

Motion Control Structured to your Specific Application

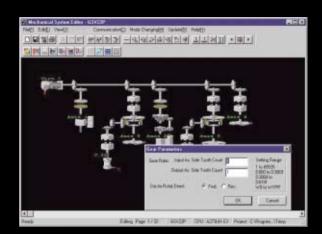
Various motion control models are available based on your specific application requirements. Models includes the A171SH(up to 4 control axes) for smaller scale applications up to the A173UH(up to 32 control axes) for larger scale applications. In addition, various motion controller operating system software packages are available. The OS with optimum control functions is selected based on your application requirements. Simple, compact and powerful motion control, custom tailored for your application needs.

High Speed Synchronous Communication Network : SSCNET

SSCNET(Servo System Controller NETwork) is a high-speed synchronous serial communication network that realized increased performance and reliability over conventional control networks. SSCNET allows for batch control of up to 32-axes thus simple one touch connection bus cabling, fast and simple connection.

Powerful Programming Environment

A powerful programming environment insures minimal system start up and programming time, as well as powerful, easy to use diagnostic and monitoring utilities. System development time is greatly reduced, saving valuable time and money.



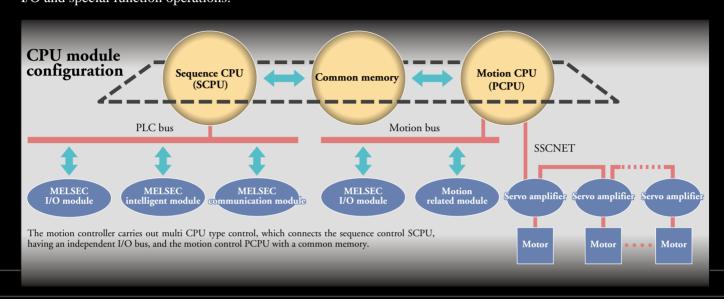


Integrated Motion and Sequence Control

The motion controller integrates motion and sequence control functions into a single compact package, thus reducing overall system size, complexity and cost. The motion controller utilities the industry leading MELSEC-A series PLC modules for networking, I/O and special function operations.

Diverse Motion Control Functions

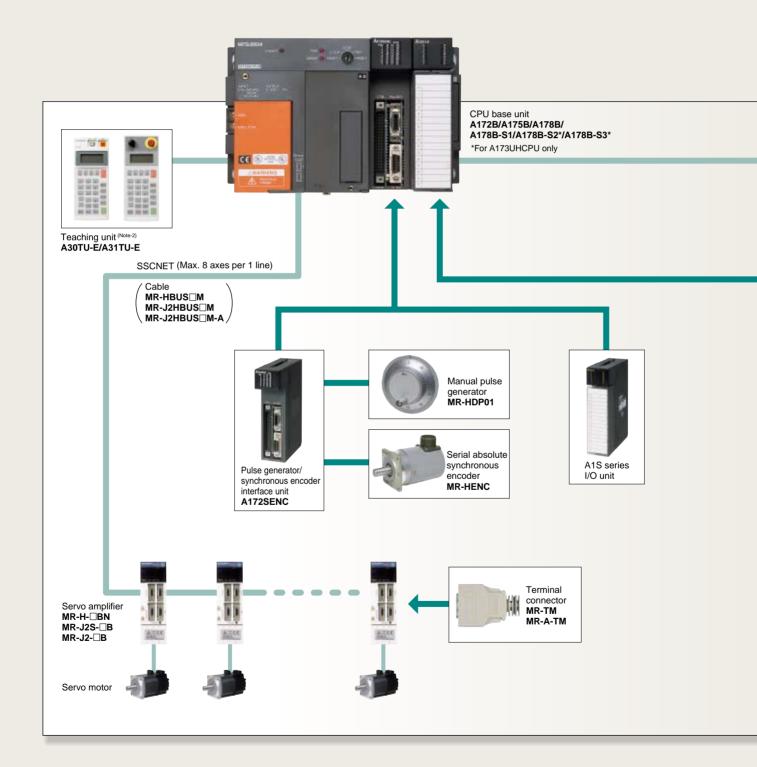
The system is provided with diverse and innovative motion control functions including interpolation control, speed control, electronic cam and locus control, so even complicated operations can be freely controlled.



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System Configuration

A171SH/A172SH/A173UH



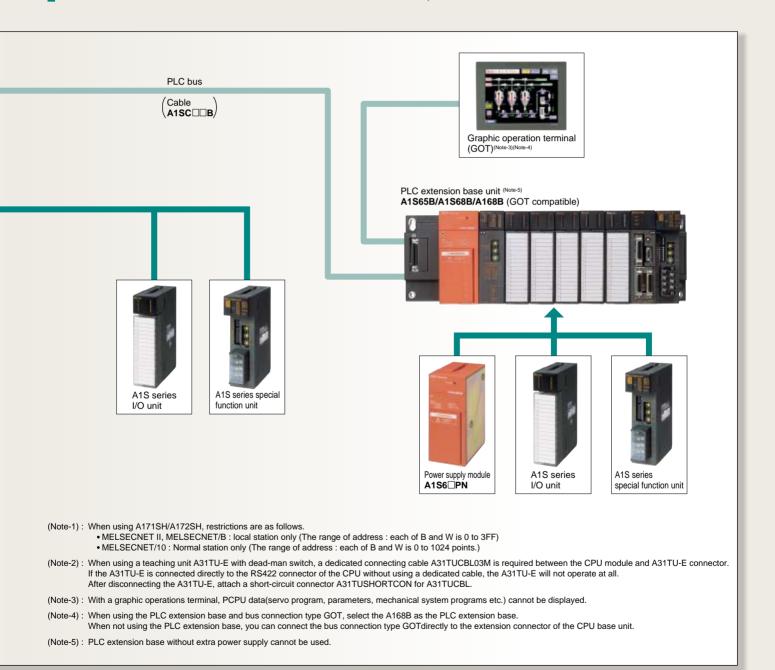
Motion controller integrates motion and sequence control into a single compact package. (220mm wide, 130mm high and 110mm deep) (A172B CPU base use).

By connecting to a PLC extension base, I/O capabilities are expanded A171SH: max. 512 points, A172SH: max. 1024* points and A173UH: max. 2048* points. The extension base can connect to max. one step.

*The real I/O points can be used within the range of main base and one extension base.

Connects to MELSECNET II, MELSECNET/B, MELSECNET/10 and CC-Link networks (Note-1)

By connecting MR-H-BN/MR-J2S-B/MR-J2-B model servo amplifiers with the SSCNET communication network, 50W to 55kW servo motors can be batch controlled A171SH: max. 4-axes, A172SH: max. 8-axes and A173UH: max. 32-axes.



Product Line-Up

A171SHCPUN



A171SHCPUN	Specifications
PLC CPU	A2SHCPU equivalent
PLC program capacity	14k steps
Real I/O points	512 points
Processing speed (sequence command)	0.25μs/step
Control axes	Max. 4
Servo program capacity	13k steps
Servo amplifier	External servo amp connected by SSCNET
Servo motor capacity	50W to 55kW
	MELSECNET II/B(local station only)
Network	MELSECNET/10(normal station only)
	CC-Link
PLC extension	Max. 1 base unit

A172SHCPUN



A172SHCPUN	Specifications
PLC CPU	A2SHCPU memory, I/O increase equivalent
PLC program capacity	30k steps
Real I/O points	1024 points (Note)
Processing speed (sequence command)	0.25μs/step
Servo program capacity	13k steps
Control axes	Max. 8
Servo amplifier	External servo amp connected by SSCNET
Servo motor capacity	50W to 55kW
	MELSECNET II/B(local station only)
Network	MELSECNET/10(normal station only)
	CC-Link
PLC extension	Max. 1 base unit

(Note): The real I/O point can be used within the range of CPU base and one extension base.

A173UHCPU



A173UHCPU(-SI)	Specifications
PLC CPU	A3UCPU equivalent
PLC program capacity	30k steps x2
Real I/O points	2048 points (Note)
Processing speed (sequence command)	0.15μs/step
Servo program capacity	14k steps
Control axes	Max. 32
Servo amplifier	External servo amp connected by SSCNET
Servo motor capacity	50W to 55kW
Network	MELSECNET II/B/10,CC-Link
PLC extension	Max. 1 base unit

(Note): The real I/O point can be used within the range of CPU base and one extension base.

OS Software Packages

Application Tailored Software Packages

The motion controller operating system software is specifically tailored and packed with functionality specific for your application needs.

Dramatic reductions in product design costs and simpler programming environments over conventional motion controllers realized great time and money savings.





OS Software Line-up

Conveyor Assembly Use

Motion SFC SV13

SV13



Offer constant-speed control, speed control, 1 to 4-axes linear interpolation and 2-axes circular interpolation, etc. Ideal for use in conveyors and assembly machines.

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

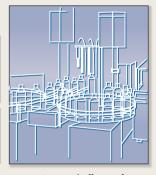
Dedicated language

- Linear interpolation(1 to 4-axes)
- Circular interpolation
- Constant-speed control
- Fixed-pitch feed
- Speed change control
- Speed control
- Speed-positionswitching
- Teaching function

Automatic Machinery Use

SV22

SV22



Provides simultaneous control multiple servo motors and offers software cam control. Ideal for use in automatic machinery.

- Press feeder
- Food processing
- Food packaging
- Winding machine
- Spinning machine
- Textile machine
- Printing machine
- Book binder
- Tire molderPaper-making machine

Mechanical support language

- Synchronous control
- Electronic shaft
- Electronic clutch
- Electronic camDraw control

Motion SFC ■

Greatly strengthed programming environment and event processing.

The Motion SFC function to describes the motion control program in flow chart form. By describing the program of the CPU(PCPU) which controls the motion in a suitable Motion SFC for the event processing, serial operation of the machine is controlled by PCPU, aiding the event response.

Motion SFC (Sequential Function Chart)

Easy-to-read and comprehend flow chart description.

- Programming can be carried out with an image that describes the flow chart with the machine operation procedures.
- A process control program can be created easily, and the control details can be visualized.

Controlling the series of machine operations with PCPU

- Using the Motion SFC, the servo control, operation and I/O control can be carried out in a batch with the PCPU.
- There is no need to start the servo program from the CPU (SCPU) that controls the sequence.

Multi-task processing

- The Motion SFC allows for multi-task program operation.
- By using parallel distribution in one program, multiple steps can be executed simultaneously.

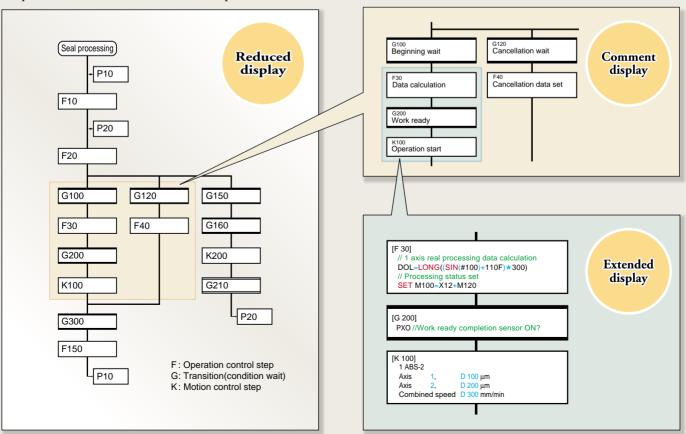
Motion SFC description

Flow chart description which easy-to-view and understand.

- As the outline operation of the process control is described as a flow chart, the entire operations can be viewed at a glance.
- The operation details can be described as a comment so an easy-to-understand program can be created.
- The program has a hierarchical structure, so detailed operations can be described for each step.

■Enhanced operation function

- The operation expression can be described in the original state.
- Compatible with 64-bit floating point operation.
- Various arithmetic functions including trigonometric functions, square root and natural logarithm are provided.
- The motion registers (#0 to #8191) have been added for Motion SFC operations.



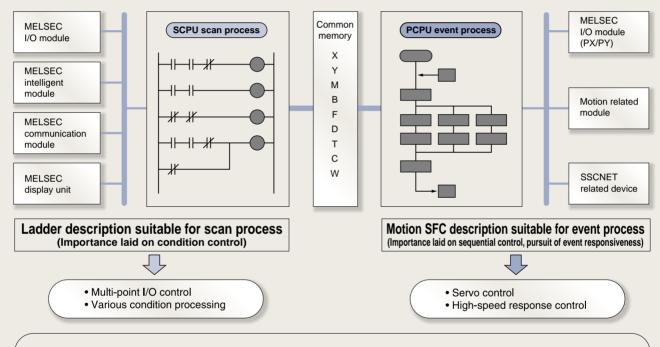
Powerful event processing functions

Minimized variation in control response time

With the conventional SV13/SV22, the series of machine operations were controlled by the SCPU so a variation occurred in the response time per seguence scan. However, this can be minimized by the strengthened Motion SFC event processing function, so the scan time can be suppressed, and variations in product machining can be reduced.

Multi-CPU method that strengthens event processing function

The multi-point I/O control and monitoring operations can be appointed to the SCPU by the ladder program, and the servo control and high-speed response control can be appointed to the PCPU by the Motion SFC program. This balances the scan process and event process, and further utilizes the multi-CPU configuration.



■Event process

This process waits for the conditions to be established (event to occur) with the changes in the input signal state or device value, and carries out high-speed response control (signal output control, servo motor start and speed change, etc.) when the conditions are established.

■Examples of events

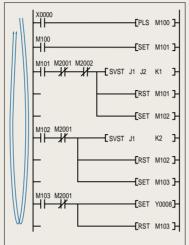
- Input signal turned ON.
- Operation results reached constant value.
- Set time elapsed.
- Positioning was completed.

Motion SFC

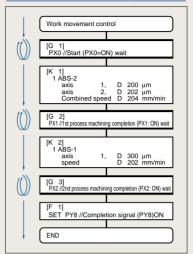
High-speed response using step execution method

• The sequence program uses a scan execution method to execute all steps with constant scanning. However, with the Motion SFC, the step execution method executes only the active steps following the shift conditions. Thus, the operation process can be reduced, and processing and response control can be realized.

Sequence program All steps are executed with constant scale



Motion SFC program nly active steps are executed following shift condi



Exclusive description unique to motion control

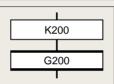
- If shift is applied immediately after the motion control step, the shift will be executed without waiting for the motion control operation to end.
- If WAIT is executed immediately after the motion control step, WAIT will be executed after waiting for the motion control operation to end.
- If WAIT ON/WAIT OFF is commanded just before the motion control step, the details of the motion control will be pre-read, and preparation for starting will be carried out. The operation will start immediately when the designated bit device turns ON/OFF

Shift



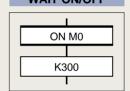
 Execute G100 without waiting for K100 operation to end

WAIT



 Execute G200 after waiting for K200 operation to end

WAIT ON/OFF

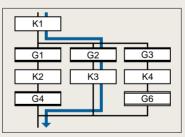


 Pre-read K300 and prepare to start
 Start immediately when designated bit (M0) turns ON

Selective branch and parallel branch

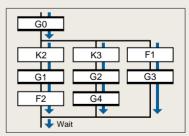
- When all routes shift after branch, or WAIT is issued for all routes, selective branch will be applied. Parallel branch is applied in all other cases.
- With selective branch, the route for which the shift conditions are established first are executed.
- With parallel branch, several routes connected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

Selective branching



 Judge G1 to G3 conditions, and execute only established route

Parallel branching



• Simultaneously execute all routes for step K2 to F1 in parallel

■Multi-task processing

- With the Motion SFC, when several programs are started, the process is carried out with multi-task operation.
- Multiple steps can be simultaneously executed with parallel branching even within one program.
- A program that executes multiple processes simultaneously, or a program that groups the control axis for independent movements can be created easily.
- A highly independent programming is possible according to the process details, so an easy-tocomprehend program can be created.

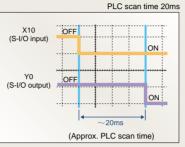
High-response to external inputs

■I/O output

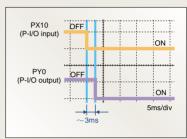
- This is used to measure the response time of the output signal in respect to the input signal from an external source.
- With the sequence program, there is a delay and variation equal to the response time 20ms and approximately the scan time.
- With the Motion SFC, the response time and variation are approximately 3ms.

S-I/O: PLC slot I/O P-I/O: Motion slot I/O

Sequence program







- Applicable CPU: A172SHCPUN
- Input module: A1SX40-S1 (OFF \rightarrow ON response: up to 0.1ms)
- Output module: A1SY40 (OFF → ON response: up to 2ms)

Great reduction in servo program start time

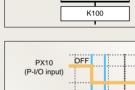
■Start up of servo program

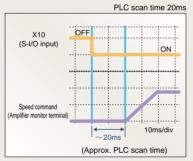
- This is an example of starting the servo program using the input signal from an external source as a trigger.
- When starting with the sequence program, a delay and variation equal to 20ms and approximately the scan time occurs from the input of the external signal to start-up of the speed command.
- With the Motion SFC, the speed command will start up with a response time of less than 10ms and variation of approximately 3ms.

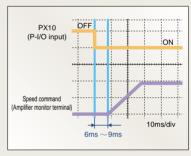
S-I/O: PLC slot I/O P-I/O: Motion slot I/O

Sequence program









Motion SFC program

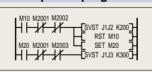
ON PX0010

- Applicable CPU: A172SHCPUN
- Input module: A1SX40-S1 (OFF → ON response: up to 0.1ms)

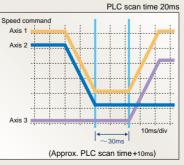
Continuous start-up of servo program

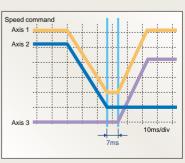
- This shows an example of starting-up the 1-axis and 3-axes linear interpolation program K300 immediately after starting-up the 1-axis and 2-axes linear interpolation program K200.
- When continuously starting-up the servo program with the sequence program, a delay and variation of approximately 30ms will occur. This is because the PLC scan time is 20ms, and the refresh cycle for the start acceptance flag M2001, which is the interlock is
- An interlock is not required with the Motion SFC, and the start delay will be approximately 7ms.

Sequence program





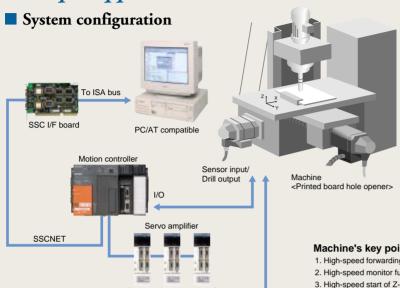


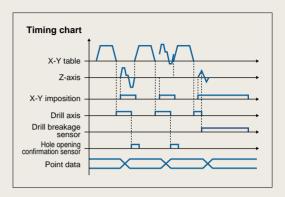


- Applicable CPU: A172SHCPUN
- Input module: A1SX40-S1 (OFF → ON response: up to 0.1ms)

Motion SFC■

Example applications

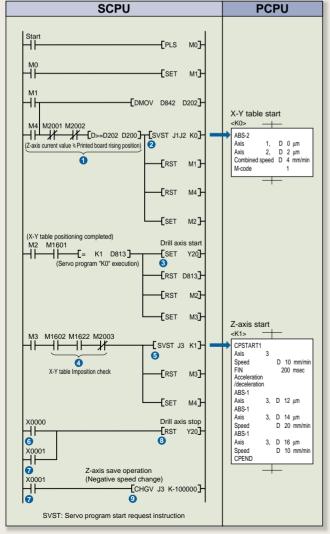




Machine's key points

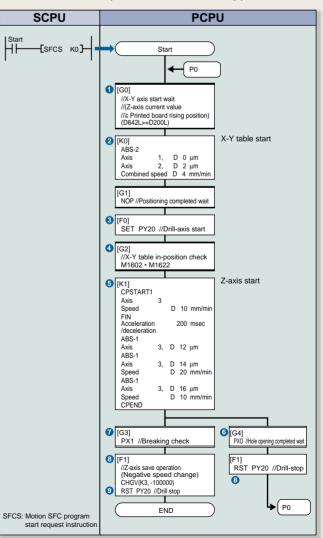
- 1. High-speed forwarding of a hole breakage data from a personal computer.
- 2. High-speed monitor function in a personal computer.
- 3. High-speed start of Z-axis after X-Y table positioning is completed.
- 4. High-speed start of X-Y axis after printed a board hole opening(Z-axis rises from printed board position).
- 5. High-speed save operation when drill breakage.

Previous method (SV13)

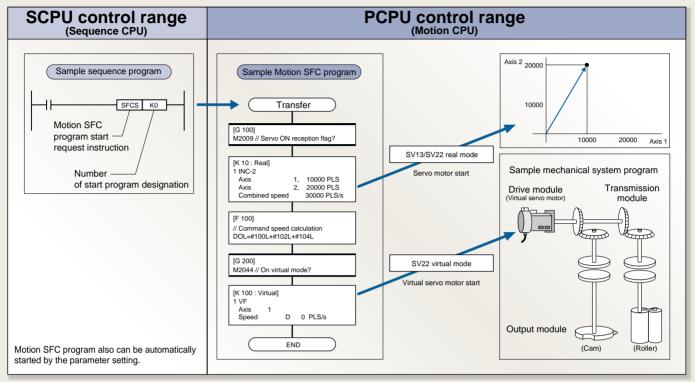


Processing action 1 to 9 of the previous method corresponds to the new method 1 to 9

New method (Motion SFC SV13)



Control flow (Motion SFC SV13/SV22)



Please refer to P19 regarding control flow of "SV13(without Motion SFC)" and P23 regarding control flow of "SV22(without Motion SFC)".

Various programming tools.

System setting -

System setting The state of th

 Set the system configuration (motion module, servo amplifier, servo motor) from the menu selection

Servo data setting | Servo data setting | Servo data | S

- Set the servo parameter and fixed parameters, etc.
- Display explanations of parameters with one-point help

Programming

Motion SFC program editing



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

Mechanical system editing



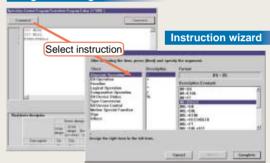
- Edit and monitor mechanics configuration program
- Lay out each module by clicking mouse to create

Ladder editing



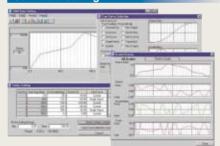
• Ladder editing software [LADDERP] is available to edit and monitor sequence program

Program editing



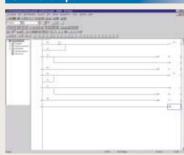
- Program for each step and transition
- Selection from menu using command wizard is also possible

Cam deta setting



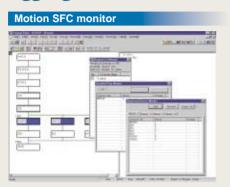
 Create cam data with cam pattern selection and free curve setting; display cam control status waveform

GX-Developer



 Highly functional windows version GPP function software [GX-Developer] can be used (optional)

Debugging

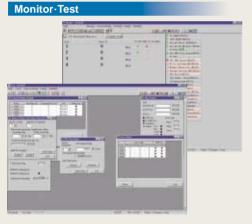


- Color display of step in execution on flow chart
- Device monitoring and testing of execution and designated step

Motion SFC debugging mode

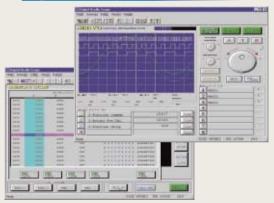
• Greatly reduced debugging time with powerful debug function (one-step execution, forced shift, brake, forced end)

Start-up adjustment



- Current value monitor, axis monitor, error history monitor
 Various tests such as zeroing and JOG by clicking mouse

Digital oscilloscope



- Data sampling synchronized with motion control cycle
- · Waveform display, dump display, file save, printing

Operation and maintenance



• Back-up of motion controller programs, parameters and internal information in a batch as a file

Document printing



· Conversion of system settings, programs and parameters into Word or Excel file and printing

Motion SFC specifications

■ Motion SFC chart symbols

Class	Name	Symbol	Function
Program	START	Program name	Indicates the start (entrance) of the program.
start/end	END	END	Indicates the end (exit) of the program.
	Motion control step	K	Starts the servo program Kn. (The servo commands are the same as the conventional SV13/SV22.)
	Once execution type operation control step	F	Executes the operation control program Fn once.
Step	Scan execution type operation control step	FS	Repeats an operation control program FSn until the next transition condition enables.
	Subroutine call/start step	Program name	Calls or starts a subroutine.
	Clear step	CLR Program name	Cancels and ends execution of the designated program.
	Shift (Pre-read transition)	G	Shifts to the next step when the transition condition enables without waiting for the previous motion control step or subroutine to end.
Transition	WAIT	G	Shifts to the next step when the transition conditions enables after the previous motion control step or subroutine ends.
Tansiion	WAIT ON	ON bit device	Prepares to start the next motion control step, and immediately outputs a command
	WAIT OFF	OFF bit device	when the conditions are established.
Jump	Jump	L→P	Jumps to the designated pointer Pn within its own program.
Pointer	Pointer	P	Indicates the jump destination pointer (label).

■ Motion SFC program parameters

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

Item	Setting range		Details	
	Automatically start		Start at rising edge of PLC READY (M2000)	
Start setting	Do not start automatically		Start with the Motion SFC program start command SFCS from PLC Start with "Subroutine call/start" GSUB from the Motion SFC program	
	Normal task		Execute in motion main cycle (free time)	
Evecuted	Executed Event task Fixed cycle External interrupt		• Execute in fixed cycle (1.7ms, 3.5ms, 7.1ms, 14.2ms)	
task			Execute when set external interrupt unit (I0 to I15) input turns ON	
PLC interrupt		PLC interrupt	Execute with interrupt from PLC (When PLC dedicated command ITP is executed)	
NMI task			Execute when set external interrupt unit (I0 to I15) input turns ON	

Operation control step and transition commands

Class	Symbol	Function	
	=	Substitution	
	+	Addition	
Binary	-	Subtraction	
operation	*	Multiplication	
	/	Division	
	%	Remainder	
	~	Bit inversion (complement)	
	&	Bit logical AND	
Bit	I	Bit logical OR	
operation	^	Bit exclusive OR	
	>>	Bit right shift	
	«	Bit left shift	
Sign	_	Sign inversion (complement of 2)	
	SHORT	Convert to 16-bit integer type (signed)	
	USHORT	Convert to 16-bit integer type (unsigned)	
	LONG	Convert to 32-bit integer type (signed)	
Type .	ULONG	Convert to 32-bit integer type (unsigned)	
conversion	FLOAT	Regarded as signed data, and convert into 64-bit floating point type	
	UFLOAT	Regarded as unsigned data, and convert into 64-bit floating point type	

Class	Syllibol	r unction	
	SIN	Sine	
	cos	Cosine	
	TAN	Tangent	
	ASIN	Arcsine	
	ACOS	Arccosine	
	ATAN	Arctangent	
Standard	SQRT	Square root	
function	LN	Natural logarithm	
	EXP	Exponential operation	
	ABS	Absolute value	
	RND	Round off	
	FIX	Round down	
	FUP	Round up	
	BIN	BCD → BIN conversion	
	BCD	BIN →BCD conversion	
Bit device	(none)	ON (normally open contact)	
status	!	OFF (normally closed contact)	
	SET	Device set	
Bit device	RST	Device reset	
control	DOUT	Device output	
	DIN	Device input	

Class	Symbol	Function	
	(none)	Logical acknowledge	
Logical	!	Logical negation	
operation	*	Logical AND	
	+	Logical OR	
	==	Equal to	
	! =	Not equal to	
Comparison	<	Less than	
operation	<=	Less than or equal to	
	>	More than	
	>=	More than or equal to	
Motion	CHGV	Speed change request	
dedicated function	CHGT	Torque limit value change request	
	EI	Event task enable	
Others	DI	Event task disable	
	NOP	No operation	
	BMOV	Block move	
	TIME	Time to wait	

■ Sequence dedicated commands

Sequence command	Control details
SFCS	At the rising edge (OFF \rightarrow ON) of the SFCS command executed by the sequence program, start of the designated the Motion SFC program is requested.
ITP	An interrupt is issued to the motion CPU (PCPU) at the rising edge (OFF \rightarrow ON) of the ITP command executed by the sequence program. The motion CPU executes the active step of the SFC program executed by the "PLC interrupt".

[•] The functions of the conventional SV13/22 PLC dedicated commands (DSFRP/SVST/DSFLP/CHGA/CHGV/CHGT) are described in the Motion SFC program, and cannot be described in the sequence program.

List of integrated start-up support software SW3RNC-GSVE software configuration

Software	Function		
	Installation	Installation of the motion OS Comparison of the motion OS	
	Project management	New creation, setting and reading of projects Batch management of user files in project units	
Conveyor assembly software SW3RN-GSV13P	System setting	Setting of system configuration (motion module/servo amplifier/servo motor, etc.) Setting of high-speed read data	
0.10	Servo data setting	 Setting of servo parameters and fixed parameters, etc. (Explanatory diagrams displayed with one-touch help) Setting of limit switch output data (Output pattern displayed with waveform display function) 	
	Program editing	Editing of the Motion SFC program, setting of the Motion SFC parameters Reduced display of the Motion SFC diagram, display of comments, enlarged display Monitor of the Motion SFC, debugging of the Motion SFC	
	Mechanical system editing (GSV22P only)	Editing of mechanical system program Monitoring of mechanical system program execution state	
	Communication	Setting of SSCNET communication CH. Writing, reading and comparison of programs and parameters in respect to the motion controller.	
Automatic machinery software	Monitoring	Current value monitor, axis monitor, error history Servo monitor, limit switch output monitor	
SW3RN-GSV22P	Testing	Servo startup, servo diagnosis Jog operation, manual pulser operation, zeroing test, program operation Teaching, error reset, current value change	
	Backup	Backup of motion controller programs and parameters in file Batch writing of backed up files into the motion CPU	
Cam data creation software SW3RN-CAMP	Cam data creation	Cam data creation with Cam pattern selection and free curve settings Graphic display of Cam control status	
Digital oscilloscope software SW3RN-DOSCP	Digital oscilloscope	Data sampling synchronized to operation cycle Waveform display, dump display and file saving of collected data	
Communication system software SW3RN-SNETP Communication A		Communication task, communication manager, common memory server, SSCNET communication driver Support of cyclic communication, transient communication, high-speed refresh communication Communication API functions compatible with VC++/VB	
Document printing software SW3RN-DOCPRNP (Note)	Printing	Printing of program, parameter and system settings (Convert into Word 97 or Excel 97 document format, and print)	
Ladder editing software SW3RN-LADDERP	Ladder editing	Editing of sequence program Monitoring of sequence program execution	

(Note): Word 97 and Excel 97 and above are required.



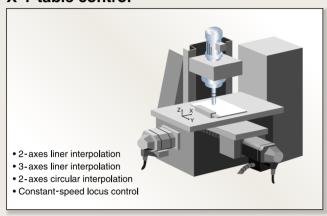
Simple programming using dedicated commands.

By using easily understood dedicated servo command and sequence commands positioning and locus control can be programmed as you like.

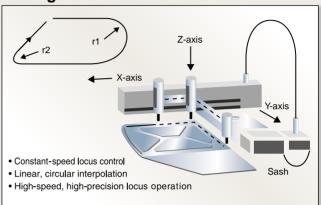
Control which is considered difficult and complex can be carried out simply using a variety of canned motion control functions.

Example applications

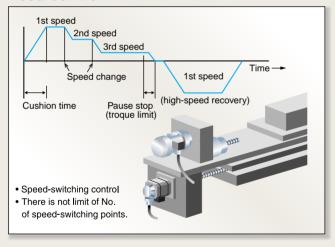
X-Y table control



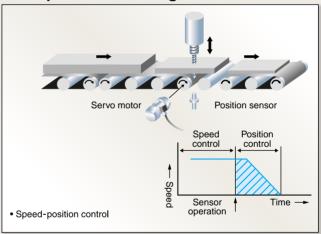
Sealing



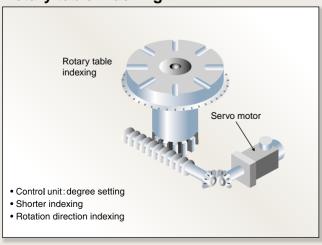
Feed control



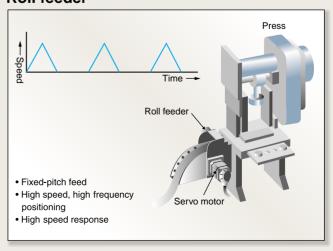
Fixed-pitch hole drilling



Rotary table indexing



Roll feeder



Example functions

Skip operation

This allows a positioning point to be made invalid during constant-speed control so that positioning moves on to the next positioning point.

Uses: Handling positioning eta.

Negative speed change

During position control, movement in the reverse direction can be made using speed change. Using the sequence command CHGV, a negative speed can be set so that the locus is retraced.

Uses: Return operations

M-code FIN waiting function

This allow a faster than normal commencement of positioning to the next point during constant-speed control.

Uses: High response positioning operation

Position follow-up control

By carrying start-up once, the setting value of the positioning point is detected in real time, and position control is carried out by tracking the changing settings.

M-code output function

During positioning, M-codes between 0 and 255 can be output at each positioning point.

Dwell time free setting

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

Parameter block setting

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

Torque limit value change

Torque limit value change can be carried out simply during positioning and JOG operation using the sequence command CHGT.

High speed read-out function

Using a signal from the input unit as a trigger, up to 11data sets(feed current value, variation counter value, etc.) out of 16 types of data can be read simultaneously to designated devices.

Uses: Measured length, synchronized correction

Cancel/start function

This forcibly halts program processing during operation, allowing you to switch to other program.

Uses: Escape operations when errors occur

S-curve acceleration/ deceleration

Using a determined ratio S-curve acceleration/deceleration characteristics can be set. The S-curve acceleration/deceleration enables smoother start and stop, and reduces stress on machines.

Speed change/pause/restart

Positioning, speed change during JOG operation as well as pause and restart can be carried out simply using the sequence command CHGV.

2 speed controls

Two types speed controls are available using position loops or speed loops.

Limit switch output

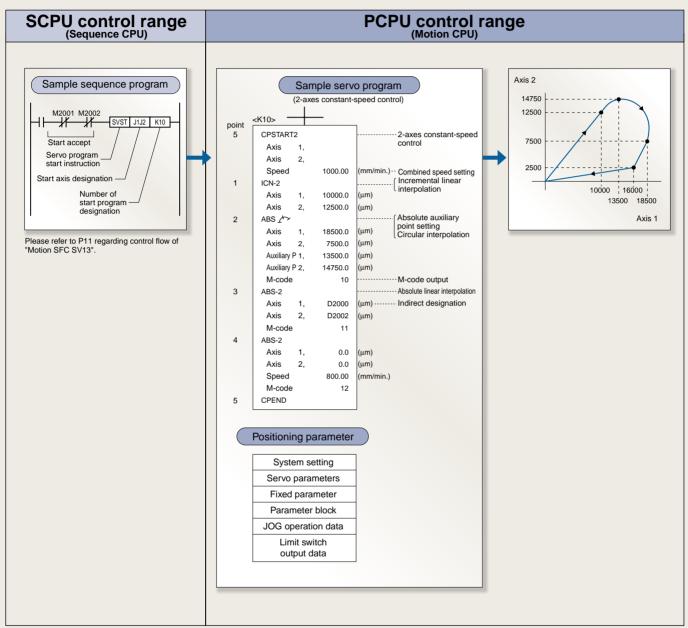
High-speed output of ON/OFF signals for up to 8 points per axis in response to the real current value during operation can be made regardeess of the sequence program.

Teaching setting

Using address teach and program teach, the positioning points can be taught.



Control flow (SV13)



Please refer to P11 regarding control flow of "Motion SFC SV13"

Servo instruction

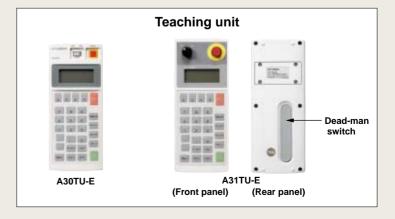
Positioning control		Instruction symbol	Processing
	1-axis	ABS-1	Absolute 1-axis positioning
	1-dxIS	INC-1	Incremental 1-axis positioning
	2-axes	ABS-2	Absolute 2-axes linear interpolation
Linear	2-0.65	INC-2	Incremental 2-axes linear interpolation
control	3-axes	ABS-3	Absolute 3-axes linear interpolation
	3-axes	INC-3	Incremental 3-axes linear interpolation
	4-axes	ABS-4	Absolute 4-axes linear interpolation
	4-0.65	INC-4	Incremental 4-axes linear interpolation
	Auxiliary point	ABS <u></u> →	Absolute auxiliary point designation circular interpolation
	designation	INC 👉	Incremental auxiliary point designation circular interpolation
	Radius designation	ABS 🦳	Absolute radius designation circular interpolation less than CW 180°
		ABS 🔿	Absolute radius designation circular interpolation CW 180° or more
		ABS 🗸	Absolute radius designation circular interpolation less than CCW 180°
		ABS 🖰	Absolute radius designation circular interpolation CCW 180° or more
2-axes circular		INC <	Incremental radius designation circular interpolation less than CW 180°
interpolation control		INC C	Incremental radius designation circular interpolation CW 180° or more
		INC 🗸	Incremental radius designation circular interpolation less than CCW 180°
		INC C	Incremental radius designation circular interpolation CCW 180° or more
	Center point designation	ABS 🔨	Absolute center point designation circular interpolation CW
		ABS 🐸	Absolute center point designation circular interpolation CCW
		INC 🔿	Incremental center point designation circular interpolation CW
		INC 🔾	Incremental center point designation circular interpolation CCW

Positioni	ng control	Instruction symbol	Processing
	1-axis	FEED-1	1-axis fixed-pitch feed start
Fixed-pitch feed	2-axes	FEED-2	2-axes linear interpolation fixed-pitch feed start
	3-axes	FEED-3	3-axes linear interpolation fixed-pitch feed start
		VSTART	Speed switching control start
Speed-sv	vitching	VEND	Speed switching control end
control		VABS	Absolute designation speed switching point
		VINC	Incremental designation speed switching point
Speed	Forward	VF	Speed control(I) forward rotation start
control (I)	Reverse	VR	Speed control(I) reverse rotation start
Speed	Forward	VVF	Speed control(II) forward rotation start
control (II)	Reverse	VVR	Speed control(II) reverse rotation start
Cnood	Forward	VPF	Speed-position control forward rotation start
Speed- position	Reverse	VPR	Speed-position control reverse rotation start
control	Restart	VPSTART	Speed-position control reverse rotation restart
Position t	racking	PFSTART	Position follow-up control start
		CPSTART1	1-axis constant-speed control start
		CPSTART2	2-axes constant-speed control start
Constant- control	-speed	CPSTART3	3-axes constant-speed control start
		CPSTART4	4-axes constant-speed control start
		CPEND	Constant-speed control end
Repetition	of	FOR-TIMES	
same con	trol	FOR-ON	Repeat range start setting
Used in s switching constant-	control and	FOR-OFF	
control)	NEXT	Repeat range end setting
Simultaneo	ous start	START	Simultaneous start
Zeroing		ZERO	Zeroing start
High-speed	d oscillation	osc	High-speed oscillation start

Teaching functions

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

Also, because the A31TU-E is fitted with a dead-man switch, error safety is assured.





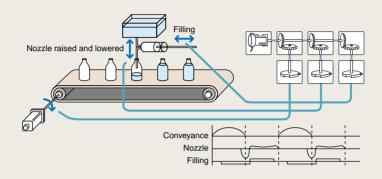
Easy on screen programming using the mechanical support language.

Loaded with a mechanical support language that allows easy programming of the machine mechanism. Ideal for controlling automated machines such as food machines and wrappers.

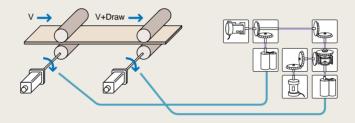
By freely combining a variety of software mechanism modules and cam patterns, complex synchronization control and coordinated control can be achieved easily and low cost.

Example applications

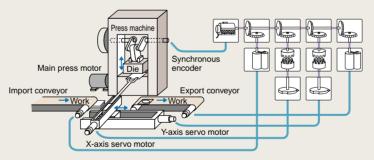
Filling machine



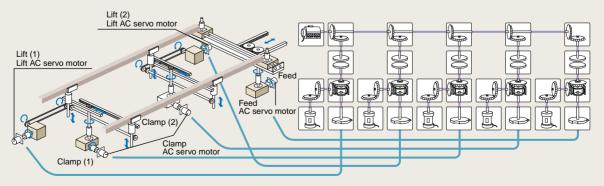
Draw control



Press conveyance

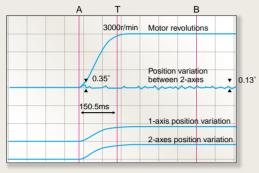


Three dimensional transfer

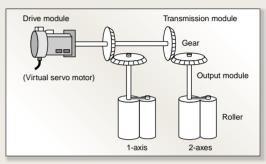


Synchronous control

The servo motor can be operated simultaneously with other motor control conditions. Using the mechanical support language, synchronous control settings can be made simply, and synchronous operation is carried out with little tracking delay.



Position variation between 2-axes during synchronous control



Synchronous control mechanical system program

Mechanical support language

Software is used for mechanism operation

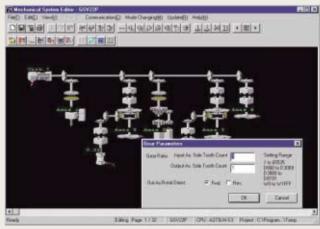
Control of hardware such as main shafts, gears, clutches and cams is handled by the software mechanical modules, conventional problems are solved.

- The machine is more compact and costs are lower.
- There no worries over friction and service life of main shafts, gear and clutches.
- Changing initial setup is simple.
- Eliminating mechanical precision errors and boosting system performance.

Control through advanced software cam

Since cam control is handled by software, there are no problems with error caused by conventional cam control. The ideal cam pattern control can be achieved. Ideal in applications such as raising or lowering control of nozzles in contact with liquid surfaces, control of amount of filler or smooth conveyance control. Changing of cams when product types alter is also easy to handle by simply adjusting the cam pattern.

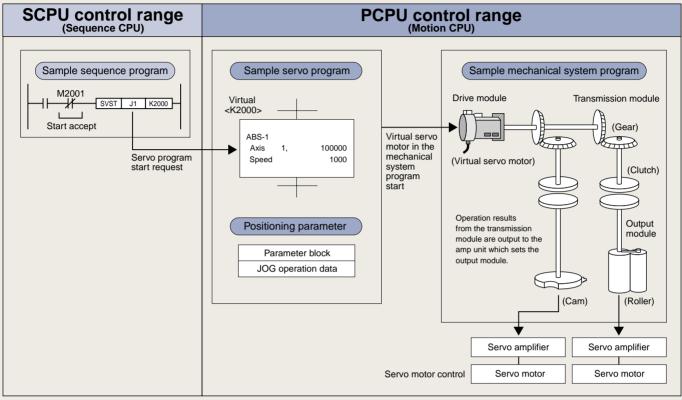
Easy programming on screen using a mouse



Monitor screen with mechanical support language



Control flow (SV22)



Please refer to P11 regarding control flow of "Motion SFC SV22"

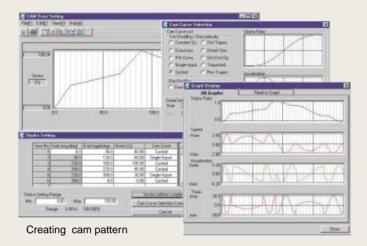
Mechanical module list

Mechanism	Mechanic	al module	Function
section	Name	Appearance	Fullction
Drive	Virtual servo motor		Used to drive the virtual axis in the mechanical system program by the servo program or JOG start.
module	Synchronous encoder		Used to drive the virtual axis by input pulse from an external synchronous encoder.
Virtual	Virtual main shaft	_	This is a virtual "link shaft". The rotation of the drive module is transferred to the transmission module.
axis Virtual auxiliary input axis	_	This is the auxiliary input axis for input to the transmission module "differential gear". It is automatically displayed when the differential gear and the gear are connected.	
	Roller		•Used when the speed control occurs at the final output.
Output	Ball screw		Used when the liner positioning occurs at the final output.
module	Rotary table		Used when the angle control occurs at the final output.
	Cam		Used when control other than those shown above occurs at the final output. Position control occurs based on the cam pattern setting data. There are two cam control modes: the two-way cam mode and the feed cam mode.

Mechanism	Mechanic	al module	Function
section	Name	Appearance	1 diletion
	Gear		Transfers the drive module rotation to the output axis. The travel valve input from the drive module multiplied by the set gear ratio, and transferred to the output axis so that it moves in the set direction.
	Direct clutch		Engages/disengages the output module with the drive module rotation. When switching the clutch ON/OFF, there is a direct clutch for direct transfer and a smoothing clutch for acceleration/deceleration processing which occurs in accordance with the smoothing time constant setting.
Transmission module	Smoothing clutch		Depending on the application, ON/OFF mode, address mode or external input mode can be selected. As the smoothing method, the time constant setting method or degree of slippage setting method can be selected.
	Speed change gear		Used to change the speed of the output module. The speed from the input axis side multiplied by the set speed change ratio and transferred to the output axis.
	Differential		The rotation of the auxiliary input axis subtracted from the rotation of the virtual main shaft and transferred to the output axis.
	gear		•The rotation of the auxiliary input axis subtracted from the rotation of the virtual main shaft and transferred to the output axis. (for connection to the virtual main shaft)

Software package for creating cam curves SW3RN-CAMP

This package sets the cam pattern when using software cam control through the mechanical support language. It makes it easy to freely create highly precise cam patterns to match the required control. Complex cam patterns are simple to create.



Ten types of cam patterns provided

Select from among the ten cam patterns provided to find the one suited to your application. Combine them to create whatever cam curve you need.

Constant velocity Simple harmonic	Constant acceleration Cycloid	• 5-dimensional • Deformed trapezoid					
Deformed sine wave	Deformed constant velocity	•					
Inverse trapeculoid							

Can be set with free-form curves

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

Select cam precision to match application

The resolution per cycle of the 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 bounding can be displayed in easy to understand graphics.

Overview of CPU Performance

■ Motion control specifications

Number of control axes A173/HCPU (-\$1): Max. 2-axes A173/HCPU (-\$1): Max.				SV13			SV22		
Control methods Contr	Number of control axes		A172SHCPUN : Max. 8-axes						
Control unit Control unit Control unit Control unit Method Position Po	Interpolation fu	nction							
Method PTP Absolute method/select of absolute or incremental method Ptod-pitch fleed, speed-position-switching control Absolute method-both absolute and incremental method can be used together Ptod-pitch fleed, speed-position-switching control Absolute method-both absolute and incremental method can be used together Ptod-pitch fleed, speed-position control Absolute method-both absolute and incremental method can be used together Ptod-pitch fleed, speed-position-switching control Absolute method Address setting range Ptod-pitch fleed, speed-position flow-up control Absolute method Address setting range Ptod-pitch fleed, speed-position flow-up control Absolute method Address setting range Ptod-pitch fleed, speed-position flow-up control Address setting range Ptod-pitch fleed, speed-position flow-pitch fleed, spee	Control method		control, const	tant-speed control, spee	ed-switching control, position	on feed, speed-po	sition control, constant-speed, sp		
Method Constant-speed, speed-position switching control Absolute and incremental method can be used together Fixed-pitch feed, speed-position control Shoelute method	Control unit				mm, inch, d	egree, PULSE			
Positioning		Method	Constant-s Fixed-pitch	feed, speed-position cor	itching control : Absolute mentrol : Incremental	ethod/both absolute an method		gether	
Positioning Positioning Positioning Positioning Positioning PLS				Control unit	Command unit	Addr	ess setting range		
Positioning		Position		mm	•	-214748	3648 to 2147483647		
Positioning	Positioning			inch		-214748	3648 to 2147483647		
Positioning Speed Control unit Speed Setting Rane mm 0.01 to 6000000.00 (mn/min) (inch/min) (degree/min) (PLSis)		Communa			× 10 ⁻⁵ degree		0 to 35999999		
Speed command Speed comman				PLS	PLS	-214748	3648 to 2147483647		
Speed command Inch O.001 to 600000.000 (inch/min) (degree o.001 to 2147483.647 (degree/min) (degree/min)						Speed Setting R	ane		
the command begree PULSE 1 to 10000000 (Inchmin) (degreemin) (degreemin) (degreemin) (pLS/s) Acceleration/ deceleration Acceleration ime: 1 to 65535ms Accelerati		'					, ,		
PULSE 1 to 10000000							,		
Acceleration/ deceleration deceleration acceleration/deceleration ime: 1 to 65535ms Acceleration/deceleration acceleration/deceleration acceleration/deceleration acceleration/deceleration acceleration/deceleration ime: 1 to 65535ms Acceleration/deceleration acceleration/deceleration ime: 1 to 65535ms Acceleration/deceleration/deceleration ime: 1 to 65535ms Acceleration/decelerati				"			· -		
Acceleration Acceleration Coceleration Coce				1 OLOL	1 to 1000	0000	(PLS/\$)		
deceleration acceleration deceleration Acceleration time : 1 to 65535ms Acceleration / Control		deceleration	Automatic trapezoidal						
Scurve acceleration/deceleration Scurve atio : 0 to 100%			acceler	ration/deceleration					
Compensation Comp		control	S-curve acc	eleration/deceleration				,	
Program	Compensation						,		
Program Program Language (Motion SFC, servo program) A173UHCPU (-S1) : 14k step (14336 steps) A172SHCPUN : 13k step (13312 steps) A171SHCPUN : 13k step (13312 steps) A172SHCPUN : 400 points/axis A172SHCPUN : 400 points/axis A172SHCPUN : 400 points/axis A171SHCPUN : 800 points/axis A171SHCPUN : 800 points/axis A171SHCPUN : 400 points/axis A172SHCPUN : 400 poi		Electronic gear		Funct	tion to compensate for real t	ravel error against con	nmand value		
Program Capacity		Language							
positioning point	Program	Capacity			A172SHCPUN :	13k step (13312 steps	s)		
Zeroing function Not absolute position system is recommended: Proximity dog type or count type can be selected. Absolute position system is recommended: Data setting type, proximity dog type or count type can be selected. Available Manual pulse generator operation function M-function M-function M-code output function ON/OFF settings can be made for each axis up to 10 points 8 output points for each axis		positioning		A172SHCPUN : 400 points/axis Positioning data can be designated indirectly					
Absolute position system is recommended : Data setting type, proximity dog type or count type can be selected. JOG operation function Manual pulse generator operation function M-function M-function M-code output function ON/OFF settings can be made for each axis up to 10 points 8 output points for each axis	Tool				PC/AT compatible, A30TU	-E/A31TU-E (for SV13	only)		
Manual pulse generator operation function A173UHCPU (-S1) : 3 units A172SHCPUN : 1 unit A171SHCPUN : 1 unit A171SHCP	Zeroing function	1						cted.	
A172SHCPUN : 1 unit and buse generator operation function A171SHCPUN : 1 unit and be connected a connected in the connected and be connected	JOG operation function				Ava	ilable			
M-function M-code output function ON/OFF settings can be made for each axis up to 10 points 8 output points for each axis					A172SHCPUN :	1 unit can be conn	ected		
Limit switch output function ON/OFF settings can be made for each axis up to 10 points 8 output points for each axis	M-function								
· · ·		put function			ON/OFF settings can be n	nade for each axis up t	o 10 points		
	Absolute position	on system		Made compatible by fittin			tal system can be specified per axis)		

■ Mechanical system program specifications (SV22)

Item		Mechanical module	A.	171SH	A1	72SH	A1	73UH	A173UH-S1	
	Drive	Virtual servo motor				D.	LS			
	module	Synchronous encoder				PI	_5			
Control		Roller				mm	inch	e" Total 36 Total 64 64 64 64 32 32 Total 32 Total 32		
unit	Output	Ball screw				111111,	IIICII			
	module	Rotary table				Fixed as	"degre	e"		
		Cam				mm, in	ch, PLS	3		
	Drive	Virtual servo motor	4	Total 5	8	Total 9	32		Total 36	
	module	Synchronous encoder	1	Total 3	1	10181 9	4		Total 30	
	Virtual	Virtual main shaft	4	Total 8	8	Total 16	32	Total 64 64 64 64	Total 64	
	axis	Virtual auxiliary input shaft	4	Total o	8	Total 10	32		10(a) 04	
		Gear (Note-1)		8		16	64		64	
Mechanical		Clutch (Note-1)		8		16		64		
system	Transmission module	Speed change gear (Note-1)		8		16			Total 64 64 64 64 32 32	
program	module	Differential gear (Note-1)		4		8			32	
		Differential gear (for the virtual main shaft) (Note-2)		4		8			32	
		Cam	4		8		32			
	Output	Roller	4	Total 4	8	Total 8	32	Total 3: Total 6: 64 64 64 32 32 Total 3: Total 3:	Total 32	
	module	Ball screw	4] Iotal 4	8	lotaro	32		10101 32	
		Rotary table	4		8		32			
	Types			Max	c. 64		Max. 64 Max. 256		Max. 256	
	Resolution pe	r cycle			2	56, 512, 1	1024, 2	048		
Cam	Memory capa	city		32k	bytes		32k by	tes (Note-3	132k bytes (Note-3)	
	Stroke resolut	tion				327	767			
	Control mode				Tw	o-way ca	m, feed	l cam		

- (Note-1): The gears, clutch, speed change gears and differential gear modules 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 module of the virtual servo motor.
- (Note-3): Strocked in block from No.10 of the expansion file resister area.

■PCPU Motion SFC specifications

	Ito	em	A172SHCPUN	A173UHCPU (-S1)		
	Code total (Motion	SFC chart+Operation control+Transition)	287k	bytes		
Program capacity	Text total(Operation	on control+Transition)	224k bytes			
	Motion control pro	gram (Servo program)	52k bytes	Approx. 56k bytes		
Program	Code-Motion cont	rol program	PCPU	SRAM		
storage area	Text		PCPU	SRAM		
	Number of Motion	SFC programs	256 (No.	0 to 255)		
	Number of Motion (1 step+1 transition	SFC steps/all programs n)	Max. approx (varies with the number of operation contr			
Motion SFC program	Motion SFC progr	am name/program	16 b (program name is u	3 *** *		
	Motion SFC chart	size/program	Max. 64k bytes(included Mo	otion SFC chart comments)		
	Motion SFC steps	/program	Max. 409	94 steps		
	Motion SFC chart	comments	Max. 80 chara	acters/symbol		
	Number of operation	Once execution type	4096 (F0 to F4095)	4096 with F and FS combined		
	control programs	Scan execution type	4096 (FS0 to FS4095)	(F/FS0 to F/FS4095)		
Operation control	Number of transiti	on programs	4096 (G0 to G4095)			
program(F/FS)	Code-size/program	n	Max. approx. 64k b	ytes (32766 steps)		
Transition	Text-size/program		Max. approx	k. 64k bytes		
Transition program(G)	Number of blocks	(lines)/program	Max. 8192 blocks(in the c	1 () ,		
program(o)	Number of charac	ters/block(line)	Max. 128 characters	,		
	Number of operar	nd/block(line)	Max. 64 (operand : consta	nts, word devices, bit devices)		
	Number of servo	programs	4096 (K0	to K4095)		
Motion control	Program steps/all	programs	13312	14334		
program	Program steps/pro	ogram	Max.13312 steps (Speed control, speed change control)			
	Positioning points		Approx. 800 points/axis	Approx. 400 points/axis		
		xecuted programs		. 256		
	Number of multi a	ctive steps		s/all programs		
Executed		Normal task		otion main cycle		
specification	Executed task	Event task	Fixed cycle (1.7ms, 3 16 external interrupt points(Input from inte Excute with interrupt from PLC 1 point (Whe	.5ms, 7.1ms, 14.2ms) rrupt input module installed in motion slot.) en PLC dedicated instruction TP is excuted.)		
		NMI task	16 external interrupt points(Input from interrupt input module installed in mot Add event task and NMI task 16 points(set in SFC parameter)			
	Number of motion	register (#0)	8192 points(#0 to #8191) (#800	00 to #8191 is dedicated device)		
Device	Number of coastir	ng timer(FT)	1 point (FT) (88	8μs timer(32bit))		
	Number of motion	slot I/O(PX/PY)	Total 64 points	Total 256 points		

Overview of CPU Performance

■ Sequence control specifications

			A171SH		A1	72SH	A17	3UH	A173U	H-S1	
Contro	l method					Repea	ted operation using sto	red program			
I/O con	trol method				e/direct mode to select)		(direct mod	Refresh e can be used partially i		instruction)	
Progra	mming langu	uage			(uence control dedicate uage, logic symbol lang	d language uage, MELSAP Ⅱ (SFC	C))		
			Sequ	ence ins	structions : 26			Sequence inst	ructions : 22		
Number of instructions		Bas	sic instru	ictions: 131			Basic/applied ins	structions : 252			
INGILIDO	i oi ilistracti	0113	Applied instructions : 106					Instruction			
Motion instructions : 4 Motion instructions : 4 Processing speed Direct mode 0.25 to 1.9 μs/step —											
		Direct mode	0	.25 to 1	.9 μs/step			_			
· ·		Refresh mode		0.25 μ	ıs/step			0.15 μs	s/step		
I/O poi	nts (Note-1)				/0 to 7FF)			8192 (X/Y0			
Real I/0	O points		512 (X/Y0 to 1F	-		/Y0 to 3FF)	2048 point	s (X/Y0 to 7FF) (within the	he range of one extens	sion base.)	
Watch	dog timer (W	/DT)		10 to 2	000ms			200r	ns		
Memor	y capacity (t	built-in RAM)	64k bytes		192	k bytes	192k	bytes	768k by	/tes	
Progra	Main se	equence	Max. 14k steps	3	Max.	30k steps		Max. 30	steps		
capacit		quence	_					Max. 30	steps		
, , , , , , , ,	Microco	mputer program	Max. 26k bytes		Max.	58k bytes			-		
	Internal rela	ay (M) (Note-1)	1000 points (M0 to I	M999)	Total 0	048 points		Total 940	1 points		
	Latch relay		1048 points (L1000 to	L2047)							
	Step relay ((S)	0 point (none at in		(set in parameters)		(Set in parameters)				
	Link relay (B)	1024	points	(B0 to B3FF)			8192 points (B	0.01 to 327.67s T2 0.1 to 3276.7s Nc by word device (D,W and R) T29 s (default 256 points) Setting range		
		Points			56			2048 (defa	ault 256)		
				Set	tting time	Device		Set	ting time	Device	
			100ms timer		o 3276.7s	T0 to T199	100ms timer			T0 to T199	
	Timer (T)	Cnasifications	10ms timer		to 327.67s T200 to T255		10ms timer 0.01 to			T200 to T255	
		Specifications	100ms				100ms retentive tim			None at initial	
			retentive timer	0.11	o 3276.7s	None at initial	Extension timer	Time set by word	d device (D,W and R)	T256 to T2047	
							Set in parameter				
		Points	256 points				1024 points (default 256 points)				
					Catting range	Davis		Setting	range	Device	
Device	Counter (C)	`\	Normal counter		Setting range	Device C0 to C255	Normal counter	1 to 3		C0 to C255	
	Courilei (C)	Specifications	Interrupt program of	ounter	1 to 32767	None at initial	Interrupt counter	C224 to		None at initial	
			110			Trono at mila	Extension counter	Count value set by wor	d device (D,W and R)	C256 to C1023	
							Set in parameter				
	Data registe	er (D) (Note-1)	1024	ooints (D	00 to D1023)			8192 points (D0	to D8191)		
	Link registe	er (W)	1024	ooints (V	V0 to W3FF)			8192 points (W0	to W1FFF)		
	Annunciato	r (F)	256	points (F	0 to F255)			2048 points (F0	to F2047)		
	File registe	r (R)				Max. 8192	points (R0 to R8191) (set in parameter)			
	Accumulato	or (A)					2 points (A0, A1)				
	Index regist	ter (V•Z)		2 points	s (V, Z)			14 points (V, V1 to	V6, Z, Z1 to Z6)		
	Pointer (P)						256 points (P0 to P2	55)			
	Interrupt po	ointer (I)					32 points (I0 to I31)			
	Special rela	ay (M)					256 points (M9000 to M	9255)			
	Special reg	ister (D)					256 points (D9000 to D	9255)			
Extensi	on file registe	er blocks (Note-2)	_ (Note-3)		-	(Note-3)	Max. 10 blocks Max. 46 blocks Depends on memory size				
Comm	ent points					Max. 403	2 points (64k bytes), 1 p (set in 64 points un				
Extension comment points (Note-2)					Max. 396	8 points (63k bytes), 1 p (set in 64 points un					
Self-diagnostic function				Ope	ration error monit	oring and detection of e	rrors in CPU,I/O, battery	etc			
Operat	ion mode in	error					Select of stop or cont	inue			
	mode when			:	Select of re-or	utput operation sta	atus before STOP (defa	ult) or output after opera	tion execution		
	unction (Note-	-4)			Year	month, day, hour	, minute, weekday (auto	matic leap year adjustm	nent)		
Clock f	unction										

⁽Note-1): The positioning dedicated device range varies with the OS. (Note-2): This changes depending on the sequence parameter. (Note-3): By used to "SW0GHP-UTLP-FN1" on A6GPP or A6PHP, possible to use max.3 blocks on A171SH and max.10 blocks on A172SH.

⁽Note-4): The year data by the clock element is only the lower two digits of the year. When used in sequence control, the data must be compensated for the sequence program in some applications of using the data.

Software Packages List ■

■OS software package list

Application	Peripheral device	Model name			
Αρριισατίστι	relipileral device	A171SHCPUN	A172HCPUN	A173UHCPU	
For conveyor assembly SV13 (Motion SFC)		-	SW3RN-SV13D	SW3RN-SV13B	
For automatic machinery SV22 (Motion SFC)	DC/AT compatible	_	SW3RN-SV22C	SW3RN-SV22A	
For conveyor assembly SV13 (without Motion SFC)	PC/AT compatible	SW0SRX-SV13G	SW0SRX-SV13D	SW2SRX-SV13B	
For automatic machinery SV22 (without Motion SFC)		SW0SRX-SV22F	SW0SRX-SV22C	SW2SRX-SV22A	

■Programming software package list

Application	Peripheral device	Model name	Notes
For conveyor assembly SV13 (Motion SFC / without Motion SFC)	PC/AT compatible	SW3RN-GSV13P	Included in the "Integrated start-up support
For automatic machinery SV22 (Motion SFC / without Motion SFC)	1 G/Al compatible	SW3RN-GSV22P	software".

■Integrated start-up support software list

Model name	Details
SW3RNC-GSVPROE	SW3RNC-GSVE (Integrated start-up support software) 1 CD-ROM • Conveyor assembly software • Automatic machinery software • Cam data creation software • Digital oscilloscope software • Communication system software • Document print software • Ladder editing software SW3RN-DOCPRNP • Ladder editing software SW3RN-LADDERP SW3RNC-GSVHELPE (operation manual) 1 CD-ROM
SW3RNC-GSVSETE	SW3RNC-GSVPROE A30CD-PCF (SSC I/F card (PCMCIA TYPEII 1CH/card)) A270CDCBL03M (cable for A30CD-PCF) 3m

System Component

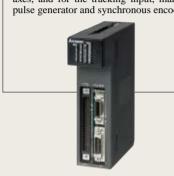
Item	Model name	Description	Standard				
	A171SHCPUN	Sequence program capacity : Max.14k steps Servo program capacity : Max.13k steps PLC control real I/O point : Max. 512 Internal power supply : Input : 100 to 240 VAC, output : 5 VDC 3A, 24 VDC 0.6A 5VDC internal consumption current : 1.63A					
CPU module	A172SHCPUN	Sequence program capacity : Max. 30k steps Servo program capacity : Max.13k steps PLC control real I/O point : Max. 1024 Internal power supply : Input : 100 to 240 VAC, output : 5 VDC 5A 5VDC internal consumption current : 1.63A	UL/cUL CE marks				
	A173UHCPU	Sequence program capacity : Max. 60k steps Servo program capacity : Max.14k steps PLC control real I/O point : Max. 2048					
	A173UHCPU-S1	Internal power supply : Input : 100 to 240 VAC, output : 5 VDC 5A 5 VDC internal consumption current : 1.90A					
	A172B	1 motion module slot and 1 PLC module slot can be fitted.					
	A175B	1 motion module slot and 4 PLC module slots can be fitted.					
	A178B	1 motion module slot and 7 PLC module slots can be fitted.	1				
CPU base unit	A178B-S1	2 motion module slots and 6 PLC module slots can be fitted.	UL/cUL				
	A178B-S2 (Note)	4 motion module slots and 4 PLC module slots can be fitted.					
	A178B-S3 (Note)	8 motion module slots can be fitted.	1				
	A1S61PN	Input: 100 to 240 VAC, output: 5 VDC 5A	111 /-111				
Power supply module	A1S62PN	Input: 100 to 240 VAC, output: 3 VDC 5A, 24 VDC 0.6A	UL/cUL CE marks				
	A1S65B		OL mano				
DI O sutanzian hass vint		For extension power supply and 5 slots, compatible with system up to one extension stage.					
PLC extension base uint	A1S68B	For extension power supply and 8 slots, compatible with system up to one extension stage.					
	A168B	For extension power supply and 8 slots, compatible with system to bus-connected one extension stage and GOT.					
	A1SC01B	55mm (2.17 inch)					
	A1SC03B	300mm (11.81 inch)					
	A1SC07B	700mm (27.56 inch)					
	A1SC12B	1200mm (47.24 inch)					
Extension cable	A1SC30B	3000mm (118.11 inch)					
Exterision cable	A1SC60B	6000mm (236.22 inch)					
	A1S05NB	450mm (17.72 inch)					
	A1S07NB	700mm (27.56 inch)					
	A1SC30NB	3000mm (118.11 inch) (For A6□B)					
	A1SC50NB	5000mm (196.85 inch) (For A6 □B)					
Pulse generator/ synchronous encoder interface unit	A172SENC	I/O signal 33 points (FLS, RLS, STOP, DOG/CHANGE : 8 points each tracking input : 1 point) Dynamic brake command output : 1 point Manual pulse generator/synchronous encoder interface : 1 Serial absolute synchronous encoder interface : 1	UL/cUL				
Transistor output module	A1SY42	Transistor output 64 points, 12/24 VDC 0.1A					
Battery	A6BAT	Replacement battery for CPU					
	A30TU-E	For SV13, 5m cable, 5 VDC internal current consumption					
Teaching unit	A31TU-E	For SV13, with dead-man switch, 5m cable(lt is necessary to both A31TUCBL03M and A31SHORTCON), 5 VDC internal current consumption 0.22A					
-	A31TUCBL03M	Cable to connect CPU module to A31TU-E (for inside the control panel)					
	A31SHORTCON	Short-circuit connector for A31TUCBL (when A31TU-E is not connected)					
Manual pulse generator	MR-HDP01	5VDC 25PLS/rev, 100PLS/rev at magnification of 4					
Serial absolute synchronous encoder cable	MR-HENC	Resolution :16384PLS/rev, Permissible rotation speed : 4300r/min, absolute type	UL/cUL				
Serial absolute synchronous encoder cable	MR-HSCBL□M	For connection of MR-HENC and A172SENC 2m, 5m, 10m, 20m, 30m (Same as encoder cables for HC-SF/RF/UF (2000r/min)/HA-LH series motors.)					
SSC I/F board	A30BD-PCF	ISA bus loaded type 2CH/board					
SSC I/F card	A30CD-PCF	PCMCIAI TYPE II 1CH/card					
	A270BDCBL03M	For A30BD-PCF 3m					
Cable for SSC I/F board	A270BDCBL05M	For A30BD-PCF 5m					
Cable for GGO I/I board	A270BDCBL03M	For A30BD-PCF 10m					
		For A30CD-PCF 3m					
Coble for CCC I/C	A270CDCBL03M						
Cable for SSC I/F card	A270CDCBL05M	For A30CD-PCF 5m					
	A270CDCBL10M	For A30CD-PCF 10m					

(Note) : For A173UHCPU only

Pulse generator/synchronous encoder interface unit

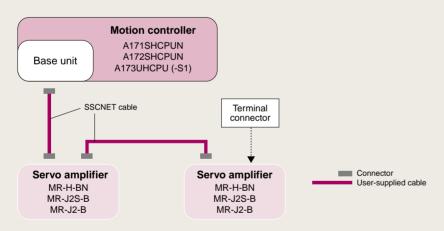
A172SENC

Loaded in motion slot. One point each is built in for the various inputs on the 8 axes, and for the tracking input, manual pulse generator and synchronous encoder.



	Item	Specification					
	Input point	Motion signal point: 32 points (8 points each for upper limit switch, lower limit switch, STOP signal, proximity dog) Tracking input: 1 point					
Motion control signal	Range of voltage used	10.2 to 26.4 VDC					
input,	ON voltage/current	Min. 7V/Min. 1.0mA					
tracking input	OFF voltage/current	Max. 1.8V/Max. 0.18mA					
	Response time	Motion control signal input OFF \rightarrow ON Max. 2ms, ON \rightarrow OFF Max. 3ms Tracking input OFF \rightarrow ON Max. 0.5ms, ON \rightarrow OFF Max. 0.5ms					
	Output point	1 point					
Dynamic brake	Range of load voltage used	21.6 to 30 VDC					
command output	Max. load current	0.1A					
	Response time	OFF \rightarrow ON max. 2ms, ON \rightarrow OFF max. 2ms					
	Usable unit	1					
Manual pulse generator/	Adaptive type	Voltage output type (5 VDC) / differential output type (26LS31 or equivalent) Possible to select by connector wiring					
synchronous encoder input	High level voltage	3.0 to 5.25 VDC					
mpat	Low level voltage	0 to 1 VDC					
	Input frequency	Max. 100k PLS/s (magnification of 4)					
Synchronous	Usable unit	1					
encoder input Adaptive type		Serial absolute synchronous encoder input (MR-HENC)					
5VDC internal consur	mption current	0.42A (Manual pulse generator/synchronous encode is contained)					

■ Cables and connectors -



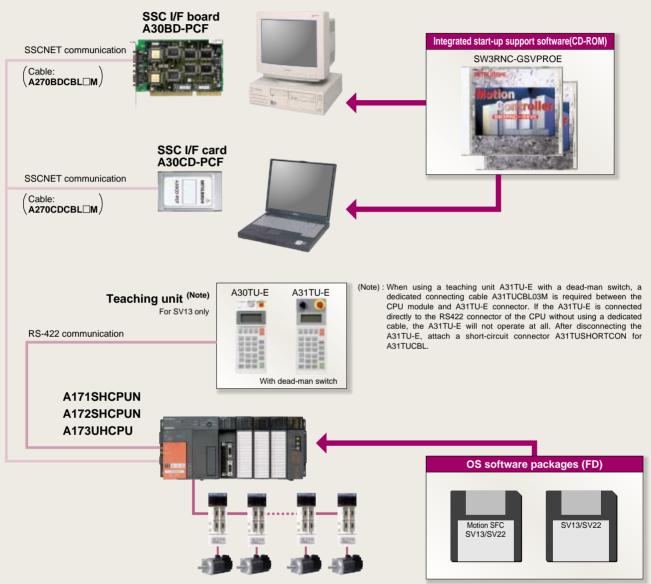
Item	Model name	Description
SSCNET cable	MR-HBUS□M	For connection of CPU module and MR-H-BN, and for connection MR-H-BN and MR-H-BN 0.5m, 1m, 5m
	MR-J2HBUS□M-A	For connection of CPU module and MR-J2S-B/MR-J2-B, and for connection MR-H-BN and MR-J2S-B/MR-J2-B 0.5m, 1m, 5m
	MR-J2HBUS□M	For connection of MR-J2S-B/MR-J2-B and MR-J2S-B/MR-J2-B 0.5m. 1m, 5m
Tin-al	MR-TM	Fitted to the last servo amplifier (MR-H-BN) by SSCNET.
Terminal connector	MR-A-TM	Fitted to the last servo amplifier (MR-J2S-B/MR-J2-B) by SSCNET.

- Please refer to the servo amplifier "MR-H series" catalogue for the power supply connectors of servo motor.
 Please refer to the servo amplifier "MR-H series", "MR-J2-Super series" and "MR-J2 series" catalogues for the encoder cables and the encoder connector set.

Peripheral Equipment

Full support from a wide-ranging lineup

The motion controller supports any of the personal computers on the market and an general use, so it can be used with familiar environment. The most appropriate programming environment for users is provided.



Motion SFC function possible to use on A172SH and A173UH. Cannot be used on A171SH.

■Operating environment

PC/AT compatible with which WindowsNT 4.0 / Windows 98 operates normally and the following use is filled.

OS		WindowsNT 4.0 / Windows 98				
CPU		More than pentium 133MHz				
Memory capacity		More than 32M bytes				
Hard disk capacity		SW3RNC-GSVE : more than 51MB + SW3RNC-GSVHELPE : more than 108MB (possible to select installation)				
Display	Resolution	More than 800 × 600 pixels				
Display	Colors	More than 256 colors				
Application software		Word 97, Excel 97 (for document printing) More than Visual C++4.0, more than Visual Basic 4.03 (32 bit) (When communication API function us				

(When using the A30CD-PCF, the PC card driver for Windows NT / Windows 98, provided by the personal computer manufacturer must be used.)

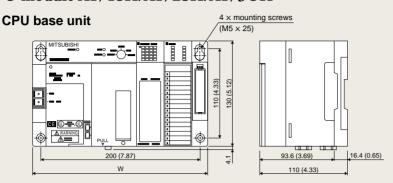
(Note): Windows, Word, Excel, Visual C++ and Visual Basic is a trade-mark of the Microsoft Corporation.

[:] Before exporting the personal computer as a single unit or assembled into a device, consult with the manufacturer and check that the OS (Windows, etc.) and network browser incorporated in the personal computer comply with the foreign exchange control laws.

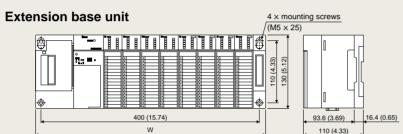
Exterior Dimensions

CPU module A171SH/A172SH/A173UH

unit : mm (inch)



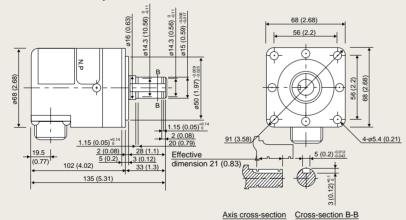
vviairi vv								
	CPU bas	e unit	Extension base unit					
A172B	A175B	A178B A178B-S1 A178B-S2* A178B-S3*	A175B	A1S68B A168B				
220 (8.66)	325 (12.8)	430 (16.9)	315 (12.4)	420 (16.5)				
* For A173l	JHCPU only							



Shows panel ceiling or wiring duct position More than 70mm More than 100mm

Serial absolute synchronous encoder MR-HENC

unit: mm (inch)

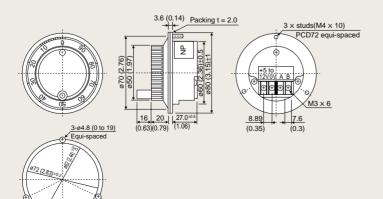


Item	Specifications			
Resolution	16384 PLS/rev			
Direction on increase	Counter clockwise (viewed from end of axis)			
Protective construction	IP52 (dust-proof, oil-proof)			
Permitted axis load	Radial : Max. 98N			
1 cmilited axis load	Thrust : Max. 49N			
Permissible rotation speed	4300 r/min			
Permissible angular acceleration	4000 rad/s			
Operating temperature	-5°c to 55°c			
Weight kg (16)	1.5 (3.3)			

Keyway dimension diagram

■ Manual pulse generator MR-HDP01

unit: mm (inch)



Item	Specifications					
Pulse resolution	25 PLS/rev (100PLS/rev at magnification of 4)					
Output voltage	Input voltage > 1V (Note)					
Consumption current	Max. 60mA					
Life	More than 1,000,000 revolutions at 200 r/min					
Permitted axis load	Radial : Max. 19.6N					
Permilieu axis ioau	Thrust: Max. 9.8N					
Operating temperature	-10°c to -60°c					
Weight kg (16)	0.4 (0.88)					

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

Combinations of Servo Amplifiers and Servo Motors

																1 May 1	E.				
				N	ID. 12	-R so	rvo ai	molifi	or.					M	R-H-E	SN so	rvo a	molifi	or		
				IV	IN-JZ	-D 56	I VU ai	прин	ן ד ד					IVI	K-11-1	DIN 26	I VU a	ПРШ	Ե Ι		
			MR -J2 10B	MR -J2 20B	MR -J2 40B	MR -J2 60B	MR -J2 70B	MR -J2 100B	MR -J2 200B	MR -J2 350B	MR -H 10BN	MR -H 20BN	MR -H 40BN	MR -H 60BN	MR -H 100BN	MR -H 200BN	MR -H 350BN	MR -H 500BN	MR -H 700BN	MR -H 11KBN	
	Small	HC-MF053	•									•									
cap	capacity	HC-MF13										•									
	HC-MF 3000r/min	HC-MF23		•																	
	series	HC-MF43			•									•	_						
		HC-MF73					•								•					\blacksquare	-
-	Small capacity	HC-KF053 HC-KF13	A								A									\blacksquare	$\overline{}$
3	HC-KF	HC-KF13 HC-KF23	A	_							_	_									
	3000r/min series	HC-KF23		_	A							A	_							\vdash	
		HA-FF053									•										
	Small	HA-FF13																			
6	capacity	HA-FF23		•								•									
7)		HA-FF33			•								•								
	series	HA-FF43			•								Ŏ								
		HA-FF63				•								•							
	Middle	HC-SF81						•							•						
	capacity	HC-SF121							•							•					
	1000r/min	HC-SF201																			
_		HC-SF301								•							•				
	Middlo	HC-SF52				•								•							
.8.		HC-SF102						•							•						
	capacity	HC-SF152							•							•					\leftarrow
-91	2000r/min series	HC-SF202							•							•					
		HC-SF352															•				$\overline{}$
		HC-SF502 HC-SF702																•			
-		HC-SF702				•								•						\vdash	
	Middle	HC-SF103																			
	capacity HC-SF	HC-SF153							•							•					
	3000r/min	HC-SF203																			
	series	HC-SF353															•				
		HC-RF103							•							•					
A.E.	Low inertia	HC-RF153							•							•					
	HC-RF 3000r/min	HC-RF203								•							•				
M	series	HC-RF353																•			
		HC-RF503																•			
	Flat	HC-UF13	•								•										
	HC-UF	HC-UF23		•									•								
	3000r/min series				•		_							•							
	3000	HC-UF73					•								•						
	Flat	HC-UF72					•								•						
	HC-UF 2000r/min	HC-UF152							•							•					
	aariaa	HC-UF202 HC-UF352								•							•				
.00	100	HC-UF352 HC-UF502																			
		HA-LH11K2																			
	-	HA-LH15K2																			
Low inertia	a Mr/min series	HA-LH22K2																			
0	Large	HA-LF30K24																			
0.00	capacity	HA-LF37K24																			
	HA-LF 2000r/min	LIA LEAGICOA																			
1		HA-LF55K24																			

						Motor
	Ι	I			Г	capacity
MR	MR	MR	MR	MR	MR	(kW)
-H 15KBN	-H 22KBN	-H 30KBN4	-H 37KBN4	-H 45KBN4	-H 55KBN4	
						0.05
						0.03
						0.2
						0.4
						0.75
						0.05
						0.1
						0.2
						0.4
						0.05
						0.1
						0.2
						0.3
						0.4
						0.6
						0.85
						1.2
						2.0
						3.0
						0.5
						1.0
						1.5
						2.0 3.5
						5.0
						7.0
						0.5
						1.0
						1.5
						2.0
						3.5
						1.0
						1.5
						2.0
						3.5
						5.0
						0.1
						0.2
						0.4
						0.75
						0.75
						1.5
						2.0
						3.5
						5.0
						11.0
						15.0
						22.0
		•				30.0 37.0
						45.0
					•	55.0
						55.0

-	 Special 	amplifier	required

							11	1,-					
							S St St						
							B.E.C.						
					MI	R-J25	S-B s	ervo a	amplit	fier			Motor capacity
			MR -J2S 10B	MR -J2S 20B	MR -J2S 40B	MR -J2S 60B	MR -J2S 70B	MR -J2S 100B	MR -J2S 200B	MR -J2S 350B	MR -J2S 500B	MR -J2S 700B	(kW)
		HC-MFS053	•										0.05
D-61	Small capacity	HC-MFS13											0.1
-5.	HC-MFS	HC-MFS23		•									0.2
10	3000r/min series	HC-MFS43			•								0.4
	Selles	HC-MFS73					•						0.75
		HC-KFS053	•										0.05
1000	Small capacity	HC-KFS13											0.1
-3 100	HC-KFS	HC-KFS23		•									0.2
	3000r/min series	HC-KFS43											0.4
	361163	HC-KFS73											0.75
	Middle	HC-SFS81						•					0.85
	capacity HC-SFS	HC-SFS121							•				1.2
	1000r/min	HC-SFS201							•				2.0
_	series	HC-SFS301								•			3.0
	Middle capacity	HC-SFS52				•							0.5
.8.		HC-SFS102						•					1.0
		HC-SFS152							•				1.5
-91	HC-SFS 2000r/min	HC-SFS202							•				2.0
	2000r/min series	HC-SFS352								•			3.5
		HC-SFS502											5.0
_		HC-SFS702										•	7.0
	Middle	HC-SFS53				•							0.5
	capacity	HC-SFS103						•					1.0
	HC-SFS 3000r/min	HC-SFS153							•				1.5
	series	HC-SFS203							•				2.0
		HC-SFS353								•			3.5
.8.0	Low inertia	HC-RFS103											1.0
	HC-RFS	HC-RFS153											1.5
-9.	3000r/min	HC-RFS203											2.0
(4)	series	HC-RFS353 HC-RFS503											3.5 5.0
		HC-UFS13											0.1
	Flat	HC-UFS13											0.1
	HC-UFS 3000r/min	HC-UFS23											0.2
	series	HC-UFS73											0.4
3		HC-UFS73											0.75
	Flat	HC-UFS152											1.5
	HC-UFS	HC-UFS202											2.0
	2000r/min series	HC-UFS352											3.5
	301103	HC-UFS502											5.0
		110 01 0002											0.0

▲ Safety Warning

To ensure proper use of the products listed in this catalog, please be sure to read the instruction manual prior to use.

