


**OPERATING MANUAL**

**FPW Series**  
**Dust Resistant, Water Tight Motors**  
**(Induction Motors)**



**Introduction**



■ **Before using the motor**  
 Only qualified personnel should work with the product.  
 Use the product correctly after thoroughly reading the section “Safety precautions”.  
 Should you require the inspection or repair of internal parts, contact the Oriental Motor office where you purchased the product.  
 The product described in this manual has been designed and manufactured for use in general industrial machinery, and must not be used for any other purpose. Oriental Motor Co., Ltd. is not responsible for any damage caused through failure to observe this warning.

■ **Standard and CE marking**  
 Motors are recognized by UL and certified by CQC. Recognized name and certified name are motor model name.  
 Voluntary display of the CE mark conforming to the Low Voltage Directives.  
**Standards**  
 UL 1004, UL 2111, CSA C22.2 No.100, CSA C22.2 No.77, IEC 60529, IEC 60034-5, GB 12350  
**Standards File No.**  
 UL File No.E64197, UL File No.166348 (Degree of protection), CQC  
**Applications for standard**  
 EN 60034-1, EN 60034-5, IEC 60664-1  
**Installation conditions**  
 Overvoltage category II, Pollution degree 3, Class I equipment (For EN/IEC Standards)  
 When the machinery to which the motor is mounted requires overvoltage category III specifications, connect to power supply via an isolation transformer.  
**Standards for accessories**  
 Capacitor: UL File No.E83671 (CYWT2), VDE License Nos.112847 (capacitors with a rated voltage of 250 VAC), 114747 (capacitors with a rated voltage of 450 VAC)  
 Capacitor cap: UL File No.E56078 (YDTU2)

■ **Hazardous substances**  
 RoHS (Directive 2002/95/EC 27Jan.2003) compliant

**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.

	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.
<b>Note</b>	The items under this heading contain important handling instructions that the user should observe to ensure safe use of the product.

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**

- Do not use the product in explosive or corrosive environments, in the presence of flammable gases, in water, or near combustibles. Doing so may result in fire, electric shock or injury.
- Assign qualified personnel the task of installing, wiring, operating/controlling, inspecting and troubleshooting the product. Failure to do so may result in fire, electric shock or injury.
- Do not transport, install the product, perform connections or inspections when the power is on. Always turn the power off before carrying out these operations. Failure to do so may result in electric shock.
- Turn off the power in the event the overheat protection device (thermal protector) is triggered. Failure to do so may result in injury or damage to equipment, since the motor will start abruptly when the overheat protection device (thermal protector) is automatically reset.
- To prevent the risk of electric shock, use the motor for class I equipment only.  
*Motore zur Verwendung in Geräten der Schutzklasse I.*
- When installing the motor, ground the motor using a protective grounding wire. Failure to do so may result in electric shock.  
*Erden Sie den Motor bei der Installation mit einem Schutzerdungskabel. Nichtbeachtung dieses Hinweises könnte einen elektrischen Schlag verursachen.*
- If the product is used in a place where it may come in contact with water during operation, provide an earth leakage breaker. Failure to do so may result in electric shock.
- Keep the input-power voltage within the specification to avoid fire and electric shock.
- Connect the cables securely according to the wiring diagram in order to prevent fire and electric shock.
- Do not forcibly bend, pull or pinch the cables. Doing so may result in fire and electric shock.
- Be sure to insulate the connection terminal of the capacitor. Failure to do so may result in electric shock.
- Turn off the power in the event of a power failure, or the motor will suddenly start when the power is restored and may cause injury or damage to equipment.
- Do not touch the connection terminal of the capacitor immediately after the power is turned off (for a period of 30 seconds). The residual voltage may cause electric shock.
- Do not disassemble or modify the motor. This may cause electric shock or injury.

 **Caution**

- Do not use the motor beyond its specifications, or electric shock, injury or damage to equipment may result.
- Do not touch the motor during operation or immediately after stopping. The surface is hot and may cause a burn.
- Do not hold the motor output shaft or motor cable. This may cause injury.
- Keep the area around the motor free of combustible materials in order to prevent fire or a burn.

- To prevent the risk of damage to equipment, leave nothing around the motor that would obstruct ventilation.
- To prevent bodily injury, do not touch the rotating parts (output shaft) of the motor during operation.
- When an abnormality is noted, turn off the power immediately, or fire, electric shock or injury may occur.
- The motor's surface temperature may exceed 70 °C, even under normal operating conditions. If a motor is accessible during operation, post the warning label shown in the figure in a conspicuous position to prevent the risk of burns.
- To dispose of the motor, disassemble it into parts and components as much as possible and dispose of individual parts/components as industrial waste.



Warning label

## Preparation

### ■ Checking the product

Upon opening the package, 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
- Capacitor ..... 1 piece (only for single-phase motors)
- Capacitor cap ..... 1 piece (only for single-phase motors)
- Operating manual ..... 1 copy
- Set of mounting bolts ..... 1 set  
(Mounting screws, Nuts, Washers 4 pieces each, Key 1 piece)

### ■ Checking the model name

Check the model number against the number indicated on the product.

#### ● 100 V/110 V/115 V type

Model	Motor model	Capacitor model
FPW425A2-□J	FPW425A2-□	CH80CFAUL2
FPW425A2-□U	FPW425A2-□	CH65CFAUL2
FPW540A2-□J	FPW540A2-□	CH110CFAUL2
FPW540A2-□U	FPW540A2-□	CH90CFAUL2
FPW560A2-□J	FPW560A2-□	CH180CFAUL2
FPW560A2-□U	FPW560A2-□	CH120CFAUL2
FPW690A2-□J	FPW690A2-□	CH250CFAUL2
FPW690A2-□U	FPW690A2-□	CH180CFAUL2

#### ● 200 V/220 V/230 V type

Model	Motor model	Capacitor model
FPW425C2-□J	FPW425C2-□	CH20BFAUL
FPW425C2-□E	FPW425C2-□	CH15BFAUL
FPW540C2-□J	FPW540C2-□	CH30BFAUL
FPW540C2-□E	FPW540C2-□	CH23BFAUL
FPW560C2-□J	FPW560C2-□	CH40BFAUL
FPW560C2-□E	FPW560C2-□	CH30BFAUL
FPW690C2-□J	FPW690C2-□	CH60BFAUL
FPW690C2-□E	FPW690C2-□	CH45BFAUL
FPW425S2-□	FPW425S2-□	—
FPW540S2-□	FPW540S2-□	—
FPW560S2-□	FPW560S2-□	—
FPW690S2-□	FPW690S2-□	—

The gear ratio appears at the model number indicated by the box (□).

## Installation

### ■ Location for installation

Install the motor in a well-ventilated location that provides easy access for inspection. The location must also satisfy the following conditions:

- Indoors
- Operating ambient temperature
  - 10 to +40 °C (+14 to +104 °F) (non-freezing)
  - 10 to +50 °C (+14 to +122 °F) for 100 V/200 V
- Area that is free from an explosive atmosphere or toxic gas (such as sulfuric gas) or liquid

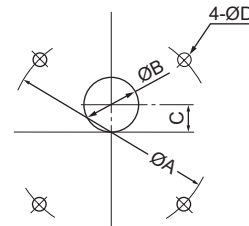
- Area not exposed to direct sun
- Area free of excessive salt
- Area not subject to continuous vibration or excessive shocks
- Area free of excessive electromagnetic noise (from welders, power machinery, etc.)
- Area free of radioactive materials, magnetic fields or vacuum
- 1000 m or less above sea level

### ■ How to install the motor

Drill holes in the mounting plate and fasten the motor to the mounting plate with screws, nuts, and washers. Be sure that no gaps are left between the gearhead pilot section of the mounting plate.

The maximum plate thickness applicable when the supplied screws are used is 10 mm (0.39 in.).

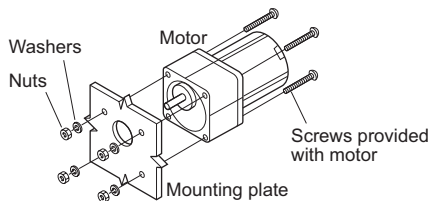
Installation holes



Model	Installation hole dimensions [mm (in.)]				Size of key [mm (in.)]
	ØA	ØB	C	4-ØD	
FPW 425	94 (3.70)	34 (1.34)	15 (0.59)	5.5 (0.22)	□4×25 (□0.1575×0.984)
FPW 540	104 (4.09)	36 (1.42)	18 (0.71)	6.5 (0.26)	□4×25 (□0.1575×0.984)
FPW 560	104 (4.09)	34 (1.34)	18 (0.71)	6.5 (0.26)	□5×25 (□0.1969×0.984)
FPW 690	120 (4.72)	42 (1.65)	20 (0.79)	8.5 (0.34)	□6×25 (□0.2362×0.984)

### Note

ØB indicates the external dimension of the gearhead boss. Provide a hole with a sufficient allowance.



### Mounting screws

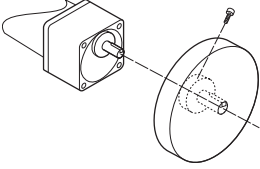
Model	Size of mounting screws		Tightening torque [N·m (lb-in.)]
	Thread size	Length [mm (in.)]	
FPW425	M5 P0.8	80 (3.15)	3.8 (33)
FPW540	M6 P1.0	90 (3.54)	6.4 (56)
FPW560	M6 P1.0	90 (3.54)	6.4 (56)
FPW690	M8 P1.25	100 (3.94)	15.5 (137)

### Note

- Do not disassemble the gearhead from the motor.
- Be sure to use the supplied screws and tighten within the specified torque in order to ensure proper water proof fit.

## ■ Attaching Load

To shaft of the gearhead has been machined to an outer diameter tolerance of h7 and is provided with a key slot for connecting the transmission parts. When connecting the transmission parts, ensure that the shaft and parts have a clearance fit, and always fix the parallel key to the output shaft with a screw to prevent the parts from rattling or spinning.



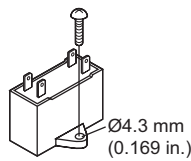
### Note

Do not use excessive force, or hammer the transmission parts onto the gearmotor shaft as damage may occur.

## ■ Mounting the capacitor (only for single-phase motors)

Before mounting the provided capacitor, check that the capacitor's capacitance matches that stated on the motor's name plate.

Mount the capacitor securely by using M4 screws (not provided).



### Note

- Do not let the screw fastening torque exceed 1 N·m (8.8 lb-in) to prevent damage to the mounting foot.
- Mount capacitor at least 10 cm (3.94 in.) away from the motor. If it is located closer, the life of the capacitor will be shortened.

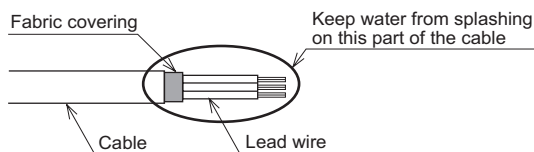
## Connection and operation

Insulate all the wire connections, such as the connection between the motor and the capacitor connection.

Ground the motor using a protective grounding wire.

### Note

- When removing the sheath of the cable, be careful not to damage the inside lead wire.
- Insulation class of this motor is B. Make sure that the motor case temperature does not exceed 90 °C (194 °F) during operation of the motor. Operation exceeding case temperature 90 °C (194 °F) may significantly deteriorate the coils and ball bearings of the motor and shorten the motor's life span. Motor case temperature can be measured by fixing a thermometer on the motor surface. It can also be measured using thermo tape or a thermocouple.
- To change rotation direction of the single-phase motor, wait until the motor completely stops. Otherwise its direction may not change or may take much time to change.
- Single-phase motors use a capacitor and keep it connected even after rotation of the motor has started.
- Be sure not to splash water on the cable terminal, otherwise water could seep inside the motor through the lead wire or the fabric covering.



## ■ Wiring Diagram

The direction of rotation is as viewed from the side of the motor's output shaft. The motor rotates in a clockwise (CW) and counterclockwise (CCW) direction.

The connection method will vary depending on the gear ratio of the gearhead.

Motor type	Gear ratio	
	3 to 18	25 to 36
25 W	3 to 18	25 to 36
40 W	50 to 180	
60 W	3 to 9	12.5 to 18
	25 to 60	75 to 180
90 W	3 to 9	12.5 to 36
	50 to 180	

Single-phase	<Clockwise>	<Clockwise>
100 V		
110 V		
115 V		
200 V		
220 V		
230 V		

Three-phase	<Clockwise>	<Clockwise>
200 V		
220 V		
230 V		

A relay box and extension cable for cable are available as an option.

Relay box **TB4-0608**

Extension cable **CC05AC43P** (4 wires, 5 m)

**CC10AC43P** (4 wires, 10 m)

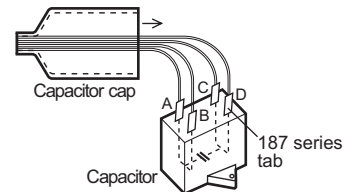
- The extension cable has 4-wires; white, gray, black and green/yellow. When using an extension cable, be sure to connect the red lead wire of the motor to the gray wire of the cable.

## ■ Capacitor connection (only for single-phase motors)

The capacitor internal wiring as follows:

Capacitor terminals are internally electrically connection in twos; A-B and C-D for easy connection. For easy to install terminals use 187 series AMP FASTON terminals (Tyco Electronics AMP).

Use the supplied capacitor cap to insulate the capacitor terminal connection.



### Note

For lead wire connection, use one lead wire for each individual terminal.

## Time rating

This motor can be operated continuously (continuous rating).

## Locked rotor burnout protection

This motor is equipped with the feature listed below to prevent the motor from burning out as a result of abnormal heating which may be caused by misapplication.

### ■ Thermal protection

“TP” is stamped on the motor nameplate. The motor has an “auto reset” type thermal protector built into its motor coil. When the motor reaches a predetermined temperature, the internal thermal protector is activated and the motor is stopped.

Always turn the power off before performing inspections.

Thermal protector activation range:

Power is turned off at 130±5 °C (266±9 °F)

Power is turned back on at 82±15 °C (180±27 °F)

## Troubleshooting

When the motor cannot be operated correctly, refer to the contents provided in this section and take appropriate action. If the problem persists, contact your nearest office.

Phenomena	Check items
The motor does not rotate.	<ul style="list-style-type: none"> <li>• Check the power supply voltage.</li> <li>• Connect the power supply and the motor correctly.</li> <li>• With a single-phase motor, connect the supplied capacitor correctly.</li> <li>• If terminal blocks or crimp terminals are used, check them for poor connection.</li> <li>• Keep the load at or below the allowable value.</li> </ul>
Motor sometimes rotates and stops.	<ul style="list-style-type: none"> <li>• Connect the power supply and the motor correctly.</li> <li>• With a single-phase motor, connect the supplied capacitor correctly.</li> <li>• If terminal blocks or crimp terminals are used, check them for poor connection.</li> </ul>
The motor rotates in the direction opposite to the specified direction.	<ul style="list-style-type: none"> <li>• Connect correctly by referring to “Wiring diagram.”</li> <li>• With a single-phase motor, connect the supplied capacitor correctly.</li> <li>• The rotating direction of the motor output shaft may be different from that of the gearhead output shaft depending on the gear ratio of the gearhead. Connect correctly by referring to “Wiring diagram.”</li> <li>• The rotating direction is indicated as viewed from the motor output shaft. Check the reference direction.</li> </ul>
Motor temperature abnormally high [Motor case temperature exceeds 90 °C (194 °F)]	<ul style="list-style-type: none"> <li>• Check the power supply voltage.</li> <li>• With a single-phase motor, connect the supplied capacitor correctly.</li> <li>• Review the ventilation condition.</li> </ul>

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