

System Q Motion Controller

MITSUBISHI ELECTRIC EUROPE B.V.



SV13 (Real Mode) and SV22 (Virtual Mode)

System Q

SW3RN-GSV13P Motion SV13

Software: conveyor assembly

With this software constant-speed control, speed control, 1 to 4-axes linear interpolation and 2-axes circular interpolation, etc are possible. Ideal for use in standard conveyors and assembly machines.

Application examples:

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

Special features:

- Linear interpolation (1 to 4-axes)
- Circular interpolation (1 to 2-axes)
- Constant-speed control
- Fixed-pitch feed
- Speed change control
- Speed control
- Speed-positionswitching
- Teaching function

SW3RN-GSV22P Motion SV22

Software: virtual mechanical system environment

This software package provides simultaneous control of multiple servo motors and offers software cam control. Ideal for use in automatic machinery. The software provides the option to replace formerly used mechanical vertical shafts, clutches, and gearings by electronic systems. Moreover, virtual and real master axes can be realized.

Application examples:

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

Special features:

- Synchronous control
- Electronic shaft
- Electronic clutch
- Electronic cam
- Draw Control





X-Y Table control

- Up to 4 axes linear interpolation
- 2 axes circular interpolation
- Uniform velocity locus control (CP control)





Sealing

- Uniform velocity control
- Linear and circular interpolation
- High-speed, high precision locus calculation





Feed Control

- Speed change control
- There is no limit to the number of speed change points





Incremental Hole Drilling

- Speed / position control
- Switching with external input





Rotary Table Indexing

- Single degree setting
- Short indexing
- Rotation direction indexing





Roll feeder

- Incremental feed
- High-speed, high-frequency positioning
- High-speed response





Servo instruction of SV13 (Real Mode)

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1 Axis	ABS-1	Absolute axis-1 positioning
	INC-1	Incremental axis-1 positioning
2 Axis	ABS-2	Absolute axis-2 positioning
	INC-2	Incremental axis-2 positioning
3 Axis	ABS-3	Absolute axis-3 positioning
	INC-3	Incremental axis-3 positioning
4 Axis	ABS-4	Absolute axis-4 positioning
	INC-4	Incremental axis-4 positioning
2 Axis	ABS	Absolute auxiliary point specification,
		circular interpolation
		Incremental auxiliary point specification, circular interpolation



System Q

Servo instruction of SV13 (Real Mode)

2 Axis	ABS (~	Absolute circular interpolation less then CW 180°
		Incremental circular interpolation less then CW 180°
2 Axis	ABS 🥎	Absolute circular interpolation CW 180° or more
		Incremental circular interpolation CW 180° or more
2 Axis	ABS 🕞	Absolute circular interpolation less then CCW 180°
	INC 🦕	Incremental circular interpolation less then CCW 180°
2 Axis		Absolute circular interpolation CCW 180° or more
		Incremental circular interpolation CCW 180° or more



Servo instruction of SV13 (Real Mode)

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2 Axis	ABS 🕂	Absolute center point circular interpolation CW
		Incremental center point circular interpolation CW
2 Axis		Absolute center point circular interpolation CCW
	INC 🕑	Incremental center point circular interpolation CCW
1 Axis	FEED-1	Axis 1 incremental feed start
2 Axis	FEED-2	Axis 2 linear incremental interpolation feed start
3 Axis	FEED-3	Axis 3 linear incremental interpolation feed start
	VF,VVF	Speed control forward start
	VR,VVR	Speed control reverse start
	VPF	Speed and position control forward start
	VPR	Speed and position control reverse start





Servo instruction of SV13 (Real Mode)

VPSTART	Speed and position control restart
VSTART	Speed switching control start
VEND	Speed switching control end
VABS	Speed switching control absolute
VINC	Speed switching control incremental
CPSTART	Constant velocity control start
CPEND	Constant velocity control end
ZERO	Start return to Zero point
START	Simultaneous start



Filling Machine







Example Application (SV22)

System Q

Draw control application







Example Application (SV22)

Press Conveyance





Mechanical Language of SV22

Mechanism module	Symbol	Function
Virtual servo motor	y and the second se	Virtual axis of the mechanism structure program starts with JOG or servo program
Synchronous encoder		Virtual axis starts by input from an extrnal synchronous encoder
Gears		Transfer the rotation of the propulsion module to the output modules with gear ratio
Direct clutch	1 - 1	Connect and disconnect the rotation to the output module with direct transfer
Smoothing clutch	- } (- -	Connect and disconnect the rotation to the output module with accerleration and decleration



Mechanical Language of SV22

Speed variation device		Change the speed of the output modules
Differential gears	پ	Rotation from the virtual main shaft and the auxilary input axis is reduced and transfered to the output axis
Differential gears	ų.	Rotation from the virtual main shaft and the auxilary input axis is reduced and transfered to the output axis
Roller		Final output module for speed control
Ball screw		Final output module for linear positioning
Rotating table	\rightarrow	Final output module for angle control
Cam		Final output module for cam control



- 1. Installation of the programming software (GSV22P for SV22 or GSV13P for SV13)
- 2. Installation of the operating system of the Motion Controller (SV22 for Virtual Mode or SV13 for Real Mode)
- 3. System settings

(Designate the settings for base unit, axis No., motor and amplifier)

4. Positioning data settings

(Designate the parameter of the servo motors and servo amplifiers)

5. Servo program creation

(Program for each motor's positioning control format and data)

6. Sequence program creation



Motion Controller Software

1. Installing Software SW6RNC-GSV22P on a <u>WINDOWS 98, WINDOWS 2000</u> or <u>NT4</u> PC

SW6RN-SNETP

SSCNet Communication driver

SW6RN-GSV13P or SW3RN-GSV22P

Programming tool

SW6RN-DOSCP

Digital oscilloscope

• SW6RN-GSVHELPE

Helpfiles

•SW3RN-CAMP

Software tool for creation of CAM curves



The Motion Controller operation system (OS) resides in the Flash Memory, which can be written by a PC. No OS is installed in the Motion Controller at the time of purchase.







Installation of Motion OS

Install one of these OS to the motion CPU

Application	Q172 CPU	Q173 CPU
SV13 (Motion SFC)	SW6RN-SV13QB	SW6RN-SV13QD
SV22 (Motion SFC)	SW6RN-SV22QC	SW6RN-SV22QA

1. Installation of Motion OS



Install Motion Controller OS

Install the motion controller OS (installation FD) into the motion CPU.

In either of the following cases, execute installation. 1) It is the first time that you use this motion CPU. 2) Update to the new version of the motion main OS.



Verify Motion Controller OS

Verify the motion controller OS (installation FD) with the motion controller OS installed in the motion CPU.

Installation $End(\ge)$

Dip switches



Turn ON switch 5 in front of the Motion CPU when installing the OS



🔚 System Setting - GSV22P × File(E) Edit(E) View(V) Option(D) Communication(C) Help(H) Update(R) Se 🛃 🗠 😓 🛋 왕 🖪 🗣 🔲 🐓 🗍 7 🔤 Cal Amp. Setting × **.**, 6 0.61E . Amp. Type Motor Setting **Resistance Setting** Detail Setting astan ([Usable Amplifier List] Amp.Model *MI-H-B Series MR-J2S-B • 10B,20B,40B,60B,100B,200B,350B 500B,700B,11KB,15KB,22KB Amp. Capa. MITSUBISH ••• 10B *MR-J2-B Series 108,208,408,608,708,1008,2008,3508 *MR-J2Jr-B Series 03B ····· *MR-H-B(N) Series 108,208,408,608,1008,2008,3508, 5008,7008,11KB,15KB,2KB *MR-H-BN4 Series 30KB,37KB,45KB,55KB -0K Cancel HH HH İ ::*· :**: ::; 1 3 3 J2S -10B J2S -10B J2S -10B AUTO AUTO AUTO 2 ABS ABS ABS 3 1 d6 d7 d3 d4 d5 d8 d2 GSV22P Project : D:\Melsec\...\g CPU: Q173

System Q

System Settings

Multi CPU System Setting

The multiple PLC settings have to be made for each CPU.



Multi CPU System Setting



Servo Data Setting

et :	🛋 Servo Data Setting - GSV22P					
File(File(E) Data Setting(D) Communication(C) Help(H) Update(R)					
$\left[\right]$	Fixed Param.	, HPR Data, JOG Ope.Dat	a	Servo Para	am.	
		Double-clickir	ng the set val, shifts to the se	tting screen.		
			1Axis	2Axis	3Axis	
		Unit Setting	mm	mm	mm	
		Pulse Count/Revo.	131072[PULSE]	131072[PULSE]	131072[PULSE]	
		Travel/Revo.	10.0[µm]	10.0[μm]	10.0[µm]	
		Unit Magnification	<u>`</u>	-	·	
	Fixed Param.	Backlash Comp.	^{rν} 0.0[μm]	0.0[µm]	0.0[µm]	
		Upper Stroke Limit	214748364.7[μm]	214748364.7[µm]	214748364.7[µm]	
		Lower Stroke Limit	-214748364.8[μm]	-214748364.8[μm]	-214748364.8[μm]	
		CMD In-position	1.0[µm]	1.0[µm]	1.0[μm]	
		Limit Switch Output		-	·	
		Direction	Reverse	Reverse	Reverse	
		Method	DATA SET1	DATA SET1	DATA SET1	
		Address	0.0[µm]	0.0[µm]	0.0[µm]	
	HPR Data	Speed		-	· ·	
		Creep Speed	-	-	· ·	
		Travel After Dog	-	-	·	
		P.B.Designation			· .	
	100 0-+ D-t-	JOG Speed Limit Val.	30.00[mm/min]	30.00[mm/min]	30.00[mm/min]	
	JUG Upe.Data	P.B.Designation	1	1	1	
	GSV22P CPU : Q173 Project : D:\Melsec\\q //					

Servo Parameter

E	Servo Data Setting - GSV22P					
F	File(F) Data Setting(D) Communication(L) Help(H) Update(R)					
ſ	Fix	ed Param., HPR Data, JOG Ope.Data	3	Servo Pa	ram.	
		Double-clip	cking the set val. shifts to the s	etting screen.		
			1Axis	2Axis	3Axis 🔺	
Ш		Amplifier Setting	MRJ2S-10B*ABS	MR-J2S-10B*ABS	MR-J2S-10B*ABS 🚽	
Ш		Resistance	No Use	No Use	No Use	
Ш		Dynamic Brake	Absent	Absent	Absent	
Ш		Motor Type	Auto	Auto	Auto	
Ш		Motor Capacity[kw]	-	-	-	
Ш	Pagio Param	Motor Speed[r/min]	-	-	-	
Ш	Dasic Farani.	Feedback Pulse[PULSE]	· .	-	-	
Ш		Rotation Direction	Fwd.(ccw) 场	Fwd.(ccw)	Fwd.(ccw)	
Ш		Auto Tuning				
Ш		Auto Tuning Selection	-	-	-	
Ш		Gain Adjustment	Auto Tuning Mode 1	Auto Tuning Mode 1	Auto Tuning Mode 1	
Ш		SV Response Setting	6	6	6	
Ш		Load Inertia Ratio[to motor]	7.0	7.0	7.0	
Ш		Position Ctrl.Gain 1[rad/sec]	35	35	35	
Ш		Speed Ctrl.Gain 1[rad/sec]	177	177	177	
Ш	Adjust.Param.	Position Ctrl.Gain 2[rad/sec]	35	35	35	
		Speed Ctrl.Gain 2[rad/sec]	817	817	817	
		Speed Integral Comp.[msec]	20	20	20	
Ш		Notch Filter[Hz]			. 🔳	
٦L						
	GSV22P CPU : Q173 Project : D:\Melsec\\q //					

Parameter Block

1	ervo Data Setting -	GSV22P			
File(E) Data Setting(<u>D)</u> Comm	unication(<u>C)</u> Help(<u>H)</u> Upd	late(<u>R)</u>		
	8 1 2 4	<u>k</u>		S 🗄 👪 🖬	9 4 9 9 <u>1 7</u> 2
P	arameter List	Double-clickir	ng the set val. shifts to the se	tting screen.	
		Block1	Block2	Block3	Block4
	Interpolation Ctrl. Unit	mm	PULSE	PULSE	PULSE
	Sp.Restriction	50.00[mm/min]	500000[PLS/sec]	200000[PLS/sec]	200000[PLS/sec]
	Acceleration Time	10[msec]	1000[msec]	1000[msec]	1000[msec]
	Deceleration Time	10[msec]	1000[msec]	1000[msec]	1000[msec]
	Rapid Stop Dec. Time	1000[msec]	1000[msec]	1000[msec]	1000[msec]
	S Curve Ratio	0[%]	0[%]	0[%]	0[%]
	Torque Limit Value	300[%]	300[%]	300[%]	300[%]
	STOP-time Dec.Process	Dec. Stop	Dec. Stop	Dec. Stop	Dec. Stop
	Circul.Inter.ERR Range	10.0[μm]	100[PULSE]	100[PULSE]	100[PULSE]
			GSV22P CPU: Q173	Project : D:\Melsec	s\\q

SFC with Multi-task processing

• With the SFC program, 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 easliy

• A higjly independent programming is possible according to the process details, so an easy-to-comprehend program can be created



SFC-Program Manager



SFC-Programing

Project	
[Path] C:_DATA_motion\SV	22\
	P
SFC Program	
NO. Program Name 🔺	
0 SUB	C Show Existing Only
2	08
3	G Show All Program
4	Cancal
5	
5	C Order by Number
	of order by Mamber
9	C
10	O order by Name
11	
12	
13	h New
15	Create a new SFC program.
16	
17	
18	Rename
19	Rename the existing SFC
20	program.
22	
23	Delete
24	Delete the existing SFC
25	program.
26	

To create a new SFC program just klick New and enter a free SFC program No. and a description name. You will then find a new entry in the SFC program list. To edit the program you can dubble klick on the program name.

🛃 New		×
Create a new SFC	program.	
SFC Program No. 1 🚔 (0 to 255)	Specify the "SFC program number" when starting the SFC program from the sequence program.	
SFC Program Name Demo	Specify the "SFC program name" used in the SFC subroutine call/start or clear step.	
(Max. To characters)	OK Cancel	

SFC-Program-Editor



SFC-Program Manager

(2) Toolbar

13) 14) 28) 29) 9) 10) 11) 12) 20) 22) 23) 24) 25) 26) 27) 30) 8) 21) 5) b) Ba ┣ ¥ 邊 Y К F FS Ρ αR G P P End 室 G ON G G OFF 19) 15) 16) 17) -18) 1) Save 12) Align 20) Project Management 2) Print 13) Start Monitor System Setting 3) SFC Program Manager 14) Stop All Monitor 22) Servo Data Setting 4) SFC Diagram Write 15) Editor Mode 23) Mechanical System Editor 5) Batch Conversion 16) Monitor Mode 24) Communication 6) Undo 17) Display Mode 25) Monitor 7) Cut 18) Zoom Setting 26) Test 8) Copy 19) The tool buttons displayed 27) Remote Diagnosis change between the Editor 9) Delete 28) CAM Data Setting Mode and Monitor Mode. 10) Insert Line 29) Digital Oscillo Scope (a) In Editor Mode 11) Insert Column 30) LADDER EDITOR (b) In Monitor Mode

SFC-Program Manager

17)

16)

Y

(a) Edit mode

2)

F

1) Motion Control Step

3)

FS

4)

Ρ

5)

<u>ar</u>

6)

G

2) 1-time Execution Type Operation Control 8) WAITON Transition
 Step
 9) WAITOFF Transition

8)

ΟN

()

G

9)

OFF

10) 11)

G

G

- 3) Scan Execution Type Operation Control Step
- 4) Subroutine Call/Start Step
- 5) Clear Step
- 6) Shift Transition

7) WAIT Transition 1 ol 8) WAITON Transition 1 9) WAITOFF Transition 1 ¹ 10) Shift Y/N Transition ⁵ 11) WAIT Y/N Transition ¹ 12) Jump ¹

12) 13) 14) 15)

HP.

4P)

13) Pointer

18)

- 14) Program End
- 15) Coupling-branching Sequence
- 16) Connection
- 17) Selection

18) Find

SFC-Program Manager

(b) Monitor mode

- 1) Execution Step Monitor
- 2) Specified Step Monitor
- 3) Registered Device Monitor
- 4) Programs Batch Monitor
- 5) Device Dump

- 6) Device Test
- 7) Automatic Scroll
- 8) MANUAL
- 9) Debug Mode Request

10) Debug Mode Cancel Request

- 11) Execution/Continuation
- 12) Execute One Step
- 13) Forced Transition
- 14) Break
- 15) Forced End

SFC Start / End

START	Program name (0)	Program name	 Indicates a program entry with a program name. Specify this program name for a subroutine call. Only one program name may be used with one program.
END	END (8)	END	 Indicates a program end (exit). When a subroutine called is made, execution returns to the call source program. Multiple or no symbols may be set within one program.
SFC Step

Name	Symbol	Function
Motion control step	Kn	Starts a servo program Kn. Specifying range: K0 to K4095

Name	Symbol	Function
Operation control step	Fn/FSn	Runs an operation control program Fn/FSn. Specifying range: F0 to F4095/FS0 to FS4095





🙀 Program Editor - GSV22P - [1	Demo]
D File(E) Edit(E) View(V) Opt.(D) Com.(C) Conv.(X) Monitor(M) Debug(D) Mode(G) Window(W) Help(H) Update(R)の
	Rei VI ver Bei Bei VI ver Bei
	Command Mode Allocation Sort Set Program Number Previous Number Next Number
Demo	Add Delete
K1 END	This is the area for the Servo Program Editor
	Program Steps: 0 Used Steps: 123 Total Steps: 13312
	Details Cancel
Ready	Edit GSV22P CPU : A172SH Project : D:\D_Proje\Koffer_Sys.

Servo Program Editor [K1 : Real] Command Mode Allocation Set Program Number Previous Number Next Number Next Number	Add Delete	To enter there are available. applicati	a servo program special commands Depending of your on you select the nmand class
Program Steps: 0 Details	Used Steps: Total Steps: Store	mand Class Positioning © Oscillation Circle © Zero Feed © Start Speed © Change Speed POS. Speed Chg. CP POS.Follow Helical	Servo Command ABS-1 ABS-2 ABS-3 ABS-4 INC-1 INC-2 INC-3 INC-4





SFC-Programing download



SFC-Programming-Operation-Control

🙀 Program Editor - GSV22P - [1:Demo]		
() File(E) Edit(E) View(V) Opt.(0) Com.	$\underline{C} Conv. \underline{\boxtimes} Monitor(\underline{M}) Debug(\underline{D}) Mode(\underline{G}) \underline{\forall} indow(\underline{\forall}) Help(\underline{H}) Update(\underline{R})$	_ B ×
		. 🔢 💦 🔳 🔳
KFSPE		
Demo	Demo 1 CALL K1 2 END	4
F F	FS, G, K Program Number Setting	
K1 END	Program Number OK F 1 Connent Cancel Your info at this point Maximum 80 characters, including <cr>.</cr>	
Ready	This comment will be included in the SFC diagram control code by conversion. Since the maximum code size is 64KB per program, pay attention to the comment size. It displays 4 lines of 20 characters in comment display mode.	Proje\Koffer_Sys.

SFC-Programming

System Q

Operation Control Program/Transiti Command 1 D964L=50 2 3	on Program Editor [F1] Instruction Wizard 1/1 After selecting the item, pres	Convert	the argument.	
Word device discription	Class Binomial Operation Bit Operation Function Logical Operation Comparative Operation Bit Device Status Type Conversion Bit Device Control Motion Special Function Sign Others	Description + - * / %	Format [D] = (S) Description Example #0=D0 #0=K100 #0=FT #0=D0+D2 #0L=D0 #0L=D0L #0L=D0L #0L=H12345678 #0L=FT #01=D01+D21	
16-' inte	= Assign the right term to the le	ft term. Ca	ancel Next >	Complete

SFC Operation control step



Comment

		Device Descriptions			Device Number (n) Specifying Ranges	
	16-bit integer type	32-bit integer type (n is even number)	64-bit floating-point type (n is even number)	A172SHCPUN	A173UHCPU(-S1) /A273UHCPU-S3	
Data register	Dn	DnL	DnF	0 to 1023	0 to 8191	
Link register	Wn	WnL	Wn:F	0 to 3FF	0 to 1FFF	
Timer current value	Tn	_	_	0 to 255	0 to 2047	
Counter current value	Cn	_	_	0 to 255	0 to1023	
Special register	Dn	DnL	DnF	9000 t	o 9255	
Motion device	#n	#nL	#nF	0 to	8191	
Coasting timer		FT	_	-	_	

Bit device descriptions

		Device Number (n) Specifying Ranges		
	Device Description	A172SHCPUN	A173UHCPU(-S1) /A273UHCPU-S3	
Input relay	Xn/PXn	0 to 7FF	0 to 1FFF	
Output relay	Yn/PYn	0 to 7FF	0 to 1FFF	
Internal relay	Mn	0 to 2047	0 to 8191	
Latch relay	Ln	0 to 2047	0 to 8191	
Link relay	Bn	0 to 3FF	0 to 1FFF	
Annunciator	Fn	0 to 255	0 to 2047	
Timer contact	TTn	0 to 255	0 to 2047	
Timer coil	TCn	0 to 255	0 to 2047	
Counter contact	CTn	0 to 255	0 to 1023	
Counter coil	CCn	0 to 255	0 to 1023	
Special relay	Mn	9000 t	o 9255	



Name	Symbol	Function
Subroutine call/start step	Program name	Calls/starts the SFC program of the specified program name.

Name	Symbol	Function
Clear step	CLR Program name	Stops the running SFC program of the specified program name.





Shift (Pre-read transition)	Gn (8)	SFT Gn	 When this transition is preceded by a motion control step, execution does not wait for completion of the motion operation, and shifts to the next step when the transition condition Gn (G0 to G4095) enables. When this transition is preceded by an operation control step, execution shifts to the next step when the transition condition enables after operation has been performed. When this transition is preceded by a subroutine call/start step, execution does not wait for completion of the subroutine operation, and shifts to the next step when the transition condition enables.
WAIT	Gn (8)	WAIT Gn	 When this transition is preceded by a motion control step, execution waits for completion of the motion operation and shifts to the next step when the transition condition Gn (G0 to G4095) enables. When this transition is preceded by an operation control step, execution shifts to the next step when the transition condition enables after operation has been performed (same operation is performed as in Shift). When this transition is preceded by a subroutine call/start step, execution waits for completion of the subroutine operation and shifts to the next step when the transition condition enables.

SFC-Programming



The shift transition G0 becomes true after M2000 AND M9076 AND M9074 are all true, the system does not check if the motion is moving or not.





한 Program Editor - GSV22P - [0:Zero]		- 8 ×
[]] File[E] Edit(E) View[V] Opt.(0) Com.(C) Conv.(X) Monitor(M) Debug(D) Mode(G) Window(W)	Help(H) Update(R)	- <u>리 ×</u>
KFBPE GGESG 9000 KK		
FU Image: Second seco	9 SFT G3 10 CALL K0 11 JMP PAE1 12 PAT2 13 CALL F11 14 SFT G12 15 CALL F12 16 SFT G13 17 CALL K10 18 JMP PAE1 19 PAT3 20 CALL F21 21 SFT G22 22 CALL F22 23 SFT G23 24 CALL K30 25 JMP PAE1 26 PAE1 27 WAIT G4 28 GSUB SFC_Prg	*
K0 K10 K30	29 END [G 4] 1 M1610*M1630*M1650	•
PAE1 G4 SFC_Prg END Ready	G4 checks if all 3 axis have completed the home position return, and waits till the movements has completed before calling the subroutine SFC_Prg	Pa

WAITON	ON bit device Kn (14)	WAITON bit device	 Prepares for starting the next motion control step, and when the specified bit device turns ON, issues a command immediately. Always pair this transition with a motion control step one-for-one.
WAITOFF	OFF bit device Kn (14)	WAITOFF bit device	 Prepares for starting the next motion control step, and when the specified bit device turns OFF, issues a command immediately. Always pair this transition with a motion control step one-for-one.

Shift Y/N	(When condition does not enable) Gn (When Y condition enables)	IFBm IFT1 SFT Gn : JMP IFEm IFT2 SFT Gn+? : JMP IFEm IFEm	 When this transition is preceded by a motion control step, execution does not wait for completion of the motion operation, and shifts to the lower step when the transition condition Gn (G0 to G4095) enables, or shifts to the right-connected step when the condition does not enable. When this transition is preceded by an operation control step, execution shifts to the low step when the transition condition enables after operation has been performed, or shifts to the right-connected step when the condition does not enable. When this transition is preceded by a subroutine call/start step, execution does not wait for completion of the subroutine operation, and shifts to the lower step when the transition condition enables, or shifts to the right-connected step when the transition does not wait for completion of the subroutine operation, and shifts to the lower step when the transition condition enables, or shifts to the right-connected step when the transition does not wait for completion of the subroutine operation, and shifts to the lower step when the transition condition enables, or shifts to the right-connected step when the condition does not enable.
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WAIT Y/N	(When condition does not enable) Gn (When Y condition enables)	IFBm IFT1 WAIT Gn : JMP IFEm IFT2 SFT Gn+? : JMP IFEm IFEm	 When this transition is preceded by a motion control step, execution waits for completion of the motion operation, and shifts to the lower step when the transition condition Gn (G0 to G4095) enables, or shifts to the right-connected step when the condition does not enable. When this transition is preceded by an operation control step, execution shifts to the low step when the transition condition enables after operation has been performed, or shifts to the right-connected step when the condition does not enable (same operation as in Shift). When this transition is preceded by a subroutine call/start step, execution waits for completion of the subroutine operation, and shifts to the lower step when the transition condition enables, or shifts to the right-connected step when the transition condition enables, or shifts to the right-connected step when the transition condition enables, or shifts to the right-connected step when the transition condition enables, or shifts to the right-connected step when the transition condition enables, or shifts to the right-connected step when the transition condition enables, or shifts to the right-connected step when the condition does not enable.
----------	--	---	---



SFC Jump

Jump	→ Pn (14)	JMP Pn	 Jumps to the specified pointer Pn (P0 to P16383) within its own program.
Pointer	← Pn (8)		 Indicates a jump destination pointer (label). This pointer can be set at a step, transition, branch point or coupling point. P0 to P16383 can be set in a single program. The same numbers may also be used in other programs.













1. Automatic start:

An automatic start is made by turning PLC Ready M2000 ON.

2. Start from SFC program:

A start is made by executing a subroutine call/start step in the SFC program.

3. Start from PLC program:

The SFC program can be started by executing the SFCS instruction in PLC program.



S.SFCS (*n*1) (*n*2) (*d*1) (*d*2) SP.SFCS (*n*1) (*n*2) (*d*1) (*d*2)

- (*n1*): Motion CPU number [16 Bit INT] CPU 2 = 3E1, CPU 3 = 3E2, CPU 4 = 3E3
- (n2): Motion SFC program number [16 Bit INT]
- (d1): Status block [2 Bit BOOL]
 (d1+0) : Start of SFC program without error
 (d1+1) : Start of SFC program with error
- (d2): Status word [16 Bit INT]

Requests start up of other CPU interruption programs



S.GINT (*n1*) (*n2*) SP.GINT (*n1*) (*n2*)

- (*n1*): Motion CPU number [16 Bit INT] CPU 2 = 3E1, CPU 3 = 3E2, CPU 4 = 3E3
- (n2): Interrupt number [16 Bit INT]



S.DDWR (*n1*) (*s1*) (*s2*) (*d1*) (*d2*) SP.DDWR (*n1*) (*s1*) (*s2*) (*d1*) (*d2*)

- (*n1*): Motion CPU number [16 Bit INT] CPU 2 = 3E1, CPU 3 = 3E2, CPU 4 = 3E3
- (s1): Control area [2*16 Bit INT] (s1+0) : Status =0 without error, >0 error code

(s1+1): Number of devices

- (s2): First device of Q-CPU [n * 16 Bit INT]
- (d1): First device of Q-Motion CPU [n * 16 Bit INT]
- (d2): Status block [2 Bit BOOL] (d2+0) : Write complete

(d2+1) : Write with error



S.DDRD (*n1*) (*s1*) (*s2*) (*d1*) (*d2*) SP.DDRD (*n1*) (*s1*) (*s2*) (*d1*) (*d2*)

- (*n1*): Motion CPU number [16 Bit INT] CPU 2 = 3E1, CPU 3 = 3E2, CPU 4 = 3E3
- (s1): Control area [2*16 Bit INT] (s1+0) : Status =0 without error, >0 error code

(s1+1): Number of devices

- (s2): First device of Q-CPU [n * 16 Bit INT]
- (d1): First device of Q-Motion CPU [n * 16 Bit INT]
- (d2): Status block [2 Bit BOOL] (d2+0) : Read complete

(d2+1) : Read with error
Virtual Mode (SV22)



Automatic Machinery SV22 (Virtual Mode)



The servo motor can be operated simultaneously with other motor control conditions. Using the mechanism support language, synchronous control settings like gears, clutches and cams can be released.

Virtual Axis 1

Virtual Servo Motor Paramo	eters	×
Virtual Axis No.		ERR-time Ope.Mode
Upper Stroke 21474	83647 pulse	C Clutch OFF
Lower Stroke	483648 pulse	- Setting Range
CMD In-position 100	pulse	1 to 8
JOG Opetime Param. P.B. NO. JOG Sp.Restriction 100	0000 pulse/sed	OK Cancel

Clutch Parameter 1 & 2 & 3

System Q



Roller

Roller Parameters			X
Out. Ax. No. 1	Cmnt.		
Roller Diameter	1000	μm	Output Unit
Pls.Count/Revo.	8192	pulse	- Tora last
Travel Per Pulse	0.3	μm	 300% (default)
Permissible Droop Pls.	65535	pulse	C Indirect Dsgnt. by Dev.
	= 25132.4	μm	
Sp.Restriction	3000	mm/min	Setting Range
			1 to 8
			OK Cancel

CAM curve



- Resolution per cycle 256, 512, 1024, 2048
- Max. number of CAM curves 256
- Change of CAM curve online during run
- CAM curves could be generated by software package on the PC and then downloaded
- 8 Limit switch outputs per axes

CAM curve



Feed CAM curve



Software for creation of CAM curves



Cam Curve 1 & 2

Cam Parameters	Cam Parameters X
Out. Ax. No. 2 Cmnt. Cam No. Setting Device D500 output Unit Pls. Count/Revo. 10000 pulse Permissible Droop Pls. 65535 pulse Stroke Setting Device D502 Limit Switch Output 0000 © Unused © Used	Out. Ax. No. 3 Cmnt. Cam No. Setting Device D510 Pls. Count/Revo. 10000 Permissible Droop Pls. 65535 Stroke Setting Device D512 Limit Switch Output © Unused © Used Used
Lower Stroke Limit Device Setting Range Virt. Ax. 1 Rev.Pre.Val. Storage Dev. 1 to 8 Main Shaft D504 Aux. Input Axis OK	Lower Stroke Limit Device Setting Range Virt. Ax. 1 Rev.Pre.Val. Storage Dev. 1 to 8 Main Shaft D514 Aux. Input Axis OK