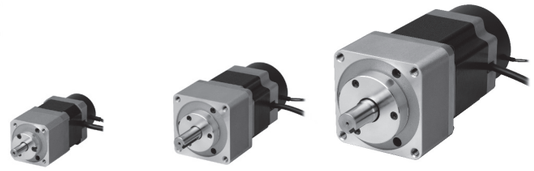
Autonics

GEARED built-in BRAKE TYPE 5-PHASE STEPPER MOTOR

INSTRUCTION MANUAL



[Frame size 42mm] [Frame size 60mm] [Frame size 85mm]

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.

※Safety considerations are categorized as follows.
⚠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.

※The symbols used on the product and instruction manual represent the following.
⚠ symbol represents caution due to special circumstances in which hazards may occur.

⚠ 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 personal injury, fire, or economic loss.
2. **Do not use the unit where flammable or explosive gas, corrosive material, water, or combustible material may be present.**
   Failure to follow this instruction may result in fire or burn.
3. **Installation, connection, operation, maintenance, and inspection should be handled by qualified individuals.**
   Failure to follow this instruction may result in fire, electronic shock, or personal injury.
4. **Please install it in power off.**
   Failure to follow this instruction may result in electronic shock.
5. **Install the motor in the housing not to touch of human body.**
   Failure to follow this instruction may result in electronic shock or personal injury.
6. **Do not disassemble or modify the unit.**
   Failure to follow this instruction may result in personal injury, performance loss, or product damage.

⚠ Caution

1. **Use the unit within the rated specifications.**
   Failure to follow this instruction may result in product damage
2. **Do not put obstacles around the unit which may obstruct ventilation.**
   Failure to follow this instruction may result in product damage, ambient equipment damage, or malfunction by heat.
3. **Affix the motor tightly on a metal plate.**
   Failure to follow this instruction may result in personal injury, or product and ambient equipment damage.
4. **Please stop this unit when mechanical trouble occurred.**
   Failure to follow this instruction may result in fire, electronic shock, or personal injury.
5. **Do not inordinate impact or continuous vibration to this unit.**
   Failure to follow this instruction may result in malfunction.
6. **The surface temperature of the motor may reach 70℃ in normal operating conditions. Place a warning sign in conditions where someone may approach the operating motor.**
   Failure to follow this instruction may result in burn.
7. **Do not use the brake for safety.**
   Failure to follow this instruction may result in personal injury, or ambient equipment damage.
8. **Do not carry the motor by the cable or rotor.**
   Failure to follow this instruction may result in motor damage or personal injury.
9. **Make sure to install covers on motor rotating components.**
   Failure to follow this instruction may result in personal injury.
10. **When disposing the unit, please categorize it as industrial waste.**

■ Ordering Information

A 35K - M 5 6 6 - GB 5

- Gear ratio: **5** 1:5; **7.2** 1:7.2; **10** 1:10
- Motor type: **GB** Geared+built-in brake type
- Motor length
- Motor frame size: **4** 42×42mm; **6** 60×60mm; **9** 85×85mm
- Motor length: **5** 47mm; **6** 59.5mm; **9** 98mm
- Motor phase: **5** 5-phase
- Rated current: **S** 0.75A/Phase; **M** 1.4A/Phase; **G** 2.8A/Phase
- Max. holding torque: **Square** kgf·cm (refer to ■ specification)
- Item: **A** Autonics motor

※**The above specifications are subject to change and some models may be discontinued without notice.**

■ Specifications

Frame size 42mm				
Model		**A10K-S545-GB5**	**A15K-S545-GB7.2**	**A15K-S545-GB10**
Max. holding torque※1		10kgf·cm (1.0N·m)	15kgf·cm (1.5N·m)	
Rotor moment of inertia※2		68 g·cm² (68×10⁻⁷ kg·m²)		
Rated current		0.75 A/Phase		
Basic step angle		0.144° / 0.072° (Full/Half step)	0.1° / 0.05° (Full/Half step)	0.072° / 0.036° (Full/Half step)
Gear ratio		1:5	1:7.2	1:10
Allowable speed range		0 to 360rpm	0 to 250rpm	0 to 180rpm
Backlash [min]		±35' (0.58°)		
Electro-Magnetic Brake	Rated excitation voltage	24VDC⎓ ±10%		
	Rated excitation current	0.2A		
	Static friction torque	1.8kgf·cm		
	Rotation part inertia	3×10⁻⁷ kg·cm²		
	Insulation class	B type (130℃)		
	B type brake	Power on: brake is released, power off: brake is operating		
	Operating time	Max. 15ms		
	Releasing time	Max. 25ms		
Weight※3		Approx. 0.78kg (approx. 0.72kg)		

Frame size 60mm				
Model		**A35K-M566-GB5**	**A40K-M566-GB7.2**	**A50K-M566-GB10**
Max. holding torque※1		35 kgf·cm (3.4 N·m)	40 kgf·cm (3.9 N·m)	50 kgf·cm (4.9 N·m)
Rotor moment of inertia※2		280 g·cm² (280×10⁻⁷ kg·m²)		
Rated current		1.4 A/Phase		
Basic step angle		0.144° / 0.072° (Full/Half step)	0.1° / 0.05° (Full/Half step)	0.072° / 0.036° (Full/Half step)
Gear ratio		1:5	1:7.2	1:10
Allowable speed range		0 to 360rpm	0 to 250rpm	0 to 180rpm
Backlash [min]		±20' (0.33°)		
Electro-Magnetic Brake	Rated excitation voltage	24VDC⎓ ±10%		
	Rated excitation current	0.33A		
	Static friction torque	8kgf·cm		
	Rotation part inertia	29×10⁻⁷ kg·cm²		
	Insulation class	B type (130℃)		
	B type brake	Power on: brake is released, power off: brake is operating		
	Operating time	Max. 20ms		
	Releasing time	Max. 25ms		
Weight※3		Approx. 1.65kg (approx. 1.57kg)		

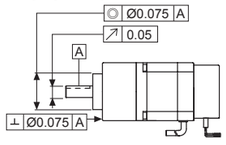
Frame size 85mm							
Model		**A140K-M599-GB5**	**A140K-G599-GB5**	**A200K-M599-GB7.2**	**A200K-G599-GB7.2**	**A200K-M599-GB10**	**A200K-G599-GB10**
Max. holding torque※1		140 kgf·cm (13.7 N·m)		200 kgf·cm (19.6 N·m)			
Rotor moment of inertia※2		2,700 g·cm² (2,700×10⁻⁷ kg·m²)					
Rated current		1.4 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		0.144° / 0.072° (Full/Half step)		0.1° / 0.05° (Full/Half step)		0.072° / 0.036° (Full/Half step)	
Gear ratio		1:5		1:7.2		1:10	
Allowable speed range		0 to 360rpm		0 to 250rpm		0 to 180rpm	
Backlash [min]		±15' (0.25°)					
Electro-Magnetic Brake	Rated excitation voltage	24VDC⎓ ±10%					
	Rated excitation current	0.62A					
	Static friction torque	40kgf·cm					
	Rotation part inertia	153×10⁻⁷ kg·cm²					
	Insulation class	B type (130℃)					
	B type brake	Power on: brake is released, power off: brake is operating					
	Operating time	Max. 15ms					
	Releasing time	Max. 60ms					
Weight※3		Approx. 5.5kg (approx. 5.2kg)					

※1: Max. holding torque is maintenance torque in stopping the motor when supply the rated current and is standard method for comparing the performance of motors.
※2: Moment of rotor inertia indicates a part, except Gear Head part.
※3: The weight includes packaging. The weight in parenthesis is for unit only.

◎ **Common specifications**

Operation type		Planetary Geared type
Insulation class		B type (130℃)
Insulation resistance		Over 100MΩ (at 500VDC megger) between motor coil-case
Dielectric strength		1 kVAC 50/60Hz for 1 min between motor coil-case
Temperature rise		5-phase excitation for rated current, below 80℃ at stopped (resistance method)
Environment	Ambient temp.	-10 to 50℃, storage: -25 to 85℃
	Ambient humi.	35 to 85%RH, storage: 35 to 85%RH
Stop angle error※1		±3' (±0.05°)
Shaft vibration※2		0.05mm T.I.R.
Radial movement※3		Max. 0.025mm (Load 5N)
Axial movement※4		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 standard)

※1: Specifications are for full-step angle, with no-load (values may vary by load size.)
※2: T.I.R.(Total Indicator Reading) - The difference between the maximum and minimum readings of a dial gauge during one complete revolution of monitored reference.

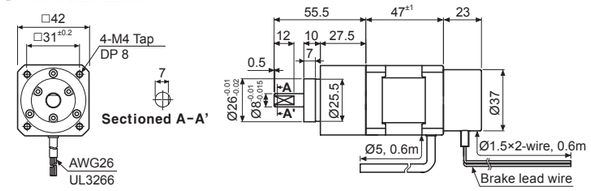


※3: Amount of radial shaft displacement when adding a radial load (5N) to the tip of the motor shaft.
※4: Amount of axial shaft displacement when adding a axial load (10N) to the shaft.
※Rotation direction of the Motor and the Gear Head output axis is same.
※Environment resistance is rated at no freezing or condensation.

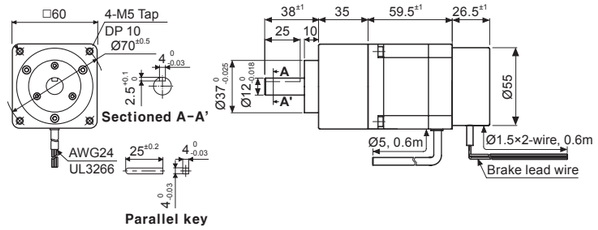
■ Dimensions

(unit: mm)

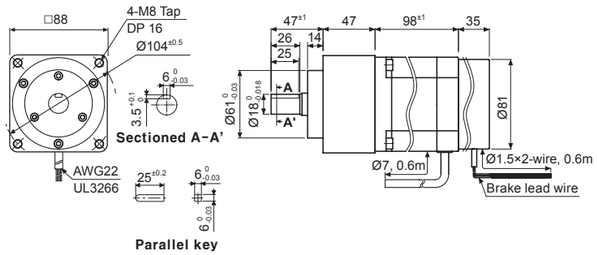
◎ **Frame size 42mm**



◎ **Frame size 60mm**

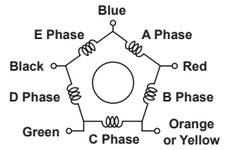


◎ **Frame size 85mm**



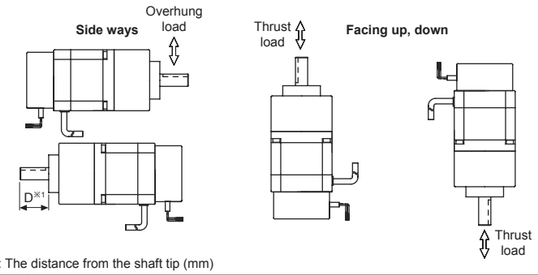
■ Connection Diagram

Autonics 5-phase stepper motors use pentagon wiring methods.
Therefore, it is a proper product for the 5-phase stepper motor driver which is working as a bipolar pentagon driving method.
The connections of each phase and each color of the lead-wire are as follows:



■ Installation

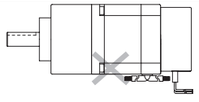
1. Mounting direction
Motor can be mounted in any directions-facing up, facing down and side ways.
No matter which direction motors to be mounted, be sure not to apply overhung or thrust load on the shaft.
Refer to the table below for allowable shaft overhung load / thrust load.



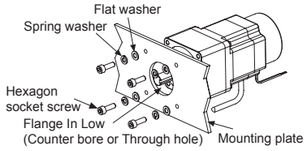
※1: The distance from the shaft tip (mm)

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

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.



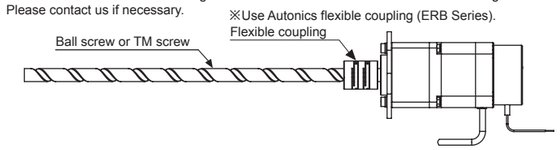
2. Motor mounting
With considering heat radiation and vibration isolation, mount the motor as tight as possible against a metal panel having high thermal conductivity such as iron or aluminum.
When mounting motors, use hexagon socket screws, spring washers and flat washers.
Refer to the table below for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



Motor size	The thickness of mounting plate	Using bolt
Frame size 42mm	Min. 5mm	M4
Frame size 60mm	Min. 8mm	M5
Frame size 85mm	Min. 12mm	M8

3. Connection with load
When connecting the load, be sure of alignment of the center, tension of the belt, and parallel of the pulley. When connecting the load such as a pulley or a belt, be cautious of the allowable thrust load, radial load, and shock, as well as tighten the screw for a coupling or a pulley not to be unscrewed.
When attach a coupling or a pulley to the shaft, be cautious of damage on shaft or bearings and it is banned to disassemble or change structure of the device or the shaft for connecting with a load. Please contact us if necessary.

※Use Autonics flexible coupling (ERB Series).



When connecting a load such as Ball screw or Tm screw directly to the shaft of the motor, use flexible coupling as image showing above. If the center of the load and the shaft is not aligned, it may cause severe vibration, damage on shaft or shortened life cycle of bearings.

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.
①The inner housing installed indoor
(This unit is manufactured and designed for attaching to equipment. Install a ventilation device.)
②Within -10 to 50℃ (at non-freezing status) of ambient temperature
③Within 35 to 85%RH (at non-dew status) of ambient humidity
④The place without explosive, flammable and corrosive gas
⑤The place without direct ray of light
⑥The place where dust or metal scrap does not enter into the unit
⑦The place without contact with water, oil, or other liquid
⑧The place without contact with strong alkali or acid material
⑨The place where easy heat dissipation could be made
⑩The place where no continuous vibration or severe shock
⑪The place with less salt content
⑫The place with less electronic noise occurs by welding machine, motor, etc.
⑬The place where radioactive substances and magnetic fields does not exist and is not in the vacuum status

■ Cautions during Use

1. **Do not disassemble or modify the product.**
   It may cause malfunction due to small dregs.
   Once disassembling the motor, its performance would significantly decline.
2. **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.
3. **Using at low temperature**
   Using motors at low temperature may cause reducing maximum starting / driving characteristics of the motor with rise of the friction torque, because grease consistency of the ball bearing and Gear Head becomes heavy. Since it is not error of the torque, start the motor in a steady manner.
4. **Temperature rise**
   The surface temperature of motor shall be under 100℃. It can be significantly increased by operation conditions (ambient temperature, drive speed, drive duty ratio, etc).
   In this case, use the cooling fan to lower the temperature forcedly.
   Or, it may cause damage on motor power cable by fire, shortening the life cycle of the inner ball-bearing, or malfunction of the unit.
5. **Use the motor within the allowable torque range.**
   The allowable 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 allowable torque range, or it may cause the breakdown of gear.
6. **Use the motor within the allowable speed range.**
   The allowable speed range includes the revolution number of gear and pulse speed of motor.
   Use the motor within the allowable speed range, or it may shorten the life cycle of gear part. (backlash is increased.)
7. **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 stepping 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.
8. **Clack sound of electromagnetic brake**
   When operating or releasing electro-magnetic brake, this machine may occur clack sound. Be assured that it is not the cause of malfunction, and do not hit or disassemble the motor.
9. **Usage of Electro-magnetic brake**
   When drive the motor, supply power to electro-magnetic brake for releasing the brake.
   If not supply power, it may cause abnormal motor operation, and the brake pad of electro-magnetic brake is worn. It may also cause shorten product life cycle, reducing the rated static friction torque.

※**Failure to follow these instructions may result in product damage.**

■ Major Products

■ Photoelectric Sensors
■ Fiber Optic Sensors
■ Door Sensors
■ Door Side Sensors
■ Area Sensors
■ Proximity Sensors
■ Pressure Sensors
■ Rotary Encoders
■ Connector/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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