for a greener tomorrow

MITSUBISHI ELECTRIC
Changes for the Better

General-Purpose AC Servo MELSERVO-J4 Series CC-Link IE Field Network Servo Amplifier MR-J4-GF(-RJ) 11 kW to 22 kW

January 2017

New Product Release
SV1701-2E

Positioning functions including indexer (turret) method and simple cam function are now available with MR-J4-GF(-RJ)

Ver.UP Expanded Functions *1

- Indexer (turret) method is newly added, enabling positioning by specifying stations. (up to 255 stations)
- MR-J4-GF-RJ supports MR-D30 functional safety unit*2 and the servo motors with functional safety. The safety level is increased to Category 4 PL e, SIL 3.
- The simple cam function is newly added, enabling simple cam operation by a combination with a master module including RJ71GF11-T2.
- Machine failure prediction function is now available. Failure can be predicted from frictions, vibrations, and total travel distance, and informed with a warning for preventive maintenance.

*1. Use MR-J4-GF(-RJ) servo amplifiers with software version A3 or later.
*2. Use MR-D30 functional safety units with software version A1 or later.

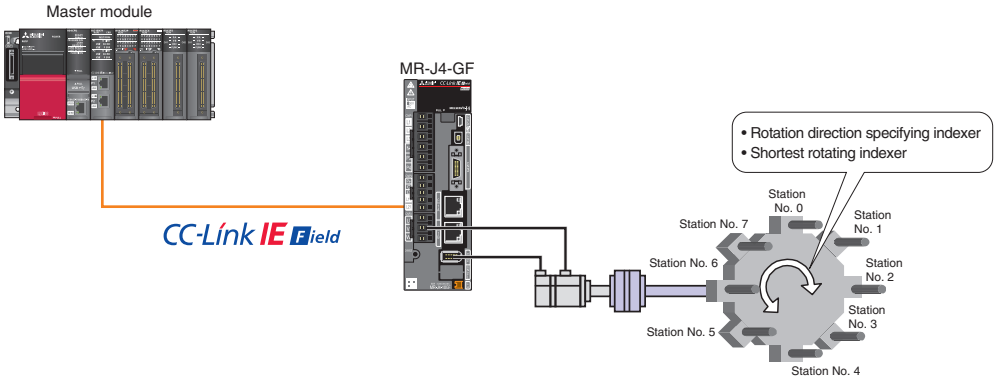
NEW Expanded Capacities

- Capacity range of the servo amplifiers is expanded by including 11 kW, 15 kW, and 22 kW. Its product lines cover 0.1 kW to 22 kW in the 200 V class and 0.6 kW to 22 kW in the 400 V class.

Automatic calculation of travel distance with parameter setting of the number of stations

Indexer (Turret) Method

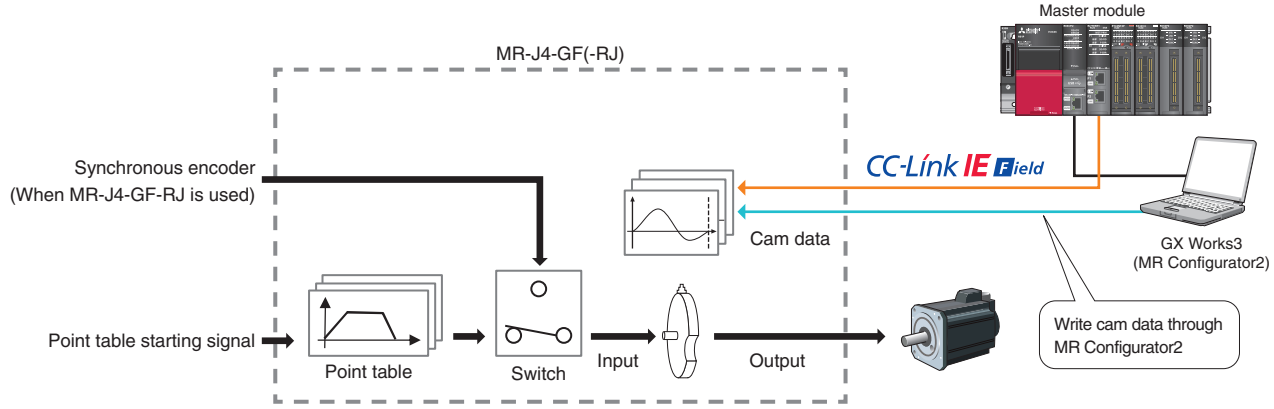
The indexer (turret) method with rotation direction specifying indexer and shortest rotating indexer is now available in addition to the point table method of the built-in positioning function. The travel distance will be calculated automatically based on the number of stations and the number of gear teeth on the motor and machine sides set in parameters. The positioning operation is performed with a start signal after the station position No. is selected.



Creating a cam with the built-in cam function of the servo amplifier

Simple Cam Function by a Combination with a Master Module

With a master module such as RJ71GF11-T2, the simple cam function enables software-based synchronous control as an alternative to mechanical control using a cam mechanism. With this function, various cam patterns can be created with MR Configurator2. The point table data is used as input to the simple cam, and commands are outputted to the servo motor based on the cam data. With MR-J4-GF-RJ, a synchronous encoder can also be inputted to the simple cam.



Simple Cam Specifications

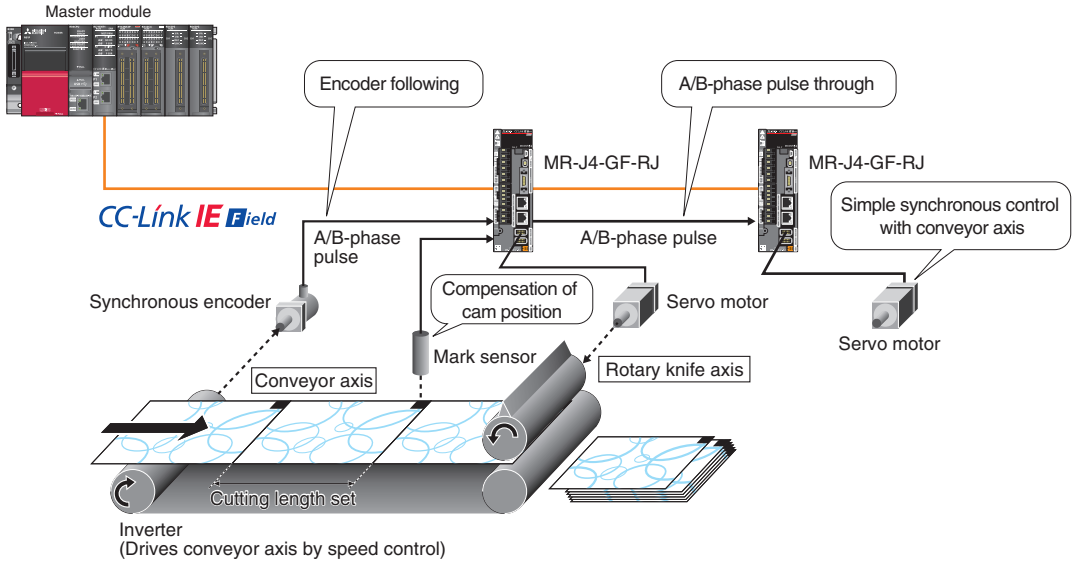
Item			Description
Memory capacity	Storage area for cam data		8 Kbytes (non-volatile memory)
	Working area for cam data		8 Kbytes (RAM)
Number of registration			Maximum 8 (depending on cam resolution and coordinate number)
Comment			Maximum 32 single-byte characters for each cam data
Cam data	Stroke ratio data type	Cam resolution (Maximum number of registration)	256 (8), 512 (4), 1024 (2), 2048 (1)
		Stroke ratio	-100.000% to 100.000%
	Coordinate data type	Coordinate number (Maximum number of registration)	2 to 1024 Example: 128 (8), 256 (4), 512 (2), 1024 (1)
		Coordinate data	Input value: 0 to 999999 Output value: -999999 to 999999
Cam curve			12 types (constant speed/constant acceleration/5th curve/single hypotenuse/ cycloid/distorted trapezoid/distorted sine/distorted constant speed/trapecloid/reverse trapecloid/double hypotenuse/reverse double hypotenuse)

When more advanced cam control is required, such as synchronous control and cam auto-generation, use RD77GF or QD77GF Simple Motion module as a master module.

Simple synchronous control with MR-J4-GF-RJ

Encoder Following Function, A/B-phase Pulse Input Through Function, and Mark Sensor Input Compensation Function

With the encoder following function, the servo amplifier receives A/B-phase output signals from a synchronous encoder as command pulses to drive the servo motor. Together with the simple cam function, setting cam data corresponding to sheet length, a circumference of a rotary knife axis, and synchronous section of the sheet enables a system having a conveyor axis and a rotary knife axis synchronized.
The A/B-phase pulse input through function allows the first axis to output A/B-phase pulses which are received from the synchronous encoder to the next axis, enabling a system in which the second and later axes are synchronized with the synchronous encoder.
The mark sensor input compensation function corrects the cam position of the rotary knife axis when there is a deviation between the target and current positions. For example, if expansion or contraction of a sheet causes such position deviation, the cam position will be corrected for proper processing.



When high-accuracy synchronous control is required, use RD77GF or QD77GF Simple Motion module as a master module, and execute motion control.

Efficient development and reduction of maintenance time with PLCopen Motion Control Function Block

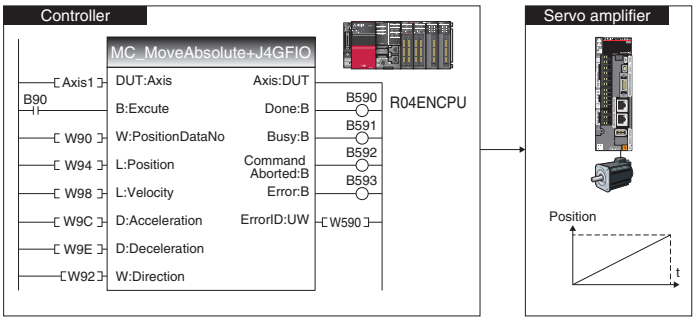
PLCopen® Function Block

PLCopen Motion Control Function Block having standardized interface offers the following advantages:

- Saving time and cost by reducing the burden of programming
- Reducing maintenance time as it is easy to understand the programs even for non-programmers

[Example: absolute positioning]
Equipment: R04ENCPU + MR-J4-GF
Function block: MC_MoveAbsolute + J4GFIO

Positioning operation is executed based on the target absolute position of the specified axis.



PLCopen Motion Control Function Block is available for free download. Contact your local sales office for more details.
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CC-Link IE Field Network Servo Amplifier MR-J4-GF(-RJ)

Higher safety level with a combination of MR-J4-GF-RJ and MR-D30 functional safety unit

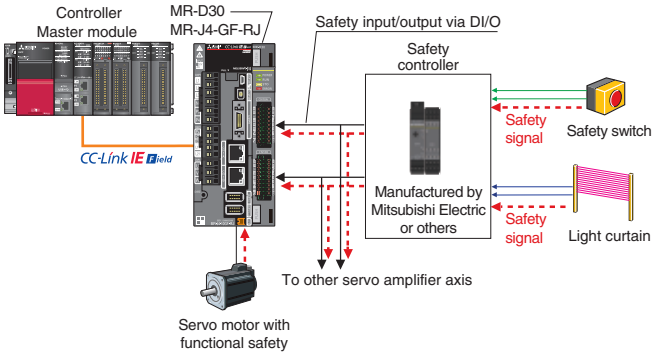
Achieving Category 4 PL e, SIL 3

● By wiring to MR-D30 functional safety unit

Category 4 PL e, SIL 3 is achieved when the safety signals are inputted directly to MR-D30 functional safety unit*3.
The safety observation function is operated on the MR-D30 by parameter setting, and therefore expansion of the safety observation function is possible independent of controllers.

IEC/EN 61800-5-2:2007 function	Safety level
STO (Safe torque off)	Category 4 PL e, SIL 3
SS1 (Safe stop 1)	
SS2 (Safe stop 2)*1	
SOS (Safe operating stop)*1	
SLS (Safely-limited speed)*2	
SBC (Safe brake control)	
SSM (Safe speed monitor)*2	

*1. SS2 and SOS are achievable with the use of the servo motor with functional safety.
*2. The safety level would be Category 3 PL d, SIL 2 when the servo motor with functional safety is not used.
*3. Use MR-D30 with software version A1 or later.



● By CC-Link IE Field Network

Available soon

Safety signals are monitored by a combination of the safety CPU and RD77GF Simple Motion module. The safety CPU checks the safety signals received via the safety remote I/O module and outputs the safety signals (STO, etc.) to the servo amplifiers. Since the safety signals are outputted through CC-Link IE Field Network, wiring of the safety signals to each functional safety unit are not necessary.

IEC/EN 61800-5-2:2007 function	Safety level
STO (Safe torque off)	Category 4 PL e, SIL 3
SS1 (Safe stop 1)	
SS2 (Safe stop 2)*1	
SOS (Safe operating stop)*1	
SLS (Safely-limited speed)*2	
SBC (Safe brake control)	
SSM (Safe speed monitor)*2	

*1. SS2 and SOS are achievable with the use of the servo motor with functional safety.
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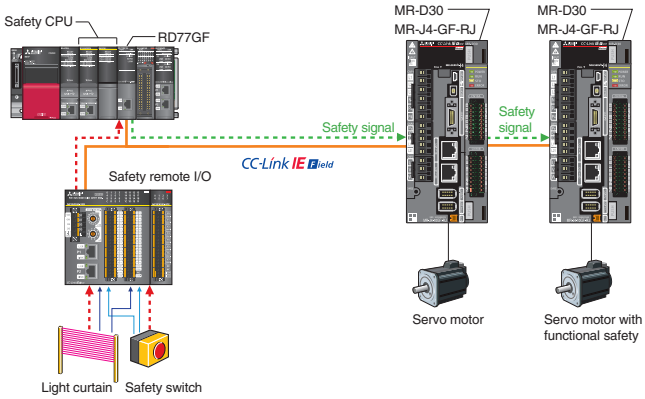
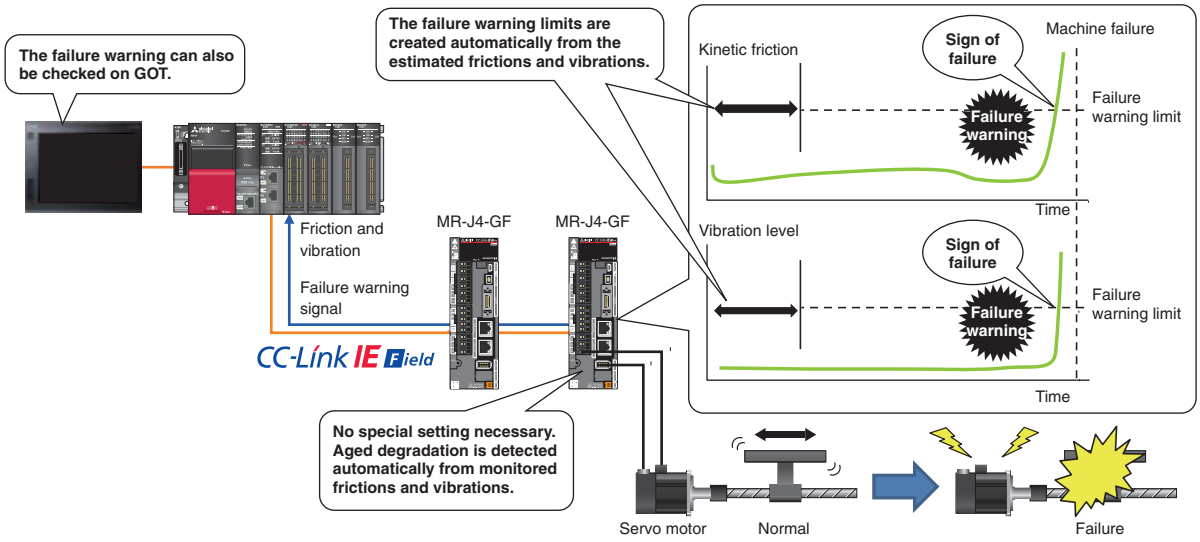


Preventive maintenance by monitoring operation

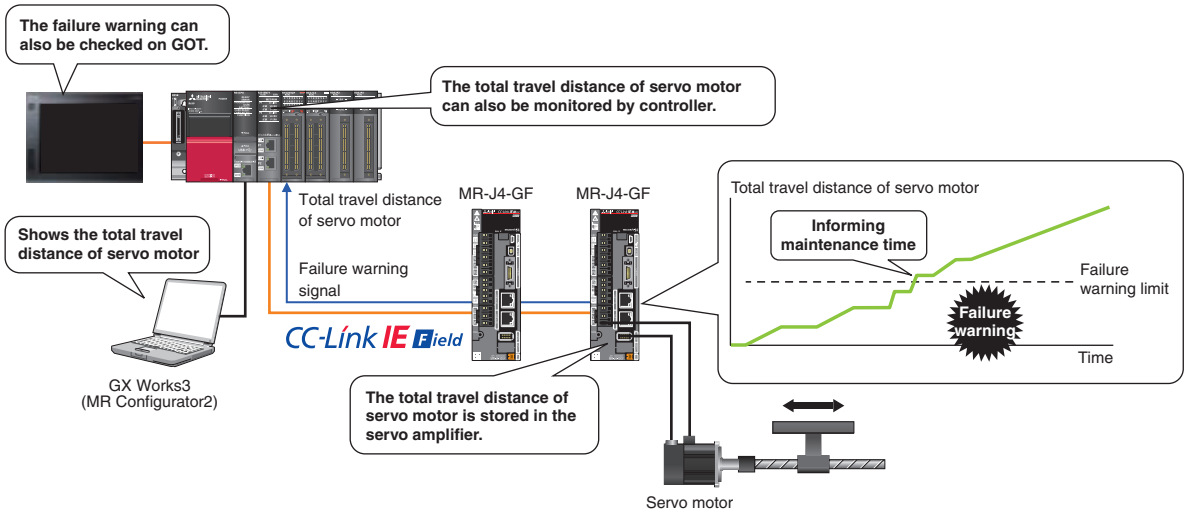
Failure Prediction Function

Patent pending

A failure prediction function is newly available for predictive maintenance, helping you detect signs of performance degradation in a machine prior to failure without a periodical inspection of frictions and vibrations.
With this function, the servo amplifier detects and predicts aging-related changes in a machine performance, based on the frictions and vibrations monitored by the machine diagnosis function, and informs the maintenance time with a warning. Periodical programs and determination values created for maintenance of each machine is no longer needed.



The servo amplifier also predicts machine failure based on the total travel distance of the servo motor. The maintenance time will be informed with a warning when the total travel distance exceeds the failure warning limit set by you. When the limit is set to the rated life of a ball screw or bearing, preventive maintenance can be executed according to the actual machine operation.



The failure prediction function is available with MR-J4-GF servo amplifiers with software version A3 or later. The failure prediction function does not guarantee that a warning is outputted before every failure. If the machine receives an external impact, the machine may break down before a warning is given by the failure prediction function. When you need to know the machine failure more precisely, it is recommended that you compare the friction and vibration values of when the warning was given and of when the operation was started. The friction and vibration values are monitored by the machine diagnosis function.

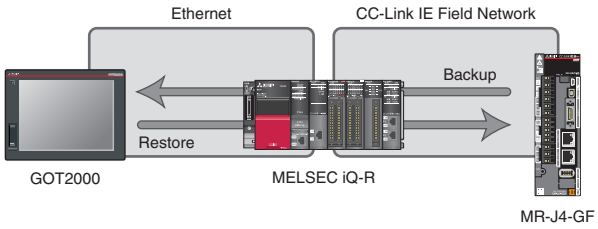
CC-Link IE Field Network Servo Amplifier MR-J4-GF(-RJ)

Protecting your data - parameters, point table, and simple cam data

GOT Drive

Backup/Restore by GOT

Backup the data such as parameters, point table, and simple cam data of the servo amplifier onto the GOT's memory card or USB memory. The backed up data in the GOT can be restored back to the servo amplifier. Sequence programs and data from other modules such as FR-A800 inverters can also be backed up and restored by GOT via CC-Link IE Field to protect the whole system.



A diverse range of network-supported master stations

Supported Master Stations

The MR-J4-GF servo amplifier supports various master stations including Easy-to-use Positioning modules, Motion modules for synchronous control, and personal computer embedded type Simple Motion board, being suitable for a wide variety of machines.

R120ENCPU

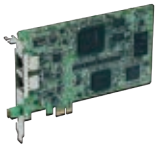
CC-Link IE embedded CPU

QJ71GF11-T2
RJ71GF11-T2　　LJ71GF11-T2

CC-Link IE Field Network master/local module

RD77GF　QD77GF

CC-Link IE Field Network Simple Motion module



MR-EM340GF

CC-Link IE Simple Motion Board

For global use

Compliance with Global Standards and Regulations

MELSERVO-J4 series complies with global standards.

Servo amplifier

European EC directive	Low voltage directive	EN 61800-5-1
	EMC directive	EN 61800-3 Category C3
	Machine directive	EN ISO 13849-1 Category 3 PL e/ EN 62061 SIL CL 3 / EN 61800-5-2
	RoHS directive	Compliant
UL standard		UL 508C
CSA standard		CSA C22.2 No.14
Measures for Administration of the Pollution Control of Electronic Information Products (Chinese RoHS)		Compliant
China Compulsory Certification (CCC)		N/A
Korea Radio Wave Law (KC)		Compliant
Certification system of the Eurasian Economic Union (EAC)		Compliant

Model Designation

M R - J 4 - 1 1 K G F -

Mitsubishi Electric general-purpose AC servo amplifier MELSERVO-J4 Series

Symbol	Power supply
None	3-phase 200 V AC
4	3-phase 400 V AC

Symbol	Interface
GF	CC-Link IE Field

Symbol	Rated output [kW]
11K	11
15K	15
22K	22

Symbol	Special specification
None	Standard
RJ	Fully closed loop control four-wire type/ load-side encoder A/B/Z-phase input compatible/ Functional safety unit compatible (Note 4)/ DC power input type (Note 2)
PX	Without an enclosed regenerative resistor (Note 1)
RZ	MR-J4-_GF_-RJ without an enclosed regenerative resistor (Note 1)
EB	Special coating specification (3C2) (Note 3)
KS	MR-J4-_GF_-RJ with a special coating specification (3C2) (Note 3)

Notes: 1. A regenerative resistor (standard accessory) is not enclosed. Refer to "MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)" for details.
2. Available only with 200 V.
3. The special coating (JIS C60721-3-3/IEC 60721-3-3 classification 3C2) is applied to the circuit board. Refer to "MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)" for details.
4. Use MR-D30 functional safety unit and MR-J4-GF-RJ servo amplifier with the following software version to execute the safety observation function control.

• Safety observation function control by input device

MR-D30 software version	Servo amplifier software version	Safety observation function (IEC/EN 61800-5-2)	Servo motor with functional safety
A1 or later	A3 or later	STO/SS1/SBC/SLS/SSM/SOS/SS2	Usable

• Safety observation function control by network (available in the future)

MR-D30 software version	Servo amplifier software version	Safety observation function (IEC/EN 61800-5-2)	Servo motor with functional safety
Undecided	Undecided	STO/SS1/SBC/SLS/SSM/SOS/SS2	Usable

Combinations of Servo Amplifier and Servo Motor

Servo amplifier	Rotary Servo Motors (Note 2)	Linear servo motor (primary side) (Note 1, 2)	Direct drive motor (Note 2)
MR-J4-11KGF(-RJ)	HG-JR903, 801, 12K1, 11K1M	LM-FP4F-36M-1SS0	-
MR-J4-15KGF(-RJ)	HG-JR15K1, 15K1M	LM-FP4H-48M-1SS0	-
MR-J4-22KGF(-RJ)	HG-JR20K1, 25K1, 22K1M	-	-
MR-J4-11KGF4(-RJ)	HG-JR9034, 8014, 12K14, 11K1M4	-	-
MR-J4-15KGF4(-RJ)	HG-JR15K14, 15K1M4	-	-
MR-J4-22KGF4(-RJ)	HG-JR20K14, 25K14, 22K1M4	LM-FP5H-60M-1SS0	-

Notes: 1. Models of the linear servo motor primary side are listed in this page. For compatible models of the secondary side, refer to "MELSERVO-J4 Catalog (L(NA)03058)".
2. Refer to "MELSERVO-J4 catalog (L(NA)03058)" for specifications and dimensions of the servo motors.

Combinations of Servo Amplifier and Servo Motor with Functional Safety

The safety observation function can be expanded with a combination of the servo motor with functional safety, MR-J4-GF-RJ servo amplifiers, and MR-D30 functional safety unit.

Servo amplifier	Servo motor with functional safety
MR-J4-10GF-RJ	HG-KR053W0C, 13W0C
MR-J4-20GF-RJ	HG-KR23W0C
MR-J4-40GF-RJ	HG-KR43W0C
MR-J4-60GF-RJ	HG-SR51W0C, 52W0C HG-JR53W0C
MR-J4-70GF-RJ	HG-KR73W0C HG-JR73W0C
MR-J4-100GF-RJ	HG-SR81W0C, 102W0C HG-JR53W0C (Note 1), 103W0C
MR-J4-200GF-RJ	HG-SR121W0C, 201W0C, 152W0C, 202W0C HG-JR73W0C (Note 1), 103W0C (Note 1), 153W0C, 203W0C
MR-J4-350GF-RJ	HG-SR301W0C, 352W0C HG-JR153W0C (Note 1), 203W0C (Note 1), 353W0C
MR-J4-500GF-RJ	HG-SR421W0C, 502W0C HG-JR353W0C (Note 1), 503W0C
MR-J4-700GF-RJ	HG-SR702W0C HG-JR503W0C (Note 1), 703W0C, 701MW0C
MR-J4-11KGF-RJ	HG-JR903W0C, 11K1MW0C
MR-J4-15KGF-RJ	HG-JR15K1MW0C
MR-J4-22KGF-RJ	HG-JR22K1MW0C

Servo amplifier	Servo motor with functional safety
MR-J4-60GF4-RJ	HG-SR524W0C HG-JR534W0C
MR-J4-100GF4-RJ	HG-SR1024W0C HG-JR534W0C (Note 1), 734W0C, 1034W0C
MR-J4-200GF4-RJ	HG-SR1524W0C, 2024W0C HG-JR734W0C (Note 1), 1034W0C (Note 1), 1534W0C, 2034W0C
MR-J4-350GF4-RJ	HG-SR3524W0C HG-JR1534W0C (Note 1), 2034W0C (Note 1), 3534W0C
MR-J4-500GF4-RJ	HG-SR5024W0C HG-JR3534W0C (Note 1), 5034W0C
MR-J4-700GF4-RJ	HG-SR7024W0C HG-JR5034W0C (Note 1), 7034W0C, 701M4W0C
MR-J4-11KGF4-RJ	HG-JR9034W0C, 11K1M4W0C
MR-J4-15KGF4-RJ	HG-JR15K1M4W0C
MR-J4-22KGF4-RJ	HG-JR22K1M4W0C

Notes: 1. The maximum torque can be increased from 300% to 400% of the rated torque with this combination.

MR-J4-GF(4)/MR-J4-GF(4)-RJ
(CC-Link IE Field Network interface) Specifications

Servo amplifier model MR-J4-_(-RJ)			200 V			400 V		
			11KGF	15KGF	22KGF	11KGF4	15KGF4	22KGF4
Output	Rated voltage		3-phase 170 V AC			3-phase 323 V AC		
	Rated current	[A]	68.0	87.0	126.0	32.0	41.0	63.0
Main circuit power supply input	Voltage/ frequency (Note 1)	AC input	3-phase 200 V AC to 240 V AC, 50 Hz/60 Hz			3-phase 380 V AC to 480 V AC, 50 Hz/60 Hz		
		DC input (Note 10)	283 V DC to 340 V DC			-		
	Rated current	[A]	46.0	64.0	95.0	23.1	31.8	47.6
	Permissible voltage fluctuation	AC input	3-phase 170 V AC to 264 V AC			3-phase 323 V AC to 528 V AC		
		DC input (Note 10)	241 V DC to 374 V DC			-		
	Permissible frequency fluctuation		±5% maximum					
Control circuit power supply input	Voltage/ frequency	AC input	1-phase 200 V AC to 240 V AC, 50 Hz/60 Hz			1-phase 380 V AC to 480 V AC, 50 Hz/60 Hz		
		DC input (Note 10)	283 V DC to 340 V DC			-		
	Rated current	[A]	0.3			0.2		
	Permissible voltage fluctuation	AC input	1-phase 170 V AC to 264 V AC			1-phase 323 V AC to 528 V AC		
		DC input (Note 10)	241 V DC to 374 V DC			-		
	Permissible frequency fluctuation		±5% maximum					
	Power consumption	[W]	45					
Interface power supply			24 V DC ± 10% (required current capacity: 0.3 A (including CN8 connector signals))					
Control method			Sine-wave PWM control/current control method					
Permissible regenerative power	Built-in regenerative resistor	[W]	-	-	-	-	-	-
	External regenerative resistor (standard accessory) (Note 7, 8)	[W]	500 (800)	850 (1300)	850 (1300)	500 (800)	850 (1300)	850 (1300)
Dynamic Brake (Note 2)			External option (Note 4)					
CC-Link IE Field communication cycle (Note 6)			0.5 ms, 1.0 ms, 2.0 ms, 4.0 ms					
Communication function			USB: Connect a personal computer (MR Configurator2 compatible)					
Encoder output pulse			Compatible (A/B/Z-phase pulse)					
Analog monitor			2 channels					
Positioning mode			Point table method, indexer (turret) method					
Fully closed loop control	MR-J4-GF(4)		Two-wire type communication method					
	MR-J4-GF(4)-RJ		Two-wire/four-wire type communication method					
Load-side encoder interface	MR-J4-GF(4)		Mitsubishi Electric high-speed serial communication					
	MR-J4-GF(4)-RJ		Mitsubishi Electric high-speed serial communication, A/B/Z-phase differential input signal					
Servo functions			Advanced vibration suppression control II, adaptive filter II, robust filter, auto tuning, one-touch tuning, tough drive function, drive recorder function, machine diagnosis function (including failure prediction), power monitoring function, scale measurement function, super trace control, lost motion compensation					
Protective functions			Overcurrent shut-off, regenerative overvoltage shut-off, overload shut-off (electronic thermal), servo motor overheat protection, encoder error protection, regenerative error protection, undervoltage protection, instantaneous power failure protection, overspeed protection, error excessive protection, magnetic pole detection protection, linear servo control fault protection					

MR-J4-GF(4)/MR-J4-GF(4)-RJ
(CC-Link IE Field Network interface) Specifications

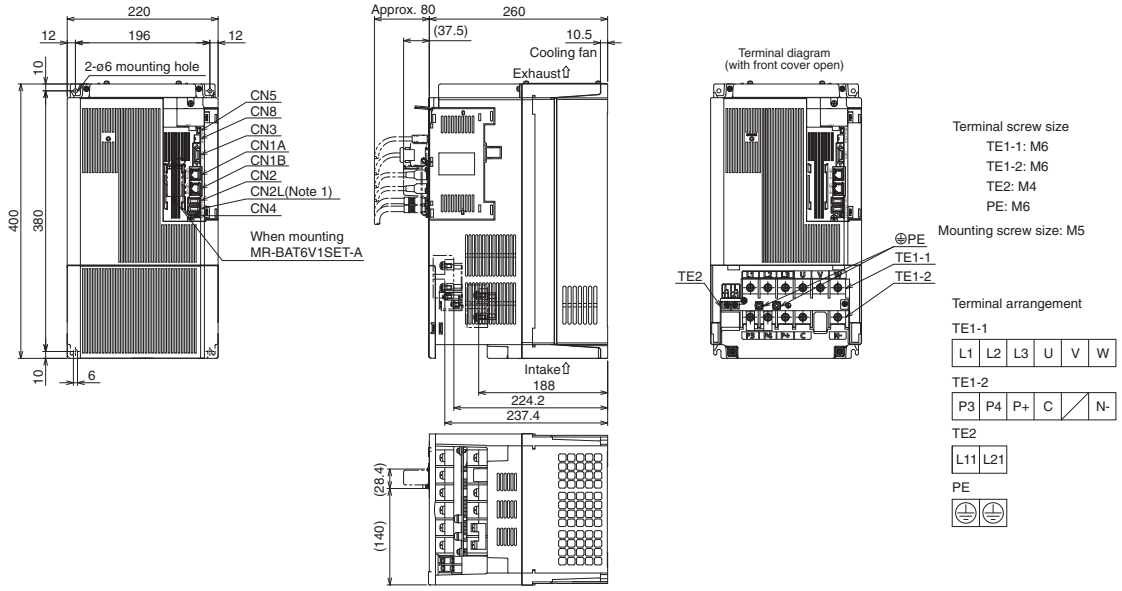
Servo amplifier model MR-J4-_(-RJ)		200 V			400 V		
		11KGF	15KGF	22KGF	11KGF4	15KGF4	22KGF4
Functional safety		STO (IEC/EN 61800-5-2)					
Safety performance	Standards certified by CB (Note 11)	EN ISO 13849-1 Category 3 PL e, IEC 61508 SIL 3, EN 62061 SIL CL 3, EN 61800-5-2					
	Response performance	8 ms or less (STO input OFF → energy shut-off)					
	Test pulse input (STO) (Note 5)	Test pulse interval: 1 Hz to 25 Hz, test pulse off time: 1 ms maximum					
	Mean time to dangerous failure (MTTFd)	MTTFd ≥ 100 [years] (314a)					
	Diagnostic coverage (DC)	DC = Medium, 97.6 [%]					
	Probability of dangerous Failure per Hour (PFH)	PFH = 6.4 × 10^{-9} [1/h]					
Compliance with global standards		Refer to "Compliance with Global Standards and Regulations" on p. 6 in this brochure.					
Structure (IP rating)		Force cooling, open (IP20) (Note 3)					
Close mounting		Not possible					
Environment	Ambient temperature	Operation: 0 ˚C to 55 ˚C (non-freezing), storage: -20 ˚C to 65 ˚C (non-freezing)					
	Ambient humidity	Operation/Storage: 5 %RH to 90 %RH (non-condensing)					
	Ambience	Indoors (no direct sunlight); no corrosive gas, inflammable gas, oil mist or dust					
	Altitude	2000 m or less above sea level (Note 9)					
	Vibration resistance	5.9 m/s^2 at 10 Hz to 55 Hz (directions of X, Y and Z axes)					
Mass	[kg]	13.4	13.4	18.2	13.4	13.4	18.2

Notes: 1. Rated output and speed of a rotary servo motor and a direct drive motor; and continuous thrust and maximum speed of a linear servo motor are applicable when the servo amplifier is operated within the specified power supply voltage and frequency.
2. When using the dynamic brake, refer to "MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)" for the permissible load to motor inertia ratio and the permissible load to mass ratio.
3. Terminal blocks are excluded.
4. Use an optional external dynamic brake with the servo amplifier. Without the external dynamic brake, a servo motor does not stop immediately at emergency stop and falls in free-run status, causing an accident such as machine collision, etc. Take measures to ensure safety on the entire system when not using the dynamic brake.
5. The test pulse is a signal for the external circuit to perform self-diagnosis by turning off the signals to the servo amplifier instantaneously at regular intervals.
6. The command communication cycle depends on the controller specifications and the number of axes connected.
7. The value in brackets is applicable when cooling fans (two units of 92 mm × 92 mm, minimum air flow: 1.0 m^3/min) are installed, and then [Pr. PA02] is changed.
8. Servo amplifiers without an enclosed regenerative resistor are also available. Refer to "MELSERVO-J4 catalog L(NA)03058" for details.
9. Refer to "MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)" for the restrictions when using the servo amplifiers at altitude exceeding 1000 m and up to 2000 m above sea level.
10. DC power input is supported by MR-J4-_GF-RJ servo amplifiers. For a connection example of power circuit with DC input, refer to "MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)".
11. The safety level depends on the setting value of [Pr. PF18 STO diagnosis error detection time] and whether or not STO input diagnosis is performed by TOFB output. Refer to "MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)" for details.

MR-J4-GF/MR-J4-GF-RJ Dimensions

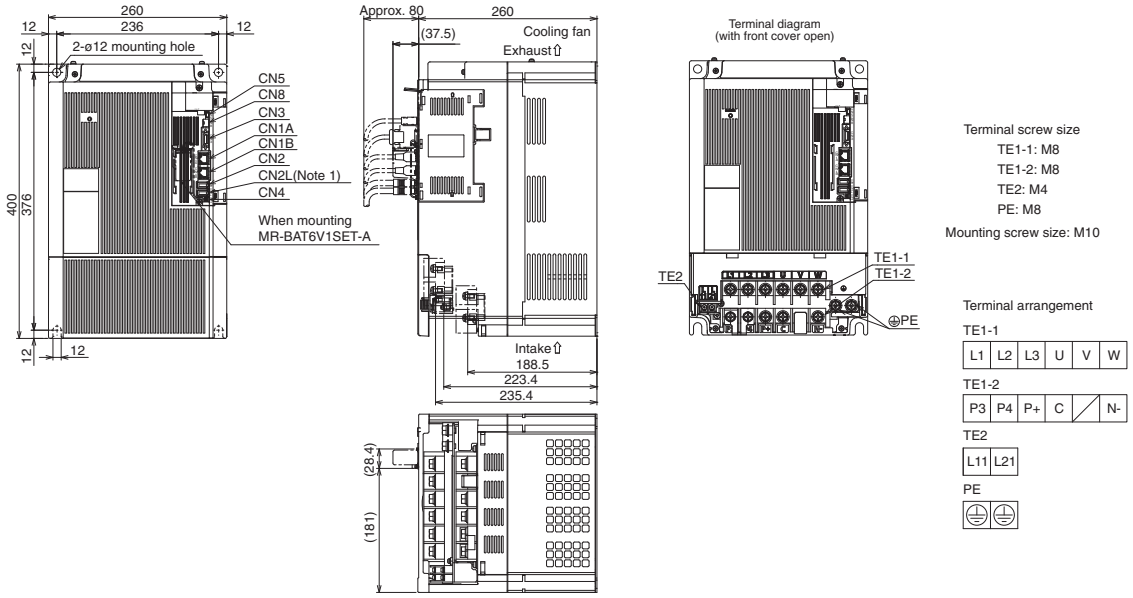
●MR-J4-11KGF, MR-J4-11KGF-RJ, MR-J4-11KGF4, MR-J4-11KGF4-RJ

●MR-J4-15KGF, MR-J4-15KGF-RJ, MR-J4-15KGF4, MR-J4-15KGF4-RJ



[Unit: mm]

●MR-J4-22KGF, MR-J4-22KGF-RJ, MR-J4-22KGF4, MR-J4-22KGF4-RJ



[Unit: mm]

Notes: 1. CN2L, CN7, and CN9 connectors are not available for MR-J4-GF servo amplifier.

Related Materials

Related materials are listed below:

Catalog

Catalog name	Document No.
Servo Amplifiers & Motors MELSERVO-J4 Catalog	L(NA)03058

Manual

Manual name	Manual No.
MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (Motion Mode)	SH-030218
MR-J4-_GF_(-RJ) Servo Amplifier Instruction Manual (I/O Mode)	SH-030221
MELSERVO-J4 Servo amplifier Instruction Manual Trouble Shooting	SH-030109
HG-KR/HG-MR/HG-SR/HG-JR/HG-RR/HG-UR/HG-AK Servo Motor Instruction Manual (Vol. 3)	SH-030113
Functional safety unit MR-D30 Instruction Manual	SH-030132

⚠ 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 EC97J1113 UKAS MANAGEMENT SYSTEMS 051

ISO 9001 BUREAU VERITAS Certification UKAS MANAGEMENT SYSTEMS 008

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