

**NEW**

Servo System  
MINAS A7 Family

# MINAS A7

Industry-leading motion performance\* for quick  
and intuitive adaptation to demanding situations

\*As of September 2023, according to in-house research.



# *Agile Adaptability*

**Increase the productivity of machine, people and applications by adapting quickly and intuitively to demanding situations.**

## **Basic servo performance that further enhances machine performance**

The MINAS A7 achieves the industry's highest motion performance\*, follows commands faithfully and provides strong resistance against disturbances.

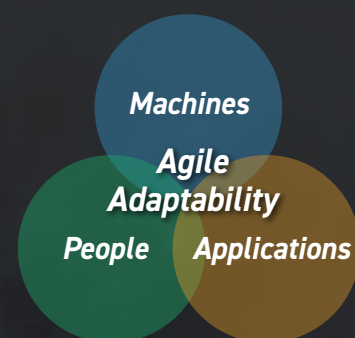
Increased responsiveness to machines enables higher speed and higher precision.

\*As of September 2023, according to in-house research.

## **Optimization of man-machine operations through servo intelligence**

Making the servo intelligent simplifies setup, which used to take long hours of development, through auto-tuning functions, maintenance functions, and application optimization.

Increase the productivity of machines, people and applications by allowing them to adapt quickly and intuitively to more demanding situations.



# *MINAS A7*

## Agile Adaptability to Machines

### Immediate response to commands and disturbances

Industry-leading\* basic motion performance is faithful to commands and has strong resistance to disturbances.

\*As of September 2023, according to in-house research.

Encoder resolution **27 bit**, Speed response frequency **4.0 kHz or more**, Max. motor rotational speed **7150 r/min** \*

\*For MHMG022

## Agile Adaptability to People

### Immediate response at start-up and when trouble occurs

Expanded auto tuning, from easy start-up to automation of high level tuning. Quick response with drive recorder function when trouble occurs.

Ultra-high precision **precAlse TUNING** High precision **One Minute TUNING** Easy **Drive recorder**

Under development

## Agile Adaptability to Applications

### Immediate adaptation to specific applications

Application-specific functions are achieved without a controller. Sensor direct input system contributes to highly responsive control.

**Displacement control** **Pressure control** **High-precision gantry control**

(Auto-focus control, meandering control)

Under development

Under development



# MINAS A7 Line-up

Servo system supporting various system configurations

## SERVO DRIVER

Rotation type

EtherCAT®

Open network  
EtherCAT-compatible  
servo driver



### MINAS A7B

- Standard type  
**A7BE**
- Multi-function type  
**A7BF**
- Application specialized type  
**A7BR**

**RTEX**  
Realtime Express

High-speed  
Realtime Express-compatible  
network servo driver



### MINAS A7N

- Standard type  
**A7NE**
- Multi-function type  
**A7NF**
- Application specialized type  
**A7NR**

## SERVO MOTOR



High inertia

### MHMG

200 W, 400 W

\*50 W to 100 W (□40), 750 W (□80) to 5.0 kW (□180) Under development

## EtherCAT/RTEX Controller



EtherCAT®



**RTEX**  
Realtime Express

Motion  
Controller  
**GM1**

### PLC programming standardization

- Conforms to IEC61131-3, PLCopen, LD/ST/FBD/SFC/IL/CFC

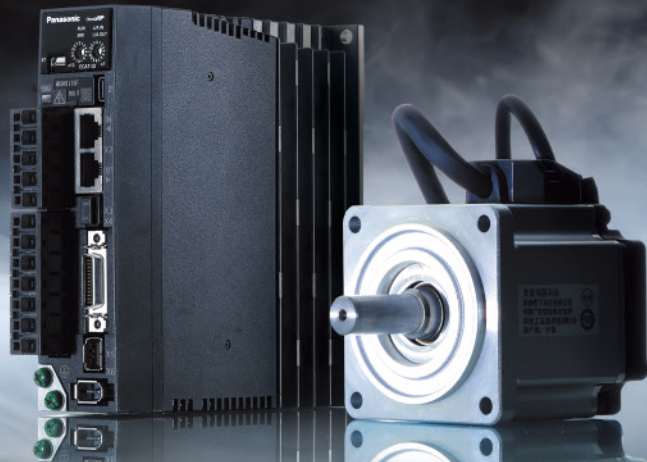
### Integration of PLC and motor

- Fastest cycle 500  $\mu$ s, multi-task control

### Expansive communication interface

- RTEX, EtherCAT
- OPC UA server, FTP server
- Ethernet/IP, Modbus, CodesysV3 communication

# MINAS A7



## Analog/pulse train Modbus communication

Under development

### MINAS A7S

Position control type  
**A7SE**

Multi-function type  
**A7SF**

Application specialized type  
**A7SR**

## Linear/DD motor type

Under development

Special order product

EtherCAT®

- Standard type **A7BL**
- Multi-function type **A7BM**
- Application specialized type **A7BV**

**RTEX**  
Realtime Express

- Standard type **A7NL**
- Multi-function type **A7NM**
- Application specialized type **A7NV**

Analog/pulse train  
Modbus communication

- Position control type **A7SL**
- Multi-function type **A7SM**
- Application specialized type **A7SV**

## Medium inertia

### MDMG

Under development

1.0 kW to 5.0 kW

## Low-speed torque

## Medium inertia

### MGMG

Under development

850 W to 4.4 kW

## Low inertia

### MSMG

Under development

50 W to 5.0 kW

## Support Tools



PANATERM

### Servo motor set-up support software

With full featured tuning functions and more, servo motor set up support is available for everything from set up to test operation, operation status verification, maintenance and troubleshooting.



Coming soon

### Servo motor selection software

This is a tool for selecting motor capacity by combining machine elements. Optional parts can also be selected.



## Motor List

|                                                                                        |       | 50 W                          | 100 W                         | 200 W                         | 400 W                         | 750 W                         | 850 W | 1.0 kW                                                    |  |
|----------------------------------------------------------------------------------------|-------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------|-----------------------------------------------------------|--|
| High inertia<br><b>MHMG</b>                                                            | 100 V | 40<br>3000 r/min (7150 r/min) | 40<br>3000 r/min (7150 r/min) | 60<br>3000 r/min (6700 r/min) | 60<br>3000 r/min (6700 r/min) |                               |       |                                                           |  |
|                                                                                        | 200 V | 40<br>3000 r/min (7150 r/min) | 40<br>3000 r/min (7150 r/min) | 60<br>3000 r/min (6700 r/min) | 60<br>3000 r/min (6700 r/min) | 80<br>3000 r/min (6000 r/min) |       | 80 3000 r/min (6700 r/min)<br>130 2000 r/min (3000 r/min) |  |
| Medium inertia<br><b>MDMG</b><br><small>Under development</small>                      | 200 V |                               |                               |                               |                               |                               |       | 130<br>2000 r/min (3000 r/min)                            |  |
| Medium inertia/<br>Low-speed torque<br><b>MGMG</b><br><small>Under development</small> | 200 V |                               |                               |                               |                               |                               | 130   |                                                           |  |
| Low inertia<br><b>MSMG</b><br><small>Under development</small>                         | 100 V | 38<br>3000 r/min (7150 r/min) | 38<br>3000 r/min (7150 r/min) | 60<br>3000 r/min (6700 r/min) | 60<br>3000 r/min (6700 r/min) |                               |       |                                                           |  |
|                                                                                        | 200 V | 38<br>3000 r/min (7150 r/min) | 38<br>3000 r/min (7150 r/min) | 60<br>3000 r/min (6700 r/min) | 60<br>3000 r/min (6700 r/min) | 80<br>3000 r/min (6000 r/min) |       | 80 3000 r/min (6700 r/min)<br>100 3000 r/min (6700 r/min) |  |

## Driver List

### Open network EtherCAT-compatible servo driver

| EtherCAT®      |                                  | Rotation type                       |                                           |                                                    | Linear/DD motor type <small>Under development</small> <small>Special order product</small> |                                           |                                                    |
|----------------|----------------------------------|-------------------------------------|-------------------------------------------|----------------------------------------------------|--------------------------------------------------------------------------------------------|-------------------------------------------|----------------------------------------------------|
|                |                                  | Standard type<br><b>A7BE</b> Series | Multi-function type<br><b>A7BF</b> Series | Application specialized type<br><b>A7BR</b> Series | Standard type<br><b>A7BL</b> Series                                                        | Multi-function type<br><b>A7BM</b> Series | Application specialized type<br><b>A7BV</b> Series |
| Control method | Position/Velocity/Torque control | ●                                   | ●                                         | ●                                                  | ●                                                                                          | ●                                         | ●                                                  |
|                | Full-closed control              |                                     | ●                                         | ●                                                  |                                                                                            |                                           |                                                    |
| Interface      | External scale                   |                                     | ●                                         | ●                                                  |                                                                                            | ●                                         | ●                                                  |
|                | Safety connector                 |                                     | ●                                         | ●                                                  |                                                                                            | ●                                         | ●                                                  |
|                | Sensor feedback                  |                                     |                                           | ●                                                  |                                                                                            |                                           | ●                                                  |

### High-speed communication Realtime Express-compatible network servo driver

| <b>RTEX</b><br>Realtime Express |                                  | Rotation type                       |                                           |                                                    | Linear/DD motor type <small>Under development</small> <small>Special order product</small> |                                           |                                                    |
|---------------------------------|----------------------------------|-------------------------------------|-------------------------------------------|----------------------------------------------------|--------------------------------------------------------------------------------------------|-------------------------------------------|----------------------------------------------------|
|                                 |                                  | Standard type<br><b>A7NE</b> Series | Multi-function type<br><b>A7NF</b> Series | Application specialized type<br><b>A7NR</b> Series | Standard type<br><b>A7NL</b> Series                                                        | Multi-function type<br><b>A7NM</b> Series | Application specialized type<br><b>A7NV</b> Series |
| Control method                  | Position/Velocity/Torque control | ●                                   | ●                                         | ●                                                  | ●                                                                                          | ●                                         | ●                                                  |
|                                 | Full-closed control              |                                     | ●                                         | ●                                                  |                                                                                            |                                           |                                                    |
| Interface                       | External scale                   |                                     | ●                                         | ●                                                  |                                                                                            | ●                                         | ●                                                  |
|                                 | Safety connector                 |                                     | ●                                         | ●                                                  |                                                                                            | ●                                         | ●                                                  |
|                                 | Sensor feedback                  |                                     |                                           | ●                                                  |                                                                                            |                                           | ●                                                  |

|  | 1.3 kW                  | 1.5 kW                  | 1.8 kW | 2.0 kW | 2.4 kW | 2.9 kW | 3.0 kW | 4.0 kW | 4.4 kW | 5.0 kW |
|--|-------------------------|-------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
|  |                         |                         |        |        |        |        |        |        |        |        |
|  |                         | 130                     |        | 180    |        |        | 180    | 180    |        | 180    |
|  |                         | 2000 r/min (3000 r/min) |        |        |        |        |        |        |        |        |
|  |                         | 130                     |        | 130    |        |        | 130    | 180    |        | 180    |
|  |                         | 2000 r/min (3000 r/min) |        |        |        |        |        |        |        |        |
|  | 130                     |                         | 130    |        | 180    | 180    |        |        | 180    |        |
|  | 1500 r/min (3000 r/min) |                         |        |        |        |        |        |        |        |        |
|  |                         |                         |        |        |        |        |        |        |        |        |
|  |                         | 100                     |        | 100    |        |        | 120    | 130    |        | 130    |
|  |                         | 3000 r/min (5000 r/min) |        |        |        |        |        |        |        |        |

(How to read the table)

130

3000 r/min (6700 r/min)

Flange angle

Rated rotation speed (maximum rotation speed)

60

Under development

## Analog/pulse train Modbus communication

|                     |                           | Rotation type <span>Under development</span> |                                          |                                             | Linear/DD motor type <span>Under development</span> <span>Special order product</span> |                                          |                                             |
|---------------------|---------------------------|----------------------------------------------|------------------------------------------|---------------------------------------------|----------------------------------------------------------------------------------------|------------------------------------------|---------------------------------------------|
|                     |                           | Position control type<br>A7SE Series         | Multi-function type<br>A7SF Series       | Application specialized type<br>A7SR Series | Position control type<br>A7SL Series                                                   | Multi-function type<br>A7SM Series       | Application specialized type<br>A7SV Series |
| Control method      | Position control          | ●                                            | ●                                        | ●                                           | ●                                                                                      | ●                                        | ●                                           |
|                     | Block operation           | External contact only                        | External contact or Modbus communication | External contact or Modbus communication    | External contact only                                                                  | External contact or Modbus communication | External contact or Modbus communication    |
|                     | Velocity control          |                                              | ●                                        | ●                                           |                                                                                        | ●                                        | ●                                           |
|                     | Internal velocity command | External contact only                        | External contact or Modbus communication | External contact or Modbus communication    | External contact only                                                                  | External contact or Modbus communication | External contact or Modbus communication    |
|                     | Torque control            |                                              | ●                                        | ●                                           |                                                                                        | ●                                        | ●                                           |
| Full-closed control |                           |                                              | ●                                        | ●                                           |                                                                                        |                                          |                                             |
|                     | Block operation           |                                              | External contact or Modbus communication | External contact or Modbus communication    |                                                                                        | External contact or Modbus communication | External contact or Modbus communication    |
| Interface           | Pulse                     | ●                                            | ●                                        | ●                                           | ●                                                                                      | ●                                        | ●                                           |
|                     | Analog                    |                                              | ●                                        | ●                                           |                                                                                        | ●                                        | ●                                           |
|                     | Modbus                    |                                              | ●                                        | ●                                           |                                                                                        | ●                                        | ●                                           |
|                     | External scale            |                                              | ●                                        | ●                                           |                                                                                        | ●                                        | ●                                           |
|                     | RS-232, RS-485            |                                              | ●                                        | ●                                           |                                                                                        | ●                                        | ●                                           |
|                     | Safety connector          |                                              | ●                                        | ●                                           |                                                                                        | ●                                        | ●                                           |
|                     | Sensor feedback           |                                              |                                          | ●                                           |                                                                                        |                                          | ●                                           |

# Improved basic performance directly linked to equipment performance Servo system boasting industry-leading motion performance\*

\*As of September 2023, according to in-house research.

## Increasing gain by improving basic performance allows for immediate response to commands and disturbances

### High precision

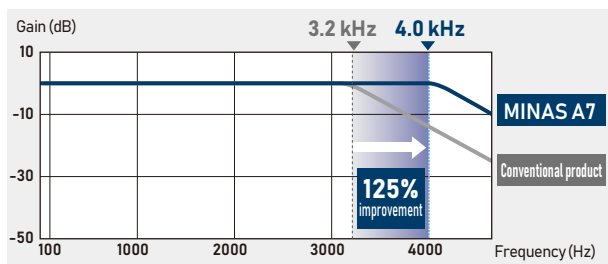
### Control performance that achieves smoother and more accurate operation

### Improved machining quality through high response control

#### Speed response frequency

**4.0 kHz** or more (Conventional product) 3.2 kHz **Industry-leading**

Velocity response frequency has been increased to 125% compared to conventional models. As gain can be increased, an immediate response to both commands and disturbances is possible, improving machining quality.



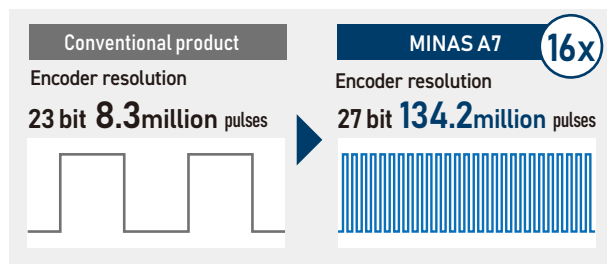
\*As of September 2023, according to in-house research.

### Improved positioning performance

#### Encoder resolution

**27 bit** (Conventional product) 23 bit **Industry-leading**

Thanks to the industry's highest\* resolution, positioning performance is greatly improved with smooth movement to the target position and accurate stopping.



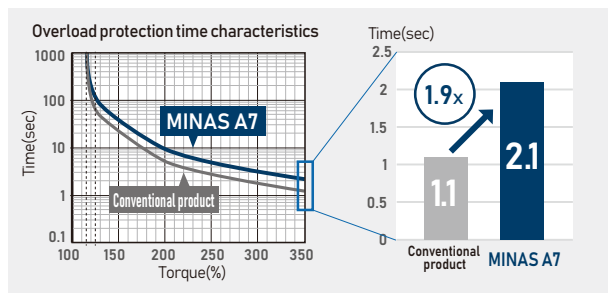
\*As of September 2023, according to in-house research.

### Stable operation

### Increased durability

### Extending overload operation time

Reducing the heat generation of the motor extends operating time during overload by 1.9 times compared to conventional models. This contributes to the stable operation of equipment that operates for long periods of time in high-load areas, such as press machines and robots.



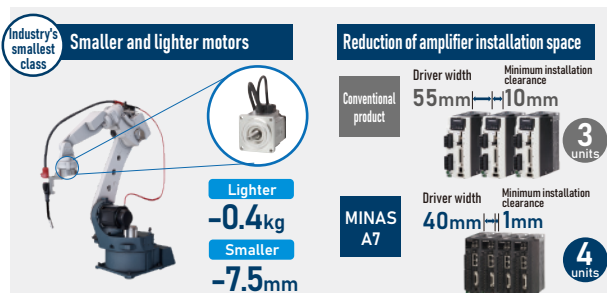
\*Example of 350% load (while rotating) with a 200 W motor

### Space saving

### More flexible installation

### Further miniaturization and weight reduction

Both servo motors and amplifiers have been further miniaturized. The motors contribute to improved control performance by reducing the size, weight, and inertia of robots and equipment in which the motors are used.



Compared to 1kW motor

Compared to 400W driver



High speed

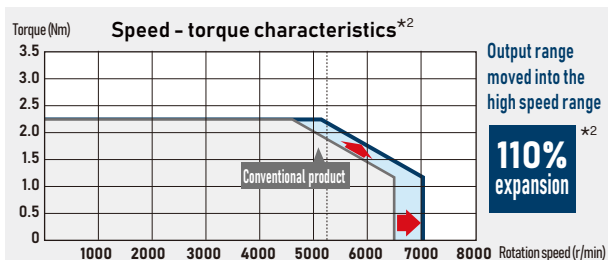
Increased speed for a shorter takt time

## Increased output without changing the size of the motor

Max. motor rotational speed

**7150** <sup>\*1</sup> r/min (Conventional product) 6500 r/min

The MINAS A7 is smaller than conventional models, and the operation range has been expanded to 110%<sup>\*2</sup>. By expanding output to the high speed range, equipment velocity has been improved without changing to a larger motor.



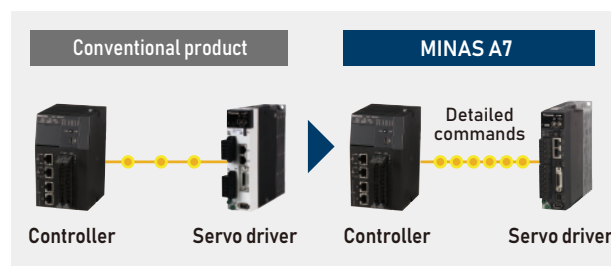
<sup>\*1</sup>: For MHMG022  
<sup>\*2</sup>: Compared to 200 W motor

## High precision with detailed command output

Minimum communication cycle

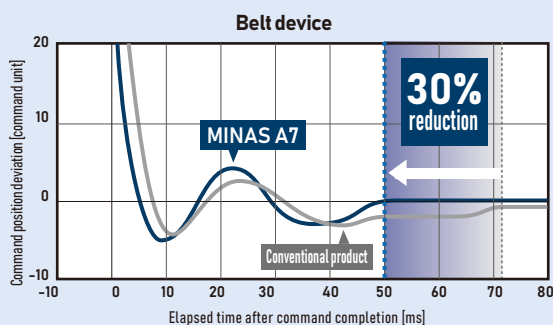
**62.5**  $\mu$ s (Conventional product) 125  $\mu$ s EtherCAT 62.5  $\mu$ s RTEX

The minimum communication cycle is 1/2 that of conventional models. It can respond to the control cycle of controllers that are becoming ever faster, allowing for more detailed control.



## Stop precisely at the target position Improved positioning setting time

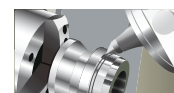
In addition to improved motor and encoder performance and an evolution of our proprietary positioning algorithm, resonance and mechanical vibration are automatically removed for highly accurate positioning.



## Contributing to improved equipment performance



Mounting of micro parts



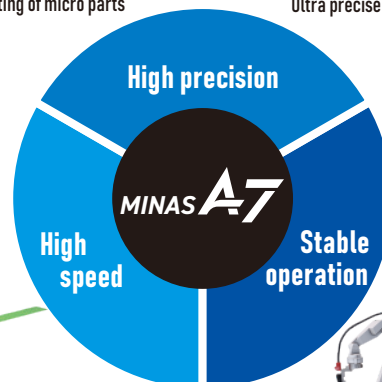
Ultra precise machining



Pick & place



Winding machines



Large press machines



Assembly/welding robots

# From simple tuning to ultra-high precision tuning that require expert skill Automatic tuning reduces startup engineering man-hours

Optimal man-machine coordination during tuning is achieved through servo intelligence  
Immediate response even at start-up

Three tuning settings can be selected according to whether you wish to prioritize tuning time or control precision

## TUNE COMPASS

It is possible to select the optimal tuning method to match customer requests, from situations that require tuning difficult for even expert engineers to those that require immediate operation.

**precAlse TUNING**

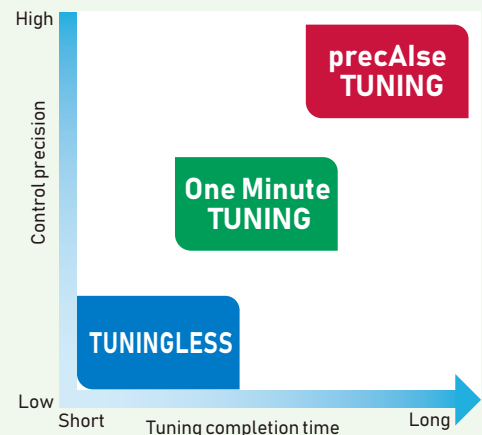
**Priority on control precision** **Ultra-high precision** From half a day  
Ultra-high precision automatic tuning that exceeds the abilities of experts

**One Minute TUNING**

**Balance on accuracy and time** **High precision** Approx. 1 min.  
High precision automatic tuning according to equipment characteristics

**TUNINGLESS**

**Priority on tuning time** **Immediate operation** 0 sec.  
Simple real-time automatic tuning according to equipment load



**High precision**

The driver understands equipment characteristics and implements tuning while taking control margins into consideration.

## One Minute TUNING

Optimized to fit the equipment in a short time with a 3-step operation. Adjustment margins for aging and individual differences can also be considered.

Automatic processing

Default settings

STEP.1

Unique algorithm

Equipment characteristics measurement

STEP.2

Unique algorithm

Control parameter optimization

STEP.3

Response confirmation

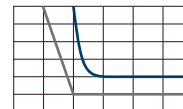
Tuning complete

«Configuration items»

- Purpose
- Operating range etc.
- \*Adjustable margin level



Automatic tuning of parameters taking control margins into consideration



Approx. 1 min.

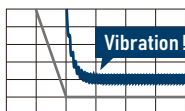
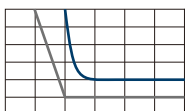
Automatic re-tuning of specific items with pinpoint accuracy in response to material and location changes

Already tuned

Design change

Automatic re-tuning of only specified items

Tuning complete



Select and recalibrate only the functions that reduce vibration.

**Purpose**

Positioning / General purpose

\* 2 degrees of freedom control is enabled.

To make control PMS of 400 must be changed from the settings screen and written to the amplifier.

**Operating range setting**

Positioning function

PM02 Check level (%)

PM03 Acceleration level (%)

☒ auto-configuration (acceleration level)

PM07 Motor operating range (rotation) 10

☒ Advanced setting

If you want to setup motion commands or adjust them with a host controller, please use "Advanced Settings". Please select "Advanced Settings".

**Tuning step**

Pre-operation ☐

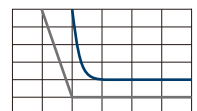
Return operation ☐

**Tuning target**

Noise filter ☐

First Vibration Damping Filter ☐

Second Vibration Damping Filter ☐



**Immediate operation**

Automatic tuning according to the equipment load during operation, to effortlessly achieve stable operation

## TUNINGLESS

Every time the equipment is moved, the servo driver automatically carries out simple real-time tuning according to the equipment load.

Tuning work

Positioning operation

Tuning when operation is completed



## Ultra-high precision

The AI uses expert judgment to easily achieve ultra-high precision tuning

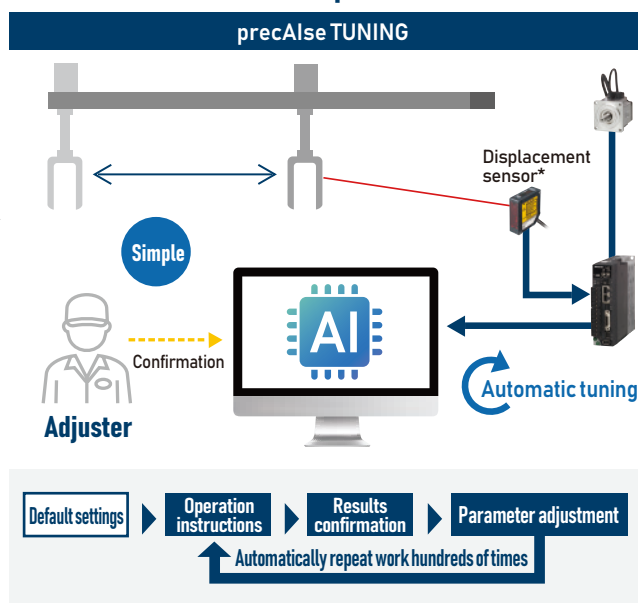
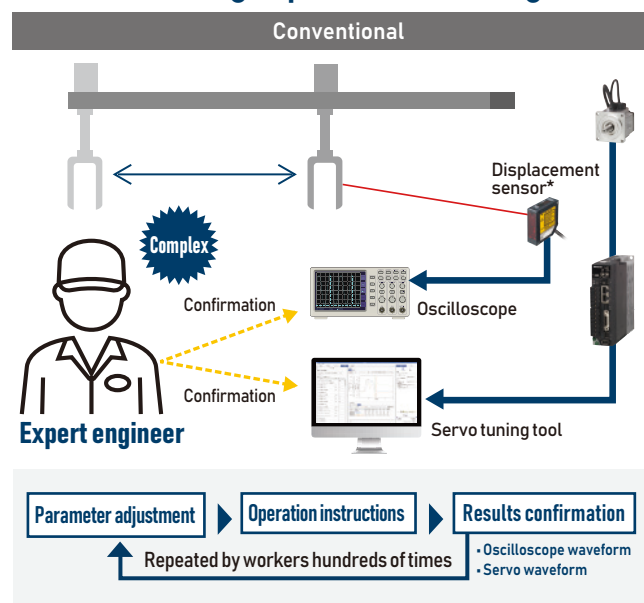
# precAlse TUNING

Complex tuning that take several days even for expert engineers are automatically optimized by AI just by setting the conditions, making  $\mu\text{m}$  level ultra-high precision tuning easily achievable.



**[Applicable equipment]** Equipment such as mounters, coating equipment and processing machines which require ultra-precise positioning accuracy

## AI achieves high-precision tuning that exceeds the abilities of experts.

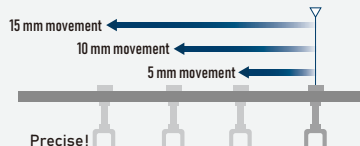


\*When using a Displacement sensor to detect vibration at the tip of the device

## High level of automatic tuning satisfies performance requirements for all locations and operations

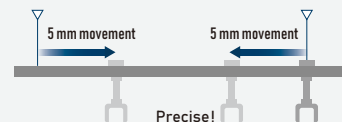
### Multiple locations

Tuning that meet the required performance at all locations with a single parameter tuning



### Multiple operations

Tuning that meet the required performance for all operations with a single parameter tuning



### メリット①

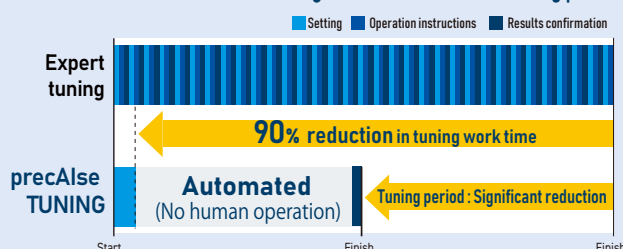
Achieves positioning accuracy exceeding that of an expert



\* Measured in our experimental environment. Measurement of the settling time required for the position deviation to settle within a specified settling range.

### メリット②

90% reduction in work time and significant reduction in tuning period



\* Measured in our experimental environment. Measured time required for tuning work to bring the position deviation within the specified settling range.

Increase productivity from start-up to maintenance

## Monitoring/diagnostic function

Optimal man-machine coordination during maintenance work is achieved through servo intelligence

## Immediate response even for maintenance work

### When trouble occurs

#### Understand the cause and resolve

By recording data before and after trouble occurs, the cause can be analyzed and the issue quickly solved.



### Before trouble occurs

#### Prevent trouble from occurring

Detects signs of abnormal equipment characteristics, notifying the user before an error occurs. The timing of mechanical adjustments and parts replacement can be understood before equipment stops due to an error.



### When trouble occurs

Record signal waveforms and error information before and after trouble occurs, on a single servo driver

## Drive recorder function

Under development\*

Servo drivers are equipped with a logging function. Since data can be recorded and saved in the servo itself, it is possible to collect data in detailed cycles, allowing for a detailed analysis of what happened when an error occurs.

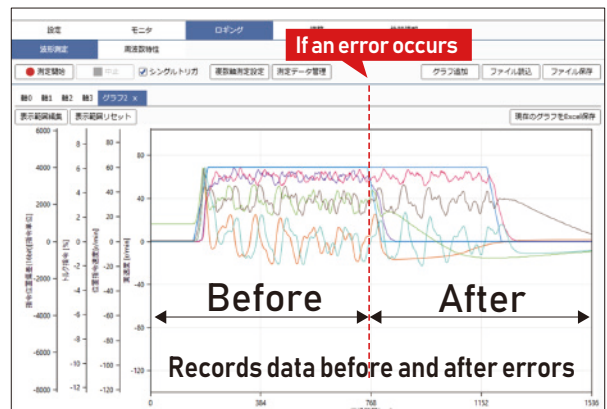


Up to 32 data sets  
can be saved

Servo driver with  
logging function

Complete functionality  
inside the servo

- Simple setup
- High-speed logging
- Transmission to a host system not required
- Data security ensured



### Analysis is possible on multiple axes together with time series data

The time stamp function can be used to understand the details of alarm occurrence times for each axis, making it possible to identify the axis on which the alarm occurred first, the axis with the accompanying alarm, etc., allowing for an analysis of the root cause of the problem.



**Before trouble occurs**

Monitor servo motor status in real time to predict and prevent trouble before it occurs

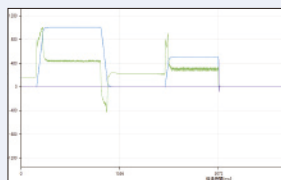
## Deterioration diagnosis function

Under development\*

Catch unusual equipment/motor characteristics during operation

### Equipment in operation

Catch signs of changes to characteristics



#### Load characteristics estimation

Are there any changes in load characteristics?

#### Torque command diagnosis

Is there torque outside the expected range?

### When signs are detected/ during periodic maintenance

Proactive maintenance of detected suspect areas

Mechanical adjustment/parts replacement for suspect areas

**Immediate response**

#### Abnormal noise risk estimation

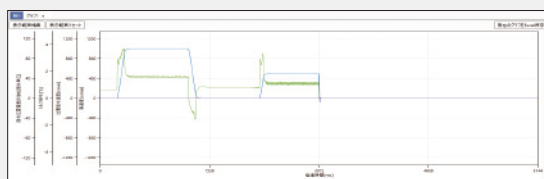
Under development

Is there any deterioration of the ball screw mechanism, etc., for the specified servo axis?

## Load characteristics estimation

Continuously diagnoses changes in load characteristics to detect signs that a motor is not moving as smoothly as usual.

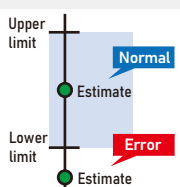
### 1 Monitor servo data in real time



### 2 Estimate the load characteristics

- Inertia ratio estimate
- Offset load estimate
- Dynamic friction estimate
- Viscous friction estimate

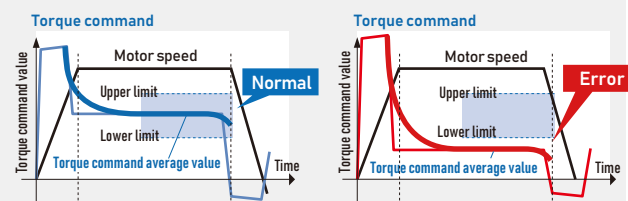
### 3 Warn if an estimate is out of the set range



## Torque command diagnosis

Constantly diagnoses torque commands during operation at a constant speed to detect issues in drive parts and the motor itself before a malfunction occurs.

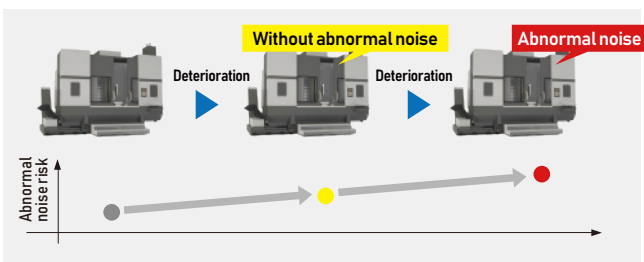
Real-time monitoring of torque command data at constant speed



## Abnormal noise risk estimation

Under development

The risk of abnormal noise due to oscillation can be estimated and diagnosed before it occurs.



\*Release schedule will vary depending on the series and capacity. Please contact us for details.

Specialized for applications

## Simple installation with no need for a host controller program

### Application specialized type

Sensor direct feedback (Displacement control)

Sensor direct feedback (Pressure control)

Under development

High-precision gantry control

Under development

EtherCAT

RTEX  
Realtime Express

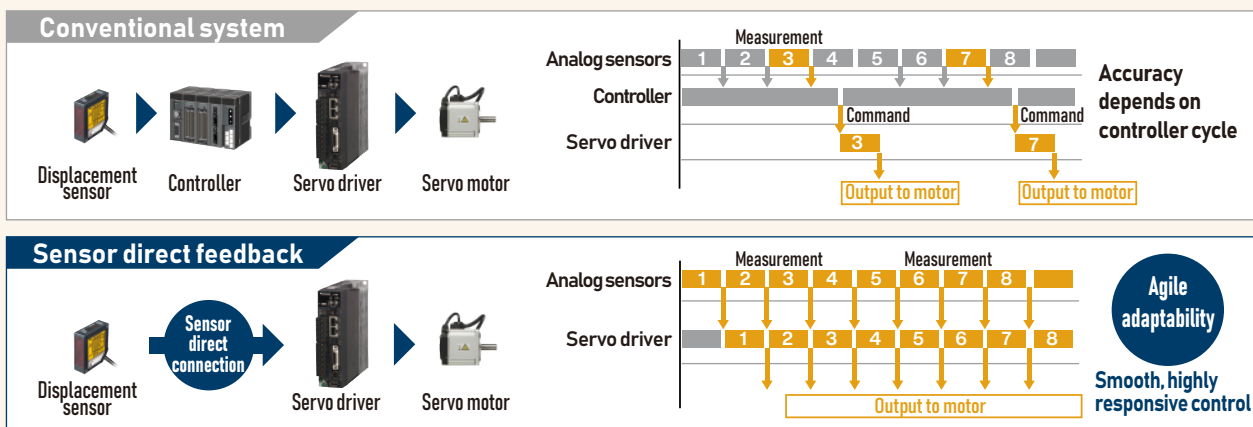
Analog, pulse train,  
Modbus



High responsiveness and smooth control not dependent on a controller

## Sensor direct feedback

Analog data from sensors, etc., is directly input to the servo driver, allowing high-speed response control simply by setting up the servo driver. This makes it possible to eliminate complex host controller programs required in the past.

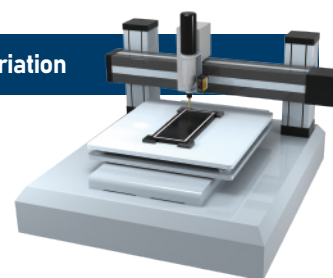


### Sensor direct feedback

Accurate position correction according to workpiece variation

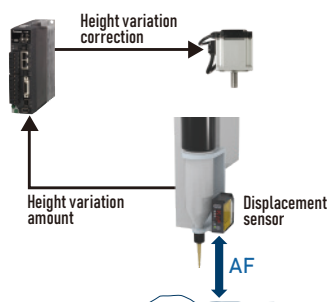
## Displacement control (Auto-focus control, meandering control)

Full-closed control that is completed within the driver through direct input of the displacement sensor to the servo driver. The high-speed feedback control is not dependent on a host controller, providing a high-speed response to workpiece variations.



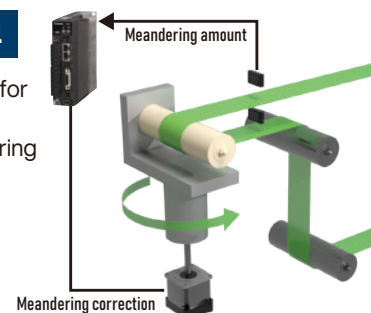
### Auto-focus control

Achieves high-quality processing/coating with a constant clearance, even for workpieces with varying heights



### Meandering control

No special unit is required for meandering correction, as high-precision meandering control is achieved with the servo



Example applications

Dispensers

Display bonding equipment

Scribing devices

Laser processing machines

Lithium-ion battery winding machines

Packing machines



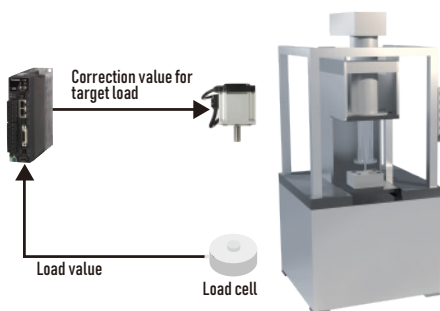
## Sensor direct feedback

Simplifies complex control programs for stable, highly precise pressure control

# Pressure control

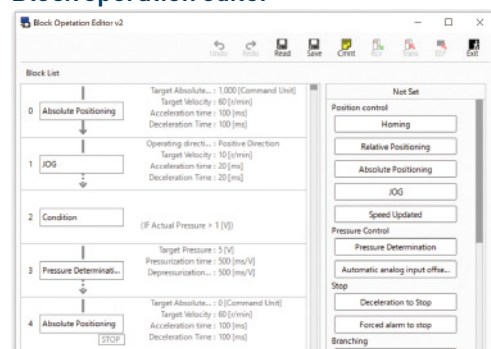
Under development\*

High response and stable operation control is achieved through full-closed control that is completed within the driver by directly inputting the pressure sensor output signal to the servo driver.



The simple block operation editor allows for immediate configuration of motion patterns with intuitive operation. High response pressure control is achieved simply by selecting control mode switching.

## Block operation editor



### Example applications

Press machines

Bonding equipment

Assembly equipment

Press fitting equipment

Capping devices

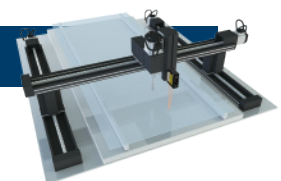
Screw tightening equipment

## Gantry control model

Advanced coordination control, ease of use and safety functions ideal for gantry mechanisms

# High-precision gantry control

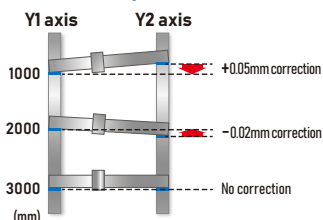
Under development\*



### Precise Gantry torsion correction (table)

Measure positional deviation between two axes beforehand and save as a table to correct torsion and improve positioning accuracy.

Correct by creating and operating a position correction table in advance

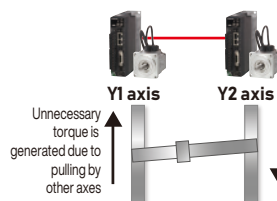


| Y1 axis position (mm) | Y2 axis position (mm) | Y2axis position correction amount (mm) |
|-----------------------|-----------------------|----------------------------------------|
| 0                     | 0                     | 0                                      |
| 1000                  | 999.95                | 0.05                                   |
| 2000                  | 2000.02               | -0.02                                  |
| 3000                  | 3000                  | 0                                      |

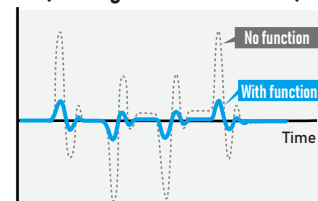
### Faster Gantry torsion correction (real-time)

Torque interference is reduced by detecting and correcting torsion between axes in real time, enabling high speed operation.

Coordinated communication between axes



Torsion (misalignment of two axes)



### Simpler Gain tuning optimization

Gantry mechanism tuning, which used to require complex tuning, is now quicker and easier.

### Safer Coordinated stoppage during an alarm

When an alarm occurs on one axis, the two axes are stopped in a coordinated manner to prevent mechanical damage.

### Example applications

Bonding equipment

Substrate inspection equipment

Scribing devices

Grinding equipment

Mounters

Laser processing machines

\*Response time will vary depending on the series and capacity. Please contact us for details.

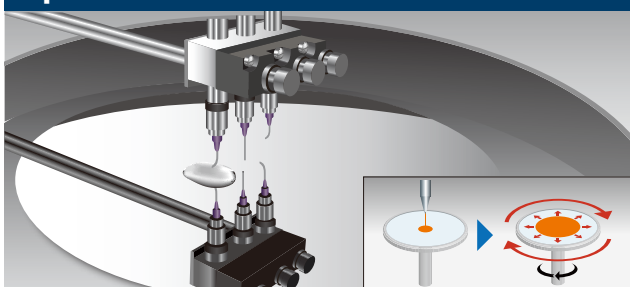
# Meeting the need for further miniaturization and increased processing accuracy

## Contributing to improved equipment performance

### Semiconductor manufacturing process

In response to the demand for miniaturization and multi-layering of semiconductor chips, higher speed and higher precision control is required in each manufacturing process.

#### Spin coaters



Chemical solutions are evenly spread by rotating the wafer. The high-speed rotation contributes to increased thinness.

Max. motor rotational speed 7150 r/min

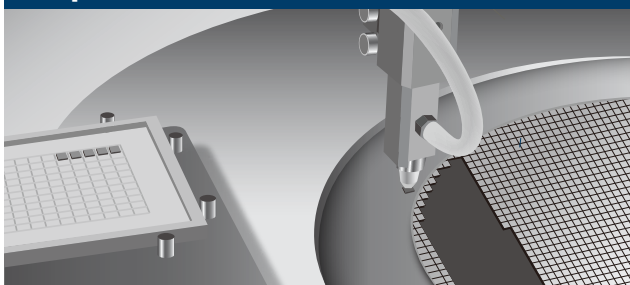
#### Dicing saws



By improving positioning accuracy, micro IC chips can be formed from wafers.

Improved positioning accuracy

#### Chip transfer machines



Suppresses minute tip vibrations and realizes high-speed pick & place of microscopic IC chips.

precAIs TUNING

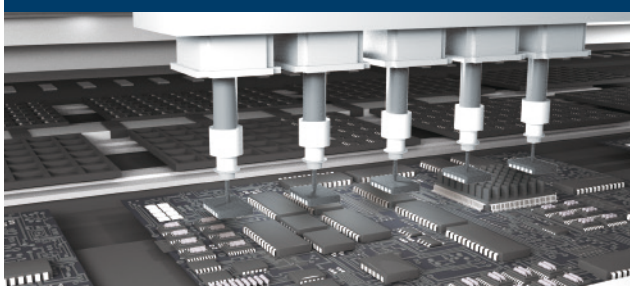
#### Bonding equipment



High-response load control prevents mounting failures and damage to microchips during substrate mounting.

Sensor direct feedback (Pressure control)

#### IC handlers



Abnormal stops due to overloading are reduced, even when quick acceleration/deceleration is repeated under high load conditions.

Extending overload operation time

#### Substrate inspection equipment



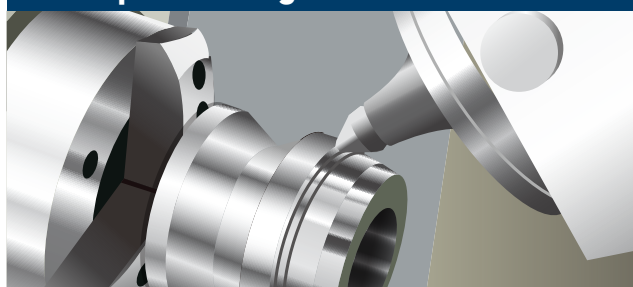
The dual axes of the gantry mechanism allow for smooth, high-speed operation, enabling high-speed inspection.

High-precision gantry control

## Processing machinery

As products become denser and more sophisticated, higher precision control is required for all machines, even those that process the individual parts making up the product.

### Metal processing machines

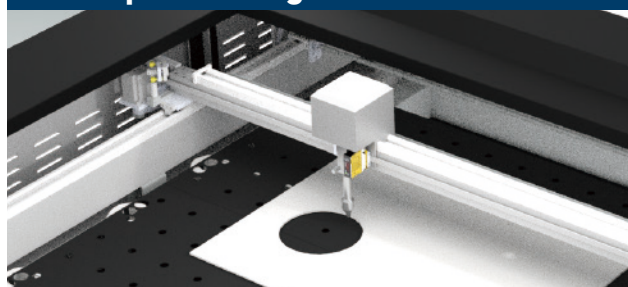


Improved basic performance can increase the gain, enabling ultra-precise, nanometer-order machining.

Encoder resolution 27 bit

Velocity response frequency 4.0 kHz or more

### Laser processing machines



High-quality machining is achieved by correcting unevenness with regard to height with a high level of responsiveness.

Sensor direct connection auto-focus control

### Press machines



Operation patterns for high-response pressure control can easily be constructed without a host program.

Block operation function

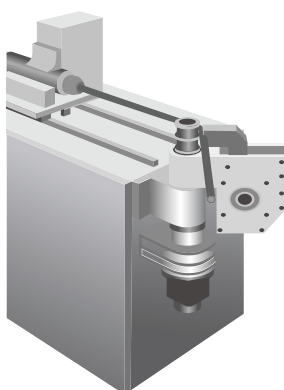
### Injection molding machines



High-response pressure control stabilizes filling pressure and suppresses filling defects and burrs.

Sensor direct feedback (Pressure control)

### Pipe bending machines



Both position control and pressure control are fully closed within the servo system, achieving high speed and accurate bending.

Sensor direct feedback (Pressure control)



# Servo system MINAS A6 Family

An extensive lineup of high-speed, high-torque, compact and lightweight servo system

## MINAS A6 Family

- Encoder resolution 23 bit
- Encoder Absolute, Incremental, Battery-less absolute
- Velocity response frequency 3.2 kHz
- Motor capacity 50 W to 22 kW



### Servo driver

#### [ Rotation type ]

Analog/Pulse train input/  
Modbus communication



#### MINAS A6S

- Position control type **A6SE**
- General-purpose communication type **A6SG**
- Multifunction type **A6SF** Special order



High speed communication  
For Realtime Express Network  
servo driver



#### MINAS A6N

- Standard type **A6NE**
- Multifunction type **A6NF**



Special order

Open network  
EtherCAT communication  
servo driver



#### MINAS A6B

- Standard type **A6BE**
- Multifunction type **A6BF**
- Application-optimized type Special order
  - Displacement control **A6BU**
  - Gantry control\* **A6BN**

\*: Linear motors supported

#### [ Linear and DD motor types ]

Special order



#### MINAS A6L

Pulse train/Modbus  
RTEX-compatible  
EtherCAT-compatible

#### [ DC 24 V /DC 48 V ]

Special order



#### MINAS A6 Frame V

Pulse train/Modbus  
RTEX-compatible  
EtherCAT-compatible

#### [ Dual-axis servo driver ]

Special order



### Servo motor

Low inertia



#### MSMF

100 V 50 W to 400 W  
200 V 50 W to 5.0 kW

Medium inertia  
Flat type



#### MQMF

100 V 100 W to 400 W  
200 V 100 W to 400 W

Medium inertia



#### MDMF

200 V 1.0 kW to 22.0 kW

Medium inertia  
Low-speed,  
high torque



#### MGMF

200 V 850 W to 5.5 kW

High inertia



#### MHMF

100 W to 750 W

100 V 50 W to 400 W  
200 V 50 W to 7.5 kW



A lineup of geared motors is also available

\*We offer a connector type and a lead wire type.

## Sustainability

### Panasonic Industry practices sustainable management, contributing to the future of the earth and the development of society

#### Panasonic GREEN IMPACT

The Panasonic Group has established "Panasonic GREEN IMPACT", a long-term environmental vision aimed at achieving better living and a sustainable global environment. Through this vision we aim to reduce CO<sub>2</sub> emissions associated with our business to virtually zero by 2030, and by 2050, we aim to create a reduce contributions by\* 300 million tons, or roughly 1% of current global emissions (approx. 33 billion tons).

\*Energy-related CO<sub>2</sub> emissions in 2019: 33.6 billion tons (source: IEA). 300 million tons calculated using 2020 emission factors

#### Reducing our environmental impact

##### ▪ Compact and lightweight

Achieves a 15% reduction compared to previous models

The MINAS A7 Family of AC servo motors, used in industrial machinery and industrial robots, have achieved industry-leading high speeds and large torques while reducing weight by 15% (500 g) compared to our conventional models.

##### ▪ Reducing the environmental impact of packaging materials

We have reviewed packaging materials from the ground up, and are switching to paper materials with a low environmental impact.

##### ▪ Front panel model nameplate changed to laser printing

This conserves model nameplate stamps, taking the environmental impact into consideration.



#### Chemical substance-based initiatives

##### ▪ Lead-free and RoHS-compliant

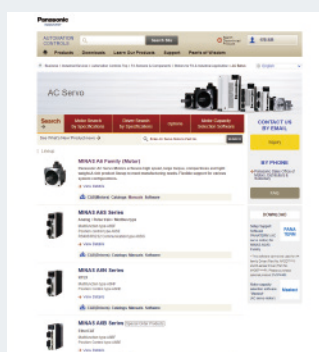
All solder used at our manufacturing sites is free of lead and conforms to the regulations preventing the inclusion of the six substances in the EU RoHS directive 2011/65/EU and the four substances in the EU RoHS directive 2015/863/EU. We have also confirmed that there is no intentional use exceeding the threshold for said substances.

(Responding to overseas environmental regulations)

- RoHS (China)
- Toxic Substances Control Act (TSCA, United States)
- K-Reach (South Korea)
- RoHS (Europe)

\*Compared with 1.0 kW motors

## Website Information



### Panasonic Industry Automation Controls website

URL [industrial.panasonic.com/ac/](https://industrial.panasonic.com/ac/)

We provide extensive technical information that ranges from motor selection to materials useful for design.

#### Product information

##### What's new

- New product information
- Motor news
- Software version upgrade information

#### Design

#### Download

- Manuals
- Technical documents
- Standard specifications
- CAD
- Software

#### Selection

#### Servo motor selection software

Automatically selects items ranging from machine elements and operation patterns, to motors, drivers and optional products!

#### Online tool



## Safety Precautions

- Important Notes on exporting this product or equipment containing this product;  
If the end-user or application of this product is related to military affairs or weapons, its export may be controlled by "Foreign Exchange and Foreign Trade Control Law" of Japan where export license will be required before product can be exported from Japan.
- This product is designed and manufactured for use in General Purpose Industrial Equipment and it is not intended to be used in equipment or system that may cause personal injury or death.
- All servicing such as installation, wiring, operation, maintenance and etc., should be performed by qualified personnel only.
- Tighten mounting screws with an adequate torque by taking into consideration strength of the screws and the characteristics of material to which the product will be mounted. Over tightening can damage the screw and/or material; under tightening can result in loosening.
- Install safety equipment to prevent serious accidents or loss that is expected in case of failure of this product.
- Consult us before using this product under such special conditions and environments as nuclear energy control, aerospace, transportation, medical equipment, various safety equipments or equipments which require a lesser air contamination.
- We have been making the best effort to ensure the highest quality of our products, however, some applications with exceptionally large external noise disturbance and static electricity, or failure in input power, wiring and components may result in unexpected action. It is highly recommended that you make a fail-safe design and secure the safety in the operative range.
- If the motor shaft is not electrically grounded, it may cause an electrolytic corrosion to the bearing, depending on the condition of the machine and its mounting environment, and may result in the bearing noise. Checking and verification by customer is required.
- Failure of this product depending on its content may generate smoke of about one cigarette. Take this into consideration when the application of the machine is clean room related.
- Please be careful when using the product in an environment with high concentrations of sulfur or sulfuric gases, as sulfuration can lead to disconnection from the chip resistor or a poor contact connection.
- Do not input a supply voltage which significantly exceeds the rated range to the power supply of this product. Failure to heed this caution may lead to damage of the internal parts, causing smoke and/ or fire and other troubles.
- The user is responsible for matching between machine and components in terms of configuration, dimensions, life expectancy, characteristics, when installing the machine or changing specification of the machine. The user is also responsible for complying with applicable laws and regulations.
- Manufacturer's warranty will be invalid if the product has been used outside its stated specifications.
- Component parts are subject to minor change to improve performance.
- Read and observe the instruction manual to ensure correct use of the product.

### Repair

Consult to the dealer from whom you have purchased this product for details of repair work.  
When the product is incorporated to the machine you have purchased, consult to the machine manufacturer or its dealer.

### URL

Electronic data of this product (Instruction Manual, CAD data) can be downloaded from the following web site;  
[industrial.panasonic.com/ac/e/](http://industrial.panasonic.com/ac/e/)

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- Realtime Express is a high-speed synchronous motion network developed by Panasonic Holdings Corporation.
- EtherCAT is a patented technology and registered trademark licensed by Beckhoff Automation GmbH in Germany.

● Contact to : \_\_\_\_\_

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