

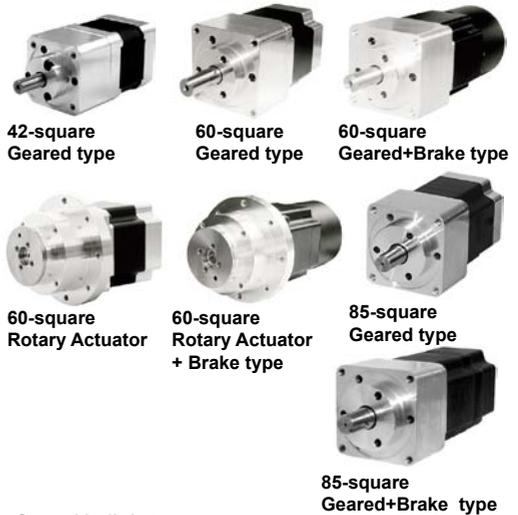
AK-G/AK-GB/AK-R/AK-RB Series

- 42mm/□60mm/□85mm Geared type/Geared+Brake built-in type
- 60mm Rotary actuator type/ Rotary actuator+Brake built-in type

■ Features

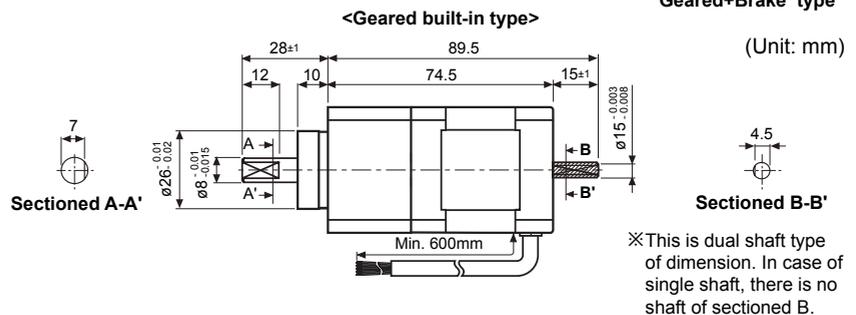
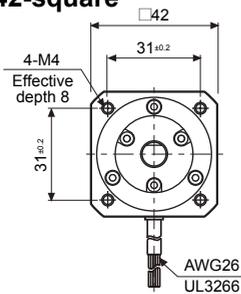
- Compact design and light weight with high accuracy, speed and torque
- Cost-effective
- Backlash
 - : □42mm - $\pm 35'$ (0.58°), □60mm - $\pm 20'$ (0.33°), □85mm - $\pm 15'$ (0.25°)
- Brake force is released when applying power on brake wire. (24VDC non-polar type)
- Basic step angle
 - : 1:5 - 0.144°, 1:7.2 - 0.1°, 1:10 - 0.072
- Allowable speed
 - : 1:5 - 0 to 360rpm, 1:7.2 - 0 to 250rpm, 1:10 - 0 to 180rpm

⚠ Please read "Caution for your safety" in operation manual before using.



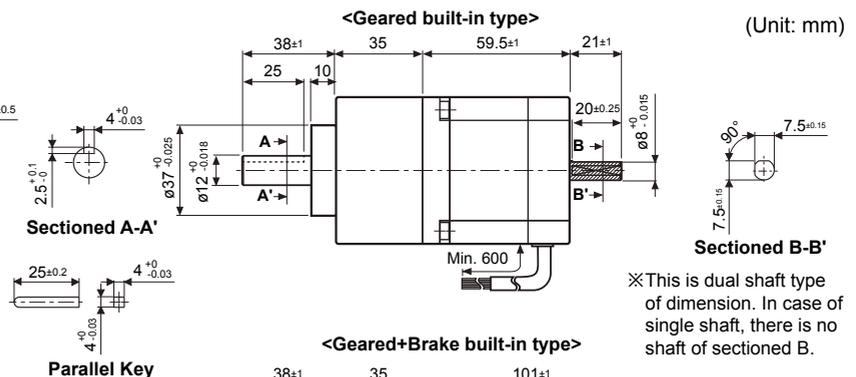
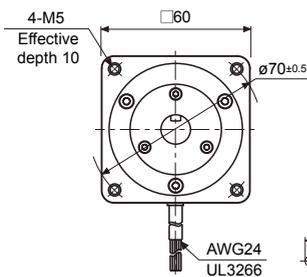
■ Dimensions

◎ 42-square



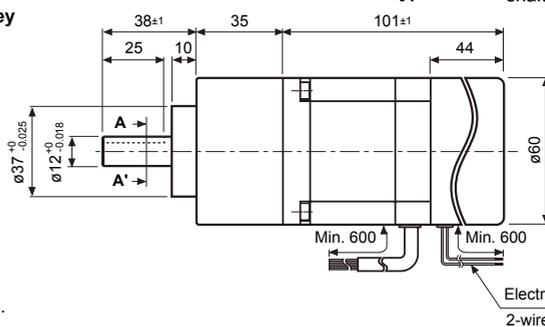
※For flexible coupling(ERB Series) information, refer to F-71 page.

◎ 60-square



Parallel Key

<Geared+Brake built-in type>



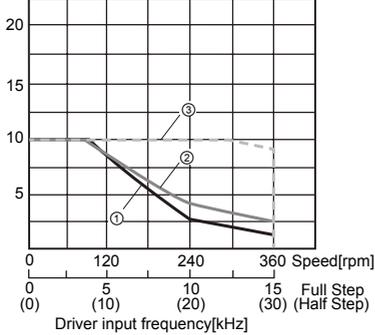
- ※ Brake is non-polar "B" type. Be sure to observe rated excitation voltage (24VDC).
- ※ SW1 ON-Brake Release / SW1 OFF-Brake Execute

AK-G/AK-GB/AK-R/AK-RB Series

Characteristic

● A10K-S545(W)-G5

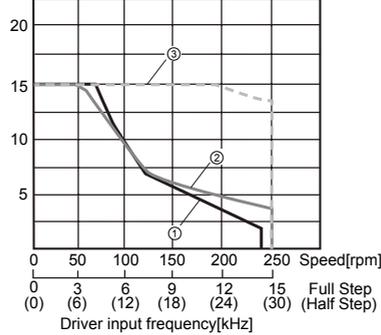
Torque (kgf·cm) ※fs : Max. starting torque



- ① Driver MDS-ND14, Power 24VDC, Setting current 1.4A/Phase
- ② Driver MDS-HD14, Power 24VDC, Setting current 1.4A/Phase
- ③ Driver MDS-HF14, Power 220VAC, Setting current 1.4A/Phase
- ① fs: 3.1kpps
- ② fs: 3.2kpps
- ③ fs: 3.2kpps

● A15K-S545(W)-G7.2

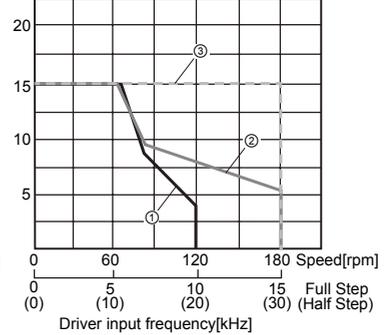
Torque (kgf·cm) ※fs : Max. starting torque



- ① Driver MDS-ND14, Power 24VDC, Setting current 1.4A/Phase
- ② Driver MDS-HD14, Power 24VDC, Setting current 1.4A/Phase
- ③ Driver MDS-HF14, Power 220VAC, Setting current 1.4A/Phase
- ① fs: 3.2kpps
- ② fs: 3.3kpps
- ③ fs: 3.4kpps

● A15K-S545(W)-G10

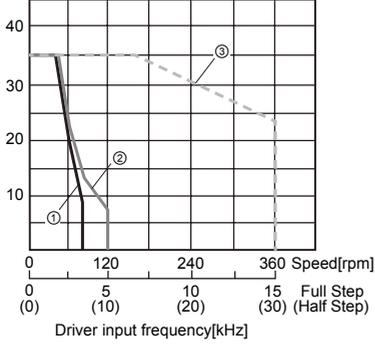
Torque (kgf·cm) ※fs : Max. starting torque



- ① Driver MDS-ND14, Power 24VDC, Setting current 1.4A/Phase
- ② Driver MDS-HD14, Power 24VDC, Setting current 1.4A/Phase
- ③ Driver MDS-HF14, Power 220VAC, Setting current 1.4A/Phase
- ① fs: 3.3kpps
- ② fs: 3.3kpps
- ③ fs: 3.4kpps

● A35K-M566(W)-□5 A35K-M566-□B5

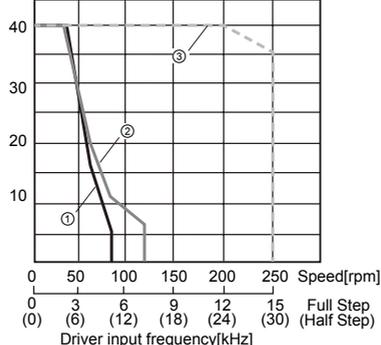
Torque (kgf·cm) ※fs : Max. starting torque



- ① Driver MDS-ND14, Power 24VDC, Setting current 1.4A/Phase
- ② Driver MDS-HD14, Power 24VDC, Setting current 1.4A/Phase
- ③ Driver MDS-HF14, Power 220VAC, Setting current 1.4A/Phase
- ① fs: 2.3kpps
- ② fs: 2.3kpps
- ③ fs: 2.6kpps

● A40K-M566(W)-□7.2 A40K-M566-□B7.2

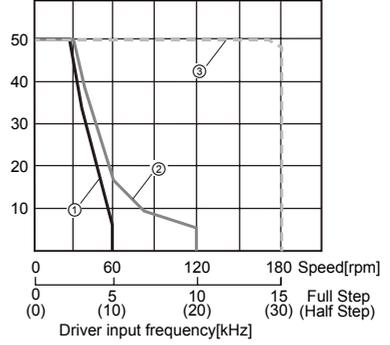
Torque (kgf·cm) ※fs : Max. starting torque



- ① Driver MDS-ND14, Power 24VDC, Setting current 1.4A/Phase
- ② Driver MDS-HD14, Power 24VDC, Setting current 1.4A/Phase
- ③ Driver MDS-HF14, Power 220VAC, Setting current 1.4A/Phase
- ① fs: 2.2kpps
- ② fs: 2.3kpps
- ③ fs: 2.6kpps

● A50K-M566(W)-□10 A50K-M566-□B10

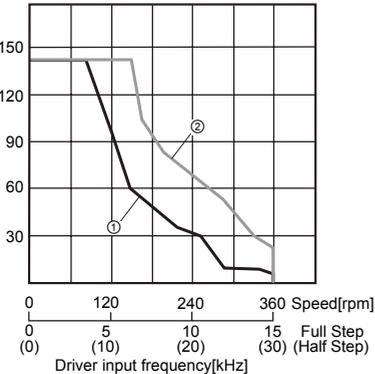
Torque (kgf·cm) ※fs : Max. starting torque



- ① Driver MDS-ND14, Power 24VDC, Setting current 1.4A/Phase
- ② Driver MDS-HD14, Power 24VDC, Setting current 1.4A/Phase
- ③ Driver MDS-HF14, Power 220VAC, Setting current 1.4A/Phase
- ① fs: 2.3kpps
- ② fs: 2.3kpps
- ③ fs: 2.6kpps

● A140K-□599(W)-G5 A140K-□599-GB5

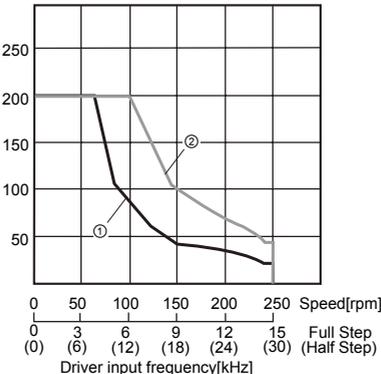
Torque (kgf·cm) ※fs : Max. starting torque



- ① Driver MDS-HF14, Power 220VAC, Setting current 1.4A/Phase
- ② Driver MDS-HF28, Power 220VAC, Setting current 2.8A/Phase
- ① fs: 1.8kpps
- ② fs: 2.1kpps

● A200K-□599(W)-G7.2 A200K-□599-GB7.2

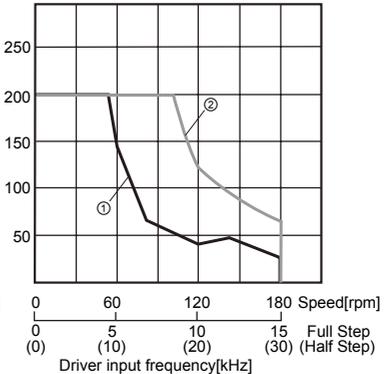
Torque (kgf·cm) ※fs : Max. starting torque



- ① Driver MDS-HF14, Power 220VAC, Setting current 1.4A/Phase
- ② Driver MDS-HF28, Power 220VAC, Setting current 2.8A/Phase
- ① fs: 1.8kpps
- ② fs: 2.1kpps

● A200K-□599(W)-G10 A200K-□599-GB10

Torque (kgf·cm) ※fs : Max. starting torque



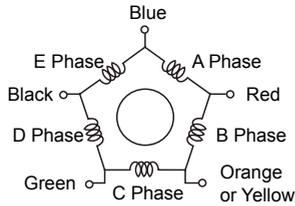
- ① Driver MDS-HF14, Power 220VAC, Setting current 1.4A/Phase
- ② Driver MDS-HF28, Power 220VAC, Setting current 2.8A/Phase
- ① fs: 1.9kpps
- ② fs: 2.1kpps

5-Phase Stepper motor

■ Connection diagram of 5-phase stepper motor

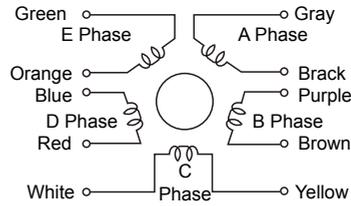
Refer to below for correlations of motor's each phase(coil) and the color of lead wire.
Note that pentagon connection type is a standard model. (Standard connection type is an option model.)

● Pentagon wiring(Standard)



In case of connecting standard connection type models to motor drivers, make sure that motor's lead wire connection must be made as specified in the table.

● Standard wiring(Optional)



Lead wire color for standard connection type	Lead wire color for pentagonconnection type
Gray+Red	Blue
Yellow+Black	Red
Orange+White	Orange
Brown+Green	Green
Blue+Purple	Black

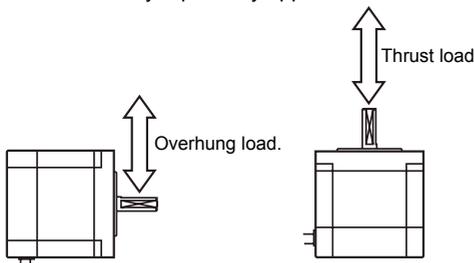
■ Motor Installation

◎ Shaft type stepper motor

● Mounting direction

Motors can be mounted in any directions - facing up, facing down and sideways. No matter which direction motors to be mounted, be sure not to apply overhung or thrust load on the shaft.

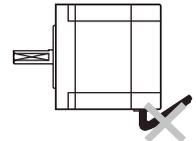
- 1) Overhung load : A type of load to be applied in vertical directions on the shaft having effect on output shaft and bearings to shorten its life cycle. In case excessive overhung load is applied on the shaft, it may cause bearing damage, output shaft bending or fatigue failure caused by repeatedly applied excessive load.
- 2) Thrust load : A type of load to be applied in parallel directions on the shaft having direct effect on output shaft and bearings to shorten its life cycle. In case excessive thrust load is applied on the shaft, it may cause bearing damage, output shaft bending or fatigue failure caused by repeatedly applied excessive load.



Refer to the table below for allowable shaft overhung load / thrust load.

Motor type	Allowable overhung load per certain distance(mm) from the end of shaft					Allowable thrust load
	0	5	10	15	20	
20-square	20[N] 2[kgf]	25[N] 2.5[kgf]	34[N] 3.4[kgf]	—	—	Under the load of Motor
42-square	20[N] 2[kgf]	25[N] 2.5[kgf]	34[N] 3.4[kgf]	52[N] 5.2[kgf]	—	
60-square	63[N] 6.3[kgf]	75[N] 7.5[kgf]	95[N] 9.5[kgf]	130[N] 13[kgf]	190[N] 19[kgf]	
85-square	260[N] 26[kgf]	290[N] 29[kgf]	340[N] 34[kgf]	390[N] 39[kgf]	480[N] 48[kgf]	

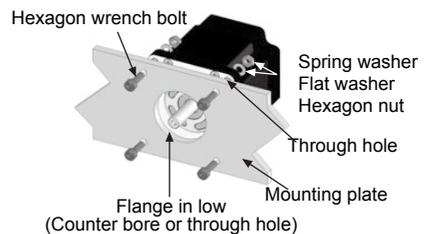
Do not apply excessive force on motor cable when installing motors.
It may cause disconnection of motor cable.



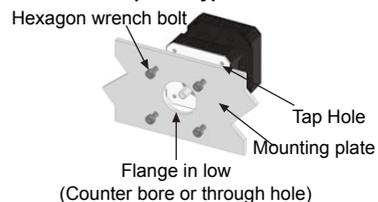
● Mounting method

With considering heat radiation and vibration isolation, mount the motor as tight as possible against a metal panel having high thermal conductivity such as iron or aluminum. When mounting motors, use hexagon wrench bolts, spring washers or flat washers. Refer to the table below for allowable thickness of mounting plate and bolt size.

< Through hole type motor >



< Tap hole type motor >



Motor size	Thickness of mounting plate	Using bolt
24-square	Min. 3mm	M2.6
42-square	Min. 4mm	M3
60-square	Min. 5mm	M4
85-square	Min. 8mm	M6

(A)	Photo electric sensor
(B)	Fiber optic sensor
(C)	Door/Area sensor
(D)	Proximity sensor
(E)	Pressure sensor
(F)	Rotary encoder
(G)	Connector/Socket
(H)	Temp. controller
(I)	SSR/ Power controller
(J)	Counter
(K)	Timer
(L)	Panel meter
(M)	Tacho/ Speed/ Pulse meter
(N)	Display unit
(O)	Sensor controller
(P)	Switching mode power supply
(Q)	Stepper motor & Driver & Controller
(R)	Graphic/ Logic panel
(S)	Field network device
(T)	Software
(U)	Other

AK-G/AK-GB/AK-R/AK-RB Series

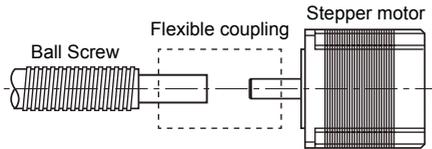
● Connection with load

In case of using motors with connecting a load-Ball screw or TM-screw - to motor's shaft, make sure to use flexible couplings as shown in the figure below.

If the center of the load is not matched to that of shaft, it may cause severe vibration, shaft damage or shortened life cycle of bearings.

Do not disassemble or modify motor shaft in order to connect a load. Contact us if it is required.

In case of making connection with a pulley or a belt, be sure to observe allowable Thrust load and Radial load. Make sure no severe vibration applied on shaft.

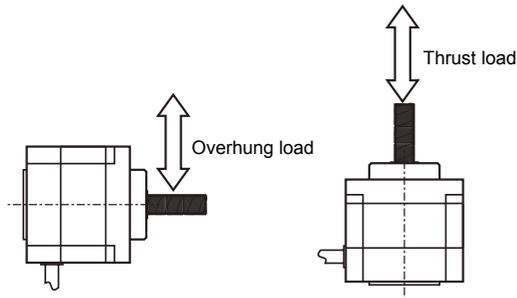


◎ Hole type stepper motor

● Mounting direction

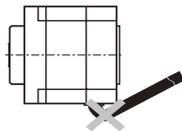
Motors can be mounted in any directions - facing up, facing down and sideways. No matter which direction motors to be mounted, be sure not to apply overhung or thrust load on the shaft.

- 1) Overhung load: A type of load to be applied in vertical directions on the shaft having effect on output shaft and bearings to shorten its life cycle. In case excessive overhung load is applied on the shaft, it may cause bearing damage, output shaft bending or fatigue failure caused by repeatedly applied excessive load.
- 2) Thrust load: A type of load to be applied in parallel directions on the shaft having direct effect on output shaft and bearings to shorten its life cycle. In case excessive thrust load is applied on the shaft, it may cause bearing damage, output shaft bending or fatigue failure caused by repeatedly applied excessive load.



Do not apply excessive force on motor cable when installing motors.

It may cause disconnection of motor cable.

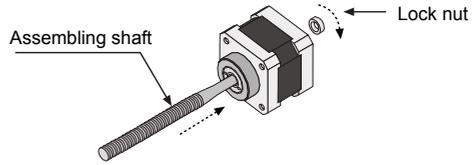


● Shaft assembly for hollow shaft motor

Make sure that external shaft assembly into motors must be made as sturdy as possible. If not, motor's torque might not be thoroughly transmitted to the shaft. In case no additional shaft assembly changes would be made, it is recommended to apply adhesives on bolt fixing part.

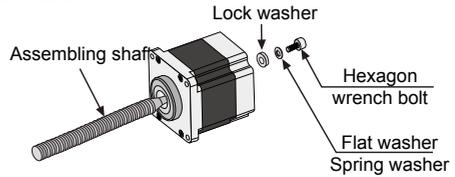
1. TAP hole type motor

Use pliers to fasten Lock Nut tightly as shown in the figure below.



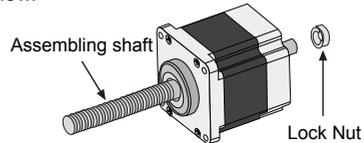
2. Through hole type motor with single shaft

Use hexagon wrench bolts, spring washers, flat washers and Lock washers to fasten the shaft tightly as shown in the figure below.



3. Through hole type motor with dual shaft

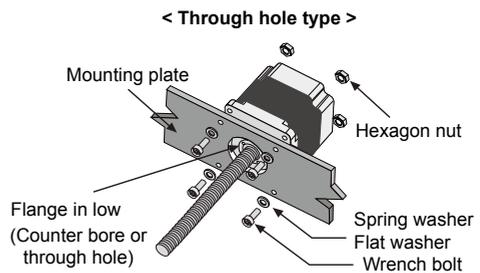
Use a Lock nut to fasten the shaft tightly as shown in the figure below.



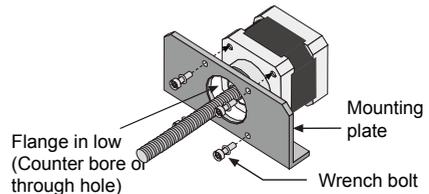
● Mounting method

With considering heat radiation and vibration isolation, mount the motor as tight as possible against a metal panel having high thermal conductivity such as iron or aluminum. When mounting motors, use hexagon wrench bolts, spring washers or flat washers.

Refer to the table below for allowable thickness of mounting plate and bolt size.



< TAP hole type >



Model	Thickness of mounting plate	Using bolt
AH□K-□54□Series	Min. 4mm	M3
AH□K-□56□Series	Min. 5mm	M4
AH□K-□59□Series	Min. 8mm	M6

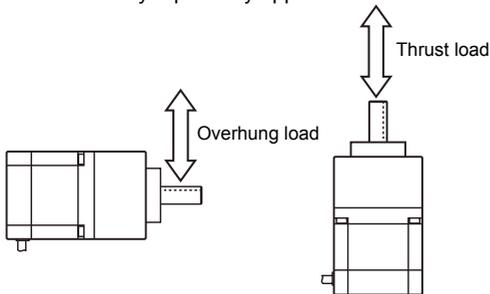
5-Phase Stepper motor

◎ Geared type stepper motor

● Mounting direction

Motors can be mounted in any directions - facing up, facing down and sideways. No matter which direction motors to be mounted, be sure not to apply overhung or thrust load on the shaft.

- 1) Overhung load : A type of load to be applied in vertical directions on the shaft having effect on output shaft and bearings to shorten its life cycle. In case excessive overhung load is applied on the shaft, it may cause bearing damage, output shaft bending or fatigue failure caused by repeatedly applied excessive load.
- 2) Thrust load : A type of load to be applied in parallel directions on the shaft having direct effect on output shaft and bearings to shorten its life cycle. In case excessive thrust load is applied on the shaft, it may cause bearing damage, output shaft bending or fatigue failure caused by repeatedly applied excessive load.

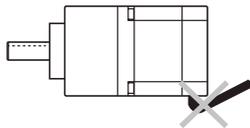


Refer to the table below for allowable shaft overhung load / thrust load.

Motor type	Allowable overhung load per certain distance(mm) from the end of shaft					Allowable thrust load
	0	5	10	15	20	
42 Square	73[N] 7.3[kg]	84[N] 8.4[kg]	100[N] 10[kg]	123[N] 12.3[kg]	—	50[N] 5[kg]
60 Square	250[N] 25[kg]	270[N] 27[kg]	300[N] 30[kg]	340[N] 34[kg]	390[N] 39[kg]	100[N] 10[kg]
85 Square	480[N] 48[kg]	540[N] 54[kg]	600[N] 60[kg]	680[N] 68[kg]	790[N] 79[kg]	300[N] 30[kg]

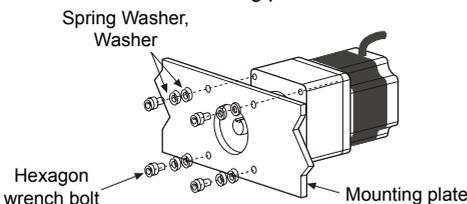
Do not apply excessive force on motor cable when installing motors.

It may cause disconnection of motor cable.



● Mounting method

With considering heat radiation and vibration isolation, mount the motor as tight as possible against a metal panel having high thermal conductivity such as iron or aluminum. When mounting motors, use hexagon wrench bolts, spring washers or flat washers. Refer to the table below for allowable thickness of mounting plate and bolt size.



Motor type	Thickness of mounting plate	Using bolt
42-square	Min. 5mm	M4
60-square	Min. 8mm	M5
85-square	Min. 12mm	M8

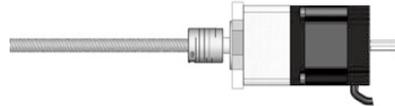
● Connection with load

In case of using motors with connecting a load-Ball screw or TM-screw - to motor's shaft, make sure to use flexible couplings as shown in the figure below.

If the center of the load is not matched to that of shaft, it may cause severe vibration, shaft damage or shortened life cycle of bearings.

Do not disassemble or modify motor shaft in order to connect a load. Contact us if it is required.

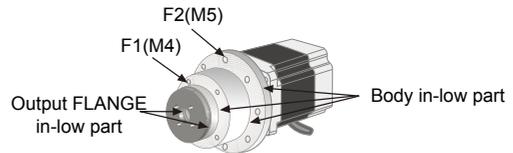
In case of making connection with a pulley or a belt, be sure to observe allowable Thrust load and Radial load. Make sure no severe vibration applied on shaft.



◎ Rotary actuator type stepper motor

● Installation of motor

- ① With considering heat radiation and vibration isolation, make sure the motor's in-low to be kept as close as possible against a metal panel having high thermal conductivity such as iron or aluminum. Make sure to use mounting plates with thickness more than 8mm.
- ② As shown in the figure below, total 4 mounting Tap holes on F1 and F2 are used to fix rotary actuator. In case of using M4, screw connecting torque is 2[N.m] and 4.4[N.m] when using M5.



- ③ Do not apply excessive force on motor cable when installing rotary actuators. Do not forcibly pull or insert the cable. It may cause poor connection or disconnection of the cable. In case of frequent cable movement required application, proper safety countermeasures must be ensured.

● Accessory mounting (Table or Arm)

- ① Mount the accessory (table or arm) on output axis flange using M4 screw. Note that $\phi 13$ in-low part is processed with c0.3. It is necessary to process the accessory under c0.2 to mount. Place a positioning pin on flange's positioning hole and push it in. Make sure not to place the pin on output flange.
- ② Do not use a hammer to mount the accessory (table or arm). It may cause product damage. Mount the accessory with hands in a gentle manner.
- ③ Make sure that accessory mounted on output axis to be fixed as tight as possible. It may cause an accident if an actuator is detached from the motor while driving.

● Proper use of product

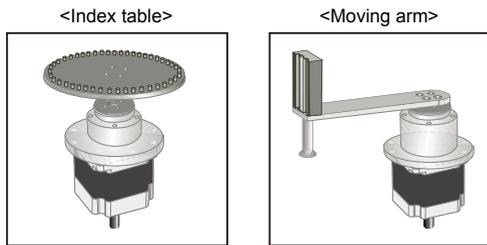
Observe the rated product specification.

- ① Do not apply rotational load on the motor while it stops.
- ② Do not apply excessive load on the motor while driving. It may cause motors to miss a step.
- ③ Use a sensor for home searching or division completed position detecting.

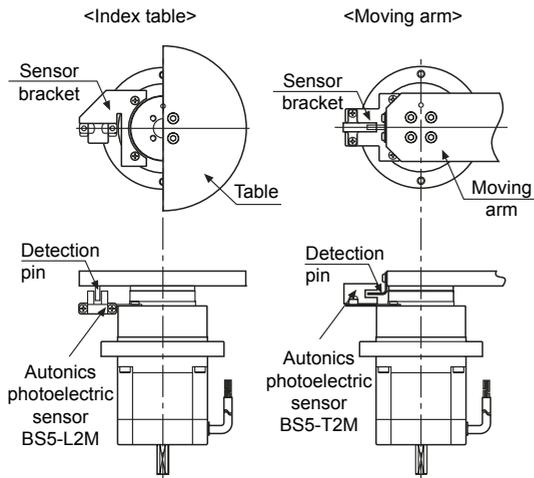
(A)	Photo electric sensor
(B)	Fiber optic sensor
(C)	Door/Area sensor
(D)	Proximity sensor
(E)	Pressure sensor
(F)	Rotary encoder
(G)	Connector/Socket
(H)	Temp. controller
(I)	SSR/ Power controller
(J)	Counter
(K)	Timer
(L)	Panel meter
(M)	Tacho/ Speed/ Pulse meter
(N)	Display unit
(O)	Sensor controller
(P)	Switching mode power supply
(Q)	Stepper motor& Driver&Controller
(R)	Graphic/ Logic panel
(S)	Field network device
(T)	Software
(U)	Other

AK-G/AK-GB/AK-R/AK-RB Series

● Application example



● Sensor Installation examples



※ Install an additional sensor to detect home position and to ensure motor's positioning, number of rotation and its speed.

■ Caution for using

● Installation condition

: Install the motor in a place that meets certain conditions specified below. It may cause product damage if instructions are not following.

- It shall be used indoors.
(This product is designed / manufactured to be installed on machinery as a part.)
- Within -10 to 50°C (at non-freezing status) of ambient temperature
- Within 35 to 85%RH (at non-dew status) of ambient humidity
- The place without explosive, flammable and corrosive gas
- The place without direct ray of light
- The place without dust, dregs etc.
- The place without water, oil etc.
- The place where easy heat dissipation could be made
- The place where no continuous vibration or severe shock
- The place with less salt content
- The place with less electronic noise occurred by welding machine, motor etc.

● Do not disassemble or modify the product.

It may cause a malfunction due to small dregs. Once disassembling the motor, its performance would significantly decline.

● Do not impact the motor.

The air-gap, the distance between rotator and stator is processed as 0.05mm, but if it is impacted, the balance of air-gap can be broken and it may cause a malfunction.

● Use the motor within the rated torque range.

The rated torque range indicates the maximum value of mechanical strength of gear part and the total of ac/ deceleration torque of start/stop and friction torque shall not be exceed the rated torque range, or, it may cause the breakdown of gear.

● Use the motor within the rated speed range.

The rated speed range includes the revolution number of gear and pulse speed of motor. Use the motor within the rated speed range, or, it may shorten the life cycle of gear part. (Backlash is increased.)

● Be careful of backlash when positioning the motors in both CW/CCW directions.

Backlash refers to the displacement occurred on motor's output shaft while gear's input axis is fixed. Geared type stepper motors are to realize high accuracy and low backlash. When positioning the motors in both CW/ CCW directions, however, backlash may possibly occur. Therefore, make sure that motor positioning will be made in one single direction in case of geared type motors.

● Temperature rise

The surface temperature of motor shall be under 100°C and it can be significantly increased in case of running motor by constant current drive. In this case, use the fan to lower the temperature forcedly.

● Using at low temperature.

Using motors at low temperature may cause reducing maximum starting / driving characteristics of the motor as ball bearing's grease consistency decreases due to low temperature. (Note that the lower the bearing's grease consistency, the higher the bearing's friction torques.) Start the motor in a steady manner since motor's torque is not to be influenced.

● Clack sound when using electromagnetic brake

In case of brake built-in type motors, there occurs certain sound while turning on/off the power to the motor. This is not a product failure symptom. Do not strike or disassemble the product for this.

● Using electromagnetic brake

Release brake force first by supplying the power to brake before starting the motor. If not, it may cause product malfunction and shortened life cycle of brake due to brake pad wear-out.