EHF120.0601

TSUBAKI

SHOCK RELAY
INSTRUCTION MANUAL

TSBSD Series

TSBSD10
TSBSD60
TSB3CT100 (3 phase CT)
TSB3CT200 (3 phase CT)
TSB3CT300 (3 phase CT)

This instruction manual explains the installation and adjustment of your SHOCK RELAY. All settings must be properly adjusted to ensure correct operation Please attach this instruction manual when you ship your equipment to the end-user

SHOCK RELAY PROTECTS YOUR MACHINERY AND EQUIPMENT FROM COSTLY DOWNTIME.

⚠ WARNING

1. Make sure you read this instruction manual thoroughly before installing, wiring, operation and inspecting this SHOCK RELAY.
2. Please make sure that this instruction manual accompanies the SHOCK RELAY to the end user.
3. Keep this instruction manual in order not to lose so that it will always be available for the duration of the SHOCK RELAY's operating life.
4. Product specification are subject to change for improvement without notice.

TSUBAKI EMERSON CO.

2003. 4. 1

Contents

1. Preface

Thank you for purchasing the Shock Relay TSBSD series.
This instruction manual describes everything from installation to adjustment.
Be sure to read it carefully before using your shock relay.
When delivering any device containing the shock relay to an end user ,be sure that this instruction manual is included.

2. Precaution in safety

⚠ WARNING

USE CARE TO PREVENT ELECTRICAL SHOCK
COMPLY WITH THE FOLLOWING
TO AVOID SERIOUS PERSONAL INJURY

1. Disconnect power. Always lock out power switch before installing ,removing ,or servicing unit. Comply with Occupational Safety and Health Standards 1910.147"The Control of Hazardous Energy(Lock Out / Tag Out)"
2. Install in proper enclosure in accordance with NEMA 250-1991 "Enclosures for Electrical Equipment (1000Volts Maximum)" and NFPA496 1993 edition "Purged and Pressurized Enclosures for Electrical Equipment ,1993 Edition " When revisions of these standards are published ,the updated edition shall apply.
3. Guards must be provided on all power transmission and conveyor applications in accordance with provisions of ASMEB15.1-1992"Safety Standard for Mechanical Power Transmission Apparatus" and ASMEB20.1-1993"Safty standard for Conveyors and Related Equipment" ,or other applicable standards. When revisions of these standards are published, the updated edition shall apply.

⚠ CAUTION

- If danger is expected from your application, take the necessary steps to ensure that it operates safety.
- If your TSUBAKI EMERSON product does not operate normally, take care to ensure that dangerous operating condition do not occur.
- Wear suitable clothing and protective equipment (safety glasses, gloves, safety shoes, etc.)
- Keep your work place tidy and safe to prevent secondary accidents.

3.Outline.

SHOCK RELAY TSBSD series is the electric-type over-load protection device.
It protects the general industry machine driven by a motor from the over-load.

(1) Typical applications.
SHOCK RELAY can be used for the load monitoring and the over-load protection of the general industry machine such as the conveyer, the stirring machine, the pump.

(2)How to detect a load.
A load is detected in the electric current value of the motor wiring that it goes through CT (current transformer) installed in TSBSD.
When electric current value exceeds 60A, 3 phase CT is set up in the external.

(3)How to distinguish an over-load.
When the actual load current exceeds the preset CURRENT for the preset SHOCK TIME ,the shock relay trips to break the motor circuit.
When starting a motor ,the starting current value is greater than the rated current. This starting current value continues until the motor reaches normal speed. During this starting period, which mainly depends on the type of load, the function of detecting the overload current is disabled.

(4)The choice of the movement of output relay.
TSBSD can be chosen either energizing at normally or energizing at trip.
And, It can be chosen either automatic reversion or self-hold of output relay.

(5)The choice of the movement of the alarm output relay.
Alarm output relay can be chosen either a flickering for the indication or a continuous movement for the buzzer.

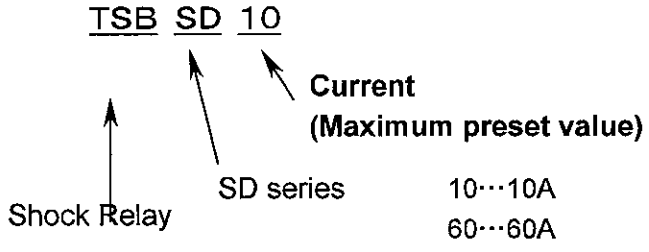
(6)The indication of over-load tripping.
The electric current value at over-load tripping is memorized and indicated.

4. When Purchasing the Shock Relay

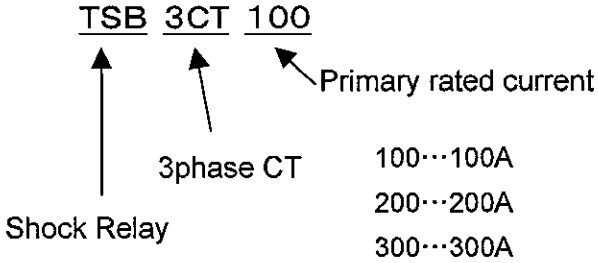
When purchasing the SHOCK RELAY , be sure to verify the following points.

(1) Verify that the model number and specifications on the name plate are the same as those of which you ordered.

①Shock Relay



②External 3 phase CT



(2) Verify that the instrument was not damaged during shipment.

5. Installation

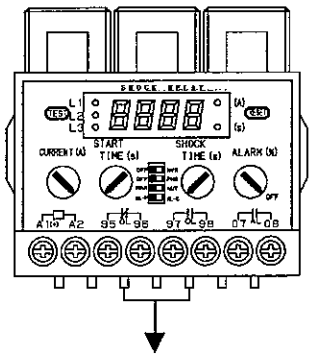
5.1 Establishment environment

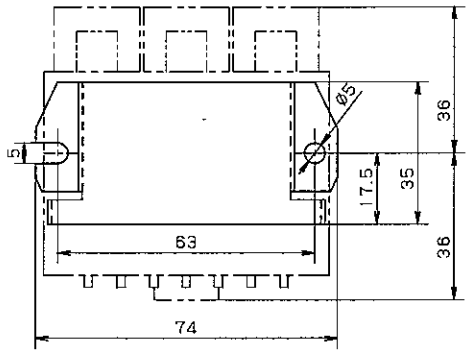
Always use the Shock Relay in an environment that follows the standard specifications.

(1)The place where direct sunlight doesn't hit it and temperature is in −10～+50℃.
(2)The place where humidity is in 45～85% relative humidity without condensation and freezing.
(3)The indoor place where water doesn't splash.
(4) The place where there are not dust, corrosion gas, mist of oil.
(5) The place of the height above sea level 1000m or less.
(6)The place of the vibration 5.9m/s^2 and under.

5.2 Installation to the panel

(1)Pull the hook of the shock relay in the direction of the arrow, and remove the mounting bracket.
(2) Fit the mounting bracket to the board.
(3) Fit a shock relay to the fixed mounting bracket.





Pull the hook in the direction of the arrow

5.3 Installation to the DIN rail

(1)Pull the hook of the shock relay in the direction of the arrow, and remove the mounting bracket.
(2)Install the shock relay on the DIN rail.

6.Wiring

(1)Connect the power source 85—250VAC or 85—250VDC(A1:+,A2:—) to the terminal A1,A2.
Be careful not to connect the output of an inverter and a servo driver by accident.
Install an insulation transformer when there is a harmonic noise occurrence machine such as inverter.

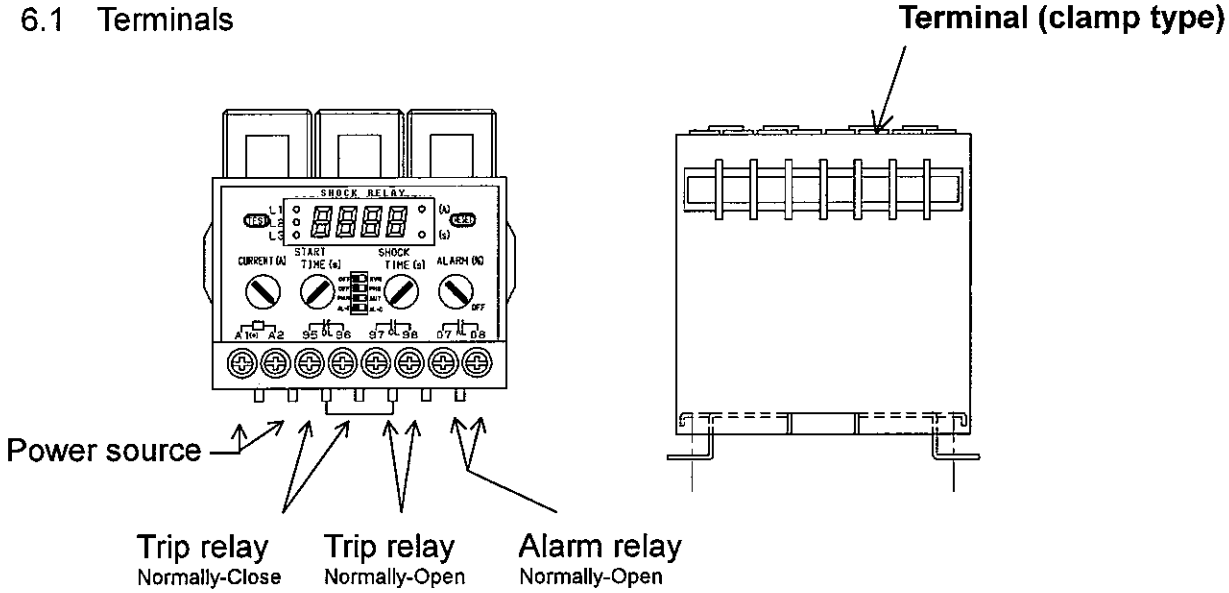
(2) Do the next confirmation if you finish connection (wiring) work.

a. Are there misconnection?

b. Have you forgotten connecting?

c. Are there abnormal condition such as short-circuit or ground fault?

6.1 Terminals

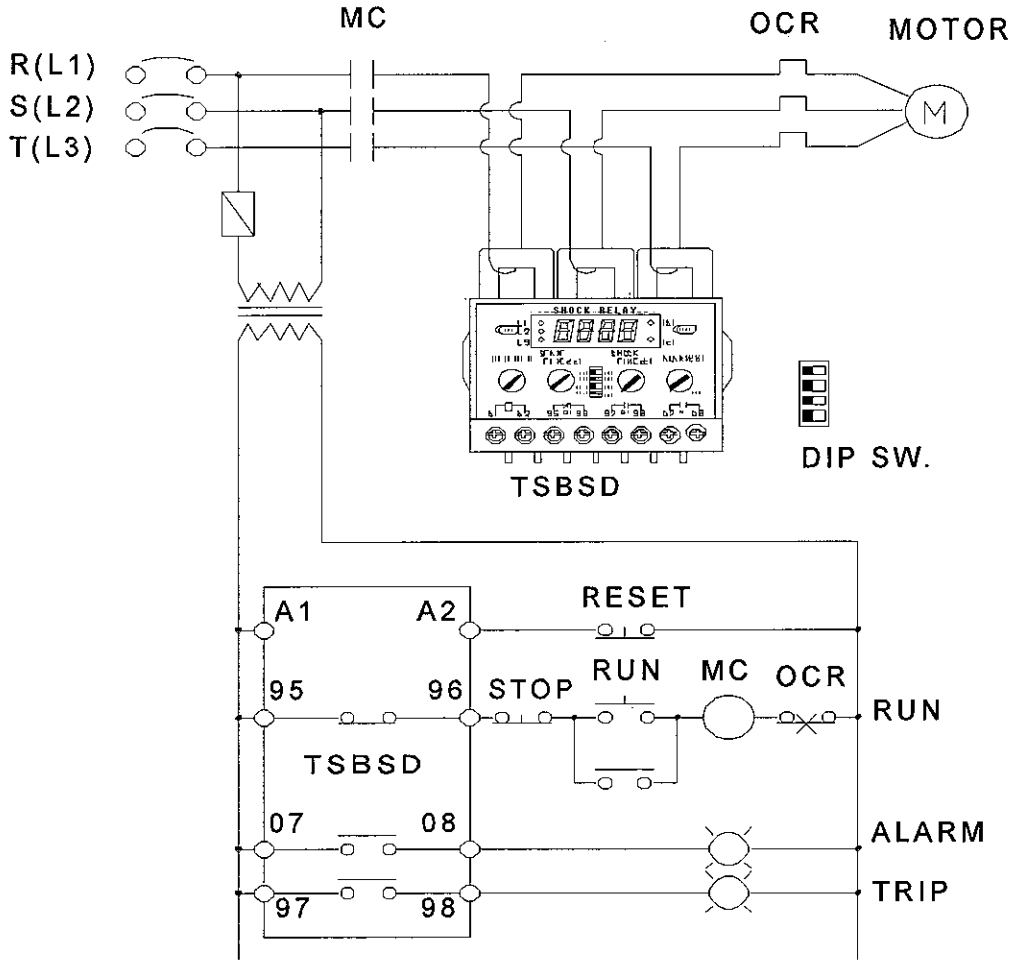


6.2 Adaptive wire

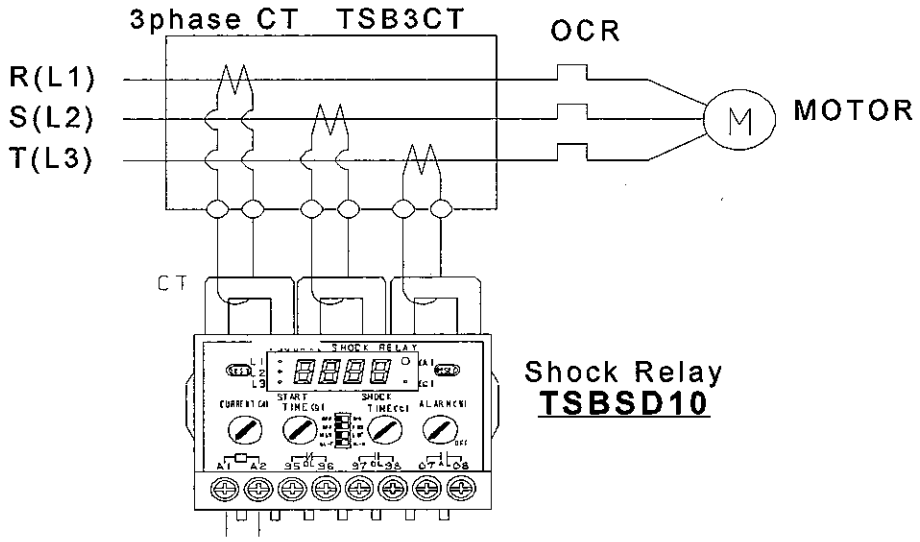
(1) SIZE : 0. 5 ~ 2. 0mm²
(2) Strip length : 10mm

7. Wiring diagram

7. 1 Basic wiring

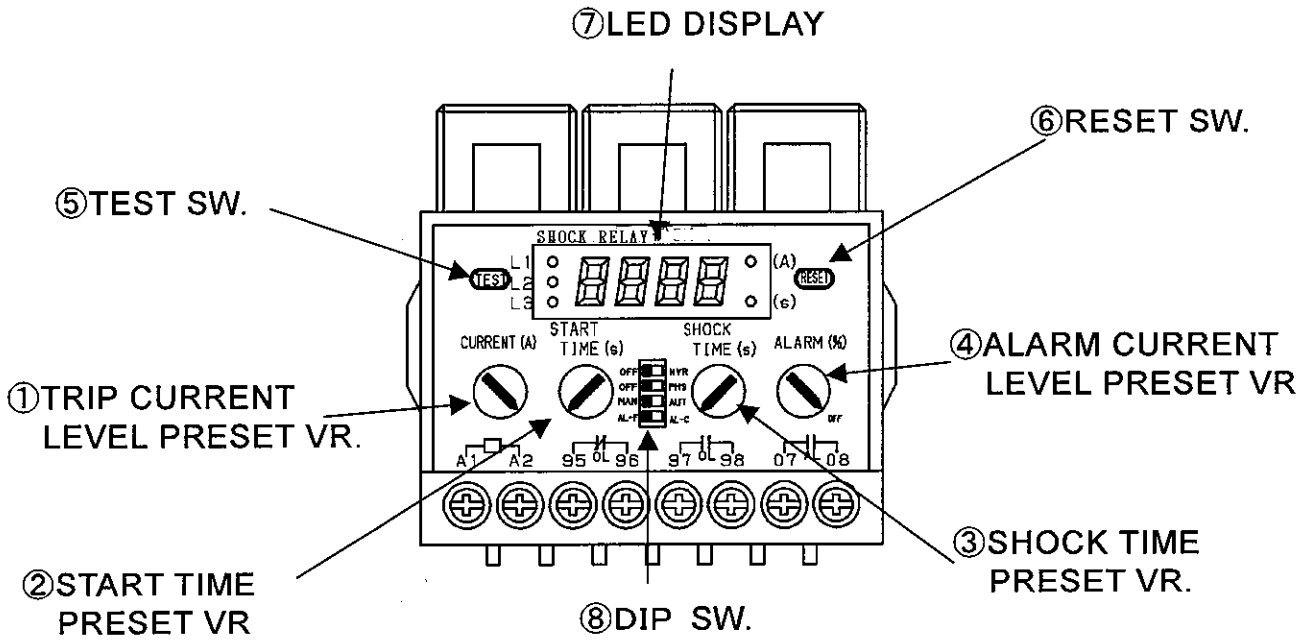


7. 2 In case of using the 3 phase CT



8. Operation

8. 1 Display panel



8. 2 Explanation of operation

①TRIP CURRENT LEVEL PRESET VR.(CURRENT)

- Trip level (electric current value) is preset. But, it can't preset during trip.
- Trip relay will be energized when current exceeds CURRENT LEVEL and goes on beyond the SHOCK TIME.

②START TIME PRESET VR.(START TIME)

- Start time (trip prevention time in the start) is preset. But, it can't preset during trip.
- Trip doesn't occur during the start time though electric current exceeds CURRENTLEVEL when a motor starts.

③SHOCK TIME PRESET VR.(SHOCK TIME)

- Shock time (over-load continuation time) is preset. But, it can't preset during trip.
- Trip relay will be energized when current exceeds CURRENTLEVEL and goes on beyond the SHOCK TIME.

④ALARM CURRENT LEVEL PRESET VR.(ALARM)

- 50—100% of the CURRENT LEVEL can be preset as an alarm level. But, it can't preset during trip.
- An alarm function doesn't work when VR is preset at the position of OFF (It finishes turning it to the clockwise direction.).

⑤TEST SW (TEST)

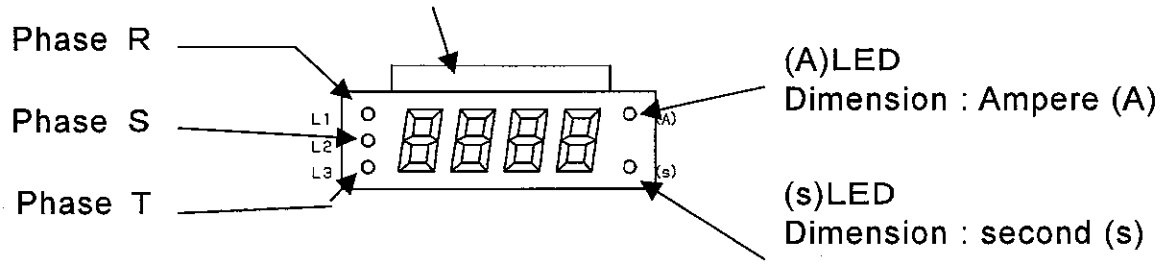
- When LED indication is a current value, if TEST SW is pushed, it will be changed to the set up screen.
- When LED indication is a setup screen, if TEST SW is pushed, it will be indication of contents of the test screen, one after another. Refer to P8 and P9 for the details.

⑥RESET SW (RESET)

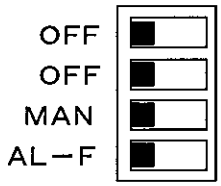
・When RESET SW is pushed, trip is canceled, on the initial screen in the power supply injection. Refer to P8 and P9 for the details.

⑦LED Display

These LED indicate actual current ,trip level ,time and trip code(refer to P8, P9)



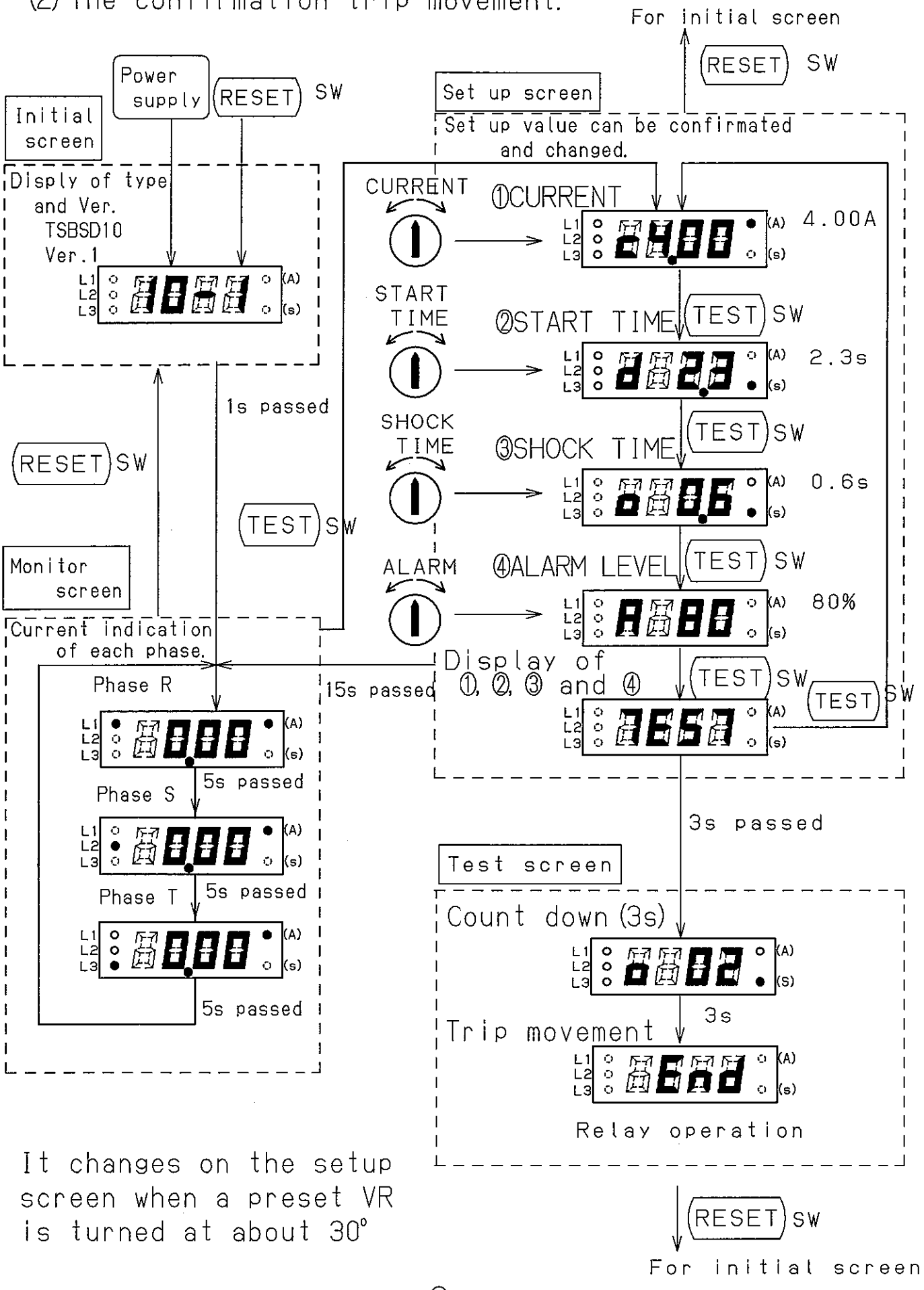
⑧DIP Switch



DIP SW	■□		□■	
SW1 Relay's movement OFF／NVR	Power on ・normal	De-energized 95-96(NC):close 97-98(NO):open	Power on ・normal	Energized 95-96(NC):open 97-98(NO):close
	・trip	Energized 95-96(NC):open 97-98(NO):close	・trip	De-energized 95-96(NC):close 97-98(NO):open
SW2 OFF／PHS	Phase-reversal protection :OFF		Phase-reversal protection :ON	
	Open-phase protection : OFF		Open-phase protection :ON	
	Phase-unbalance protection :OFF		Phase-unbalance protection :ON	
SW3 Reset MAN／AUT	Over-load	Manual reset	Over-load	Automatic reset after 1s
	Phase-reversal		Phase-reversal	Manual reset
	Open-phase		Open-phase	
	Phase-unbalance		Phase-unbalance	
SW4 Alarm relay's movement AL-F/AL-C	AL 07－08(NO)		AL 07－08(NO)	
	Power on	Open	Power on	Open
	Motor run	Close	Motor run	Open
	Over alarm	flicker(1/s)	Over alarm	Close
	Under alarm	Close	Under alarm	Open
	Trip	flicker(2/s)	Trip	Open

8.3 Operation before the motor start and LED display.

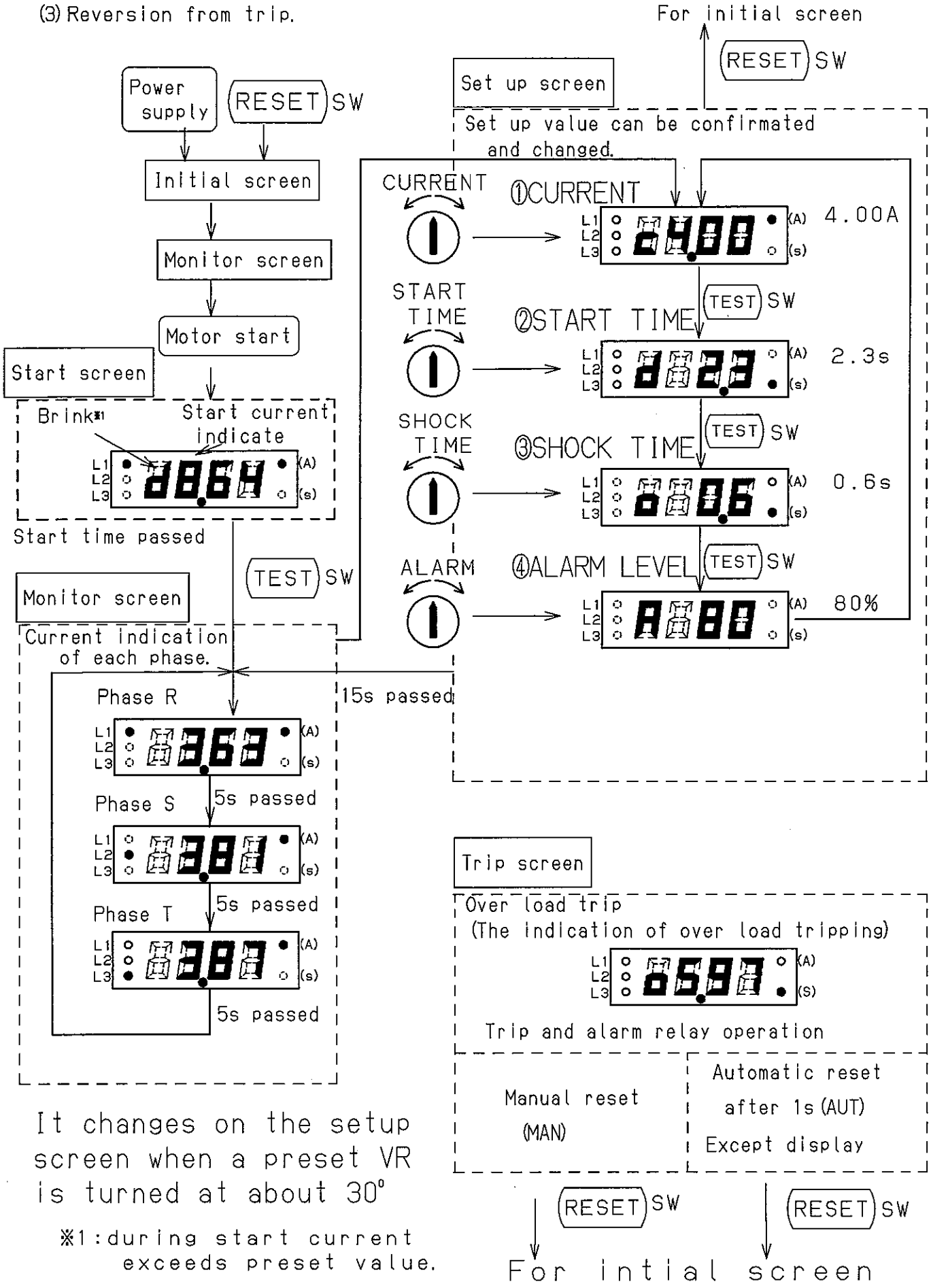
(1) The confirmation and change of the set up value.
(2) The confirmation trip movement.



It changes on the setup screen when a preset VR is turned at about 30°

8.4 LED display at motor running and Tripping.

(1) Current indication of each phase.
(2) The confirmation and change of the set up value.
(3) Reversion from trip.



It changes on the setup screen when a preset VR is turned at about 30°

※1 : during start current exceeds preset value.

9. 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	Under 85V AC/DC	A proper power supply is inputted. 85~250V AC/DC
		85~250V AC/DC	It is repaired or changed.
Locked rotor during starting L * * * A	Motor shaft	A motor shaft is restrained.	The restraint of the motor shaft is canceled.
	Ratio of external CT	Ratio of external CT is wrong	Ratio is made correct. (CT, The number of penetration)
	Start time setup value is examined.	Time is too short	It is set up a little long.
After the start, over-load trip occurs.	Load of motor	Over-load	Motor capacity is reexamined.
		Inertia is too big.	
	Start time setup value is examined.	Too short	It is set up a little long.
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.
	External CT	Ratio of external CT is wrong.	Ratio is made correct.
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.
A motor doesn't stop in spite of over-load trip.	Wiring of the relay output.	It isn't being wired. Wiring is wrong.	It is wired properly.

10. Attention in the use.

(1)When TSBSD10 is used for low capacity motor such as 200Vclass 0.1kW or 400Vclass 0.2kW The next treatment is necessary when a load is very small and operation electric current becomes under 0.5A.

[Phenomenon]

①Electric current value indication is 0.00A.

②Because motor current is too small, shock relay misunderstands motor is stop. When over-load occurs, relay output slowly(Start time + Shock time.)

③An alarm relay can't output when the setup of the alarm is under 0.5A.

[Treatment]

Wind an electric wire around CT twice. The indication value of current is two times。 CURRENT volume is set up in the value of two times of actual current. And, when current value is read, 1/2 of the indication value is actual current.

(2)When it is used external CT (3CT).

Convert current value as the next table, when read an electric current indication and setup a current volume.

	Actual current	Body.
TSB3CT100	Indication value × 20	TSBSD10
TSB3CT200	Indication value × 40	
TSB3CT300	Indication value × 60	

11.The reversion process of TRIP

(1) See LED indication, and confirm the contents of trip at tripping. An example is shown in the next table.

LED indication	The contents of Trip	Check
Over-load 	Current value exceeded CURRENT setup value after the start time, and went on beyond the shock time. Current value at tripping is 6.7A.	Check whether there is a wrong point in the machine.
Locked rotor 	It kept being charged with electricity beyond 300% of the CURRENT setup value after the start during the start time. Current value at tripping is 34.8A.	Check whether there is a wrong point in the machine.
Phase reversal 	Phase of power source is reversal. (After phase reversal is detected, it works in about 0.1 seconds.)	Check the phase sequence by phase sequence checker.
Phase loss 	Phase-S is phase loss. (After phase loss is detected, it works in about 3 seconds.)	Check motor wiring.
Phase unbalance 	Each phase current became unbalance. The biggest phase current was more than two times of minimum phase current. Minimum current was 2.1A of a U phase. (After phase unbalance is detected, it works in about 8 seconds.)	Check a power supply, a motor and motor wiring.

(2) Check whether there is a wrong point in a machine, a motor, wiring, the power supply.

(3) If there is a wrong point, remove that cause, and make a machine, a motor, wiring, a power supply normal condition

(4) When relay output is self-hold, let it revert by RESET switch.

(5) Start a machine again after you confirm the clause (1)(2)(3) and (4).

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

(1) Do a cleanup around the machine, and make it safe condition as a secondary disaster does not occur.

(2) When check the installation and connection of the shock relay, turn off the power source, and do it under the condition that a machine stops completely, and the LED indication of the shock relay turns off completely. Prevent it from turning on the power source by careless.

(3) Observe the standards NEMA 250-1991 "Enclosures for Electrical Equipment (1000Volts Maximum)" , NFPA496 1993 edition "Purged and Pressurized Enclosures for Electrical Equipment , 1993 Edition " and applicable standards. When revisions of these standards are published , the updated edition shall apply.

13.About the daily check, routine inspection.

A daily check

(1) Confirm that LED indication is to be turned on during the power on, and motor current value is indicated during the motor running.

A routine inspection

(1) Confirm that there is no looseness in the installation of CT, Shock relay, and in the terminal connection.(In a half year, more than one time.)

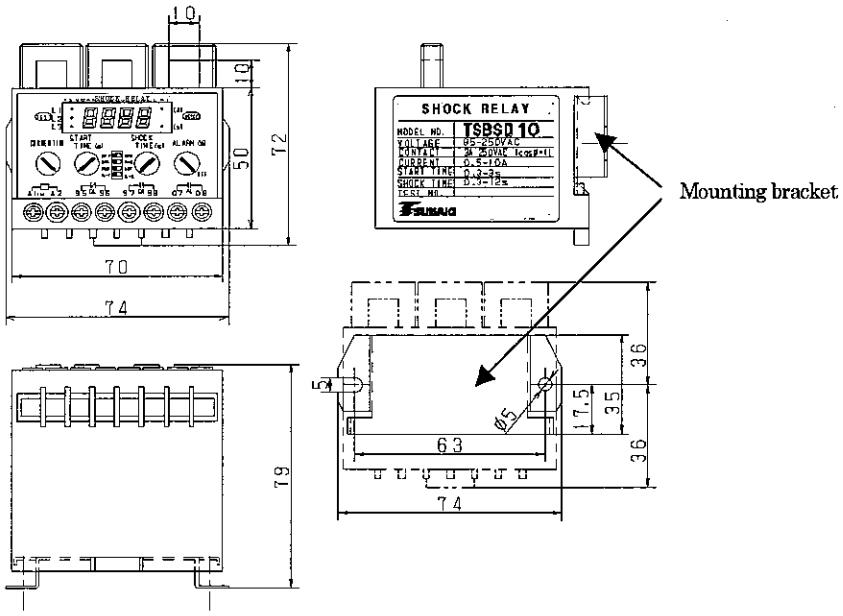
(2) Check the movement of the relay output (terminal 95-96, terminal 97-98) by the test mode regularly. (In a half year, more than one time. refer to P.8)

(3) Add DC500V between the earth terminal and the circuit when you carry out a megger-test. Don't add a test voltage to the shock relay, and carry it out when you do a dielectric strength test of the outside circuit.

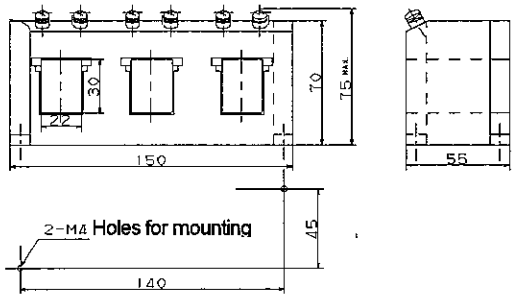
(4) As for the shock relay, a life time of electrolytic condenser is usually about 10 years in condition that ambient temperature is 30℃ in average during a year ,though a life time varies in the ambient environment and the operating time when power is supplied.We recommend an exchanging it for the new product or overhaul, before a trouble occurs.

14. OUT LINE

(1)shock relay TSBSD10, TSBSD60



(2) External 3phase CT TSB3CT100, TSB3CT200, TSB3CT300



15. **Specifications**

<table>
<tr><td colspan="4">Model No.</td><td>TSBSD10</td><td>TSBSD60</td></tr>
<tr><td colspan="3" rowspan="2">Control power source</td><td>AC</td><td colspan="2">85～250VAC,50/60Hz</td></tr>
<tr><td>DC</td><td colspan="2">85～250VDC (A1:＋ , A2:－)</td></tr>
<tr><td colspan="4">Power consumption</td><td colspan="2">Less than 4.0VA(3.0W)</td></tr>
<tr><td colspan="2" rowspan="2">Motor kW</td><td colspan="2">200V class</td><td>0. 1(※1)～2. 2kW</td><td>3. 7 ～ 11kW</td></tr>
<tr><td colspan="2">400V class</td><td>0. 2(※1)～3. 7kW</td><td>5. 5 ～ 22kW</td></tr>
<tr><td colspan="2">Current display</td><td colspan="2">Minimum current</td><td>0.5A</td><td>2A</td></tr>
<tr><td rowspan="6">Protective function</td><td rowspan="3">Over-load</td><td colspan="2">Trip current</td><td>0.5～10.0A</td><td>5～60A</td></tr>
<tr><td colspan="2">Start time</td><td colspan="2">0.3～12.0s</td></tr>
<tr><td colspan="2">Shock time</td><td colspan="2">0.3～3.0s</td></tr>
<tr><td colspan="3">Locked rotor</td><td colspan="2">Trip works when current exceed 300% of CURRENT LEVEL during START TIME.</td></tr>
<tr><td>Phase-reversal</td><td rowspan="3">SW.2 : ON</td><td colspan="2">Trip (after 0.1s)</td></tr>
<tr><td>Open-phase</td><td colspan="2">Trip (after 3s)</td></tr>
<tr><td>Phase-unbalance</td><td colspan="2">Trip (after 8s)
Maximum phase current≧2xminimum phase current</td></tr>
<tr><td>Alarm function</td><td colspan="3">Alarm setting</td><td colspan="2">50～100% of trip current level or OFF</td></tr>
<tr><td rowspan="3">Relay</td><td colspan="3">Contact rating</td><td colspan="2">3A,250VAC (cosϕ=1)</td></tr>
<tr><td colspan="3">Minimum allowable load</td><td colspan="2">DC24V , 4mA</td></tr>
<tr><td colspan="3">Life</td><td colspan="2">100,000 at rated load</td></tr>
<tr><td rowspan="5">Trip output</td><td colspan="3">Contact</td><td colspan="2">1a , 1b (97-98 : NO , 95-96 :NC)</td></tr>
<tr><td rowspan="2">Status</td><td colspan="2">SW.1 : ON(NVR)</td><td colspan="2">Normally energized</td></tr>
<tr><td colspan="2">SW.1 : OFF</td><td colspan="2">Normally de-energized</td></tr>
<tr><td rowspan="2">Reset</td><td colspan="2">SW.3 : MAN</td><td colspan="2">Manual reset by RESET button</td></tr>
<tr><td colspan="2">SW.3 : AUT</td><td colspan="2">Automatic reset in 1 second after the trip.</td></tr>
<tr><td rowspan="3">Alarm output</td><td colspan="3">Contact</td><td colspan="2">1a (07-08 : NO)</td></tr>
<tr><td rowspan="2">Movement</td><td>SW.4 : AL-F</td><td rowspan="2">Over the alarm level during 3seconds</td><td>Close→flicker</td></tr>
<tr><td>SW.4 : AL-C</td><td>open→close</td></tr>
<tr><td colspan="4">Terminal</td><td colspan="2">Clump</td></tr>
<tr><td colspan="2" rowspan="2">Dielectric strength</td><td colspan="2">Between casing and circuit
Between circuits</td><td colspan="2">2000VAC 1minute</td></tr>
<tr><td colspan="2">Between relay contacts</td><td colspan="2">1000VAC 1minute</td></tr>
<tr><td rowspan="5">Ambient environment</td><td colspan="2">Installation location</td><td colspan="2">Do not install in a dusty location or expose to corrosive gasses, oil splashes or direct sunlight or out-door.</td></tr>
<tr><td colspan="2">Temperature</td><td colspan="2">-10～+50℃(operating)</td></tr>
<tr><td colspan="2">Humidity</td><td colspan="2">45～85%RH(non-condensing)</td></tr>
<tr><td colspan="2">Altitude</td><td colspan="2">1000m or less</td></tr>
<tr><td colspan="2">Vibration</td><td colspan="2">5.9m/s^2 or less</td></tr>
<tr><td colspan="4">Mass</td><td colspan="2">0.22kg</td></tr>
</table>

(※1)refer to P.10 "Attention in the use"

16.Point for safety use

(1) Take measures beforehand to prevent danger if you can foresee danger when using a TSUBAKI EMERSON product.

(2) If our product begins to operate improperly, be sure to take measures to prevent a dangerous situation from arising in the machine.

17. Guarantee.

17. 1 Range of guarantee

With regard to any troubles happened to our products, replacement or repair of such troubled parts will be provided for free of charge during the effective period of guarantee, provided that installation and maintenance/management of said products have been performed properly pursuant to the description of this instruction manual and said products have been used under the condition described in the brochures or agreed separately through mutual consultations. The content of guarantee is limited only to the Shock Relay itself delivered to you and the judgment thereof will be made by our selection because such judgment pertaining to the range of guarantee is often complex.

Items falling under any of the following points shall be excluded from our guarantee;

1.when used under other conditions than the same described in the brochures or agreed separately,

2.when any failure is found in the installation , wiring or coupling with other equipment,

3.in case either the customer or supplier has altered the structure of our products by undertaking remodeling, etc.,

4.in case the product is repaired by other facility than our company or our designated factory,

5. in case the customer's maintenance /management has been insufficient and operational environment is not appropriate,

6.when damaged by such unavoidable situations as an act of God or disaster,

7.when our product has suffered from secondary damage owing to the failure of customer's equipment,

8. when damaged owing to the parts which were supplied by the customer and built-in our product, or the parts which were designated by the customer and used in our product, or

9.when any damage other than the above has been caused by reason we shall not be held

17. 2 Guarantee period

The guarantee period shall be either 18 months after shipment from our factory or 12 months after starting operation, whichever is shorter. Any and all inspection/repair undertaken by us after the above guarantee period has passed will be charged. We will be willingly accepting at cost your request for any inspection and repair arising by reasons outside our guarantee as above even during the guarantee period. Please do not hesitate to contact our dealers from whom you purchased.

17. 3 Miscellaneous

(1) Any matters described in this instruction manual may be changed without notice, to which your understanding is appreciated.

(2) We have tried our best in preparing the contents of this instruction manual so that any mistakes or oversights may be minimized. Should any mistake or oversight be found, we will be more than happy if you would advice us of them.