# B

## αSTEP

# Hybrid Control System, Alpha Step

# Product Line of Hybrid Control System αSTEP

One feature of αSTEP products is that they can perform accurate positioning operations with ease. To expand applications of stepper motors, Oriental Motor offers many different product series designed with different power supply specifications and various functions. A wide spectrum of variation are available within each series, as products come in many frame sizes and pre-assembled options, such as electromagnetic brake type and geared types.

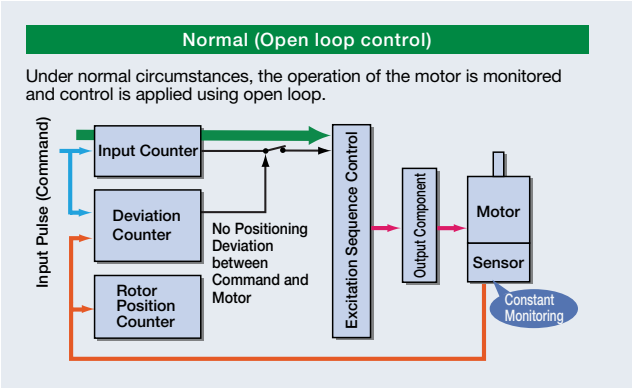
| Classification | | **AZ** Series with Battery-Free Absolute Sensor | | **AR** Series | |
|---|---|---|---|---|---|
| | | AC Input | DC Input | AC Input | DC Input |
| Series | |  |  |  |  |
| Reference Page | | ▶ Page B-16 | ▶ Page B-44 | ▶ Page B-84 | ▶ Page B-98 |
| Key Features | | ● Reduced Wiring and Reduced System Cost<br>● Uses Multi-Turn Absolute Sensor<br>● No Battery Required | | ● High Efficiency and Low Heat Generation<br>● Continuous Operation and Extended Function<br>● Conforms to International Safety Standards | |
| Control Method | | Closed Loop | | Closed Loop | |
| Basic Step Angle | | 0.36° (Resolution setting: 1000 P/R) | | 0.36° (Resolution setting: 1000 P/R) | |
| Excitation Mode | | Microstep | | Microstep | |
| Resolution | | 3.6°~0.036° | | 3.6°~0.036° | |
| Driver Type | Built-in Controller | ● | ● | ● | ● |
| | Pulse Input with RS-485 Communication | ● | ● | – | – |
| | Pulse Input | ● | ● | ● | ● |
| | Network Compatible | Modbus(RTU) | Modbus(RTU) | Modbus(RTU) | Modbus(RTU) |
| Motor Frame Size | □20 mm (0.79 in.) | – | ● | – | – |
| | □28/30 mm (1.1/1.18 in.) | – | ● | – | ● |
| | □40/42 mm (1.57/1.65 in.) | ● | ● | ● | ● |
| | □60 mm (2.36 in.) | ● | ● | ● | ● |
| | □85/90 mm (3.35/3.54 in.) | ● | – | ● | ● |
| Additional Function | Electromagnetic Brake | ● | ● | ● | ● |
| Geared Types | **TH** (Spur gear mechanism) | – | – | ● | ● |
| | **TS** (Spur gear mechanism) | ● | ● | – | – |
| | **PS** (Planetary gear mechanism) | ● | ● | ● | ● |
| | **PN** (Planetary gear mechanism) | – | – | ● | ● |
| | **HPG** (Planetary gear mechanism) | ● | ● | – | – |
| | Harmonic | ● | ● | ● | ● |
| Driver Functions | Push-Motion Operation | ● | ● | ● | ● |
| | Extended Functions | ● | ● | ● | ● |
| | Waveform Monitoring Function | ● | ● | ● | ● |
| Power Supply Input | | Single-Phase 100-120 VAC<br>Single-Phase/<br>Three-Phase 200-240 VAC | 24/48*2 VDC | Single-Phase 100-115 (120) VAC<br>Single-Phase 200-230 (240) VAC<br>Three-Phase 200-230 VAC*1 | 24/48*2 VDC |
| International Standards | | UL CE | c UL us *2*3 CE | c UL us CE | UL*2 CE |
| Price Range | | $838.00 ~ $2,272.00 | $667.00 ~ $1,859.00 | $727.00 ~ $2,161.00 | $494.00 ~ $1,983.00 |

*1 Pulse input type only
*2 20 mm (0.79 in.), 28 mm (1.1 in.) frame size excluded
*3 Motor only

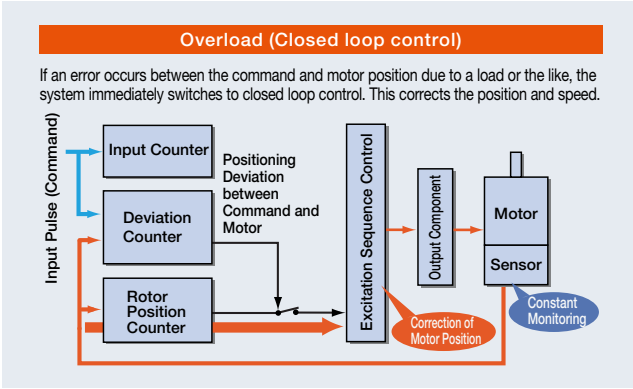
## Overview of Hybrid Control System αSTEP

αSTEP products are stepper motor based hybrid motors with a unique control system combining the benefits of "open loop control" and "closed loop control".
The position of the motor is always monitored, and then the driver automatically switches between 2 types of control depending on the situation.

### ●Normally Operates in Open Loop Control for the Same Ease of Use as a Stepper Motor

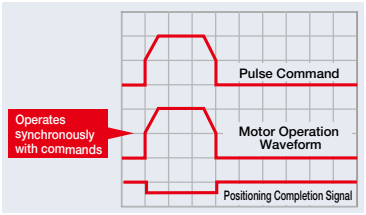



### ●Switches to Closed Loop Control during Overload for More Reliable Operation




### ◇High Response

By utilizing the high responsiveness of the stepper motor, moving a short distance for a short time is possible. The motors can execute commands without lag.




### ◇Holding the Stop Position without Hunting

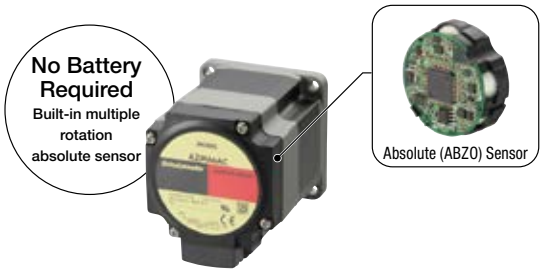
During positioning, the motor stops with its own holding force without hunting. Because of this, it is ideal for applications where the low rigidity of the mechanism requires absence of vibration upon stopping.

### ◇Tuning-Free

Because it is normally operated with open loop control, positioning is still possible without gain adjustment even when the load fluctuates due to the use of a belt mechanism, cam or chain drive, etc.

### ◇AZ Series with Absolute (ABZO) Sensor

- Mechanical Multi-Turn Absolute Sensor
  Absolute position detection is possible with ±900 rotations (1800 rotations) of the motor shaft from the home reference.
- No Battery Required
  Because positioning information is managed mechanically by the absolute sensor, the positioning information can be preserved, even if the power turns off or if the cable between the motor and the driver is disconnected.




### ◇Continues Operation Even with Sudden Load Fluctuation and Sudden Acceleration

It operates synchronously with commands using open loop control during normal conditions. In an overload condition, it switches immediately to closed loop control to correct the position.

### ◇Alarm Signal Output in Case of Abnormality

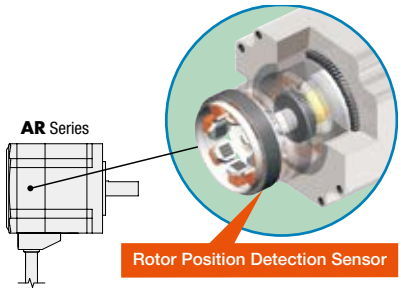
If an overload is applied continuously, an alarm signal is output. When the positioning is complete, an END signal is output. This ensures the same level of reliability as a servo motor.

### ●Smooth Operation Even at Low Speed

Thanks to the standard microstep drive and smooth drive function*, vibration is reduced even at low speed, and the motor can move the load smoothly.
* The smooth drive function automatically microsteps based on the same traveling amount and speed used in the full step mode, without changing the pulse input settings.

### ◇AR Series with Rotor Position Detection Sensor (Resolver)

- Because the sensor is compact and slim, the overall length of the motor has been reduced.
- Performance such as heat resistance and vibration resistance is better than with regular optical encoders.
- Because an encoder cable is not necessary, the motor and driver can be connected with just 1 cable.

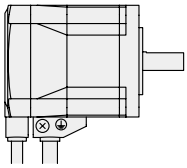


## Motor Types

Motors come in several different types including the standard type, electromagnetic brake type and various geared types. The availability of such a wide selection means that you can choose an optimal type according to the function and performance required in your specific application.
Typical examples are introduced below.

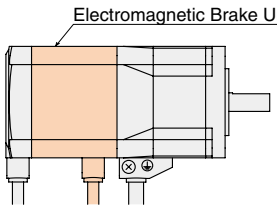
### Standard Type

A basic model that is easy to use and designed with a balanced set of functions and characteristics.

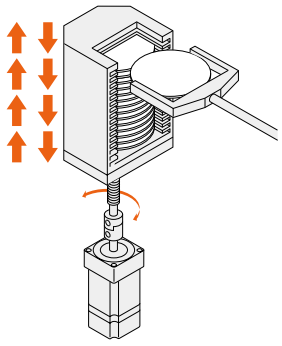


### Electromagnetic Brake Type

These motors incorporate a non-excitation type electromagnetic brake. When the power is accidentally cut off due to power outage or other unexpected event, the electromagnetic brake holds the load in position to prevent it from dropping or moving.

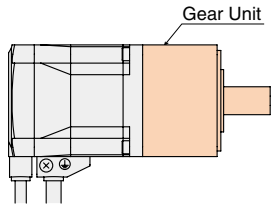



Once the power is cut off, the self-holding torque of the motor is lost and the motor can no longer be held at the stopped position in vertical operations or when an external force is applied. In lift and similar applications, use an electromagnetic brake type.



### Geared Type

These motors incorporate a dedicated position-control gearhead with reduced backlash to make the most of the high controllability of the motors. The gearhead ensures highly accurate, smooth operation even in applications where a high torque is required.




## Driver Type

AC : Single-phase 100-120 VAC, Single-phase/ Three-phase 200-240 VAC input
DC : 24/48 VDC input

### Built-in Controller Type FLEX AC DC

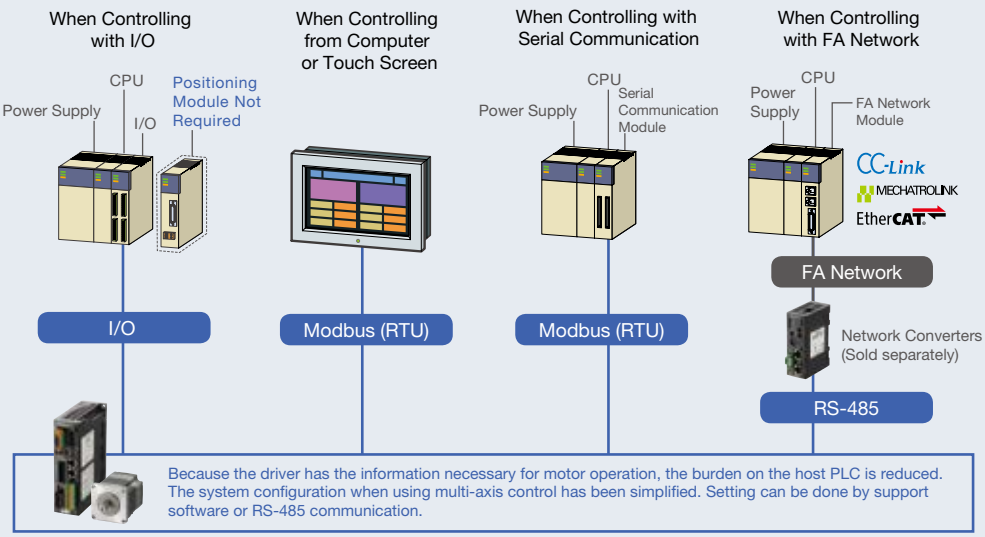
With this type, the operating data is set in the driver, and is then selected and executed from the host system. Host system connection and control are performed with any of the following: I/O, Modbus (RTU), RS-485 communication, or FA network. By using a network converter (sold separately), CC-link, MECHATROLINK or EtherCAT communication is possible.

Basic Setting (Factory setting)


Operating Data Setting / Parameter Changing
Support Software (**MEXE02**)

●Setting using RS-485 communication is also possible.

FLEX is the collective name for products that support I/O control, Modbus (RTU) control, and FA network control via network converters.



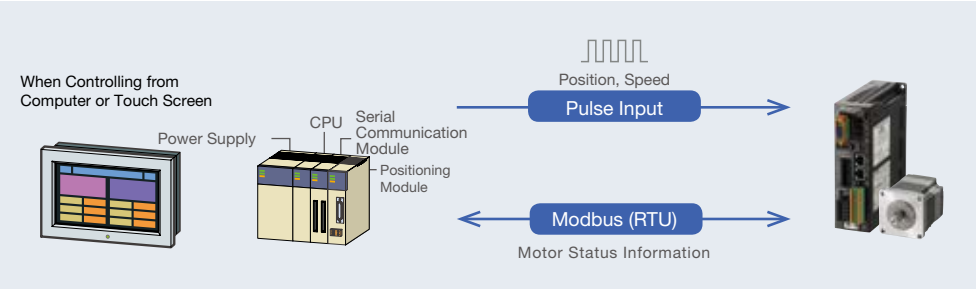

### Pulse Input Type with RS-485 Communication AC DC ✻ AZ Series Only

This type executes operations by inputting pulses into the driver. Control the motor using a positioning module (pulse generator) that you have obtained yourself. RS-485 communication can be used to monitor status information for the motor (position, speed, torque, alarms, temperature, and more).

Basic Setting (Factory setting)


I/O Assignment Changing / Parameter Changing
Support Software (**MEXE02**)

The support software (**MEXE02**) can also be used to check the alarm history and monitor status information.



AC : Single-phase 100-120 VAC, Single-phase/ Three-phase 200-240 VAC input
DC : 24/48 VDC input

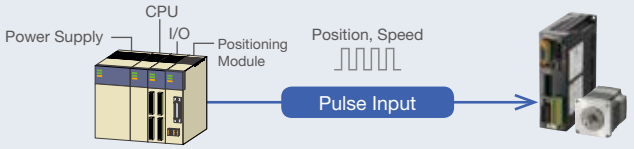
## Pulse Input Type AC DC

This type executes operations by inputting pulses into the driver. Control the motor using a positioning module (pulse generator) that you have obtained yourself. The support software (**MEXE02**) can be used to check the alarm history and monitor status information.

**Basic Setting (Factory setting)**

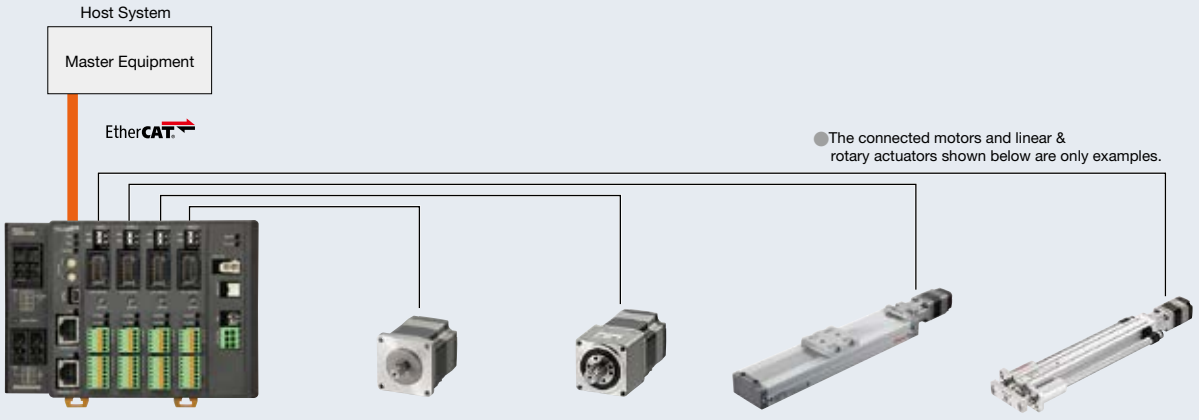
**I/O Assignment Changing** **IParameter Changing**
Support Software (**MEXE02**)


The support software (**MEXE02**) can also be used to check the alarm history and monitor status information.




## Network Compatible Multi-Axis Driver DC ✻ **AZ** Series DC Input Only

This multi-axis driver is compatible with EtherCAT drive profiles.
**AZ** Series DC input motors (and linear & rotary actuators that contain them) can be connected.
Drivers that can connect to 2, 3 or 4 axes are available.



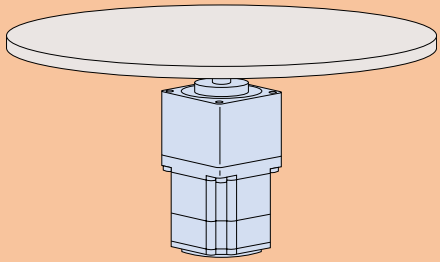

- EtherCAT is registered trademark licensed by Beckhoff Automation GmbH, Germany.
- The support software (**MEXE02**) can be downloaded from the Oriental Motor website. We also provide the tool on media (free of charge).

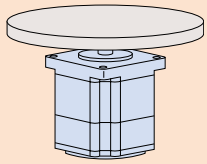
## Advantages of Geared Motors

We offer motors pre-assembled with gears, as variations of motors. Geared motors not only achieve deceleration, high torque and high resolution, but they also provide these additional advantages:

### Capable of Driving Large Inertial Loads

When a geared motor is used, the inertial load that can be turned increases in comparison with a comparable standard motor in proportion to the square of the gear ratio. This means that larger inertial loads can be driven with geared motors.

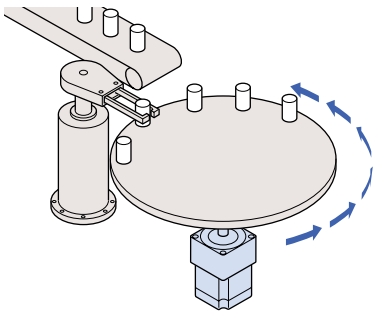


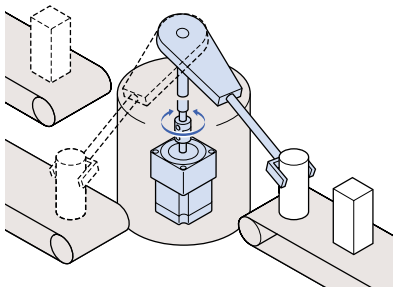


| Motor Type | Geared Type (Gear ratio 5) | Standard Type |
|---|---|---|
| Product Name | **AZM66AC-PS5** | **AZM66AC** |
| Load Inertia (30 times the rotor inertia) | 277.5×10$^{-4}$ kg·m$^2$ (1520 oz-in$^2$) | 11.1×10$^{-4}$ kg·m$^2$ (61 oz-in$^2$) |
| Diameter of Load Inertia (Thickness: 20 mm (0.78 in.), Material: Aluminum) | 317 mm (12.5 in.) | 142 mm (5.59 in.) |
| Speed Range | 0~600 r/min | 0~6000 r/min |

### Improved Damping Characteristics at Start and Stop

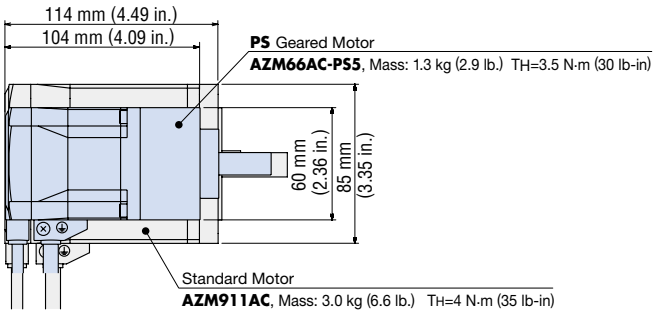
If the inertial load is large or acceleration/deceleration time is short, a geared motor can increase damping more effectively and thereby ensure more stable operation compared to a standard motor. Geared motors are ideal for applications where a large inertia such as an index table or arm must be driven to perform quick positioning.





### Smaller Size

When a standard motor is compared with a geared motor that generates equivalent torque at low speed, the geared motor has a smaller frame size, thus its mass and volume are also smaller.
Geared motors are effective when equipment must be kept small and light.



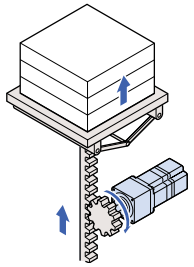

* TH: Max. holding torque.

## ●High Rigidity, Resistant to Torsional Force

Geared motors have high rigidity and are therefore resistant to torsional force. Compared to standard motors, geared motors are less subject to load torque fluctuation. This means that stability and high positioning accuracy can be ensured even when the load size changes.

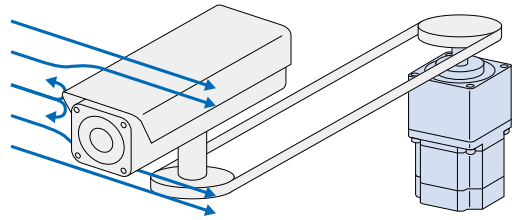
### ◇Applications: Elevator

The load can be stopped accurately, even with elevators and other mechanisms that perform vertical operations where the number of loads or weight of loads changes.



### ◇Applications: Security Camera

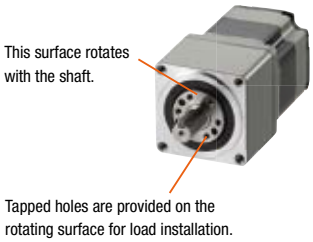
The position can be held securely even when the camera sways due to strong wind.

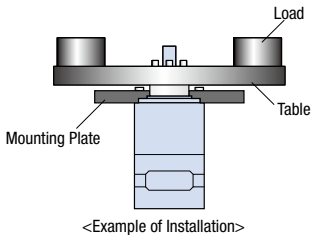


## ●Surface Installation of Load (Harmonic/**HPG** geared type)

Harmonic geared types [excluding those with a frame size of 90 mm (3.54 in.)] and **HPG** geared types permit the placement of a load directly on the rotating surface integrated with the shaft.

### ◇Appearance and Installation Example

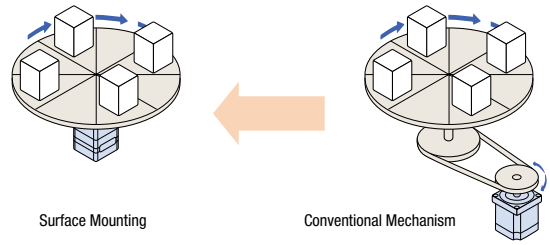



<Example of Installation>

### ◇Application: Index Table

This not only reduces the number of parts/processes, but also improves reliability. They are also suitable for operation with moment loads.



Surface Mounting

Conventional Mechanism

# How to Read Specifications

| | | | | | |
|---|---|---|---|---|---|
| | Motor Product Name | Single Shaft | | AZM66AC | AZM66AC-PS5 |
| | | With Electromagnetic Brake | | AZM66MC | AZM66MC-PS5 |
| | Driver Product Name | Built-in Controller | | **AZD-AD** (Single-Phase 100-120 VAC), **AZD-CD** (Single-Phase/Three-Phase 200-240 VAC) | |
| | | Pulse Input with RS-485 Communication | | **AZD-AX** (Single-Phase 100-120 VAC), **AZD-CX** (Single-Phase/Three-Phase 200-240 VAC) | |
| | | Pulse Input | | **AZD-A** (Single-Phase 100-120 VAC), **AZD-C** (Single-Phase/Three-Phase 200-240 VAC) | |
| ① | Maximum Holding Torque | | N·m (lb-in) | 1.2 (170 oz-in) | 3.5 (30) |
| ② | Rotor Inertia | | J：kg·m$^2$ (oz-in$^2$) | 370×10$^{-7}$ (2) [530×10$^{-7}$ (2.9)]※1 | 370×10$^{-7}$ (2) [530×10$^{-7}$ (2.9)]※1 |
| ③ | Gear Ratio | | | – | 5 |
| ④ | Resolution | | 1000 P/R Setting | 0.36°/Pulse | 0.072°/Pulse |
| ⑤ | Permissible Torque | | N·m (lb-in) | – | 3.5 (30) |
| ⑥ | Maximum Instantaneous Torque | | N·m (lb-in) | – | ※ |
| ⑦ | Holding Torque at | Power ON | N·m (lb-in) | 0.6 (85 oz-in) | 3 (26) |
| | Motor Standstill | Electromagnetic Brake | N·m (lb-in) | 0.6 (85 oz-in) | 3 (26) |
| ⑧ | Speed Range | | r/min | – | 0～600 |
| ⑨ | Backlash | | arcmin | – | 7 (0.12°) |
| ⑩ | Power Supply Input | Voltage and Frequency | | Single-Phase 100-120 VAC, Single-Phase/Three-Phase 200-240 VAC −15～+6% 50/60 Hz | |
| | | Input Current A | Single-Phase 100-120 VAC | 3.8 | |
| | | | Single-Phase 200-240 VAC | 2.3 | |
| | | | Three-Phase 200-240 VAC | 1.4 | |
| | Control Power Supply | | | 24 VDC ±5% 0.25 A[0.5 A] | |

※For the geared motor output torque, refer to the speed - torque characteristics.
※1 The bracket [ ] indicates the value for the product with an electromagnetic brake.

### ①Maximum Holding Torque

This is the maximum holding torque (holding force) the motor has when power is supplied (at rated current), but the motor is not rotating. (With geared types, the value of holding torque considers the permissible strength of the gear.)

### ②Rotor Inertia

This refers to the inertia of the rotor inside the motor. This is necessary when the required torque (acceleration torque) for the motor is calculated.

### ③Gear Ratio

This is the ratio of the rotation speed between the input speed from the motor and the speed of the output gear shaft. For example, a gear ratio of 10 indicates that when the input speed from the motor is 10 r/min, the output gear shaft speed is 1 r/min.

### ④Resolution

The resolution is the angular distance (in degrees) that the motor moves upon input of one pulse from the driver.
It differs depending on the motor structure and excitation mode.

### ⑤Permissible Torque

The permissible torque represents the maximum value limited by the mechanical strength of the output gear shaft when operated at a constant speed.
For the types other than the **TS** geared, **PS** geared, **HPG** geared, and harmonic geared types, the total torque including acceleration and deceleration torque should not exceed the permissible torque.

### ⑥Maximum Instantaneous Torque (TS geared, PS geared, HPG geared, and harmonic geared types)

This is the maximum torque that can be applied to the gear output shaft during acceleration/deceleration such when an inertial load is started and stopped.

### ⑦Holding Torque at Motor Standstill

While Power is ON: Holding torque when the automatic current cutback function is active (factory setting) is shown.
Electromagnetic Brake: Static friction torque when the electromagnetic brake is activated at standstill is shown.
(Electromagnetic brake is power off activated type)

### ⑧Speed Range

This is the range for rotation speed on the output gear shaft.

### ⑨Backlash

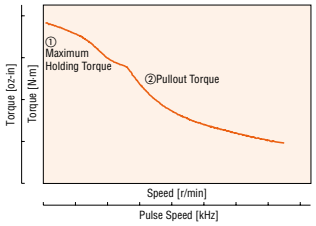
This is the play of the output gear shaft when the motor shaft is fixed.
When positioning in bi-direction, the positioning accuracy is affected.

### ⑩Power Supply Input

The current value of the power input is the maximum input current value. (The input current varies according to the rotation speed.)

# How to Read Speed – Torque Characteristics

The characteristics diagram below shows the relationship between the speed and torque when $\alpha_{STEP}$ is driven. The required speed and torque are always used when selecting $\alpha_{STEP}$. On the graph of characteristics, the horizontal axis expresses the speed at motor output shaft while the vertical axis expresses the torque.




The speed – torque characteristics are determined by the motor and driver, so they are greatly affected by the type of driver being used.

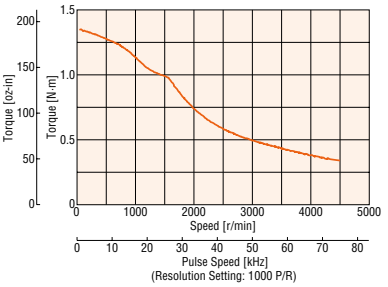
### ①Maximum Holding Torque

This is the maximum holding torque (holding force) the motor has when power is supplied (at rated current) but $\alpha_{STEP}$ is not rotating.

### ②Pullout Torque

The pullout torque is the maximum torque that can be output at a given speed.
When selecting a motor, be sure that the required torque falls within this curve.

The figure to the right depicts speed – torque characteristics for Hybrid Control System $\alpha_{STEP}$ **AZ** Series.



# Common Specifications



## Permissible Moment Load

When an eccentric load is applied to the output flange-installation surface, the load moment acts on the bearing.
Use the following formula to check whether the axial load and load moment are within specifications.

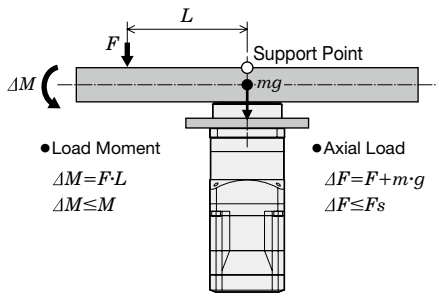
### ●HPG Geared Type Flange Output Type

| Product Name | Gear Ratio | Permissible Axial Load [N] | Permissible Moment Load [N·m] | $\alpha$ Constant [m] |
|---|---|---|---|---|
| AZM46 | 5 | 430 | 4.9 | 0.006 |
| | 9 | 510 | 5.9 | |
| AZM66 | 5 | 700 | 12.0 | 0.011 |
| | 15 | 980 | 17.2 | |
| AZM98 | 5 | 1460 | 38.7 | 0.0115 |
| | 15 | 2030 | 53.5 | |

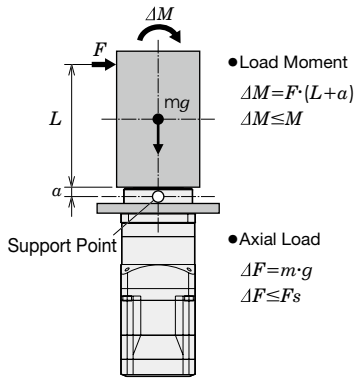
$m$ : Load Mass (kg)
$g$ : Gravitational acceleration (m/s²)
$F$ : External force (N)
$L$ : Overhung distance (m)
$\alpha$ : Constant (m)
$\Delta F$ : Load on output flange surface (N)
$Fs$ : Permissible axial load (N)
$\Delta M$ : Load moment (N·m)
$M$ : Permissible moment load (N·m)

The load moment can be calculated with the following formulas.

Example 1: An external force F (N) is applied at L (m) overhang position in a horizontal direction from the center of the output flange




Example 2: An external force F (N) is applied at L (m) overhang position in a vertical direction from the output flange-installation surface

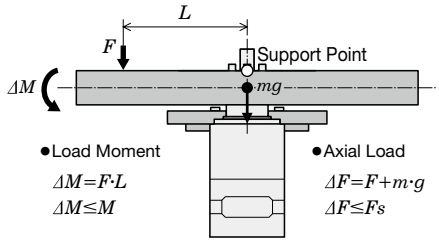



### ●Harmonic Geared Type

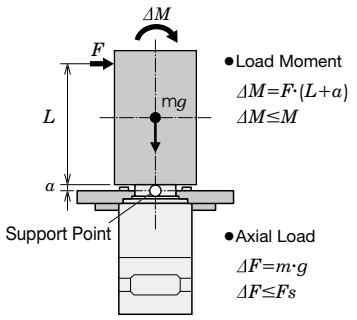
| Motor Frame Size | Permissible Axial Load [N] | Permissible Moment Load [N·m] | $\alpha$ Constant [m] |
|---|---|---|---|
| 42 mm (1.65 in.) | 220 | 5.6 | 0.009 |
| 60 mm (2.36 in.) | 450 | 11.6 | 0.0114 |

The permissible moment load can be calculated with the following formulas.

Example 1: An external force F (N) is applied at L (m) overhang position in a horizontal direction from the center of the output flange




Example 2: An external force F (N) is applied at L (m) overhang position in a vertical direction from the output flange-installation surface



# Permissible Radial Load and Permissible Axial Load

## AZ Series

Unit : N (lb.)

| Type | Motor Frame Size mm [in.] | Product Name | Gear Ratio | Permissible Radial Load | | | | | Permissible Axial Load |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Distance from Shaft End mm [in.] | | | | | |
| | | | | 0 [0] | 5 [0.2] | 10 [0.39] | 15 [0.59] | 20 [0.79] | |
| Standard Type | 20 [0.79] | **AZM14**<br>**AZM15** | – | 12 (2.7) | 15 (3.3) | – | – | – | 3 (0.67) |
| | 28 [1.10] | **AZM24**<br>**AZM26** | | 25 (5.6) | 34 (7.6) | 52 (11.7) | – | – | 5 (1.12) |
| | 42 [1.65] | **AZM46** | | 35 (7.8) | 44 (9.9) | 58 (13) | 85 (19.1) | – | 15 (3.3) |
| | | **AZM48** | | 30 (6.7) | 35 (7.8) | 44 (9.9) | 58 (13) | 85 (19.1) | 15 (3.3) |
| | 60 [2.36] | **AZM66**<br>**AZM69** | | 90 (20) | 100 (22) | 130 (29) | 180 (40) | 270 (60) | 30 (6.7) |
| | 85 [3.35] | **AZM98**<br>**AZM911** | | 260 (58) | 290 (65) | 340 (76) | 390 (87) | 480 (108) | 60 (13.5) |
| **TS** Geared Type | 42 [1.65] | **AZM46** | **3.6**, **7.2**, **10** | 20 (4.5) | 30 (6.7) | 40 (9) | 50 (11.2) | – | 15 (3.3) |
| | | | **20**, **30** | 40 (9) | 50 (11.2) | 60 (13.5) | 70 (15.7) | – | |
| | 60 [2.36] | **AZM66** | **3.6**, **7.2**, **10** | 120 (27) | 135 (30) | 150 (33) | 165 (37) | 180 (40) | 40 (9) |
| | | | **20**, **30** | 170 (38) | 185 (41) | 200 (45) | 215 (48) | 230 (51) | |
| | 90 [3.54] | **AZM98** | **3.6**, **7.2**, **10** | 300 (67) | 325 (73) | 350 (78) | 375 (84) | 400 (90) | 150 (33) |
| | | | **20**, **30** | 400 (90) | 450 (101) | 500 (112) | 550 (123) | 600 (135) | |
| **PS** Geared Type | 42 [1.65] | **AZM46** | **5** | 70 (15.7) | 80 (18) | 95 (21) | 120 (27) | – | 100 (22) |
| | | | **7.2** | 80 (18) | 90 (20) | 110 (24) | 140 (31) | – | |
| | | | **10** | 85 (19.1) | 100 (22) | 120 (27) | 150 (33) | – | |
| | | | **25** | 120 (27) | 140 (31) | 170 (38) | 210 (47) | – | |
| | | | **36** | 130 (29) | 160 (36) | 190 (42) | 240 (54) | – | |
| | | | **50** | 150 (33) | 170 (38) | 210 (47) | 260 (58) | – | |
| | 60 [2.36] | **AZM66** | **5** | 170 (38) | 200 (45) | 230 (51) | 270 (60) | 320 (72) | 200 (45) |
| | | | **7.2** | 200 (45) | 220 (49) | 260 (58) | 310 (69) | 370 (83) | |
| | | | **10** | 220 (49) | 250 (56) | 290 (65) | 350 (78) | 410 (92) | |
| | | | **25** | 300 (67) | 340 (76) | 400 (90) | 470 (105) | 560 (126) | |
| | | | **36** | 340 (76) | 380 (85) | 450 (101) | 530 (119) | 630 (141) | |
| | | | **50** | 380 (85) | 430 (96) | 500 (112) | 600 (135) | 700 (157) | |
| | 90 [3.54] | **AZM98** | **5** | 380 (85) | 420 (94) | 470 (105) | 540 (121) | 630 (141) | 600 (135) |
| | | | **7.2** | 430 (96) | 470 (105) | 530 (119) | 610 (137) | 710 (159) | |
| | | | **10** | 480 (108) | 530 (119) | 590 (132) | 680 (153) | 790 (177) | |
| | | | **25** | 650 (146) | 720 (162) | 810 (182) | 920 (200) | 1070 (240) | |
| | | | **36** | 730 (164) | 810 (182) | 910 (200) | 1040 (230) | 1210 (270) | |
| | | | **50** | 820 (184) | 910 (200) | 1020 (220) | 1160 (260) | 1350 (300) | |
| **HPG** Geared Type | 40 [1.57] | **AZM46** | **5** | 150 (33) | 170 (38) | 190 (42) | 230 (51) | 270 (60) | 430 (96) |
| | | | **9** | 180 (40) | 200 (45) | 230 (51) | 270 (60) | 320 (72) | 510 (114) |
| | 60 [2.36] | **AZM66** | **5** | 250 (56) | 270 (60) | 300 (67) | 330 (74) | 360 (81) | 700 (157) |
| | | | **15** | 360 (81) | 380 (85) | 420 (94) | 460 (103) | 510 (114) | 980 (220) |
| | 90 [3.54] | **AZM98** | **5** | 600 (135) | 630 (141) | 670 (150) | 710 (159) | 750 (168) | 1460 (320) |
| | | | **15** | 830 (186) | 880 (198) | 930 (200) | 980 (220) | 1050 (230) | 2030 (450) |
| Harmonic Geared Type | 42 [1.65] | **AZM46** | **50**, **100** | 180 (40) | 220 (49) | 270 (60) | 360 (81) | 510 (114) | 220 (49) |
| | 60 [2.36] | **AZM66** | | 320 (72) | 370 (83) | 440 (99) | 550 (123) | 720 (162) | 450 (101) |
| | 90 [3.54] | **AZM98** | | 1090 (240) | 1150 (250) | 1230 (270) | 1310 (290) | 1410 (310) | 1300 (290) |

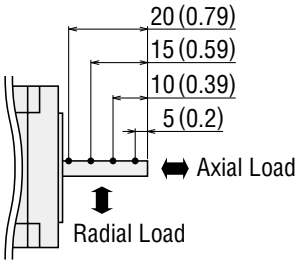
- **PS** geared types and **HPG** geared types have a full lifespan of 20,000 hours when either the permissible radial load or the permissible axial load is applied. For the life of gearhead, please contact the nearest Oriental Motor sales office, or visit the Oriental Motor website.

Note

- With a double shaft product, the output shaft located on the opposite side of the motor output shaft is used to install a slit disk or similar device. Do not apply load torque, radial load, and axial load.

## Radial Load and Axial Load

Distance from Shaft End [mm (in.)]



## Rotation Direction

This indicates the rotation direction as viewed from the output shaft side of the motor (factory setting).
The rotation direction of the output gear shaft relative to the standard type motor output shaft varies depending on the gear type and gear ratio.
Please check the following table.

| Type | Gear Ratio | Rotation direction Relative to Motor Output Shaft |
|---|---|---|
| **TS** Geared | **3.6**, **7.2**, **10** | Same direction |
| | **20**, **30** | Opposite direction |
| **PS** Geared<br>**HPG** Geared | All gear ratios | Same direction |
| Harmonic Geared | All gear ratios | Opposite direction |

### Standard Type Motor