Standard AC Motors

Brake Pack SB50W

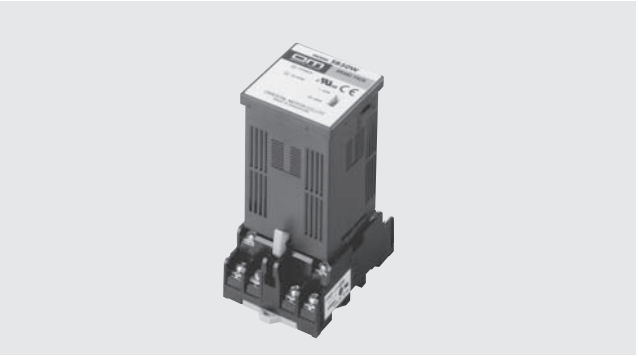
RoHS RoHS-Compliant

Brake Pack
SB50W

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

The **SB50W** provides instantaneous stop, bi-directional operation, electromagnetic brake control and thermal protector open detection functions integrated into one unit. This brake pack can sense when the thermal protector is opened, further ensuring the safety of your equipment.
For greater convenience, a function has been added to reset alarms using an external signal.

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



Features

●Four Functions in One Integrated Unit

The **SB50W** provides instantaneous stop, bi-directional operation, electromagnetic brake control and thermal protector open detection function*.

*Thermal protector open detection function
(Available only when combined with a motor having a built-in thermal protector)
When the motor's thermal protector (overheat protection device) is activated, the **SB50W** outputs an alarm signal and automatically cuts the power supply to the motor. The motor will not restart by itself, even after the temperature drops and the thermal protector recovers. Possible to reset the alarm through external signals.

●Wide Voltage Range of 100 to 230 VAC

The **SB50W** covers a single-phase voltage range of 100 to 230 VAC ±10%, accommodating world's major voltage.

●Conforms to Safety Standards

The **SB50W** is recognized by UL and CSA, and the CE Marking is used in accordance with the EMC Directive and Low Voltage Directive. Use this product according to the power supply voltage of applicable motors.

●Supports Motors with 6 W to 90 W Output

The **SB50W** can be used with induction motors, reversible motors, electromagnetic brake motors and watertight, dust-resistant motors with an output power of 6 W to 90 W.

●Switchable Sink/Source Logic

Select the sink logic or source logic for the input/output circuit. You can change the setting at any time.

●RoHS RoHS-Compliant

The **SB50W** conforms to the RoHS Directive that prohibits the use of six chemical substances including lead and cadmium.

● Details of RoHS Directive ➜ Page G-23

●Instantaneous Stop

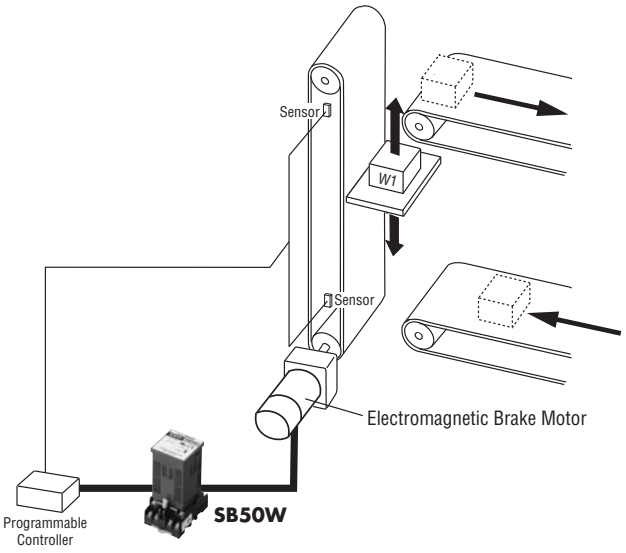
The electronic brake stops the motor instantaneously. A large braking force causes the motor to stop in approximately 0.1 second, allowing for an overrun of 1 to 1.5 rotations. The braking current flows through the motor for approximately 0.4 seconds, after which the power supply to the motor is cut off automatically (The motor will lose its holding brake force).

●Long Life, Simple Wiring and Maintenance-Free

The electronic brake operates on current flow, so it lasts longer than the mechanically operated electromagnetic brake that is subject to wear. This makes the **SB50W** ideal for indexing applications.
The electronic-input type brake pack doesn't use a power relay, so no maintenance is required. Wiring is easy, as well.

●Link Electronic Brake and Electromagnetic Brake

By combining the **SB50W** with a motor equipped with an electromagnetic brake, you can link the electronic brake with the electromagnetic brake to allow the load to be held automatically following an instantaneous stop. This configuration is ideal for vertical applications in which the load must be held following the instantaneous stop of the motor.



Features A-144 / System Configuration A-146 / Specifications A-147

Characteristics of Brake Pack

How to Read Braking Characteristics (Reference values)

The brake pack provides stable braking characteristics for the instantaneous stop of the motor. The braking characteristics are illustrated by the braking curve, which indicates the amount of overrun corresponding to the load inertia.
The braking time is $4n/f$ seconds or less.
Where, n: overrun, f: power supply frequency.

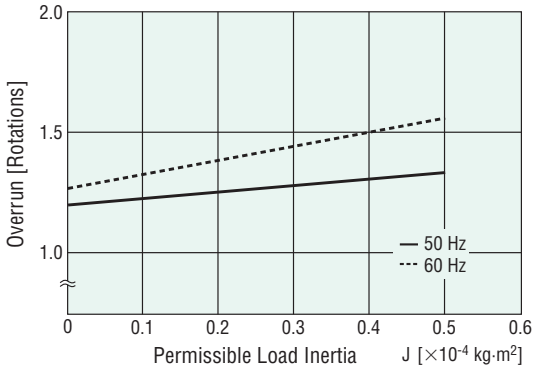
For example, if the **4IK25GN-CW2E** (single-phase 220/230 VAC, 25 W) and **SB50W** are used together to stop a load with an inertia of $J = 0.25$ [$\times 10^{-4}$ kg·m^2], the overrun and braking time required will be approximately 1.25 rotations and 0.1 second, respectively, at a power supply frequency of 50 Hz. In the case of deceleration using a gearhead, refer to the braking characteristics curve after converting the load inertia at the gearhead shaft to its corresponding value at the motor shaft.

Use the following formula to convert the load inertia at the gearhead shaft to its corresponding value at the motor shaft:

$$J_M = \frac{J_G}{i^2} \text{ [kg·m}^2\text{]}$$

J_M : Load inertia converted to corresponding value at the motor shaft
J_G : Load inertia at the gearhead shaft
i : Gear ratio of gearhead

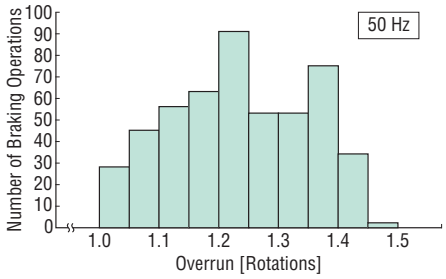
●Example of Braking Characteristics with Brake Pack
Brake Pack: **SB50W**
Motor: **4IK25GN-CW2E**



Stopping Accuracy

The figure to the right shows the stopping position error (variation in stopping position) when braking force is applied to the motor using the brake pack. The diagram shows an overrun distribution when braking is repeated 500 times under the same conditions. Varying stopping positions are caused by the power-supply phase when the switch is operated to apply the brake, which could generate a maximum delay of one cycle (power supply frequency) and variation in initial braking force. The sagging at the center reflects the slot-position relationship between the stator and rotor. Refer to the braking characteristics curve representing the average overrun.

Brake Pack: **SB50W**
Motor: **4IK25A-CW2E**
J: 0.25×10^{-4} kg·m^2

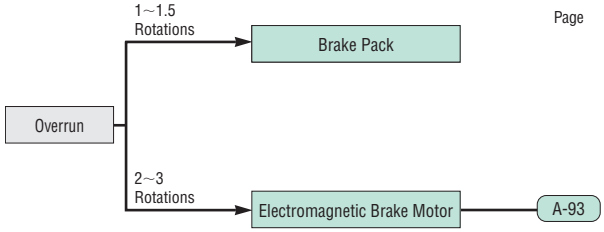


Other Brake Motors

In addition to the brake pack, various brake motors are available to suit a variety of applications.

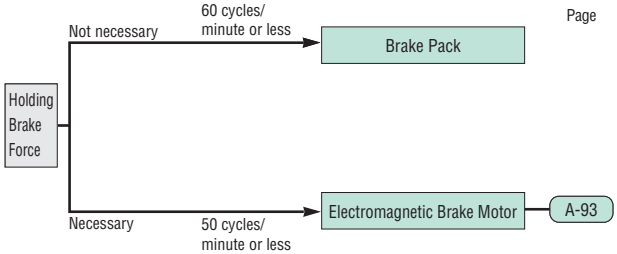
How to Select a Brake Motor

◇Selecting Based on Stopping Accuracy



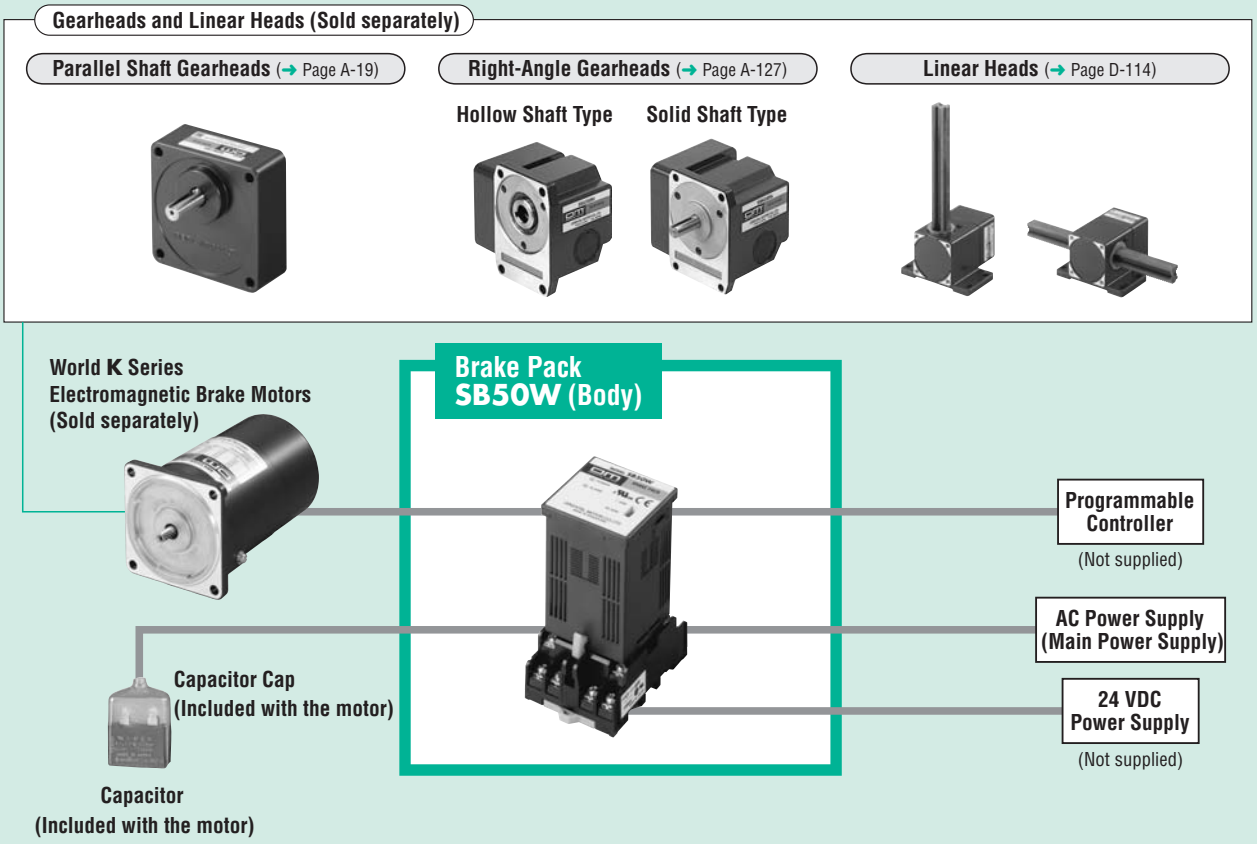
●The values for overrun applies to the motor only.

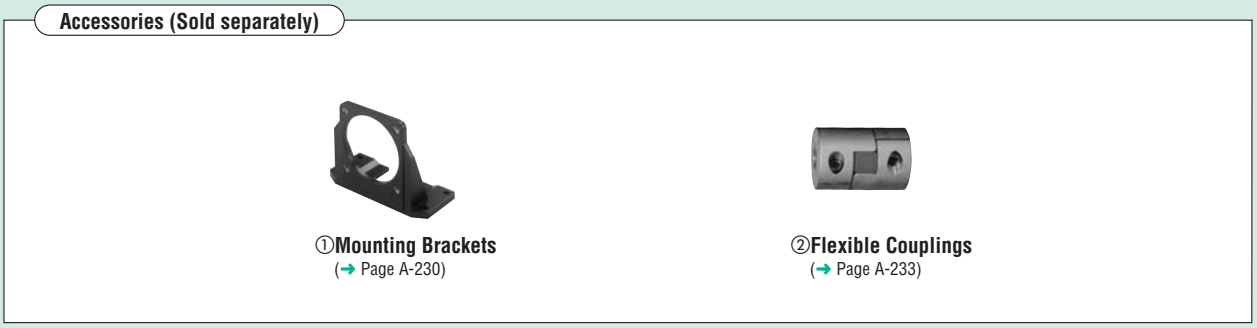
◇Selecting Based on Frequency of Use



Notes:
- The operating cycles are based merely on brake response. The value specified above is the maximum, so it may not be possible to repeat braking operation at this frequency.
- In an actual application, be certain the surface temperature of the motor case remains at 90°C or less by considering a rise in motor temperature.

System Configuration





No.	Product Name	Overview	Page
①	Mounting Brackets	Dedicated mounting bracket for the motor and gearhead.	A-230
②	Flexible Couplings	Clamp type coupling that connects the motor or gearhead shaft to the driven shaft.	A-233

●Example of System Configuration

(Body)	(Sold separately)			(Sold separately)	
Brake Pack	Electromagnetic Brake Motor (Pinion Shaft)	Long Life, Low Noise Gearhead	+	Mounting Bracket	Flexible Coupling
SB50W	4RK25GN-CW2ME	4GN25S		SOL4M5	MCL301012

●The system configuration shown above is an example. Other combinations are available.

Specifications (RoHS)

Model	Power Supply Voltage	Frequency	Applicable Motor Output Power	Functions	Power Source for Control	Input Signals	Output Signals	Braking Current Duration
SB50W	Single-Phase 100-230 VAC ±10%	50/60 Hz	6 W～90 W	Instantaneous stop bi-directional operation Electromagnetic brake control (Electromagnetic brake motors) Thermal protector open detection (Alarm output) Sink/Source logic switch	24 VDC ±10% 0.1 A min.	CW, CCW, FREE/ALARM-RESET Input specifications Photocoupler input Input impedance 4.7 kΩ 24 VDC ±10%	ALARM Output specifications Open collector output External use conditions 26.4 VDC max. 10 mA max.	Approximately 0.2～0.4 seconds

General Specifications

Item	Specifications
Insulation Resistance	100 MΩ or more when 500 VDC megger is supplied between the power supply input terminal and the signal input terminal after rated operation under normal ambient temperature and humidity.
Dielectric Strength	Sufficient to withstand 3.0 kV at 50 Hz or 60 Hz applied between the power supply input terminal and the signal input terminal for 1 minute after rated operation under normal ambient temperature and humidity.
Ambient Temperature	0～+40°C (non-freezing)
Ambient Humidity	85% or less (non-condensing)
Degree of Protection	IP10

Applicable Products

World **K** Series 6 W～90 W	Induction Motors* Reversible Motors Electromagnetic Brake Motors
FPW Series 25 W～90 W	Induction Motors

*Except for 2-pole type

Braking Current

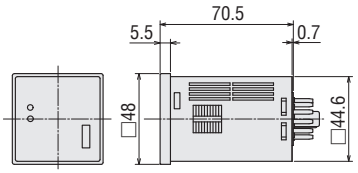
When a motor is stopped instantaneously, a large half-wave rectified current flows through the motor for approximately 0.2 to 0.4 seconds. When connecting a circuit breaker, fuse or transformer, refer to the table below for the braking current (peak value) and select its current capacity.

Motor Output Power	Braking Current (Peak value) [A]
	220/230 VAC
6 W	1.0
15 W	2.5
25 W	4.0
40 W	7.0
60 W	8.5
90 W	17

Dimensions (Unit = mm)

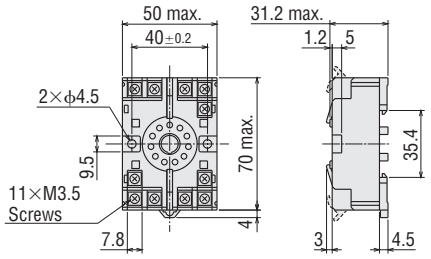
◇SB50W

Mass: 0.1 kg

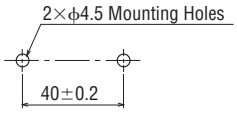


The following items are included in each product.
Brake Pack, Flush Mounting Socket, Operating Manual

◇Flush Mounting Socket (Included)



◇Flush Mounting Socket Panel Cut-Out

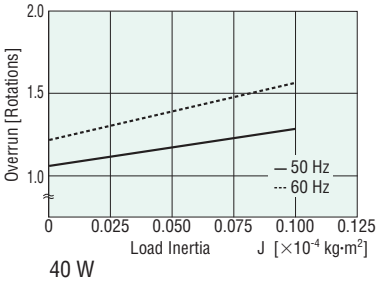


Braking Characteristics (Reference values)

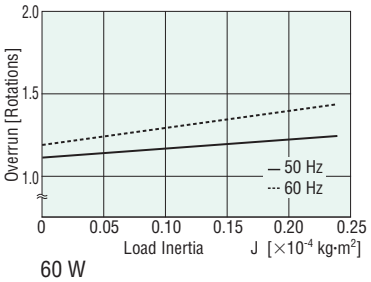
World K Series

◇Induction Motors

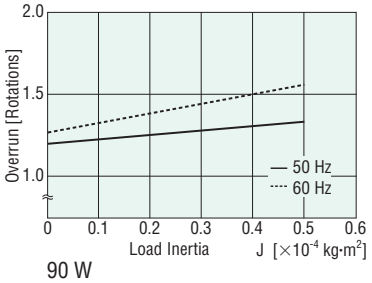
6 W



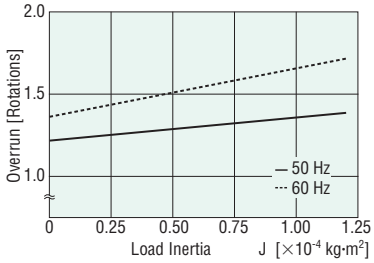
15 W



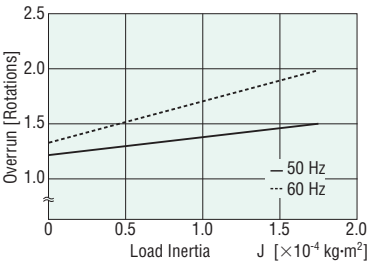
25 W



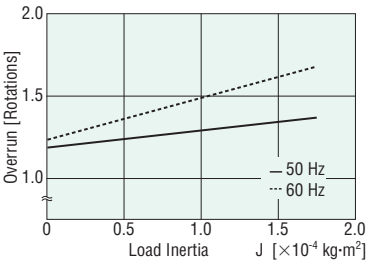
40 W



60 W

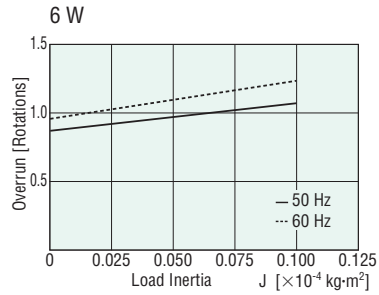


90 W

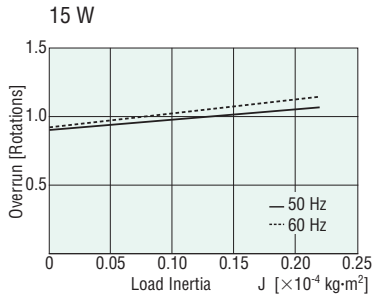


◇Reversible Motors

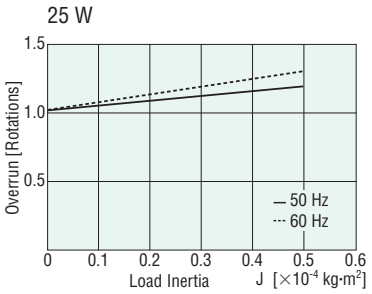
6 W



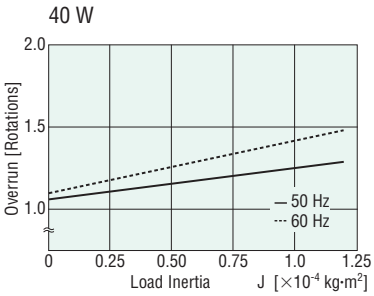
15 W



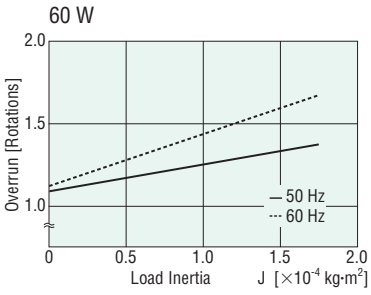
25 W



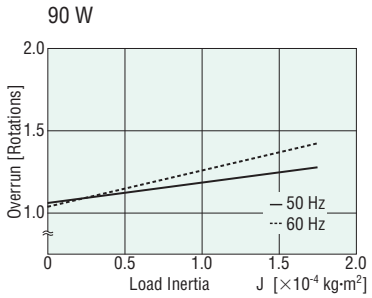
40 W



60 W

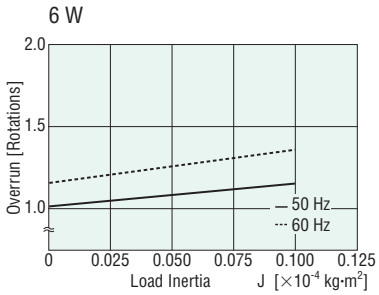


90 W

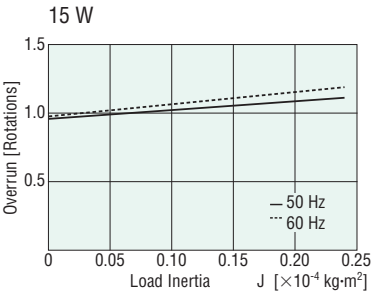


◇Electromagnetic Brake Motors

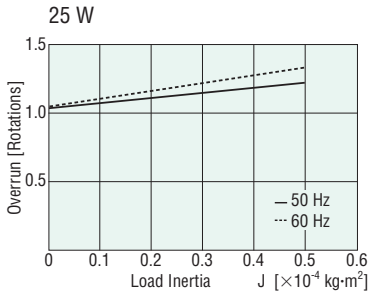
6 W



15 W



25 W



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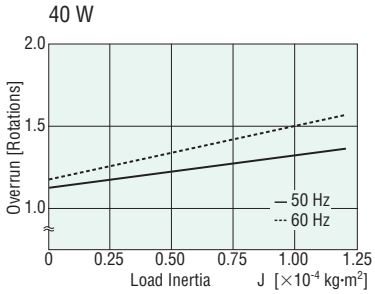

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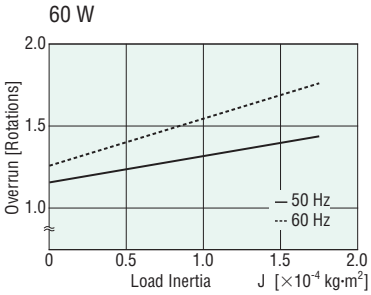
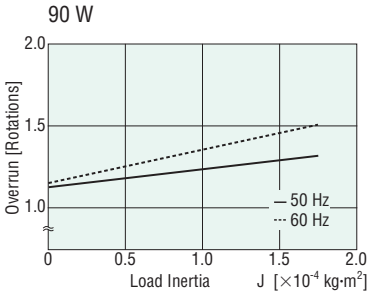
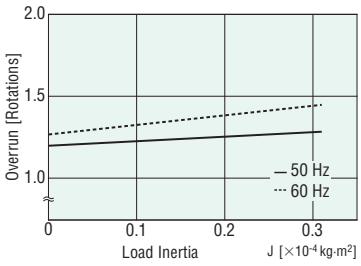


90 W

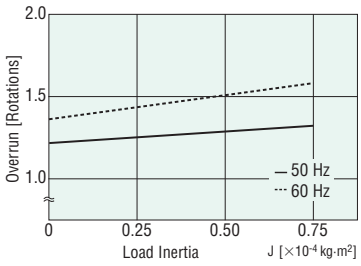


●FPW Series

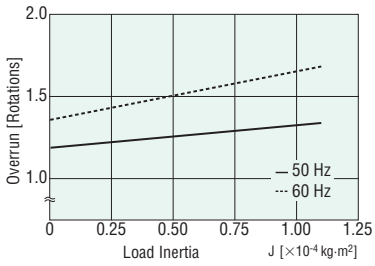
25 W



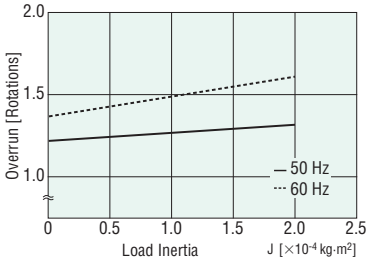
40 W



60 W

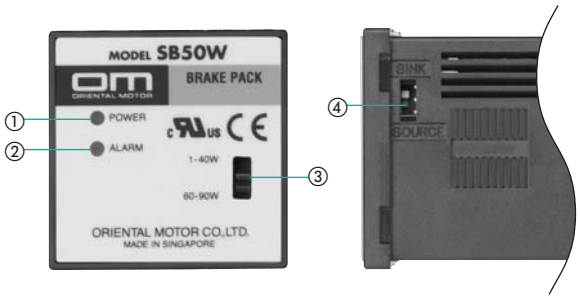


90 W



■Connection and Operation

●Names and Functions of Brake Pack Parts



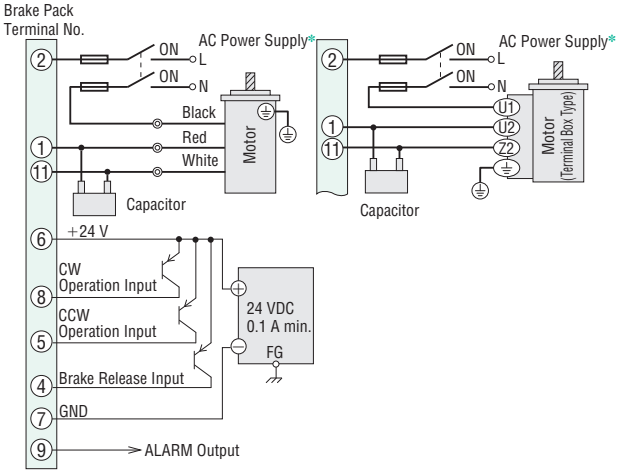
No.	Name	Factory Setting	Functions
①	POWER Indicator (Green)	–	Lights when 24 VDC is supplied.
②	ALARM Indicator (Red)	–	Lights when the ALARM is activated. (The ALARM output is "OFF.")
③	Motor Output Select Switch	60－90 W	Used to set the motor output.
④	SINK/SOURCE Select Switch	SOURCE	Used to switch between Sink/Source for the control signal input/output.

●Connection Diagrams

The wiring diagram is for when the SINK/SOURCE select switch is set to the "SOURCE" side.

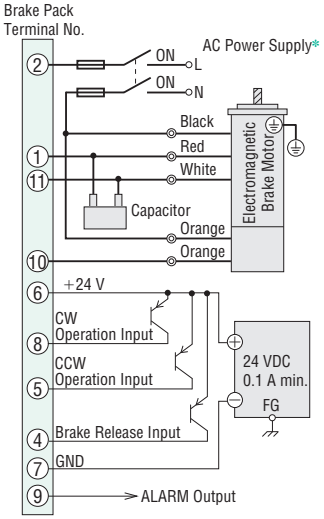
◇World **K** Series

• Induction Motors/Reversible Motors



*Single-phase 220/230 VAC

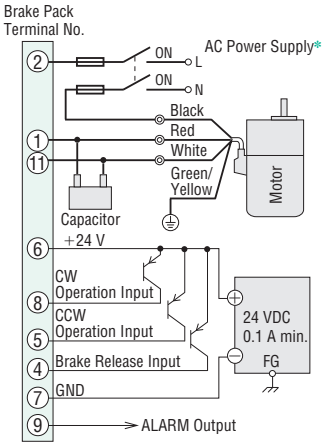
• Electromagnetic Brake Motors



*Single-phase 220/230 VAC

◇**FPW** Series

• Induction Motors



*Single-phase 220/230 VAC

●Terminal Arrangement for Flush Mounting Socket

Terminal No.	Signal Name	Description
①	Motor/Capacitor	Connect the motor and capacitor.
②	AC Power Supply Input (L)	Single-phase 100-115 VAC or Single-phase 200-230 VAC
③	NC	Not used. Leave this terminal unconnected.
④*1	Brake Release Input*2	Not an instantaneous stop but coast to a stop
	ALARM-RESET Input	Reset ALARM Output.
⑤	CCW Operation Input	Motor rotates in the CCW direction during "ON."
⑥	DC Power Input	+24 VDC input
⑦	GND	GND
⑧	CW Operation Input	Motor rotates in the CW direction during "ON."
⑨	ALARM Output	Turns "OFF" when the motor's thermal protector is "open."
⑩	Electromagnetic Brake*3	Connect to the electromagnetic brake.
⑪	Motor/Capacitor	Connect to the motor and capacitor.

*1 Functions as a brake release input during normal operation, and as an ALARM-RESET input when the ALARM is activated.
*2 Releases the electromagnetic brake for electromagnetic brake motors.
*3 Only for electromagnetic brake motors

Notes:

- The input-signal voltage is 24 VDC±10%, 0.1 A min.
- Minimize the length of the motor cable and the input/output signal cable.
- Use a cable of AWG18 (0.75 mm²) or more in diameter for the motor cable and power supply cable.
- Be sure to connect the GND terminal to GND (negative side) of the external control device, or the motor will not operate.

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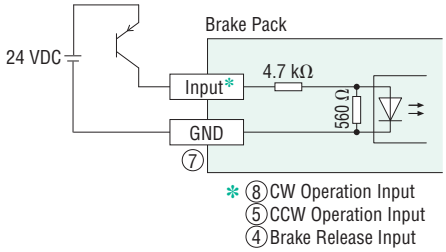
●I/O Signal Circuit

The factory setting is the source logic for both input and output circuits. Select the sink logic or source logic according to the external control device you will be using.

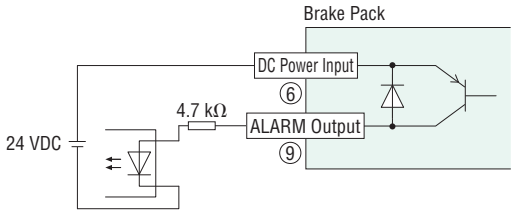
◇Source Logic

• Input Circuit



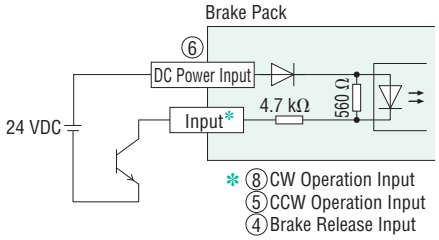
* ⑧CW Operation Input
⑤CCW Operation Input
④Brake Release Input

• Output Circuit



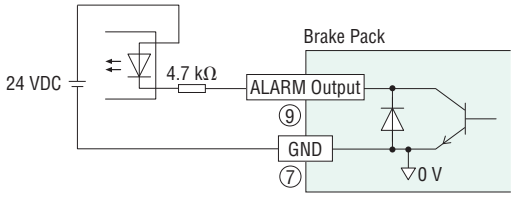
◇Sink Logic

• Input Circuit

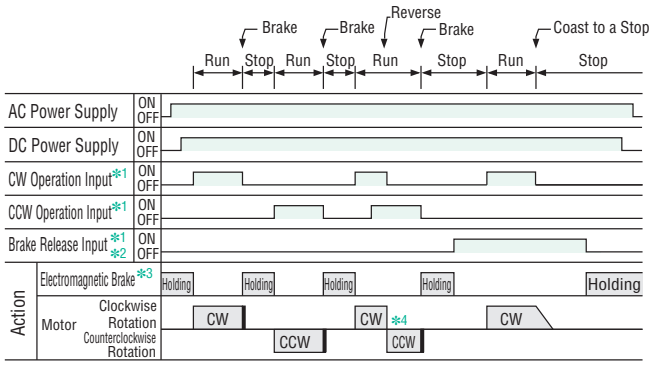


* ⑧CW Operation Input
⑤CCW Operation Input
④Brake Release Input

• Output Circuit



●Timing Chart



*1 Turn on CW operation input, CCW operation input and brake release input after turning on AC power.
The motor does not operate if they are input ahead of AC power.
The ALARM indicator will light and ALARM output will switch to "OFF."
*2 The brake release input becomes ALARM-RESET input when the ALARM output is OFF.
*3 Only for electromagnetic brake motors
*4 The induction motor will not accommodate instantaneous bi-directional switching.

◇CW Operation Input

Turning the CW operation signal to "ON" causes the motor's output shaft to turn in the CW direction. Turning it to "OFF" triggers an instantaneous stop.

◇CCW Operation Input

Turning the CCW operation signal to "ON" causes the motor's output shaft to turn in the CCW direction. Turning it to "OFF" triggers an instantaneous stop.
If both the CW and CCW operation signals are simultaneously turned "ON," the CW operation signal will take priority.

◇Brake Release Input [ALARM-RESET Input]

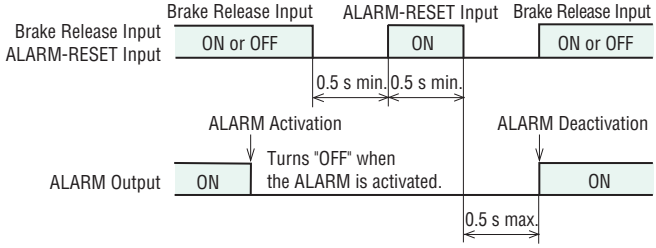
Functions as a brake release input during normal operation, and as an ALARM-RESET input when the ALARM is activated.

• When Normal Operation: Brake Release Input

Turning the brake release signal to "ON" disables both the electronic brake and electromagnetic brake. When the CW and CCW operation signals are turned "OFF," the motor operates via inertial force before coast to a stop. When the motor is stationary, the electromagnetic brake is not activated, so the motor's output shaft can be moved freely.
Turning the brake release signal to "OFF" (or leaving the signal unconnected) and turning both CW and CCW operation signals to "OFF" will activate the electronic brake and electromagnetic brake, bringing the motor to an instantaneous stop. Once the motor stops, the electronic brake will be cut off automatically. However, the electromagnetic brake will continue to operate and hold the load.

• When an Alarm is Activated (When the ALARM output turns "OFF"): ALARM-RESET Input

When an alarm is activated, the ALARM output will turn "OFF." In this case, turn all input signals "OFF," and then input the ALARM-RESET signal for at least 0.5 second.
Wait at least 0.5 seconds after turning the ALARM-RESET input OFF before restarting operation.



It is also possible to deactivate the alarm by turning off the power supply and turning it on again. Turn off the DC or AC power supply, and turn all input signals "OFF" before turning it on again.

◇ALARM Output (Thermal Protector Open Detection)

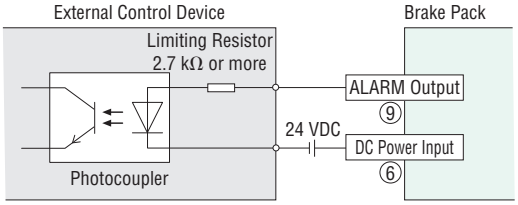
Since the **SB50W** ALARM output function detects the action of the thermal protector, the current flowing in the motor is monitored. ALARM output is activated under the following conditions:

- When the thermal protector built-in to the motor is activated (open)
- When there is improper connection/disconnection of the power supply cable and motor cable
- When the input signal is turned "ON" before the AC power supply is turned on
- When the AC power supply is turned off while the motor is in operation or while it is stopped

In the above conditions, the **SB50W** ALARM function is activated and ALARM output is "OFF." Also, the ALARM indicator lamp (red) on the panel lights up, and power supply to the motor is stopped. With electromagnetic brake motors, the brake is activated in order to hold the load in position.

Note:

- When the DC power supply is turned on, the alarm indicator lamp lights up instantaneously, but this is not an abnormality.



Use a power supply of 26.4 VDC max., and limit the output current to 10 mA max.

■Operating/Braking Repetition Cycle

The repeated operating and braking of a motor will cause about a temperature rise in the motor and brake pack, thereby limiting the continuous operating time.
Observe the repetition cycle given in the table below for the operation and braking of the motor. The motor may generate heat depending on the conditions in which it is driven. Ensure that the temperature of the motor case does not exceed 90°C.

Motor Output Power	Repetition Cycle
6 W～25 W	2 seconds min.
40 W～90 W	4 seconds min.

(A repetition cycle of two seconds represents operation for one second and stopping for one second.)

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