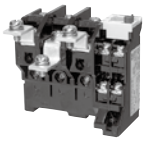
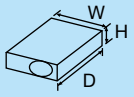
5

TH-T/N Type Thermal Overload Relays

5.1 Model List

Frame			T18	T25	T50	T65	T100
Appearance							
Model Name	Standard with 2-Element	For Magnetic Starters	TH-T18	TH-T25	TH-T50	TH-T65	TH-T100
		For Independent Mounting	UT-HZ18 + TH-T18		—		—
	With 3-Element (2E)	For Magnetic Starters	TH-T18KP	TH-T25KP	TH-T50KP	TH-T65KP	TH-T100KP
		For Independent Mounting	UT-HZ18 + TH-T18KP		—		—
	Outline Drawing [mm] W x H x D	For Magnetic Starters	46 x 55 x 76.5	63 x 53 x 80	74.3 x 74 x 88	89 x 57 x 83.5	89 x 68.5 x 83.5
		For Independent Mounting	46 x 63 x 82.7		—		—
Applicable Standard			JIS C8201-4-1, IEC60947-4-1, EN60947-4-1, GB14048.4				
Use Conditions		Ambient Temperature [°C]	-10 to +40 (Standard is 20°C, Inner Panel Maximum Temperature is 55°C)				
		Frequency [Hz]	0 (DC) to 400				
Specifications of the Main Circuit	Rated Insulation Voltage [V]		690				
	Rated Impulse Withstand Voltage [kV]		6				
	Pollution Degree		3				
	Heater Designation (Adjustment Range of Settling Current) [A] (The --- line in the table on the right represents the correspondence between the magnetic contactor and frame to be combined) (Refer to the relevant text regarding the heater designation of the applied products)		0.12 (0.1 to 0.16) 0.17 (0.14 to 0.22) 0.24 (0.2 to 0.32) 0.35 (0.28 to 0.42) 0.5 (0.4 to 0.6) 0.7 (0.55 to 0.85) 0.9 (0.7 to 1.1) 1.3 (1 to 1.6) 1.7 (1.4 to 2) 2.1 (1.7 to 2.5) 2.5 (2 to 3) 3.6 (2.8 to 4.4) 5 (4 to 6) 6.6 (5.2 to 8) 9 (7 to 11) 11 (9 to 13) 15 (12 to 18)	0.24 (0.2 to 0.32) 0.35 (0.28 to 0.42) 0.5 (0.4 to 0.6) 0.7 (0.55 to 0.85) 0.9 (0.7 to 1.1) 1.3 (1 to 1.6) 1.7 (1.4 to 2) 2.1 (1.7 to 2.5) 2.5 (2 to 3) 3.6 (2.8 to 4.4) 5 (4 to 6) 6.6 (5.2 to 8) 9 (7 to 11) 11 (9 to 13) 15 (12 to 18) 22 (18 to 26)	29 (24 to 34) 35 (30 to 40) 42 (34 to 50)	15 (12 to 18) 22 (18 to 26) 29 (24 to 34) 35 (30 to 40) 42 (34 to 50) 54 (43 to 65)	67 (54 to 80) 82 (65 to 100) 95 (85 to 105)
	Power Consumption [VA/Element] Minimum/Maximum Settling		0.8/1.8	1.0/2.1	1.6/3.2	2.4/5.5	2.5/6.0
	Terminal Screw Size		M3.5	M4	M5	M6	M6
	Terminal-Compatible	Wire Size [mm²]	φ1.6, 0.75 to 2.5	φ1.6 to 2.6, 1.25 to 6	φ2 to 3.6, 4 to 14	—	—
		Crimp Lug Size	1.25-3.5 to 2-3.5, 5.5-S3	1.25-4 to 5.5-4	5.5-5 to 14-5	5.5-6 to 22-6	14-6 to 22-6, 38-S6
Specifications of the Control Circuit (Contact)	Contact Arrangement		1a1b	1a1b	1a1b	1a1b	1a1b
	Conventional Free Air Thermal Current Ith [A]		2	5	5	5	5
	Rating Use Current [A] — Category AC-15 (AC Contactors Coil Switching) Make Contact/Break Contact. The value in parentheses is the rating during auto reset	AC24 V	2 (0.5)/2 (0.5)	2 (0.5)/3 (0.5)	2 (0.5)/3 (0.5)	2 (0.5)/3 (0.5)	2 (0.5)/3 (0.5)
		AC120 V	2 (0.5)/2 (0.5)	2 (0.5)/3 (0.5)	2 (0.5)/3 (0.5)	2 (0.5)/3 (0.5)	2 (0.5)/3 (0.5)
		AC240 V	1 (0.5)/1 (0.5)	1 (0.5)/2 (0.5)	1 (0.5)/2 (0.5)	1 (0.5)/2 (0.5)	1 (0.5)/2 (0.5)
		AC550 V	0.3 (0.3)/0.3 (0.3)	0.3 (0.3)/0.3 (0.3)	0.3 (0.3)/0.3 (0.3)	0.5 (0.5)/1 (0.5)	0.5 (0.5)/1 (0.5)
	Rating Use Current [A] — Category DC-13 (DC Contactors Coil Switching). The value in parentheses is the rating during auto reset	DC24 V	0.5 (0.3)	1 (0.3)	1 (0.3)	1 (0.3)	1 (0.3)
		DC110 V	0.2 (0.2)	0.2 (0.2)	0.2 (0.2)	0.2 (0.2)	0.2 (0.2)
		DC220 V	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)
	Minimum Applicable Load Level		20 V 5 mA	20 V 5 mA	20 V 5 mA	20 V 5 mA	20 V 5 mA
	Terminal Screw Size		M3.5	M3.5	M3.5	M4	M4
	Terminal-Compatible	Wire Size [mm²]	φ1.6, 0.75 to 2.5	φ1.6, 0.75 to 2.5	φ1.6, 1.25 to 2	φ1.6, 1.25 to 2	φ1.6, 1.25 to 2
		Crimp Lug Size	1.25-3.5 to 2-3.5	1.25-3.5 to 2-3.5	1.25-3.5 to 2-3.5	1.25-4 to 2-4,5.5-S4	1.25-4 to 2-4,5.5-S4
Properties/Functions	Operating Characteristic Curve Page		153				
	Vibration Resistance (Vibration and Malfunction Resistance Performance)		10 to 55Hz 19.6m/s²				
	Trip Free		◎	◎	◎	◎	◎
	Reset Method		Manual/Automatic Switchable	Manual/Automatic Switchable	Manual/Automatic Switchable	Manual/Automatic Switchable	Manual/Automatic Switchable
	Operation Indicator (Lever Display)		◎	◎	◎	◎	◎
	Manual Tripping Check		◎	◎	◎	◎	◎
Frame of the Combined Magnetic Contactor			T10, T12, T20 T12, T20 T20	T21, T25, T35, T50	T35, T50 T50	T65, T80, T100	T80, T100 T100
Applied Products	With Saturable Reactor [See Page 146]	With 2-Element (TH-□SR)	○ (TH-T18SR)	○ (TH-T25SR)	○ (TH-T50SR)	○ (TH-T65SR)	○ (TH-T100SR)
		With 3-Element (2E) (TH-□KPSR)	—	○ (TH-T25KPSR)	○ (TH-T50KPSR)	○ (TH-T65KPSR)	○ (TH-T100KPSR)
	Quick Trip Type [See Page 147]	With 2-Element (TH-□FS)	—	△ (TH-T25FS)	△ (TH-T50FS)	△ (TH-T65FS)	△ (TH-T100FS)
		With 3-Element (2E) (TH-□FSKP, KF)	△ (TH-T18FSKP)	△ (TH-T25FSKP)	△ (TH-T50FSKP)	△ (TH-T65FSKP)	△ (TH-T100FSKP)
Optional	Live Part Protection Cover		(Standard Equipment)	(Standard Equipment)	(Standard Equipment)	◎ (UN-CZ605)	—
	Reset Release		◎ (UT-RR□5)	◎ (UN-RR□0)	◎ (UN-RR□0)	◎ (UN-RR□6)	◎ (UN-RR□6)
	Operation Indicator Lamp		◎ (UN-TL12)	◎ (UN-TL20)	◎ (UN-TL20)	◎ (UN-TL60)	◎ (UN-TL60)
	Independent/IEC 35 mm Rail Mounting Unit		◎ (UT-HZ18)	◎ (UN-RM20)	—	—	—
	Misoperation Prevention Cover		—	◎ (UN-CV203)	◎ (UN-CV203)	◎ (UN-CV603)	◎ (UN-CV603)

Note 1. All model names come with ambient temperature compensation device.
Note 2. ◎ indicates standard type (standard equipment), ○ indicates semi-standard type, △ indicates special products and - indicates products outside production range.

	N120	N120TA	N220	N400	N600
					
	TH-N120	TH-N120TA	TH-N220RH	TH-N400RH	—
		TH-N120TAHZ	TH-N220HZ	TH-N400HZ	TH-N600(Note 3)
	TH-N120KP	TH-N120TAKP	TH-N220RHKP	TH-N400RHKP	—
		TH-N120TAHZKP	TH-N220HZKP	TH-N400HZKP	TH-N600KP(Note 3)
	103 x 67 x 105	112 x 87 x 105	144 x 114 x 179	144 x 160 x 193	—
		112 x 103 x 105	144 x 104 x 166.5	144 x 173 x 166.5	63 x 42 x 83.5
	JIS, JEM, IEC, VDE, BS, UL, GB				
	-10 to +40 (Standard is 20°C, Inner Panel Maximum Temperature is 55°C)				
	0 (DC) to 400		50 to 60		
	690				
	6				
	3				
	42 (34 to 50) 54 (43 to 65) 67 (54 to 80) 82 (65 to 100)	105 (85 to 125) 125 (100 to 150)	82 (65 to 100) 105 (85 to 125) 125 (100 to 150) 150 (120 to 180) 180 (140 to 220) 210 (170 to 250)	105 (85 to 125) 125 (100 to 150) 150 (120 to 180) 180 (140 to 220) 250 (200 to 300) 330 (260 to 400) ∗The thermal overload relay with the heater designation of 180A or less is the same as the N220 frame.	250 (200 to 300) (Current Transformer Ratio: 400/5 A) 330 (260 to 400) (Current Transformer Ratio: 500/5 A) 500 (400 to 600) (Current Transformer Ratio: 750/5 A) 660 (520 to 800) (Current Transformer Ratio: 1000/5 A)
	3.0/7.1	3.8/8.6	1.0/2.3 (Note 4)	1.0/2.3 (Note 4)	1.0/2.3 (Note 4)
	M8	M8	M10	M12	—
	—	—	—	—	—
	8-8 to 38-8	38-8 to 100-8	22-10 to 150-10	22-12 to 200-12	—
	1a1b	1a1b	1a1b	1a1b	1a1b
	5	5	5	5	5
	2(0.5)/3(0.5)	2(0.5)/3(0.5)	2(0.5)/3(0.5)	2(0.5)/3(0.5)	2(0.5)/3(0.5)
	2(0.5)/3(0.5)	2(0.5)/3(0.5)	2(0.5)/3(0.5)	2(0.5)/3(0.5)	2(0.5)/3(0.5)
	1(0.5)/2(0.5)	1(0.5)/2(0.5)	1(0.5)/2(0.5)	1(0.5)/2(0.5)	1(0.5)/2(0.5)
	0.5(0.5)/1(0.5)	0.5(0.5)/1(0.5)	0.5(0.5)/1(0.5)	0.5(0.5)/1(0.5)	0.5(0.5)/1(0.5)
	1(0.3)	1(0.3)	1(0.3)	1(0.3)	1(0.3)
	0.2(0.2)	0.2(0.2)	0.2(0.2)	0.2(0.2)	0.2(0.2)
	0.1(0.1)	0.1(0.1)	0.1(0.1)	0.1(0.1)	0.1(0.1)
	20V 5mA	20V 5mA	20V 5mA	20V 5mA	20V 5mA
	M4	M4	M4	M4	M4
	φ1.6, 1.25 to 2	φ1.6, 1.25 to 2	φ1.6, 1.25 to 2	φ1.6, 1.25 to 2	φ1.6, 1.25 to 2
	1.25-4 to 2-4, 5.5-S4	1.25-4 to 2-4, 5.5-S4	1.25-4 to 2-4, 5.5-S4	1.25-4 to 2-4, 5.5-S4	1.25-4 to 2-4, 5.5-S4
	156		156		156
	10 to 55Hz 19.6m/s^2				
	◎	◎	◎	◎	◎
	Manual/Automatic Switchable	Manual/Automatic Switchable	Manual/Automatic Switchable	Manual/Automatic Switchable	Manual/Automatic Switchable
	◎	◎	◎	◎	◎
	◎	◎	◎	◎	◎
	N125, N150	N125, N150 N150	N180, N220 N220	N300, N400 N400	N600, N800
	○ (TH-N120SR)	○ (TH-N120TASR)	○ (TH-N220□SR)	○ (TH-N400□SR)	○ (TH-N600SR)
	○ (TH-N120KPSR)	○ (TH-N120TAKPSR)	○ (TH-N220□KPSR)	○ (TH-N400□KPSR)	○ (TH-N600KPSR)
	—	—	—	—	—
	—	—	—	—	—
	—	—	—	—	—
	◎ (UN-RR□6)	◎ (UN-RR□6)	◎ (UN-RR□6)	◎ (UN-RR□6)	◎ (UN-RR□6)
	◎ (UN-TL60)	◎ (UN-TL60)	◎ (UN-TL60)	◎ (UN-TL60)	◎ (UN-TL60)
	—	—	—	—	—
	◎ (UN-CV603)	◎ (UN-CV603)	◎ (UN-CV603)	◎ (UN-CV603)	◎ (UN-CV603)

Note 3. Use TH-N600(KP) in combination with current transformer for measuring instruments (rated secondary load of 15 VA or more). The recommended model names are CW-15LM or CW-15L for 250, 330 and 500 A, and CW-40LM for 660 A. The ratio of current transformation is as shown in the heater designation field in the table.

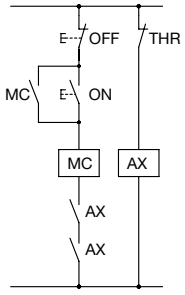
Note 4. The power consumption indicates the amount consumed by the heater element only. (The current transformer consumption amounts of the N220 to N600 frames are not included.)

5.2 Contact Rating

● Main circuit specifications... as shown on page136 ● Specifications of the control circuit (contact) ● The contact rating is as shown in the following table

Frame		T18		T25,T50		T65,T100,N120 to N600	
Contact		Break Contact	Make Contact	Break Contact	Make Contact	Break Contact	Make Contact
Conventional Free Air Thermal Current Ith [A]		2	2	5	5	5	5
Class AC-15 Rated Operating Current [A]	AC24V	2 (0.5)	2 (0.5)	3 (0.5)	2 (0.5)	3 (0.5)	2 (0.5)
	AC120V	2 (0.5)	2 (0.5)	3 (0.5)	2 (0.5)	3 (0.5)	2 (0.5)
	AC240V	1 (0.5)	1 (0.5)	2 (0.5)	1 (0.5)	2 (0.5)	1 (0.5)
	AC550V	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)	1 (0.5)	0.5 (0.5)
Class DC-13 Rated Operating Current [A]	DC24V	0.5 (0.3)	0.5 (0.3)	1 (0.3)	1 (0.3)	1 (0.3)	1 (0.3)
	DC110V	0.2 (0.2)	0.2 (0.2)	0.2 (0.2)	0.2 (0.2)	0.2 (0.2)	0.2 (0.2)
	DC220V	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)

Note 1. The withstand voltage is AC2500 V for 1 minute.
Note 2. The contact arrangement is 1a1b.
Note 3. If the coil current of the DC operated magnetic contactor (SD) exceeds 0.2 A at DC110 V or 0.1 A at DC220 V (SD-N125 or higher), conduct through the SR or SRD contactor relay. (Refer to the figure on the right)
Note 4. The minimum available voltage and current level in a clean atmosphere is 20 V 5 mA.
Note 5. The value in parentheses is the rating during auto reset.



MC : SD Type
AX : SRD Type
THR : TH Type

5.3 Operating Properties (Standard Value)

The operating properties of the thermal overload relays are specified as shown in the table below according to the standards.

Standard	Conditions	Operation in Balanced Circuit				Operation in Unbalanced Circuit		Ambient Temperature
		Limit Operations		Operation During Overload	Operation During Constraint	Non-Operation	Operation	
		A (Cold Start)	B (Continued From A)	C (Hot Start)	D (Cold Start)	A (Cold Start)	B (Continued From A)	
JIS C8201-4-1	Multiple of Settling Current	1.05	1.2	1.5	7.2	2-Pole 1.0 1-Pole 0.9	2-Pole 1.15 1-Pole 0	20℃
	Operating Time	Non-Operation (2 Hours)	Within 2 Hours	(5) Less Than 2 Minutes (10A) Less Than 2 Minutes (10) Less Than 4 Minutes (20) Less Than 8 Minutes (30) Less Than 12 Minutes	(5) Tp ≤ 5 Seconds (10A) 2 < Tp ≤ 10 Seconds (10) 4 < Tp ≤ 10 Seconds (20) 6 < Tp ≤ 20 Seconds (30) 9 < Tp ≤ 30 Seconds	Non-Operation (2 Hours)	Within 2 Hours	
IEC 60947-4-1	Multiple of Settling Current	1.05	1.2	1.5	7.2	2-Pole 1.0 1-Pole 0.9	2-Pole 1.15 1-Pole 0	20℃
	Operating Time	Non-Operation (2 Hours)	Within 2 Hours	(10A) Less Than 2 Minutes (10) Less Than 4 Minutes (20) Less Than 8 Minutes (30) Less Than 12 Minutes	(10A) 2 < Tp ≤ 10 Seconds (10) 4 < Tp ≤ 10 Seconds (20) 6 < Tp ≤ 20 Seconds (30) 9 < Tp ≤ 30 Seconds	Non-Operation (2 Hours)	Within 2 Hours	
JEM 1356	Multiple of Settling Current	1.05	1.2	1.5	7.2	2-Pole 1.0 1-Pole 0.9	2-Pole 1.15 1-Pole 0	20℃
	Operating Time	Non-Operation (2 Hours)	Within 2 Hours	(Quick) Within 4 Minutes (Standard) Within 8 Minutes (Delay) Within 12 Minutes	(Quick) Tp ≤ 5 Seconds (Standard) 2 ≤ Tp ≤ 15 Seconds (Delay) 9 ≤ Tp ≤ 30 Seconds	Non-Operation (2 Hours)	Within 2 Hours	

Note 1. It shows the case of the thermal overload relay with ambient temperature compensation and open phase detection.
Note 2. Tp shows the operating time while restrained.
Note 3. The operating time field ( ) of the operation during overload and constraint represents the trip class in JIS and IEC, and type in JEM.

5.4 Selection and Application

● Selecting Thermal Overload Relays

The principles in the selection of the thermal overload relay are that its operating characteristic curve falls below the thermal properties (overcurrent - service lifetime properties) of the motor, and exceeds the startup properties (startup current - time properties) curve of the motor. Judge the suitability of the thermal properties and starting properties of the motor by superposing them on the operating characteristic curve (see page 153) of the thermal overload relay. (Refer to Figure 4 on page 143)

Motor, Running, Protection Conditions, etc.	Selection	Applicable Thermal Overload Relays	
		With 2-Element	With 3-Element (2E)
Standard Start, Stop (Low Frequency)	Standard Thermal Overload Relays	TH-□Type	TH-□KP Type
Fan, blower, etc. with long start-up time	Thermal Overload Relays With Saturable Reactor	TH-□SR Type	TH-□KPSR Type
Submersible motor and compressor motor with short allowable constraint time	Quick-acting Characteristics Thermal Overload Relays	TH-□FS Type	TH-T□FSKP Type
Inching, High Frequency Intermittent Running	Although unnecessary trips may be avoided by the thermal overload relay with a saturable reactor to provide the adequate protection, detailed consideration is required	Consideration Required	Consideration Required
For Open-Phase Protection	Thermal Overload Relays With 3-Element (2E)	—	TH-□KP Type
Reverse-Phase and Open-Phase Protection Dual Use	Electronic Motor Protection Relays (3E)	—	(ET-□ Type)

Note 1. For more information on the startup time of motors and application of thermal overload relays, refer to page 140.

● Thermal Overload Relay Heater Designation Selection Table

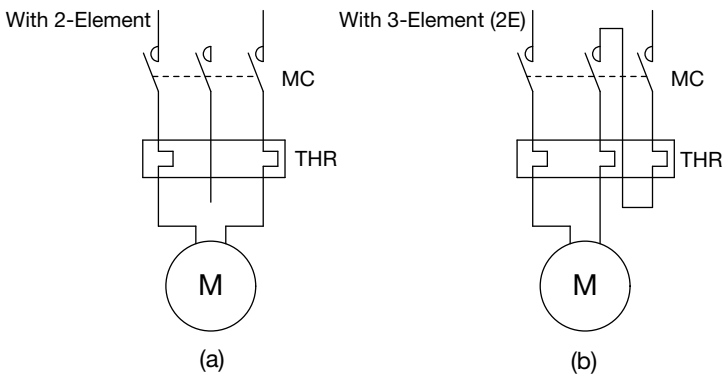
Guidelines for the selection of general thermal overload relays are shown in the following table.

Voltage / Motor Capacity [kW]	Three-Phase Motors								Single-Phase Motors				Voltage / Capacity [kW]
	200 to 220V	230 to 240V	346 to 350V	380V	400 to 440V	460 to 500V	550 to 600V	660V	100 to 110V	115 to 120V	200 to 220V	230 to 240V	
0.03	0.24A	0.24A	—	—	—	—	—	—					0.03
0.035	0.35A	0.24A	0.24A	0.24A	—	—	—	—	1.7A		0.9A		0.035
0.05	0.35A	0.35A	0.24A	0.24A	0.24A	—	—	—					0.05
0.06 to 0.065	0.5A	0.35A	0.35A	0.24A	0.24A	0.24A	—	—	2.5A		1.3A		0.06 to 0.065
0.07	0.5A	0.5A	0.35A	0.35A	0.35A	0.24A	—	—					0.07
0.09	0.7A	0.7A	0.35A	0.35A	0.35A	0.24A	0.24A	—					0.09
0.1	0.7A	0.7A	0.35A	0.35A	0.35A	0.35A	0.24A	—	3.6A		1.7A		0.1
0.12	0.9A	0.7A	0.5A	0.5A	0.5A	0.35A	0.24A	—		3.6A		2.1A	0.12
0.15	0.9A	0.9A	0.7A	0.7A	0.5A	0.5A	0.35A	—	5A		2.5A		0.15
0.18	1.3A	0.9A	0.7A	0.7A	0.7A	0.5A	0.5A	—	5A	5A		2.5A	0.18
0.2	1.3A	0.9A	0.7A	0.7A	0.7A	0.7A	0.5A	—	5A		2.5A		0.2
0.25	1.7A	1.3A	0.9A	0.9A	0.7A	0.7A	0.5A	—	6.6A	6.6A	3.6A	3.6A	0.25
0.3	1.7A	1.3A	0.9A	0.9A	0.9A	0.9A	0.7A	—	6.6A		3.6A		0.3
0.37 to 0.4	2.1A	2.1A	1.3A	1.3A	1.3A	0.9A	0.7A	—	9A	9A	5A	5A	0.37 to 0.4
0.55	2.5A	2.5A	1.7A	1.7A	1.3A	1.3A	0.9A	—	11A	11A	5A	6.6A	0.55
0.75	3.6A	3.6A	2.1A	2.1A	1.7A	1.7A	1.3A	1.3A	15A	15A	6.6A	9A	0.75
1.0	5A	5A	2.5A	2.5A	2.5A	2.1A	1.7A	1.7A					1.0
1.1	5A	5A	3.6A	2.5A	2.5A	2.1A	1.7A	1.7A	22A	22A	9A	9A	1.1
1.3	6.6A	5A	3.6A	3.6A	2.5A	2.5A	2.1A	2.1A					1.3
1.5	6.6A	6.6A	3.6A	3.6A	3.6A	2.5A	2.5A	2.1A	29A	22A	15A	11A	1.5
2.2	9A	9A	5A	5A	5A	3.6A	3.6A	3.6A					2.2
3	11A	11A	6.6A	6.6A	6.6A	5A	5A	3.6A		35A		15A	3
3.7 to 4	15A	15A	9A	9A	6.6A	6.6A	5A	5A		54A		29A	3.7 to 4
5.5	22A	22A	15A	11A	11A	9A	9A	6.6A		82A		42A	5.5
7.5	29A	29A	15A	15A	15A	11A	9A	9A		105A		54A	7.5
9	35A	29A	22A	22A	15A	15A	11A	11A					9
11	42A	42A	22A	22A	22A	22A	15A	15A					11
15	54A	54A	35A	29A	29A	22A	22A	15A					15
18.5 to 19	67A	67A	42A	35A	35A	29A	22A	22A					18.5 to 19
22	82A	82A	54A	42A	42A	35A	29A	22A					22
25	82A	82A	54A	54A	54A	35A	35A	29A					25
30	105A	105A	67A	54A	54A	42A	42A	35A					30
37	125A	125A	82A	67A	67A	54A	54A	42A					37
45	150A	150A	105A	82A	82A	67A	54A	54A					45
55 to 60	180A	180A	125A	105A	105A	82A	67A	67A					55 to 60
75	250A	250A	150A	125A	125A	105A	105A	82A					75
90	330A	330A	180A	150A	150A	125A	105A	105A					90
110	330A	330A	250A	180A	180A	150A	125A	105A					110
132	500A	500A	250A	250A	250A	180A	150A	150A					132
150 to 160	500A	500A	330A	250A	250A	250A	180A	180A					150 to 160
185	660A	500A	330A	330A	330A	250A	250A	180A					185
200	660A	660A	500A	330A	330A	330A	250A	180A					200
220	660A	660A	500A	500A	500A	330A	250A	250A					220
250	—	—	500A	500A	500A	330A	330A	250A					250
300 to 315	—	—	660A	500A	500A	500A	330A	330A					300 to 315
370 to 400	—	—	—	660A	660A	500A	500A	500A					370 to 400

Note 1. The table above shows the selection of heater designation based on the full-load current value of the 4-pole standard three-phase motor and single-phase motor manufactured by Mitsubishi Electric.
When ordering by motor capacity, determine the heater designation of the thermal overload relay with this table. Specify the voltage and capacity accurately.

Note 2. If the number of poles in the three-phase motor is different, or in the case of special motors, the full-load current value may be different.
In such a case, specify by the heater designation upon investigating the full-load current of the motor.

Note 3. For single-phase motors, the full-load current varies depending on the start-up and running methods. Therefore, treat the values in the above table as guidelines, and specify the appropriate heater designation upon checking the full-load current for actual use. For single-phase motors, connect as shown in the figure below.



Connecting Thermal Overload Relays to a Single-Phase Motor

TH-T/N Type Thermal Overload Relays

Application of Various Thermal Overload Relays

- TH (standard/with 2-element):
  General overload and constraint protection of the motor
- TH-KP (with 3-element [2E]):
  Overload, constraint and open-phase protection of the motor
- TH-SR (with saturable reactor)
  Motors with long startup time, applications with frequent inching and intermittent running.
- TH-T□FSKP (quick trip type with 3-element [2E])
  Protection of submersible motors and explosion proof motors
- TH-FS (2-element quick trip type)
  Protection of compressor motor for refrigerators

Application to Standard Three-Phase Motors

Select the frame and heater designation from the table below. Refer to page 139 for details.

Heater Designation [A]	Setting Range Current [A]	Frame	Standard Three-Phase Motor Capacity [kW]		Reference Connecting Electric Wire Size [mm²]
			200 to 220 V	380 to 440 V	
0.12	0.1 to 0.16	T18			
0.17	0.14 to 0.22	T18			
0.24	0.2 to 0.32	T18	0.03	0.05	1.5
0.35	0.28 to 0.42	T18	0.05	0.1	1.5
0.5	0.4 to 0.6	T18	0.07		1.5
0.7	0.55 to 0.85	T18	0.1	0.2	1.5
0.9	0.7 to 1.1	T18			
1.3	1 to 1.6	T18	0.2	0.4	1.5
1.7	1.4 to 2	T18		0.75	1.5
2.1	1.7 to 2.5	T18	0.4		1.5
2.5	2 to 3	T18		1	1.5
3.6	2.8 to 4.4	T18	0.75	1.5	1.5
5	4 to 6	T18	1	2.2	1.5
6.6	5.2 to 8	T18	1.5	3.7	1.5
9	7 to 11	T18	2.2		1.5
11	9 to 13	T18		5.5	2.5
15	12 to 18	T18	3.7	7.5	4
22	18 to 26	T25	5.5	11	6
29	24 to 34	T25	7.5	15	10
35	30 to 40	T25		18.5	10
42	34 to 50	T50	11	22	16
54	43 to 65	T50	15	30	25
67	54 to 80	T65	18.5	37	25
82	65 to 100	T65	22	45	35
95	85 to 105	T100	30	55	50
105	85 to 125	T100	30	55	50
125	100 to 150	N120	37	75	50
150	120 to 180	N120	45	90	70
180	140 to 220	N120	55	110	95
210	170 to 250	N120TA	75	132	150
250	200 to 300	N220	75	132, 160	150
330	260 to 400	N220	90, 110	200	185
500	400 to 600	N220	132, 160	315	2 x 200 (2 x 150) ∗2
660	520 to 800	N220	200	400	2 x 240

∗1 The thermal overload relay with the heater designation of 180A or less in the N400 frame is the same as that of the N220 frame.
∗2 The value in parentheses is applicable to 220 V, 132 kW

Note 1. The connecting electric wire size indicates the selection of HIV wire based on indoor wiring regulations (Section 1340) when performing metal tube wiring at the ambient temperature of 40°C.

Startup Time of Motor and Application of TH Thermal Overload Relays

An overview of the application classifications for the standard TH and TH-SR with saturable reactor by motor start-up time is shown in the table below.

Frame	Heater Designation [A]	Motor Starting Time [sec] 5 8 10 15 20		
T18	0.12 to 15	T18	T18SR	The heater of the thermal overload relay is short-circuited during the start-up.
T25	0.24 to 22	T25	T25SR	
T50	29 to 42	T50	T50SR	
T65	15 to 54	T65	T65SR	
T100	67, 82, 95	T100	T100SR	
N120, N120TA	42 to 125	N120, N120TA	N120SR, N120TASR	
N220	82 to 210	N220	N220SR	
N400	105 to 330	N400	N400SR	
N600	250 to 660	N600	N600SR	

Note 1. The above table is a measure of the central value of the heater designation when the motor startup current is 500 to 600%. Check the characteristic curve for details.

Application to Single-Phase Circuits

When applying a thermal overload relay (TH-□KP, etc.) with 3-element (2E) to a single-phase circuit, it will not operate normally if only 2 elements are energized. As in Fig. (b) on page 139, make sure that all 3 elements can be energized.

5.5 Structure

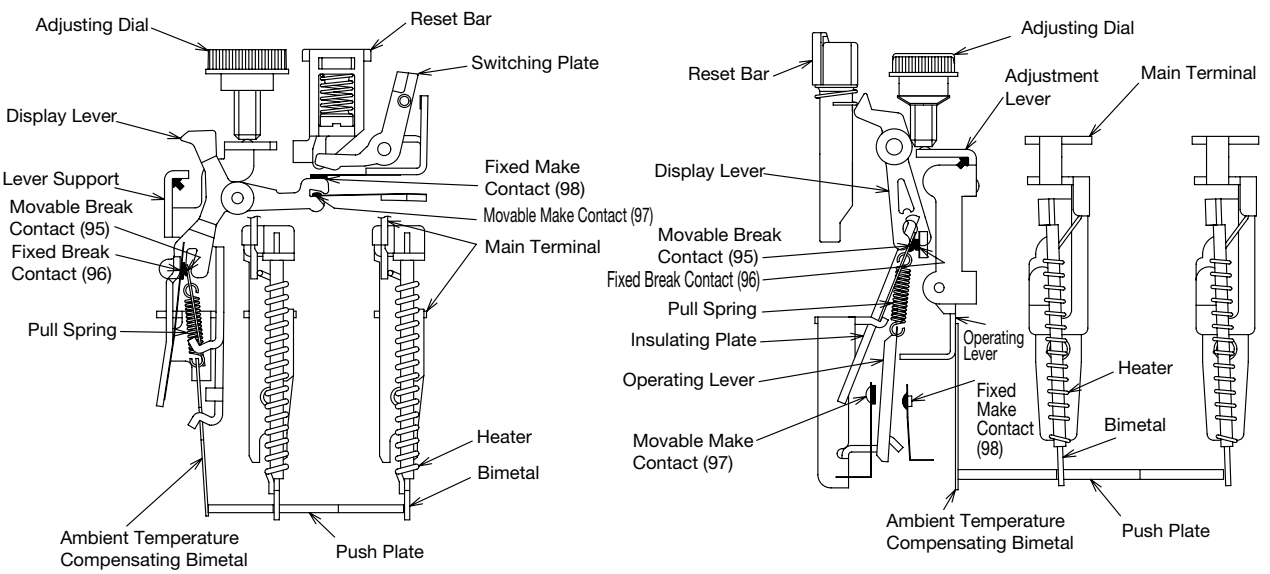


Fig. 1. Structure of the Thermal Overload Relay (with 2-Element)

● Reset Method

All models of TH-T/N Series thermal overload relays have a structure that allows manual/automatic reset switching. The factory default (standard) is manual reset.

● Structure of the Thermal Overload Relay With Open-Phase Protection Function

The push plate of the thermal overload relay with overload and open-phase protection (TH-☐KP) has a differential amplification mechanism that transmits the action of the bimetal to the contact mechanism as shown in Figure 2. Its design is suitable for protection during open phase.

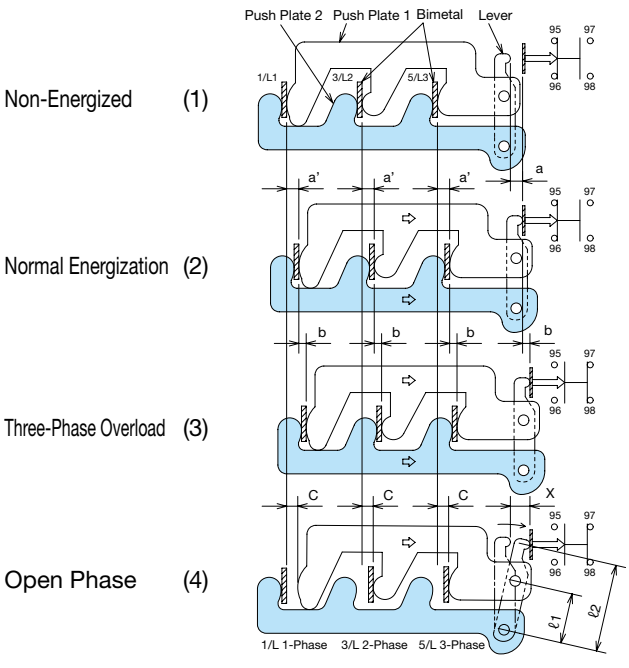


Fig. 2. Operation explanatory diagram of TH-KP thermal overload relay with 3-element (2E)

(1) Non-Energized
The 3-pole bimetal is not displaced and maintains a distance of "a" from the position where the lever is pressed. The push plates 1 and 2 are placed so as to sandwich the bimetal.

(2) Normal Energization
If the 3-pole bimetal is displaced by the amount a', push plate 1 also slides by a' (a' < a), and push plate 2 slides with it. This state does not lead to the operation of the contact.

(3) Three-Phase Overload
The state of the bimetal is further displaced from (2), making the push plate slide by b together with the lever to operate (trip) the contact.

(4) Open Phase
As shown in the figure, if the 1/L1 phase is open, the bimetal of this phase will not be displaced, and the bimetal of 3/L2 phase and 5/L3 phase that are energized will be displaced by C. In this case, push plate 2 will be restrained by the bimetal of the 1/L1 phase at open-phase and will not be able to slide to the right, and only push plate 1 will slide. As a result, the lever will rotate clockwise about the rotation axis of push plate 2. This enlarges the movement of the position where the lever contact is pushed by $x \approx c \times \ell_2/\ell_1$, allowing operation with a smaller current at open-phase compared with the all-phase energization.

5.6 Precautions for Use

● Model Name Identification by Mounting Method

Note 1. T25, T65 and N120 can be independently mounted as standard.

Note 2. T18, T50, T100, N120TA, N220RH and N400RH are for magnetic starters. (No Independent Mounting)
N120TAHZ, N220HZ and N400HZ are for independent mounting.

Note 3. For T18, independent mounting and IEC 35 mm rail mounting may be enabled by combining with UT-HZ18.
For T25, IEC 35 mm rail mounting may be enabled by combining with UN-RM20.

● Disassembly

The Thermal Overload Relays are adjusted at the time of assembly. Do not disassemble it.
Do not use with the terminal removed, as the properties may change.

● Ambient Temperature Compensation

The TH-T/N type Thermal Overload Relays are adjusted with the Magnetic Starters in the standard box (the MS type) relative to the ambient temperature of 20°C (The temperature on the control board of the MSO type Magnetic Starters is 35°C). The ambient temperature compensator is mounted on the TH-T/N type Thermal Overload Relays. Therefore, the ambient temperature less affects the operational characteristic change. The minimum operating current change according to the ambient temperature change relative to the ambient temperature of 20°C (the temperature on the control board of 35°C) generally depends on the characteristics in the diagrams 1 and 2. The Thermal Overload Relays have a characteristic that the operating current becomes high when the ambient temperature is low and becomes low when the ambient temperature is high. If the ambient temperature of the installation site is significantly different from 20°C (the temperature on the control board of 35°C), the setting current of the Thermal Overload Relays needs to be corrected as shown in diagrams 1 and 2. In addition, note that the compensation factor has a characteristic to be the minimum scale>middle scale>maximum scale at the adjustment knob location. (Note that the Thermal Overload Relays may operate at a current of less than 100% stabilized current if in use at temperatures exceeding the allowable working temperature of 40°C (55°C).)

Fig. 3.1 Ambient temperature compensation curve (T18 frame)

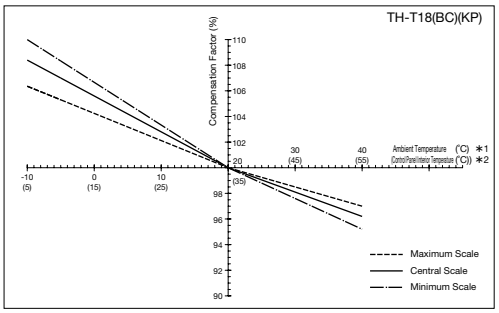


Fig. 3.2 Ambient temperature compensation curve (T25/T50/T65/T100 frame)

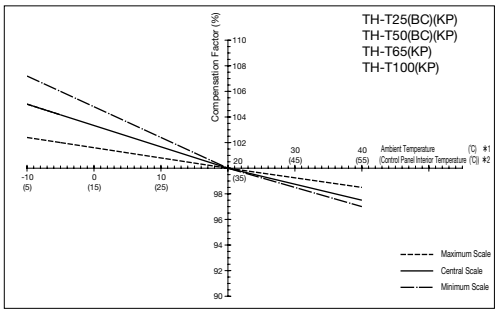


Fig. 3.3 Ambient temperature compensation curve (N120 frame)

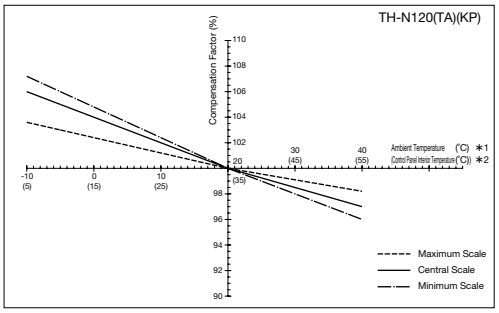


Fig. 3.4 Ambient temperature compensation curve (N220/N400 frame)

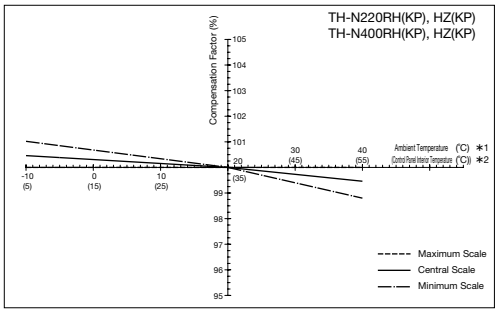
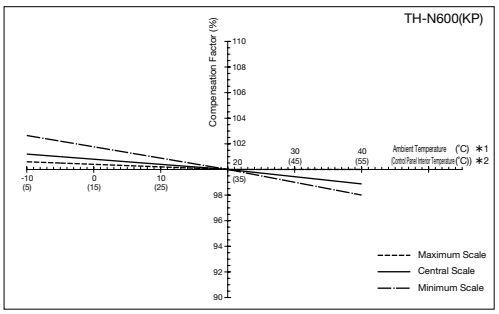


Fig. 3.5 Ambient temperature compensation curve (N600 frame)



Compensation factor: Percentage of the minimum operating current at the ambient temperature of 20°C(the temperature on the control board of 35°C)

<Compensation procedure of setting current>
Determine the compensation factor of the working ambient temperature according to the curves in diagrams 3.1 and 3.5 and use the value of all load currents of the motor divided by the determined compensation factor as the stabilization value.
(Example: The ambient temperature compensation factor for TH-T50 at the ambient temperature of 40°C (the temperature on the control board of 55°C) is 97% at the minimum scale according to diagram 3.2. If the motor rated current is 43A, the stabilization value is 44.3A (=43/0.97).)

Note 1. The ambient temperature applied to MS type indicates the outside temperature of the box.

Note 2. The temperature including the temperature increase on the control board applied to the MSO type is indicated.

Note 2. When the thermal overload relay is independently mounted, divide the settling value obtained in Figure 3.1 to 3.5 by the compensation factors in the table below.

● Compensation factor when using the thermal overload relay independently

Model Name	Independent Thermal Overload Relays TH-□
TH-T18(BC)(KP) 0.12 to 2.5A	1.04
TH-T18(BC)(KP) 3.6A	1.05
TH-T18(BC)(KP) 5 to 15A	1.06
TH-T25(BC)(KP)	1.06
TH-T65(KP)	1.05

Model Name	Independent Thermal Overload Relays TH-□
TH-N120(KP) 42A 54A	1.08
TH-N120(KP) 67A 82A	1.16
TH-N220(KP)/N400(KP)	1.01
TH-N600(KP)	1.02

● Connecting Electric Wire Size And Operating Current

The minimum operating current of TH-T/N has been adjusted by the standard wire size as shown in the table below. If the electric wire is thicker or thinner than this standard electric wire size, the operating current becomes high or low, respectively. Therefore, correct the stabilized current (divide it by the change rate of the minimum operating current) to use a size different from the standard connecting electric wire size.

● Connecting Electric Wire Size and Minimum Operating Current

Model Name	Heater Designation [A]	Standard Electric Wire Size [mm^2]	Connecting Electric Wire Size [mm^2]	Change Rate of Minimum Operating Current [%]
TH-T18(KP)	0.12 to 15	2	1.25 2.5	98 103
TH-T25(KP)	0.24 to 11			
TH-T25(KP)	15, 22	3.5	2 6	97 104
TH-T50(KP)	29	8	5.5 14	96 104
	35			
	42	14	8	95
TH-T65(KP)	15	3.5	2 5.5	95 105
	22, 29	5.5	3.5 8	96 105
	35	8	5.5 14	95 105
	42	14	8 22	95 104
	54	22	14 30	96 104

Model Name	Heater Designation [A]	Standard Electric Wire Size [mm^2]	Connecting Electric Wire Size [mm^2]	Change Rate of Minimum Operating Current [%]
TH-T100(KP)	67	22	14 30	97 103
	82	38	30	97
TH-N120(KP)	42	14	8 22	95 104
	54, 67	22	14 30	96 104
	82	38	30 50	97 103
TH-N120TA(KP)	105	60	38 60	97 103
	125	60	50 80	98 103

● Combination With No-Fuse Breaker (Protection Coordination)

Magnetic starters are responsible for the starting and stopping of motors, and protection from burnout due to overload, constraint or open-phase. Short-circuit protection devices such as no-fuse breakers are responsible for the current larger than the interruption capability of the magnetic starter caused by a short circuit, etc.

Properly performing these allocations is called protection coordination and the principles are as follows (see Figure 4)

(1) The combined operating properties of the thermal overload relay and no-fuse breaker must be on the lower side of the thermal properties of the motor, which are on the upper side (right side) of the start-up properties and full-load current of the motor.
(2) For overload current of less than the constraint (startup) current, the thermal overload relay must operate earlier than the no-fuse breaker.
(3) The no-fuse breaker must operate if the current is larger than the interruption capability of the magnetic starter.
(4) The no-fuse breaker should operate if the current is less than the overload resistance of the magnetic starter.
(5) The operating properties of the no-fuse breaker must be lower than the allowable current - time properties of the wire.

For more information, refer to the catalog and technical documents of the no-fuse breaker.

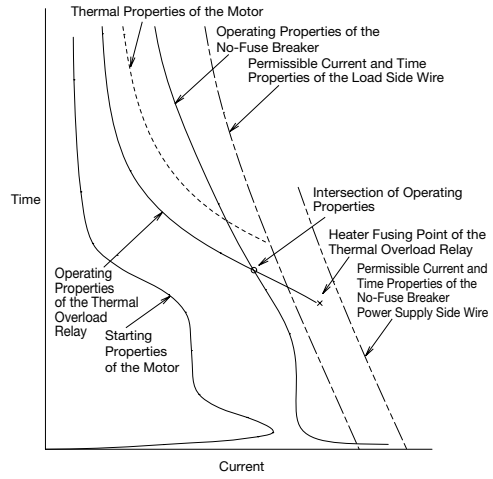


Fig. 4. Protection coordination

Handling (Precautions)

(1) When restarting the tripped thermal overload relay, remove the cause of the trip.
When the automatic reset method is used, in order to prevent the motor from automatically restarting due to reset, implement measures such as adopting a self-retaining circuit. Regardless of the method, the resettable time will be from about 10 seconds to 10 minutes depending on the heating temperature of the bimetal.
Furthermore, to cool the bimetal to the surrounding temperature, use equipment such as fans for about 30 minutes.

(2) Never touch the inside of the thermal overload relay.

(3) The heater wire of the thermal overload relay may blow before tripping if it is charged with a current of 13 times higher than the rating.

(4) The reset method is changed as follows.

Changing the reset method of TH-T18

· Manual→automatic switching method:
After removing the stopper by cutting it with a nipper or the like, slide the switching plate to the right and align it with A as shown in Figure 5.
(In the state as shown in Figure 6.2)

· Automatic→manual switching method:
Slide the switching plate to the left to align with H.
(In the state as shown in Figure 6.1)

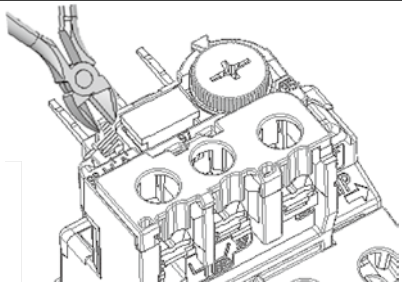


Fig. 5. Cutting the stopper

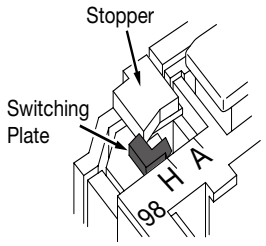


Fig. 6.1 Manual reset

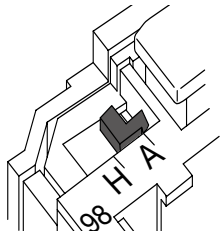


Fig. 6.2 Automatic reset

Note 1. Take precautions as follows when cutting off the stopper.
· Be careful not to let fragments enter the eyes.

Changing the reset method of TH-T25 to T100, TH-N120 to N600

· Manual→automatic switching method:
After cutting off the stopper on the tip of the reset bar, fully push it in, then rotate it in the direction of A. (Figs. 7, 8)

· Automatic→manual switching method:
Rotate the reset bar in the direction of H, to pop out the reset bar. (Fig. 9)

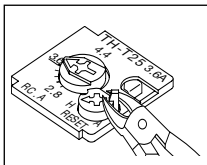


Fig. 7. Cutting the stopper

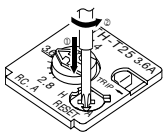


Fig. 8. Automatic reset

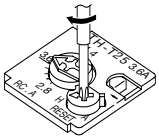
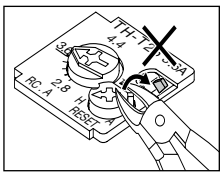


Fig. 9. Manual reset

Note 1.Take precautions as follows when cutting off the stopper on the tip of the reset bar.
·Make sure that segments do not enter from the display window.
The display lever may stop moving.
Block the display window when cutting off the stopper to prevent segments from entering it.
·Be careful not to let fragments enter the eyes.



(5) Manual tripping

Manual tripping is enabled by inserting a screwdriver or the like into the display window in manual reset. (Fig. 10)

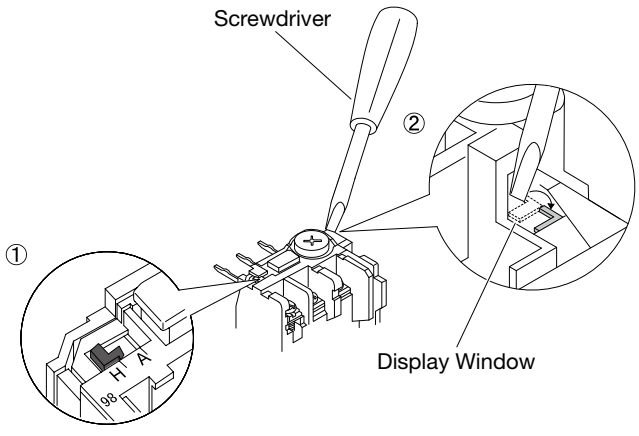


Fig. 10. Manual tripping

Note.For TH-T18, do not perform manual tripping in the automatic reset mode, as this leads to internal component failure. When performing a sequence check, be sure that the automatic reset is switched to manual reset.

(6) Precautions When Combining With the Magnetic Contactor

For the assembling method and precautions when using in combination with the thermal overload relay and magnetic contactor, refer to page 231.

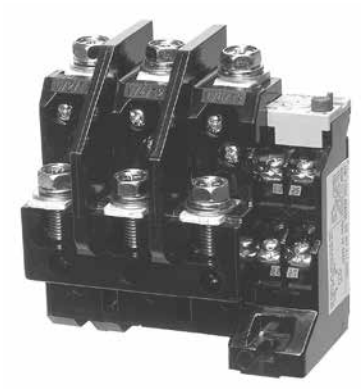
5.7 Standard/Overload and Open-Phase Protection Type Thermal Overload Relays TH-□/KP

TH (standard with 2-element) is suitable for the overload and constraint protection of standard motors, and TH-KP (with 3-element (2E)) is suitable for the overload, constraint and open-phase protection of motors.

TH-KP has the same shape and size as TH (standard with 2-element), and can be easily combined with magnetic contactors.

Features

- Extensive lineup
  2-Element / With 3-Element (2E) — Same Dimensions
- Changing the reset method
  Changing between the manual reset and automatic reset is easy
- Easy wiring



TH-N120

- Easy current setting
  The motor current direct setting can be adjusted by both Phillips and flathead screwdrivers
- Can be manually checked
  Allows manual tripping from the surface using a screwdriver
- With operation indicator
- Trip-Free structure
- With 1a1b contact
  Make and break contacts with different voltage can be used

Features of the TH Thermal Overload Relay

Application

For the selection of heater designation for the capacity of the standard three-phase motor, refer to page 48 or 139.
The manufactured model name, heater designation and combined magnetic contactor frame are shown in the table below.

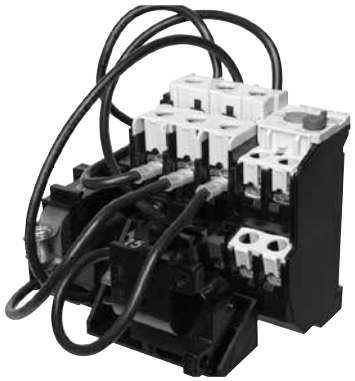
- Manufactured model name, heater designation and combined magnetic contactor frame (standard 2-element, 3-element, and overload and open-phase protection type)

Model Name												
	Standard with 2-Element	For Magnetic Starters	TH-T18	TH-T25	TH-T50	TH-T65	TH-T100	TH-N120	TH-N120TA	TH-N220RH	TH-N400RH	TH-N600 (Note 3)
		For Independent Mounting	(Note 1)		—		—		TH-N120TAHZ	TH-N220HZ	TH-N400HZ	
	With 3-Element (2E)	For Magnetic Starters	TH-T18KP	TH-T25KP	TH-T50KP	TH-T65KP	TH-T100KP	TH-N120KP	TH-N120TAKP	TH-N220RHKP	TH-N400RHKP	TH-N600KP (Note 3)
		For Independent Mounting	(Note 1)		—		—		TH-N120TAHZKP	TH-N220HZKP	TH-N400HZKP	
Operating Frequency Range [Hz]			0 (DC) to 400 (Note 6)							50 to 60		
Heater Designation (Adjustment Range of Settling Current) [A] (The --- line in the table on the right represents the correspondence between the magnetic contactor and frame to be combined)			0.12 (0.1 to 0.16) 0.17 (0.14 to 0.22) 0.24 (0.2 to 0.32) 0.35 (0.28 to 0.42) 0.5 (0.4 to 0.6) 0.7 (0.55 to 0.85) 0.9 (0.7 to 1.1) 1.3 (1 to 1.6) 1.7 (1.4 to 2) 2.1 (1.7 to 2.5) 2.5 (2 to 3) 3.6 (2.8 to 4.4) 5 (4 to 6) 6.6 (5.2 to 8) 9 (7 to 11) 11 (9 to 13) 15 (12 to 18)	0.24 (0.2 to 0.32) 0.35 (0.28 to 0.42) 0.5 (0.4 to 0.6) 0.7 (0.55 to 0.85) 0.9 (0.7 to 1.1) 1.3 (1 to 1.6) 1.7 (1.4 to 2) 2.1 (1.7 to 2.5) 2.5 (2 to 3) 3.6 (2.8 to 4.4) 5 (4 to 6) 6.6 (5.2 to 8) 9 (7 to 11) 11 (9 to 13) 15 (12 to 18) 22 (18 to 26)	29(24 to 34) 35(30 to 40) 42(34 to 50)	15(12 to 18) 22(18 to 26) 29(24 to 34) 35(30 to 40) 42(34 to 50) 54(43 to 65)	67(54 to 80) 82 (65 to 100) 95 (85 to 105)	42(34 to 50) 54(43 to 65) 67(54 to 80) 82(65 to 100)	105(85 to 125) 125 (100 to 150)	82(65 to 100) 105(85 to 125) 125 (100 to 150) 150 (120 to 180) 180 (140 to 220) 210 (170 to 250)	105(85 to 125) 125 (100 to 150) 150(120 to 180) 180 (140 to 220) 250(200 to 300) 330 (260 to 400) ∗The thermal overload relay with heater designation of 180A or less is the same as the N220 frame.	250 (200 to 300) Current Transformer Ratio 400/5 A 330 (260 to 400) Current Transformer Ratio 500/5 A 500 (400 to 600) Current Transformer Ratio 750/5 A 660 (520 to 800) Current Transformer Ratio 1000/5 A
Trip Class (see page 148)			10A	10A	10A	15A to 42A : 10 54A : 10A	67A : 10 82A : 10A	10	10	10	10	10A
Frame of the Combined Magnetic Contactor			T10, T12, T20 T12, T20 T20	T21, T25 T35, T50	T35,T50 T50	T65,T80 T100	T80,T100 T100	N125,N150	N125,N150 N150	N180,N220 N220	N300,N400 N400	N600,N800

Note 1.For TH-T18(KP), independent mounting and IEC 35 mm rail mounting may be enabled by combining with UT-HZ18.
Note 2.For TH-T25(KP), IEC 35 mm rail mounting may be enabled by combining with UN-RM20.
Note 3.Use TH-N600(KP) in combination with current transformer for measuring instruments (rated secondary load of 15 VA or more: recommended model names are CW-15LM, CW-15L or CW-40LM).
The ratio of current transformation is as shown in the heater designation field in the table.
Note 4.The - mark in the model name field indicates that it is outside production range.
Note 5.TH-T18(KP), T25(KP), T50(KP) with BC and TH-T65(KP) with CW can also be manufactured.
However, TH-T50BC(KP) has no screw holder attached to the main circuit terminal (3-pole) on the power supply side.
Note 6.It is standardly used at the commercial frequency of 50/60 Hz. Make sure that the protection coordination with motor characteristics is possible before use.

5.8 Thermal Overload Relays with Saturable Reactor TH-□(KP)SR

As the standard thermal overload relay operates at startup, suitable protective properties may not be obtained for motors that take a long time to start, such as those that are started with a large inertial load.
The thermal overload relay with saturable reactor has a structure with a small reactor with an iron-containing core connected in parallel with the heater. It causes little change to the operating properties in the current range of up to about 200% of settling current, and in the current range beyond that, the iron core of the reactor is saturated to increase the shunt current to the reactor and limit the current to the heater in order to increase the operating time limit.
In addition, it helps achieve protection coordination with a low voltage circuit breaker.



TH-T25KPSR

● Application

For selection of heater designation for the capacity of the standard three-phase motor, refer to pages 48 and 139. Selection guidelines for motor start-up time are shown on page 140. The manufactured model name, heater designation and combined magnetic contactor frame are indicated in the table below.

● Manufactured model name, heater designation and combined magnetic contactor frame (with saturable reactor)

Model Name													
	With 2-Element	For Magnetic Starters	For Non-Reversing	TH-T18SR	TH-T25SR (Note 5)	TH-T50SR	TH-T65SR	TH-T100SR	TH-N120SR	TH-N120TASR	TH-N220RHSR	TH-N400RHSR	TH-N600SR
			For Reversing	TH-T18HZSR									
		For Independent Mounting		(See Note 1)		–		–		–	TH-N220HZSR	TH-N400HZSR	
	With 3-Element (2E)	For Magnetic Starters	For Non-Reversing	–	TH-T25KPSR (Note 5)	TH-T50KPSR	TH-T65KPSR	TH-T100KPSR	TH-N120KPSR	TH-N120TAKP SR	TH-N220RHKP SR	TH-N400RHKP SR	TH-N600KPSR
			For Reversing										
		For Independent Mounting		–		–		–		–	TH-N220HZKP SR	TH-N400HZKP SR	
Operating Frequency Range [Hz]				50 to 60									
Heater Designation (Adjustment Range of Settling Current) [A] (The --- line in the table on the right represents the correspondence between the magnetic contactor and frame to be combined)				0.24 (0.2 to 0.32) 0.35 (0.28 to 0.42) 0.5 (0.4 to 0.6) 0.7 (0.55 to 0.85) 0.9 (0.7 to 1.1) 1.3 (1 to 1.6) 1.7 (1.4 to 2) 2.1 (1.7 to 2.5) 2.5 (2 to 3) 3.6 (2.8 to 4.4) 5 (4 to 6) 6.6 (5.2 to 8) 9 (7 to 11) 11 (9 to 13) 15 (12 to 18)	0.24 (0.2 to 0.32) 0.35 (0.28 to 0.42) 0.5 (0.4 to 0.6) 0.7 (0.55 to 0.85) 0.9 (0.7 to 1.1) 1.3 (1 to 1.6) 1.7 (1.4 to 2) 2.1 (1.7 to 2.5) 2.5 (2 to 3) 3.6 (2.8 to 4.4) 5 (4 to 6) 6.6 (5.2 to 8) 9 (7 to 11) 11 (9 to 13) 15 (12 to 18) 22 (18 to 26)	29 (24 to 34) 35 (30 to 40) 42 (34 to 50)	15 (12 to 18) 22 (18 to 26) 29 (24 to 34) 35 (30 to 40) 42 (34 to 50) 54 (43 to 65)	67 (54 to 80) 82 (65 to 100) 95 (85 to 105)	42 (34 to 50) 54 (43 to 65) 67 (54 to 80) 82 (65 to 100)	105 (85 to 125) 125 (100 to 150)	82 (65 to 100) 105 (85 to 125) 125 (100 to 150) 150 (120 to 180) 180 (140 to 220) 210 (170 to 250)	105 (85 to 125) 125 (100 to 150) 150 (120 to 180) 180 (140 to 220) 250 (200 to 300) 330 (260 to 400) *The thermal overload relay with heater designation of 180A or less is the same as the N220 frame.	250 (200 to 300) [Current Transformer Ratio 400/5 A] 330 (260 to 400) [Current Transformer Ratio 500/5 A] 500 (400 to 600) [Current Transformer Ratio 750/5 A] 660 (520 to 800) [Current Transformer Ratio 1000/5 A]
Frame of the Combined Magnetic Contactor				T10, T12, T20 T12,T 20 T20	T21,T25 T35,T50	T35, T50 T50	T65, T80 T100	T80, T100 T100	N125, N150	N125, N150 N150	N180, N220 N220	N300, N400 N400	N600, N800

Note 1. For TH-T18HZSR, independent mounting and IEC 35 mm rail mounting may be enabled by combining with UT-HZ18.
Note 2. Use TH-N600(KP)SR in combination with current transformer for measuring instruments (rated secondary load of 15 VA or more: recommended model names are CW-15LM, CW-15L or CW-40LM).
The alternating current ratio is as shown in the heater designation field in the table.
Note 3. The - mark in the model name field indicates that it is outside production range.
Note 4. TH-T18(HZ)SR, T25(KP)SR, T50(KP)SR with BC can also be manufactured.
However, TH-T50BC(KP)SR has no screw holder attached to the main circuit terminal (3-pole) on the power supply side.
Note 5. TH-T25BC (KP) SR with wiring streamlining terminal and S(D)-2 x T21 to T50BC cannot be combined. Order with MSO(D) (MSO(D)-2 x T21 to T50BC (KP) SR).

5.9 Quick-acting Characteristics Thermal Overload Relays TH-□FS(KP)

TH-FSKP and FS quick-acting characteristics thermal overload relays have quicker operation time than the standard TH type, so that they can be applied to motors such as submersible motors that have short allowable time during constraint.
Please note that TH-T□FSKP has 3 elements and can be used for 2E thermal, while TH-FS has 2 elements.

TH-T25FSKP

● Application

The manufactured model name, heater designation and combined magnetic contactor frame are shown in the table below.

Model Name							
With 2-Element	For Magnetic Starters	—	TH-T25FS	TH-T50FS	TH-T65FS	TH-T100FS
	For Independent Mounting	—		—		—
With 3-Element (2E)	For Magnetic Starters	TH-T18FSKP	TH-T25FSKP	TH-T50FSKP	TH-T65FSKP	TH-T100FSKP
	For Independent Mounting	(See Note 1)		—		—
Operating Frequency Range [Hz]		0 (DC) to 400 (Note 4)				
Heater Designation (Adjustment Range of Settling Current) [A] (The --- line in the table on the right represents the correspondence between the magnetic contactor and frame to be combined)		2.1(1.7 to 2.5) 3.6(2.8 to 4.4) 5(4 to 6) 6.6(5.2 to 8) 9(7 to 11) 11(9 to 13) 15(12 to 18)	2.1(1.7 to 2.5) 3.6(2.8 to 4.4) 5(4 to 6) 6.6(5.2 to 8) 9(7 to 11) 11(9 to 13) 15(12 to 18) 22(18 to 26)	29(24 to 34) 35(30 to 40) 42(34 to 50)	42(34 to 50) 54(43 to 65)	67(54 to 80) 82(65 to 93)
Trip Class (see page 138)		5	5	5	5	5
Frame of the Combined Magnetic Contactor		T10, T12, T20 T12, T20 T20	T21, T25, T35, T50 T25, T35, T50	T35, T50 T50	T65, T80, T100	T80, T100 T100

Note 1. For TH-T18FSKP, independent mounting and IEC 35 mm rail mounting may be enabled by combining with UT-HZ18.
For TH-T25FS(KP), IEC 35 mm rail mounting may be enabled by combining with UN-RM20.
Note 2. TH-T18FSKP, T25FS(KP), T50FS(KP) with BC can also be manufactured.
Note 3. The - mark in the model name field indicates that it is outside production range.
Note 4. It is standardly used at the commercial frequency of 50/60 Hz. Make sure that the protection coordination with motor characteristics is possible before use.

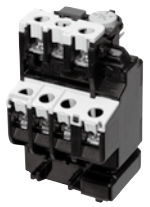
● Outline Drawings

The same as the standard (with 2-element and 3-element (2E)). Refer to page 148.

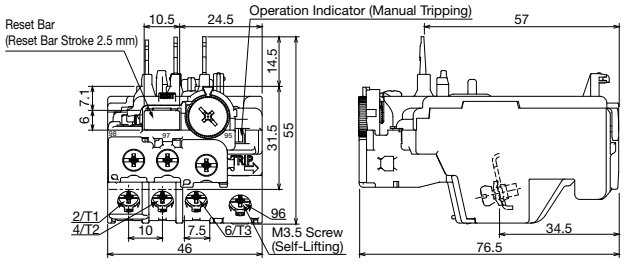
5.10 Outline Drawings/Contact Arrangements

T18 (The diagrams show models without "BC".)

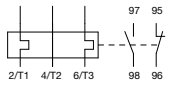
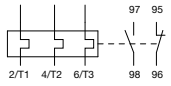
TH-T18(BC)(KP)



0.11kg

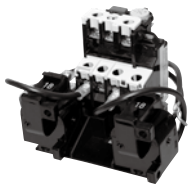


For combination with the following magnetic contactors
TH-T18: S-T10, T12, T20 SD-T12, T20
Independent use is possible by combining with the independent mounting unit UT-HZ18

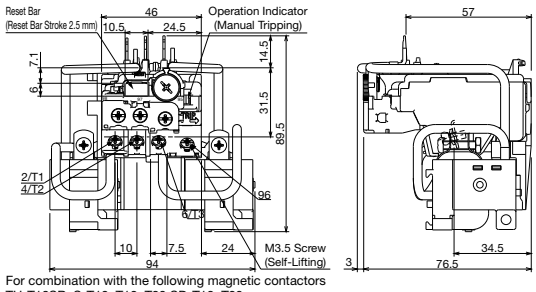
Contact Arrangement	
TH-T18	
TH-T18KP	

Model Name		Model Name	
TH-T18	0.12A to 11A 15 A	TH-T18BC	0.12A to 11A 15 A

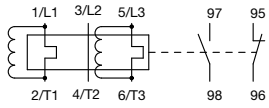
TH-T18(HZ)SR



0.29kg



For combination with the following magnetic contactors
TH-T18SR: S-T10, T12, T20 SD-T12, T20
TH-T18HZSR can be used independently when used in combination with the independent mounting unit UT-HZ18.

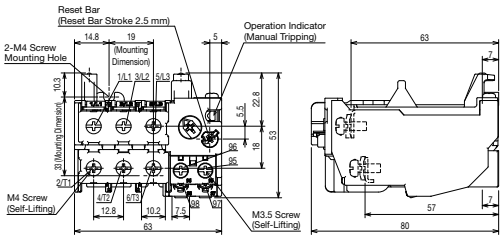
Contact Arrangement	
TH-T18(HZ)SR	

Model Name		Model Name	
TH-T18SR	0.12A to 11A 15 A	TH-T18SR	0.12A to 11A 15 A

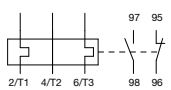
T25 (The diagrams show models without "BC".)

TH-T25(BC)(KP)

0.16kg

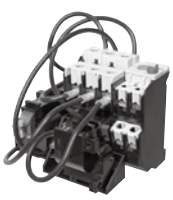


When combining with a magnetic contactor, the following connecting conductor kits (sold separately) are used
Combination with S-T21/T25(BC), SD-T21(BC), SL(D)-T21(BC): UN-TH21
Combination with S-T35/T50(BC), SD-T35/T50(BC), SL(D)-T35/T50(BC): UT-TH50
Independent DIN rail mounting is possible by combining with the independent mounting unit UN-RM20

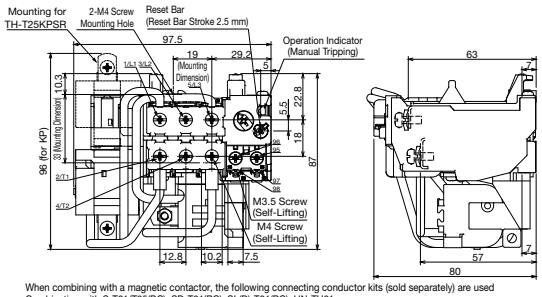
Contact Arrangement	
TH-T25	
TH-T25KP	

Model Name		Model Name	
TH-T25	0.24A to 15A 22 A	TH-T25BC	0.24A to 15A 22 A

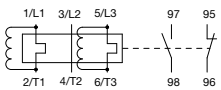
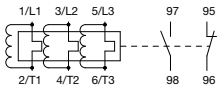
TH-T25(BC)(KP)SR



0.36(0.44)kg



When combining with a magnetic contactor, the following connecting conductor kits (sold separately) are used
Combination with S-T21/T25(BC), SD-T21(BC), SL(D)-T21(BC): UN-TH21
Combination with S-T35/T50(BC), SD-T35/T50(BC), SL(D)-T35/T50(BC): UT-TH50
∗ Reversible magnetic contactor with wiring streamlining terminal S-2xT21/T25BC and TH-T25BC(KP)SR cannot be combined.

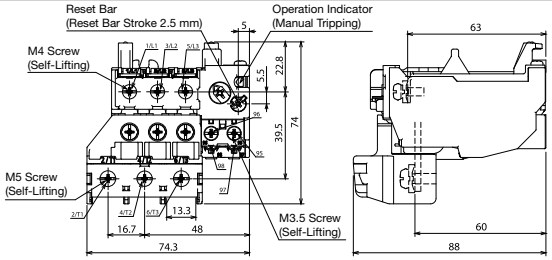
Contact Arrangement	
TH-T25(BC)SR	
TH-T25(BC)KPSR	

Model Name		Model Name	
TH-T25BCSR	0.24A to 15A 22 A	TH-T25SR	0.24A to 15A 22 A

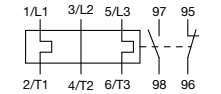
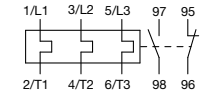
T50 (The diagrams show models without "BC".)

TH-T50(BC)(KP)

0.2kg

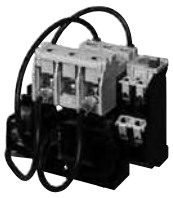


Cannot be used in independent mounting
When combining with a magnetic contactor, the following connecting conductor kit (sold separately) is used
Combination with S-T35/T50(BC) and SD-T35/T50(BC): UT-TH50

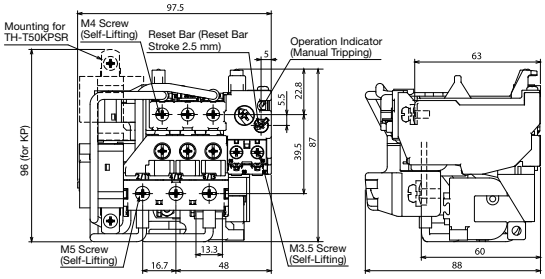
Contact Arrangement	
TH-T50	
TH-T50KP	

Model Name		Model Name	
TH-T50	29 A 35 A/42 A	TH-T50BC	29 A 35 A/42 A

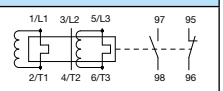
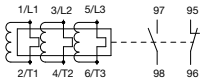
TH-T50(BC)(KP)SR



0.4(0.48)kg



Cannot be used in independent mounting
When combining with a magnetic contactor, the following connecting conductor kit (sold separately) is used
Combination with S-T35/T50(BC) and SD-T35/T50(BC): UT-TH50

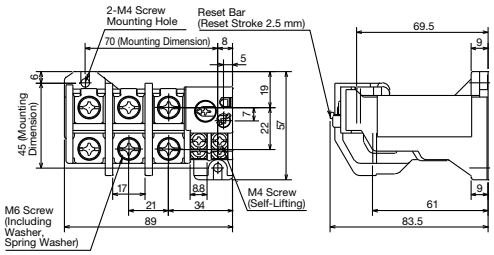
Contact Arrangement	
TH-T50(BC)SR	
TH-T50(BC)KPSR	

Model Name	
TH-T50SR	29 A
	35 A/42 A

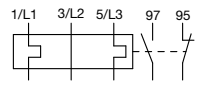
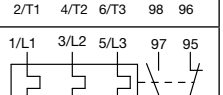
T65 (The diagrams show models without "CW".)

TH-T65(CW)(KP)

0.26(0.27)kg

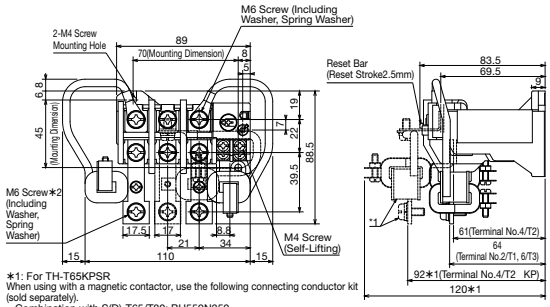


When combining with a magnetic contactor, the following connecting conductor kits (sold separately) are used
Combination with S(D)-T65/T80: BH559N350
Combination with S-T100: BH569N350
Combination with SD-T100: BH569N352

Contact Arrangement	
TH-T65	
TH-T65KP	

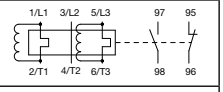
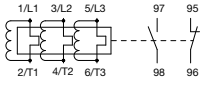
Model Name	
TH-T65	15A to 54A

TH-T65(KP)SR



0.41(0.5)kg

∗1: For TH-T65KPSR
When using with a magnetic contactor, use the following connecting conductor kit (sold separately).
Combination with S(D)-T65/T80: BH559N350
Combination with S-T100: BH569N350
Combination with SD-T100: BH569N352

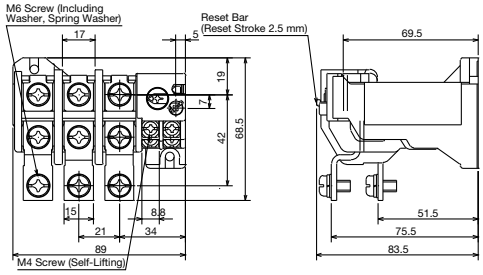
Contact Arrangement	
TH-T65SR	
TH-T65KPSR	

Model Name	
TH-T65SR	15A to 54A

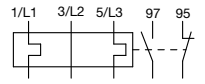
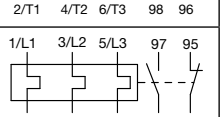
T100

TH-T100(KP)

0.32(0.33)kg

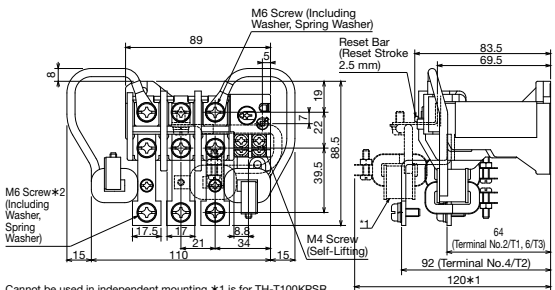


Cannot be used in independent mounting
When combining with a magnetic contactor, the following connecting conductor kits (sold separately) are used
Combination with S(D)-T80: BH559N350
Combination with S-T100: BH569N350
Combination with SD-T100: BH569N352

Contact Arrangement	
TH-T100	
TH-T100KP	

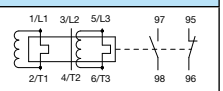
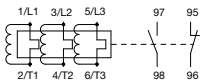
Model Name	
TH-T100	67A/82A

TH-T100(KP)SR



0.45(0.52)kg

Cannot be used in independent mounting ∗1 is for TH-T100KPSR
When combining with a magnetic contactor, the following connecting conductor kits (sold separately) are used
Combination with S(D)-T80: BH559N350
Combination with S-T100: BH569N350
Combination with SD-T100: BH569N352

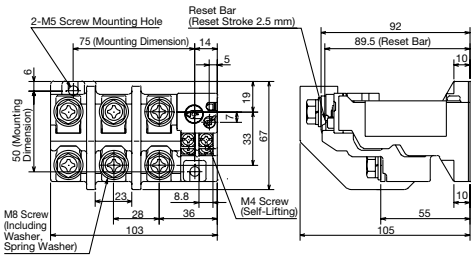
Contact Arrangement	
TH-T100SR	
TH-T100KPSR	

Model Name	
TH-T100SR	67A/82A

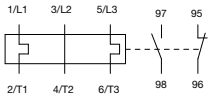
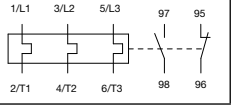
N120/N120TA

TH-N120(KP)

0.48 (0.51) kg



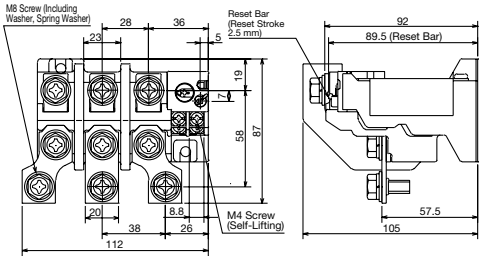
When combining with a magnetic contactor, the following connecting conductor kit (sold separately) is used
Combination with S(D)-N125, SL(D)-N125: BH579N355
Combination with S(D)-N150, SL(D)-N150: BH589N355
TH-N120 and TH-N120KP can be used for both magnetic starter (MSO) or independent mounting

Contact Arrangement	
TH-N120	
TH-N120KP	

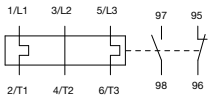
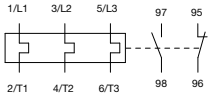
Model Name	Model Number
TH-N120	THN65 □□

TH-N120TA(KP)

0.59 (0.61) kg



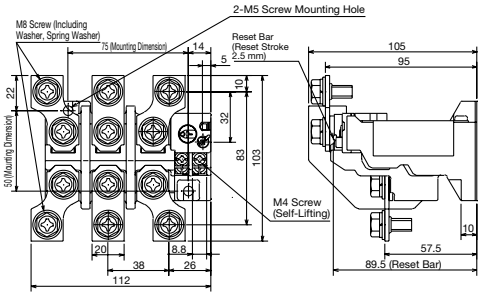
Cannot be used in independent mounting When combining with a magnetic contactor, the following connecting conductor kits (sold separately) are used
Combination with S(D)-N125, SL(D)-N125: BH579N355
Combination with S(D)-N150, SL(D)-N150: BH589N355

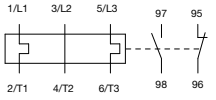
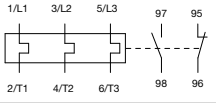
Contact Arrangement	
TH-N120TA	
TH-N120TAKP	

Model Name	Model Number
TH-N120TA	THN65□□

TH-N120TAHZ(KP)

0.7 (0.72) kg

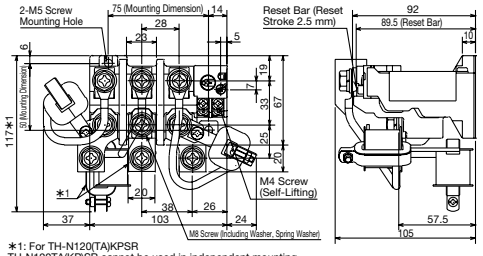


Contact Arrangement	
TH-N120TAHZ	
TH-N120TAHZKP	

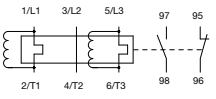
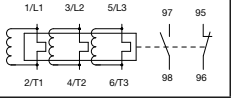
Model Name
TH-N120TAHZ

TH-N120(TA)(KP)SR

TH-N120SR: 0.67 kg
TH-N120TASR: 0.78 kg
TH-N120KPSR: 0.78 kg
TH-N120TAKPSR: 0.9 kg



*1: For TH-N120(TA)KPSR
TH-N120TA(KP)SR cannot be used in independent mounting
When combining with a magnetic contactor, the following connecting conductor kit (sold separately) is used
Combination with S(D)-N125, SL(D)-N125: BH579N355
Combination with S(D)-N150, SL(D)-N150: BH589N355

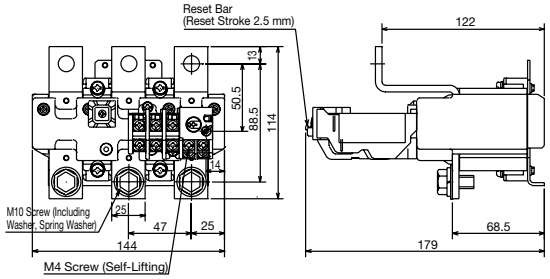
Contact Arrangement	
TH-N120SR TH-N120TASR	
TH-N120KPSR TH-N120TAKPSR	

Model Name
TH-N120SR
TH-N120TASR

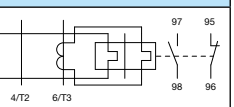
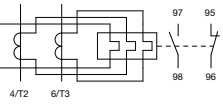
N220RH/N220HZ

TH-N220RH(KP)

1.8 (2.1) kg



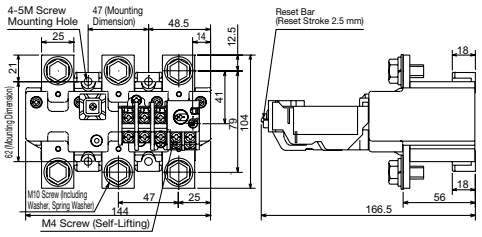
Cannot be used in independent mounting
Attached 2 M4 screws and wiring screws for magnetic contactor are used when combining with S-N180/N220, SD-N220 and SL(D)-N220

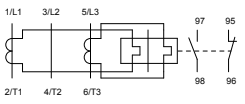
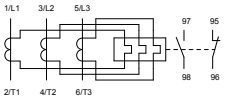
Contact Arrangement	
TH-N220RH	
TH-N220RHKP	

Model Name	Model Number
TH-N220RH	THN70 □□

TH-N220HZ(KP)

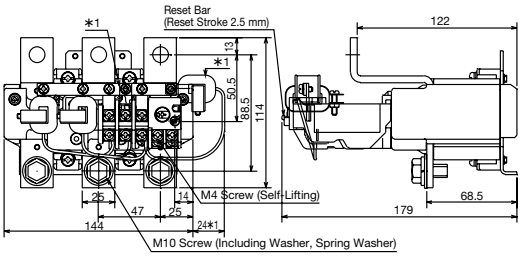
1.5 (1.8) kg



Contact Arrangement	
TH-N220HZ	
TH-N220HZKP	

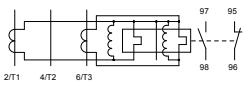
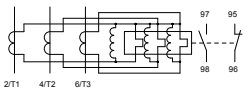
Model Name	Model Number
TH-N220HZ	THN72□□

TH-N220RH(KP)SR



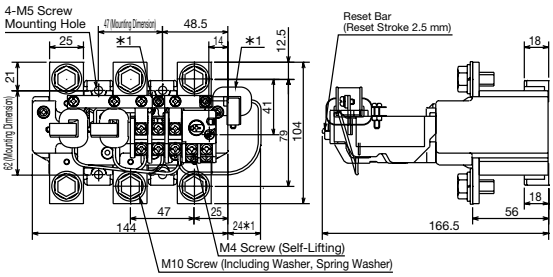
2.0 (2.3) kg

∗1: For TH-N220RHKPSR
Cannot be used in independent mounting
The attached 2 M4 screws and wiring screws for magnetic contactor are used when combining with S-N180/N220, SD-N220 and SL(D)-N220

Contact Arrangement	
TH-N220RHSR	
TH-N220RHKPSR	

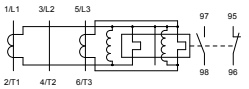
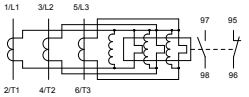
Model Name
TH-N220RHSR

TH-N220HZ(KP)SR



1.6 (2.0) kg

∗1: TH-N220HZKPSR

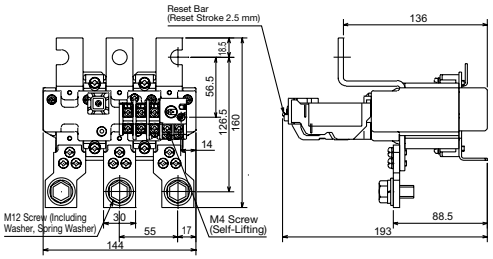
Contact Arrangement	
TH-N220HZSR	
TH-N220HZKPSR	

Model Name
TH-N220HZSR

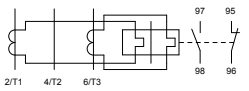
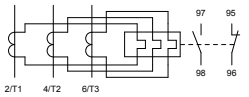
● N400RH/N400HZ

TH-N400RH(KP)

2.2 (2.5) kg



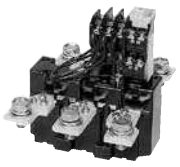
Cannot be used in independent mounting
Attached M5 screw and wiring screws for magnetic contactor are used when combining with S(D)-N300/N400 and SL(D)-N300/N400

Contact Arrangement	
TH-N400RH	
TH-N400RHKP	

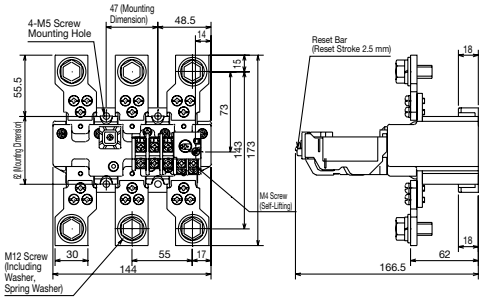
Model Name	Model Number
TH-N400RH	THN75 □□

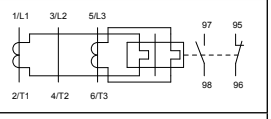
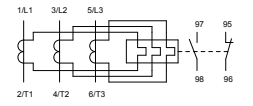
5

TH-N400HZ(KP)



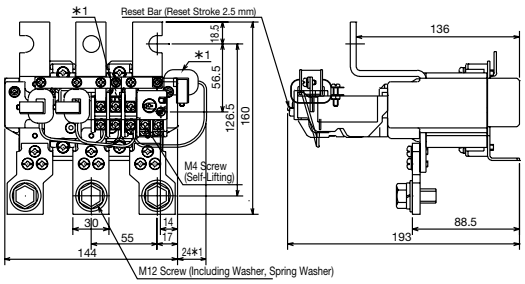
2.1 (2.4) kg



Contact Arrangement	
TH-N400HZ	
TH-N400HZKP	

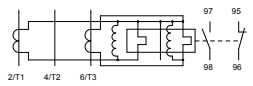
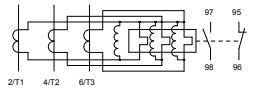
Model Name	Model Number
TH-N400HZ	THN77 □□

TH-N400RH(KP)SR



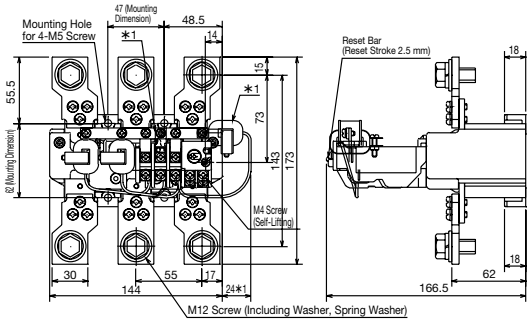
2.4 (2.6) kg

∗1: TH-N400RHKPSR
Cannot be used in independent mounting
The attached M5 screw and wiring screws for magnetic contactor are used when combining with S(D)-N300/N400 and SL(D)-N300/N400

Contact Arrangement	
TH-N400RHSR	
TH-N400RHKPSR	

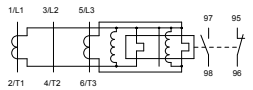
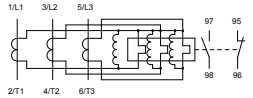
Model Name
TH-N400RHSR

TH-N400HZ(KP)SR



2.3 (2.5) kg

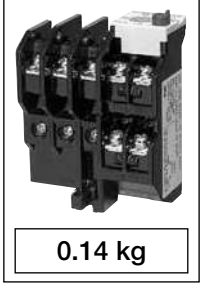
∗1: For TH-N400HZKPSR

Contact Arrangement	
TH-N400HZSR	
TH-N400HZKPSR	

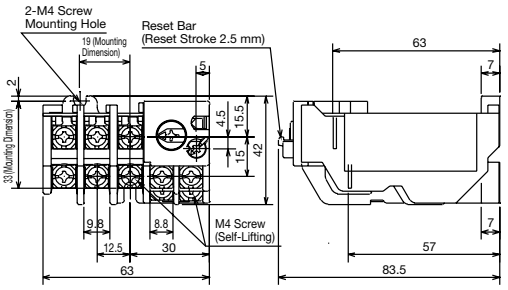
Model Name
TH-N400HZSR

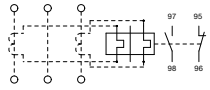
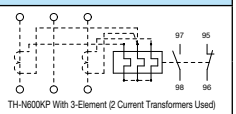
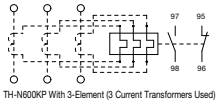
■ N600

TH-N600(KP)



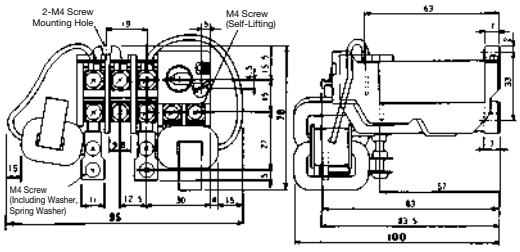
0.14 kg



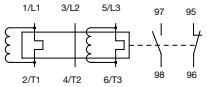
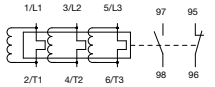
Contact Arrangement
Use in combination with current transformer for measuring instruments (refer to page 136) as shown in the figure below.
 TH-N600 With 2-Element
 TH-N600KP With 3-Element (2 Current Transformers Used)
 TH-N600KP With 3-Element (3 Current Transformers Used)

Model Name
TH-N600

TH-N600(KP)SR



0.3 (0.36) kg

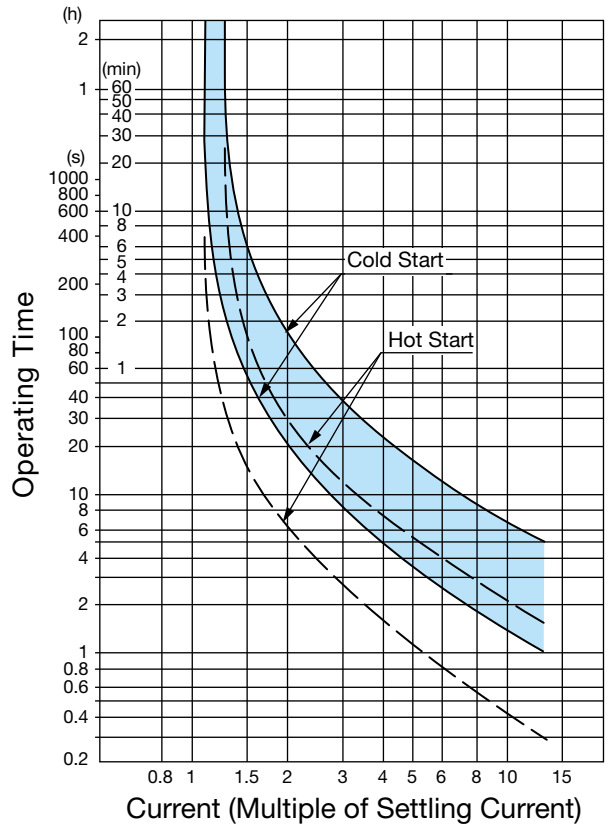
Contact Arrangement
As with TH-N600(KP), use in combination with current transformer for measuring instruments (refer to page 136).
 TH-N600SR With 2-Element
 TH-N600KPSR With 3-Element

Model Name
TH-N600SR
TH-N600KPSR

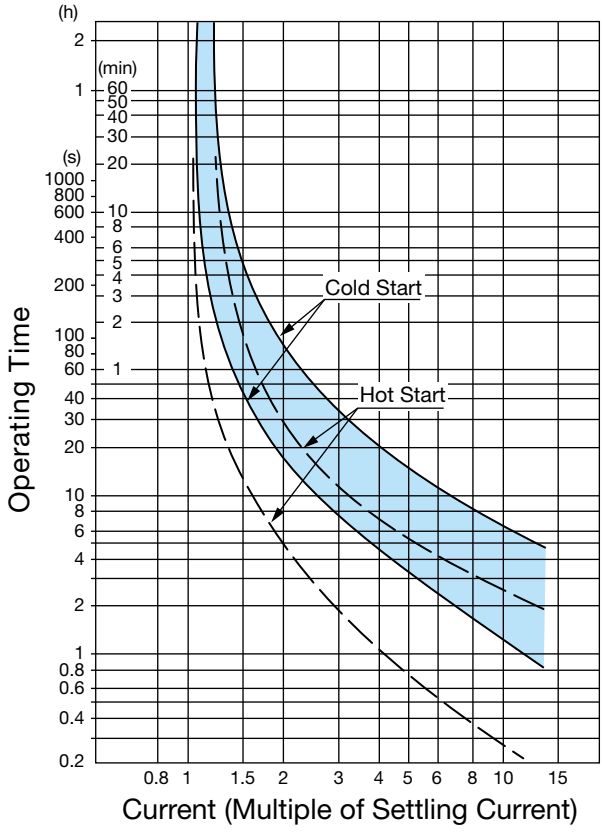
5.11 Operating Characteristic of Thermal Over Relay (Ambient Temperature of 20°C)

Refer to page 143 regarding the connecting electric wire size.

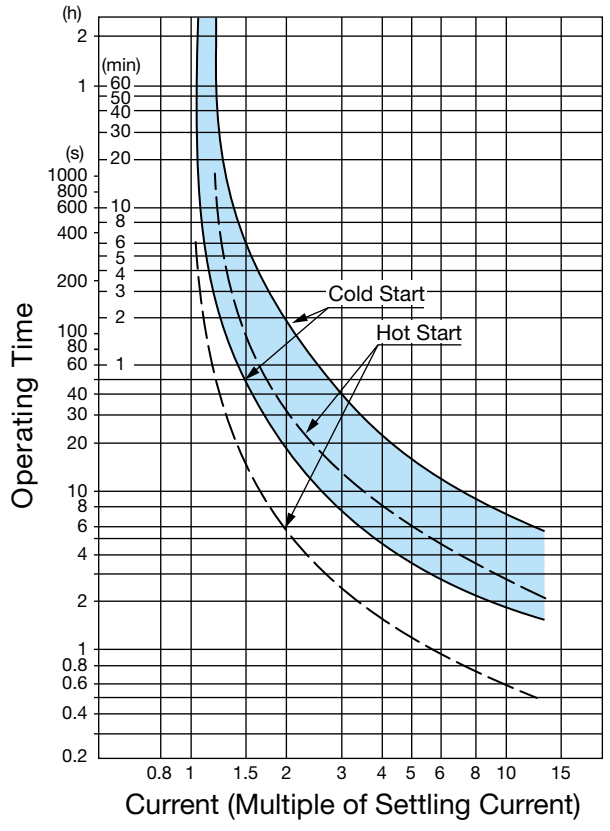
TH-T18, T18KP



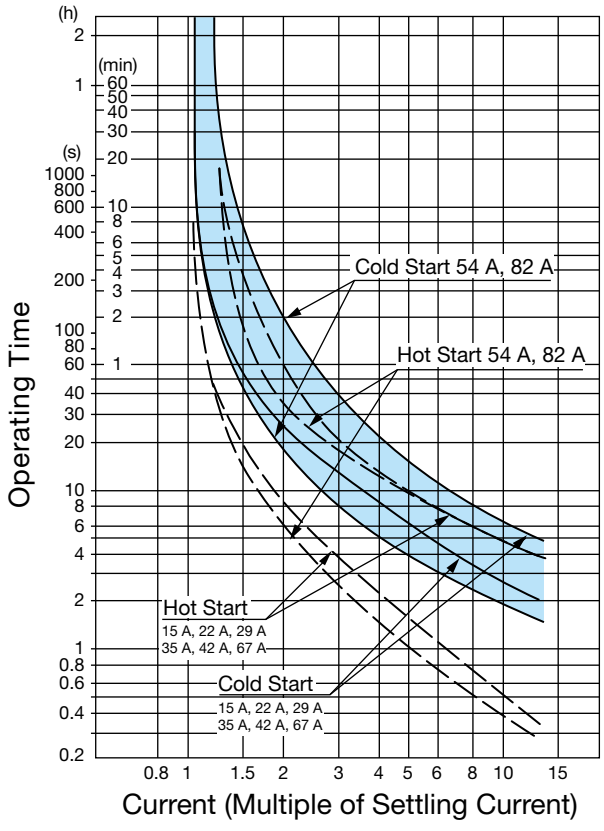
TH-T25, T25KP



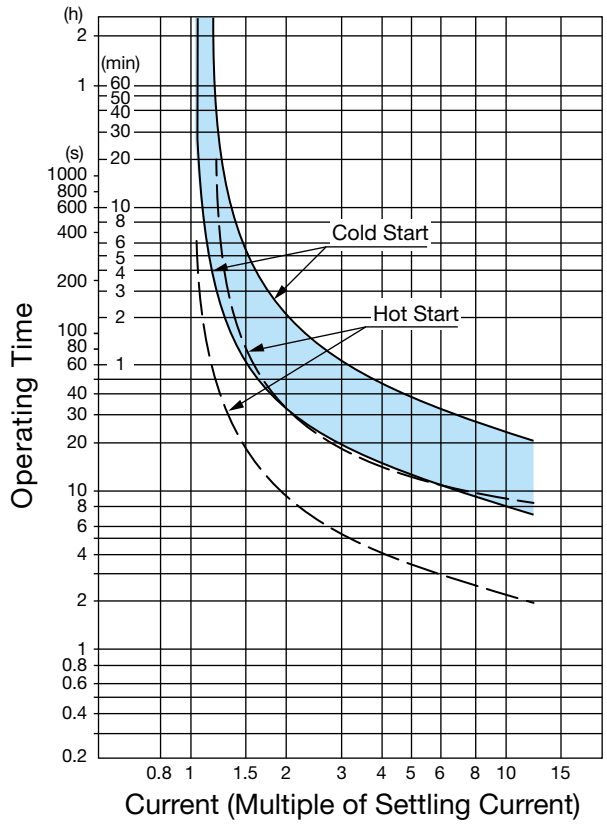
TH-T50, T50KP



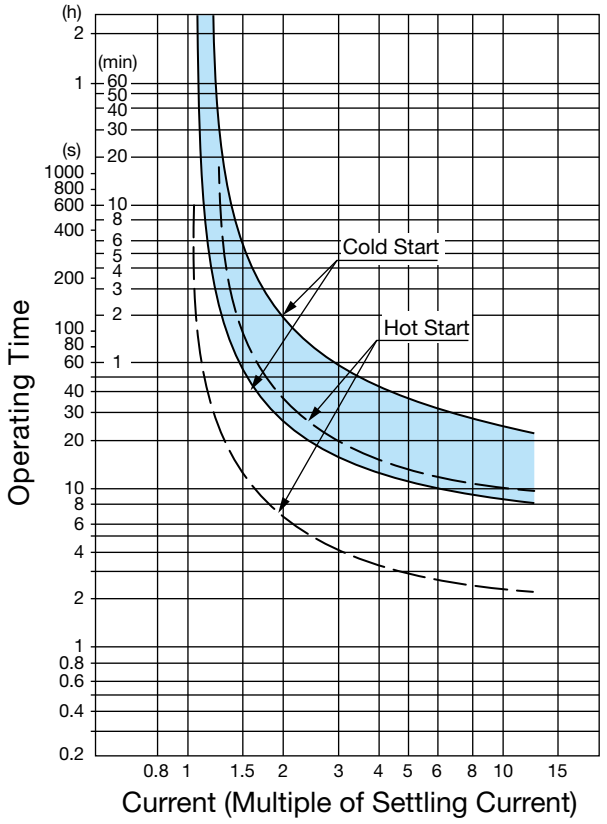
TH-T65, T65KP,
TH-T100, T100KP



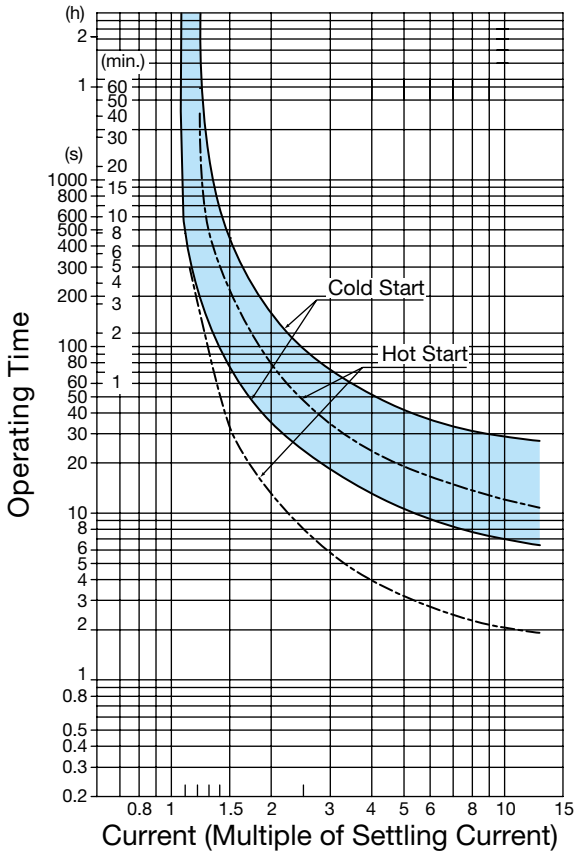
TH-T18SR



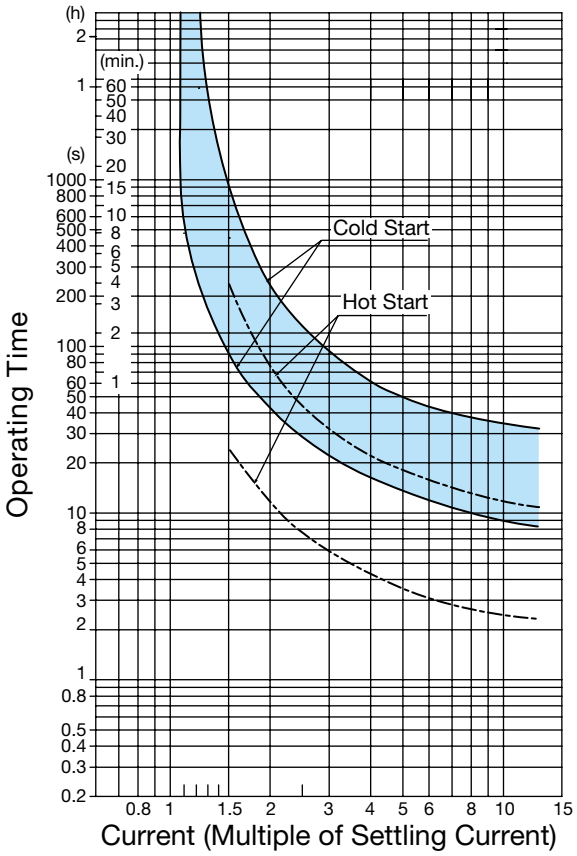
TH-T25SR, T25KPSR



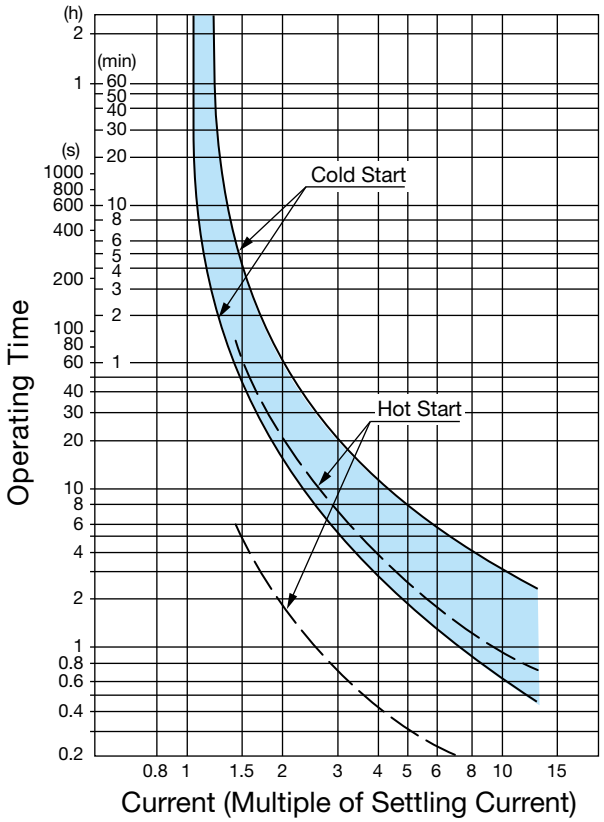
TH-T50SR, T50KPSR



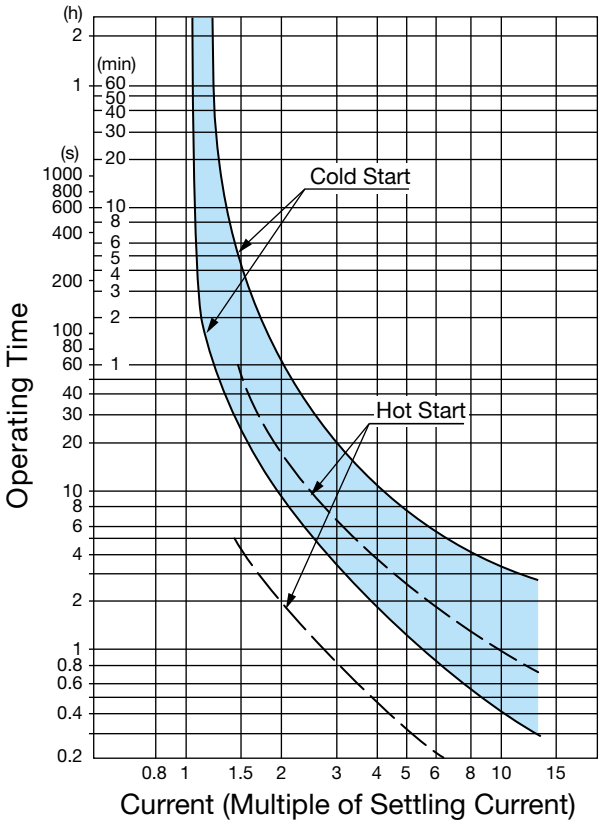
TH-T65SR, T65KPSR,
TH-T100SR, T100KPSR



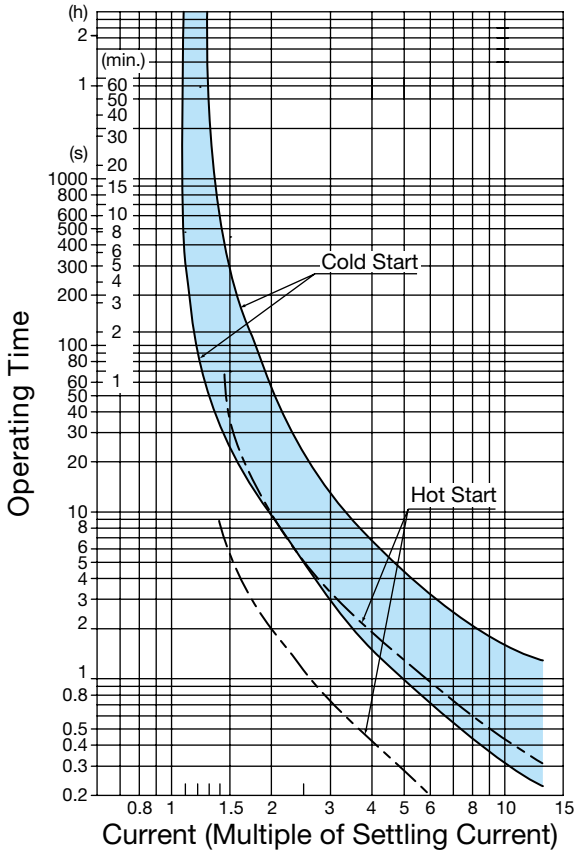
TH-T18FSKP



TH-T25FS, TH-T25FSKP,
TH-T50FS, TH-T50FSKP

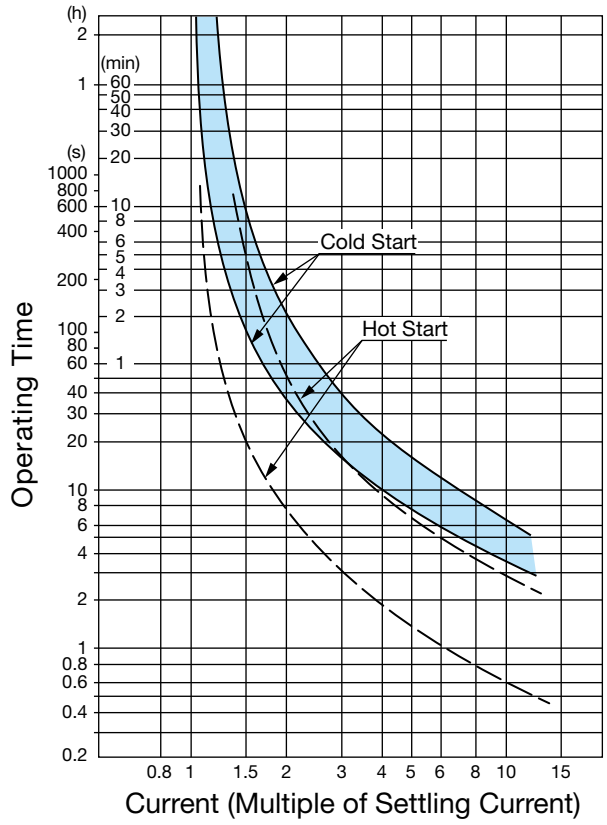


TH-T65FS, T65FSKP,
TH-T100FS, T100FSKP

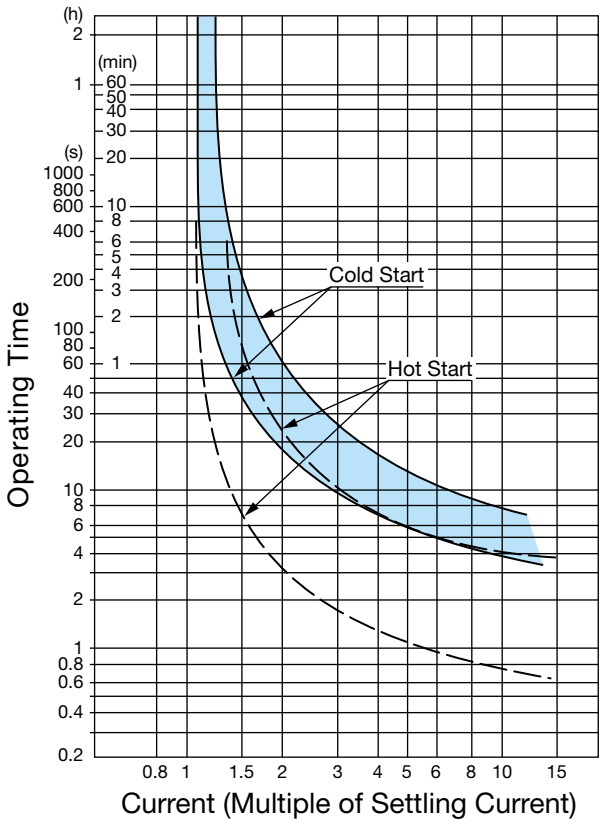


5

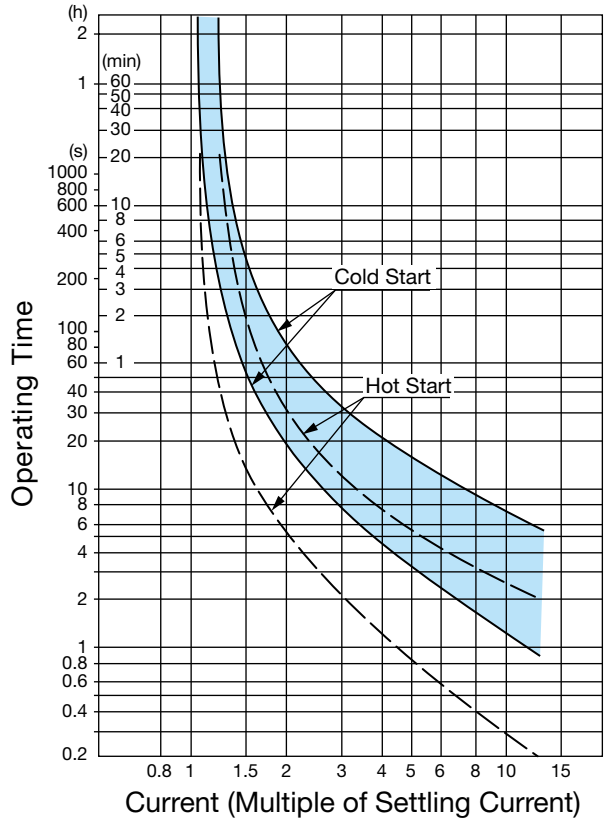
TH-N120, N120TA, N120KP, N120TAKP



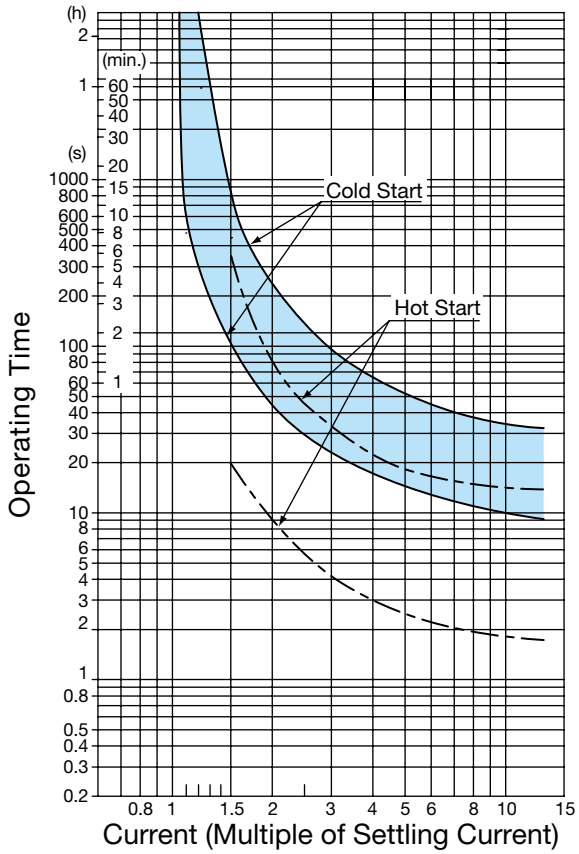
TH-N220RH/HZ(KP), N400RH/HZ(KP)



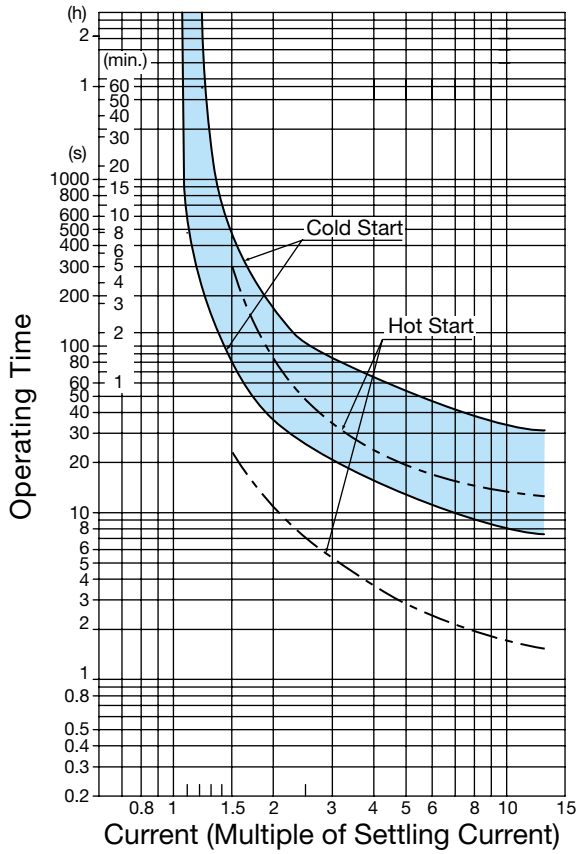
TH-N600, N600KP



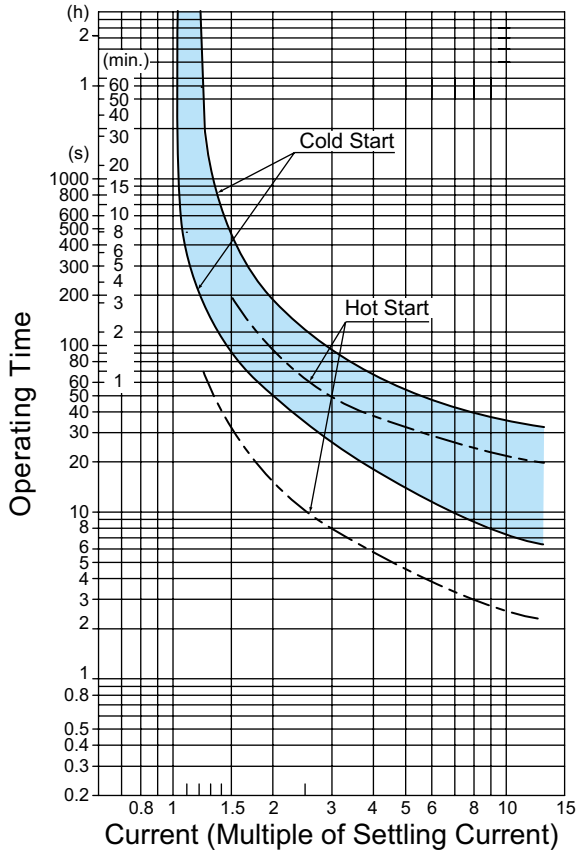
TH-N120SR, N120TASR, N120KPSR, N120TAKPSR



TH-N220RH/HZ(KP)SR, N400RH/HZ(KP)SR



TH-N600SR, N600KPSR



5.12 How to Order

Follow the steps below when ordering. (Enter a space in ▲ .)

● TH-T Thermal Overload Relays

Model Name		Heater Designation
TH-T25	▲	15A
Specify from the following model name codes.		Specify the heater designation from pages 145, 146 or 147. When the full-load current of the motor is included in 2 heater designations, give priority to the heaters listed in the table on page 48.

● Model Name Codes of Thermal Overload Relays

TH – T18 ▲ KP Heater Designation

Frame
T18
T25
T50
T65
T100

Symbol	Specifications
None	With 2-Element
KP	With 3-Element (2E)
FS	Quick Trip Type
SR	With Saturable Reactor
BC	Wiring Streamlining Terminal
AR	Automatic Reset

● TH-N Thermal Overload Relays

Model Name		Heater Designation
TH-N120KP	▲	82A
Specify from the following model name codes.		Specify the heater designation from pages 145, 146 or 147. When the full-load current of the motor is included in 2 heater designations, give priority to the heaters listed in the table on page 48.

● Model Name Codes of Thermal Overload Relays

TH – N220 KP ▲ Heater Designation

Frame
N120
N120TA
N220
N400
N600

Symbol	Specifications
None	With 2-Element
KP	With 3-Element (2E)
RH	For Magnetic Starter
HZ	For Independent Mounting
SR	With Saturable Reactor
AR	Automatic Reset

Note 1. Model names that correspond to mounting methods (for magnetic starters, independent mounting and DIN rail mounting) are shown in the table below.

For Magnetic Starters	For Independent Mounting	For DIN Rail Mounting
TH-T18 ∗1	TH-T18 + UT-HZ18 ∗2	TH-T18 + UT-HZ18 ∗2
TH-T25	TH-T25	TH-T25 + UN-RM20 ∗2
TH-T50 ∗1	—	—
TH-T65	TH-T65	—
TH-T100 ∗1	—	—
TH-N120	TH-N120	—
TH-N120TA ∗1	TH-N120TAHZ	—
TH-N220RH ∗1	TH-N220HZ	—
TH-N400RH ∗1	TH-N400HZ	—
—	TH-N600 + CT ∗3	—

∗1 Cannot be independently mounted.
∗2 Order UT-HZ18 and UN-RM20 separately from the thermal overload relay body (TH-T18 and TH-T25). (Refer to page 230)
∗3 Use TH-N600 in combination with current transformer for measuring instruments (rated secondary load of 15 VA or more). (Refer to page 136)

2. MOTOR PROTECTION RELAYS

2.1 Thermal Overload Relays

TH-N Series Thermal Overload Relays Will Make a Convenience and Safer Systems.

TH-N12

TH-N20

TH-N12CX

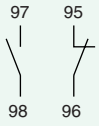
A Selection of Relays for Optimum Motor Protection Characteristics

The thermal relay line-up includes two-element units as well as the phase failure protection type models (three-element relays), all with the same external dimensions.
This array of protection characteristics allows you to choose the units best suited to your motor protection needs.

Maintenance and Inspection Are Easy

An operation indicator makes maintenance and inspection easy. Checks can be performed using manual operations.

1NO + 1NC Contacts



The NO and NC contacts can be used independently as signals contacts.

Rated Current Can Be Set Easily

The value of the rated current is displayed on a dial.
Simply adjust the dial to the full-load current of the motor and motor protection is assured.

Finger Protectors

Models with finger protectors that conform to DIN VDE 0106 Part 100 (TH-N□CX) are also available.

Various Accessories

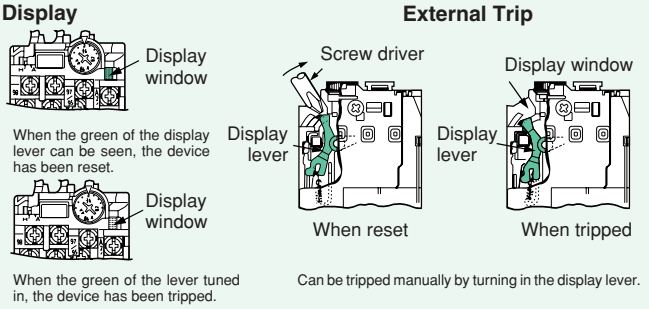
- Independent mount adaptor for TH-N12(CX).
  : UN-HZ12(CX)
- Reset release : UN-RR□□□
- Trip indicating LED : UN-TL□□

Trip-Free Reset Bar

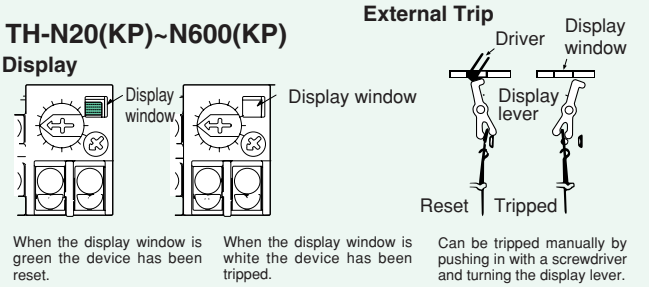
Choose between automatic and manual reset. Also features tripfree reset bar mechanism.

• Display and External Trip Mechanism

TH-N12(KP)/TH-N18(KP)

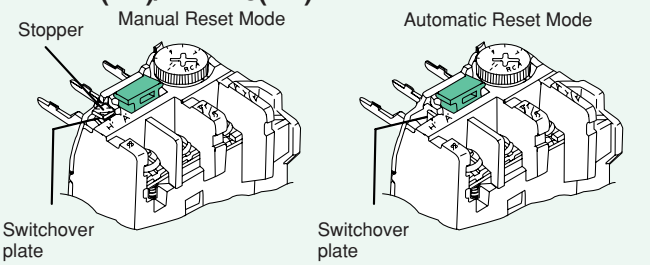


TH-N20(KP)~N600(KP)



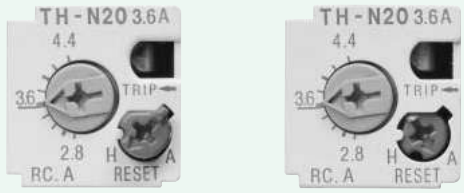
• Switching Between Automatic and Manual Reset

TH-N12(KP)/TH-N18(KP)



Switching from manual to automatic : Break the stopper off and then, slide the switchover plate to the right (to position "A") to immobilize the reset bar.
Switching from automatic to manual : Slide the switchover plate to the left (to position "H").

TH-N20(KP)~N600(KP)



Switching from manual to automatic : Flip the stopper on the end of the reset bar down and then, after pushing it all the way in, rotate it counterclockwise 90° (to position "A").
Switching from automatic to manual : Rotate the reset bar 90° clockwise (to position "H") and the reset bar will pop out.

2.1.1 Selection Guide of Thermal Overload Relays

Table 2.1.1

Max. Fuse Rating (660Vac) IEC 269-1 (A)			Overload Relay			Motor Capacity [kW, (hp)] (Three phase 50/60Hz, based on four poles)			
			Heater designation	Setting range (A)	Model (TH-)				
aM	gG	gM				AC220-240V	AC380V	AC400-440V	AC500V
0.5	0.5	—	0.12A	0.1-0.16	N12	—	—	—	—
0.5	1	—	0.17A	0.14-0.22	N12	—	—	—	—
1	2	—	0.24A	0.2-0.32	N12	0.03(1/24)	0.06(1/12)	0.06(1/12)	0.09(1/8)
1	2	—	0.35A	0.28-0.42	N12	0.05(1/16)	0.09(1/8)	0.09(1/8)	0.12(1/6)
1	2	—	0.5A	0.4-0.6	N12	0.06(1/12)	0.12(1.6)	0.12(1.6)	0.18(1/4)
2	4	—	0.7A	0.55-0.85	N12	0.09(1/8)	0.18(1/4)	0.18(1/4)	0.25(1/3)
2	4	—	0.9A	0.7-1.1	N12	0.12(1/6)	0.25(1/3)	0.25(1/3)	0.37(1/2)
2	4	—	1.3A	1.0-1.6	N12	0.18(1/4)	0.37(1/2)	0.37(1/2) 0.55(3/4)	0.55(3/4)
4	6	—	1.7A	1.4-2.0	N12	0.25(1/3)	0.55(3/4)	0.75(1)	0.75(1)
4	6	—	2.1A	1.7-2.5	N12	0.37(1/2)	0.75(1)	—	1.1(1-1/2)
6	10	—	2.5A	2.0-3.0	N12	0.55(3/4)	1.1(1-1/2)	1.1(1-1/2)	1.5(2)
6	10	—	3.6A	2.8-4.4	N12	0.75(1)	1.5(2)	1.5(2)	2.2(3)
8	16	—	5A	4.0-6.0	N18	1.1(1-1/2)	2.2(3)	2.2(3)	3(4)
12	20	—	6.6A	5.2-8.0	N18	1.5(2)	3(4)	3,3.7(4.5)	3.7(5)
12	20	—	9A	7.0-11	N18	2.2(3)	3.7(5) 4(5-1/2)	3(4) 3.7(5)	5.5(7-1/2)
16	25	32M35	11A	9.0-13	N18	3(4)	5.5(7-1/2)	5.5(7-1/2)	7.5(10)
20	32	32M50	15A	12-18	N20	3.7(5)	7.5(10)	7.5(10) 9(12.5)	9(12/5)
25	40	32M63	19A	16-22	N20	5.5(7-1/2)	11(15)	11(15)	11(15)
40	63	32M63	22A	18-26	N20	5.5(7-1/2)	11(15)	11(15)	15(20)
50	80	63M80	29A	24-34	N20	7.5(10)	15(20)	15(20)	18.5(25)
63	80	63M80	35A[1]	30-40	N20	9(12.5)	18.5(25)	18.5(25)	22(30)
63	100	100M100	42A	34-50	N20TA	11(15)	22(30)	22(30)	30(40)
80	125	100M125	54A	43-65	N20TA	15(20)	30(40)	30(40)	37(50)
100	160	100M160	67A	54-80	N20TA	18.5(25)	37(50)	37(50)	45(60)
125	200	100M200	82A	65-100	N20TA	22(30)	45(50)	45(60)	55(75)
—	200	100M200	95A[2]	85-105	N60	30(40)	55(75)	55(75)	—
—	250	200M250	105A	85-125	N60	30(40)	55(75)	55(75)	75(100)
—	250	200M250	125A	100-150	N60	37(50)	75(100)	75(100)	90(125)
—	315	200M315	150A	120-180	N60	45(60)	90(125)	90(125)	110(150)
—	400	—	180A	140-220	N60	55(75)	110(150)	110(150)	132(175)
—	500	—	210A[3]	170-250	N60	75(100)	132(180)	132(180)	—
—	630	—	250A	200-300	N60	75(100)	132(180) 160(220)	132(180) 160(220)	160(220)
—	630	—	330A	260-400	N60	90(125) 110(150)	200(270)	200(270)	220(300) 250(340)
—	800	—	500A	400-600	N60	132(180) 160(220)	220(300) 250(340) 300(400)	220(300) 250(340) 300(400)	400(530)
—	1000	—	660A	520-800	N60	200(270) 220(300)	400(530)	400(530)	500(670)

Notes: 1. For starter size N35 only. 2. For starter size N95 only. 3. For starter size N220 only. 4. Selection by mounting

Contactor mounting	W/o F/P (2)	TH-N12(KP)	TH-N18(KP)	TH-N20(KP) (1)	TH-N20TA(KP) (1)	TH-N60(KP) (1)	TH-N60TA(KP) (1)	TH-N120(KP) (1)	TH-N120TA(KP) (1)	TH-N220RH(KP)	TH-N400RH(KP)	—
	With F/P (3)	TH-N12CXKP	TH-N18CXKP	TH-N20CXKP (1)	TH-N20TAKPCX (1)	TH-N60CXKP (1)	—	—	—	—	—	—
Independent mounting	W/o F/P (2)	TH-N12(KP) + UN-HZ12 (4)	—	TH-N20(KP)	—	TH-N60(KP)	—	TH-N120(KP)	TH-N120TAHZ(KP)	TH-N220HZ(KP)	TH-N400HZ(KP)	TH-N600(KP) + CT
	With F/P (3)	TH-N12CXKP + UN-HZ12CX (4)	—	TH-N20CXHZKP	—	TH-N60CXKP	—	—	—	—	—	—

Notes: 1. Use "Connecting parts" when couple with contactor (see Table 2.1.6(3)). 2. W/o F/P:Without Finger Protection.
3.With F/P:With Finger Protection. 4. UN-HZ12(CX) is shipped separately from TH-N12(CX)(KP).
5. CT should be supplied by customer.

2.1.2 Selection Guide of the Current Transformers for TH-N600KP

Table 2.1.2

Current Transformer for TH-N600KP	Heater Designation(A)		250	330	500	660
	Setting Range(A)		200~300	260~400	400~600	520~800
	Current Transformer Ratio		400/5A	500/5A	750/5A	1,000/5A
	Current Transformer Capacity		At least 15VA			
	Recommended MITSUBISHI Current Transformer Model Number	Cable wiring	CW-15L 400/5A 15VA	CW-15L 500/5A 15VA	CW-15L 750/5A 15VA	—
		Bus bar wiring	CW-15LM 400/5A 15VA	CW-15LM 500/5A 15VA	CW-15LM 750/5A 15VA	CW-40LM 1000/5A 40VA

** Current transformer to be supplied by customer.*

2.1.3 Technical Data

Table 2.1.3

Three heater type TH- / Two heater type TH-			N12(CX)KP N12(CX)	N18(CX)KP N18(CX)	N20(CX)KP N20(CX)	N20TA(CX)KP N20TA(CX)	N60(CX)KP N60(CX)	N60TAKP N60TA	N120KP N120	N120TAKP N120TA	N220RHKP N220RH	N400RHKP N400RH	N600KP N600
Max. setting current		A	13	18	22	40	65	105	100	150	220	400	800
Range of setting current		A	0.1-13	2.8-18	0.2-22	18-44	12-65	54-105	34-100	85-150	65-250	85-400	200-800
Rated insulation voltage		V	690	690	690	690	690	690	690	690	1000	1000	690
Permissible ambient temperature		°C	–25 to + 55										
Single phase protection			Types TH-N□□□KP provide the protection.										
Bimetal heating			Direct								Via CTs		Via CTs[1]
Max. heater dissipation per current path	Min. setting	W	0.8	0.9	0.8	1.4	1.7	2.4	2.5	3.2	2.5	2.5	2.5
	Max. setting	W	1.8	2.2	2.2	3.5	4.9	5.2	7.1	8.6	6.0	6.0	6.0
Auxiliary contact			1NO + 1NC										
Rated operating current of aux. contacts Category AC-15	NO contact 120V	A	2		2								
	NO contact 240V	A	1		1								
	NO contact 500V	A	0.5		0.5								
	NC contact 120V	A	2		3								
	NC contact 240V	A	1		2								
	NC contact 500V	A	0.5		1								
Category DC-13	48V	A	0.4		0.5								
	110V	A	0.2		0.2								
	220V	A	0.1		0.1								
Main terminal screw size	Line side	mm	—		M4	M4	M6	M6	M8	M8	—	—	M4
	Load side	mm	M3.5	M4	M4	M5	M6	M6	M8	M8	M10	M12	M4
Standard wire sizes recommended Heater designation-wire size		(mm²)	0.24A-2 ≀ 11A-2	3.6A-2 ≀ 11A-2 15A-3.5	0.24A-2 ≀ 11A-2 15A-3.5 19A-3.5	22A-5.5 29/35A-8	15A-3.5 22A-5.5 29/35A-8 42A-14 54A-22	67A-22 82/95A-38	42A-14 54/67A-22 82A-38	105A-60 125A-60	— —	— —	— —
Max. conductor size Main	Line side	mm²	(2.5)[2]	—	6	—	25	—	38	60	—	—	6
	Load side	mm²	2.5	6	6	16	25	38	38	60	150	240	6
Busbar width	Line side	mm	—		—	—	15	—	20	20	—	—	—
	Load side	mm	—		—	—	15	20	20	20	25	30	—
Aux. contacts		mm²	2.5		4	4	4	4	4	4	4	4	4

Notes: 1. Used with current transformer (to be supplied by the customer). See Table 2.1.2.
2. When used with UN-HZ 12(CX)adaptor.

2.1.4 Selection Guide of Quick Trip Thermal Overload Relay

Table 2.1.4

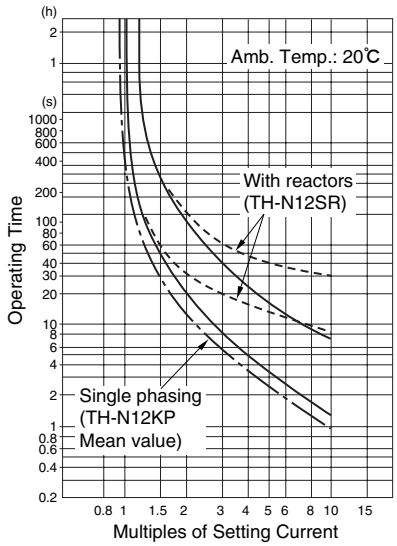
Applicable contactor	**S-N10 S-N11 S-N12**	**S-N20 S-N21 S-N25 S-N35**	**S-N25 S-N35**	**S-N50 S-N65 S-N80 S-N95**	**S-N80 S-N95**
Three heater type with phase failure protection	**TH-N12KF**	**TH-N20KF**	**TH-N20TAKF**	**TH-N60KF**	**TH-N60TAKF**
Two heater type	—	**TH-N20FS**	**TH-N20TAFS**	**TH-N60FS**	**TH-N60TAFS**
Heater setting range (Ordering designation)	1.7~2.5**(2.1A)** 2.8~4.4**(3.6A)** 4~6**(5A)** 5.2~8**(6.6A)** 7~11**(9A)** 9~13**(11A)**	1.7~2.5 **(2.1A)** 2.8~4.4 **(3.6A)** 4~6 **(5A)** 5.2~8 **(6.6A)** 7~11 **(9A)** 9~13 **(11A)** 12~18 **(15A)**	18~26 **(22A)** 24~34 **(29A)** 30~40 **(35A)**[1]	34~50 **(42A)** 43~65 **(54A)**	54~80 **(67A)** 65~93 **(82A)**[2]

*Notes: *1. Only for S-N35.*
**2. Only for S-N95.*

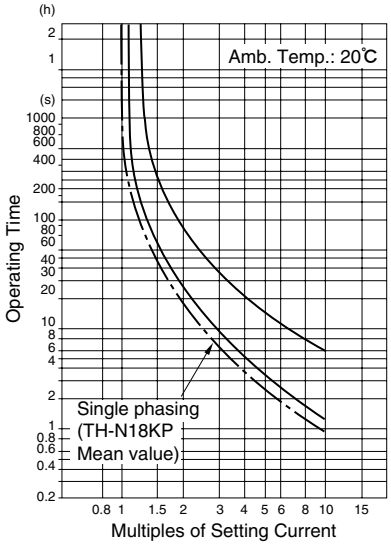
2.1.5 Operating Characteristics of Thermal Overload Relays

(Connecting wire size: Refer to "standard wire size" of Table 2.1.3)

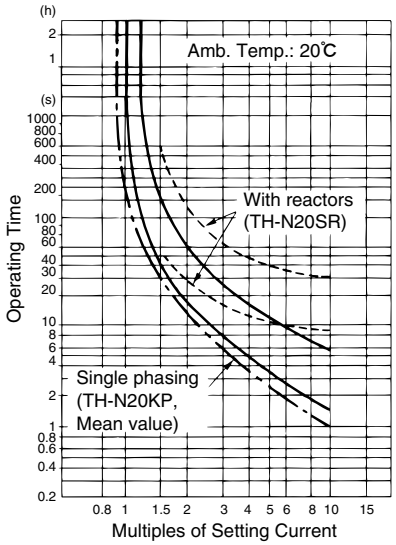
TH-N12
TH-N12KP·TH-N12SR



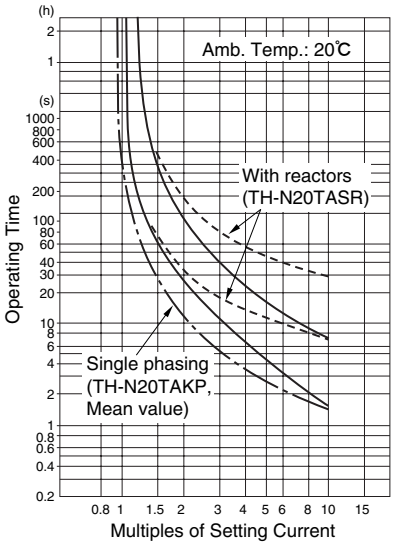
TH-N18
TH-N18KP



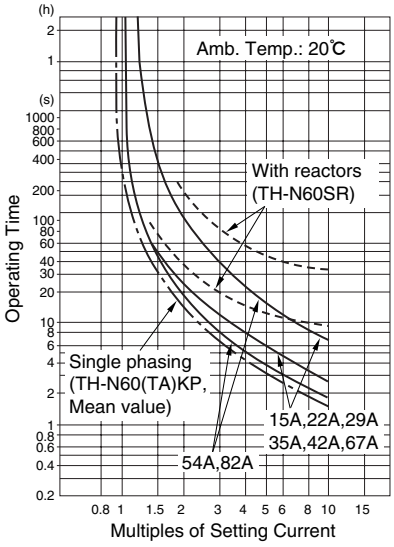
TH-N20·TH-N20KP
TH-N20SR·TH-N20KPSR



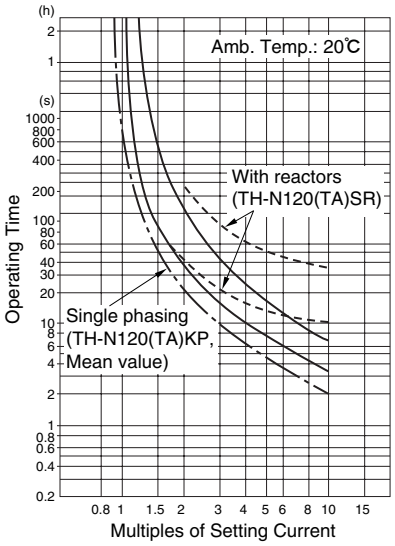
TH-N20TA·TH-N20TAKP
TH-N20TASR·TH-N20TAKPSR



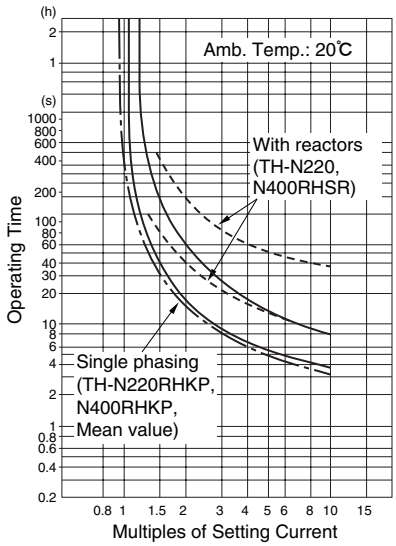
TH-N60·TH-N60TA
TH-N60KP·TH-N60TAKP
TH-N60SR·TH-N60TASR
TH-N60KPSR·TH-N60TAKPSR



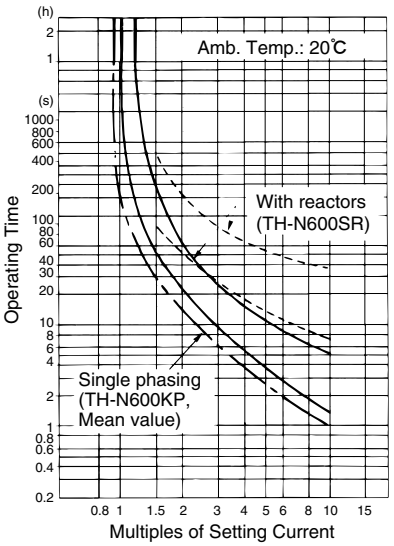
TH-N120·TH-N120KP
TH-N120SR·TH-N120KPSR
TH-N120TA·TH-N120TAKP
TH-N120TASR·TH-N120TAKPSR



TH-N220RH
TH-N220RHKP
TH-N220RHSR
TH-N220RHKPSR
TH-N400RH
TH-N400RHKP
TH-N400RHSR
TH-N400RHKPSR



TH-N600
TH-N600KP
TH-N600SR
TH-N600KPSR



2.1.6 Optional Parts and Accessories

Saturable Reactors for Slow Tripping

Ordering designation

THR - G22	PT	
Part number	3 heater	2 heater
see table 2·1·6(1)	PT	PD

Table 2.1.6 (1)

Heater Designation	Part number						
	TH-N12[1]	TH-N20(KP)	TH-N20TA(KP)	TH-N60(KP) TH-N60TA(KP)	TH-N120(KP) TH-N120TA(KP)	TH-N220□□(KP) TH-N400□□(KP)	TH-N600(KP)
0.24A	TSR-A0Y	TSR-C0Y	—	—	—	—	—
0.35A	TSR-A0Y	TSR-C0Y	—	—	—	—	—
0.5A	TSR-A01	TSR-C0Y	—	—	—	—	—
0.7A	TSR-A03	TSR-C03	—	—	—	—	—
0.9A	TSR-A05	TSR-C03	—	—	—	—	—
1.3A	TSR-A09	TSR-C07	—	—	—	—	—
1.7A	TSR-A11	TSR-C09	—	—	—	—	—
2.1A	TSR-A12	TSR-C10	—	—	—	—	—
2.5A	TSR-A13	TSR-C12	—	—	—	—	—
3.6A	TSR-A15	TSR-C15	—	—	—	—	—
5A	TSR-A18	TSR-C17	—	—	—	—	—
6.6A	TSR-A21	TSR-C20	—	—	—	—	—
9A	TSR-A23	TSR-C23	—	—	—	—	—
11A	TSR-A25	TSR-C25	—	—	—	—	—
15A	—	TSR-C26	—	THR-G22	—	—	—
19A	—	TSR-C29	—	—	—	—	—
22A	—	—	TSR-D28	THR-G24	—	—	—
29A	—	—	TSR-D29	THR-G26	—	—	—
35A	—	—	TSR-D28	THR-G27	—	—	—
41A	—	—	—	THR-G27	THR-H41	—	—
54A	—	—	—	THR-G29	THR-H42	—	—
67A	—	—	—	THR-G29	THR-H43	—	—
82A	—	—	—	THR-G30	THR-H43	THR-F10	—
95A	—	—	—	THR-G30	—	—	—
105A	—	—	—	—	THR-H44	THR-F13	—
125A	—	—	—	—	THR-H45	THR-F13	—
150A	—	—	—	—	—	THR-F15	—
180A	—	—	—	—	—	THR-F16	—
210A	—	—	—	—	—	THR-F17	—
250A	—	—	—	—	—	THR-F18	THR-E13
330A	—	—	—	—	—	THR-F19	THR-E13
500A	—	—	—	—	—	—	THR-E13
660A	—	—	—	—	—	—	THR-E13

Note: 1. Saturable reactors can be adopted only for the two heater type TH-N12

Table 2.1.6 (2)

Trip indicator	Thermal overload relay	Voltage(50/60Hz)	Part number	
	TH-N12(CX)(KP) TH-N18(CX)(KP)	AC 24/DC24V AC 100-127V AC 200-240V	**UN-TL15DC24V** **UN-TL15AC100V** **UN-TL15AC200V**	
	TH-N20,N20TA(CX)(KP) TH-N60(CX)(KP)~N600(KP)	AC 24/DC24V AC 100-127V AC 200-240V	**UN-TL20DC24V** **UN-TL20AC100V** **UN-TL20AC200V**	
Reset release	Thermal overload relay		Part number	Length (mm)
	TH-N12(CX)(KP) TH-N18(CX)(KP)		**UN-RR205** **UN-RR405** **UN-RR555** **UN-RR705**	200 400 550 700
	TH-N20,N20TA(CX)(KP) TH-N60(KP)~-N600(KP)[1]		**UN-RR200** **UN-RR400** **UN-RR550** **UN-RR700**	200 400 550 700
Separate mounting adaptor	Thermal overload relay		Part number	
	TH-N12(TP/KP) TH-N12CX(TP/KP)		**UN-HZ12** **UN-HZ12CX**	

Note: 1. Except for type TH-N60CX and TH-N60CXKP.

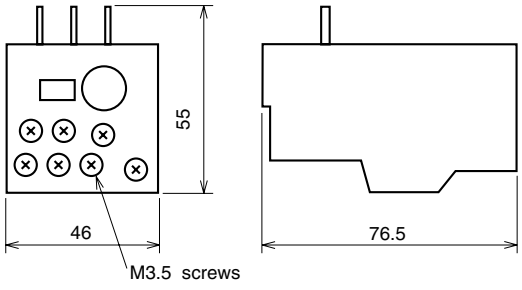
• Connecting Parts for Contactors to Thermal Overload Relays

Table 2.1.6 (3)

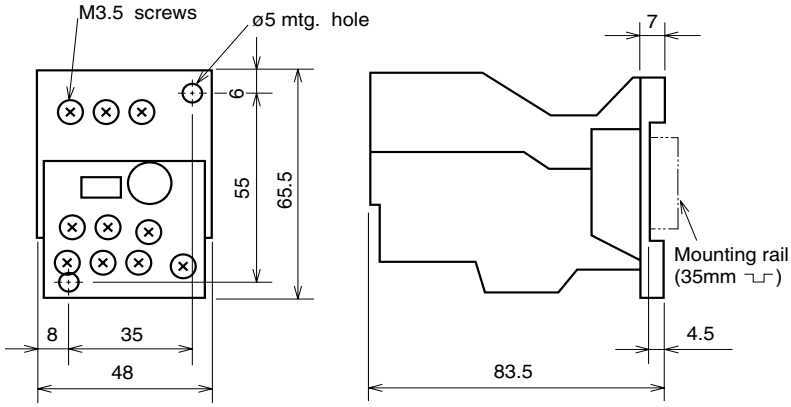
** Connecting bars and mounting plate are included in the OLR of TH-N220RH(KP) and TH-N400RH(KP) for S-N180, -N220, -N300, -N400.*

For connection between contactor (non-reversing type) and thermal overload relay	Overload relay	Contactor	Part number	Mass(kg)
	TH-N20(CX)(KP)	S-N20(CX), S(D)-N21(CX)	UN-TH21(CX)	0.02
	TH-N20(CX)(KP),-N20TA(CX)(KP)	S-N25(CX), S(D)-N35(CX)	UN-TH25(CX)	0.02
	TH-N60(CX)(KP)	S-N50(CX), -N65(CX) SD-N50, -N65	BH559N350	0.02
	TH-N60(KP), -N60TA(KP)	S-N80, -N95 SD-N80, -N95	BH569N350 BH569N352	0.04 0.04
	TH-N120(KP), N120TA(KP)	S(D)-N125 S(D)-N150	BH579N355 BH589N355	0.36 0.36

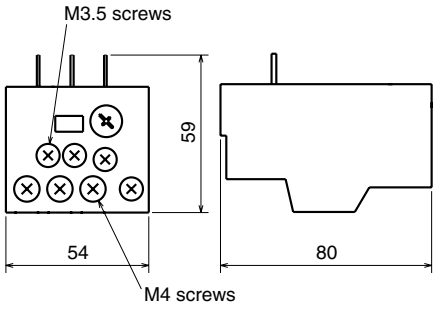
2.1.7 Outline Dimensions



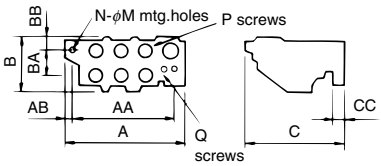
TH-N12(CX)(KP) (Mass: 0.11kg)

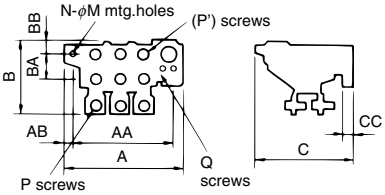


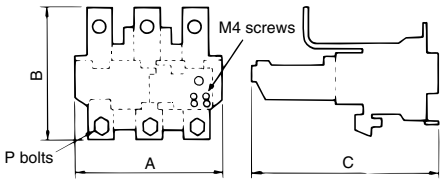
TH-N12(CX)(KP) with mounting adapter UN-HZ12(CX)

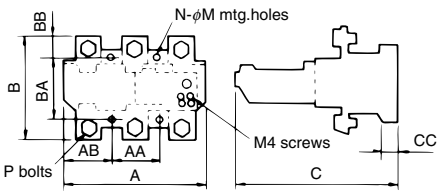


TH-N18(CX)(KP) (Mass: 0.14kg)









Type	A	B	C	AA	AB	BA	BB	CC	N	M	P	Q	Mass (kg)
TH-N20(CX)(KP)	63	51	79	19	15	33	8.5	7	2	4.5	M4	M3.5	0.14
TH-N60(KP)	91.5	57	87	70	12	45	6	9	2	4.5	M6	M4	0.28
TH-N60CX(KP)	91.5	57	87	70	12	45	6	9	2	4.5	M6	M4	0.28
TH-N120(KP)	103	67	105	75	14	50	6	10	2	6	M8	M4	0.48
TH-N600(KP)	63	42	83.5	19	14	33	2	7	2	4.5	M4	M4	0.14

Type	A	B	C	AA	AB	BA	BB	CC	N	M	P(Ṕ)	Q	Mass (kg)
TH-N20TA(CX)(KP)	74	72	83.5	—	—	—	—	—	—	—	M5 (M4)	M3.5	0.2
TH-N60TA(KP)	89	73.5	83.5	—	—	—	—	—	—	—	M6 (M6)	M4	0.32
TH-N120TA(KP)	112	87	105	—	—	—	—	—	—	—	M8 (M8)	M4	0.75
TH-N120TAHZ(KP)	112	103	105	75	25	50	25	10	2	6	M8 (M8)	M4	1.0

Type	A	B	C	AA	AB	BA	BB	CC	N	M	P	Mass (kg)
TH-N220RH(KP)	144	114	179.5	—	—	—	—	—	—	—	M10	2.5
TH-N400RH(KP)	144	160	193.5	—	—	—	—	—	—	—	M12	2.7

Type	A	B	C	AA	AB	BA	BB	CC	N	M	P	Mass (kg)
TH-N220HZ(KP)	144	104	166.5	47	48.5	62	21	18	4	6	M10	2.5
TH-N400HZ(KP)	144	173	166.5	47	48.5	62	55.5	18	4	6	M12	2.7

Note: Suffix "HZ" denotes separate mounting type.