

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

Soft-start Function Starts Motors Smoothly and Economically

- The soft-start function allows a smooth startup of motors by holding down the starting current, and functions like an inverter.
- 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.



Model Number Structure

Model Number Legend

G3J-□□□□□□
1 2 3 4 5 6 7

1. Basic Model Name

G3J: Solid State Contactor

2. Load Power Supply

Blank: AC output

3. Functions

S: Soft-start function

4. Rated Load Power Supply Voltage

2: 200 VAC

4: 400 VAC

5. Rated Load Current

11: 11.1 A (200-V models)

05: 4.8 A (200-V models), 5.5 A (400-V models)

03: 2.4 A (400-V models)

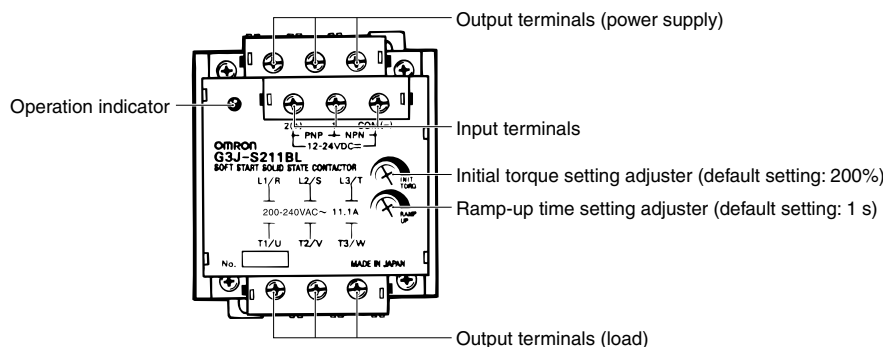
6. Terminal Type

B: Screw terminals

7. Zero Cross Function

L: Not equipped with zero cross function

Appearance



Ordering Information

List of Models

Number of elements	Insulation method	Rated supply voltage	Input method	Applicable motor		Model
3	Phototriac	12 to 24 VDC	No-voltage input (open and short-circuit input)	2.2 kW (5.5 A)	380 to 400 VAC	G3J-S405BL
				0.75 kW (2.4 A)		G3J-S403BL
				2.2 kW (11.1 A)	200 to 220 VAC	G3J-S211BL
				0.75 kW (4.8 A)		G3J-S205BL

Note: When ordering, specify the rated supply voltage.

Specifications

Ratings (at an Ambient Temperature of 25°C)

Power Supply

Rated supply voltage	12 to 24 VDC
Operating voltage range	10.2 to 26.4 VDC
Current consumption	100 mA max. (at 12 to 24 VDC)

Operation Circuit

Input current	10 mA max. (at 12 to 24 VDC)
Input method No-voltage input (short-circuiting and opening inputs) (See note.)	Short-circuiting or opening terminals 1 and COM or 2 (+) and 1 SSR input turned ON: A maximum residual voltage of 2 V between short-circuited terminals SSR input turned OFF: A maximum leakage current of 0.15 mA Relay input: For minute signals

Note: Refer to *Safety Precautions for the G3J-T, G3J-S, and G3J*.

Main Circuit

Item		G3J-S405BL	G3J-S403BL	G3J-S211BL	G3J-S205BL
Rated load voltage		200 to 400 VAC (50/60 Hz)		200 to 240 VAC (50/60 Hz)	
Load voltage range		180 to 440 VAC (50/60 Hz)		180 to 264 VAC (50/60 Hz)	
Rated carry current		5.5 A (Ta = 40°C)	2.4 A (Ta = 40°C)	11.1 A (Ta = 40°C)	4.8 A (Ta = 40°C)
Min. load current		0.5 A			
Peak-value current resistivity		220 A, 60 Hz, 1 cycle	96 A, 60 Hz, 1 cycle	350 A, 60 Hz, 1 cycle	150 A, 60 Hz, 1 cycle
Overload resistance		Refer to <i>Information Common to the G3J, G3J-T, and G3J-S</i> .			
Closed current (effective value)	AC3	55 A	24 A	111 A	48 A
	AC4	66 A	28.8 A	133.2 A	57.6 A
Breaking current (effective value)	AC3	44 A	19.2 A	88.8 A	38.4 A
	AC4	55 A	24 A	111 A	48 A
Applicable load	3-phase inductive motor (AC3 AC4 AC53-a)	380 to 400 VAC, 2.2 kW, 5.5 A	380 to 400 VAC, 0.75 kW, 2.4 A	200 to 220 VAC, 2.2 kW, 11.1 A	200 to 220 VAC, 0.75 kW, 4.8 A
	Resistive load (AC1) (See note.)	200 to 400 VAC, 5.5 A	200 to 400 VAC, 2.4 A	200 to 240 VAC, 11.1 A	200 to 240 VAC, 4.8 A

Note: No single-phase load can be connected.

■ Characteristics

Item	G3J-S405BL	G3J-S403BL	G3J-S211BL	G3J-S205BL
Ramp-up time	Set within a range from 1 to 25 s.			
Reset time	5/6 cycles of load power supply + 1 ms max.			
Starting torque	Set within a range from 200% to 450% I _n .			
Output ON-voltage drop	1.8 V _{RMS} max.		1.6 V _{RMS} max.	
Leakage current	20 mA max. (at 400 VAC)		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 ²			
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	730 g max.			
Certified standards	UL508 File No. E64562 CSA 22.2 No. 14 File No. LR35535 IEC947-4-1 File No. 96.2597.02			
EMC	Emission	AC mains	IEC947-4-2, CISPR 11 Class A	
	Emission	Electromagnetic	IEC947-4-2, CISPR 11 Class A	
	Immunity	ESD	IEC947-4-2, IEC801-2: 4 kV contact discharge 8 kV air discharge	
	Immunity	Electromagnetic	IEC947-4-2, IEC1000-4-3 10 V/m (80 MHz to 1 GHz)	
	Immunity	EFT	IEC947-4-2, IEC801-4: 2 kV AC power-signal line	
	Immunity	Surge transient	IEC947-4-2, IEC1000-4-5 1 kV differential mode 2 kV common mode	
	Immunity	RF disturbance	IEC947-4-2, IEC/DIS1000-4-6 10 V (0.15 to 80 MHz)	

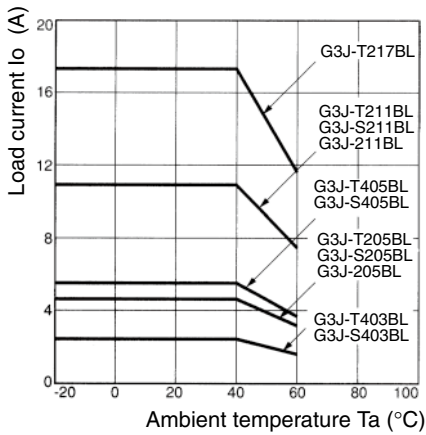
ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

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.

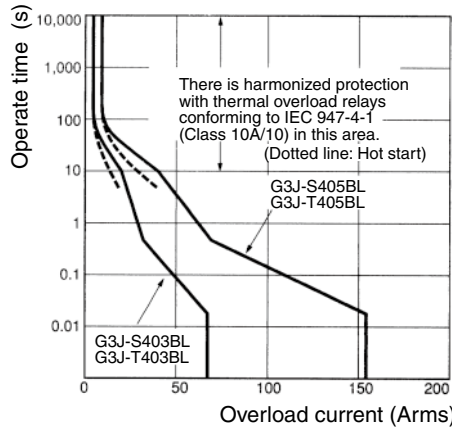
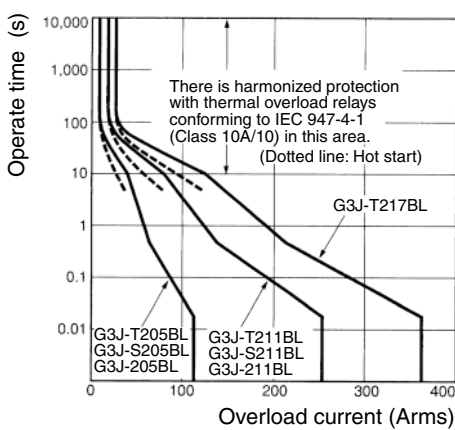
Engineering Data

Load Current vs. Ambient Temperature



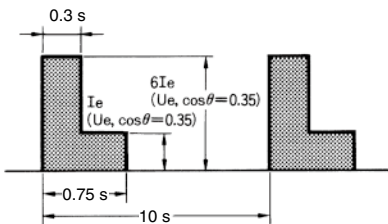
Overload Current Resistivity

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)

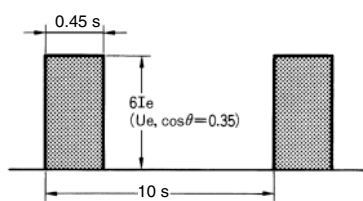
The following Soft-start conditions apply.

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)

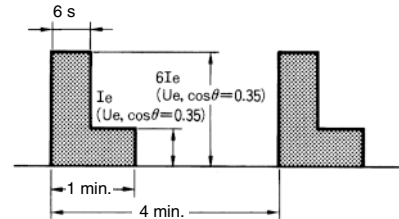
The following Soft-start conditions apply.

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.

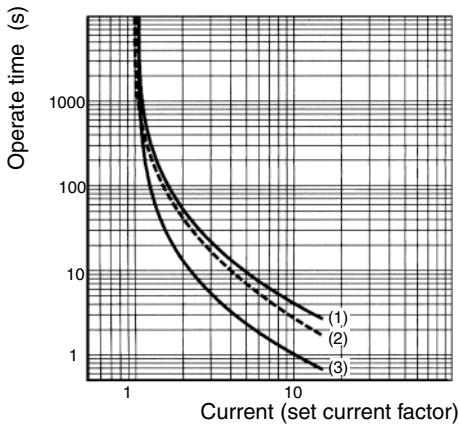
Ramp-up time: 1 s
Starting torque: 450% In

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



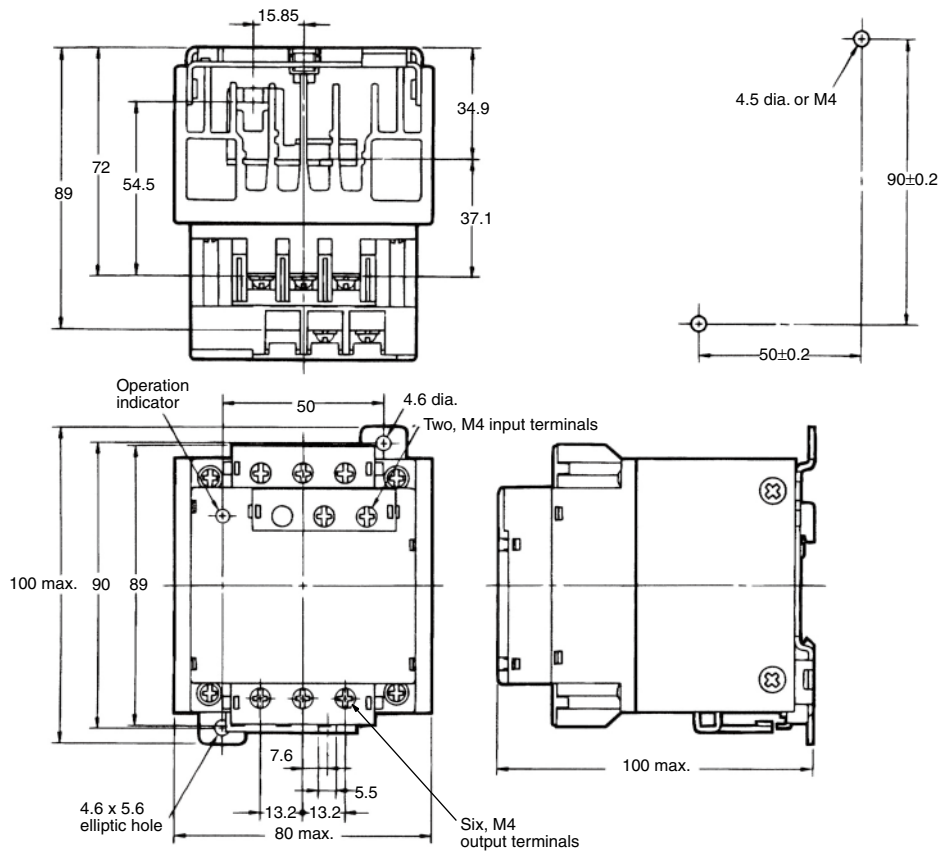
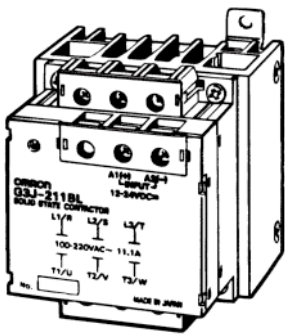
- (1): Balanced operation, 3-phase, from cold state
- (2): Balanced operation, 2-phase, from cold state
- (3): Balanced operation, 3-phase, after a long period of set current flow (hot state).

Dimensions

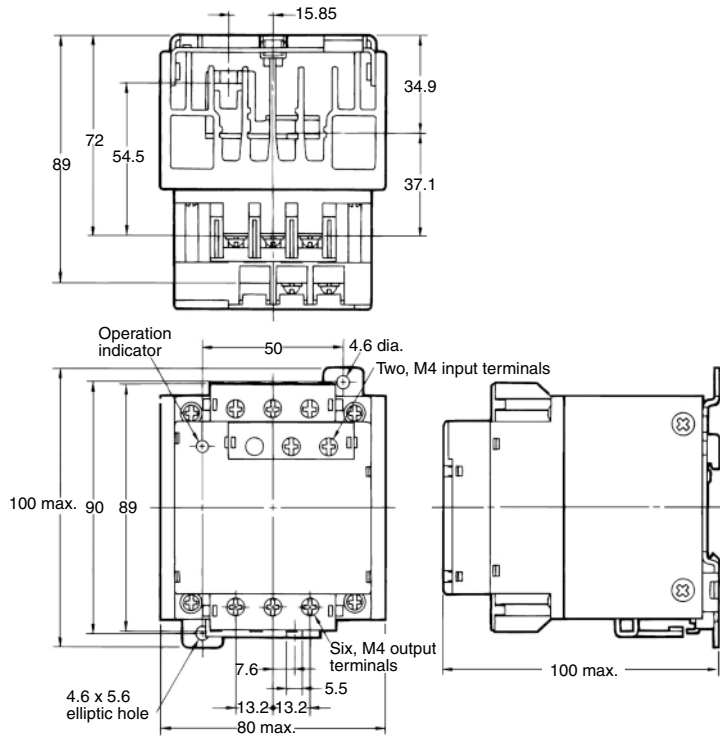
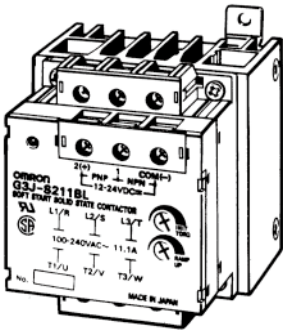
Note: All units are in millimeters unless otherwise indicated.

Solid State Contactors

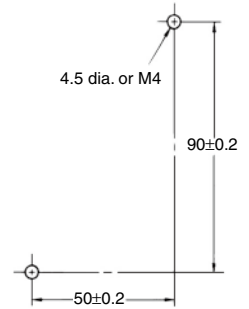
- G3J-211BL
- G3J-205BL
- G3J-211BL-2
- G3J-205BL-2



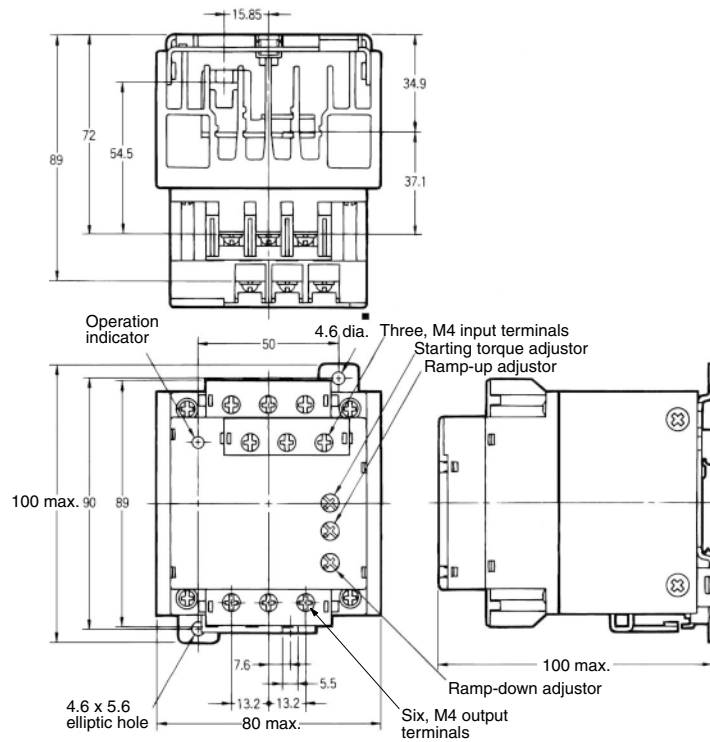
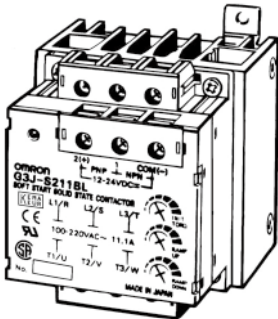
G3J-T211BL
G3J-T205BL
G3J-T405BL
G3J-T403BL



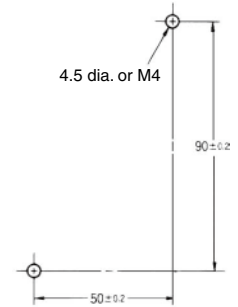
Mounting Holes



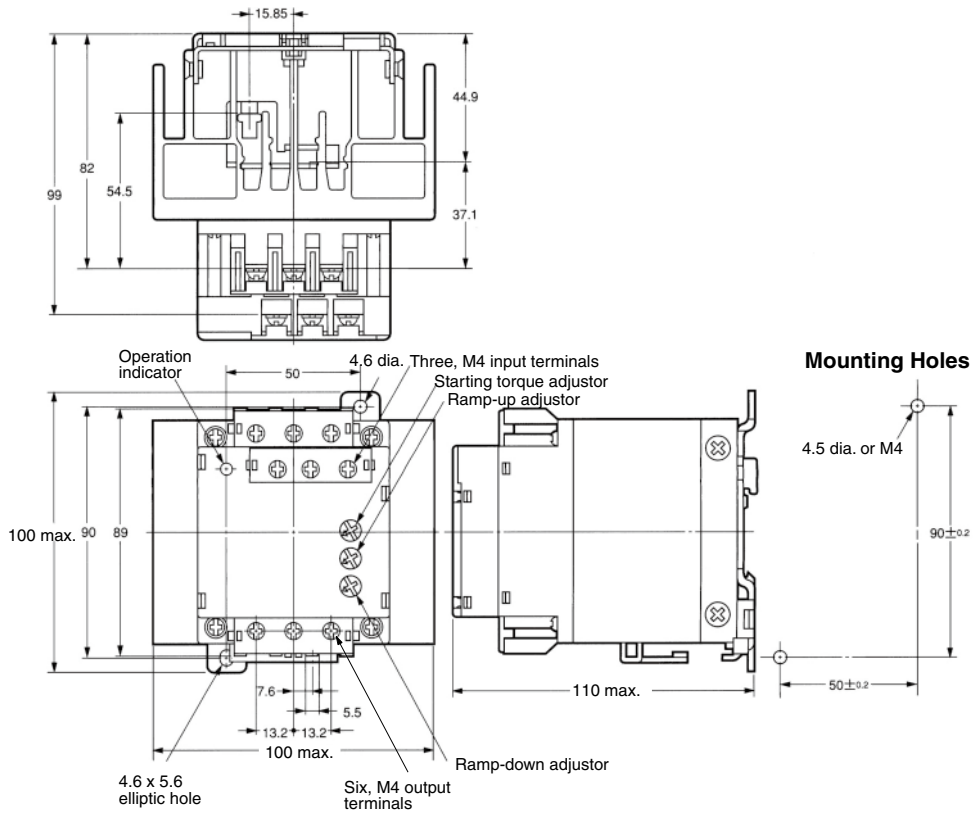
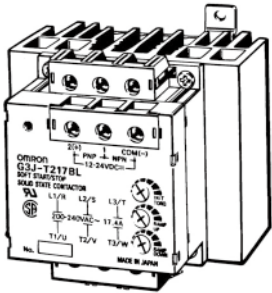
G3J-S211BL
G3J-S205BL
G3J-S405BL
G3J-S403BL



Mounting Holes



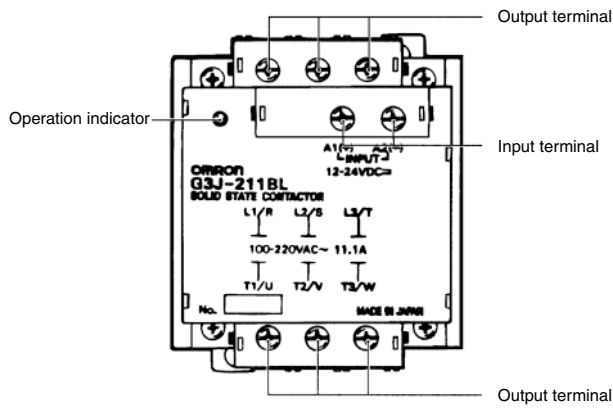
G3J-T217BL



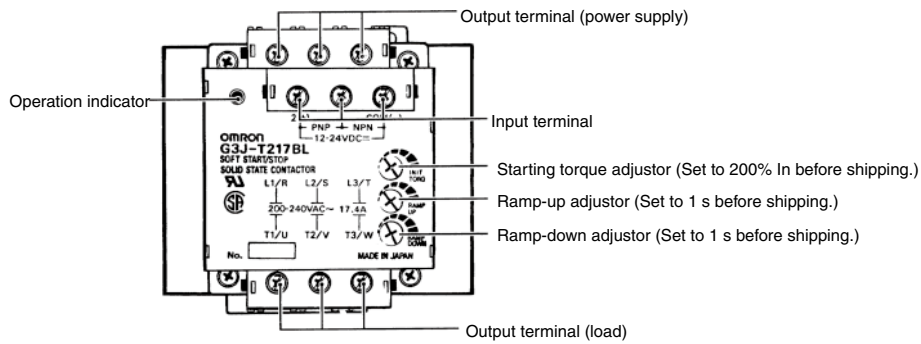
Installation

■ Nomenclature

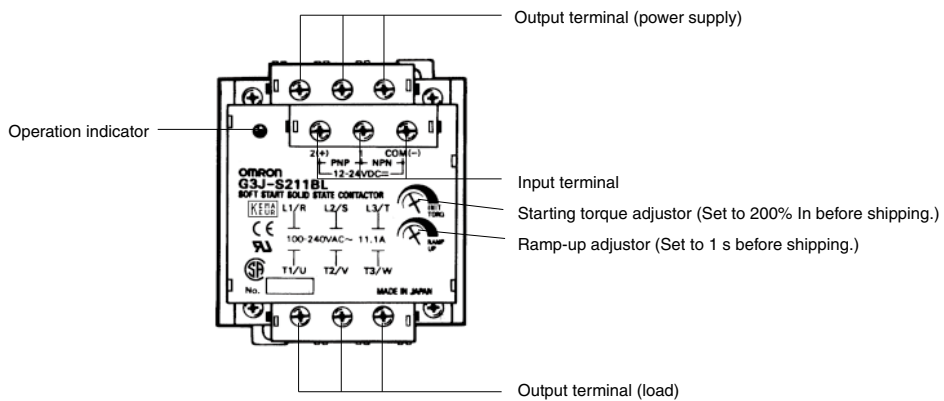
G3J



G3J-T

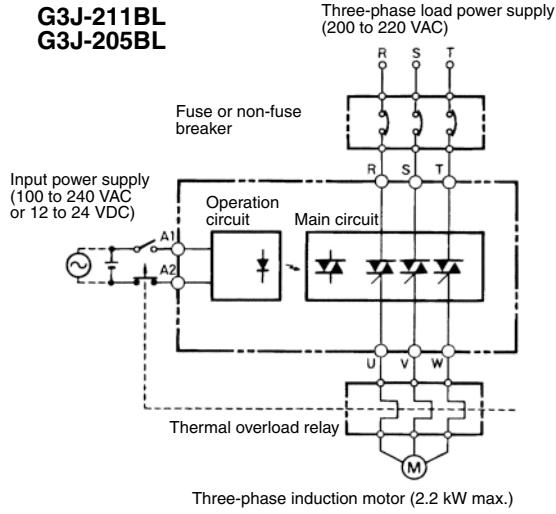


G3J-S

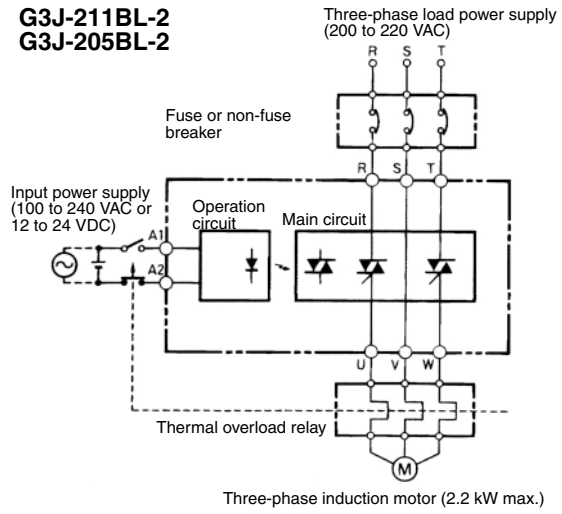


Internal Connections

Simple 3-element Models

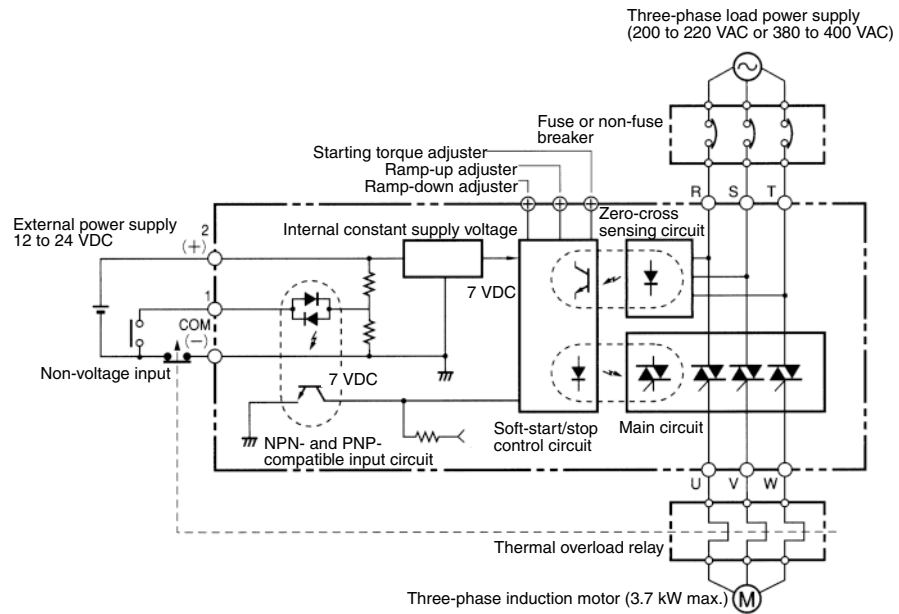


Simple 2-element Models



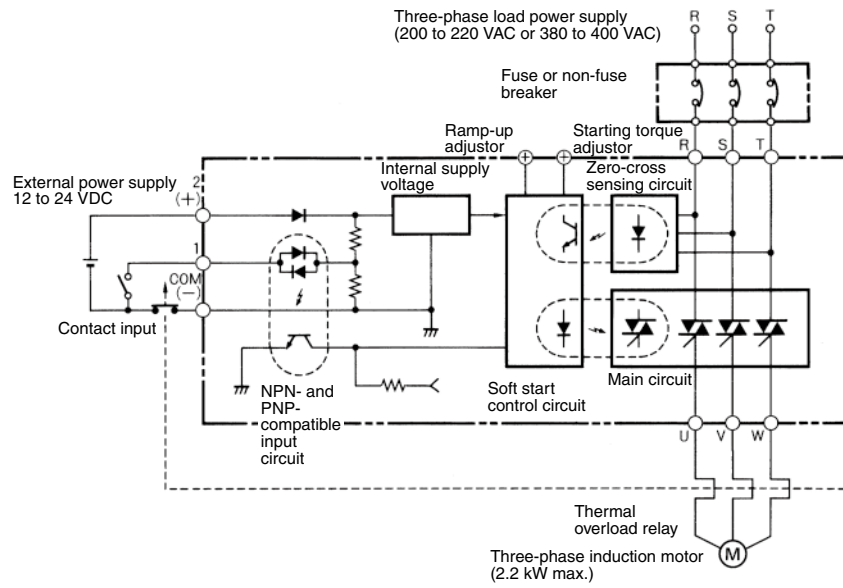
Soft-start/stop Models

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



Soft-start Models

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

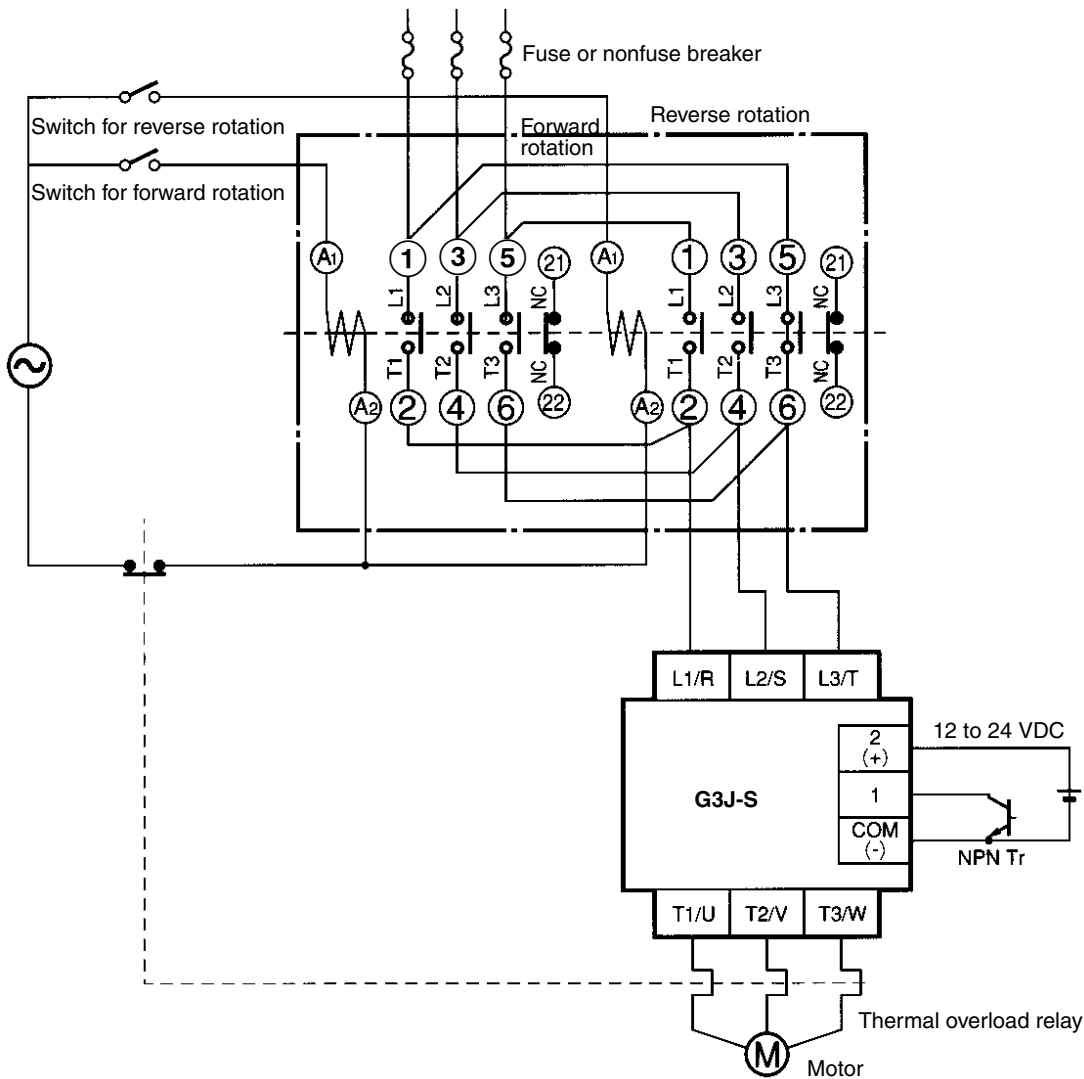


Forward/Reverse Rotation

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

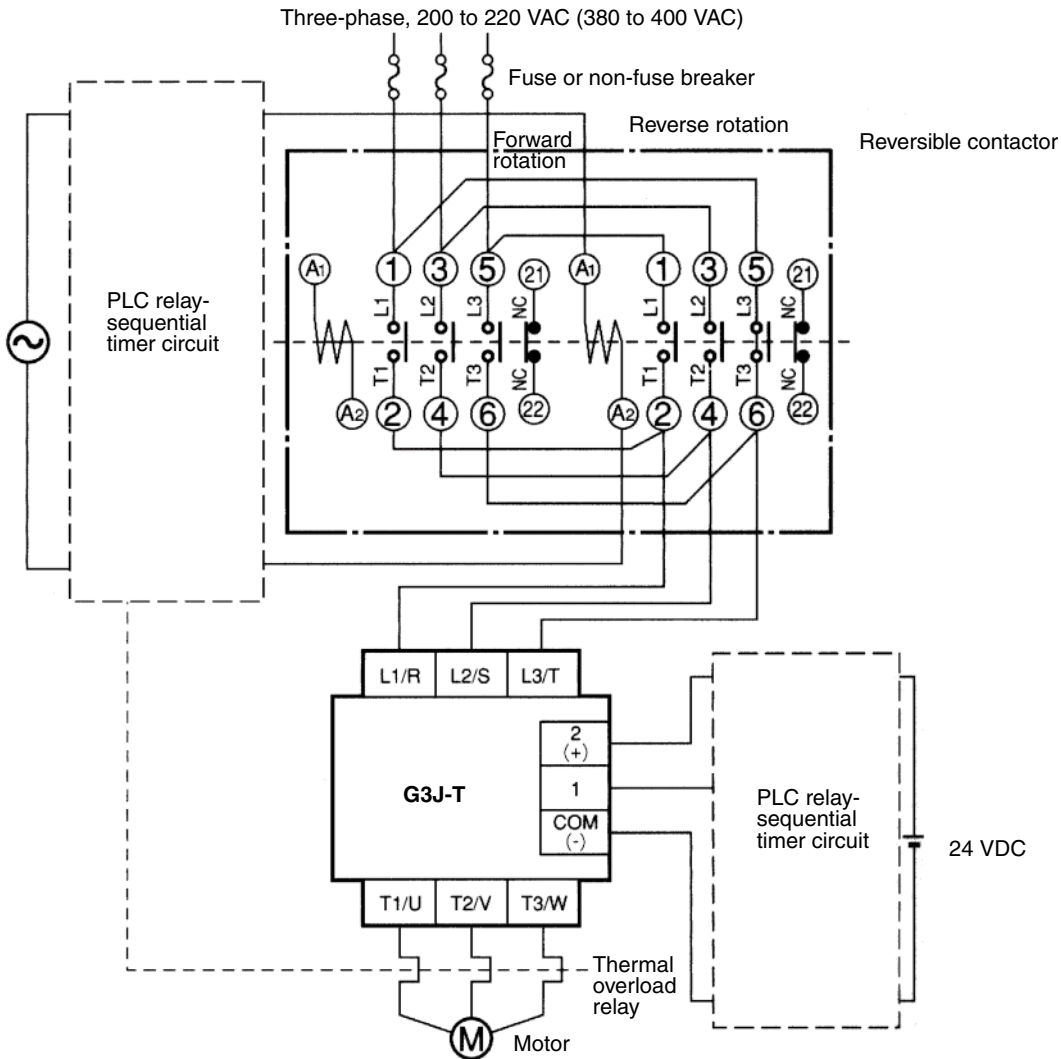
G3J-S□BL or G3J-T□BL

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

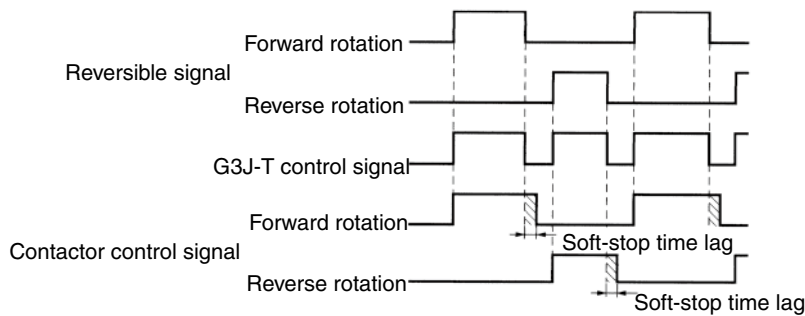


- Note:**
1. Be sure to use a fuse or non-fuse breaker to protect the G3J.
 2. Make sure that the interval between forward and reverse operations is at least 100 ms.
 3. Be sure to apply the input signal of the G3F-S after the reversible contactor starts operating. If the input signal is applied before 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

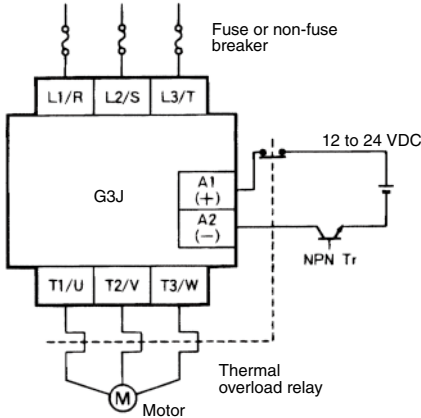
Harmonized protection is ensured for motor overcurrents.

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

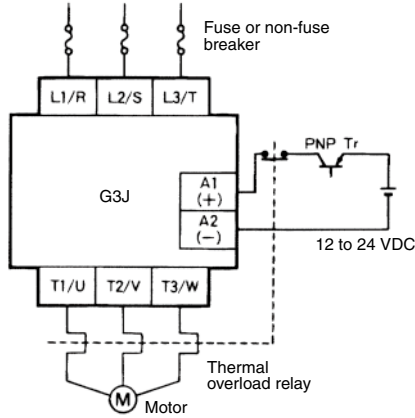
Three-phase, 200 to 220 VAC



Simple DC-input Models

G3J-□BL, G3J-□BL-2

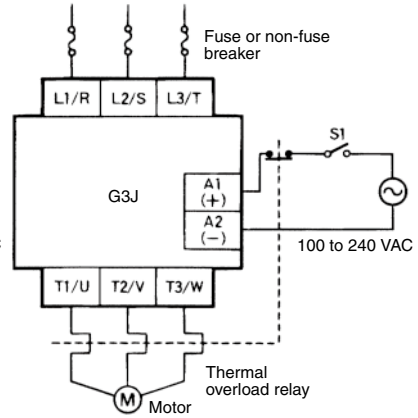
Three-phase, 200 to 220 VAC



Simple AC-input Models

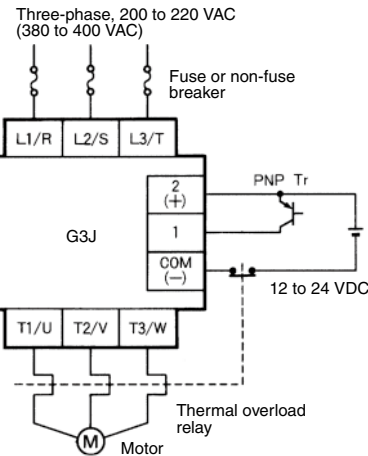
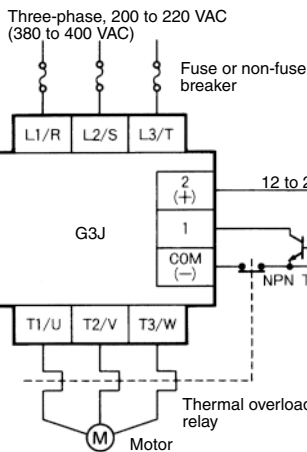
G3J-□BL, G3J-□BL-2

Three-phase, 200 to 220 VAC



Soft-start/Soft-start/stop Models

G3J-S□BL, G3J-T□BL



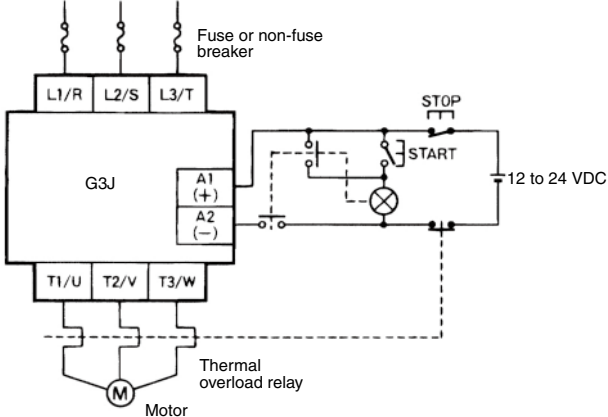
Note: 1. When the minimum applicable load of the thermal relay auxiliary contacts becomes smaller than the input current of the G3J, insert a bleeder resistance.

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

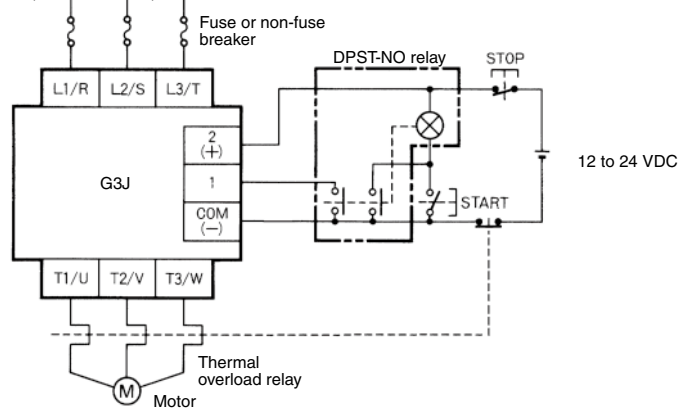
G3J-□BL, G3J-□BL-2

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 ² s
G3J-S211BL G3J-T211BL	1,260A ² s
G3J-S205BL G3J-T205BL	121A ² s
G3J-S405BL G3J-T405BL	260A ² s
G3J-S403BL G3J-T403BL	260A ² 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 α is gradually reduced, thus gradually increasing the rotation speed of the motor.

Ramp-up Time

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

Starting Torque

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

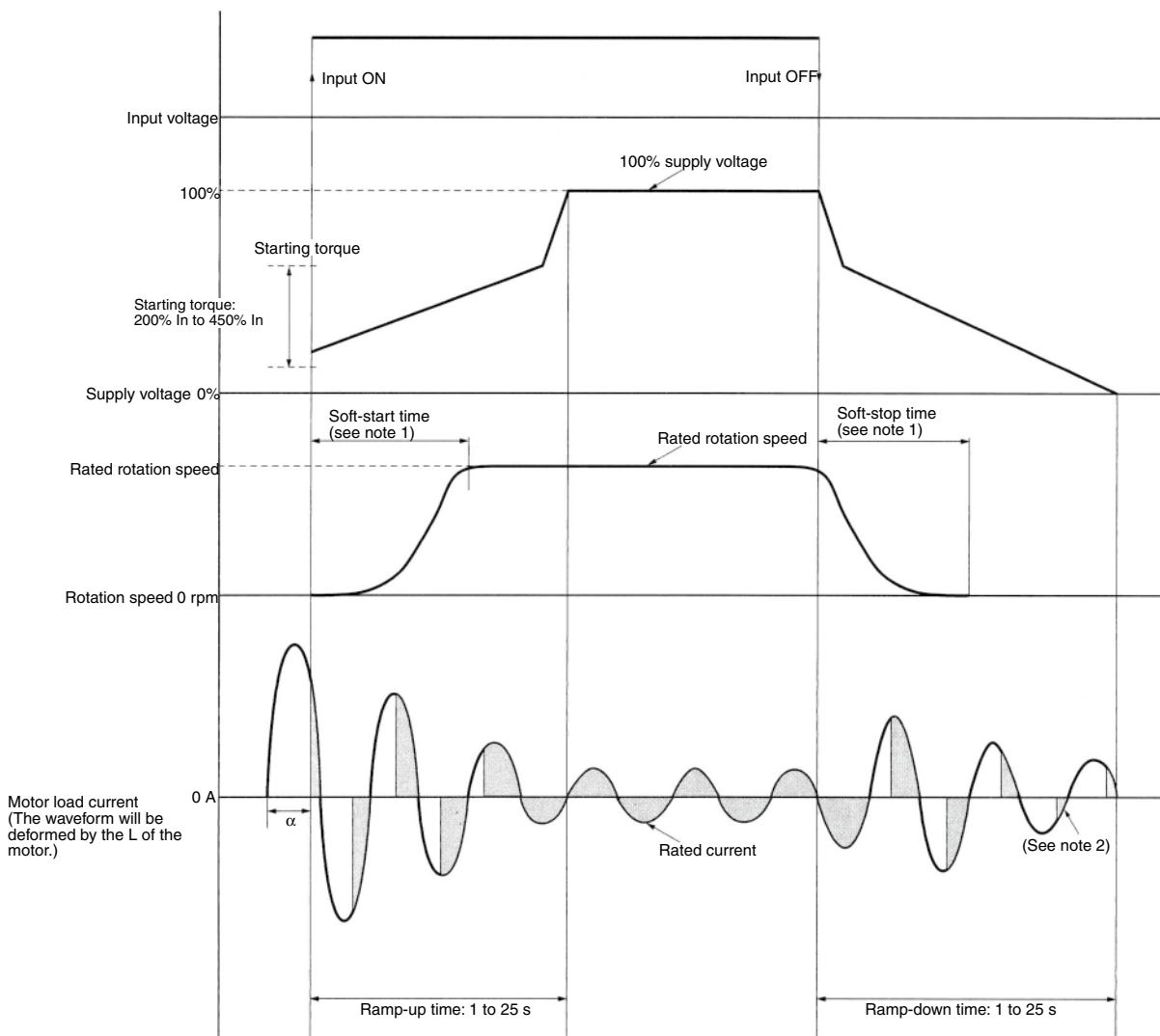
Soft-stop Time

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

Ramp-down Time

Ramp-down time is a period required for ignition α 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.



Set with a Phillips or flat-blade screwdriver.

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.



Set with a Phillips or flat-blade screwdriver.

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.



Set with a Phillips or flat-blade screwdriver.

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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