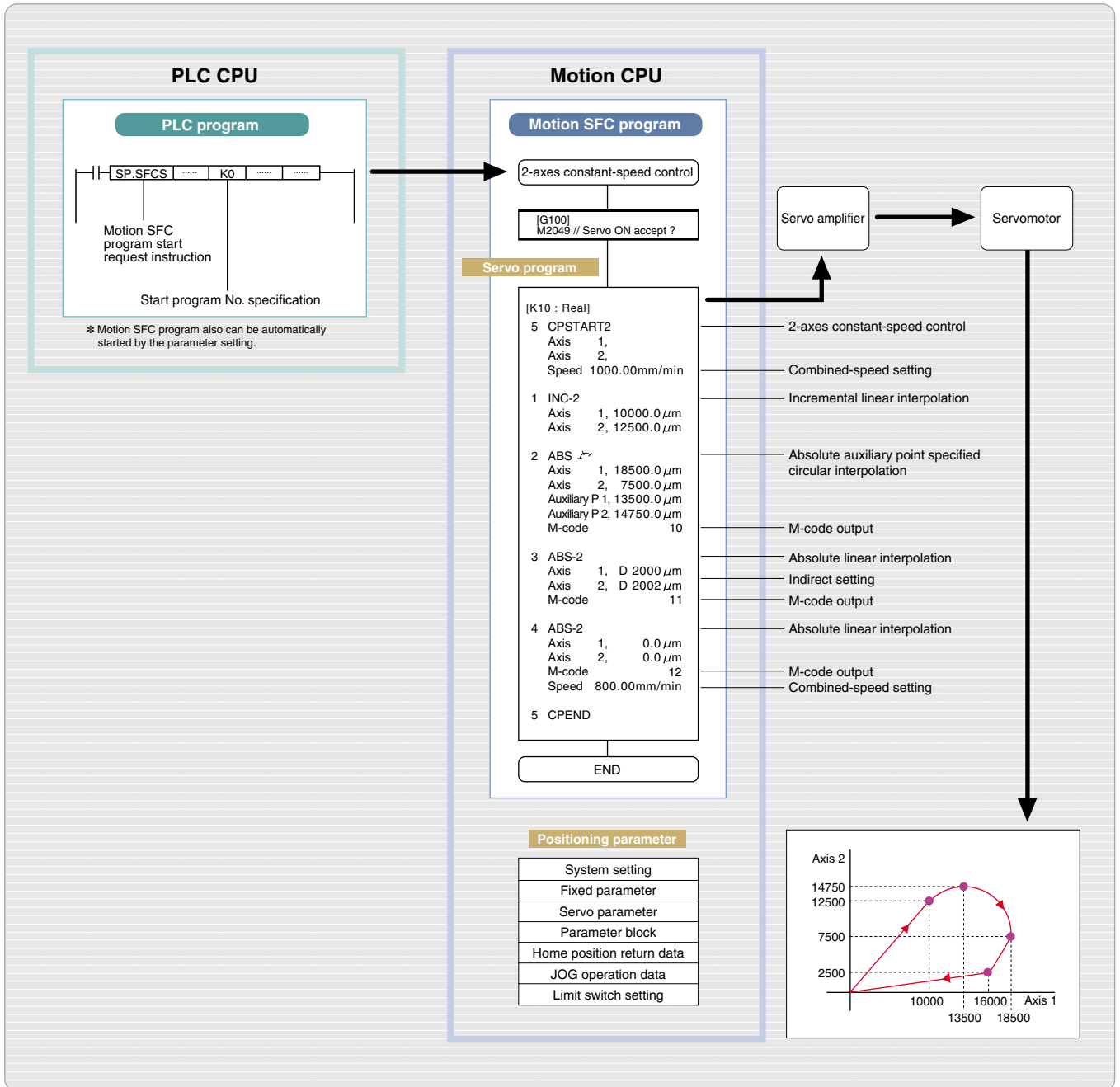


# SV13 (Conveyor Assembly Use)

## Simple Programming Using Dedicated Instructions

Colorful positioning controls and locus controls such as “1 to 4 axes linear interpolation, 2 axes circular interpolation, helical interpolation, positioning control, speed control or constant-speed control” are supported. Particularly simple programming for positioning systems is attained by using dedicated servo and PLC instructions. A variety of enhanced functions allow easy programming of conventionally complex systems.

### Control flow



## Servo instructions

Positioning control	Instruction symbol	Processing		
Linear interpolation control	1 axis	ABS-1	Absolute 1-axis positioning	
		INC-1	Incremental 1-axis positioning	
	2 axes	ABS-2	Absolute 2-axes linear interpolation	
		INC-2	Incremental 2-axes linear interpolation	
	3 axes	ABS-3	Absolute 3-axes linear interpolation	
		INC-3	Incremental 3-axes linear interpolation	
	4 axes	ABS-4	Absolute 4-axes linear interpolation	
		INC-4	Incremental 4-axes linear interpolation	
Circular interpolation control	Auxiliary point-specified	ABS ↻	Absolute auxiliary point-specified circular interpolation	
		INC ↻	Incremental auxiliary point-specified circular interpolation	
		ABS ↻	Absolute radius-specified circular interpolation less than CW 180°	
		ABS ↻	Absolute radius-specified circular interpolation CW 180° or more	
	Radius-specified	ABS ↻	Absolute radius-specified circular interpolation less than CCW 180°	
		ABS ↻	Absolute radius-specified circular interpolation CCW 180° or more	
		INC ↻	Incremental radius-specified circular interpolation less than CW 180°	
		INC ↻	Incremental radius-specified circular interpolation CW 180° or more	
		INC ↻	Incremental radius-specified circular interpolation less than CCW 180°	
		INC ↻	Incremental radius-specified circular interpolation CCW 180° or more	
		Central point-specified	ABS ↻	Absolute central point-specified circular interpolation CW
			ABS ↻	Absolute central point-specified circular interpolation CCW
	INC ↻		Incremental central point-specified circular interpolation CW	
	INC ↻		Incremental central point-specified circular interpolation CCW	

Positioning control	Instruction symbol	Processing	
Helical interpolation control	Auxiliary point-specified	ABH ↻	Absolute auxiliary point-specified helical interpolation
		INH ↻	Incremental auxiliary point-specified helical interpolation
	Radius-specified	ABH ↻	Absolute radius-specified helical interpolation less than CW 180°
		ABH ↻	Absolute radius-specified helical interpolation CW 180° or more
		ABH ↻	Absolute radius-specified helical interpolation less than CCW 180°
		ABH ↻	Absolute radius-specified helical interpolation CCW 180° or more
		INH ↻	Incremental radius-specified helical interpolation less than CW 180°
		INH ↻	Incremental radius-specified helical interpolation CW 180° or more
		INH ↻	Incremental radius-specified helical interpolation less than CCW 180°
		INH ↻	Incremental radius-specified helical interpolation CCW 180° or more
	Central point-specified	ABH ↻	Absolute central point-specified helical interpolation CW
		ABH ↻	Absolute central point-specified helical interpolation CCW
		INH ↻	Incremental central point-specified helical interpolation CW
		INH ↻	Incremental central point-specified helical interpolation CCW
	Fixed-pitch feed	FEED-1	1-axis fixed-pitch feed start
		FEED-2	2-axes linear interpolation fixed-pitch feed start
FEED-3		3-axes linear interpolation fixed-pitch feed start	
Speed control (I)	VF	Speed control (I) forward rotation start	
	VR	Speed control (I) reverse rotation start	
	VVF	Speed control (II) forward rotation start	
	VVR	Speed control (II) reverse rotation start	

Positioning control	Instruction symbol	Processing	
Speed-position control	VPF	Speed-position control forward rotation start	
	VPR	Speed-position control reverse rotation start	
	VPSTART	Speed-position control restart	
Speed switching control	VSTART	Speed switching control start	
	VEND	Speed switching control end	
	VABS	Speed switching point absolute specification	
	VINC	Speed switching point incremental specification	
Speed control with fixed position stop	PVF	Speed control with fixed position stop absolute specification	
	PVR		
Position follow-up control	PFSTART	Position follow-up control start	
Constant-speed control	CPSTART1	1-axis constant-speed control start	
	CPSTART2	2-axes constant-speed control start	
	CPSTART3	3-axes constant-speed control start	
	CPSTART4	4-axes constant-speed control start	
	CPEND	Constant-speed control end	
Repetition of same control (used in speed switching control, constant-speed control)	FOR-TIMES	Repeat range start setting	
	FOR-ON		
	FOR-OFF		
	NEXT	Repeat range end setting	
Simultaneous start	START	Simultaneous start	
Home position return	ZERO	Home position return start	
High-speed oscillation	OSC	High-speed oscillation start	
Current value change	Servo	CHGA	Servo/virtual servo current value change
	Encoder	CHGA-E	Encoder current value change
	CAM	CHGA-C	CAM shaft current value change

## Teaching function

Portable teaching units, perfect on-site environments. In addition, they also have servo programming functions, data setting, servo monitor and servo testing function.

Also, because the A31TU-D3K13 is fitted with 3-position deadman switch, error safety is assured.

- A31TU-D3K13(With 3-position deadman switch)
- A31TU-DNK13



3-position deadman switch  
(Front panel) (Rear panel)  
Teaching unit

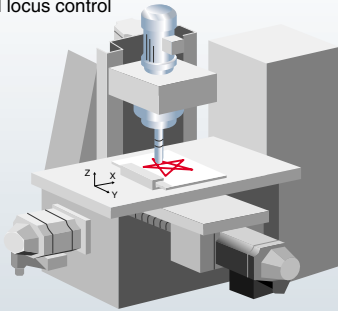
(Note): In planning stages

# SV13 (Conveyor Assembly Use)

## Application examples

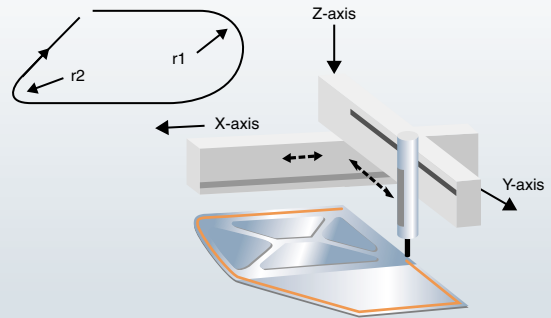
### X-Y table

- 2-axes linear interpolation
- 3-axes linear interpolation
- 2-axes circular interpolation
- Constant-speed locus control



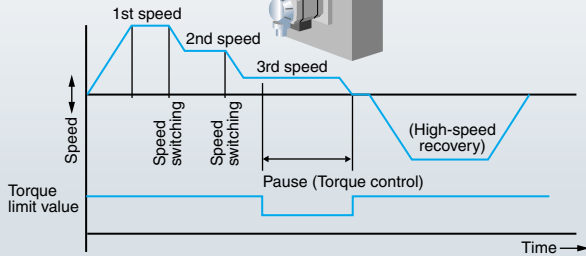
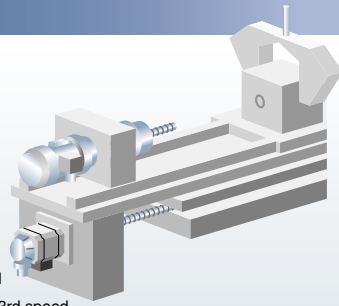
### Sealing

- Constant-speed locus control
- Linear, circular interpolation
- High speed, high-precision locus operation



### Drilling machine

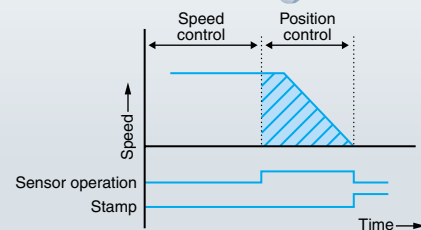
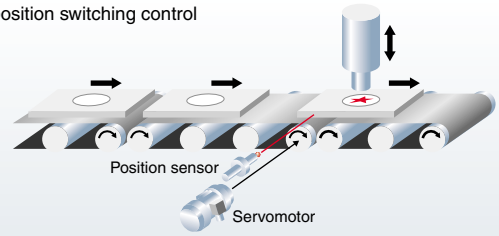
- Speed-switching control



(Note) : There is not limit of number of speed-switching points.

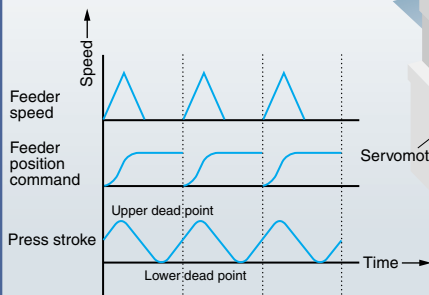
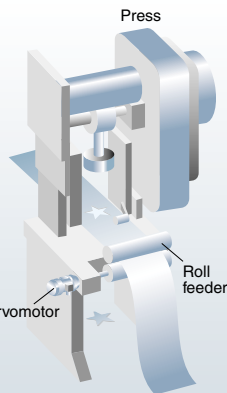
### Fixed-pitch stamping machine

- Speed/position switching control



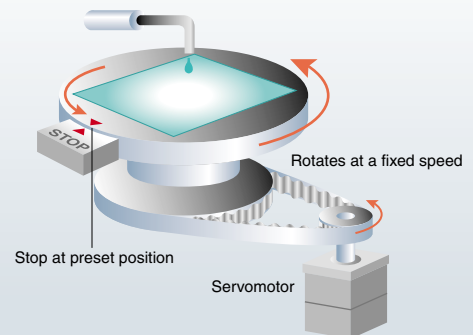
### Roll feeder

- Fixed-pitch feed
- High speed, high frequency positioning
- High speed response



### Spinner

- Rotary shaft specified position stop
- Speed control
- Speed, acceleration/deceleration time change during operation





## Functions

### ■ Speed control function with fixed position stop (Orientation function) *New*

The servomotor can be rotated at present speed and then stopped at present position after the fixed position stop command ON.

Not only the speed but also acceleration/deceleration time can be changed to an optional value while operating.

Uses : Spinner

### ■ M-code FIN waiting function

Positioning start to the next point during constant-speed control can be executed at high speed than usual.

Uses : High response positioning start

### ■ Position follow-up control

By starting once, the set value of positioning point is detected in real time, and the position control is executed by following the changing set value.

### ■ M-code output

M-codes between 0 and 32767 can be outputted at each positioning point during positioning operation.

### ■ Dwell time free setting

Dwell time can be set for any value between 0 and 5000 ms.

### ■ Parameter block setting

Common setting items in positioning control can be set as parameter blocks up to 64 types, and freely selected.

### ■ Torque limit value change

Torque limit value change can be simply executed during positioning and JOG operation using the Motion dedicated instruction CHGT.

### ■ Indirect setting of home position return data *New*

A part of home position return data can be executed the indirect setting by the word devices(D,W,#) of the Motion CPU.

### ■ Optional data monitor function *New*

Data(effective load ratio, regenerative load ratio, bus voltage, etc.) can be monitored by setting the data type and storage device of monitor data in the system setting.

### ■ High speed reading function

Up to 11 data among 16 types(feed current value, deviation counter value, etc.) can be read simultaneously to the specified device using a signal from input module as a trigger.

Uses : Measured length, synchronized correction

### ■ S-curve acceleration/deceleration control

The acceleration/deceleration characteristics can be set with the optional ratio S-curve.

### ■ Speed change/pause/re-start

Positioning, speed change during JOG operation and pause/re-start can be executed simply using the Motion dedicated instruction CHGV.

### ■ 2 types of speed control

2 types of speed control are available using the position loops or speed loops.

### ■ Limit switch output

Up to 32 points ON/OFF output signal for the real current value, motor current and word device data, etc. during operation can be outputted at high-speed regardless of the Motion SFC program.

### ■ Teaching setting

The positioning points can be set with teaching in the test mode of MT Developer.

### ■ Gain changing function *New*

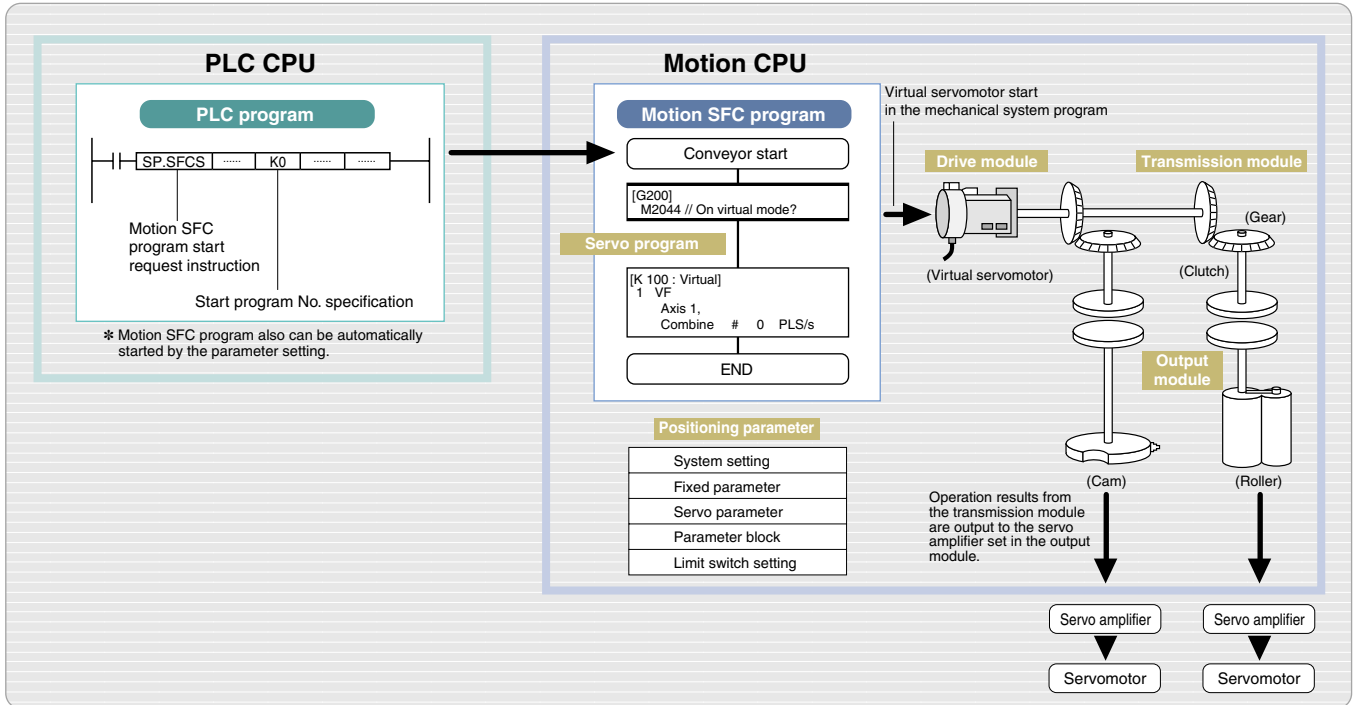
The gain changing of servo amplifier can be executed in the Motion controller by gain changing command ON/OFF.

# SV22 (Automatic Machinery Use)

## Easy On-Screen Programming Using the Mechanical Support Language

- Incorporating a mechanical support language that allows easy programming of the mechanical system. By combining a variety of software mechanical modules and cam patterns, complex synchronized control and coordinated control can be achieved easily and at low-cost. Ideal for controlling automatic machinery such as food processing and packaging.

### Control flow



### Mechanical modules

Class	Mechanical Module		Function Description
	Name	Appearance	
Drive module	Virtual servomotor		• It is used to drive the virtual axis of mechanical system program by the servo program or JOG operation.
	Synchronous encoder		• It is used to drive the virtual axis by the input pulses from the external synchronous encoder.
Virtual axis	Virtual main shaft	—	• This is a virtual "link shaft". • Drive module rotation is transferred to the transmission module.
	Virtual auxiliary input axis	—	• This is the auxiliary input axis for input to the differential gear of transmission module.
Transmission module	Gear		• The drive module rotation is transmitted to the output axis. • A setting gear ratio is applied to the travel value (pulse) input from the drive module, and then transmits to the output axis that it becomes in the setting rotation direction.
	Direct clutch		• Transmit or separate the drive module rotation to the output module. • There are a direct clutch transmitted directly and the smoothing clutch which performs the acceleration/deceleration and transmission by the smoothing time constant setting at the switching ON/OFF of the clutch.
	Smoothing clutch		• It can be selected the ON/OFF mode, address mode or the external input mode depending on the application. • Time constant system or slippage system can be selected as a smoothing system.

Class	Mechanical Module		Function Description
	Name	Appearance	
Transmission module	Speed change gear		• It is used to change speed of output module (roller). • The setting speed change ratio is applied to input axis speed, and transmits to the output axis.
	Differential gear		• Auxiliary input axis rotation is subtracted from virtual main shaft rotation, and the result is transmitted to the output axis.
		• Auxiliary input axis rotation is subtracted from virtual main shaft rotation, and the result is transmitted to the output axis. (Connect to the virtual main shaft)	
Output module	Roller		• It is used to perform the speed control at the final output.
	Ball screw		• It is used to perform the linear positioning control at the final output.
	Rotary table		• It is used to perform the angle control at the final output.
	Cam		• It is used to control except the above. Position control is executed based on the Cam pattern setting data. • There are 2 Cam control modes: the two-way Cam and feed Cam.

## Mechanical support language

### Realizing mechanical operation using software

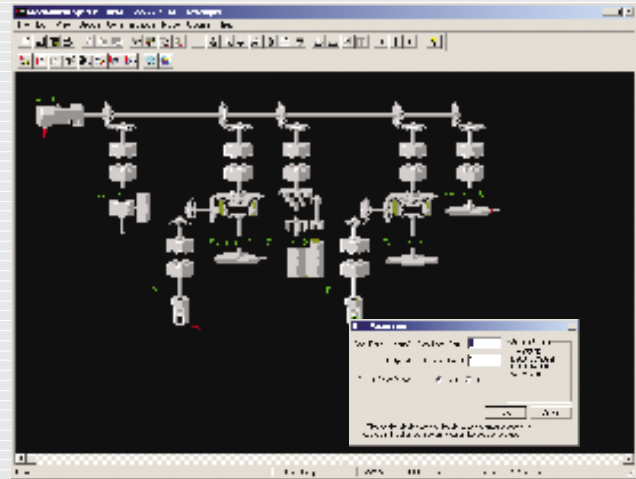
By replacing the mechanical system of main shafts, gears, clutches, and cams with the software mechanical modules, the following merits can be realized.

- Machine is more compact and costs are lower.
- There are no worries over friction and service life for the main shaft, gear and clutch.
- Changing initial setup is simple.
- There is no error caused by mechanical precision, and system performance improves.

### Advanced control using electronic cam

Ideal cam pattern control was achieved without problems, such as an error produced in the conventional cam control, by processing the cam control by software. The cam control for the nozzle lowering control in contact with liquid surfaces, amount of filler control or smooth conveyance control, etc. can be realized simply. Exchanging of cam for product type change is also possible easily by changing the cam pattern only.

### Easy programming on screen using a mouse



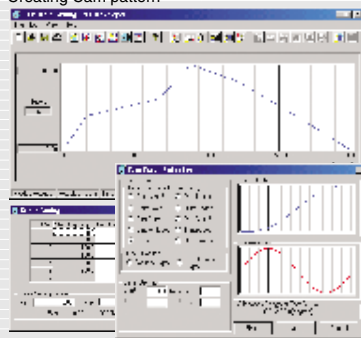
Programming monitor by mechanical support language

## Cam data creation software SW3RN-CAMP

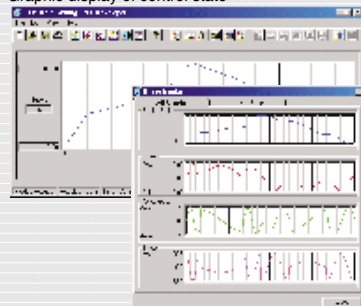
By using the cam data creation software (SW3RN-CAMP), the cam pattern (form) is set to execute the electronic cam control by mechanical support language.

Flexible and highly precise cam patterns can be created to match the required control. Complex cam patterns are easy to program.

Creating Cam pattern



Graphic display of control state



### 11 types of cam patterns

Whatever cam curve you need can be created, by selecting and combining cam patterns suited to your application among 11 types.

#### Cam patterns

Constant-speed Constant-acceleration 5th curve Cycloid Distorted trapezoid  
Distorted sine Distorted constant-speed Trapezoid Reverse trapezoid  
Single hypotenuse Double hypotenuse

### Can be set by free-form curves

Cam curves can be set by free curves using spline interpolation.

### Selectable cam precision to match application

The resolution per cycle of cam can be set in the following four stages.

256 512 1024 2048

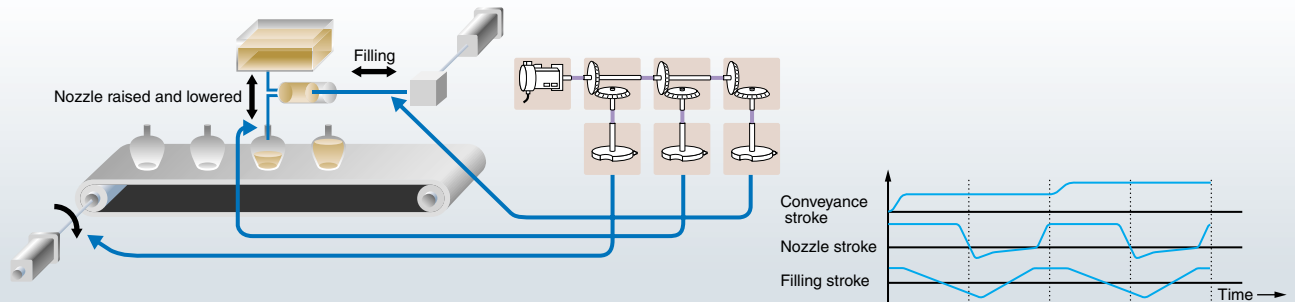
### Graphic display of control status

Control status information such as stroke ratio, speed and acceleration can be displayed in simple graphics.

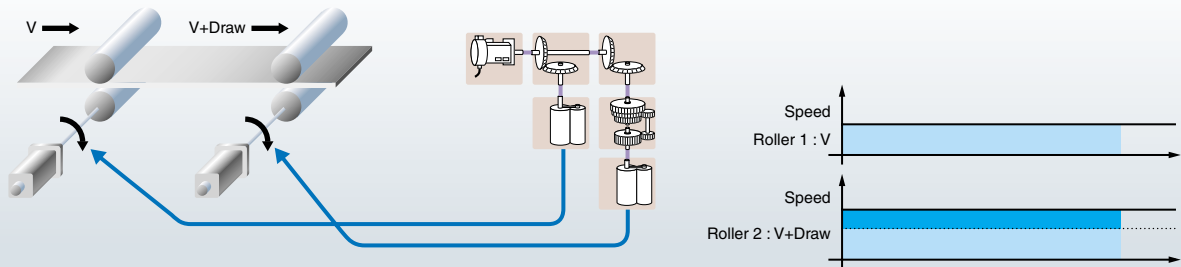
# SV22 (Automatic Machinery Use)

## Application examples

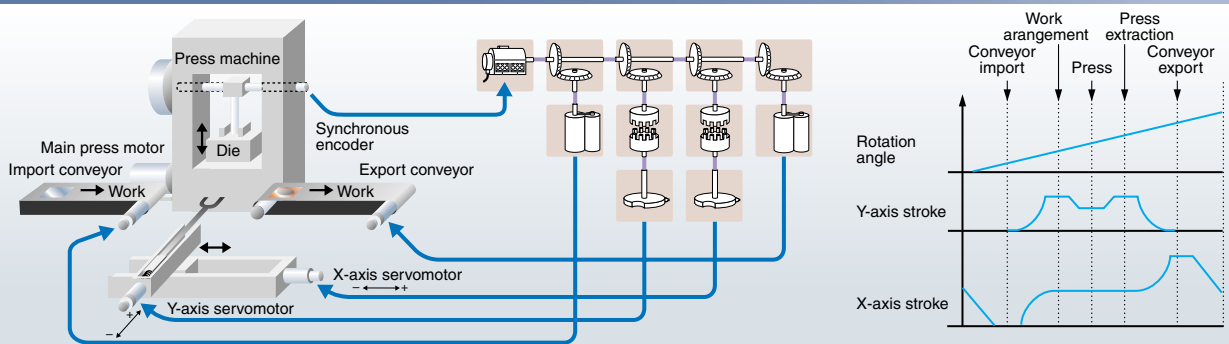
### Filling machine



### Draw control

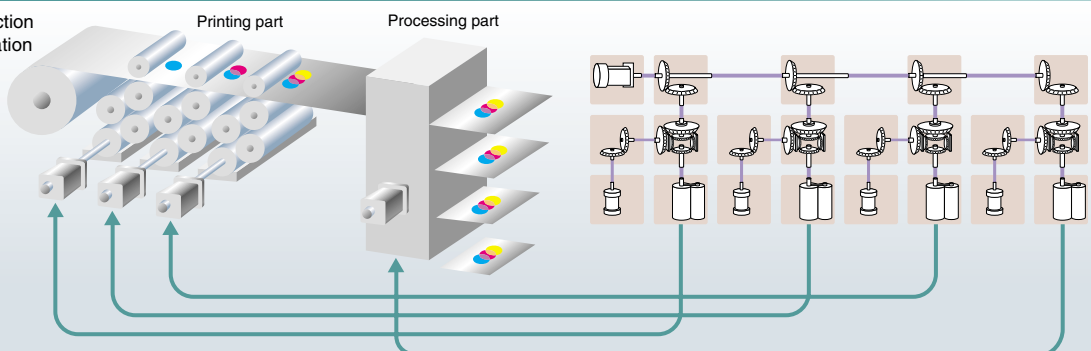


### Press conveyance



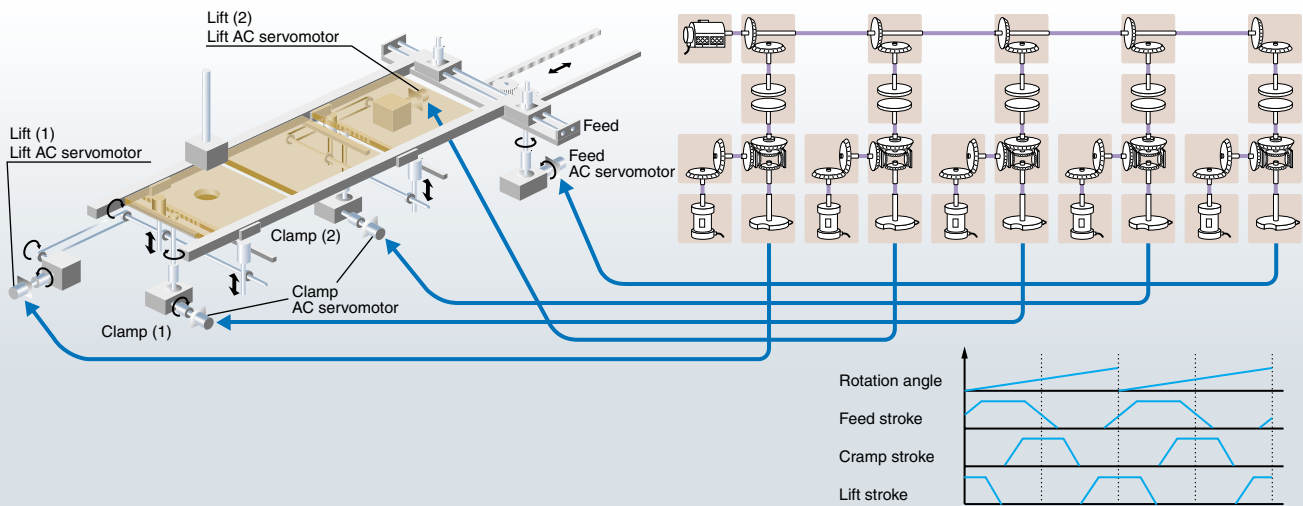
### Printing machine

- Mark detection function
- Synchronous operation between axes
- Tandem operation
- Torque control



(Note) : Consult individually about the case applied to a printing machine.  
 (It is necessary to use the operating system software, servo amplifiers and servomotors with special specification according to the system.)

### Three dimensional transfer



## New function

### Phase compensation *New*

When carrying out tracking synchronization with the synchronous encoder, the deviation between the synchronous encoder and servomotor shaft end can be eliminated by phase compensation.

### Smoother clutch linear acceleration/deceleration function *New*

In the smoother clutch, the linear acceleration/deceleration system can be selected. The impact of servomotor immediately after ON/OFF of clutch can be eased compared with the past exponential function system.

### Mixed function of virtual mode with real mode *New*

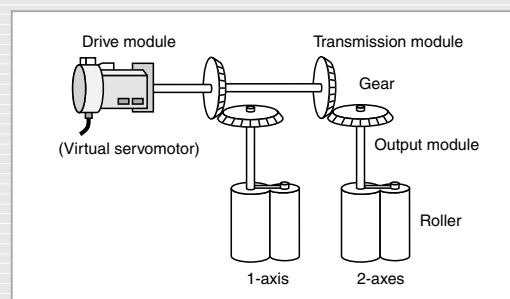
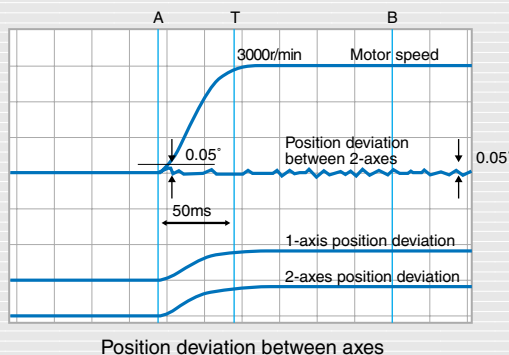
The positioning control (real mode operation) can be executed for the axis set to the real mode axis in the virtual mode.

### Smoother clutch completion signal output function *New*

The signal turned on in proportion to the remainder of clutch slippage was added. It is possible to use it for the judgment of the following synchronous clutch ON completion.

## Synchronous control

The servomotor can be operated by making it synchronous with other motor control conditions. Synchronous operation with simple setting for synchronous control and little tracking delay can be realized by a mechanical support language.



Mechanical system program



# Integrated Start-Up Support Software MT Developer



## Various programming tools in a effective background on Windows

- The operativeness of effective background on Windows is made the best use of, and the best programming and maintenance for Motion controller is prepared.

## Integrated start-up support software MT Developer

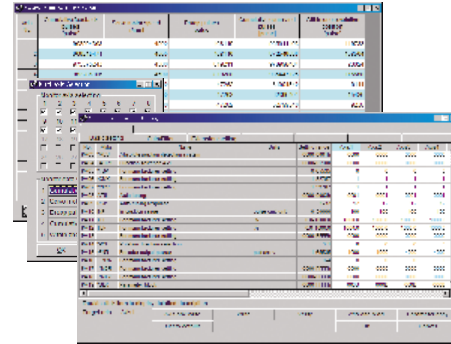
System design

### System setting



- Set the system configuration (Motion module, servo amplifier) with menu selection

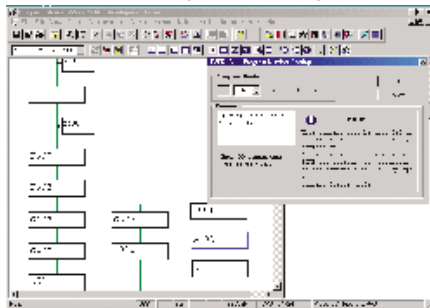
### Servo parameter setting



- Direct start of MT Developer in the parameter setting screen

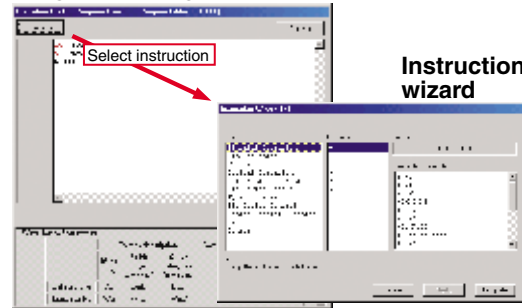
Programming

### Motion SFC program editing



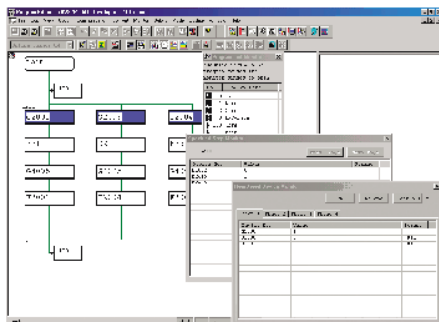
- Describe machine operation procedures with flow chart format
- Lay out graphic symbols by clicking mouse and connect by dragging

### Program editing



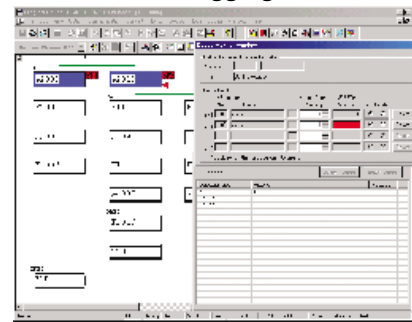
- Program for each step and transition
- Selection with menu is also possible using command wizard

### Motion SFC monitor



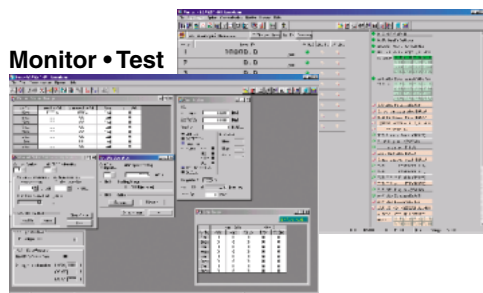
- Color indication of executing step on flow chart
- Device monitor and test of execution/specification step

### Motion SFC debugging mode

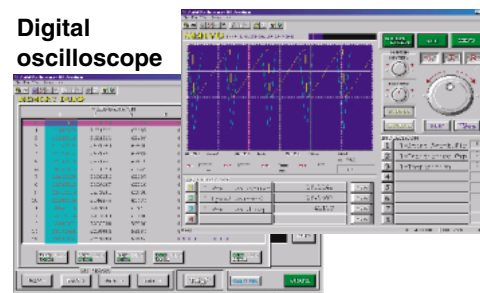


- Greatly reduced debugging time with powerful debug function (One-step execution/Forced shift/Brake/Forced end)

Start-up adjustment



- Current value monitor/Axis monitor/Error history monitor
- Various tests such as home position return/JOG operation by clicking mouse



- Data sampling synchronized with motion control cycle
- Waveform display/Dump display/File save/Printing

## Integrated start-up support software MT Developer

Software	Function	
Conveyor assembly software <b>SW6RN-GSV13P</b> Automatic machinery software <b>SW6RN-GSV22P</b>	Installation	<ul style="list-style-type: none"> <li>• Installation of operating system (OS)</li> <li>• Comparison of operating system (OS)</li> </ul>
	Project management	<ul style="list-style-type: none"> <li>• New creation, setting and reading of projects</li> <li>• Batch management of user files in project units</li> </ul>
	System setting	<ul style="list-style-type: none"> <li>• Setting of system configuration (Motion module, servo amplifier or servomotor, etc.)</li> <li>• Setting of high-speed reading data</li> </ul>
	Servo data setting	<ul style="list-style-type: none"> <li>• Setting of servo parameters or fixed parameters, etc.</li> <li>• Setting of limit switch output data</li> </ul>
	Program editing	<ul style="list-style-type: none"> <li>• Editing of servo program</li> <li>• Editing of Motion SFC program/Setting of Motion SFC parameters</li> <li>• Reduced display, comment display and extended display of Motion SFC chart</li> <li>• Motion SFC monitor/Motion SFC debug</li> </ul>
	Mechanical system editing (GSV22P only)	<ul style="list-style-type: none"> <li>• Editing of mechanical system program</li> <li>• Monitoring of mechanical system program execute state</li> </ul>
	Communication	<ul style="list-style-type: none"> <li>• Setting of SSCNET communication CH/Communication setting between USB and RS-232</li> <li>• Writing, reading and comparison of programs and parameters for Motion controller</li> </ul>
	Monitoring	<ul style="list-style-type: none"> <li>• Current value monitor/Axis monitor/Error history monitor</li> <li>• Axis state monitor/Limit switch output monitor</li> </ul>
	Test	<ul style="list-style-type: none"> <li>• Servo startup/Servo diagnosis</li> <li>• Jog operation/Manual pulser operation/Home position return test/Program operation</li> <li>• Teaching/Error reset/Current value change</li> </ul>
	Backup	<ul style="list-style-type: none"> <li>• Backup of Motion controller programs and parameters in file</li> <li>• Batch writing of backed up files to Motion CPU</li> </ul>
Cam data creation software <b>SW3RN-CAMP</b>	Cam data creation	<ul style="list-style-type: none"> <li>• Cam data creation with Cam pattern selection and free curve settings</li> <li>• Graphic display of Cam control state</li> </ul>
Digital oscilloscope software <b>SW6RN-DOSCP</b>	Digital oscilloscope	<ul style="list-style-type: none"> <li>• Data sampling synchronized to operation cycle</li> <li>• Waveform display, dump display and file saving of collected data</li> </ul>
Communication system software <b>SW6RN-SNETP</b>	Communication system Communication API	<ul style="list-style-type: none"> <li>• Communication task/Communication manager/Common memory server/SSCNET communication driver</li> <li>• Support of cyclic communication, transient communication, high-speed refresh communication</li> <li>• Communication API functions compatible with VC++/VB</li> </ul>
Document printing software <b>SW3RN-DOCP RNP</b> (Note-1) <b>SW20RN-DOCP RNP</b> (Note-2)	Printing	<ul style="list-style-type: none"> <li>• Printing of programs, parameters and system settings (Convert into Office 97 or Office 2000 document format, and print)</li> </ul>

(Note-1) : Office 97 are required.  
(Note-2) : Office 2000 are required.

## Operating environment IBM PC/AT with which WindowsNT4.0/98/2000/XP English version operated normally.

Item	WindowsNT <sup>®</sup> 4.0 (Service Pack 2 or later) or Windows <sup>®</sup> 98	Windows <sup>®</sup> 2000	Windows <sup>®</sup> XP
CPU	Recommended Pentium <sup>®</sup> 133MHz or more	Recommended Pentium <sup>®</sup> II 233MHz or more	Recommended Pentium <sup>®</sup> II 450MHz or more
Memory capacity	Recommended 32MB or more	Recommended 64MB or more	Recommended 192MB or more
Hard disk free space	SW6RNC-GSVE: 333MB + SW6RNC-GSVHELPE: 155MB (Possible to select installation)		
Display	SVGA (Resolution 800 X 600 pixels, 256 colors) or more		
Application software	Office 97 or Office 2000 (For document printing) Visual C++ 4.0 or more, Visual Basic 4.03 (32 bit) or more (For communication API function)		

(Note) • When using the A30CD-PCF, the PC card driver for WindowsNT<sup>®</sup> provided by the personal computer manufacturer must be used.  
• WindowsNT<sup>®</sup>, Windows<sup>®</sup>, Office<sup>®</sup>, Visual C++ and Visual Basic are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.  
• Pentium<sup>®</sup> is trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.

# Overview of CPU Performance

## Motion control

Item		Q173HCPU(-T)	Q172HCPU(-T)
Number of control axes		32 axes (Up to 16 axes/system)	8 axes
Operation cycle (default)	SV13	0.44ms : 1 to 3 axes 0.88ms : 4 to 10 axes 1.77ms : 11 to 20 axes 3.55ms : 21 to 32 axes	0.44ms : 1 to 3 axes 0.88ms : 4 to 8 axes
	SV22	0.88ms : 1 to 5 axes 1.77ms : 6 to 14 axes 3.55ms : 15 to 28 axes 7.11ms : 29 to 32 axes	0.88ms : 1 to 5 axes 1.77ms : 6 to 8 axes
Interpolation functions		Linear interpolation (Up to 4 axes), Circular interpolation (2 axes), Helical interpolation (3 axes)	
Control modes		PTP (Point to Point) control, Speed control, Speed/position switching control, Fixed-pitch feed, Constant-speed control, Position follow-up control, Speed control with fixed position stop, Speed switching control, High-speed oscillation control, Synchronous control (SV22)	
Acceleration/deceleration control		Automatic trapezoidal acceleration/deceleration, S-curve acceleration/deceleration	
Compensation function		Backlash compensation, Electronic gear, Phase compensation (SV22)	
Programming language		Motion SFC, Dedicated instruction, Mechanical support language (SV22)	
Servo program (dedicated instruction) capacity		14k steps	
Number of positioning points		3200 points (Positioning data can be set indirectly)	
Programming tool		IBM PC/AT	
Peripheral I/F		USB/SSCNET	
Teaching operation function		Provided (Q17□HCPU-T, SV13 use)	
Home position return function		Proximity dog (2 types), Count (3 types), Data set (2 types), Dog cradle, Stopper (2 types), Limit switch combined	
JOG operation function		Provided	
Manual pulse generator operation function		Possible to connect 3 modules	
Synchronous encoder operation function		Possible to connect 12 modules (SV22 use)	Possible to connect 8 modules (SV22 use)
M-code function		M-code output function provided, M-code completion wait function provided	
Limit switch output function		Number of output points : 32 points Watch data : Motion control data/Word device	
ROM operation function		Provided	
Absolute position system		Made compatible by setting battery to servo amplifier (Possible to select the absolute data method or incremental method for each axis)	
Number of SSCNET III systems		2 systems	1 system
Number of usable Motion related interface modules		Q172LX : 4 modules Q172EX-S2 : 6 modules <sup>(Note-1)</sup> Q173PX : 4 modules <sup>(Note-2)</sup>	Q172LX : 1 module Q172EX-S2 : 4 modules <sup>(Note-1)</sup> Q173PX : 3 modules <sup>(Note-2)</sup>

(Note-1) : Q172EX-S2 cannot be used in SV13.

(Note-2) : When using the incremental synchronous (SV22 use), you can use above number of modules.  
When connecting the manual pulse generator, you can use only 1 module.

## Mechanical system program (SV22)

Item			Q173HCPU(-T)		Q172HCPU(-T)				
Control unit	Drive module	Virtual servomotor	PLS						
		Synchronous encoder							
	Output module	Roller	mm, inch						
		Ball screw							
		Rotary table					Fixed as "degree"		
Cam		mm, inch, PLS							
Mechanical system program	Drive module	Virtual servomotor	32	Total 44	8	Total 16			
		Synchronous encoder	12		8				
	Virtual axis	Virtual main shaft	32	Total 64	8	Total 16			
		Virtual auxiliary input axis	32		8				
	Transmission module	Gear (Note-1)	64		16				
		Clutch (Note-1)	64		16				
		Speed change gear (Note-1)	64		16				
		Differential gear (Note-1)	32		8				
		Differential gear (Connect to the virtual main shaft) (Note-2)	32		8				
	Output module	Roller	32	Total 32	8	Total 8			
		Ball screw	32		8				
		Rotary table	32		8				
		Cam	32		8				
	Cam	Types		Up to 256					
		Resolution per cycle		256, 512, 1024, 2048					
		Memory capacity		132k bytes					
Stroke resolution		32767							
Control mode		Two-way cam, feed cam							

(Note-1) : The gear, clutch, speed change gear or differential gear module can be used only one module per one output module.  
(Note-2) : The differential gears connected to the virtual main shaft can be used only one module per one main shaft.

## Motion SFC performance

Item			Q173HCPU(-T) / Q172HCPU(-T)		
Motion SFC program capacity	Code total (Motion SFC chart + Operation control + Transition)		543k bytes		
	Text total (Operation control + Transition)		484k bytes		
Motion SFC program	Number of Motion SFC programs		256 (No.0 to 255)		
	Motion SFC chart size/program		Up to 64k bytes (Included Motion SFC chart comments)		
	Number of Motion SFC steps/program		Up to 4094 steps		
	Number of selective branches/branch		255		
	Number of parallel branches/branch		255		
	Parallel branch nesting		Up to 4 levels		
Operation control program (F/FS) / Transition program (G)	Number of operation control programs		4096 with F(Once execution type) and FS(Scan execution type) combined (F/FS0 to F/FS4095)		
	Number of transition programs		4096 (G0 to G4095)		
	Code size/program		Up to approx. 64k bytes (32766 steps)		
	Number of blocks(line)/program		Up to 8192 blocks (In the case of 4 steps (min)/blocks)		
	Number of characters/block		Up to 128 (Comment included)		
	Number of operand/block		Up to 64 (Operand: Constants, Word devices, Bit devices)		
	( ) nesting/block		Up to 32		
Descriptive expression	Operation control program	Calculation expression/Bit conditional expression			
	Transition program	Calculation expression/Bit conditional expression/Comparison conditional expression			
Execute specification	Number of multi executed programs		Up to 256		
	Number of multi active steps		Up to 256 steps per all programs		
	Executed task	Normal task		Executed in motion main cycle (Free time)	
		Event task (Execution can be masked.)	Fixed cycle	Executed in fixed cycle (0.88ms, 1.77ms, 3.55ms, 7.11ms, 14.2ms)	
			External interrupt	Executed when input ON is set among the input 16 points of interrupt module QI60	
PLC interrupt			Executed with interrupt instruction from PLC CPU		
NMI task		Executed when input ON is set among the input 16 points of interrupt module QI60			
Number of I/O points (X/Y)			8192 points		
Number of real I/O points (PX/PY)			256 points		
Number of devices	Internal relays (M)	Total (M + L) 8192 points			
	Latch relays (L)				
	Link relays (B)	8192 points			
	Annunciators (F)	2048 points			
	Special relays (M)	256 points			
	Data registers (D)	8192 points			
	Link registers (W)	8192 points			
	Special registers (D)	256 points			
	Motion registers (#)	8192 points			
Coasting timers (FT)	1 point (888μs)				

# Equipment Configuration

## Software packages

Software	Application	Model name		Note
		Q173HCPU(-T)	Q172HCPU(-T)	
Operating system software	Conveyor assembly use <b>SV13</b>	SW6RN-SV13QK	SW6RN-SV13QM	—
	Automatic machinery use <b>SV22</b>	SW6RN-SV22QJ	SW6RN-SV22QL	
Programming software	Conveyor assembly use <b>SV13</b>	SW6RN-GSV13P		Included in the "Integrated start-up support software"
	Automatic machinery use <b>SV22</b>	SW6RN-GSV22P		
	Digital oscilloscope use	SW3RN-CAMP		
		SW6RN-DOSCP		

## Integrated start-up support software MT Developer

Model name	Details
SW6RN-GSVPROE	<ul style="list-style-type: none"> <li>• Conveyor assembly software : SW6RN-GSV13P</li> <li>• Automatic machinery software : SW6RN-GSV22P</li> <li>• Cam data creation software : SW3RN-CAMP</li> <li>• Digital oscilloscope software : SW6RN-DOSCP</li> <li>• Communication system software : SW6RN-SNETP</li> <li>• Document print software : SW3RN-DOCPRNP</li> </ul>
	SW6RNC-GSVHELPE (Operation manual [1 CD-ROM] )
	Installation manual
SW6RNC-GSVSETE	SW6RNC-GSVPROE
	A30CD-PCF (SSC I/F card (PCMCIA TYPE II 1CH/card) )
	Q170CDCBL3M (A30CD-PCF cable 3m(9.84ft.) )



## Servo set up software MR Configurator

Model name	Details
MRZJW3-SETUP221E	Servo set up software MR Configurator [1 CD-ROM]





## Equipment

### <Motion dedicated equipments>

Part name	Model name	Description	Standards	
Motion CPU module	Q173HCPU	Up to 32 axes control, Operation cycle 0.44[ms]-	CE, UL	
	Q172HCPU	Up to 8 axes control, Operation cycle 0.44[ms]-	CE, UL	
	Q173HCPU-T	Up to 32 axes control, Operation cycle 0.44[ms]-, For teaching unit	CE, UL	
	Q172HCPU-T	Up to 8 axes control, Operation cycle 0.44[ms]-, For teaching unit	CE, UL	
Servo external signals interface module	Q172LX	Servo external signal input 8 axes (FLS-RLS-STOP-DOG/CHANGE X8)	CE, UL	
Serial absolute synchronous encoder interface module	Q172EX-S2	Serial absolute synchronous encoder Q170ENC interfaceX2, Tracking input 2 points (A6BATbuilt-in)	CE, UL	
Manual pulse generator interface module	Q173PX	Manual pulse generator MR-HDP01/Incremental synchronous encoder interfaceX3, Tracking input 3 points	CE, UL	
Serial absolute synchronous encoder	Q170ENC	Resolution: 262144PLS/rev, Permitted speed: 3600r/min Permitted axial loads [Radial load: Up to 19.6N, Thrust load: Up to 9.8N]	CE, UL	
Serial absolute synchronous encoder cable (Note-1)	Q170ENCBL□M	Serial absolute synchronous encoder Q170ENC ⇔ Q172EX-S2	2m(6.56ft.)	—
			5m(16.40ft.)	—
			10m(32.81ft.)	—
			20m(65.62ft.)	—
			30m(98.43ft.)	—
Battery holder unit	Q170HBATC (Note-2)	Battery holder for Q6BAT (Attachment: battery cable)	UL	
	Q6BAT	For IC-RAM memory backup of Q17□HCPU(-T) module (Motion SFC programs, Servo programs, Parameters)	—	
Battery	A6BAT	For backup of Q170ENC	—	
	MR-HDP01	Pulse resolution: 25PLS/rev (100PLS/rev after magnification by 4), Permitted speed: 200r/min (Normal rotation) Permitted axial loads [Radial load: Up to 19.6N, Thrust load: Up to 9.8N], Voltage output	—	
SSCNET III cable (Note-1)	MR-J3BUS□M	<ul style="list-style-type: none"> <li>• Q17□HCPU(-T) ⇔ MR-J3-□B</li> <li>• MR-J3-□B ⇔ MR-J3-□B</li> </ul>	Standard code for inside panel 0.15m(0.49ft.), 0.3m(0.98ft.), 0.5m(1.64ft.), 1m(3.28ft.), 3m(9.84ft.)	—
	MR-J3BUS□M-A		Standard code for outside panel 5m(16.40ft.), 10m(32.81ft.), 20m(65.62ft.)	—
	MR-J3BUS□M-B (Note-3)		Long distance cable 30m(98.43ft.), 40m(131.23ft.), 50m(164.04ft.)	—
SSC I/F board	A10BD-PCF	PCI bus loading type, 2ch/board	UL	
	A30BD-PCF	ISA bus loading type, 2ch/board	—	
SSC I/F card	A30CD-PCF	PCMCIA TYPE II, 1ch/card	UL	
Cable for SSC I/F board (Note-1)	Q170BDCBL□M	Q17□HCPU(-T) ⇔ SSC I/F board	3m(9.84ft.)	—
			5m(16.40ft.)	—
			10m(32.81ft.)	—
Cable for SSC I/F card (Note-1)	Q170CDCBL□M	Q17□HCPU(-T) ⇔ SSC I/F card	3m(9.84ft.)	—
			5m(16.40ft.)	—
			10m(32.81ft.)	—
Teaching unit (Note-4)	A31TU-D3K13	For SV13, With 3-position deadman switch, Only Japanese	CE	
	A31TU-DNK13	For SV13, Without deadman switch, Only Japanese	CE	
Cable for teaching unit	Q170TUD3CBL3M	Q17□HCPU-T ⇔ A31TU-D3K13 3m(9.84ft.), (Attachment: short-circuit connector(A31TUD3TM) for teaching unit)	—	
	Q170TUDNCBL3M	Q17□HCPU-T ⇔ A31TU-DNK13 3m(9.84ft.), (Attachment: short-circuit connector(A31TUD3TM) for teaching unit)	—	
	Q170TUDNCBL03M-A	Exchange cable for direct connection of Q17□HCPU-T ⇔ A31TU-DNK13, 0.3m(0.98ft.)	—	
Short-circuit connector for teaching unit	Q170TUTM	For direct connection to Q17□HCPU-T, It is packed together with Q17□HCPU-T.	—	
	A31TUD3TM	For connection to Q170TUD□CBL3M, It is packed together with Q170TUD□CBL3M.	—	

(Note-1) : □=Cable length (015: 0.15m(0.49ft.), 03: 0.3m(0.98ft.), 05: 0.5m(1.64ft.), 1: 1m(3.28ft.), 2: 2m(6.56ft.), 3: 3m(9.84ft.), 5: 5m(16.40ft.), 10: 10m(32.81ft.), 20: 20m(65.62ft.), 30: 30m(98.43ft.), 40: 40m(131.23ft.), 50: 50m(164.04ft.))

(Note-2) : Battery Q6BAT is not attached to Battery holder unit Q170HBATC. Please arrange separately.

(Note-3) : Please contact your nearest Mitsubishi sales representative for the cable of less than 30m(98.43ft.).

(Note-4) : In planning stages.

### <PLC common equipments>

Part name	Model name	Description	Standards
PLC CPU module	Q00CPU	Program capacity 8k steps	CE, UL
	Q01CPU	Program capacity 14k steps	CE, UL
	Q02CPU	Program capacity 28k steps	CE, UL
	Q02HCPU	Program capacity 28k steps	CE, UL
	Q06HCPU	Program capacity 60k steps	CE, UL
	Q12HCPU	Program capacity 124k steps	CE, UL
	Q25HCPU	Program capacity 252k steps	CE, UL
CPU base unit	Q33B	Power supply + CPU + 3 I/O slots, For Q series modules	CE, UL
	Q35B	Power supply + CPU + 5 I/O slots, For Q series modules	CE, UL
	Q38B	Power supply + CPU + 8 I/O slots, For Q series modules	CE, UL
	Q312B	Power supply + CPU + 12 I/O slots, For Q series modules	CE, UL
Extension base unit	Q63B	Power supply + 3 I/O slots, For Q series modules	CE, UL
	Q65B	Power supply + 5 I/O slots, For Q series modules	CE, UL
	Q68B	Power supply + 8 I/O slots, For Q series modules	CE, UL
	Q612B	Power supply + 12 I/O slots, For Q series modules	CE, UL
Extension cable	QC□B	Length 0.45m(1.48ft.), 0.6m(1.97ft.), 1.2m(3.94ft.), 3m(9.84ft.), 5m(16.40ft.), 10m(32.81ft.)	—
Power supply module (Note-1)	Q61P-A1	100 to 120VAC input/ 5VDC 6A output	CE, UL
	Q61P-A2	200 to 240VAC input/ 5VDC 6A output	CE, UL
	Q62P	100 to 240VAC input/ 5VDC 3A/ 24VDC 0.6A output	CE, UL
	Q63P	24VDC input/ 5VDC 6A output	CE, UL
	Q64P	100 to 240VAC/200 to 240VAC input/ 5VDC 8.5A output	CE, UL

(Note-1) : Please use the power supply module within the range of power supply capacity.

# Equipment Configuration

## Combinations of servo amplifier and servomotor



Servo amplifier			MR-J3 series																
			MR-J3-																
Servomotor			10B(1)	20B(1)	40B(1)	60B	70B	100B	200B	350B	500B	700B	11KB	15KB	22KB	11K B4	15K B4	22K B4	
	Ultra low inertia, Small capacity HF-MP series	HF-MP053(B)	●																
		HF-MP13(B)	●																
		HF-MP23(B)		●															
		HF-MP43(B)			●														
	Low inertia, Small capacity HF-KP series	HF-KP053(B)	●																
		HF-KP13(B)	●																
		HF-KP23(B)		●															
		HF-KP43(B)			●														
	Middle inertia, Middle capacity HF-SP 1000r/min series	HF-SP51(B)				●													
		HF-SP81(B)					●												
		HF-SP121(B)						●											
		HF-SP201(B)							●										
		HF-SP301(B)								●									
	Middle inertia, Middle capacity HF-SP 2000r/min series	HF-SP421(B)									●								
		HF-SP52(B)				●													
		HF-SP102(B)					●												
		HF-SP152(B)						●											
		HF-SP202(B)							●										
	Ultra low inertia, Middle capacity HC-RP series	HC-RP103(B)							●										
		HC-RP153(B)							●										
		HC-RP203(B)								●									
		HC-RP353(B)									●								
		HC-RP503(B)										●							
	Flat, Middle capacity HC-UP series	HC-UP72(B)					●												
		HC-UP152(B)						●											
		HC-UP202(B)							●										
		HC-UP352(B)								●									
	Low inertia, Middle capacity HC-LP series	HC-LP52(B)				●													
		HC-LP102(B)					●												
		HC-LP152(B)						●											
		HC-LP202(B)							●										
		HC-LP302(B)								●									
	Low inertia, Middle/large capacity HA-LP 1000r/min series	HA-LP601(B)										●							
		HA-LP801(B)											●						
		HA-LP12K1(B)												●					
		HA-LP15K1													●				
		HA-LP20K1														●			
		HA-LP25K1															●		
		HA-LP8014(B)															●		
	Low inertia, Middle/large capacity HA-LP 1500r/min series	HA-LP12K14(B)															●		
		HA-LP15K14																●	
		HA-LP20K14																	●
		HA-LP701M(B)											●						
		HA-LP11K1M(B)												●					
		HA-LP15K1M(B)													●				
		HA-LP22K1M														●			
Low inertia, Middle/large capacity HA-LP 2000r/min series	HA-LP11K1M4(B)															●			
	HA-LP15K1M4(B)																●		
	HA-LP22K1M4																	●	
	HA-LP502										●								
	HA-LP702											●							
	HA-LP11K2(B)												●						
	HA-LP15K2(B)													●					
HA-LP22K2(B)														●					
HA-LP11K24(B)															●				
HA-LP15K24(B)																●			
HA-LP22K24(B)																	●		

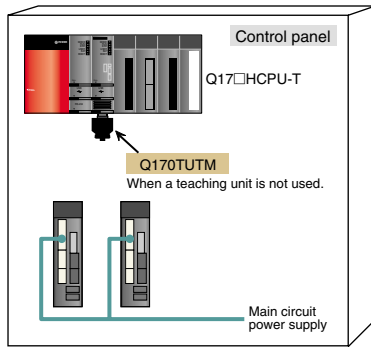
(As of Jan. 2006)

MR-J3 series															Motor capacity (kW)	
MR-J3-																
Fully closed loop control compatible																
10B(1) -RJ006	20B(1) -RJ006	40B(1) -RJ006	60B -RJ006	70B -RJ006	100B -RJ006	200B -RJ006	350B -RJ006	500B -RJ006	700B -RJ006	11K -RJ006	15K -RJ006	22K -RJ006	11KB4 -RJ006	15KB4 -RJ006	22KB4 -RJ006	
●																0.05
●																0.1
	●															0.2
		●														0.4
				●												0.75
●																0.05
●	●															0.1
	●															0.2
		●														0.4
				●												0.75
			●	●												0.5
					●											0.85
						●										1.2
						●										2.0
							●									3.0
			●													4.2
				●												0.5
					●											1.0
						●										1.5
						●										2.0
							●									3.5
								●								5.0
									●							7.0
																1.0
																1.5
																2.0
																3.5
																5.0
																0.8
																1.5
																2.0
																3.5
																5.0
																0.5
																1.0
																1.5
																2.0
																3.0
																6.0
										●						8.0
										●						12.0
											●					15.0
												●				20.0
												●				25.0
													●			8.0
													●			12.0
														●		15.0
															●	20.0
																7.0
										●						11.0
											●					15.0
												●				22.0
													●			11.0
														●		15.0
															●	22.0
																5.0
																7.0
										●						11.0
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													●			11.0
														●		15.0
															●	22.0

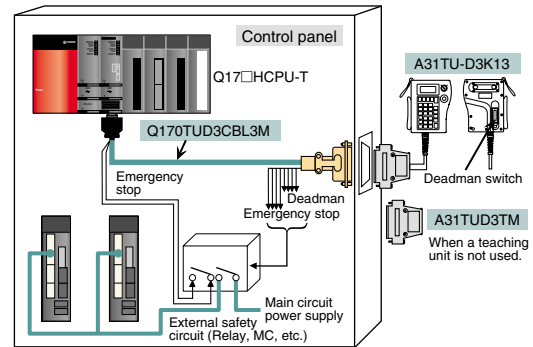
# Equipment Configuration

## Connecting method of teaching unit

### Not using a teaching unit



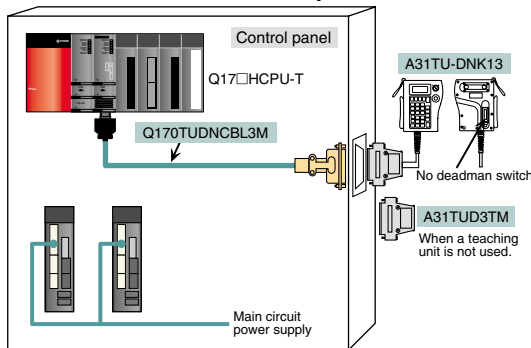
### Using the teaching unit (A31TU-D3K13 (With deadman switch))



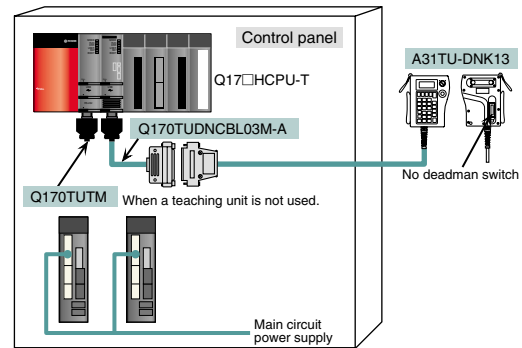
(Note):The teaching unit and cable for the teaching unit must be used the one that suited the above-mentioned combination. (It causes the malfunction and the breakdown of the system when connecting it by the combinations other than the above-mentioned.)

### Using the teaching unit (A31TU-DNK13 (Without deadman switch))

#### Connecting with the cable in the control panel



#### Connecting directly with CPU unit

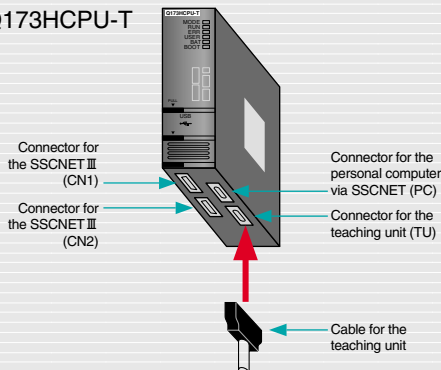


(Note):The teaching unit and cable for the teaching unit must be used the one that suited the above-mentioned combination. (It causes the malfunction and the breakdown of the system when connecting it by the combinations other than the above-mentioned.)

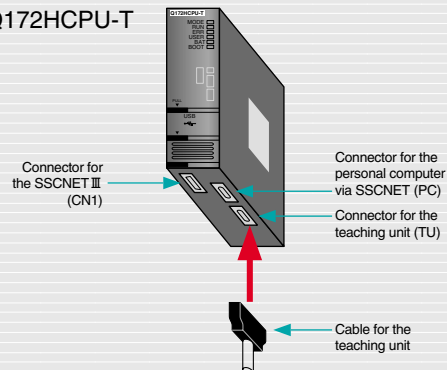
## Connector arrangement of the Motion CPU for the teaching unit

Be sure to connect the teaching unit(A31TU-D□K13) with the TU connector in bottom of the Motion CPU using the cable for the teaching unit.

### ●Q173HCPU-T



### ●Q172HCPU-T

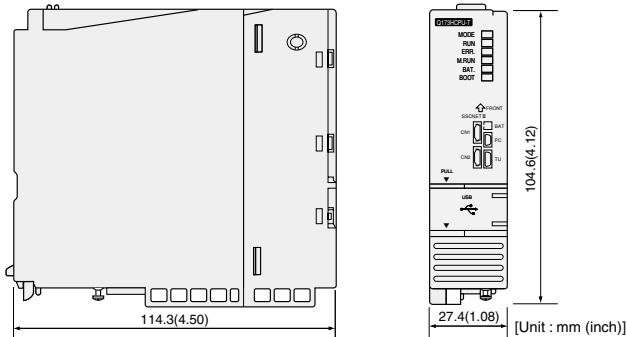




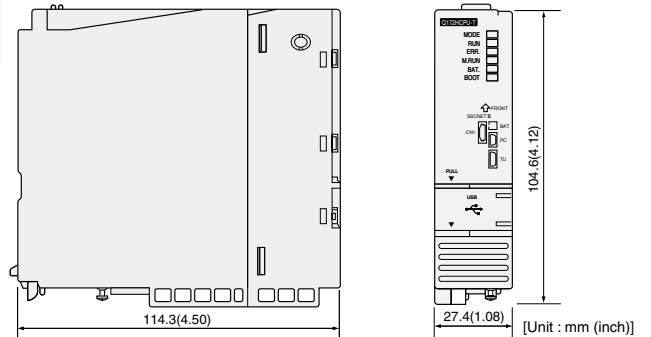


# Exterior Dimensions

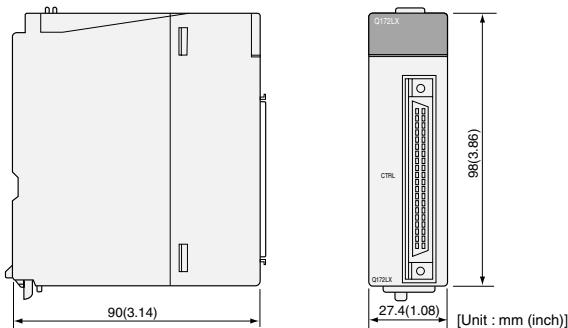
### CPU module Q173HCPU(-T)



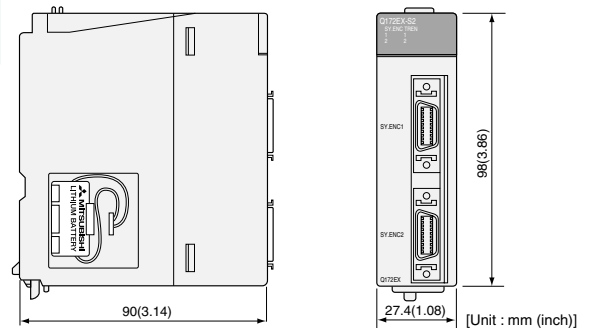
### CPU module Q172HCPU(-T)



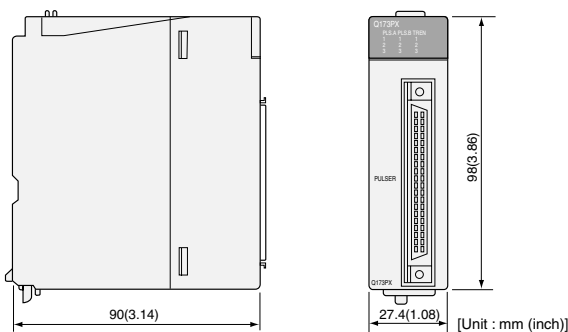
### Servo external signals interface module Q172LX



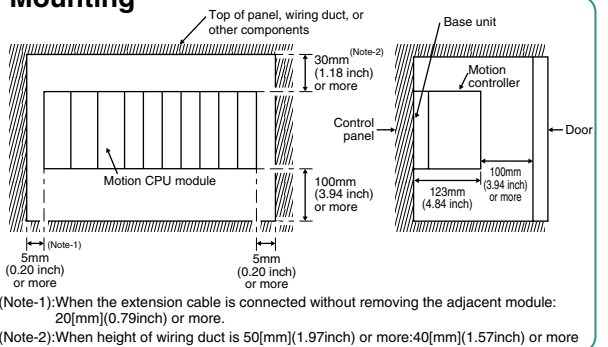
### Serial absolute synchronous encoder interface module Q172EX-S2



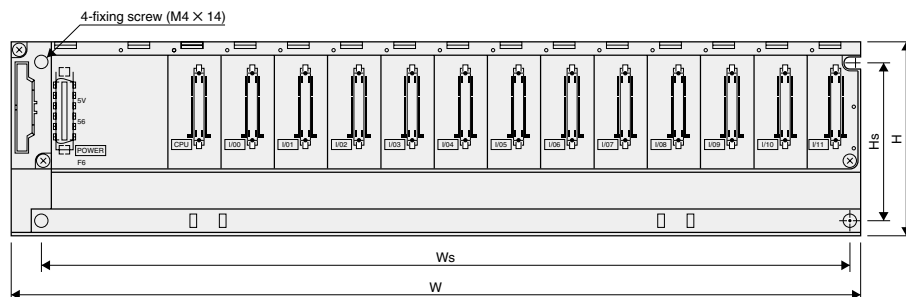
### Manual pulse generator interface module Q173PX



### Mounting



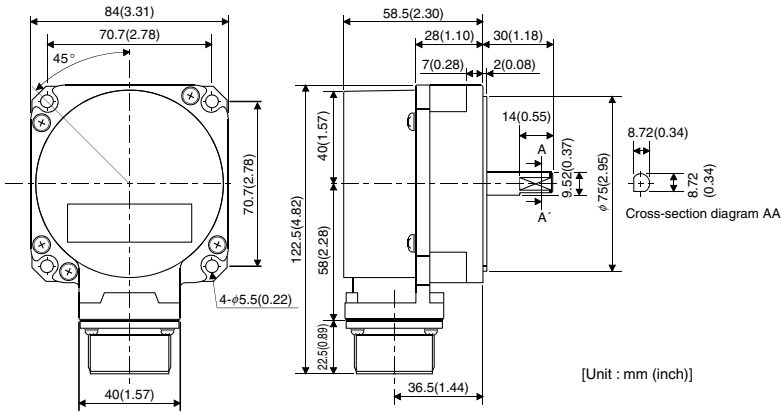
### Base unit Q3 □ B/Q6 □ B



	CPU base			Extension base		
	Q35B	Q38B	Q312B	Q65B	Q68B	Q612B
W	245 (9.65)	328 (12.92)	439 (17.30)	245 (9.65)	328 (12.92)	439 (17.30)
Ws	224.5 (8.85)	308 (12.14)	419 (16.51)	222.5 (8.77)	306 (12.06)	417 (16.43)
H	98(3.86)					
Hs	80(3.16)					

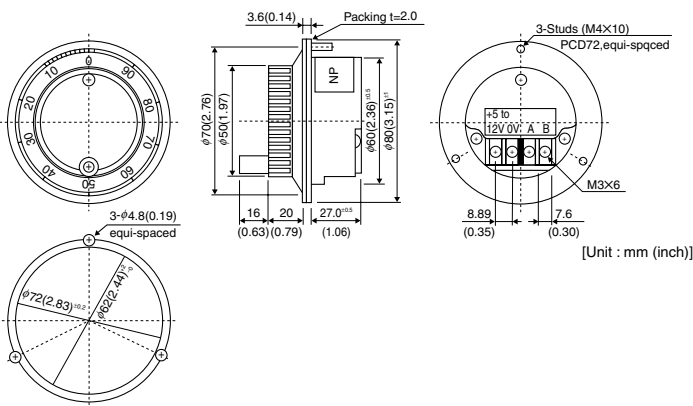
[Unit : mm (inch)]

### Serial absolute synchronous encoder Q170ENC



Item	Specifications
Resolution	262144PLS/rev
Direction of increasing addresses	CCW (viewed from end of shaft)
Protective construction	Dustproof/Waterproof (IP65: Except for the shaft-through portion)
Permitted axial loads	Radial load : Up to 19.6N Thrust load : Up to 9.8N
Permitted speed	3600r/min
Permitted angular acceleration	40000rad/s <sup>2</sup>
Ambient temperature	-5 to 55°C (23 to 131°F)
5VDC consumption current	0.2A
Mass	0.6kg

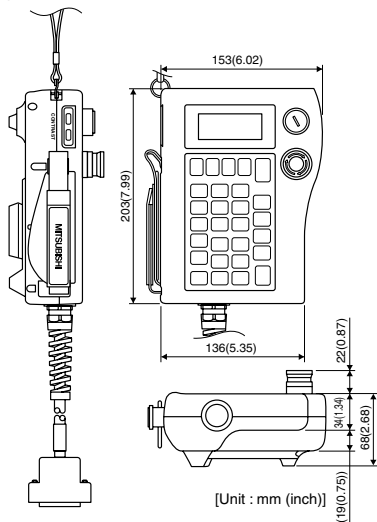
### Manual pulse generator MR-HDP01



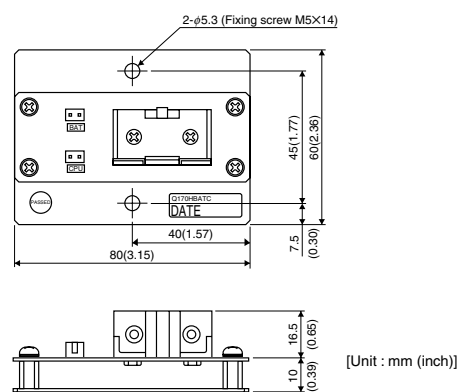
Item	Specifications
Pulse resolution	25PLS/rev (100PLS/rev after magnification by 4)
Output voltage	Input voltage > -1V (Note)
Life time	1,000,000 revolutions (at 200r/min)
Permitted axial loads	Radial load : Up to 19.6N Thrust load : Up to 9.8N
Ambient temperature	-10 to 60°C (14 to 140°F)
5VDC consumption current	0.06A
Mass	0.4kg

(Note) : When using an external power supply, necessary to 5V power supply.

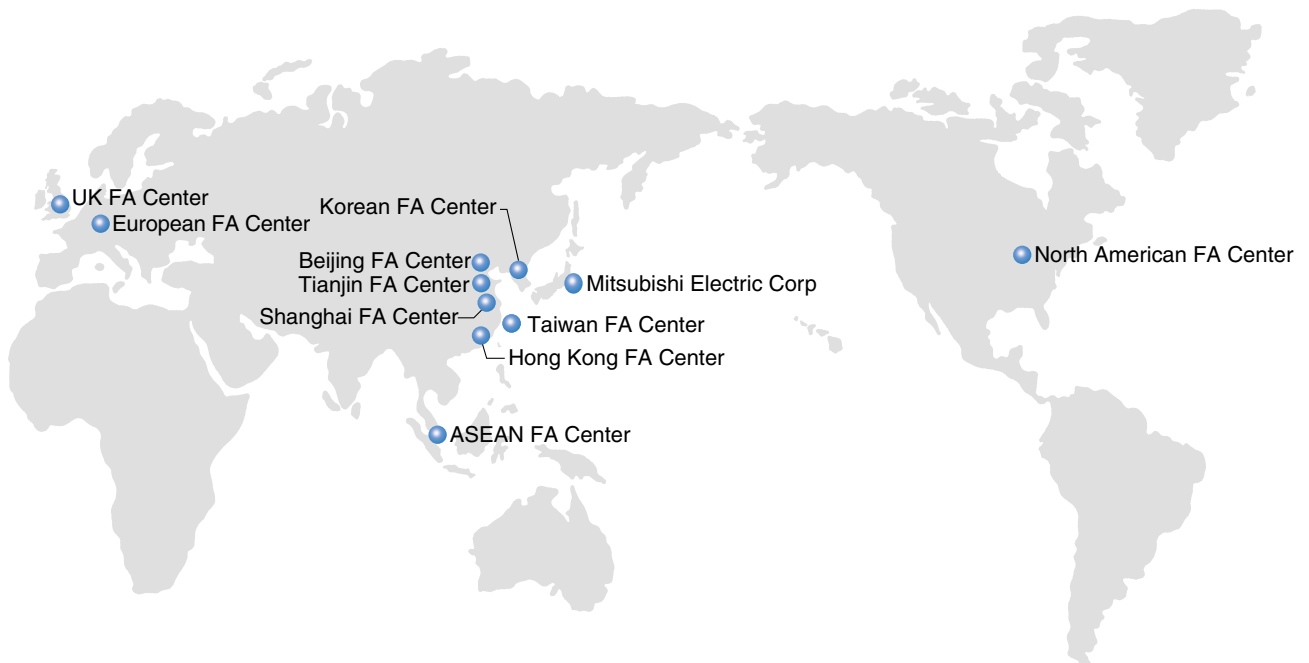
### Teaching unit



### Battery holder unit Q170HBATC



Item	Specifications	
	A31TU-D3K13	A31TU-DNK13
Operation	Tact switch	28 keys for SV13
	ENABLE/DISABLE switch	Operation enable/disable
	Emergency stop switch	Push lock return reset type
	Deadman switch	3-position switch   None
	Contrast adjusting switch	Shade/light
Display method	4 lines X 16 characters LCD display	
Interface	Comforming RS-422	
Protective construction	IP54 equivalent	
Ambient temperature	0 to 40°C (32 to 104°F)	
5VDC power supply	Supplied from Motion CPU	
5VDC consumption current	0.26A	
Mass	1.74kg (including cable 5m (16.40ft.))	



### ● Shanghai FA Center

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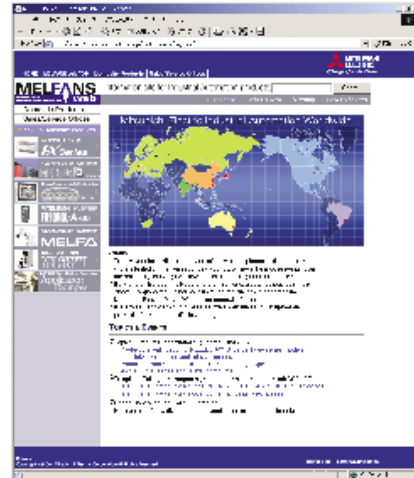
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**MELFANSweb web site URL:**

<http://www.MitsubishiElectric.co.jp/melfansweb/english>



## WARRANTY

Please confirm the following product warranty details before using this product.

### 1. Gratis Warranty Term and Gratis Warranty Range

If any faults or defects (hereinafter “Failure”) found to be the responsibility of Mitsubishi occurs during use of the product within the gratis warranty term, the product shall be repaired at no cost via the sales representative or Mitsubishi Service Company.

However, if repairs are required onsite at domestic or overseas location, expenses to send an engineer will be solely at the customer’s discretion. Mitsubishi shall not be held responsible for any re-commissioning, maintenance, or testing on-site that involves replacement of the failed module.

[Gratis Warranty Term]

Note that an installation period of less than one year after installation in your company or your customer’s premises or a period of less than 18 months (counted from the date of production) after shipment from our company, whichever is shorter, is selected.

[Gratis Warranty Range]

#### (1) Diagnosis of failure

As a general rule, diagnosis of failure is done on site by the customer.

However, Mitsubishi or Mitsubishi service network can perform this service for an agreed upon fee upon the customer’s request.

There will be no charges if the cause of the breakdown is found to be the fault of Mitsubishi.

#### (2) Breakdown repairs

There will be a charge for breakdown repairs, exchange replacements and on site visits for the following four conditions, otherwise there will be a charge.

- ① Breakdowns due to improper storage, handling, careless accident, software or hardware design by the customer
- ② Breakdowns due to modifications of the product without the consent of the manufacturer
- ③ Breakdowns resulting from using the product outside the specified specifications of the product
- ④ Breakdowns that are outside the terms of warranty

Since the above services are limited to Japan, diagnosis of failures, etc. are not performed abroad.

If you desire the after service abroad, please register with Mitsubishi. For details, consult us in advance.

### 2. Exclusion of Loss in Opportunity and Secondary Loss from Warranty Liability

Mitsubishi will not be held liable for damage caused by factors found not to be the cause of Mitsubishi; opportunity loss or lost profits caused by faults in the Mitsubishi products; damage, secondary damage, accident compensation caused by special factors unpredictable by Mitsubishi; damages to products other than Mitsubishi products; and to other duties.

### 3. Onerous Repair Term after Discontinuation of Production

Mitsubishi shall accept onerous product repairs for seven years after production of the product is discontinued.

### 4. Delivery Term

In regard to the standard product, Mitsubishi shall deliver the standard product without application settings or adjustments to the customer and Mitsubishi is not liable for on site adjustment or test run of the product.

### 5. Precautions for Choosing the Products

- (1) To use the products given in this catalog properly, always read “manuals” before starting to use them.
- (2) These products have been manufactured as a general-purpose part for general industries, and have not been designed or manufactured to be incorporated in a device or system used in purposes related to human life.
- (3) Before using the products for special purposes such as nuclear power, electric power, aerospace, medicine, passenger movement vehicles or under water relays, contact Mitsubishi.
- (4) These products have been manufactured under strict quality control. However, when installing the product where major accidents or losses could occur if the product fails, install appropriate backup or failsafe functions in the system.
- (5) When exporting any of the products or related technologies described in this catalogue, you must obtain an export license if it is subject to Japanese Export Control Law.

# MOTION CONTROLLERS Q series –SSCNETIII Compatible–

