

Standard AC Motors

Watertight, Dust-Resistant Motors

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RoHS RoHS-Compliant

Watertight, Dust-Resistant Motors

FPW Series

Induction Type

● Additional Information ●
 Technical reference → Page F-1
 Safety standards → Page G-2

The **FPW** Series are geared motors which conform to the IEC Standard IP67 (Recognized by UL). They are ideal for applications where they are splashed or where the equipment needs washing periodically. These watertight motors are available in 25 W, 40 W, 60 W and 90 W models, and conform to the RoHS Directive.



● List of safety standard approved products (Model, Standards, File No., Certification Body)
 → Page G-10



Features

● Watertight and Dust-Resistant Performance IP67

The **FPW** Series motors are watertight, dust-resistant geared induction motors which conform to the IEC Standard IP67. They can be used where they are splashed with water, but they are not suitable for use under high pressure jets of water or immersion in water.

IP67: IP codes indicating the grade of dust-resistance and waterproofing are specified under IEC 60529 and EN 60034-5 (= IEC 60034-5).

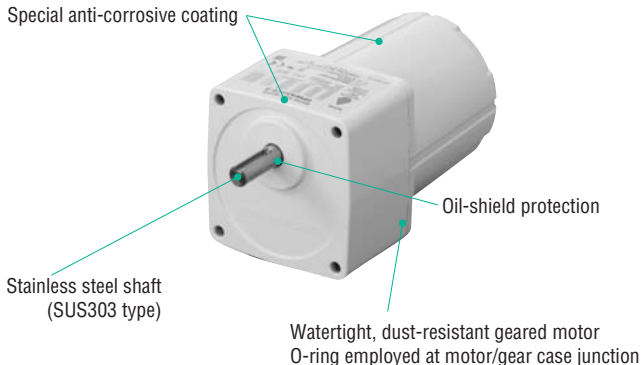
FPW Series recognized by UL conforms to IP67 (UL File No. E166348).

● Improved Anti-Corrosion Properties

High corrosion resistance is achieved through special anti-corrosive coating and re-examination of shaft material [stainless steel (SUS303 type)].

● Designed and Constructed for Watertight and Dust-Resistance

Special anti-corrosive coating



● Conform to Safety Standards

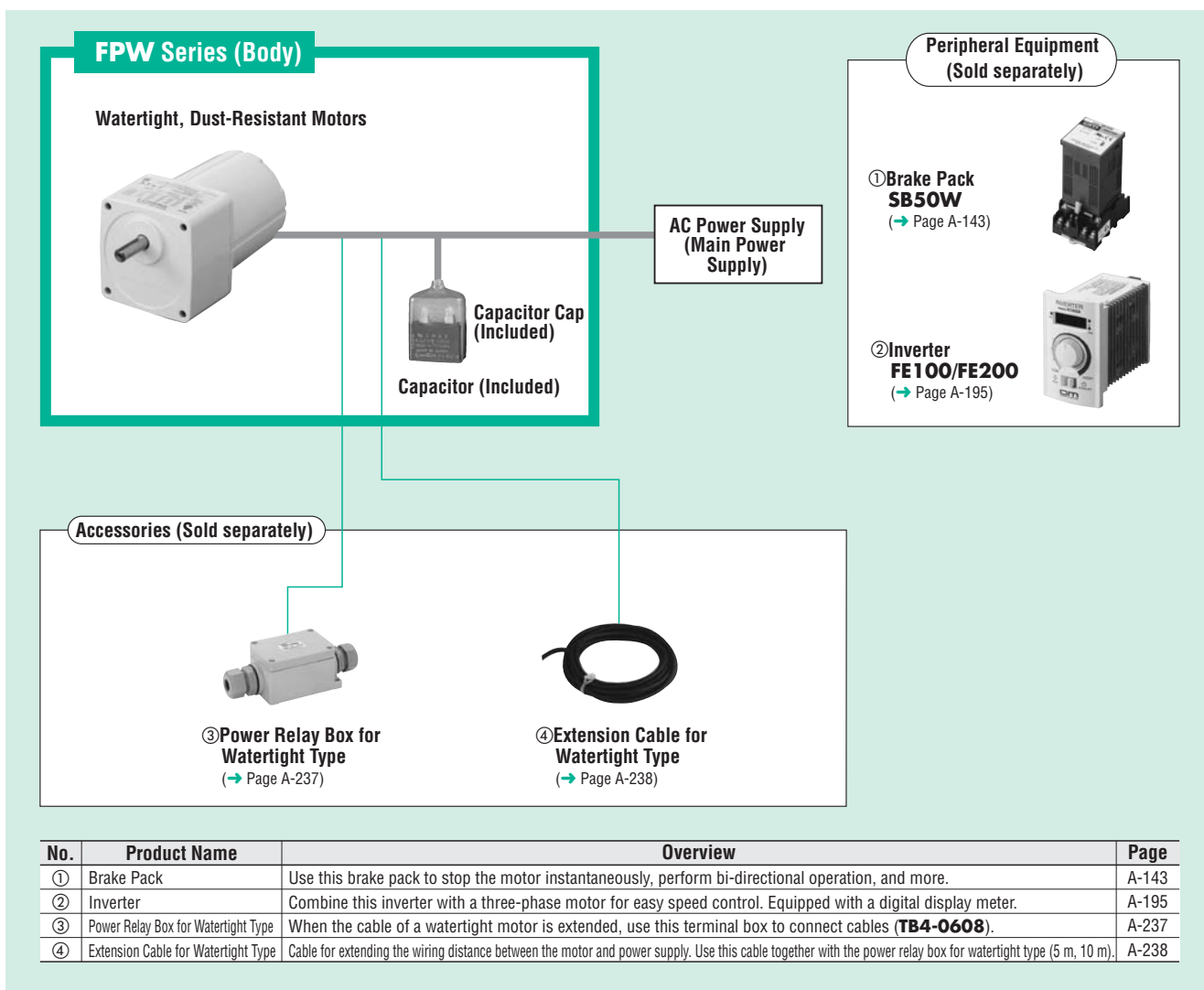
The **FPW** Series is recognized by UL/CSA Standards and conforms to CE Marking (Low Voltage Directive). These motors are also certified under the China Compulsory Certification System (CCC System).

● **RoHS** RoHS-Compliant

The **FPW** Series conforms to the RoHS Directive that prohibits the use of six chemical substances including lead and cadmium.

● Details of RoHS Directive → Page G-23

System Configuration



● Example of System Configuration



- The system configuration shown above is an example. Other combinations are available.
- A capacitor is included with single-phase motors. The capacitors for the motors are neither watertight nor dust-resistant.

Product Number Code

FPW 4 25 C 2 - 15 E

① ② ③ ④ ⑤ ⑥ ⑦

①	Series	FPW: FPW Series
②	Motor Frame Size	4: 80 mm 5: 90 mm 6: 104 mm
③	Output Power (W)	(Example) 25: 25 W
④	Power Supply Voltage	A: Single-Phase 100 VAC, 110/115 VAC C: Single-Phase 200 VAC, 220/230 VAC S: Three-Phase 200/220/230 VAC
⑤	RoHS-Compliant	2: RoHS-Compliant
⑥	Gear Ratio	
⑦	Included Capacitor	J: For Single-Phase 100 VAC and 200 VAC U: For Single-Phase 110/115 VAC E: For Single-Phase 220/230 VAC

● The **J**, **U** and **E** at the end of the model name indicate that the unit includes a capacitor. These letters are not listed on the motor nameplate.

When the motor is approved under various safety standards, the model name on the nameplate is the approved model name. → Page G-10

(Example) Model: **FPW425C2-15E**

→ Motor nameplate and product approved under various safety standards: **FPW425C2-15**

Product Line (RoHS)

Output Power	Power Supply Voltage	Model	Gear Ratio	Page
25 W	Single-Phase 100 VAC	FPW425A2-□J	3~180	*
	Single-Phase 110/115 VAC	FPW425A2-□U	3~180	*
	Single-Phase 200 VAC	FPW425C2-□J	3~180	*
	Single-Phase 220/230 VAC	FPW425C2-□E	3~180	A-211
	Three-Phase 200/220/230 VAC	FPW425S2-□	3~180	A-211
40 W	Single-Phase 100 VAC	FPW540A2-□J	3~180	*
	Single-Phase 110/115 VAC	FPW540A2-□U	3~180	*
	Single-Phase 200 VAC	FPW540C2-□J	3~180	*
	Single-Phase 220/230 VAC	FPW540C2-□E	3~180	A-211
	Three-Phase 200/220/230 VAC	FPW540S2-□	3~180	A-211
60 W	Single-Phase 100 VAC	FPW560A2-□J	3~180	*
	Single-Phase 110/115 VAC	FPW560A2-□U	3~180	*
	Single-Phase 200 VAC	FPW560C2-□J	3~180	*
	Single-Phase 220/230 VAC	FPW560C2-□E	3~180	A-211
	Three-Phase 200/220/230 VAC	FPW560S2-□	3~180	A-211
90 W	Single-Phase 100 VAC	FPW690A2-□J	3~180	*
	Single-Phase 110/115 VAC	FPW690A2-□U	3~180	*
	Single-Phase 200 VAC	FPW690C2-□J	3~180	*
	Single-Phase 220/230 VAC	FPW690C2-□E	3~180	A-211
	Three-Phase 200/220/230 VAC	FPW690S2-□	3~180	A-211

● Enter the gear ratio in the box (□) within the model name.

* For the single-phase 100 VAC, the single-phase 110/115 VAC and the single-phase 200 VAC models, please contact the nearest Oriental Motor sales office.

— The following items are included in each product. —

Motor, Capacitor*, Capacitor Cap*, Mounting Screws, Parallel Key, Operating Manual

* Only for single-phase motors

Specifications – Continuous Rating (RoHS)



Model	Output Power W	Voltage VAC	Frequency Hz	Current A	Starting Torque mN·m	Rated Torque mN·m	Rated Speed r/min	Capacitor μ F
TP FPW425C2-□E	25	Single-Phase 220	50	0.27	110	205	1200	1.5
			60	0.23		170	1450	
		Single-Phase 230	50	0.27	120	205	1200	
			60	0.23		170	1450	
TP FPW425S2-□	25	Three-Phase 200	50	0.23	240	190	1300	-
			60	0.21		160	1550	
		Three-Phase 220	60	0.21	160	160	1600	
			60	0.22		160	1600	
TP FPW540C2-□E	40	Single-Phase 220	50	0.39	200	315	1250	2.3
			60	0.35		260	1500	
		Single-Phase 230	50	0.39		300	1300	
			60	0.34		260	1500	
TP FPW540S2-□	40	Three-Phase 200	50	0.32	400	300	1300	-
			60	0.30		260	1550	
		Three-Phase 220	60	0.30	260	260	1600	
			60	0.31		260	1600	
TP FPW560C2-□E	55	Single-Phase 220	50	0.52	300	430	1250	3.0
			60	0.48		405	1450	
		Single-Phase 230	50	0.51		430	1250	
			60	0.47		405	1450	
TP FPW560S2-□	60	Three-Phase 200	50	0.48	600	450	1300	-
			60	0.43		500	1550	
		Three-Phase 220	60	0.44	500	380	1600	
			60	0.45		380	1600	
TP FPW690C2-□E	90	Single-Phase 220	50	0.82	400	700	1250	4.5
			60	0.73		605	1450	
		Single-Phase 230	50	0.81		700	1250	
			60	0.71		605	1450	
TP FPW690S2-□	90	Three-Phase 200	50	0.54	700	680	1300	-
			60	0.51		570	1550	
		Three-Phase 220	60	0.50	700	570	1600	
			60	0.49		570	1600	

TP: Contains a built-in thermal protector (automatic return type). If a motor overheats for any reason, the thermal protector is activated and the motor is stopped. When the motor temperature drops, the thermal protector closes and the motor restarts. Be sure to turn the motor off before inspecting.

- Enter the gear ratio in the box (□) within the model name.
- The value for each specification applies to the motor only.
- In addition to the products shown above, the products for single-phase 100 VAC, single-phase 110/115 VAC and single-phase 200 VAC are also available. Please contact the nearest Oriental Motor sales office.

General Specifications

Item	Specifications
Insulation Resistance	100 M Ω or more when 500 VDC megger is applied between the windings and the case after rated operation under normal ambient temperature and humidity.
Dielectric Strength	Sufficient to withstand 1.5 kV at 50 Hz or 60 Hz applied between the windings and the case for 1 minute after rated operation under normal ambient temperature and humidity.
Temperature Rise	Temperature rise of windings are 80°C or less measured by the resistance change method after rated operation under normal ambient temperature and humidity. (Three-phase type: 70°C or less)
Insulation Class	Class B (130°C)
Overheat Protection	Built-in thermal protector (automatic return type) Operating temperature; open: 130 \pm 5°C, close: 82 \pm 15°C
Ambient Temperature	Three-Phase 200 VAC: -10 ~ +50°C (non-freezing) Single-Phase 220/230 VAC, Three-Phase 220/230 VAC: -10 ~ +40°C (non-freezing)
Degree of Protection	IP67

Notes:

- Since these are special watertight, dust-resistant geared motors, the motor and gearhead sections cannot be disassembled.
- The capacitors for the motors are neither watertight nor dust-resistant.

■ Gearmotor – Torque Table

● 50 Hz

Unit = N-m

Model	Speed r/min	500	417	300	250	200	167	120	100	83	60	50	42	30	25	20	17	15	12.5	10	8.3
	Gear Ratio	3	3.6	5	6	7.5	9	12.5	15	18	25	30	36	50	60	75	90	100	120	150	180
FPW425C2-□E (230 VAC)	Rated	0.50	0.60	0.83	1.0	1.2	1.5	2.1	2.5	3.0	3.7	4.5	5.4	6.8	8	8	8	8	8	8	8
	Starting	0.29	0.35	0.49	0.58	0.73	0.87	1.2	1.5	1.7	2.2	2.6	3.2	4.0	4.8	5.9	7.1	7.9	8	8	8
FPW425C2-□E (220 VAC)	Rated	0.50	0.60	0.83	1.0	1.2	1.5	2.1	2.5	3.0	3.7	4.5	5.4	6.8	8	8	8	8	8	8	8
	Starting	0.27	0.32	0.45	0.53	0.67	0.80	1.1	1.3	1.6	2.0	2.4	2.9	3.6	4.4	5.4	6.5	7.3	8	8	8
FPW425S2-□	Rated	0.46	0.55	0.77	0.92	1.2	1.4	1.9	2.3	2.8	3.5	4.2	5.0	6.3	7.5	8	8	8	8	8	8
	Starting	0.46	0.55	0.77	0.92	1.2	1.4	1.9	2.3	2.8	3.5	4.2	5.0	6.3	7.5	8	8	8	8	8	8
FPW540C2-□E (220 VAC)	Rated	0.77	0.92	1.3	1.5	1.9	2.3	3.2	3.8	4.6	5.7	6.9	8.3	10	10	10	10	10	10	10	10
	Starting	0.49	0.58	0.81	0.97	1.2	1.5	2.0	2.4	2.9	3.7	4.4	5.3	6.6	7.9	9.9	10	10	10	10	10
FPW540C2-□E (230 VAC)	Rated	0.73	0.87	1.2	1.5	1.8	2.2	3.0	3.6	4.4	5.5	6.6	7.9	9.9	10	10	10	10	10	10	10
	Starting	0.49	0.58	0.81	0.97	1.2	1.5	2.0	2.4	2.9	3.7	4.4	5.3	6.6	7.9	9.9	10	10	10	10	10
FPW540S2-□	Rated	0.73	0.87	1.2	1.5	1.8	2.2	3.0	3.6	4.4	5.5	6.6	7.9	9.9	10	10	10	10	10	10	10
	Starting	0.73	0.87	1.2	1.5	1.8	2.2	3.0	3.6	4.4	5.5	6.6	7.9	9.9	10	10	10	10	10	10	10
FPW560C2-□E	Rated	1.0	1.3	1.7	2.1	2.6	3.1	3.9	4.7	5.7	7.1	8.5	10.2	14.2	15	15	15	15	15	15	15
	Starting	0.73	0.87	1.2	1.5	1.8	2.2	2.7	3.3	3.9	5.0	5.9	7.1	9.9	11.9	13.3	15	15	15	15	15
FPW560S2-□	Rated	1.1	1.3	1.8	2.2	2.7	3.3	4.1	4.9	5.9	7.4	8.9	10.7	14.9	15	15	15	15	15	15	15
	Starting	1.1	1.3	1.8	2.2	2.7	3.3	4.1	4.9	5.9	7.4	8.9	10.7	14.9	15	15	15	15	15	15	15
FPW690C2-□E	Rated	1.7	2.0	2.8	3.4	4.3	5.1	6.4	7.7	9.2	12.8	15.3	18.4	23.1	27.7	30	30	30	30	30	30
	Starting	0.97	1.2	1.6	1.9	2.4	2.9	3.7	4.4	5.3	7.3	8.8	10.5	13.2	15.8	19.8	23.8	26.4	30	30	30
FPW690S2-□	Rated	1.7	2.0	2.8	3.3	4.1	5.0	6.2	7.4	8.9	12.4	14.9	17.9	22.4	26.9	30	30	30	30	30	30
	Starting	1.7	2.0	2.8	3.3	4.1	5.0	6.2	7.4	8.9	12.4	14.9	17.9	22.4	26.9	30	30	30	30	30	30

● 60 Hz

Unit = N-m

Model	Speed r/min	600	500	360	300	240	200	144	120	100	72	60	50	36	30	24	20	18	15	12	10
	Gear Ratio	3	3.6	5	6	7.5	9	12.5	15	18	25	30	36	50	60	75	90	100	120	150	180
FPW425C2-□E (230 VAC)	Rated	0.41	0.50	0.69	0.83	1.0	1.2	1.7	2.1	2.5	3.1	3.7	4.5	5.6	6.7	8	8	8	8	8	8
	Starting	0.29	0.35	0.49	0.58	0.73	0.87	1.2	1.5	1.7	2.2	2.6	3.2	4.0	4.8	5.9	7.1	7.9	8	8	8
FPW425C2-□E (220 VAC)	Rated	0.41	0.50	0.69	0.83	1.0	1.2	1.7	2.1	2.5	3.1	3.7	4.5	5.6	6.7	8	8	8	8	8	8
	Starting	0.27	0.32	0.45	0.53	0.67	0.80	1.1	1.3	1.6	2.0	2.4	2.9	3.6	4.4	5.4	6.5	7.3	8	8	8
FPW425S2-□	Rated	0.39	0.47	0.65	0.78	0.97	1.2	1.6	1.9	2.3	2.9	3.5	4.2	5.3	6.3	7.9	8	8	8	8	8
	Starting	0.39	0.47	0.65	0.78	0.97	1.2	1.6	1.9	2.3	2.9	3.5	4.2	5.3	6.3	7.9	8	8	8	8	8
FPW540C2-□E	Rated	0.63	0.76	1.1	1.3	1.6	1.9	2.6	3.2	3.8	4.7	5.7	6.8	8.6	10	10	10	10	10	10	10
	Starting	0.49	0.58	0.81	0.97	1.2	1.5	2.0	2.4	2.9	3.7	4.4	5.3	6.6	7.9	9.9	10	10	10	10	10
FPW540S2-□	Rated	0.63	0.76	1.1	1.3	1.6	1.9	2.6	3.2	3.8	4.7	5.7	6.8	8.6	10	10	10	10	10	10	10
	Starting	0.63	0.76	1.1	1.3	1.6	1.9	2.6	3.2	3.8	4.7	5.7	6.8	8.6	10	10	10	10	10	10	10
FPW560C2-□E	Rated	0.98	1.2	1.6	2.0	2.5	3.0	3.7	4.4	5.3	6.7	8.0	9.6	13.4	15	15	15	15	15	15	15
	Starting	0.73	0.87	1.2	1.5	1.8	2.2	2.7	3.3	3.9	5.0	5.9	7.1	9.9	11.9	13.3	15	15	15	15	15
FPW560S2-□	Rated	0.92	1.1	1.5	1.8	2.3	2.8	3.5	4.2	5.0	6.3	7.5	9.0	12.5	15	15	15	15	15	15	15
	Starting	0.92	1.1	1.5	1.8	2.3	2.8	3.5	4.2	5.0	6.3	7.5	9.0	12.5	15	15	15	15	15	15	15
FPW690C2-□E	Rated	1.5	1.8	2.5	2.9	3.7	4.4	5.5	6.6	7.9	11.0	13.2	15.9	20.0	24.0	29.9	30	30	30	30	30
	Starting	0.97	1.2	1.6	1.9	2.4	2.9	3.7	4.4	5.3	7.3	8.8	10.5	13.2	15.8	19.8	23.8	26.4	30	30	30
FPW690S2-□	Rated	1.4	1.7	2.3	2.8	3.5	4.2	5.2	6.2	7.5	10.4	12.5	15.0	18.8	22.6	28.2	30	30	30	30	30
	Starting	1.4	1.7	2.3	2.8	3.5	4.2	5.2	6.2	7.5	10.4	12.5	15.0	18.8	22.6	28.2	30	30	30	30	30

● Enter the gear ratio in the box (□) within the model name.

● The speed is calculated by dividing the motor's synchronous speed (50 Hz: 1500 r/min, 60 Hz: 1800 r/min) by the gear ratio.

The actual speed is 2-20% less than the displayed value, depending on the load.

Permissible Overhung Load and Permissible Thrust Load

Model	Gear Ratio	Permissible Overhung Load		Permissible Thrust Load N
		10 mm from Shaft End N	20 mm from Shaft End N	
FPW425 Type	3~18	100	150	50
	25~180	200	300	
FPW540 Type	3~18	250	350	100
	25~180	300	450	
FPW560 Type	3~9	400	500	150
	12.5~18	450	600	
	25~180	500	700	
FPW690 Type	3~9	550	800	200
	12.5~180	650	1000	

Permissible Load Inertia: J

Unit = $J \times 10^{-4} \text{ kg-m}^2$

Model	Gear Ratio	3	3.6	5	6	7.5	9	12.5	15	18	25	30	36	50	60	75	90	100	120	150	180	
FPW425 Type		2.79	4.02	7.75	11.2	17.4	25.1	48.4	69.8	100	194	279	402	775	775	775	775	775	775	775	775	775
FPW540 Type		6.75	9.72	18.8	27	42.2	60.8	117	169	243	469	675	972	1875	1875	1875	1875	1875	1875	1875	1875	1875
FPW560 Type		9.9	14.3	27.5	39.6	61.9	89.1	172	248	356	688	990	1426	2750	2750	2750	2750	2750	2750	2750	2750	2750
FPW690 Type		18	25.9	50	72	113	162	313	450	648	1250	1800	2592	5000	5000	5000	5000	5000	5000	5000	5000	5000

Dimensions (Unit = mm)

- Mounting screws are included with the motor. Dimensions for mounting screws → Page A-246
- Enter the gear ratio in the box (□) within the model name.

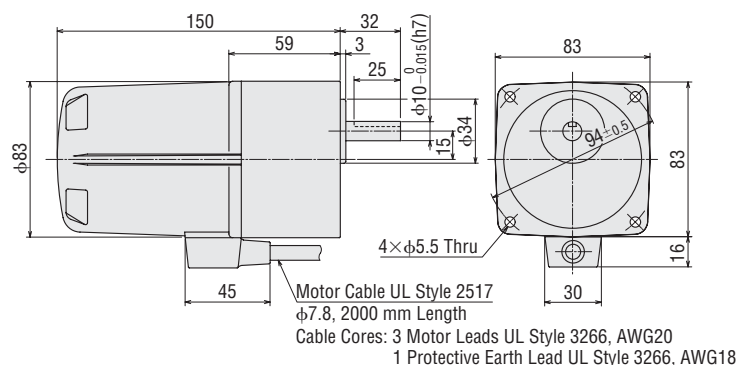
● 25 W

◇ Geared Motors

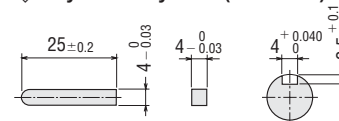
FPW425C2-□E, FPW425S2-□

Motor: FPW425C2-□, FPW425S2-□

Mass: 3.0 kg



◇ Key and Key Slot (Included)



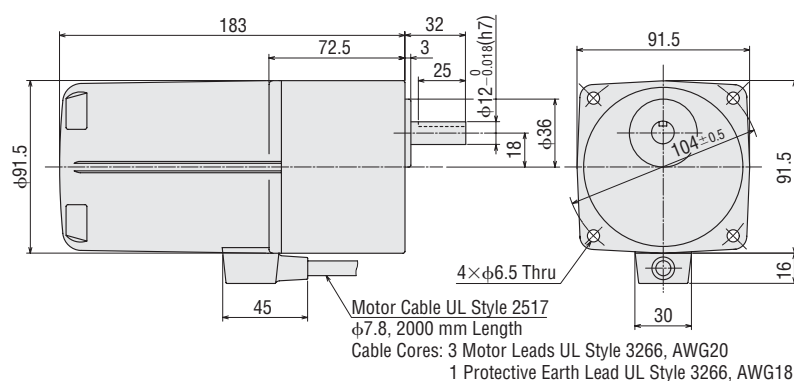
● 40 W

◇ Geared Motors

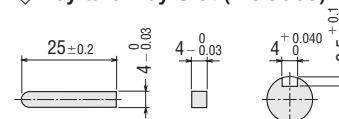
FPW540C2-□E, FPW540S2-□

Motor: FPW540C2-□, FPW540S2-□

Mass: 4.0 kg



◇ Key and Key Slot (Included)



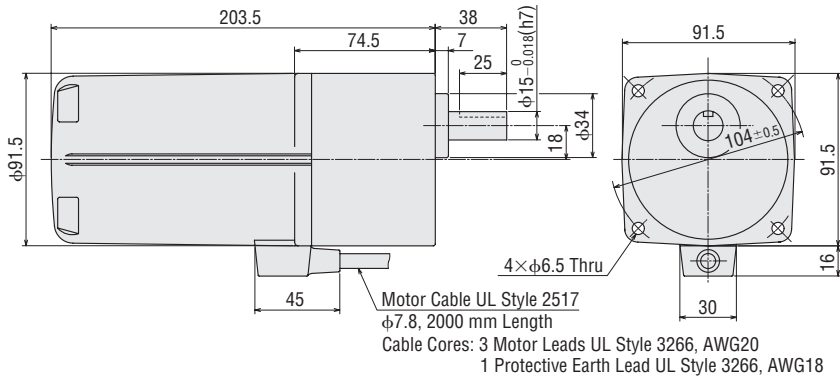
● 60 W

◇ Geared Motors

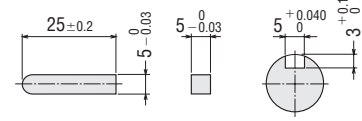
FPW560C2-□E, FPW560S2-□

Motor: FPW560C2-□, FPW560S2-□

Mass: 5.0 kg



◇ Key and Key Slot (Included)



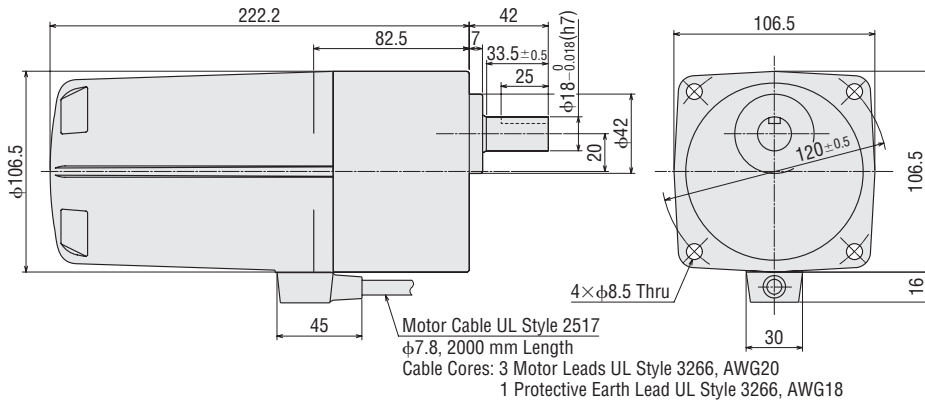
● 90 W

◇ Geared Motors

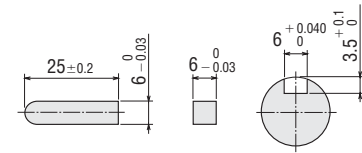
FPW690C2-□E, FPW690S2-□

Motor: FPW690C2-□, FPW690S2-□

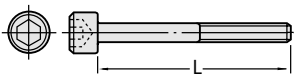
Mass: 7.5 kg



◇ Key and Key Slot (Included)



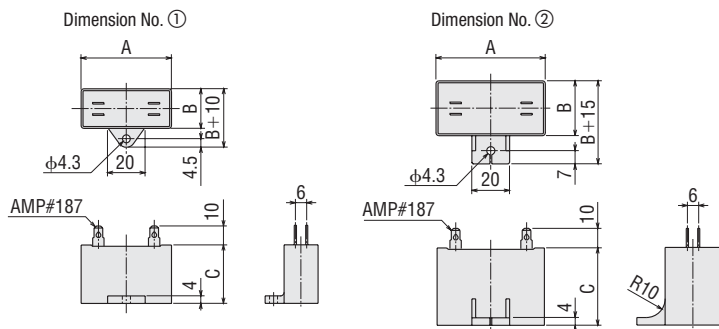
◇ Mounting Screws (Included) (Material: Stainless steel)



	Length: L (mm)	Size
FPW425 Type	80	M5 P0.8
FPW540 Type	90	M6 P1.0
FPW560 Type	90	M6 P1.0
FPW690 Type	100	M8 P1.25

● 4 flat washers and hexagonal nuts are included.

◇ Capacitor (Included with single-phase motors)



◇ Capacitor Dimensions (mm)

Model	Capacitor Model	A	B	C	Mass (g)	Dimension No.
FPW425C2 -□E	CH15BFAUL	38	21	31	35	①
FPW540C2 -□E	CH23BFAUL	48	21	31	40	①
FPW560C2 -□E	CH30BFAUL	58	21	31	50	①
FPW690C2 -□E	CH45BFAUL	58	23.5	37	73	②

- A capacitor cap is included with a capacitor.
- Enter the gear ratio in the box (□) within the model name.

■ Connection and Operation

- The direction of motor rotation is as viewed from the shaft end of the motor. CW represents the clockwise direction, while CCW represents the counterclockwise direction.
- The connection method varies with the output power or the gear ratio.
- For added safety, it is advisable to use a ground fault interrupt circuit in situations where the motor is likely to get wet during operation.

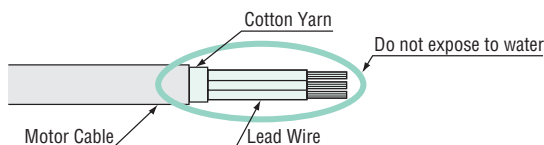
	Single-Phase 220/230 VAC		Three-Phase 200/220/230 VAC	
25 W 40 W	Gear Ratio 3~18 50~180	Gear Ratio 25~36	Gear Ratio 3~18 50~180	Gear Ratio 25~36
60 W	Gear Ratio 3~9 25~60	Gear Ratio 12.5~18 75~180	Gear Ratio 3~9 25~60	Gear Ratio 12.5~18 75~180
90 W	Gear Ratio 3~9 50~180	Gear Ratio 12.5~36	Gear Ratio 3~9 50~180	Gear Ratio 12.5~36
	Clockwise 	Clockwise 	Clockwise 	Clockwise
	Counterclockwise 	Counterclockwise 	Counterclockwise To change the rotation direction, change any two connections between R, S and T.	Counterclockwise To change the rotation direction, change any two connections between R, S and T.

Note:

- Change the direction of single-phase motor rotation only after bringing the motor to a stop. If an attempt is made to change the direction of rotation while the motor is rotating, motor may ignore reversing command or change its direction of rotation after some delay.
- How to connect a capacitor → Page A-247

● Wiring Precautions

The terminals of the motor cable are not waterproofed. Be sure not to splash water on the terminal, otherwise water could seep inside the motor through the lead wire or the cotton yarn, resulting in damage to the motor.



Standard AC Motors

Accessories

	<u>Page</u>
Motor/Gearhead Mounting Brackets.....	A-230
Flexible Couplings	A-233
External Speed Potentiometer.....	A-237
Power Relay Box for Watertight Type.....	A-237
Extension Cable for Watertight Type.....	A-238
Extension Cables.....	A-238
Connection Cables	A-239
Front Cover.....	A-239
Noise Filter	A-240
CR Circuit for Surge Suppression	A-240

Accessories

Motor/Gearhead Mounting Brackets RoHS

Dedicated mounting Brackets for attaching and securing a motor and gearhead. They are high-strength type, which can be used with high power motor and gearhead. These brackets come with tapped holes. To mount the motor and gearhead, simply fasten with the screws provided to the gearhead. To mount the motor alone, mounting screws must be purchased separately.

Please note that these mounting brackets cannot be used with the following products:

- Right-angle gearheads (**RH** type, **RA** type)
- Right-angle shaft type (**BH** Series)
- Watertight, dust-resistant motors
- Hollow shaft flat gearhead (**GFS2G**□**FR**, **GFS4G**□**FR**, **GFS5G**□**FR**)
- **GFS6G**□



■ For Motor Frame Size: □ 42 mm

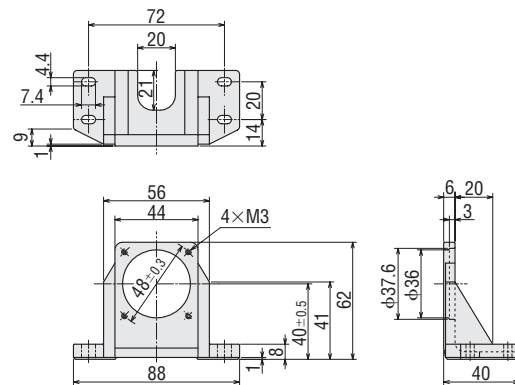
● Model: **SOLOM3**

Mass: 85 g Material: Aluminum alloy

◇ Applicable Products

BLH Series Round shaft type
Frame size 42 mm motor

● Dimensions (Unit = mm)



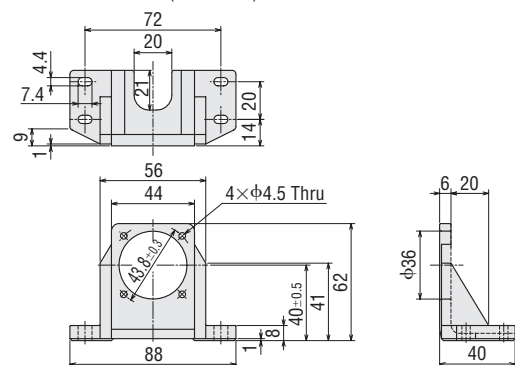
● Model: **SOLOB**

Mass: 85 g Material: Aluminum alloy

◇ Applicable Products

BLH Series Geared motor

● Dimensions (Unit = mm)



For Motor Frame Size: □60 mm

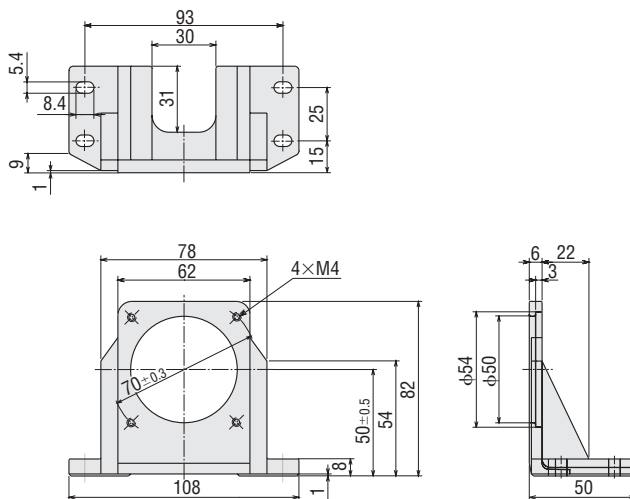
● Model: **SOL2M4**

Mass: 135 g Material: Aluminum alloy

◇ Applicable Products

- 2GN** gearhead
- GFS2G** gearhead
- Frame size 60 mm motor

● Dimensions (Unit = mm)



For Motor Frame Size: □70 mm

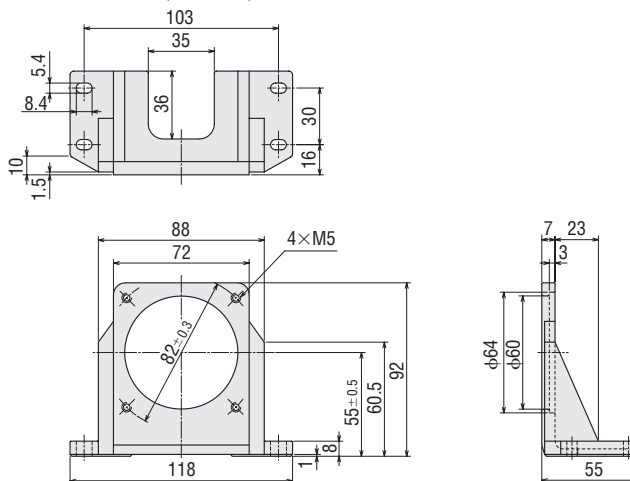
● Model: **SOL3M5**

Mass: 175 g Material: Aluminum alloy

◇ Applicable Products

- 3GN** gearhead
- Frame size 70 mm motor

● Dimensions (Unit = mm)



For Motor Frame Size: □80 mm

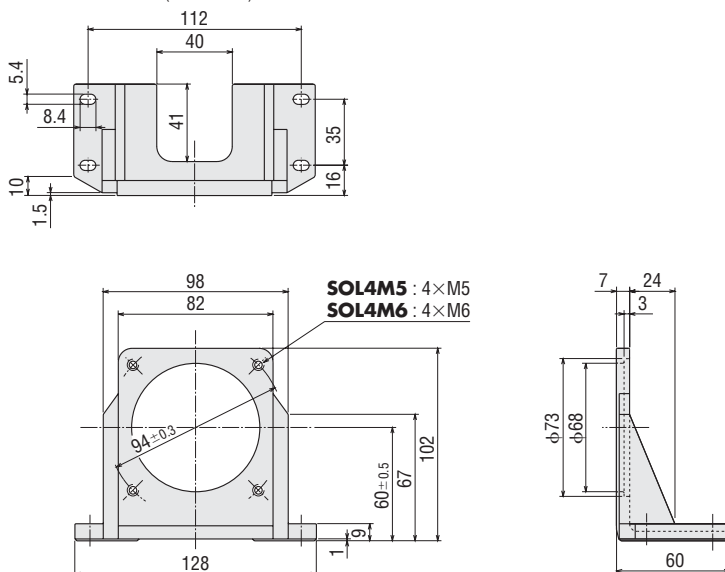
● Model: **SOL4M5, SOL4M6**

Mass: 210 g Material: Aluminum alloy

◇ Applicable Products

- **SOL4M5**
4GN gearhead
For standard AC motors with a frame size 80 mm
- **SOL4M6**
GFS4G gearhead
For brushless DC motors with a frame size 80 mm

● Dimensions (Unit = mm)



For Motor Frame Size: □ 90 mm

● **Model: SOL5M6, SOL5M8**

Mass: 270 g Material: Aluminum alloy

◇ **Applicable Products**

● **SOL5M6**

5GN gearhead

5GE gearhead

5GU□KB gearhead

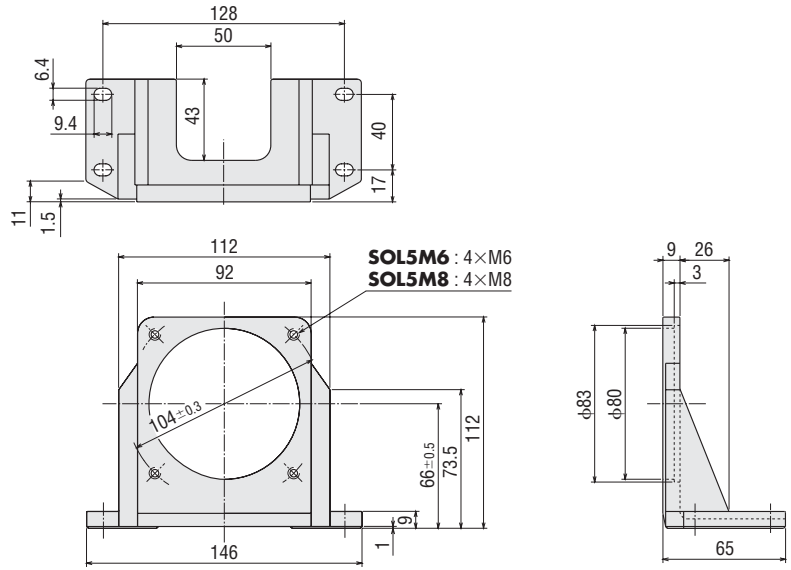
For standard AC motors with a frame size 90 mm

● **SOL5M8**

GFS5G gearhead

For brushless DC motors with a frame size 90 mm

● **Dimensions (Unit = mm)**



For Motor Frame Size: □ 104 mm

● **Model: SOL6M8**

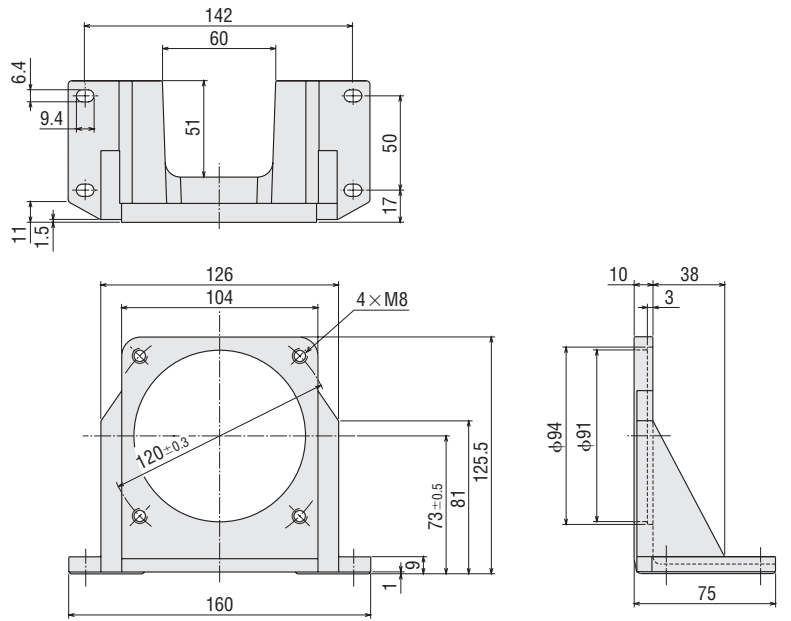
Mass: 380 g Material: Aluminum alloy

◇ **Applicable Products**

BH Series

BLF Series Round shaft type

● **Dimensions (Unit = mm)**



Flexible Couplings RoHS

These products are clamp type couplings to connect motor or gearhead shaft to the shaft of the equipment to be connected. Once the motor or gearhead are determined, the coupling can be selected.



Features

- Couplings come with shaft holes and have standardized combinations for different diameter shaft holes.
- Characteristics are the same for clockwise and counterclockwise rotation.
- Oil-resistant and electrically insulated
- Aluminum alloy construction
- The driven shaft is not damaged, since shafts are joined by clamping.
- Easy installation due to a separated hub and sleeve design

Selecting a Flexible Coupling

Once you decide on a motor or gearhead and the shaft diameter of the equipment to be connected, you can select the proper flexible coupling to use. **MCL** couplings are available in external diameter that provide the strength required for the torque of motor or gearhead.

Example **MCL 30 10 12**

Inner Diameter d1 Inner Diameter d2

- For uniform load, when the gearhead is **4GN□S** (shaft outer diameter of $\phi 10$ mm) and the shaft diameter of the equipment to be connected is $\phi 12$ mm, use **MCL301012**.
- For impact-applied use, when the gearhead is **4GN□S** (shaft outer diameter of $\phi 10$ mm) and the shaft diameter of the equipment to be connected is $\phi 12$ mm, use **MCL401012**.

Product Number Code

MCL 40 12 15

① ② ③ ④

①	Flexible Coupling	
②	Outer Diameter of Coupling	20: $\phi 20$ mm ~ 65: $\phi 65$ mm
③	Inner Diameter d1 (Small Inner Diameter)	05: $\phi 5$ mm ~ 25: $\phi 25$ mm
④	Inner Diameter d2 (Large Inner Diameter)	05: $\phi 5$ mm ~ 25: $\phi 25$ mm

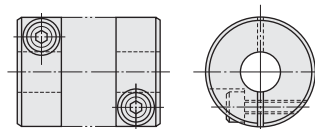
● Details of applicable products → Page A-234

Mounting on a Shaft

The **MCL** couplings are clamp type for mounting the flexible coupling to the shaft.

Clamp Type

Clamp type couplings use the binding force of the screw to compress the axis hole diameter and thereby fasten the coupling to the shaft. This does not damage the shaft and is easy to mount and remove. The following table shows the screw tightening torque. And, the use of a torque wrench is recommended for tightening.



Type	*MCL20	MCL30	MCL40	MCL55	MCL65
Tightening torque [N·m]	1	2.5	12	25	50
Tightening torque of key press screw [N·m]	0.7	1.7	1.7	1.7	4

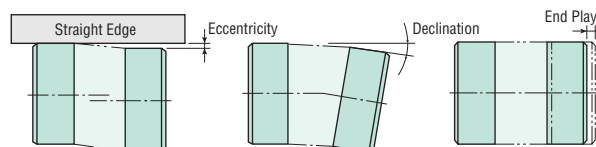
* The screws for holding shaft flat are used for **MCL20** Type.

Alignment Adjustment

Flexible couplings tolerate misalignment of the axis center and transfer rotation angle and torque, but produce vibration when the permissible value for misalignment is exceeded. This can dramatically shorten the life of coupling. Be sure to adjust the alignment.

Misalignment of the axis center includes eccentricity (parallel error of both centers), declination (angle error of both centers) and end play (shaft movement in the axial direction). To keep misalignment within the permissible value, always check and adjust the alignment.

To increase the life of the coupling, we recommend keeping misalignment to below 1/3 of the permissible value.



Notes:

- Misalignment or excessive torque beyond the permissible values will deform the coupling and shorten its life.
- If you hear a strange metallic noise from the coupling while operating, stop the motor immediately and check for misalignment, shaft interference, loose screws or the like.
- When the load fluctuates substantially, paint adhesive over the screws or switch to a larger coupling diameter. This helps to prevent coupling screws from coming loose.
- When using couplings that have no key slot, as on the **MCL20**, **MCL30**, etc., fasten clamping screws before fastening set screws.
- Only use the screws specified by Oriental Motor. Other screws may damage the couplings.
- Do not bring fingers or hands into contact with an operating coupling as injury may result. Always use protective covers to prevent accidents. Also, install safety systems that stop motor rotation as soon as the protective cover is opened.
- Always be sure the power is off during installation. Should the drive unit accidentally start running, injury can occur by being drawn into the device. Always check that main power supply of the device is off before installation.

■ Applicable Products

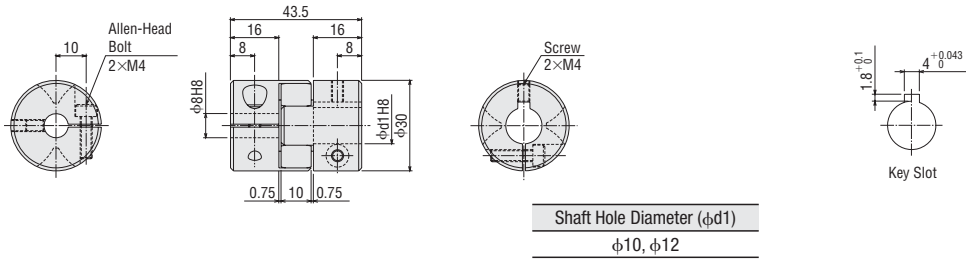
Couplings are also available for round shaft motors if a shaft diameter matches.

□: For uniform load □: For impact load □: Common use of uniform load and impact load

Gearhead Model		Gearhead Output Shaft Outer Diameter mm	Applicable Shaft Diameter to be Connected mm											Coupling Type	Nominal Torque N-m	Mass g	Outer Diameter mm	Length mm			
Uniform Load	Impact Load		φ5	φ6	φ8	φ10	φ12	φ14	φ15	φ16	φ18	φ20	φ22						φ25		
2GN□S		φ8															MCL20	5	19	φ20	29
	2GN□S	φ8																			
3GN□S 4GN□S 4GN□RA GFS2G□	3GN□S GFS2G□	φ10															MCL30	12.5	66	φ30	43.5
5GN□S 5GN□RA		φ12																			
	4GN□S 4GN□RA	φ10																			
	5GN□S 5GN□RA	φ12																			
5GE□S 5GU□KB 5GE□RA 5GU□RA GFS4G□		φ15															MCL40	25	150	φ40	64
	5GE□S 5GU□KB 5GE□RA 5GU□RA GFS4G□	φ15																			
GFS5G□ BH6G2-□	GFS5G□	φ18																			
	BH6G2-□	φ18																			
BH6G2-□RA GFS6G□	BH6G2-□RA GFS6G□	φ22															MCL65	160	570	φ65	87.5

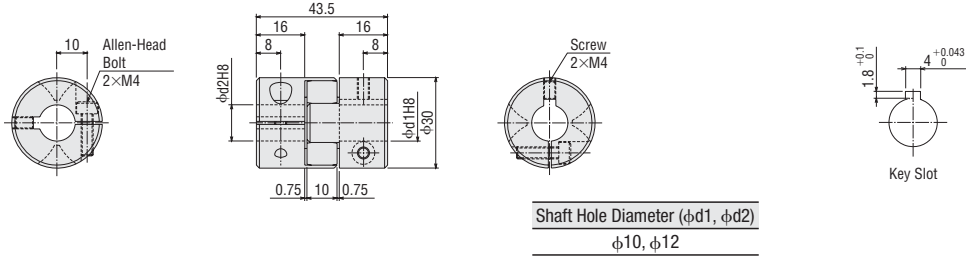
● The load in this table are of common use. Check the specifications values of each coupling for details.

MCL300810
MCL300812



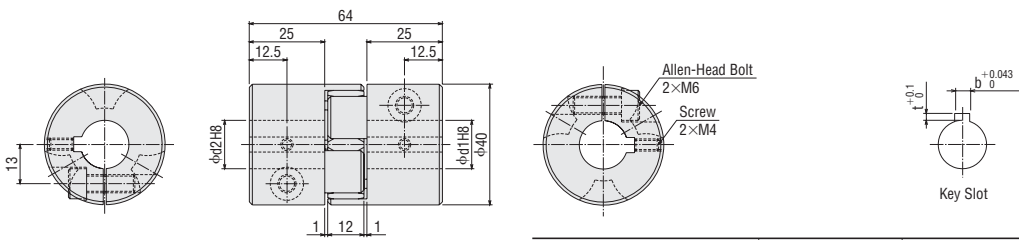
Shaft Hole Diameter ($\phi d1$)
 $\phi 10, \phi 12$

MCL301010
MCL301012
MCL301212



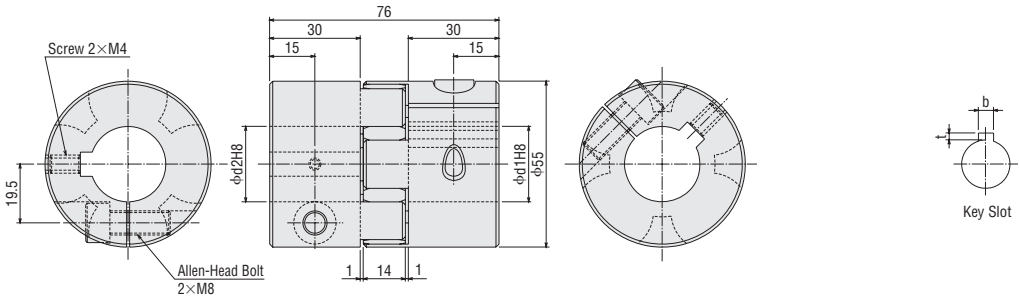
Shaft Hole Diameter ($\phi d1, \phi d2$)
 $\phi 10, \phi 12$

MCL40 type



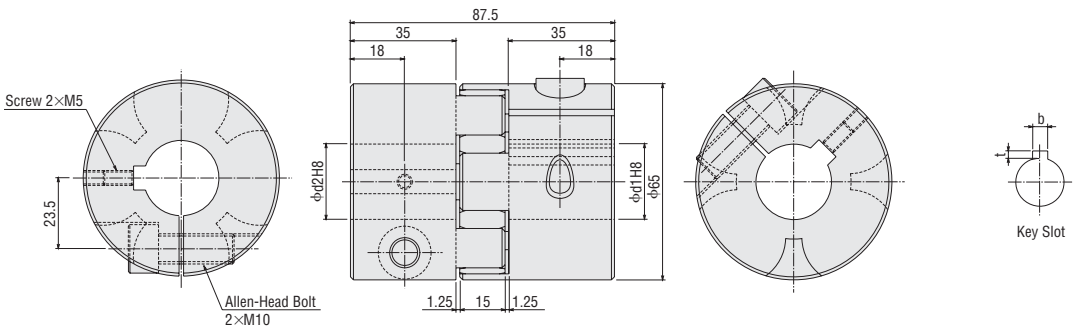
Shaft Hole Diameter ($\phi d1, \phi d2$)	Key Slot Width b	Key Slot Length t
$\phi 10, \phi 12$	4	1.8
$\phi 14, \phi 15, \phi 16$	5	2.3

MCL55 type



Shaft Hole Diameter ($\phi d1, \phi d2$)	Key Slot Width b	Key Slot Length t
$\phi 15, \phi 16$	$5^{+0.043}_0$	$2.3^{+0.1}_0$
$\phi 18, \phi 20$	$6^{+0.052}_0$	$2.8^{+0.1}_0$
$\phi 25$	$8^{+0.052}_0$	$3.3^{+0.2}_0$

MCL65 type



Shaft Hole Diameter ($\phi d1, \phi d2$)	Key Slot Width b	Key Slot Length t
$\phi 15, \phi 16$	$5^{+0.043}_0$	$2.3^{+0.1}_0$
$\phi 18, \phi 20, \phi 22$	$6^{+0.052}_0$	$2.8^{+0.1}_0$
$\phi 25$	$8^{+0.052}_0$	$3.3^{+0.2}_0$

External Speed Potentiometer RoHS

- Model: **PAVR-20KZ**
(20 k Ω 1/4 W, with a linear resistance vs. angle curve)

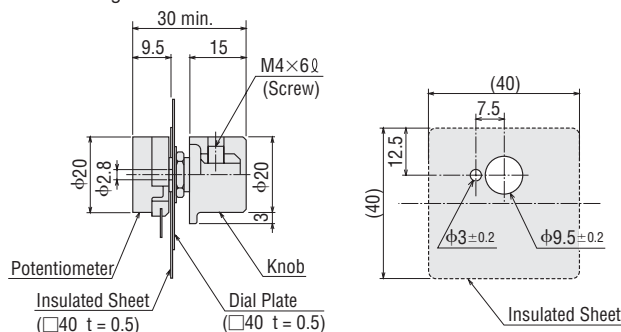


- ◇ Applicable Products
ES02
BLF Series
BLH Series

Note:

- One set of this external speed potentiometer is included with **ES02**.
External speed potentiometer is not included with **BLF** Series and **BLH** Series.
The external speed potentiometer is used for control involving multiple speed settings.

- Dimensions (Unit = mm)
Mass: 20 g



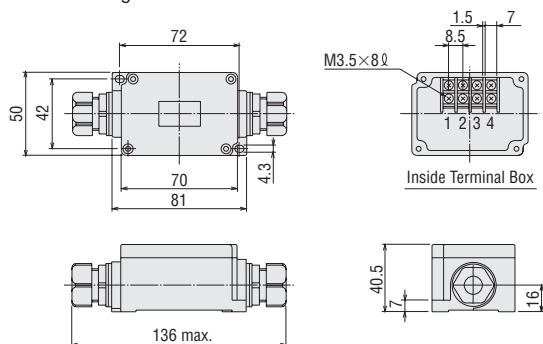
Recommended thickness of a mounting plate is a maximum 4.5 mm.

Power Relay Box for Watertight Type RoHS

- Model: **TB4-0608** (4-Terminal Type)



- Dimensions (Unit = mm)
Mass: 150 g



- ◇ Applicable Motors
FPW Series
BH Series

Applicable cable diameter: $\phi 6.5 \sim \phi 8.5$ mm

- The power relay box conforms to IP65 only when used with an extension cable for watertight type for **FPW** Series. (Does not conform to IP65 when used with **BH** Series.)

Screws for the sealed connector and the cover of power relay box should be adjusted to the torque shown below.

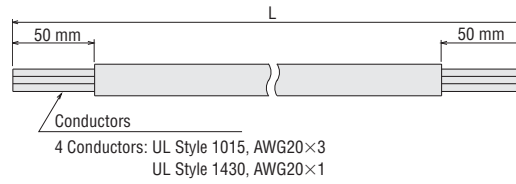
Sealed connector	1.0~1.5 N·m
Cover of power relay box	0.54~0.66 N·m

- This product can be used with lead wire type. However, they are not watertight. Also, note that lead wires cannot be fixed with the sealed connectors.

Extension Cable for Watertight Type RoHS

Use with the power relay box for watertight type. An extension of 5 m and 10 m is possible.

Number of Conductors	Model	Applicable Product	Cable Length: L (m)
4 Conductors	CC05AC43P	BH Series	5
	CC10AC43P	FPW Series	10



Specifications

Conductor construction: Refer to the dimension on the right

Finished outer diameter: $\phi 7.8$

Outer casing: Heat-resistant vinyl chloride

Extension Cables

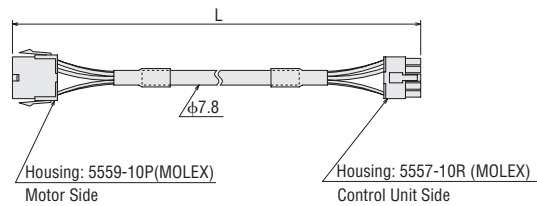
Cables for US Series RoHS

Extension cable for connecting **US** Series motor and control unit. Two types are available, depending on the motor output power. The maximum extension length is 4.75 m.

Applicable Motors

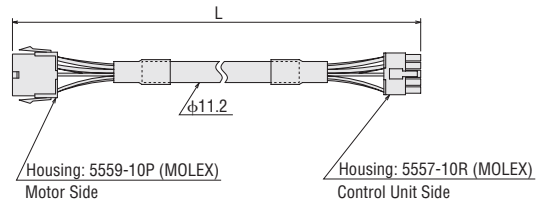
◇ **US206, US315, US425** and **US540** types

Model	Cable Length: L (m)
CC01SU05	1
CC02SU05	2
CC03SU05	3
CC04SU05	4



◇ **US560** and **US590** types

Model	Cable Length: L (m)
CC01SU07	1
CC02SU07	2
CC03SU07	3
CC04SU07	4



Note:

- These cables are for exclusive use with RoHS-Compliant. They cannot be connected to **US** Series that do not conform to RoHS Directive, as the connector is different.

Connection Cables RoHS

This cable is needed when connecting the motor and inverter (**FE100/FE200**) or extending their wiring length.

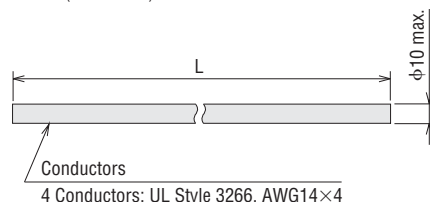
● **Applicable Products**

◇ **FE100/FE200**

Model	Cable Length: L (m)
CC01AC04	1
CC02AC04	2
CC03AC04	3
CC05AC04	5
CC10AC04	10
CC20AC04	20



● **Dimensions** (Unit = mm)

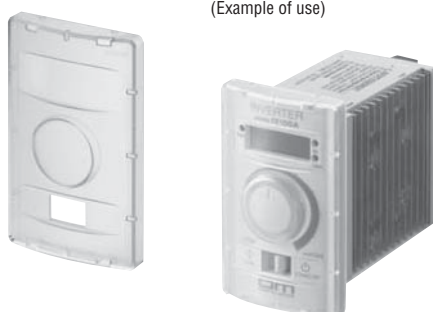


Front Cover RoHS

A clear cover placed over the front panel of inverter **FE100/FE200**. This cover prevents accidental contact with the speed potentiometer and resulting shift in the set speed. The front cover is not waterproof.

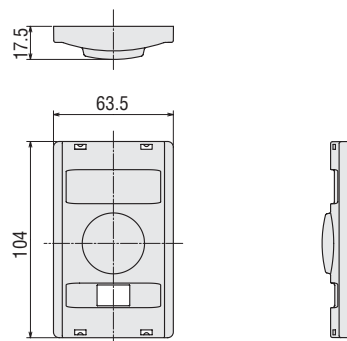
● **Model: PAFC01**

◇ **Applicable Product**
FE100/FE200



● **Dimensions** (Unit = mm)

Mass: 10 g



Noise Filter RoHS

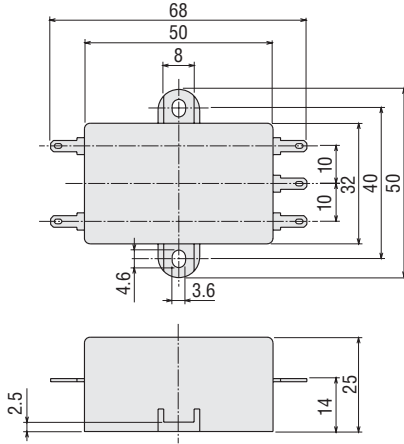
The noise filter can be used to reduce electrical noise generated by speed controller and brake pack.

● **Model: ZCB2203-11S**

250 VAC 3A

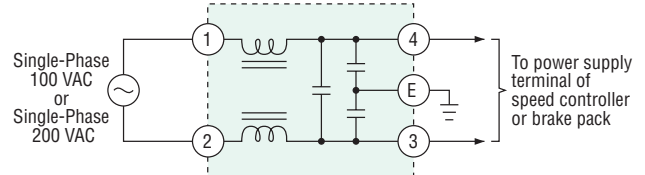
● **Dimensions** (Unit = mm)

Mass: 55 g

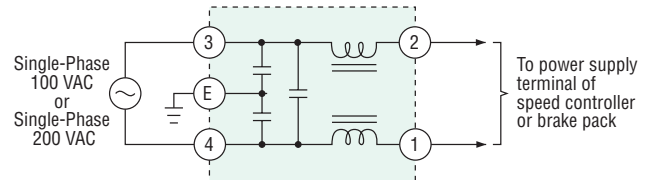


● **Connecting Method**

1. Protection from external noise



2. Prevention of noise generation

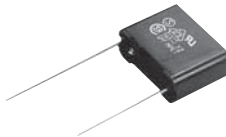


CR Circuit for Surge Suppression RoHS

This product is used to protect the contacts of the relay or switch used in the bi-directional circuit section or the instantaneous stop circuit section of a motor.

● **Model: EPCR1201-2**

250 VAC (120 Ω, 0.1 μF)



● **Dimensions** (Unit = mm)

Mass: 5 g

