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**MITSUBISHI  
ELECTRIC**

*Changes for the Better*

FACTORY AUTOMATION

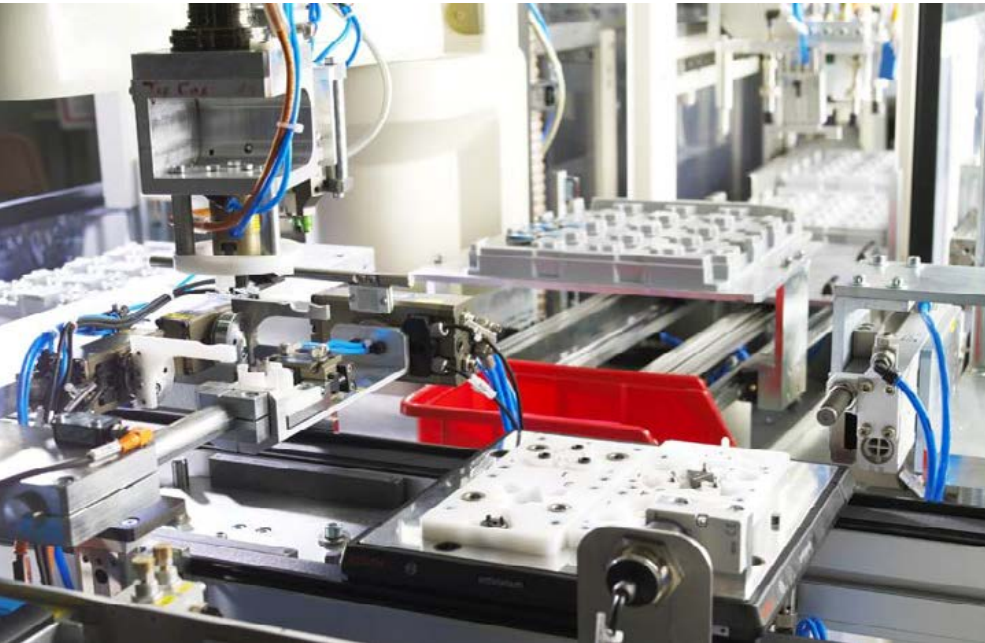
# MR-J4-TM

Multi-Network servo with EtherCAT



- Standard IEC61158 type 12 CAN application control over EtherCAT
- Short communication cycle times
- Dual 100Base-TX Ethernet ports
- Higher efficiency and more space in the cabinet

# Real-Time Performance with EtherCAT



Feed equipment is one of the servo's many applications.



**EtherCAT**

With the MR-J4-TM-ECT servo amplifier the industry leading performance, features and reliability of the MR-J4 series servo system is combined with an EtherCAT open network interface. Even if the control system is specified by end-customer, system manufacturers can use Mitsubishi Electric servo technology and benefit of the highly compact and powerful technology of the MR-J4 series.

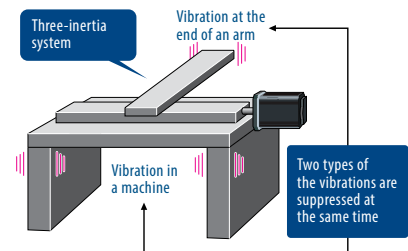
## Interface to the Ethernet fieldbus

EtherCAT (Ethernet for Control Automation Technology) is a real-time Industrial Ethernet technology organized by the user organization EtherCAT Technology Group. The EtherCAT protocol which is disclosed in the IEC standard IEC61158 is suitable for real-time requirements in industrial automation technology and in many other applications. The MR-J4-TM-ECT servo amplifier provides the the interface to EtherCAT and supports the IEC 61158 type 12 CAN application protocol and the IEC 61800-7 CiA402 drive profile for excellent compatibility.

The dual 100BASE-TX Ethernet ports of the MR-J4-TM-ECT support line, tree, star, and ring topologies for maximum flexibility in wiring layout. The communication cycle times are 250  $\mu$ s, 500  $\mu$ s, 1 ms and 2 ms.

## Outstanding performance

Mitsubishi Electric has incorporated numerous innovative and user-friendly functions to the MR-J4-TM to minimise the time-consuming and elaborate matching of mechanical and electronic systems.



Automatic vibration suppression

The MR-J4-TM has an industry-leading performance with 2.5 kHz speed frequency response for shortest settlingtime. The absolute encoder which is fitted as standard has a resolution of 22 bits. This corresponds to 4,194,304 pulses/revolution. The result is excellent true-running characteristics, smooth rotation and a maximum positioning accuracy and processing speed which more than satisfy the performance requirements of modern high-end machines.

The system tunes itself quickly and easily thanks to "Realtime Auto Tuning" and "Vibration suppression control". These functions are available both at start-up and during operation and thus reduce commissioning and parameterisation times. No tuning experience is necessary and no additional motion controllers or protocol converters are required for a clean installation with a minimum amount of hardware and software.

The amplifiers also feature a "Life Diagnosis Function". This function checks the state and quality of the installed components, such as capacitors and relays, over the whole life cycle, and informs the user and operator of any abnormalities. This virtually eliminates failures and machine downtime.

Mechanical system characteristics are also monitored, and undesirable vibration and friction are checked and directly suppressed, thus preventing system resonance. This function not only damps drive train vibrations but also oscillations at the end of a tool arm.



Large choice of different servo motors

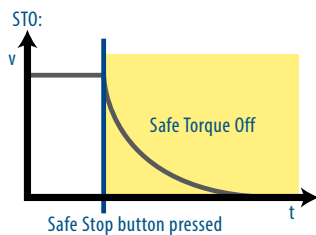
## Target applications

The MR-J4-TM is especially suitable for applications like:

- Packaging
- Life Sciences and medical devices
- Electronic and semiconductor equipment
- Pharmaceutical industry

## Safety is top priority

The designers of the MR-J4 series also had the user and the future in their sights when it came to safety and safety functions. As standard, the amplifiers feature STO (Safe Torque Off) safety functions in accordance with EN 61800 5-2. This achieves safety level SIL according to EN 62061 and PLD according to EN 13849 1.



Maintain safe control of motor behaviour even in emergency situations

\* Extended Safety functions (STO/SS1/SS2/SOS/SBC/SLS/SSM) available from Summer 2016

## Flexible motor selection

Another highlight of functionality and flexibility is the possibility of connecting different motors to the MR-J4 amplifier. The servo amplifier can be conveniently and easily used with rotary motors, linear motors and also direct drive motors.

Five series of rotary motors are available, covering the range from small to medium power and speeds from 2000–6000 rpm. Individual series are distinguished by particularly small moments of inertia or a particularly low-profile design. All motors have protection class IP65 or IP67 (protected against dust and spray water) and are therefore suitable even for the toughest industrial environments. Output powers range from 50–750 W for the HG-KR/MR series, 1–5 kW for the HG-RR series, 0.5–7 kW for the HG-SR series and 0.5–22 kW for the HG-JR series.

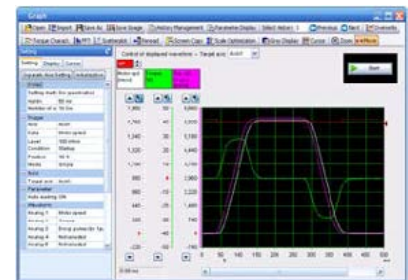
Linear motors are available in four ranges: with core (LM-H3 series), without core (LM-U2 series), core with liquid or self-cooling (LM-F series), and core with magnetic counter-force (LM-K2 series). A number of serial interfaces for linear encoders including the A/B/Z phase encoder with differential output are supported. The maximum speed is up to 3 m/s and the thrust between 50–6000 N depending on the model range.

Special features of the direct drive motors of the TM-RFM series include high torque density and extremely uniform rotation for direct connection to the

mechanical equipment, thus obviating the need for a gearbox. The standard design with high-resolution 20-bit encoder (1,048,576 pulses/rev) enables the utmost machine precision to be achieved. The motors are available with four outside diameters and cover a torque range from 2–240 Nm.

## User-friendly software

The MR Configurator2 programming tool allows convenient commissioning and diagnostics. Calibration, monitoring, diagnostics, reading and writing of parameters and test operation can



Monitoring and testing with the online diagnostics

be carried out easily on a standard PC. MR Configurator2 ensures a stable machine system, optimum control and short set-up times. Even less experienced users can set up an MR-J4 servo system quickly and precisely thanks to the wide range of automatic adjustment aids.

# MR-J4-TM / Multi-Network servo with EtherCAT

## Specifications

SERVO AMPLIFIER MR-J4-□ (200 V TYPE)		10 TM	20 TM	40 TM	60 TM	70 TM	100 TM	200 TM	350 TM	500 TM	700 TM
<b>Capacity range</b>	[kW]	0.1	0.2	0.4	0.6	0.75	1	2	3.5	5	7
<b>Power supply</b>	<b>Voltage/frequency</b>	3-phase or 1-phase 200–240 V AC, 50 Hz/60 Hz					3-phase 200–240 V AC, 50 Hz/60 Hz				
	<b>Rated current [A]</b>	0.9	1.5	2.6	3.2	3.8	5.0	10.5	16.0	21.7	28.9

SERVO AMPLIFIER MR-J4-□ * (400 V TYPE)		60 TM4	100 TM4	200 TM4	350 TM4	500 TM4	700 TM4
<b>Capacity range</b>	[kW]	0.6	1	2	3.5	5	7
<b>Power supply</b>	<b>Voltage/frequency</b>	3-phase 380–480 V AC, 50 Hz/60 Hz					
	<b>Rated current [A]</b>	1.4	2.5	5.1	7.9	10.8	14.4

\* MR-J4-11KTM(4) to MR-J4-22KTM(4) are available from March 2016

GENERAL DATA	
<b>Control system</b>	Sinusoidal PWM control/current control system
<b>Control functions</b>	Cyclic synchronous position mode (csp), Cyclic synchronous velocity mode (csv), Cyclic synchronous torque mode (cst), Profile position mode (pp), Profile velocity mode (pv), Profile torque mode (tq), Homing mode (hm)
<b>Latch function</b>	Hardware and Software latch method, 2 channels (1 ch. 55 μs + 1 ch. 2 μs)
<b>Interfaces</b>	USB, 2 ports RJ45 100 BASE-TX
<b>Function Safety</b>	STO (IEC/EN 61800-5-2)
<b>Protective functions</b>	Overcurrent shutdown, regeneration overvoltage shutdown, overload shutdown (electronic thermal), servomotor overheat protection, encoder fault protection, regeneration fault protection, undervoltage / sudden power outage protection, excess error protection
<b>Protection</b>	Self-cooling, open (IP20); Fan cooling, open (IP20)
<b>Ambient temperature</b>	Operation: 0–55 °C (no freezing); Storage: –20–65 °C (no freezing)
<b>Ambient humidity</b>	Operation, storage: 90 % RH max. (no condensation)
<b>Others</b>	Elevation: 2000 m or less above sea level; Oscillation: 5.9 m/s <sup>2</sup> (0.6 G) max.

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### Version check



Art.-Nr. 291887-A

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Printed October 2015