

SHOCK RELAY

INSTRUCTION MANUAL

TSBED Series

TSB020ED
TSB075ED
TSB220ED
TSB550ED

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. Safety precaution

- Please read this instruction manual thoroughly before using this Shock Relay.
- Familiarize yourself with all of the knowledge of the devices, safety information, and precautions before using the Shock Relay.
- After reading this manual, be sure to keep it in a place where users can access any time.
- 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.



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 (SO_2 , H_2S) 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.

3. 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 020 ED

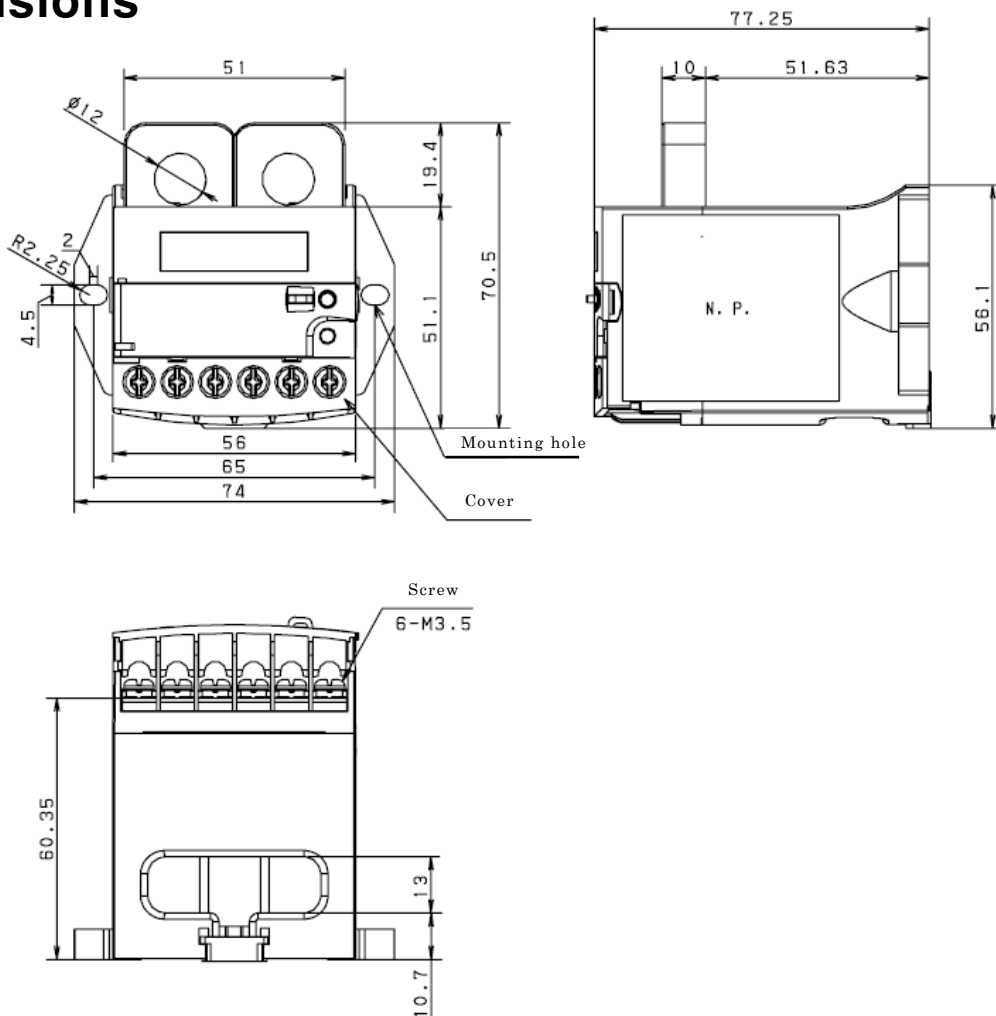
ED series

SHOCK RELAY

Maximum Motor Capacity (class 200V)

020	0.2kW
075	0.75kW
220	2.2kW
550	5.5kW

4. Demensions



5. Specifications

Model				TSB020ED	TSB075ED	TSB220ED	TSB550ED
Item							
Applied Motor * 1	200V	Number of CT Penet-rations	T2	0. 1kW	0. 4kW	1. 5kW	3. 7kW
			T1	0. 2kW	0. 75kW	2. 2kW	5. 5kW
	400V		T2	0. 1, 0. 2kW	—	2. 2, 3. 7kW	7. 5kW
			T1	0. 4, 0. 75kW	1. 5kW	5. 5kW	11kW
Detected Frequency				20~200Hz			
Maximum Voltage				AC600V 50/60Hz			
Current setting		Dip Switch	T2	0. 20~1. 20A (BY 0.01A)	1. 20~3. 20A (BY 0.02A)	3. 00~10. 0A (BY 1A)	6. 00~26. 0A (BY 0.2A)
			T1	0. 40~2. 40A (BY 0.02A)	1. 80~5. 80A (BY 0.04A)	4. 00~14. 0A (BY 0.1A)	9. 00~34. 0A (BY 0.25A) * 2
Start time setting				0. 2 ~ 10. 0s (BY 0.2s)			
Shock time setting				0. 2 ~ 5. 0s (BY 0.2s)			
Current Accuracy				±5%±1 digit less(In case of using Inverter ±10%±1 digit)			
Time Accuracy				±5%±1 digit less			
Protective Locked Motor				The relay will be tripped after the sum of start time and 0.2s by stall when the current more than 200% of current setting			
Control Power source				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			Normally de-energized			
	Return* 3			A: Automatic reset in 1 second after the trip M: Manual reset by Check/Reset button			
	Contact Rating(max.)			1 a1b 3A, 250VAC (cos ϕ = 1)			
	Min.applicable load * 4			DC10V、10mA			
	Life			80,000 at rated load			
Environment	Temperature			-20~+60℃			
	Humidity			45~85%RH(non-condensing)			
	Vibration			5.9m/s ² or less			
	Altitude			2000m or less			
	Installation			Do not install in a dusty location or expose to corrosive gasses, oil splashes or direct sunlight or out-door			
Dielectric Strength	Between casing and circuit			AC2000V 60Hz 1min			
	Between contacts			AC1000V 60Hz 1min			
	Between circuits and contacts			AC2000V 60Hz 1min			
Mass				0. 2kg MAX			
Power Consumption				2W MAX			

*1. The applicable motors are just a rough indication for reference. Make your selection based upon actual electrical current value. Select by electrical current value for single-phase motors as well.

*2. Set values 10A and higher are displayed as described on the right due to a maximum number of display digits. 10.0A→10.2A→10.5A→10.7A→11.0A

*3. DIP switch is set on T1 side and A side when delivery.

*4. 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.

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

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

6. Storage

 CAUTION	●Storage shock relay on condition of temperature -30 to +70℃ , no condensation, freeze, oil mist, corrosive gases, and dust
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If you do not comply with the above storage environment, Shock Relay may not function properly

7. Installation

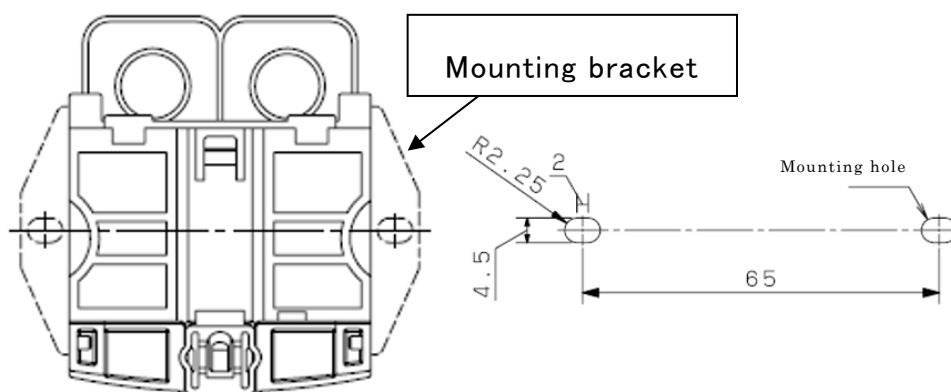
7. 1 Environment

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
 CAUTION	●Avoid usage in the corrosive gas environment. Sulfide gases (SO₂, H₂S) corrode cooper and cooper alloy used on PCBs and parts and cause the malfunction.

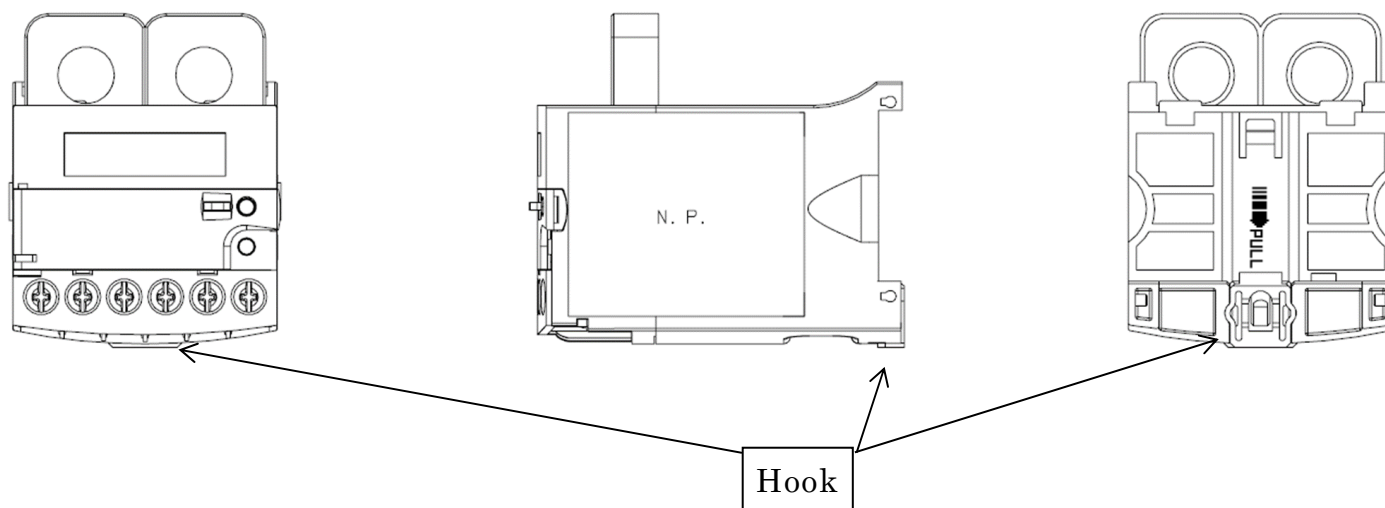
7. 2 Install with Screw

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



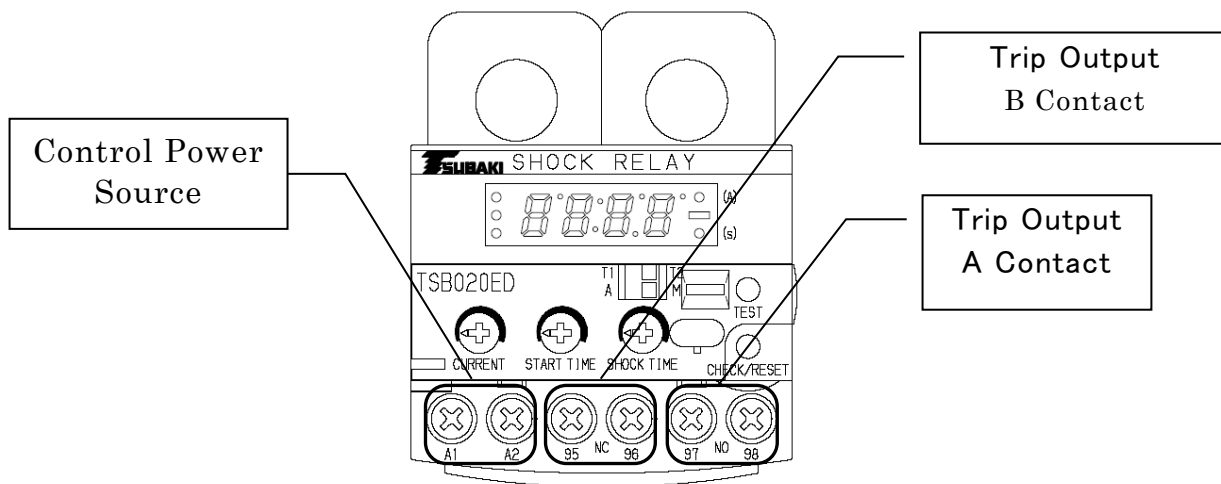
7. 3 Installation of DIN rail

Pull the hook on the Shock Relay in the direction of the arrow as shown the figure (PULL).



8. Wiring

8.1 Explanation of the Terminals



(1) Connect to a commercial power supply. Never mistake the voltage of the control power source. If device with harmonic noise, such as inverter is used, install an isolation transformer.

(2) When connecting without crimp terminal, tightening torque of $0.4 \sim 0.6 \text{ N} \cdot \text{m}$ (※) is recommended to avoid screw damage.

Terminal block specification: M3.5 screw, tightening torque: $0.8 \sim 1.2 \text{ N} \cdot \text{m}$

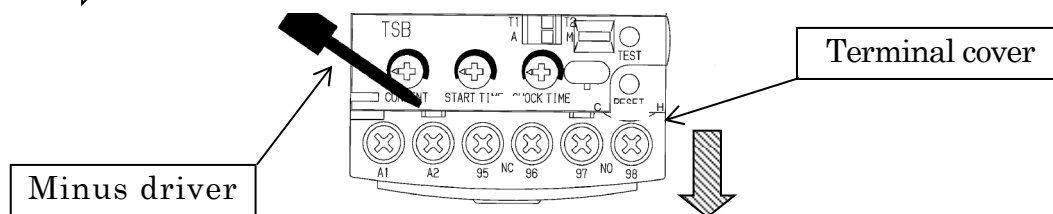
※tightening torque without crimp terminal : $0.4 \sim 0.6 \text{ N} \cdot \text{m}$

(3) Never contact the output of an inverter or a servo driver to terminal A1-A2.

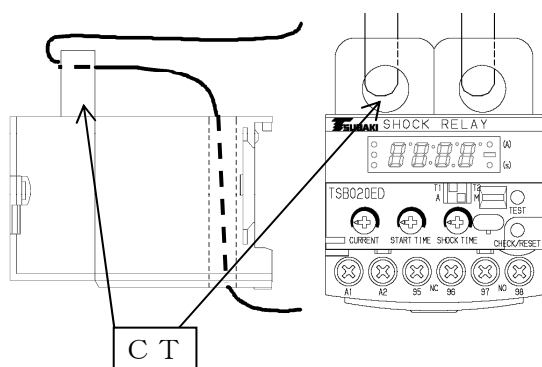
(4) Install an insulation transformer between the power line and terminal A1-A2 of the Shock Relay when harmonic noise is included in the power on.

(5) How to take off the terminal cover.

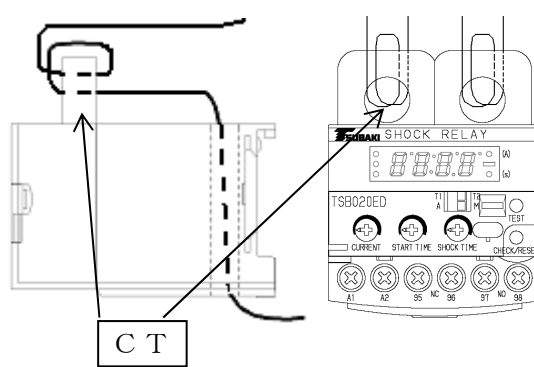
Put in the minus driver as shown the figure and push strongly in the direction of the arrow. ()



(6) Two of three phases of the motor are passed once or twice by Dip Switch setting through the Shock Relay's



In case of Dip Switch: T1



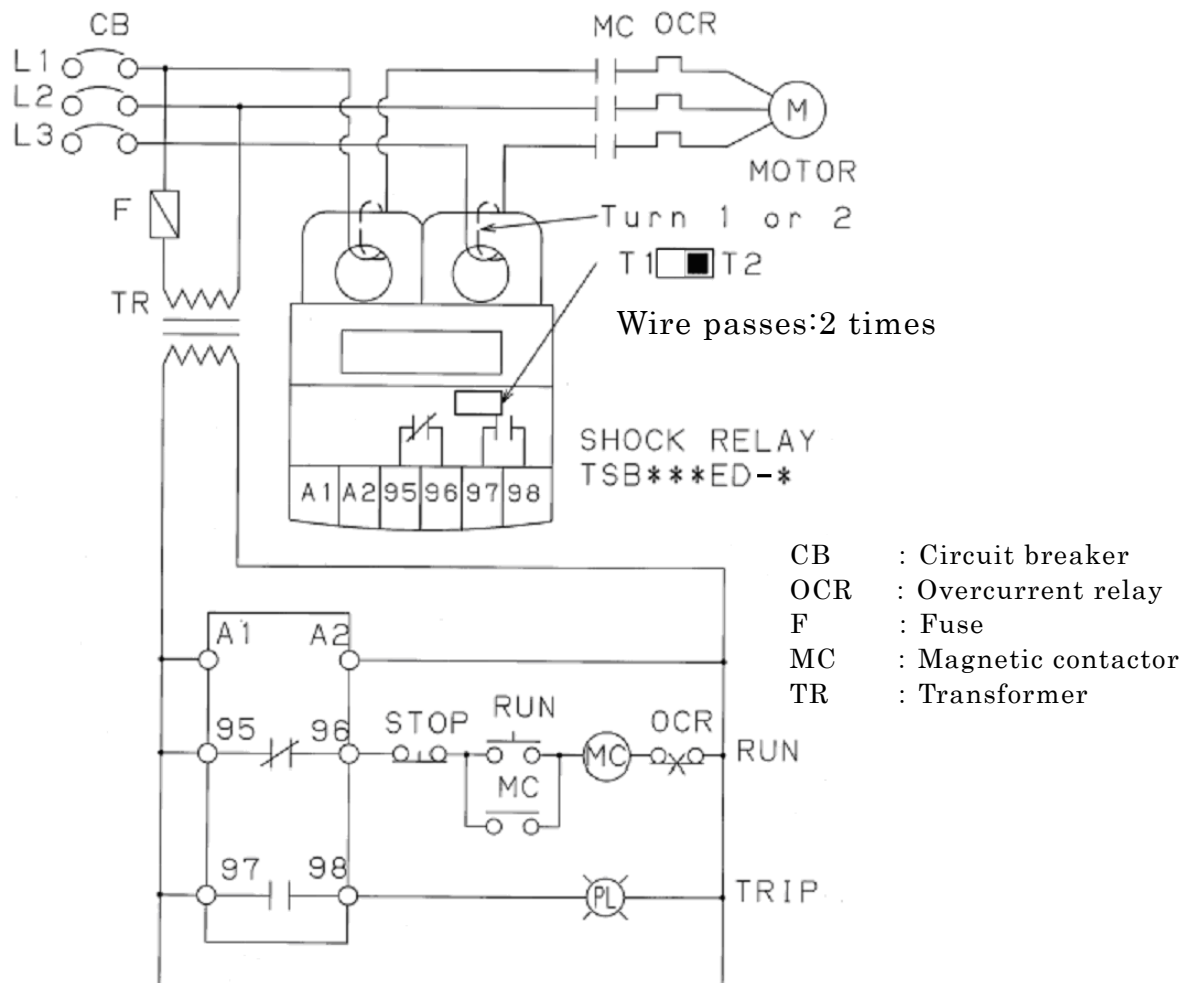
In case of Dip Switch: T2



WARNING

- Wiring must be performed by electricians.
 - Power Off before starting.
- Shock Risk**

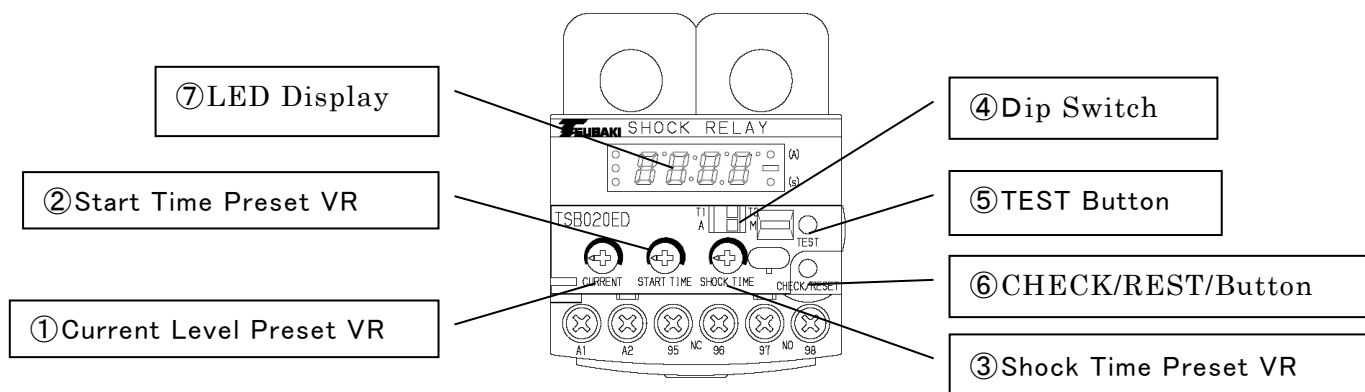
9. Wiring diagram



- (1) A Transformer may be required, depending on the voltage of Motor.
- (2) Install an insulation transformer between the power line and terminal A1-A2 of the Shock Relay when harmonic noise is included in the power on.
- (3) When the Shock Relay detect the single-phase motor, pass the main winding line.
- (4) If the capacity of the operating electromagnetic coil of the electromagnetic contactor is above 200VA during closing time or 20VA during holding time, then drive a secondary relay output, and the open and close the electromagnetic contactor with the contacts of the secondary relay.
- (5) Confirm that Dip Switch setting is correct against Wire passes.

Wire passes	Dip Switch Setting
1	T 1
2	T 2

10. Function



- ① **Current Level Preset VR (CURRENT)** Factory default setting: MAX (fully right)
 - Trip level (electric current value) is preset.
 - It changes on the setup screen when a preset VR is turned.
 - Trip relay will be energized when current exceeds CURRENT LEVEL and goes on beyond the Shock Time.
- ② **Start Time Preset VR (START TIME)** Factory default setting: MIN (fully left)
 - Start Time (trip prevention time in the start) is preset.
 - It changes on the setup screen when a preset VR is turned.
 - Trip does not occur during the start time though electric current exceeds Current Level when a motor starts.
- ③ **Shock Time Preset VR (SHOCK TIME)** Factory default setting: MIN (fully left)
 - Shock Time (over-load continuation time) is preset.
 - It changes on the setup screen when a preset VR is turned.
 - Trip relay will be energized when current exceeds Current Level and goes on beyond Shock Time

④ Dip Switch

SELECT	FUNCTION				
T1 / T2	Current range	T1	Wire passes : 1 time	T2	Wire passes : 2 times
A / M	Relay mode	A	Automatic reset after 1s	M	Manual reset

⑤ TEST Button (T E S T)

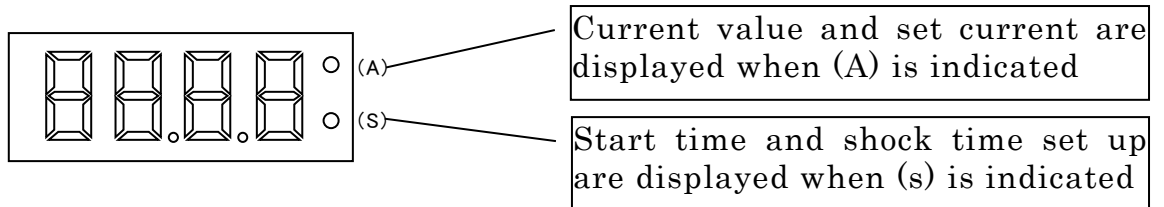
- When LED indication is a current value, if TEST Button is pushed, it will be changed to the set up screen.

⑥ Check / Reset Button (C H E C K / R E S E T)

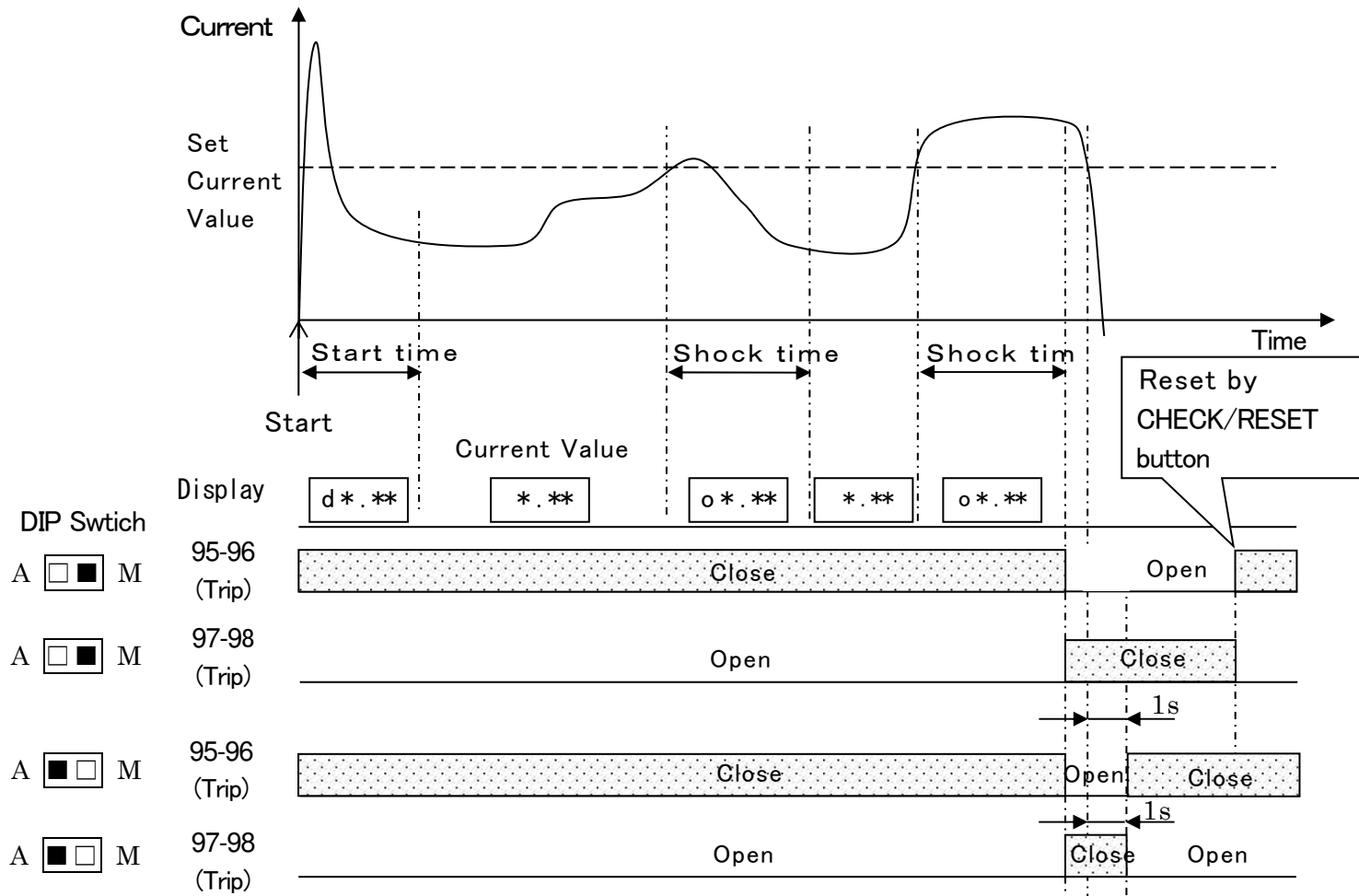
- normal operation ... When LED Display is a current value, if Check/Reset Button is pushed, it will be changed to the set up screen. When LED Display is a the set up screen, if Check/Reset Button is pushed, it will be changed and finally be changed to a current value. Refer to page 10 and 11 for the detail.
- Trip ... When Check/Reset Button is pushed, trip is canceled and it will be changed to a current value.
- Setting ... When Check/Reset Button is pushed, it will be changed to Current Level, Start Time and Shock Time by turns

⑦ LED Display

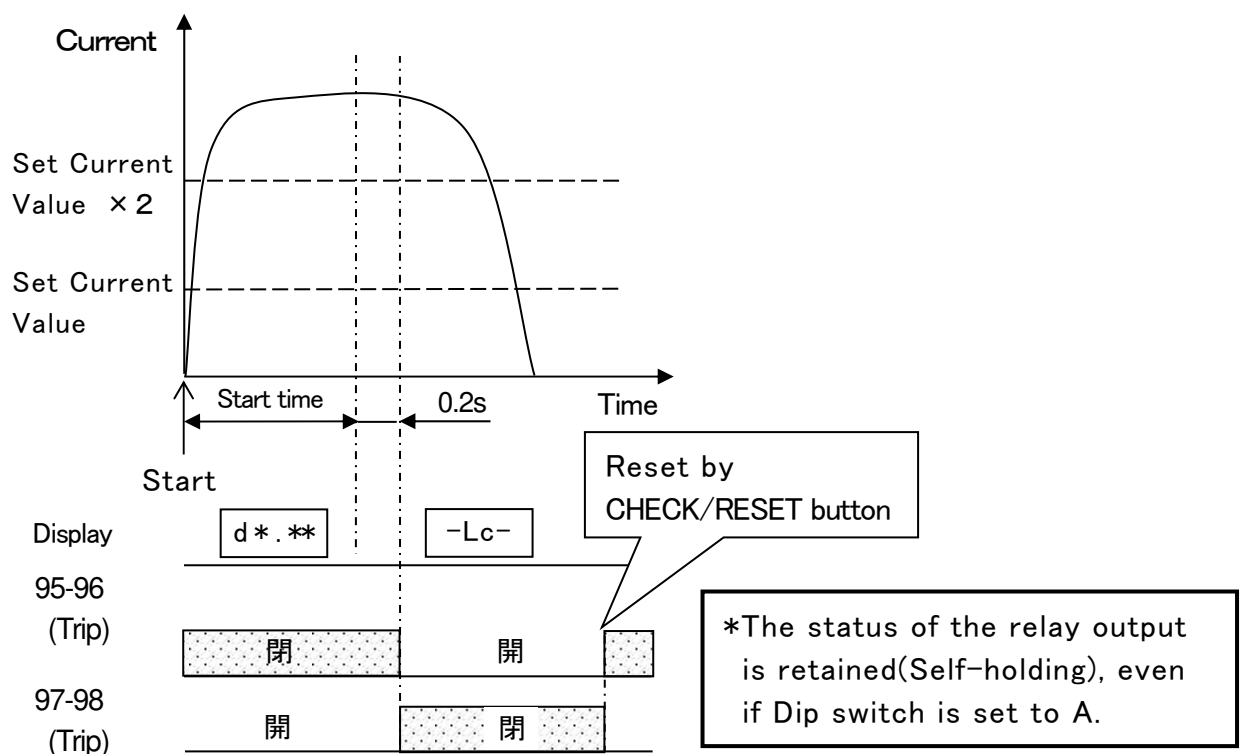
- These LED indicate actual current, trip level, time and trip code.



Dip Switch setting, display and relay movement

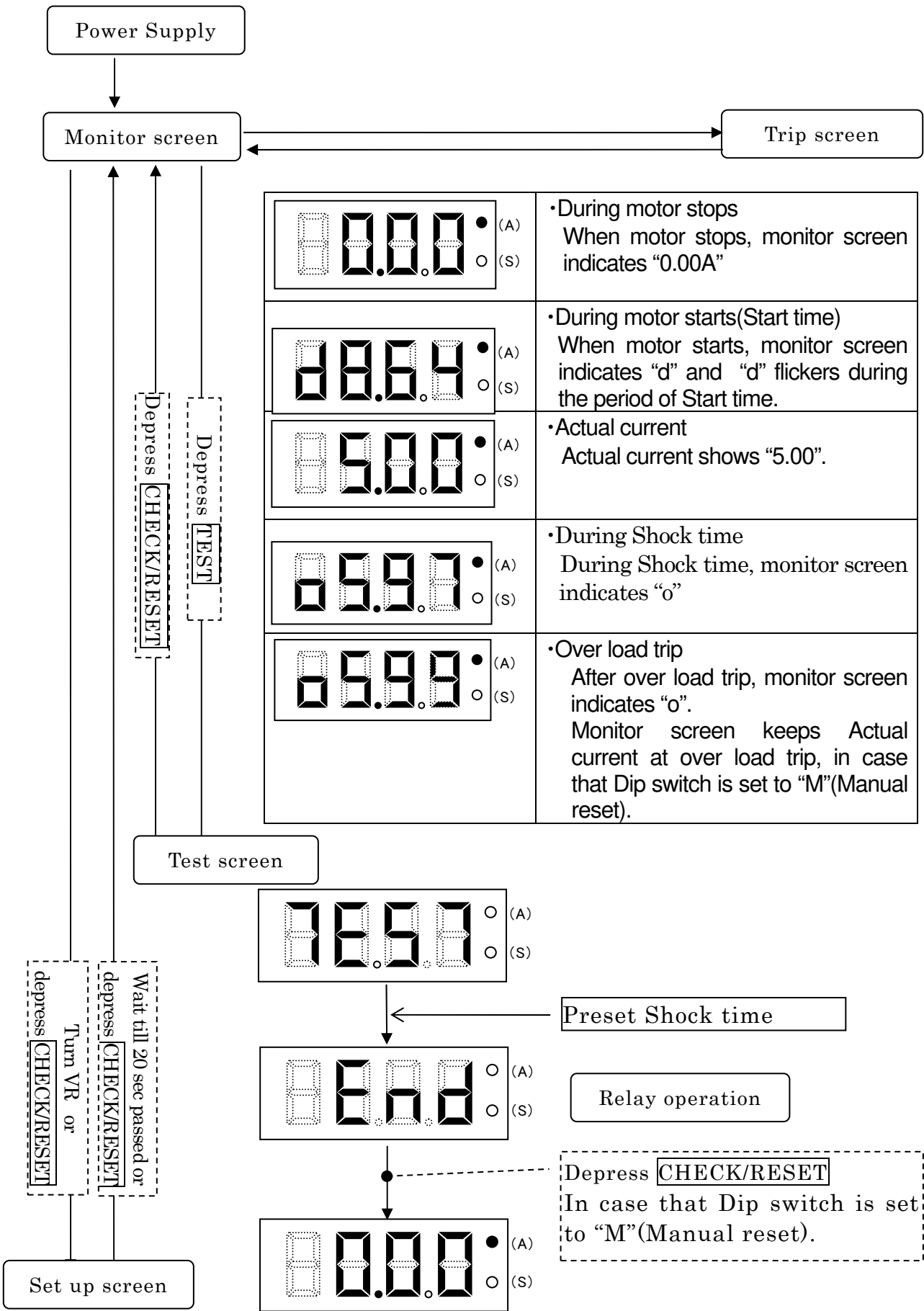


Locked Motor Trip

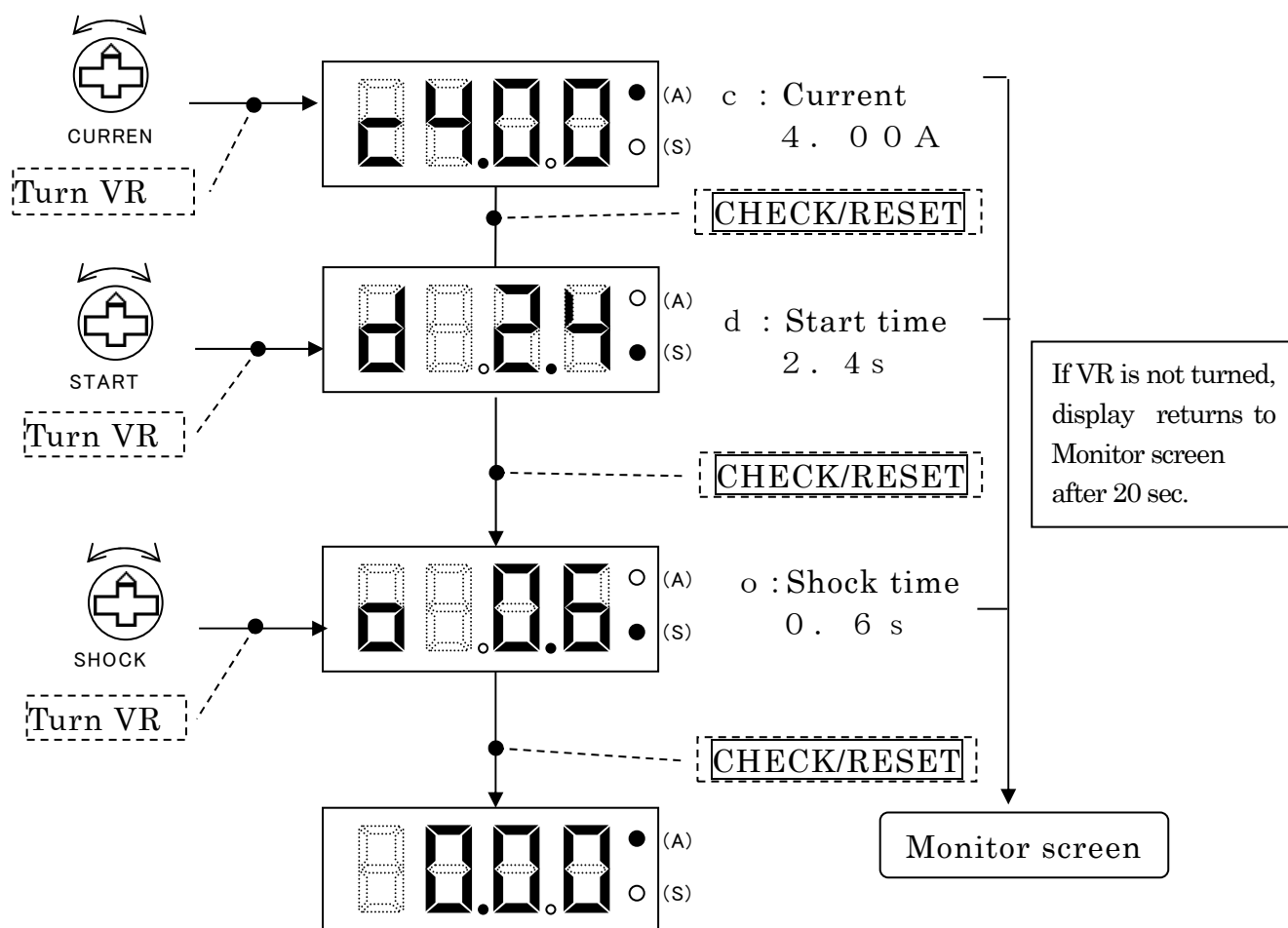


11. LED Display

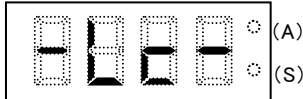
(1) Display



Set up screen



Trip display

LED indication	The contents of Trip	Check
Over-load 	Current value exceeded CURRENT setup after the start time, and went on beyond the shock time. Current value at tripping is 5.97 A	Check whether there is a wrong point in the machine.
Locked rotor 	It kept being charged with electricity beyond 200% of the CURRENT setup value after the start during the sum of the start time and 0.2 sec.	Check whether there is a wrong point in the machine.

12. Set up

1 2 . 1 Setting before the motor start

Current	Set the rated motor current	
Start time	Set 3 sec	
Shock time	Set minimum data(0.2 sec)	

1 2 . 2 Start time setup value

- 1) Start the motor
- 2) In case that relay does not operate by above setup value, set shortest value without trip.
- 3) In case that relay operates, set proper values that relay does not operate.

1 2 . 3 Current setup value

- 1) Start the motor and actual current.
- 2) Set little higher values than actual current. Check that relay does not operate in this time.

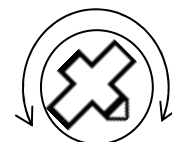
1 2 . 4 Shock time setup value

- 1) Relay does not operate by instant over load
- 2) Check the user's machine and set shortest value.

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. Trouble shooting

Phenomenon	Check item	Check result	Treatment
LED indication isn't turned on	Wiring of the power source (A1-A2)	It isn't being wired	It is wired properly.
	Check a power source voltage (A1-A2) by voltage tester	It is different from proper supply voltage TSBED :24~240V	A proper power supply is input.
Relay does not trip even if current setting value is minimum.	Shock Relay Model No.	Model No. is different	Exchange Shock Relay
	Ratio of external CT	Ratio of external CT is wrong	Ratio is made correct. (CT, The number of penetration)
	Depress TEST button	Relay does not trip	Exchange Shock Relay
After the start, over-load trip occurs.	Load of motor	Over-load Inertia is too big.	Motor capacity is reexamined.
	Start time setup value is examined.	It is too short	It is set up a little long.
	Current setup value is examined.	It is too small	Proper value is established.
Over-load trip occurs though it is not an over-load.	Current setup value.	It is too small.	Proper value is established.
	Shock time setup value	It is too short.	Proper value is established.
Over-load trip doesn't occur in spite of the over-load.	Current setup value	It is too big.	Proper value is established.
	Shock time setup value	It is too long.	Proper value is established.
	Ratio of external CT	Ratio of external CT is wrong	Ratio is made correct.

If replacement of the shock Relay is necessary, please make contact with our company office.

14. Reset procedure for trip operation

- (1) Confirm content indication on LED when trip occurs.(Refer to page 8)
- (2) Confirm if machine, connection and power supply have any abnormal.
- (3) If there is anything abnormal, remove its roots and set to right situation.
- (4) In case holding relay output, push Check/Reset button or turn off Shock relay.
- (5) After confirming (1), (2), (3) and (4), restart the machine.

15. In the case of the maintenance, the check work

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

-  (1)In the external circuit withstand voltage test, do not apply test voltage on Shock Relay.
-  (2)To prevent an accident, keep the surrounding area clean and safe.
-  (3)Power off before the installation / connection of Shock Relay
-  (4)Comply with the 2-1-1 General Standard of “Ordinance on Labor Safety and Hygiene “.

16. Daily check

LED 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.
-  (5) In the external circuit withstand voltage test, do not apply test voltage on Shock Relay. Same is with CT.
-  (6) 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.

Perform the periodic inspection during trial operation, and when the equipment was moved, and when the wiring was changed.

18. Guarantee : 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.



TSUBAKIMOTO CHAIN CO.

1-1, Kohtari-Kuresumi, Nagaokakyo

Kyoto 617- 0833, Japan

Internet : <https://tsubakimoto.com/>

U.S. Tsubaki Power Transmission, LLC

<https://www.ustsubaki.com/>

Tsubaki of Canada Limited

<https://tsubaki.ca/>

Tsubaki Australia Pty. Limited

<https://tsubaki.com.au/>

Tsubakimoto Singapore Pte. Ltd.

<https://tsubaki.sg/>

Taiwan Tsubakimoto Co.

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