


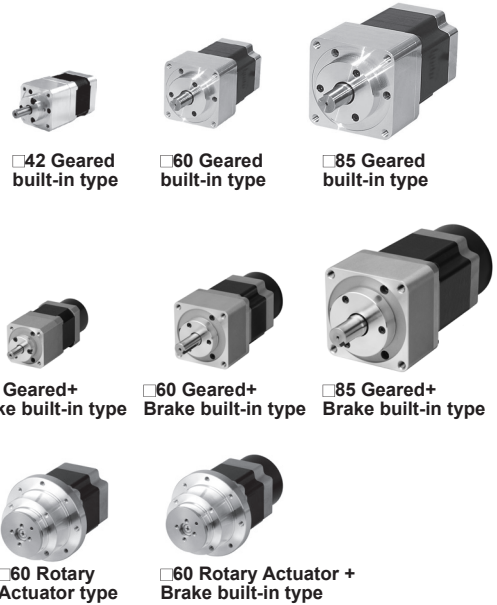
AK-G/AK-GB/AK-R/AK-RB Series 5-Phase Stepper Motor

- 42mm / 60mm / 85mm Geared Built-In 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 24VDC on brake wire
- Basic step angle
 - 1:5 \rightarrow 0.144° , 1:7.2 \rightarrow 0.1° , 1:10 \rightarrow 0.072°
- Allowable speed
 - 1:5 \rightarrow 0 to 360rpm, 1:7.2 \rightarrow 0 to 250rpm, 1:10 \rightarrow 0 to 180rpm

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

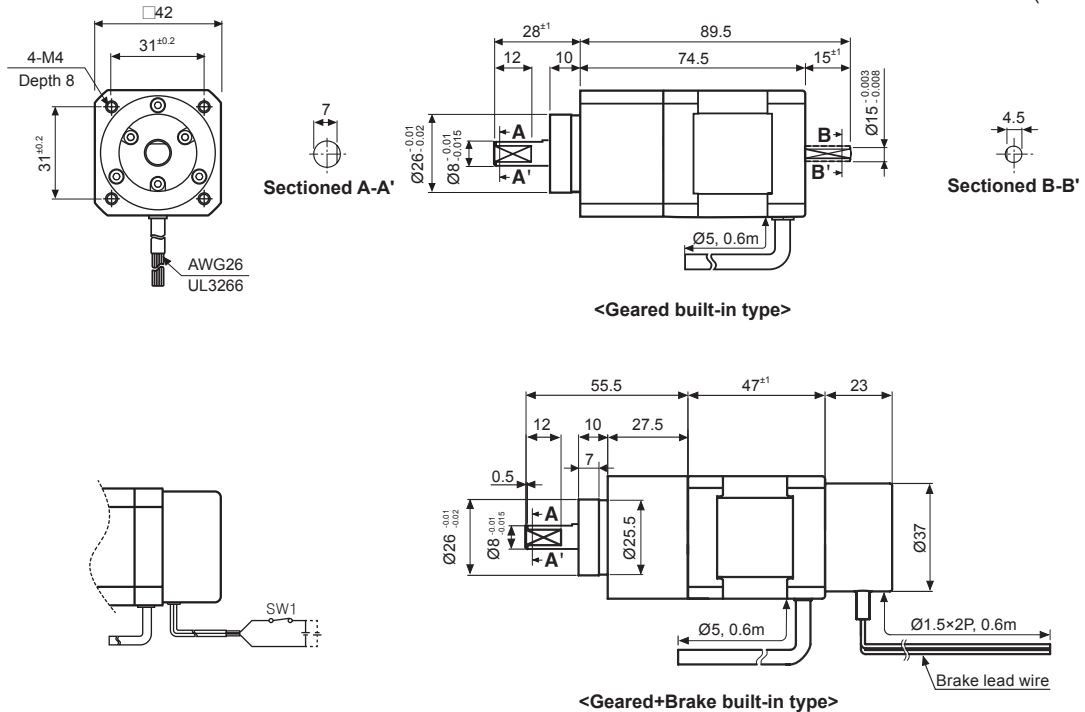


■ Dimensions

- ※ These dimensions are for dual shaft models. Single shaft models do not include shafts indicated in the dotted lines.
- ※ For flexible coupling (ERB Series) information, refer to the catalogue. (60, 80: Geared built-in type, Geared+Brake built-in type)
- ※ Brake is non-polar and be sure to observe rated excitation voltage (24VDC).
- ※ SW1 ON : Brake Release / SW1 OFF : Brake Execute

◎ 42

(unit: mm)



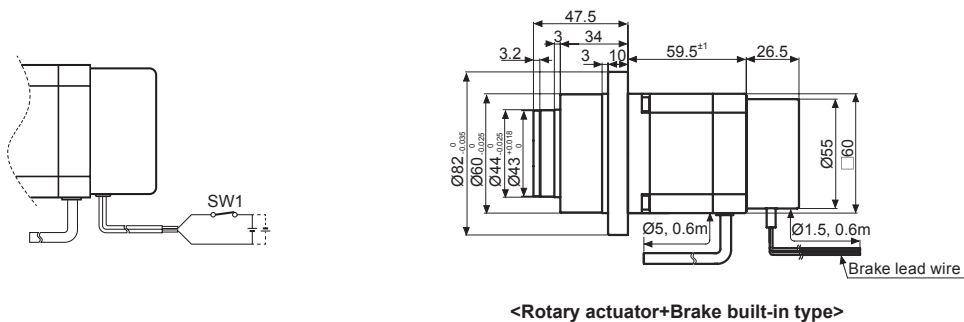
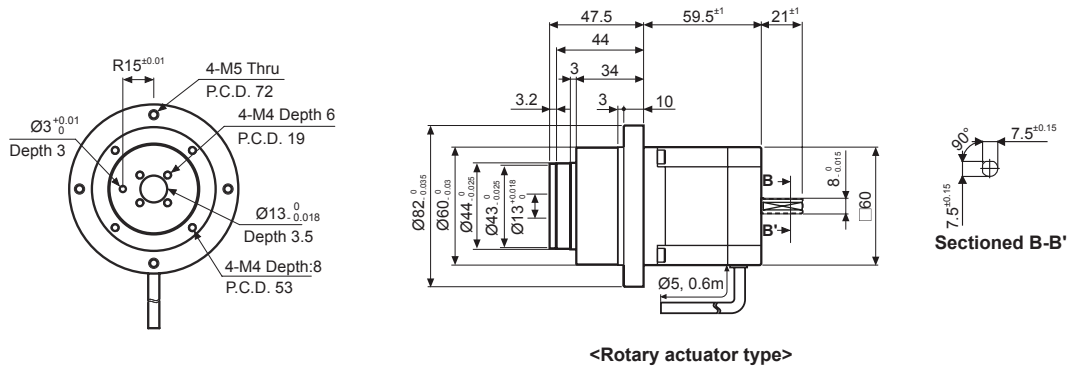
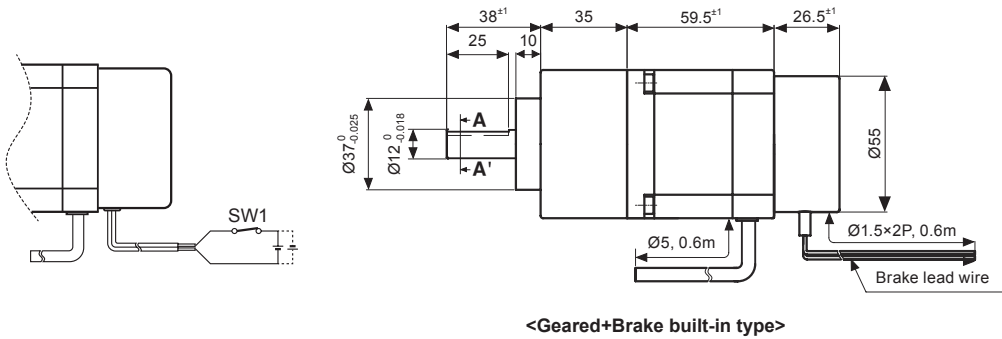
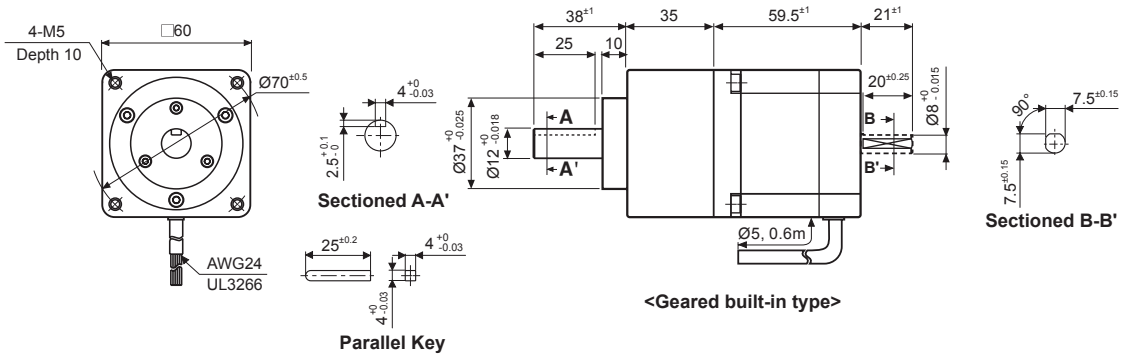
(A) Photoelectric Sensors
(B) Fiber Optic Sensors
(C) Door/Area Sensors
(D) Proximity Sensors
(E) Pressure Sensors
(F) Rotary Encoders
(G) Connectors / Sockets
(H) Temperature Controllers
(I) SSRs / Power Controllers
(J) Counters
(K) Timers
(L) Panel Meters
(M) Tacho / Speed / Pulse Meters
(N) Display Units
(O) Sensor Controllers
(P) Switching Mode Power Supplies
(Q) Stepper Motors & Drivers & Controllers
(R) Graphic / Logic Panels
(S) Field Network Devices
(T) Software

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

■ Dimensions

◎ □ 60

(unit: mm)

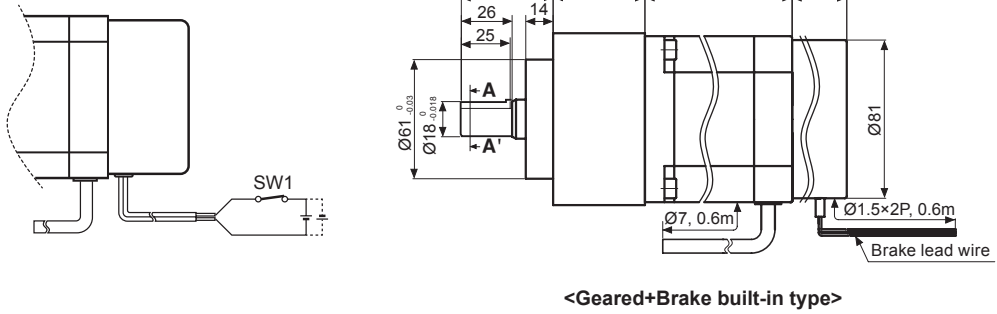
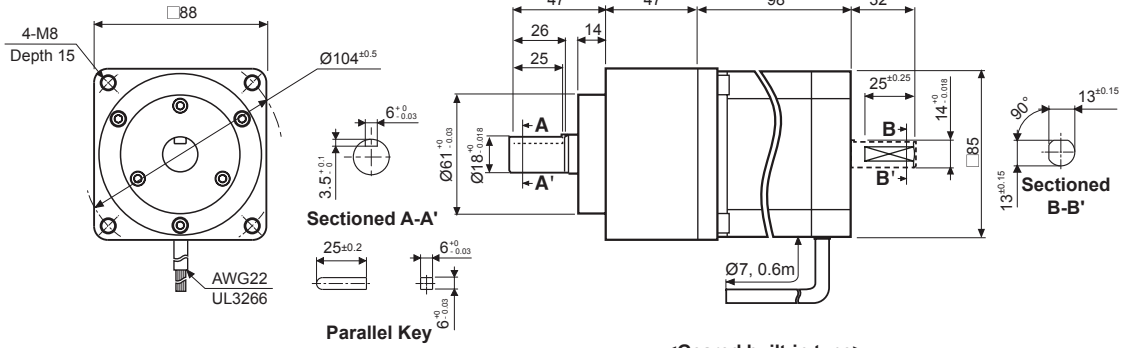


5-Phase Stepper Motor

■ Dimensions

◎ □85

(unit: mm)



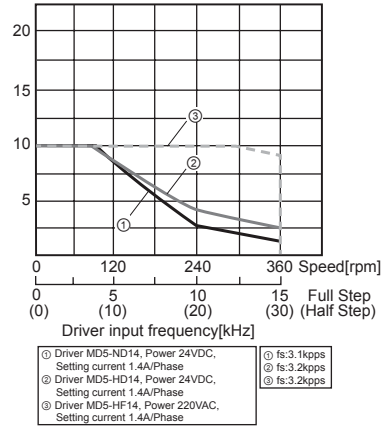
(A)	Photoelectric Sensors
(B)	Fiber Optic Sensors
(C)	Door/Area Sensors
(D)	Proximity Sensors
(E)	Pressure Sensors
(F)	Rotary Encoders
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AK-G/AK-GB/AK-R/AK-RB Series

Characteristic

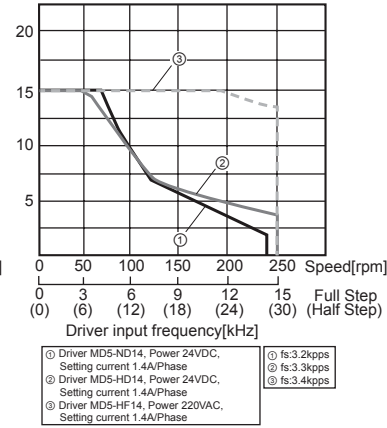
● A10K-S545 (W)-G5 A10K-S545-GB5

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



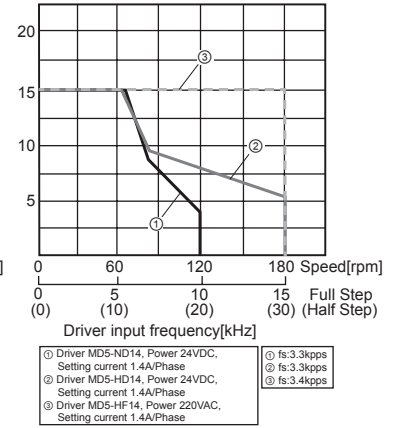
● A15K-S545 (W)-G7.2 A15K-S545-GB7.2

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



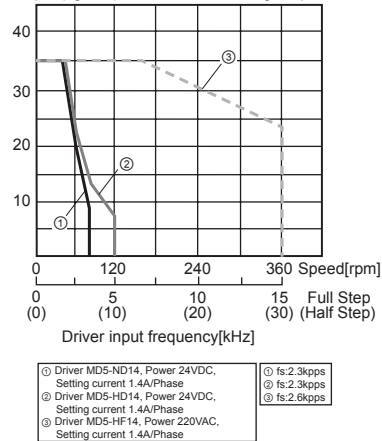
● A15K-S545 (W)-G10 A15K-S545-GB10

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



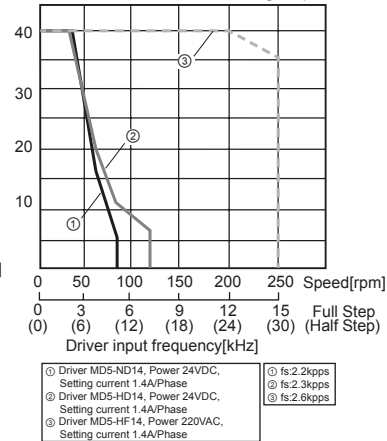
● A35K-M566 (W)-□5 A35K-M566-□B5

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



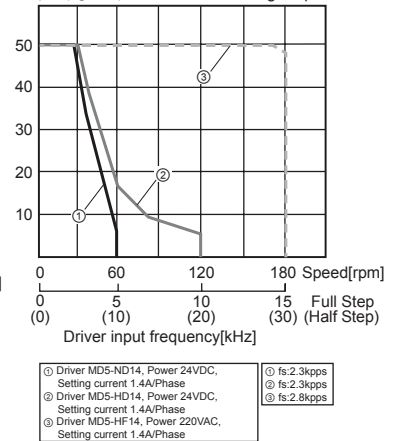
● A40K-M566 (W)-□7.2 A40K-M566-□B7.2

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



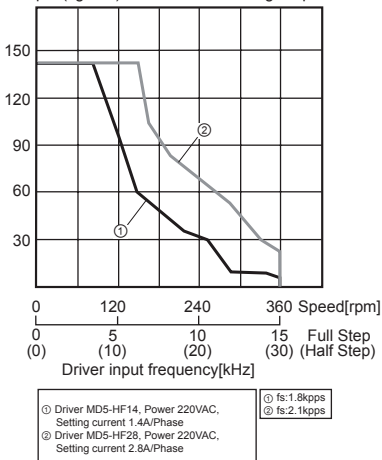
● A50K-M566 (W)-□10 A50K-M566-□B10

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



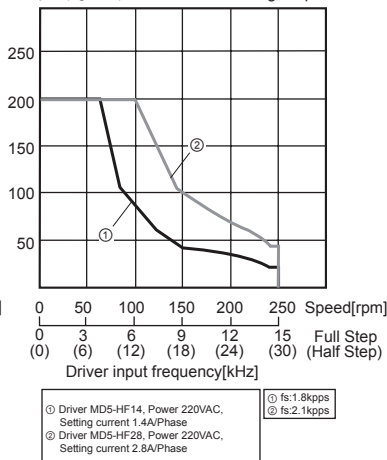
● A140K-□599 (W)-G5 A140K-□599-GB5

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



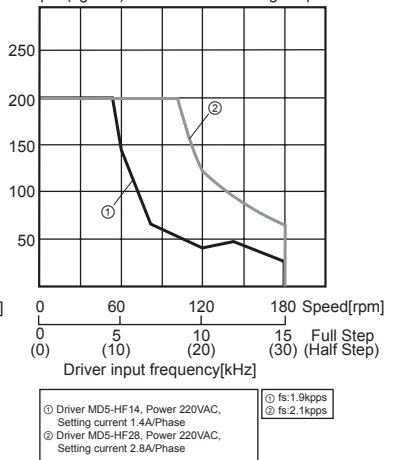
● A200K-□599 (W)-G7.2 A200K-□599-GB7.2

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



● A200K-□599 (W)-G10 A200K-□599-GB10

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



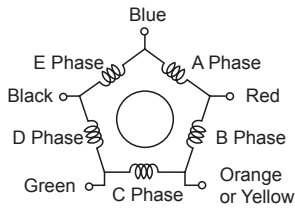
5-Phase Stepper Motor

■ Connection Diagram

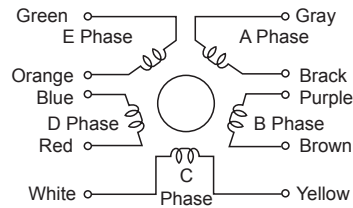
Refer to the below for correlations of motor's each phase(coil) and the color of lead wire.

Note that Pentagon connection type is a standard model.(Standard connection type is an option model.)

● Pentagon wiring (Standard)



● Standard wiring (Option)



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.

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

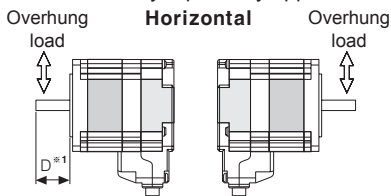
■ Motor Installation

◎ Shaft type stepper motor

● Motor installation direction

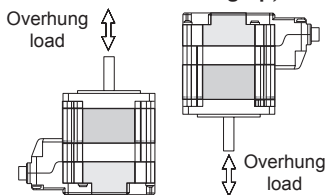
The motor can be installed in any direction horizontally, or vertically. Please take careful consideration of shaft overhung load and thrust load under all conditions. Please refer to the table below for permissible overhung load and thrust load of the shaft.

- 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.



※ 1: The distance from the shaft in front (mm)

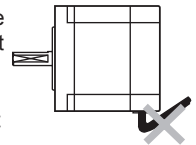
Vertical facing up, down



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

Motor size	Permissible overhung load [kgf(N)] by distance from shaft tip (mm)					Permissible thrust load
	0	5	10	15	20	
□24	2(20)	2.5(25)	3.4(33)	-	-	Under the load of motor
□42	2(20)	2.5(25)	3.4(33)	5.2(51)	-	
□60	6.3(62)	7.5(74)	9.5(93)	13(127)	19(186)	
□85	26(255)	29(284)	34(333)	39(382)	48(470)	

When installing the motor, make sure that excessive force is not applied to the motor cable. Also, the motor cable must not be pulled or inserted too tightly. If the motor is operated with excessive force applied on the cable, it may result in failed contact or disconnection. Please take safety measures when excessive force or continuous operation is required.

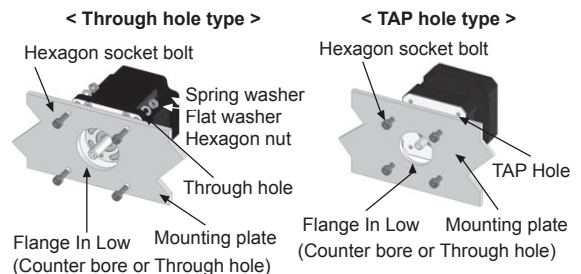


● Motor installation method

When installing the motor, carefully consider heat radiation and vibration resistance. Mount the unit tightly on the surface of a metal with high thermal conductivity. (steel, aluminum, etc.)

Use hexagon bolts, spring washers and flat washers when installing the motor.

Please refer to the table below for mounting plate size and bolt types.



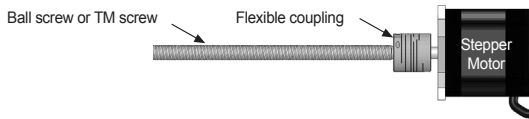
Motor size	Mounting plate size (depth)	Bolt type
□24	Min. 3mm	M2.6
□42	Min. 4mm	M3
□60	Min. 5mm	M4
□85	Min. 8mm	M6

- (A) Photoelectric Sensors
- (B) Fiber Optic Sensors
- (C) Door/Area Sensors
- (D) Proximity Sensors
- (E) Pressure Sensors
- (F) Rotary Encoders
- (G) Connectors/ Sockets
- (H) Temperature Controllers
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- (J) Counters
- (K) Timers
- (L) Panel Meters
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- (N) Display Units
- (O) Sensor Controllers
- (P) Switching Mode Power Supplies
- (Q) Stepper Motors & Drivers & Controllers
- (R) Graphic/ Logic Panels
- (S) Field Network Devices
- (T) Software

5-Phase Stepper Motor

● Load connection

Use a flexible coupling when attaching a load (ball-screw, TM-screw, etc.) directly on the shaft of the motor. If the center does not match the load, vibration, degradation of the bearing, motor shaft damage, or other problems may occur. When attaching the load, do not modify or disassemble the motor or the shaft. When attaching the load of pulleys or belt please consider the thrust load, radial load, and shock.

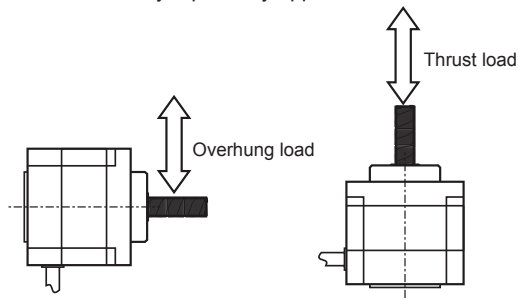


◎ Hole type stepper motor

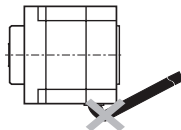
● Motor installation direction

The motor can be installed in any direction horizontally, or vertically. Please take careful consideration of shaft overhung load and thrust load under all conditions. Please refer to the table below for permissible overhung load and thrust load of 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.



When installing the motor, make sure that excessive force is not applied to the motor cable. Also, the motor cable must not be pulled or inserted too tightly. If the motor is operated with excessive force applied on the cable, it may result in failed contact or disconnection. Please take safety measures when excessive force or continuous operation is required.

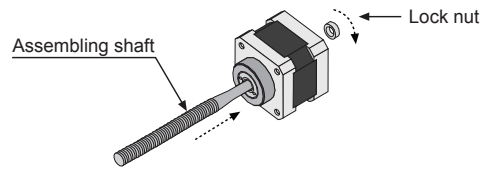


● Shaft assembly for hollow shaft motor

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.

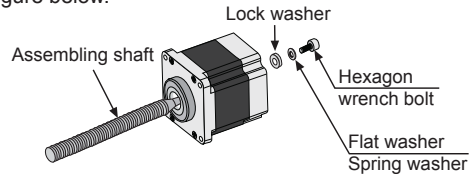
1. TAP hole type motor

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



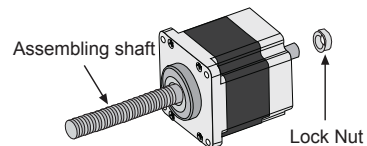
2. Through hole type motor with single shaft

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.

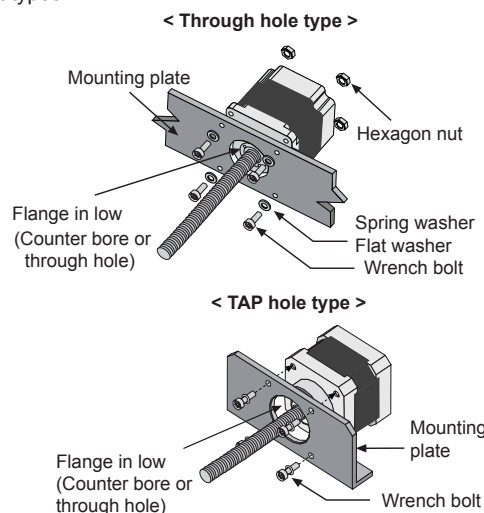


● Motor installation method

When installing the motor, carefully consider heat radiation and vibration resistance. Mount the unit tightly on the surface of a metal with high thermal conductivity. (steel, aluminum, etc.)

Use hexagon bolts, spring washers and flat washers when installing the motor.

Please refer to the table below for mounting plate size and bolt types.



Motor size	Mounting plate size (depth)	Bolt type
□42	Min. 4mm	M3
□60	Min. 5mm	M4
□85	Min. 8mm	M6

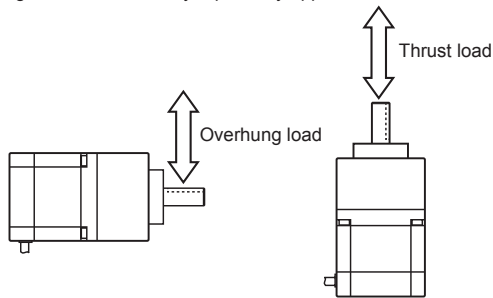
5-Phase Stepper Motor

◎ Geared built-in type stepper motor

● Motor installation direction

The motor can be installed in any direction horizontally, or vertically. Please take careful consideration of shaft overhung load and thrust load under all conditions. Please refer to the table below for permissible overhung load and thrust load of the shaft.

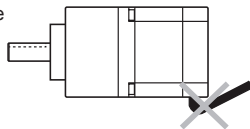
- 1) Overhung load: A type of load to be applied in vertical directions on the shaft having effect on output shaft and bearings to shorten its life cycle. In case excessive overhung load is applied on the shaft, it may cause bearing damage, output shaft bending or fatigue failure caused by repeatedly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

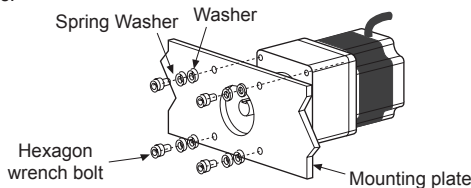
Motor type	The distance from the shaft in front (mm), Allowable overhung load [kgf (N)]					Allowable thrust load
	0	5	10	15	20	
□42	7.3 (72)	8.4 (82)	10 (98)	12.3 (121)	-	5 (49)
□60	25 (245)	27 (265)	30 (294)	34 (333)	39 (382)	10 (98)
□85	48 (471)	54 (530)	60 (588)	68 (667)	79 (775)	30 (294)

When installing the motor, make sure that excessive force is not applied to the motor cable. Also, the motor cable must not be pulled or inserted too tightly. If the motor is operated with excessive force applied on the cable, it may result in failed contact or disconnection. Please take safety measures when excessive force or continuous operation is required.



● Motor installation method

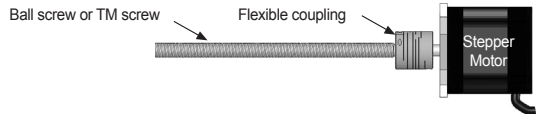
When installing the motor, carefully consider heat radiation and vibration resistance. Mount the unit tightly on the surface of a metal with high thermal conductivity. (steel, aluminum, etc.) Use hexagon bolts, spring washers and flat washers when installing the motor. Please refer to the table below for mounting plate size and bolt types.



Motor size	Mounting plate size (depth)	Bolt type
□42	Min. 5mm	M4
□60	Min. 8mm	M5
□85	Min. 12mm	M8

● Load connection

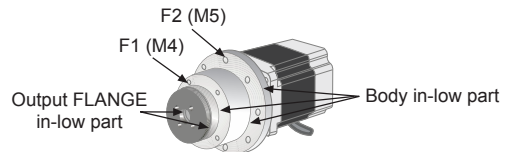
Use a flexible coupling when attaching a load (ball-screw, TM-screw, etc.) directly on the shaft of the motor. If the center does not match the load, vibration, degradation of the bearing, motor shaft damage, or other problems may occur. When attaching the load, do not modify or disassemble the motor or the shaft. When attaching the load of pulleys or belt please consider the thrust load, radial load, and shock.



◎ 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 tightening torque is 2N.m and 4.4N.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.

● Installation of accessories (index table, arm, etc.)

- ① Mount the accessory (index table or arm) on output axis flange using M4 screw. Note that $\varnothing 13$ 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) Photoelectric Sensors

(B) Fiber Optic Sensors

(C) Door/Area Sensors

(D) Proximity Sensors

(E) Pressure Sensors

(F) Rotary Encoders

(G) Connectors/ Sockets

(H) Temperature Controllers

(I) SSRs / Power Controllers

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(Q) Stepper Motors & Drivers & Controllers

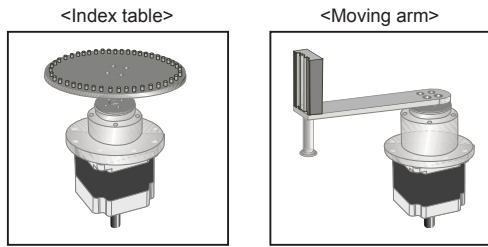
(R) Graphic/ Logic Panels

(S) Field Network Devices

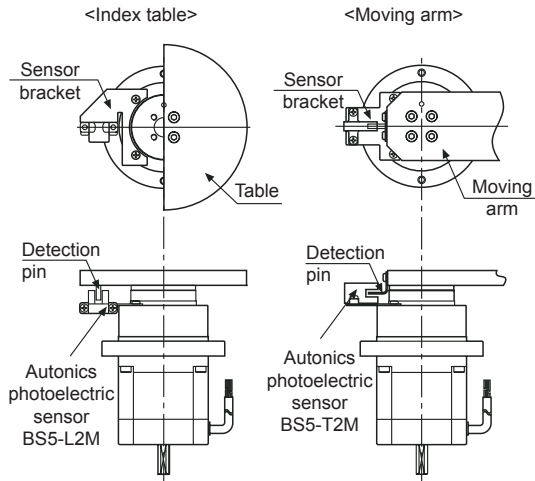
(T) Software

5-Phase Stepper Motor

● 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.

■ Cautions During Use

● 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.