Servo motor that brings out potential of the machine. MINAS A5 Family

Two-degree-of-freedom control system

All-in-one type

A5Ⅱ series

Rated output: **50 W to 15.0 kW**

- 20 bit incremental encoder, 17 bit absolute/ incremental encoder
- All-in-one: Speed, Position, Torque*1, Full-closed*1 control type

*1 Not applicable to two-degree-of-freedom control system.

All-in-one type

A5 series

Rated output: **50 W to 15.0 kW**

- 20 bit incremental encoder, 17 bit absolute/ incremental encoder
- All-in-one: Speed, Position, Torque, Full-closed control type

Two-degree-of-freedom control system

Position control type

A5ⅡE series

Rated output: **50 W to 5.0 kW**

- 20 bit incremental encoder
- Position control (pulse train commands)

Position control type

A5E series

Rated output: **50 W to 5.0 kW**

- 20 bit incremental encoder
- Position control (pulse train commands)

Slim design and position control type

E series

Rated output: **50 W to 400 W**

- Ultra-small design and pulse train command type only
- Real-time auto gain tuning
- DIN-rail mountable (using mounting Kit)

Linear motor and DD motor control type

Special Order Product

A5L series

Capacity of applying Linear motor:
Compatible with 5.0 kW rotaly AC servo motor

- Position, Speed, Thrust control
- Drastically reduced setup time by automatic setup
- Automatic magnetic pole detection function will detect the magnetic pole position of the linear motor.

General-purpose RS485 communication AE-LINK support type

Special Order Product
Coming soon

A5A series

AE-LINK®

Rated output:
50 W to 15.0 kW

- Positioning is possible by built-in NC function
- Can connect up to 31 axes
- Standard Ethernet cable*2 using

• AE-LINK is a registered trade mark of Asahi Engineering.

High-speed communication "Realtime Express" support model

Ultra high-speed Network type

Special Order Product

A5N series

RTEX Realtime Express

Rated output:
50 W to 15.0 kW

- Synchronized motion and precise CP control up to 32 axes with 100 Mbps communication
- Standard Ethernet cable*2 using

Linear motor and DD motor control type

Special Order Product

A5NL series

RTEX Realtime Express

Capacity of applying Linear motor:
Compatible with 5.0 kW rotaly AC servo motor

- Position, Speed and Thrust controls can be done by using the "Realtime Express"
- Drastically reduced setup time by automatic setup
- Automatic magnetic pole detection function will detect the magnetic pole position of the linear motor.

DC 24 V type

Special Order Product
Coming soon

A5MN series

RTEX Realtime Express

Rated output:
10 W, 20 W, 30 W

- Synchronized motion and precise CP control up to 32 axes with 100 Mbps communication
- Standard Ethernet cable*2 using

Linear motor control, DC 24 V type

Special Order Product
Coming soon

A5MNL series

RTEX Realtime Express

Capacity of applying Linear motor:
Compatible with 30 W rotaly AC servo motor

- Position, Speed and Thrust controls can be done by using the "Realtime Express"
- Drastically reduced setup time by automatic setup

Special Order Product : For details, see the website or request for information.
*2 Shielded twisted pair cable (CAT5e or higher)

Contents

A5Ⅱ, A5ⅡE, A5, A5E series

Quicker, Wiser and Friendlier A5Ⅱ series

Two-degree-of-freedom control system All-in-one type

• Full-closed control and torque control are not applicable to 2DOF control system.

A5Ⅱ series

Ball screw settling time **0 ms**

Belt device settling time **4 ms**

• The above is a measure based on our test environment.

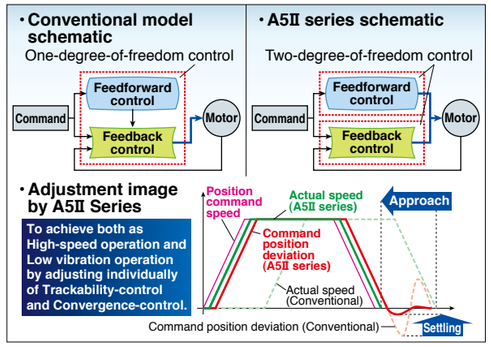
Two-degree-of-freedom control system Only for position control type

A5ⅡE series

Realizes quick and accurate movement. Fast response & High-precision positioning

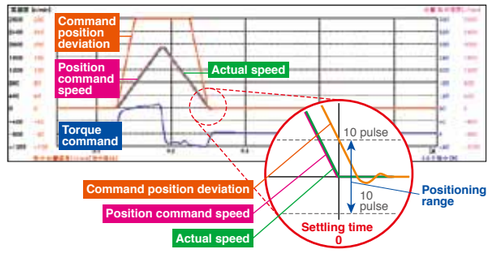
Adopted New Algorithm "Two-degree-of-freedom control" (2DOF) to improve productivity and machining accuracy.

In the conventional model, because we could not adjust separately feedforward control and feedback controls, in other words even if we only adjust "Approach" of feedforward, it had connection with "Settling" of feedback control, mutual adjustment was required.
In 2DOF adopted A5Ⅱ series, feedforward and feedback controls are adjusted separately, meaning "Approach" reaction to the given command, and the "Settling" can be adjusted separately.
Realized low vibration and reduction of settling time.
Realizes tact speed of the electronic component mounting machines, improves the accuracy of surface treatment of metal processing machines, allows for smooth operation and High speed industrial robots.



• Full-closed control and torque control are not applicable to 2DOF control system.

• **Waveform of PANATERM**
(the case of the ball screw: 0 ms / waveform measured settling time)



Easy and quick adjusting time. 5 times faster* than conventional

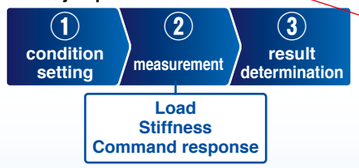
Greatly improved "operability", easy-to-use software "PANATERM".

We have upgraded setup support software PANATERM, the convenient tool for parameter setting and monitoring often required during start-up of the machine for adjustment motor and driver. Improved to more easy-understandable screen.

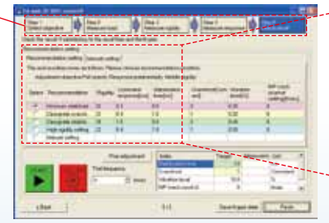
Equipped with "FitGain" function to realize speedy setup.

Newly developed feature "FitGain" maximizes the charecteristics of A5II series. And adaptive notch filter function can reduce the vibration that occurs when the rigidity of the device is low, you can set and adjust automatically the best variety of gain.

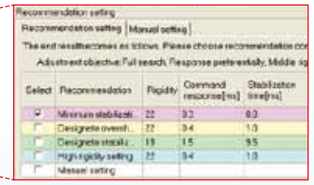
• **Adjustment is completed in only 3 processes**



• **Fit gain adjustment window**



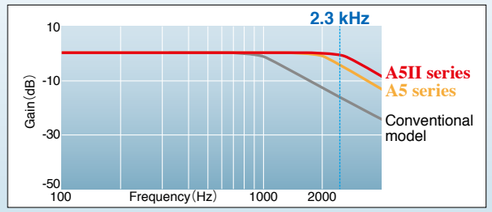
• **Automatically proposes various settings**



Realized 2.3 kHz frequency response to improve productivity

Comparison* 1.15 times faster than conventional

Realized 2.3 kHz response makes possible high-speed operation and improves productivity.



* Comparison with conventional product A5-series.

1 Quick

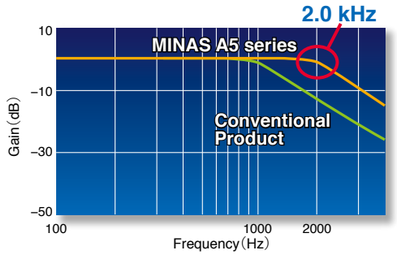
2.0 kHz Frequency Response

A5 A5E

Example application Semiconductor production equipment, packaging, etc.

Achieves the industry's leading frequency response of 2.0 kHz.

Operation speed up by new developed LSI and high responsible control. **By the industry's leading speed and positioning response, a highly advanced system can be created. What's more, the shorter response delay will realize an extremely lower vibration.**



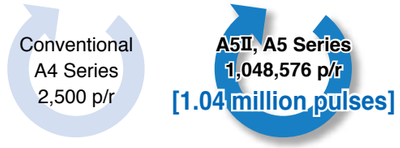
20 bits/revolution, 1.04 million pulses (At incremental type)

A5Ⅱ A5 A5ⅡE A5E

Example application Machine tools, textile machinery, etc.

Ensures smoother operation and reduced vibration at stopping.
Ensures accurate positioning in a short time.

New proprietary signal processing technology achieves 1.04 million pulses with a 20-bit incremental encoder.



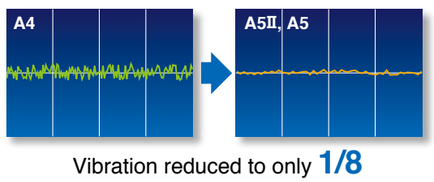
Low Cogging Torque (Excluding MSMD, MHMD, MDME 11.0 kW. 15.0 kW)

A5Ⅱ A5 A5ⅡE A5E

Example application Semiconductor production equipment, textile machinery, etc.

For the industry's most stable speed and lowest cogging

We've achieved the industry's lowest cogging by minimizing the pulse width by a new design incorporating a 10-pole rotor for the motor and a magnetic field parsing technique. **Positioning and stability are greatly improved by the minimal torque variation. This results to improved speed stability and positioning of motor rotation.**



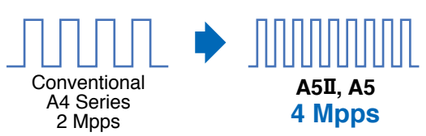
The Input/Output Pulse 4 Mpps

A5Ⅱ A5 A5ⅡE A5E

Example application Semiconductor production equipment, machine tools, etc.

Accommodates the industry's leading positioning resolution commands (with pulse train commands).

The command input and feedback output operate at the high speed of 4 Mpps. Accommodates high-resolution and high-speed operation, including standard full closed operation. (Provided with A5Ⅱ, A5 only.)

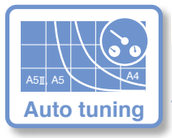


2 Smart

Highly Functional Real-time Auto-Gain Tuning

A5Ⅱ A5 A5ⅡE A5E

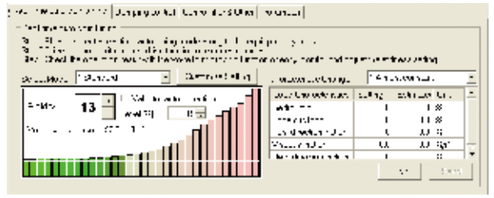
Example application Semiconductor production equipment, food processing machinery, etc.



High-performance real-time auto-gain tuning featuring simple setup.

After installation, tuning will be completed automatically after several operations. When the response is adjusted, **simple tuning** is supported with a change of one parameter value. Use of the gain adjustment mode in the setup support software contributes to optimum adjustment. **The built-in auto vibration suppression function reduces equipment damage.** Appropriate modes are provided for various machines such as **vertical axis machines and high friction machines with belts**.

This makes it possible to perform simple optimal adjustments simply by selecting the mode and stiffness.



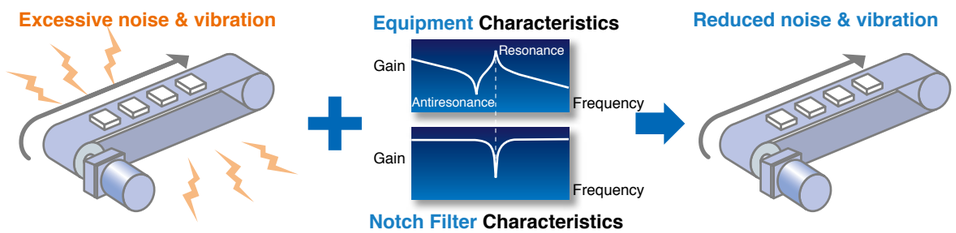
Manual/Auto Notch Filters

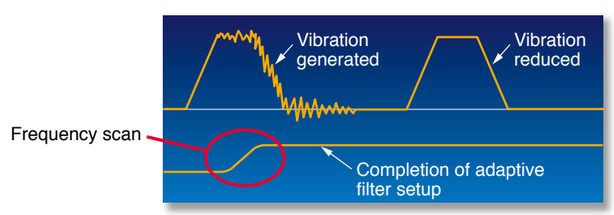
A5Ⅱ A5 A5ⅡE A5E

Example application Semiconductor production equipment, food processing machinery, etc.

Equipped with auto-setting notch filters for greater convenience.

Now there is no need to measure troublesome vibration frequencies. Our notch filters automatically detect vibration and provide simple auto-setting. These notch filters greatly reduce noise and vibration caused by equipment resonance and respond quickly during operation. The A5Ⅱ, A5 series features an industry-largest total of four notch filters with setup frequencies of 50 Hz to 5,000 Hz. This approach enables depth adjustment within this frequency range. (Two of the filters share the auto set-up.)





Manual/Auto Damping Filter

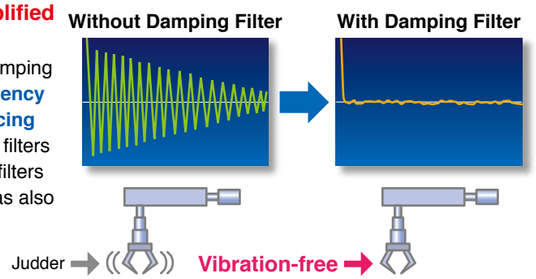
A5Ⅱ A5 A5ⅡE A5E

Damping filter

Example application: Chip mounters, food processing machinery, robots, general production machinery, etc.

Equipped with a damping filter featuring simplified automatic setup.

The setup software features automatic setup of the damping filter. **This filter removes the natural vibration frequency component from the command input, greatly reducing vibration of the axis when stopping.** The number of filters has been increased to four from the conventional two filters (two for simultaneous use). The adaptive frequency has also been significantly expanded from 1 Hz to 200 Hz.



Motion Simulation

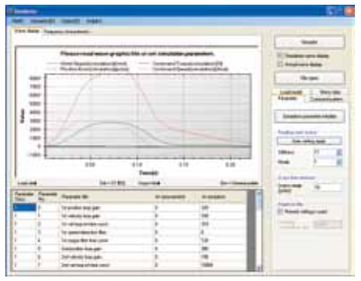
A5Ⅱ A5 A5ⅡE A5E

Simulation

Example application: General production machinery, etc.

Equipped with a simplified machine simulation function.

The setup software uses frequency response data acquired from the actual machine. In addition, it features a machine simulation function for performing simulated operation. **This allows you to easily confirm the effects of gain and various filters without adjusting the actual equipment.**



3 Light

New Structure/ Innovative Core/ Innovative Encoder

(Excluding MSMD, MHMD type)

A5Ⅱ A5 A5ⅡE A5E

New structure
Innovative core
Innovative encoder

Example application: Robots, chip mounters, general production machinery, etc.

Featuring significantly reduced weight and a more compact motor

We've developed new designs for both compact motors and large motors. The new design used for the core has succeeded in compact. **The addition of an innovative compact encoder has contributed to a 10 % to 25 % (1 to 6 kg) reduction in motor weight in the 1 kW and larger class when compared with conventional motors.**

[Examples for MSM or MDM]

Series	A4	A5Ⅱ A5	Weight Reduction
MSM 1 kW	4.5 kg	3.5 kg	▲1 kg
MSM 2 kW	6.5 kg	5.3 kg	▲1.2 kg
MDM 1 kW	6.8 kg	5.2 kg	▲1.6 kg
MDM 2 kW	10.6 kg	8.0 kg	▲2.6 kg

4 Safe

Complies with European Safety Standards.

A5Ⅱ A5

Safe torque off

Example application: Semiconductor and LCD production equipment, etc.

Compliance with EU safety standards.

Features non-software-based independent redundant circuitry for motor power isolation. independent redundant circuitry for motor power isolation. This obviates the need for magnetic contactors to isolate the required motor in order to accommodate low-voltage machinery commands.
(The final safety compliance must be applied as machine.)

Low noise

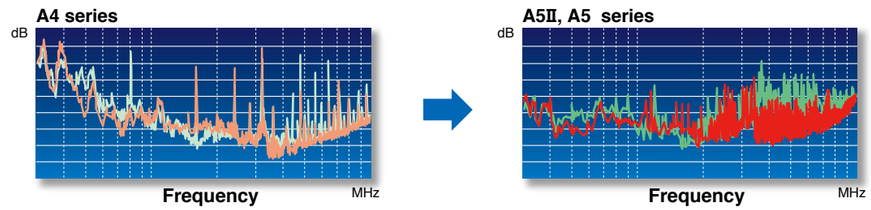
A5Ⅱ A5 A5ⅡE A5E

Low noise

Example application: Semiconductor and LCD production equipment, etc. general production machinery for export to the European market

Complies with the European EMC Directive

By incorporating the latest circuit technology, A5Ⅱ, A5 series achieves a further noise reduction of 3 dB compared with the conventional A4 series, which also features noise suppression. (The A4 series also conforms to the EMC Directive.)



IP67 Enclosure Rating (Products are build to order items.)

A5Ⅱ A5 A5ⅡE A5E

IP67

Example application: Machine tools, robots, printing machines, etc.

IP67 enclosure rating for increased environmental resistance

Our improved motor seals and direct-mount connectors in the motor power supply and encoder input-output areas contribute to this unit's IP67 enclosure rating.

Adoption of direct-mount connector

IP67
- Protection against water
  - Protection against temporary immersion in water
- Protection against dust
  - Protected against dust penetration when in full contact

- Motors of MSMD and MHMD series and 0.9 kW or higher standard stock items have IP65 rating.
- Motors of IP67 have smaller encoder connector that requires cable compatible with IP67 motor.

* IP67 motor is build to order items.

5 Easy

PANATERM Set-up Support Software

A5Ⅱ A5 A5ⅡE A5E

The PANATERM Set-up Support Software, with many added features.

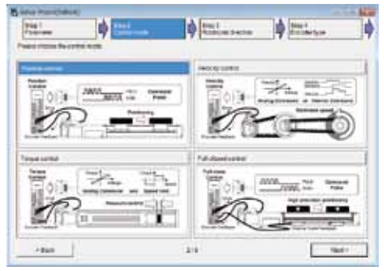
The PANATERM assists users in setting parameters, monitoring control conditions, setup support, and analyzing mechanical operation data on the PC screen, when installed in a commercially available personal computer, and connected to the MINAS A5 Family through the USB interface.

Localized in 4 languages

Choose either **English, Japanese, Chinese, or Korean**-language display.

Setup Wizard

This wizard supports fundamental settings in each control mode step by step, includeing reading of default setting. In on-line condition, input data related to each step can be monitored in real time.

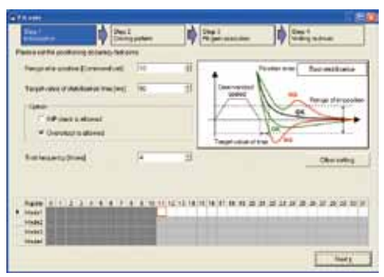


The fit gain function for setting two-degree-of-freedom control.

1) Select the adjustment method
2) Load measurement
3) Adjust gain to meet your needs by confirming results. (for A5Ⅱ, A5ⅡE)

Fit gain

This function automatically searches the best suitable stiffness setting and mode and adjusts the gain once the target in-position range and setting time are set.



Service Life Prediction

The service life prediction function considers the internal temperature for main components such as the fan and condenser. If the rated value is exceeded, an alarm is displayed. **This approach prevents unexpected suspension of operation and allows for planning of systemized maintenance.**

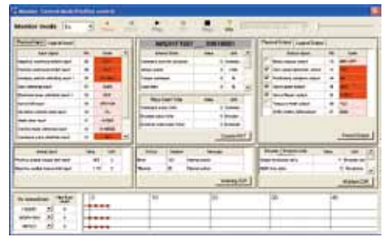
Note: The life span prediction value should be considered as a guide only.

Encoder Temperature Monitor

The Encoder Temperature Monitor is a new function capable of **real-time measurement of the interior temperature of the encoder, something that has been difficult to achieve in the past**. It is valuable for monitoring the motor and can be used as a diagnostic in the event of a malfunction (provided with 20-bit encoder only).

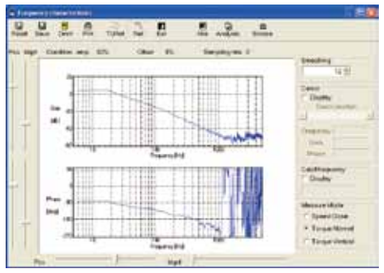
Other New Function

The software offers a wide range of convenient features including motor and driver data such as load factor, voltage, and driver temperature. Moreover, the logging function records the interface history. As well, a non-rotating contributing factor display function.



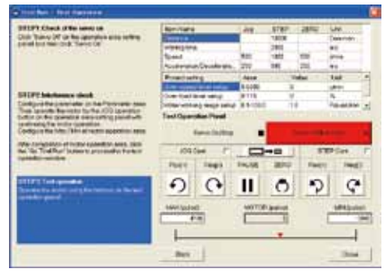
Frequency characteristics measurement function

Can check frequency response characteristics of the mechanism and motor. Since resonance frequency of the mechanism is measurable, it is effective for start-up time redcution.

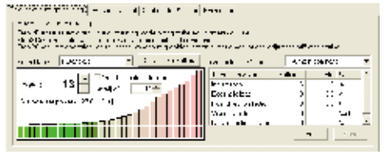


Trial run

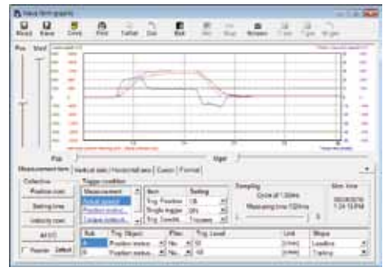
This function supports positioning with the Z-phase search and software limit.



Added New screen for gain adjustment, equipped with stiffness oscillation auto-reduction function



Significant increase of measuring objects Multi-functional waveform graphic



<CAUTION>
This software is applicable only to A5Ⅱ, A5, A5ⅡE, A5E series.
To apply this software to conventional product (A, AⅢ, E or A4 series), consult our distributors.

Hardware configuration		
Personal computer	CPU	Pentium III 512MHz or more
	Memory	256MB or more (512MB recommended)
	Hard disk capacity	Vacancy of 512MB or more recommended
	OS	Windows® XP SP3 (32-bit Ver.), Windows® VISTA SP1 (32-bit Ver.) Windows® 7 (32-bit Ver., 64-bit Ver.) [English, Japanese, Chinese or Korean version]
	Serial communication port	USB port
Display	Resolution	1024 × 768pix or more (desirably 1024 × 768)
	Number of colors	24bit colors (TrueColor) or more

Please download from our web site and use after install to the PC.
http://industrial.panasonic.com/ww/i_e/25000/motor_fa_e/motor_fa_e.html

Other Functions

Command Control Mode A5II A5

- Command control mode is available for Position, Speed (including eight internal velocities) and Torque.
- Using parameter settings, you can set up one optional command control mode or two command control modes by switching.
- According to suitable application utility, proper optional command control mode can be chosen.

Full-closed Control A5II A5

AB-phase linear scale (for general all-purpose products) or serial scale (for products with Panasonic's exclusive format) scales can be used (P.14).

SEMI F47 A5II A5 A5IIE A5E

- Includes a function in compliance with the SEMI F47 standard for voltage sag immunity under no load or light load.
- Ideal for the semiconductor and LCD industries.
  Notes:
  1) Excluding the single-phase 100-V type.
  2) Please verify the actual compliance with your machine checking the F47 standard for voltage sag immunity.

Inrush Current Preventive Function A5II A5 A5IIE A5E

- This driver is equipped with a rush current preventive resistor to prevent the circuit breaker from shutting off the power supply as a result of inrush current occurring at power-on.

Regenerative Energy Discharge A5II A5 A5IIE A5E

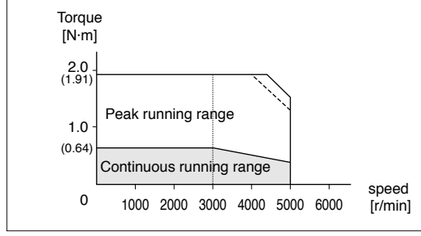
- A regenerative resistor is used to discharge regenerative energy, which is the energy generated when stopping a load with a large moment of inertia or when using this unit in vertical operation. This energy is returned to the driver from the motor.
- Frame A, B, G and frame H model drivers do not contain a regenerative resistor. Optional regenerative resisters are recommended.
- Frame C to frame F model drivers contain one regenerative resistor; however, adding an optional regenerative resistor provides additional regeneration capability.

6,000-rpm capability (build to order item) A5II A5 A5IIE A5E

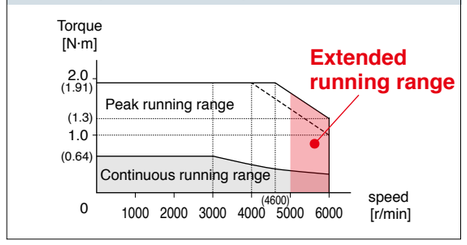
The MSME motor (under 750 W) can accommodate a maximum speed of 6,000 r/min.

[Comparison of new and conventional 200 W]

〈5000 r/min motor〉 MSMD022∗∗∗



〈6000 r/min motor〉 MSME022∗∗∗



- **Gear head**
  Gear heads for 6000 r/min and 5000 r/min motors are available.Set 5000 r/min gear head only to 5000 r/min motor, and set 6000 r/min gear head only to 6000 r/min motor.
  When customers prepare a gear head, use it as follows:
  MSME → 6000 r/min
  MSMD, MHMD → 5000 r/min

Dynamic Braking A5II A5 A5IIE A5E

- With parameter settings, you can select dynamic braking, which shorts servomotor windings U, V and W at Servo-OFF, during positive direction/ negative direction, and during power shutdown and tripping of the circuit breaker for over travel inhibition.
  * The dynamic brake circuit of H-frame is external.
- The desired action sequence can be set up to accommodate your machine requirements.

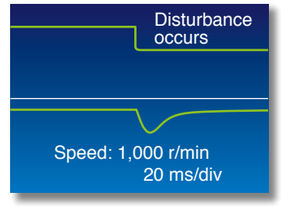
Parameter Initialization A5II A5 A5IIE A5E

Using the front panel or by connecting a PC, you can restore the parameters to the factory settings.

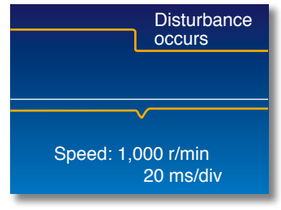
Disturbance Observer A5II A5 A5IIE A5E

By using a disturbance observer to add an estimated disturbance torque value to the torque canceling command, this function diminishes the impact of the disturbance torque, reduces vibration, and offsets any speed decline.

Disturbance observer function not in effect



Disturbance observer function in effect



Torque Feed Forward A5II A5 A5IIE A5E

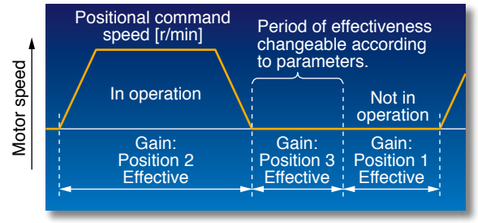
The Torque Feed Forward function performs a comparison with feedback and calculates the amount of torque to add to the necessary torque command in the command for actuation.

Friction Torque Compensation A5II A5 A5IIE A5E

This function reduces the effect of machine-related friction and improves responsiveness. Two kinds of friction compensation can be set up: unbalanced load compensation, which compensates with a constant operational offset torque; and kinetic friction, which changes direction in response to the direction of movement.

3-Step Gain A5II A5 A5IIE A5E

A 3-step gain switch is available in addition to the normal gain switch.
This chooses appropriate gain tunings at both stopping and running.
The 3-step gain switch gives you choices of 3 different tunings for normal running, stopping for faster positioning and at stopping.
The right gaining tunings achieve lower vibration and quicker positioning time of your application.



Inertia Ratio Conversion A5II A5 A5IIE A5E

You can adjust right inertia ratio by Inertia Ratio Conversion input(J-SEL).
When you have significant load inertia changes, it can adjust unbalanced speed and position gain turning combination.
It ends up quicker response of your system.

Input/Output Signal Assignment A5II A5 A5IIE A5E

You can use the parameters to arbitrarily allocate the universal 10 inputs and 6 outputs. (Inputs can be selected as either A contacts or B contacts). The Panaterm setup software provides an exclusive screen for a more simplified setup.

Torque Limiter Switching A5II A5 A5IIE A5E

You can use the I/Os to set up torque limits. These can be used for applications such as simplified pressure, tension control, and sensor-less homing.

Applicable international safety standards

A5Ⅱ A5 A5ⅡE A5E

(A5Ⅱ, A5 series) (A5ⅡE, A5E series)

		Driver	Motor
EC Directives	EMC Directives	EN55011 EN61000-6-2 IEC61800-3	—
	Low-Voltage Directives	EN61800-5-1	EN60034-1 EN60034-5
	Machinery Directives Functional safety *1	ISO13849-1(PL d) (Cat. 3) EN61508(SIL2) EN62061(SILCL 2) EN61800-5-2(STO) IEC61326-3-1	—
UL Standards		UL508C (E164620)	UL1004-1 (E327868: 50 W to 750 W, 6.0 kW to 15.0 kW) UL1004 (E327868: 400 W(400 V), 600 W(400 V), 750 W(400 V), 0.9 kW to 5.0 kW)
CSA Standards		C22.2 No.14	C22.2 No.100
Korea Radio Law (KC) *2		KN11 KN61000-4-2, 3, 4, 5, 6, 8, 11	—

IEC : International Electrotechnical Commission
EN : Europaischen Normen
EMC : Electromagnetic Compatibility
UL : Underwriters Laboratories
CSA : Canadian Standards Association

Pursuant to the directive 2004/108/EC, article 9(2)
Panasonic Testing Centre
Panasonic Service Europe, a division of
Panasonic Marketing Europe GmbH
Winsbergring 15, 22525 Hamburg, F.R. Germany

• When export this product, follow statutory provisions of the destination country.

*1 A5ⅡE and A5E series doesn't correspond to the functional safety standard.

*2 Information related to the Korea Radio Law
This servo driver is a Class A commercial broadcasting radio wave generator not designed for home use.
The user and dealer should be aware of this fact.

A 급 기기 (업무용 방송통신기자재)
이 기기는 업무용(A 급) 전자파적합기기로서 판매자
또는 사용자는 이 점을 주의하시기 바라며, 가정외의
지역에서 사용하는 것을 목적으로 합니다.

(대상기종 : Servo Driver **)**

This product is not an object of China Compulsory Certification (CCC).

Applicable External Scales

A5Ⅱ A5

Applicable External Scale	Manufacturer	Model No.	Resolution [µs]	Maximum Speed (m/s)*3
Parallel Type (AB-phase)	General	—	Maximum speed after 4 × multiplication: 4 Mpps	
Serial Type (Incremental)	Magnescale Co., Ltd.	SR75	0.01 to 1	3.3
		SR85	0.01 to 1	3.3
		SL700-PL101RP/RHP	0.1	10
		SL710-PL101RP/RHP	0.1	10
	MicroE Systems	MⅡ5000si/P MⅡ6000si/P	0.1 *4	5 *5
Serial Type (Absolute)	Mitutoyo Corporation	AT573A	0.05	2.5
		ST778A(L)	0.1	5
	Magnescale Co., Ltd.	SR77	0.01 to 1	3.3
		SR87	0.01 to 1	3.3
	Renishaw plc	RESOLUTE	0.001	0.4
			0.05	20
			0.1	40
	Fagor Automation S.Coop	SVAP	0.05	2.5
		SAP	0.05	2.5
		GAP	0.05	2.5
		LAP	0.1	2

*3 The maximum speed is a characteristic of the driver. It is limited by the configuration of the machine and the system.
*4 It changes by the setting.
*5 At 0.1 µm resolution.