

SHOCK RELAY

INSTRUCTION MANUAL

TSBSB Series



WARNING

- Make sure you read this instruction manual thoroughly before installing, wiring, operating and inspecting this SHOCK RELAY
- Please make sure that this instruction manual accompanies the SHOCK RELAY to the end user.
- Please keep this instruction manual safe until this product is disposed of.
- Product specification is subject to change for improvement without notice.

TSUBAKIMOTO CHAIN CO.

February 21, 2024

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1. Preface

Thank you for purchasing the Shock Relay TSBSB series.

The Shock Relay is a current monitoring device that quickly detects motor overload, thus protecting your equipment from costly damage.

This instruction manual describes everything from installation to adjustment. Be sure to read this manual carefully before using your Shock Relay.

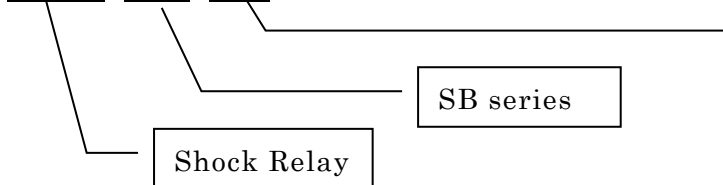
2. Checking the package

Upon receiving the Shock Relay, please check the following:

- ① Check whether the model and specification conform to what you ordered.
- ② Check to see no damages occurred during the delivery.
- ③ Package: Shock Relay, Instruction Manual

< Model Identification >

TSB SB 05



Current setting range

05	0.5 ~ 6A
10	1 ~ 12A
30	3 ~ 30A
60	5 ~ 60A
*100	10 ~ 100A
*200	20 ~ 200A
*300	30 ~ 300A

*Following 3 models include main body and external CT

TSBSB100 ... TSBSB05 (Main body) + TSB2CT100 (External CT)

TSBSB200 ... TSBSB05 (Main body) + TSB2CT200 (External CT)

TSBSB300 ... TSBSB05 (Main body) + TSB2CT300 (External CT)

3. Safety precaution

- Please read this instruction manual thoroughly before using this Shock Relay.
In this instruction manual, the rank of safety requirements is divided into WARNING and CAUTION.

 WARNING	Death or serious injury may result from product misuse due to not following the instructions.
 CAUTION	Minor or moderate injury, as well as damage to the product may result from product misuse due to not following the instructions.

Even if the instructions are followed, a serious consequence may result depending on the situation.
Be sure to exercise due caution and follow all of these important instructions.

 WARNING ● Follow safety related rules and regulations. (Ordinance on Industrial Safety and Health, etc.) ● In the case of installation, removal, maintenance, please follow the below requirements. (1) Power off. (2) To avoid falling accident, do not stand under the device. (3) Tighten moving parts. (4) Wear proper work clothes and protective equipment. ● When carrying out operation test or periodic inspection, make sure protective device functions properly. ● Megger testing is conditional, must be performed in accordance with instruction manual. ● Never operate under the live wire condition, power off before starting operation. Electric Shock Risk. ● The wiring, operation, maintenance, check of Shock Relay must be performed by workers with expertise. Electric Shock, Injury, Fire Risk.
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 CAUTION ● In case the instruction manual is not available, request to furnish one from the distributor or our sales office. ● Do not recompose or rebuild parts or units. ● Consumable parts (condenser, relay, etc.) are built in the products. Function check should be performed periodically. In the case of malfunction, contact the distributor for repair. ● Avoid usage in the corrosive gas environment. Sulfide gases (SO₂, H₂S) corrode copper and copper alloy used on PCBs and parts and cause the malfunction. ● Dirt and dust may result in overheat and fire, should be cleaned periodically. ● Products must be discarded in accordance with industrial waste rules.
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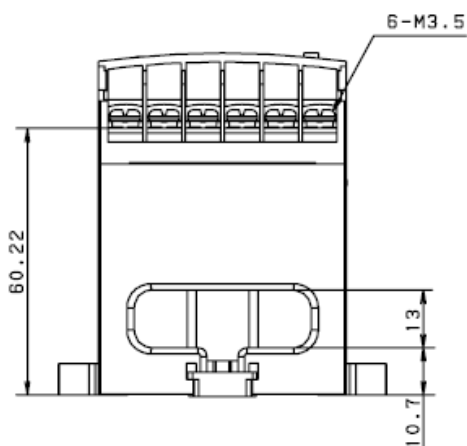
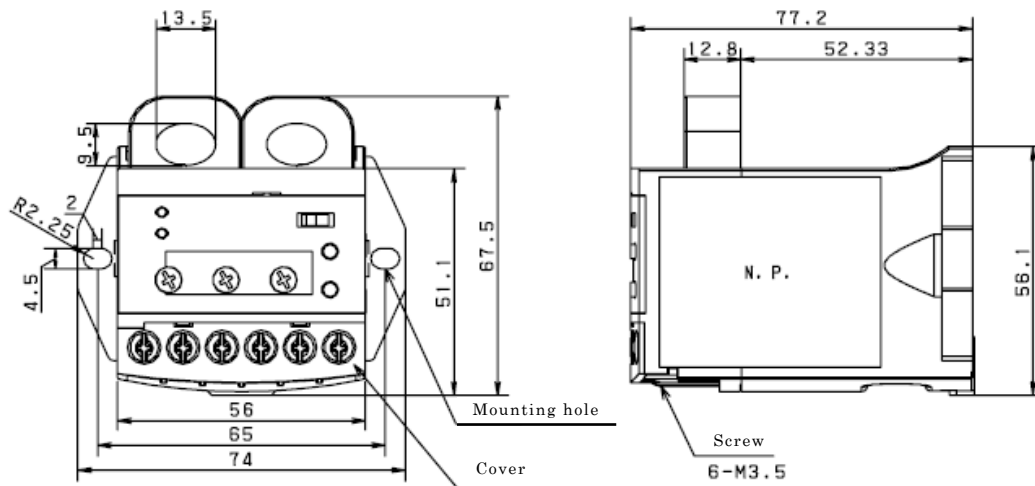
4. Dimension

TSBSB05

TSBSB10

TSBSB30

TSBSB60

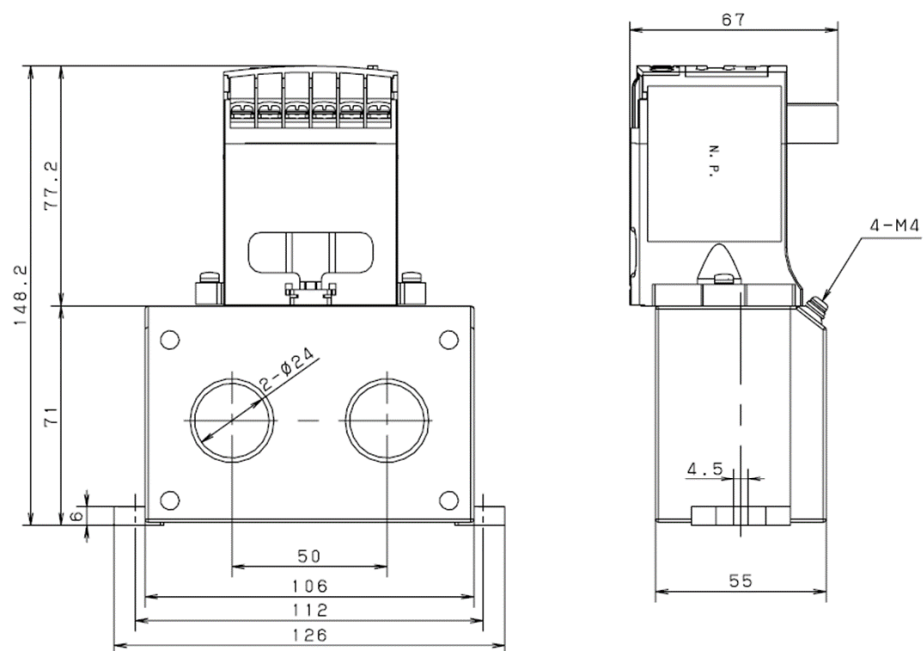


※ Install with 35mmDIN rail or mounting bracket.

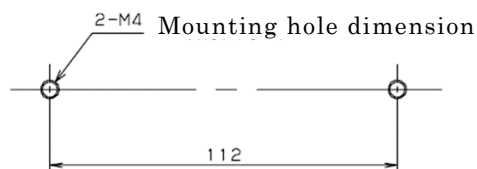
TSBSB100

TSBSB200

TSBSB300



CT and main unit is wired before shipment



5. Specifications

Model		TSBSB05	TSBSB10	TSBSB30	TSBSB60	TSBSB100	TSBSB200	TSBSB300	
Item	Applied motor	200V	0.1～ 0.75kW	1.5～ 2.2kW	3.7～ 5.5kW	7.5～ 11kW	1.5～ 18.5kW	22～ 37kW	45～ 75kW
		400V	0.2～ 2.2kW	3.7kW	5.5～ 11kW	15～ 22kW	30～ 45kW	55～ 90kW	110～ 132kW
Maximum motor voltage		AC600V 50/60Hz* ¹							
Current setting* ²		0.5～6A	1～12A	3～30A	5～60A	10～100A	20～200A	30～300A	
Time setting* ²	Start Time	0.2～10.0s* ³							
	Shock Time	0.2～5.0s* ³							
Control Power Supply		24～240V AC/DC (No polarity) ±10%							
Control Power Frequency		50/60Hz							
Accuracy		±10% (Full Scale)							
Current sensing method		2 Integral Current Transformer							
Output	Operation selecting* ⁴	SS : Normal operation/excitation; self-holding after trip SA : Abnormal/excitation; automatically reset after trip							
	Contact rating	1a1b 3A AC250V cosφ=1							
	Minimum allowable load* ⁵	DC10V,10mA							
	Expected life	80,000 times at rated load							
Ambient Environment	Operating temperature	－20～＋60℃							
	Humidity	45～85% RH without condensation							
	Vibration	5.9m／s ² or less							
	Altitude	2,000m or less							
Dielectric Strength	Pollution degree	Class 3, free from dust and corrosive gas							
	Between casing and circuit	AC2000V, 60Hz, 1min							
	Between contacts	AC1000V, 60Hz, 1min							
	Between circuits and contacts	AC2000V, 60Hz, 1min							
	Protection structure	IP20							
	Weight	0.2 kg MAX							
Power Consumption		2W MAX							

*1. In the case of inverter drive, there is a possibility of malfunction due to the distortion of the current waveform. If the frequency is within the range of 30 to 60Hz, it can be used because the influence is minor.

*2. Current · Time setting ranges are settable ranges, not the upper or lower level of setting knob.

*3. The minimum value on the display is 1s, values smaller than 1s can be set with the dial.

*4. DIP switch is set on SS side when delivery.

*5. Be sure to input minute electric currents through the relay when inputting an output relay contact directly into the PLC (Programmable logic controller), because there is a risk of contact failure due to minute electric current.

*6. When power off to reset, power off more than 1 second.

*7. Certificate standard : UL certification – UL508, CCC certification – GB/T14048.4

6. Installation

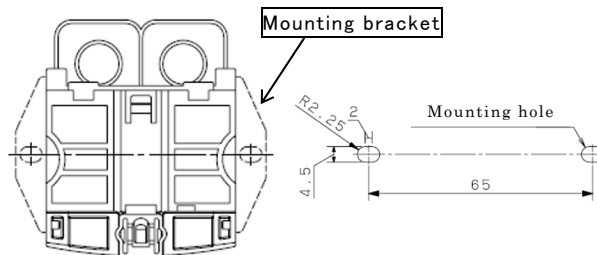
6. 1 Environment

Install Shock Relay in the following environment.

 Caution	• Keep Shock Relay free from lint, paper, wooden chips, dirt, dust, metal scrap, etc. Fire, Accident Risk
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6. 2 Install with Screw

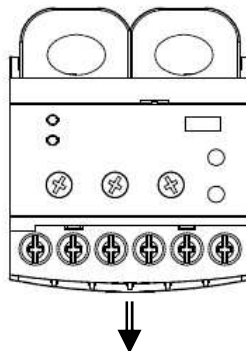
Attach the mounting brackets and install Shock Relay to the panel.



6. 3 Install to DIN rail

While pulling the hook to the arrow direction, install Shock Relay to 35mm DIN rail.

When remove, pull the hook to the arrow direction with flathead screwdriver.



7. Wiring

- ① Connect power supply to commercial power source. If device with harmonic noise, such as inverter is used, install an isolation transformer.

- ② Remove terminal cover and use crimp terminal to connect terminal block and wire.

When connecting without crimp terminal, tightening torque of 0.4~0.6N·m(※) is recommended to avoid screw damage.

Terminal block specification: M3.5 screw, tightening torque: 0.8~1.2N·m

※tightening torque without crimp terminal : 0.4~0.6N·m

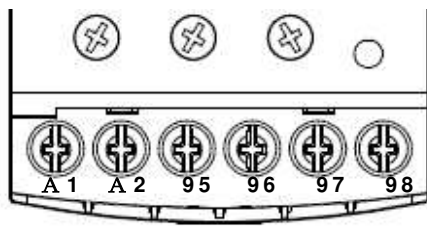
m

Appropriate wire size: ISO 0.75~4mm², AWG # 18~12 75°C Copper wire, 2 wires are connected to 1 terminal.

- ③ When wiring is finished, put back terminal cover, and check the following.
 - a. Is there any misconnection?
 - b. Have you forgotten to complete any connections?
 - c. Are there any abnormal conditions such as short-circuit or ground fault?

 WARNING	• Wiring must be performed by electricians. • Power Off before starting. Shock Risk
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8. Terminal Function



Terminal	Function	Contents
A1	Power supply	Connect to 24~240VAC/DC
A2		
95	Relay output	DIP switch: SS 95-96:normal/open, trip/close
96		97-98:normal/close, trip/open
97		DIP switch: SA 95-96:normal/close, trip/open
98		97-98:normal/open, trip/close

9. Current Transformer (CT)

Select the number of wires passing through the CT (Current Transformer) by using the following table for best performance. The number of wires that pass through the CT is a rough standard used when the motor load factor ranges between 80~100%. In the case of low motor load factor, increase the number of passing through as needed.

For motors (small capacity, single-phase, abnormal voltage, etc.) not listed below, select Shock Relay and the number of wires' pass through according to set current values.

Main unit alone

Capacity (kW)	AC200VMotor			AC400VMotor		
	Motor Rate Current (A)	Shock Relay	No. of wires that pass through the CT hole	Motor Rate Current (A)	Shock Relay	No. of wires that pass through the CT hole
0.1	0.7	TSBSB05	4	—	—	—
0.2	1.8	TSBSB05	3	0.8	TSBSB05	4
0.4	2.5	TSBSB05	2	1.5	TSBSB05	3
0.75	4.0	TSBSB05	1	2.0	TSBSB05	2
1.5	7.0	TSBSB10	1	3.3	TSBSB05	1
2.2	10	TSBSB10	1	5.3	TSBSB05	1
3.7	16	TSBSB30	1	9.0	TSBSB10	1
5.5	25	TSBSB30	1	14	TSBSB30	1
7.5	30	TSBSB60	1	20	TSBSB30	1
11	50	TSBSB60	1	25	TSBSB30	1
15	—	—	—	30	TSBSB60	1
18.5	—	—	—	37	TSBSB60	1
22	—	—	—	50	TSBSB60	1

If wire passes the CT hole twice or more, it is necessary to convert the current scale value of CURRENT knob.

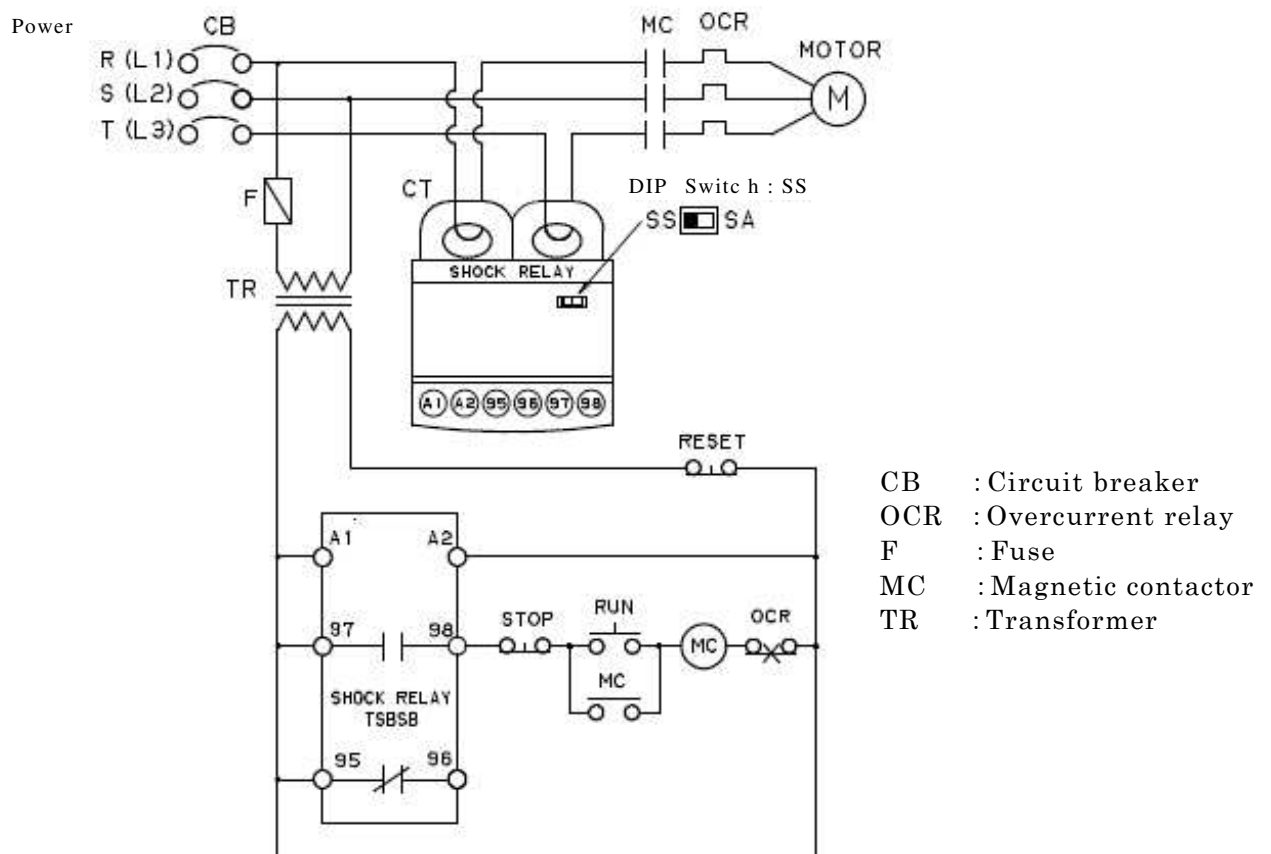
(EX) When a wire passes the CT hole twice, the value on the CURRENT value scale should be at half value.

With external CT (TSB2CT)

Capacity (kW)	AC200V Motor			AC400V Motor		
	Motor Rate Current (A)	Shock Relay	No. of wires that pass through the CT hole	Motor Rate Current (A)	Shock Relay	No. of wires that pass through the CT hole
15	55	TSBSB100	1	—	—	—
18.5	67	TSBSB100	1	—	—	—
22	78	TSBSB200	1	—	—	—
30	107	TSBSB200	1	54	TSBSB100	1
37	132	TSBSB200	1	66	TSBSB100	1
45	160	TSBSB300	1	80	TSBSB100	1
55	198	TSBSB300	1	99	TSBSB200	1
75	270	TSBSB300	1	135	TSBSB200	1
90	—	—	—	160	TSBSB200	1
110	—	—	—	192	TSBSB300	1
132	—	—	—	254	TSBSB300	1

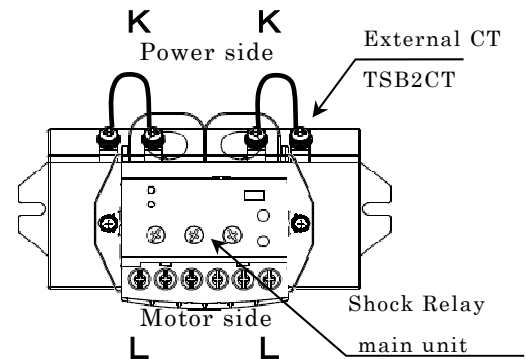
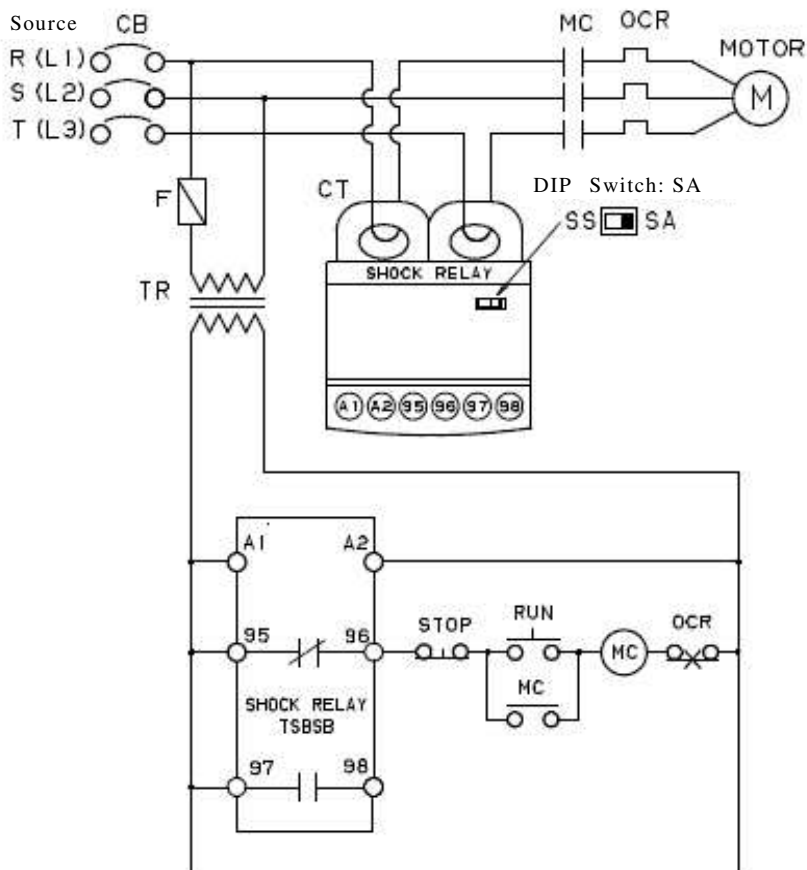
10. Wiring Diagram

1) DIP switch SS



2) DIP Switch SA

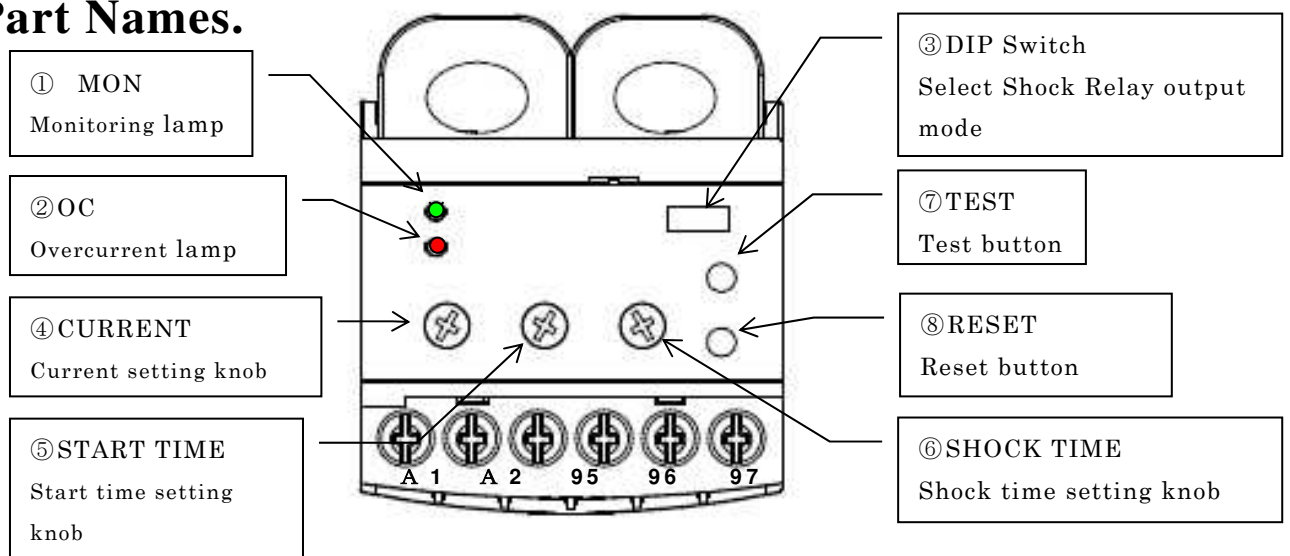
Power



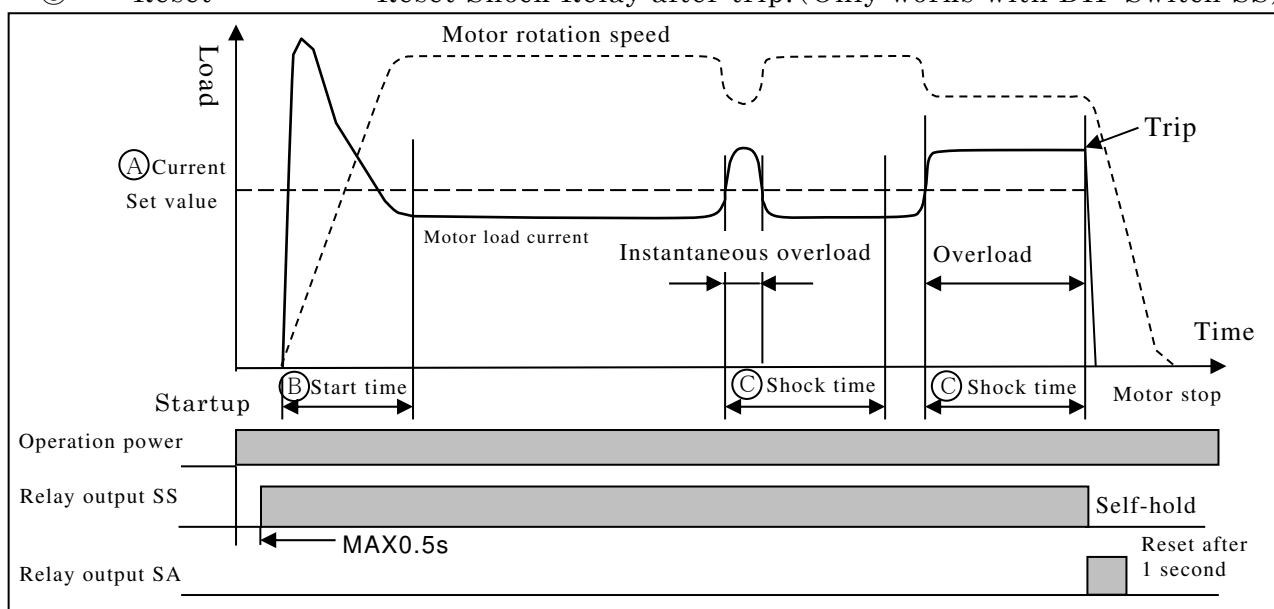
Note) For TSBSB100~300, pass motor wires through external CT as shown above.

- * 1. If necessary, set transformer (TR) according to the voltage of Shock Relay, Magnetic Contact (MC). Also, if device with harmonic noise, such as inverter is used, install an isolation transformer.
- * 2. Power off when convert Shock Relay DIP switch.
- * 3. Two wires out of three phases of the motor are passed through the Shock Relay's CT in the same direction.
- * 4. Coil capacity of the electromagnetic contactor MC which output contact opens and closes should be less than 200VA when throwing, and less than 20VA when holding.

11. Part Names.



- ① MON The lamp lights during normal monitoring conditions and turns off during Shock Relay output.
- ② OC The lamp lights when present current exceeds set level.
- ③ DIP SwitchSelect Shock Relay output mode.
 SS: Normal / excitation, self-hold after trip.
 SA: Normal / No excitation, automatically reset after trip.
 To convert DIP switch, open with miniature driver from the left side of cover.
 Note) Power off when convert DIP switch.
- ④ Current Current setting knob
- ⑤ Start TimeStart time setting knob (Mon and OC lamps flicker during start time.)
- ⑥ Shock TimeShock time setting knob
- ⑦ TESTTest Shock Relay operation. To test, press and hold the TEST button longer than the set START TIME or SHOCK TIME.
 To check SHOCK TIME, minimize START TIME; to check START TIME, minimize SHOCK TIME.
 Note) Output relay works by pressing TEST button when motor stops.
 (Output relay doesn't work when motor is running.)
- ⑧ Reset Reset Shock Relay after trip. (Only works with DIP Switch SS)



Note) Shock Relay output mode varies with DIP switch selection.

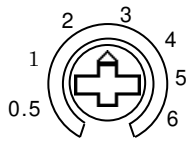
12. Basic Function

- (A) Current (Operation current value) Factory default setting : MAX (fully right)
 When the motor current exceeds the present CURRENT value, Shock Relay detects the overload and trips.
- (B) Start Time (Start prohibiting time) Factory default setting : MIN (fully left)
 When the motor starts, there is a possibility that the motor current will exceed the set current value. To prevent Shock Relay from tripping due to the spike in start current, start time is set a little longer than motor startup period.
 * When overload takes place in the motor startup, Shock Relay trips after the total time of start time and shock time lapse.
- (C) Shock Time (Continuous overload time) Factory default setting : MIN (fully left)
 When instantaneous overload occurs, motor current may exceed current set value. Shock time is set to not activate at instantaneous overload.

13. Set up

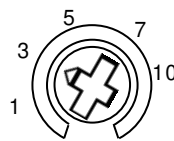
13.1 Setup before operation

• Current set knob



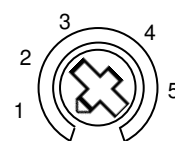
Set to motor rated current

• Start time set knob



Set to 3 seconds

• Shock time set knob



Set to the minimum

13.2 Start Time knob setting

- ① Start motor. In case that Shock Relay does not operate but motor operates, turn knob counterclockwise by slow degrees and set to the minimum.
- ② In case that Shock Relay operates, turn knob clockwise by slow degrees, prolong Start Time sequentially until motor operates, and set to the position where Shock Relay does not operate at the starting.
- ③ For settings beyond the scale, check operating time with TEST button.

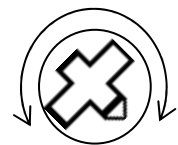
13.3 Current knob setting

Turn knob counterclockwise until Shock Relay activates. Turn knob back (about 20~30%) clockwise to set.

Cautions when operating volume knobs

- ⚠ ● When operating volume knobs, please use small screw driver and avoid applying excessive pressure. There is **risk of knob damage.**
- ⚠ ● Knob turning angle is 270°. Please adjust within the range of MIN fully left) and MAX (fully right) with moderate pressure. There is **risk of knob damage.**

Turning angle 270°



13.4 Shock Time knob setting

Set Shock Time knob to the position at which Shock Relay will not trip due to instantaneous overload.

Preferably, set Shock Time to the minimum in accordance with the device property.

14. Troubleshooting

Trouble	Check	Result	Solution
Mon does not light	A1, A2 wiring	Incorrect wiring	Wire correctly
	A1, A2 voltage	Not between 24~240V	Supply 24~240V
Does not trip at current knob MIN.	Wiring of CT	Incorrect wiring	Wire correctly
	Press and hold TEST	Does not trip	Change Shock Relay
Instantly trip after startup.	Start Time setting	Set too short	Set properly
	Current setting	Set too low	Set properly
Trip at instantaneous overload.	Current setting	Set too low	Set properly
	Shock Time setting	Set too short	Set properly
Does not trip at overload	Current setting	Set too high	Set properly
	Shock Time setting	Set too long	Set properly
	Press and hold TEST	Does not trip	Change Shock Relay

If above contents are not applicable or the replacement of Shock Relay is necessary, please contact our sales office.

15. Maintenance

Maintenance and check must be performed in accordance with the following matters.

- ① To prevent an accident, keep the surrounding area clean and safe.
- ② Power off before the installation / connection of Shock Relay
- ③ Comply with the 2-1-1 General Standard of “Ordinance on Labor Safety and Hygiene “.

16. Daily check

MON lamp (green) lights when Shock Relay is power on.

17. Periodic check

- (1) Check whether there is any looseness in the installation of the Shock Relay and current transformer. (Every six months)
- (2) Check relay output function by pressing the TEST button until it trips. (Every six months)
- (3) Check relay output function by dialing CURRENT knob counterclockwise during motor operation. (Every six months)
- (4) In the megger test, DC500V needs to be applied on the earth connection and circuit.
In the external circuit withstand voltage test, do not apply test voltage on Shock Relay. Same is with CT.
- (5) The typical life span of electrolytic capacitor is about 10 years at an average ambient temperature of 30°C. It is recommended to overhaul or exchange for a new one before trouble occurs.

18. Warranty: Tsubakimoto Chain Co.: hereinafter referred to as “Seller” Customer: hereinafter referred to as “Buyer” Goods sold or supplied by Seller to Buyer: hereinafter referred to as Goods.

18.1 Warranty period without charge

Effective 18 months from the date of shipment or 12 months from the first use of Goods, including the installation of the Goods to the Buyer’s equipment or machine – whichever comes first.

18.2 Warranty coverage

Should any damage or problem with the Goods arise within the warranty period, given that the Goods were operated and maintained according to the instructions provided in the manual, the Seller will repair and replace at no charge once the Goods are returned to the Seller.

This warranty does not include the following:

- (1) Any costs related to removal of Goods from the Buyer’s equipment or machine to repair or replace parts.
- (2) Cost to transport Buyer’s equipment or machines to the Buyer’s repair shop.
- (3) Costs to reimburse any profit loss due to any repair or damage and consequential losses caused by the Buyer.

18.3 Warranty with charge

Seller will charge for any investigation and repair of Goods caused by

- (1) Improper installation by failing to follow the instruction manual.
- (2) Insufficient maintenance or improper operation by the Buyer.
- (3) Incorrect installation of the Goods to other equipment or machines.
- (4) Any modifications or alterations of Goods by the Buyer.
- (5) Any repair by engineers other than the Seller or those designated by the Seller.
- (6) Operation in an environment not specified in the manual.
- (7) Force Majeure or forces beyond the Seller’s control such as natural disasters and injustices inflicted by a third party.
- (8) Secondary damage or problems incurred by the Buyer’s equipment or machines.
- (9) Defective parts supplied or specified by the Buyer.
- (10) Incorrect wiring or parameter settings by the Buyer.
- (11) The end of life cycle of the Goods under normal usage.
- (12) Losses or damages not liable to the Seller.

18.4 Dispatch service.

The service to dispatch a Seller’s engineer to investigate, adjust or trial test the Seller’s Goods is at the Buyer’s expense.

 **TSUBAKI** TSUBAKIMOTO CHAIN CO.

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