

# Development of Environment-Friendly Latching Relay

## 1-Pole 8A Latching Relay JSL Series

A latching-type relay has been added to the JS Series family, which has a good track record. By adopting a bridge-type magnetic circuit with a new structure in which attraction and repulsion forces function efficiently, further miniaturization has been realized.

### Introduction

A relay is an electromechanical part that closes or opens a contact by electromagnetic force. It is an energy-saving switching element that uses no standby power (including driving power) since it completely opens the circuit and shuts off the electric current when it is not operating. Most importantly, the latching relay does not require driving power when maintaining the operation status or recovery status (although it needs pulsed power when it switches between operation and recovery). It is currently receiving attention as an element that may aid in CO<sub>2</sub> reduction and thereby help prevent global warming.

As latching-type products in JS Series relays that have good track records in applications in air conditioners and heater control, timers, and I/O modules, FUJITSU COMPONENT has developed relays that incorporate bridge-type magnetic circuits with a new structure in which attraction and repulsion forces function efficiently; these products were added to the series as JSL relays. The contact material is gold-plated silver tin oxide (making it a cadmium-free product), and it adopts green measures such as lead-free solder so as to conform to the RoHS directive.

### Original Structure Bridge-type Magnetic Circuit

Latching-type relays can be divided into two types: relays

with a mechanical lock mechanism to maintain the operation status and those with an electromagnetic lock mechanism. Since mechanical lock types usually have high cost due to their complex structures, electromagnetic lock types using permanent magnets are more commonly used. They are also called polarized relays because the (+) pole of the driving coil is determined by specifications. JSL relays are classified as polarized relays. Polarized relays are largely classified into those with permanent magnets on the yoke side of the driving coil and those with permanent magnets on the side of movable armatures. These relays open or close the contact by armature movement. JSL relays adopt a bridge-type magnetic circuit in which the permanent magnet is located on the armature. While bridge-type magnetic circuits normally stabilize the armature at recovery using an E-shaped yoke, JSL relays adopt

Photo 1 External View



an unique structure and stabilize the armature using a C-shaped yoke.

Further miniaturization has been addressed for all types of latching relays by adopting a bridge magnetic circuit that requires no yoke to stabilize the magnetic circuit at recovery outside the armature.

## Operation Principles

**Figure 1** presents the operation principles.

Once recovered, the armature is maintained stably on one side of the C-shaped yoke by the magnetic flux emanating from the permanent magnet.

When operation is initialized, voltage is applied on the set coil, which generates and runs magnetic flux through the yoke that causes repulsion and attraction forces between the edges of the bridge-shaped armature and the yoke. This makes the armature move to the operation maintenance position. When it moves, the magnetic flux of the permanent magnet flows through the yoke and is maintained at operation maintenance status even though the coil is de-energized.

When recovery is initialized, voltage is applied on the reset coil to generate a magnetic flux through the yoke in the reverse direction of the operation initialization status that causes repulsion and attraction forces in the reverse direction so that the armature moves to the recovery position.

Since it has a structure that maintains the armature magnetically at operation maintenance status and recovery status, it has uniform shock resistance while in both statuses.

## Specifications

**Table 1** presents the main specifications, and **Figure 2** the diagram of internal connection and relay structure for a 2-coil relay.

There are 1-coil and 2-coil products. Operation recovery is executed in 1-coil products by changing the polarity of the voltage applied on the coil. In 2-coil products, a voltage with prespecified polarity is applied on different coil terminals. Furthermore, it is possible to increase the number of turns in

each coil in 1-coil products the power consumption can be suppressed in this manner.

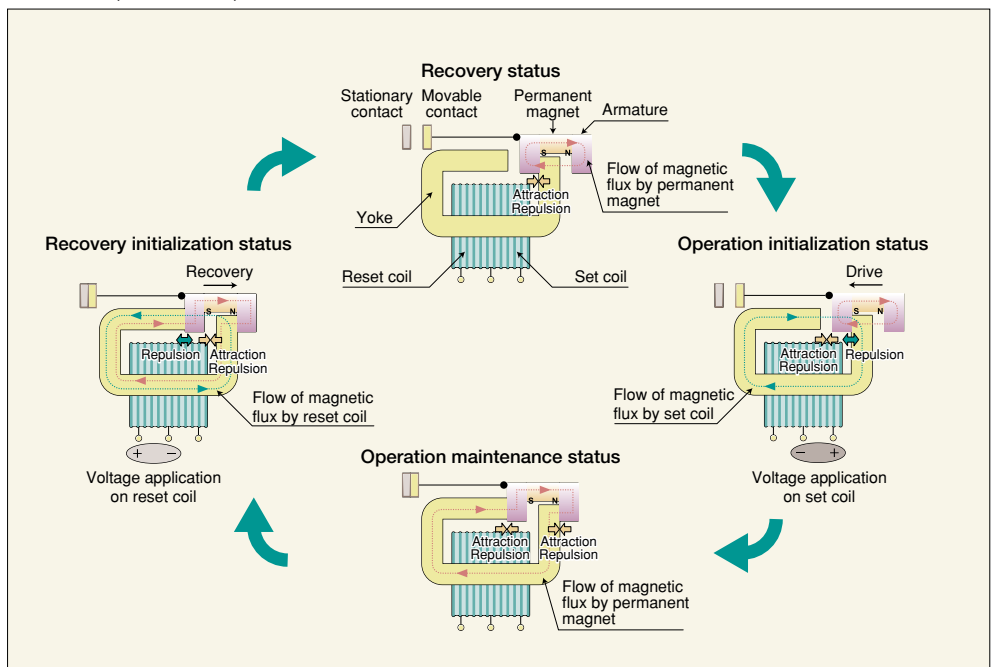
## Precautions

To use a latching relay, the following points must be noted. Although the products are set to recovery status at the time of shipment, they may have changed to operation maintenance status as a result of impact during transport. It is necessary for the power supply sequence to be constructed so that it operates from the recovery status when using relays. Neglect may cause the device that the relay controls to operate immediately after power startup and lead to human injury or device damage.

## Conclusion

We have realized the miniaturization of latching relays using bridge-type magnetic circuits. We will continue to develop more relays that will further contribute to the prevention of global warming through green design. \*

**Figure 1** Operation Principles



**Table 1** Main Specifications

Item		JSL— ( )	
Contact	Arrangement	1 make or transfer	
	Material	Gold-plated silver tin oxide alloy	
	Type	Single contact	
	Contact resistance (initial)	100mΩ or smaller (at 6VDC 1A)	
	Rating (resistive load)	8A 250VAC / 24VDC	
	Max. carrying current	10A	
	Max. switching power	2,000VA	
	Max. switching voltage	400VAC/150VDC	
	Max. switching current	10A	
	Min. switching load*1	100mA 5VDC	
Coil	Rated power consumption (at 20°C)	1 coil	220mW (24V product: 250mW)
		2 coils	480mW
	Operating temperature range	-40 to +70°C (no condensation or freezing)	
Time	Operation/release time (at rated voltage)	Max. 10ms (bounce not included)	
	Min. coil voltage duration time (at rated voltage)	Min. 20ms	
Insulation	Insulation resistance (at 500VDC)	Min. 1,000MΩ	
	Dielectric strength	Between open contacts	1,000VAC (50/60Hz) 1 minute
		Between coil-contact	5,000VAC (50/60Hz) 1 minute
Surge strength (between coil-contact)	10,000V (1.2×50μs standard wave)		
Life	Mechanical	Min. 5 million operations	
	Electrical (at rated load)	Min. 50,000 operations	
Vibration resistance	Misoperation	10 to 55Hz at double amplitude of 2mm	
	Endurance	10 to 55Hz at double amplitude of 3mm	
Shock resistance	Misoperation	100m/s <sup>2</sup> (11±1ms)	
	Endurance	1,000m/s <sup>2</sup> (6±1ms)	
Others	External dimensions	10±0.3×29+0.3×12.5+0.3mm	
	Weight	Approx. 8g	

\*1 : Minimum switching loads mentioned above are reference values. Please perform the confirmation test with the actual load before production, since reference values may vary according to switching frequencies, environmental conditions and expected reliability levels.

**Figure 2** Diagram of Internal Connection and Relay Structure

