MITSUBISHI ELECTRIC

Changes for the Better

Mitsubishi Electric Programmable Controller

January 2011

New Product Release

SV1101-3E

MELSEC *L series*

Simple Motion Module

LD77MH4

New LD77MH16

Advanced motion control similar to a positioning module

Simple Motion Module, now part of MELSEC-L Series

4-axis type

New 16-axis type

Simple Motion

Making Motion Simple

Advanced and wide-range motion control

- Positioning control
- Speed control
- Torque control
- Cam control
- Synchronous control
- Mark detection function

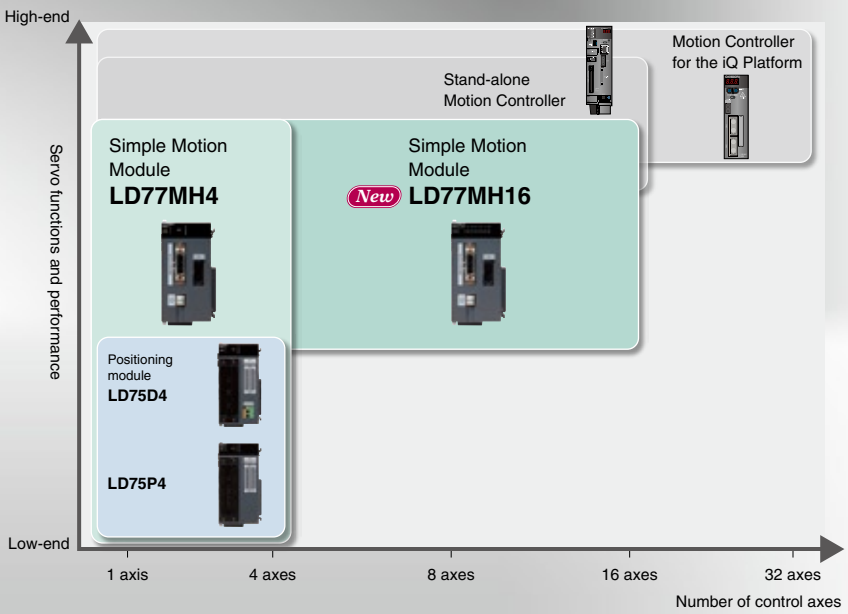
Graphical setting software

Simple and smart system installation

for a greener tomorrow eco Changes

Advanced Motion Control

The MELSEC-L Series lineup now includes the Simple Motion Module in addition to the regular positioning modules. Various control functions previously only possible with Motion Controllers, such as synchronous control, are now available in the same manner as a positioning module.



Features

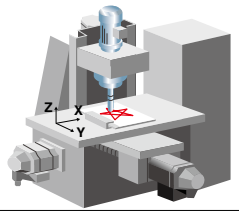
Making Motion Simple in various applications

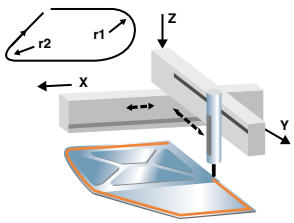
A variety of controls including positioning control, speed control, torque control, cam control and synchronous control can be realized easily just with simple parameter settings and a sequence program.

Positioning control

- Various applications are supported with extensive control formats including linear interpolation control (up to 4 axes), 2-axis circular interpolation control, fixed feed control and continuous orbit control.
- Execute automatic operation by setting the positioning addresses and speeds, etc., easily from a sequence program.
- Powerful auxiliary functions such as M codes, skip function, step operation and target position change function.

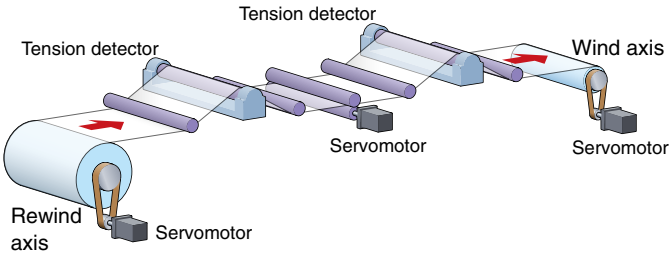
XY table	Ceiling
• 2-axis linear interpolation • 2-axis circular interpolation • 3-axis linear interpolation • Continuous orbit control	• Continuous orbit control • High-speed, high-accuracy orbit calculation • Linear/circular interpolation





Speed and torque control are also available

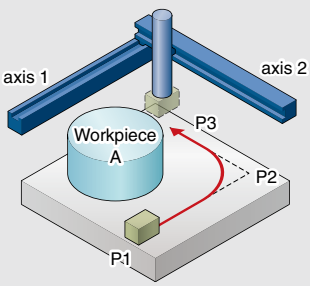
- Tension control applications such as rewinding and winding axes are supported.
- Control can be switched between “positioning control”, “speed and torque control” and “position control”.
  As a result, it is now possible to maintain the positioning control with the absolute position coordinates after switching the control.

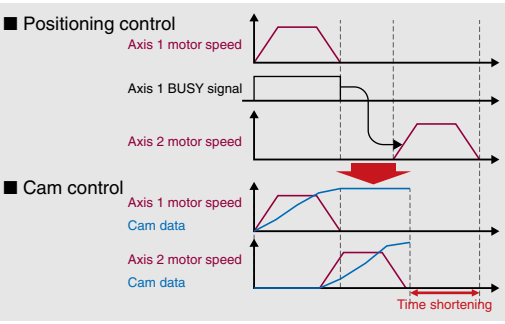


Synchronous control and cam control

- Synchronous control and cam control can be combined and used in systems requiring synchronous control.

Example applications for cam control
When making a detour around workpiece A and transferring from point P1 to point P3, with positioning control the BUSY signal of axis 1 is checked at point P2, and axis 2 starts.
By using cam control, the BUSY signal does not need to be checked at point P2 so the positioning time is shortened.

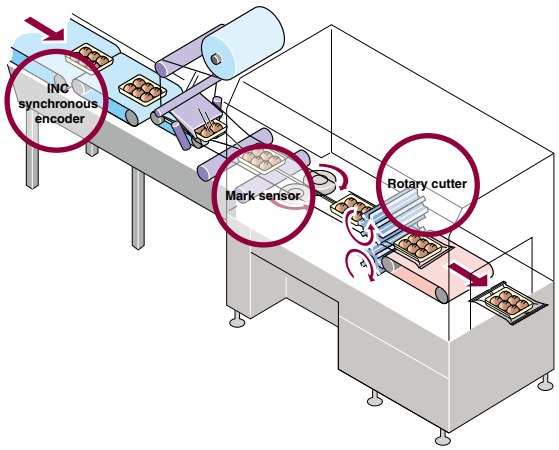




Making Motion Simple with compactly packed extra functions

Using synchronous control with a synchronous encoder

- Realize synchronous control and cam control by using input pulses from a synchronous encoder.
- Use an incremental synchronous encoder with the directly built-in interface of LD77MH, or use an absolute synchronous encoder (coming soon) via a servo amplifier. Optional modules are no longer necessary.
- Further improve the synchronization accuracy with the phase compensation function, designed to compensate for synchronous encoder delays.

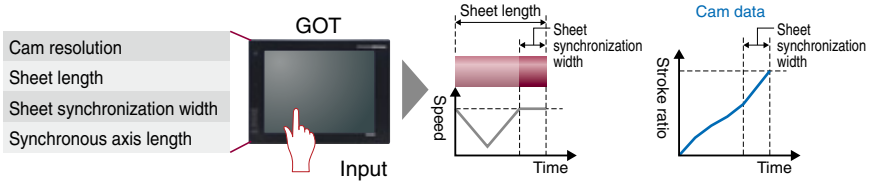


Standard mark detection function *New*

- The built-in mark detection signal interface allows incorporation in packaging systems etc., without optional modules.

Automatic cam data generation for rotary cutter

- Easily program and automatically generate difficult cam data for rotary cutters just by specifying the sheet length and synchronization width, etc.



Making Motion Simple with amplifier-less debugging functions

- Perform programming and debugging on a desktop using just the L Series CPU module, LD77MH and power supply module. This benefits your designing and debugging efficiency.
- Debug sequence programs and positioning data without the servo amplifier and servomotor.

Amplifier-less operation function
This function carries out the LD77MH positioning control without a servo amplifier connected. Use this to debug the user program for system installation, or to simulate the positioning operation.

Making Motion Simple in systems requiring high response

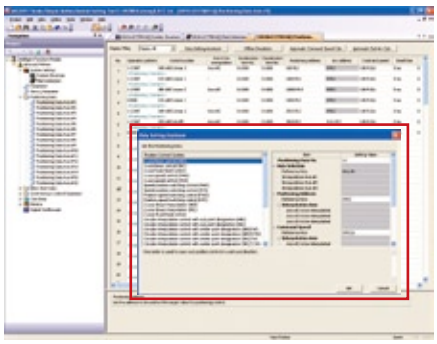
- The 50Mbps high-speed optical communication greatly increases the speed of data exchange between the Simple Motion Module and servo amplifier, and reduces the cycle time.
- The degree of freedom in system layout is enhanced for long-distance wiring.
- The adopted optical fiber cable has outstanding noise resistance properties.
- The SSCNETⅢ compatible servo amplifier supports various servomotors, linear servomotors and direct drive motors, and can be used in various applications.

Simple Settings without Programs

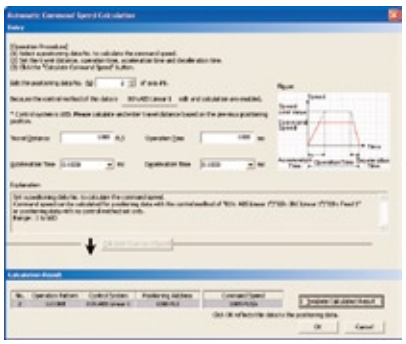
Simple setting of positioning data

Execute positioning control with the data table method.

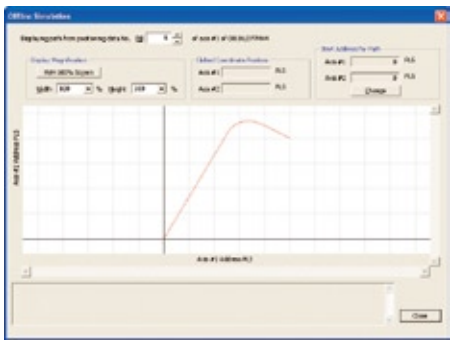
- The Data Setting Assistant function simplifies settings.
- Positioning data can be set very simply by using functions such as Automatic Command Speed Calculation, Offline Simulation, and automatic calculation of auxiliary arc, etc.



Data Setting Assistant function



Automatic Command Speed Calculation

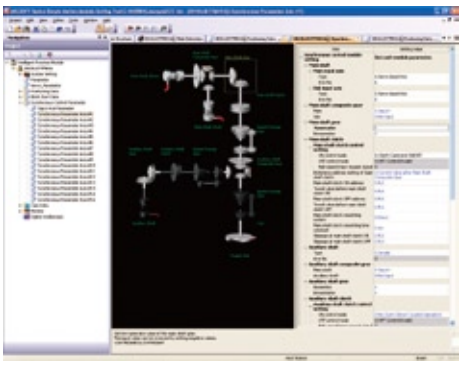


Offline Simulation

Simple setting of synchronous control data

Using software, realize synchronous control which replaces machine mechanisms, such as the gear, shaft, speed change gear and cam.

- It is possible to realize synchronous control easily with parameter settings. There is no need to create complicated programs.
- Start and stop synchronous control for each axis.
  Use the synchronous control axis and positioning control axis together.
- Convey the travel value of main shaft to the output axis via the clutch.
  New

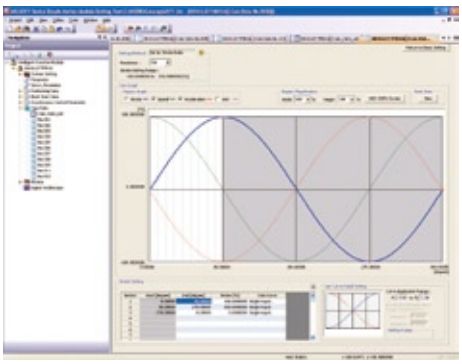


Synchronous Control Parameter Settings

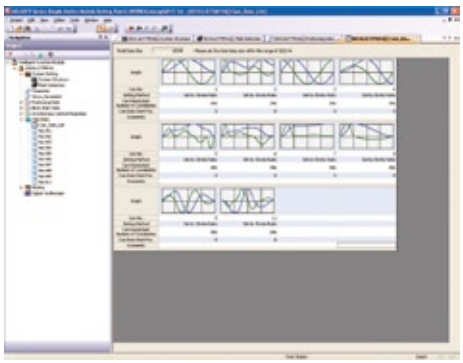
Simple setting of cam control data

Easily prepare cam data for various patterns.

- Set cams with a high degree of freedom. There's no need to worry about existing concepts of electronic cam control.
- Set the stroke, speed, acceleration and throb while simultaneously checking the profile on a graph.
- Easily check the created cam data by viewing as thumbnail displays of cam data.
- Import and export cam data in CSV format.



Cam Data

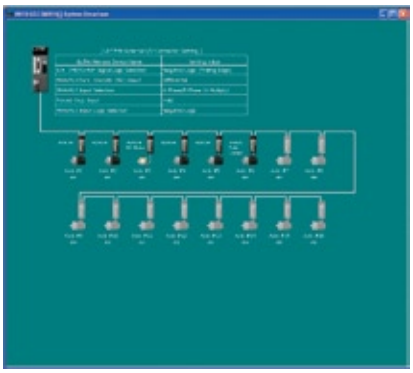


Cam Data List

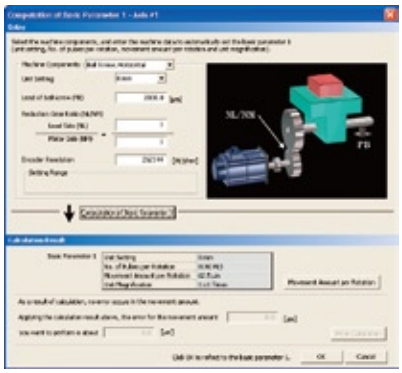
Simple parameter settings

- One-point help allows parameters to be set without needing a manual.
- Easily set the applicable servo amplifier on a graphical screen.
- Do away with bothersome electronic gear calculation just by specifying the mechanism configuration (reduction ratio, ball screw pitch, etc.).

Parameter Settings



System Structure Setting

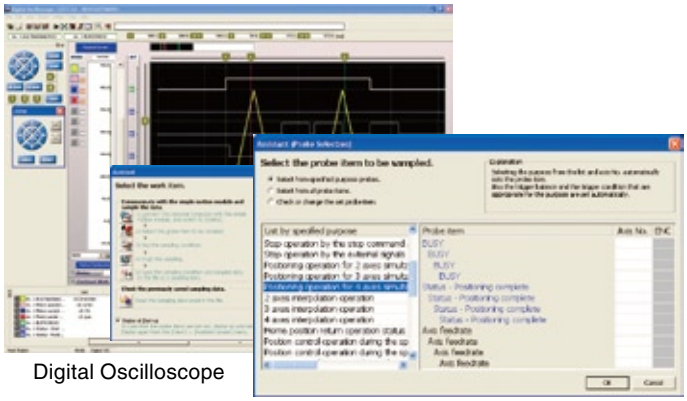


Electronic Gear Settings

Simple installation

Digital oscilloscope function

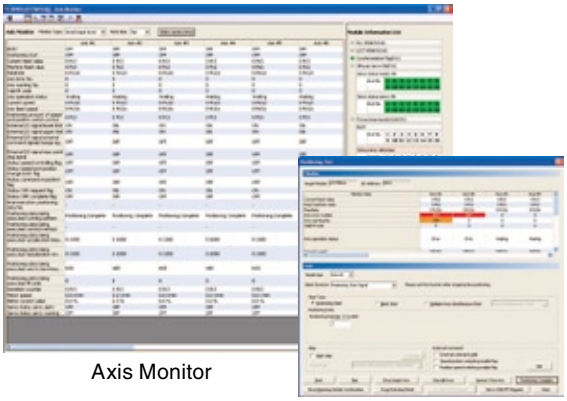
- Collection of data in the Simple Motion Module synchronized with the operation cycle and waveform displays facilitate efficient start up.
- The assistant function explains all work steps.
- Set often-viewed data easily with the purpose-based probe setting.
- Sample 16CH word and 16CH bit data. Of this, 8CH words and 8CH bits can be displayed in real time. *New*



Digital Oscilloscope

Monitor and test functions

- Easily complete system installation and operation checks with powerful monitor and test functions.
- Select items to be displayed on the monitor from the voluminous information monitor options. *New*
- Use the test function to check basic operations without a sequence program.

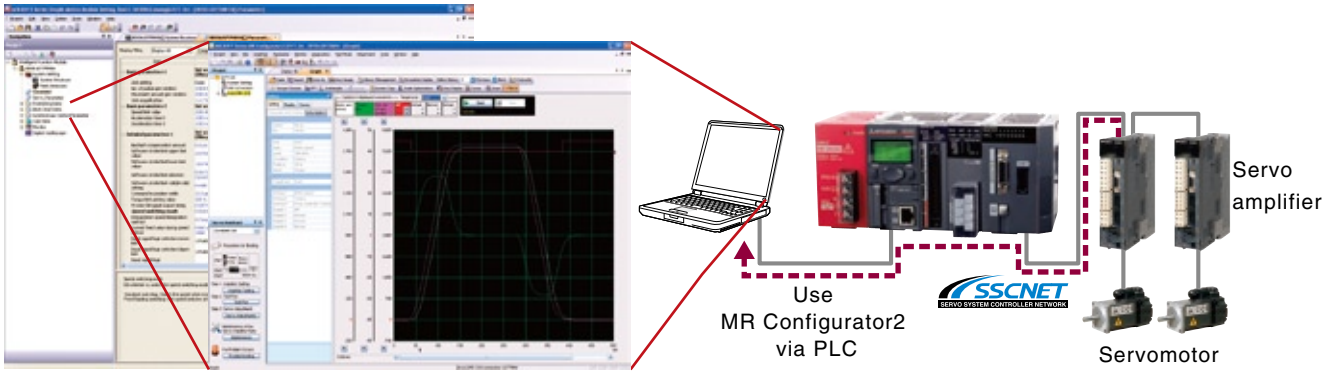


Axis Monitor

Positioning Test

Simple setting of servo amplifier parameters

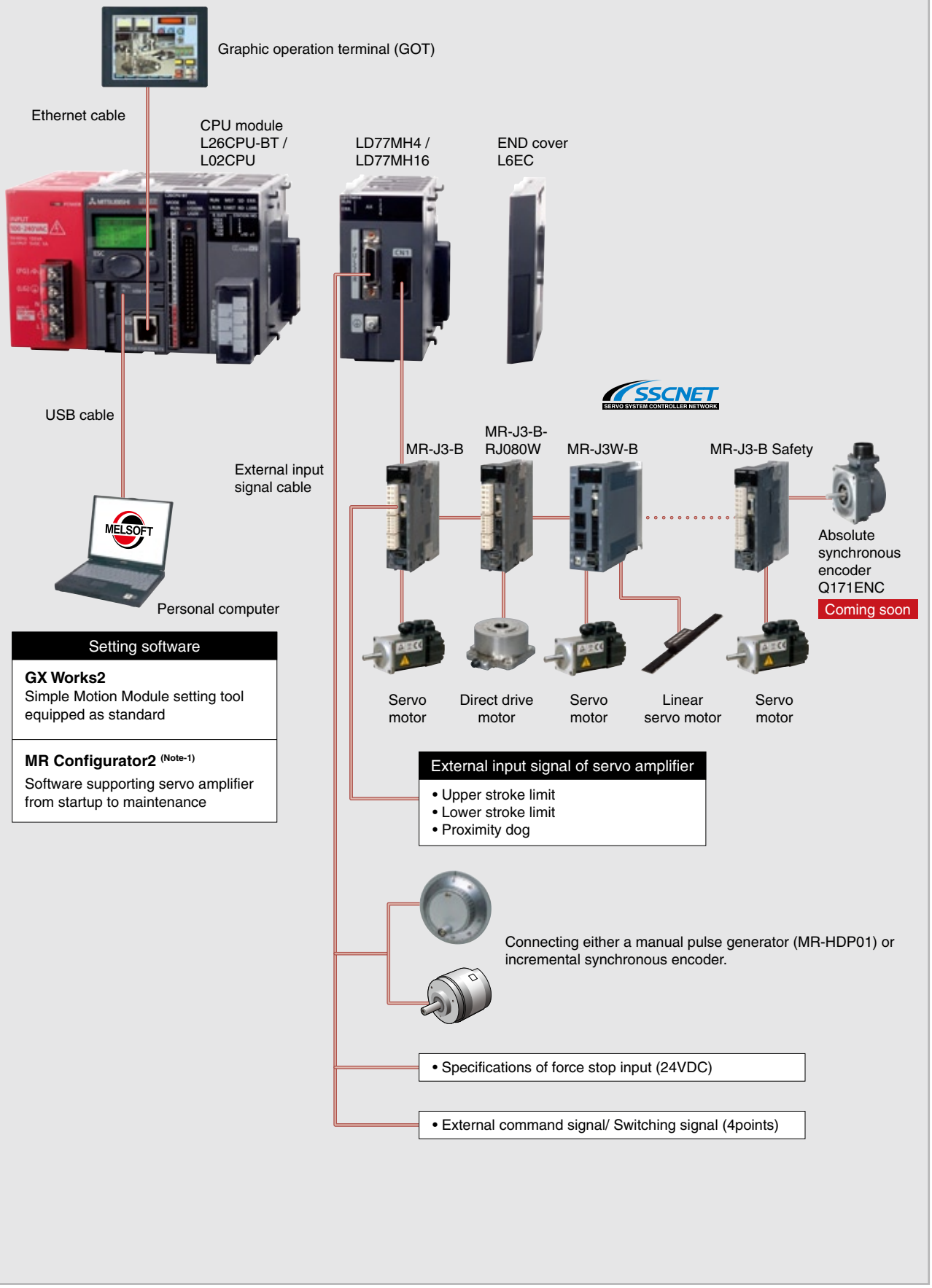
Collaboration with the MR Configurator2 increases the servo installation efficiency.
Set and adjust servo amplifier parameters with the MR Configurator2, a treasure trove of Mitsubishi servo know-how.



System Configuration

Structure an integral system consisting of the MR-J3 Series servo amplifier and servomotor with the PLC CPU module and SSCNETⅢ integrated.

- LD77MH4 can control up to 4 axes and the LD77MH16 can control up to 16 axes.

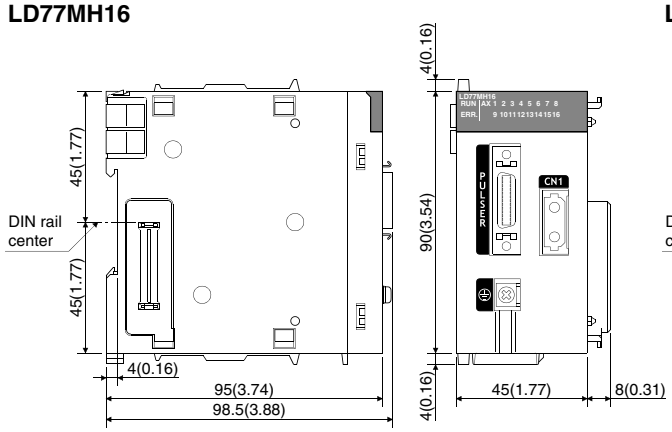


Module

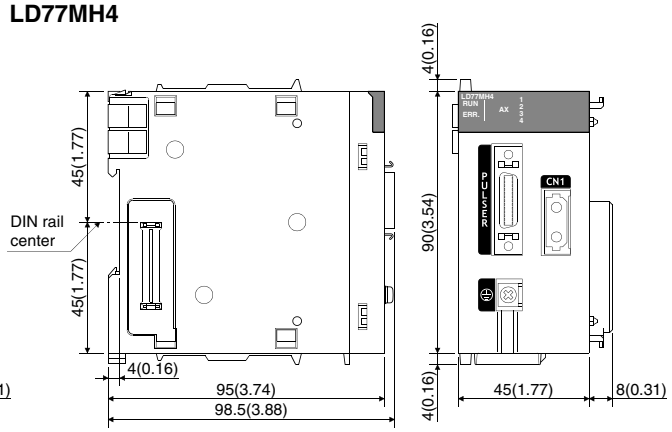
Item				LD77MH16	LD77MH4
Servo amplifier connection system				SSCNET Ⅲ -compatible (50Mbps)	
Transmission Distance				50m(164.04ft)	
PERIPHERAL I/F				Via CPU module (USB, RS-232, Ethernet)	
Interface with external devices	External command signal/ Switching signal		Number of input points	4 points	
			Input method	Positive common/Negative common shared (Photocoupler)	
			Rated input voltage/Rated input current	24VDC/Approx. 5mA	
			Operating voltage range	21.6 to 26.4VDC (24VDC ±10%, ripple ratio 5% or less)	
			ON voltage/current	17.5VDCor more/3.5mA or more	
			OFF voltage/current	5VDCor less/0.9mA or less	
			Input resistance	Approx 5.6kΩ	
			Response time: OFF→ON, ON→OFF	1ms or less	
			Recommended wire size	AWG24 (0.2mm^2)	
	Specifications of force stop input signal		Number of input points	1point	
			Input method	Positive common/Negative common shared (Photocoupler)	
			Rated input voltage/Rated input current	24VDC/Approx. 2.4mA	
			Operating voltage range	20.4 to 26.4VDC (24VDC+10%/-15%, ripple ratio 5% or less)	
			ON voltage/current	17.5VDCor more/2.0mA or more	
			OFF voltage/current	1.8VDC or less/0.18mA or less	
			Input resistance	Approx 10kΩ	
			Response time	1ms or less	
			Recommended wire size	AWG24(0.2mm^2)	
	Manual pulse generator/ Incremental synchronous encoder signal	signal input form		Phase A/Phase B(magnification by 4/magnification by 1), PLS/SIGN	
		Differential-output type	Input frequency	1Mpps(After magnification by 4, up to 4Mpps)	
			High-voltage	2.0 to 5.25VDC	
			Low-voltage	0 to 0.8VDC	
			Differential-voltage	±0.2V	
			Cable length	30m(98.43ft)	
		Voltage-output/ High-voltage 3.0 to 5.25VDC Open-collector type (5VDC)	Input frequency	200kpps(After magnification by 4, up to 800kpps)	
			High-voltage	3.0 to 5.25VDC	
			Low-voltage	0 to 1.0VDC	
			Cable length	10m(32.81ft)	
Number of I/O occupying points				32 points(I/O allocation: Intelligent, 32 points)	
Maximum number of modules specification				Counts as 2 modules	
Internal current consumption(5VDC)[A]				0.70	0.55
Mass [kg]				0.22	
Exterior dimensions [mm(inch)]				90.0(3.54)(H)×45.0(1.77)(W)×95(3.74)(D)	

External Dimension Diagram

LD77MH16



LD77MH4



UNIT: mm(inch)

Motion control

Item			LD77MH16	LD77MH4
Number of control axes			16axes	4axes
Operation cycle			0.88ms/1.77ms (Note-1)	0.88ms
Interpolation function			Linear interpolation(Up to 4 axes),Circular interpolation(2 axes)	
Control system			PTP (Point To Point) control, path control (both linear and arc can be set), speed control, torque control, speed-position switching control, position-speed switching control	
Acceleration/deceleration process			Trapezoidal acceleration/deceleration, S-pattern acceleration/deceleration	
Compensation function			Backlash compensation, Electronic gear, Near pass function	
Synchronous control			External encoder, Cam, Phase Compensation, Cam generated automatically	
Control unit			mm, inch, degree, PLS	
Positioning data			600 data (positioning data No. 1 to 600)/ axis (Can be set with GX Works2 or PLC program.)	
Backup			Parameters, positioning data, and block start data can be saved on flash ROM (battery-less backup)	
OPR control	Machine OPR control		Near-point dog method, Count method 1), Count method 2), Data set method, scale origin signal detection method	
	Fast OPR control		Provided	
	Sub functions		OPR retry, OP shift	
Position control	Position control	Linear control	1-axis linear control, 2-axis linear interpolation control, 3-axis linear interpolation control, 4-axis linear interpolation control (Composite speed, Reference axis speed)	
		Fixed-feed control	1-axis fixed-feed control, 2-axis fixed-feed control, 3-axis fixed-feed control, 4-axis fixed-feed control	
		2-axis circular interpolation control	sub point designation, center point designation	
	Speed control		1-axis speed control, 2-axis speed control, 3-axis speed control, 4-axis speed control	
	Speed-position switching control		INC mode, ABS mode	
	Position-speed switching control		INC mode	
	Other control	Current value changing	Changing to a new current value using the positioning data , Changing to a new current value using the start No.	
		NOP instruction	Provided	
		JUMP instruction	Unconditional JUMP, Conditional JUMP	
		LOOP,LEND	Provided	
High-level positioning control			Block start, Condition start, Wait start, Simultaneous start, Repeated start	
Manual control	JOG operation		Provided	
	Inching operation		Provided	
	Manual pulse generator operation		Possible to connect 1 module (Incremental) Unit magnification (1 to 10000times)	
Expansion control	Speed-torque control		Speed control without positioning loops, Torque control without positioning loops	
Absolute position system			Made compatible by setting battery to servo amplifier	
Synchronous encoder interface			Up to 4 channel (internal interface , servo amplifier, via the PLC CPU interface)	
	Internal interface		1channel (Incremental)	
	Via servo amplifier		Support coming soon	
Functions that limit control	Speed limit function		Speed limit value, JOG speed limit value	
	Torque limit function		Torque limit value_same setting, torque limit value_individual setting	
	Forced stop function		valid/invalid setting	
	Software stroke limit function		Movable range check with current feed value, movable range check with machine feed value	
	Hardware stroke limit function		Provided	
Functions that change control details	Speed change function		Provided	
	Override function		Provided	
	Acceleration/deceleration time change function		Provided	
	Torque change function		Provided	
	Target position change function		Target position address and target position speed are changeable	
Other functions	M code output function		Provided	
	Step function		Deceleration unit step, Data No. unit step	
	Skip function		Via sequence CPU, Via external command signal	
	Teaching function		Provided	
Mark detection function			Mark detection mode (Continuous Detection mode, Specified Number of Detections mode, Ring Buffer mode)	
	mark detection signal		4points	
	mark detection setting		16	4
Optional data monitor function			4points/axis	
Master-slave operation function			Provided	
Amplifier-less operation function			Provided	
Digital oscilloscope function			bit data :16channels, word data: 16channels (Note-2)	bit data :8channels, word data: 4channels

Note-1 : Default value is 1.77 ms. If necessary, check the operation time and change to 0.88 ms.
Note-2 : 8CH word data and 8CH bit data can be displayed in real time.

Synchronous control

Item		LD77MH16	LD77MH4
Input axis	Servo input axis	16axes/module	4axes/module
	Synchronous encoder axis	4axes/module	1axis/module
Composite main shaft gear		1/output axis	
Main shaft input axis		1/output axis	
Main shaft sub input axis		1/output axis	
Main shaft gear		1/output axis	
Main shaft clutch		1/output axis	
Auxiliary shaft		1/output axis	
Auxiliary shaft gear		1/output axis	
Auxiliary shaft clutch		1/output axis	
Auxiliary shaft composite gear		1/output axis	
Speed change gear		1/output axis	
Output axis		16axes/module	4axes/module

Cam

Item			LD77MH16	LD77MH4
Memory capacity	Storage area for cam data		256k bytes	
	Working area for cam data		1024k bytes	
Number of registration			Max. 256 program items (according to memory capacity, cam resolution and number of coordinates)	
Comment			Max. 32 characters (half-byte) for each cam data	
Cam data	Stroke ratio data type	Cam resolution	256,512,1024,2048,4096,8192,16384,32768	
		Stroke ratio	-214.7483648 to 214.7483647 [%]	
	Coordinate data type	Coordinate number	2 to 16384	
		Coordinate data	Output value: -2147483648 to 2147483647	
Cam generated automatically			Cam generated automatically for rotary cutter	

Equipment

Model		Description		Standards
MELSEC-L series Simple Motion Module	LD77MH4	Up to 4 axes control		CE,UL
	LD77MH16	Up to 16 axes control		CE,UL
connector for external input signal cable	LD77MHIOCON	Manual pulse generator/ incremental synchronous encoder interface/ Specifications of force stop input interface/ external command signal/ switching signal interface provided with Simple Motion Module		-
SSCNETⅢ cable(Note-1)	MR-J3BUS□M	• LD77MH4 ⇔ MR-J3(W)-B • LD77MH16 ⇔ MR-J3(W)-B • MR-J3(W)-B ⇔ MR-J3(W)-B	Standard cord for inside a panel: 0.15m(0.49ft.),0.3m(0.98ft.),0.5m(1.64ft.),1m(3.28ft.),3m(9.84ft.)	-
	MR-J3BUS□M-A		Standard cable for outside a panel: 5m(16.40ft.),10m(32.81ft.),20m(65.62ft.)	-
	MR-J3BUS□M-B(Note-2)		Long-distance cable: 30m(98.43ft.),40m(131.23ft.),50m(164.04ft.)	-
Manual pulse generator	MR-HDP01	Pulse resolution: 25 PLS/rev -- 100 PLS/rev a f ter magnification by 4Allowable speed: 200 r/min in normal rotation Voltage output Allowable load Radial load: 19.6 N Thrust load: 9.8 N		-

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

Note-2 : Check with Mitsubishi Electric regarding cables less than 30m long.

MELSOFT-Related Tool

Product	Model	Application version	Description
GX Works2	SW1DNC-GXW2-E	Version 1.48A or later	Setting of LD77MH4 and LD77MH16
MR Configurator2	SW1DNC-MRC2-E	Version 1.01B or later	Setting and adjustment of MR-J3 Series servo amplifier

MEMO

MEMO

Precautions before use

This publication explains the typical features and functions of the products herein and does not provide restrictions and other information related to usage and module combinations. Before using the products, always read the product user manuals. Mitsubishi Electric will not be held liable for damage caused by factors found not to be the cause of Mitsubishi Electric; opportunity loss or lost profits caused by faults in Mitsubishi Electric products; damage, secondary damage, or accident compensation, whether foreseeable or not, caused by special factors; damage to products other than Mitsubishi Electric products; and to other duties.

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- To use the products given in this publication properly, always read the relevant manuals before use.
- The products have been manufactured as general-purpose parts for general industries, and have not been designed or manufactured to be incorporated in a device or system used in purposes related to human life.
- Before using the products for special purposes such as nuclear power, electric power, aerospace, medicine or passenger movement vehicles, consult with Mitsubishi.
- The products have been manufactured under strict quality control. However, when installing the products where major accidents or losses could occur if the products fail, install appropriate backup or fail-safe functions in the system.

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