MITSUBISHI ELECTRIC

Changes for the Better

for a greener tomorrow eco Changes

SSCNET III/H Compatible
MELSEC iQ-F Series Simple Motion Module
FX5-40SSC-S

January 2015

New Product Release
SV1501-2E

Superior Motion Control with Easy Settings

State-of-the-art Motion performance is packed in a compact module. Combined with SSCNET III/H compatible servo amplifiers, FX5-40SSC-S Simple Motion module achieves high-speed, high-accuracy control.

The Simple Motion module is the perfect choice as a controller for compact machines

- The Simple Motion module achieves wide-range, advanced Motion controls, such as synchronous/cam controls, boosting machine performance further.
- Provided with various functions as standard, such as synchronous encoder input and mark detection function, the Simple Motion module is applied to various machines without any additional optional units.
- The parameters and servo data are managed centrally via SSCNET III/H, which simplifies the time-consuming startup and adjustment work as much as possible.
- Easy settings without complex programming using MELSOFT GX Works3 allows a quick startup and easy debugging.

MELSEC iQ-F 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.

The next level of industry

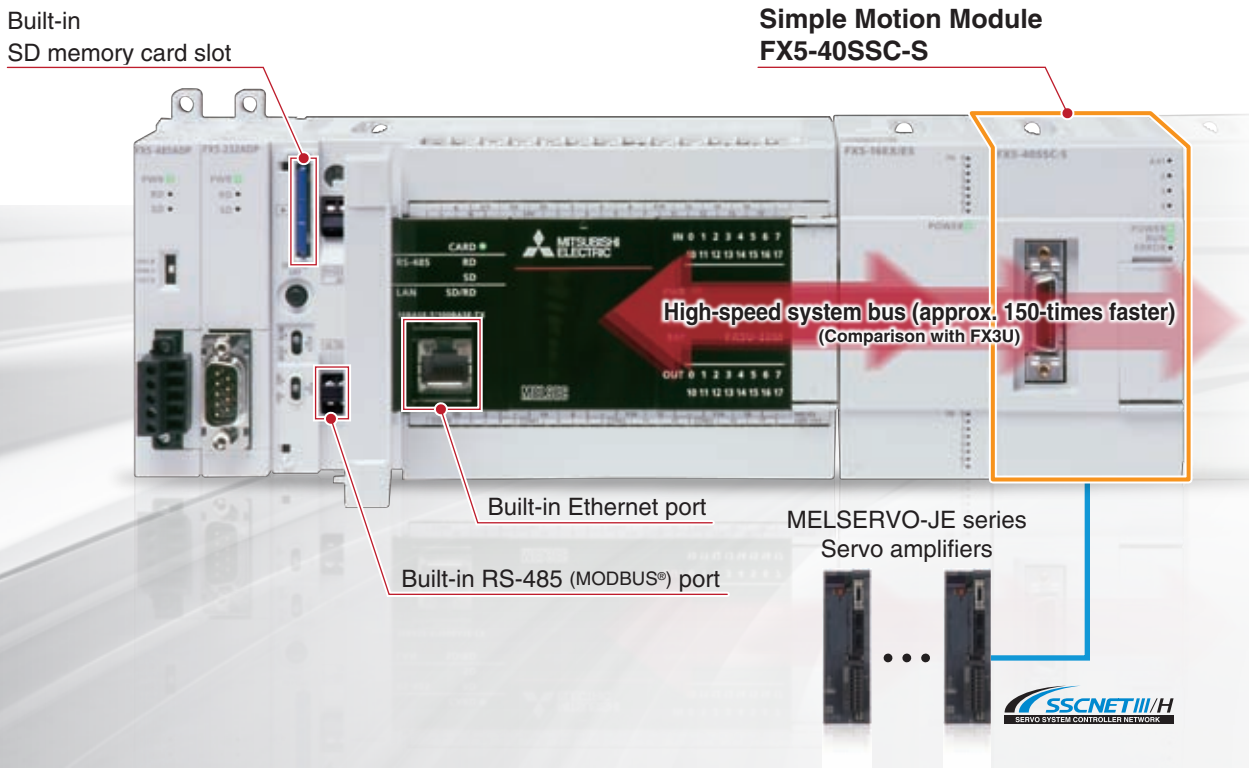
MELSEC iQ-F series

Witness the evolution of the micro PLC.
Designed on the concepts of outstanding performance, superior drive control, and user centric programming,
Mitsubishi's MELSEC-F Series has been reborn as the MELSEC iQ-F Series.
From standalone use to networked system application,
MELSEC iQ-F series brings your business to the next level of industry.

FX5-40SSC-S

Superior Drive Control Achieved

Simple Motion Module Debut



Synchronous/Cam Controls Contribute to Higher Performance of Small-sized Equipment

The Simple Motion module is provided with synchronous and cam controls required for food processing machines and packaging machines. Combined with the Mitsubishi Electric's high-performance servo amplifier, the Simple Motion module enables downsizing of machinery while achieving outstanding performance. In addition, diverse engineering environment allows you to create desired systems with ease.

Central Control via SSCNET III/H Boosts Efficiency in Startup

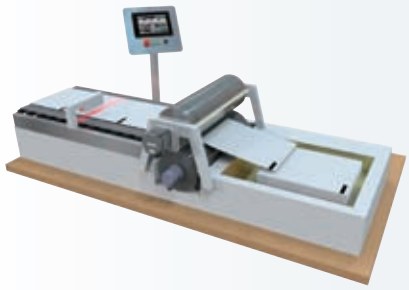
The Simple Motion module can consolidate multiple servo amplifier parameters, shortening the startup time further. Also, operation information, such as power consumption and total power consumption of the servo amplifiers, can be monitored in real time, which enables further reduction in maintenance time.

Solutions

The Simple Motion Module Opens up Many Possibilities for Higher Performance

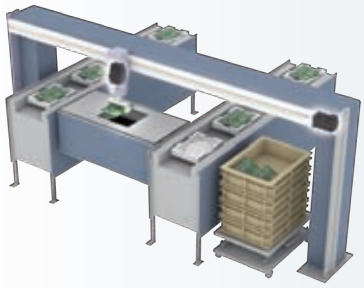
➤ Rotary Knife

Sheet can be cut accurately at high speed by using synchronous control, cam control, and mark detection function. Additionally, cam data for the rotary knife axis can be easily created with the cam auto-generation function, which enables further reduction in programming time.



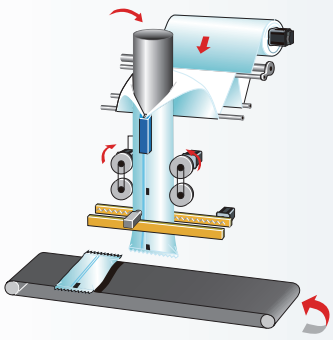
➤ Material Handling Machines

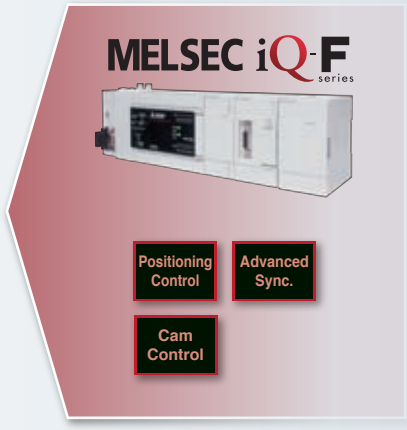
The machine can move workpieces easily from one line to another by using a combination of linear interpolation, 2-axis circular interpolation, and continuous trajectory control. Smooth trajectory can be traced with S-curve acceleration/deceleration function. As a result, the machine vibration can be minimized.



➤ Packing Machines

When the machine packs food, the whole process is synchronized by using advanced synchronous and cam controls. The high synchronization between the conveying roller axis and the sealing & cutting axis improves the packing accuracy, achieving high-quality production.





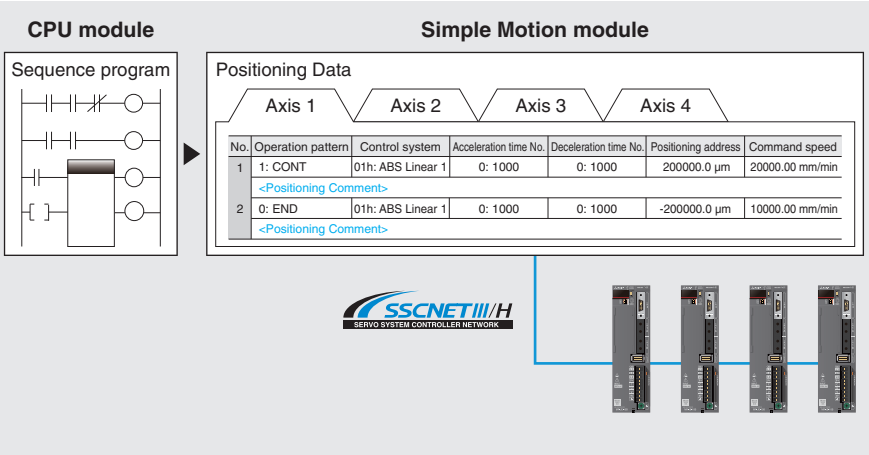
Features

Cutting-edge Technologies Packed in a Compact Module

➤ Basic Positioning Control

Positioning Control

Positioning control is easily performed with a sequence program starting positioning data of a point table.
To respond to extensive applications, various positioning controls are available: Linear interpolation, 2-axis circular interpolation, fixed-pitch feed, and continuous trajectory controls, etc.

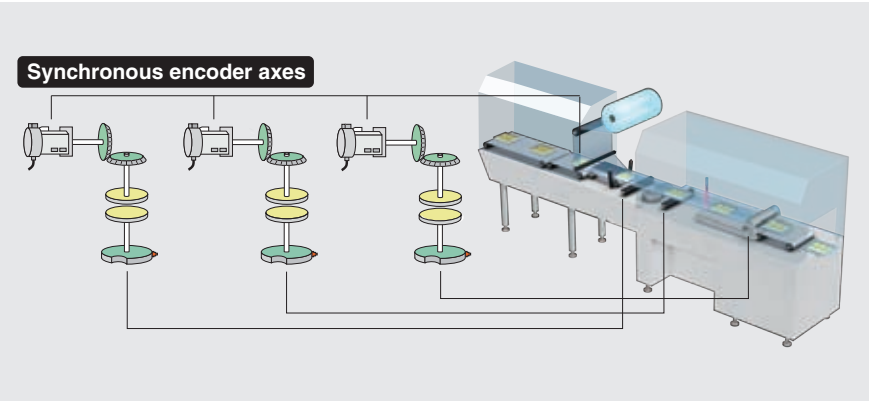


➤ Synchronous/Cam controls

Advanced Sync. | Cam Auto-Generation

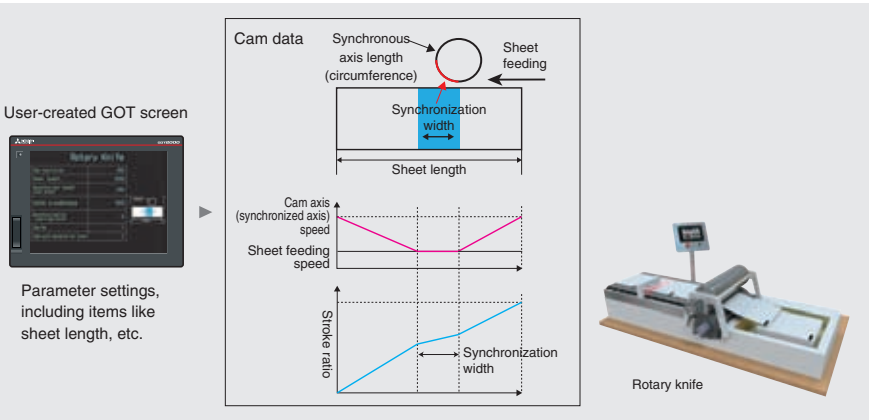
● Advanced synchronous control

The advanced synchronous control is the software-based control that can be used as an alternative to mechanical control such as gear, shaft, clutch, speed change gear, and cam.
The settings are easily made with parameters on MELSOFT GX Works3.
In addition, the output axes for the synchronous control are operated with a cam.



● Cam auto-generation

Cams for rotary knife can be generated automatically.
An ideal cam data can be created just by registering sheet length, synchronous width, and cam resolution to the specified device memory on GOT screen.

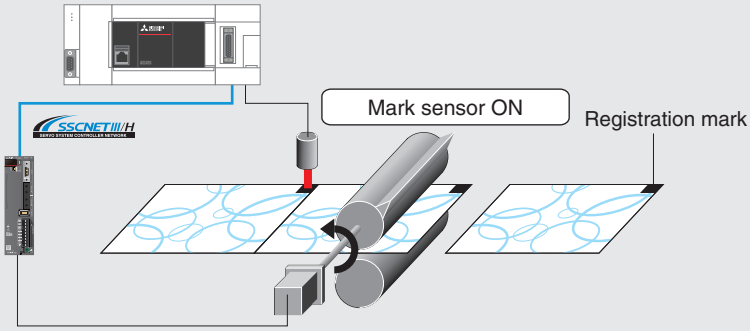


➤ Mark Detection Function

Mark Detection

The actual position of the servo motor can be obtained based on the inputs from the sensor that detects the registration marks printed on the high-speed moving film.
By compensating the cutter axis position errors based on those inputs from the sensor, the film can be cut at the set position.

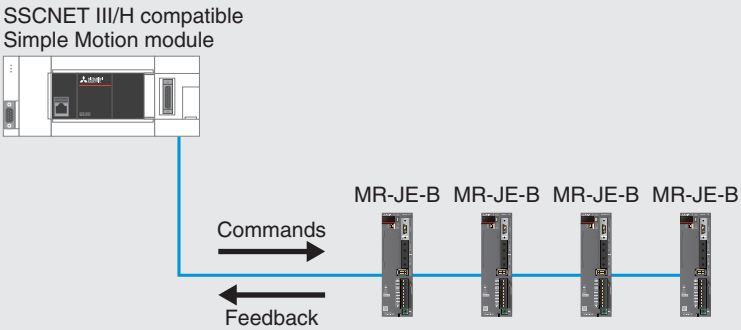
[Position compensation when the registration marks are being detected]



➤ Supporting the Servo High-speed Synchronous Network "SSCNET III/H"

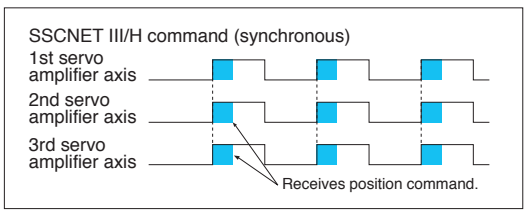
SSCNET III/H SERVO SYSTEM CONTROLLER NETWORK

Communication speed is increased to 150 Mbps full duplex (equivalent to 300 Mbps half duplex), three times faster than the conventional speed. Moreover, the network achieves faster system response, multiple-axis operation, and reduced wiring, contributing to improving machine performance further.



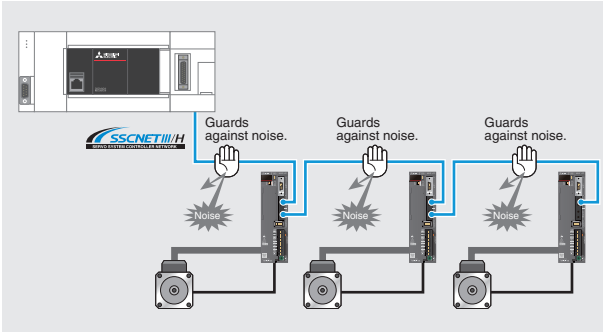
● Synchronous communication realizing a higher-performance machine

Complete deterministic and synchronized communication is achieved with SSCNET III/H, offering technical advantages in machines such as printing and food processing machines that require synchronous accuracy.



● No transmission collision

The fiber-optic cables thoroughly shut out noise that enters from the power cable or external devices. Noise tolerance is dramatically improved as compared to metal cables.



Easy point-and-click programming architecture

MELSOFT GX Works3

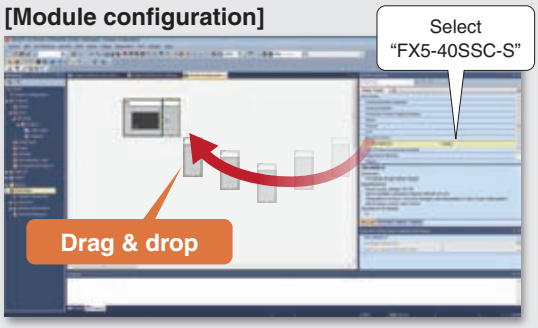
This software supports the whole product development cycle - creation, startup, debugging and maintenance of sequence programs, parameters, positioning/cam data.

➤ Designed for Efficiency and Ease of Use over a Whole Development Process

System configuration through point-and-click

A system can be configured just through drag and drop of a necessary module name from the list.

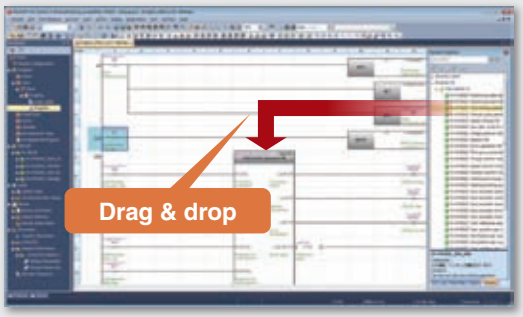
[Module configuration]



Easy programming using module FB Coming soon

A sequence program can be created through drag & drop of module FB to the editor.

[Sequence program]

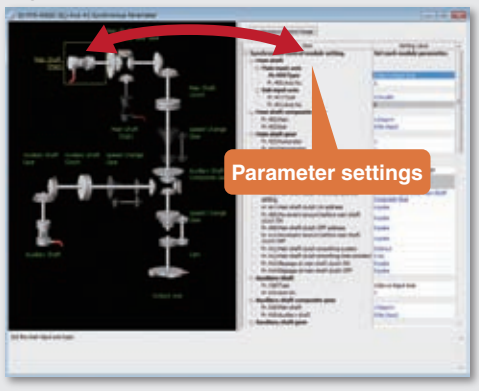


System design → Programming → Startup → Maintenance

Only parameter settings required

The synchronous control is achieved just by setting parameters with the graphical configuration screen for mechanical modules.

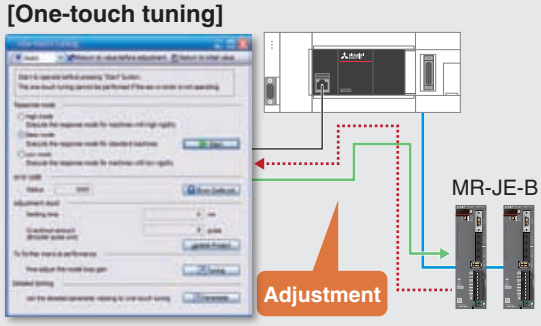
[Synchronous parameter]



Quick startup and adjustment

Servo amplifier settings and adjustment can be done without replugging the cables.

[One-touch tuning]



Reliable basic performance and advanced ease-of-use

MITSUBISHI SERVO AMPLIFIERS & MOTORS

MELSERVO-JE

Advanced ease-of-use without compromising high performance.
The reliable basic performance and the advanced servo gain adjustment boost machine performance further.

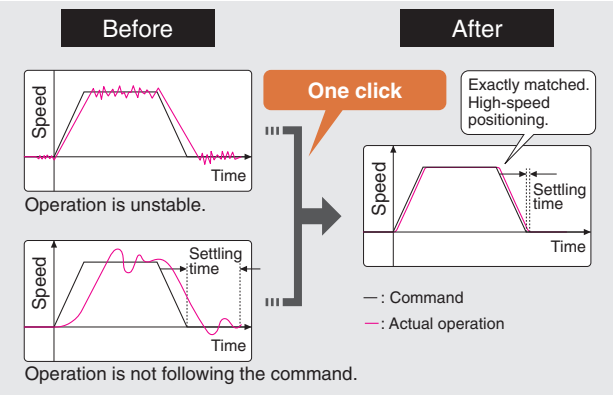
➤ Reliable Basic Performance

MELSERVO-JE series with class top-level basic performance enables shorter settling time and reduced tact time, boosting machine performance in combination with the Simple Motion module.

- Speed frequency response of 2.0 kHz
- High-resolution encoder of 131072 pulses/rev
- Dramatically reduced torque ripple during conduction
- Absolute position detection system configurable with ease
- Conformity to global standards (European EC directives, etc.)

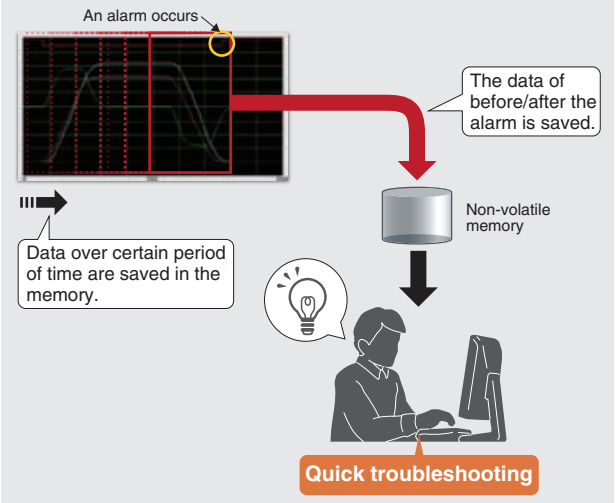
➤ Servo Gain Adjustment is Just a Click Away

Mitsubishi Electric's unique "Advanced one-touch tuning" enables servo gain adjustment with one-touch ease. Machine performance is utilized to the fullest using the advanced vibration suppression control function.



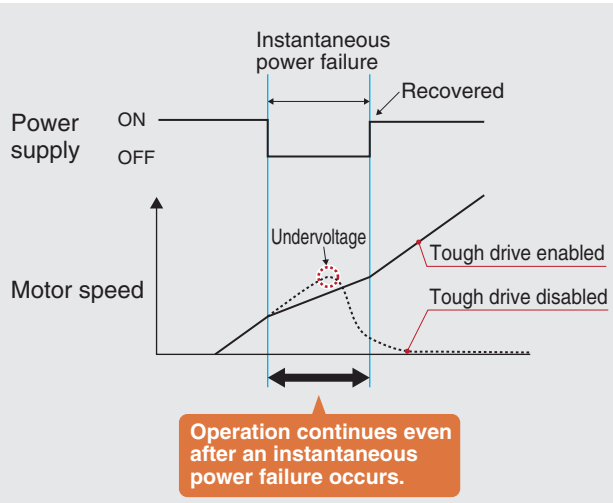
➤ Large-capacity Drive Recorder for Quick Troubleshooting

The drive recorder saves data of before/after the alarms in the non-volatile memory in the servo amplifier. This helps you investigate the condition of before/after the alarm in details through those data, enabling quick troubleshooting.

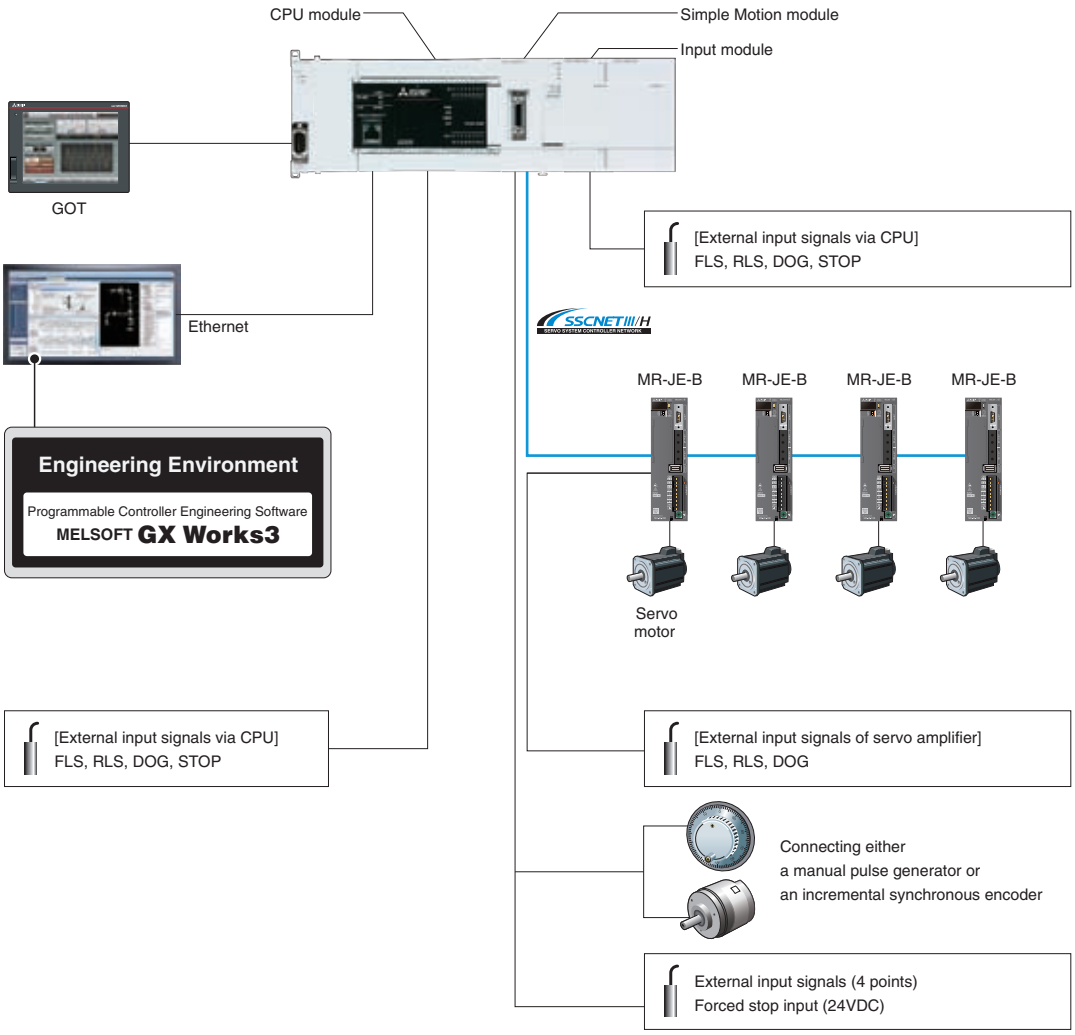


➤ Instantaneous Power Failure Tough Drive

When an instantaneous power failure is detected, this function allows the servo amplifier to use the electric energy charged in the main circuit capacitor in the servo amplifier to avoid an alarm occurrence, increasing the machine availability even with an unstable power supply.



System configuration



MELSEC iQ-F series product lineup

MELSEC iQ-F series

Expansion adapter (Up to 6 modules) | CPU modules | Expansion modules (Up to 16 modules)

●CPU modules

FX5U Terminal block type

FX5UC Connector type

●Expansion adapters

- Communication adapter (RS-232C, RS-485)
- Analog I/O adapter

●Expansion modules

- I/O module
- Intelligent function module (Simple Motion module, etc.)
- Connector conversion module
- Bus conversion module
- Extension power supply module

Control specifications

Item		Specifications
		FX5-40SSC-S
Number of control axes (Virtual servo amplifier axis included)		Up to 4 axes
Operation cycle		1.777ms
Interpolation function		Linear interpolation (Up to 4 axes), Circular interpolation (2 axes)
Control modes		PTP (Point To Point) control, Trajectory control (both linear and arc), 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	Input axis	Servo input axis, Synchronous encoder axis
	Output axis	Cam axis (Up to 4 axes)
Cam control	Number of cam registration	Up to 64 (depending on memory capacity, cam resolution and number of coordinates)
	Cam data type	Stroke ratio data type, Coordinate data type
	Cam auto-generation	Cam auto-generation for rotary knife
Control unit		mm, inch, degree, pulse
Number of positioning data		600 data (positioning data No. 1 to 600)/axis (Can be set with MELSOFT GX Works3 or a sequence program.)
Backup		Parameters, positioning data, and block start data can be saved on flash ROM (battery-less backup)
Home position return	Home position return method	Proximity dog method, Count method 1, Count method 2, Data set method, Scale home position signal detection method
	Fast home position return control	Provided
	Sub functions	Home position return retry, Home position shift
Positioning control	Linear control	1-axis linear control, 2-axis linear interpolation control, 3-axis linear interpolation control, 4-axis linear interpolation control (Note-1) (Composite speed, Reference axis speed)
	Fixed-pitch feed control	1-axis fixed-pitch feed, 2-axis fixed-pitch feed, 3-axis fixed-pitch feed, 4-axis fixed-pitch feed
	2-axis circular interpolation	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
	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 a battery to servo amplifier
Synchronous encoder interface		Up to 4 channels (Total of the internal interface, via PLC CPU interface, and servo amplifier interface (Note-3))
	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	1 to 300 [%]
	Acceleration/deceleration time change function	Provided
	Torque change function	Provided
	Target position change function	Target position address and speed 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
Parameter initialization function		Provided
External input signal setting function		Via CPU, Via servo amplifier (Note-3)
Amplifier-less operation function		Provided
Mark detection function		Regular mode, Specified Number of Detections mode, Ring Buffer mode
	Mark detection signal	Up to 4 points
	Mark detection setting	16 settings
Optional data monitor function		4 points/axis
Driver communication function		Provided (Note-3)
SSCNET connect/disconnect function		Provided
Digital oscilloscope function (Note-2)	Bit data	16 channels
	Word data	16 channels

(Note-1): 4-axis linear interpolation control is enabled only at the reference axis speed.
(Note-2): 8CH word data and 8CH bit data can be displayed in real time.
(Note-3): Available only when the MR-J4-B servo amplifiers are connected.

Module specifications

Item			Specifications
			FX5-40SSC-S
Number of control axes (Virtual servo amplifier axis included)			Up to 4 axes
Servo amplifier connection method			SSCNET III/H
Maximum overall cable distance [m(ft.)]			400 (1312.32)
Maximum distance between stations [m(ft.)]			100 (328.08)
Peripheral I/F			Via CPU module (Ethernet)
Manual pulse generator operation function			Possible to connect 1 module
Synchronous encoder operation function			Possible to connect 4 modules (Total of the internal interface, via PLC CPU interface, and servo amplifier interface (Note-1))
Input signals (DI)	Number of input points		4 points
	Input method		Positive common/Negative common shared (Photocoupler isolation)
	Rated input voltage/current		24 VDC/ Approx. 5 mA
	Operating voltage range		19.2 to 26.4 VDC (24 VDC +10%/-20%, ripple ratio 5% or less)
	ON voltage/current		17.5 VDC or more/ 3.5 mA or more
	OFF voltage/current		7 VDC or less/ 1.0 mA or less
	Input resistance		Approx. 6.8 kΩ
	Response time		1 ms or less (OFF→ON, ON→OFF)
	Recommended wire size		AWG24 (0.2 mm^2)
Forced stop input signal (EMI)	Number of input points		1 point
	Input method		Positive common/Negative common shared (Photocoupler isolation)
	Rated input voltage/current		24 VDC/ Approx. 5 mA
	Operating voltage range		19.2 to 26.4 VDC (24 VDC +10%/-20%, ripple ratio 5% or less)
	ON voltage/current		17.5 VDC or more/ 3.5 mA or more
	OFF voltage/current		7 VDC or less/ 1.0 mA or less
	Input resistance		Approx. 6.8 kΩ
	Response time		4 ms or less (OFF→ON, ON→OFF)
	Recommended wire size		AWG24 (0.2 mm^2)
Signal input form			Phase A/Phase B (magnification by 4/magnification by 2/ magnification by 1), PULSE/SIGN
Manual pulse generator/ Incremental synchronous encoder signal	Differential output type (26LS31 or equivalent)	Input pulse frequency	Up to 1 Mpulse/s (After magnification by 4, up to 4 Mpulse/s)
		Pulse width	1 µs or more
		Leading edge/ trailing edge time	0.25 µs or less
		Phase difference	0.25 µs or more
		Rated input voltage	5.5 VDC or less
		High/Low-voltage	2.0 to 5.25 VDC/0 to 0.8 VDC
		Differential voltage	±0.2V
		Cable length	Up to 30 m (98.43ft.)
	Voltage-output/ Open-collector type (5 VDC)	Input pulse frequency	Up to 200 kpulse/s (After magnification by 4, up to 800 kpulse/s)
		Pulse width	5 µs or more
		Leading edge/ trailing edge time	1.2 µs or less
		Phase difference	1.2 µs or more
		Rated input voltage	5.5 VDC or less
		High/Low-voltage	3.0 to 5.25 VDC/2 mA or less, 0 to 1.0 VDC/5 mA or more
		Cable length	Up to 10m (32.81ft.)
24 VDC internal current consumption [A]			0.25
Mass [kg]			0.30
Exterior dimensions [mm(inch)]			90.0 (3.55)(H) × 50.0 (1.97)(W) × 83.0 (3.27)(D)

(Note-1): Available only when the MR-J4-B servo amplifiers are connected.

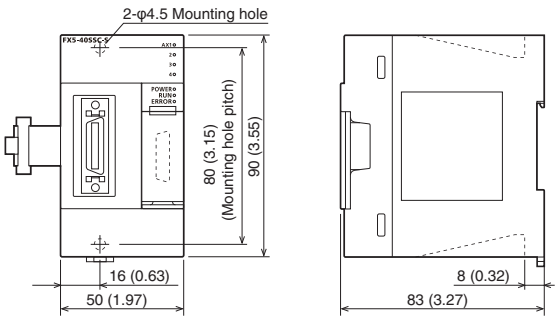
Applicable CPU

PLC CPU	FX5U, FX5UC

Exterior dimensions

Simple Motion module

FX5-40SSC-S



Unit: mm (inch)

Component

Simple Motion dedicated equipment

Item	Model	Specifications			Standards
Simple Motion module	FX5-40SSC-S	Up to 4 axes			CE, UL, KC
Internal I/F connector set	LD77MHIOCON	Incremental synchronous encoder/Mark detection signal interface connector set			–
SSCNET III cable	MR-J3BUS_M	• FX5-40SSC-S⇔Servo amplifier • Servo amplifier⇔Servo amplifier	Standard code for inside panel	0.15m (0.49ft.), 0.3m (0.98ft.), 0.5m (1.64ft.), 1m (3.28ft.), 3m (9.84ft.)	–
	MR-J3BUS_M-A		Standard code for outside panel	5m (16.40ft.), 10m (32.81ft.), 20m (65.62ft.)	–
	MR-J3BUS_M-B		Long distance cable	30m (98.43ft.), 40m (131.23ft.), 50m (164.04ft.)	–
Manual pulse generator	MR-HDP01	Number of pulses per revolution: 25pulse/rev (100pulse/rev after magnification by 4), Permitted speed: 200r/min (Normal rotation)			–

Servo amplifiers

Model	Description
MR-JE-B	SSCNET III/H compatible servo amplifier rated output: 0.1 to 3kW
MR-J4-B(-RJ)	SSCNET III/H compatible servo amplifier rated output: 0.1 to 55kW
MR-J4W2-B	SSCNET III/H 2-axis servo amplifier rated output: 0.2 to 1kW
MR-J4W3-B	SSCNET III/H 3-axis servo amplifier rated output: 0.2 to 0.4kW

(Note): Only the rotary servo motors are supported.

Engineering environment

Engineering software list

Product	Model	Description		Version
MELSOFT GX Works3	SW1DND-GXW3-E	Sequence program creation, FX5-40SSC-S settings	DVD-ROM	1.007H or later
MELSOFT iQ Works	SW2DND-IQWK-E	FA Engineering Software (Note-1) • System Management Software [MELSOFT Navigator] • Programmable Controller Engineering Software [MELSOFT GX Works3] • Motion Controller Engineering Software [MELSOFT MT Works2] • Screen Design Software [MELSOFT GT Works3] • Robot Total Engineering Support Software [MELSOFT RT ToolBox2 mini] • Inverter Setup Software [MELSOFT FR Configurator2]	DVD-ROM	–

(Note-1): Refer to each product manual for software needed for the model.

Operating environment

Item	Description
OS	Microsoft® Windows® 8.1 (64bit/32bit), Microsoft® Windows® 8.1 (Enterprise, Pro) (64bit/32bit) Microsoft® Windows® 8 (64bit/32bit), Microsoft® Windows® 8 (Enterprise, Pro) (64bit/32bit) Microsoft® Windows® 7 (Enterprise, Ultimate, Professional, Home Premium, Starter) (64bit/32bit) Microsoft® Windows Vista® (Enterprise, Ultimate, Business, Home Premium, Home Basic) (32bit) Microsoft® Windows® XP Service Pack3 or later (Professional, Home Edition) (32bit)
CPU	Intel® Core™2 Duo 2 GHz or more recommended
Required memory	For 32-bit edition: 1GB or more recommended For 64-bit edition: 2GB or more recommended
Available hard disk capacity	When installing MELSOFT GX Works3: HDD available capacity is 5GB or more.
Optical drive	DVD-ROM supported disk drive
Monitor	Resolution 1024 × 768 dots or higher

⚠ Safety Warning

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

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

ISO 14001 JACO JAPAN AUDIT AND CERTIFICATION ORGANIZATION FOR ENVIRONMENT AND QUALITY
EC97J1113

UKAS MANAGEMENT SYSTEMS
051

ISO 9001
BUREAU VERITAS Certification

BUREAU VERITAS 1828

UKAS MANAGEMENT SYSTEMS
008

MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE: TOKYO BUILDING, 2-7-3, MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN
NAGOYA WORKS: 1-14, YADA-MINAMI 5, HIGASHI-KU, NAGOYA, JAPAN

IP(1501)

New publication, effective January 2015.
Specifications are subject to change without notice.