

A (Ace) Servo for the Next Generation

MINAS A4 Series



Advanced Gain Tuning

- Further Evolution in Real-Time Auto-Gain Tuning

Agile and Intelligent

- Improved Damping Control handles all types of machines, from low to high stiffness machines with simple but solid operation

Almighty

- Position Control, Velocity Control and Torque Control in one Driver supports multiplicity of application.

Amazingly slim size

- Another Evolution in down-sizing, by 25% in size (compared to A-series)

MINAS A4 Series

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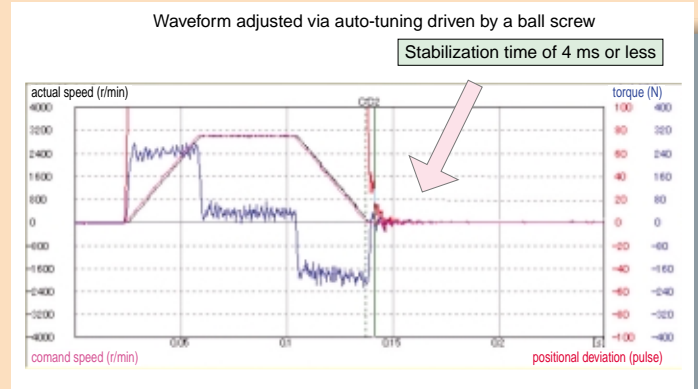
Remarks :Instruction manual is available as an option as
 Japanese version : DV0P4200 and
 English version : DV0P4210

Details of Features

1. Further Adjustment-Free Operation

High-functionality Real-Time Auto-Gain Tuning

- Corresponds to even variation of load inertia. Offers real automatic gain tuning to low and high stiffness machines with a combination of an adaptive filter.
- Supports the vertical axis application where the load torque is different in rotational direction.
- Prevents the machine from over-traveling during automatic gain tuning with over-travel detecting function.
- Enables you to set and check while monitoring real-time automatic gain tuning conditions on the front panel.

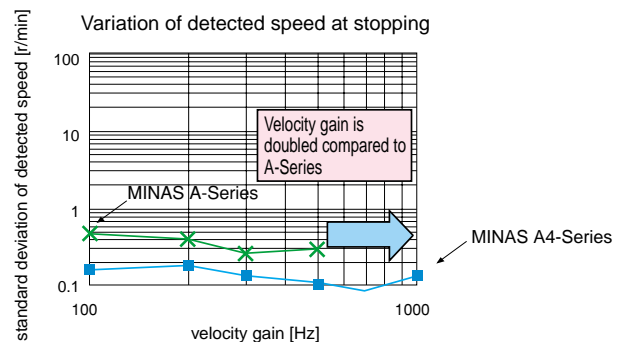
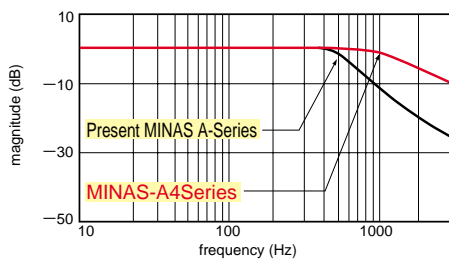


2. Further High-Speed and High-Response

Velocity response (bandwidth) of 1kHz

- Implementation of Instantaneous Velocity Observer realizes a detection of motor speed with higher speed and higher resolution.

*) In case of high stiffness machine



High-functionality Real-Time Auto-Gain Tuning

- Supports the low stiffness machine of belt-driven and the high stiffness machine of short stroke ball screw driven, and enables to realize high-speed positioning with high-functionality real-time auto-gain tuning.

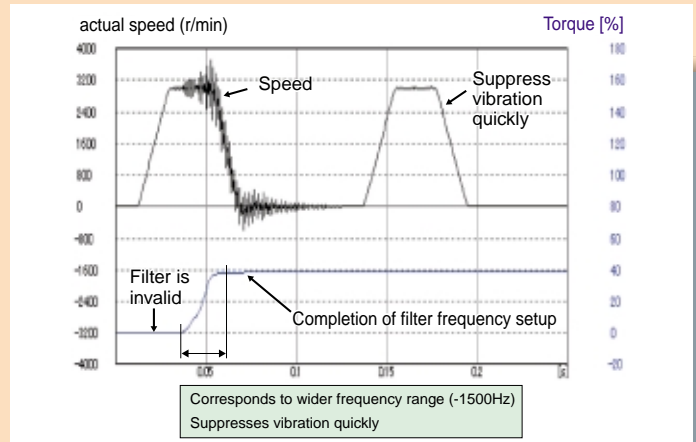
3. Further Reduction of Vibration

Adaptive filter

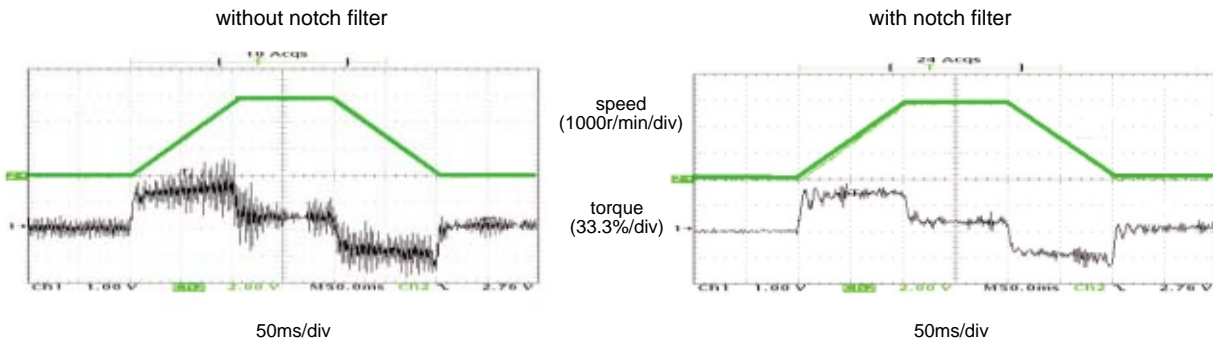
- Makes the notch filter frequency automatically follow the machine resonance frequency.
- Suppression of "Judder" noise of the machine can be expected which is caused by variation of the machines or resonance frequency due to aging.

2-channel notch filters

- 2-channel notch filters are equipped in the driver independent from adaptive filter.
- You can set up both frequency and width for each of 2 filters, and set up frequency in unit of 1Hz.
- Suppression of "Judder" noise of the machine which has multiple resonance points can be expected



Effect of notch filter



Damping control

- 2-channel damping filters are equipped in this driver. You can suppress vibration occurring at both starting and stopping in low stiffness machine, by manually setting up vibration frequency in 0.1Hz unit.
- You can also switch the vibration frequency set by 2-channel with rotating direction or with an external input to correspond to the variation of vibration frequency caused by the machine position.
- Easy setup with entry of only frequency and filter value. Improper setup values do not result in unstable operation



4. Further Flexibility and Multiplicity

Setup support with substantial monitoring function

- Faster communication speed of RS232/RS485 (Max.57600bps) establishes an easy and comfortable operating condition for setup support software, "PANATERM[®]".
- Displays the factors of no-motor run and helps you to analyze the causes of troubles.
- You can set up the panel operation lock to inhibit the operation from the front panel, thus enables you to prevent miss-operation such as unintentional change of parameters.

*Note) Refer to page "F4" for setup support software.

Command control modes

- Offers you "Position", "Velocity (including internal 8-speed)" and "Torque" command control modes
- You can set up any one of the command control modes, or selectable two command control mode with parameter.
- You can set up any command control mode depending on your application.

Monitoring function with front panel

- LED display and analog monitor terminals are installed in the front panel.
- Displays "Motor speed", "Motor torque" Position deviation", "Motor load factor" and "Regeneration load factor" on LED.
- You can monitor "Motor speed", "Motor torque" and "Position deviation" through analog monitor terminals.

Trial run (JOG)

- Features the function for trial (JOG) run through the front panel or console (option) without connecting to a host controller.
- You can shorten the machine setup time.

Full-closed control (High precision positioning)

- Features the full-closed control of position and velocity, using the signals from linear scale installed on the load side and high resolution encoder.

Note) Applicable external linear scales are as follows,

AT500 series by Mitutoyo (Resolution 0.05[μ m], max, speed 2[m/s])

ST771 series by Mitutoyo (Resolution 0.5[μ m], max, speed 2[m/s])

- Best suits to high precision machines.

Inrush current suppressing function

- Inrush current suppressing resistor is equipped in this driver, which prevents the circuit breaker shutdown of the power supply caused by inrush current at power-on.
- Prevents unintentional shutdown of the power supply circuit breaker in multi-axes application and does not give load to the power line.

Regeneration discharging function

- Discharges the regenerative energy with resistor, which energy is generated while stopping the load with large moment of inertia, or use in up-down operation, and is returned to the driver from the motor.
- No regeneration discharge resistor is built-in to Frame A driver (MADDT1105 type.) and Frame B driver (MBDDT2210 type.), and we recommend you to connect optional regenerative resistor.
- Regenerative resistor is built-in to Frame C to F drivers, however, connection of the optional regenerative resistor bring you further regenerative capability.

Built-in dynamic brake

- You can select the dynamic brake action which short the servo motor windings of U, V and W, at Servo-OFF, CW/CCW over-travel inhibition, power shutdown and trip.
- You can select the action sequence setup depending on the machine requirement.

Positioning pulse

- Corresponds up to 2Mpps of pulse input at positioning control.

Setup support software

- With the setup support software, "PANATERM[®]" via RS232/RS485 communication port, you can monitor the running status of the driver and set up parameters.
- You can read out the absolute position data of the motor with absolute encoder.

Wave-form graphic function

- With the setup support software, "PANATERM[®]", you can monitor the "Command speed", "Actual speed", "Torque", "Position deviation" and "Positioning complete signal".
 - Helps you to analyze the machine and shorten the setup time
- *Note) Refer to page "F4" for setup support software.

Torque limit value switching

- You can setup 2 torque limits and use them for tension control or press & hold control
- It is possible to apply it to bumping homing

SEMI F47 voltage sag immunity

- Features the function which complies to voltage sag immunity standard of SEMI F47 at no load or light load.
- Useful for semiconductor industry.

Notes)

- 1)Not applicable to single phase, 100V type.
- 2)Verify with the actual machine condition to F47, voltage sag immunity standard.

Frequency analyzing function

- You can confirm the response frequency characteristics of total machine mechanism including the servo motor with the setup support software, "PANATERM[®]"
 - Helps you to analyze the machine and shorten the setup time
- *Note) Refer to page "F4" for setup support software.









■Applicable overseas safety standards



Subject	Standard conformed		
Motor	IEC60034-1	IEC60034-5	Conforms to Low-Voltage Directives
	UL1004	CSA22.2 NO.100	
Motor and driver	EN50178	UL508C	Conforms to references by EMC Directives
	EN55011	Radio Disturbance Characteristics of Industrial, Scientific and Medical (ISM) Radio-Frequency Equipment	
	EN61000-6-2	Immunity for Industrial Environments	
	IEC61000-4-2	Electrostatic Discharge Immunity Test	
	IEC61000-4-3	Radio Frequency Electromagnetic Field Immunity Test	
	IEC61000-4-4	Electric High-Speed Transition Phenomenon/Burst Immunity Test	
	IEC61000-4-5	Lightening Surge Immunity Test	
	IEC61000-4-6	High Frequency Conduction Immunity Test	
	IEC61000-4-11	Instantaneous Outage Immunity Test	

I E C : International Electrotechnical Commission
 E N : Europaischen Normen
 EMC : Electromagnetic Compatibility
 U L : Underwriters Laboratories
 CSA : Canadian Standards Association

List of Specifications

	Motor series	Rated output (kW)	Rated rotational speed (Max. speed) (r/min)	Rotary encoder		Brake	Gear	CE/UL	Enclosure	Features	Applications
				2500P/r incremental	17bit absolute/incremental	Holding	High precision				
Ultra low inertia	MAMA 	0.1-0.75 4 models 0.1, 0.2, 0.4 and 0.75	5000 (6000)	○	○	○	—	○	IP65 (Except shaft through hole and connector)	·Small capacity ·Suitable for the machines directly coupled with high speed ball screw and high stiffness and high repetitive application	·SMT machines ·Inserters ·High repetitive positioning application
Low inertia	MSMD 	0.05-0.75 5 models 0.05, 0.1, 0.2, 0.4 and 0.75	3000 (5000) *For 400W/100V and 750W 3000 (4500)	○	○	○	○	○	IP65 (Except shaft through hole and connector)	·Small capacity ·Suitable for all applications	·Inserters ·Belt driven machines ·Unloading robot
	MQMA 	0.1-0.4 3 models 0.1, 0.2, and 0.4	3000 (5000) *For 400W/100V 3000 (4500)	○	○	○	—	○	IP65 (Except shaft through hole and connector)	·Small capacity ·Suitable for flat type and low stiffness machines with belt driven	·SMT machines ·Inserters ·Belt driven machines ·Unloading robot
	MSMA 	1.0-5.0 6 models 1.0,1.5,2.0, 3.0,4.0 and 5.0	3000 (5000) *For 4kW and 5kW 3000 (4500)	○	○	○	—	○	IP65 (Except cannon plug/connector pins)	·Middle capacity ·Suitable for the machines directly coupled with ball screw and high stiffness and high repetitive application	·SMT machines ·Inserter ·Food machines
Middle inertia	MDMA 	1.0-7.5 6 models 1.0,1.5,2.0, 3.0,4.0,5.0 and 7.5	2000 (3000) *For 7.5kW 1500 (3000)	○	○	○	—	○	IP65 (Except cannon plug/connector pins)	·Middle capacity ·Suitable for low stiffness machines with belt driven	·Belt driven machines ·Conveyors ·Robots
	MGMA 	0.9-6.0 4 models 0.9,2.0, 3.0,4.5 and 6.0	1000 (2000)	○	○	○	—	○	IP65 (Except cannon plug/connector pins)	·Middle capacity ·Suitable for machines requiring low speed with high torque	·Belt driven machines ·Conveyors ·Robots
	MFMA 	0.4-4.5 4 models 0.4,1.5, 2.5 and 4.5	2000 (3000)	○	○	○	—	○	IP65 (Except cannon plug/connector pins)	·Middle capacity ·Flat type and suitable for machines with space limitation	·Robots ·Food machines
High inertia	MHMA 	0.5-7.5 7 models 0.5,1.0,1.5, 2.0,3.0,4.0, 5.0 and 7.5	2000 (3000) *For 7.5kW 1500 (3000)	○	○	○	—	○	IP65 (Except cannon plug/connector pins)	·Middle capacity ·Suitable for low stiffness machines with belt driven, and large load moment of inertia	·Belt driven machines ·Conveyors ·Robots

Motor is sharing with A4P series

Model Designation

■ Servo Motor

M S M D 5 A Z S 1 S * *

Symbol	Type
MAMA	Ultra low inertia (100W-750W)
MSMD	Low inertia (50W-750W)
MQMA	Low inertia (100W-400W)
MSMA	Low inertia (1.0kW-5.0kW)
MDMA	Middle inertia (1.0kW-7.5kW)
MGMA	Middle inertia (900W-6.0kW)
MFMA	Middle inertia (400W-4.5kW)
MHMA	High inertia (500W-7.5kW)

Special specifications

Design order
1 : Standard

Rotary encoder specifications

Symbol	Format	Pulse counts	Resolution	Wires
P	Incremental	2500P/r	10000	5
S	Absolute/ Incremental common	17bit	131072	7

Voltage specifications

Symbol	Specifications
1	100V
2	200V
Z	100V/200V common(50W only)

Motor rated output

Symbol	Rated output	Symbol	Rated output
5A	50W	15	1.5kW
01	100W	20	2.0kW
02	200W	25	2.5kW
04	400W	30	3.0kW
05	500W	40	4.0kW
08	750W	45	4.5kW
09	900W	50	5.0kW
10	1.0kW	60	6.0kW
		75	7.5kW

Motor structure

MSMD (standard stock), MQMA (build to order)

Symbol	Shaft		Holding brake		Oil seal	
	Round	Key-way, center tap	without	with	without	with*
A	●		●		●	
B	●			●	●	
S		●	●		●	
T		●		●	●	

*Motor with oil seal is manufactured by order.

MSMA, MDMA, MGMA, MFMA, MHMA

Symbol	Shaft		Holding brake		Oil seal	
	Round	Key-way	without	with	without	with
C	●			●		●
D	●			●		●
G		●	●			●
H		●		●		●

Products are standard stock items or build to order items. See index (page F31).

MAMA

Symbol	Shaft		Holding brake		Oil seal	
	Round	Key-way	without	with	without	with
A	●		●		●	
B	●			●	●	
E		●	●		●	
F		●		●	●	

Products are standard stock items or build to order items. See index (page F31).

See page, A4-49 for motor specifications

■ Motor with reduction gear

M S M D 0 1 1 P 3 1 N

Symbol	Type
MSMD	Low inertia (100W-750W)

Motor rated output

Symbol	Rated output
01	100W
02	200W
04	400W
08	750W

Voltage specifications

Symbol	Specifications
1	100V
2	200V

Rotary encoder specifications

Symbol	Format	Pulse counts	Resolution	Wires
P	Incremental	2500P/r	10000	5
S	Absolute/ Incremental common	17bit	131072	7

Gear reduction ration, gear type

Symbol	Gear reduction ratio	Motor output (W)				Gear type
		100	200	400	750	
1N	1 / 5	●	●	●	●	For high accuracy
2N	1 / 9	●	●	●	●	
3N	1 / 15	●	●	●	●	
4N	1 / 25	●	●	●	●	

Motor structure

Symbol	Shaft		Holding brake	
	Key-way	without	with	
3	●	●		
4	●		●	

See page, A4-105 for motor with gear reducer specifications

■ Servo Driver

M A D D T 1 2 0 5 * * *

Special specifications

Frame symbol

Symbol	Frame
MADD	A4 series, Frame A
MBDD	A4 series, Frame B
MCDD	A4 series, Frame C
MDDD	A4 series, Frame D
MEDD	A4 series, Frame E
MFDD	A4 series, Frame F
MGDD	A4 series, Frame G

Power device Max. current rating

Symbol	Power device Max. current rating
T1	1.0A
T2	1.5A
T3	3.0A
T5	5.0A
T7	7.5A
TA	1.0A
TB	1.5A
TC	3.0A

Supply voltage specifications

Symbol	Specifications
1	Single phase, 100V
2	Single phase, 200V
3	3-phase, 200V
5	Single/3-phase, 200V

Current detector current rating

Symbol	Current detector, current rating
05	5A
07	7.5A
10	1.0A
20	2.0A
30	3.0A
40	4.0A
64	6.4A
90	9.0A
A2	1.2A
B4	2.4A

See page, A4-15 for driver specifications