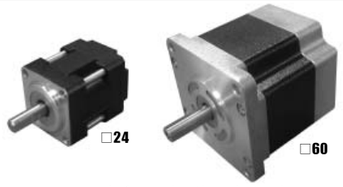
Autonics

SHAFT TYPE 5 PHASE STEPPING MOTOR

M A N U A L



Thank you very much for selecting Autonics products.
For your safety, please read the following before using.

▣ Caution for your safety

※Please keep these instructions and review them before using this unit.

※Please observe the cautions that follow;
⚠ Warning Serious injury may result if instructions are not followed.
⚠ Caution Product may be damaged, or injury may result if instructions are not followed.

※The following is an explanation of the symbols used in the operation manual.
⚠ Caution: Injury or danger may occur under special conditions.

⚠Warning

1. **In case of using this unit with machinery(nuclear power control, medical equipment, vehicle, train, airplane, combution apparatus, entertainment or safty device, etc.), is requried to install fail-safe device, or contact us for information required.**
   It may cause a fire, human injury or property loss.
2. **Do not use this unit where flammable or explosive gas, corrosion and water exist.**
   It may cause a fire or burn.
3. **Installation, connection, operation, control, maintenan.**
   It may cause a fire or human injury, give electronic shock.
4. **Please install it in power off.**
   It may give electronic shock.
5. **Please earth or install it with housing so that protecting a touch of human body.**
   It may give electronic shock or human injury.
6. **Do not disassemble or modify this unit.**
   It may cause damage to this product or quality down.

⚠Caution

1. **Please keep the specification of this unit.**
   It may cause damage to this product.
2. **Do not put obstacle object for well ventilation around this unit.**
   It may cause a damage to this product or malfunction of peripheral equipment by motor heating.
3. **Please fix this unit on a metal plate tightly.**
   It may cause human injury or damage of this product and peripheral device.
4. **Please stop this unit when mechanical trouble occurred.**
   It may cause a fire or human injury.
5. **Do not inordinate impact or continuous vibration to this unit.**
   It may cause malfunction of this product.
6. **The surface temperature of the motor is possible to be over 70℃ in normal operating state. Please put a caution mark on outstanding place when somebody may approach to the operating motor.**
   It may cause a burn.
7. **Do not carry the cable or rotating part of this unit.**
   It may cause human injury.
8. **Please put a cover on the rotating part of this unit.**
   It may cause human injury.
9. **Please separate as industrial scrapped material when disuse this unit.**

▣ Ordering information

A 1K - S 5 4 3 W - S

Wire connection		**No mark**	Pentagon
	※	**S**	Standard
Shaft type		**No mark**	Single shaft
		W	Dual shaft
Motor length			
Motor frame size (width×length)	**2** □24 (24mm×24mm)	**3**	30.5mm
		4	46.5mm
	4 □42 (42mm×42mm)	**3**	33mm
		4	39mm
		5	47mm
	6 □60 (60mm×60mm)	**4**	48.5mm
		6	59.5mm
		9	89mm
	9 □85 (85mm×85mm)	**6**	68mm
		9	98mm
		13	128mm
Motor phase		**5**	5 phase
Rated current		**S**	0.75 A/Phase
		M	1.4 A/Phase
		G	2.8 A/Phase
Max. Holding torque		**Square**	kgf·cm (Refer to motor specifications)
		Autonics motor	

※ Standard wiring is optional.(Except 24 square motor modes.)

※The above specifications are subject to change without notice.

▣ Specifications

□24		
Model	**02K-S523(W)**	**04K-S525(W)**
Max. Holding torque※1	0.18 kgf·cm(0.018 N·m)	0.28 kgf·cm(0.028 N·m)
Moment of rotor inertia	4.2 g·cm²(4.2x10⁻⁷ kg·m²)	8.2 g·cm²(8.2x10⁻⁷ kg·m²)
Rated current	0.75 A/Phase	
Basic step angle	0.72 ° / 0.36 ° (Full/Half)	
Unit weight	Approx. 0.07kg	Approx. 0.12kg

□42			
Model	**A1K-S543(W)-□**	**A2K-S544(W)-□**	**A3K-S545(W)-□**
Max. Holding torque※1	1.3 kgf·cm(0.13 N·m)	1.8 kgf·cm(0.18 N·m)	2.4 kgf·cm(0.24 N·m)
Moment of rotor inertia	35 g·cm²(35x10⁻⁷ kg·m²)	54 g·cm²(54x10⁻⁷ kg·m²)	68 g·cm²(68x10⁻⁷ kg·m²)
Rated current	0.75 A/Phase		
Basic step angle	0.72 ° /0.36 ° (Full/Half)		
Unit weight	Approx. 0.25kg	Approx. 0.3kg	Approx. 0.4kg

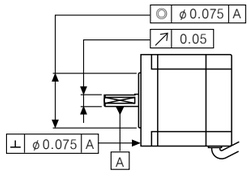
□60						
Model	**A4K-S564(W)-□**	**A4K-M564(W)-□**	**A8K-S566(W)-□**	**A8K-M566(W)-□**	**A16K-M569(W)-□**	**A16K-G569(W)-□**
Max. Holding torque(※1)	4.2 kgf·cm(0.42 N·m)		8.3 kgf·cm(0.83 N·m)		16.6 kgf·cm(1.66 N·m)	
Moment of rotor inertia	175 g·cm² (175x10⁻⁷ kg·m²)		280 g·cm² (280x10⁻⁷ kg·m²)		560 g·cm² (560x10⁻⁷ kg·m²)	
Rated current	0.75 A/ Phase	1.4 A/Phase	0.75 A/ Phase	1.4 A/Phase	1.4 A/Phase	2.8 A/Phase
Basic step angle	0.72 ° /0.36 ° (Full/Half)					
Unit weight	Approx. 0.6kg		Approx. 0.8kg		Approx. 1.3kg	

□85						
Model	**A21K-M596(W)-□**	**A21K-G596(W)-□**	**A41K-M599(W)-□**	**A41K-G599(W)-□**	**A63K-M5913(W)-□**	**A63K-G5913(W)-□**
Max. Holding torque(※1)	21 kgf·cm(2.1 N·m)		41 kgf·cm(4.1 N·m)		63 kgf·cm(6.3 N·m)	
Moment of rotor inertia	1,400 g·cm² (1,400x10⁻⁷ kg·m²)		2,700 g·cm² (2,700x10⁻⁷ kg·m²)		4,000 g·cm² (4,000x10⁻⁷ kg·m²)	
Rated current	1.4 A/Phase	2.8 A/Phase	1.4 A/Phase	2.8 A/Phase	1.4 A/Phase	2.8 A/Phase
Basic step angle	0.72 ° / 0.36 ° (Full/Half)					
Unit weight	Approx. 1.7kg		Approx. 2.8kg		Approx. 3.8kg	

※ **1**: Max. Holding torque is a retaining torque when 5 phase excitation stopped after the rated current is flowed in motor.

Common specification	
Insulation class	CLASS B(130℃)
Insulation resistance	Min. 100㏁ (at 500VDC megger) between Motor coil-case
Dielectric strength	1 kVAC(at 0.75 A/Phase is 0.5 kVAC) 50/60Hz for 1 minute between Motor coil-case
Temperature rise	5-Phase excitation for rated current, below 80℃ at stop status (resistance method)
Enviornment: Ambient temperature	-10 to 50℃, Storage: -25 to 85℃
Enviornment: Ambient humidity	35 to 85%RH, Storage: 35 to 85%RH
Positional accuracy※1	±3'(±0.05 °)
Shaft vibration※4	0.05 T.I.R.[mm]
Radial Movement※2	0.025[mm] Max.(Load 5N)
Axial Movement※3	0.075[mm] Max.(Load 10N)
Concentricity for shaft of setup in low	0.075 T.I.R.[mm]
Perpendicularity of seating plane shaft	0.075 T.I.R.[mm]
Protection	IP30(IEC34-5 standards)

※1: This vaule is when full-step and no-load.(It varies as load size.)
※2: It is shaft displacement quantity of radial direction when load 5N is added to edge part of the motor shaft to vertical way.
※3: It is shaft displacement quantity of axis direction when load 10N is added to the motor shaft to axis way.
※4: T.I.R.(Total Indicator Reading): In case of making 1 rotation with the standard point as the center, it indicates the whole quantity of dial gauge.

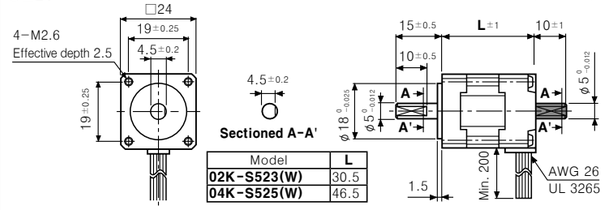


※Environment resistance is rated at no freezing or condensation.

▣ Dimensions

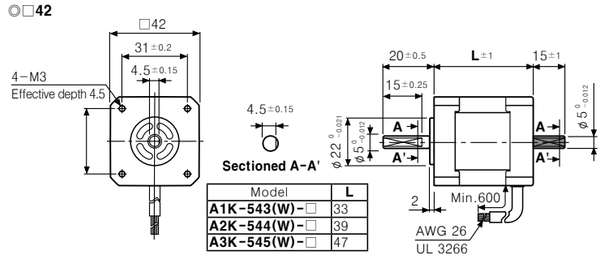
(Unit: mm)

◎□24



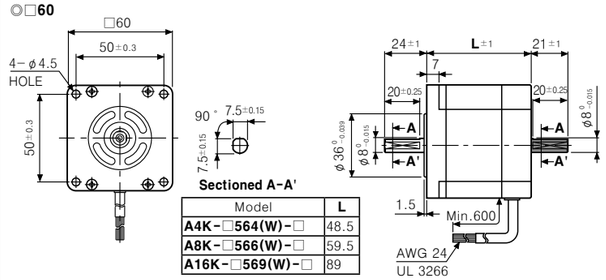
Model	L
02K-S523(W)	30.5
04K-S525(W)	46.5

◎□42



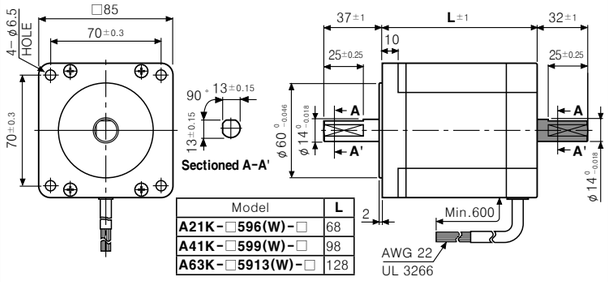
Model	L
A1K-543(W)-□	33
A2K-544(W)-□	39
A3K-545(W)-□	47

◎□60



Model	L
A4K-□564(W)-□	48.5
A8K-□566(W)-□	59.5
A16K-□569(W)-□	89

◎□85



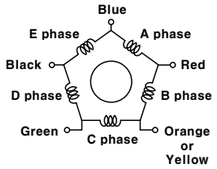
Model	L
A21K-□596(W)-□	68
A41K-□599(W)-□	98
A63K-□5913(W)-□	128

※There dimensions are for dual shaft models.
For single shaft models, ignore shadow(▭) part.

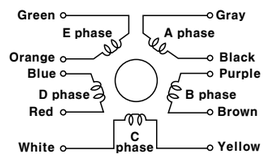
▣ Connection diagram

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)



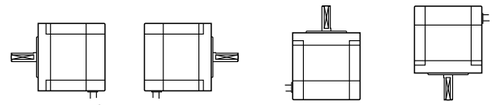
In case of connecting standard connection type models to motor drivers, make sure that motor's lead wire connection must be made as specified in the table.

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

▣ Installation

1. Mounting direction

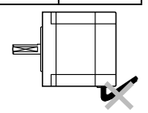
Motors can be mounted in any directions – facing up, facing down and side ways. No matter which direction motors to be mounted, be sure not to apply overhung or thrust load on the shaft.
Refer to the table below for allowable shaft overhung load/ thrust load.



Unit: kgf(N)

Motor frame size	Allowable overhung load per certain distance(mm) from the end of shaft					Allowable thrust load
	0	5	10	15	20	
□24	2(20)	2.5(25)	3.4(34)	–	–	Under the load of motor
□42	2(20)	2.5(25)	3.4(34)	5.2(52)	–	
□60	6.3(63)	7.5(75)	9.5(95)	13(130)	19(190)	
□85	26(260)	29(290)	34(340)	39(390)	48(480)	

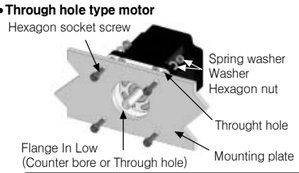
Do not apply excessive force on motor cable when mounting motors. Do not forcibly pull or insert the cable. It may cause poor connection or disconnection of the cable. In case of frequent cable movement required application, proper safety countermeasures must be ensured.



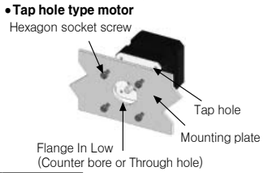
2. Motor mounting

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 socket screws, hexagon nuts, spring washers and flat washers.
Refer to the table below for allowable thickness of mounting plate and using screw.

•Through hole type motor



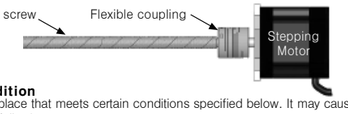
•Tap hole type motor



Motor size	The thickness of mounting plate	Using screw
□24	Min. 3mm	M2.6
□42	Min. 4mm	M3
□60	Min. 5mm	M4
□85	Min. 8mm	M6

3. 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.



4. Installation condition

Install the motor in a place that meets certain conditions specified below. It may cause product damage if instructions are not following.
① It shall be used indoors.(This product is designed / manufactured to be installed on machinery as a part.)
② Within -10℃ to 50℃ (at non-freezing status) of ambient temperature
③ Within 85%RH (at non-dew status) of ambient humidity
④ The place without explosive, flammable and corrosive gas
⑤ The place without direct ray of light
⑥ The place without dust, dregs, etc.
⑦ The place without water, oil, etc.
⑧ The place where easy heat dissipation could be made
⑨ The place where no continuous vibration or severe shock
⑩ The place with less salt content
⑪ The place with less electronic noise occurred by welding machine, motor, etc.
⑫ The place where no radioactive substances and magnetic fields exist. It shall be no vacuum status as well.

▣ Caution for using

1. Temperature rise
   The surface temperature of motor shall be under 100℃ 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.
2. 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.

※It may cause malfunction if above instructions are not followed.

▣ Major products

- Proximity sensors
- Area sensors
- Photoelectric sensors
- Fiber optic sensors
- Door/Door side sensors
- Rotary encoders
- Graphic/Logic panels
- Temperature controllers
- Tachometer/Pulse(Rate) meters
- Temperature/Humidity transducers
- Switching power supplies
- Stepping motors/drivers/motion controllers
- Field network devices
- Laser marking system(CO_2, Nd:YAG)
- Laser welding/soldering system
- Counters
- Timers
- Display units
- Panel meters
- Pressure sensors
- Power controllers
- Sensor controllers

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