Driver Specification for Linear Motor Drive Tables

MR-J4

■ Specification of MR-J4, a driver for NT38V

- Low-voltage (DC24V) specification and compact design of 100×90×30 mm. It contributes to miniaturization of devices and compactness.
- Servo gain adjustment, including machine resonance suppression filter, advanced vibration control Ⅱ, and robust filter, can be completed simply by turning on the one-touch tuning function. Easy driving of the cutting-edge vibration suppression function allows the machine to produce its best performance.
- Machine diagnosis, startup and adjustment of the linear motor can be easily performed thanks to parameter settings, monitor display and machine analyzer of the setup software (MR Configurator2).

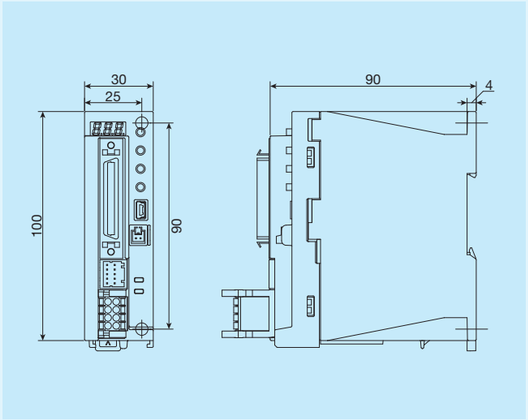


Table 1 Specifications for MR-J4

Item		Identification Number: MR-J4-03A6-NL156J154/ MR-J4-03A6-NL156J155
Output	Rated voltage	Three-phase AC13V
	Rated current	2.4A
Main circuit power supply input	Voltage	DC24V
	Rated current	2.4A
	Allowable power fluctuation	DC21.6V to 26.4V
Control circuit power supply input	Voltage	DC24V
	Rated current	0.2A
	Allowable power fluctuation	DC21.6V to 26.4V
	Power consumption	5.0W
Power supply for interface		DC24V ±10% (required current capacity: 0.3 A)
Control method		Sine wave PWM control/current control method
Allowable regenerative power for servo amplifier built-in regenerative resistor		0.7W
Dynamic brake		Built-in
Communication function		USB: connection with personal computer, etc. (MR Configurator2 supported)
Encoder output pulse		Supported (ABZ-phase pulse)
Analog monitor		2-channel
Position control mode	Maximum input pulse frequency	4 Mpulses/s (with differential receiver), 200 kpulses/s (with open collector)
	Command pulse magnification	Electronic gears A/Bx A = 1 to 1.6777215, B = 1 to 16777215, 1/10 < A/B < 4000
	Positioning complete width setting	0 pulses to ±65535 pulses (command pulse unit)
Positioning mode		Point table method
Protective function		Overcurrent interrupt, regeneration overvoltage interrupt, overloading interrupt (electric thermal), servomotor overheat protection, encoder error protection, regeneration error protection, undervoltage protection, momentary power failure protection, overspeed protection, excessive error protection, magnetic pole detection protection, linear servo control error protection
Compliant overseas standards	CE marking	LVD:EN 61800-5-1/EN 60959-1 EMC:EN 61800-3
	UL standard	UL 508C（NMM S2）
Structure (protection degree)		Natural air cooling and opening (IP20)
Environmental conditions	Ambient temperature	Operation: 0 to 55°C (keep freeze free), Storage: -20 to 65°C (keep freeze free)
	Ambient humidity	Operation/storage: 5% to 90% RH or lower (keep condensation free)
	Atmosphere	Indoors (no exposure to direct sunlight) Must be free from corrosive gas, flammable gas, oil mist and dust
	Altitude	1,000 m or lower
	Vibration resistance	5.9 m/s² or less, 10 Hz to 55 Hz (X, Y, Z directions)
Mass		0.2 kg

MVDL

■ Specifications for NT30V Driver MVDL

- Low-profile, slim design just 30 mm thick. This contributes to keeping equipment small and compact.
- Achieves the optimal speed response control for equipment through high-speed response characteristics, load fluctuation suppression, and vibration suppression function.

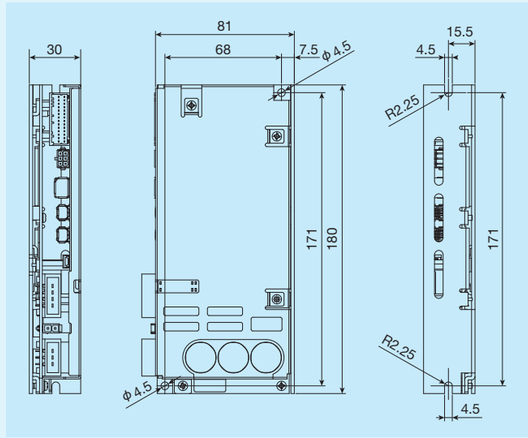


Table 2 Specifications for MVDL

Item			Identification number: MVDLN2CSM	MVDLN2CNL	MVDLN2CBL
Basic specification	Input power supply (1) (2)		24 VDC (+21, -17%)		
	Maximum output current		4 Arms		
	Control mode		・Position control ・Speed control (built-in command/analog command) ・Thrust force control ・Position/speed control ・Position/thrust force control Switching with parameters	・Position control Profile control (PP) ・Position control Cyclic control (CP) ・Speed control Cyclic control (CV) ・Thrust force control Cyclic control (CT) Switching with RTEX communication commands	・Position control Profile control (pp) ・Position control Cyclic control (scp) ・Position control Return to origin position control (hm) ・Speed control Profile control (pv) ・Speed control Cyclic control (scv) ・Thrust force control Profile control (tq) ・Thrust force control Cyclic control (cst) Switching with EtherCAT communication commands
Input/Output relation function	Motion commands		Pulse train input Line driver: 500 kpps (after 4-time multiplication) Open collector: 200 kpps (after 4-time multiplication) Analog input 0 to ±10 V (1-input 16-bit A/D)	Realtime Express (RTEX)	EtherCAT
	Contact input / output	Input	Universal 5-input (function selection with parameters) 12 to 24 VDC (±5%) Open collector signal input	Universal 8-input (function selection with parameters) 12 to 24 VDC (±5%) Open collector signal input	
		Output	Universal 3-output (function selection with parameters) 12 to 24 VDC (±5%) Open collector signal output	Universal 2-output (function selection with parameters) Alarm 1-output 12 to 24 VDC (±5%) Open collector signal output	
	Analog monitor output		1-output ± 10 V (function selection with parameters)	-	
Internal function	Communication function		USB : Parameter setting, status monitor RS232C : Higher-level controller 1:1 communication RS485 : Higher-level controller 1:N communication Modbus : Higher-level controller 1:N communication	USB : Parameter setting, status monitor RTEX : Parameter setting, status monitor	USB : Parameter setting, status monitor EtherCAT : Parameter setting, status monitor
	Dynamic brake circuit		Built-in		
	Regenerative processing circuit		Not supported		
	Safety terminal		Not supported		
Operating environment	Ambient operating temperature / Storage temperature (3)		0 to 50°C (keep condensation free)/-20 to 65°C (maximum guaranteed temperature: 80°C, 72 hours, keep condensation free)		
	Operating / Storage humidity (3)		20 to 85% RH or lower (keep condensation free)		
	Vibration resistance		5.8 m/s² or less, 10 to 60 Hz		
	Altitude		1,000 m or less		
	Pollution degree		Pollution degree 2		
Mass			0.35 kg		

Notes (1) For the DC power supply, use a stabilized power supply with reinforced insulation. Also, consider the DC power supply voltage fluctuation, load fluctuation, regeneration, etc. in order to keep it within the input power supply range.
(2) The input power voltage range is the range within which the servo amp can functionally drive the motor. Depending on the motor specifications, if the voltage falls below the rated voltage nominal value (24 V), the overload protection function may operate even if the speed and torque are within the rated ranges.
(3) Note that condensation may occur easily if the temperature falls.

NCR-H (VPH)

■ Specifications for NT88H Driver NCR-H (VPH)

- Pulse train command operation and built-in command operation are supported by mode selection for a wide range of usages.
- Additional functions offer improved positioning time, speed stability performance, and stopping stability beyond what is available with conventional models. (2-stage S acceleration/deceleration control function, improved feed-forward command accuracy, feed-forward command filter function, torque ripple suppression, stopping filter function, improved stopping torque accuracy, enhanced low-speed gain switching function)
- Using USB communication, it is possible to connect with the dedicated editing software (VPH Data Editing Software) and edit the servo oscilloscope waveform display, frequency response characteristics display, parameters, programs, and indirect data.

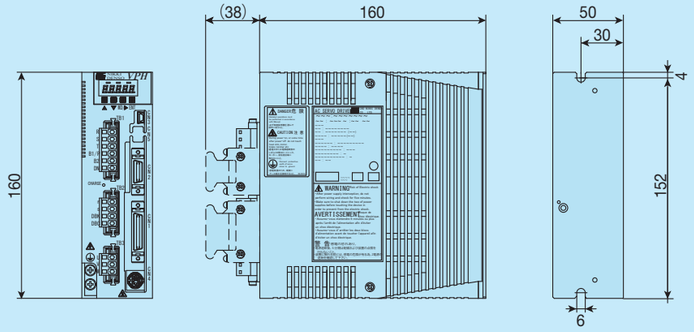


Table 3 Specifications for NCR-H (VPH)

Item \ Identification number			NCR-HA2101A-B-000-S304
Basic specification	Applicable linear motor		Nano Linear NT88H
	Continuous output current		1.1 Arms
	Momentary output current		3.3 Arms
	Input power (main circuit and control circuit)		Single-phase 200 to 240 VAC (allowable voltage fluctuation 170 to 264 VAC) 50/60 Hz
	Control method		Three-phase sine wave PWM
	Operation mode		Pulse train command operation, built-in command operation, speed command operation, torque command operation
Input/Output relation function	Command input	Pulse train command	Line driver method: Maximum input frequency 6.25 Mpps (1-time multiplication) Select from 90˚ phase difference pulse (1-, 2-, 4-time multiplication), pulse by direction (1-, 2-time multiplication), and direction signal + feeding pulse (1-, 2-time multiplication)
		Speed control operation	Internal speed command 7 points
		Torque control operation	Internal torque command 7 points
		Built-in designation	Jogging: Speed 8 points, command: 256 points 3 types
	Input signal		External input signal 8 points. The following signals can be allocated for each signal. RST (reset), ARST (alarm reset), EMG (emergency stop), SON (servo on), DR (start-up), CLR (deviation clear), CIH (pulse train command prohibit), TL (torque limit), FOT (standard configuration overtravel), ROT (reverse configuration overtravel), MD1 to 2 (mode selection 1 to 2), GSL1 to 2 (gain selection 1 to 2), RSV (command direction reverse), SS1 to 8 (command selection 1 to 8), ZST (positioning start-up), ZLS (origin deceleration), ZMK (external marker), TRG (external trigger), CMDZ (command zero), ZCAN (positioning cancel), FJOG (standard configuration jogging), RJOG (reverse configuration jogging), MTOH (motor overheat)
	Output signal		External output signal 4 points. The following signals can be allocated for each signal. ALM (alarm), WNG (warning), RDY (servo ready), SZ (speed zero), PE1 to 2 (position deviation range 1 to 2), PN1 to 2 (positioning complete 1 to 2), PZ1 to 2 (positioning complete response), ZN (command complete), ZZ (command complete response), ZRDY (command trajectory ready), PRF (rough match), VCP (speed reached), BRK (brake release), LIM (limiting), EMGO (in emergency stop), HCP (return to origin complete), HLDZ (command zeroing), OTO (overtraveling), MTON (motor energizing), OUT1 to 8 (universal output), SMOD (in speed command mode), TMOD (in torque command mode), PMOD (in pulse train command mode), NMOD (in built-in command mode), OUT1 to 8 (universal output), OCEM (marker output)
	Encoder pulse output		Line driver method: 90˚ phase difference pulse + marker Hardware frequency dividing output: Max. output frequency 25 Mpps (4-time multiplication) Software control output: Max. output frequency 20.46 Mpps (4-time multiplication)
Internal function	Protective function		Encoder abnormality, overspeed abnormality, motor overload abnormality, equipment overload abnormality, insufficient voltage abnormality, overvoltage abnormality, overcurrent abnormality, servo control abnormality, cable disconnection abnormality, magnetic pole abnormality, deviation abnormality, backup data abnormality, CPU abnormality, etc.
	Communication function		Serial communication (RS-422) 1 ch USB2.0 standard compliant (Full Speed) 1 ch For computer (VPH DES) and equipment connection
Operating environment	Temperature		Operating temperature: 0 to 55˚C (keep freeze free) Storage temperature: -20 to 65˚C
	Humidity		90% RH or lower (keep condensation free)
	Vibration resistance		Acceleration 5.9 m/s² (10 to 55Hz) Keep resonance free
	Installation location		Altitude 1,000 m or less; do not install in harmful atmospheres such as corrosive gas, cutting oil, metal powder, oil, etc. Indoors, with no direct exposure to sunlight
Mass			Approx. 1.0 kg

SANMOTION G

■ Specifications for LT170H2 Driver SANMOTION G

- Newly developed current control achieves high response control (3.5 kHz speed frequency response).
- By detecting and compensating for Coulomb friction, viscous friction and gravity with high accuracy, positioning settling time is shortened.
- Since the frequency characteristics of the machine are measured with high precision and the optimum servo parameters are automatically adjusted, start-up is easy.
- The driver setup support software enables parameter setting, status display, tuning through various diagnostics, trial runs, operation tracing, etc.

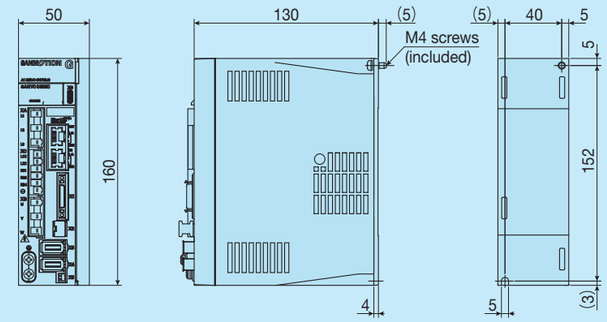


Table 4 Specifications for SANMOTION G

Item \ Identification number		GADSA03AAA2 (Pulse train/analog) GADSA03AHA4 (EtherCAT)
Basic specification	Input power supply (1)	Single-phase / Three-phase: 200 to 240 VAC (+10, -15%) 50/60 Hz (±3 Hz) DC: 300 VDC (±20%)
	Rated current / momentary current	5.2 Arms / 16.3 Arms
	Power plant capacity	2.4 kVA
	Control mode	Position control / Speed control / Thrust force control (parameter switching)
Input/Output relation function	Speed command	Analog input: 0 to ±10 V / Maximum speed (gain configurable) or EtherCAT
	Thrust force command	Analog input: 0 to ±10 V / Highest thrust force (gain configurable) or EtherCAT
	Position command	Line driver signal: 4 Mpps (non-isolated input / after 4-time multiplication) or EtherCAT Open collector signal: 4 Mpps (isolated input / after 4-time multiplication)
	Contact input / output	[Input] Functions of 8 input terminals can be selected using parameters 5 VDC ±5%, 12 to 24 VDC ±10% contact signal / open collector signal input (sink type, source type) EtherCAT specification has 2 photo coupler inputs (independent power supply can be used) [Output] Functions of 8 output terminals (2 output terminals for EtherCAT specifications) can be selected using parameters Open collector signal output (sink type, source type)
	Analog monitor	2ch output (X11) 2.0 V ±10%: Speed, current, and other parameters can be selected
Internal function	Digital operator	Pulse train / analog: Status display, parameter setting, adjustment mode, trial operation mode, alarm history display, monitor display, motor code setting EtherCAT: Status display, adjustment mode, alarm history display, monitor display
	External operator	Can be connected to Windows (32bit, 64bit) computers (USB Type C)
	Regenerative processing circuit	Built-in
	Dynamic brake circuit	Built-in
	Protective function	Output power device abnormality (overcurrent), current detection abnormality, safety torque interruption abnormality, cooling fan stopped, overload, regenerative overload, magnetic pole position estimation abnormality, excessive continuous rotation speed, overheat abnormality, external abnormality, servo amplifier temperature abnormality, overvoltage, main circuit insufficient voltage, main circuit power supply incomplete phase, main circuit voltage detection abnormality, rush prevention time abnormality, control power supply abnormality, control circuit insufficient voltage, encoder abnormality, overspeed, speed control abnormality, speed feedback abnormality, model following damping control abnormality, excessive position deviation, position command abnormality, inter-axis synchronization error, excessive dual position error, dual position feedback abnormality, amplifier communication abnormality, excessive position deviation difference, memory abnormality, CPU abnormality, parameter abnormality, control circuit abnormality, task processing abnormality
Operating environment	Ambient operating temperature / Storage temperature (2)	0 to 60˚C / -20 to 65˚C
	Operating humidity	95% RH or lower (keep condensation free)
	Vibration resistance	6m/s² (Impact: 20m/s²)
	Altitude	2,000 m or less
	Overvoltage Category	Ⅲ
Mass		0.9kg

Notes (1) Configure the parameters when using single-phase or DC.
(2) For use at +55˚C to +60˚C or 1,000 to 2,000 m, the rating must be reduced.

ADVA

■ Specifications for ADVA

■ Applicable model numbers
NT series: NT55V, NT80V, NT88H, NT...XZ, NT...XZH
SA series: all model numbers
LT series: all model numbers

- In addition to the conventional pulse train command input, high speed motion network EtherCAT is also supported.
- 10 input terminals, 6 output terminals, and analog input (0 to ±10 V) can be controlled by intelligent terminals.
- The high controllability shortens the settling time, realizing further improvement of productivity.
- Machine diagnosis, startup and adjustment of linear motor can be easily performed thanks to parameter settings, monitor display, operation trace and automatic tuning function of the setup software.

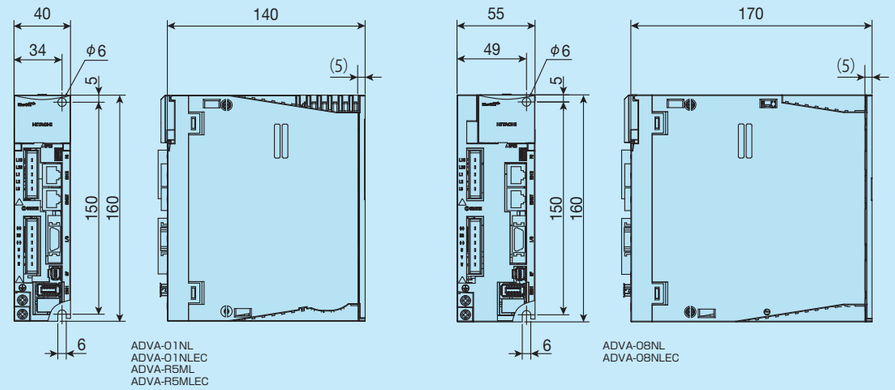


Table 5 Specifications for ADVA

Item \ Identification number		ADVA-01NL ADVA-01NLEC	ADVA-08NL ADVA-08NLEC	ADVA-R5ML ADVA-R5MLEC
Basic specification	Input power	Single-phase / Three-phase AC 200 to 230 V 50 / 60Hz		Single-phase AC100 to 115V 50 / 60Hz
	Rated current / momentary current	1.2Arms / 3.6Arms	5.1Arms / 15.3Arms	1.2Arms / 3.6Arms
	Power plant capacity	0.3kVA	1.3kVA	0.2kVA
	Protective structure(1)	Semi-enclosed IP20		
	Control mode	Position control / Speed control / Thrust force control		
Input/Output relation function	Speed command	Analog input: 0 to ±10 V / Maximum speed (gain configurable) or EtherCAT		
	Thrust force command	Analog input: 0 to ±10 V / Maximum thrust force (gain configurable) or EtherCAT		
	Position command	Line driver signal: 20 Mpps (non-isolated input / after 4-time multiplication) Open collector signal: 2 Mpps (isolated input / after 4-time multiplication) or EtherCAT		
	Contact input / output	[Input] Intelligent terminal selects 10 input terminal (6 input terminal for EtherCAT specification) function by parameter DC12 / 24 V Contact signal / Open collector signal input (with internal DC24 V power supply) [Output] Intelligent terminal selects 6 output terminal (4 output terminal for EtherCAT specification) function by parameter (Open collector signal output: sink output)		
Internal function	Built-in operator	Pulse train command specification: Five digit numeric display, five key push button / DIP switch (Modbus communication setting) EtherCAT specification: 2-digit numeric display, DIP switch (node address setting for EtherCAT)		
	External operator	Windows 7/8 (32-bit, 64-bit) PC can be connected (USB 2.0 full speed)		
	Regenerative braking circuit	Built-in		
	Dynamic brake(2)	Built-in (motion condition configurable)		
	Protective function	Overcurrent, overload, braking resistor overload, main circuit overvoltage, memory error, main circuit under voltage, CT failure, CPU error 1, external trip (motor temperature error), servo ON ground detection, control circuit under voltage, servo amplifier temperature error, drive prohibition error, power module failure, safety circuit failure, emergency shutdown, encoder failure, mismatch error, power reactivation request, magnetic pole position estimation error, magnetic pole position estimation not executed, position deviation error, speed deviation error, overspeed error, momentary power failure, main circuit power supply failure, drive range error (network communication error, DC synchronization error, under voltage display)		
Operating environment	Ambient temperature in operation/ Storage temperature (3)	0 ~ 55℃ / −10 ~ 70℃		
	Operating humidity	20 to 90% RH (keep condensation free)		
	Vibration resistance (4)	5.9m/s² (0.6G) 10 to 55Hz		
	Service space	Altitude of 1000 m or below, indoor (no corrosive gas and dust)		
Mass		0.7kg	1.2kg	1.1kg

Notes (1) Protection method is compliant with JEM1030.
(2) Use the dynamic brake for emergency stop
(3) The storage temperature is the temperature during transportation.
(4) Compliant with JIS C60068-2-6:2010.

● Setup software

- Used for setting, referencing, changing, printing and saving driver parameters.
- Allows for real-time monitoring of operational status and output status.
- Indicates speed and current, etc. on charts.
- Supports commissioning and gain tuning.

Table 6 Operating environment of the setup software

Item	Operating conditions
PC	CPU: Pentium 4 1.8 GHz or higher HDD free space: 1 GB or more Display resolution: 1024x768 or higher recommended
OS	Windows Vista 32-bit SP1 Windows 7 (32-bit, 64-bit) Windows 8 (32-bit, 64-bit)

Remark: Windows® is a registered trademark of Microsoft Corporation in USA and other countries.
Pentium is a registered trademark of Intel Corporation in USA and other countries.

● Automatic tuning function

By using the automatic tuning function of the setup software for ADVA, non-expert users can easily perform high-accuracy gain adjustment.

<Operating conditions>
Main body: NT55V25/05R + ADVA-01NL/NT55V25
Carrying mass: 200g Speed: 500mm/s Positioning complete width: ±5μm Traveling distance: 10mm
Acceleration/deceleration time: 12ms

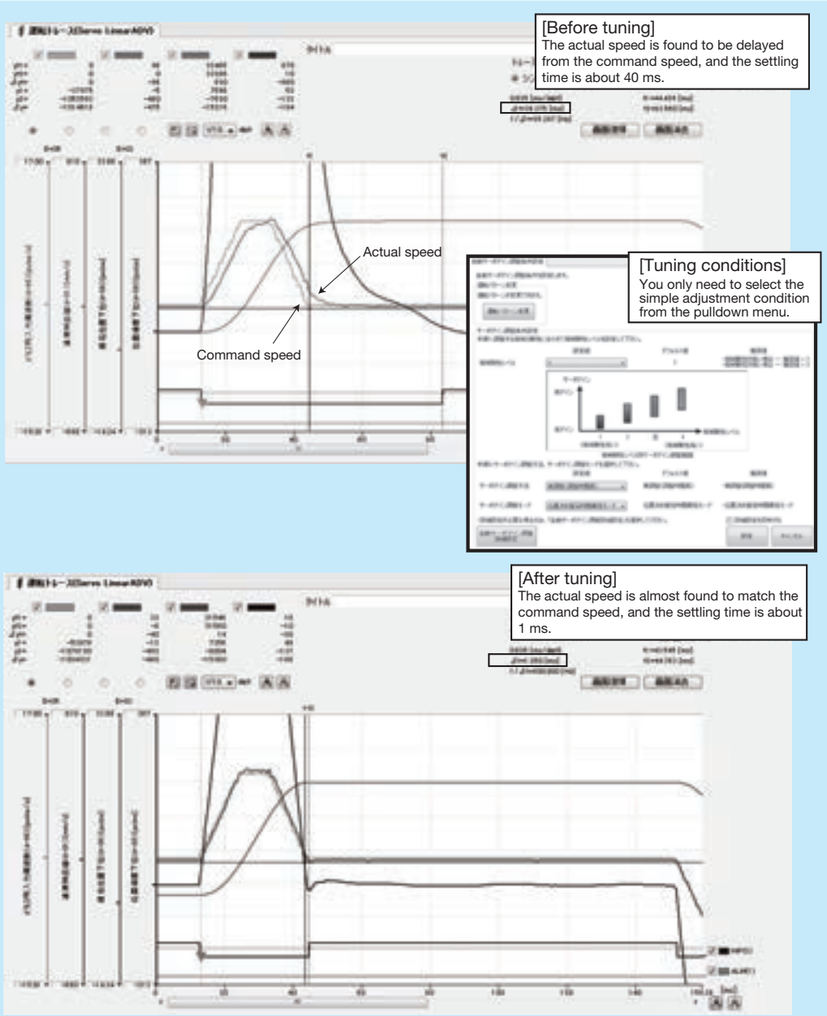


Fig. 2 Automatic tuning

MR-J4

■ Specifications for MR-J4

■ Applicable model numbers
NT series: NT55V, NT80V
SA series: all model numbers

- Supports SSCNET Ⅲ/H (high-speed serial bus). Higher speed and accuracy are realized by optical communication system.
- Servo gain adjustment, including machine resonance suppression filter, advanced vibration control II, and robust filter, can be completed simply by turning on the one-touch tuning function. Easy driving of the cutting-edge vibration suppression function allows the machine to produce its best performance.
- Machine diagnosis, startup and adjustment of linear motor can be easily performed thanks to parameter settings, monitor display and machine analyzer of the setup software (MR Configurator2).

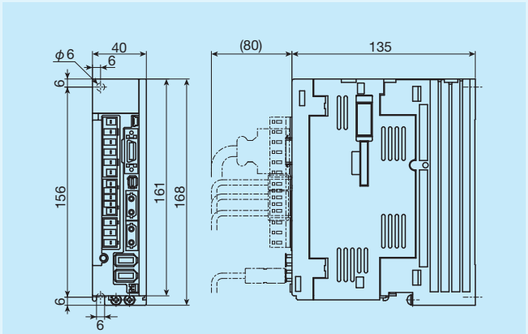
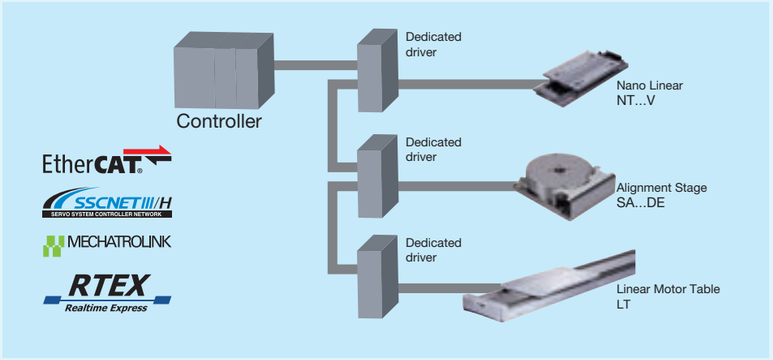


Table 7 Specifications for MR-J4

Item \ Identification Number			MR-J4-10B-RJ
Basic specification	Output	Rated voltage	Three-phase AC170V
		Rated current	1.1A
	Main circuit power supply	Voltage / Frequency	Single-phase / Three-phase AC200-240V 50/60Hz
		Allowable power fluctuation	Single-phase / Three-phase AC170-264V
		Allowable frequency fluctuation	Within ± 5%
	Control circuit power supply	Voltage / Frequency	Single-phase AC200-240V 50/60Hz
		Allowable power fluctuation	Single-phase AC170-264V
		Allowable frequency fluctuation	Within ± 5%
		Power consumption	30W
	Power supply for interface		DC24V ± 10% (required current capacity: 0.3A (includes CN8 connector signal))
	Structure (protection class)		Natural air cooling and opening (IP20)
	Control method		Sine wave PWM control/current control method
	Machine end encoder interface		Mitsubishi high-speed serial communication / ABZ-phase differential input signal
Input/Output function	Encoder output pulse		Supported (ABZ-phase pulse)
	Analog monitor		2ch
Internal function	Communication function		USB: connection with personal computer, etc. (MR Configurator2 supported)
	Dynamic brake		Built-in
	Protective function		Overcurrent interrupt, regeneration overvoltage interrupt, overloading interrupt (electric thermal), servomotor overheat protection, encoder error protection, regeneration error protection, undervoltage protection, momentary power failure protection, overspeed protection, excessive error protection, magnetic pole detection protection, linear servo control error protection
Operating environment	Ambient temperature		0 to 55˚ C (keep freeze free), Storage: 20 to 65˚ C (keep freeze free)
	Ambient humidity		90%RH or lower (keep condensation free), Storage: 90%RH or lower (keep condensation free)
	Atmosphere		Indoor (no exposure to direct sun light), must be free from corrosive gas, flammable gas, oil mist and dust
	Altitude		1 000m or lower
	Vibration resistance		5.9m/s^2 or less, 10Hz to 55Hz (X, Y, Z directions)
Mass			0.8kg

Motion Network

Drivers for linear motor drive tables include those supporting motion networks EtherCAT, SSCNET Ⅲ/H, MECHATROLINK, and RTEX. Motion networks realize higher performance and higher accuracy of devices free from pulse frequency constraint in pulse train command, noise effects in analog command (voltage command), voltage drop due to cable length and effects of temperature drifting. Reduction of wiring can also be achieved, so a synchronization system with more than one table can easily be established.



Model	Features
EtherCAT	This is an Ethernet-based open network communication system developed by Beckhoff of Germany, allowing the real time control. High speed communication and high accuracy inter-node synchronization realize the higher performance and higher accuracy of devices. In addition, Ethernet cables available on the market can be used and various wiring types can be supported.
SSCNET Ⅲ/H	This is a motion network communication system for servo system control developed by Mitsubishi Electric Corporation. It applies the optical fiber cables, so noise immunity is improved relative to conventional SSCNET.
MECHATROLINK	The open field network communication that connects the controller and various components. Developed by Yaskawa Electric Corporation and managed by MECHATROLINK Members Association.
RTEX	RTEX (Realtime Express) is an advanced network developed independently by Panasonic Corporation, in order to deliver the high real time performance required for servos. It offers extremely high-speed communication (100Mbps), and supports commercially available LAN cables to help reduce system costs.