

TSUBAKI Electrical Control Devices



Tsubaki electrical control devices boost visualization and equipment management in factories

Rapidly advancing IoT is raising productivity and quality in factories.

Tsubaki plays a key role here, with electrical control devices that watch over factories by providing visualization of operational circumstances and detection of overload.

Shock Relay

These current-monitoring control devices quickly detect overcurrent during motor overload and thus prevent equipment from damage. Their applications include lifting/lowering devices and conveyors.

Features

- Quickly detects overcurrent
- Easy to install onto existing equipment
- Sends emergency signal only when problems detected



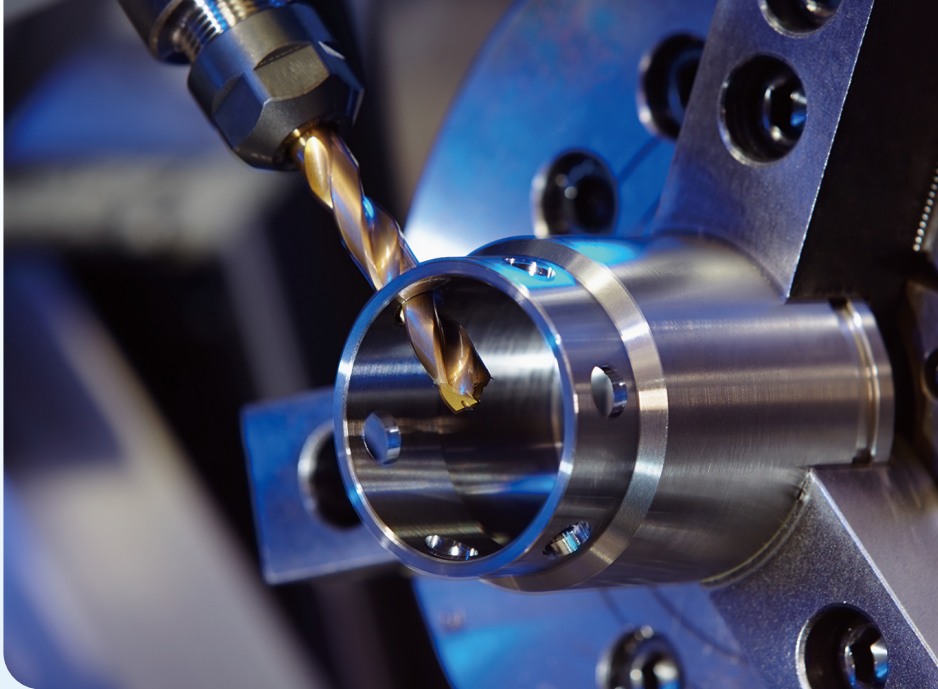
ED Series



SB Series



150 Series



Shock Monitor

These electricity-monitoring control devices detect minimal load variations by monitoring motor input power. They can be used on machine tools to shorten processing times and detect broken drills.

Features

- Power detection to monitor minimal variations in load
- Wide frequency range (5 to 120 Hz)
- Quick response
- Records load conditions



Basic type



Economy type (H1)



Contact detection type (M1)



Tool breakage detection type (M3)

Applications ideal for protecting

Hoisting system

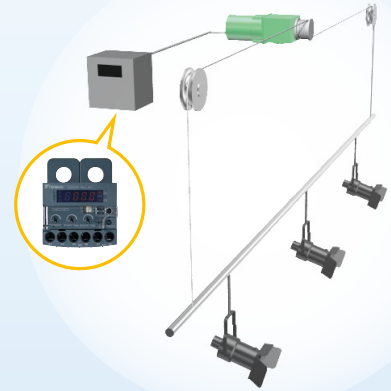
Detects overweight



Shock Relay
ED Series

Features

- Load value can be precisely set while verifying motor current on the digital display during operation
- Economical



Dishwasher

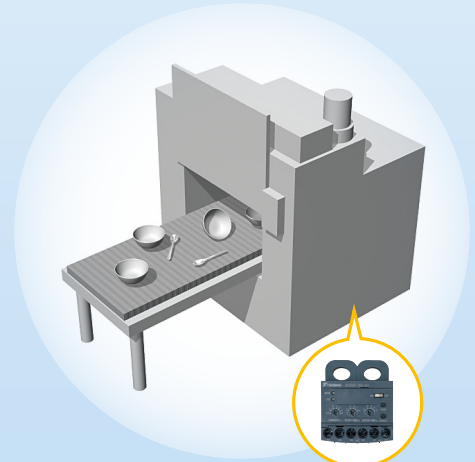
Stops equipment when spoons or other utensils get jammed in the machine



Shock Relay
SB Series

Features

- Compact
- Economical
- Can be installed inside the control box



Power Sensors

Realize preventive device maintenance and automation by detecting minute overload variations in things like grindstone-workpiece contact, tool wear, and crusher automatic operation.

Grinding machine

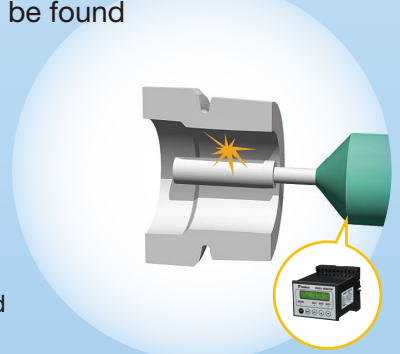
Through contact detection of grindstone-workpiece, the grinding cycle can be reduced and grindstone processing starting points can be found



Shock Monitor
TSM4000M1

Features

- Can offset the load factor at no-load operation before contact with the workpiece, allowing detection of only tiny contact loads



machine/equipment from overload

Shredder

Stops the shredder when the load becomes heavy



Shock Relay
SB Series

Features

- Automatic reset suitable for frequent stops
- Compact
- Economical



Multi-spindle drilling machine

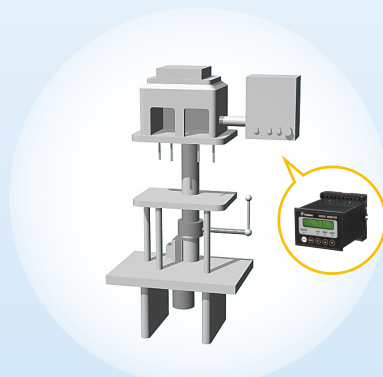
Overload protection and tool breakage detection



Shock Monitor
TSM4000

Features

- During machining, detects overload and tool breakage with high precision
- Selectable value for each tool (8 types)



Water treatment equipment

Sewage collector overload protection



Shock Monitor
TSM4000H2

Features

- Thanks to the load-following function, the set value can be followed and abnormal load can be detected precisely even if there is a small efficiency change in the high-gear-ratio reducer

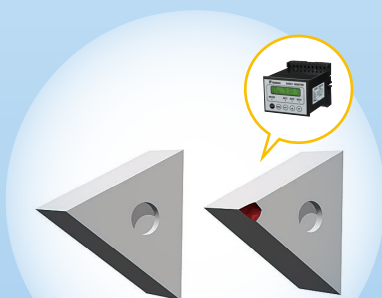


Lathe

Chip wear detection



Shock Monitor
TSM4000M2



Features

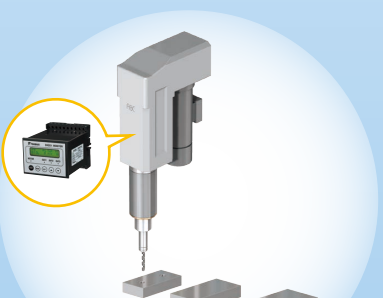
- Integrates power consumption during processing and detects minimal load variations due to wear, so users know the appropriate time to change the chips

Drilling machine

Tool breakage detection during continuous processing



Shock Monitor
TSM4000M3



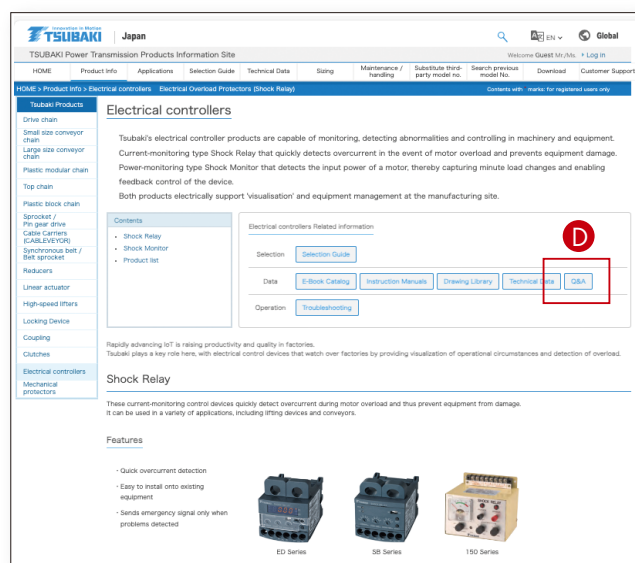
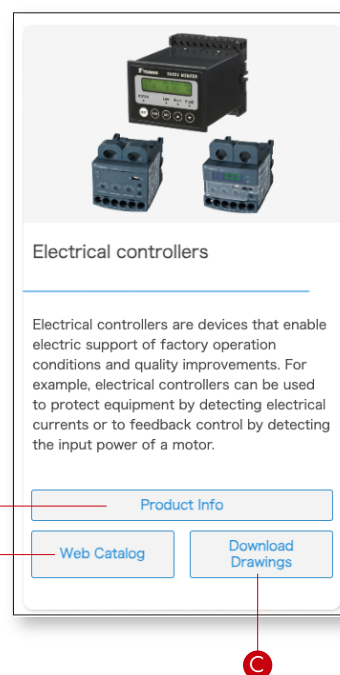
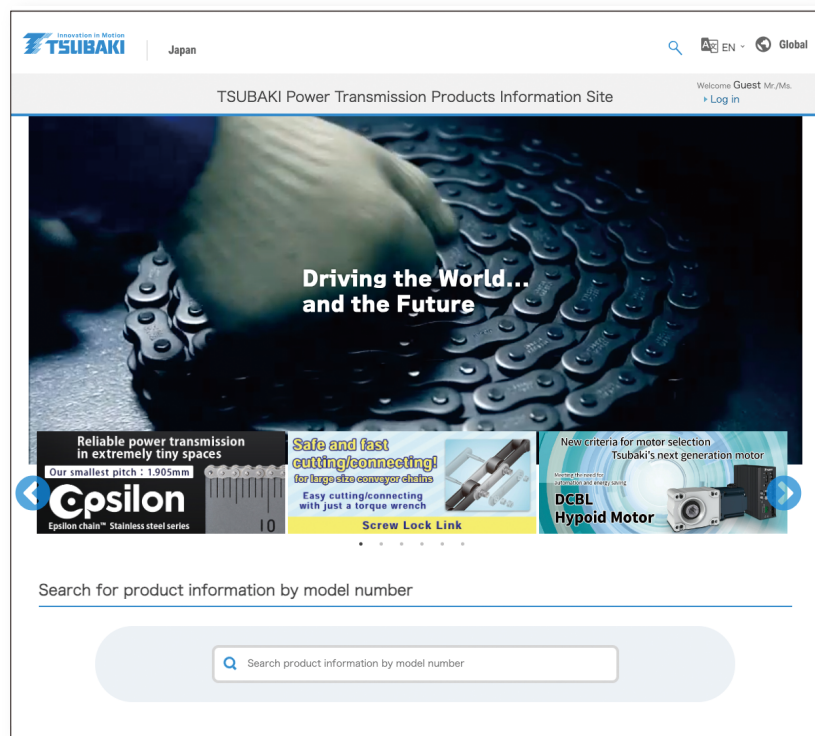
Features

- Quickly detects tool breakage, thus preventing continuous output of defective processed items

New! Tsubaki Power Transmission Products Information Site

From here users can download information on products and sizing, as well as drawings and instruction manuals.

<https://tt-net.tsubakimoto.co.jp/tecs/top/index.asp?lang=en>



B Catalogs Instruction Manuals

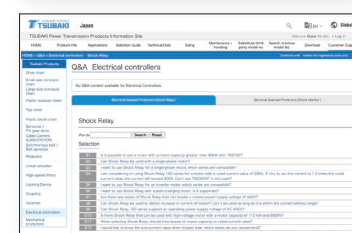
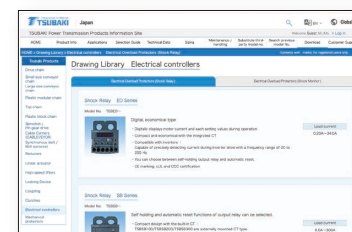
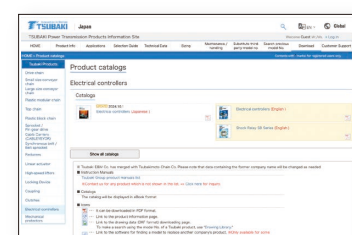
Download catalogs, pamphlets, and instruction manuals.

C Drawings

Download 3D-CAD data, DXF drawings, and PDF files.

D Q&A

Read answers to frequently asked questions about our products.



A Product Info

Browse product features and specifications.

SHOCK RELAY



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Special models and
optional specifications

Shock Relay ED Series p11

Shock Relay SB Series p14

Shock Relay 150 Series p17

Shock Relay

Quickly detects equipment overload!

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



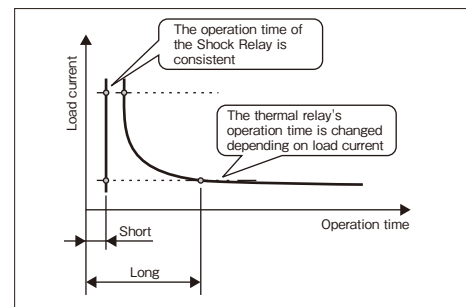
Features

1. Instantly detects overcurrent

When the motor current exceeds the predetermined current value, the relay contact signal can be output after a preset time.
For example, when a foreign object gets caught up in the conveyor, the Shock Relay sends a signal causing an emergency stop, thus minimizing equipment damage.

It's not a thermal relay

The purpose of the thermal relay is to protect the motor from burnout.
When the motor current continually exceeds the rated value for a certain period of time, an emergency signal is sent to protect the motor from burnout.
Generally, it takes a long time for operation to begin, so it is not suitable for equipment/machine protection.



2. Easy to install on existing equipment

The Shock Relay is an electrical protection device.
When adding the Shock Relay to existing equipment, it is not necessary to make major modifications to the equipment as in the case of mechanical protection devices.
Because the Shock Relay is installed inside the control panel, it can function outdoors or in harsh environments.

	Operation time	Protected object
Shock Relay	Short	Equipment
Thermal Relay	Long *	Motor

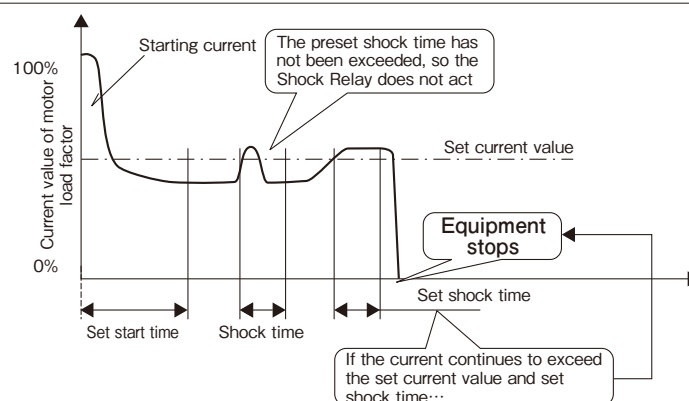
* If the motor current slightly exceeds the preset value, the thermal relay will not work. Even if it does work, it will do so slowly.

	Existing equipment	Environment
Electrical	Easy to install later	Built inside the panel
Mechanical	Difficult to install later	Necessary environmental precautions

3. The emergency signal is only output under abnormal conditions

The Shock Relay sends an emergency signal when overcurrent continues to exceed the preset period of time.
Sometimes during normal operation, conveyors will experience insignificant short-term current overloads due to reasons such as the current pulsation of the equipment, or when packages are put on the conveyor. By using the shock time function these small overloads will not be recognized as overloads, therefore avoiding nuisance stoppages.

Operation time chart



Applications

ED Series

Lifting device for lighting and screens

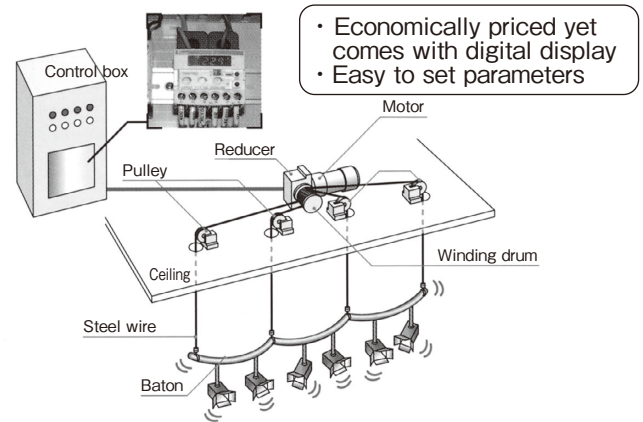


Operation

1. Due to over-installation of the lighting system, when the total weight of the baton exceeds the permissible load, the lifting device will be automatically shut down.
2. When the lifting device becomes overloaded during operation it automatically shuts down.

Key points

During operation the motor current is displayed digitally, and allowable load and stopping due to overload can be set as a digital numeric value.



SB Series

Chip conveyor



Operation

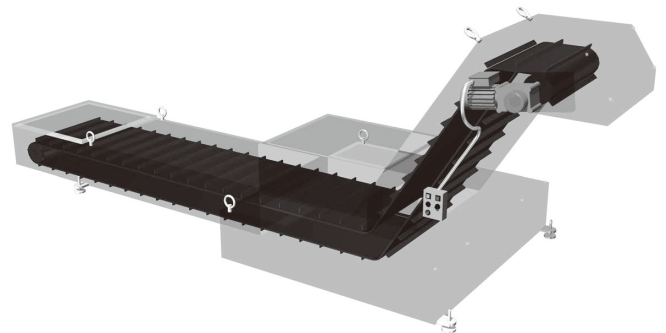
Protects the conveyor from damage when a tool gets caught in its belt.

Key points

The drive can be compact and less expensive.

Note: We can also provide a Shock Relay built into the gear motor terminal box.

- Ideal for hollow type reducers (for applications where it is difficult to install a mechanical safety device)
- Easy to change settings
- Smaller than a mechanical safety device, even for large-capacity motors



Shock Relay

Series reference chart

Series name		ED Series		SB Series		150 Series	
Model no.		TSB020ED to TSB550ED		TSBSA05 to 300		TSB151, 152	
Features		Digital display, economical, self-holding or automatic reset		Economical, self-holding or automatic reset		Analog display, self-holding	
Motor	(kW)						
	 132 90 75 22 11 3.7 0.2 0.1						
Power source (V)		200/220	400/440	200/220	400/440	200/220	400/440
Operation setting level		Ampere (A)		Ampere (A)		Ratio to motor rated current value (%)	
Start time setting range		0.2 to 10.0s adjustable		0.2 to 10s adjustable		0.2 to 20s adjustable	
Shock time setting range		0.2 to 5.0s adjustable		0.2 to 5.0s adjustable		0.2 to 3s adjustable	
Operating power supply voltage		DC/AC24 to 240V		DC/AC24 to 240V		AC100/110V or AC200/220V, 50/60Hz	
Condition of output relay after activation		Selectable; self-holding or automatic reset		Selectable; self-holding or automatic reset		Self-holding	
Test function		○		○		○	
Operation display		LED digital display		LED light		LED light	
Open phase, phase reversal, phase unbalance detection		×		×		×	
Alarm output		×		×		×	
DIN rail mounting		○		○		×	
Display		Digital current value		×		Analog %	
CT (current transformer)		Built-in		Built-in (for large-capacity external CT)		Separate external CT	
Special models *2	Impact load detection	×		×		△	
	1A input	×		×		△	
	Upper/lower limit detection	×		×		△	
Additional specifications *2	cUL certification CE	○		○		×	
	marking	○		○		×	
	CCC certification	○		○		×	
	Subtropical specifications	×		×		△	
	Control power supply voltage modification	× *1		× *1		△	
	Panel mounted	×		×		△	
	Start time modification	×		×		△	
	Shock time modification	×		×		△	
Automatic reset		○		×		△	

○...Standard △...Made to order ×...Not available

Notes: *1. Even if the voltage for operation is not standard, it is possible to use the standard units if the voltage fluctuation is taken into consideration and the voltage is within the above range.

*2. For more information, refer to page 10.

Notes when selecting

1. When used with human transportation equipment or lifting devices, install a suitable protection device on that equipment/device for safety purposes. Otherwise an accident resulting in death, serious injury, or damage to equipment may occur.

2. CT (current transformer)

The CT is essential for current detection (150 Series only). For more information about the appropriate CT, refer to the page of each series.

3. Model selection for special capacity and/or motor voltage

Normally a Shock Relay can be selected by motor capacity, but when the motor capacity and/or motor voltage is special (a standard Shock Relay can be used up to a maximum of 600V), select a Shock Relay based on the motor rated current value (set current range).

4. Operating power supply voltage

The operating power supply voltage described in the chart is the standard. For operating power supply voltages other than the standard, the 150 Series is available for special operating power supply voltage as a special MTO product.

5. Output relay operation

The output relay operation consists of two modes: the activation type and the reverting type when overcurrent is detected.

In the event of a power outage, make sure to switch off the machine as the sudden activation of the output relay may cause an accident or equipment damage.

1) Activation when overcurrent is detected

The output relay is activated (contact inverts) only when overcurrent is detected.

Corresponding models ED Series, SB Series (auto reset), 150 Series

2) Reverting when overcurrent is detected

When the power source for the Shock Relay is ON, the output relay is activated (contact inverts). The output relay, which was activated when overcurrent was detected returns to its original state.

Corresponding model SB Series (self-holding)

6. Self-holding and automatic reset

The methods used for output relay resetting are self-holding and automatic reset.

1) Self-holding

Even after overcurrent has stopped, the self-holding mode continues to function. In order to return it to normal operation, push the RESET button or cut the operation power supply.

Corresponding models 150 Series

2) Automatic reset

The output relay automatically resets after overcurrent is gone.

3) Self-holding or automatic reset

It is possible to switch between these two modes.

Corresponding models ED Series, SB Series

7. Inverter drive applicability

- 1) Detection accuracy decreases but generally if it is within the 30 to 60 Hz range, it can be used.
- 2) Even within the 30 to 60 Hz range, when the inverter accelerates and decelerates, and the current increases or decreases, the Shock Relay can sometimes cause an unnecessary trip. Slowly accelerate and decelerate or set it so that there is some leeway in load current within the allowable range.
- 3) Connect the CT to the secondary side of the inverter, but make sure to connect the Shock Relay operation power source to a commercial power source (never connect it to the secondary side of the inverter).

8. Note

When the inertia of the equipment/machine is large or the speed reduction ratio is large, the Shock Relay may sometimes not work. Conduct a trial test first before putting it into regular use. The default knob settings for start time/shock time is "min", while current is "max".

Contact a Tsubaki representative regarding whether a product contains substances restricted for use in specific industries and applications.



Refer to the manual for further details.

Outline of special models (Special models are available based on the 150 Series)

Special models	Outline of specifications	Special model no.
Impact load detection	Separately from the usual overload, abnormally large current is instantly detected and output. Impact load can be set from 30%–300%. Impact load shock time is within 0.05s. Other functions and outline dimensions conform to standard products.	TSB151M TSB152M
1A input	When the secondary side of CT is 1A, it can input directly to the Shock Relay. (It's not necessary to consider motor capacity.) Other specifications and outline dimensions conform to standard products.	TSB152C
Upper/lower limit detection	Detects both overload and under-loads; however, because there is only one output relay, it cannot distinguish between upper and lower limits.	TSB151W TSB152W

Outline of optional specifications (Optional specifications are available based on the 150 Series)

Optional specifications	Outline of specifications	Order symbol
Subtropical specifications	Can be used when ambient humidity is 90% RH and below. Other specifications conform to standard products.	S
Control power supply voltage modification	Voltage: AC230V, AC240V, AC115V, AC120V (Contact us for more information on other voltages.)	V
Panel mounted	It can be mounted on the control panel surface and operated.	P
Start time modification	The integral multiple can be extended for a maximum of 60 seconds. The front panel scale becomes an integral multiple (x2, x3 ...). Other specifications conform to standard products.	T1
Shock time modification	The integral multiple can be extended for a maximum of 60 seconds. The front panel scale becomes an integral multiple (x2, x3 ...). Other specifications conform to standard products.	T2
Automatic reset	For the 150 Series only, the output relay can be changed from self-holding to automatic reset.	H

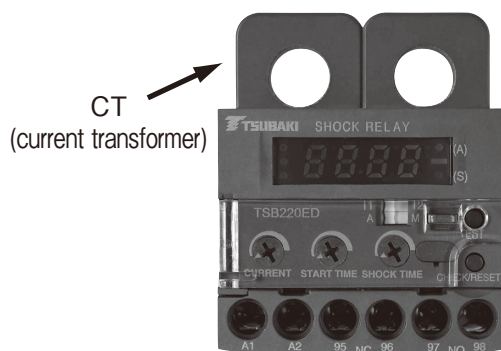
Shock Relay ED Series

Features

- Digitally displays motor current and set values
- Economically priced
- CT included in one compact unit
- Works with inverter*
Current can be precisely detected when inverter is operating between 20 to 200 Hz.
- Choose between self-holding or automatic reset for the output relay
- CE marking
- UL/cUL certification
- CCC certification

* To prevent unnecessary operation of the Shock Relay due to the increase in current during acceleration/deceleration, accelerate or decelerate slowly or allow a margin in the preset current.

CT all-in-one model



TSB020ED TSB220ED
TSB075ED TSB550ED

Standard specifications

Model no.				TSB020ED	TSB075ED	TSB220ED	TSB550ED
Applicable motors*1	200V class	DIP switch to select no. of wires passing through CT*2	T2	0.1kW	0.4kW	1.5kW	3.7kW
			T1	0.2kW	0.75kW	2.2kW	5.5kW
	400V class	DIP switch to select no. of wires passing through CT*2	T2	0.1, 0.2kW	—	2.2, 3.7kW	7.5kW
			T1	0.4, 0.75kW	1.5kW	5.5kW	11kW
Maximum motor circuit voltage				AC600V 50/60Hz			
Load current setting range*3		DIP switch to select no. of wires passing through CT	T2	0.20 to 1.20A (0.01A increments)	1.20 to 3.20A (0.02A increments)	3.00 to 10.0A (0.1A increments)	6.00 to 26.0A (0.2A increments)
			T1	0.40 to 2.40A (0.02A increments)	1.80 to 5.80A (0.04A increments)	4.00 to 14.0A (0.1A increments)	9.00 to 34.0A (0.25A increments)*4
Start time setting range*3				0.2 to 10.0s			
Shock time setting range*3				0.2 to 5.0s			
Rated operating power supply voltage				24 to 240V AC/DC (non-polar)			
Rated operating power supply frequency				50/60Hz			
Current setting accuracy				±10% (full-scale)			
Current detection system				2-phase CT system			
Output relay		Operation selection		A: Auto reset after tripping M: Self-holding after tripping			
		Contact capacity		1a1b 3A AC250V cos ϕ = 1			
		Min. applicable load*5		DC10V, 10mA			
		Life		80,000 activations			
Usage environment		Ambient temperature		−20 to +60°C			
		Ambient humidity		30 to 85% RH; no condensation			
		Ambient vibration		5.9m/s ² or less			
		Altitude		2000m or less			
		Atmosphere		No dust or corrosive gas			
Withstand voltage		Between circuit-housing		2000V AC, 60Hz, 1 minute (power supply circuit and contact circuit)			
		Between contacts		1000V AC, 60Hz, 1 minute			
		Between circuit		2000V AC, 60Hz, 1 minute (power supply circuit and contact circuit)			
Protective structure				IP20			
Mass				0.2kg max.			
Power consumption				2W max.			

Notes: *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. Be sure to make one turn when selecting T1 and two turns when selecting T2.

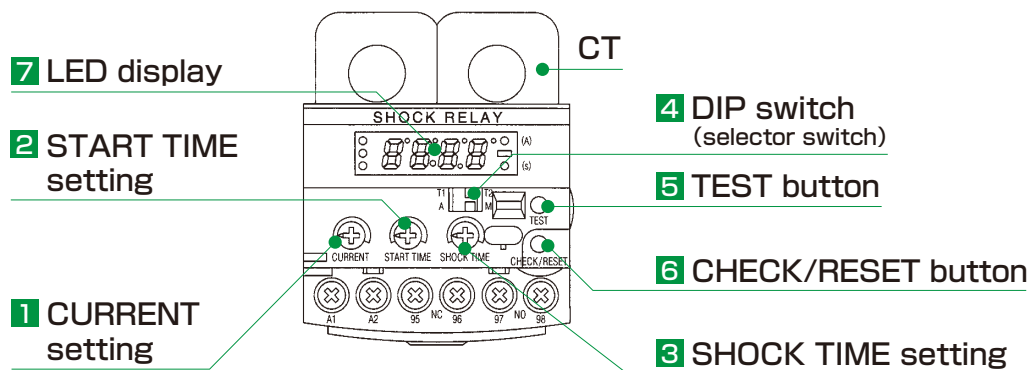
*3. A ±1 digit error can occur with the current and the set time in the range indicated.

*4. Set values 10A and higher are displayed as follows due to the maximum number of display digits. 10.0A→10.2A→10.5A→10.7A→11.0A

*5. When directly inputting output relay contact into the programmable controller (PLC), be aware that a minute electric current can cause contact failure.

Therefore, before inputting the output relay contact into the PLC, it is recommended that you drive the relay coil for a minute current via the relay signal.

Part names and functions



Note: Use a micro screwdriver when changing each of the settings. Do not use a large screwdriver since it may cause damage.

1 Current setting (CURRENT)

Sets current at the value at which trip occurs.

2 Start time setting (START TIME)

Sets start time (start-up compensation time). When the motor starts, there is a possibility that the motor current will exceed the set current value, but during the start time period it will not trip.

3 Shock time setting (SHOCK TIME)

Sets shock time (output delay time). When the motor current exceeds the set current value, the count begins, and when shock time has elapsed, it will trip.

4 DIP switch (selector switch)

Setting	Purpose	☒ ☐		☐ ☒	
No. of motor wires passing through CT T1/ T2	Current value set range selection	T1	No. of passes through the CT: 1	T2	No. of passes through the CT: 2
Trip reset A / M	Output relay reset selection	A	Automatically returns from the trip state a second after current value returns to below the set current value.	M	Trip state is maintained until the check/ reset button is pressed. It then resets.

5 TEST button (TEST)

While the LED is displaying current value, pressing the TEST button will carry out an operation test.

6 CHECK/RESET button (CHECK/RESET)

During normal operation:

By pressing the CHECK/RESET button while the LED is displaying current value, the display switches to the setting screen.

During trip:

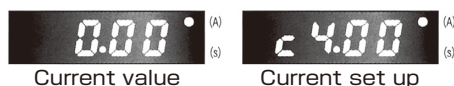
When the CHECK/RESET button is pressed, trip is cleared and the display switches to the current value.

During set-up:

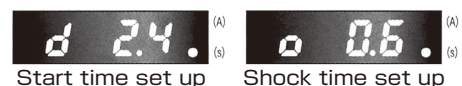
While the LED is showing the setting screen, pressing the CHECK/RESET button will switch the display between current setting, start time setting, shock time settings, and current value, in this order.

7 LED display

The LED to the left of (A) will light up when current value and current set-up are displayed.
(A = ampere)



The LED to the left of (s) will light up when start time set-up and shock time set-up are displayed.
(s = seconds)



Shock Relay ED Series

Comparison with meter relays (analog)

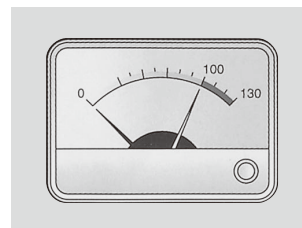
The ED Series is also ideal for applications that use a meter relay (analog).

Here are features not available with meter relays.

- Start time (start-up compensation) function
- Shock time (output delay) function
- Compact design, includes CT
- Works with inverter driving
- Choose between self-holding or automatic reset for the output relay
- Includes test function
- Detects locked rotor start

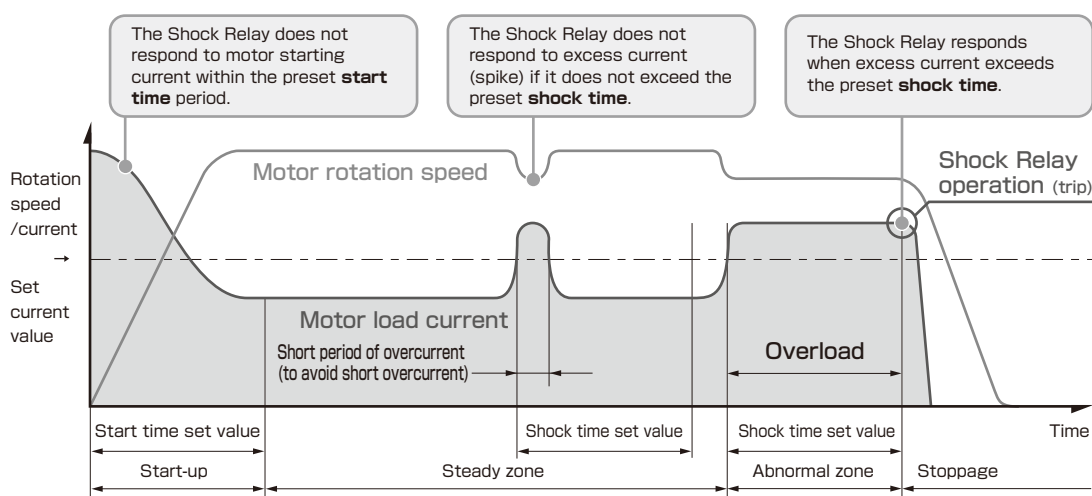


ED Series

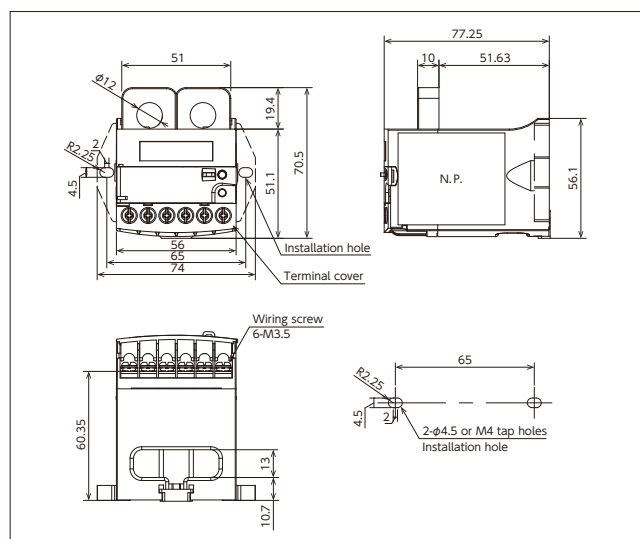


Meter relay (analog type)

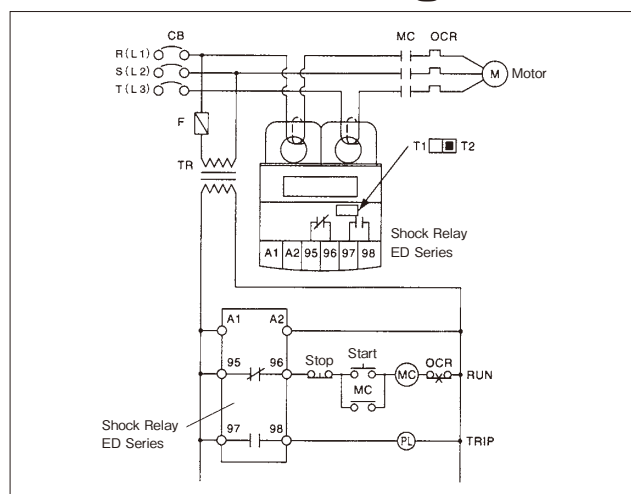
Operating mode



Outline dimensions



Basic connection diagram



Model

TSB020ED

Shock Relay

Maximum applicable
motor capacity (200V class)
020...0.2kW 075...0.75kW
220...2.2kW 550...5.5kW

ED Series

Shock Relay SB Series

Features

- Choose between self-holding or automatic reset for the output relay
- Economically priced
- Broad current setting range
- High repeating accuracy
- Includes TEST/RESET buttons
- All-in-one unit with CT (current transformer)
- CE marking
- DIN rail (35 mm) mountable
- Can be used with a single-phase motor
- UL/cUL certification
- CCC certification

CT all-in-one model

CT
(current transformer)

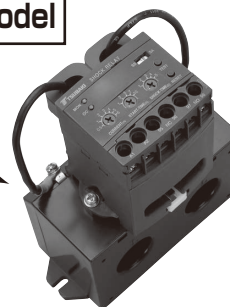
TSBSB05
TSBSB10
TSBSB30
TSBSB60



CT externally mounted model

External CT
(current transformer)

TSBSB100 (TSBSB05+TSB2CT100)
TSBSB200 (TSBSB05+TSB2CT200)
TSBSB300 (TSBSB05+TSB2CT300)



Standard specifications

Model no.		TSBSB05	TSBSB10	TSBSB30	TSBSB60	TSBSB100	TSBSB200	TSBSB300
Applicable motors	200V class	0.1 to 0.75kW	1.5 to 2.2kW	3.7 to 5.5kW	7.5 to 11kW	15 to 18.5kW	22 to 37kW	45 to 75kW
	400V class	0.2 to 2.2kW	3.7kW	5.5 to 11kW	15 to 22kW	30 to 45kW	55 to 90kW	110 to 132kW
Maximum motor circuit voltage		AC600V 50/60Hz						
Load current setting range*1		0.5 to 6.0A	1 to 12A	3 to 30A	5 to 60A	10 to 100A	20 to 200A	30 to 300A
Start time setting range*1		0.2 to 10.0s*2						
Shock time setting range*1		0.2 to 5.0s*2						
Rated operating power supply voltage		24 to 240V AC/DC (non-polar)						
Rated operating power supply frequency		50/60Hz						
Current setting accuracy		±10% (full-scale)						
Current detection system		2-phase CT system						
Output relay	Operation selection	SS: Excitation during normal operation, self-holding after tripping SA: Excitation during abnormal operation, auto reset after tripping						
	Contact capacity	1a1b 3A AC250V $\cos \phi = 1$						
	Min. applicable load*3	DC10V, 10mA						
	Life	80,000 activations						
Usage environment	Ambient temperature	-20 to +60°C						
	Ambient humidity	45 to 85% RH; no condensation						
	Ambient vibration	5.9m/s ² or less						
	Altitude	2000m or less						
Withstand voltage	Atmosphere	No dust or corrosive gas						
	Between circuit-housing	2000V AC, 60Hz, 1 minute (power supply circuit and contact circuit)						
	Between contacts	1000V AC, 60Hz, 1 minute						
Protective structure	Between circuit	2000V AC, 60Hz, 1 minute (power supply circuit and contact circuit)						
	Protective structure	IP20						
Mass		0.2kg max.						
Power consumption		2W max.						

Notes: *1. Current and time setting ranges are settable ranges, not the upper and lower levels of setting volume.

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

*3. When directly inputting output relay contact into the programmable controller (PLC), be aware that a minute electric current can cause contact failure.

Therefore, before inputting the output relay contact into the PLC, it is recommended that you drive the relay coil for a minute current via the relay signal.

Shock Relay SB Series

Part names and functions

LOAD CURRENT setting

Load current can be set to stop the motor at the desired level when overload occurs. When the motor current exceeds the preset current value (continues to exceed the preset shock time), the Shock Relay activates and stops the motor.

START TIME setting

To prevent the Shock Relay from operating due to the motor start-up current, set the start time a little bit longer than the time the motor settles into the steady zone.

TEST button

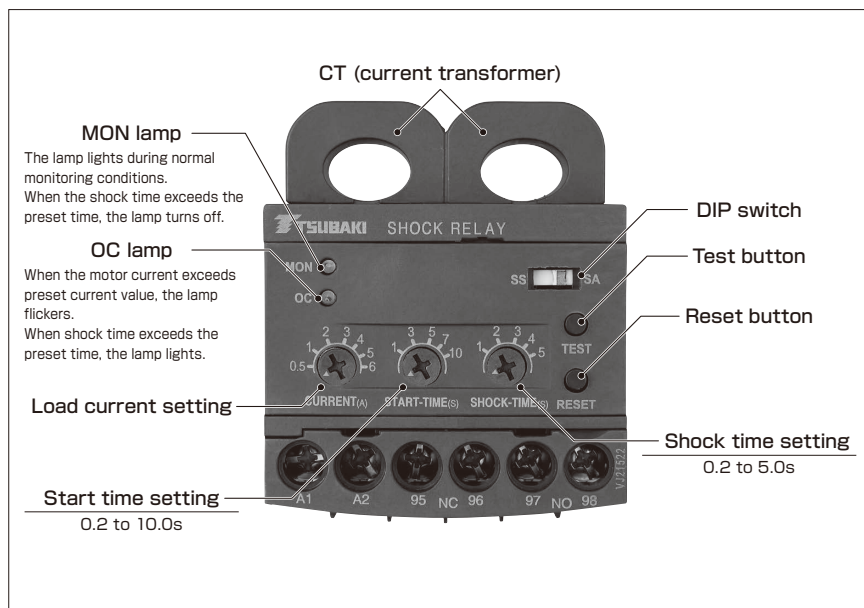
Shock Relay can be tested standalone or when not in operation. (When testing the Shock Relay, continue to press and hold the TEST button longer than the set start time or shock time, whichever is longer.)

RESET button

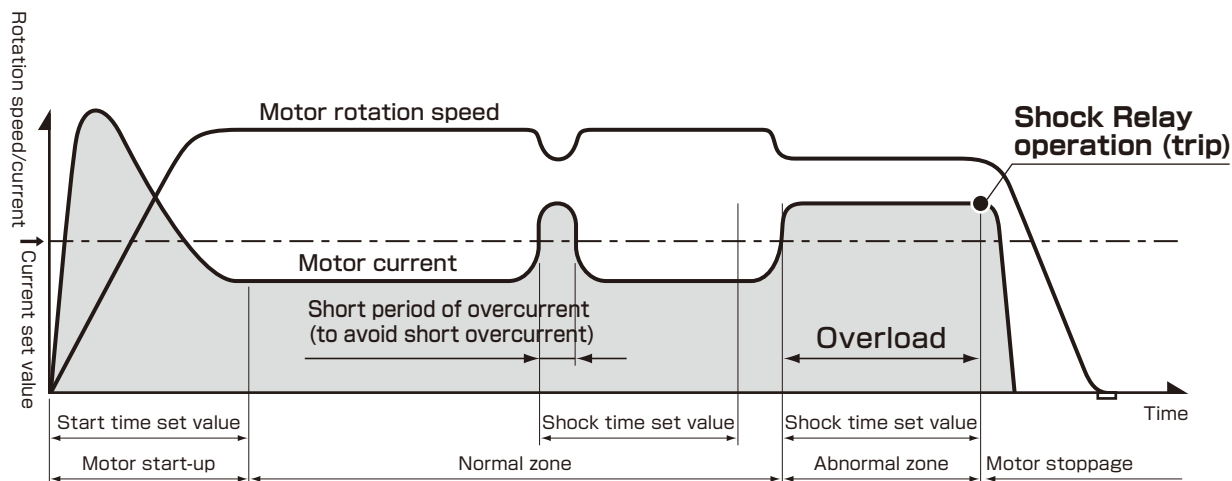
After the Shock Relay activates, the RESET button is used to cancel the self-holding of the output contact.

SHOCK TIME setting

Shock time is the amount of time set until the Shock Relay activates when overload occurs. Within the set time, the Shock Relay will not activate, even if it is overloaded.



Operating mode

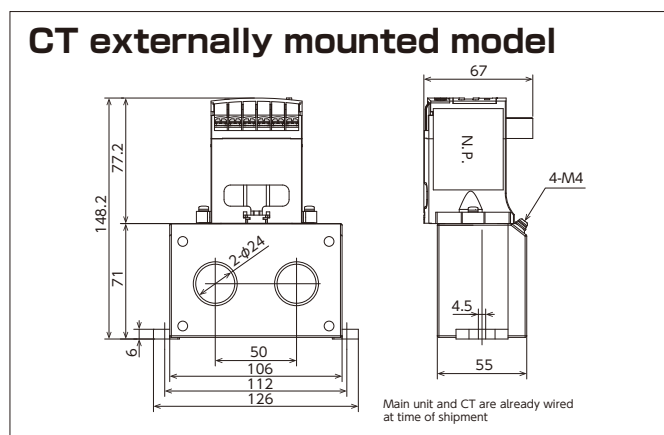
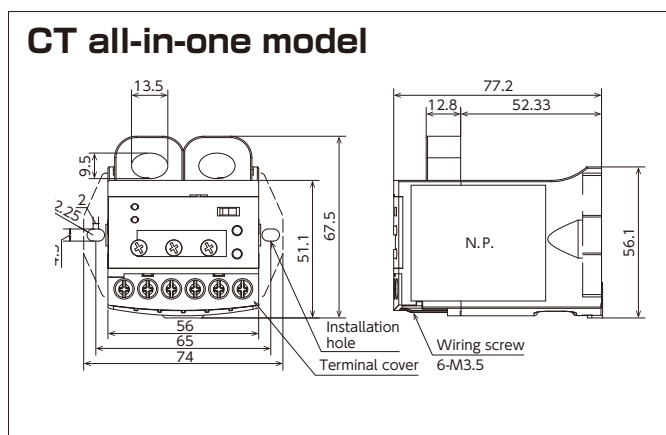


Model

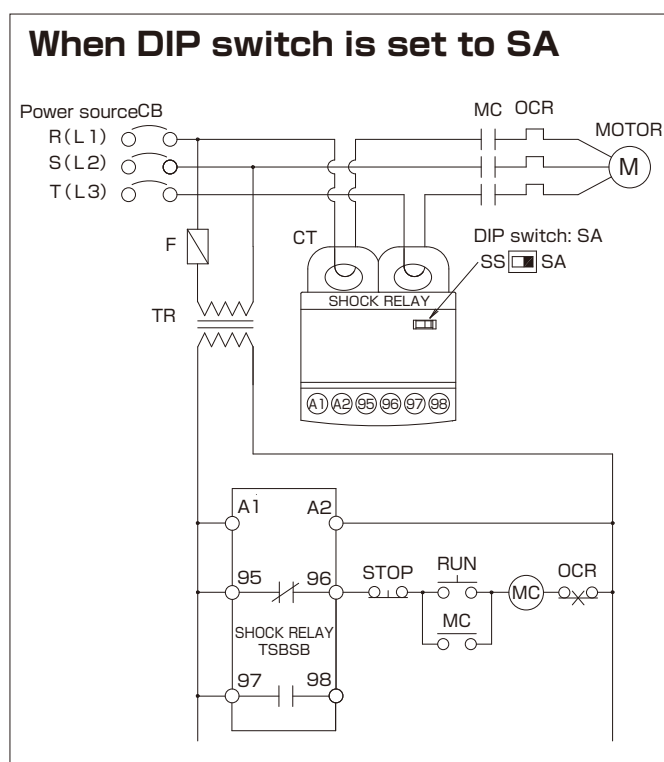
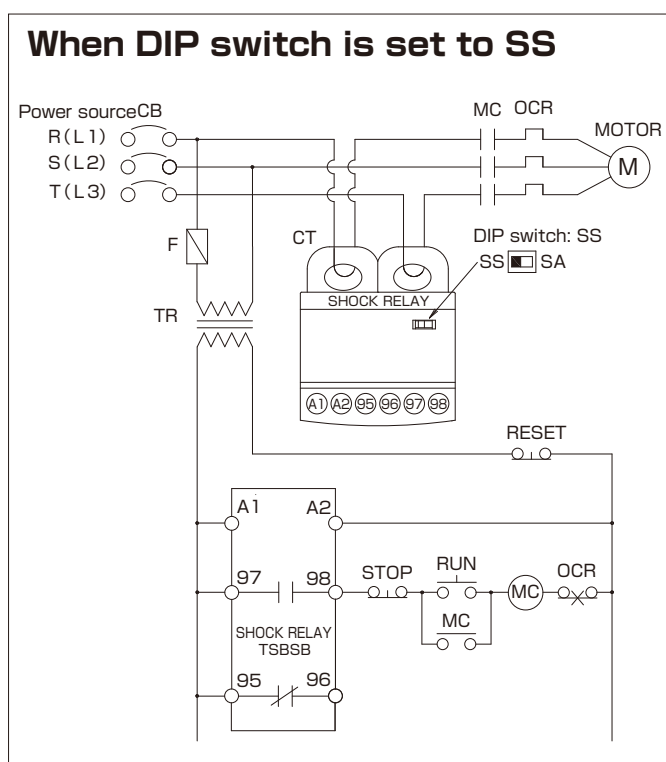
TSB SB 05

Shock Relay — SB Series — Size

Outline dimensions



Basic connection diagram



Number of wire(s) that pass through the CT

Depending on motor capacity, use the chart on the right to select the applicable Shock Relay model and number of wire(s) to pass through the CT.

In order to increase the current setting accuracy, the number of wires that pass through the CT is two times or more for small motor currents.

When the motor load factor is low, increase the number of wires that pass through the CT as necessary.

Furthermore, when the number of the wires that pass through the CT is more than two, it is necessary to convert the current scale value of current volume.

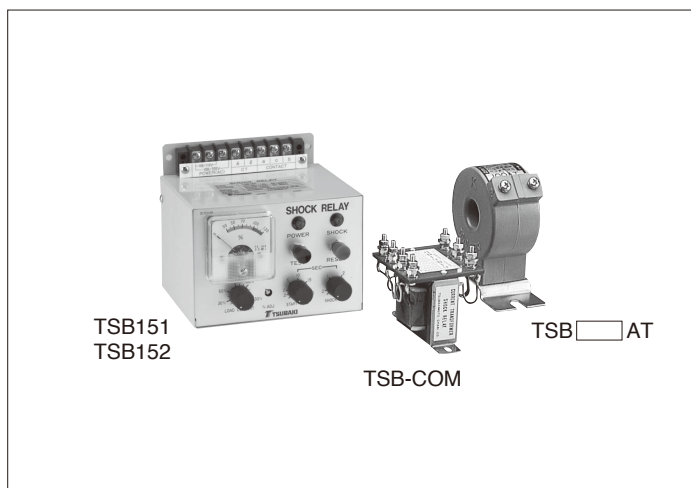
(Ex.) When a wire passes two times through the CT, the value on the current scale should be at half value.

AC 200V class motor			AC 400V class motor		
Capacity (kW)	Shock Relay model no.	No. of wires passing through CT	kW	Shock Relay model no.	No. of wires passing through CT
0.1	TSBSB05	4	—	—	—
0.2	TSBSB05	3	0.2	TSBSB05	4
0.4	TSBSB05	2	0.4	TSBSB05	3
0.75	TSBSB05	1	0.75	TSBSB05	2
1.5	TSBSB10	1	1.5	TSBSB05	1
2.2	TSBSB10	1	2.2	TSBSB05	1
3.7	TSBSB30	1	3.7	TSBSB10	1
5.5	TSBSB30	1	5.5	TSBSB30	1
7.5	TSBSB60	1	7.5	TSBSB30	1
11	TSBSB60	1	11	TSBSB30	1
—	—	—	15	TSBSB60	1
—	—	—	18.5	TSBSB60	1
—	—	—	22	TSBSB60	1

Shock Relay 150 Series

Features

- Analog meter
- Self-holding type
- Special MTO models and optional specifications are available



TSB151
TSB152

TSB-COM

TSB [] AT

Standard specifications

Model		TSB151-COM	TSB152, TSB [] AT*1
Applicable motor capacity	200V class	0.2 to 3.7kW*2	5.5 to 90kW
	400V class	0.2 to 3.7kW	5.5 to 90kW
Max. motor circuit voltage		AC600V 50/60Hz	
Load current setting range*3		30 to 130% (100%=5mA)	30 to 130% (100%=5A)
Start time setting range*3		0.2 to 20s	
Shock time setting range*3		0.2 to 3s	
Rated operating power supply voltage		AC100/110V or AC200/220V, 50/60Hz $\pm 10\%$	
Operating power supply voltage fluctuation range		90 to 110% of rated value	
Current setting accuracy		$\pm 10\%$ (full-scale)	
Current detection system		1-phase CT system	
Output relay	Operation	Self-holding	
	Contact capacity	1c contact, AC250V 0.2A (inductive load $\cos\phi=0.4$)	
	Min. applicable load*4	DC24V, 4mA	
	Life	100,000 activations	
Usage environment	Ambient temperature	-10 to $+50^{\circ}\text{C}$	
	Ambient humidity	45 to 85% RH; no condensation	
	Ambient vibration	5.9m/s^2 or less	
	Altitude	2000m or less	
	Atmosphere	No dust or corrosive gas	
Withstand voltage	Between circuit-housing	700V AC, 60Hz, 1 minute (power supply circuit and contact circuit)	
	Between contacts	700V AC, 60Hz, 1 minute	
	Between circuits	700V AC, 60Hz, 1 minute (power supply circuit and contact circuit)	
Protective structure		IP20	
Mass		1.0kg	
Power consumption		1.2VA	
External CT	Accessory external CT model	TSB-COM	TSB [] AT ([] ...Rated input current value)
	Rated input current	0.75A, 1.5A, 1.75A, 2.0A, 2.5A, 3.3A, 4.0A 5.3A, 7.0A, 9.0A, 10.0A, 16.0A	100A, 120A, 150A, 200A, 250A, 300A
	Rated output current	5mA	5A
	Rated load	0.5VA	5VA
	Mass	0.5kg	0.6kg

Notes: *1. TSB152 and TSB AT (external CT) have different model numbers.

*2. If the TSB-COM-A (small-capacity CT) is used, a motor of 0.1kW or less can be used.

*3. Current and time setting ranges are settable ranges, not the upper and lower levels of setting volume.

*4. When directly inputting output relay contact into the programmable controller (PLC), be aware that a minute electric current can cause contact failure.

Therefore, before inputting the output relay contact into the PLC, it is recommended that you drive the relay coil for a minute current via the relay signal.

Part names and functions

% Display meter

The meter displays the percentage of the motor current in operation vs. the motor rated current. (The rated current here is based on "Motor rated current" in the CT selection table on page 28.)

LOAD CURRENT knob

Load current can be set to stop the motor at the desired level when overload occurs. When the motor current exceeds the preset current value (continues to exceed the preset shock time), the Shock Relay activates and stops the motor.

% Adjust knob

If the input from the CT is 5mA (TSB151) or 5A (TSB152), the meter can be modified in the 95 to 130% range. Also, after adjusting the % adjuster, the meter scale indicator and load current set scale are the same.

START TIME knob

To prevent the Shock Relay from operating due to the motor start-up current, set the start time a little bit longer than the time the motor settles into the steady zone.

Terminals

All terminals are located on the upper portion of the Shock Relay, making wiring easy.

POWER indicator

Lights up when the Shock Relay is turned on.

Activation indicator

Lights up when the Shock Relay is operating.

TEST button

Shock Relay operation can be tested stand-alone or during motor operation.

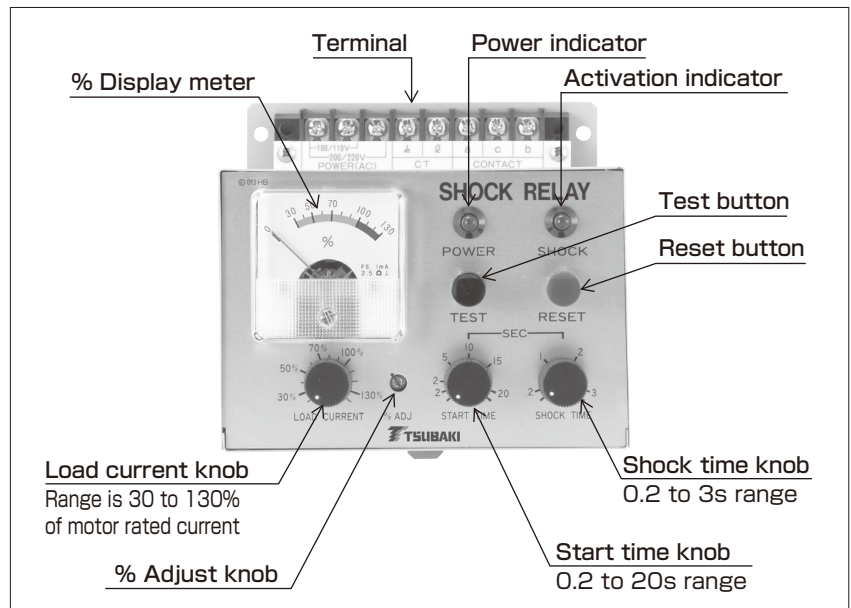
(When testing the Shock Relay, continue to press and hold the TEST button longer than the set start time or shock time, whichever is longer.)

RESET button

After the Shock Relay activates, the RESET button is used to cancel the self-holding of the output contact.

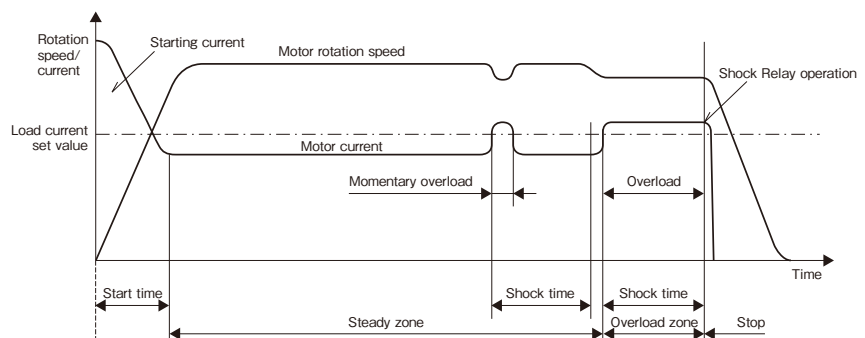
SHOCK TIME knob

Shock time is the amount of time set until the Shock Relay activates when overload occurs. Within the set time, the Shock Relay will not activate, even if it is overloaded.



Operating mode

■ Overload operating mode

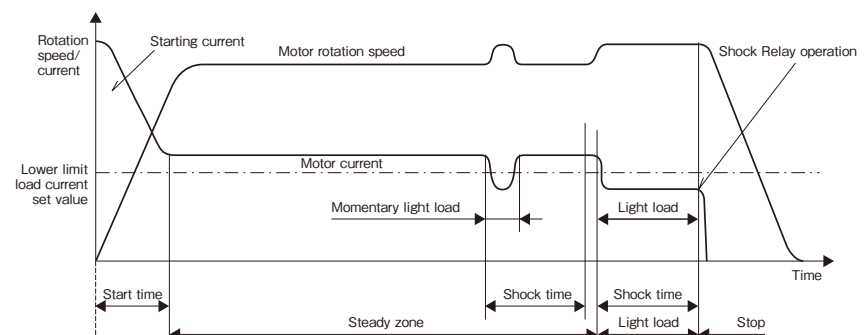


■ Light-load operating mode

TSB151W, 152W

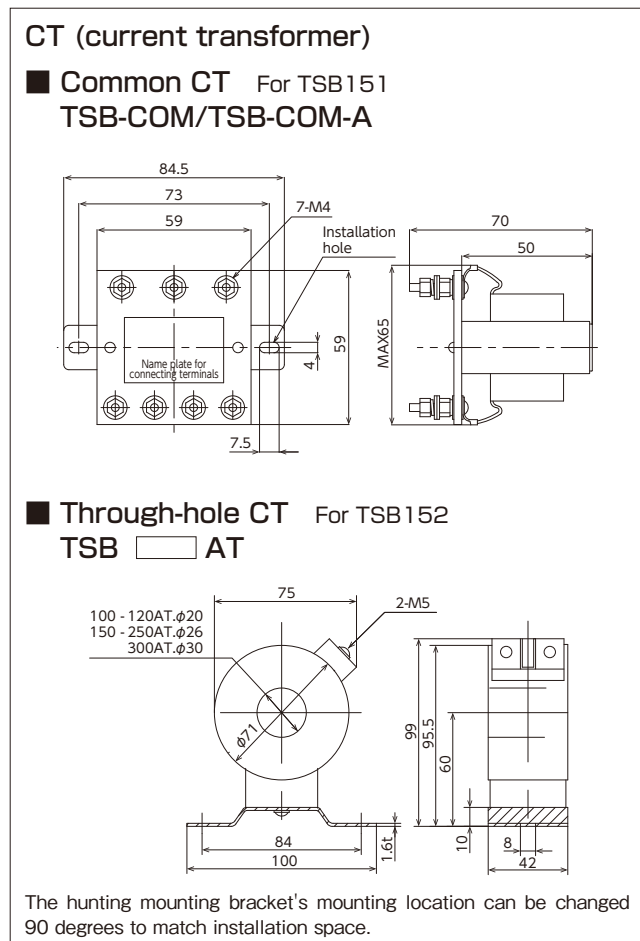
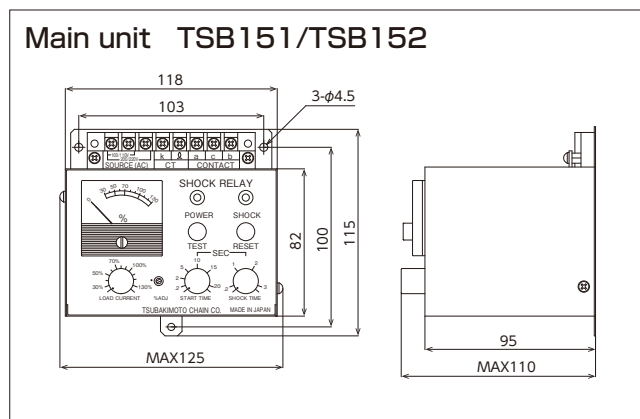
(Lower/upper limit detector specifications)

Note: Because there is only one output relay, it is not possible to distinguish between overload operation and light-load operation.



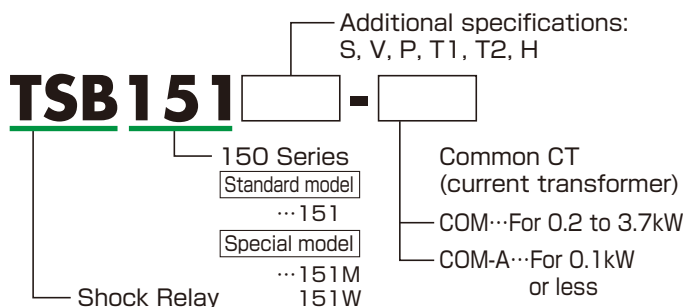
Shock Relay 150 Series

Outline dimensions

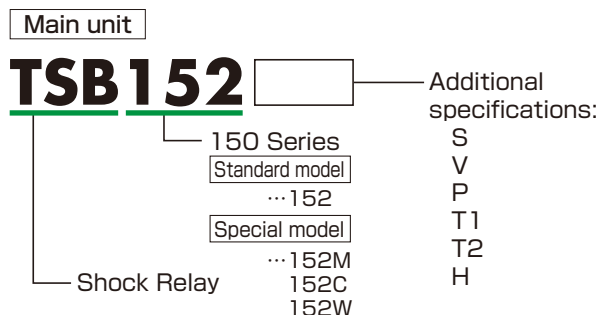


Model

■ For motors 3.7kW or smaller



■ For motors 5.5kW or larger



Through-hole CT



Note: Use the main unit and CT as a set.

Tsubaki uses COM-5-XX through-hole CTs from Toyo Keiki Co., Ltd.

Through-hole CT comparison chart

Current	Tsubakimoto Chain	Toyo Keiki
100A	TSB100AT	COM-5-20 100AT
120A	TSB120AT	COM-5-20 120AT
150A	TSB150AT	COM-5-26 150AT
200A	TSB200AT	COM-5-26 200AT
250A	TSB250AT	COM-5-26 250AT
300A	TSB300AT	COM-5-30 300AT

Standard model and special models with optional specifications

Optional specifications		Subtropical spec.	Control power supply voltage modification	Panel mounted	Start time modification	Shock time modification	Auto-reset
Model		S	V	P	T1	T2	H
Standard	151/152	○	○	○	○	○	○
Impact load detection	151M/152M	○	○	○	○	○	○
1A input (motor capacity is not necessary to consider)	152C	○	○	○	○	○	○
Upper/lower limit detection	151W	○	○	○	○	○	○
	152W	○	○	○	○	○	○

Notes: 1. Refer to page 10 for detailed specifications

2. For optional specifications V, specify control power source

3. For optional specifications T1 and T2, indicate the start time and shock time modification time.

◎ : Multiple specifications available

CT (current transformer)

■ Common CT: for motors 3.7kW or smaller

- TSB-COM (standard) can be used with 0.2 to 3.7kW motors.
- TSB-COM-A (small capacity) can be used with motors up to and including 0.1kW.

■ TSB-COM (standard type)

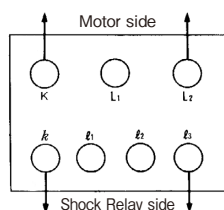
Motors (kW)	Power supply: AC200/220V			Power supply: AC400/440V		
	Motor rated current (A)	Connecting terminal	Shock Relay side	Motor rated current (A)	Connecting terminal	Shock Relay side
0.2	1.75	K-L ₂	k-ℓ ₁	0.75	K-L ₂	ℓ ₁ -ℓ ₂
0.4	2.5	K-L ₂	k-ℓ ₂	1.5	K-L ₂	ℓ ₂ -ℓ ₃
0.75	4.0	K-L ₂	k-ℓ ₃	2.0	L ₁ -L ₂	ℓ ₂ -ℓ ₃
1.5	7.0	K-L ₁	k-ℓ ₁	3.3	L ₁ -L ₂	k-ℓ ₂
2.2	10.0	K-L ₁	k-ℓ ₂	5.3	L ₁ -L ₂	k-ℓ ₃
3.7	16.0	K-L ₁	k-ℓ ₃	9.0	K-L ₁	ℓ ₁ -ℓ ₃

Note: Common CT motor side L₁-L₂ or Shock Relay side ℓ₁-ℓ₂ can be combined with a 1A output CT.

■ TSB-COM-A (small-capacity type)

Motor rated current (A)	Connecting terminal	
	Motor side	Shock Relay side
0.15	K-L ₂	k-ℓ ₁
0.25	K-L ₂	k-ℓ ₂
0.4	K-L ₂	k-ℓ ₃
0.6	K-L ₁	k-ℓ ₁
1.0	K-L ₁	k-ℓ ₂
1.6	K-L ₁	k-ℓ ₃

Note: Select by current value.



■ Through-type CT for motors 5.5kW or larger

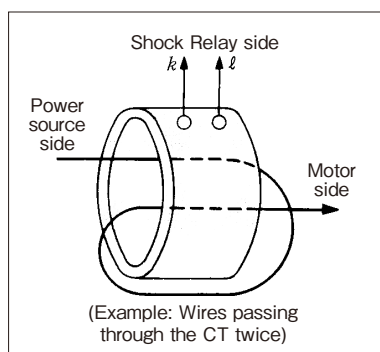
- Select a CT size applicable to motor capacity.

Motor (kW)	Power supply: AC200/220V			Power supply: AC400/440V		
	Motor rated current (A)	CT size	No. of wires passing through CT (I)	Motor rated current (A)	CT size	No. of wires passing through CT (I)
5.5	25	100AT	4	14	100AT	7
7.5	30	120AT	4	20	100AT	5
11	50	100AT	2	25	100AT	4
15	60	120AT	2	30	120AT	4
19	75	150AT	2	37	150AT	4
22	100	100AT	1	50	100AT	2
30	120	120AT	1	60	120AT	2
37	150	150AT	1	75	150AT	2
45	170	200AT	1	85	100AT	1
55	200	200AT	1	100	100AT	1
75	250	250AT	1	130	150AT	1
90	300	300AT	1	150	150AT	1

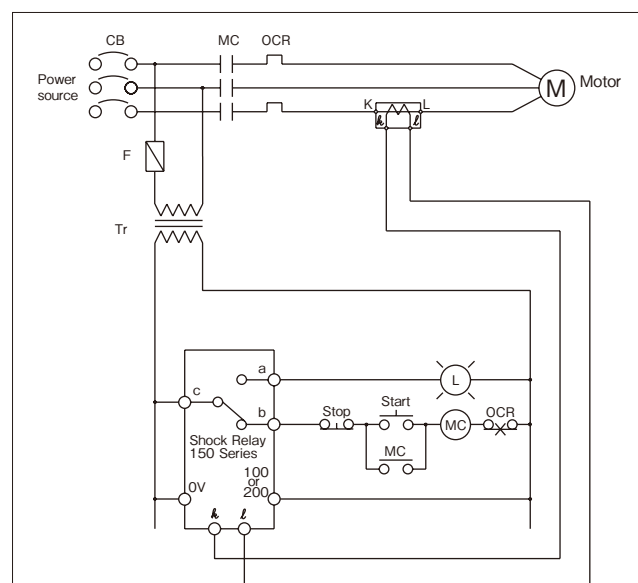
Note: Contact a Tsubaki representative if you need a CT size larger than 300AT.

For single-phase motors or motor capacities not on the selection chart, use the following calculation to make your selection:

$$\text{CT size} \geq \text{Motor rated current} \times \text{Number of wire(s) passing through CT}$$



Basic connection diagram

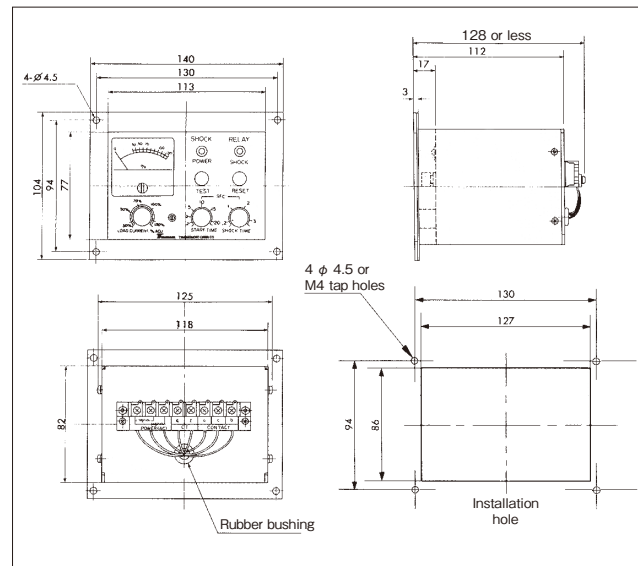


Notes:

1. If the voltage of the main circuit exceeds 220VAC, install a step-down transformer Tr. As well, do not improperly wire the power source wires (AC100V or AC200V).
2. If the CT's secondary side is left open while the primary side is energized, it will cause damage to the CT. When the Shock Relay is not connected, short-circuit the CT's secondary side.
3. The coil capacity of the electromagnetic contactor MC which the TSB150 output contact opens and closes should be less than 200VA when injecting, and less than 20VA when holding.

Special models and optional specifications

■ TSB151P, TSB152P (panel mounted type) outline dimensions



■ Notes on CT (current transformer) selection

When the actual motor rated current value is not on the chart, use a through-hole CT or common CT for which the motor rated current is within the 80% to 100% range of the Shock Relay load current.

MEMO

Handwriting practice lines consisting of 20 horizontal dotted lines.

SHOCK MONITOR



Features p23

Model reference chart p24

Application examples
and basic operations of each type

Shock Monitor
TSM4000 p25

Shock Monitor
TSM4000 / TSM4000H1 p29

Shock Monitor
TSM4000H2 p30

Shock Monitor
TSM4000M1 p31

Shock Monitor
TSM4000M2 p32

Shock Monitor
TSM4000M3 p33

Shock Monitor
TSM4000C1 p34

External connection,
parameter settings,
terminal functions p35

Shock Monitor

Features

The Shock Monitor is an electricity-monitoring control device that detects minimal load variations by monitoring motor input power.

• Ideal for monitoring light loads

For a standard motor there are only minute current variations in the light load zone. For load monitoring of a device used in the light load zone, monitoring electric power variations in the proportional load is ideal.

• Almost completely unaffected by source voltage variation

Even with a constant load, if the power supply voltage fluctuates then current will fluctuate largely, thus making accurate load detection impossible. The Shock Monitor monitors electricity so it is almost completely unaffected by voltage fluctuation, making stable load detection possible.

• Can be used with a wide range of frequencies (5 to 120Hz)

Can be used with an inverter and a servomotor drive. (The inverter's electronic thermal relay is for burnout protection and is not suitable for device protection.)
Note: If the power source frequency exceeds 120Hz, such as a servomotor for a machine tool's main spindle, consult Tsubaki.

• Quick response

Motor input power is measured every 0.02 seconds. Right after an emergency, the signal is output in a minimum of 0.05 seconds.

• Records load conditions

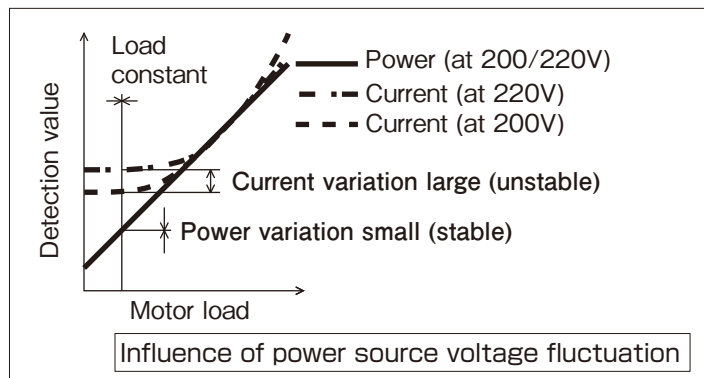
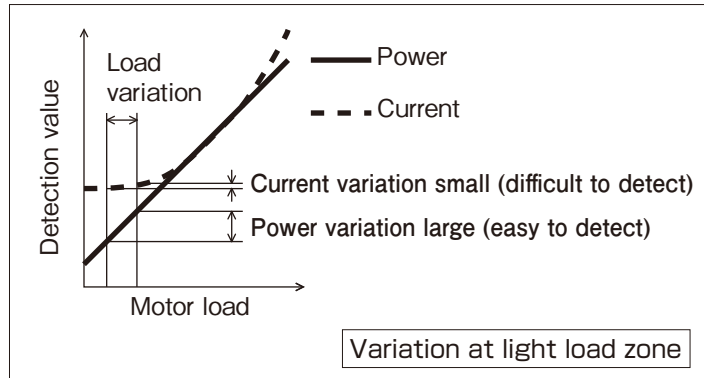
The direct current voltage that is proportionate to motor input power is output, so the load condition can be recorded on the recorder.

TSM4000 Series

-200 to +200% converted into 0 to 10V (basic type)
0 to +200% converted into 4 to 20mA (option code: A1)
0 to +200% converted into 0 to 5V (option code: A2)

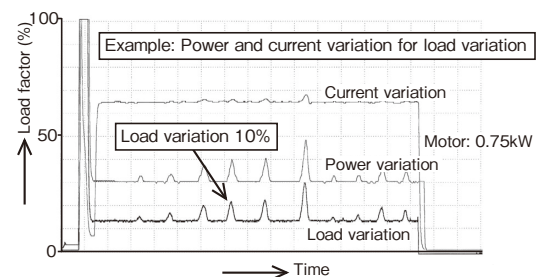
• CE compliancy possible

For details, contact Tsubaki.



Example: Power and current variation corresponding to load variation

- (1) Power variation that is proportional to load variation can be seen.
- (2) From the chart below we can see that with a load variation of about 10%, there is almost no change in current, while power makes a significant change.



Model reference chart

Model no.		TSM4000 Basic type*1 *2	TSM4000H1 Economy type*2	TSM4000H2 Load following type	TSM4000M1 Contact detection type	TSM4000M2 Integral power type	TSM4000M3 Processing tool breakage detection type	TSM4000C1 Built-in forward/reverse sequencer type		
Motor	Capacity	0.1 to 110kW								
	Power supply voltage*3	AC200/220V, AC400/440V								
	Frequency	5 to 120Hz								
Control power supply voltage		AC90 to 250V 50/60Hz, DC90 to 250V Nonpolar								
Input	Motor voltage*3	AC250V, MAX								
	Current sensor	±15V								
Output	Control input		X1, X2, X3, IH, RST	X1, X2, RST	X1, RST	X1, X2, X3, X4, X5		X1, X2		
	No. of contacts		3c	2c		3c		2a, 1b, 1c		
	Relay contact output		AC250V, 0.5A (Inductive load cos ϕ = 0.4) DC30V, 0.4A (inductive load) DC110V, 0.2A (inductive load), Minimum applicable load DC24V, 4mA							
	Output relay life	Mechanical	10,000,000 activations							
		Electrical	100,000 activations							
	Analog output signal		DC0 to 10V							
Settings	Load setting level	Output 1	High1 -200 to -5% 5 to 200%	HIGH1 5 to 200%	HIGH1 1 to 99%	OUT1 1 to 99%	OUT1 0 to 99%	OUT1 1 to 99%	Overload 5 to 200%	
		Output 2	High2 -200 to -5% 5 to 200%	HIGH1 5 to 200%		OUT2 1 to 99%	OUT2 5 to 200%		No load 5 to 200%	
		Output 3	Low - 99 to 99%	———		OUT3 5 to 200%		OUT3 100 to 30000%	———	
	Start time setting range		0.1 to 20.0s							1 to 300s
	Shock time setting range		“MIN” or 0.1 to 10.0s If motor power souce frequency is 50Hz or higher, shock time at “MIN” is approximately 50ms.							
	Reponse		Set by average number of movements	QUICK (average 1 time), NORMAL (average 5 times), SLOW (average 20 times)				Set by average number of movements	QUICK (average 1 time) NORMAL (average 5 times) SLOW (average 20 times)	
Functions	Inhibit function*4		Manual/auto switching	Auto inhibit		Manual/auto switching		———		
	Relay self-holding		Self-hold/auto reset selectable				Only OUT3 is selectable	Self-hold/auto reset selectable	Sequencer function	
	Detection level changeover		8 steps	4 steps	None	8 steps		4 steps	None	
	Test function		Relay output test							
	Peak-hold function		When the load factor exceeds the preset level (or falls below it), the monitor shows the maximum value within shock time. Only when the relay output is set as self-hold, the monitor will show the highest signal level for a certain amount of time (peak hold).							
Display	% Power display range		- 200 to 200%	0 to 200%						
	Voltage display range		0 to 500V							
	Current display range		0.01 to 999A							
	Frequency display range		5 to 120Hz							
Power consumption		10VA (inrush current 5A within 5ms)								
Mass		1.0kg								
Usage environment	Ambient temperature		0 to 50°C							
	Relative humidity		45 to 85% RH; no condensation							
	Altitude		1000m or less							
	Atmosphere		No oil mist, corrosive gas, or dust							

Note: *1. Basic type can monitor not only positive (plus) torque but also negative (minus) torque.

*2. Basic type and economy type can monitor power or torque. (Negative torque cannot be monitored by the economy type.)

In case of torque monitoring, torque is calculated by the monitored power, and displayed. In this case, rated torque (100%) is that at 60Hz.

If the frequency is 20Hz or below, errors become larger due to motor efficiency. In this case, use for power monitoring.

*3. If the Shock Monitor is used with a AC400/440V motor, the TSM4-PR1 400V class resistor is required.

*4. A function to stop the power detection of the Shock Monitor. Basic, M1, M2, and M3 types can inhibit manually. During the time the inhibit input terminal and CM are ON within the preset time, or during ON, the load factor will blink at 0% and the Shock Monitor will not detect power. In addition, if the motor voltage sees a frequency change of 4Hz/1s, detection is automatically stopped. (Auto inhibit)

Contact a Tsubaki representative regarding whether a product contains substances restricted for use in specific industries and applications.

Warning

When using the Shock Monitor with a human transport device or a lifting/lowering device, install a suitable protection device on that equipment for safety purposes. Otherwise an accident resulting in death, serious injury, or damage to the equipment may occur due to a falling accident.

Shock Monitor

Quickly detects small load changes Shock Monitor TSM4000



Features

Safety design

The terminal block is equipped with a cover. This structure prevents dust from entering the main unit.

Analog output

0 to 10 V analog output comes standard, enabling action and monitoring according to the load. (0 to 5 V and 4 to 20 mA outputs are optionally available.)

Environmentally friendly

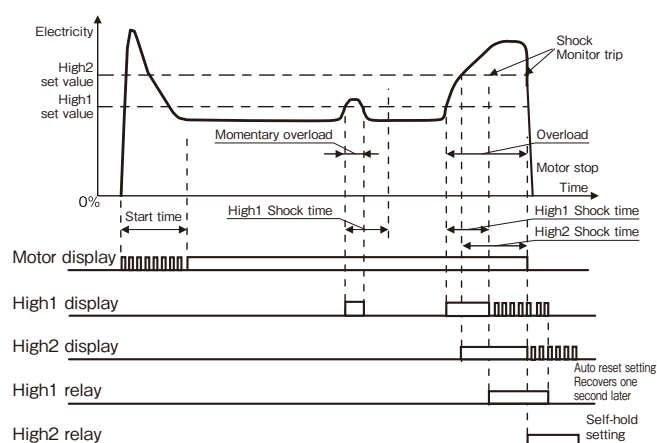
The backlight automatically turns off, contributing to energy savings. This product also does not contain any RoHS restricted substances.

Improved handleability

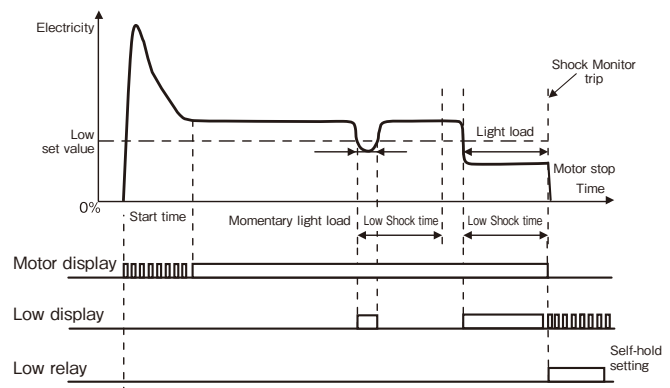
The panel-mount design has been standardized to make connection to the terminal block easy when mounting this product on a panel. Also, this product can be mounted on DIN rails.

Basic operations of TSM4000

■ Overload operating mode



■ Light-load operating mode

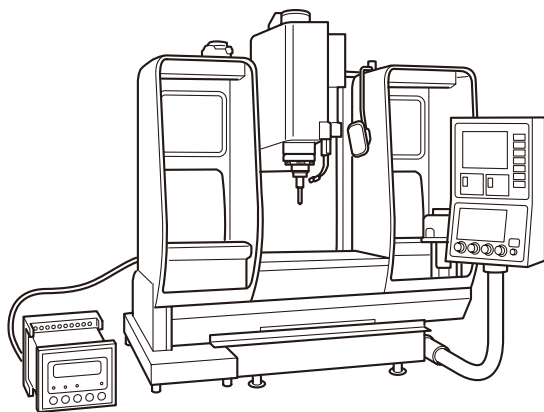


Note: The counting of both the start time and the shock time begins when the motor starts. Therefore, the one set to a longer time is valid.

- 1) The TSM4000 compares the load with the preset overload detection level, and presents an external notification of load abnormality when an overload state (or a light-load state) continues for a certain period of time (the shock time).
- 2) Two upper-limit emergency signals and one lower-limit emergency signal are available and can be used as advance notification signals or motor stop signals.
- 3) To prevent false output due to acceleration, the load detection is canceled for a preset time (the start time) when starting the motor.
- 4) A torque monitoring function (20 to 120 Hz) is available, which is effective when an inverter is used. See Note *2 on page 36.

● Usage examples

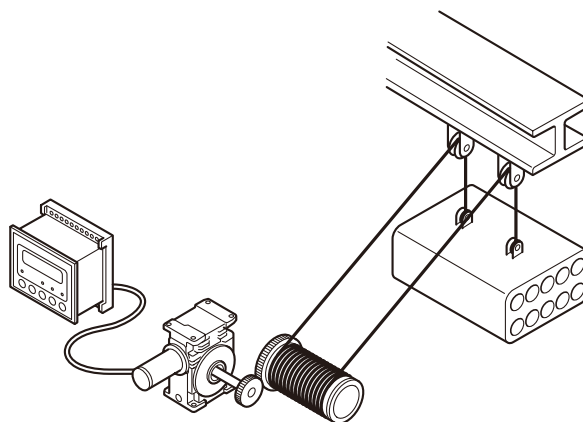
Overload protection for machine tools, detection of drill breakage



In a drilling process using a machine tool, the Shock Monitor reliably detects not only overload but also any breakage of the drill, preventing defective products from being produced during unattended operation.

Additionally, using a model that calculates integral power values enables detection of wear in the drill with high accuracy. Replacing the drill before breakage can contribute to better productivity.

Overload protection for suspension/hoisting devices



The Shock Monitor can be used with a hoisting device on a staging set or in a factory. When the load on the device exceeds the design load (allowable load), the drive system is stopped automatically to prevent accidents such as dropping.

The power detection method ensures highly accurate load detection even for high-reduction operation using a worm gear reducer in the drive unit.

Shock Monitor

● Model

TSM4000 H1 P - □□□□ - A1

Shock Monitor main unit

Blank: Wall mounted
P: Panel mounted

Current sensor
(Example: □□□□□)

A1

Type

Blank : Basic

P : Panel-mounted

H1 : Economy

H2 : Load following

M1 : Contact detection

M2 : Integral power type

M3 : Processing tool breakage detection type

C1 : Built-in forward/reverse sequencer

Option code

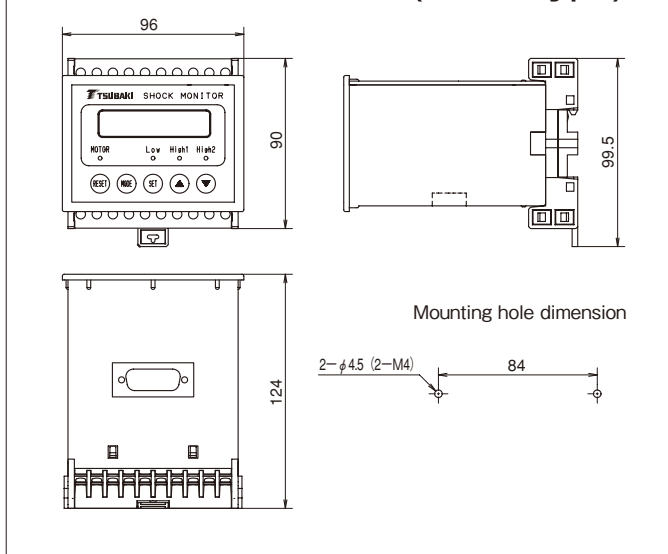
Blank : Standard specification

A1 : Analog output 4 to 20mA

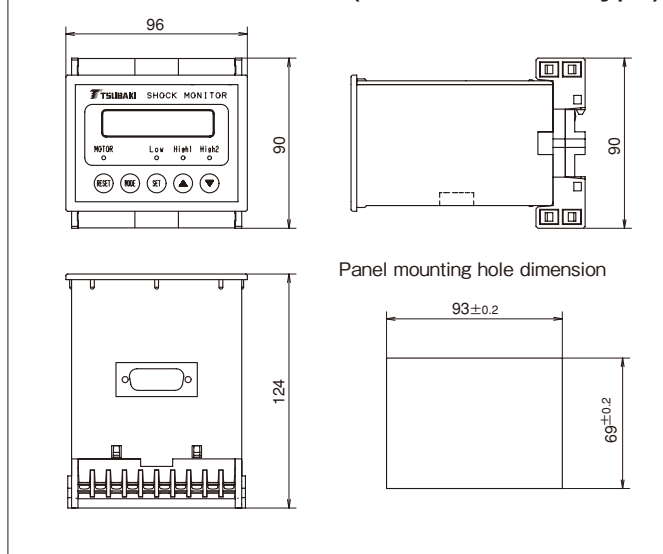
A2 : Analog output 0 to 5V

Note: Use as a set with a current sensor based on the motor capacity.

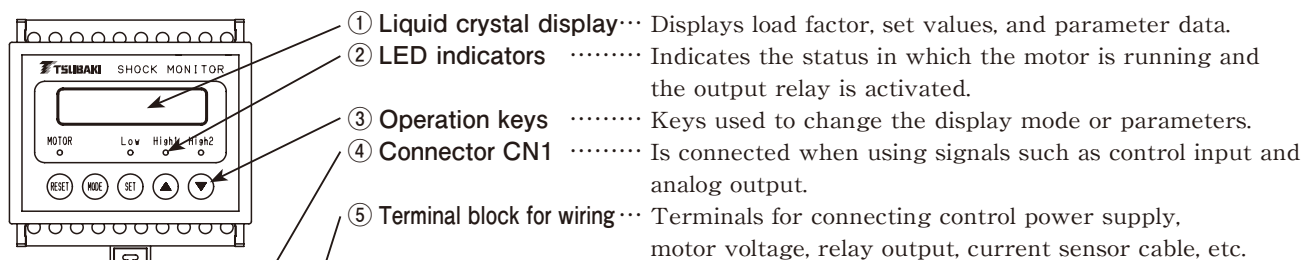
● Outline dimensions (Basic type)



● Outline dimensions (Panel mounted type)



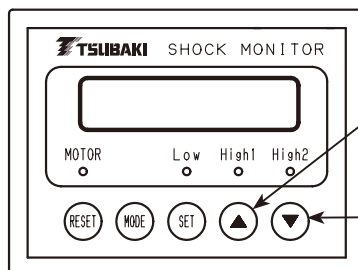
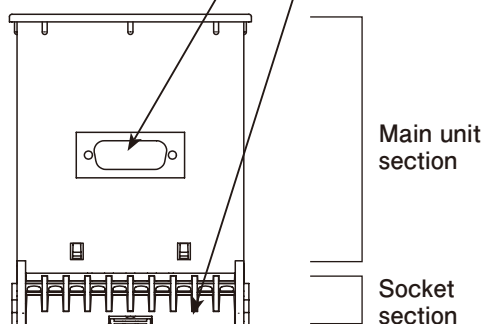
● Part names and functions



■ LCD contrast adjustment

If the LCD is hard to read, hold down the SET key and press ▲ or ▼ key to adjust it.

(Note that excessively high contrast will shorten the LCD service life.)



Hold down the SET key and press ▲ to make the display darker.

Hold down the SET key and press ▼ to make the display lighter.

Option

■ Current sensor (sold separately)

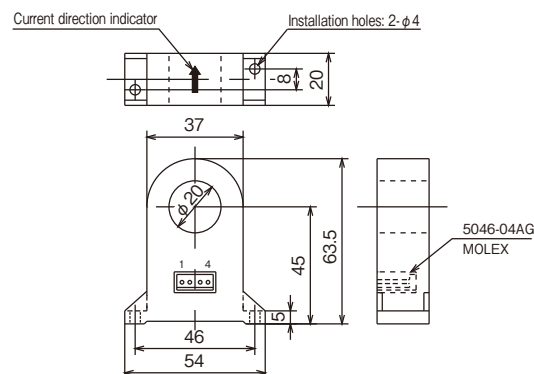
The current sensor is needed to bring motor current into the Shock Monitor unit.

Select a model from the chart below depending on the motor capacity and voltage.

Motor capacity (kW)	AC 200/220V motor		AC 400/440V motor	
	Sensor model no.	Number of wires passing through CT	Sensor model no.	Number of wires passing through CT
0.1	TSM-U010	6	TSM-U010	12
0.2	TSM-U010	3	TSM-U010	6
0.4	TSM-U010	2	TSM-U010	3
0.75	TSM-U050	6	TSM-U010	2
1.5	TSM-U050	3	TSM-U050	6
2.2	TSM-U050	2	TSM-U050	5
3.7	TSM-U050	1	TSM-U050	3
5.5	TSM-U050	1	TSM-U050	2
7.5	TSM-U100	1	TSM-U050	1
11	TSM-U100	1	TSM-U050	1
15	TSM-U150	1	TSM-U100	1
18.5	TSM-U150	1	TSM-U100	1
22	TSM-U200	1	TSM-U100	1
30	TSM-M300	1	TSM-U150	1
37	TSM-M300	1	TSM-U150	1
45	TSM-M400	1	TSM-U200	1
55	TSM-M600	1	TSM-M300	1
75	TSM-M600	1	TSM-M300	1
90	TSM-M800	1	TSM-M400	1
110	TSM-M800	1	TSM-M400	1

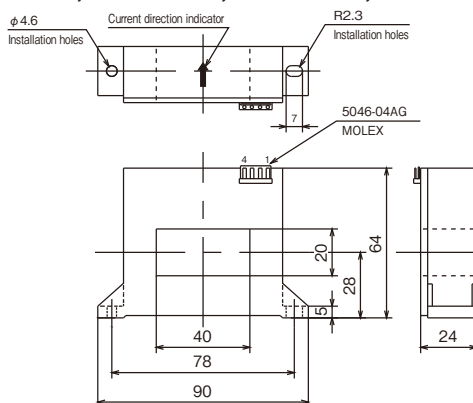
Sensor model no.

TSM-U010, TSM-U050, TSM-U100, TSM-U150, TSM-U200



Sensor model no.

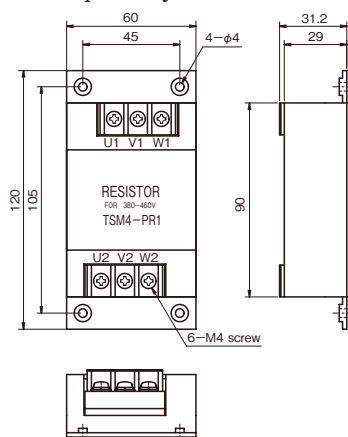
TSM-M300, TSM-M400, TSM-M600, TSM-M800



■ 400V class resistor

This is required if the motor voltage is 400/440V. Please order separately.

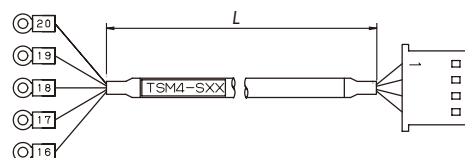
TSM4-PR1



■ Sensor cable

A sensor cable (TSM4-S01) comes standard to connect the Shock Monitor and the current sensor. If a different cable is required, order a cable with connector as shown below.

Model No.	Cable length (L)
TSM4-S01 (attached)	1m
TSM4-S03	3m
TSM4-S05	5m
TSM4-S10	10m
TSM4-S20	20m
TSM4-S30	30m

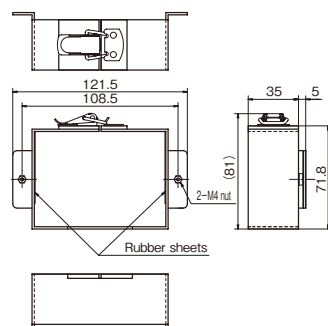


■ Panel mounting bracket

This bracket is used to secure the panel-mounted Shock Monitor.

TSM4-PL1

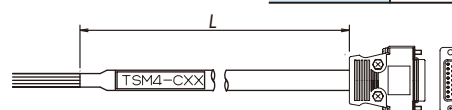
Note
1. Included
: M4 3-point SEMS screw x 15
2. Screw tightening torque
: 0.12 to 0.16N·m
3. Panel mounting hole dimension
: See the figure on the right.



■ I/O cable

This cable is required when you want to perform process changeover from the outside, when resetting the Shock Monitor, and when connecting an external meter. It should be ordered as necessary.

Model No.	Cable length (L)
TSM4-C01	1m
TSM4-C03	3m



Applications for the Shock Monitor

Various application-specific types based on the TSM4000 basic model

Our line-up of Shock Monitors fits all kinds of applications.

Application examples and basic operations of each type

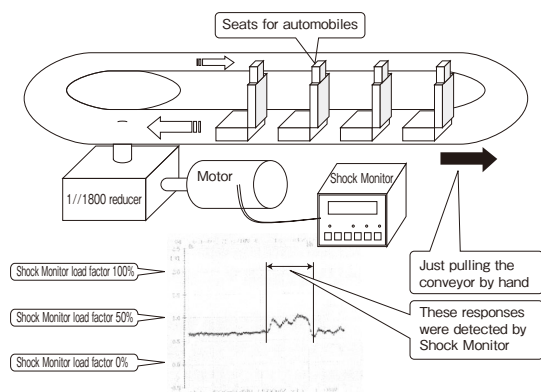
1. Basic type: TSM4000 For general industrial machines
 Economy type: TSM4000H1 For general industrial machines

The economy type has fewer functions than the basic type.

Refer to the below chart for a comparison of Shock Monitor functions.

■ Damage prevention

Low speed conveyor overload protection



Key point

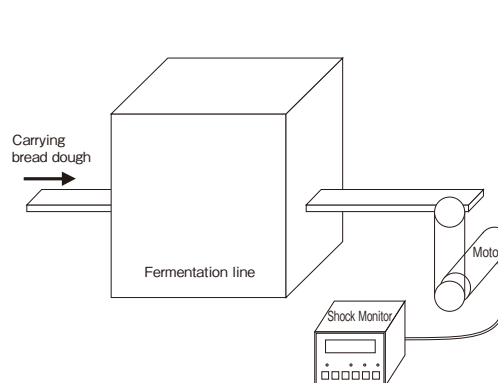
There is little current variation due to a high gear ratio, making it difficult for the Shock Relay to detect the overload, so a power-detecting Shock Monitor is the best option.

Applications

Assembly conveyor, water and sewage treatment, garbage disposal conveyors, etc.

■ Preventive maintenance

Bread making line lubrication maintenance



Key point

The Shock Monitor detects a minute load rise due to a lack of lubrication on the chain. It then sends an alarm signal and operates the automatic lubricator.

Applications

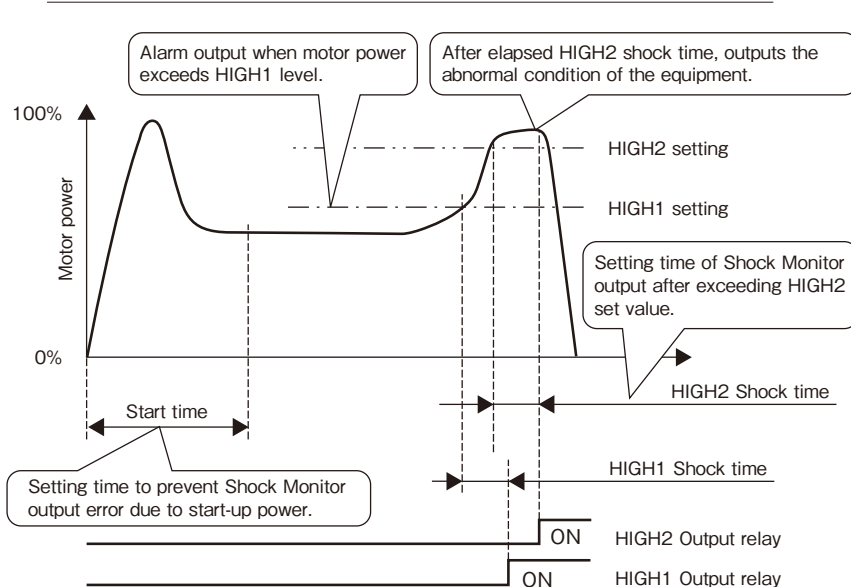
Food processing machines that operate 24 hours a day, etc.

Note: Overload may be difficult to detect depending on the characteristics of the machine. Check your usage conditions and contact us if you are considering this type of application.

Basic operations of TSM4000H1

● Economical load detection is possible: Economy type

Simplified model with only the essential functions



Features

- 1) Simplified functions means easy setting.
- 2) Relay output has two outputs. It can be used as an alarm signal (HIGH1) and an abnormal level output (HIGH2).
- 3) As a set, HIGH1 and HIGH2 can be switched externally for a maximum of 4 types. It is useful for changing the setting depending on the workpiece being carried.
- 4) It comes with an efficient torque* monitoring function (20 to 120Hz) for when using the inverter.

*Refer to page 36, Note: *2

Comparison of function: Basic model and Economy model

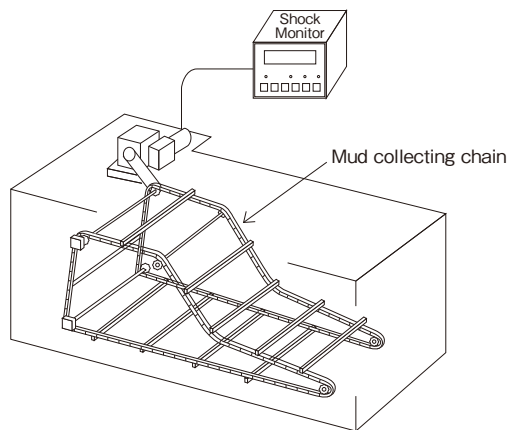
Function	Basic model	Economy model
Load detection		
	HIGH1	○
	HIGH2	○
	LOW	×
Torque monitoring function	○	○
No. of selection of detection level (No. of process to monitor)	8	4
Monitoring negative torque	○	×

Application examples and basic operations of each type

2. Load following type: TSM4000H2...For general industrial machines

■ Protection for efficiency-varying equipment

● Equipment driven by worm reducer



Key point

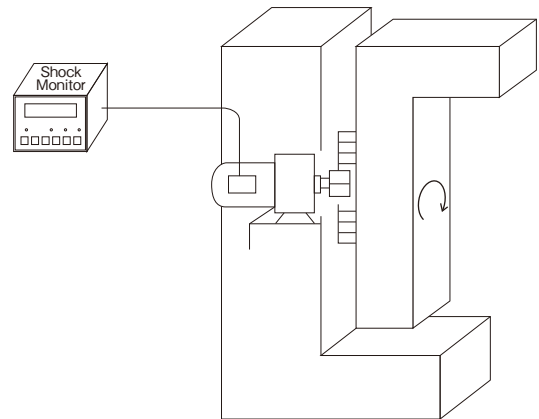
The efficiency of the reducer varies according to operating time. As well, even for equipment where the load factor varies, it is possible to detect abnormal condition due to the load following function.

Applications

Water treatment equipment, etc.

■ Protection for equipment on which load periodically changes

● Swivel



Key point

Even if the load of the equipment varies during 1 rotation, it is possible to detect abnormal conditions due to the load following function.

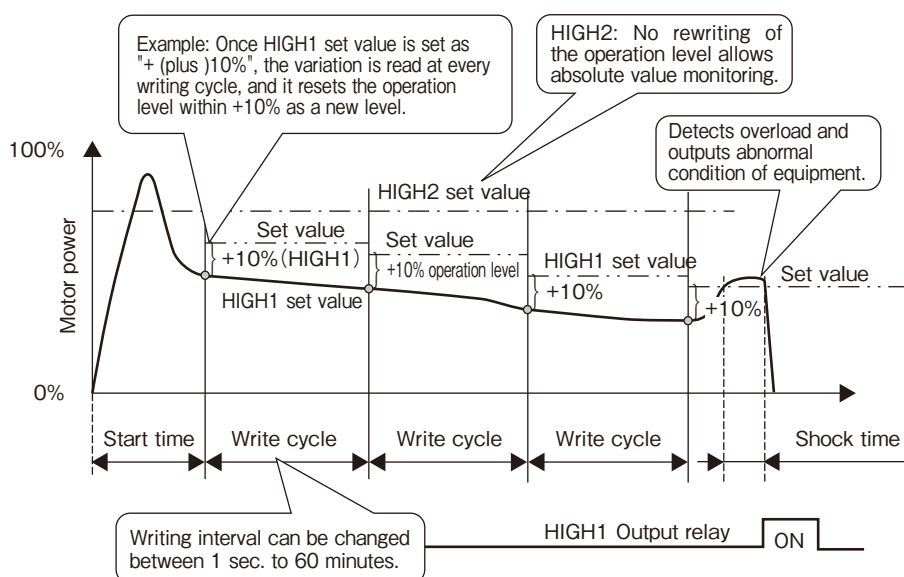
Applications

Medical equipment, etc.

Basic operations of TSM4000H2

● The set value automatically follows the variation in load: Load following

Because variation in machine efficiency does not affect the Shock Monitor, it makes the ideal overload protection device.



Features

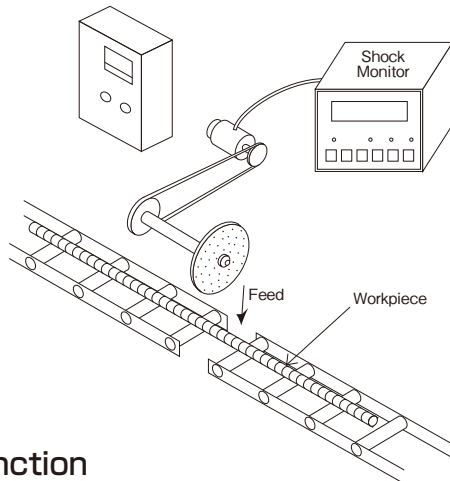
- 1) For equipment where mechanical efficiency varies, by periodically following the operational level and minimizing the efficiency variation effect, the practical overload state can be detected.
- 2) The write cycle can be changed according to fluctuations in efficiency.
- 3) Because the operational level of HIGH2 is constant and has no variation, absolute value monitoring can be done by HIGH2.

Application examples and basic operations of each type

3. Contact detection type: TSM4000M1 ····For machine tools (patent granted)

■ Tool and workpiece contact detection (Feed speed control, etc.)

● Grindstone contact detection



Function

Until the grindstone makes contact with the workpiece, the feed speed is high. After the Shock Monitor has detected contact with the workpiece, the TSM4000M1 immediately switches to a low feed speed. (Shortens work time.)

Key point

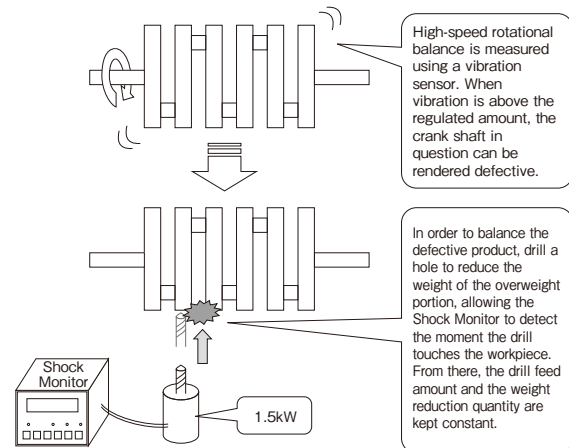
A minute load at the moment the grindstone contacts with the workpiece is quickly and accurately detected. Consequently, a substantial decrease in the finishing cycle time is realized.

Applications

Metalworking, machine tools, etc.

■ Tool and workpiece contact detection

● Rotational balance corrector for auto parts (crank shaft)



Function

When drilling a hole, if the drill touches the workpiece, it will be detected and the Shock Monitor will immediately output. From there, by keeping feed time constant, the drilled quantity is managed uniformly.

Key point

The Shock Monitor ignores common changes to idling power. Because it detects only work volume, it can securely judge the moment contact is made with the drill (0.05s).

Applications

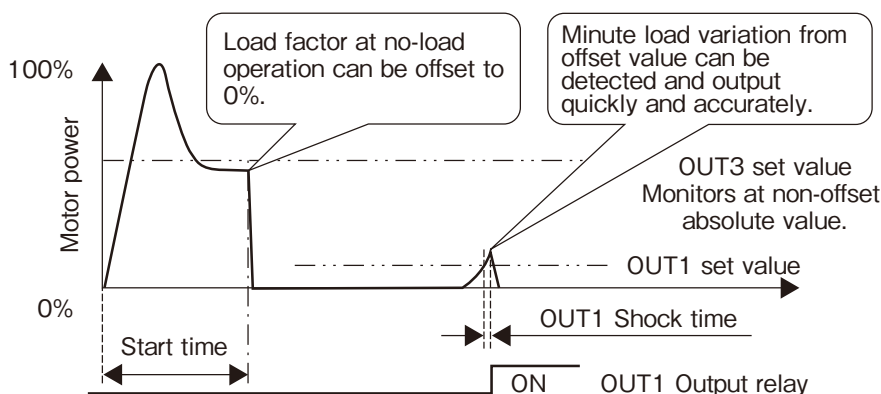
Machine tools (drilling machine, grinding machine, etc.)

Note: If the power source frequency exceeds 120Hz, such as a servomotor for a machine tool's main spindle, consult Tsubaki.

Basic operations of TSM4000M1

● Rapidly detects workpiece contact: Contact detection

The idling position is automatically offset to a 0% load factor, and the Shock Monitor will detect only work volume.



Features

- 1) Because the TSM4000M1 automatically offsets power during idling to 0%, the minute power change during tool and workpiece contact can be detected with high precision. (There are two types of output: OUT1 and OUT2.)
- 2) OUT3 can do absolute value monitoring with non-offset values.
- 3) In regard to detection levels, as a set, OUT1, OUT2, and OUT3 can be switched externally for a maximum of 8 types. It can deal with changes in grindstones and workpieces.

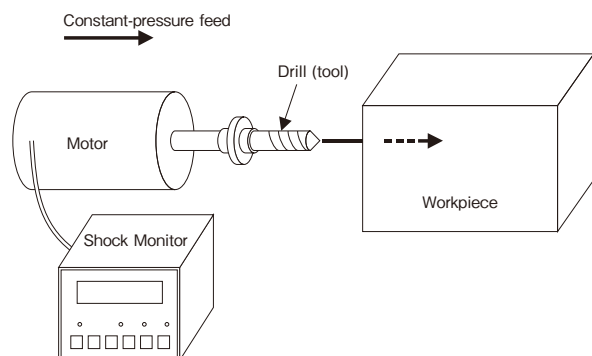
Application examples and basic operations of each type

4. Integral power type: TSM4000M2···· For machine tools

By integrating one cycle of power from the manufacturing process, tool wear condition and breakage, as well as overload can be detected.

■ Tool service life estimation

● Drill piece wear detection



Key point

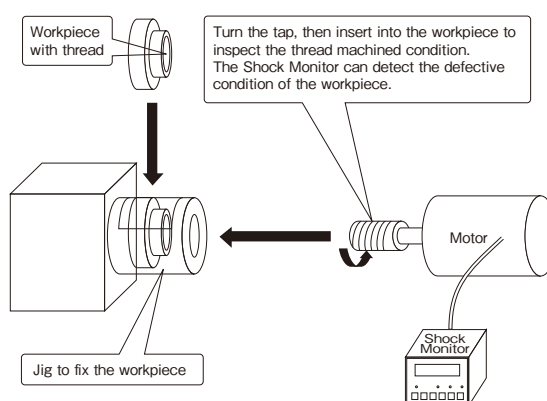
In a constant-pressure finishing machine, the tool wears but the load variation is small. By taking advantage of the increase in machining time, the integral power type can precisely detect wear.

Applications

Machine tools, etc.

■ Check product quality

● Screw thread quality inspection



Key point

Similar to checking the quality of a tap hole, the integral power type is ideal for applications where instantaneous power is unstable and setting the detection level is difficult.

Applications

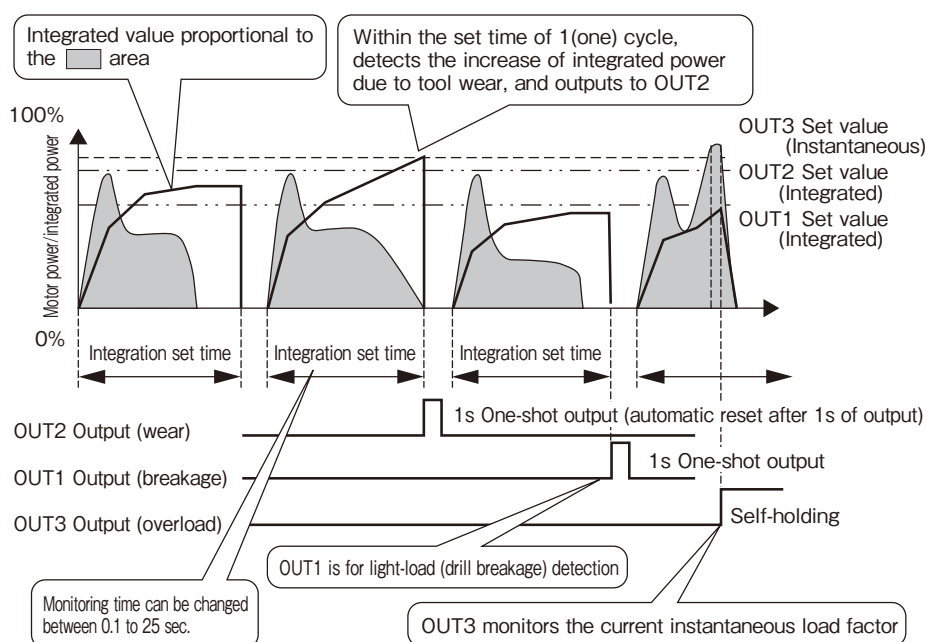
Inspection equipment, etc.

Note: If the power source frequency exceeds 120Hz such as a servomotor for a machine tool's main spindle, consult Tsubaki.

Basic operations of TSM4000M2

●With total power consumption of one cycle, machine tool wear, breakage, and overload can be detected: Integral power

Machine tool wear can be detected by integrated power, and outputting the abnormal condition.



Features

- 1) In a constant-pressure finishing machine, the tool wears but the load factor does not increase while the machining time increases. Such an application is monitored by power consumption (area).
- 2) After machining is completed, the drill wear is detected by the upper limit of power integration (OUT2), while the drill breakage can be detected by the lower limit (OUT1).
- 3) OUT3 does absolute value monitoring of overload due to jams via instantaneous value.
- 4) As a set, OUT1, OUT2, and OUT3 can be switched externally for a maximum of 8 types. It can deal with changes in tools and workpieces.
- 5) The elapsed time setting can be changed easily.

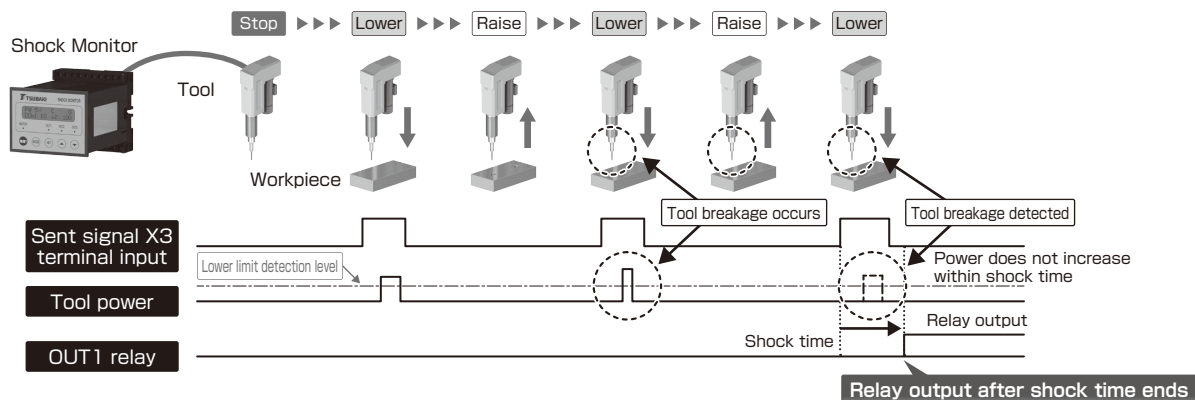
Application examples and basic operations of each type

5. Processing tool breakage detection type: TSM4000M3 ... For processing tools

Basic operations of TSM4000M3

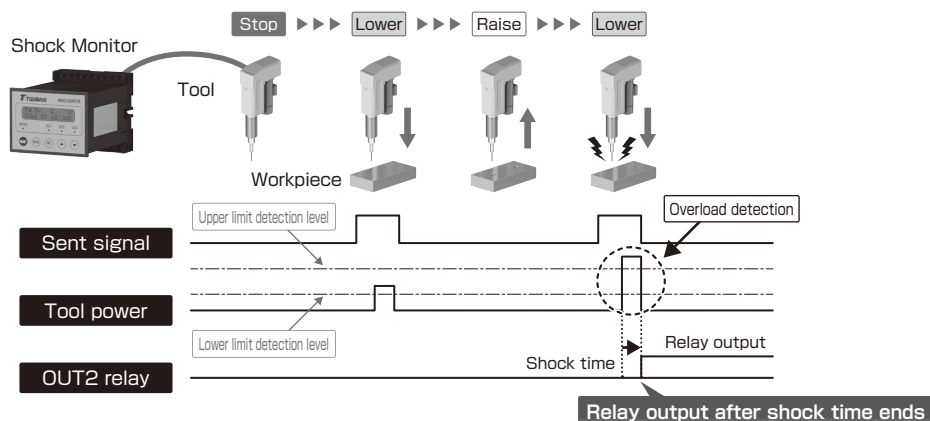
● How breakage detection OUT1 relay works

After the sent signal is input, the Shock Monitor determines operation to be normal if power exceeds the set value due to tool processing; however, if tool breakage occurs in the previous process, the power will not exceed the set value within the shock time period following signal input, and as a result the monitor judges tool breakage to have occurred and the OUT1 relay is output.



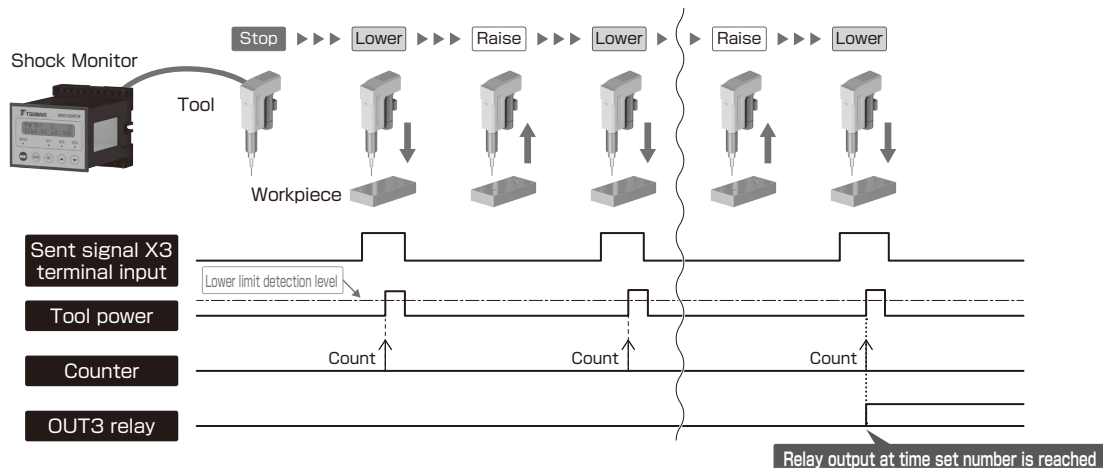
● How upper limit detection OUT2 relay works

If power increases due to things like wear and overload, the upper limit is detected and the OUT2 relay is activated. When power exceeds OUT2 set value, the OUT2 relay is output after shock time ends.



● How detection of number of times of operation OUT3 relay works

After the signal sent from the tool is detected, the counter function counts up when power exceeds the OUT1 set value. When this number exceeds the pre-set number of times of operation, the OUT3 relay is output.



Precautions

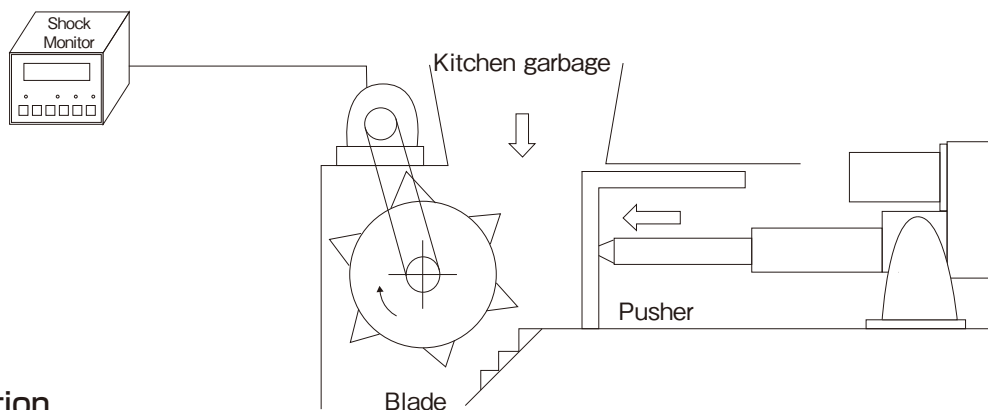
This product monitors the processing motor and detects irregularities based on changes in the motor's electricity consumption. Therefore, it is not suitable for applications in which there is no change in electricity consumption between normal and irregular operation. In addition, there are cases in which this product cannot consistently detect changes of less than 5% when motor capacity is 100%. Please consult your Tsubaki dealer if the power needed for processing is small compared to motor capacity.

Application examples and basic operations of each type

6. Built-in forward/reverse sequencer type: TSM4000C1.....For crushers

■ Crusher blade protection and forward/reverse control

● Crusher



Function

Precisely detects load on crusher blades. When a jam occurs, the machine automatically detects overload → the machine stops → moves into reverse → stops → moves forward repeatedly until the machine becomes un-jammed.

Key point

Blade life span increases significantly. The sequence program necessary for forward and reverse movement is built-in, so it is easy to control the crusher.

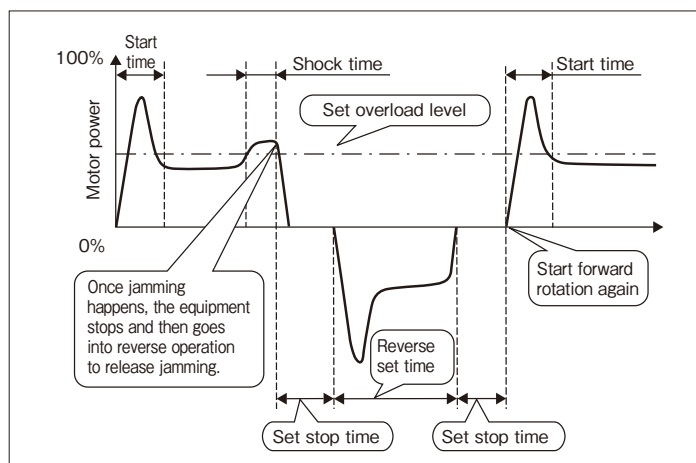
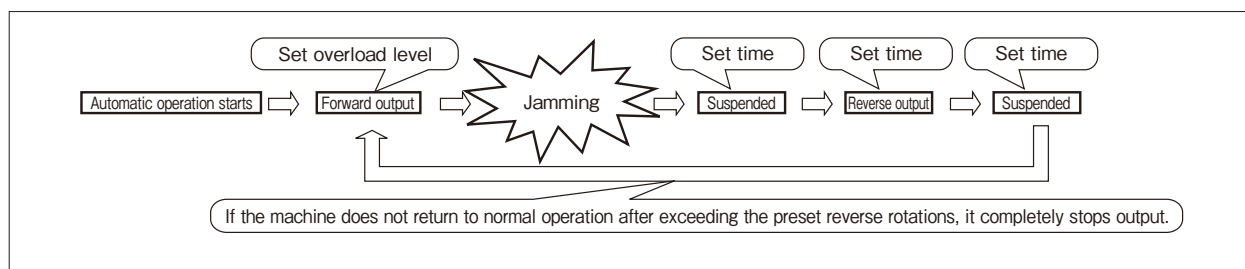
Applications

Crusher for waste disposal, baling press, screw conveyor, etc.

Basic operations of TSM4000C1

● When overload occurs, the machine automatically runs in reverse: Sequence program for forward and reverse rotation is built-in

Built-in sequence control program for crushers



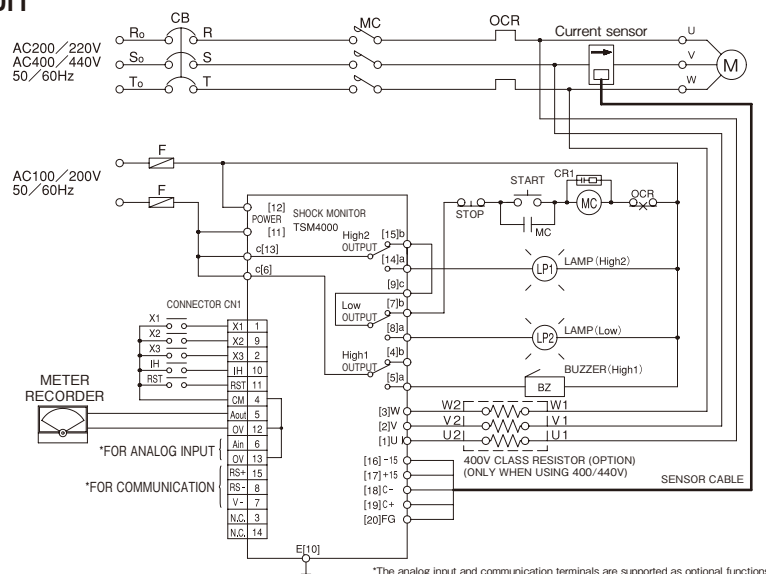
Features

- 1) Just by inputting the starting (forward movement) signal, stopping, reversing, and restarting during overload can be controlled without an external sequencing program.
- 2) If the preset number of reversing has past and the machine does not return to normal operation, the stop signal is output and the device can be completely stopped.
- 3) The setting of overload level, stop time, and reverse running time can be easily done on site.
- 4) To save energy, it is possible to automatically stop when there is no load.

Shock Monitor

External connection

Name	Symbol	IN/OUT	Pin no.	Explanation
Process changeover	X1	IN	1	Power process terminal
	X2	IN	9	
	X3	IN	2	
Inhibit	IH	IN	10	Inhibit terminal
Common	CM	IN	4	X1,X2,X3,IH,RST common terminal
Reset	RST	IN	11	Resets self-hold status



CB : Circuit breaker
F : Fuse
MC : Electromagnetic contactor for motor
OCR : Overcurrent relay
CR1 : CR filter
START : Start button
STOP : Stop button

When the operating electromagnetic coil capacity (electromagnetic capacity) of the electromagnetic contactor (MC) for the motor is less than 100 VA for injection and less than 10 VA for holding.

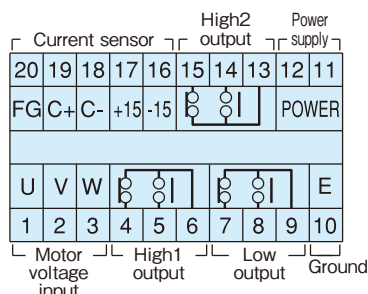
Note:

1. Select the current sensor from the Current Sensor Table based on motor capacity and voltage. Use the specified CT through number and current direction.
2. Make sure to put the current sensor into phase V, and use the sensor cable to connect with the Shock Monitor.
3. If using a 400/440V motor, use the 400V class resistor shown in dashed line.
4. Connect the motor voltage terminal of the Shock Monitor U [1], V [2], W [3] with the phase of [U], [V], [W] respectively.
5. Use relay for minute electric current for [X1], [X2], [X3], [IH], and [RST].

© In case of a wrong connection, load cannot be detected correctly and the Shock Monitor will not work properly.

Terminal functions

Terminal block



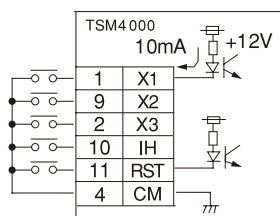
Name	Symbol	IN/OUT	Pin no.	Explanation
Control power supply	POWER	IN	11	Connection of control power supply
Ground	E	—	10	Ground terminal
Current sensor	- 15	OUT	16	Sensor cable
	+15	OUT	17	
	C -	IN	18	
	C +	IN	19	
	FG	—	20	
Motor voltage	U	IN	1	Motor voltage input terminal
	V	IN	2	
	W	IN	3	
Low output	b	OUT	7	Relay contact output when lower limit output is activated
	a	OUT	8	
	c	OUT	9	
High1 output	b	OUT	4	Relay contact output when upper limit 1 is output
	a	OUT	5	
	c	OUT	6	
High2 output	c	OUT	13	Relay contact output when upper limit 2 is output
	a	OUT	14	
	b	OUT	15	

Parameter settings

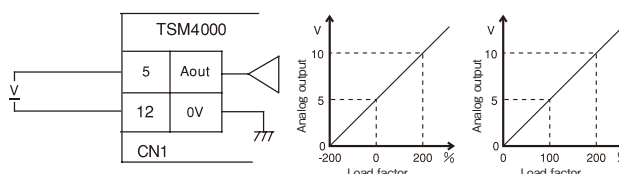
No.	Parameter	Data	Default settings	Details
1	Parameter Lock	(1)Unlocked (2)Locked	(1)	All parameters can be changed Parameters other than this parameter cannot be changed
2	Motor Voltage	(1)200-230V (2)380-460V	(1)	Motor voltage 3-phase 200V class Motor voltage 3-phase 400V class
3	Motor kW	0.1 to 110kW	0.75	Set motor capacity
4	Start Time	0.1 to 20.0s	3.0s	Set start time
5	Process	1 to 8	1	Number of processes
6	High2 Level Process[1]	-200 to -5% 5 to 200%	100%	Upper limit 2 value of process 1
7	Shock Time H2	MIN,0.1 to 10s	1.0s	Upper limit 2 shock time
8	Output Relay H2	(1)Self-Hold (2)Auto-Reset	(1)	Select upper limit 2 output operation mode
9	High1 Level Process[1]	-200 to -5% 5 to 200%	80%	Upper limit 1 value of process 1
10	Shock Time H1	MIN,0.1 to 10s	1.0s	Upper limit 1 shock time
11	Output Relay H1	(1)Self-Hold (2)Auto-Reset	(2)	Select upper limit 1 output operation mode
12	Low Level Process[1]	-99 to 0 to 99%	0%	Lower limit value of process 1
13	Shock Time L	MIN,0.1 to 10s	1.0s	Lower limit shock time
14	Output Relay L	(1)Self-Hold (2)Auto-Reset	(1)	Select lower limit output operation mode
15	Motor Efficiency	10 to 100%	100%	Motor efficiency
16	Response	1 to 50times	5times	Number of moving average sampling operations
17	Inhibit Time	IH,0.1 to 10s	IH	Inhibit time*
18	Auto Inhibit	(1)On (2)Off	(2)	Set auto inhibit function
19	Power/Torque	(1)Power (2)Torque	(1)	Monitor with motor input power Monitor with torque calculated by power
20	H2Relay Logic	(1)Fail Safe (2)Nomal Logic	(2)	Select fail-safe operation
21	Output Select	(1)-200 to 200% (2)0 to 200%	(2)	Select analog output
22	LCD Backlight	(1)Always (2)2min	(1)	Keep backlight on at all times Backlight turns off in 2 minutes after key operation
23	Trip Test	(1)Motor on/off (2)Motor off	(1)	Select test mode during motor operation

* Inhibit time: Time during which power detection is temporarily stopped.

Control input



Analog output

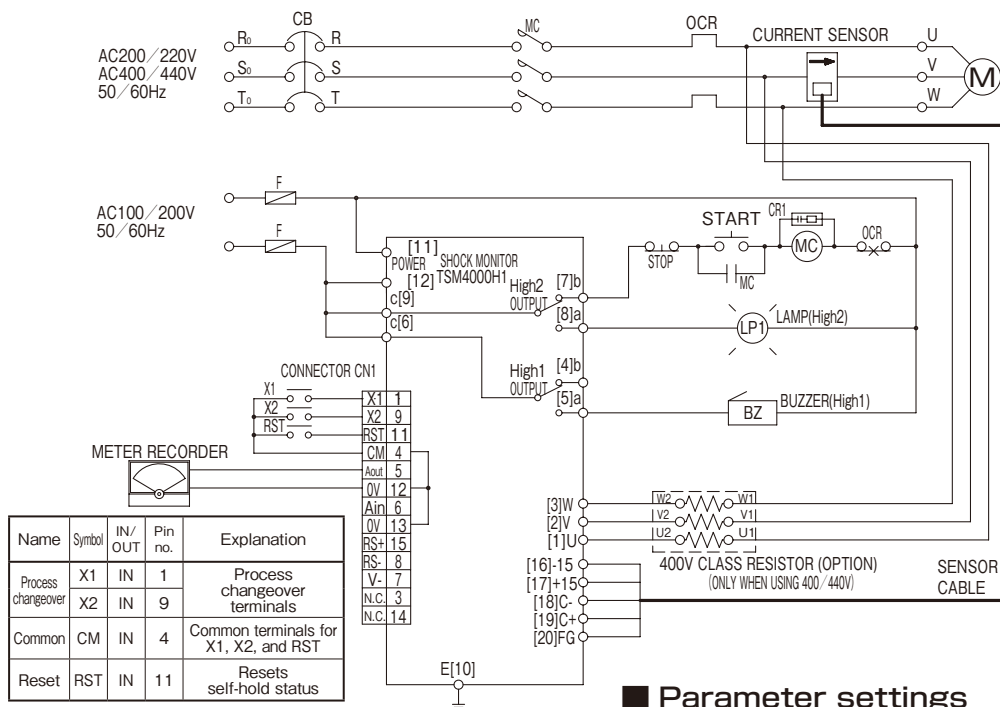


When the model supports the terminal function as standard, the analog output characteristic can be selected with Parameter 21: OUTPUT SELECT.

External connection, parameter settings, terminal functions

1. Economy type TSM4000H1 For general industrial machinery

External connection



CB : Circuit breaker
F : Fuse
MC : Electromagnetic contactor for motor
OCR : Overcurrent relay
CR1 : CR filter
START : Start button
STOP : Stop button

When the operating electromagnetic coil capacity (electromagnetic capacity) of the electromagnetic contactor [MC] for the motor is less than 100 VA for injection and less than 10 VA for holding.

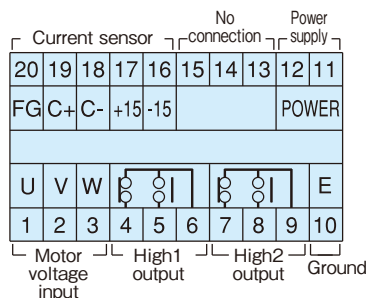
Note:

1. Select the current sensor from the Current Sensor Table based on motor capacity and voltage. Use the specified CT through number and current direction.
 2. Make sure to put the current sensor into phase V, and use the sensor cable to connect with the Shock Monitor.
 3. If using a 400/440V motor, use the 400V class resistor shown in dashed line.
 4. Connect the motor voltage terminal of the Shock Monitor U [1], V [2], W [3] with the phase of [U], [V], [W] respectively.
 5. Use relay for minute electric current for [X1], [X2], and [RST].
- ◎ In case of a wrong connection, load cannot be detected correctly and the Shock Monitor will not work properly.

Parameter settings

No.	Parameter	Data	Default settings	Details
1	Motor Voltage	(1)200-230V (2)380-460V	(1)	Motor voltage 3-phase 200V class Motor voltage 3-phase 400V class
2	Motor kW	(1)0.1kW (11)15kW (2)0.2kW (12)18.5kW (3)0.4kW (13)22kW (4)0.75kW (14)30kW (5)1.5kW (15)37kW (6)2.2kW (16)45kW (7)3.7kW (17)55kW (8)5.5kW (18)75kW (9)7.5kW (19)90kW (10)11kW (20)110kW	0.75kW	Set motor capacity
3	Start Time	0.1 to 20.0s	3.0	Set start time
4	Process	1 to 4	1	Number of processes
5	High1 Level	5 to 200%	80	Upper limit 1 value of process 1
6	Shock Time H1	MIN 0.1 to 10.0s	1.0	Set upper limit 1 shock time
7	Output Relay H1	(1)Self-Hold (2)Auto-Reset	(2)	Select output operation mode (High1)
8	High2 Level	5 to 200%	100	Upper limit 2 value of process 1
9	Shock Time H2	MIN 0.1 to 10.0s	1.0	Set upper limit 2 shock time
10	Output Relay H2	(1)Self-Hold (2)Auto-Reset	(1)	Select output operation mode (High2)
11	Response	(1)QUICK (2)NORMAL (3)SLOW	(2)	Average number of movements
12	Auto Inhibit	(1)On (2)Off	(2)	Set auto inhibit function
13	Power/Torque	(1)Power (2)Torque	(1)	Monitor with motor input power Monitor with torque calculated by power
14	LCD Backlight	(1)Always (2)2min	(1)	Set backlight illumination time

Terminal functions



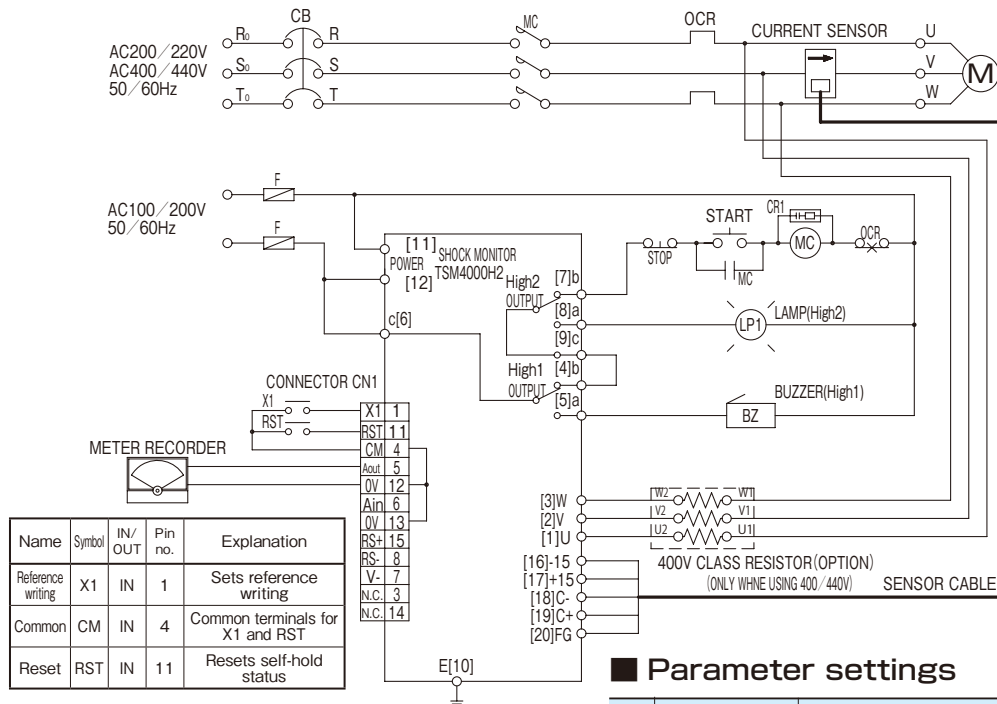
Name	Symbol	IN/OUT	Pin no.	Explanation
Control power supply	POWER	IN	11	Connection of control power supply
Ground	E	-	10	Ground terminal
Current sensor	-15	OUT	16	Current sensor cable
	15	OUT	17	
	C-	IN	18	
	C+	IN	19	
Motor voltage	FG	-	20	Motor voltage input terminal
	U	IN	1	
	V	IN	2	
HIGH 1 output	W	IN	3	Relay contact output when upper limit 1 is output
	b	OUT	4	
	a	OUT	5	
HIGH 2 output	c	OUT	6	Relay contact output when upper limit 2 is output
	b	OUT	7	
	a	OUT	8	
No connection	-	N.C	13	Do not connect anything
	-	N.C	14	
	-	N.C	15	

Shock Monitor

External connection, parameter settings, terminal functions

2. Load following type TSM4000H2..... For general industrial machinery

External connection



CB : Circuit breaker
F : Fuse
MC : Electromagnetic contactor for motor
OCR : Overcurrent relay
CR1 : CR filter
START : Start button
STOP : Stop button

When the operating electromagnetic coil capacity (electromagnetic capacity) of the electromagnetic contactor [MC] for the motor is less than 100 VA for injection and less than 10 VA for holding.

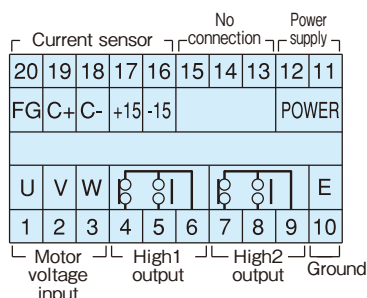
Note:

- Select the current sensor from the Current Sensor Table based on motor capacity and voltage. Use the specified CT through number and current direction.
 - Make sure to put the current sensor into phase V, and use the sensor cable to connect with the Shock Monitor.
 - If using a 400/440V motor, use the 400V class resistor shown in dashed line.
 - Connect the motor voltage terminal of the Shock Monitor U [1], V [2], W [3] with the phase of [U], [V], [W] respectively.
 - Use relay for minute electric current for [X1] and [RST].
- © In case of a wrong connection, load cannot be detected correctly and the Shock Monitor will not work properly.

Parameter settings

No.	Parameter	Data	Default settings	Details
1	Motor Voltage	(1)200-230V (2)380-460V	(1)	Motor voltage 3-phase 200V class Motor voltage 3-phase 400V class
2	Motor kW	(1)0.1kW (11)15kW (2)0.2kW (12)18.5kW (3)0.4kW (13)22kW (4)0.75kW (14)30kW (5)1.5kW (15)37kW (6)2.2kW (16)45kW (7)3.7kW (17)55kW (8)5.5kW (18)75kW (9)7.5kW (19)90kW (10)11kW (20)110kW	0.75kW	Set motor capacity
3	Start Time	0.1 to 20.0s	3.0	Set start time
4	High1 Level	1 to 99%	10	Value of upper limit 1
5	Shock Time H1	MIN 0.1 to 10.0s	1.0	Set upper limit 1 shock time
6	Output Relay H1	(1)Self-Hold (2)Auto-Reset	(2)	Set output operation mode (High 1)
7	High2 Level	5 to 200%	100	Value of upper limit 2
8	Shock Time H2	MIN 0.1 to 10.0s	1.0	Set upper limit 2 shock time
9	Output Relay H2	(1)Self-Hold (2)Auto-Reset	(1)	Select output operation mode (High2)
10	Response	(1)QUICK (2)NORMAL (3)SLOW	(2)	Average number of movements
11	Auto Inhibit	(1)On (2)Off	(2)	Set auto inhibit function
12	Offset Mode	(1)Interval (2)X1	(2)	Set reference writing
13	Interval Time	1 to 60s 1.1 to 60.0min	50s	Write cycle
14	LCD Backlight	(1)Always (2)2min	(1)	Set backlight illumination time

Terminal functions

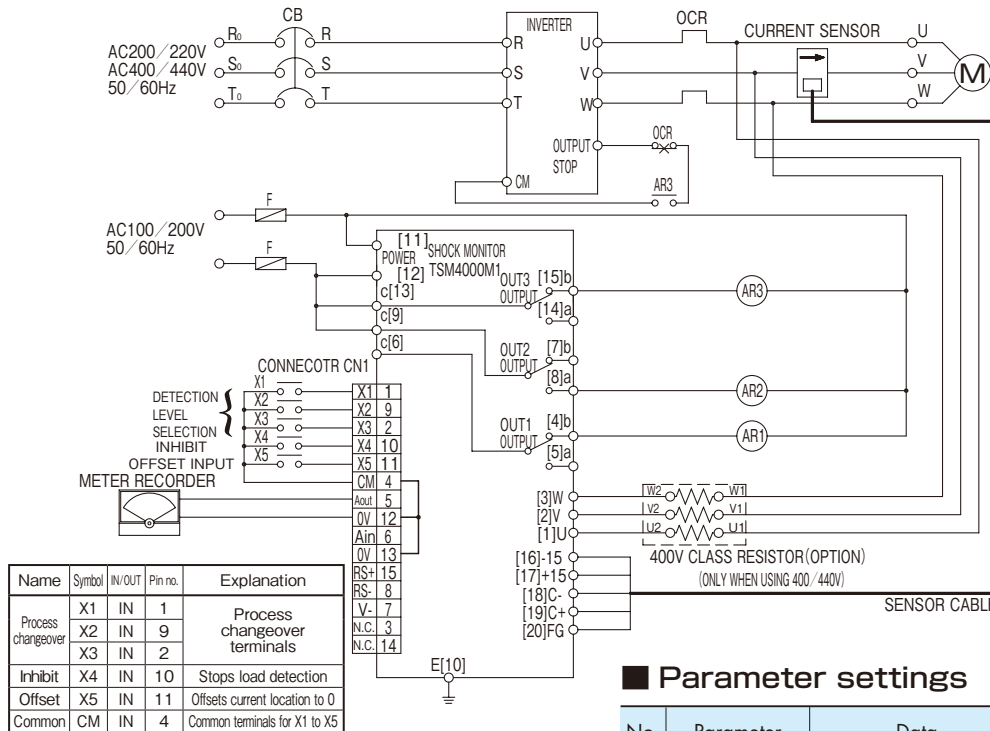


Name	Symbol	IN/OUT	Pin no.	Explanation
Control power supply	POWER	IN	11	Connection of control power supply
Ground	E	-	10	Ground terminal
Current sensor	-15	OUT	16	Current sensor cable
	15	OUT	17	
	C-	IN	18	
	C+	IN	19	
Motor voltage	FG	-	20	Motor voltage input terminal
	U	IN	1	
	V	IN	2	
HIGH 1 output	W	IN	3	Relative value upper limit output 1
	b	OUT	4	
	a	OUT	5	
HIGH 2 output	c	OUT	6	Absolute value upper limit output 2
	b	OUT	7	
	a	OUT	8	
No connection	-	N.C	13	Do not connect anything
	-	N.C	14	
	-	N.C	15	

External connection, parameter settings, terminal functions

3. Contact detection type TSM4000M1 For machine tools

External connection



CB : Circuit breaker
F : Fuse
MC : Electromagnetic contactor for motor
OCR : Overcurrent relay
CR1 : CR filter
START : Start button
STOP : Stop button

When the operating electromagnetic coil capacity (electromagnetic capacity) of the electromagnetic contactor [MC] for the motor is less than 100 VA for injection and less than 10 VA for holding.

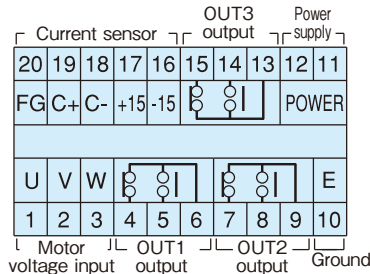
Note:

1. Select the current sensor from the Current Sensor Table based on motor capacity and voltage. Use the specified CT through number and current direction.
 2. Make sure to put the current sensor into phase V, and use the sensor cable to connect with the Shock Monitor.
 3. If using a 400/440V motor, use the 400V class resistor shown in dashed line.
 4. Connect the motor voltage terminal of the Shock Monitor U [1], V [2], W [3] with the phase of [U], [V], [W] respectively.
 5. Use relay for minute electric current for [X1], [X2], [X3], [X4], and [X5].
- ⊙ In case of a wrong connection, load cannot be detected correctly and the Shock Monitor will not work properly.

Parameter settings

No.	Parameter	Data	Default settings	Details
1	Parameter Lock	(1)200-230V (2)380-460V	(1)	Parameters can be changed Parameters cannot be changed
2	Motor Voltage	(1)200-230V (2)380-460V		Motor voltage 3-phase 200V class Motor voltage 3-phase 400V class
3	Motor kW	(1)0.1kW (11)15kW (2)0.2kW (12)18.5kW (3)0.4kW (13)22kW (4)0.75kW (14)30kW (5)1.5kW (15)37kW (6)2.2kW (16)45kW (7)3.7kW (17)55kW (8)5.5kW (18)75kW (9)7.5kW (19)90kW (10)11kW (20)110kW	0.75kW	Set motor capacity
4	Start Time	0.1 to 20.0s	3.0	Set start time
5	Process	1 to 8	1	Number of processes
6	OUT1 Level	1 to 99%	10	OUT1 value
7	Shock Time OUT1	MIN 0.1 to 10.0s	1.0	OUT1 shock time
8	Output Relay OUT1	(1)Self-Hold (2)Auto-Reset	(2)	Select output operation mode (OUT1)
9	OUT2 Level	5 to 200%	15	OUT2 value
10	Shock Time OUT2	MIN 0.1 to 10.0s	1.0	OUT2 shock time
11	Output Relay OUT2	(1)Self-Hold (2)Auto-Reset	(2)	Select output operation mode (OUT2)
12	OUT3 Level	(1)QUICK	80	OUT3 value
13	Shock Time OUT3	(2)NORMAL (3)SLOW	1.0	OUT3 shock time
14	Output Relay OUT3	(1)On (2)Off	(1)	Select output operation mode (OUT3)
15	Response	(1)QUICK (2)NORMAL (3)SLOW	(2)	Average number of movements
16	Auto Inhibit	IH 0.1 to 10.0s	IH	Set inhibit time
17	Power/Torque	(1)On (2)Off	(2)	Set auto inhibit function
18	LCD Backlight	(1)Always (2)2min	(1)	Set backlight illumination time

Terminal functions



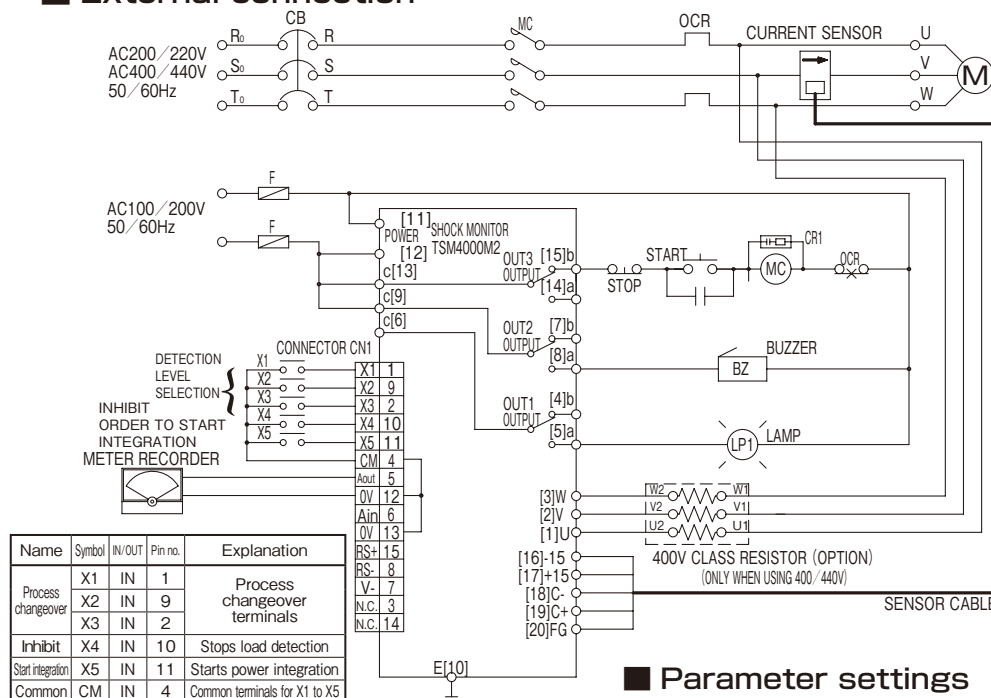
Name	Symbol	IN/OUT	Pin no.	Explanation
Control power supply	POWER	IN	11	Connection of control power supply
Ground	E	-	10	Ground terminal
Current sensor	-15	OUT	16	Current sensor cable
	15	OUT	17	
	C-	IN	18	
	C+	IN	19	
Motor voltage	FG	-	20	Motor voltage input terminal
	U	IN	1	
	V	IN	2	
OUT 1 output	W	IN	3	Relative value upper limit output 1 after offset
	b	OUT	4	
	a	OUT	5	
OUT 2 output	c	OUT	6	Relative value upper limit output 2 after offset
	b	OUT	7	
	a	OUT	8	
OUT 3 output	c	OUT	9	Non-offset absolute value upper limit output
	b	OUT	13	
	a	OUT	14	

Shock Monitor

External connection, parameter settings, terminal functions

4. Integral power type TSM4000M2..... For machine tools

External connection



CB : Circuit breaker
 F : Fuse
 MC : Electromagnetic contactor for motor
 OCR : Overcurrent relay
 CR1 : CR filter
 START : Start button
 STOP : Stop button

When the operating electromagnetic coil capacity (electromagnetic capacity) of the electromagnetic contactor [MC] for the motor is less than 100 VA for injection and less than 10 VA for holding.

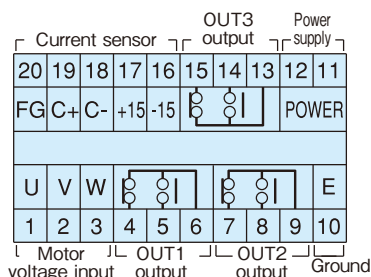
Note:

- Select the current sensor from the Current Sensor Table based on motor capacity and voltage. Use the specified CT through number and current direction.
 - Make sure to put the current sensor into phase V, and use the sensor cable to connect with the Shock Monitor.
 - If using a 400/440V motor, use the 400V class resistor shown in dashed line.
 - Connect the motor voltage terminal of the Shock Monitor U [1], V [2], W [3] with the phase of [U], [V], [W] respectively.
 - Use relay for minute electric current for [X1], [X2], [X3], [X4], and [X5].
- © In case of a wrong connection, load cannot be detected correctly and the Shock Monitor will not work properly.

Parameter settings

No.	Parameter	Data	Default settings	Contents
1	Parameter Lock	(1)Unlocked (2)Locked	(1)	Parameters can be changed Parameters cannot be changed
2	Base Time	0.1 to 25s	2.5	Set time for rated value of integrated power
3	Integration Time	X5, 0.1 to 25s	5.0	Set time for power value integration
4	Motor Voltage	(1)200-230V (2)380-460V	(1)	Motor voltage 3-phase 200V class Motor voltage 3-phase 400V class
5	Motor kW	(1)0.1kW (11)15kW (2)0.2kW (12)18.5kW (3)0.4kW (13)22kW (4)0.75kW (14)30kW (5)1.5kW (15)37kW (6)2.2kW (16)45kW (7)3.7kW (17)55kW (8)5.5kW (18)75kW (9)7.5kW (19)90kW (10)11kW (20)110kW	0.75kW	Set motor capacity
6	Start Time	0.1 to 20.0s	3.0	Set start time
7	Process	1 to 8	1	Number of processes
8	OUT1 Level	0 to 99%	0	Value of OUT1 integrated power lower limit
9	OUT2 Level	5 to 200%	80	Value of OUT2 integrated power upper limit
10	OUT3 Level	5 to 200%	100	Value of OUT3 instantaneous power upper limit
11	Shock Time OUT3	MIN 0.1 to 10.0s	1.0	Set OUT3 shock time
12	Output Relay OUT3	(1)Self-Hold (2)Auto-Reset	(1)	Select output operation mode (OUT3)
13	Response	(1)QUICK (2)NORMAL (3)SLOW	(2)	Average number of movements
14	Inhibit Time	IH 0.1 to 10.0s	IH	Set inhibit time
15	Auto Inhibit	(1)On (2)Off	(2)	Set auto inhibit function
16	LCD Backlight	(1)Always (2)2min	(1)	Set backlight illumination time

Terminal functions

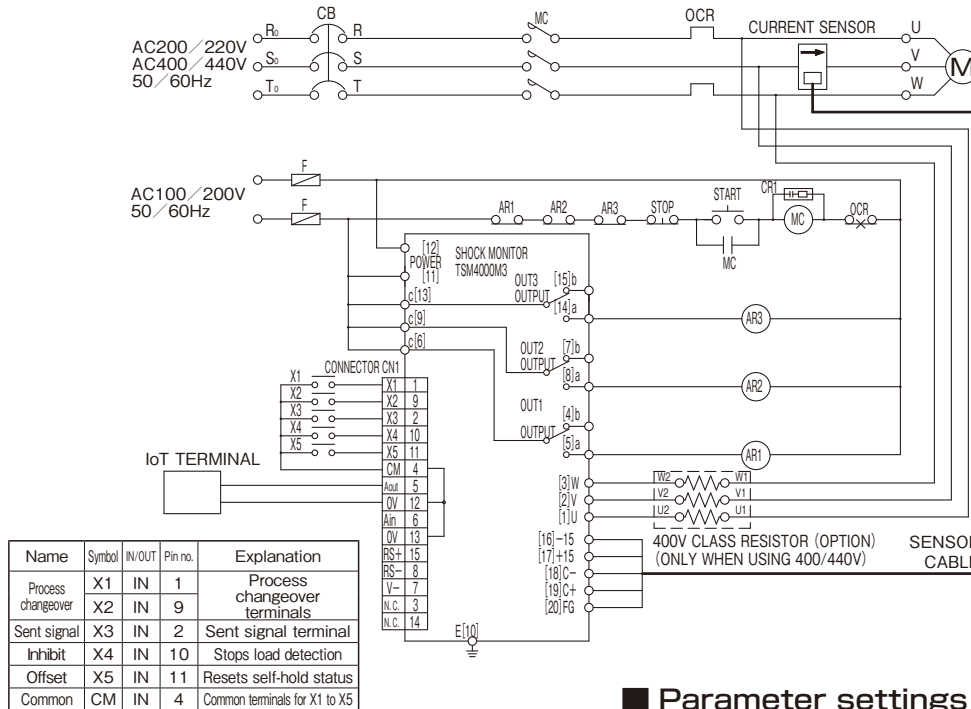


Name	Symbol	IN/OUT	Pin no.	Explanation
Control power supply	POWER	IN	11	Connection of power source
Ground	E	-	10	Ground terminal
Current sensor	-15	OUT	16	Current sensor cable
	15	OUT	17	
	C-	IN	18	
	C+	IN	19	
Motor voltage	FG	-	20	Motor voltage input terminal
	U	IN	1	
	V	IN	2	
OUT 1 output	W	IN	3	Lower limit output after integration
	b	OUT	4	
	a	OUT	5	
OUT 2 output	c	OUT	6	Upper limit output after integration
	b	OUT	7	
	a	OUT	8	
OUT 3 output	c	OUT	9	Upper limit output at instantaneous electric power
	b	OUT	13	
	a	OUT	14	

External connection, parameter settings, terminal functions

5. Processing tool breakage detection type: TSM4000M3.....For processing tools

External connection



CB : Circuit breaker
F : Fuse
MC : Electromagnetic contactor for motor
OCR : Overcurrent relay
CR1 : CR filter
START : Start button
STOP : Stop button

When the operating electromagnetic coil capacity (electromagnetic capacity) of the electromagnetic contactor [MC] for the motor is less than 100 VA for injection and less than 10 VA for holding.

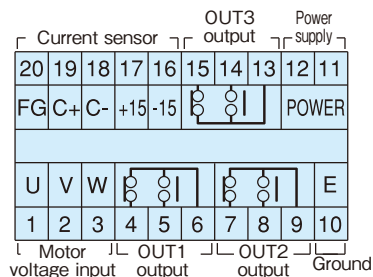
Note:

- Select the current sensor from the Current Sensor Table based on motor capacity and voltage. Use the specified CT through number and current direction.
 - Make sure to put the current sensor into phase V, and use the sensor cable to connect with the Shock Monitor.
 - If using a 400/440V motor, use the 400V class resistor shown in dashed line.
 - Connect the motor voltage terminal of the Shock Monitor U [1], V [2], W [3] with the phase of [U], [V], [W] respectively.
 - Use relay for minute electric current for [X1], [X2], [X3], [X4], and [X5].
- © In case of a wrong connection, load cannot be detected correctly and the Shock Monitor will not work properly.

Parameter settings

No.	Parameter	Data	Default settings	Details
1	Parameter Lock	(1)Unlocked (2)Locked	(1)	Parameters can be changed Parameters cannot be changed
2	Motor Voltage	(1)200-230V (2)380-460V	(1)	Motor voltage 3-phase 200V class Motor voltage 3-phase 400V class
3	Motor kW	(1)0.1kW (11)15kW (2)0.2kW (12)18.5kW (3)0.4kW (13)22kW (4)0.75kW (14)30kW (5)1.5kW (15)37kW (6)2.2kW (16)45kW (7)3.7kW (17)55kW (8)5.5kW (18)75kW (9)7.5kW (19)90kW (10)11kW (20)110kW	0.75kW	Set motor capacity
4	Start Time	0.1 to 20.0s	3.0	Set start time
5	Process	1 to 4	1	Number of processes
6	OUT1 Level	0 to 99%	10	OUT1 value
7	Shock Time OUT1	MIN 0.1 to 30.0s	1.0	OUT1 shock time
8	Output Relay OUT1	(1)Self-Hold (2)Auto-Reset	(2)	Select output operation mode (OUT1)
9	OUT2 Level	5 to 200%	100	OUT2 value
10	Shock Time OUT2	MIN 0.1 to 10.0s	1.0	OUT2 shock time
11	Output Relay OUT2	(1)Self-Hold (2)Auto-Reset	(2)	Select output operation mode (OUT2)
12	OUT3 Count	100 to 30000	10000	OUT3 value
13	Output Relay OUT3	(1)Self-Hold (2)Auto-Reset	(1)	Select output operation mode (OUT3)
14	Response	1 to 50	5	Average number of movements
15	Inhibit Time	IH 0.1 to 10.0s	IH	Set inhibit time
16	Auto Inhibit	(1)On (2)Off	(2)	Set auto inhibit function
17	Power/Torque	(1)Power (2)Torque	(1)	Monitor with motor input power Monitor with torque calculated by power
18	LCD Backlight	(1)Always (2)2min	(1)	Set backlight illumination time

Terminal functions



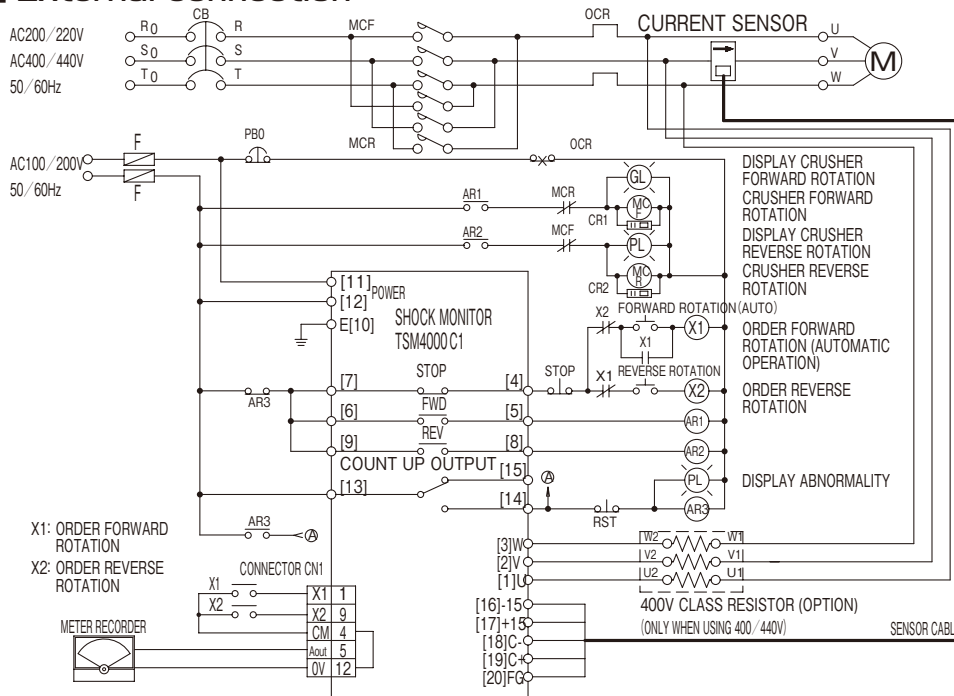
Name	Symbol	IN/OUT	Pin no.	Explanation
Control power supply	POWER	IN	11	Connection of power source
Ground	E	-	10	Ground terminal
Current sensor	-15	OUT	16	Current sensor cable
	15	OUT	17	
	C-	IN	18	
	C+	IN	19	
Motor voltage	FG	-	20	Motor voltage input terminal
	U	IN	1	
	V	IN	2	
OUT 1 output	W	IN	3	Breakage detection output
	b	OUT	4	
	a	OUT	5	
OUT 2 output	c	OUT	6	Upper limit detection output
	b	OUT	7	
	a	OUT	8	
OUT 3 output	c	OUT	9	Output of detection of number of times of operation
	b	OUT	13	
	a	OUT	14	

Shock Monitor

External connection, parameter settings, terminal functions

6. Built-in forward/reverse sequencer type TSM4000C1 For crushers

External connection



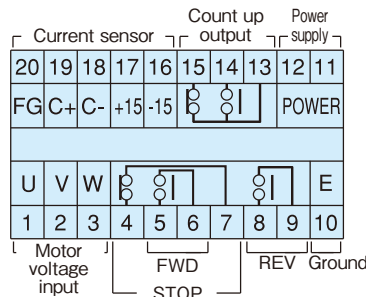
CB : Circuit breaker
 F : Fuse
 MCF : Electromagnetic contactor for motor to forward rotation
 MCR : Electromagnetic contactor for motor to reverse rotation
 OCR : Overcurrent relay
 AR1 : Auxiliary relay for forward output
 AR2 : Auxiliary relay for reverse output
 AR3 : Auxiliary relay to light alarm lamp
 CR1, 2 : CR absorber
 PB0 : Emergency stop button
 RST : Alarm display reset

Note:

1. Select the current sensor from the Current Sensor Table based on motor capacity and voltage. Use the specified CT through number and current direction.
 2. Make sure to put the current sensor into phase V, and use the sensor cable to connect with the Shock Monitor.
 3. If using a 400/440V motor, use the 400V class resistor shown in dashed line.
 4. Connect the motor voltage terminal of the Shock Monitor U [1], V [2], W [3] with the phase of [U], [V], [W] respectively.
 5. Use relay for minute electric current for [X1] and [X2].
- ◎ In case of a wrong connection, load cannot be detected correctly and the Shock Monitor will not work properly.

Name	Symbol	IN/OUT	Pin no.	Explanation
Auto operation input	X1	IN	1	Auto operation
Manual reverse order	X2	IN	9	Manual reverse operation
Common	CM	IN	4	Common terminals for X1 and X2

Terminal functions



Name	Symbol	IN/OUT	Pin no.	Explanation
Control power supply	POWER	IN	11	Connection of power source
Ground	E	-	10	Ground terminal
Current sensor	-15	OUT	16	Current sensor cable
	15	OUT	17	
	C-	IN	18	
	C+	IN	19	
Motor voltage	U	IN	1	Motor voltage input terminal
	V	IN	2	
	W	IN	3	
FWD	a	OUT	4	Order forward rotation
	c	OUT	5	
STOP	b	OUT	6	Order stop (1s shot)
	c	OUT	7	
REV	a	OUT	8	Order reverse rotation
	c	OUT	9	
Count up output	c	OUT	13	Count-up output (1s shot)
	a	OUT	14	
	b	OUT	15	

Parameter settings

No.	Parameter	Data	Default settings	Details
1	Parameter Lock	(1)Unlock (2)Lock	(1)	Parameters can be changed Parameters cannot be changed
2	Motor Voltage	(1)200-230V (2)380-460V	(1)	Motor voltage 3-phase 200V class Motor voltage 3-phase 400V class
3	Motor kW	(1)0.1kW (2)0.2kW (3)0.4kW (4)0.75kW (5)1.5kW (6)2.2kW (7)3.7kW (8)5.5kW (9)7.5kW (10)11kW (11)15kW (12)18.5kW (13)22kW (14)30kW (15)37kW (16)45kW (17)55kW (18)75kW (19)90kW (20)110kW (21)132kW* (22)150kW* (23)200kW*	0.75kW	Set motor capacity * Parameters (21) 132kW to (23) 200kW can be set only for a 400V class motor.
4	No load level	Unused 5 to 200%	Unused	Idle running prevention level
5	Overload level	5 to 200%	100	Overload detection level
6	Start time	1 to 300s	5	Set start time
7	No load continuing level	0.1 to 60min	15.0	Time until count-up output after falling below non-load level
8	Overload duration time (Overload time)	MIN 0.1 to 10.0s	1.0	Set shock time for when overload occurs
9	Pause time (1)	1 to 600s	10	Pause time during switching from forward to reverse rotation
10	Reverse time	1 to 600s	5	Reverse running time
11	Pause time (2)	1 to 600s	10	Pause time during switching from reverse to forward rotation
12	No. of reverse rotation	1 to 10 times	5	No. of reverse rotations until count-up output
13	Reverse rotation	Plus 1 to 600s	10	Time to count the no. of reverse rotations. Add to 1 cycle time
14	Response	(1)QUICK (2)NORMAL (3)SLOW	(2)	Average number of movements
15	LCD Backlight	(1)Always (2)2min	(1)	Set backlight illumination time

Safety Guide and Warranty



WARNING

Death or serious injury may result from product misuse due to not following the instructions.

- When carrying out an operation test or making a periodic inspection, make sure to verify that it functions properly as a protection device.
- Follow the instruction manual when carrying out megger testing because most electrical devices have certain requirements for megger testing.
- Check the operation of the device periodically so that it can be sure to function properly when overloaded occurs.
- Comply with the 2-1-1 General Standard of "Ordinance on Labor Safety and Hygiene".
- When performing maintenance or inspections:
 - 1) Wear proper work clothes and protective equipment (safety devices, gloves, shoes, etc.). To avoid an accident, make sure to perform maintenance and inspections in an appropriate environment.
 - 2) Make sure the power is switched off, and the machine has stopped completely before carrying out maintenance and inspections. Take the necessary measures to ensure the power is not turned back on.
 - 3) Follow the instruction manual.
 - 4) Wire according to the technical standards of Electrical Installation and company regulations. Take note of the cautions in this manual which explain installation direction, clearance and environmental conditions. Make sure to ground the device to prevent electrical shock and to improve noise resistance.
- When using with lifting equipment, install a suitable protection device for safety purposes, otherwise an accident resulting in death, serious injury or damage to the equipment may occur due to a falling accident.



CAUTION

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

- Consumable parts (tantalum electrolytic capacitors, relays, etc.) are built-in the products. Using the manual, periodically check the functions and operation of the device. If it is not functioning properly, contact the distributor for repair.
- Do not use the device in a corrosive gas environment. Sulphidizing gases (SO₂, H₂S) can especially corrode the copper and copper alloy used on PCBs and parts, and cause a malfunction.
- Read the instruction manual carefully, and use the product properly. In case the instruction manual is not available, request one from the distributor where you purchased the product, or our sales office with the product name and model number.
- Deliver this instruction manual to the final customer who uses the product.

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"

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.

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.

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.

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.



CAUTION

The contents of this catalog are mainly to aid in product selection. Read the instruction manual thoroughly before using the product in order to use it properly.

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Tsubakimoto Chain Co.

<https://tsubakimoto.com/>

Global Group Companies

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United States

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

Brazil

Tsubaki Brasil Equipamentos Industriais Ltda.

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The Tsubaki Eco Link logo is used only on products that satisfy the standards for environmental friendliness set by the Tsubaki Group.