

Refer to *Safety Precautions for All Solid State Relays*.

## Solid State Contactors That Can Drive 3-phase Motors Frequently, and Achieve Harmonized Protection with Thermal Overload Relays

- Harmonized protection with thermal overload relays complying with IEC 947-4-1 (Class 10A/10); can be used like a standard contactor.
- Comply with UL, CSA, IEC, and JEM requirements.
- Mount with screws or to DIN tracks.
- Compact monoblock construction (W: 80 × H: 100 × D: 100 mm) with a heat sink.
- Snubber circuit and varistor are built-in.
- Operation indicator.
- Two-element models added to series.



## Model Number Structure

### Model Number Legend

G3J-□□□□□□-□  
 1 2 3 4 5 6 7 8

#### 1. Basic Model Name

G3J: Solid State Contactor

#### 2. Load Power Supply

Blank: AC output

#### 3. Functions

Blank: Simple models

#### 4. Rated Load Power Supply Voltage

2: 200 VAC

#### 5. Rated Load Current

11: 11.1 A (200-V models)

05: 4.8 A (200-V models)

#### 6. Terminal Type

B: Screw terminals

#### 7. Zero Cross Function

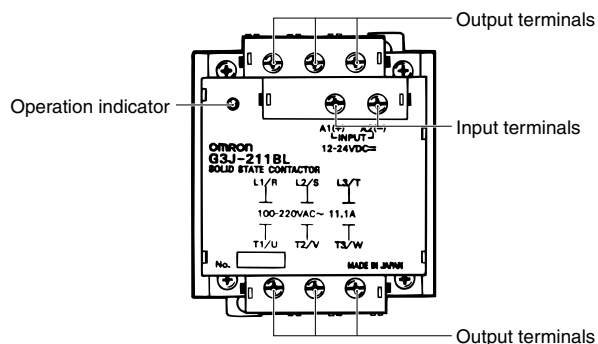
L: Not equipped with zero cross function

#### 8. Number of Elements

Blank: Standard models (3 elements)

2: 2 elements

## Appearance



# Ordering Information

## List of Models

Number of elements	Insulation method	Rated supply voltage	Applicable motor		Model
3	Phototriac	12 to 24 VDC	2.2 kW (11.1 A)	200 to 220 VAC	G3J-211BL
			0.75 kW (4.8 A)		G3J-205BL
	Photocoupler	100 to 240 VAC	2.2 kW (11.1 A)		G3J-211BL
			0.75 kW (4.8 A)		G3J-205BL
2	Phototriac	12 to 24 VDC	2.2 kW (11.1 A)		G3J-211BL-2
			0.75 kW (4.8 A)		G3J-205BL-2
	Photocoupler	100 to 240 VAC	2.2 kW (11.1 A)		G3J-211BL-2
			0.75 kW (4.8 A)		G3J-205BL-2

Note: When ordering, specify the rated supply voltage.

## Specifications

### Ratings (at an Ambient Temperature of 25°C)

#### Operation Circuit

Item	DC-input models	AC-input models
Rated supply voltage	12 to 24 VDC	100 to 240 VAC (50/60 Hz)
Operating voltage range	9.6 to 26.4 VDC	75 to 264 VAC (50/60 Hz)
Rated input current (impedance)	15 mA max. (at 12 to 24 VDC)	36 kΩ ±20% (100 to 240 VAC)
Must operate voltage	9.6 VDC max.	75 VAC max.
Must release voltage	3.6 VDC min.	20 VAC min.

#### Main Circuit

Item	G3J-211BL, G3J-211BL-2		G3J-205BL, G3J-205BL-2	
Rated load voltage	100 to 240 VAC (50/60 Hz)			
Load voltage range	75 to 264 VAC (50/60 Hz)			
Rated carry current (See note 3.)	11.1 A (Ta = 40°C)		4.8 A (Ta = 40°C)	
Min. load current	0.1 A			
Peak-value current resistivity	350 A, 60 Hz, 1 cycle		150 A, 60 Hz, 1 cycle	
Overload resistance	Refer to <i>Safety Precautions for the G3J-T, G3J-S, and G3J.</i>			
Closed current (effective value)	AC3	111 A	48 A	
	AC4	133.2 A	57.6 A	
Breaking current (effective value)	AC3	88.8 A	38.4 A	
	AC4	111 A	48 A	
Applicable load	3-phase inductive motor (AC3 AC4 AC53-a)	200 to 220 VAC, 2.2 kW, (11.1 A)		200 to 220 VAC, 0.75 kW, (4.8 A)
	Single-phase motor (AC3) (See note 1.)	100 VAC, 0.4 kW (11.1 A) 200 VAC, 0.75 kW (8.8 A)		100 VAC, 0.1 kW, (5.1 A) 200 VAC, 0.4 kW (5.5 A) (See note 2.)
	Resistive load (AC1)	100 to 240 VAC, 11.1 A		100 to 240 VAC, 4.8 A

Note: 1. With 2-element models, L2 and T2 are shorted internally.

2. When using 0.75-W models with 3 poles ON simultaneously, use either combination at 4.8 A max.

3. The rated carry current varies depending on the ambient temperature. Refer to *Load Current vs. Ambient Temperature* under *Engineering Data* for details.

## ■ Characteristics

Item	DC-input models	AC-input models
Operate time	1 ms max.	50 ms max.
Release time	5/6 of the load power supply cycle time + 1 ms max.	3/2 of the load power supply cycle time + 1 ms max.
Output ON-voltage drop	1.6 V <sub>RMS</sub> max.	
Leakage current (See note.)	10 mA max. (at 200 VAC)	
Insulation resistance	100 MΩ min. (at 500 VDC)	
Dielectric strength	2,500 VAC, 50/60 Hz for 1 min	
Vibration resistance	Destruction: 10 to 55 to 10 Hz, 0.75-mm single amplitude	
Shock resistance	Destruction: 294 m/s <sup>2</sup>	
Ambient temperature	Operating: -20°C to 60°C (with no icing or condensation) Storage: -30°C to 70°C (with no icing or condensation)	
Ambient humidity	Operating: 45% to 85%	
Weight	Approx. 700 g	
Standards	UL508, CSA22.2 No. 14, IEC947-4-1	

**Note:** With 2-element models, the S-phase leakage current will be larger by a factor of  $\sqrt{3}$ .

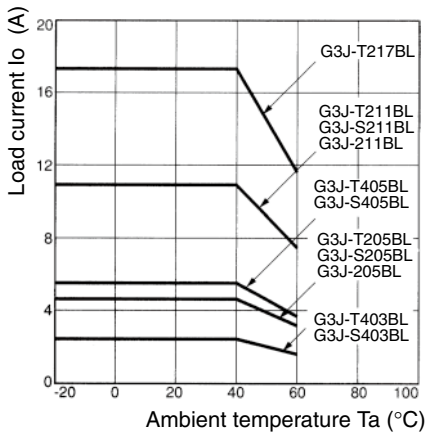
ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

In the interest of product improvement, specifications are subject to change without notice.

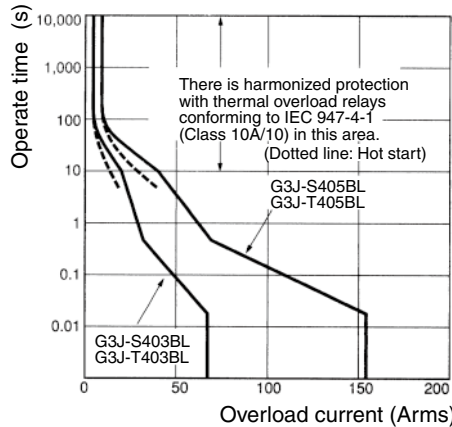
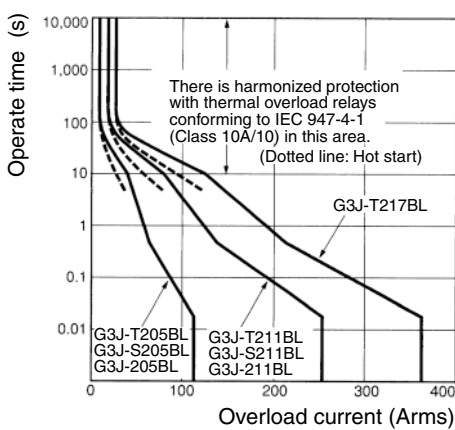
## Engineering Data

### Load Current vs. Ambient Temperature



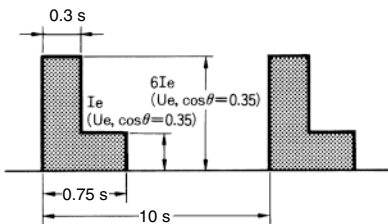
### Overload Current Resistivity

Conditions: 60 Hz, Ta of 25°C, non-repetitive (1/2 for repetitive)



## Switching Frequency Test Conditions (AC3/AC4/AC53-a)

### AC3 Class (Immediate Start)



Ie: Rated carry current  
Ue: Rated load voltage (200/400 V)

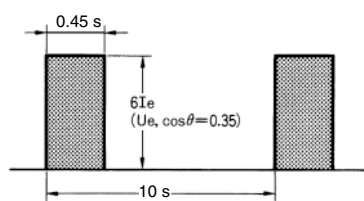
The following Soft-start conditions apply.

Ramp-up time: 1 s  
Starting torque: 450% In

The following Soft-start/stop conditions apply:

Ramp-up time: 1 s  
Ramp-down time: 1 s  
Starting torque: 450% In

### AC4 Class (Inching)



Ie: Rated carry current  
Ue: Rated load voltage (200/400 V)

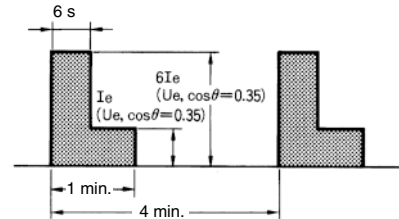
The following Soft-start conditions apply.

Ramp-up time: 1 s  
Starting torque: 450% In

The following Soft-start/stop conditions apply:

Ramp-up time: 1 s  
Ramp-down time: 1 s  
Starting torque: 450% In

### AC53-a: 6-6: 25-15



Ie: Rated carry current  
Ue: Rated load voltage (200/400 V)

The following Soft-start conditions apply.

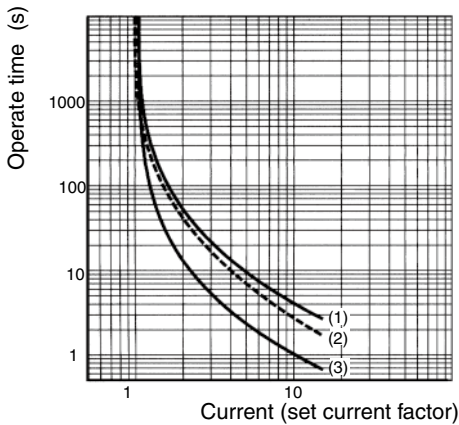
Ramp-up time: 1 s  
Starting torque: 450% In

The following Soft-start/stop conditions apply:

Ramp-up time: 1 s  
Ramp-down time: 1 s  
Starting torque: 450% In

# Recommended Thermal Overload Performance

## Overload Characteristics



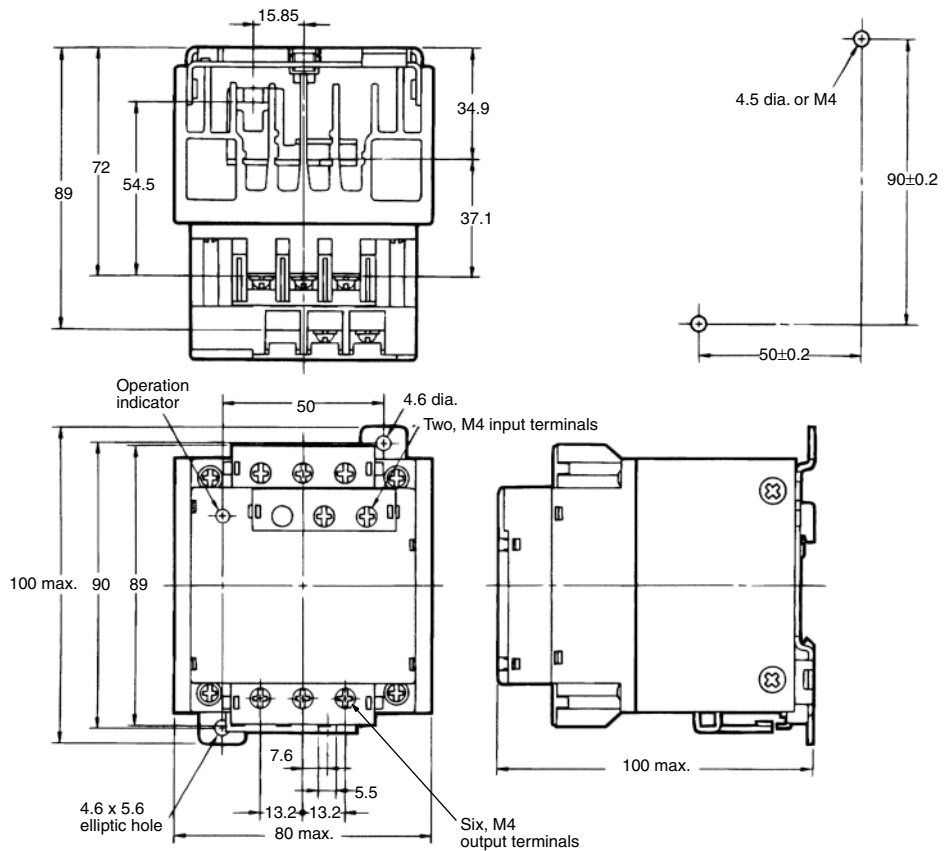
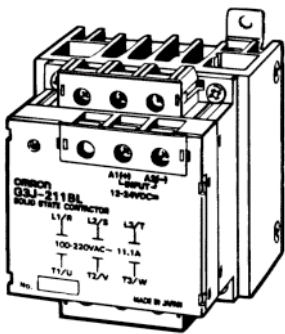
- (1): Balanced operation, 3-phase, from cold state
- (2): Balanced operation, 2-phase, from cold state
- (3): Balanced operation, 3-phase, after a long period of set current flow (hot state).

## Dimensions

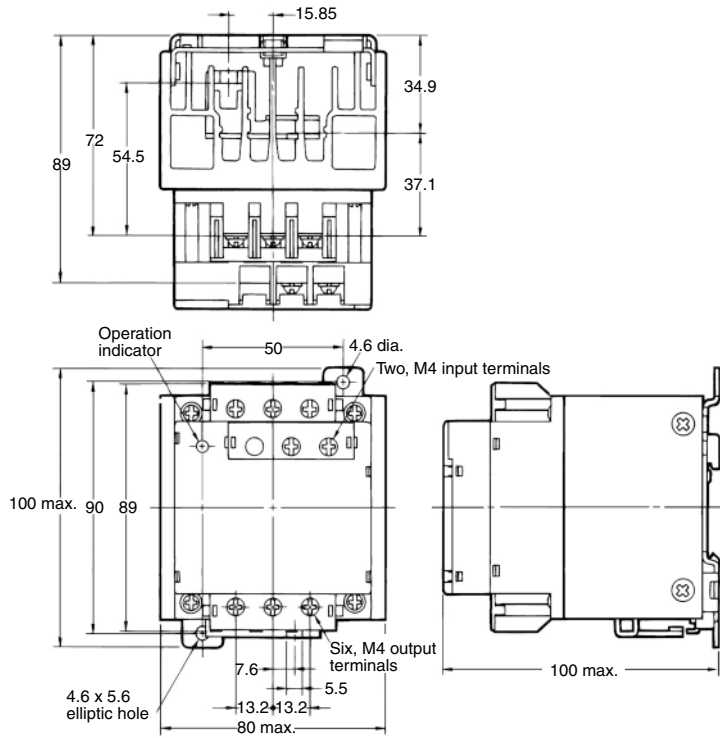
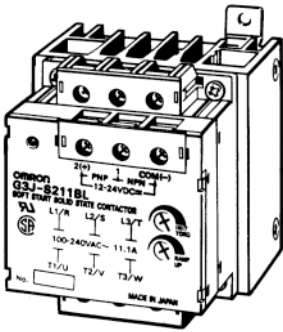
Note: All units are in millimeters unless otherwise indicated.

### Solid State Contactors

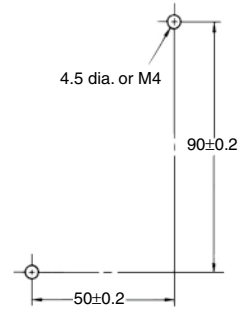
- G3J-211BL
- G3J-205BL
- G3J-211BL-2
- G3J-205BL-2



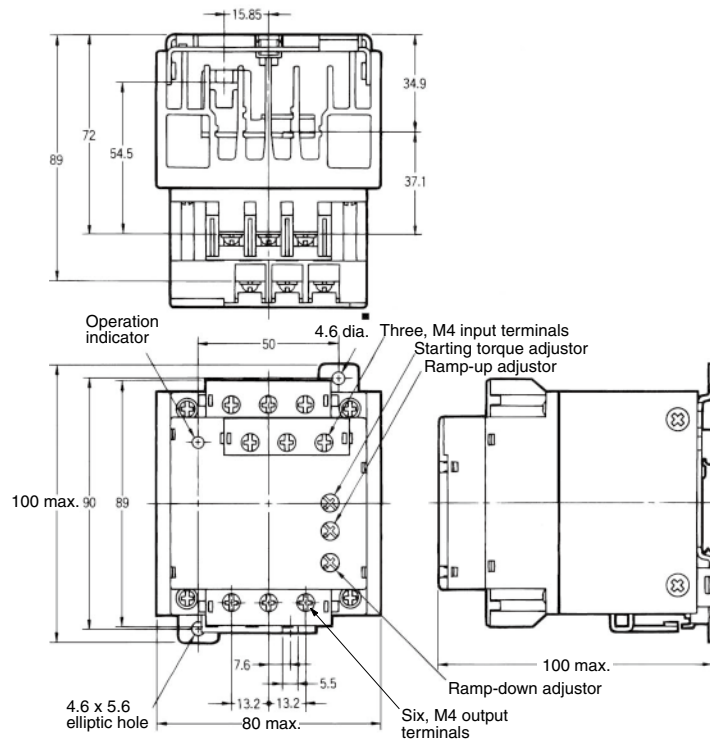
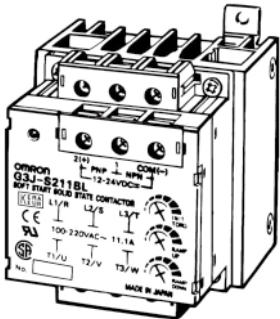
**G3J-T211BL**  
**G3J-T205BL**  
**G3J-T405BL**  
**G3J-T403BL**



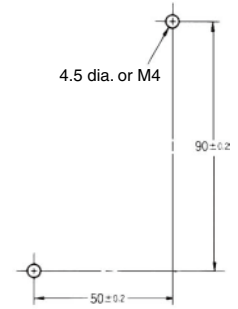
**Mounting Holes**



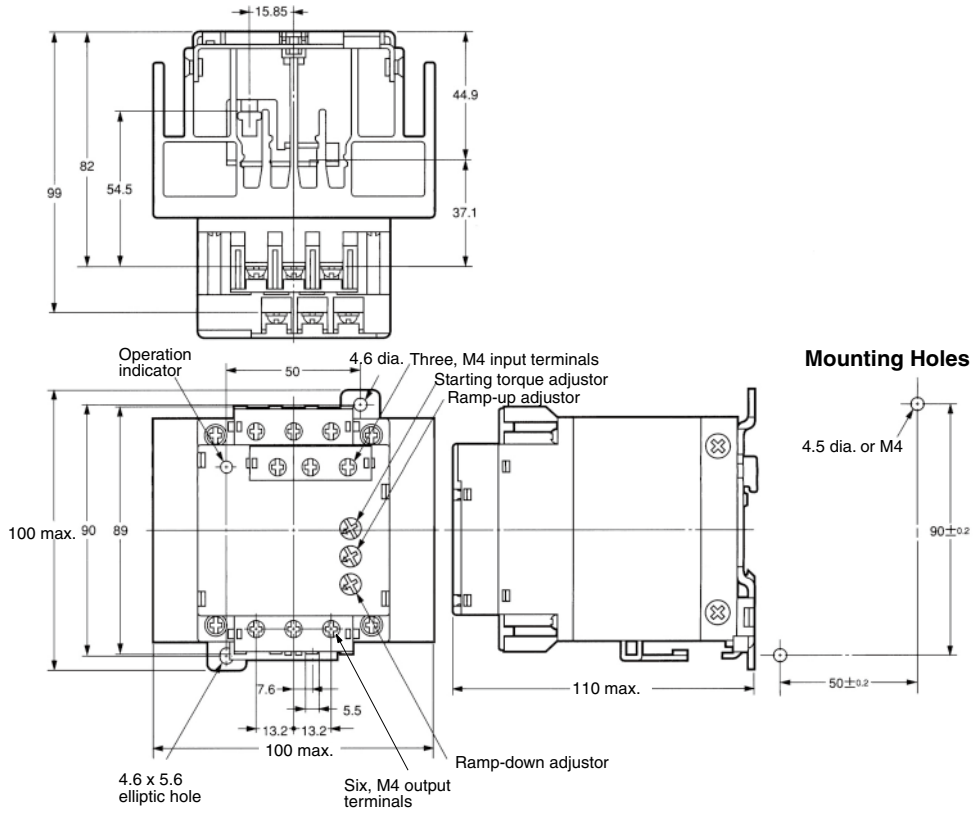
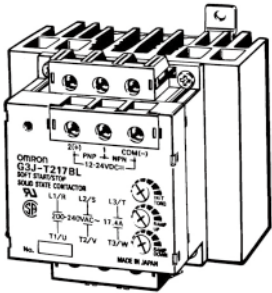
**G3J-S211BL**  
**G3J-S205BL**  
**G3J-S405BL**  
**G3J-S403BL**



**Mounting Holes**



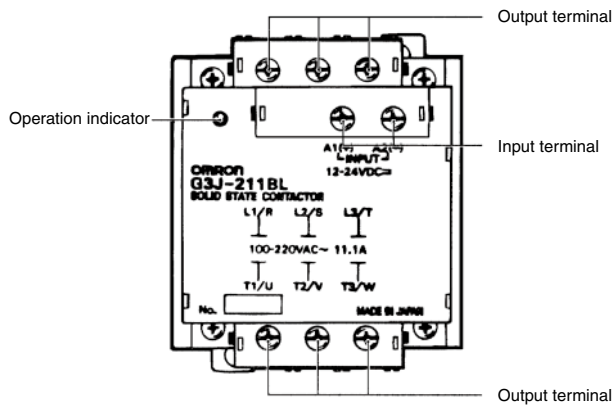
# G3J-T217BL



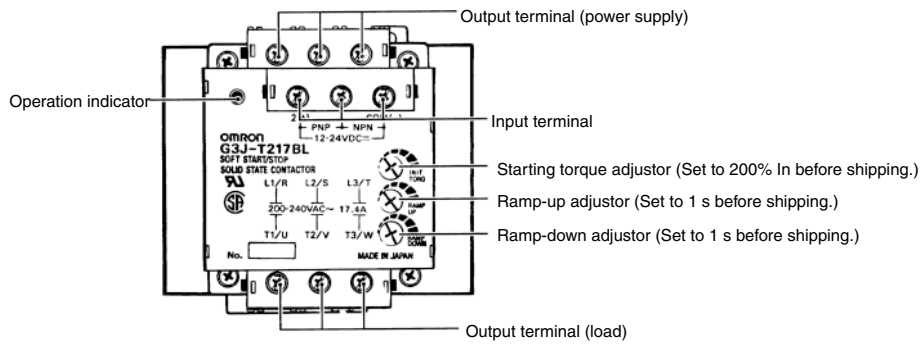
# Installation

## ■ Nomenclature

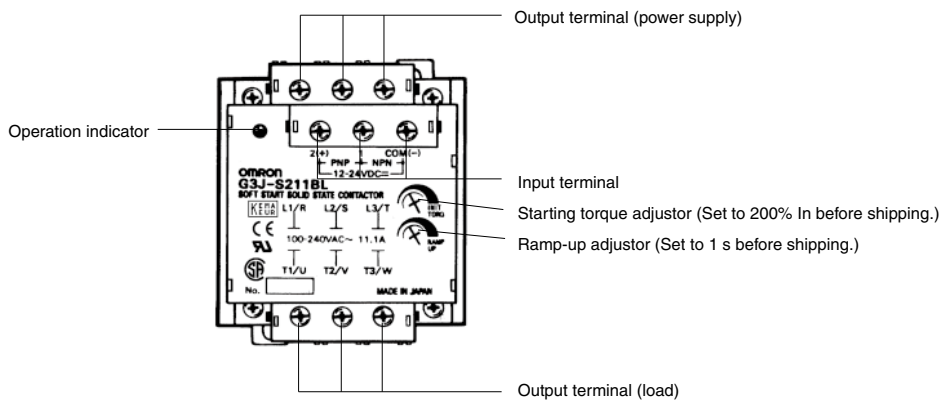
### G3J



### G3J-T



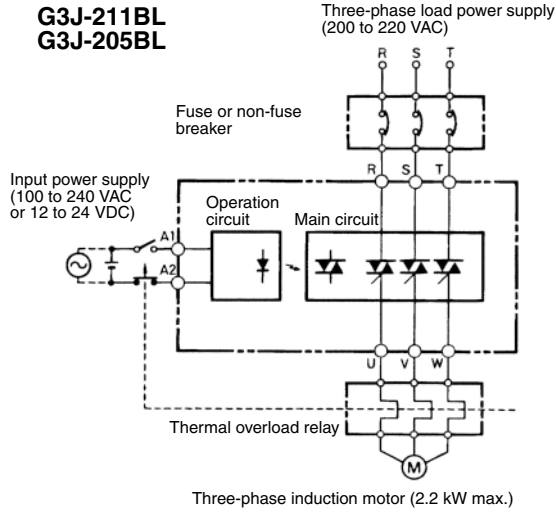
### G3J-S



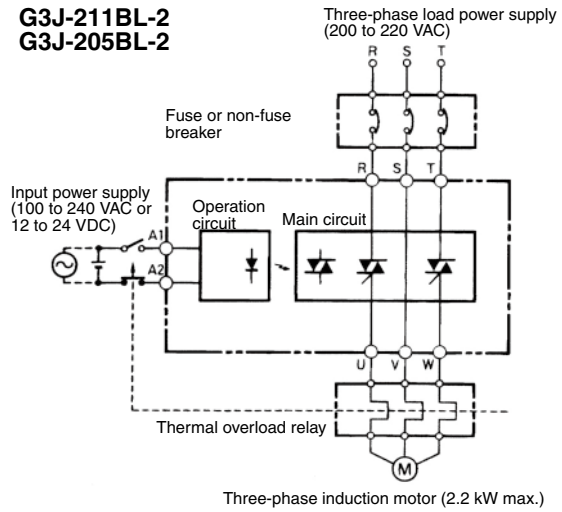


# Internal Connections

## Simple 3-element Models

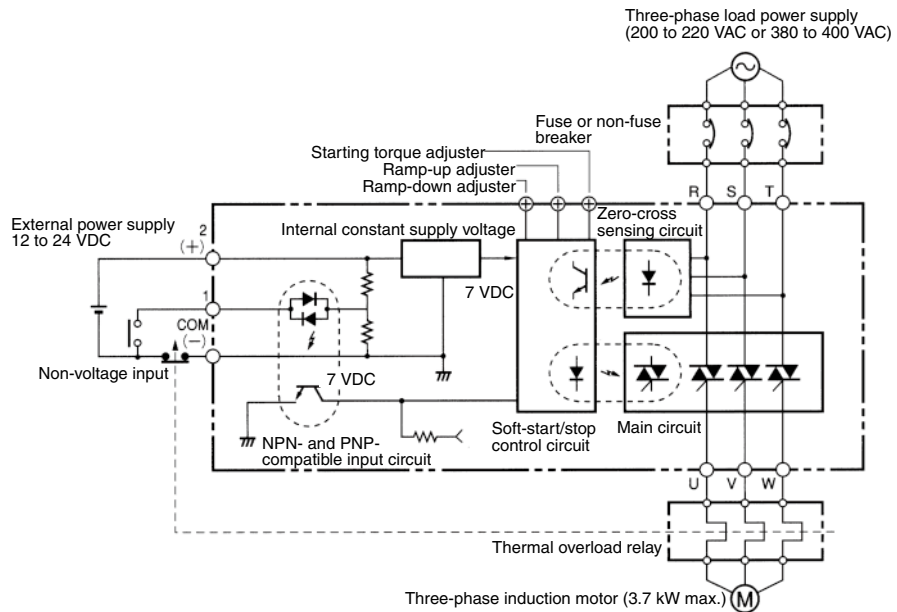


## Simple 2-element Models



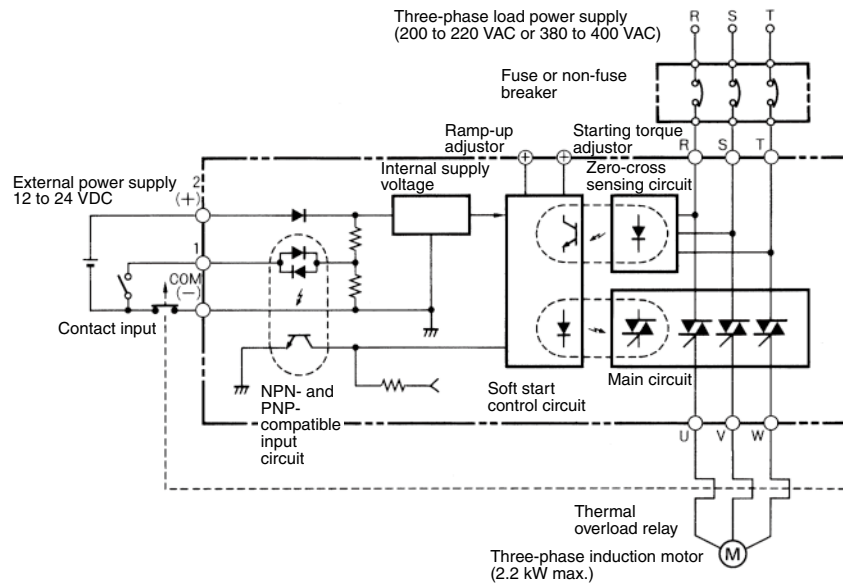
## Soft-start/stop Models

**G3J-T217BL**  
**G3J-T211BL**  
**G3J-T205BL**  
**G3J-T405BL**  
**G3J-T403BL**



## Soft-start Models

G3J-S211BL  
 G3J-S205BL  
 G3J-S405BL  
 G3J-S403BL

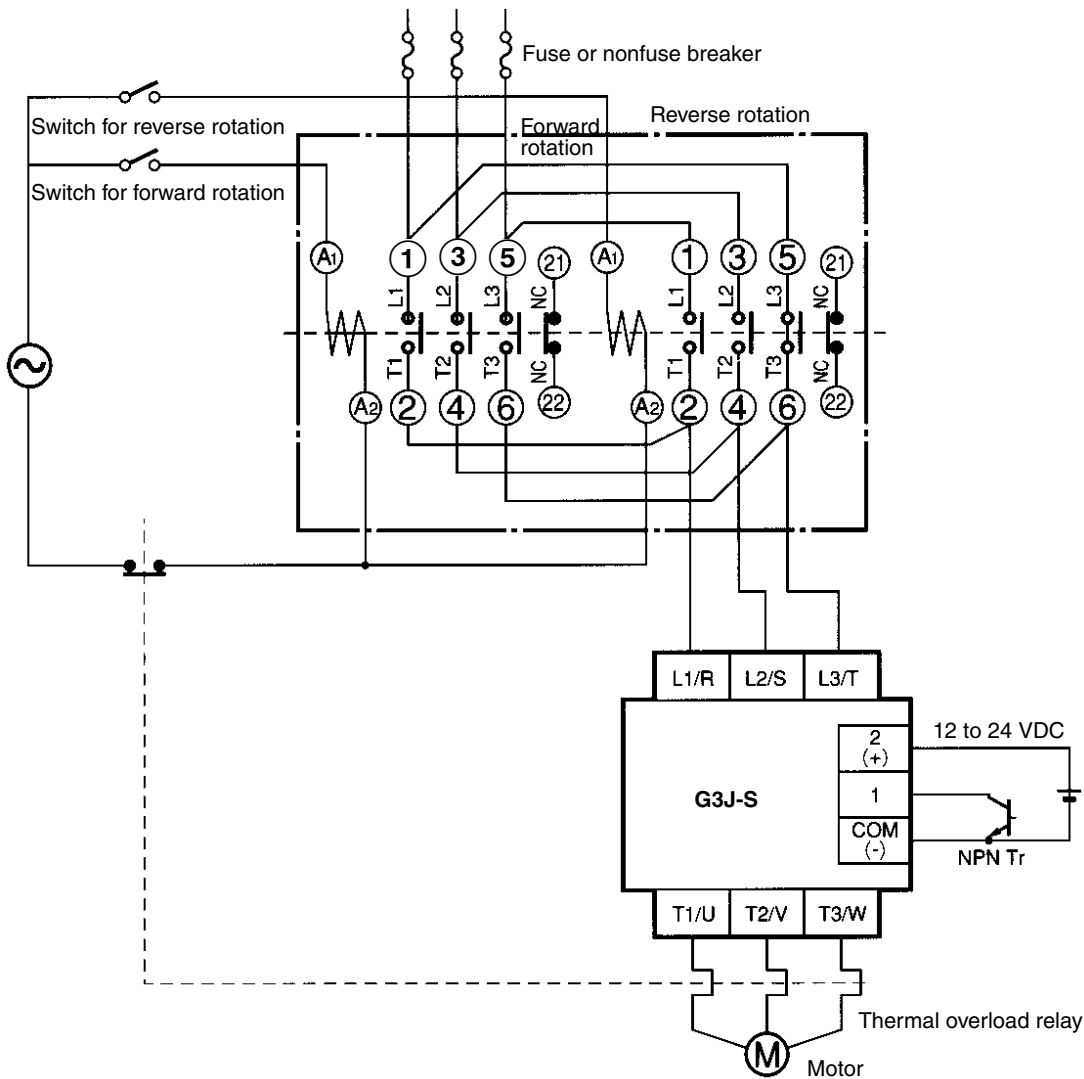


## Forward/Reverse Rotation

### G3J-S or G3J-T with a Reversible Contactor with Built-in Mechanical Interlock Function

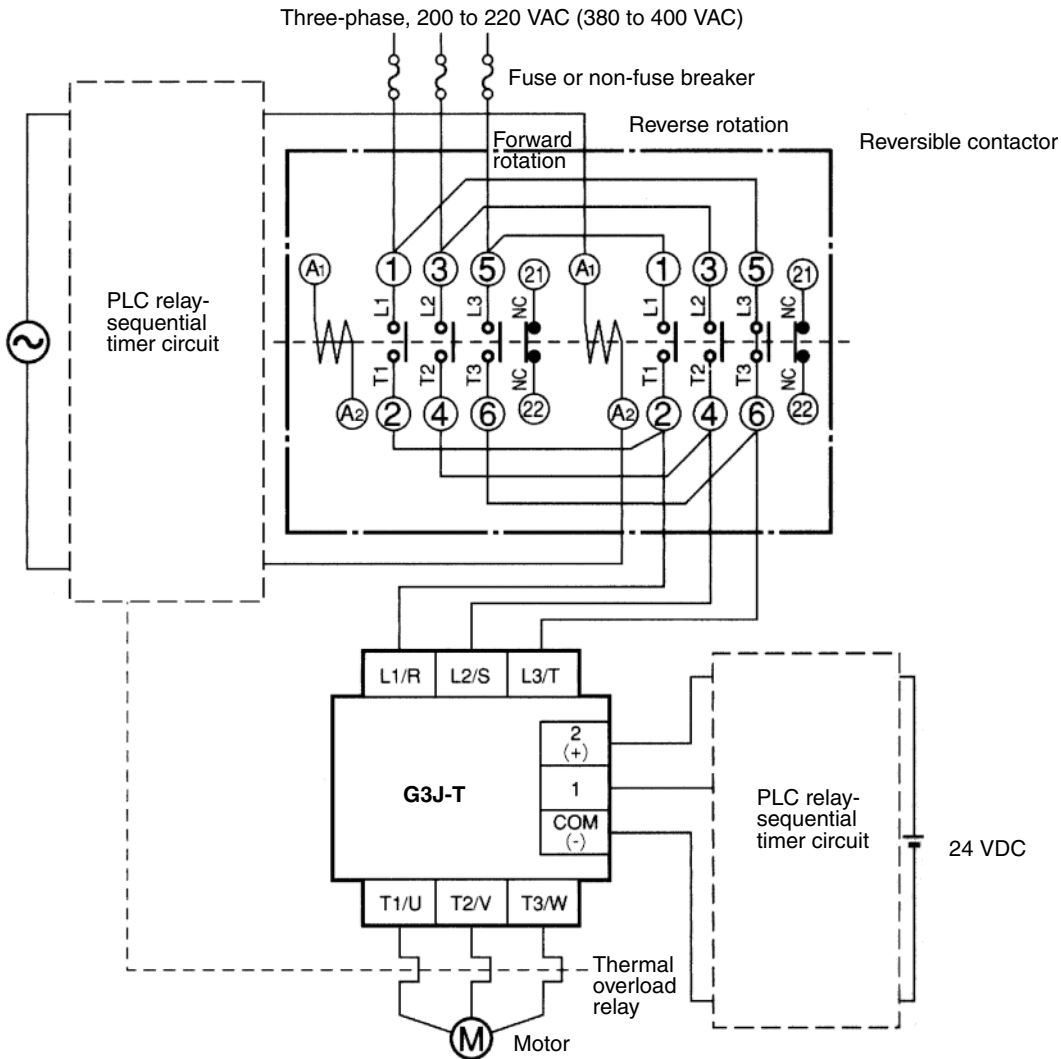
G3J-S□BL or G3J-T□BL

Three-phase, 200 to 220 VAC (380 to 400 VAC)

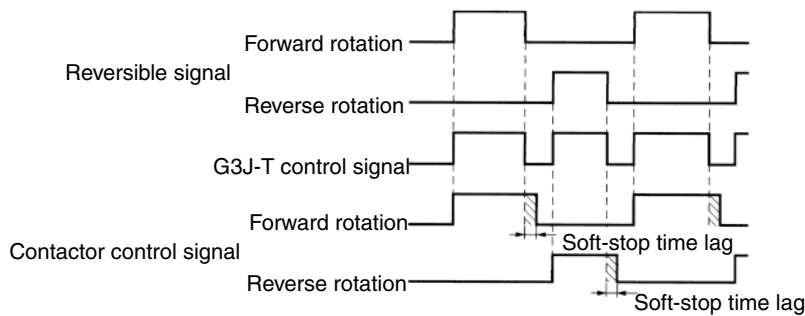


- Note:**
1. Be sure to use a fuse or non-fuse breaker to protect the G3J.
  2. Make sure that the interval between forward and reverse operations is at least 100 ms.
  3. Be sure to apply the input signal of the G3F-S after the reversible contactor starts operating. If the input signal is applied before the contactor starts operating, the soft-start function may not operate.

**G3J-S or G3J-T**



For soft-stop control, the G3J-T has enough load current to continue rotating the motor during ramp-down time setting even after the control signal of the G3J-T is tuned OFF. Therefore, a time lag is required between the time when the G3J-T stops operating up to the time when the reversible contactor is turned OFF. The ramp-down time of the G3J-T is adjustable up to approximately 25 s max. Therefore, set the time lag to 25 s in the initial sequence during the adjustment stage. Adjust the time lag of the sequential circuit according to the application.



**Note:** Make sure that the interval between forward and reverse operations is at least 100 ms. If the G3J is turned ON by noise input, short-circuiting between phases will result. In order to prevent this, insert a protective resistor.

**⚠ WARNING**  
Do not use two G3J-S or G3J-T Units together in reversible operation.

# Connections Example

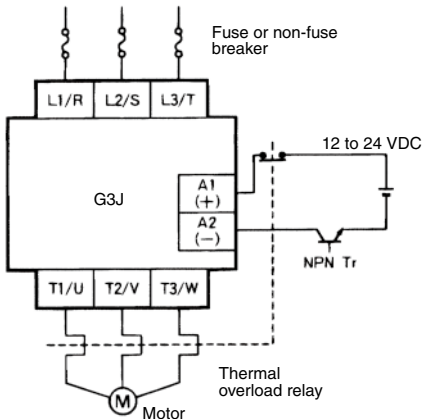
Harmonized protection is ensured for motor overcurrents.

Be sure to supply power to the G3J through a fuse or non-fuse breaker to protect the G3J from damage due to short-circuiting.

## Simple DC-input Models

G3J-□BL, G3J-□BL-2

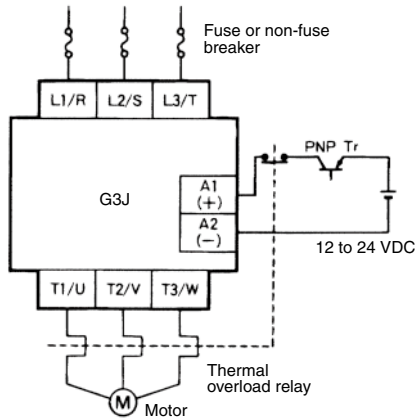
Three-phase, 200 to 220 VAC



## Simple DC-input Models

G3J-□BL, G3J-□BL-2

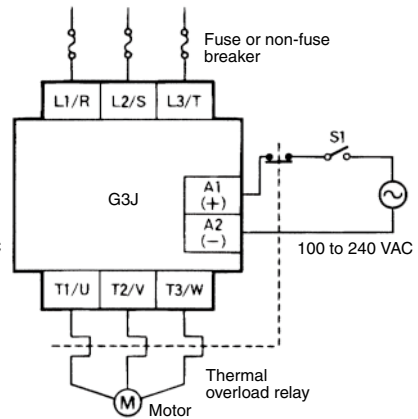
Three-phase, 200 to 220 VAC



## Simple AC-input Models

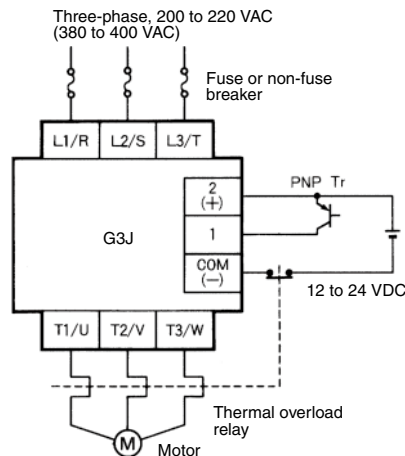
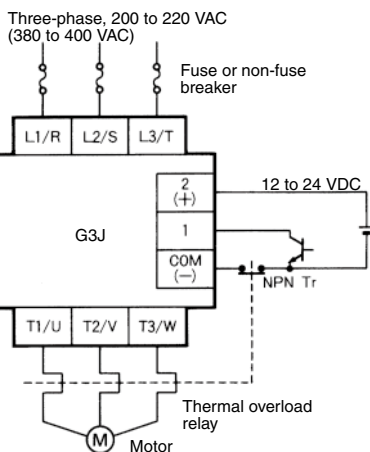
G3J-□BL, G3J-□BL-2

Three-phase, 200 to 220 VAC



## Soft-start/Soft-start/stop Models

G3J-S□BL, G3J-T□BL



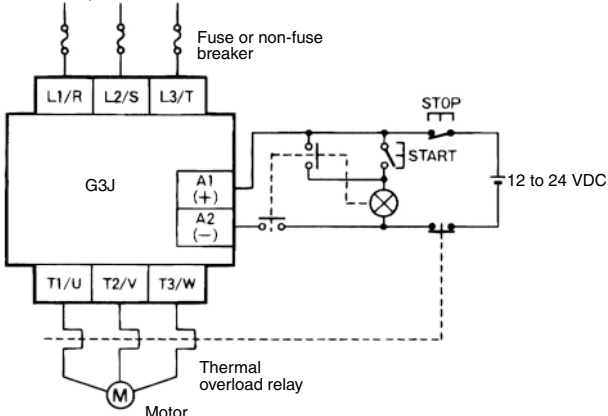
**Note:** 1. When the minimum applicable load of the thermal relay auxiliary contacts becomes smaller than the input current of the G3J, insert a bleeder resistance.

2. Connect the thermal relay NC contact to the 2 (+) or COM (-) line. Connecting the thermal relay NC contact to the 1 input will cause contact failure.

## Self-hold Circuits

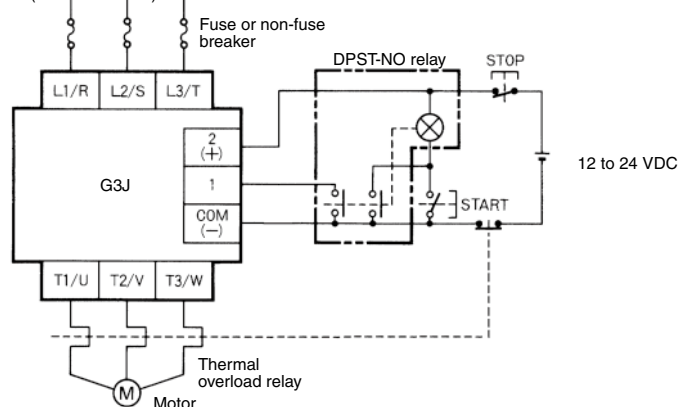
G3J-□BL, G3J-□BL-2

Three-phase, 200 to 220 VAC



G3J-S□BL, G3J-T□BL

Three-phase, 200 to 220 VAC (380 to 400 VAC)



**Note:** Be sure to use a fuse or non-fuse breaker to protect the G3J.

## ■ Fuse Selection

The following table shows the  $I^2t$  (60 Hz half-wave 1 cyc) values for G3J models.

Model	$I^2t$
G3J-T217BL	2,660A <sup>2</sup> s
G3J-S211BL G3J-T211BL	1,260A <sup>2</sup> s
G3J-S205BL G3J-T205BL	121A <sup>2</sup> s
G3J-S405BL G3J-T405BL	260A <sup>2</sup> s
G3J-S403BL G3J-T403BL	260A <sup>2</sup> s

When selecting a fuse to protect a G3J, use a quick-breaking fuse for semiconductor protection that satisfies the following condition:  
fuse's  $I^2t < G3J$ 's  $I^2t$ .

# Operation

## ■ Soft-Start/Stop (Function of G3J-T)

The G3J-T is a solid state contactor that smoothly starts and stops machines and equipment connected to power supplies without damaging the machines, equipment, or power supplies.

### Soft-start Time

The voltage imposed on the motor increases while ignition  $\alpha$  is gradually reduced, thus gradually increasing the rotation speed of the motor.

### Ramp-up Time

Ramp-up time is a period required for ignition  $\alpha$  to become zero degrees with a 100% voltage imposed on the motor.

### Starting Torque

Starting torque is determined by the value of ignition  $\alpha$  immediately after the input signal is turned ON.

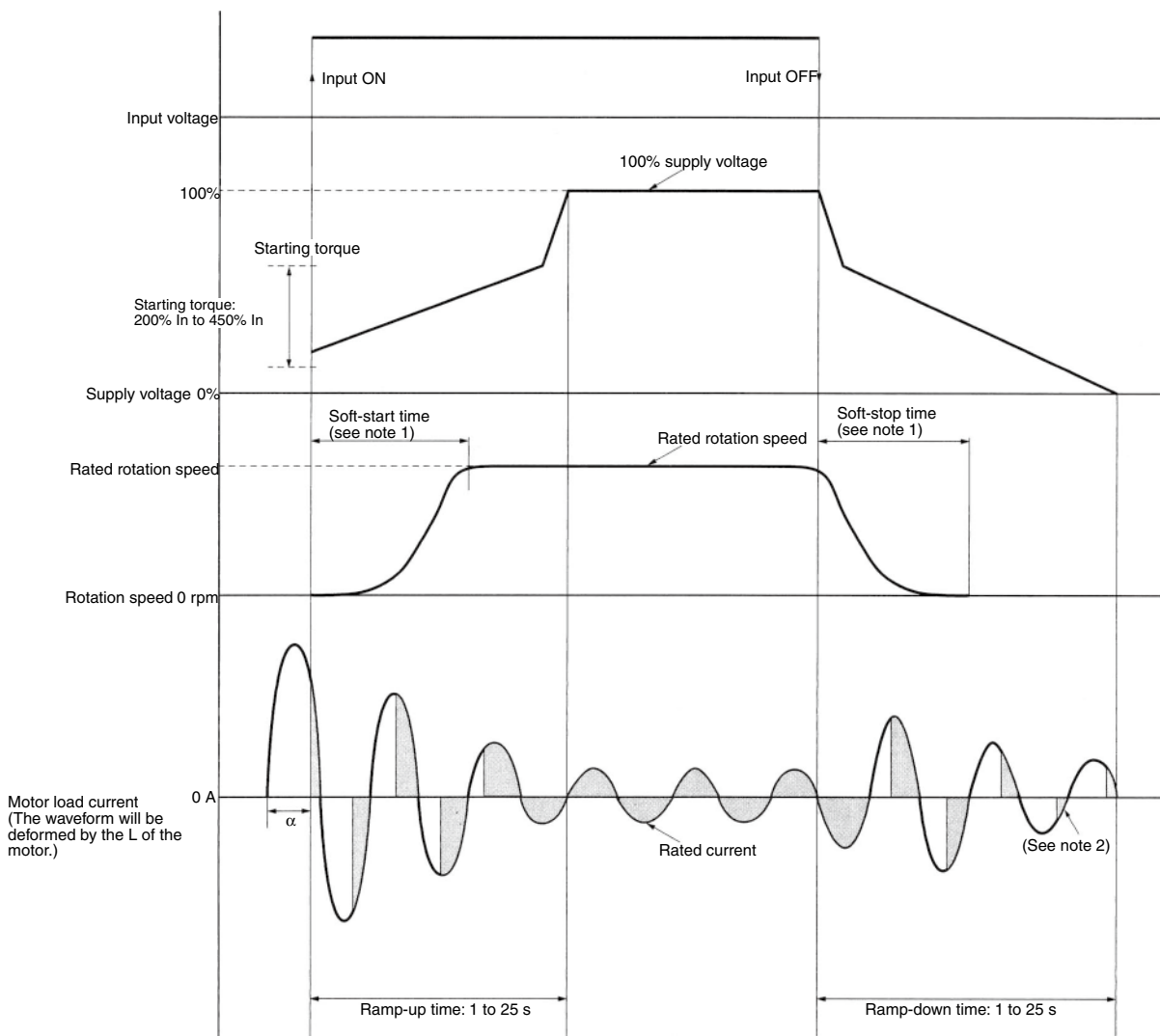
### Soft-stop Time

The voltage imposed on the motor decreases while ignition  $\alpha$  is gradually increased, thus gradually decreasing the rotation speed of the motor.

### Ramp-down Time

Ramp-down time is a period required for ignition  $\alpha$  to become 180 degrees with a 0% voltage imposed on the motor.

## Soft-start/stop Characteristics



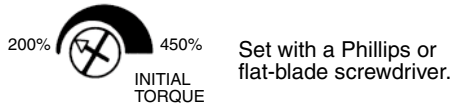
- Note: 1.** In addition to starting torque, ramp-up time, and ramp-down time, the soft-start time and soft-stop time vary with the load characteristics such as the inertia and friction factor of the load. Therefore, the soft-start time or soft-stop time will not increase beyond a certain point.
- 2.** Due to the soft-stop control characteristics, the load current continues flowing even after the motor stops. Set to the optimum value according to the adjustment steps.

## ■ Soft-start/stop Setting Method

### Adjuster

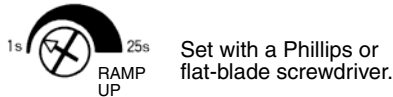
#### Starting Torque Setting with the Starting Torque Adjuster

The starting torque of a motor can be set within a range from 200% to 450% In provided that the starting torque is 600% In when the motor is started at full voltage, which allows optimum motor control without any time lag at the time the motor starts.



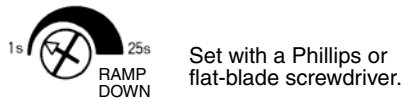
#### Ramp-up Time Setting with the Ramp-up Adjuster

The ramp-up time of a motor can be set within a range from 1 to 25 s, with which the soft-start time of the motor is adjusted until the motor rotates at full speed.



#### Ramp-down Time Setting with the Ramp-down Adjuster

The ramp-down time of a motor can be set within a range from 1 to 25 s, with which the soft-stop time of the motor is adjusted until the motor decelerates to a stop.



### Adjustment Steps

1. Start and stop the motor with the factory settings.  
Ramp-up adjuster: 1 s  
Starting torque adjuster: 200% In  
Ramp-down adjuster: 1 s
2. If the motor does not rotate smoothly, increase the starting torque.
3. Gradually increase the ramp-up time to adjust the start time.
4. Gradually increase the ramp-down time to adjust the stop time.
5. The soft-start time or soft-stop time will not increase beyond a certain point (depend on load). Do not set the ramp-up time or ramp-down time beyond this point.

### Further Adjustment or Arrangement

1. Increase the starting torque if the motor does not start with a long soft-start time.
2. To start normally (i.e., not using soft-start) use a simple G3J model.

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To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

In the interest of product improvement, specifications are subject to change without notice.



# Safety Precautions for All Solid State Relays

Refer to the *Safety Precautions* section for each SSR for specific precautions applicable to that SSR.

## ⚠ CAUTION

Do not touch the SSR or the heat sink while the power is being supplied or immediately after the power supply has been turned OFF.  
Touching the SSR or heat sink while it is hot may result in burns.



Do not touch the LOAD terminals on the SSR immediately after the power supply has been turned OFF.  
Shock may result due to the electrical charge stored in the built-in snubber circuit.



Always attach the cover terminal if the SSR has one.  
Contact with current-carrying parts may result in shock.



Always turn OFF the power supply before performing wiring.  
Not doing so may result in shock.



Do not allow short-circuit current to flow to the load side of the SSR.  
The SSR may explode if short-circuit current flows.



## ■ Precautions for Safe Use

OMRON constantly strives to improve quality and reliability. SSRs, however, use semiconductors, and semiconductors may commonly malfunction or fail. In particular, it may not be possible to ensure safety if the SSRs are used outside the rated ranges. Therefore, always use the SSRs within the ratings. When using an SSR, always design the system to ensure safety and prevent human accidents, fires, and social harm in the event of SSR failure. System design must include measures such as system redundancy, measures to prevent fires from spreading, and designs to prevent malfunction.

1. Do not apply voltage or current in excess of the ratings to the terminals of the SSR.  
Doing so may result in failure or burn damage.
2. Do not use the SSR with loose terminal screws.  
Doing so may result in burn damage due to abnormal heat produced by the terminals.
3. Do not block the movement of the air surrounding the SSR or heat sink.  
Abnormal heating of the SSR may result in shorting failures of the elements or burn damage.
4. Follow the *Precautions for Correct Use* when performing wiring or tightening the screws.  
If the SSR is used with the wiring or screw tightening performed improperly, burn damage may occur due to abnormal heat generated when the power is being applied.

## ■ Precautions for Correct Use

For details, refer to *Technical Guide for Solid State Relays*.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

In the interest of product improvement, specifications are subject to change without notice.

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