MITSUBISHI ELECTRIC
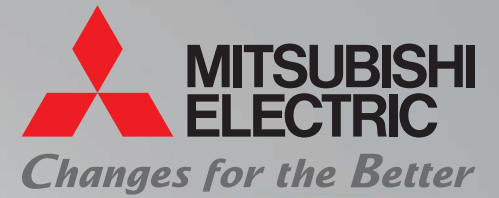*Changes for the Better*

MELSERVO-J4 Function Guide

New Features of

MITSUBISHI SERVO AMPLIFIERS & MOTORS

MELSERVO-J4

A complete system lineup to meet your production and manufacturing needs

CONTROLLER

Programmable controller

MELSEC iQ-R series	MELSEC-Q series	MELSEC-QS/WS series	MELSEC-L series	MELSEC iQ-F series	MELSEC-F series

Graphic operation terminal

GOT2000

Master/local module
CC-Link IE Field Network

Simple Motion module
SSCNET III/H

C controller interface module
SSCNET III/H

Motion controller
SSCNET III/H

RJ71GF11-T2 QJ71GF11-T2	RD77GF QD77GF	RD77MS QD77MS	LD77MS	FX5-40SSC-S FX5-80SSC-S	Q173SCCF	RnMTCPU	Q17nDSCPU	Q170MSCPU

INTERFACE

CC-Link IE Field Network
CC-Link IE Field

SSCNET III/H
SSCNET III/H
SERVO SYSTEM CONTROLLER NETWORK

Pulse train/analog voltage/RS-422/RS-485[1]/MODBUS®RTU[2]
*1. RS-485 is supported by MR-J4-A-(-RJ). (but not by MR-J4-03A6(-RJ))
*2. MODBUS® RTU is supported by MR-J4-A-RJ. (but not by MR-J4-03A6-RJ)

SERVO AMPLIFIER

CC-Link IE Field Network compatible servo amplifier	SSCNET III/H compatible servo amplifier	Power regeneration converter unit + SSCNET III/H compatible drive unit	SSCNET III/H compatible 2-axis servo amplifier	SSCNET III/H compatible 3-axis servo amplifier	SSCNET III/H compatible 2-axis servo amplifier Ultra-small capacity	General-purpose interface servo amplifier	General-purpose interface servo amplifier Ultra-small capacity
MR-J4-GF(-RJ)	MR-J4-B(-RJ/-LL)	MR-CV+ MR-J4-DU_B(-RJ)	MR-J4W2-B	MR-J4W3-B	MR-J4W2-0303B6	MR-J4-A(-RJ)	MR-J4-03A6(-RJ)

SERVO MOTOR*1

Rotary servo motor

Small capacity, low inertia
HG-KR series
Capacity: 50 to 750 W

Ultra-compact size, ultra-small capacity
HG-AK series
Capacity: 10 to 30 W

Small capacity, ultra-low inertia
HG-MR series
Capacity: 50 to 750 W

Medium capacity, ultra-low inertia
HG-RR series
Capacity: 1 to 5 kW

Medium capacity, medium inertia
HG-SR series
Capacity: 0.5 to 7 kW

Medium capacity, flat type
HG-UR series
Capacity: 0.75 to 5 kW

Medium/large capacity, low inertia
HG-JR series
Capacity: 0.5 to 55 kW

Coming in future
Ultra-large capacity*2
HG-JR series
Capacity: 110 to 220 kW

*1. Refer to "MELSERVO-J4 catalog (L(NA)03058)" for the combination.
*2. Contact your local sales office for details.

Linear servo motor

Core type
LM-H3 series
Rating: 70 to 960 N

Core type with magnetic attraction counter-force
LM-K2 series
Rating: 120 to 2400 N

Core type (natural/liquid cooling)
LM-F series
Rating: 300 to 3000 N (natural cooling)
Rating: 600 to 6000 N (liquid cooling)

Coreless type
LM-U2 series
Rating: 50 to 800 N

SOLUTION

e-F@ctory
e-F@ctory is the Mitsubishi Electric solution for improving the performance of any manufacturing enterprise by enhancing productivity, and reducing the maintenance and operation costs together with seamless information flow throughout the plant.

PLATFORM

iQ Platform
Mitsubishi Electric's integrated FA platform for achieving lateral integration of controllers & HMI, engineering environments and networks at production sites.

To respond to an expanding range of applications including semiconductor and FPD manufacturing, robots, and food processing machines, MELSERVO-J4 combines with other Mitsubishi Electric product lines such as Motion controllers, networks, graphic operation terminals, programmable controllers and more. This gives you the freedom and flexibility to create a more advanced servo system.

Personal computer

SOFTWARE

MELSOFT GX Works3

MELSOFT MT Works2

MELSOFT MR Configurator2

Capacity selection software

Simple Motion board	Position board	Positioning module			
CC-Link IE Field Network	SSCNET III/H				
MR-EM340GF	MR-MC2_ _	RD75P RD75D	QD75P QD75D	LD75P LD75D	FX2N-10PG

SSCNET III/H

SSCNET III/H
SERVO SYSTEM CONTROLLER NETWORK

SENSING MODULE

SSCNET III/H compatible sensing module

MR-MT2000 series

LOW-VOLTAGE SWITCHGEAR

Molded-case circuit breaker	Magnetic contactor
WS-V	MS-T

Direct drive motor

NEW Low-profile flange type
TM-RG2M series
Rating: 2.2 to 9 N·m

NEW Low-profile table type
TM-RU2M series
Rating: 2.2 to 9 N·m

TM-RFM series
Rating: 2 to 240 N·m

GF MR-J4-GF GF-RJ MR-J4-GF-RJ B MR-J4-B/MR-J4-DU_B B-RJ MR-J4-B-RJ/MR-J4-DU_B-RJ
B-LL MR-J4-B-LL WB MR-J4W2-B/MR-J4W3-B/MR-J4W2-0303B6 A MR-J4-A/MR-J4-DU_A/MR-J4-03A6
A-RJ MR-J4-A-RJ/MR-J4-DU_A-RJ/MR-J4-03A6-RJ

Man, machine and environment in perfect harmony

MELSERVO-J4 and our servo products come with a wide selection of functions to solve the challenges in production. Our newest functions are easier to use, and safer than ever before.

Functions

Related catalogs

MELSERVO-J4 Catalog
L(NA)03058

GOT2000 Series
Drive Control Interactive Solutions
L(NA)08335ENG

Failure Prediction

Supported by: GF   GF-RJ

Optimal solution with MELSERVO-J4

1   Predictive maintenance of mechanical drive components

2   Improvement of operation rate

Failure prediction for improved operation rates

Predictive maintenance is a key to avoid unplanned production downtime. With the failure prediction functions, failures can be easily predicted in advance. By utilizing failure prediction data to schedule maintenance at optimal times, unplanned downtime is avoided, improving operation rates for the entire production line.
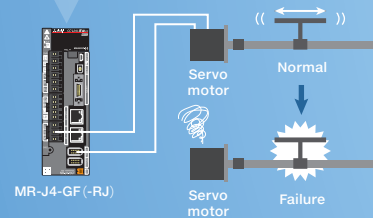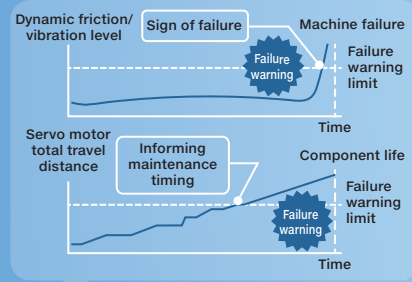
Friction failure prediction function
Predicts failure based on changes in the coulomb and viscous friction of guides and ball screws.

Vibration failure prediction function
Predicts failure based on aging in guides, ball screws, and belts from the vibration and frequency changes.
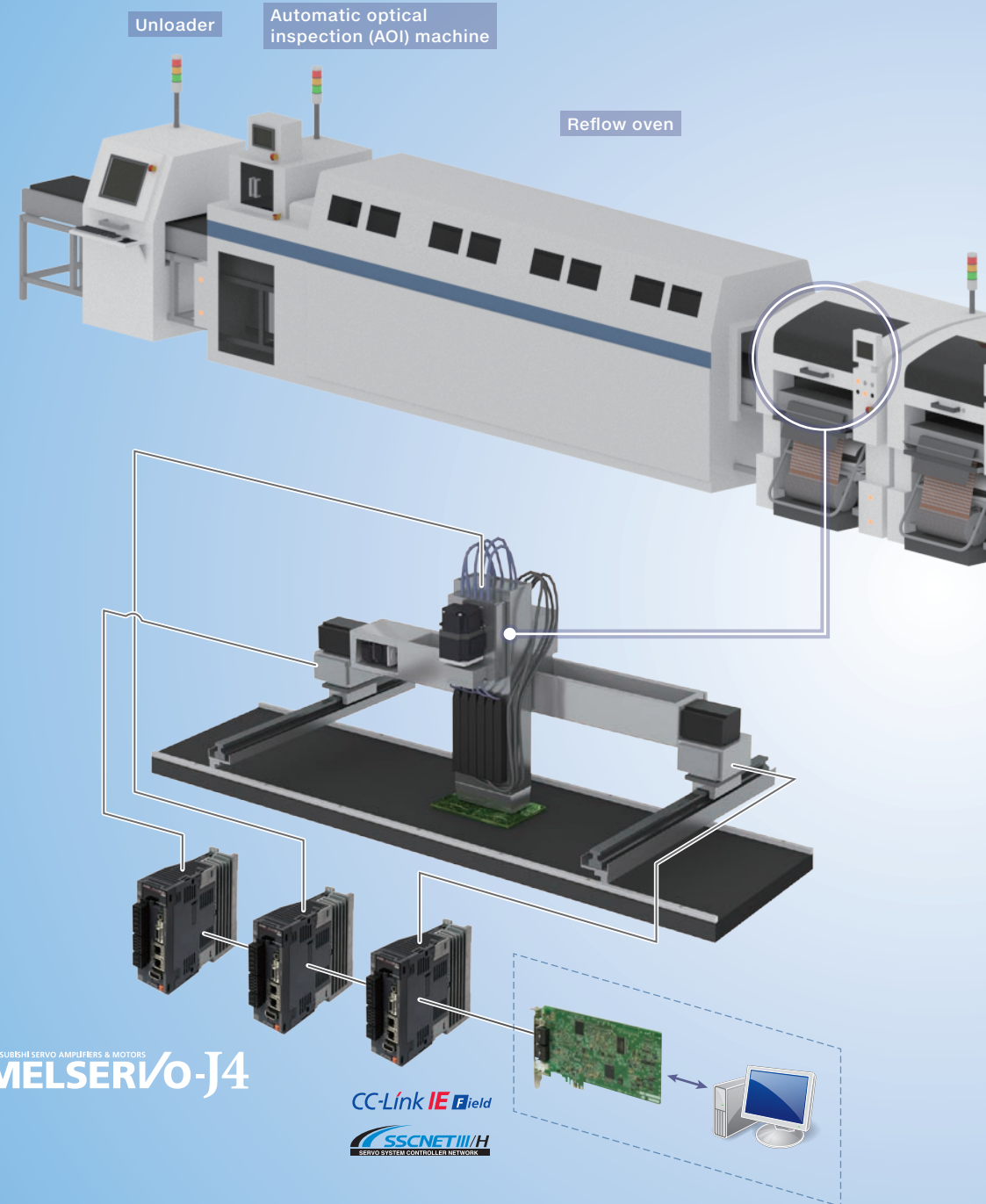
Total distance failure prediction function
Predicts failure based on the total travel distance of the servo motor to determine when ball screws and bearings are approaching product life.

* The failure prediction function is available with MR-J4-GF(-RJ) servo amplifiers with software version A3 or later.
* Note that this function does not guarantee the prediction of all failures.

Recommended applications

Automotive production lines/Semiconductor manufacturing lines/FPD manufacturing lines/Surface mounting lines, etc.

Unloader   Automatic optical inspection (AOI) machine   Reflow oven

Dynamic friction/vibration level   Sign of failure   Machine failure
Failure warning   Failure warning limit
Time

Servo motor total travel distance   Informing maintenance timing   Component life
Failure warning limit
Failure warning
Time

MR-J4-GF(-RJ)   Servo motor   Normal
Servo motor   Failure

MITSUBISHI SERVO AMPLIFIERS & MOTORS
MELSERVO-J4

CC-Link IE Field
SSCNET III/H
SERVO SYSTEM CONTROLLER NETWORK

Surface mounting line

Predictive maintenance is essential for minimizing risks of machine failure and maximizing productivity. The servo amplifier predicts a machine failure based on the changes in a machine from aging. In case of failure, you can check the operation status recorded by the drive recorder function to analyze the cause of the alarm, and quickly get machinery running again.

Chip mounter

Solder paste inspection (SPI) machine

Screen printer

Loader
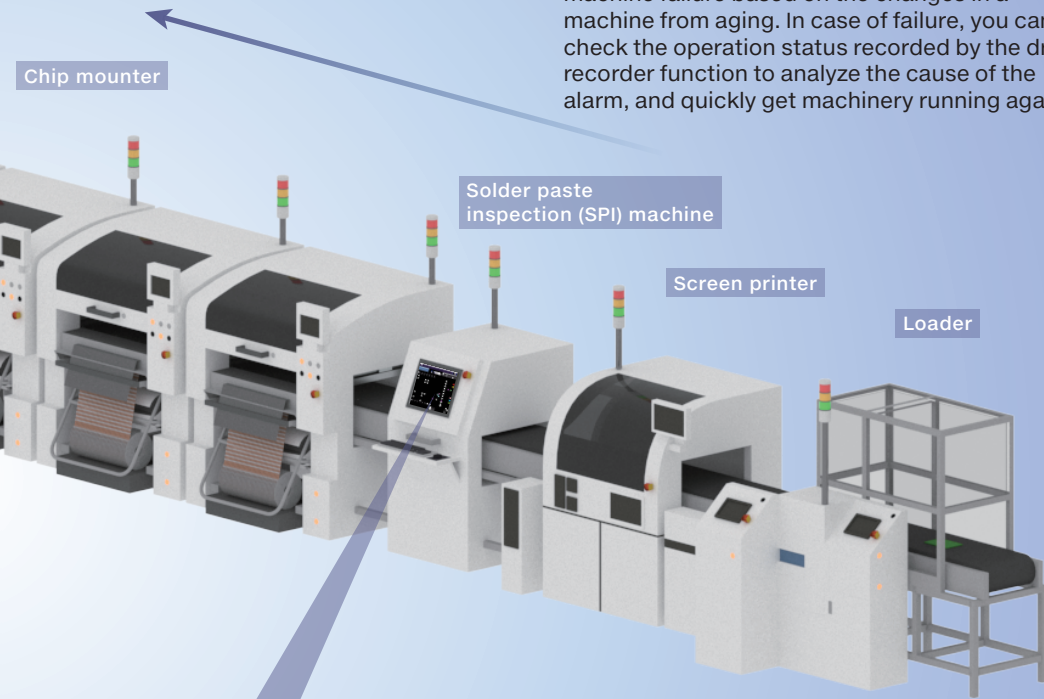
GOT Drive: GOT and Servo System Configurations

The GOT2000 provides some functions of MR Configurator2. The new GOT Drive enhanced functionality is designed to eliminate need for additional hardware, software and suits customers' applications to speed up system startup, improve maintenance and troubleshooting.

Example: alarm display

GOT2000

Motion controller/
Simple Motion module

Servo amplifier

Serial, Ethernet, etc.

CC-Link IE Field
SSCNET III/H
SERVO SYSTEM CONTROLLER NETWORK

[Interactive functions]
Drive recorder function/Machine diagnosis function/Servo amplifier life diagnosis function/One-touch tuning

Drive Recorder

Supported by: GF | GF-RJ | B | B-RJ | B-LL | WB | A | A-RJ

Optimal solution with MELSERVO-J4

1 Reduction of downtime by quick recovery

2 Simple configuration without data logger

Monitoring and recording for failure analysis

In case of machine failure, operators need to analyze the operation status and the cause of failure for quick recovery. The drive recorder function monitors operations 24/7 and stores the status data when an alarm occurs. The waveforms of past 16-time alarms are stored, and operators can check the data on MR Configurator2 or GOT.

Example of when AL. 52
(Error excessive) has occurred

Recorded information

ALM
EM1
RD
TLC
Torque
Speed
Droop pulse

Operation | Alarm! | Stop | Recovery | Operation

Recorded

Find out the cause and restart the operation quickly.

Torque was insufficient right before the alarm occurrence.

When an alarm occurs, the servo data is recorded in the non-volatile memory of the servo amplifier.
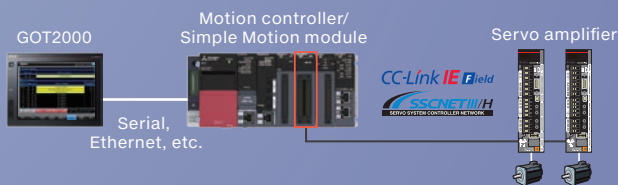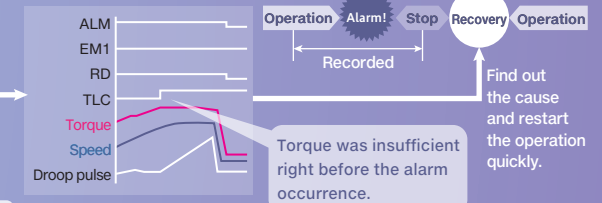
The recording can also be started with a specific alarm.

Recommended applications

Surface mounting lines/Semiconductor manufacturing lines/FPD manufacturing lines/Processing machines/Food processing machines/Material handling systems, etc.
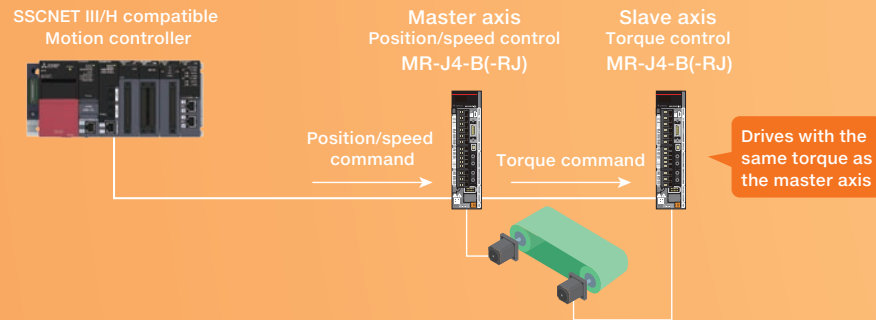
Master-Slave Operation

Supported by: B | B-RJ

Master axis | **Slave axis** | **Slave axis** | **Slave axis**

SSCNET III/H
SERVO SYSTEM CONTROLLER NETWORK

Optimal solution with MELSERVO-J4

1. Easy configuration of torque-assist system

2. Space utilization with distributed arrangement of slave axes

### Torque-coordination of multiple axes

While the master axis is operated in position or speed control mode, the slave axes are operated in torque control mode with the same torque as the master axis. Since multiple smaller-capacity servo motors are used for sharing load instead of a large-capacity servo motor, minimal space can be effectively used. The torque command is transmitted from the master axis to the slave axes via SSCNET III/H with a parameter setting, and no additional wiring is required for this function. Each SSCNET III/H line can have up to eight master axes.

SSCNET III/H compatible
Motion controller

Master axis
Position/speed control
MR-J4-B(-RJ)

Slave axis
Torque control
MR-J4-B(-RJ)

Position/speed
command

Torque command

Drives with the same torque as the master axis

Recommended applications

Press machines/Molding machines/Material handling systems, etc.
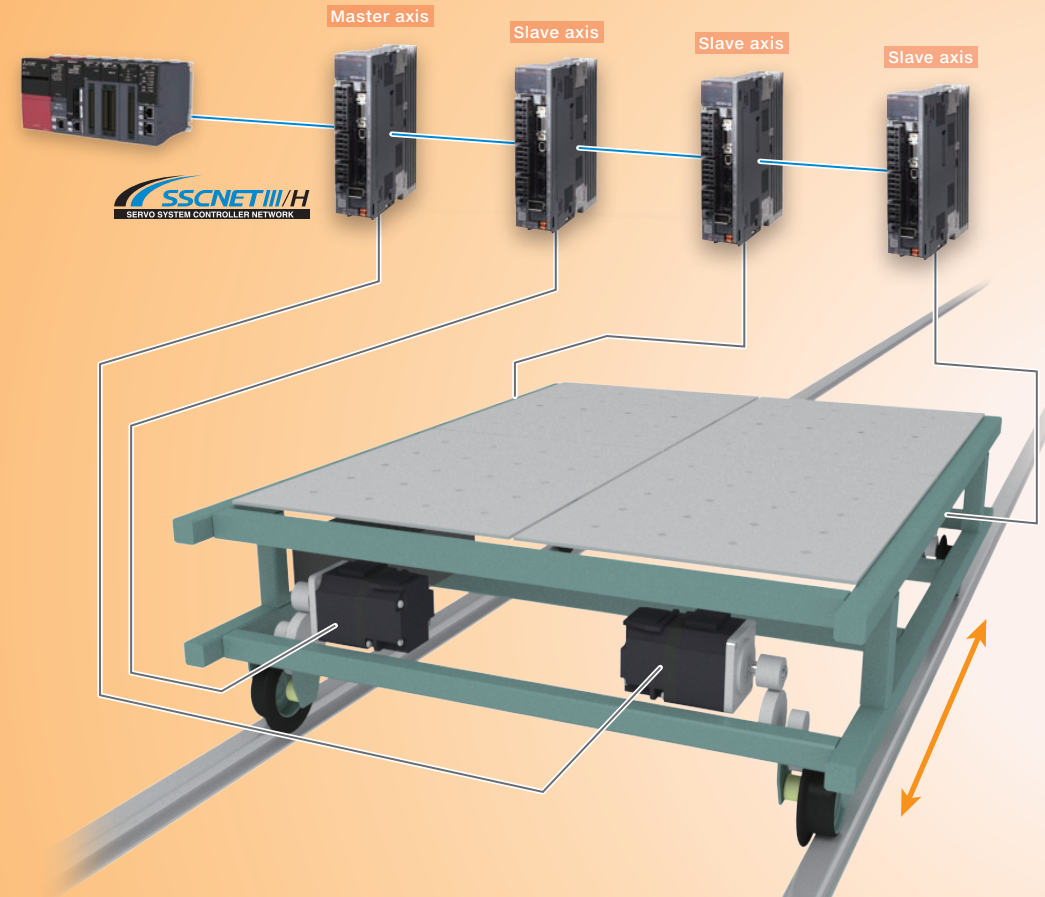
Guided vehicle

The stable operation and simple configuration of a guided vehicle is possible when multiple servo motors in a distributed arrangement all operate with the same torque as the master axis.
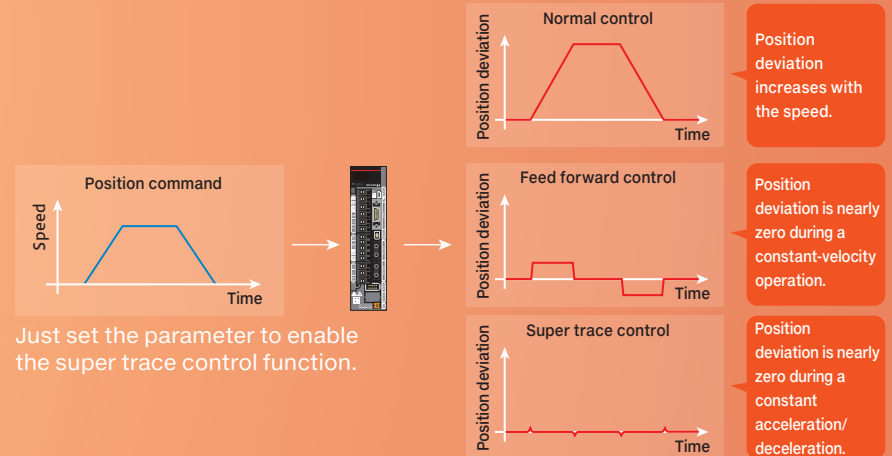
Without super trace control   With super trace control

Commanded path   Commanded path

Actual path   Actual path

Deviation is reduced with super trace control.

CC-Link IE Field

SSCNET III/H
SERVO SYSTEM CONTROLLER NETWORK

MITSUBISHI SERVO AMPLIFIERS & MOTORS
MELSERVO-J4

Simplified machine tools

Super trace control enables high-precision machining and improves quality of curved surfaces with minimal deviation from the command.

Super Trace Control

Supported by: GF GF-RJ B B-RJ A A-RJ

Optimal solution with MELSERVO-J4

1 Actual path exactly as commanded

2 Reduction of deviation errors on arc motion

Increasing path accuracy

In normal control, a position deviation occurs in response to the position command from the controller, causing a deviation error between the machine axis' target path and the actual path. The super trace control function reduces this deviation error close to zero, enabling actual movement almost exactly as commanded, resulting in improved processing.

Normal control

Position deviation increases with the speed.

Position command

Feed forward control

Position deviation is nearly zero during a constant-velocity operation.

Just set the parameter to enable the super trace control function.

Super trace control

Position deviation is nearly zero during a constant acceleration/ deceleration.

* This function is applicable only for high-rigidity machines because the feed forward gain needs to be set high.

Recommended applications

Processing machines/Mounters/Bonders, etc.

Simple Cam

Supported by: **A-RJ**

Optimal solution with MELSERVO-J4

1. Cam control with multiple synchronized axes
2. Compensation of position errors
3. Cost-effective configuration without a Positioning module

New functions for positioning

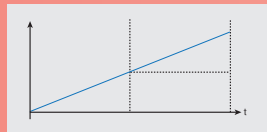A wider variety of applications with the additional new functions

Simple cam function
Smooth conveyance and stoppage by cam control based on the cam data
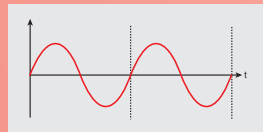
| Linear motion	Reciprocating motion	Feeding motion
Ball screw Rotary table	Reciprocating cam	Belt conveyor Rotary table
Linear cam motion by one cycle	Reciprocating cam motion within a cam stroke range	Cam motion which resets a cam reference position per cycle
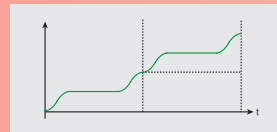
Any point can be set as an end point of the feeding motion.
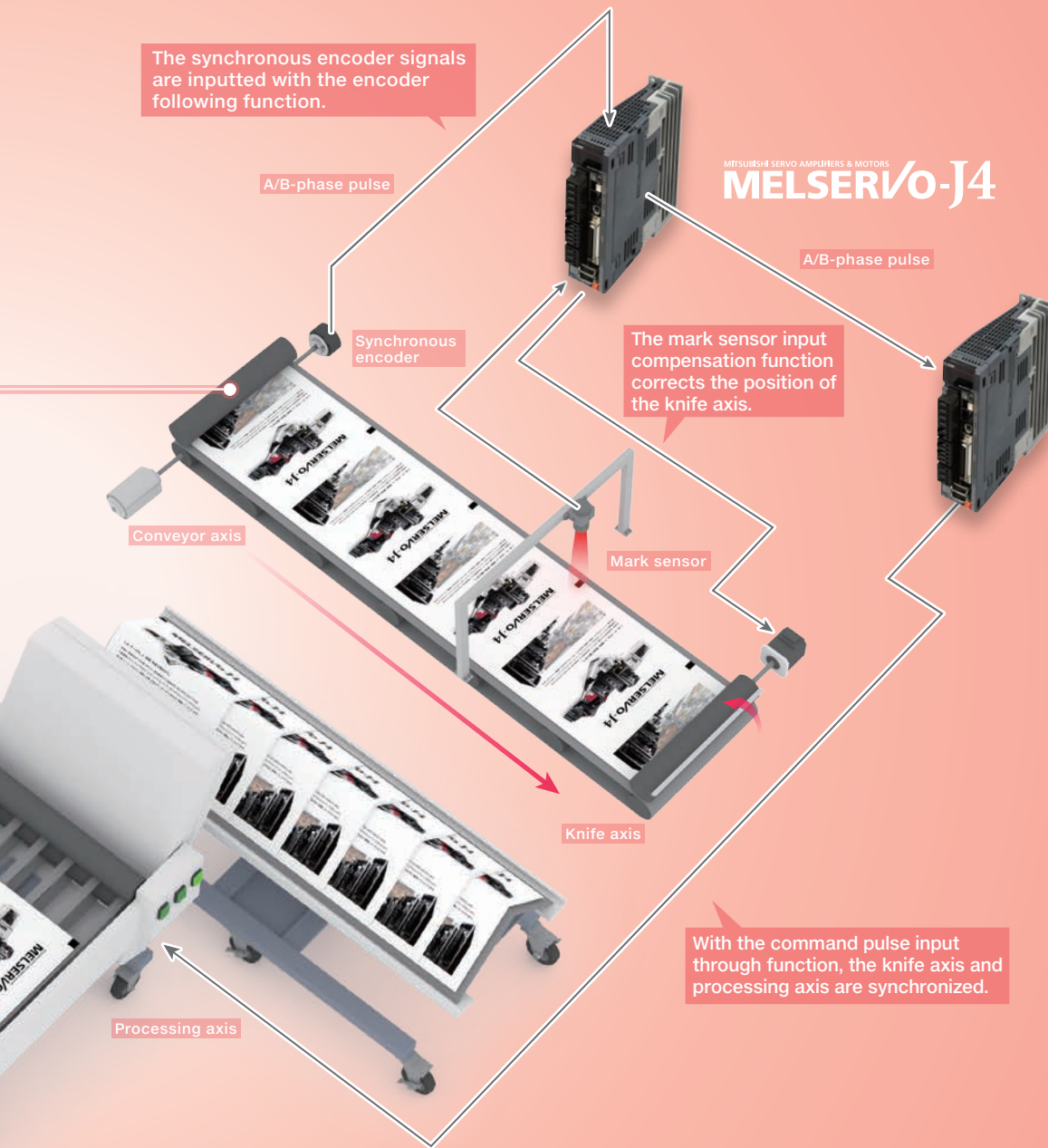
Create various cam data patterns with MR Configurator2.
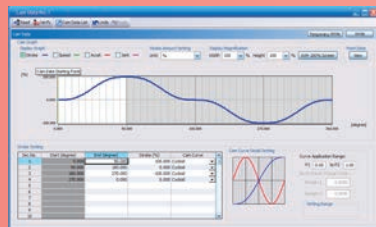
Simple cam setting window of MR Configurator2
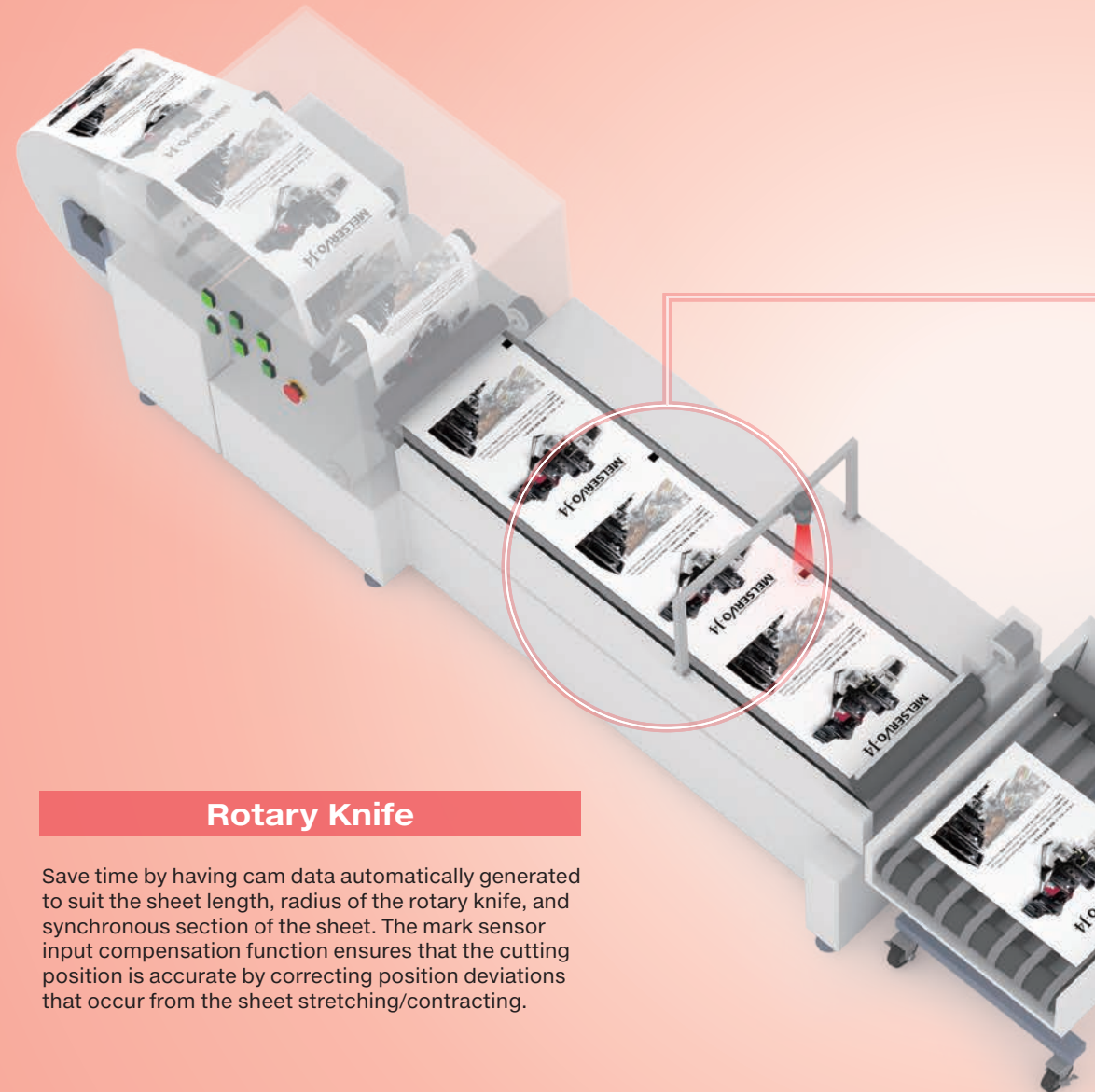
Rotary Knife

Save time by having cam data automatically generated to suit the sheet length, radius of the rotary knife, and synchronous section of the sheet. The mark sensor input compensation function ensures that the cutting position is accurate by correcting position deviations that occur from the sheet stretching/contracting.

The synchronous encoder signals are inputted with the encoder following function.

A/B-phase pulse

MITSUBISHI SERVO AMPLIFIERS & MOTORS
MELSERVO-J4

A/B-phase pulse

Synchronous encoder

The mark sensor input compensation function corrects the position of the knife axis.

Conveyor axis

Mark sensor

Knife axis

With the command pulse input through function, the knife axis and processing axis are synchronized.

Processing axis

Encoder following function
This function allows the synchronous encoder signals to be used as command pulses.

Command pulse input through function
The first servo amplifier axis outputs command pulses to the subsequent axes, enabling a synchronous system of multiple axes.
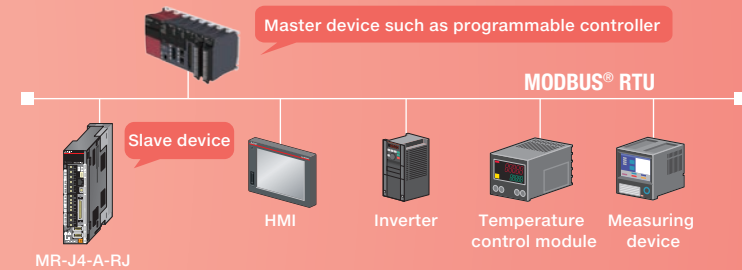
Mark sensor input compensation function
The servo amplifier compensates a position error between the reference position and the position detected by a sensor, allowing the workpiece to be cut correctly on a registration mark.

Additional function

Communication function (MODBUS® RTU)
MR-J4-A-RJ supports not only RS-422/RS-485 communication (Mitsubishi Electric AC Servo Protocol) but also RS-485 communication (MODBUS® RTU protocol). MODBUS® RTU protocol is compatible with function code 03h (Read holding registers), etc. The cam data can be set through MODBUS® RTU.

Master device such as programmable controller

MODBUS® RTU

Slave device

MR-J4-A-RJ

HMI   Inverter   Temperature control module   Measuring device

✻ RJ-45 junction connector terminal block and RJ-45 compatible cable designed for MR-J4-A-RJ are required.

Recommended applications

Rotary knife devices/Simple packaging machines/Sheet pasting machines, etc.

Functional Safety

Supported by: GF-RJ B-RJ A-RJ

Optimal solution with MELSERVO-J4

1 High-level functional safety

2 Less-wiring safety monitoring system

For the maximum level of safety required by FA systems

A system using both MR-D30 functional safety unit and the servo motors with functional safety is Category 4 PL e, SIL 3 compliant. Using the servo motors with functional safety eliminates the need for an external encoder on the machine end, creating a simple system with less wiring. Using a safety network eliminates the need to send safety signals to MR-D30, further reducing the need for wiring.
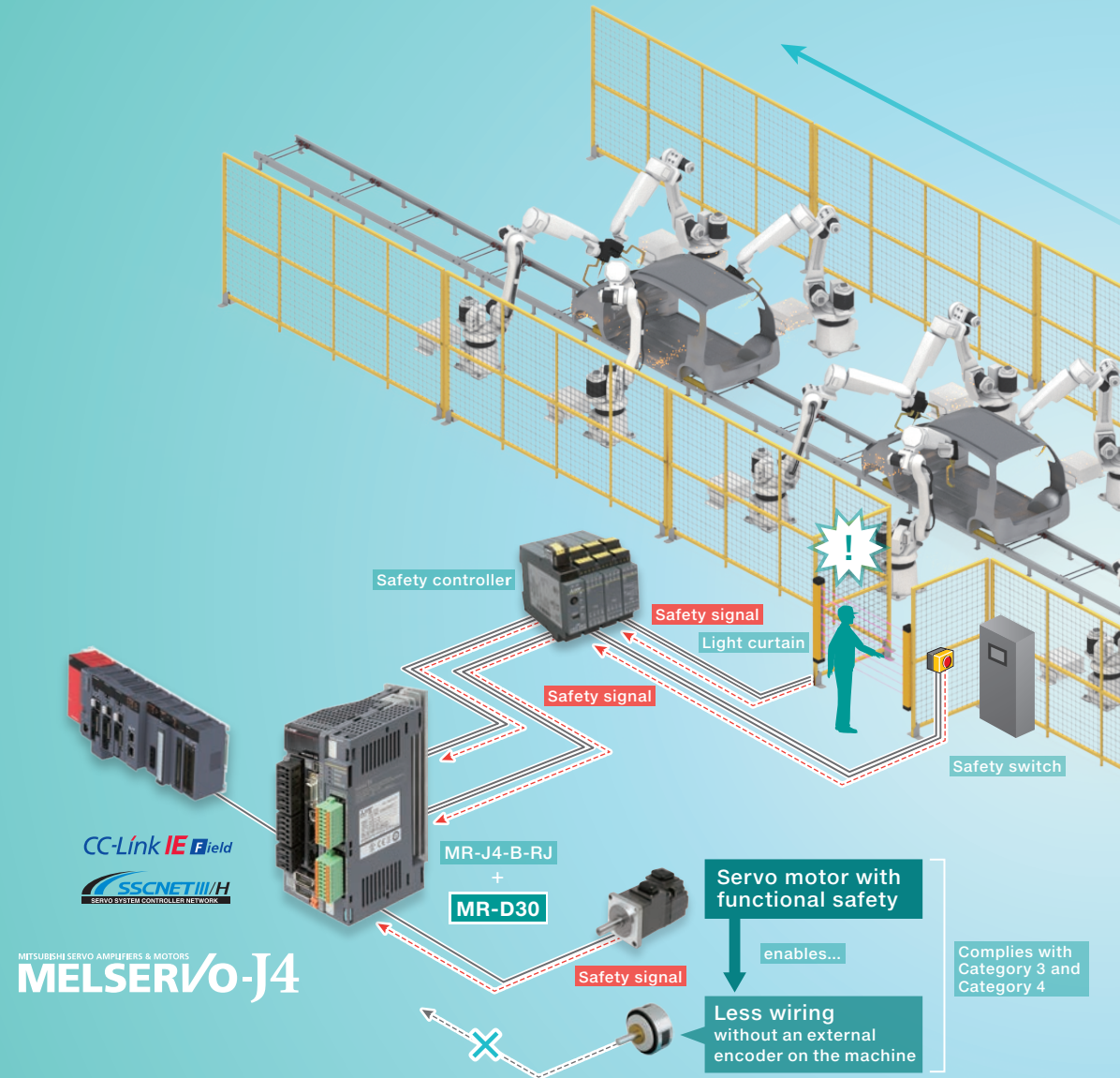
IEC/EN 61800-5-2:2007 function	Safety level
STO (Safe torque off)	Category 4 PL e, SIL 3
SS1 (Safe stop 1)	
SS2 (Safe stop 2)*1	
SOS (Safe operating stop)*1	
SLS (Safely-limited speed) *2	
SBC (Safe brake control)	
SSM (Safe speed monitor)*2	

*1. Requires the use of a servo motor with functional safety.
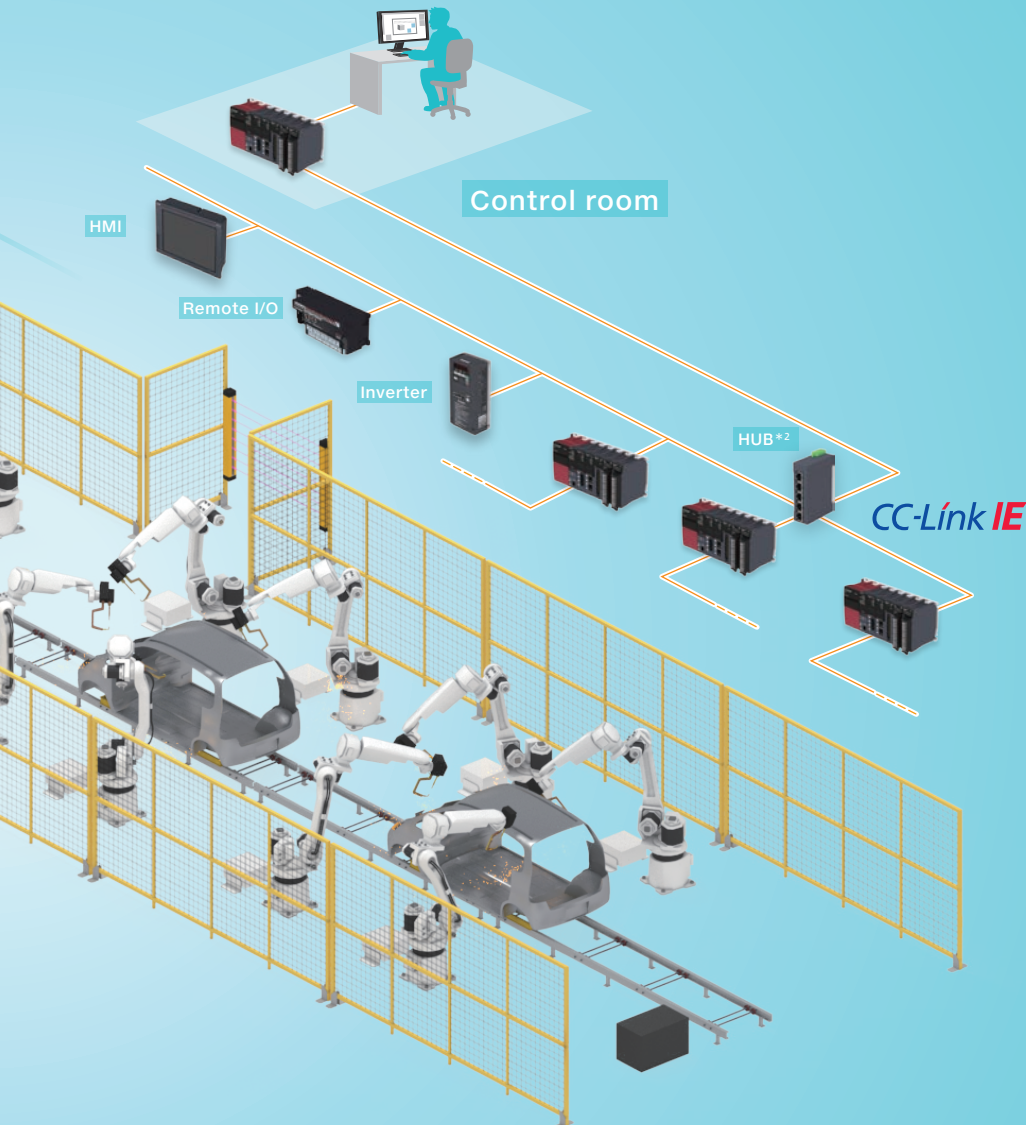*2. Safety level is Category 3 PL d, SIL 2 when the servo motor with functional safety is not used.

Recommended applications

Automotive production lines/Press machines/Material processing equipment/ Material handling systems/X-Y crane equipment/Filling machines/Cardboard manufacturing equipment, etc.

Safety controller

Safety signal

Light curtain

Safety signal

Safety switch

CC-Link IE Field

SSCNET III/H
SERVO SYSTEM CONTROLLER NETWORK

MR-J4-B-RJ
+
MR-D30

MITSUBISHI SERVO AMPLIFIERS & MOTORS
MELSERVO-J4

Safety signal

Servo motor with functional safety

enables...

Less wiring without an external encoder on the machine

Complies with Category 3 and Category 4

Control room

HMI

Remote I/O

Inverter

HUB*²

CC-Link IE

Automobile production line

A Category 4 PL e compliant safety system can be constructed with simple wiring. By using the safety integrated MR-J4 and MR-D30, machinery turns off when the light curtain is obstructed, and the unintended restart of machinery is prevented. The monitoring function also allows the centralized control of servo and mechanical drive components, helping save energy and schedule maintenance, and enabling quick recovery from machinery failures.

Monitoring

Supported by: | GF | GF-RJ | B | B-RJ | B-LL | WB

Optimal solution with MELSERVO-J4

1 Reduction of machine downtime caused by failure

2 Monitoring power consumption for energy saving

3 Integrated management of line operation information

TCO*¹ reduction with effective use of servo information

Integrated information management is necessary for manufacturers to seek solutions for reducing cost and improving systems. The servo amplifier offers constant monitoring of power consumption and operation status of the servo amplifiers and servo motors, and the data is transmitted from the servo amplifier to a controller via CC-Link IE Field Network or SSCNET III/H for more cost-effective information management, helping optimize the production site.
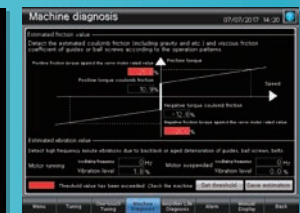
Servo status monitor	Power monitor	Machine diagnosis
Effective load ratio/bus voltage/ internal temperature of encoder	Unit power consumption/ total power consumption	Estimated friction and vibration values
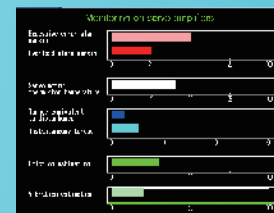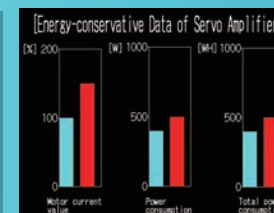
*1. TCO: Total Cost of Ownership
*2. When using motion mode, a dedicated hub for CC-Link IE Field Network is necessary. Refer to "MELSERVO-J4 catalog (L(NA)03058)" for details.

Recommended applications

Semiconductor manufacturing lines/FPD manufacturing lines/Automobile production lines/Gear grinding machines/Bearing insertion machines, etc.

One-touch Tuning

Supported by: GF*¹ GF-RJ*¹ B B-RJ B-LL*² WB A A-RJ

*1. The amplifier command method will be supported by MR-J4-GF(-RJ) in the future.
*2. MR-J4-B-LL does not support the amplifier command method. One-touch tuning is not available when the MR-J4-B-LL is used in the pressure control mode.

Optimal solution with MELSERVO-J4

1 Gain adjustment in less time

2 Easy-to-use advanced vibration suppression control

Easy gain adjustment

Gain adjustment has never been easier. With the one-touch tuning, machine resonance filters, advanced vibration suppression control II, and robust filters are automatically adjusted, enabling high-response yet stable operations and shorter settling time.

Shorter adjustment time with "amplifier command method" NEW

All you need is to set the servo motor permissible travel distance in the amplifier command method, and appropriate commands for the one-touch tuning will be created to adjust the gains.

[Amplifier command method]

Speed

Travel amount (shaded area)

Time
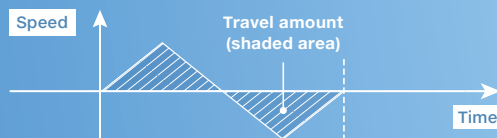
With the user command method, the one-touch tuning is enabled also with a command inputted from outside the servo amplifier.

[User command method]

Speed

Adjusted with actual operation command

Time

Recommended applications

Screen printers/Material handling systems/Filling machines/Mounters/Take-out Robots/Automatic assembly equipment/Motion alignment/Polishing systems, etc.

One-touch tuning for a wide variety of machines
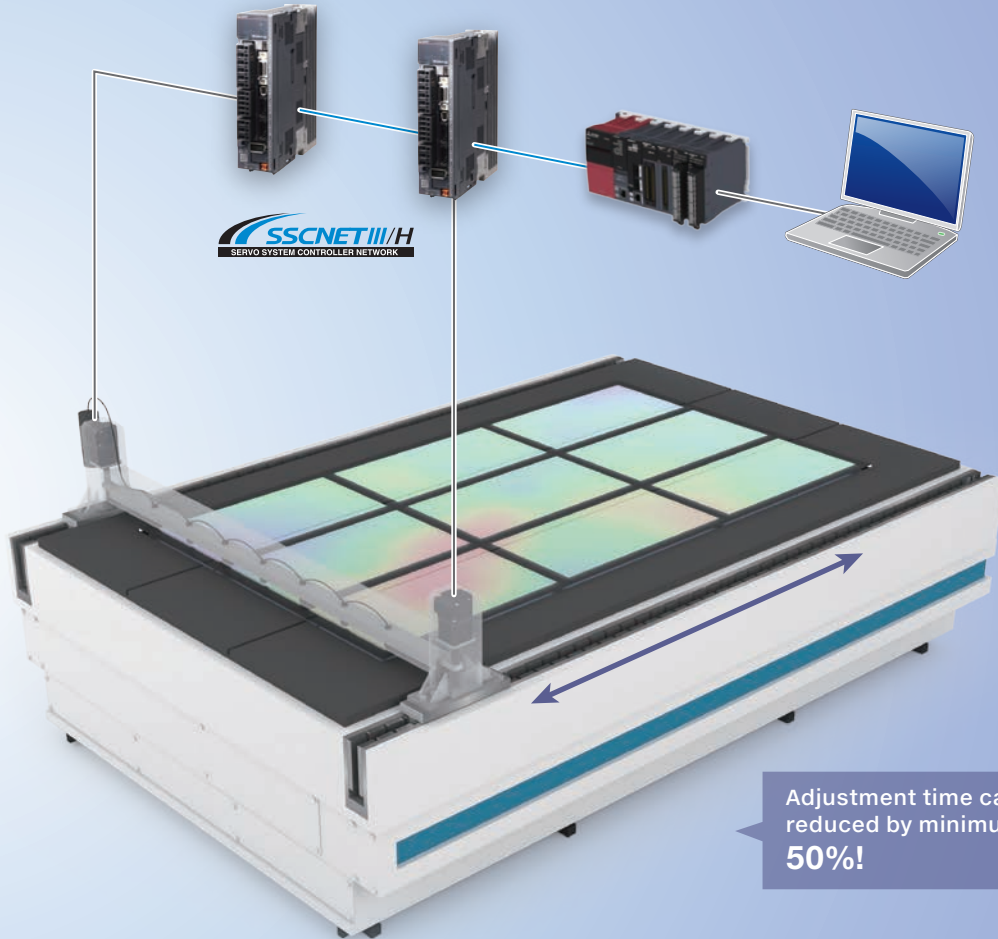
Screen printers

Material handling systems

Filling machines

MITSUBISHI SERVO AMPLIFIERS & MOTORS
MELSERVO-J4

SSCNET III/H
SERVO SYSTEM CONTROLLER NETWORK

Adjustment time can be reduced by minimum of **50%!**

Coater

The multi-axis adjustment enables a test operation and gain adjustment on multiple axes simultaneously, making the startup time shorter. This function is useful for coaters having a coating head driven by two servo motors.

Multi-axis Adjustment

Supported by: B | B-RJ | WB

＊ The multi-axis adjustment function is enabled when the servo amplifier and RnMTCPU or RD77MS are combined.

### Optimal solution with MELSERVO-J4

1 Simultaneous gain adjustment for parallel drive axes

2 Simultaneous test operation on multiple axes

Quick startup by simultaneous gain adjustment

When multiple axes are used in equipment, adjusting gain is time-consuming work even for experienced personnel. Now, the gain adjustment time can be cut to half with the multi-axis adjustment function. This function simultaneously adjusts parallel drive axes which make the same motion and also executes test operation and gain adjustment for up to four axes at the same time. The target axes can be selected with a simple operation on the engineering software.

Test operation window
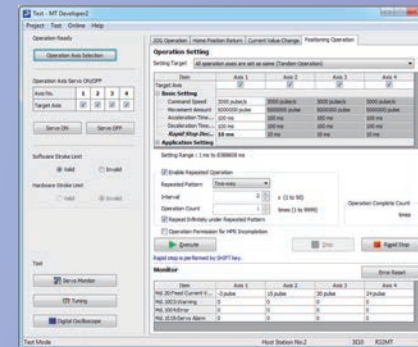
Gain adjustment window

Recommended applications

Material handling systems/Automatic assembly equipment/Mounters/Servo press machines/Coaters, etc.
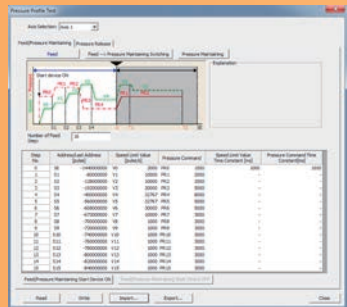
Pressure Control

✳ The pressure control function is enabled when the servo amplifier and RnMTCPU are combined.

Optimal solution with MELSERVO-J4

1 High-response pressure control

2 Smooth switching between pressure and position control

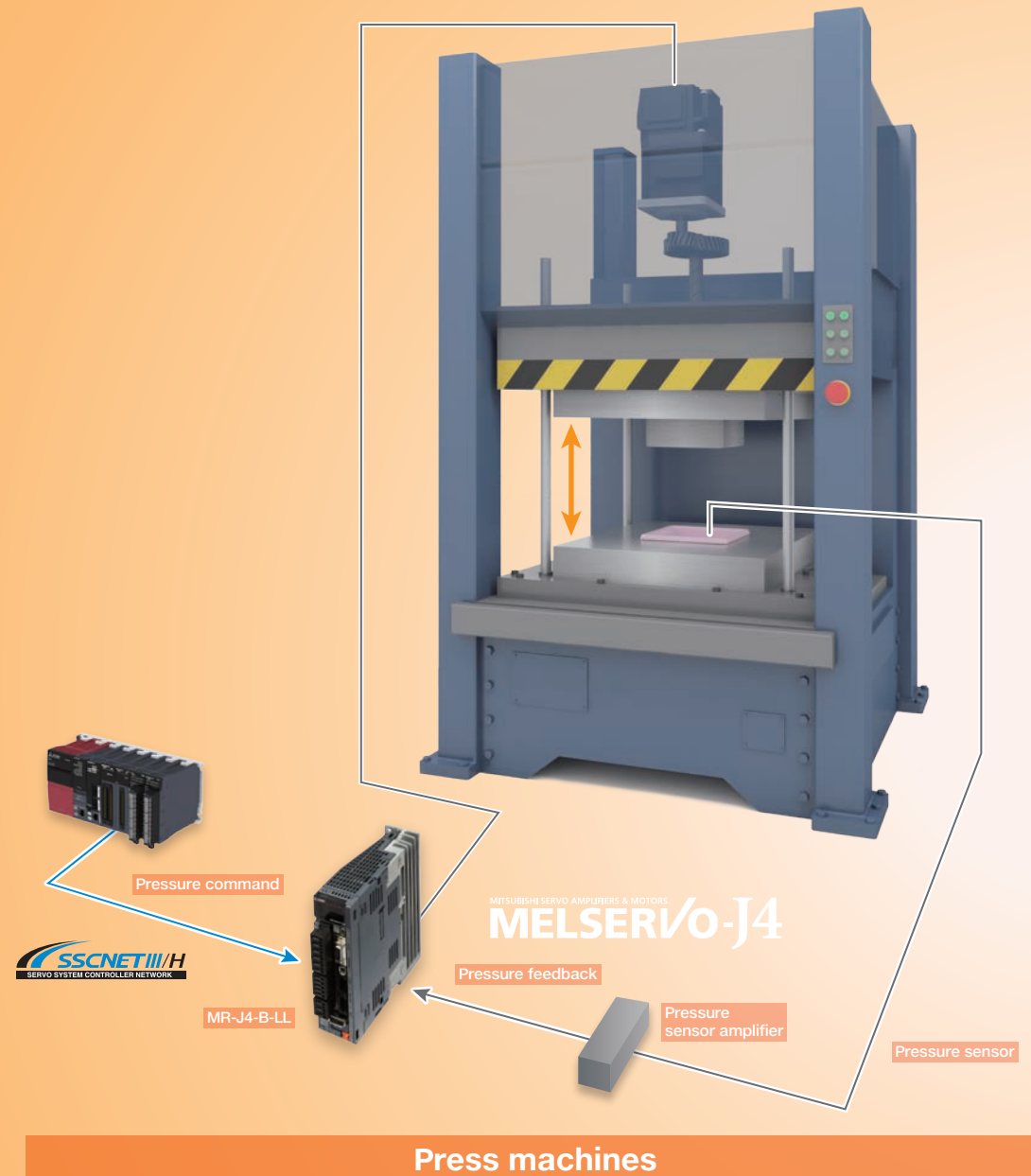3 Easy adjustment

High-response pressure control

Profile setting window

- Pressure sensor signals are inputted directly to the servo amplifier, enabling high-response feedback control.

- Pressure commands (applying/holding/releasing pressure) can be created easily on the profile setting window of the engineering software.

- Optimal pressure commands and gains can be adjusted in the test operation of the engineering software.

Recommended applications

Press machines/Molding machines/FPD bonding equipment/Bonders, etc.

Pressure command

SSCNET Ⅲ/H
SERVO SYSTEM CONTROLLER NETWORK

MR-J4-B-LL

MITSUBISHI SERVO AMPLIFIERS & MOTORS
MELSERVO-J4

Pressure feedback

Pressure sensor amplifier

Pressure sensor

Press machines

High-response pressure control is achieved by inputting pressure sensor signals for pressure feedback control directly to the servo amplifier. Furthermore, the smooth switching between position and pressure control in press machines contributes to high-speed, high-response processing, and a higher productivity.

YOUR SOLUTION PARTNER
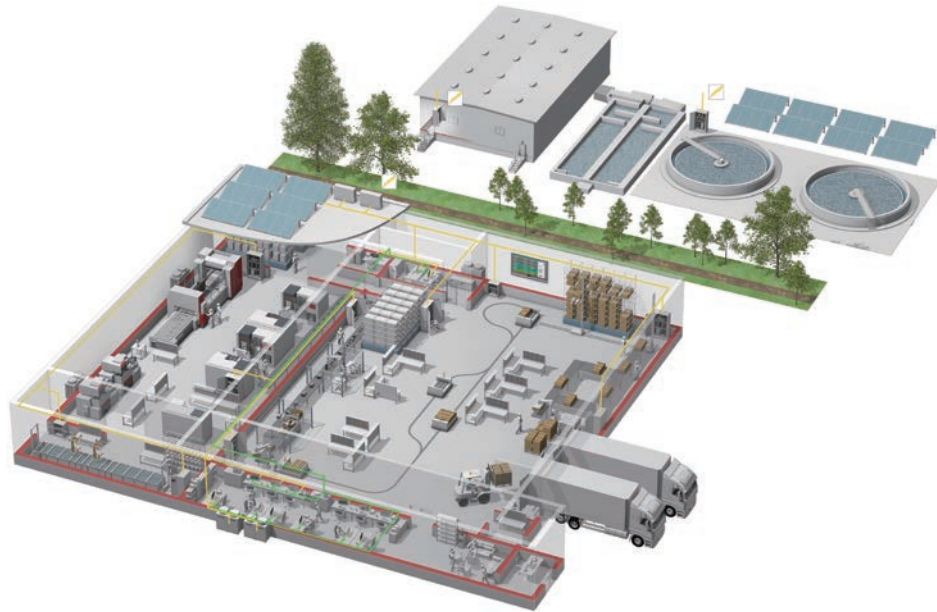
Mitsubishi Electric offers a wide range of automation equipment from PLCs and HMIs to CNC and EDM machines.

A NAME TO TRUST

Since its beginnings in 1870, some 45 companies use the Mitsubishi name, covering a spectrum of finance, commerce and industry.

The Mitsubishi brand name is recognized around the world as a symbol of premium quality.

Mitsubishi Electric Corporation is active in space development, transportation, semi-conductors, energy systems, communications and information processing, audio visual equipment and home electronics, building and energy management and automation systems, and has 237 factories and laboratories worldwide in over 121 countries.

This is why you can rely on Mitsubishi Electric automation solution - because we know first hand about the need for reliable, efficient, easy-to-use automation and control in our own factories.

As one of the world's leading companies with a global turnover of over 4 trillion Yen (over $40 billion), employing over 100,000 people, Mitsubishi Electric has the resource and the commitment to deliver the ultimate in service and support as well as the best products.

* Not all products are available in all countries.

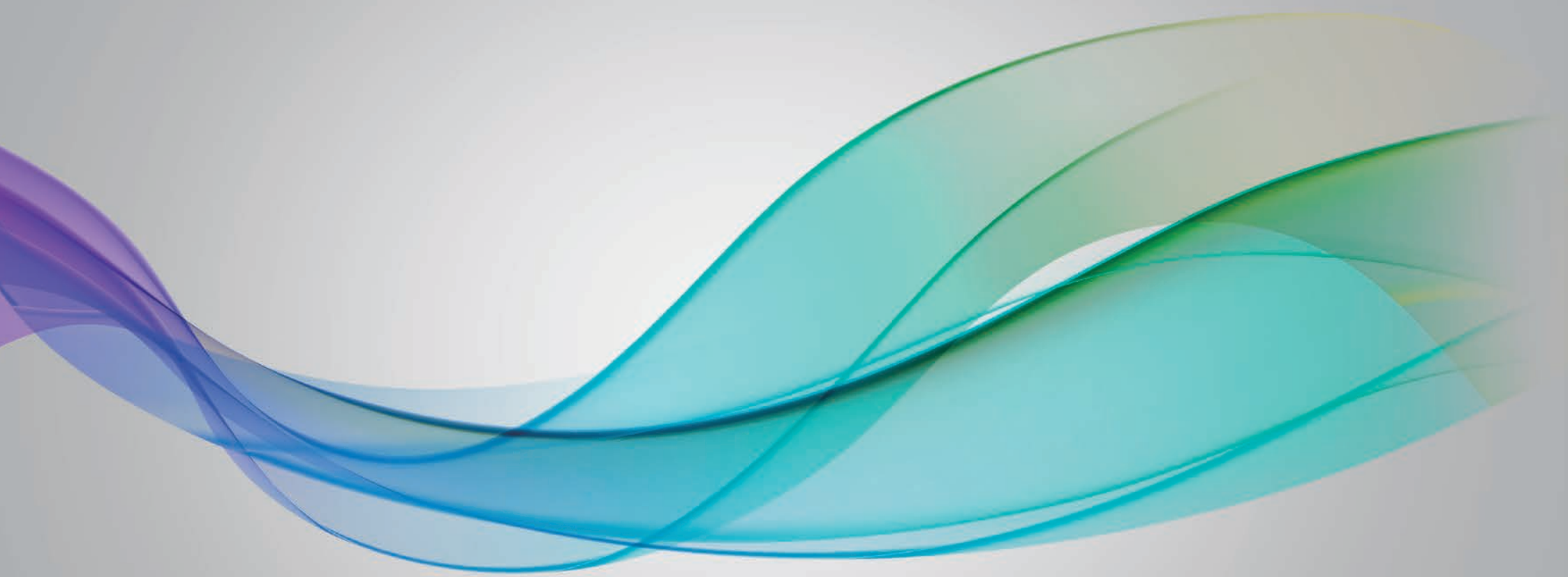|				
Low voltage: MCCB, MCB, ACB	Medium voltage: VCB, VCC	Power monitoring, energy management	Compact and Modular Controllers	Processing machines: EDM, Lasers, IDS
Inverters, Servos and Motors	Visualisation: HMIs	Numerical Control (NC)	Robots: SCARA, Articulated arm	Transformers, Air conditioning, Photovoltaic systems

MELSERVO-J4 Function Guide

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