Autonics

SHAFT TYPE 5 PHASE STEPPER MOTOR

INSTRUCTION MANUAL

CE

□24 □42 □60 □85

Thank you for choosing our Autonics product.
Please read the following safety considerations before use.

■ Safety Considerations

※Please observe all safety considerations for safe and proper product operation to avoid hazards.
※⚠ symbol represents caution due to special circumstances in which hazards may occur.

⚠ **Warning** Failure to follow these instructions may result in serious injury or death.
⚠ **Caution** Failure to follow these instructions may result in personal injury or product damage.

⚠Warning

1. **Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)**
   Failure to follow this instruction may result in fire, personal injury, or economic loss.
2. **Fix the unit on the metal plate.**
   Failure to follow this instruction may result in personal injury, or product and ambient equipment damage.
3. **Do not connect, repair, or inspect the unit while connected to a power source.**
   Failure to follow this instruction may result in fire.
4. **Install the unit after considering counter plan against power failure.**
   Failure to follow this instruction may result in personal injury, or economic loss.
5. **Check 'Connections' before wiring.**
   Failure to follow this instruction may result in fire.
6. **Do not disassemble or modify the unit.**
   Failure to follow this instruction may result in electric shock or fire.
7. **Install the motor in the housing or ground it.**
   Failure to follow this instruction may result in electronic shock, fire, or personal injury.
8. **Make sure to install covers on motor rotating components.**
   Failure to follow this instruction may result in personal injury.
9. **Do not touch the unit during or after operation for a while.**
   Failure to follow this instruction may result in burn due to high temperature of the surface.
10. **Turn OFF the power directly when error occurs.**
    Failure to follow this instruction may result in electric shock, fire, or personal injury.

⚠Caution

1. **Use the unit within the rated specifications.**
   Failure to follow this instruction may result in fire or product damage.
2. **Use dry cloth to clean the unit, and do not use water or organic solvent.**
   Failure to follow this instruction may result in fire.
3. **Do not use the unit in the place where flammable/explosive/corrosive gas, humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present.**
   Failure to follow this instruction may result in fire or explosion.
4. **The motor may overheat depending on the environment.**
   Install the unit at the well-ventilated environment and forced cooling with a cooling fan.
   Failure to follow this instruction may result in product damage and degradation.

■ Ordering Information

A 1K - S 5 4 3 W - S

Wire connection	No mark	Pentagon
	S※1	Standard
Shaft type	No mark	Single shaft
	W	Dual shaft
Motor length	3	30.5mm
(□24)	4	46.5mm
Motor length	3	33mm
(□42)	4	39mm
	5	47mm
Motor length	4	48.5mm
(□60)	6	59.5mm
	9	89mm
Motor length	6	68mm
(□85)	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	

Motor frame size (width×length): 2 = □24 (24×24mm); 4 = □42 (42×42mm); 6 = □60 (60×60mm); 9 = □85 (85×85mm)

※1: Standard wiring is optional.(Except □24 motor model, A4K-G564(W), A8K-G566(W).)
※The above specifications are subject to change and some models may be discontinued without notice.
※Be sure to follow cautions written in the instruction manual and the technical descriptions (catalog, homepage).

■ 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 (0.027 N·m)
Rotor moment of 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	
Standard step angle	0.72˚/ 0.36˚ (Full/Half step)	
Weight※2	Approx. 0.10kg (approx. 0.08kg)	Approx. 0.16kg (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)
Rotor moment of 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		
Standard step angle	0.72˚/0.36˚ (Full/Half step)		
Weight※2	Approx. 0.34kg (approx. 0.25kg)	Approx. 0.39kg (approx. 0.3kg)	Approx. 0.49kg (approx. 0.4kg)

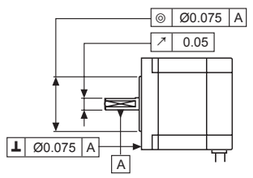
□60								
Model	**A4K-S564(W)-□**	**A4K-M564(W)-□**	**A4K-G564(W)**	**A8K-S566(W)-□**	**A8K-M566(W)-□**	**A8K-G566(W)**	**A16K-M569(W)-□**	**A16K-G569(W)-□**
Max. Holding torque※1	4.2 kgf·cm (0.41 N·m)			8.3 kgf·cm (0.81 N·m)			16.6 kgf·cm (1.63 N·m)	
Rotor moment of inertia	175 g·cm² (175x10⁻⁷ kg·m²)			280 g·cm² (280x10⁻⁷ kg·m²)			560 g·cm² (560x10⁻⁷ kg·m²)	
Rated current	0.75 A/Phase	1.4 A/Phase	2.8 A/Phase	0.75 A/Phase	1.4 A/Phase	2.8 A/Phase	1.4 A/Phase	2.8 A/Phase
Standard step angle	0.72˚/0.36˚ (Full/Half step)							
Weight※2	Approx. 0.85kg (approx. 0.6kg)			Approx. 1.05kg (approx. 0.8kg)			Approx. 1.55kg (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 (4.0 N·m)		63 kgf·cm (6.2 N·m)	
Rotor moment of 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
Standard step angle	0.72˚/ 0.36˚ (Full/Half step)					
Weight※2	Approx. 2.15kg (approx. 1.7kg)		Approx. 3.25kg (approx. 2.8kg)		Approx. 4.25kg (approx. 3.8kg)	

※ 1: Max. Holding torque is a retaining torque when 5 phase excitation stopped after the rated current is flowed in motor.
※ 2: The weight includes packaging. The weight in parentheses is for unit only.

Common specification		
Insulation class		B type (130℃)
Insulation resistance		Over 100MΩ (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℃ while stopped
Environment	Ambient temperature	-10 to 50℃, Storage: -25 to 85℃
	Ambient humidity	35 to 85%RH, Storage: 35 to 85%RH
Positional accuracy※1		±3' (±0.05˚)
Shaft vibration※4		0.05mm T.I.R.
Radial Movement※2		Max. 0.025mm (Load 5N)
Axial Movement※3		Max. 0.075mm (Load 10N)
Concentricity for shaft of setup in-low		0.075mm T.I.R.
Perpendicularity of set-up plate shaft		0.075mm T.I.R.
Protection structure		IP30 (IEC34-5 standards)

※ 1: Specifications are for full-step angle, with no-load. (Values may vary by load size.)
※ 2: Amount of radial shaft displacement when adding a radial load(5N) to the tip of the motor shaft.
※ 3: Amount of axial shaft displacement when adding an axial load(10N) to the shaft.
※ 4: T.I.R.(Total Indicator Reading): The difference between the maximum and minimum readings of a dial gauge during one complete revolution of the monitored reference.



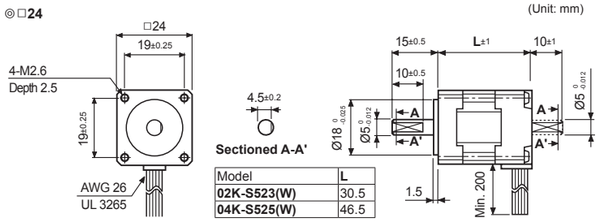
※ Environment resistance is rated at no freezing or condensation.

■ Dimensions

※The 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. (Except for □85)

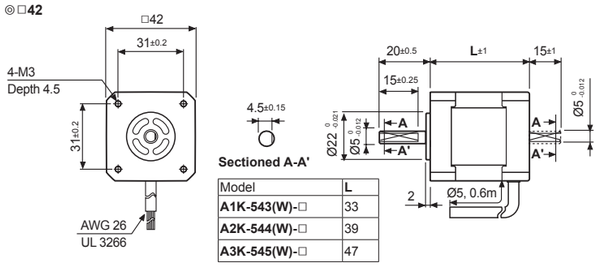
(Unit: mm)

◎□24



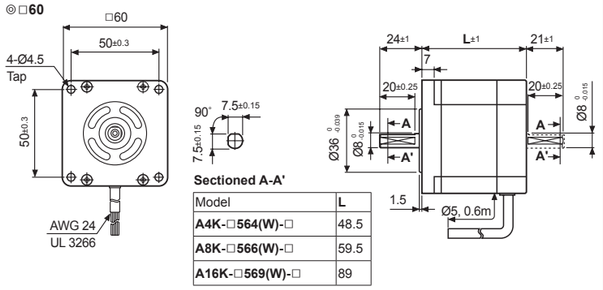
Model	L
02K-S523(W)	30.5
04K-S525(W)	46.5

◎□42



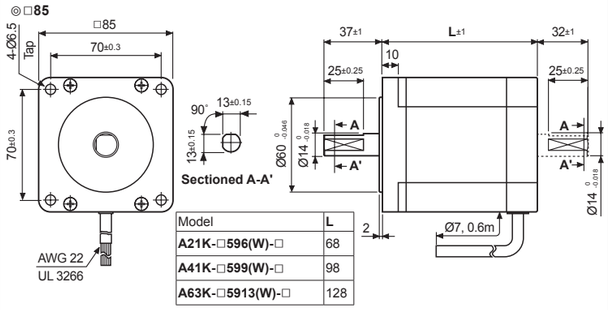
Model	L
A1K-543(W)-□	33
A2K-544(W)-□	39
A3K-545(W)-□	47

◎□60



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

◎□85

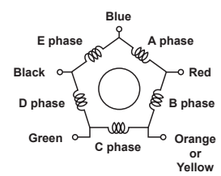


Model	L
A21K-□596(W)-□	68
A41K-□599(W)-□	98
A63K-□5913(W)-□	128

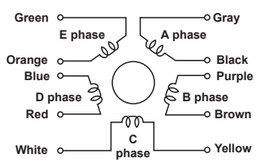
■ Connection Diagram

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 connection type (Standard)



·Standard connection type (Option)



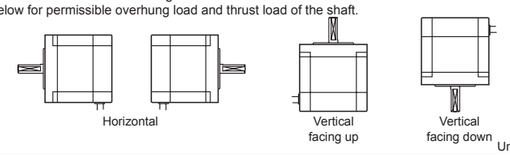
In case of connecting standard connection type models to motor drivers, make sure that motor's lead wire connection must be made as specified in the table.

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

1. Motor installation direction

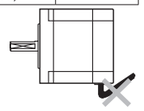
The motor can be installed in any direction horizontally, or vertically. Please take careful consideration of shaft overhung load and thrust load under all conditions. Please refer to the table below for permissible overhung load and thrust load of the shaft.



Unit: kgf(N)

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)	

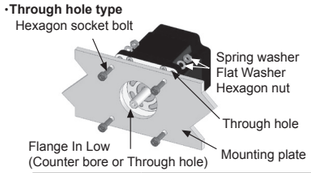
When installing the motor, make sure that excessive force is not applied to the motor cable. Also, the motor cable must not be pulled or inserted too tightly. If the motor is operated with excessive force applied on the cable, it may result in failed contact or disconnection. Please take safety measures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



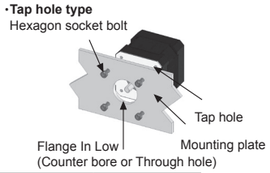
2. Motor installation method

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.

·Through hole type



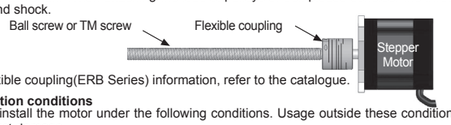
·Tap hole type



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

3. 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.



※For flexible coupling(ERB Series) information, refer to the catalogue.

4. Installation conditions

Please install the motor under the following conditions. Usage outside these conditions may result in product damage.

① Indoor environment (this product is inteded for use with machinery.)
② Ambient temperature : -10℃ to 50℃ (non-freezing status)
③ Ambient humidity : 35% to 85%RH (non-condensation)
④ Environments without explosive, flammable, or corrosive gas
⑤ Environments without exposure to direct sunlight
⑥ Environments with minimal dust
⑦ Environments without direct contact with water or oil
⑧ Environments suitable for heat dissipation
⑨ Environments without concentrated vibration or excessive shock
⑩ Environments with low salinity
⑪ Environments with minimal electromagnetic noise from other machinery
⑫ Environments without radioactive substances or magnetic fields
Must be installed in a non-vacuum state.

■ Cautions during Use

1. Follow instructions in 'Cautions during Use'. Otherwise, It may cause unexpected accidents.
2. Using motors at low temperature may cause reducing ball bearing's grease consistency and friction torque is increased.
   Start the motor in a steady manner since motor's torque is not to be influenced.
3. For using motor, it is recommended to maintenance and inspection regularly.
   ①Unwinding bolts and connection parts for the unit installation and load connection
   ②Strange sound from ball bearing of the unit
   ③Damage and stress of lead cable of the unit
   ④Connection error with driver
   ⑤Inconsistency between the axis of motor output and the center, concentric (eccentric, declination) of the load, etc.
4. This unit may be used in the following environments.
   ①Indoors (in the environment condition rated in 'Specifications')
   ②Altitude max. 2,000m
   ③Pollution degree 2
   ④Installation category II

■ Major Products

■ Photoelectric Sensors
■ Fiber Optic Sensors
■ Door Sensors
■ Door Side Sensors
■ Area Sensors
■ Proximity Sensors
■ Pressure Sensors
■ Rotary Encoders
■ Connectors/Sockets
■ Switching Mode Power Supplies
■ Control Switches/Lamps/Buzzers
■ I/O Terminal Blocks & Cables
■ Stepper Motors/Drivers/Motion Controllers
■ Graphic/Logic Panels
■ Field Network Devices
■ Laser Marking System (Fiber, CO_2, Nd: YAG)
■ Laser Welding/Cutting System
■ Temperature Controllers
■ Temperature/Humidity Transducers
■ SSRs/Power Controllers
■ Counters
■ Timers
■ Panel Meters
■ Tachometer/Pulse (Rate) Meters
■ Display Units
■ Sensor Controllers

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