MITSUBISHI ELECTRIC
Changes for the Better

for a greener tomorrow eco Changes

SSCNET III/H Compatible MELSEC-L Series Simple Motion Module LD77MS16/LD77MS4/LD77MS2

July 2013

New Product Release
SV1307-1E

Motion control made simpler

High-speed control is achieved by combining the SSCNET III/H compatible MELSERVO-J4 series amplifiers with this Simple Motion module.
This module features advanced Motion control with the flexibility and ease of use of the MELSEC-L series.

Achieving advanced Motion controls but simple to use just like the positioning module

- **Used for various applications**
  Advanced and wide-range Motion controls are available, such as synchronous and cam control.
- **Applied to various machines**
  The synchronous encoder and Mark detection function are equipped as standard.
- **Effortless debugging and quick startup**
  Simple settings without programming are achieved in collaboration with Mitsubishi's MELSOFT series Engineering environment.
- **Future system expansion**
  Program resources are utilized efficiently.

MELSEC L series

SSCNET III/H
SERVO SYSTEM CONTROLLER NETWORK

Mitsubishi has invented an original servo system synchronous network "SSCNET III/H" in pursuit of high response and reliability. The SSCNET III/H is an optical network that achieves smooth, high-response and high-accuracy operation.

Features

Advanced and wide-range Motion control with ease of use

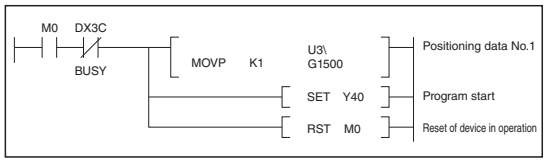
The Simple Motion module is simple to use just like the positioning module while being capable of performing various advanced Motion controls with only sequence programs, such as synchronous/cam/speed-torque (tightening & press-fit) control, which are unavailable with the positioning modules.

LD77MS16 LD77MS4 LD77MS2

● Positioning control

Positioning control can be performed easily by starting the positioning data in Motion profile table, initiated by the instruction in the sequence program. Various controls, such as linear interpolation control, 2-axis circular interpolation control, fixed-pitch feed control and continuous trajectory control are provided for a wide variety of applications.

Sequence program



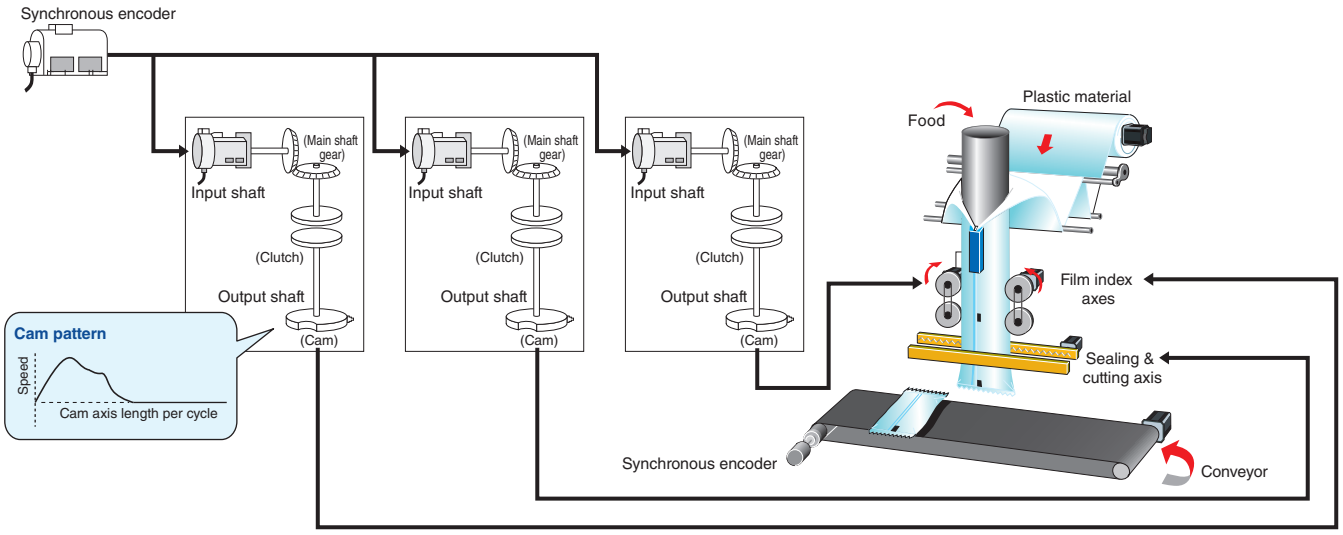
Positioning data

No.	Operation pattern	Control system	Acceleration time No.	Deceleration time No.	Positioning address	Command speed
1	1: CONT	01h: ABS Linear 1	0: 1000	0: 1000	200000.0 μm	20000.00 mm/min
	<Positioning comment>					
2	0: END	01h: ABS Linear 1	0: 1000	0: 1000	-200000.0 μm	10000.00 mm/min
	<Positioning comment>					

MR-J4-B

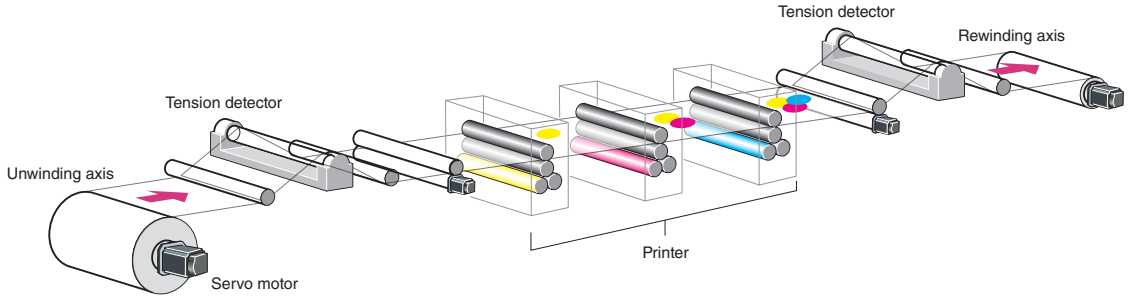
● Synchronous, Cam control

Using software to replace machine mechanisms, such as the gear, shaft, speed change gear and cam achieves synchronous control, just by setting parameters. Various cam patterns are easily created without complex program.



● Speed-torque control (Tightening & press-fit control)

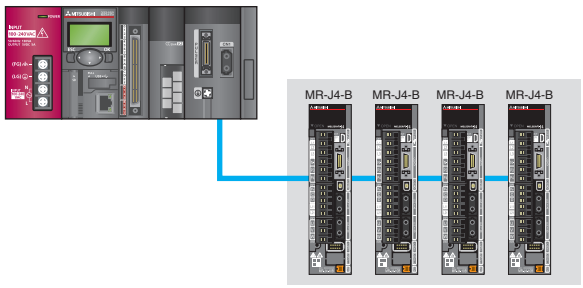
Tension control applications such as unwinding and rewinding axes can be performed easily. Since the current position is stored even during Speed-torque control, the positioning on the absolute position coordinates is possible after switching from Speed-torque control back to position control.



Compatible with servo system synchronous network "SSCNET III/H"

Communication speed is increased to 150Mbps full duplex (equivalent to 300 Mbps half duplex), three times faster than the conventional speed. System response is dramatically improved.

- No transmission collision
- Dramatically reduced wiring
- Deterministic and synchronized communication
- SSCNET III/H and SSCNET III compatible amplifiers can be connected in a same system.

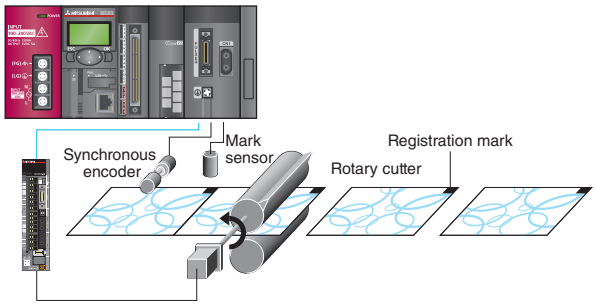


Various functions are equipped in this compact module

Incremental synchronous encoder and mark detection signal interfaces are integrated in this module. Therefore no option module is required.

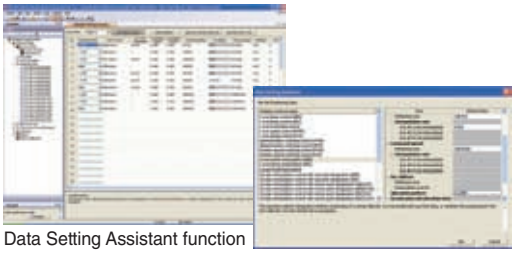
● Synchronous control with synchronous encoder
Select the synchronous encoder to be used from either the incremental synchronous encoder using the LD77MS built-in interface, or the absolute synchronous encoder via servo amplifier. The synchronization accuracy is improved further with the phase compensation function, designed to compensate for synchronous encoder delays.

● Mark detection function
This function detects registration marks on the packing material moving at high speed by sensor and sets the current position to the buffer memory. Any fluctuation errors between the current sensed position and the reference position are compensated, and the packing material is cut at the set position.

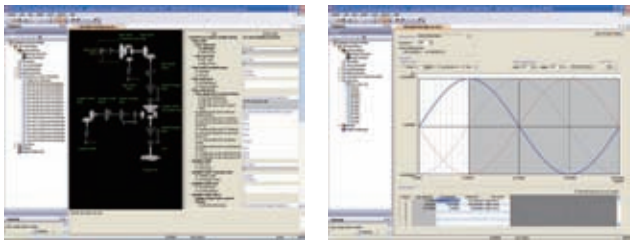


MELSOFT GX Works2 helps you create engineering environment

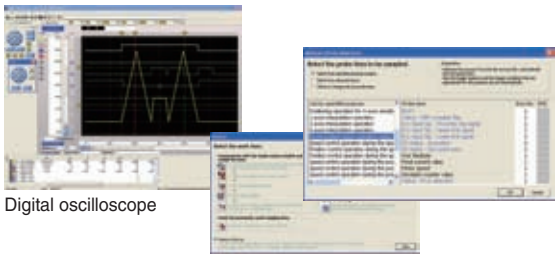
● Positioning data
Functions, such as Data setting assistant, and Automatic calculation of auxiliary arc, simplify the setting input process of positioning data.


Data Setting Assistant function

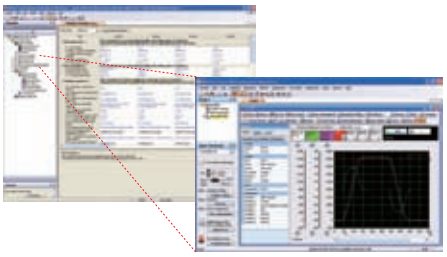
● Synchronous control parameter
Complex synchronous control can be executed just by setting it intuitively using the graphical screen.



● Digital oscilloscope function
Operation confirmation and troubleshooting are powerfully supported with data collection and wave displays which are synchronized to the Motion operation cycle.


Digital oscilloscope

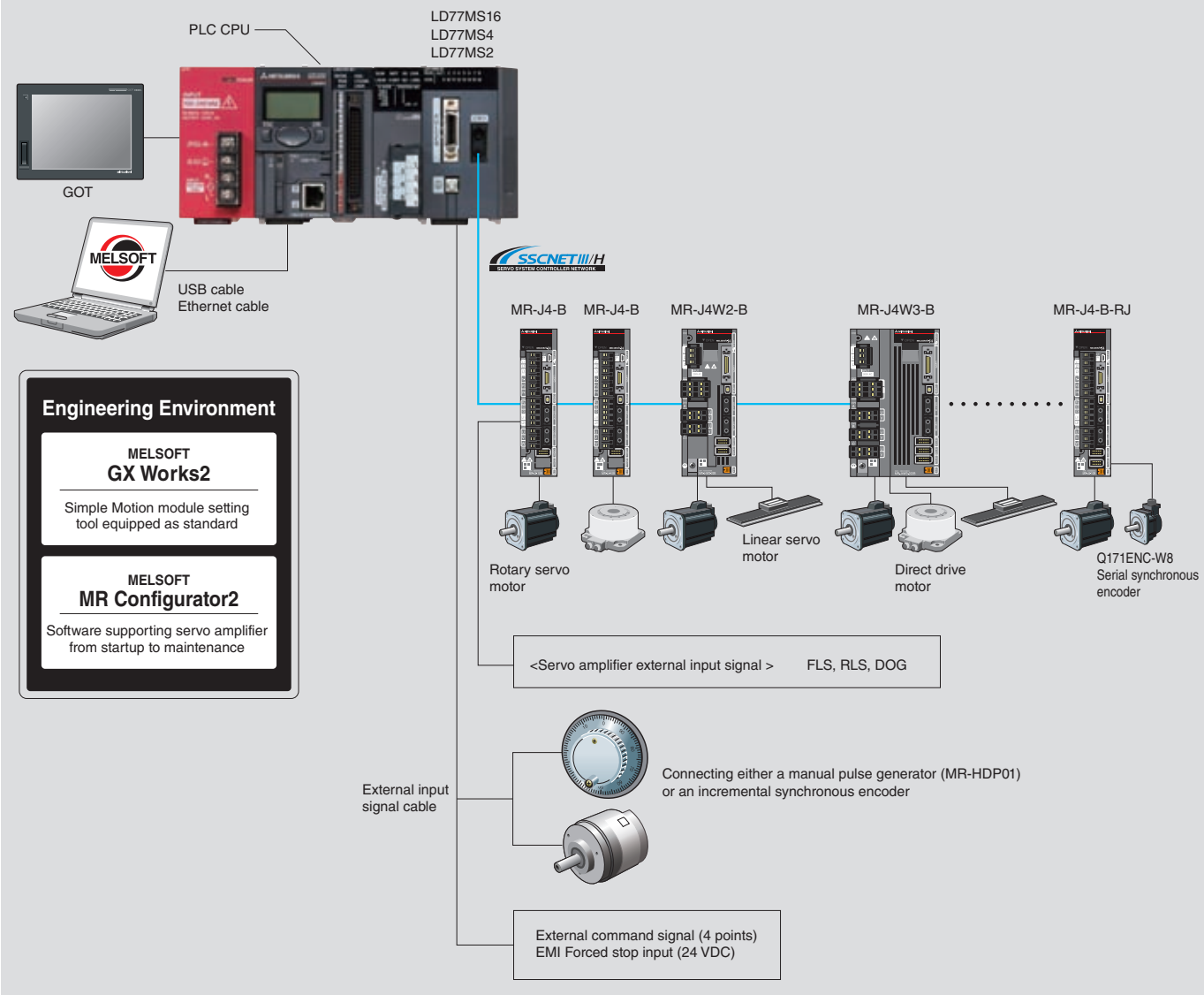
● Servo amplifier setup
Using Servo setup software MR Configurator2, via the PLC CPU, achieves easy parameter settings and adjustment of servo amplifiers.



System configuration

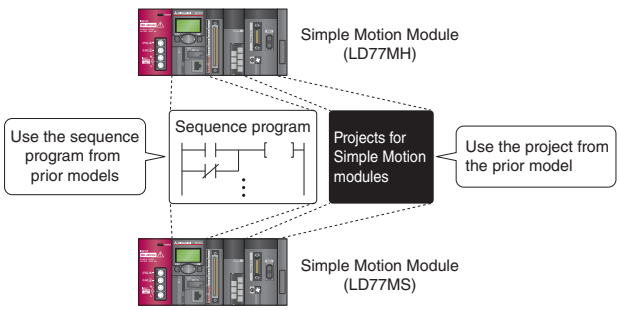
Structure an integral system consisting of the MR-J4 series servo amplifiers and servo motors with the PLC CPU module and SSCNET III/H integrated.

• LD77MS16/LD77MS4/LD77MS2 can control up to 16/4/2 axes respectively.



High compatibility

The projects and sequence programs created for LD77MH Simple Motion modules can be diverted to the LD77MS.



Module specification

Item				Specifications		
				LD77MS16	LD77MS4	LD77MS2
Servo amplifier connection system				SSCNET III/H (1 system)		
Maximum overall distance [m(ft.)]				SSCNET III/H : 1600 (5249.34), SSCNET III : 800 (2624.67)		
Maximum distance between stations [m(ft.)]				SSCNET III/H : 100 (328.08), SSCNET III : 50 (164.04)		
PERIPHERAL I/F				Via CPU module (USB, Ethernet)		
Interface with external devices	External input signal/ Switching signal (CHG)		Number of input points	4 points		2 points
			Input method	Positive common/Negative common shared (Photocoupler)		
			Rated input voltage/Rated input current	24 VDC/Approx. 5 mA		
			Operating voltage range	21.6 to 26.4 VDC (24 VDC ±10 %, ripple ratio 5 % or less)		
			ON voltage/current	17.5 VDC or more/3.5 mA or more		
			OFF voltage/current	5 VDC or less/0.9 mA or less		
			Input resistance	Approx. 5.6 kΩ		
			Response time	1 ms or less		
			Recommended wire size	AWG24 (0.2 mm^2)		
	Forced stop input signal (EMI)		Number of input points	1 point (EMI)		
			Input method	Positive common/Negative common shared (Photocoupler)		
			Rated input voltage/Rated input current	24 VDC/Approx. 2.4 mA		
			Operating voltage range	20.4 to 26.4 VDC (24 VDC +10 %/-15 %, ripple ratio 5 % or less)		
			ON voltage/current	17.5 VDC or more/2.0 mA or more		
			OFF voltage/current	1.8 VDC or less/0.18 mA or less		
			Input resistance	Approx. 10 kΩ		
			Response time	1 ms or less		
			Recommended wire size	AWG24 (0.2 mm^2)		
	Manual pulse generator/ Incremental synchronous encoder signal	Signal input form		Phase A/Phase B (magnification by 4/magnification by 2/magnification by 1), PLS/SIGN		
		Differential-output type	Input frequency	Up to 1 Mpps (After magnification by 4, up to 4 Mpps)		
			High-voltage	2.0 to 5.25 VDC		
			Low-voltage	0 to 0.8 VDC		
			Differential-voltage	±0.2 V		
			Cable length [m(ft.)]	Up to 30 (98.43)		
		Voltage-output/ Open-collector type (5 VDC)	Input frequency	Up to 200 kpps (After magnification by 4, up to 800 kpps)		
			High-voltage	3.0 to 5.25 VDC		
			Low-voltage	0 to 1.0 VDC		
			Cable length [m(ft.)]	Up to 10 (32.81)		
Number of I/O occupying points				32 points (I/O allocation: intelligent function module: 32 points)		
Number of module occupied slots				2		
5VDC internal current consumption [A]				0.7	0.55	
Mass [kg]				0.22		
Exterior dimensions [mm(inch)]				90.0 (3.54) (H) × 45.0 (1.77) (W) × 95.0 (3.74) (D)		

Control specification

Item			Specifications		
			LD77MS16	LD77MS4	LD77MS2 (Note-3)
Number of control axes			Up to 16 axes	Up to 4 axes	Up to 2 axes
Operation cycle			0.88 ms/1.77 ms (Note-1)	0.88 ms	0.88 ms
Interpolation function			Linear interpolation (Up to 4 axes), Circular interpolation (2 axes)		
Control modes			PTP (Point To Point) control, Trajectory control (both linear and circular can be set), Speed control, Speed-position switching control, Position-speed switching control, Speed-torque control		
Acceleration/deceleration process			Trapezoidal acceleration/deceleration, S-curve acceleration/deceleration		
Compensation function			Backlash compensation, Electronic gear, Near pass function		
Synchronous control			External encoder, Cam, Phase compensation, Cam auto-generation		
Control unit			mm, inch, degree, PLS		
Number of positioning data			600 data (positioning data No. 1 to 600)/axis (Can be set with MELSOFT GX Works2 or Sequence 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		
Positioning control	Position control	Linear control	1-axis linear control, 2-axis linear interpolation control, 3-axis linear interpolation control, 4-axis linear interpolation control (Note-4) (Composite speed, Reference axis speed)		
		Fixed-pitch feed control	1-axis fixed-pitch feed control, 2-axis fixed-pitch feed control, 3-axis fixed-pitch feed control, 4-axis fixed-pitch 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 controls	Current value change	Positioning data, Start No. for a current value changing		
		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		Possible to connect 1 module (Incremental), Unit magnification (1 to 10000 times)		
Expansion control	Speed-torque control		Speed control without positioning loops, Torque control, Tightening & press-fit control		
Absolute position system			Made compatible by setting battery to servo amplifier		
Synchronous encoder interface			Up to 4 channels (Total of the internal interface, interface via servo amplifier, and interface via the PLC CPU)		
	Internal interface		1 channel (Incremental)		
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		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 speed to target position are changeable		
Other functions	M code output function		Provided		
	Step function		Deceleration unit step, Data No. unit step		
	Skip function		Via PLC CPU, Via external command signal		
	Teaching function		Provided		
Mark detection function			Continuous Detection mode, Specified Number of Detections mode, Ring Buffer mode		
	Mark detection signal		4 points		2 points
	Mark detection setting		16	4	
Optional data monitor function			4 points/axis		
Amplifier-less operation function			Provided		
Digital oscilloscope function (Note-2)			Bit data 16 channels, Word data 16 channels	Bit data 8 channels, Word data 4 channels	

(Note-1): Default value is 1.77 ms. If necessary, check the operation time and change it to 0.88 ms.
(Note-2): 8 CH word data and 8 CH bit data can be displayed as a wave form in real time.
(Note-3): The maximum number of control axes for LD77MS2 is two axes. Use LD77MS4 or LD77MS16 to control three or more axes.
(Note-4): 4-axis linear interpolation control is enabled only at the reference axis speed.

Synchronous control

Item		Number of settable axes		
		LD77MS16	LD77MS4	LD77MS2
Input axis	Servo input axis	16 axes/module	4 axes/module	2 axes/module
	Synchronous encoder axis	4 axes/module		
Composite main shaft gear		1/output axis		
Main shaft main 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		16 axes/module	4 axes/module	2 axes/module

Cam control

Item			Specifications
Memory capacity	Storage area for cam data		256k bytes
	Working area for cam data		1024k bytes
Number of registration			Up to 256 (depending on memory capacity, cam resolution and number of coordinates)
Comment			Up to 32 characters 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	Number of coordinate	2 to 16384
		Coordinate data	Input value: 0 to 2147483647 Output value: -2147483648 to 2147483647
Cam auto-generation			Cam auto-generation for rotary cutter

Configuration

Dedicated devices

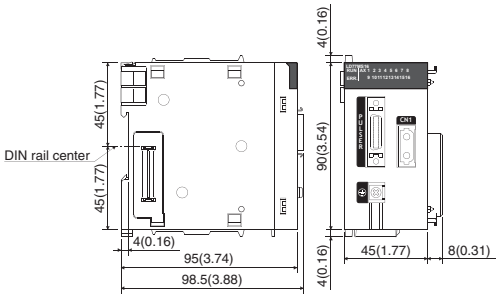
Item	Model name	Specifications		Standards
Simple Motion module	LD77MS16	Up to 16 axes		UL, CE, KC
	LD77MS4	Up to 4 axes		UL, CE, KC
	LD77MS2	Up to 2 axes		UL, CE, KC
Internal I/F connector set	LD77MHIOCON	Incremental synchronous encoder/Mark detection signal interface connector set		—
SSCNET III cable	MR-J3BUS_M	LD77MS ⇔MR-J4-B MR-J4-B ⇔MR-J4-B	Standard code for inside panel	—
	MR-J3BUS_M-A		Standard code for outside panel	—
	MR-J3BUS_M-B		Long distance cable	—
Manual pulse generator	MR-HDP01	Pulse resolution: 25 PLS/rev (100 PLS/rev after magnification by 4), Permitted speed: 200 r/min (Normal rotation)		—

Software list
<Engineering environment MELSOFT series>

Product	Model name	Description		Applicable version
MELSOFT GX Works2	SW1DNC-GXW2-E	Sequence program creation, settings for LD77MS		1.492N or later
MELSOFT MR Configurator2	SW1DNC-MRC2-E	Settings and adjustments of MR-J4 series servo amplifiers		1.20W or later
MELSOFT iQ Works	SW1DNC-IQWK-E	• System Management Software [MELSOFT Navigator] • Programmable Controller Engineering Software [MELSOFT GX Works2] • Motion Controller Engineering Software [MELSOFT MT Works2]	License product (1 license in CD-ROM)	—
	SW1DND-IQWK-E	• Servo Setup Software [MELSOFT MR Configurator2] • Screen Design Software [MELSOFT GT Works3] • Robot Total Engineering Support Software [MELSOFT RT ToolBox2 mini]	License product (1 license in DVD-ROM)	—

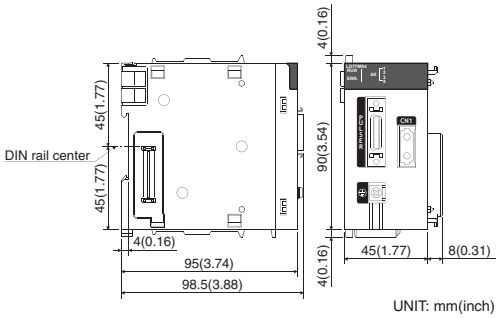
Exterior dimensions

LD77MS16



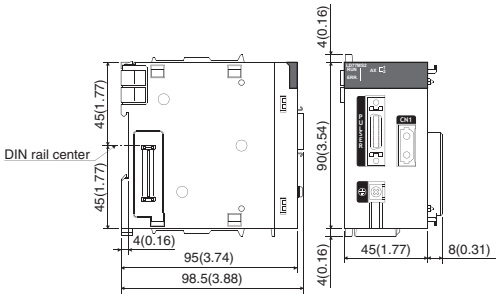
UNIT: mm(inch)

LD77MS4



UNIT: mm(inch)

LD77MS2



UNIT: mm(inch)

Mitsubishi Electric Corporation Nagoya Works is a factory certified for ISO14001 (standards for environmental management systems) and ISO9001(standards for quality assurance management systems)

MELSOFT

ISO 14001 EC97J1113 051

ISO 9001 BUREAU VERITAS Certification

Safety Warning

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

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