



## Instruction Manual

### Thermal Overload Relays

Type TK13 \*1, \*2, \*3  
TK25 \*3  
TK26 \*1, \*2, \*3  
TK26E \*3

\*1:L (Long-time operating type),  
Q (Quick operating type)  
\*2:H (Separate mounting type)  
\*3:A (Auto-reset type)

### Note!


Please give careful consideration in handling this instruction manual and make sure that it is delivered without fail over to the hands of the person who takes the final responsibility for operation and maintenance.

## 1. Introduction

Thank you for purchasing the thermal overload relays manufactured by Fuji Electric. Please confirm that the delivered product matches your requirements including ratings and specifications. In case the product is damaged or accessories are not included in the package, or if there is a defect in the product, please contact our nearest sales office.

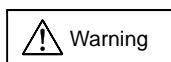
Please read this instruction manual carefully and familiarize yourself with the contents before using the product. Please make sure that this instruction manual is delivered to the final user and is properly kept for easy access while the product is in use. If this instruction manual is lost, you can download one from our website.

URL: <http://www.fujielectric.co.jp/fcs/>

 Precautions: General
● Read the instruction manual carefully before using the product so that you can use it safely.

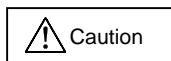
## 2. Safety Precautions

- This product must be handled by a person who has sufficient knowledge and skills to ensure safe use of the product.
- Before using the product, read this instruction manual and other attached documents to familiarize yourself with the contents to ensure proper use of the product. Use the product only after you have gained sufficient knowledge about the product, safety information, and relevant precautions.  
After reading the documents, keep them in a place where people who use the product can access any time.
- In this instruction manual, safety precautions are classified as “Warning” and “Caution”.



Warning

Indicates a potentially hazardous situation, which, if not avoided, may result in death or serious injury.



Caution

Indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate injury, or property damage.

It must be noted that items described in





Caution

may lead to a serious result depending on situations.

Be sure to observe these precautions because every one of them is important.

The warnings and cautions described in this instruction manual are listed below.

 Warning
● Do not touch the product or attempt to access the product while the power is turned ON. Otherwise, electric shock or burn may occur.
● Be sure to turn OFF the power supply before performing maintenance or inspection. Otherwise, electric shock may occur.

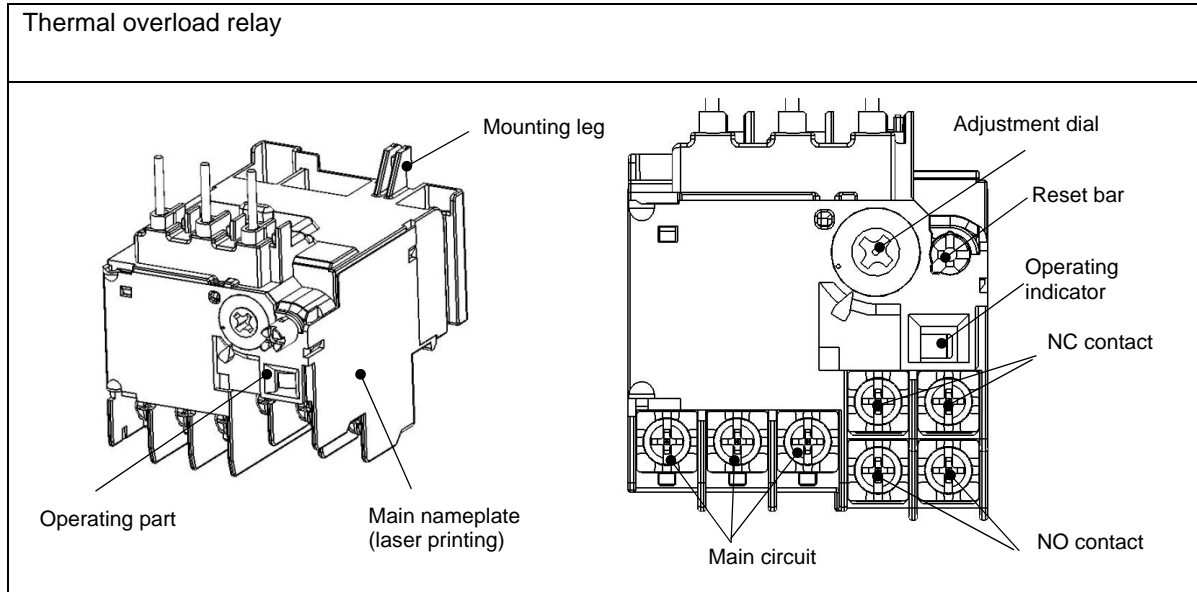
 Caution
● When installing the product, provide a space equal to or larger than the value specified in the instruction manual. Otherwise, burn or fire may occur.
● For wiring, use wire sizes appropriate for the applied voltage and flowing current and tighten them to the tightening torques specified in the instruction manual. Otherwise, fire may occur.
● Use attached terminal screws. Due to loosening, etc., fire may occur.
● Do not touch the product immediately after the power is turned OFF. Because the product is hot, you may get burnt.
● Do not modify or disassemble the product. Doing so may cause trouble.
● Dispose of the product as an industrial waste.

## Contents

1. Introduction .....	- 2 -
2. Safety Precautions.....	- 2 -
3. Structure, Part Name, and Manufacturing Lot Number .....	- 4 -
3.1 Structure and Part Name .....	- 4 -
3.2 Type and Specifications Indication Example.....	- 4 -
3.3 Interpretation of Manufacturing Lot Number .....	- 4 -
4. Unpacking.....	- 5 -
5. Precautions in Handling, Unpacking, and Storage .....	- 5 -
6. Mounting.....	- 5 -
7. Wiring .....	- 6 -
8. Usage Instructions.....	- 7 -
9. Maintenance and Inspection.....	- 9 -
9.1 Inspection before Operation.....	- 9 -
9.2 Periodical Inspection .....	- 9 -
10. Additional Information Related to UL and CSA Standards .....	- 10 -
10.1 Short circuit protective devices (SCPD).....	- 10 -
10.2 Wiring diagram.....	- 11 -

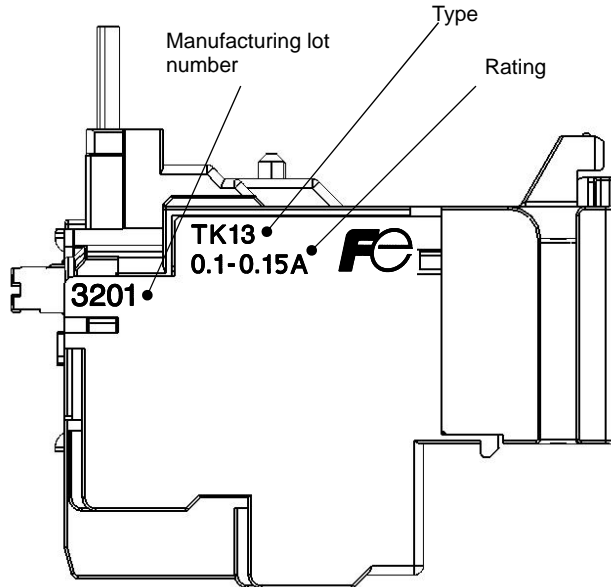
### 3. Structure, Part Name, and Manufacturing Lot Number

#### 3.1 Structure and Part Name



#### 3.2 Type and Specifications Indication Example

##### (2) Main nameplate (type and rating)



#### 3.3 Interpretation of Manufacturing Lot Number

Example: 3 2 01

(a) (b) (c)

(a) Last digit of the Christian year (3: Year 2013)

(b) Manufactured month (2: February)

- 1 ... January
- 2 ... February
- :
- 9 ... September
- 0 ... October
- X ... November
- Y ... December

(c) Manufactured day (01: 1st)

#### 4. Unpacking

- (1) Confirm that the type and rating match your requirements including specifications. The type is indicated on the packing box and wrapping paper.
- (2) Check if there are any missing parts or damage due to an accident during transportation.

#### 5. Precautions in Handling, Unpacking, and Storage

- (1) It is recommended that the product be used and operated immediately after unpacking. When storing the product, pay attention to the following points.
  - Carefully store the product so that it is not exposed to water (rain water, etc.) or moisture to avoid condensation.
  - Store the product in a clean place free of dust.
  - Store the product in a place free of corrosive gas.
  - Store the product in a packaged state and in a place where it is not exposed to high temperature, high humidity, corrosive gases or direct sunlight.

#### 6. Mounting

- (1) Mount the product in a place where there is little humidity, dust, smoke, inflammable gas, steam, oil steam, salt, corrosive gas, or vibration.
- (2) Mount the product on a vertical plane. The allowable inclination angle is 30° or less. (Figure 6.1)
- (3) Pay attention to the following points with regard to the space for mounting. (Figure 6.2)
  - Provide a space of at least the value shown in the Figure below.  
The dimension C is a value specified under the short-circuit breaking capacity test conditions in the IEC standard, JIS standard, and JEM standard.
  - When the products are mounted by dense side-by-side mounting, the service life of the coil may be reduced due to temperature rise depending on the service condition (continuous current usage or dense side-by-side mounting of products with high switching frequency).  
Besides, the characteristics of thermal overload relays will slightly change due to the influence of heat generated by heaters. When installing the products very closely to one another, they need to be separated from one another by at least 5 mm.

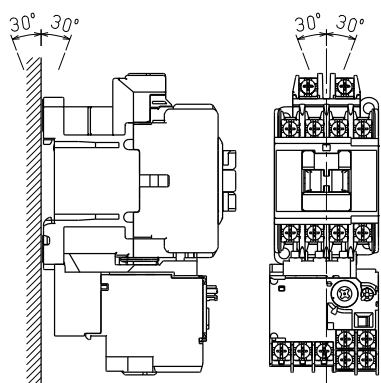
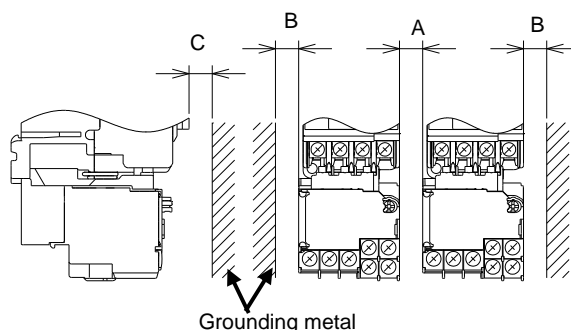


Figure 6.1 Mounting Angle



	A [mm]	B [mm]	C [mm]
Magnetic contactors	5	10	0

Figure 6.2 Minimum Mounting Space

- (4) For using thermal overload relays in combination with magnetic contactors, refer to the following table.

Thermal overload relay	Magnetic contactor to be combined			
	New SC Series	SK Series	E Series	
			For direct wiring	For using crimp terminals
TK13 TK13-TN	SC-03 SC-0 SC-05	—	—	—
TK25	—	SK18 SK22	—	—
TK26 TK26-TN	SC-4-0 SC-4-1 SC-5-1	SK32	—	—
TK26E	—	—	SC-E02 SC-E03 SC-E04 SC-E05	SC-E02P SC-E03P SC-E04P SC-E05P


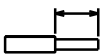

## 7. Wiring

(1) Terminals can be constituted by using solid wires, twisted wire, or crimp terminals.

When using the round crimp terminal, remove the terminal cover before wiring.

(2) For connectable wire size and tightening torque, refer to Table 7.1.

Table 7.1 Connectable Wire Size and Tightening Torque

Type		Main terminal			Control and auxiliary terminals		
		TK13	TK25, TK26	TK26E	Common		
Direct connection	Solid wire	[mm <sup>2</sup> ]	1 pc. x (φ1.2 to 2) 2 pcs. x (φ1.2 to 1.6) 2 pcs. x (φ1.6 to 2)	1 pc. x (φ1.2 to 2.6) 2 pcs. x (φ1.2 to 1.6) 2 pcs. x (φ1.6 to 2)	1 pc. x (0.75 to 4) 2 pcs. x (1 to 4)	1 pc. x (φ1.2 to 2) 2 pcs. x (φ1.2 to 1.6) 2 pcs. x (φ1.6 to 2)	
		[AWG]	1 pc. x (16 to 12) 2 pcs. x (16 to 14) 2 pcs. x (14 to 12)	1 pc. x (16 to 10) 2 pcs. x (16 to 14) 2 pcs. x (14 to 12)	1 pc. x (18 to 12) 2 pcs. x (18 to 12)	1 pc. x (16 to 12) 2 pcs. x (16 to 14) 2 pcs. x (14 to 12)	
	Twisted wire	[mm <sup>2</sup> ]	1 pc. x (0.75 to 2.5) 2 pcs. x (0.75 to 1.5) 2 pcs. x (1.5 to 2.5)	1 pc. x (0.75 to 5.5) 2 pcs. x (0.75 to 1) 2 pcs. x (1 to 1.5) 2 pcs. x (1.5 to 2.5) 2 pcs. x (2.5 to 4)	1 pc. x (0.75 to 4) 2 pcs. x (1 to 4)	1 pc. x (0.75 to 2.5) 2 pcs. x (0.75 to 1.5) 2 pcs. x (1.5 to 2.5)	
		[AWG]	1 pc. x (18 to 14) 2 pcs. x (18 to 16) 2 pcs. x (16 to 14)	1 pc. x (18 to 10) 2 pcs. x (16 to 14) 2 pcs. x (14 to 12)	1 pc. x (18 to 12) 2 pcs. x (18 to 12)	1 pc. x (18 to 14) 2 pcs. x (18 to 16) 2 pcs. x (16 to 14)	
	Stripping length [mm]			9 to 10	10 to 11	9 to 10	
	Flexible twisted wire (With sleeve)	[mm <sup>2</sup> ]	1 pc. x (0.75 to 2.5) 2 pcs. x (0.75 to 1.5) 2 pcs. x (1.5 to 2.5)	1 pc. x (0.75 to 2.5) 2 pcs. x (0.75 to 1) 2 pcs. x (1 to 1.5) 2 pcs. x (1.5 to 2.5)	1 pc. x (0.75 to 4) 2 pcs. x (1 to 4)	1 pc. x (0.75 to 2.5) 2 pcs. x (0.75 to 1.5) 2 pcs. x (1.5 to 2.5)	
		[AWG]	1 pc. x (18 to 14) 2 pcs. x (18 to 16) 2 pcs. x (16 to 14)	1 pc. x (18 to 12) 2 pcs. x (16 to 14) 2 pcs. x (14 to 12)	1 pc. x (18 to 12) 2 pcs. x (18 to 12)	1 pc. x (18 to 14) 2 pcs. x (18 to 16) 2 pcs. x (16 to 14)	
	Sleeve dimension [mm]			10	11	10	
	Crimp terminal connection	Twisted wire, flexible twisted wire	[mm <sup>2</sup> ]	0.75 to 4	0.75 to 10	0.75 to 10	0.75 to 2.5
			[AWG]	18 to 10	18 to 8	18 to 8	18 to 14
Maximum crimp terminal width [mm]			7.7	9.7	9.7	7.7	
F dimension of the lower one of the two crimp terminals (Figure 7.1)		[mm]	7 or larger	9 or larger	9 or larger	6 or larger	
Terminal screw size			M3.5	M4	M3.5		
Tightening tool			Phillips H2 type Flat-head screwdriver I-1 x 5.5 x L type B				
Tightening torque		[N•m]	0.8 to 1.0	1.2 to 1.5	0.8 to 1.0		

(Note 1) The flexible twisted wires cannot be used without sleeves.

As for using sleeves, crimp the sleeve (ferrule).

Twisted wire of 0.75 to 5.5 mm<sup>2</sup> (18 to 10 AWG): The number of wires must be seven or less.

Flexible twisted wire: The number of wires is larger than the above.

(Note 2) Use sleeves that comply with the DIN46228 standard.

- When using wire of 1.5 to 2.5 mm<sup>2</sup> (16 to 14 AWG), use sleeves with no insulation sheath.
- Depending on the crimping tool, there is a case where sleeves cannot be inserted into terminals. Use the Phoenix Contact CRIMPFOX 6 or an equivalent crimping tool.

For the wire stripping length, follow the instructions provided by the sleeve manufacturer.

(Note 3) To comply with the UL and CSA standards, use the wire size of 14 AWG or 12 AWG.

And, use solid wires, twisted wires, or crimp terminals.

(Note 4) It is possible to connect two crimp terminals. (Figure 7.1) The length of wire protrusion must be 1 mm or less.

(Note 5) Tighten all the terminals including ones not wired.

(Note 6) When connected wires are bent for line arrangement after wiring, confirm again that the tightening torque is appropriate.

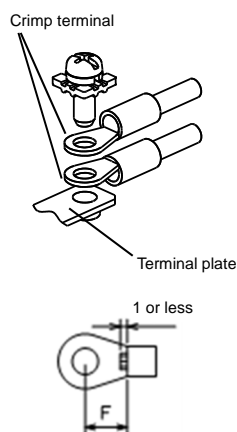


Figure 7.1 Connecting Two Crimp Terminals

## 8. Usage Instructions

### (1) Mounting to and removing from the magnetic contactor

- Mount the thermal overload relay according to the following procedure. (Figure 8.1)
  - (a) Loosen the terminal screws for Nos. 2, 4, and 6 terminals of the magnetic contactor.
  - (b) Align the thermal overload relay leg with the hole in the magnetic contactor and insert it in the direction indicated by an arrow.
  - (c) Insert the thermal overload relay so that the main circuit section of the thermal overload relay comes to the right of the terminal screws of the main circuit.
  - (d) Tighten the terminal screws of the magnetic contactor to the specified torque. (Refer to the instruction manual for magnetic contactors.)
- Remove the thermal overload relay according to the following procedure. (Figure 8.2)
  - (a) Remove all the terminal screws for Nos. 2, 4, and 6 terminals of the magnetic contactor.
  - (b) Remove the thermal overload relay in the direction indicated by an arrow.

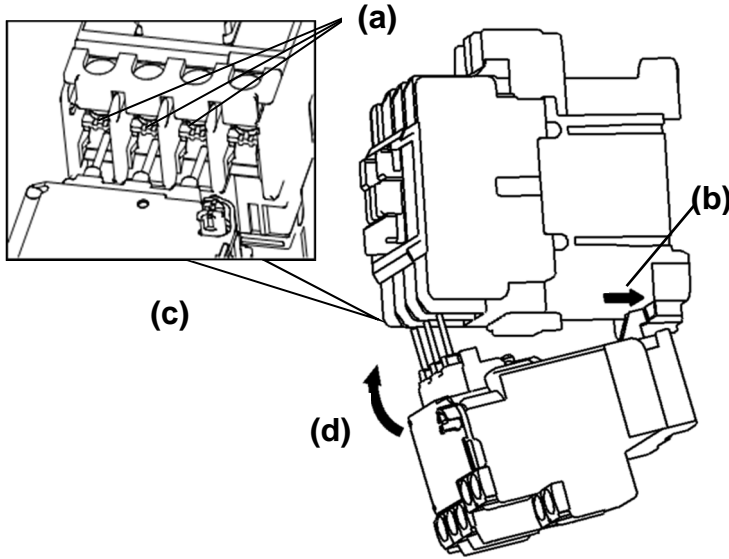


Figure 8.1 Mounting to the Magnetic Contactor

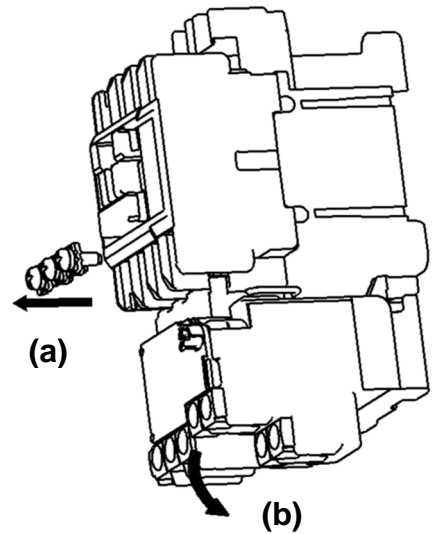


Figure 8.2 Removing from the Magnetic Contactor

### (2) Removing the terminal cover (Figure 8.3)

Firmly hold down the thermal overload relay, insert a screwdriver or similar tool into the terminal cover, and then move the screwdriver down as indicated by arrows.

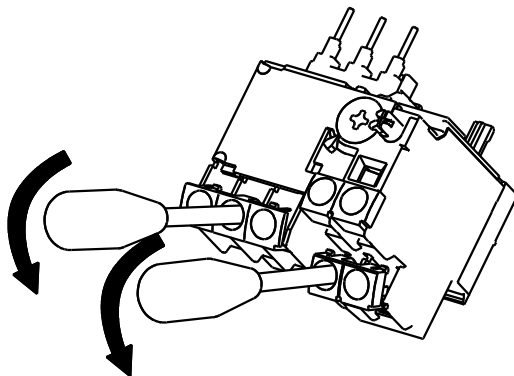


Figure 8.3 Removing the Terminal Cover

(3) Current setting method (Figure 8.4)

- Turn the adjustment dial within its scale and set the full load current of the motor to the downward triangle mark (▼). If it is used outside the scale, the product performance will not be satisfied.
- When the inverter is used in the secondary side, a faulty tripping may be caused by leakage current. When using the inverter, measure the current at the place where the thermal overload relay is mounted and select an appropriate one.
- When using a surge prevention device in the secondary side of the thermal overload relay, set the current to a value with leakage current added.
- Depending on the type of motor to be used, the thermal overload relay may make unnecessary actions at the startup. In such a case, increase the current value set by the dial to approximately 5% or less. If it is increased higher than that guideline, the motor may not be properly protected. Also, select an appropriate thermal overload relay such as long-time operating type or quick operating type depending on motor characteristics and load conditions.

(3)-1 When using as a separate mounting type

- When TK26 and TK26Q are used under the following ratings as a separate mounting type (TK26H or TK26QH), the thermal overload relay tends to remain in a non-operation state compared with the case when used as a magnetic starter. In such a case, correct the dial set current as shown in the following table.

Type	Rating	Correction value
TK26H	16-22A	Set to a value 5% lower than the dial set value.
TK26H	20-26A	Set to a value 10% lower than the dial set value.
TK26QH	12-18A	Set to a value 10% lower than the dial set value.

(4) Operating indicator (Figure 8.4)

When the thermal overload relay operates, the white trip indicator in the operating indicator window will be hidden.

(The white trip indicator will not be hidden when tripped in the automatic reset state.)

(5) Sequence checking (Figure 8.4)

Press the white trip indicator in the direction shown by an arrow to perform sequence checking.

(6) Resetting method (Figure 8.4)

When the thermal overload relay operates, first remove the cause of an error such as overload and then press the reset bar. Press the reset bar until it comes to a stop.

(Resetting will not be possible unless the thermal overload relay is sufficiently cooled down.)

(7) Changing from manual reset to automatic reset (Figure 8.5)

Change from the manual reset to the automatic reset according to the following procedure.

Or, change from the automatic reset to the manual reset according to the reverse procedure.

- Open the front cover.
- Using a screwdriver or a similar tool, press the reset bar and turn it clockwise by 90 degrees.
- Confirm that the reset bar is held pushed in.
- Close the front cover.

Note) Attention must be paid to the fact that, in case of a two-wire control circuit, the motor is automatically started when the thermal overload relay is automatically reset.

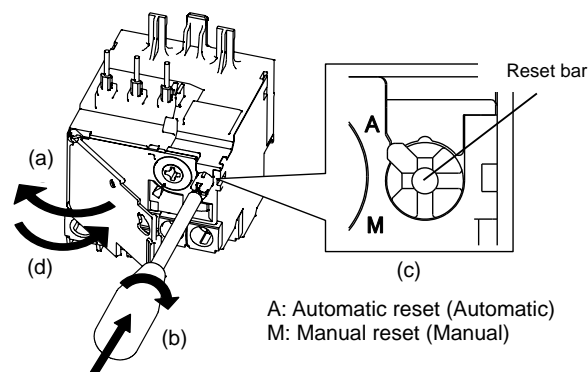
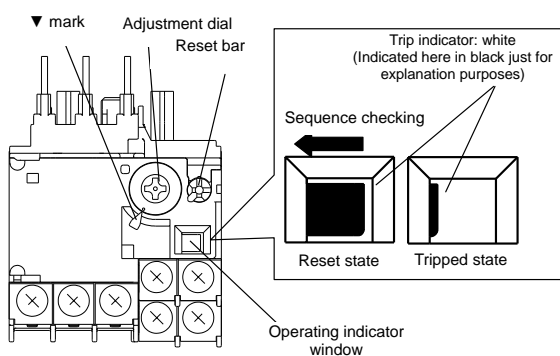


Figure 8.4 Current Setting, Operating Indicator, Sequence Checking, and Resetting

Figure 8.5 Changing to Automatic Reset



(8) When applying to a single-phase motor or DC motor

(8)-1 Standard type (trip class of 10A) and quick operating type (trip class of 5)

The standard type relays for all ratings and the quick operating type relays for some ratings include phase loss protection function as standard.

Therefore, unless power is supplied to all the phases, the relay may operate at a value smaller than the set current value.

When applying to a single-phase motor circuit or to a DC circuit, perform wiring according to either one of the wiring patterns shown in Figure 8.6 (a) and (b).

When using the wiring pattern (b), select an appropriate heater rating so that the current adjustment range of the thermal overload relay is not exceeded.

(a) Connect wires so that power is supplied in series to all polarities.

(b) Set the adjustment dial to a value approximately 10% higher.

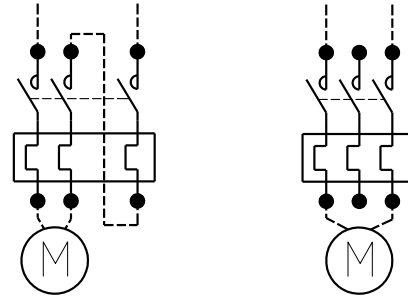


Figure 8.6 When Applying to a Single-phase Motor or DC Motor

(8)-2 Long-time operating thermal overload relays

Long-time operating thermal overload relays are exclusively for AC applications.

When using the relay for a single-phase AC motor, wire the circuit as shown in Figure 8.7 because each phase contains a reactor and power must be supplied to each one of those phases.

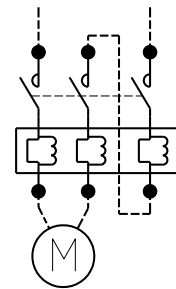


Figure 8.7 Wiring for Long-time Operating Thermal Overload Relays

## 9. Maintenance and Inspection

### 9.1 Inspection before Operation

- (1) Check if there are any loose screws.
- (2) Check if there are any wire scraps, washers, etc. are caught in the product.
- (3) Check if the thermal overload relay is set to the reset state because the relay may be tripped due to vibration or shock during transportation.

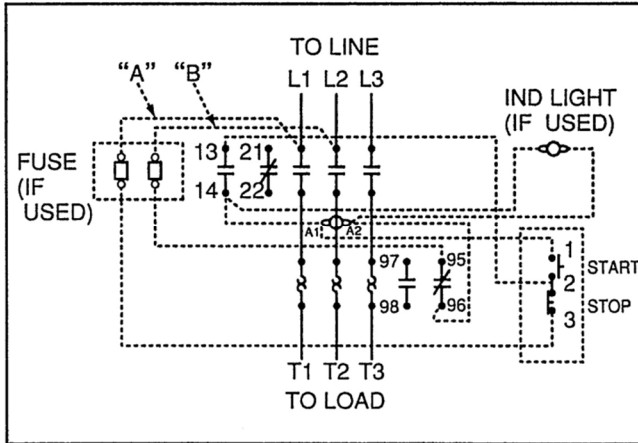
### 9.2 Periodical Inspection

- (1) Perform the initial inspection as early as possible after starting operation. Afterwards, perform the periodical inspection.
- (2) Periodically retighten terminal tightening screws.
- (3) It is recommended that the product be renewed 10 years after the manufacturing date on condition that the product has been used under the standard usage conditions as specified in the "Report on Recommended Renewal Timing for Low Voltage Devices" issued by Japan Electrical Manufacturers' Association (JEMA).

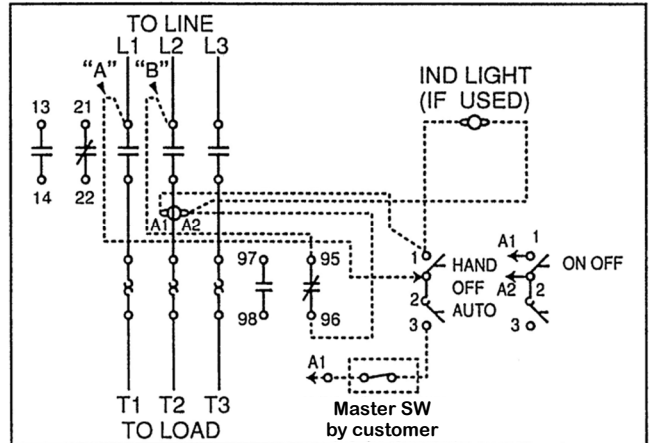


10.2 Wiring diagram

(1) 3-wire control circuit



(2) 2-wire control circuit



In 2-wire control circuits, be careful of the following points when using thermal overload relay with setting reset button to auto reset mode. If over-current flows, which is not large enough to blow the fuse or to operate the circuit breaker, the magnetic contactor repeats make/break operations. It does this because the thermal overload relay repeats the resets and the trips automatically. This repeated make/break operations would damage the magnetic contactor and the thermal overload relay. Eventually, contact welding short-circuit (phase to phase) or grounding occur, and the fuse blow or circuit breaker operate. In this case, check the magnetic contactor and the thermal overload relay. Replace them if they have been damaged.

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