



OPERATING MANUAL

Low-Speed Synchronous Motor
SMK Series



Introduction

Before use

Only qualified personnel of electrical and mechanical engineering should work with the product. Use the product correctly after thoroughly reading the section "Safety precautions." In addition, be sure to observe the contents described in warning, caution, and note in this manual. The product described in this manual has been designed and manufactured to be incorporated in general industrial equipment. Do not use for any other purpose. Oriental Motor Co., Ltd. is not responsible for any damage caused through failure to observe this warning.

Safety precautions

The precautions described below are intended to prevent danger or injury to the user and other personnel through safe, correct use of the product. Use the product only after carefully reading and fully understanding these instructions.

Description of signs

	Handling the product without observing the instructions that accompany a "Warning" symbol may result in serious injury or death.
	Handling the product without observing the instructions that accompany a "Caution" symbol may result in injury or property damage.
	The items under this heading contain important handling instructions that the user should observe to ensure the safe use of the product.

Description of graphic symbols

	Indicates "prohibited" actions that must not be performed.
	Indicates "compulsory" actions that must be performed.

WARNING	
	<ul style="list-style-type: none"> Do not use the motor in explosive or corrosive environments, in the presence of flammable gases, locations subjected to splashing water, or near combustibles. This may cause fire or injury. Do not forcibly bend, pull or pinch the motor lead wires or cable. Doing so may result in fire. Do not disassemble or modify the motor. This may cause injury. Be sure to insulate the connection terminals of the capacitor and external resistor. Failure to do so may result in electric shock. Do not touch the connection terminals of the motor or capacitor immediately (within 30 seconds) after the power is turned off. The residual voltage may cause electric shock.
	<ul style="list-style-type: none"> Assign qualified personnel the task of installing, wiring, operating/controlling, inspecting and troubleshooting the motor. Failure to do so may result in fire or injury.

Thank you for purchasing an Oriental Motor product. This Operating Manual describes product handling procedures and safety precautions.

- Please read it thoroughly to ensure safe operation.
- Always keep the manual where it is readily available.

WARNING	
	<ul style="list-style-type: none"> Turn off the power in the event of a power failure. Or the motor may suddenly start when the power is restored and may cause injury or damage to equipment. Take measures to keep the moving parts in position for vertical operations such as elevator applications. Failure to do so may result in injury or damage to equipment. Install the motor in an enclosure. Failure to do so may result in injury. Connect the motor securely in accordance with the connection example. Failure to do so may result in fire. For a power supply for DC excitation, use a DC power supply with reinforced insulation on its primary and secondary sides. Failure to do so may result in electric shock.

CAUTION	
	<ul style="list-style-type: none"> Do not use the motor beyond its specifications. This may cause injury or damage to equipment. Do not touch the motor and external resistor during operation or immediately after stopping. This may cause a skin burn(s). Do not carry the motor by holding the motor output shaft, motor lead wires or cable. Doing so may cause injury. Do not use the motor near flammable objects. Doing so may result in fire or a skin burn(s). Do not leave anything around the motor that would obstruct ventilation. Doing so may result in damage to equipment. Do not touch the rotating part (output shaft) during operation. Doing so may cause injury.
	<ul style="list-style-type: none"> Provide a cover over the rotating parts (output shaft) of the motor. Failure to do so may result in injury. Provide an emergency stop device or emergency stop circuit external to the equipment so that the entire equipment will operate safely in the event of a system failure or malfunction. Failure to do so may result in injury. Immediately when trouble has occurred, stop running and turn off the driver power. Failure to do so may result in fire or injury. The motor surface temperature may exceed 70 °C (158 °F) even under normal operating conditions. If the operator is allowed to approach the running motor, attach a warning label as shown below in a conspicuous position. Failure to do so may result in skin burn(s).



Warning label

Precautions for use

Do not give any constraint to the motor shaft.

If the motor shaft is constrained with a load torque exceeding the motor torque, the motor cannot be started and a vibrating condition will occur, resulting in a significant decrease in motor life. Be sure to use a load torque that is less than the motor torque.

Grease leakage

On rare occasions, a small amount of grease may ooze out from the geared motor. If there is concern over possible environmental damage resulting from the leakage of grease, check for grease stains during regular inspections. Alternatively, install an oil pan or other device to prevent leakage from causing further damage. Oil leakage may lead to problems in the customer's equipment or products.

• Allowable torque

Operate the motor by making sure the sum of the acceleration/deceleration torque at the starting/stopping of the motor and the load (friction) torque doesn't exceed the allowable torque. Operating the motor in excess of the allowable torque may result in a damaged gear part.

Preparation

■ **Checking the product**

Verify that the items listed below are included. Report any missing or damaged items to the branch or sales office from which you purchased the product.

- Motor 1 unit
- Mounting screw 4 pcs. (Included with geared motor)
- Capacitor..... 1 pc.
- Capacitor cap 1 pc.*
- External resistor..... 1 pc. (Included with the **SMK5** types)
- OPERATING MANUAL 1 copy (this document)

* Included with the capacitor that has UL in the model name.

Motor model	Capacitor		External resistor	
	Model	Capacitance (μF)	Ω	W
SMK014K-A SMK014K-B	CH120	12	–	–
SMK014A-A SMK014A-B SMK014MA-A SMK014MA-B SMK0A-□A* SMK0A-□B*	CH06BFAUL	0.6	–	–
SMK237A-A SMK237A-B SMK216A-GN SMK216A-GNB	CH12UL	1.2	–	–
SMK5100A-A SMK5100A-B SMK5160A-A SMK5160A-B	CH25UL	2.5	400	30
SMK5100C-A SMK5100C-B	CH06BUL	0.6	1500	30
SMK550A-GN SMK550A-GNB		0.6	400	30
SMK550C-GN SMK550C-GNB	CH035B	0.35	2000	30

* The box (□) in the model name indicates a number representing the gear ratio.

Installation

■ **Location for installation**

The motor has been designed and manufactured to be incorporated in equipment. Install it in a well-ventilated location that provides easy access for inspection. The location must also satisfy the following conditions:

- Inside an enclosure that is installed indoors (provide vent holes)
- Operating ambient temperature –10 to +40 °C (+14 to +104 °F) (non-freezing)
- Operating ambient humidity 85% or less (non-condensing)
- Area that is free of explosive atmosphere or toxic gas (such as sulfuric gas) or liquid
- Area not exposed to direct sun
- Area free of excessive amount of dust, iron particles or the like
- Area not subject to splashing water (rain, water droplets), oil (oil droplets) or other liquids
- Area free of excessive salt
- Area not subject to continuous vibration or excessive shocks
- Area free of excessive electromagnetic noise (from welders, power machinery, etc.)
- Area free of radioactive materials, magnetic fields or vacuum
- 1000 m (3300 ft.) or lower above sea level

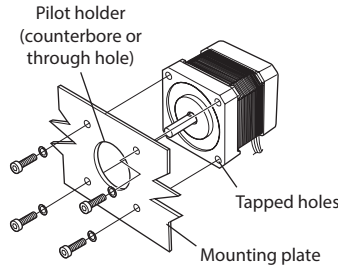
■ **Installation method**

Install the motor onto an appropriate flat metal plate having excellent vibration resistance and heat conductivity. When installing the motor, secure it with screws so that there is no gap between the motor and metal plate.

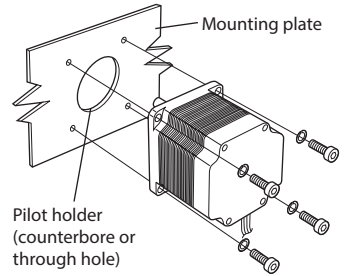
● **Round shaft type**

Using the four mounting holes (or tapped holes) located on the motor mounting surface, secure the motor with four screws (not included). Fit the pilot located on the motor mounting surface into a pilot-receiving hole having performed counterbore or through-hole machining.

● **SMK0 type**



● **SMK2, SMK5 type**



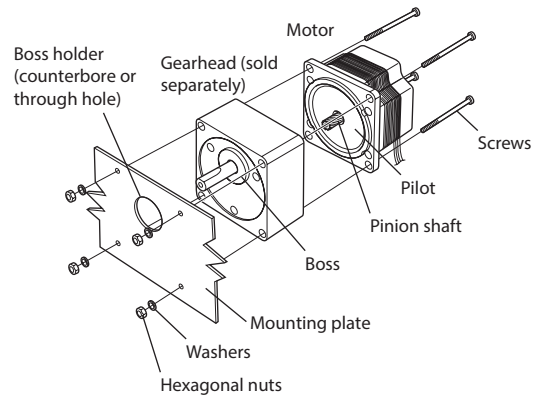
Motor type	Screw size	Tightening torque [N·m (oz-in)]
SMK0 type	M3	1 (142)
SMK2 type	M4	2 (280)
SMK5 type	M5	3 (420)

● **Pinion shaft type**

Assemble a gearhead with a motor. Match the pilot sections of the gearhead and motor, and assemble them while slowly turning the gearhead clockwise/ counterclockwise.

And secure with the screw set included with the gearhead using four mounting holes on the motor frame.

Fit the boss section on the gearhead mounting surface into a boss-receiving hole having performed counterbore or through-hole machining.



Note Do not assemble the motor and gearhead forcibly, nor bring the pinion shaft into forcible contact with the gearhead's side plate or gear. This precaution must be observed in order to avoid abnormal noise or reduced service life in the gearhead.

Combinations of motors and gearheads (sold separately)

Use the pinion shaft type in combination with the following gearhead:

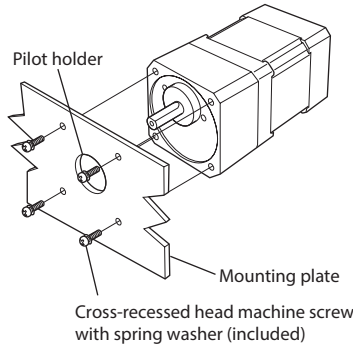
Motor model	Applicable gearhead model (sold separately) *
SMK216A-GN, SMK216A-GNB	2GN□K, 2GN□S
SMK550A-GN, SMK550A-GNB SMK550C-GN, SMK550C-GNB	5GN□K, 5GN□S

* The box (□) in the model name indicates a number representing the gear ratio.

● Geared motor (SMK0A type)

Mount the motor with four screws (included) through the four tapped holes provided on the motor mounting surface.

- Screw size: M3
- Tightening torque: 1 N·m (142 oz-in)

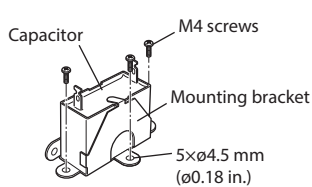
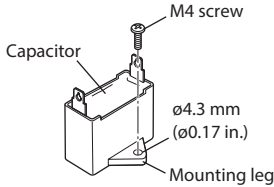


■ Installing the capacitor

Secure the capacitor in place using screws (not included), as shown in the figure.

Tightening torque: 1 N·m (142 oz-in) or less

- Type with mounting leg
- Type with mounting bracket



■ Installing a load

When installing a load to the motor, align the centers of the motor output shaft and load shaft.

When installing a flexible coupling or pulley on the motor output shaft, do so without damaging the output shaft and bearings.

■ Permissible radial load and permissible axial load

The radial load and axial load on the motor output shaft must be kept under the permissible values in the table.

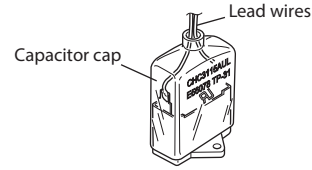
Motor type	Permissible radial load [N (lb.)]					Permissible axial load [N (lb.)]
	Distance from the tip of output shaft [mm (in.)]					
	0 (0)	5 (0.2)	10 (0.39)	15 (0.59)	20 (0.79)	
SMK014A						
SMK014K	20 (4.5)	25 (5.6)	34 (7.6)	52 (11.7)	–	10 (2.2)
SMK014M						
SMK0A *	10 (2.2)	15 (3.3)	20 (4.5)	30 (6.7)	–	15 (3.3)
SMK237	54 (12.1)	67 (15)	89 (20)	130 (29)	–	20 (4.5)
SMK5100	260 (58)	290 (65)	340 (76)	390 (87)	480 (108)	60 (13.5)
SMK5160						

* This table indicates the permissible radial load and permissible axial load of the gearhead.

Connection

■ Installing the capacitor cap

If a capacitor cap is included with a capacitor, connect lead wires to the capacitor terminals before covering with the capacitor cap.



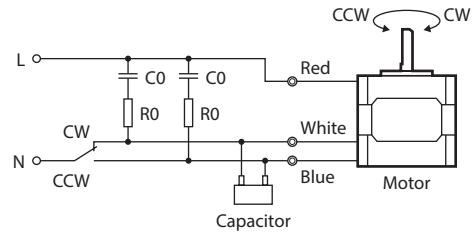
■ Connection and operation

- Be sure to connect the included capacitor as shown in the figures.
- An external resistor is also included in the **SMK5** type. Be sure to connect it.
- Setting the switch to the CW side rotates the motor output shaft in the clockwise direction. Setting the switch to the CCW side rotates the motor output shaft in the counterclockwise direction. The rotation direction of the motor output shaft indicates as viewed from the output shaft side.
- If the power supply is turned off, the motor stops.

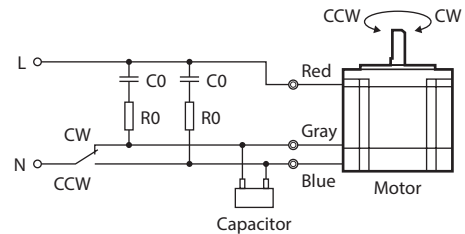
Note

- The output shaft of the pinion motors with ratios of **25, 30** and **36** rotate in the opposite direction of the motor shaft.
- The output shaft of the geared motors with ratios of **15, 18, 100** and **120** rotate in the opposite direction of the motor shaft.

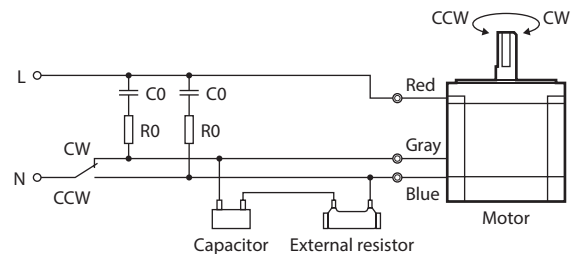
SMK0 type



SMK2 type



SMK5 type



Note

Be sure to connect a circuit for surge suppression in order to protect switches and contacts.

● About DC excitation

If a DC voltage is applied to the motor, a holding force larger than the holding torque can be obtained.

For details, check on the Oriental Motor Website.

Maintenance/inspection

■ Inspection

It is recommended that periodic inspections would be conducted for the items listed below after each operation of the motor. If an abnormal condition is noted, discontinue any use and contact your nearest Oriental Motor sales office.

During inspection

- Check if any of the motor mounting screws come loose.
- Check if a bearing part (ball bearings) of the motor generates unusual noises.
- Check if any of the motor lead wires has a scratch or receive a stress.
- Check if the motor output shaft and the load shaft are out of alignment.

■ Warranty

Check on the Oriental Motor Website or General Catalog for the product warranty.

■ Disposal

Dispose the product correctly in accordance with laws and regulations, or instructions of local governments.

Specifications and general specifications

Check on the Oriental Motor Website for the product specifications and general specifications.

Regulations and standards

The **SMK014** type and **SMK0A** type are exempt from the UL Standards and the CE Marking.

■ UL Standards

Applicable Standards	Certification Body	File No.
UL 1004-1, UL 1004-2 CSA C22.2 No.77 CSA C22.2 No.100	UL	E64199

■ CE Marking

Motors of AC power input type are affixed the CE Marking under the Low Voltage Directive.

● Low Voltage Directive

Applicable Standards

EN 60034-1, EN 60034-5, EN 60664-1, EN 60950-1

Installation conditions (EN Standard)

- To be incorporated in equipment.
- Overvoltage category: II
- Pollution degree: 2
- Protection against electric shock: Class I

■ RoHS Directive

The products do not contain the substances exceeding the restriction values of RoHS Directive (2011/65/EU).

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• Please contact your nearest Oriental Motor office for further information.

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