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## Hitachi Industrial Equipment Systems Co., Ltd.

<http://www.hitachi-ies.co.jp/english/index.htm>

For further information, please contact your nearest sales representative.

Hitachi Circuit Breakers & Miniature Circuit Breakers

# Hitachi Circuit Breakers & Miniature Circuit Breakers



Hitachi Industrial Equipment Systems Co., Ltd.

# Circuit Breakers & Miniature Circuit Breakers



Hitachi Industrial Equipment Systems Co., Ltd.

Hitachi Circuit Breakers and Miniature Circuit Breakers are designed for circuit protection of low-voltage distribution systems. They are suitable for application as main breakers and for protection of branch and feeder circuits and connected apparatus. These breakers provide overload protection for conductors and short-circuit protection for all circuit elements

such as conductors, motors, and starters.

They are designed for use in switchboard, control centers, panel boards, combination starters, and separate individual enclosures. In these various enclosures, they are applicable to the requirements of lighting, distribution, and other power circuits.

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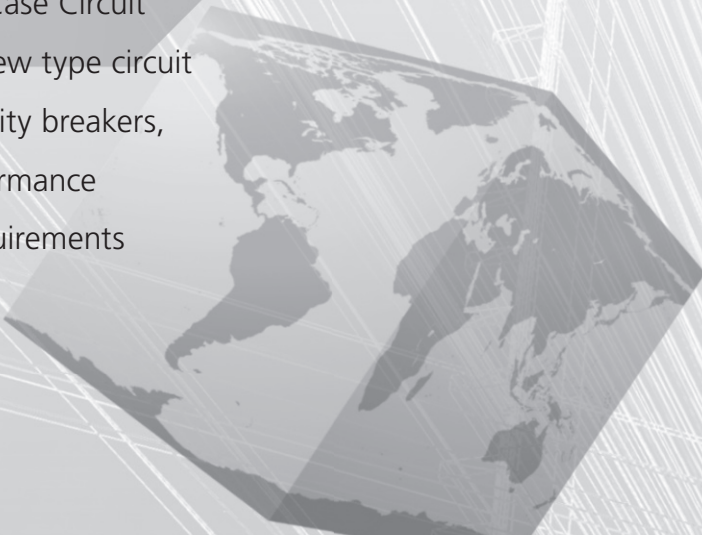
# FUSE-FREE BREAKER

NEW LINE-UPS WITH FULLY INTEGRATED CONFIGURATION,  
ADVANCED PERFORMANCE AND SIMPLIFIED OPERATION

## Hitachi Global Series

Hitachi has been developing new Molded Case Circuit Breakers and now we have just launched new type circuit breakers and these are innovative high quality breakers, new technology fulfills improving the performance and new design satisfies all application requirements and world customers.

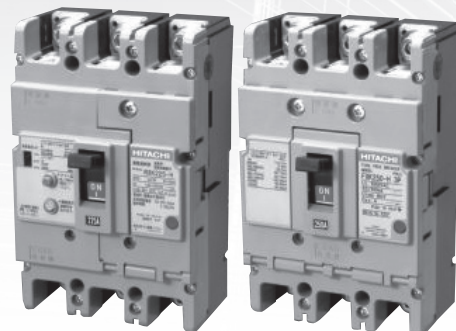
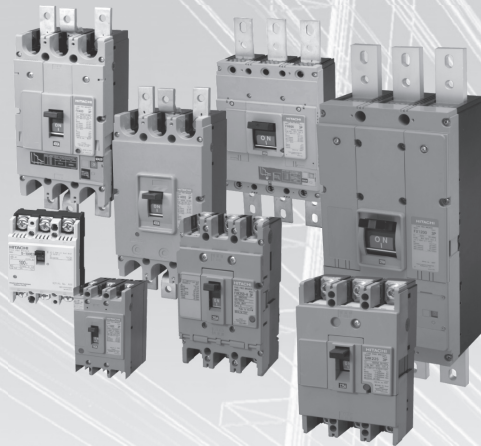
It's a new solution of the breakers.



## FEATURES

New color  
of  
the face

Renew the color of the face of the breakers from black to brighter color, Light Gray, and the impression of the distribution panels will be improved brightly and sophisticated.



**High  
breaking  
performance**

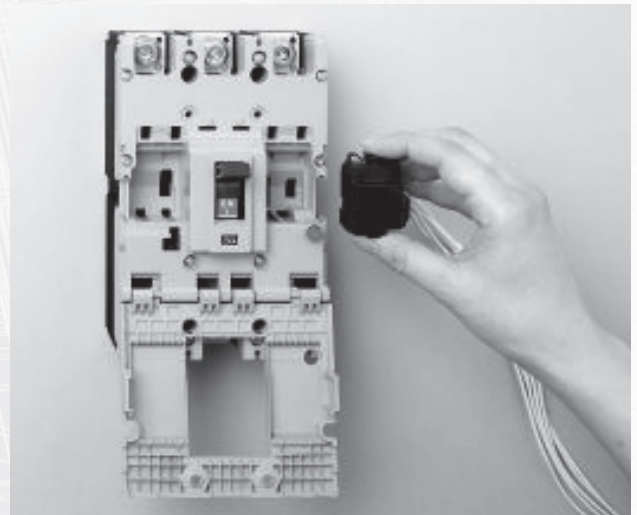
Breaking performance of standard type (F series) are  $I_{cs} = 100\%I_{cu}$  which is world level performance of the breaking current by new solution of breaking system and new breaking system reduces thermal and mechanical stress to distribution systems and they can be used any distribution system.

AF	60AF	100AF	250AF	400AF	600AF	800AF	1000AF	1200AF
Types	F-60RB	F-100KB FXK125-S FXK125-H	F-250FB F-250KC FXK250-S FXK250-H	F-400R FX400	F-600F FX600	F-800R FX800	FX1000	FX1200

**Easy to  
install  
accessories**

Easy to install the accessories and easy to change the specifications

Hitachi Global series provides wide range of the frame and the varieties of accessories for customers. The specifications of breakers can be changed by cassette type internal accessories. They can be installed by users, quickly responding to changing specifications. Applicable type are stated in table of Ratings and Specifications.

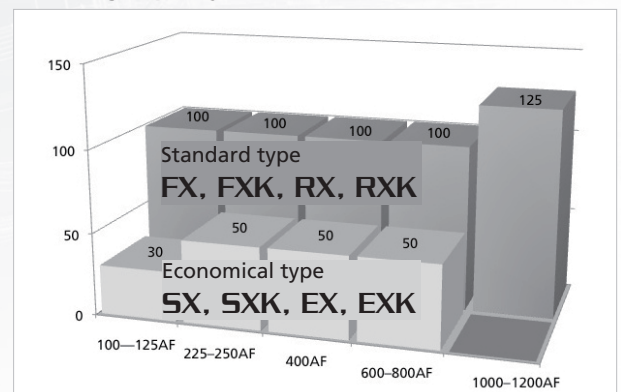


**Dimensions  
are  
unified**

Dimensions are unified for the economical and standard types, contributing to total cost reduction of the control panel.




Even height is unified in addition to the conventional projected area unification. This compatibility reduces the total cost in mounting panels. Interrupting capacity is also unified for the fuse-free breaker and earth leakage breaker within the frame of the same rated current, enabling easy, smooth replacement.


**Breaking Capacity at 230V**



## CLASSIFICATION AND COMPOSITION

Hitachi Fuse-Free Breakers are produced in the variety of types shown below. Any type can be freely chosen according to the purposes of applications and circuit conditions, making it possible to design an electric circuit with high economy and reliability.

Fuse-Free Breaker for General Purpose		
<b>F Series</b> Standard Breaker	<b>L Series</b> High Interrupting Capacity Breaker	<b>S Series</b> Economical Breaker
<Fundamental>	<Current Limiting>	<Small>
		
30A – 1600A frame	50A – 800A frame	30A – 800A frame

Motor Breaker
<b>M Series</b>

30A – 225A frame

# COMPOSITION IN TERMS OF INTERRUPTING CAPACITY

## AC 230V — 240V



Transformer capacity (kVA)	- 30		50 - 100		150	200 - 500				750 - 1500	2000 - 3000		
	Interrupting capacity kA (sym)		5	7.5	10	14	25	35	42	50	85	100	125
30	S-30E	F-30FB											
50	S-50EB	S-50SB	L-50E										
60	S-60RB		F-60RB										
100 125	S-100EB		S-100S		S-100SB	FXK125-S		FXK125-H		L-100E			
225 250	S-225SB, SXK225					FXK250-S F-250FB		FXK250-H F-250KC		L-225E			
400	SX400, S-400S							FX400, F-400R		L-400E			
600	SX600, S-600S							FX600, F-600F		L-600E			
800	SX800 S-800S									FX800 F-800R	F-800RH	L-800E	
1000 - 1200	FX1000, FX1200, F-1000K, F-1200K, F-1000C, F-1200C												
1600	F-1600CB, F-1600B, F-1600E												

Frame (AF)

## AC 380V — 440V







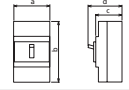
Transformer capacity (kVA)	- 50		75 - 100		200 - 500			750 - 1000			1500 - 2000			2500 - 3500		
	Interrupting capacity kA (sym)		1.5	2.5	5	7.5	10	15	18	22	25	30	35	50	85	125
30	S-30E	F-30FB														
50	S-50EB	S-50SB	L-50E													
60	S-60RB		F-60RB													
100 125	S-100S, S-100SB				FXK125-S			FXK125-H		L-100E						
225 250	S-225SB, SXK225					FXK250-S F-250FB		FXK250-H F-250KC		L-225E						
400	SX400 S-400S							FX400 F-400R		L-400E						
600	SX600 S-600S							FX600 F-600F		L-600E						
800	SX800, S-800S									FX800 F-800R	F-800RH	L-800E				
1000 - 1200	FX1000, FX1200, F-1000K, F-1200K, F-1000C, F-1200C															
1600	F-1600CB, F-1600B, F-1600E															

Frame (AF)

 **F Series**  
 **S Series**

# RATINGS AND SPECIFICATIONS

Table 1 **F series**

Type		F-30FB	F-60RB	F-60R	F-100S	FXK125-S	FXK125-H	F-100KB				
Appearance												
Number of poles		2 3	2 3 4		4	2 (*1) 3	2 (*1) 3	4				
Rated Current (A) (Base ambient temperature 40°C)		3 5 10 15 20 30	15 20 30 40 50 60		15 20 30 50 60 75 100	15 20 30 40 50 63 75 100 125	15 20 30 40 50 63 75 100 125	15 20 30 40 50 60 75 100				
Rated Insulation Voltage Ui (V)		690	690		690	690	690	690				
Rated Impulse withstand Voltage Uimp (kV)		6	6		8	8	8	8				
Rated Breaking Capacity (kA)	IEC 60947-2 (Icu/Ics)	AC	690V	—		—	—	—	—			
			440V	2.5/1	10/10		10/5	30/30	50/50			
			415V	2.5/1	10/10		10/5	30/30	50/50			
			400V	2.5/1	10/10		10/5	30/30	50/50			
			380V	2.5/1	10/10		10/5	30/30	50/50			
			240V	7.5/2	25/25		35/18	50/50	100/100	85/85		
			230V	7.5/2	25/25		35/18	50/50	100/100	85/85		
			DC	250V	2.5/1	—	5/2	—	—	25/13	—	
	125V	5/2	—	7.5/2	—	—	25/13	—				
Dimensions (mm)		a	52	75	52	75	100	120	90	90	120	
		b	130		130		150	150	150			
		c	60		60		60	68	68	86		
		d	84		84		85	94	94	106		
Net Weight (kg)		0.48	0.6	0.53	0.74	0.96	1.3	1.4	1.4	1.4	1.4	2.3
Standard Connection Type		Front Terminal		Front Terminal		Front Terminal	Front Terminal	Front Terminal				
Phase Separator for Line Side		○		● (*2)		●	● (*2)	● (*2)				
Interior Accessories	Alarm Switch	AL	○	○	○	○	○ (*3)	○ (*3)	○			
	Auxiliary Switch	AUX	○	○	○	○	○ (*3)	○ (*3)	○			
	Shunt Trip	SHT	○	○	○	○	○ (*3)	○ (*3)	○			
	Undervoltage Trip	UVT	—	—	—	—	—	—	○			
	Terminal Block	TB	○	○	○	○	○	○	○			
	TB2	○	○	○	○	○	○	○				
Exterior Accessories	Rear-connecting Stud	STB	STB-2M	STB-2M	STB-1B	STB-3H (Up to 50A:STB-2D)	STB-2S (Up to 50A) BSD-3S (60A or more)	STB-2S (Up to 50A) BSD-3S (60A or more)	STB-3J (Up to 50A:STB-2)			
		BSD	—	—	—	—	—	—	—			
	Flush Mounting Base Assembly	GKW(STB)	○	○	○	○	—	—	○			
		GK·GKW(BSD)	—	—	—	—	○ (Up to 50A)	○ (Up to 50A)	—			
	Plug-in Mounting Base Assembly	PK	○	○	○	○	○ (60A or more)	○ (60A or more)	○			
	Drawout Assembly	PDK	—	—	—	—	—	—	—			
	Mechanical Interlock	MIW	MIW-2E	MIW-2E	MIW-1C	MIW-2C	MIW-3H	MIW-3H	MIW-3D			
	Motor-operating Mechanism	MMK-S	—	—	—	—	○	○	○			
		MMK-C	—	—	—	—	—	—	—			
		MMK	—	—	—	—	—	—	—			
	Lock Cover	LC	LC-2E	LC-2E	LC-1B	LC-2C	○	○	LC-2C			
	Handle Lock	HL	○	○	○	○	○	○	○			
	Handle Operating Mechanism	HA	HA-108	HA-108	HA-107	HA-104	—	—	HA-106			
		HM	—	HM-S12	—	HM-S12	HM-57	—	HM-S13	HM-S13	HM-S11	
	Terminal Cover	Front Type	TMC	TMC-1	TMC-1	—	TMC-2C	TMC-2C	TMC-2C	TMC-3C		
Short Type			TMC-1S	TMC-1S	—	—	—	—	—			
Long Type			TMC-2D	TMC-2D	—	—	—	—	—			
Rear Type		BTC	BTC-1	BTC-1	—	BTC-2C	BTC-2C	BTC-2C	BTC-3C			
IEC Rail 35 mm		○	○	—	—	—	—	—				
Automatic Tripping Device		Full Magnetic		Full Magnetic		Full Magnetic	Thermal-Magnetic	Thermal-Magnetic	Full Magnetic			
Trip Button		●		●		●	●	●				

## Attention

- : Standard ○ : Option
- 2-pole types marked with (\*1) are supplied in 3-pole type.
- Please state "For DC" in case of DC use. Especially, state please state kind of the power supply in case of from 30 to 100AF.
- Flush Mounting Base Assembly, GKW are standard in case of up to 250AF and FX400.
- Please state that number of poles of breakers when order MIW.
- Installation of phase separators is required in case of types marked (\*2).
- Tripping system of F-1000K and F-1200K are induction heat system, please state frequency when ordering.
- For DC use, the tripping character is only instantaneous trip in case of F-1000K and F-1200K.
- The accessories marked (\*3) can be installed by customers.














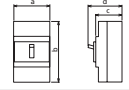
FXK250-S			F-250FB			FXK250-H			F-250KC			F-400R			FX400			F-600F			FX600																																
																																																					
2 (*1)			3			4			2 (*1)			3			4			2 (*1)			3			2 (*1)			3			4			3																				
125 150 175 200 225 250			125 150 175 200 225 250			125 150 175 200 225 250			250 300 300 400			200/225/250 300/350/400 adjustable			500 600			300/350/400 500/600 adjustable																																			
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105			140			105			140			140			185			210			280																																
165			165			165			257			257			274			274																																			
68			103			68			103			103			103			103																																			
95			127			95			127			133			133			141																																			
1.6			3.1			1.6			3.1			5.3			6.1			8.2			5.1			5.9			10			13			9.7																				
Front Terminal			Front Terminal			Front Terminal			Front Bar Terminal			Front Bar Terminal			Front Bar Terminal			Front Bar Terminal																																			
● (*2)			● (*2)			● (*2)			● (*2)			● (*2)			● (*2)			● (*2)																																			
○ (*3)			○			○ (*3)			○			○			○ (*3)			○			○ (*3)																																
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MIW-4M			MIW-4H			MIW-4M			MIW-4H			MIW-5D			MIW-5F			MIW-5			MIW-5G																																
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LC-4J			LC-4H			LC-4J			LC-4H			—			—			—			—																																
HL-4J			○			HL-4J			○			HL-5			HL-5			HL-6			HL-6																																
HA-210			HA-206			HA-210			HA-206			HA-405			HA-406			HA-402			HA-402																																
HM-S25			HM-S21			HM-S25			HM-S21			HM-405			HM-406			HM-402			HM-407																																
TMC-4J			TMC-4H			TMC-4J			TMC-4H			TMC-5B			TMC-5B			TMC-5D			TMC-5D																																
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BTC-4J			—			BTC-4J			—			BTC-5B			BTC-5B			—			—																																
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Thermal-Magnetic			Thermal-Magnetic			Thermal-Magnetic			Thermal-Magnetic			Electronic Relay			Thermal-Magnetic			Electronic Relay																																			
●			●			●			●			●			●			●																																			

Table 1 **F series**

Type		F-800R	FX800	F-800RH	F-1000K	F-1000C				
Appearance										
Number of poles		3   4	3	3   4	3   4	3   4				
Rated Current (A) (Base ambient temperature 40°C)		700 800	400/450/500 600/700/800 adjustable	700 800	1000	500/600/700 800/900/1000 adjustable				
Rated Insulation Voltage Ui (V)		690	690	690	690	690				
Rated Impulse withstand Voltage Uimp (kV)		8	8	8	8	8				
Rated Breaking Capacity (kA)	IEC 60947-2 (Icu/Ics)	AC	690V	—	—	—	—			
			440V	50/50	50/50	85/43	85/22	85/22		
			415V	50/50	50/50	85/43	85/22	85/22		
			400V	50/50	50/50	85/43	85/22	85/22		
			380V	50/50	50/50	85/43	85/22	85/22		
			240V	100/100	100/100	125/63	125/32	125/32		
			230V	100/100	100/100	125/63	125/32	125/32		
			DC	250V	40/40	—	—	40/10	—	
		125V	40/40	—	—	40/10	—			
Dimensions (mm)		a	210	280	210	280	210	280		
		b	—	274	—	274	—	410	—	
		c	—	103	—	103	—	150	—	
		d	—	141	—	141	—	190	—	
Net Weight (kg)		10.5	13.5	11	10.5	13.5	26	33	26	33
Standard Connection Type		Front Bar Terminal		Front Bar Terminal	Front Bar Terminal	Front Bar Terminal	Front Bar Terminal		Front Bar Terminal	
Phase Separator for Line Side		● (*2)		● (*2)	● (*2)	● (*2)	● (*2)		● (*2)	
Interior Accessories	Alarm Switch	AL	○	○ (*3)	○	○	○	○	○	
	Auxiliary Switch	AUX	○	○ (*3)	○	○	○	○	○	
	Shunt Trip	SHT	○	○ (*3)	○	○	○	○	○	
	Undervoltage Trip	UVT	○	○	○	○	○	○	○	
	Terminal Block	TB	○	○	○	○	○	○	○	○
TB2		○	○	○	○	○	○	○	○	
Rear-connecting Stud	STB	—	—	—	—	—	—	—	—	
	BSD	○	○	○	○	○	○	○	○	
Flush Mounting Base Assembly	GKW(STB)	—	—	—	—	—	—	—	—	
	GK·GKW(BSD)	○ (GK)	○ (GK)	○ (GK)	○ (GK)	○ (GK)	○ (GK)	○ (GK)	○ (GK)	
Plug-in Mounting Base Assembly	PK	○	○	○	○	○	○	○	○	
Drawout Assembly	PDK	—	—	—	—	—	—	—	—	
Mechanical Interlock	MIW	MIW-5	MIW-5G	MIW-5	MIW-8	MIW-8	MIW-8	MIW-8	MIW-8	
Motor-operating Mechanism	MMK-S	—	—	—	—	—	—	—	—	
	MMK-C	○	○	○	○	○	○	○	○	
	MMK	—	—	—	—	—	—	—	—	
Lock Cover	LC	—	—	—	—	—	—	—	—	
Handle Lock	HL	HL-6	HL-6	HL-6	HL-6	○	○	○	○	
Handle Operating Mechanism	HA	HA-402	HA-402	HA-402	HA-801	—	—	—	—	
	HM	HM-402	HM-407	HM-402	—	—	—	—	—	
Terminal Cover	Front Type	TMC	TMC-5D	TMC-5D	TMC-5D	TMC-6	TMC-6	TMC-6	TMC-6	
		Short Type	—	—	—	—	—	—	—	
	Long Type	—	—	—	—	—	—	—	—	
Rear Type	BTC	—	—	—	—	—	—	—	—	
IEC Rail 35 mm		—	—	—	—	—	—	—	—	
Automatic Tripping Device		Thermal-Magnetic		Electronic Relay	Thermal-Magnetic	Thermal-Magnetic	Thermal-Magnetic		Electronic Relay	
Trip Button		●		●	●	●	●		●	

**Attention**

- : Standard ○ : Option
- 2-pole types marked with (\*1) are supplied in 3-pole type.
- Please state "For DC" in case of DC use. Especially, state please state kind of the power supply in case of from 30 to 100AF.
- Flush Mounting Base Assembly, GKW are standard in case of up to 250AF and FX400.
- Please state that number of poles of breakers when order MIW.
- Installation of phase separators is required in case of types marked (\*2).
- Tripping system of F-1000K and F-1200K are induction heat system, please state frequency when ordering.
- For DC use, the tripping character is only instantaneous trip in case of F-1000K and F-1200K.
- The accessories marked (\*3) can be installed by customers.













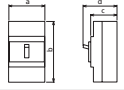
FX1000	F-1200K	F-1200C	FX1200	F-1600CB	F-1600B	F-1600E
						
3	3   4	3   4	3	3   4	3   4	3   4
500/600/700 800/900/1000 adjustable	1200	600/700/800 1000/1200 adjustable	600/700/800 1000/1200 adjustable	800/900/1000 1200/1400/1600 adjustable	1000 1200 1400 1600	800/900/1000 1200/1400/1600 adjustable
690	690	690	690	690	690	690
8	8	8	8	8	8	8
—	—	—	—	—	—	45/34
85/85	85/22	85/22	85/85	85/22	85/22	85/64
85/85	85/22	85/22	85/85	85/22	85/22	85/64
85/85	85/22	85/22	85/85	85/22	85/22	100/75
85/85	85/22	85/22	85/85	85/22	85/22	100/75
125/125	125/32	125/32	125/125	125/32	125/32	125/94
125/125	125/32	125/32	125/125	125/32	125/32	125/94
—	40/10	—	—	—	40/10	—
—	40/10	—	—	—	40/10	—
210	210   280	210   280	210	210   280	210   280	210   280
410	410	410	410	410	410	370
150	150	150	150	150	150	140
190	190	190	190	190	190	191
26	26   33	26   33	26	37   49	37   49	27   36
Front Bar Terminal	Front Bar Terminal	Front Bar Terminal	Front Bar Terminal	Front Bar Terminal	Front Bar Terminal	Front Bar Terminal
● (*2)	● (*2)	● (*2)	● (*2)	● (*2)	● (*2)	—
○ (*3)	○	○	○ (*3)	○	○	○
○ (*3)	○	○	○ (*3)	○	○	○
○ (*3)	○	○	○ (*3)	○	○	○
○	○	○	○	○	○	○
○	○	○	○	○	○	○
○	○	○	○	○	○	○
—	—	—	—	—	—	—
○	○	○	○	○	○	○
—	—	—	—	—	—	—
○ (GK)	○ (GK)	○ (GK)	○ (GK)	○ (GK)	○ (GK)	○ (GK)
○	○	○	○	—	—	—
—	—	—	—	—	—	○
MIW-8	MIW-8	MIW-8	MIW-8	MIW-8D	MIW-8D	○
—	—	—	—	—	—	—
○	○	○	○	○	○	—
—	—	—	—	—	—	○
—	—	—	—	—	—	○
○	○	○	○	○	○	○
HA-801	HA-801	HA-801	HA-801	HA-801	HA-801	○
—	—	—	—	—	—	—
TMC-6B	TMC-6	TMC-6	TMC-6B	—	—	—
—	—	—	—	—	—	—
—	—	—	—	—	—	—
—	—	—	—	—	—	—
—	—	—	—	—	—	—
Electronic Relay	Thermal-Magnetic	Electronic Relay	Electronic Relay	Electronic Relay	Magnetic	Electronic Relay
●	●	●	●	●	●	●

Table 2 **S series**

Type		S-30S	S-30E	S-50E	S-50EB	S-50SB	S-60RB	S-100EB		
Appearance										
Number of poles		2   3	2   3	2   3	2   3	2   3	2   3	2   3		
Rated Current (A) (Base ambient temperature 40°C)		3   5   10 15   20   30	3   5   10 15   20   30	5   10   15   20 30   40   50	5   10   15   20 30   40   50	5   10   15   20 30   50	5   10   15   20 30   50   60	60   75   100		
Rated Insulation Voltage Ui (V)		500	500	500	500	690	690	250		
Rated Impulse withstand Voltage Uimp (kV)		—	4	—	4	6	6	6		
Rated Breaking Capacity (kA)	IEC 60947-2 (Icu/Ics)	AC	690V	—	—	—	—	—	—	
			440V	—	—	—	2.5/1	5/2	—	
			415V	—	1.5/1	—	1.5/1	2.5/1	5/2	—
			400V	1.5/1	1.5/1	1.5/1	1.5/1	2.5/1	5/2	—
			380V	1.5/1	—	1.5/1	—	2.5/1	5/2	—
			240V	2.3/1.3	—	2.3/1.3	—	7.5/2	10/3	10/3
			230V	2.5/1.3	5/2	2.3/1.3	5/2	7.5/2	10/3	10/3
			DC	250V	—	—	—	2.5/1	—	2.5/1
125V	—	—	—	—	5/2	—	5/2	—		
Dimensions (mm)		a	50   75	50   75	50   75	50   75	52   75	52   75	52   75	
		b	95	96	96	96	130	130	130	
		c	60	60	60	60	60	60	60	
		d	79	76	79	76	84	84	84	
Net Weight (kg)		0.32   0.47	0.25   0.37	0.32   0.47	0.25   0.37	0.48   0.6	0.5   0.7	0.5   0.7		
Standard Connection Type		Front Terminal	Front Terminal	Front Terminal	Front Terminal	Front Terminal	Front Terminal	Front Terminal		
Phase Separator for Line Side (*2)		—	—	—	—	○	○	○		
Interior Accessories	Alarm Switch	AL	—	○	—	○	○	○		
	Auxiliary Switch	AUX	—	○	—	○	○	○		
	Shunt Trip	SHT	—	○	—	○	○	○		
	Undervoltage Trip	UVT	—	—	—	—	—	—		
	Terminal Block	TB	—	—	—	—	○	○	○	
TB2	—	○	—	○	○	○	○			
Exterior Accessories	Rear-connecting Stud	STB	—	—	—	—	STB-2M	STB-3K (Up to 50A:STB-2M)	STB-3K (Up to 50A:STB-2M)	
		BSD	—	—	—	—	—	—	—	
	Flush Mounting Base Assembly	GKW(STB)	—	—	—	—	○	○	○	
		GK·GKW(BSD)	—	—	—	—	—	—	—	
	Plug-in Mounting Base Assembly	PK	—	—	—	—	○	○	○	
	Drawout Assembly	PDK	—	—	—	—	—	—	—	
	Mechanical Interlock	MIW	—	—	—	—	MIW-2E	MIW-2E	MIW-2E	
	Motor-operating Mechanism	MMK-S	—	—	—	—	—	—	—	
		MMK-C	—	—	—	—	—	—	—	
		MMK	—	—	—	—	—	—	—	
	Lock Cover	LC	LC-0B	LC-03	LC-0B	LC-03	LC-2G	LC-2G	LC-2G	
	Handle Lock	HL	—	—	—	—	HL-2G	HL-2G	HL-2G	
	Handle Operating Mechanism	HA	—	—	—	—	HA-108	HA-108	HA-108	
		HM	—	—	—	—	—	—	—	
	Terminal Cover	Front Type	TMC	TMC-0C   TMC-0A	TMC-0G	TMC-0C   TMC-0A	TMC-0G	TMC-1	TMC-1	TMC-1
Short Type			—	—	—	—	TMC-1S	TMC-1S	TMC-1S	
Long Type			—	—	—	—	TMC-2D	TMC-2D	TMC-2D	
Rear Type	BTC	—	—	—	—	BTC-1	BTC-1	BTC-1		
IEC Rail 35 mm		●	●	●	●	○	○	○		
Automatic Tripping Device		Full Magnetic	Full Magnetic	Full Magnetic	Full Magnetic	Full Magnetic	Full Magnetic	Full Magnetic		
Trip Button		●	—	●	—	●	●	●		

**Attention**

- : Standard ○ : Option
- 2-pole types marked with (\*1) are supplied in 3-pole type.
- Please state "For DC" in case of DC use . Especially, state please state kind of the power supply in case of from 30AF to 100AF.
- Please state that number of poles of breakers when order MIW.
- Installation of phase separators is required in case of types marked (\*2).
- The accessories marked (\*3) can be installed by customers.

















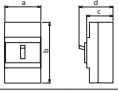
S-100SB		S-100S		S-225SB		SXK225		S-400S		SX400		S-600S		SX600		S-800S		SX800	
																			
2	3	2	3	2 (*1)	3	2 (*1)	3	2 (*1)	3	2 (*1)	3	2 (*1)	3	3	3	3	3	3	3
60 75 100		60 75 100		125 150 175 200 225		125 150 175 200 225		250 300 350 400		200/225/250 300/350/400 adjustable		500 600		300/350/400 500/600 adjustable		700 800		400/450/500 600/700/800 adjustable	
690		690		690		690		690		690		690		690		690		690	
6		6		6		6		8		8		8		8		8		8	
—		—		—		—		—		—		—		—		—		—	
10/3		10/3		15/8		15/8		36/18		36/18		36/18		36/18		36/18		36/18	
10/3		10/3		15/8		15/8		36/18		36/18		36/18		36/18		36/18		36/18	
10/3		10/3		15/8		15/8		36/18		36/18		36/18		36/18		36/18		36/18	
10/3		10/3		15/8		15/8		36/18		36/18		36/18		36/18		36/18		36/18	
35/9		25/7		35/18		35/18		50/25		50/25		50/25		50/25		85/43		85/43	
35/9		25/7		35/18		35/18		50/25		50/25		50/25		50/25		85/43		85/43	
5/2	—	5/2	—	10/5	—	10/5	—	25/13	—	—	—	40/20	—	—	—	40/20	—	—	—
7.5/2	—	7.5/2	—	15/8	—	15/8	—	25/13	—	—	—	40/20	—	—	—	40/20	—	—	—
52	75	65	90	105	—	105	—	140	—	140	—	210	—	210	—	210	—	210	—
130	—	150	—	165	—	165	—	257	—	257	—	274	—	274	—	274	—	274	—
60	—	60	—	60	—	68	—	103	—	103	—	103	—	103	—	103	—	103	—
84	—	85	—	85	—	95	—	133	—	133	—	141	—	141	—	141	—	141	—
0.53	0.74	0.7	1	1.6	—	1.6	—	5.3	6.1	5.1	5.9	10	—	9.7	—	10.5	—	11	—
Front Terminal	Front Terminal	Front Terminal	Front Terminal	Front Terminal	Front Terminal	Front Bar Terminal	Front Bar Terminal	Front Bar Terminal	Front Bar Terminal	Front Bar Terminal	Front Bar Terminal	Front Bar Terminal	Front Bar Terminal	Front Bar Terminal	Front Bar Terminal	Front Bar Terminal	Front Bar Terminal	Front Bar Terminal	Front Bar Terminal
● (*2)	○	○	○	● (*2)	● (*2)	● (*2)	● (*2)	● (*2)	● (*2)	● (*2)	● (*2)	● (*2)	● (*2)	● (*2)	● (*2)	● (*2)	● (*2)	● (*2)	● (*2)
○	○	○	○	○	○ (*3)	○	○	○	○ (*3)	○	○	○	○ (*3)	○	○	○	○	○ (*3)	○
○	○	○	○	○	○ (*3)	○	○	○	○ (*3)	○	○	○	○ (*3)	○	○	○	○	○ (*3)	○
○	○	○	○	○	○ (*3)	○	○	○	○ (*3)	○	○	○	○ (*3)	○	○	○	○	○ (*3)	○
—	—	○	—	—	—	○	—	○	—	○	—	○	—	○	—	○	—	○	—
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
STB-3K (Up to 50A:STB-2M)	STB-3H (Up to 50A:STB-2D)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	○	—	○	—	○	—	○	—	○	—	○	—	○	—	○	—	○	—
○	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	○	—	○	—	○ (GK)	—	○	—	○ (GK)	—	○ (GK)	—	○ (GK)	—	○ (GK)	—	○ (GK)	—
○	○	—	—	—	—	○	—	○	—	○	—	○	—	○	—	○	—	○	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MIW-2E	MIW-2C	MIW-4F	MIW-4L	MIW-5D	MIW-5F	MIW-5	MIW-5G	MIW-5	MIW-5G	MIW-5	MIW-5G	MIW-5	MIW-5G	MIW-5	MIW-5G	MIW-5	MIW-5G	MIW-5	MIW-5G
—	—	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
LC-2G	LC-2C	LC-4E	LC-2F	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
HL-2G	○	HL-4E	HL-2F	HL-5	HL-5	HL-6	HL-6	HL-6	HL-6	HL-6	HL-6	HL-6	HL-6	HL-6	HL-6	HL-6	HL-6	HL-6	HL-6
HA-108	HA-104	HA-207	HA-209	HA-405	HA-406	HA-402	HA-402	HA-402	HA-402	HA-402	HA-402	HA-402	HA-402	HA-402	HA-402	HA-402	HA-402	HA-402	HA-402
—	HM-512	—	HM-522	HM-523	HM-405	HM-406	HM-402	HM-402	HM-402	HM-402	HM-402	HM-402	HM-402	HM-402	HM-402	HM-402	HM-402	HM-402	HM-402
TMC-1	TMC-2C	TMC-4K	TMC-4J	TMC-5B	TMC-5B	TMC-5D	TMC-5D	TMC-5D	TMC-5D	TMC-5D	TMC-5D	TMC-5D	TMC-5D	TMC-5D	TMC-5D	TMC-5D	TMC-5D	TMC-5D	TMC-5D
TMC-1S	—	TMC-4JS	TMC-4JS	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
TMC-2D	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
BTC-1	BTC-2C	BTC-4G	BTC-4J	BTC-5B	BTC-5B	—	—	—	—	—	—	—	—	—	—	—	—	—	—
○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Full Magnetic	Full Magnetic	Thermal-Magnetic	Thermal-Magnetic	Thermal-Magnetic	Electronic Relay	Thermal-Magnetic	Electronic Relay	Thermal-Magnetic	Electronic Relay	Thermal-Magnetic	Electronic Relay	Thermal-Magnetic	Electronic Relay	Thermal-Magnetic	Electronic Relay	Thermal-Magnetic	Electronic Relay	Thermal-Magnetic	Electronic Relay
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●









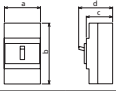
Table 3 L series

Type		L-50E		L-100E		L-225E		L-400E		L-600E		L-800E		
Appearance														
Number of poles		3	4	3	4	3	4	3	4	3	4	3	4	
Rated Current (A) (Base ambient temperature 40°C)		5	10	15	15	20	30	125	150	175	250	300	350	400
Rated Insulation Voltage Ui (V)		690		690		690		690		690		690		
Rated Impulse withstand Voltage Uimp (kV)		8		8		8		8		8		8		
Rated Breaking Capacity (kA)	IEC 60947-2 (Icu/Ics)	AC	690V	—	—	—	—	—	—	—	—	—	—	
			440V	125/32	125/32	125/32	125/32	125/32	125/32	125/32	125/32	125/32		
			415V	125/32	125/32	125/32	125/32	125/32	125/32	125/32	125/32	125/32		
			400V	125/32	125/32	125/32	125/32	125/32	125/32	125/32	125/32	125/32		
		380V	125/32	125/32	125/32	125/32	125/32	125/32	125/32	125/32	125/32			
		240V	175/88	175/88	175/88	175/88	175/88	175/88	175/88	175/88	175/88			
		230V	175/88	175/88	175/88	175/88	175/88	175/88	175/88	175/88	175/88			
		DC	250V	—	—	—	—	—	—	—	—	—	—	
125V	—	—	—	—	—	—	—	—	—	—	—			
Dimensions (mm)		a	90	120	90	120	140	185	140	185	210	280	210	280
		b	150	150	257	257	274	274						
		c	103	103	103	103	103	103						
		d	123	123	133	133	141	141						
Net Weight (kg)		2.0	2.5	2.0	2.5	5.2	7.0	6.1	8.2	10.0	13.0	10.5	13.5	
Standard Connection Type		Front Terminal		Front Terminal		Front Terminal		Front Bar Terminal		Front Bar Terminal		Front Bar Terminal		
Phase Separator for Line Side (*2)		● (*2)		● (*2)		● (*2)		● (*2)		● (*2)		● (*2)		
Interior Accessories	Alarm Switch	AL	○	○	○	○	○	○	○	○	○	○	○	
	Auxiliary Switch	AUX	○	○	○	○	○	○	○	○	○	○	○	
	Shunt Trip	SHT	○	○	○	○	○	○	○	○	○	○	○	
	Undervoltage Trip	UVT	○	○	○	○	○	○	○	○	○	○	○	
	Terminal Block	TB	○	○	○	○	○	○	○	○	○	○	○	
TB2		○	○	○	○	○	○	○	○	○	○	○		
Exterior Accessories	Rear-connecting Stud	STB	○	○	○	○	○	○	○	○	○	○	○	
		BSD	—	—	○	○	○	○	○	○	○	○		
	Flush Mounting Base Assembly	GKW(STB)	○	○	—	—	—	—	—	—	—	—	—	
		GK·GKW(BSD)	—	—	○ (GK)	○ (GK)	○ (GK)	○ (GK)	○ (GK)	○ (GK)	○ (GK)	○ (GK)		
	Plug-in Mounting Base Assembly	PK	○	○	○	○	○	○	○	○	○	○		
	Drawout Assembly	PDK	—	—	—	—	—	—	—	—	—	—		
	Mechanical Interlock	MIW	MIW-3E	MIW-3E	MIW-5D	MIW-5D	MIW-5D	MIW-5D	MIW-5	MIW-5	MIW-5			
	Motor-operating Mechanism	MMK-S	○	○	—	—	—	—	—	—	—	—		
		MMK-C	—	—	○	○	○	○	○	○	○			
		MMK	—	—	—	—	—	—	—	—	—			
	Lock Cover	LC	LC-2C	LC-2C	—	—	—	—	—	—	—			
	Handle Lock	HL	○	○	HL-5	HL-5	HL-5	HL-5	HL-6	HL-6	HL-6			
	Handle Operating Mechanism	HA	HA-106	HA-106	HA-405	HA-405	HA-405	HA-405	HA-402	HA-402	HA-402			
HM		HM-S11	HM-S11	HM-405	HM-405	HM-405	HM-405	HM-402	HM-402	HM-402				
Terminal Cover	Front Type	TMC	TMC-3C	TMC-3C	TMC-5B	TMC-5B	TMC-5B	TMC-5D	TMC-5D	TMC-5D				
		Short Type	—	—	—	—	—	—	—	—				
		Long Type	—	—	—	—	—	—	—	—				
Rear Type	BTC	BTC-3C	BTC-3C	BTC-5B	BTC-5B	BTC-5B	BTC-5B	—	—	—				
IEC Rail 35 mm		—		—		—		—		—		—		
Automatic Tripping Device		Full Magnetic		Full Magnetic		Thermal-Magnetic		Thermal-Magnetic		Thermal-Magnetic		Thermal-Magnetic		
Trip Button		●		●		●		●		●		●		

**Attention**

- : Standard ○ : Option
- Please state "For DC" in case of DC use. Especially, state please state kind of the power supply in case of from 30 to 100AF.
- Please state that number of poles of breakers when order MIW.
- Installation of phase separators is required in case of types marked (\*2).
- The accessories marked (\*3) can be installed by customers.

Table 4 **M series**

Type		MS-30E	MS-50EB	MS-50SB	MS-100SB	MFXX100-S	MS-225SB	MSXK225	MFXX225-S		
Appearance											
Number of poles		3	3	3	3	3	3	3	3		
Rated Current (A) (Base ambient temperature 40°C)		0.8 1.2 1.4 2 2.5 4 5 6.3 7.1 8 10 12 16 25 32	10 12 16 25 32 40 45	0.7 1.4 2.3 2.6 4.2 5.6 7.4 9 10 14 16 25 33 40 45	60 75 90	60 75 90	125 150 175 225	125 150 175 225	125 150 175 225		
Rated Insulation Voltage Ui (V)		500	500	690	690	690	690	690	690		
Rated Impulse withstand Voltage Uimp (kV)		4	4	6	6	8	6	6	8		
Rated Breaking Capacity (kA)	IEC 60947-2 (Icu/Ics)	AC	690V	—	—	—	—	—	—	—	
			500V	—	—	1.5/1	2.5/1	10/10	5/3	5/3	10/5
			440V	—	—	2.5/1	10/3	30/30	15/8	15/8	30/15
			415V	1.5/1	1.5/1	2.5/1	10/3	30/30	15/8	15/8	30/15
			400V	1.5/1	1.5/1	2.5/1	10/3	30/30	15/8	15/8	30/15
			380V	—	—	2.5/1	10/3	30/30	15/8	15/8	30/15
			240V	—	—	7.5/2	35/9	50/50	35/18	35/18	50/25
Dimensions (mm)			a	75	75	75	75	90	105	105	105
			b	96	96	130	130	150	165	165	165
			c	60	60	60	60	68	60	68	68
			d	76	76	84	84	94	85	95	95
Net Weight (kg)		0.37	0.37	0.6	0.74	1.6	1.6	1.6	1.6		
Standard Connection Type		Front Terminal	Front Terminal	Front Terminal	Front Terminal	Front Terminal	Front Terminal	Front Terminal	Front Terminal		
Phase Separator for Line Side (*2)		—	—	○	●(*2)	●(*2)	●(*2)	●(*2)	●(*2)		
Interior Accessories	Alarm Switch	AL	○	○	○	○	○	○	○(*3)	○(*3)	
	Auxiliary Switch	AUX	○	○	○	○	○	○	○(*3)	○(*3)	
	Shunt Trip	SHT	○	○	○	○	○	○	○(*3)	○(*3)	
	Undervoltage Trip	UVT	—	—	—	—	—	—	—	—	
	Terminal Block	TB	—	—	○	○	○	○	○	○	
Exterior Accessories	Rear-connecting Stud	STB	—	—	STB-2M	STB-3K	—	—	—	—	
		BSD	—	—	—	—	—	○	○	○	
	Flush Mounting Base Assembly	GKW(STB)	—	—	○	○	—	—	—	—	
		GK-GKW(BSD)	—	—	—	—	—	○	○	○	
	Plug-in Mounting Base Assembly	PK	—	—	○	○	○	—	—	○	
	Drawout Assembly	PDK	—	—	—	—	—	—	—	—	
	Mechanical Interlock	MIW	—	—	MIW-2E	MIW-2E	—	MIW-4F	MIW-4L	MIW-4M	
	Motor-operating Mechanism	MMK-S	—	—	—	—	○	—	—	—	
		MMK-C	—	—	—	—	—	—	—	—	
		MMK	—	—	—	—	—	—	—	—	
	Lock Cover	LC	LC-03	LC-03	LC-2G	LC-2G	○	LC-4E	LC-2F	LC-4J	
	Handle Lock	HL	—	—	HL-2G	HL-2G	○	HL-4E	HL-2F	HL-4J	
	Handle Operating Mechanism	HA	—	—	HA-108	HA-108	—	HA-207	HA-209	HA-210	
		HM	—	—	HM-S12	HM-S12	HM-S13	HM-S22	HM-S23	HM-S25	
	Terminal Cover	Front Type	TMC	TMC-0G	TMC-0G	TMC-1	TMC-1	TMC-2C	TMC-4K	TMC-4J	TMC-4J
Short Type			—	—	TMC-1S	TMC-1S	—	TMC-4JS	TMC-4JS	TMC-4JS	
Long Type			—	—	TMC-2D	TMC-2D	—	—	—	—	
Rear Type	BTC	—	—	BTC-1	BTC-1	BTC-2C	BTC-4G	BTC-4J	BTC-4J		
IEC Rail 35 mm		●	●	○	○	—	—	—	—		
Automatic Tripping Device		Full Magnetic	Full Magnetic	Full Magnetic	Full Magnetic	Thermal-Magnetic	Thermal-Magnetic	Thermal-Magnetic	Thermal-Magnetic		
Trip Button		—	—	●	●	●	●	●	●		

**Attention**

- : Standard ○ : Option
- Please state that number of poles of breakers when order MIW.
- Installation of phase separators is required in case of types marked (\*2).
- The accessories marked (\*3) can be installed by customers.

**Table 5 Selecting Table of a Motor Breaker for 3-phase Induction Motor**

**200 – 220V AC**

Motor Capacity (kW)	Motor Breaker		Motor Capacity (kW)	Motor Breaker	
	Rated Current (A)	Type		Rated Current (A)	Type
0.2	1.4	MS-30E	11	45	MS-50EB, MS-50SB
0.4	2.5		15	60	MS-100SB, MFXX100-S
0.75	4		18.5	75	
1.5	8		22	90	MS-225SB, MFXX225-S
2.2	10		30	(125)*	
3.7	16		37	(150)*	
5.5	25				
7.5	32				

**400 – 440V AC**

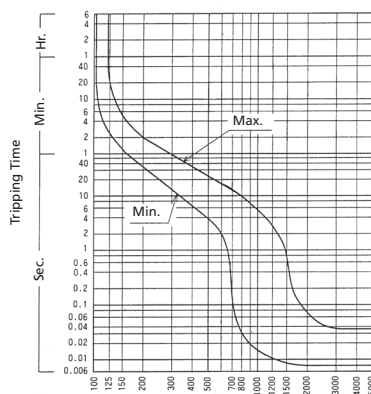
Motor Capacity (kW)	Motor Breaker		Motor Capacity (kW)	Motor Breaker	
	Rated Current (A)	Type		Rated Current (A)	Type
0.2	0.8	MS-30E	11	25	MS-30E, MS-50EB
0.4	1.4		15	32	MS-50SB
0.75	2.5		18.5	40	
1.5	4		22	45	MS-100SB, MFXX100-S
2.2	6.3		30	60	
3.7	10		37	75	
5.5	16		45	90	
7.5	16			50	(125)*

Note:

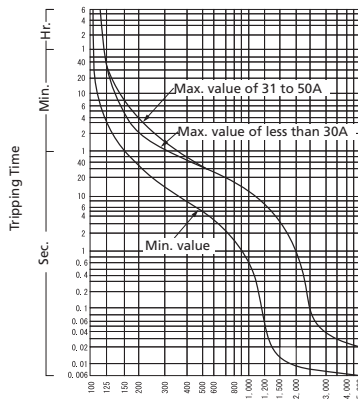
- Starting conditions are set within 3 seconds at 500% (2 seconds at 600%) of full load current for types MS-30E, MS-50EB, MS-50SB and within 8 seconds at 500% (5 seconds at 600%) of full load current for other types.
- Specify the rated current since the figures with asterisks are the mere reference current.

● **Overcurrent Tripping Characteristics**

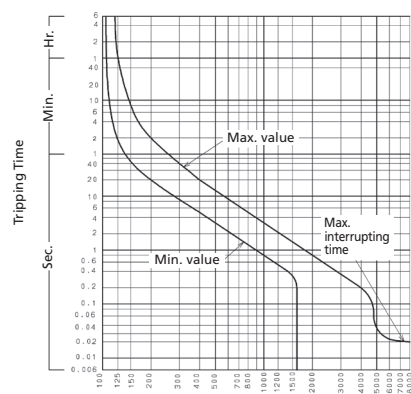
**MS-30E, MS-50EB**



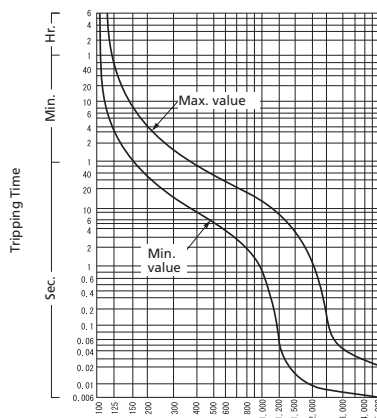
**MS-50SB**



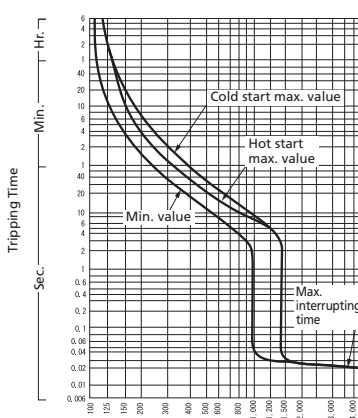
**MFXX100-S**



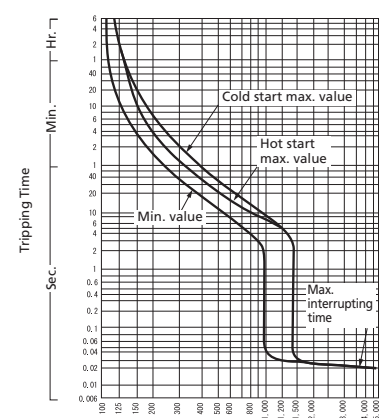
**MS-100SB**



**MS-225SB**



**MFXX225-S**





Hitachi Fuse-Free Breaker is comprised a switching mechanism, arc extinguishing devices, and a tripping unit contained in a compact molded case.

## ■ Switching Mechanism

The switching mechanism is a quick-make/quick-break type utilizing a trip-free toggle mechanism.

## ■ Arc Extinguishing Device

The series of grid plates is mounted in parallel between supports of insulating material. The slots in the steel plates extend directly over the contacts and draw the arc from moving contact up into the divided chamber.

The arc is thus confined, divided and extinguished.

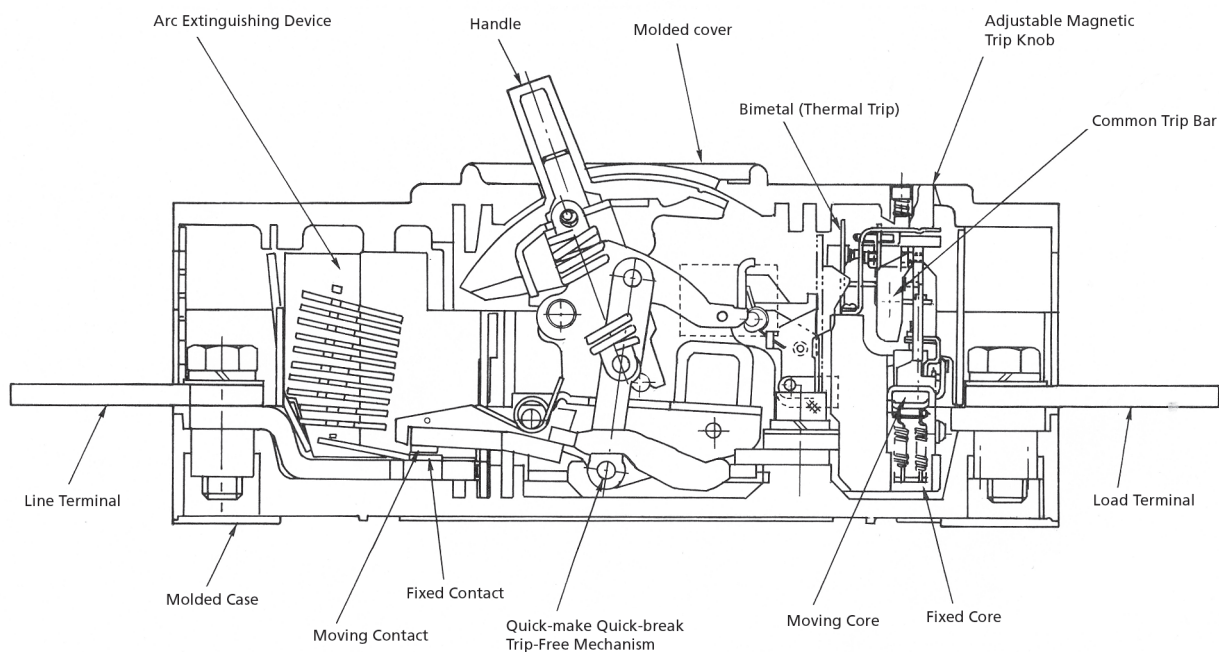
## ■ Tripping Unit

The tripping unit of the Fuse-Free Breaker is produced in two types: a thermal-magnetic type and a full-magnetic type. The tripping unit is provided for each pole of the breaker, and if any one pole operates, all of the poles open the circuit simultaneously.

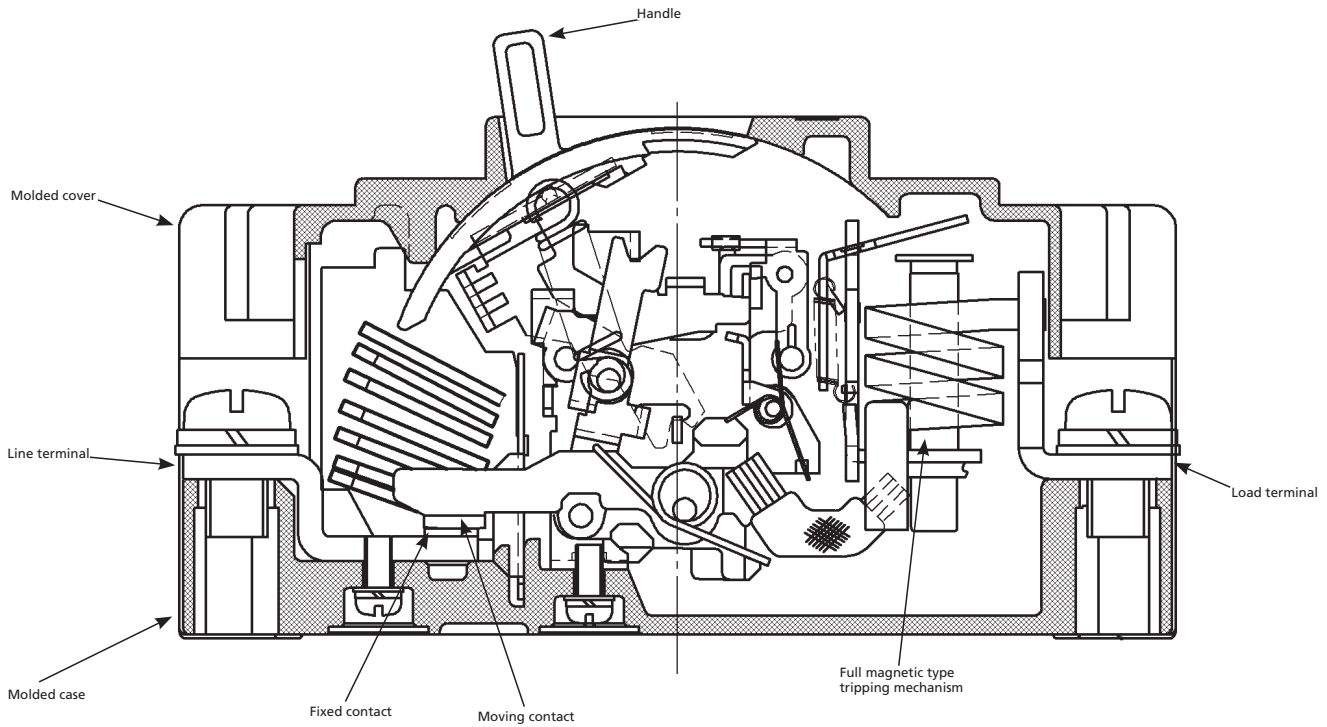
## ■ Positive Indication

The handle position gives positive indication of whether the breaker is ON (top), OFF (down) or tripped (midway).

Fig. 1 Thermal Magnetic Type

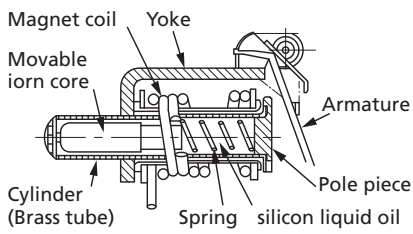


**Fig. 2 Full magnetic Type**



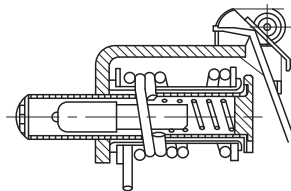
**Principle (How the tripping mechanism operates)**

**Fig. 3 Normality**



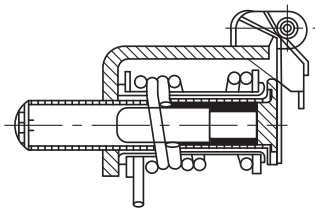
This figure shows that the movable iron core and armature do not move at less than rated current of the breaker.

**Fig. 4 Time-Delay Action (1)**



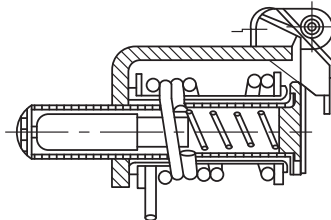
When overcurrent flows through the magnet coil, only the movable iron core moves for the pole piece, overcoming viscosity of the silicon liquid oil.

**Fig. 5 Time-Delay Action (2)**



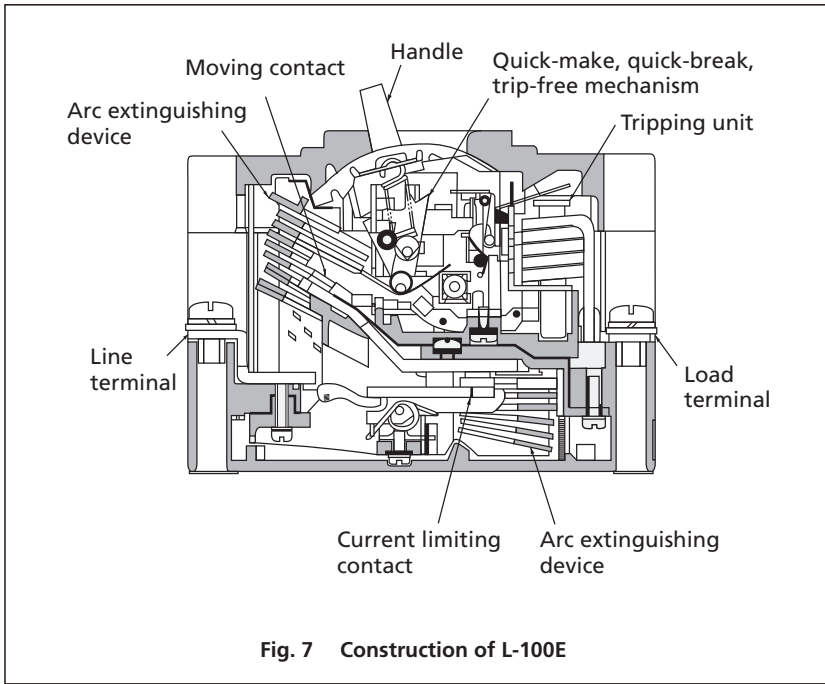
The armature is pulled at the pole piece, overcoming the core spring by increasing of the flux, and the armature operates the tripping mechanism of the breaker.

**Fig. 6 Instantaneous Action**

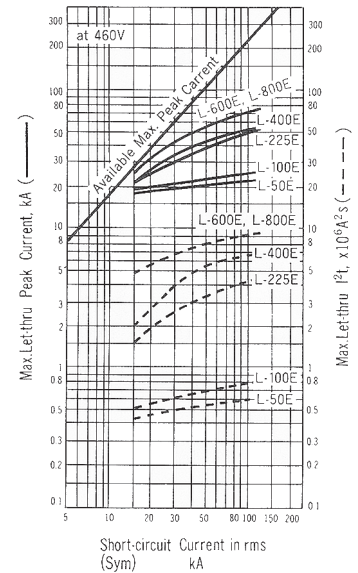
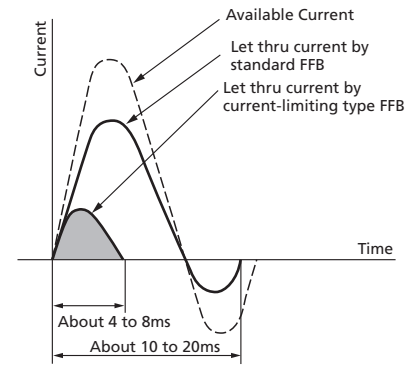


When a large current flows through the magnet coil, take short circuit for instance, armature is pulled at pole piece instantly without moving iron core, and it operates the tripping mechanism of the breaker.

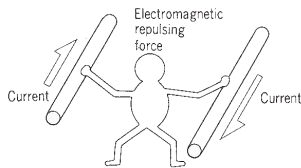
## Construction of Current-Limiting Type Breakers (L series)



L-Series breakers rapidly interrupt high faulty current by electromagnetic repulsing mechanism.

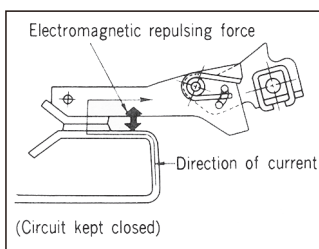


**Fig. 8 Current limiting characteristics**

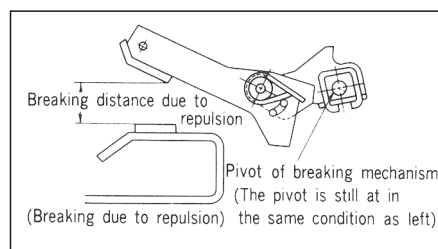


When a current flows through a conductor in one direction while another current flows through a conductor in the opposite direction (as shown in the figure on the left), an electromagnetic repulsing force act between the conductors. The current-limiting type breaker utilizes this force to complete high-speed current interruption within an extremely short period of time.

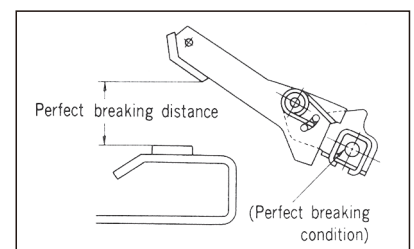
Function of Hitachi Current-Limiting Type Breaker is as follows:



**Fig. 9-1**



**Fig. 9-2**



**Fig. 9-3**

When a short circuit current flows through this breaker, an electromagnetic repulsing force works in the direction shown above.

The electromagnetic repulsing force causes the moving contact to swing apart from the fixed contact before the breaking mechanism functions, accomplishing extremely quick breaking.

The breaking mechanism has functioned to open the circuit.

## Construction of Electronics Type Breakers (FX400 – FX1200)

### Excellent Current Limiting Function

Owing to high-speed current interruption, excellent current limiting is achievable. Thus breaker stress with respect to temperature or mechanic is reduced circuits are securely protected.

### Higher MT current Reduces Miss trip by motors rush Current

Instantaneous tripping current is now greater \*than conventional models. Reduces probability of miss trip at high inrush current. Improvement of the voltage equilibrium characteristic of the earth leakage breaker.

\*In-house comparison

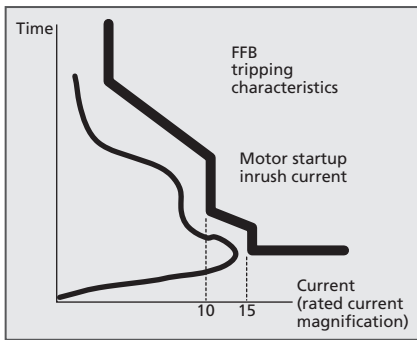
### Double Instantaneous Trip\*

Double electronic and mechanical instantaneous tripping characteristic protects equipments from short circuit.

### Easy Coordination\*

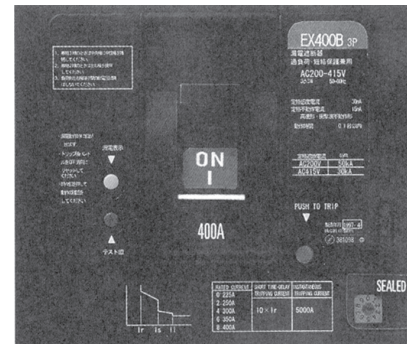
Tripping characteristics include adjustable long time delay & short time delay in proportion to long time delay (setting current x 1,000%) are contribute to easier coordination with other electric appliance such as down stream circuit breakers, transformers and wires.

\*over 400A frame



Frame	MT Current
400A	5,000A
600A	8,000A
800A	10,000A
1,000A	17,000A
1,200A	20,000A

(FFB)



## 1. Overcurrent Tripping

Because of its tripping device with proper time-delay characteristics, Hitachi Fuse-Free Breaker automatically opens circuits for overcurrents up to about 800% of its ampere rating. For heavy short-circuit currents, its instantaneous magnetic tripping device functions to break the circuit. These characteristics are specified in Circuit Breakers IEC60947-2, as shown in Table 6, according to which Hitachi Fuse-Free Breaker is designed.

**Table 6 Overcurrent Tripping characteristics**

All poles loaded		Conventional time (h)
Conventional non-tripping current	Conventional tripping current	
1.05 times current setting	1.3 times current setting	2*
*1 hour when $I_n \leq 63A$		

### <Base ambient temperature>

Tripping device of Hitachi Fuse-Free Breaker is factory-adjusted for application at an ambient temperature of 40°C, the base ambient temperature specified by IEC standard.

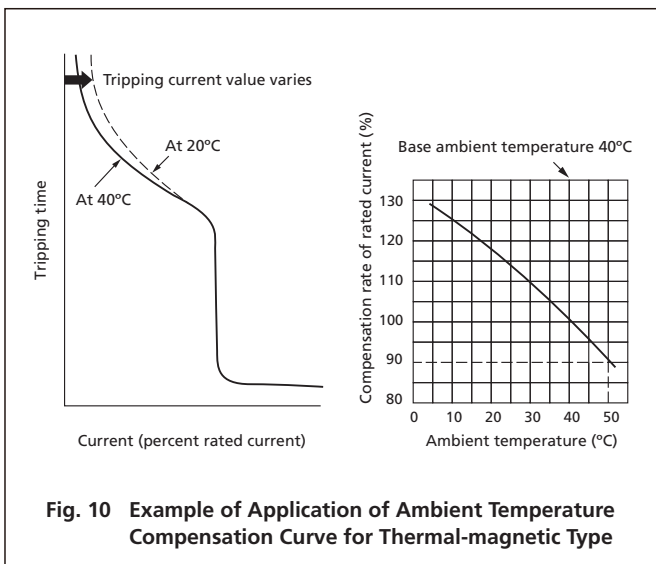
### ■ Thermal-magnetic type

When employing or testing a thermal-magnetic type at ambient temperatures other than 40°C, the operating current for tripping varies (as shown in Fig. 10). It is necessary to compensate for the rated current according to the temperature compensation curve prepared for each frame. Application of the temperature curve is as follows:

The compensation current I is represented by:

$$I = \frac{I_1 \times 100}{X(\%)}$$

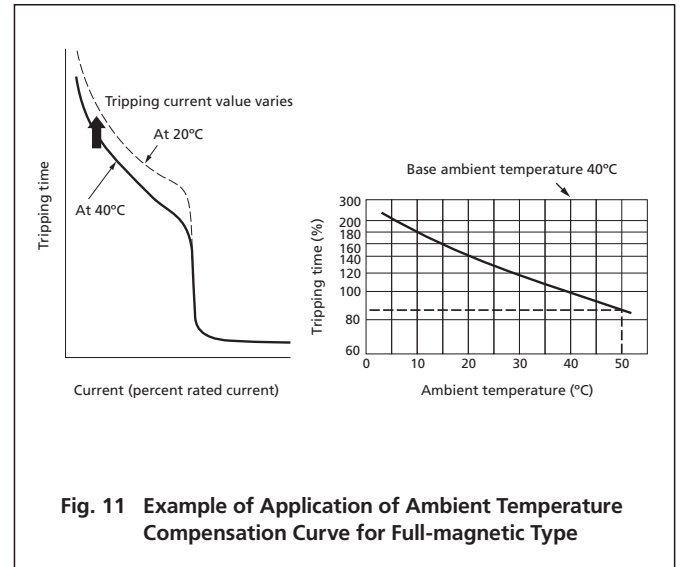
Where I = value of compensation current,  $I_1$  = value of current required at certain ambient temperature, and X = rate of increase or decrease of current at a certain ambient temperature compensation curve for determining the amount of compensation for the rated current value. The example shown below illustrates that the rated current of a device adjusted at the base ambient temperature 40°C at a site whose ambient temperature is 50°C decreases to 90% of the rating.



**Fig. 10 Example of Application of Ambient Temperature Compensation Curve for Thermal-magnetic Type**

### ■ Full-magnetic type

The rated current of a full-magnetic type which has no thermal element will not undergo a change despite variations in ambient temperature. Instead, the viscosity of the oil in its dash pot relay varies with temperature, causing the operating time to change as shown in Fig. 11. The rate of change in the operating time which the example below illustrates is as follows: If this tripping device adjusted to an ambient temperature of 40°C is employed at a site whose ambient temperature is 50°C, and if it trips over a circuit because of an overcurrent, its operating time will be reduced to 85% of standard time.

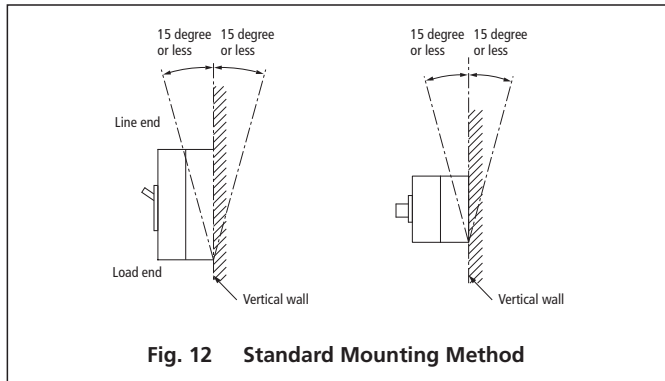


**Fig. 11 Example of Application of Ambient Temperature Compensation Curve for Full-magnetic Type**

### <Maximum applicable temperature>

Fuse-Free Breaker is applicable to ambient temperatures up to 50°C. Application at a site whose ambient temperature exceeds 50°C is a special case, for which users are requested to contact Hitachi for advice.

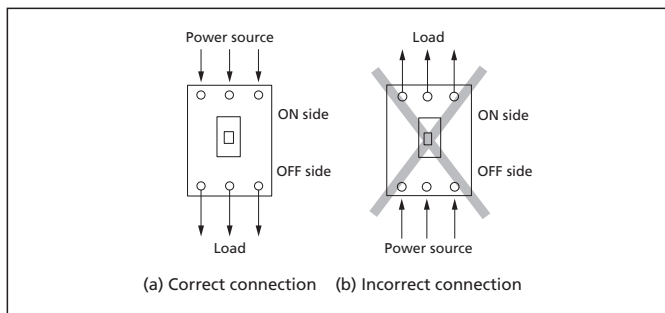
### 1. Standard mounting is shown in the diagram below.



If mounting in another direction is inevitable, contact Hitachi for advice.

### 2. Reversible connection types are available.

Reverse connection is basically prohibited (See following figure (Fig.13))



But reversible connection type available as follows:

Frame	F series	S series	Maximum applicable voltage	Remarks
100AF	F-100KB	—	AC460V	1. Please state "Reversible connection type" when ordered.
225AF	FXK250-S, FXK250-H	S-225SB, SXX225		
400AF	F-400R	S-400S		
600AF	F-600F	S-600S		2. Installation of phase separators on the load side is required.
800AF	F-800F, F-800RH	S-800S		
1000AF	F-1000K	—		
1200AF	F-1200K	—		

3. Don't install the breaker at a site whose ambient temperature of an installation site exceeds 50°C. If installing the breaker in such a high ambient temperature is unavoidable, contact with Hitachi in advance.

### 4. Application of full magnetic type for DC circuit

Breakers for AC and breakers for DC are separately calibrated, and different application cannot be performed.

If DC application, please specify pure DC, single-phase full-wave rectified or three-phase full-wave rectified, etc.

### 5. Insulation clearance on line end of FFB is as follows:

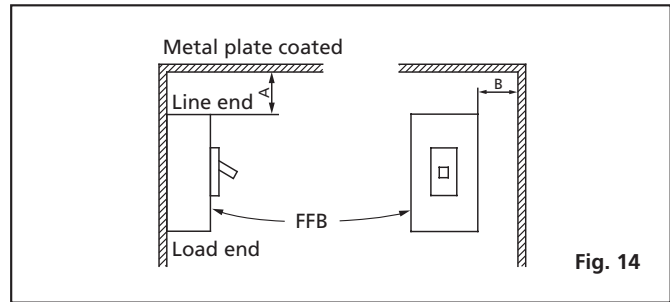


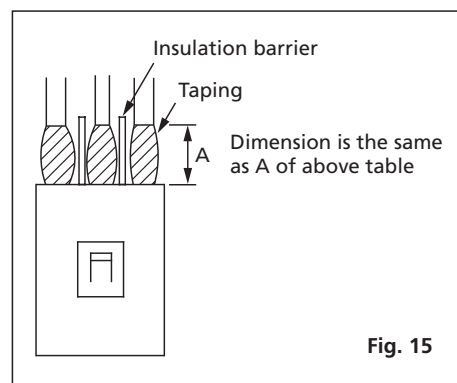
Table 7 Insulation Clearance

( ) dimension is 400V class

Classification	FFB frame	Minimum dimensions (mm)	
		A	B
1	30A Frame, 50A Frame (Excluding L-50E) 60A Frame	30	25
2	L-50E 100A Frame	40	40
3	125A 225A 250A Frame	50	40
4	F-250FB F-250KC	100	40
5	400A Frame, 600A Frame, 800A Frame	80 (110)	50
6	1000A Frame, 1200A Frame, 1600A Frame	150 (190)	100

### 6. Insulation of line side's living parts

It is recommended that line side's live parts of front connected type breakers are insulated by insulation tape or insulation barrier.



## 1. Select a breaker type according to the purpose

- Protection of general wiring: Table 1 to 4
- Protection of motor: Table 5
- Protection of branch lamp circuit: Table 6
- Protection against earth leakage

### <Consideration to available short circuit current>

In estimating short circuit currents, there are many considerations, such as characteristics of transformer, connecting wire size and the distance from the transformer to the faulty point and so on.

The below charts bring you an easy solution for selecting the breaker type.

## 2. Estimate the available short-circuit current and select economical frames — whose interrupting capacity is higher than that estimation — from among the following series:

- F series: Standard type for general service
- S series: Small-scaled and low-cost, economical type
- L series: High-performance, current-limiting, high-interrupting capacity type

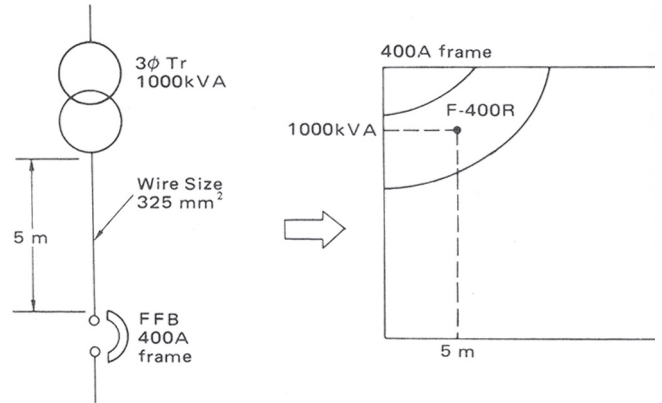
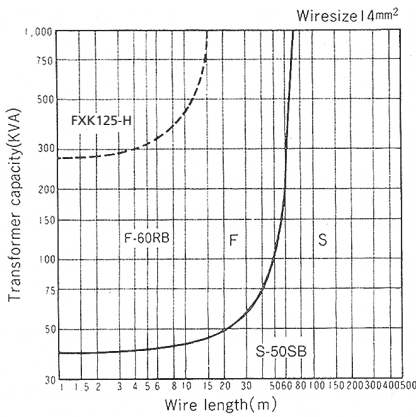


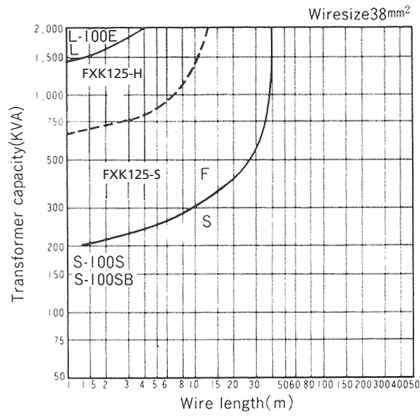
Fig. 16 Example of selection

### AC 460V (Transformer voltage: 415V)

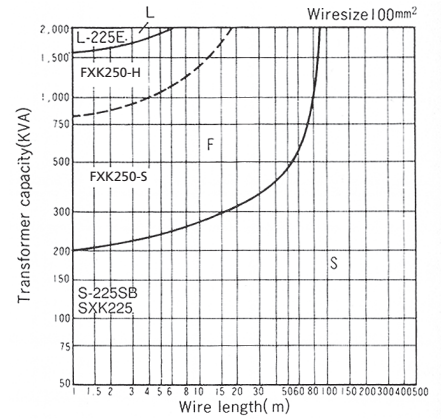
#### 50A 125A frame



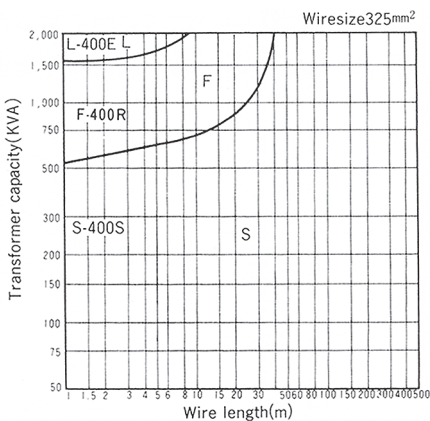
#### 100AF 125A frame



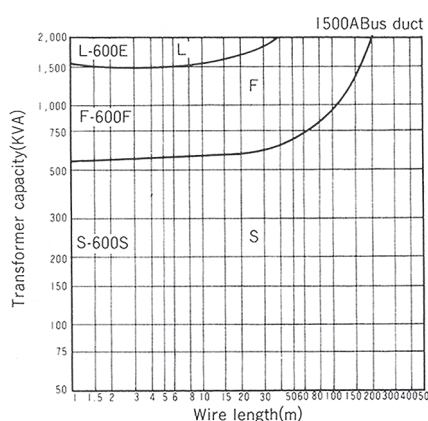
#### 225AF 250AF frame



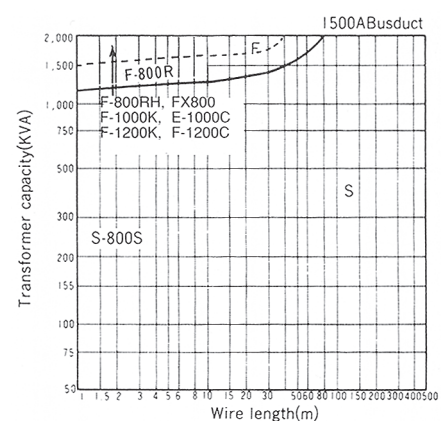
#### 400A frame



#### 600A frame



#### 800A, 1000A, 1200A frame



### 3. Select the rated current as follows:

- Rated currents for heater and lamp circuits  
Select a circuit breaker whose current rating corresponds to the value of the current allowable for the circuit.
- The rated current of a motor circuit is selected as follows:

#### <For general type breakers for protection of wiring>

#### ■ Rated current of branch circuit for motor

Table 8, 9, 10, 11 shows rated currents of the breakers which have been selected on condition that they will not effect erroneous operation at motor starting time. Where two or more motors are connected to one branch circuit, the sum of the rated currents of these motors forms the basis for selecting the rated current of the breakers.

#### ■ Rated Current of main circuit for motor

The motor groups connected to this circuit are divided into subgroups, each consisting of motors which are started simultaneously. Each subgroup is regarded as one motor for convenience (and the sum of the full load current of each motor within this subgroup is regarded as the full load current of this virtual motor). Then select the rated current of a subgroup whose full-load current is largest from the Table 8, 9, 10, 11. The sum of this tentative rated current and the full-load current of all the other subgroups is selected as the rated current of the breaker under consideration.

**Table 8 Directly Starting a 3-phase Induction Motor (400 – 440V AC)**

Motor		FFB													
Capacity (kW)	Full-load current (A)	Rated current (A)	Interrupting capacity (kA) Sym												
			2.5	5	7.5	10	15	22	25	30	35	43	50	85	
0.2	0.7	15	F-30FB	S-60RB	F-60RB	FXK125-S						FXK125-H			L-50E
0.4	1.4	15													
0.75	2.3	15													
1.5	4.2	15													
2.2	5.6	15													
3.7	9.0	20													
5.5	14	30													
7.5	16	30													
11	25	50	S-50SB	FXK125-S						FXK125-H			L-100E		
15	33	60	S-100S			FXK125-S						FXK125-H			L-100E
18.5	40	60	S-100SB			FXK125-S						FXK125-H			L-100E
22	45	75	S-225SB						FXK250-S			FXK250-H			L-225E
30	60	100	S-225SB						FXK250-S			FXK250-H			L-225E
37	75	100	S-225SB						FXK250-S			FXK250-H			L-225E
45	90	150	S-225SB						FXK250-S			FXK250-H			L-225E
55	(110)	175	S-225SB						FXK250-S			FXK250-H			L-225E
75	(150)	225	S-225SB						FXK250-S			FXK250-H			L-225E
90	(180)	225	S-225SB						FXK250-S			FXK250-H			L-225E
110	(220)	350	S-400S						SX400			F-400R FX400		L-400E	
150	(300)	500	S-600S						SX600			F-600F FX600		L-600E	
190	(380)	600	S-600S						SX600			F-600F FX600		L-600E	

Note: (1) The starting conditions are set within 15 seconds at 500% (10 seconds at 600%) of full load current.

**Table 9 Star-delta Starting a 3-phase Induction Motor (400 – 440V AC)**

Motor		FFB													
Capacity (kW)	Full-load current (A)	Rated current (A)	Interrupting capacity (kA) Sym												
			2.5	5	7.5	10	15	22	25	30	35	43	50	85	
For a capacity of 15 kW or less, select the same breaker among those for direct-starting															
18.5	40	75	S-100S						FXK125-S			FXK125-H			L-100E
22	45	75	S-100SB						FXK125-S			FXK125-H			L-100E
30	60	100	S-100SB						FXK125-S			FXK125-H			L-100E
37	75	125	S-225SB						FXK250-S			FXK250-H			L-225E
45	90	150	S-225SB						FXK250-S			FXK250-H			L-225E
55	(110)	175	S-225SB						FXK250-S			FXK250-H			L-225E
75	(150)	225	S-225SB						FXK250-S			FXK250-H			L-225E
90	(180)	350	S-400S						SX400			F-400R FX400		L-400E	
110	(220)	400	S-400S						SX400			F-400R FX400		L-400E	
150	(300)	600	S-600S						SX600			F-600F FX600		L-600E	
190	(380)	700	S-800S						SX800			F-800R FX800		L-800E	



**Table 10 Selecting table of Fuse-Free Breaker for Motor Branch Circuit Directly Starting 3-phase Induction Motor (200 – 220V AC)**

Motor			FFB											
Capacity (kW)	Full-load current (A)	Rated current (A)	Interrupting capacity (kA) Sym											
			5	10	14	25	30	35	42	50	85	175		
0.2	1.4	15	S-30E S-30FB	S-60RB	F-60RB	FXK125-S					FXK125-H	L-50E		
0.4	2.6	15												
0.75	4.2	15												
1.5	7.4	15												
2.2	10	20												
3.7	16	30												
5.5	25	50	S-50EB, S-50SB	S-100SB					FXK125-S	FXK125-H	L-100E			
7.5	33	60	S-100EB		S-100S S-100SB	S-100SB					FXK125-S	FXK125-H	L-100E	
11	45	75	S-225SB SXX225					FXK250-S					FXK250-H	L-225E
15	60	100	S-225SB SXX225					FXK250-S					FXK250-H	L-225E
18.5	75	100	S-225SB SXX225					FXK250-S					FXK250-H	L-225E
22	90	150	S-225SB SXX225					FXK250-S					FXK250-H	L-225E
30	(120)	200	S-225SB SXX225					FXK250-S					FXK250-H	L-225E
37	(150)	225	S-225SB SXX225					FXK250-S					FXK250-H	L-225E
45	(180)	225	S-225SB SXX225					FXK250-S					FXK250-H	L-225E
55	(220)	350	S-400S SX400					S-400S SX400					F-400R FX400	L-400E
60	(240)	400	S-400S SX400					S-400S SX400					F-400R FX400	L-400E
75	(300)	500	S-600S SX600					S-600S SX600					F-600F FX600	L-600E
90	(360)	600	S-600S SX600					S-600S SX600					F-600F FX600	L-600E

**Table 11 Star-delta Starting a 3-phase Induction Motor (200 – 220V AC)**

Motor			FFB											
Capacity (kW)	Full-load current (A)	Rated current (A)	Interrupting capacity (kA) Sym											
			2.5	5	10	14	25	30	35	50	85	125	175	
For a capacity of 15 kW or less, select the same breaker among those for direct-starting														
18.5	75	125	S-225SB SXX225					FXK250-S					FXK250-H	L-225E
22	90	150	S-225SB SXX225					FXK250-S					FXK250-H	L-225E
30	(120)	200	S-225SB SXX225					FXK250-S					FXK250-H	L-225E
37	(150)	225	S-225SB SXX225					FXK250-S					FXK250-H	L-225E
45	(180)	350	S-400S, SX400					S-400S, SX400					F-400R FX400	L-400E
55	(220)	400	S-400S, SX400					S-400S, SX400					F-400R FX400	L-400E
60	(240)	500	S-600S, SX600					S-600S, SX600					F-600F FX600	L-600E
75	(300)	600	S-600S, SX600					S-600S, SX600					F-600F FX600	L-600E
90	(360)	700	S-800S, F-800R, SX800					S-800S, F-800R, SX800					F-800RH FX800	L-800E

**<Breaker Used for Protection of Motor Against Overload>**

A motor breaker is used to protect wiring and a motor against overload. Its rated current is about the same value as full-load current of the motor. The applicable conditions are subject to the following restrictions:

- 1) Only one motor is installed on the circuit under consideration.
- 2) Starting current is less than 600% of the full-load current and motor load is light (for specific requirements for each rated current, refer to Table 12).

When the above restrictions cannot be met use a general type FFB. When ordering, please specify the Frame (selected by the interrupting capacity) and the rated current. (About the same as full load current of the motor.)

**• When using the breaker for the transformer primary circuit.**

Since exciting inrush current may be 20 to 30 times the transformer rated current, the breaker rated current should be selected more than two times the transformer rated current.

**Table 12 Applicable Conditions of Motor Breaker**

Rated current (Amperes)	Starting condition	
	Starting current/ full load current	Starting time
50 or less	500%	Within 3 sec
	600%	Within 2 sec
From 51 to 150	500%	Within 8 sec
	600%	Within 5 sec

#### 4. Application to discrimination coordination

In a discrimination coordination system, only the breaker nearest the fault opens to isolate the faulty circuit from the rest of the power system. This system results in maximum continuity of service. ELECTRONICS TYPE breakers are best suited to application as the upstream (main) breaker.

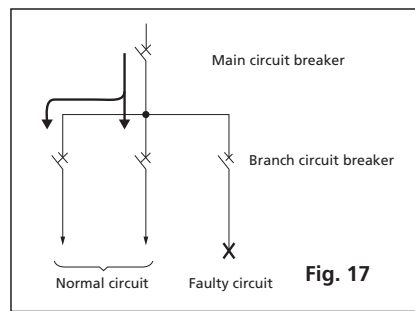


Fig. 17

Table 13 Discrimination between standard FFBs and ELECTRONICS TYPE FFBs

#### 230V class

FFB for branch circuit Type	FFB for main circuit		Type	FX400	FX600	FX800	FX1000	FX1200	F-1600CB
	Interrupting Capacity(kA)	Capacity(kA)							
F-30FB	5	5	5	5	5	5	5	5	5
F-50FC	10	5	5	7.5	7.5	10	10	10	10
F-60RB	25	5	5	10	10	10	25	25	25
F-50HB	35	5	5	10	10	10	35	35	35
FXK125-H	100	5	5	14	14	14	85	85	85
FXK125-S	50	5	5	10	10	10	50	50	50
FXK125-H	100	5	5	14	14	14	85	85	85
FXK250-S, FXK250-H, F-250FB, F-250KC	85/100	4	4	10	10	10	35	35	65
FX400, F-400R	100	—	—	—	—	10	18	22	25
F-600F, FX600	100	—	—	—	—	—	—	22	25
F-800F, FX800, F-800R	100	—	—	—	—	—	—	—	25
FX1000	125	—	—	—	—	—	—	—	—
FX1200	125	—	—	—	—	—	—	—	—
S-30E, S-50EB, S-50SB	5	4	4	5	5	5	5	5	5
S-100EB, S-60RB	10	4	4	7.5	7.5	7.5	10	10	10
S-100SB	35	5	5	14	14	14	25	25	25
S-225SB, SXK225	35	4	4	10	10	10	25	25	25
SX400, S-400S	50	—	—	—	—	10	18	22	25
SX600, S-600S	50	—	—	—	—	—	—	22	25
SX800, S-800S	85	—	—	—	—	—	—	—	25
L-50E	175	5	5	14	14	14	125	125	125
L-100E	175	5	5	14	14	14	125	125	125
L-225E	175	4	4	10	10	10	42	65	125
L-400E	175	—	—	—	—	10	18	22	42
L-600E	175	—	—	—	—	—	—	22	42
L-800E	175	—	—	—	—	—	—	—	42

#### 380V class

FFB for branch circuit Type	FFB for main circuit		Type	FX400	FX600	FX800	FX1000	FX1200	F-1600CB
	Interrupting Capacity(kA)	Capacity(kA)							
F-30FB	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
F-50FC	7.5	4	4	7.5	7.5	7.5	7.5	7.5	7.5
F-60RB	10	4	4	7.5	7.5	7.5	10	10	10
FXK125-H	50	4	4	7.5	7.5	7.5	50	50	50
FXK125-S	30	4	4	7.5	7.5	7.5	25	25	25
FXK125-H	50	4	4	7.5	7.5	7.5	35	50	50
FXK250-S, F-250FB	30	4	4	7.5	7.5	7.5	22	22	30
FXK250-H, F-250KC	50	4	4	7.5	7.5	7.5	22	22	30
FX400, F-400R	50	—	—	—	—	7.5	18	22	22
F-600F, FX600	50	—	—	—	—	—	—	22	22
FX800, F-800R	50	—	—	—	—	—	—	—	22
FX1000	85	—	—	—	—	—	—	—	—
FX1200	85	—	—	—	—	—	—	—	—
S-50SB	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
S-60RB	5	4	4	5	5	5	5	5	5
S-100S, S-100SB	10	4	4	7.5	7.5	7.5	10	10	10
S-225SB, SXK225	15	4	4	7.5	7.5	7.5	15	15	15
SX400, S-400S	35	—	—	—	—	7.5	22	22	22
SX600, S-600S	35	—	—	—	—	—	—	22	22
SX800, S-800S	35	—	—	—	—	—	—	—	22
L-50E	125	4	4	10	10	10	30	30	85
L-100E	125	4	4	10	10	10	30	30	85
L-225E	125	4	4	7.5	7.5	7.5	22	22	50
L-400E	125	—	—	—	—	7.5	18	22	22
L-600E	125	—	—	—	—	—	—	22	22
L-800E	125	—	—	—	—	—	—	—	22

## Interior Accessories

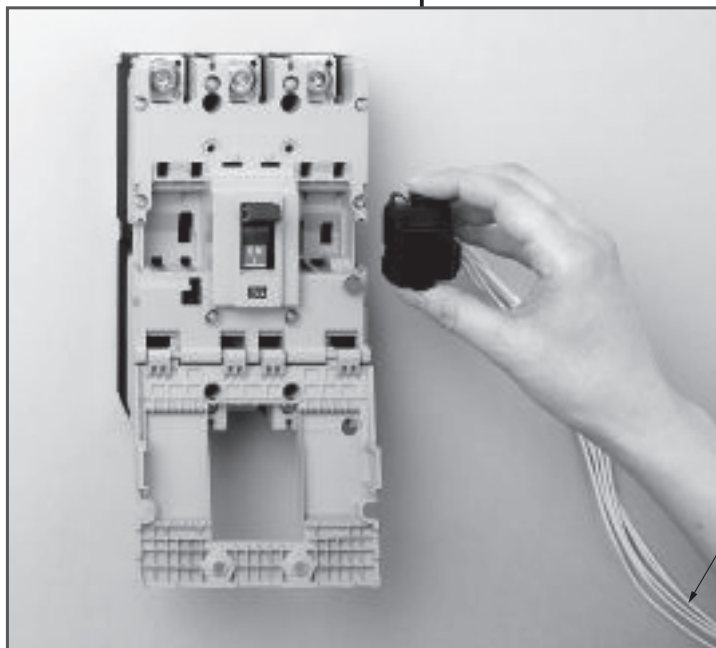
■ Available accessories inside of FFB are as follows:

### Undervoltage Trip (UVT)

The Undervoltage Trip is used to automatically trip the breaker when the line voltage drops to 35 to 70% of its normal value. The standard mounting method of the breaker with this trip is vertically on the wall with its line end positioned upward.

### Shunt Trip (SHT)

The Shunt Trip is used to trip the breaker electrically from a remote point. Since this trip coil does not have a continuous rating, the coil circuit must be broken by making connections to the load end of the breaker (Fig. 20 (a)). If a separate power supply is to be used, the customer is requested to specify an auxiliary switch to prevent the coil from being burnt by overheating (Fig. 20 (b)). The standard mounting method of the breaker with this trip is on the wall with its line end positioned upward.



Lead wire  
0.5mm<sup>2</sup> PVC-insulated wire (yellow),  
0.5 meter long

### Alarm Switch (AL)

When the breaker is tripped, this switch closes to energize an indicating light or sound an alarm. It employs a microswitch equipped with a C-contact.

#### ■ Terminal Symbols and Connection Condition of AL Switch

Condition of Breaker	Connection condition of AL switch
ON and OFF	
Tripped	

( ) : for 2C contacts

### Auxiliary Switch (AUX)

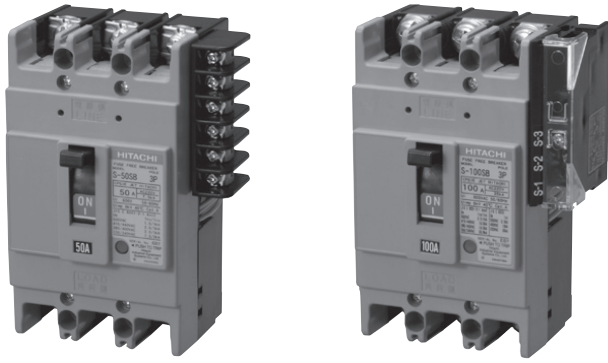
The auxiliary switch, a device interlocked with opening and closing operation of a breaker, is used to open or close control circuits as the breaker operates. It employs a microswitch equipped with a C-contact.

#### ■ Terminal Symbols and Connection Condition of AUX Switch

Condition of Breaker	Connection condition of AUX switch
ON and OFF	
OFF or Tripped	

( ) : for 2C contacts

### Terminal Block for Interior Accessories



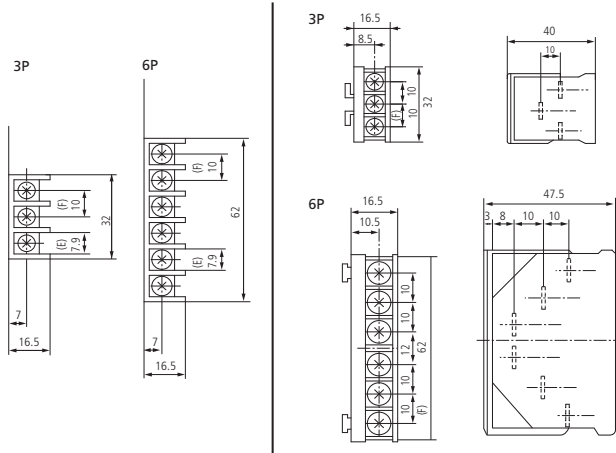
TB

TB2

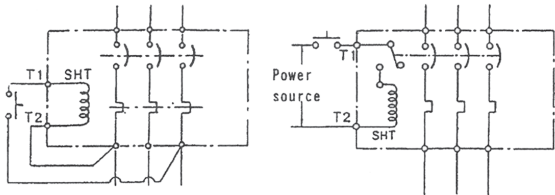
**Fig. 18 External View of a Breaker with Terminal Block for an Interior Accessory**

TB

TB2



**Fig. 19 Dimensions of FFB with Terminal Block for Interior Accessory**



(a) Uni-power

(b) Separate power  
(excepting F-250FB F-250KC)

**Fig. 20 Wiring Diagram of Shunt Trip**

**Table 14 Rating of Alarm Switch and Auxiliary Switch**

Voltage		Rated current	Time constant
AC	250V	2A	—
	500V	1A	
DC	110V	0.5A	10 ms or less
	220V	0.25A	

**Table 15 Coil rating of SHT and UVT**

Type	SHT		UVT		
	Voltage	Input (VA)	Voltage		
S-30E, S-50EB, S-225SB, SXK225		100 (for 400V: 200VA)	—		
F-30FB, S-50SB, F-60RB, F-50KB, L-50E, S-100EB, S-100S, S-100SB, F-100S, F-100RB, F-100KB, L-100E	AC 100-110V AC 200-220V AC 230-240V AC 380V AC 400-440V AC 480V	200	50Hz AC 100V 200V 230V 240V	60Hz AC 100V 110V 200V 220V	20
FXK125-S, FXK125-H, FXK250-S, FXK250-H, F-250FB, F-250KC	(Common use for 50 and 60 Hz)		—		—
L-225E, S-400S, SX400, F-400R, FX400, L-400E			50Hz AC 100V 200V 230V 240V 400V 415V	60Hz AC 100V 110V 200V 220V 400V 440V	20
S-600S, SX600, F-600F, FX600, L-600E, S-800S, SX800, F-800R, F-800RH, FX800, L-800E, FX1000, FX1200, F-1000C, F-1000K, F-1200C, F-1200K, F-1600CB, F-1600B	DC 100V DC 110V				30

**Table 16 Applicability of interior accessories**

Type	F		F-30FB F-60RB		F-100S F-100KB		*FXK125-S *FXK125-H *FXK250-H *FXK250-S F-250FB F-250KC		*FX400 F-400R		*FX600 F-1200K *FX800 F-1600B F-600F F-800R F-1000K F-800RH		*FX1000 *FX1200 F-1600CB			
	S		S-30E S-50EB		S-100S		S-225SB *SXX225		*SX400 S-400S		*SX600 S-600S *SX800 S-600S					
	L				L-50E L-100E				L-225E L-400E		L-600E L-800E					
	M		MS-30E MS-50EB		MS-50SB MS-100SB				*MFXK100-S *MFXK225-S MS-225SB MF-250FB							
Number of poles	2		3		2		3, 4		2, 3		2, 3, 4		2, 3, 4		3, 4	
Accessories	2		3		2		3, 4		2, 3		2, 3, 4		2, 3, 4		3, 4	
AL																
AUX																
SHT																
UVT																
AL + AUX																
AL + SHT																
AL + UVT																
AUX + SHT																
AUX + UVT																
AL + AUX + SHT																
AL + AUX + UVT																



**Notes:**

- 2C means that it can be mounted 1C, if required.
- \*: Terminal block (TB) for UVT wiring is equipped.
- The accessories of marked \*types can be installed by customers.
- AL 2C or AUX 2C is available in case of FXK125-S/H and FXK250-S/H

## Exterior Accessories

### ■ Accessories mounted on the outside of breaker are as follows:

- Rear Connecting Stud (STB) and Bar Stud (BSD)
- Plug-in Mounting Base Assembly (PK)
- Flush Mounting Base Assembly (GK)
- Mechanical Interlock (MI)
- Motor Operating Mechanism (MMK, MMK-C)
- Electro-magnetic Operating Mechanism (MK-C)
- Handle Operating Mechanism

#### 1. Rear Connecting Stud (STB) and Bar Stud (BSD)

Rear connecting stud is used as rear connecting terminal.

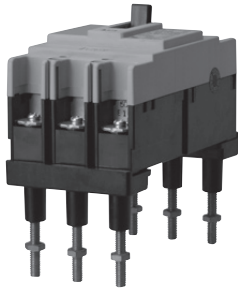


Fig. 21 FFB with Rear Connecting Studs

For 600A frame or less and S-800S, molded insulating bushings are provided.

#### 2. Plug-in Mounting Base Assembly (PK)

The plug-in mounting base assembly is an accessory demounting a breaker by saving the trouble of removing the connection wiring from it when inspecting or replacing a breaker mounted on a switchboard or a panel board.

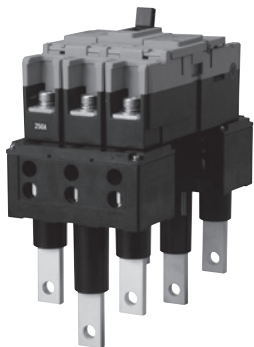


Fig. 22 FFB with Plug-in Mounting Base Assembly

#### 3. Flush-mounting Base Assembly (GKW, GK)

The flush-mounting base assembly is an accessory for mounting a breaker on a switchboard. A breaker is secured via insulating bushings to an exclusive mounting frame by using screws as same method as the rear connecting stud or bar stud. A rectangular hole sized a little larger than that of a breaker is cut into the switchboard and the breaker is embedded into this hole and secured to the switchboard by the mounting frame. The flush plate is mounted on the breaker.

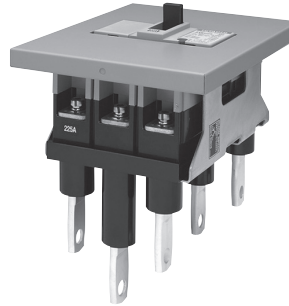


Fig. 23 FFB with Flush-mounting Base Assembly

#### 4. Mechanical Interlock (MIW)

This mechanical interlock prevent from any of two breakers to be closed.

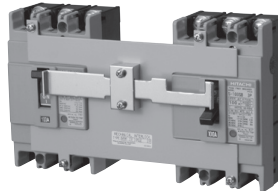


Fig. 24 FFB with Mechanical Interlock

#### 5. Drawout Mechanism (PDK)

The drawout mechanism is an accessory for easy mounting and removal of F-1600E.

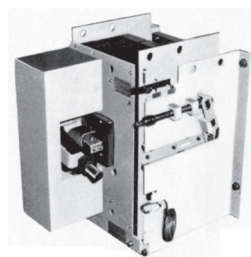


Fig. 25 FFB with Drawout Mechanism

## 6. Motor Operating Mechanism (MMK-S)

- This mechanism is suitable to remote control a breaker by utilizing a motor. Since the control circuit is self holding type, the operation of this mechanism is completed by brief closing of push button switch contact. As soon as completing of operation, the control circuit is opened and the motor is stopped by instant operation of a limit switch.
- The manual operation is also available.

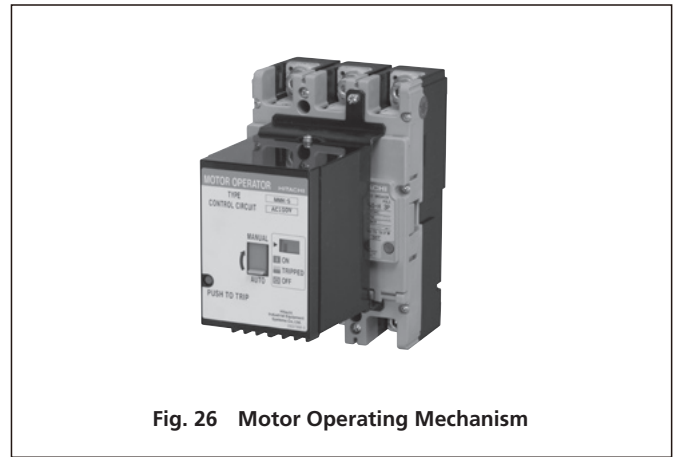


Fig. 26 Motor Operating Mechanism

Table 17 Standard Ratings of Motor Operated Mechanism

Type		MMK-S			
Type of FFB	F series	3P		4P	
		FXK125-S FXK125-H	FX400 F-400R	F100KB F-250FB F-250KC	F-400R
		L-50E L-100E	L-225E L-400E	L-50E L-100E	L-225E L-400E
Max. operational current peak (A)	S series	S-225SB SXX225	SX400 S-400S	—	—
	DC100	—			
	DC110	—			
	AC100	0.2	0.3	0.2	0.3
	AC110	(0.6)	(0.9)	(0.6)	(0.9)
	AC200	0.1	0.15	0.1	0.15
AC220	(0.3)	(0.45)	(0.3)	(0.45)	
Power supply (VA)		500	100	50	100

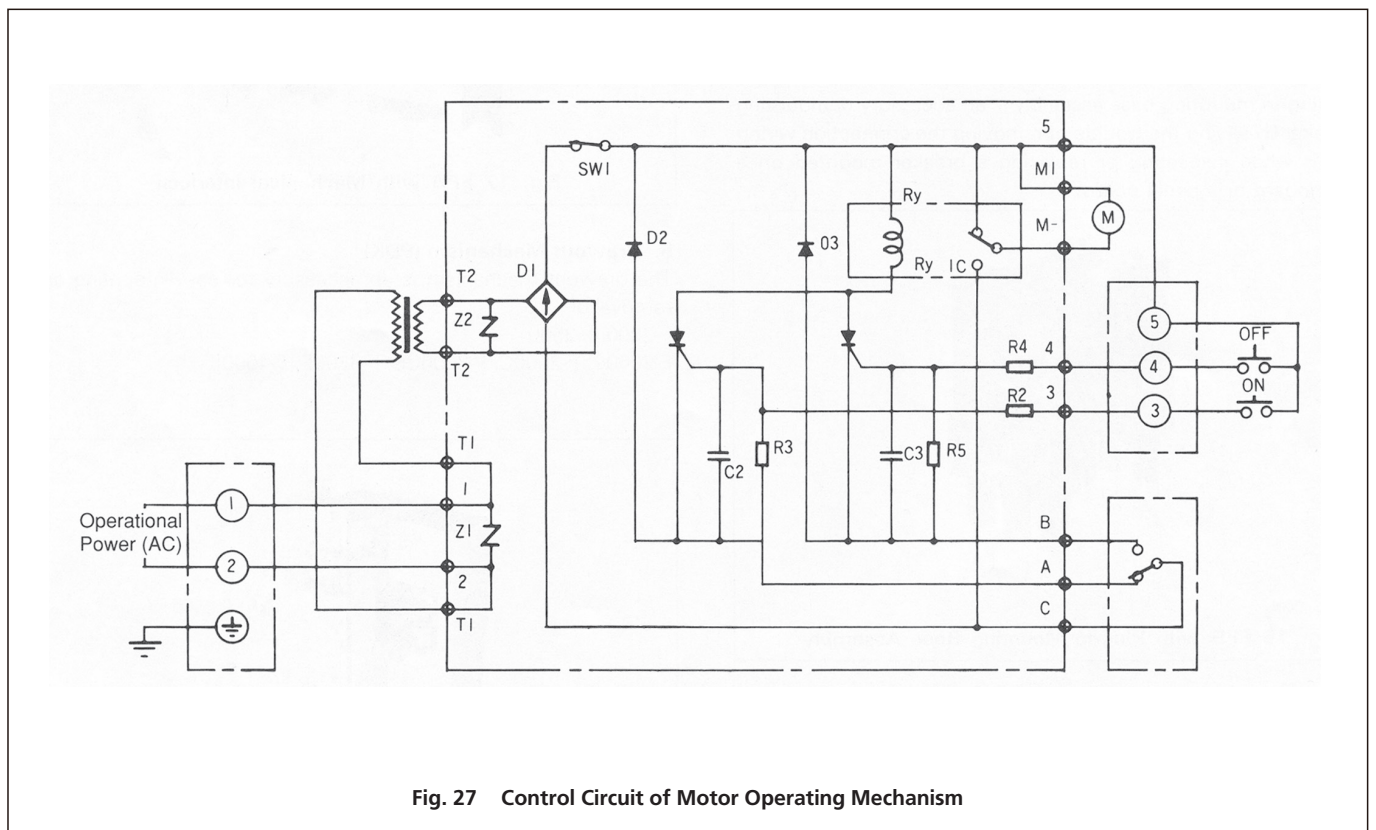
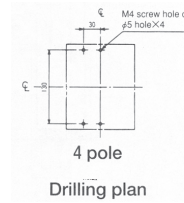
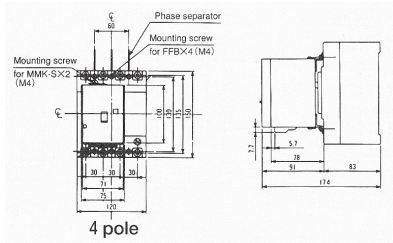


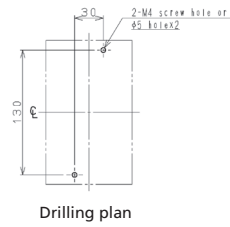
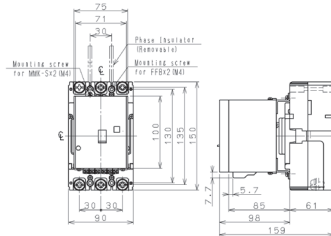
Fig. 27 Control Circuit of Motor Operating Mechanism

# DIMENSIONS OF MMK-S

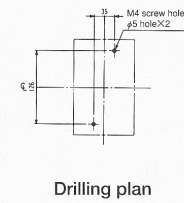
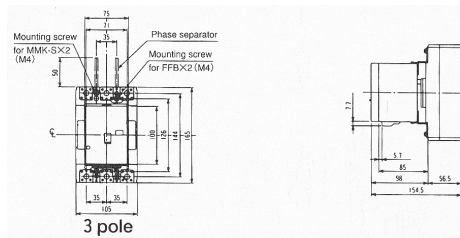
## F-100KB



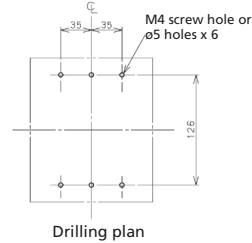
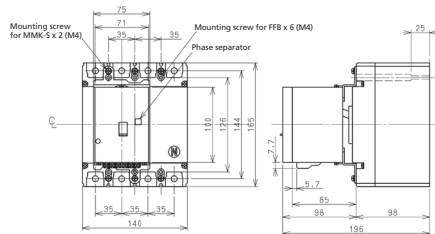
## FXK125-S, FXK125-H



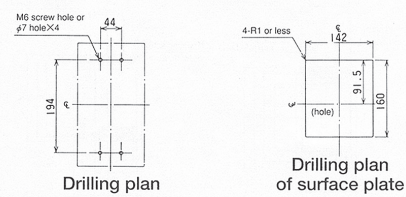
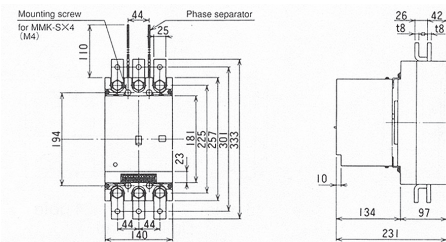
## S-225SB



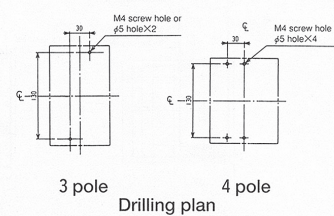
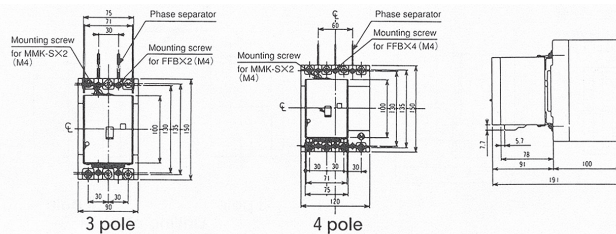
## F-250FB, F-250KC



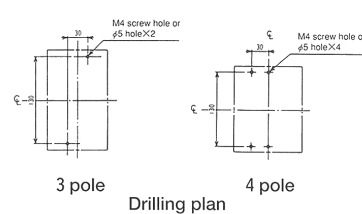
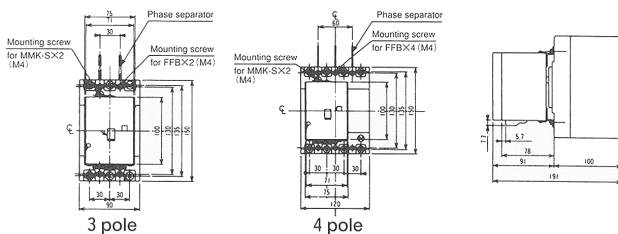
## SX400, FX400



## L-50E



## L-100E





## 7. Motor Operating Mechanism (MMK-C)

- This mechanism is suitable to remote control a breaker by utilizing a motor. There is one type as follows.

MMK-C (Compact Type): The breaker is operated by rotation of a single phase series commutator motor with reduction gear.

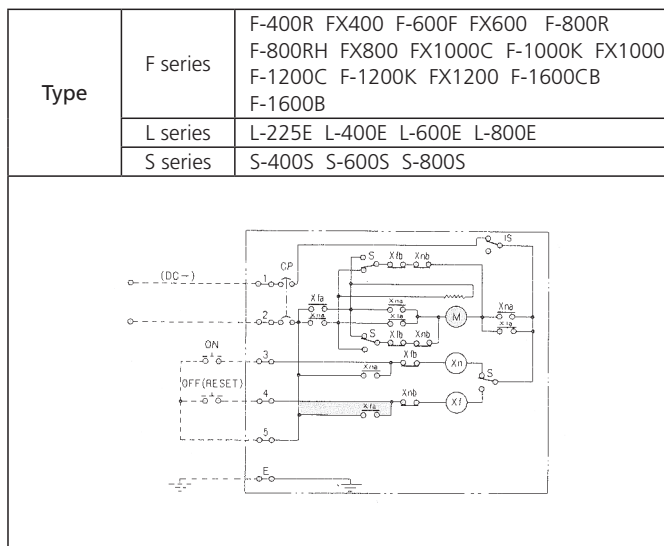


Fig. 28 Motor Operating Mechanism

\*excepting 4 poles FFB

Table 18 Standard Ratings of Motor Operated Mechanism

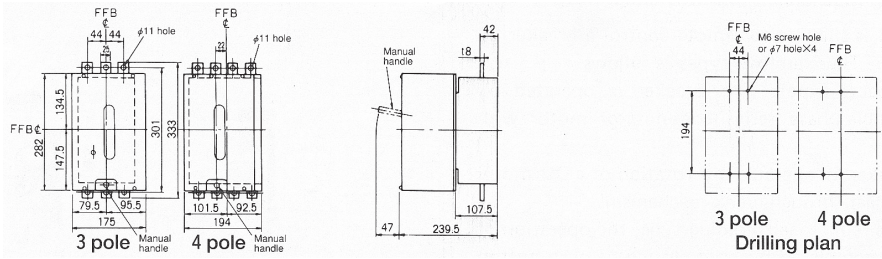
Type		MMK-C			
Type of FFB	F series	F-400R FX400	F-600F FX600	F-800R F-800RH FX800 F-1000C* F-1000K* F-1200C* F-1200K* F-1600CB* F-1600B*	F-1000C (4P) F-1000K (4P) F-1200C (4P) F-1200K (4P) F-1600CB (4P) F-1600B (4P)
	L series	L-225E L-400E	—	L-600E L-800E	—
	S series	S-400S	S-600S	S-800S	—
Max. operational current peak (A)	DC100·110V	3	6.5	8	10
	AC120V	3	6.5	8	10
	AC240V	1.5	3.5	4	5
Operating time (sec)		1.2	1.5	1.5	1.5
Power supply (VA)		100	200	200	400



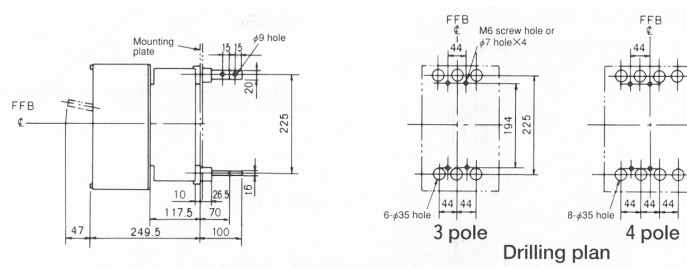
PS	Push-button Switch
X	Auxiliary Electromagnetic Contactor
n	For operating FFB' ON"
f	For operating FFB' OFF"
a	Closed by operation (normally open)
b	Opened by operation (normally closed)
CP	Circuit Protector
Z	Timer
Si	Silicon Rectifier
R	Resister
M	Motor
IS S LS	Limit Switch

# DIMENSIONS OF MMK-C

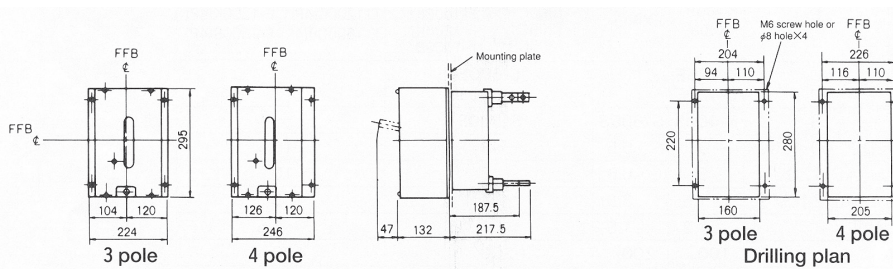
## L-225E (Standard Type)



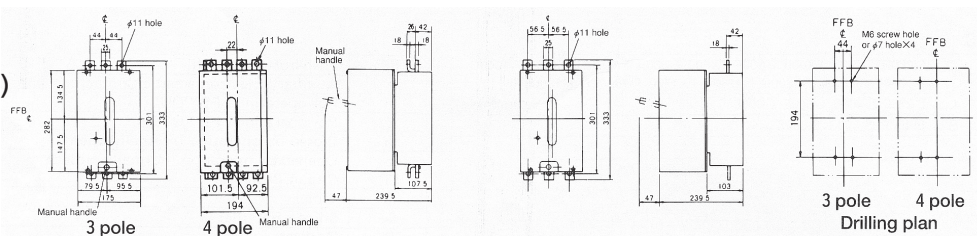
## (Rear Connecting Type)



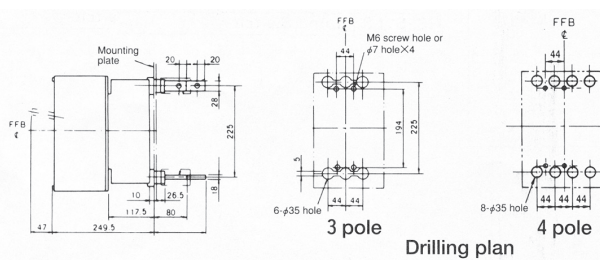
## (Built-in Type)



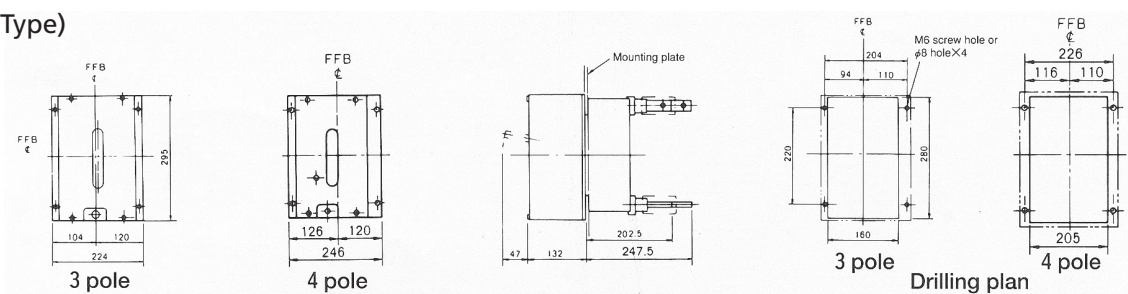
## FX400, F-400R SX400, L-400E (Standard Type)



## (Rear Connecting Type)



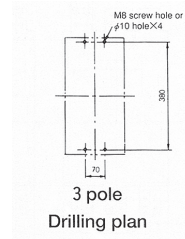
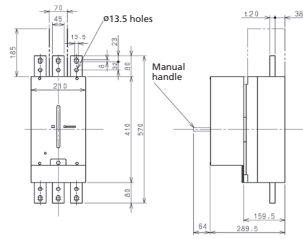
## (Built-in Type)





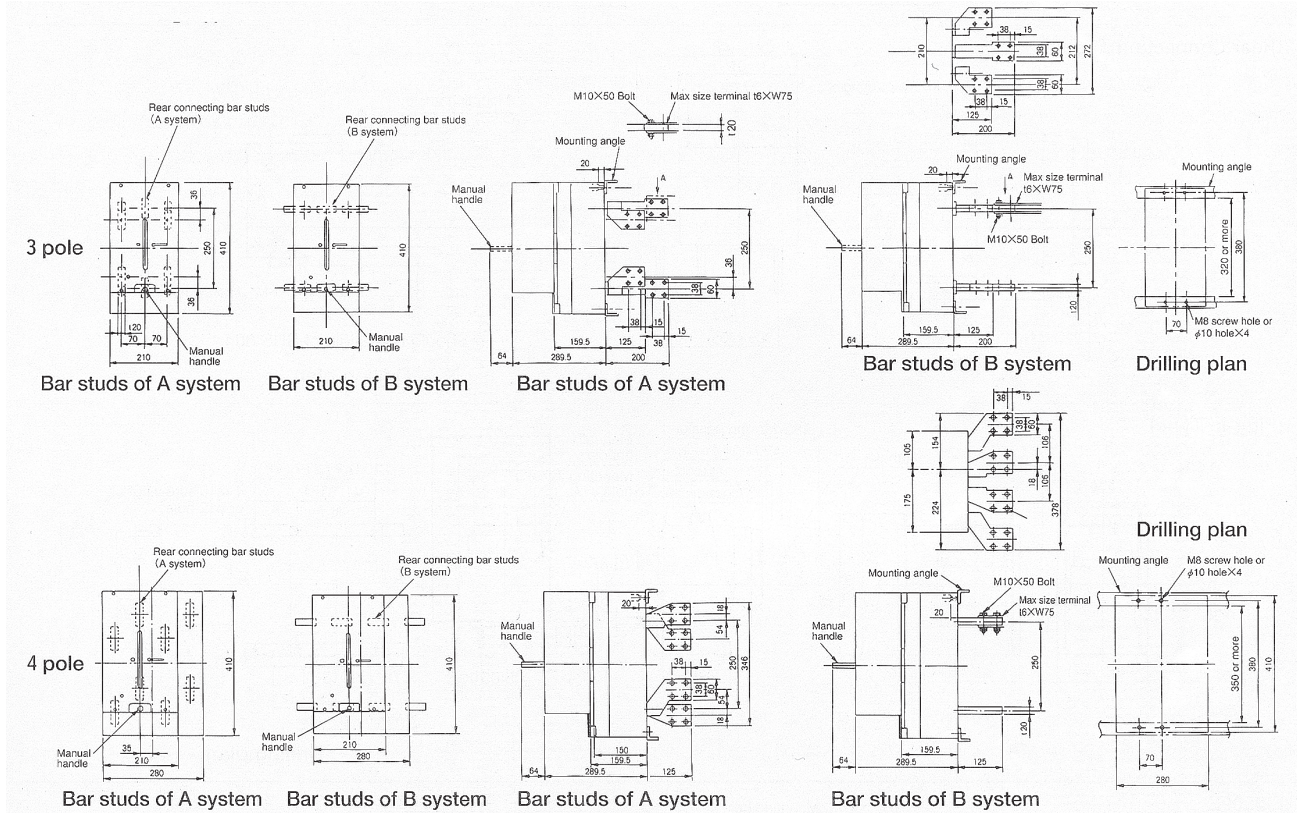


**F-1600B, F-1600CB**  
(Standard Type)



3 pole  
Drilling plan

**(Rear Connecting Type)**



3 pole

Bar studs of A system

Bar studs of B system

Bar studs of A system

Bar studs of B system

Drilling plan

4 pole

Bar studs of A system

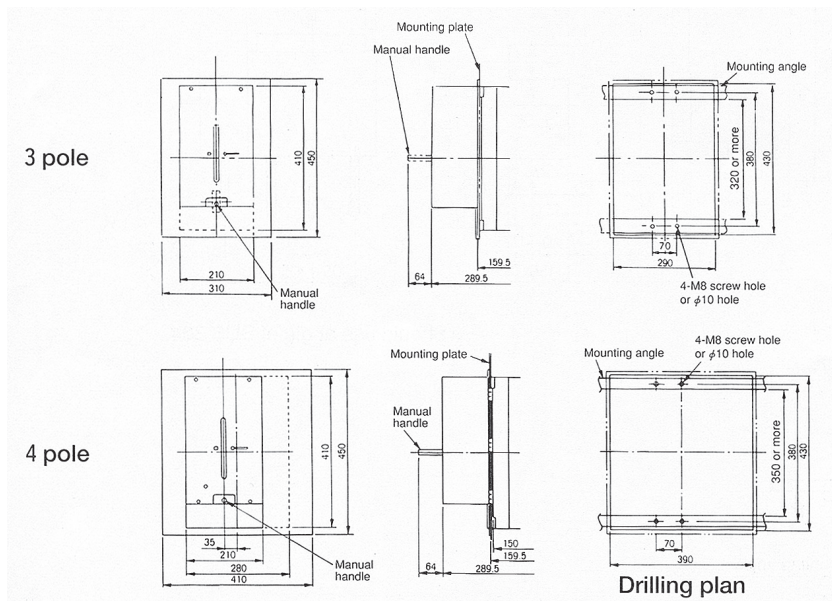
Bar studs of B system

Bar studs of A system

Bar studs of B system

Drilling plan

**(Built-in Type)**

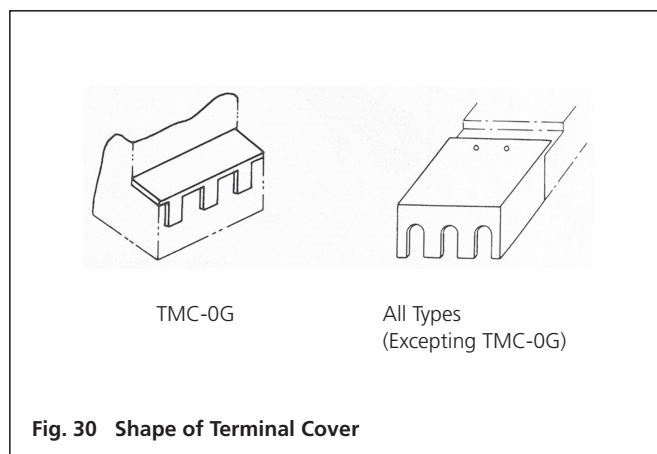
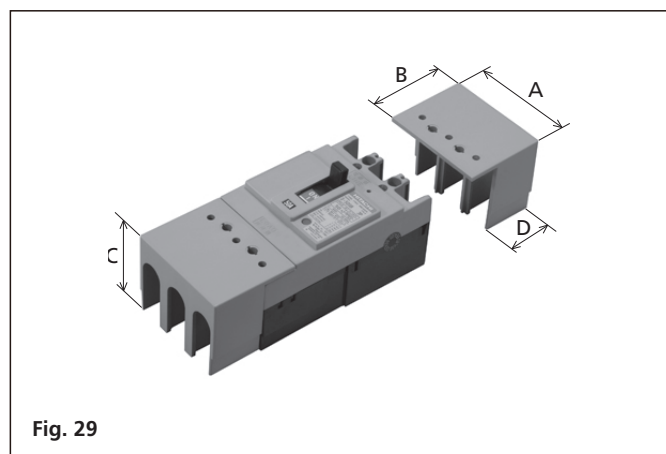


3 pole

4 pole

Drilling plan

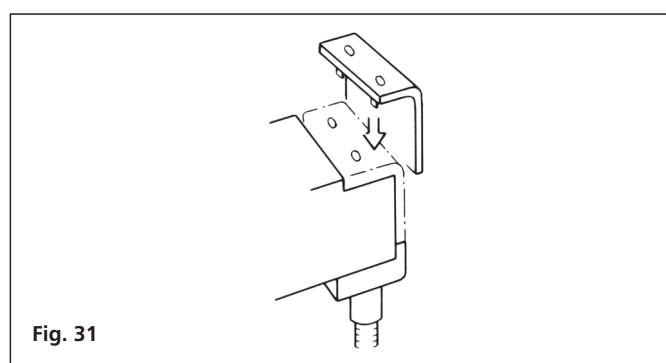
## 8. Terminal Cover (TMC)



Types	Applicable breakers	Dimensions				Remarks
		A	B	C	D	
TMC-0G	S-30E, S-50EB	75 (50)	19.5	56	5	
TMC-1	F-30FB, S-50SB, S-60SB, F-60RB, S-100EB, S-100SB	75 (50)	48	59.5	28	
TMC-1S		75 (50)	25	56	5	Short type
TMC-2D		75 (50)	56	59.5	36	Long type
TMC-2C	S-100S, F-100S, FXK125-S, FXK125-H	90 (60)	63	63	36	
TMC-3C	F-100KB, L-50E, L-100E	90 (60)	56	85.5	36	
TMC-4K	S-225SB	105	79	56	50	
TMC-4J	SXK225	105	79	53	50	
TMC-4JS	FXK250-S, FX-250-H	105	28	51	5	Short type
TMC-4H	F-250FB, F-250KC	105	71	99	40	
TMC-5B	L-225E, S-400S, F-400FB, L-400E	147	147	99	110	
TMC-5D	S-600S, F-600F, L-600E, SX600, FX600, S-800S, F-800R, F-800RH, L-800E, SX800, FX800	210	154	91.5	129	
TMC-6	F-1000K, F-1200K	210	159	145	130	
TMC-6B	FX1000, FX1200	210	159	138.5	130	

Remarks Dimensions with ( ) are for 2-pole types

## Terminal Cover (BTC)



Types	Applicable FFB Type
BTC-1	F-30FB, S-50SB, S-60RB, F-60RB, S-100EB, S-100SB
BTC-2C	S-100S, F-100S, FXK125-S, FXK125-H
BTC-3C	F-100KB, L-50E, L-100E
BTC-4G	S-225SB, MS-225SB
BTC-4J	SXK225, FXK250-S, FXK250-H
BTC-5B	L-225E, L-400E, S-400S, F-400R, SX400, FX400

## 9. Handle operating mechanism

This device is mounted on the face or door of a switchboard or a control board, making it possible to open or close a breaker from the outside. Following interlocks are attached as standard.

### ■ Handle Interlock

This handle interlocks is for preventing unnecessary manipulations of a breaker. Users are requested to provide a padlock for this device.

### ■ Door Interlock

For a handle mounted on a hinged door, this door interlock allows the door to be opened only when the breaker's operating handle is placed at the OPEN COVER position. When the handle is placed at the ON or OFF position, this device will prevent the door from being opened.

### ■ Color of Handle and Nameplate

The standard colors of handle and nameplate are as follows:

Handle: No1.5 (Black)

Nameplate: Black letters on silver aventurine

## Handle Operating Mechanism

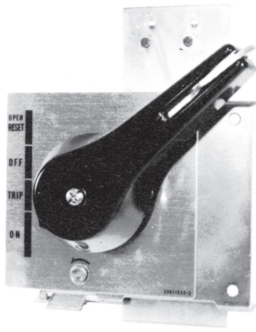
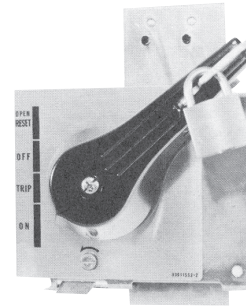


Fig. 32



(with padlock)

### ■ Dimension of HA Type Handle (3P)

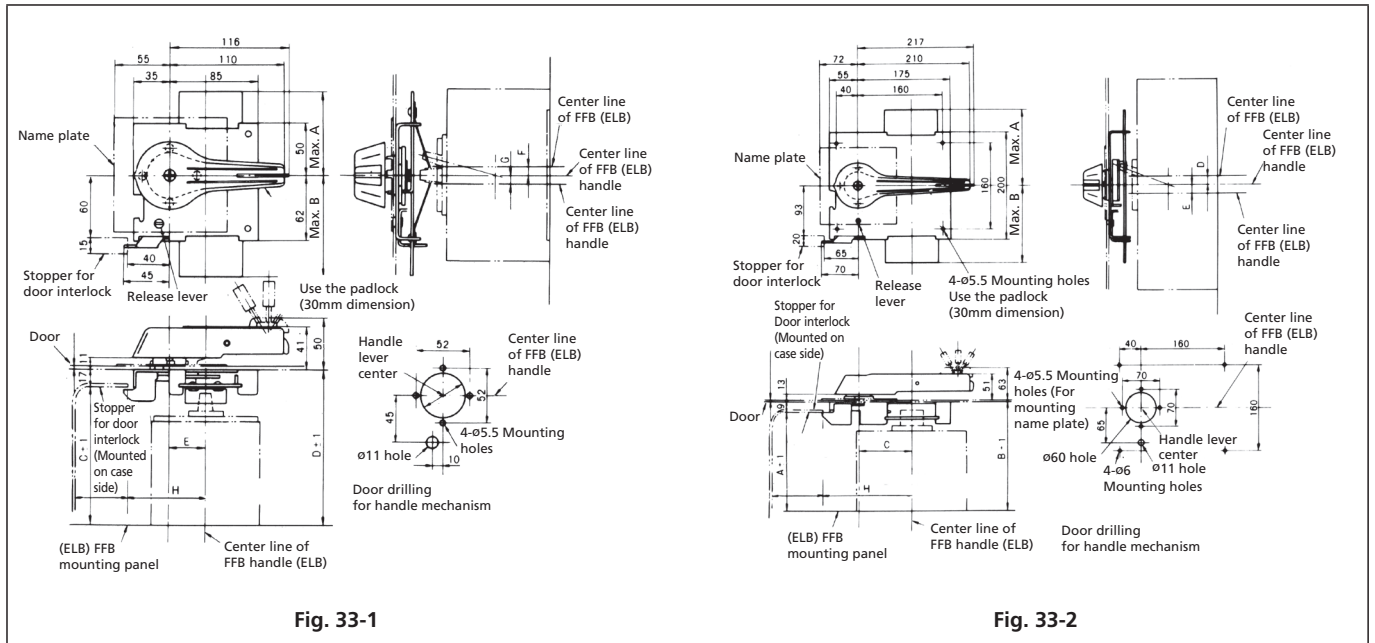
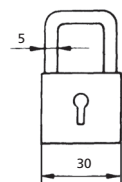


Fig. 33-1

Fig. 33-2

Types	Applicable breakers	Panel cutting Fig.	A	B	C	D	E	F	G	H
HA-104	S-100S, F-100S	Fig.33-1	102	115	91	108	35	—	—	75
HA-108	F-30FB, S-50SB, S-60RB, F-60RB, S-100EB, S-100SB	Fig.33-1	104	114	88	105	35	1.5	—	75
HA-106	F-100KB L-50E, L-100E	Fig.33-1	102	115	110	127	35	—	—	75
			102	115	127	144	35	—	—	75
HA-206	F-250FB, F-250KC	Fig.33-1	110	118	131	148	35	—	—	75
HA-207	S-225SB	Fig.33-1	100	118	90	107	35	1.5	—	75
HA-209	SXK225	Fig.33-1	106	110	96	115	35	—	—	75
HA-210	FXK250-S, FXK250-H	Fig.33-1	106	110	98	115	35	—	—	75
HA-405	L-225E, S-400S, F-400R, L-400E	Fig.33-1	113	120	140	157	38	—	6	78
HA-406	SX400, FX400	Fig.33-1	113	120	140	157	38	—	6	78
HA-402	S-600S, F-600F, L-600E, SX600, FX600 S-800S, F-800R, F-800RH, L-800E, SX800, FX800	Fig.33-1	113	120	145	162	38	7.5	—	78
			113	120	145	162	38	7.5	—	78
			113	120	145	162	38	7.5	—	78
			113	120	145	162	38	7.5	—	78
HA-801	FX1000, F-1000K, FX1200, F-1200K, FX1600CB, F-1600B	Fig.33-2	195	200	187	206	100	—	—	165

### ■ Padlock



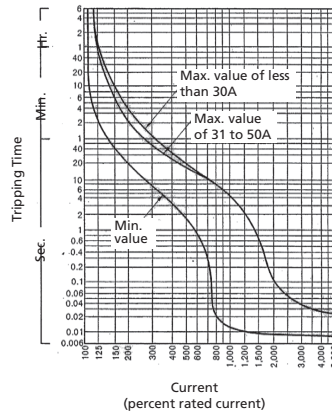
(Padlock is not attached as standard)

Fig. 34

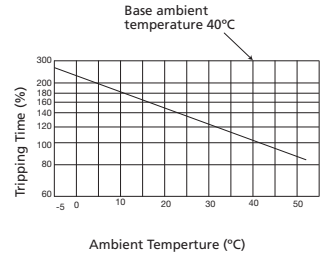




## S-30S/S-50E

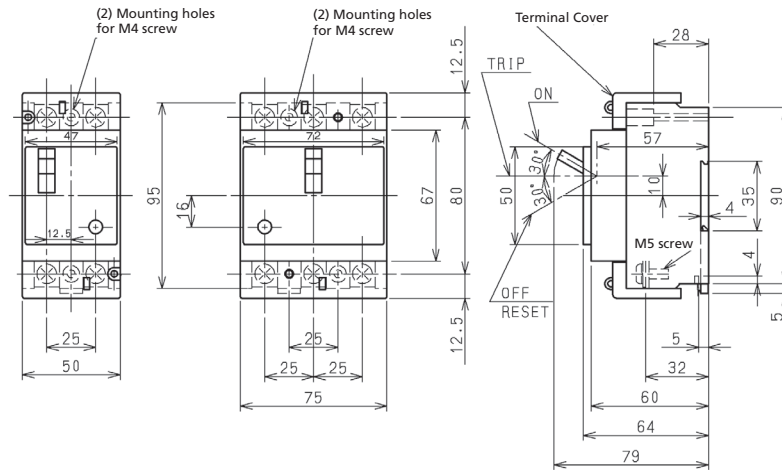


**Overcurrent Tripping Characteristic Curve**

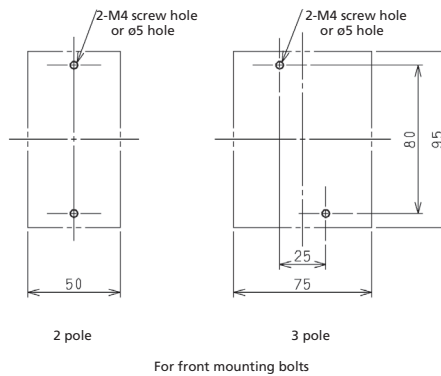


**Temperature Compensation Curve**

### ■ Dimensions

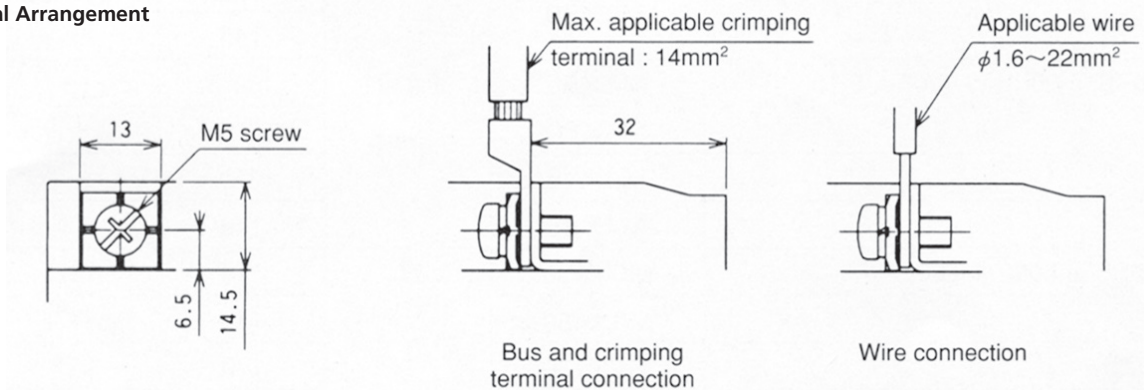


### ■ Drilling Plan



For front mounting bolts

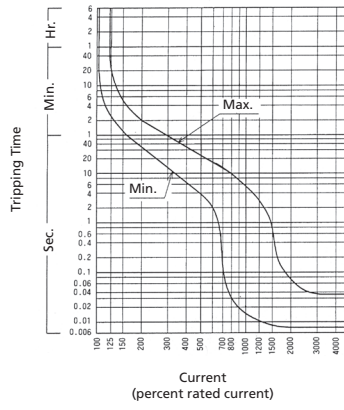
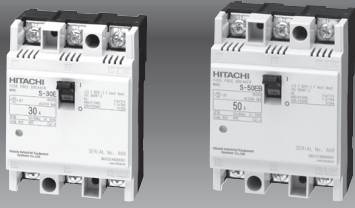
### ■ Terminal Arrangement



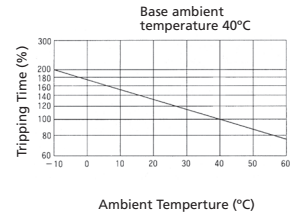
Bus and crimping terminal connection

Wire connection

# S-30E/S-50EB (MS-30E/MS-50EB)

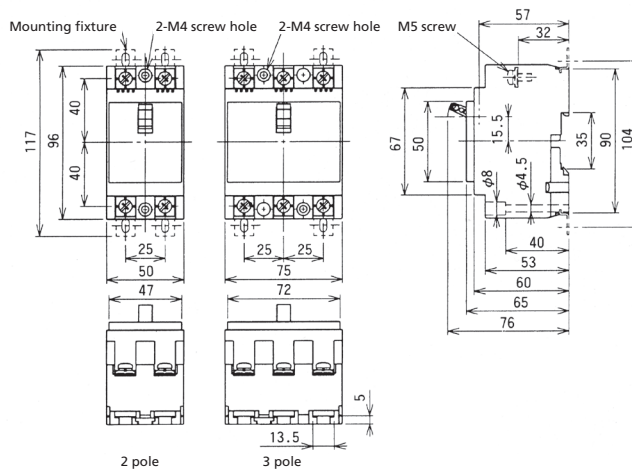


**Overcurrent Tripping Characteristic Curve**

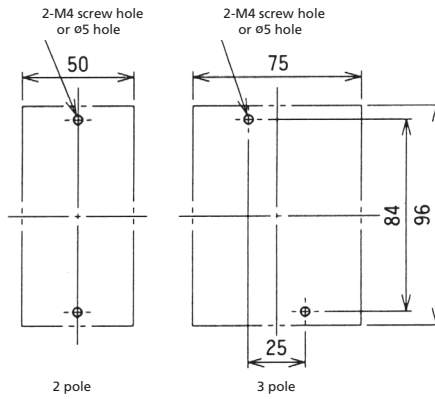


**Temperature Compensation Curve**

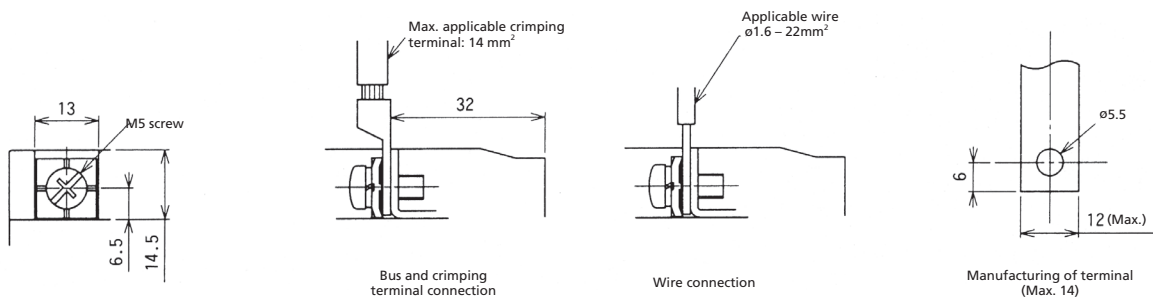
■ **Dimensions**



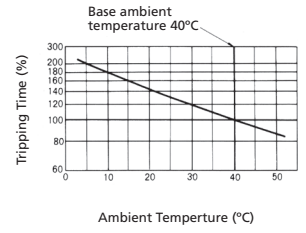
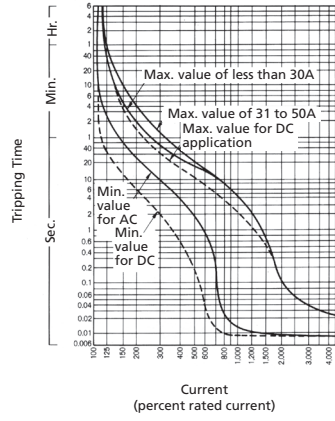
■ **Drilling Plan**



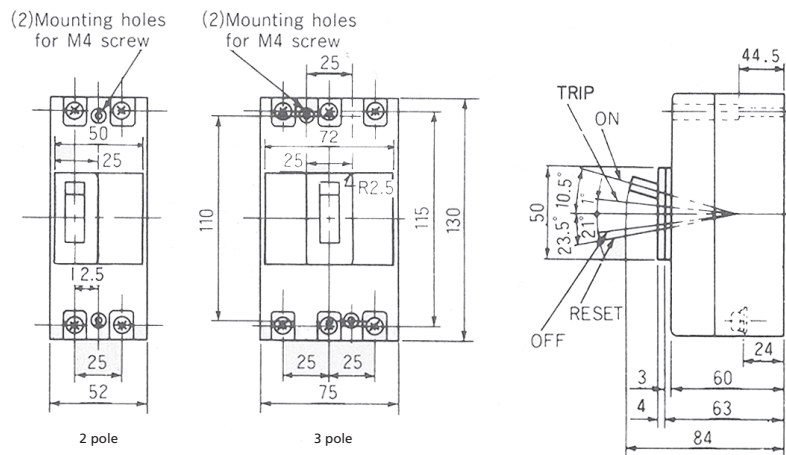
■ **Terminal Arrangement**



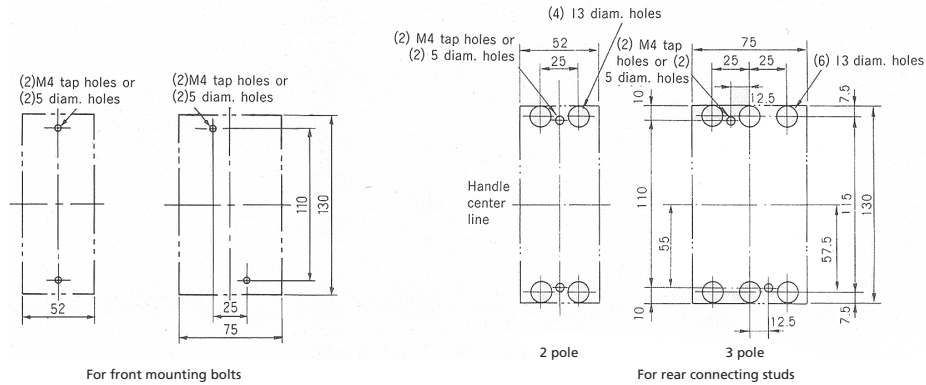
# S-30FB/S-50SB (MS-50SB)



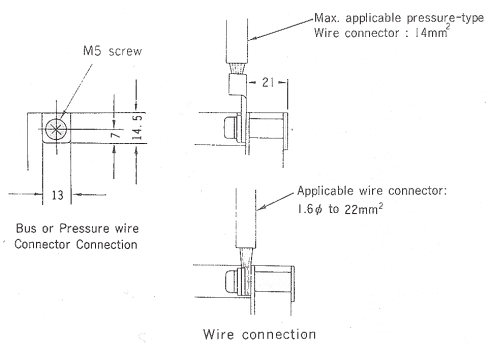
## ■ Dimensions



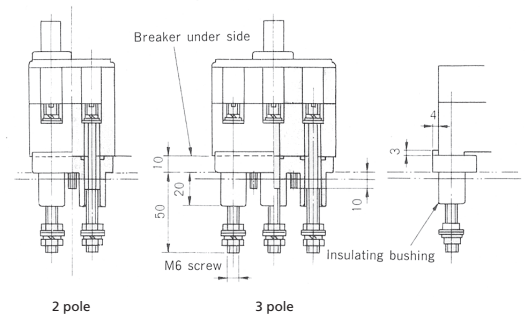
## ■ Drilling Plan



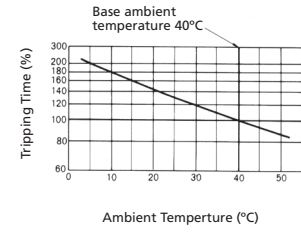
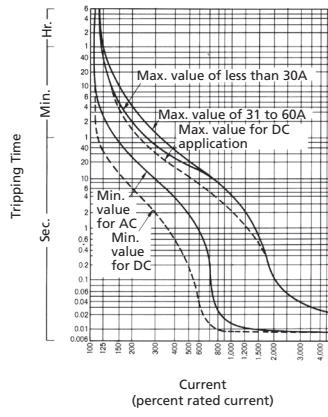
## ■ Terminal Arrangement



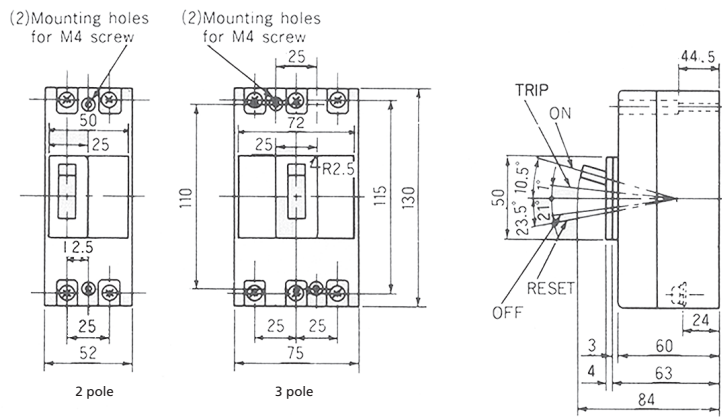
## ■ For Rear Connecting Studs



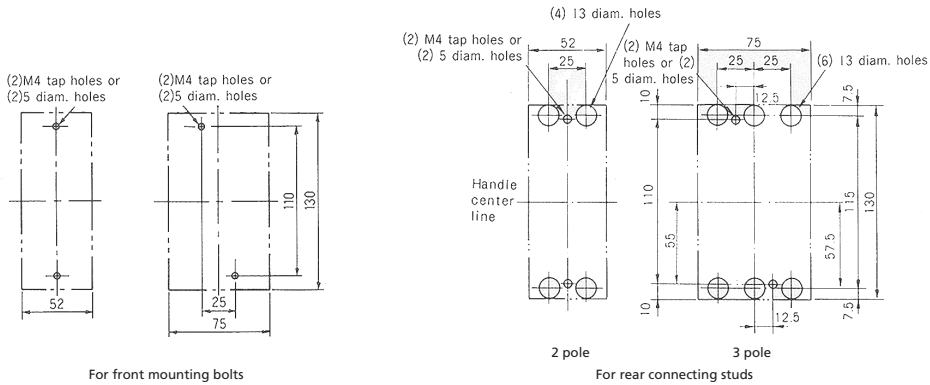
# F-60RB S-60RB



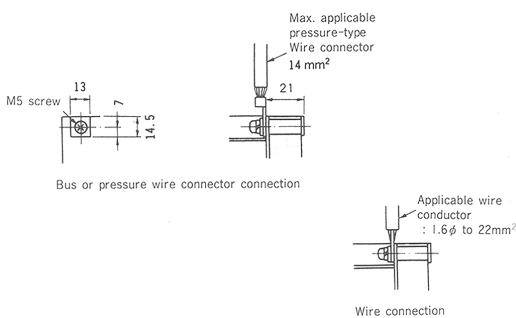
## ■ Dimensions



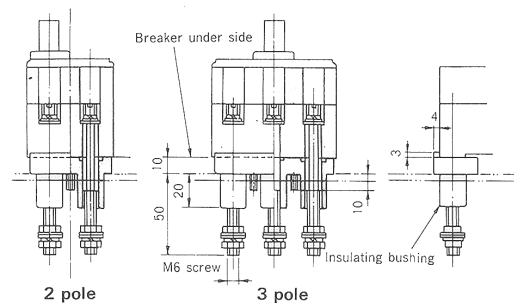
## ■ Drilling Plan



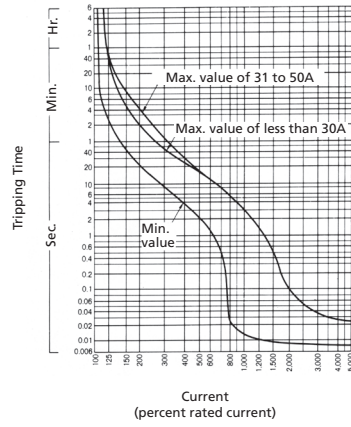
## ■ Terminal Arrangement



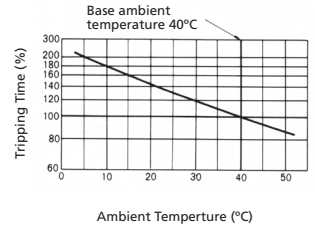
## ■ For Rear Connecting Studs



# L-50E

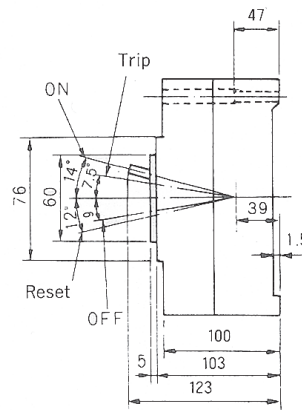
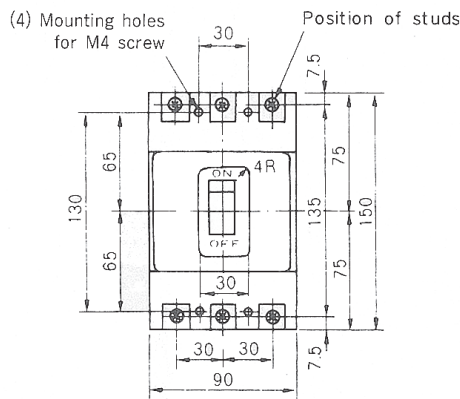


**Overcurrent Tripping Characteristic Curve**

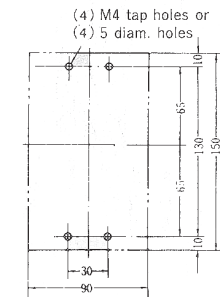


**Temperature Compensation Curve**

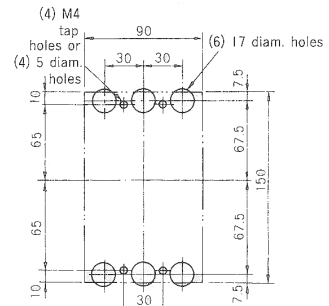
## ■ Dimensions



## ■ Drilling Plan

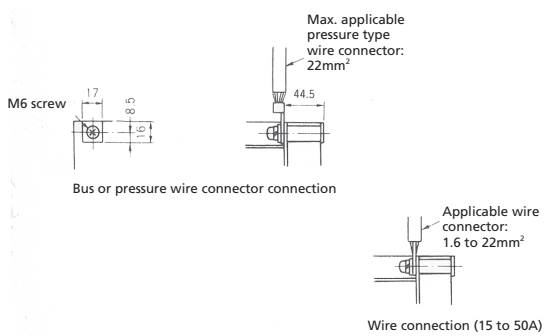


3 pole  
For front mounting bolts

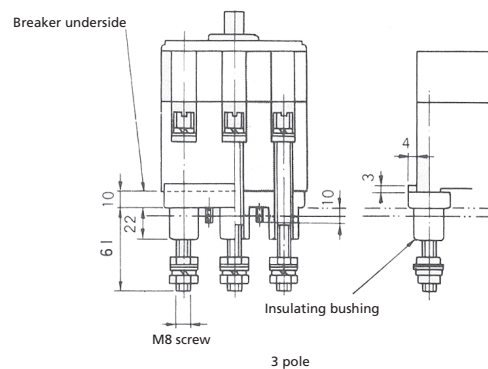


3 pole  
For rear connecting studs

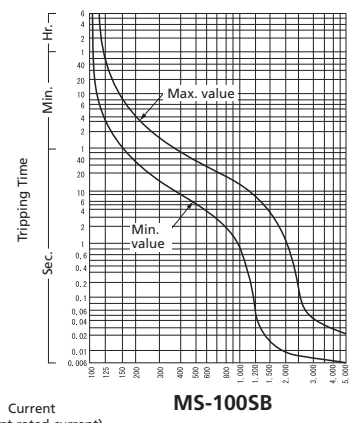
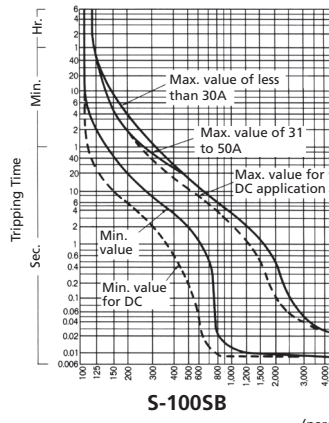
## ■ Terminal Arrangement



## ■ For Rear Connecting Studs

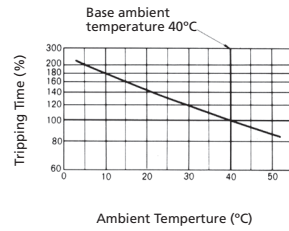
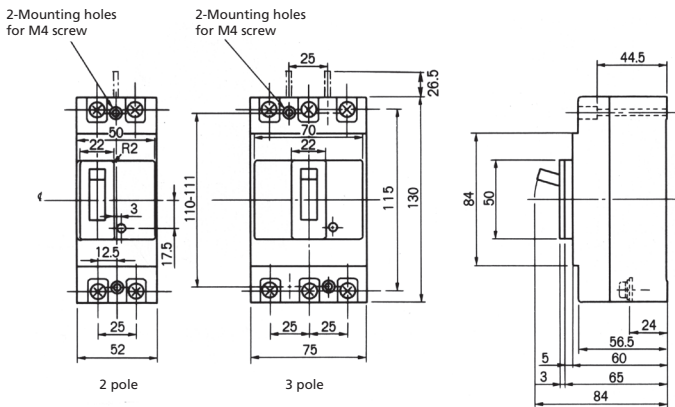


# S-100EB/S-100SB (MS-100SB)



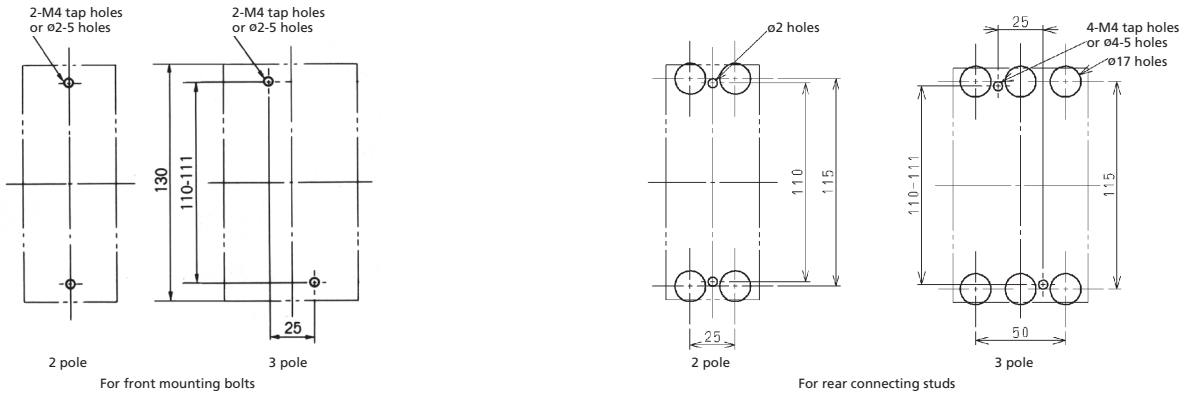
**Overcurrent Tripping Characteristic Curve**

## ■ Dimensions

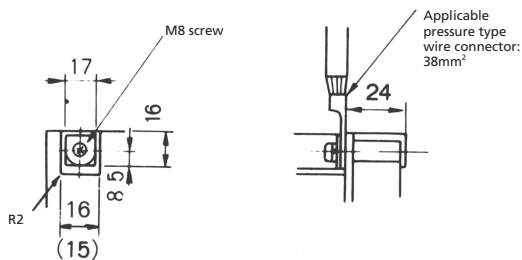


**Temperature Compensation Curve**

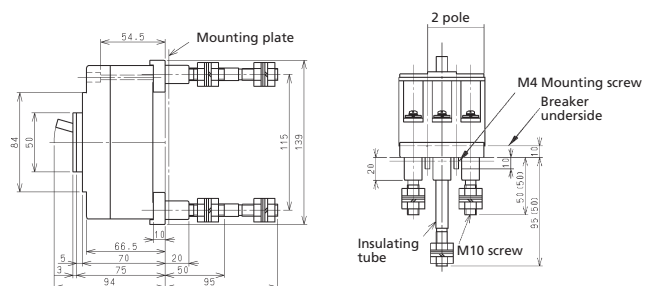
## ■ Drilling Plan



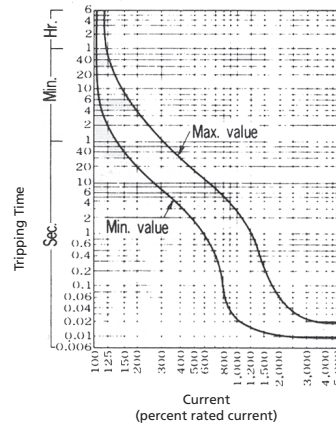
## ■ Terminal Arrangement



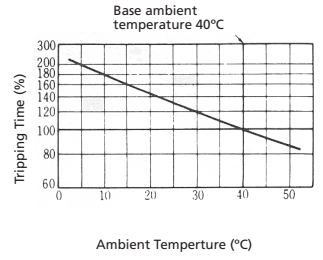
## ■ For Rear Connecting Studs



# S-100S

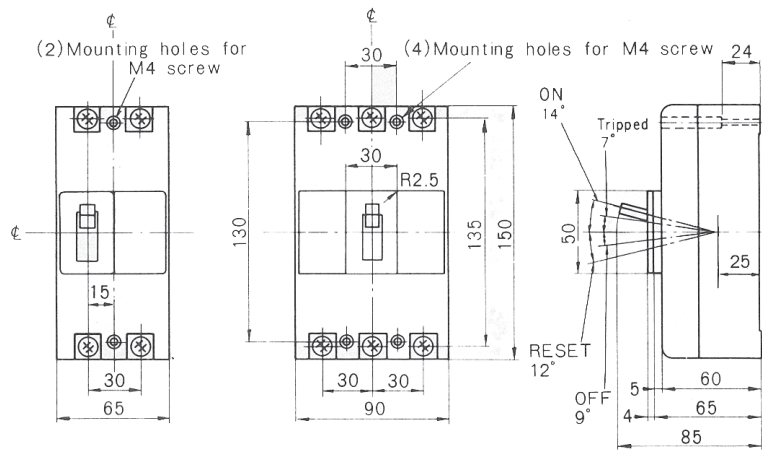


**Overcurrent Tripping Characteristic Curve**

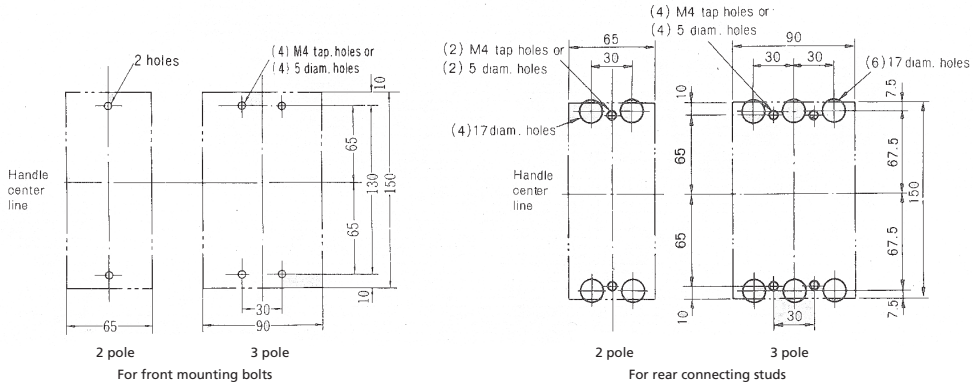


**Temperature Compensation Curve**

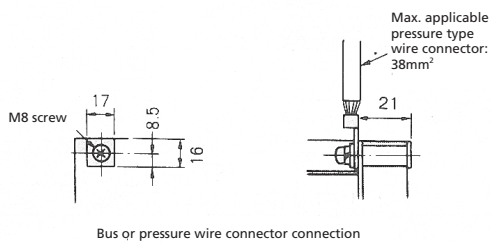
■ **Dimensions**



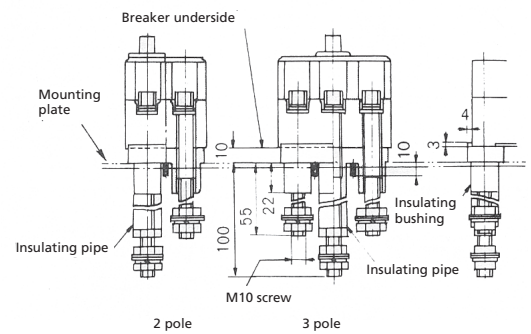
■ **Drilling Plan**



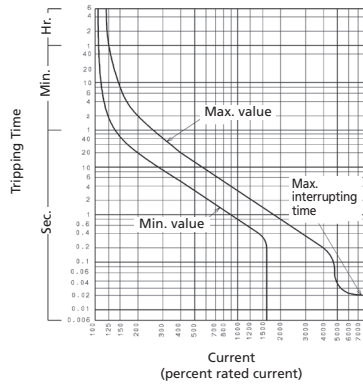
■ **Terminal Arrangement**



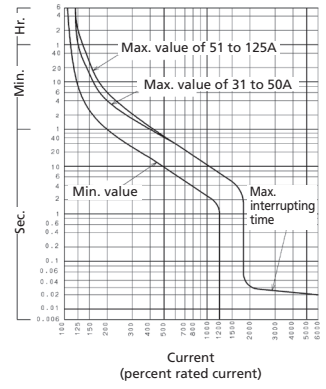
■ **For Rear Connecting Studs**



# FXK125-S/FXK125-H (MFXK100-S)

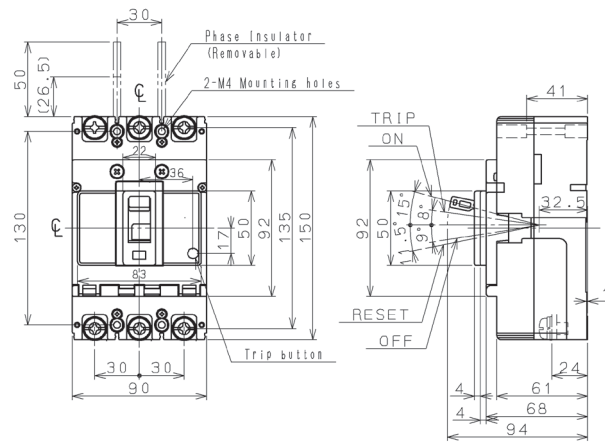


**Overcurrent Tripping Characteristic Curve (15-30A)**



**Overcurrent Tripping Characteristic Curve (31-125A)**

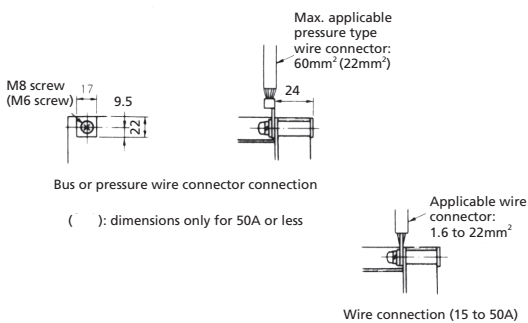
## ■ Dimensions



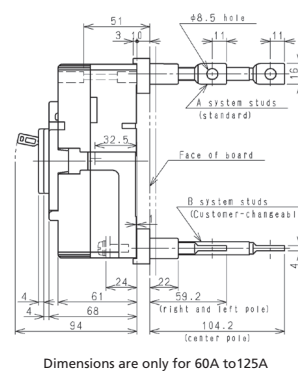
## ■ Drilling Plan



## ■ Terminal Arrangement

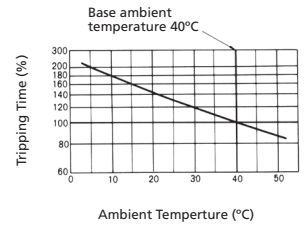
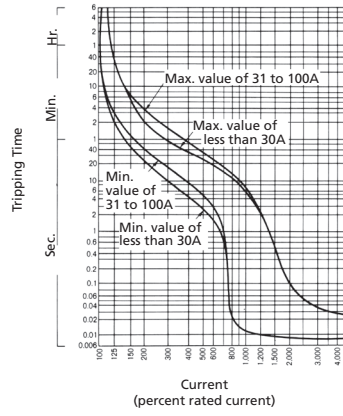


## ■ For Rear Connecting Studs





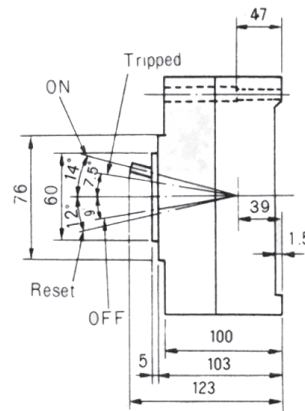
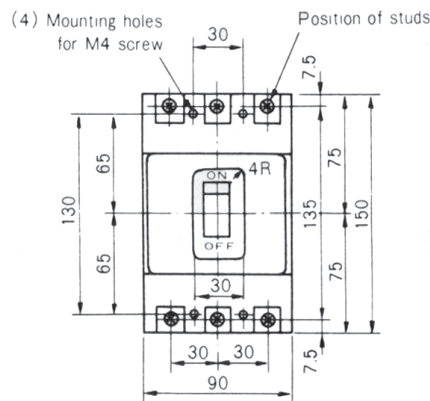
# L-100E



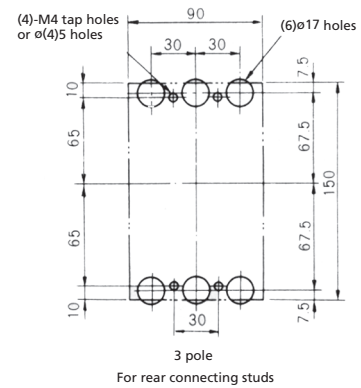
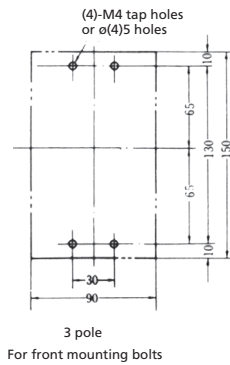
Overcurrent Tripping Characteristic Curve

Temperature Compensation Curve

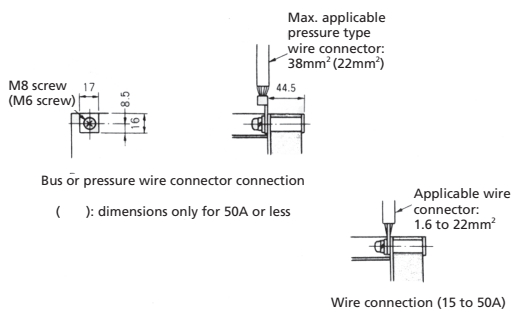
## ■ Dimensions



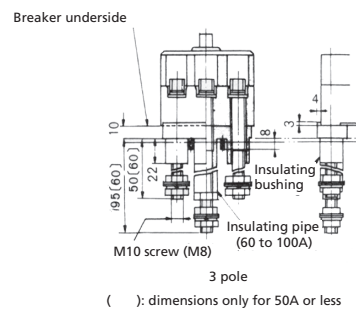
## ■ Drilling Plan



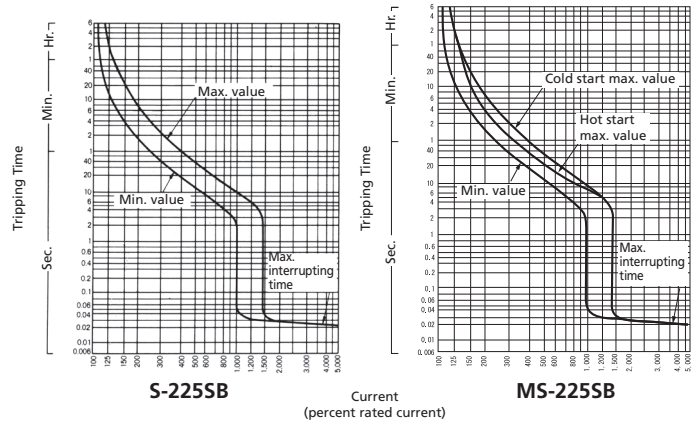
## ■ Terminal Arrangement



## ■ For Rear Connecting Studs

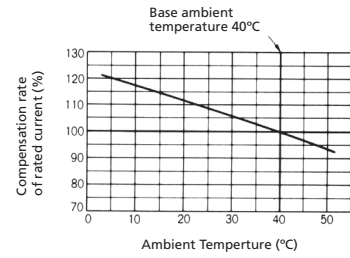
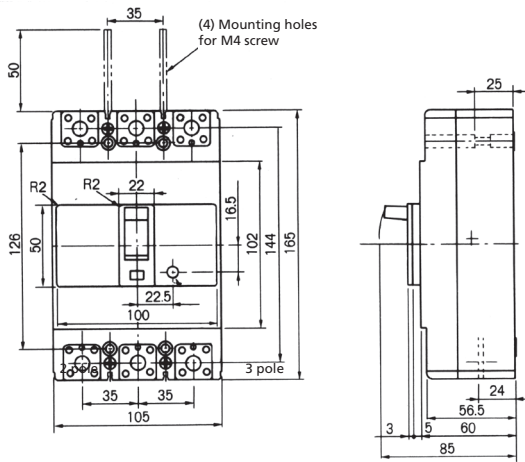


# S-225SB (MS-225SB)



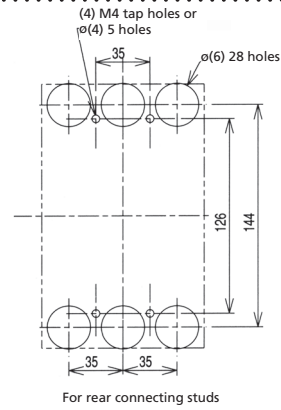
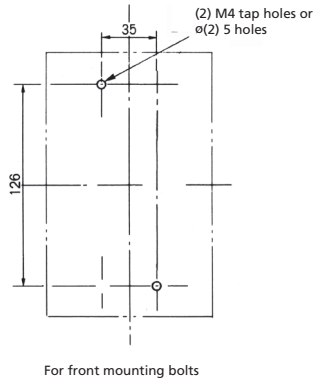
Overcurrent Tripping Characteristic Curve

## ■ Dimensions



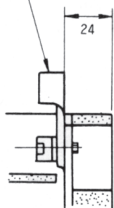
Temperature Compensation Curve

## ■ Drilling Plan



## ■ Terminal Arrangement

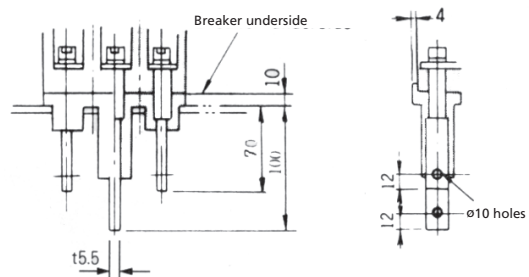
Maximum applicable pressure type-wire connector = 60mm<sup>2</sup>  
Special pressure type wire connector is attached for 175 – 225A as shown on the right table



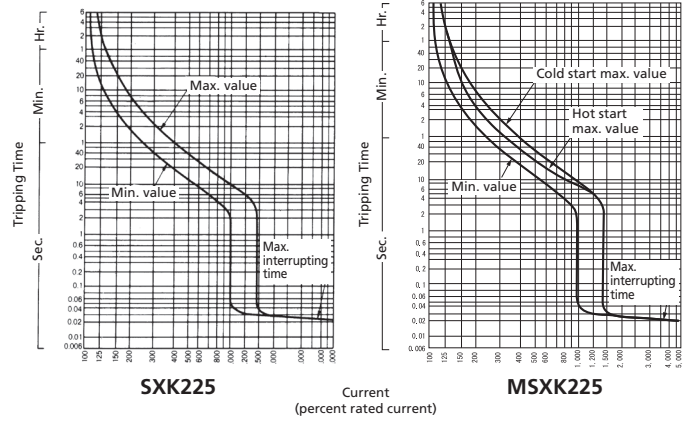
Rated current (A)	Applicable wire size of pressure type wire connector (mm <sup>2</sup> )
175 – 225	Pressure type wire connector 80, 100, 125 (mm)

Pressure type wire connector directly connected

## ■ For Rear Connecting Studs

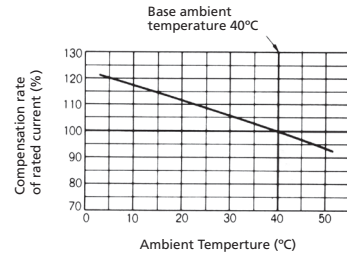
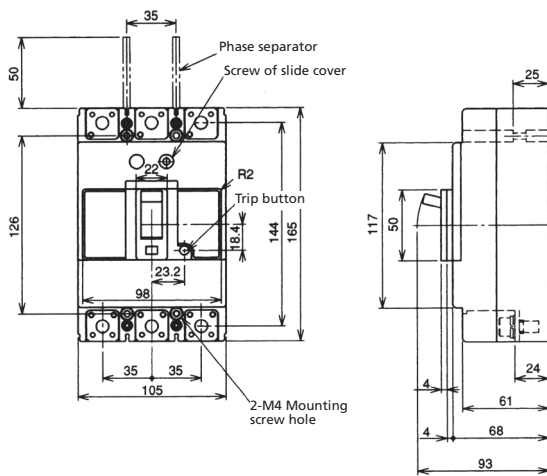


# SXK225 (MSKX225)



Overcurrent Tripping Characteristic Curve

## ■ Dimensions

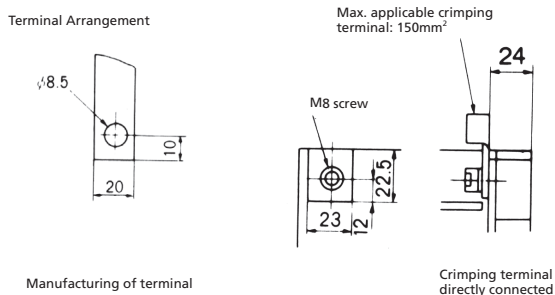


Temperature Compensation Curve

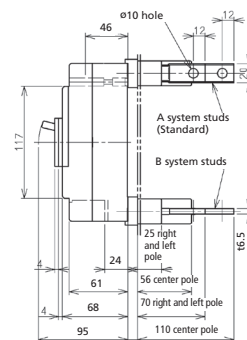
## ■ Drilling Plan



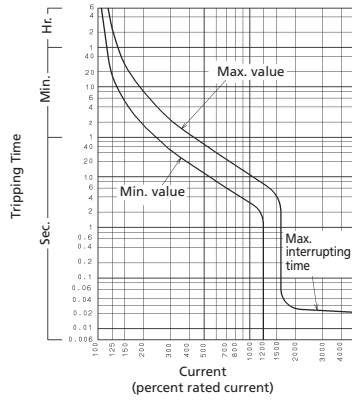
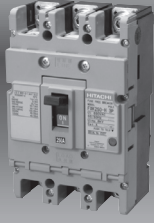
## ■ Terminal Arrangement



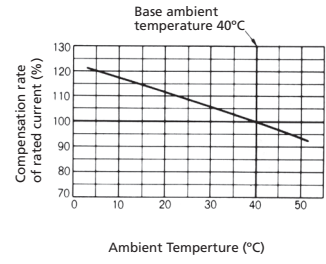
## ■ For Rear Connecting Studs



# FXK250-S/FXK250-H (MFXK225-S)

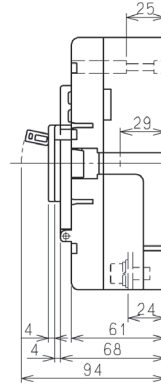
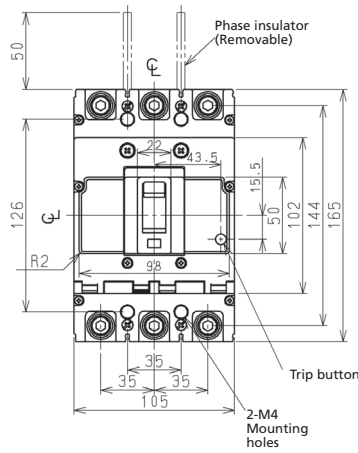


**Overcurrent Tripping Characteristic Curve**

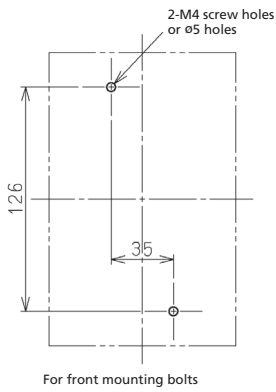


**Temperature Compensation Curve**

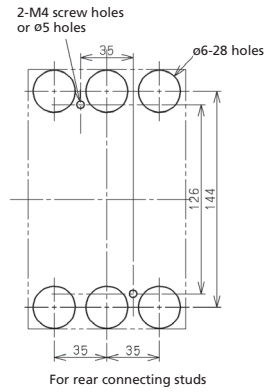
■ **Dimensions**



■ **Drilling Plan**



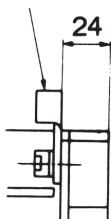
For front mounting bolts



For rear connecting studs

■ **Terminal Arrangement**

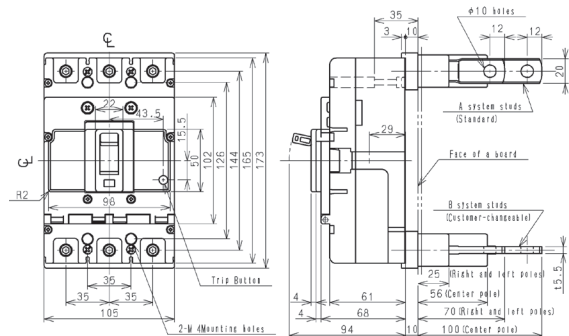
Maximum applicable pressure type-wire connector = 60mm<sup>2</sup>  
Special pressure type wire connector is attached for 175 – 225A as shown on the right table



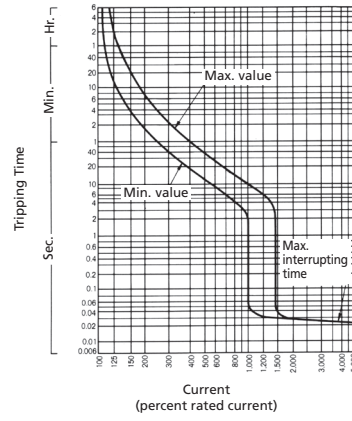
Pressure type wire connector directly connected

Rated current (A)	Applicable wire size of pressure type wire connector (mm <sup>2</sup> )
175 – 225	Pressure type wire connector 80, 100, 125 (mm)

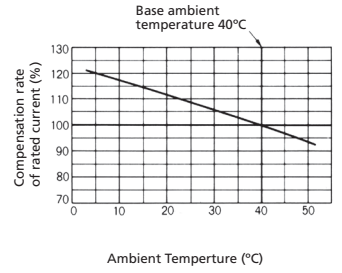
■ **For Rear Connecting Studs**



# L-225E

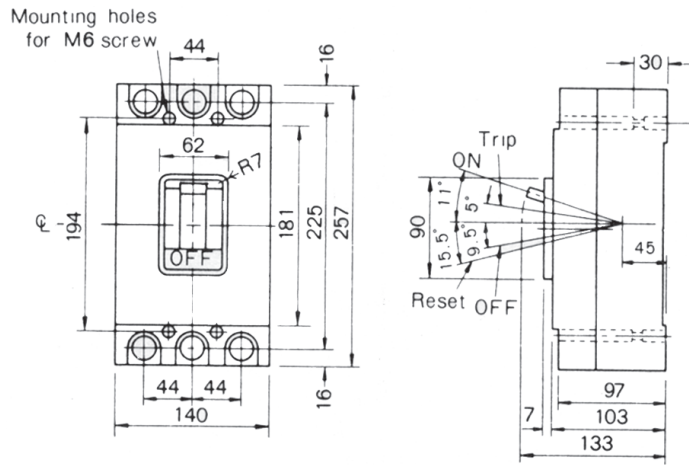


**Overcurrent Tripping Characteristic Curve**

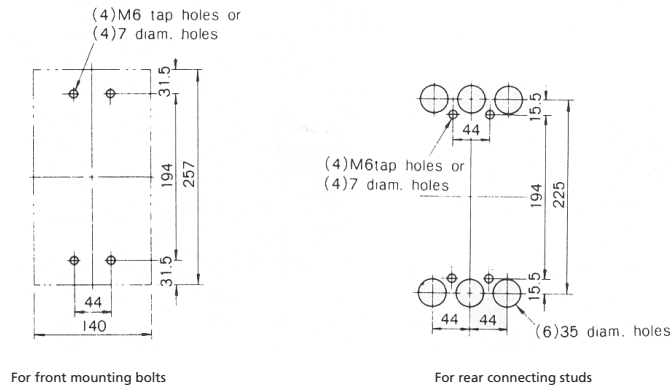


**Temperature Compensation Curve**

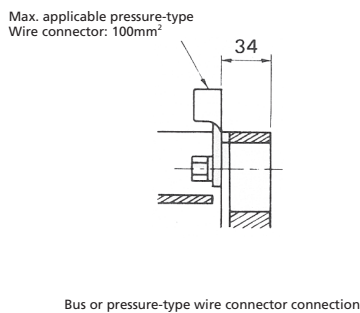
## ■ Dimensions



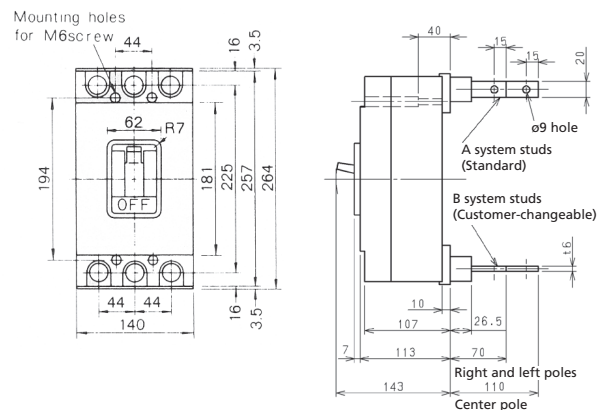
## ■ Drilling Plan



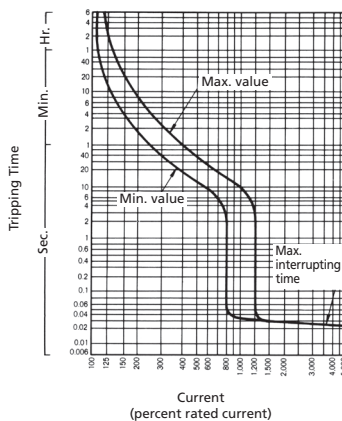
## ■ Terminal Arrangement



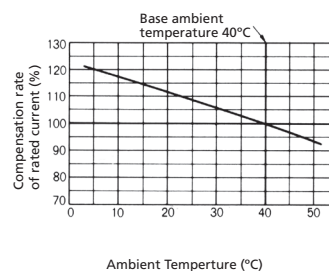
## ■ For Rear Connecting Studs



# S-400S / F-400R / L-400E

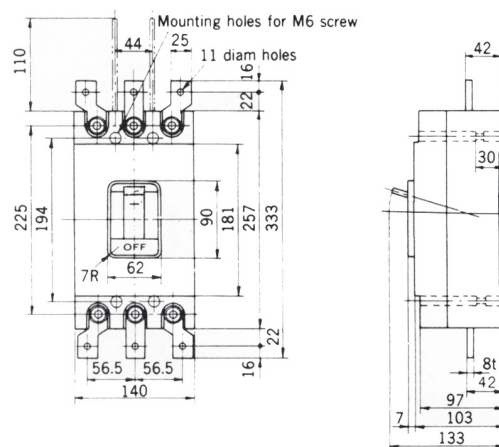
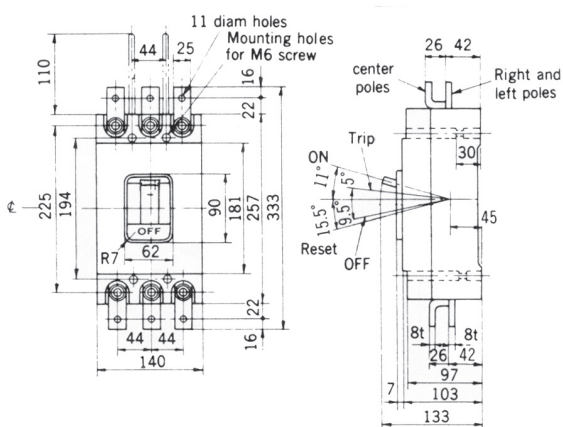


**Overcurrent Tripping Characteristic Curve**

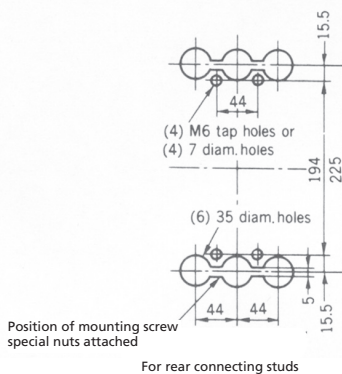
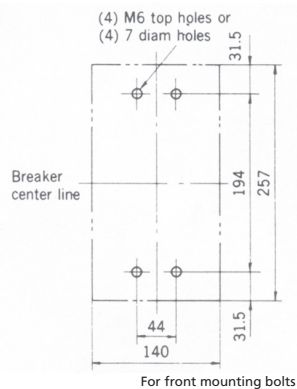


**Temperature Compensation Curve**

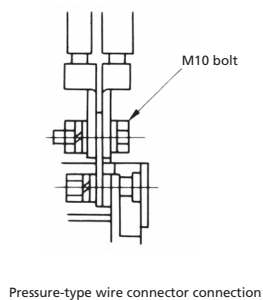
■ **Dimensions**



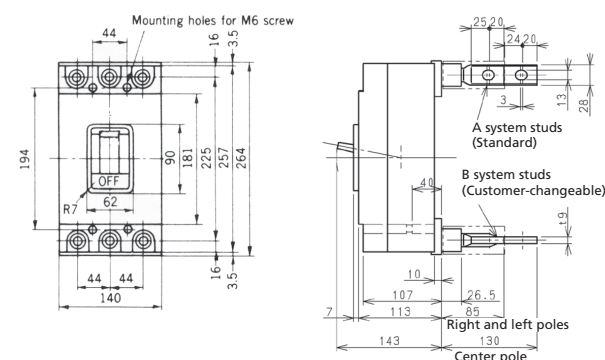
■ **Drilling Plan**



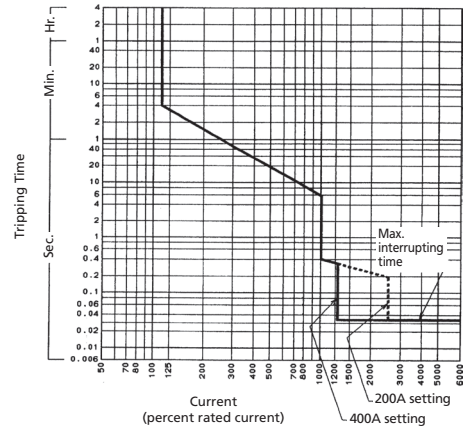
■ **For front connection**



■ **For Rear Connecting Studs**

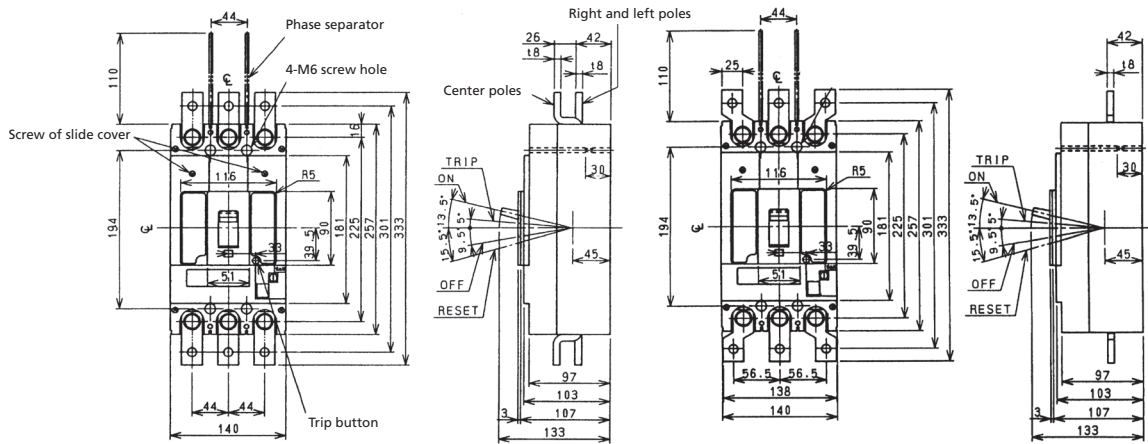


# SX400 / FX400



Overcurrent Tripping Characteristic Curve

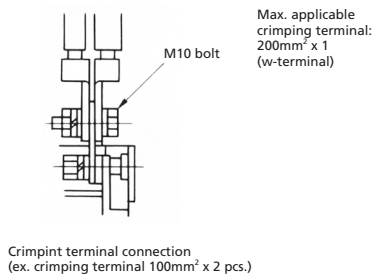
## ■ Dimensions



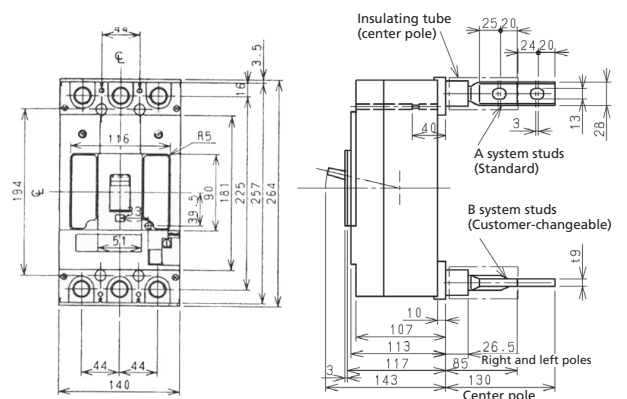
## ■ Drilling Plan



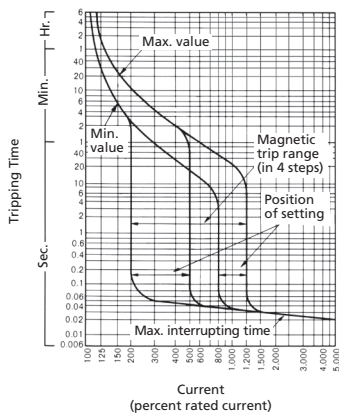
## ■ Terminal Arrangement



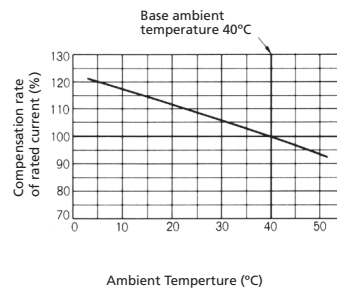
## ■ For Rear Connecting Studs



# S-600S / F-600F / L-600E

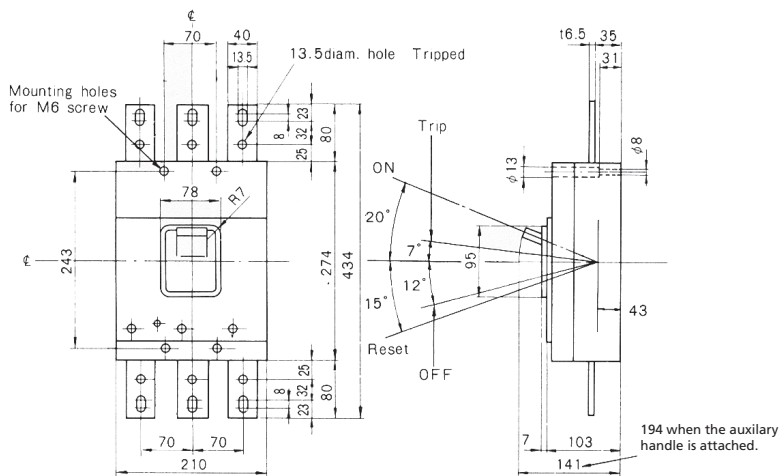


**Overcurrent Tripping Characteristic Curve**

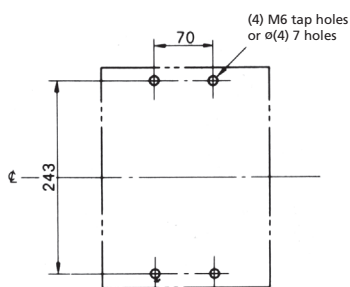


**Temperature Compensation Curve**

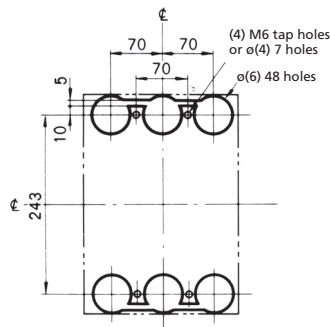
■ **Dimensions**



■ **Drilling Plan**

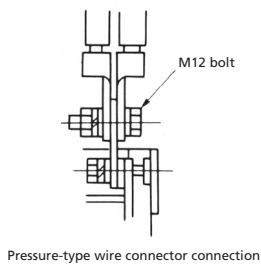


For front mounting bolts



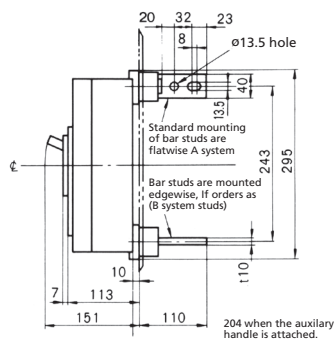
For rear connecting studs

■ **For front connection**



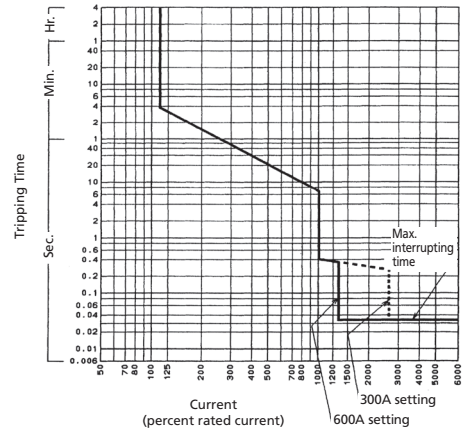
Pressure-type wire connector connection

■ **For Rear Connecting Studs**



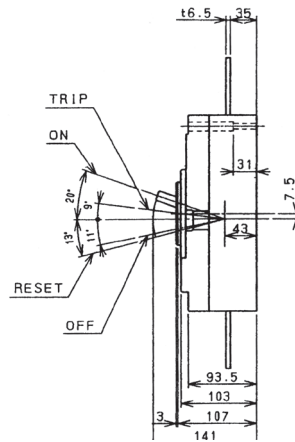
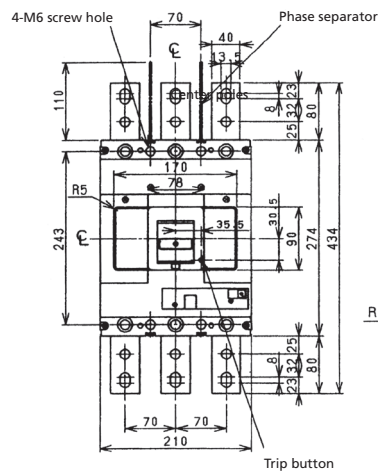


# SX600/FX600

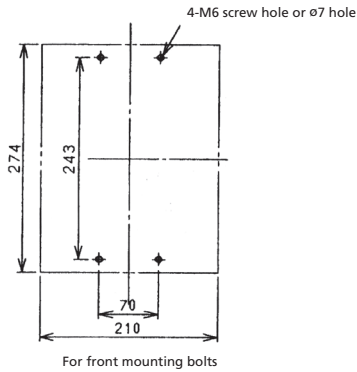


Overcurrent Tripping Characteristic Curve

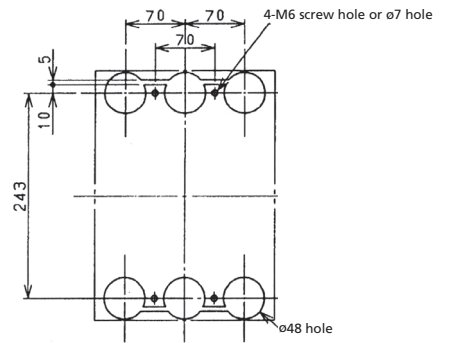
## ■ Dimensions



## ■ Drilling Plan

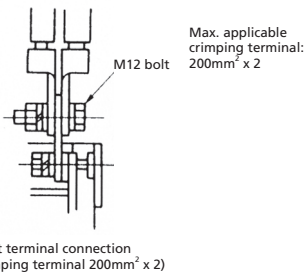


For front mounting bolts

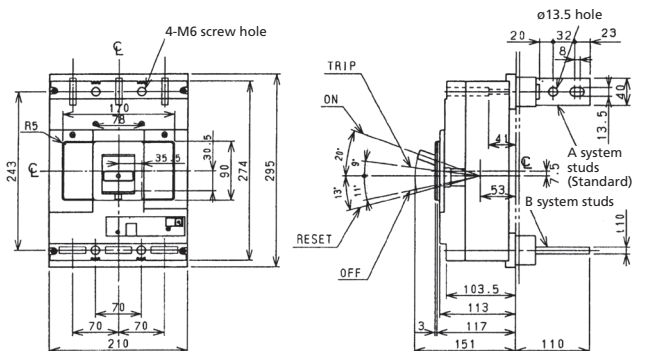


For rear connecting studs

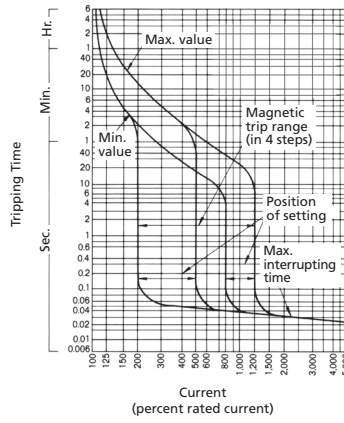
## ■ Terminal Arrangement



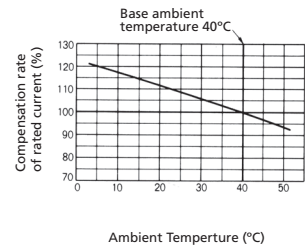
## ■ For Rear Connecting Studs



# S-800S / F-800R / F-800RH / L-800E

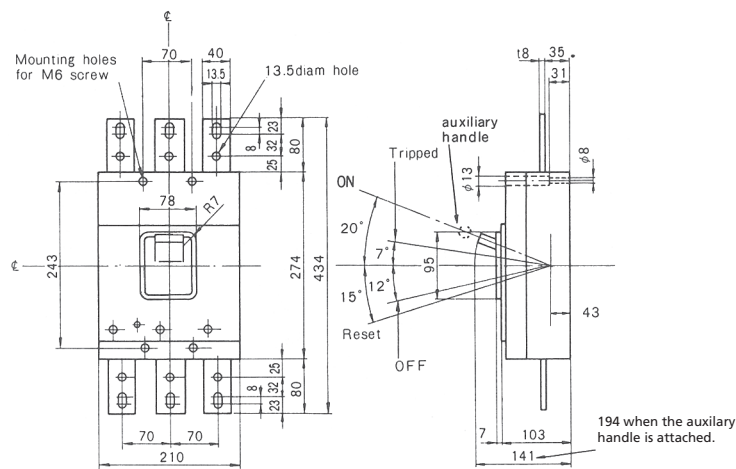


**Overcurrent Tripping  
Characteristic Curve**

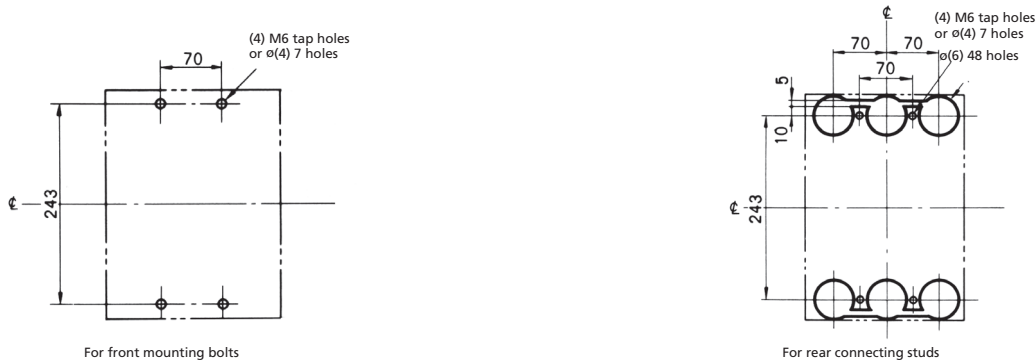


**Temperature  
Compensation Curve**

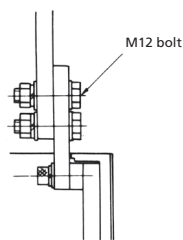
■ **Dimensions**



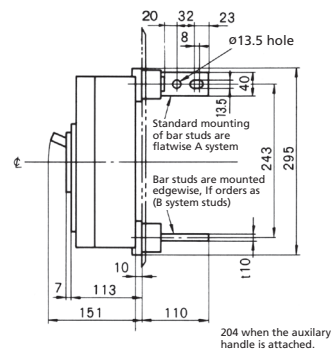
■ **Drilling Plan**



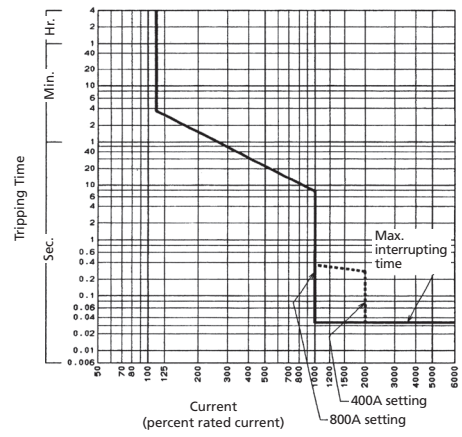
■ **For front connection**



■ **For Rear Connecting Studs**

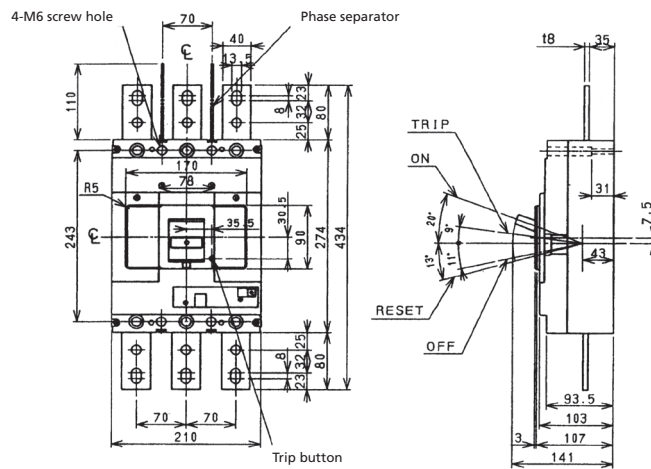


# SX800/FX800

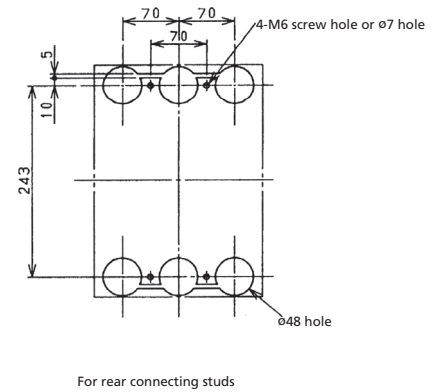
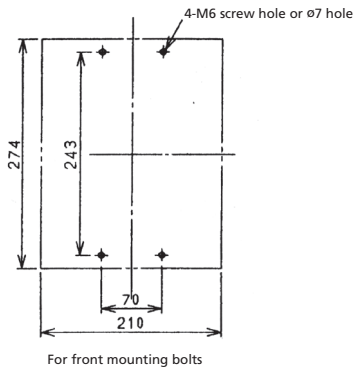


Overcurrent Tripping Characteristic Curve

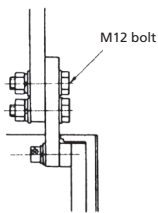
## ■ Dimensions



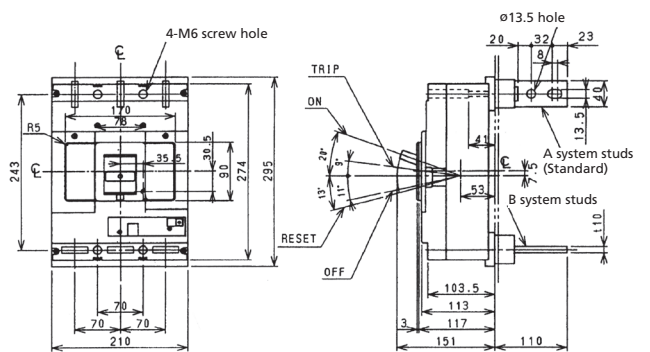
## ■ Drilling Plan



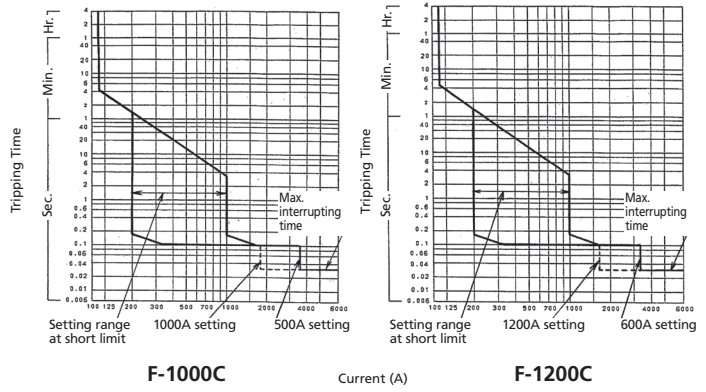
## ■ Terminal Arrangement



## ■ For Rear Connecting Studs

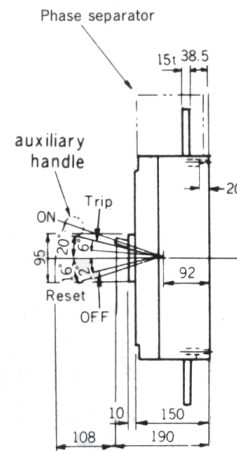
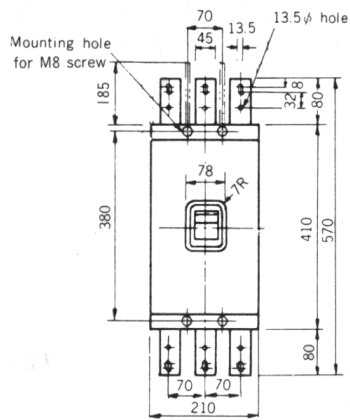


# F-1000C/F-1200C

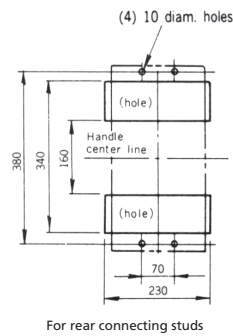
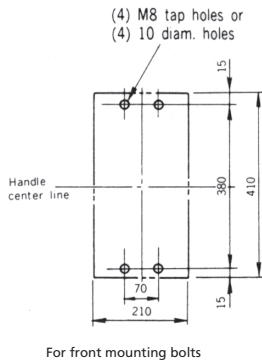


Overcurrent Tripping Characteristic Curve

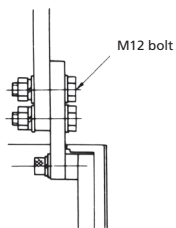
## ■ Dimensions



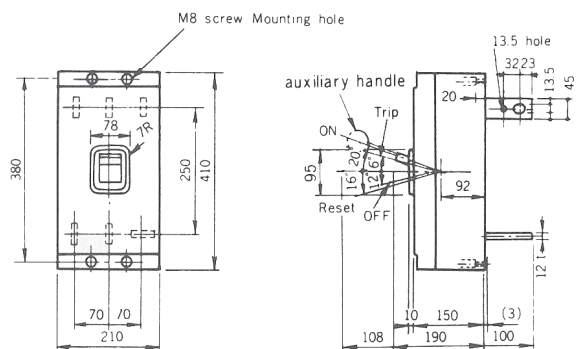
## ■ Drilling Plan



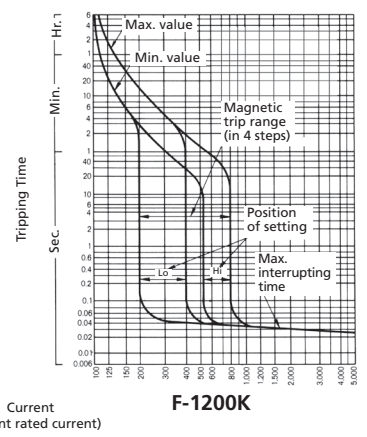
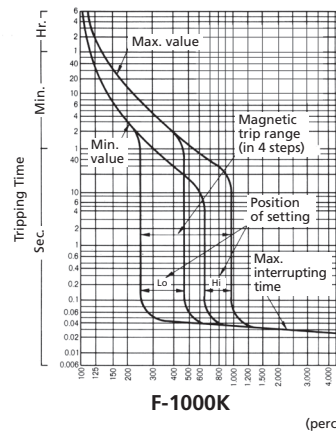
## ■ For front connection



## ■ For Rear Connecting Studs

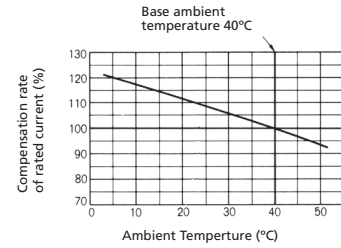
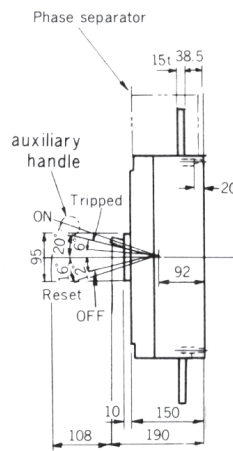
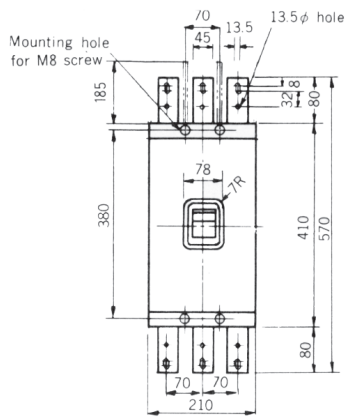


# F-1000K / F-1200K



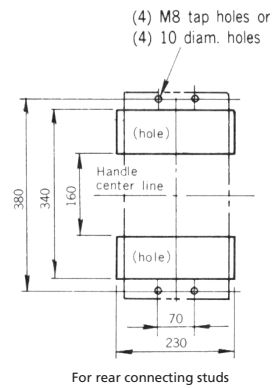
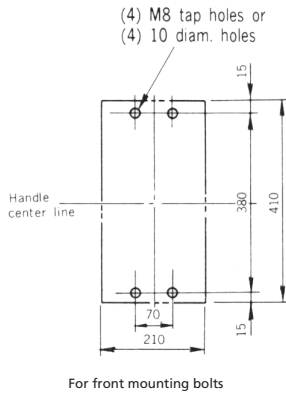
Overcurrent Tripping Characteristic Curve

## ■ Dimensions

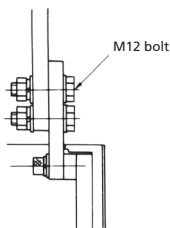


Temperature Compensation Curve

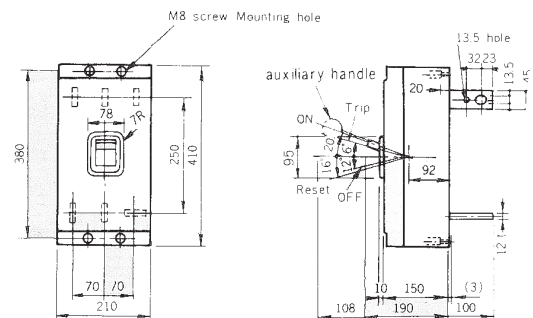
## ■ Drilling Plan



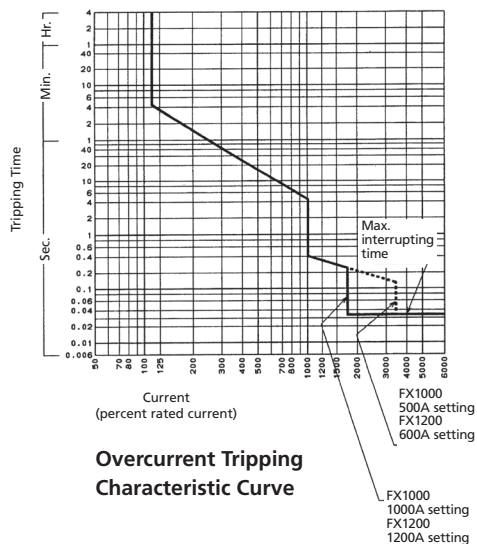
## ■ For front connection



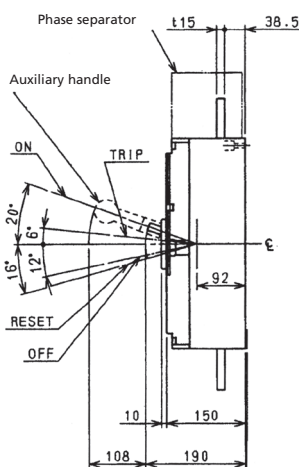
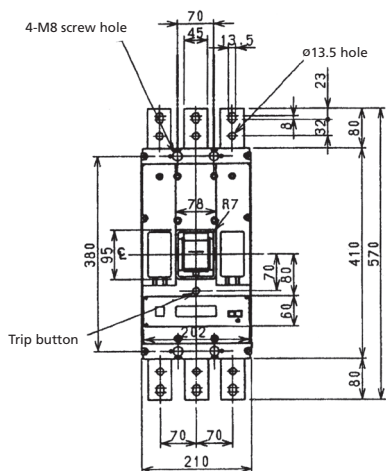
## ■ For Rear Connecting Studs



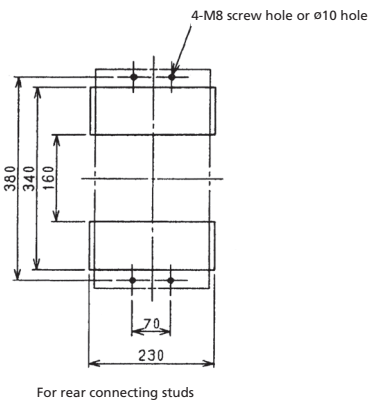
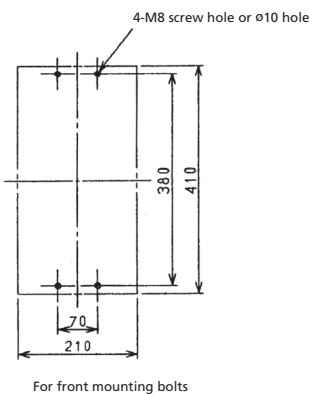
# FX1000/FX1200



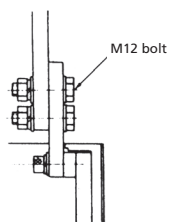
## ■ Dimensions



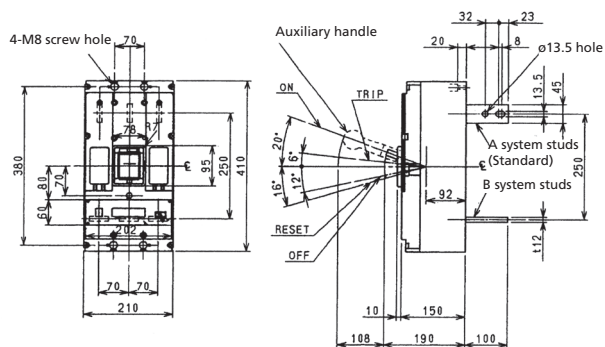
## ■ Drilling Plan



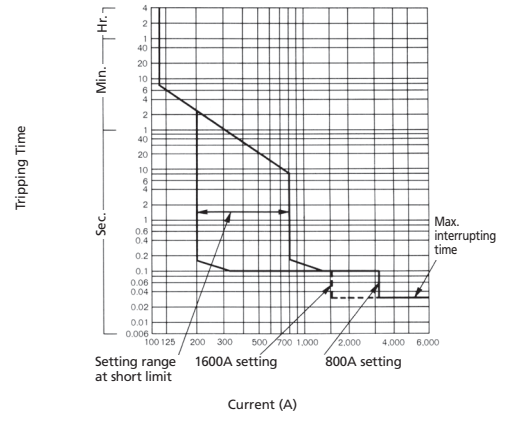
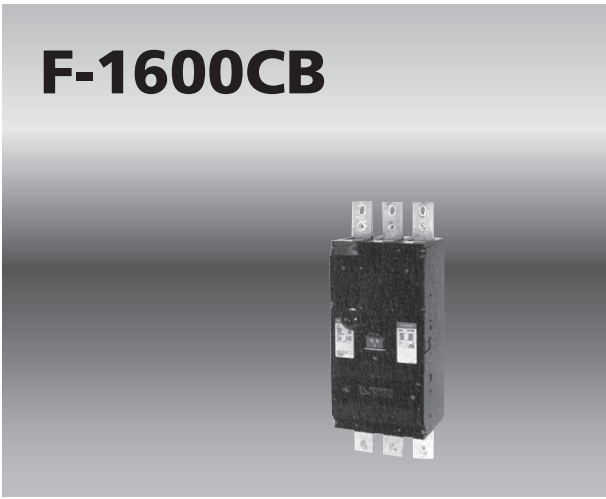
## ■ Terminal Arrangement



## ■ For Rear Connecting Studs

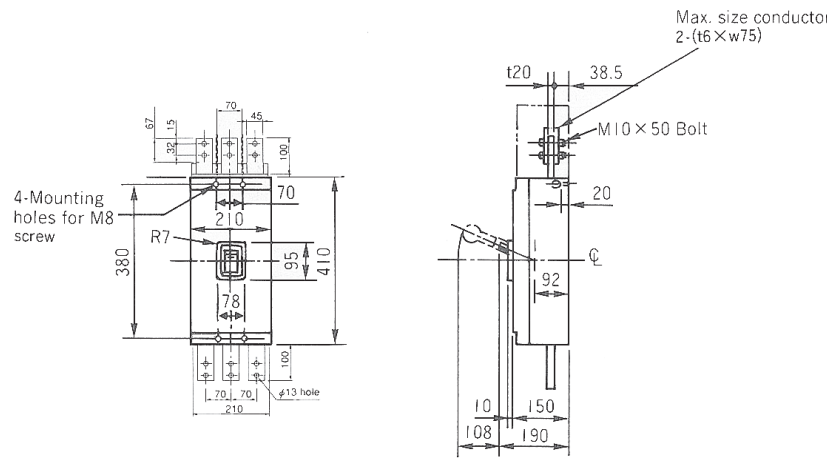


# F-1600CB

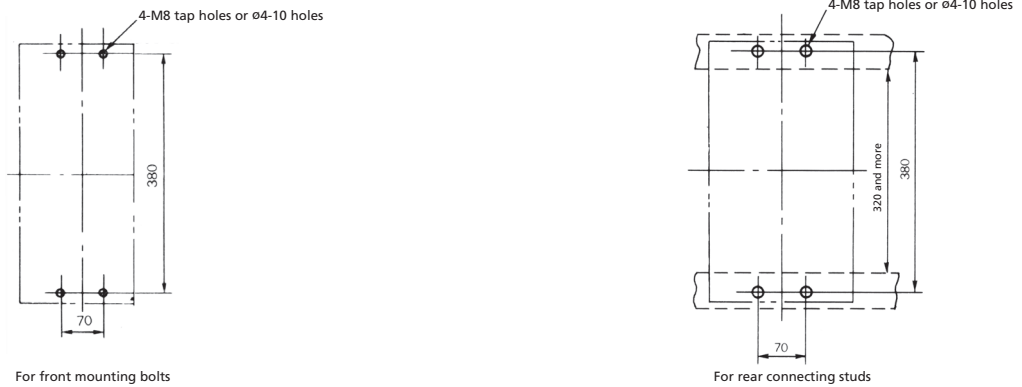


**Overcurrent Tripping Characteristic Curve**

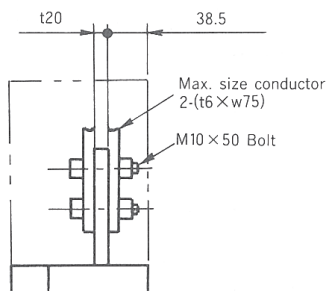
## ■ Dimensions



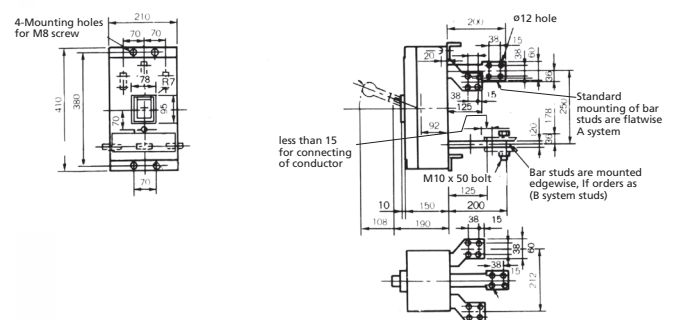
## ■ Drilling Plan



## ■ Terminal Arrangement



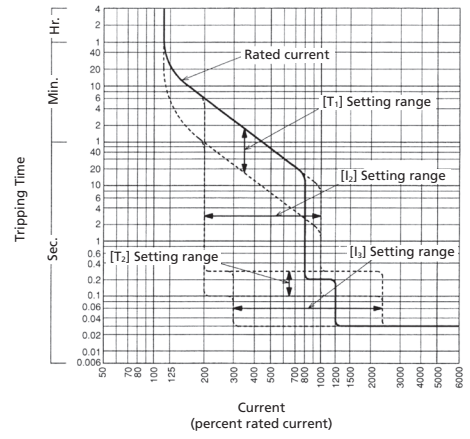
## ■ For Rear Connecting Studs





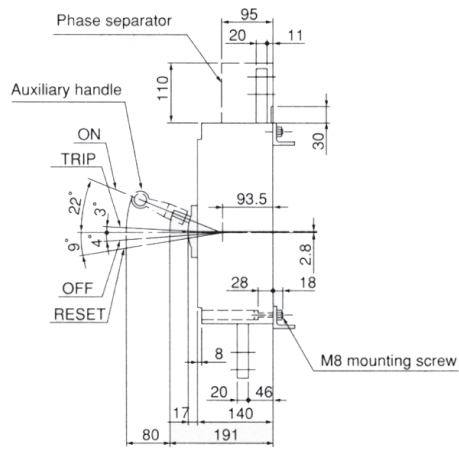
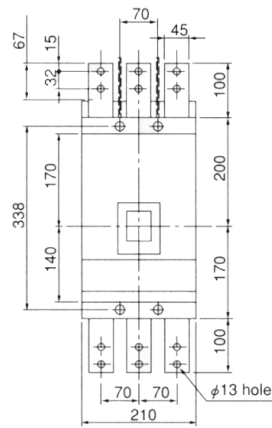


# F-1600E

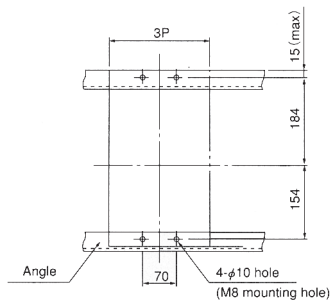


Overcurrent Tripping Characteristic Curve

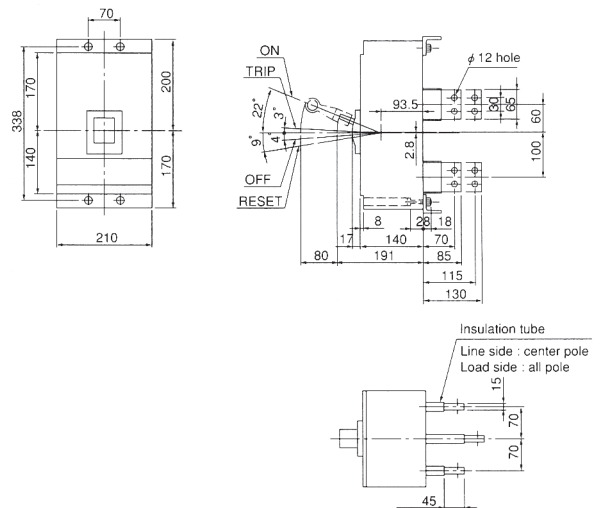
## ■ Dimensions



## ■ Drilling Plan

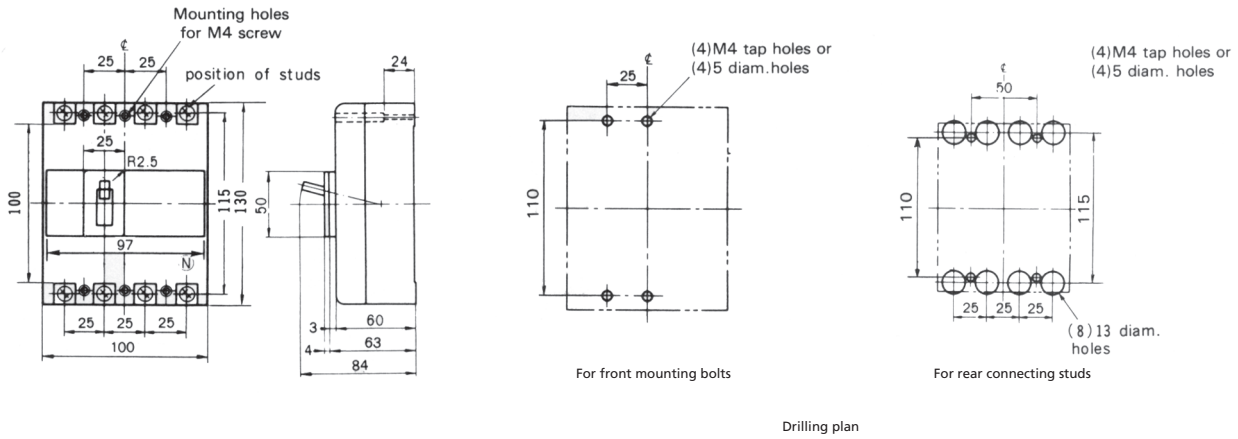


## ■ For Rear Connecting Studs

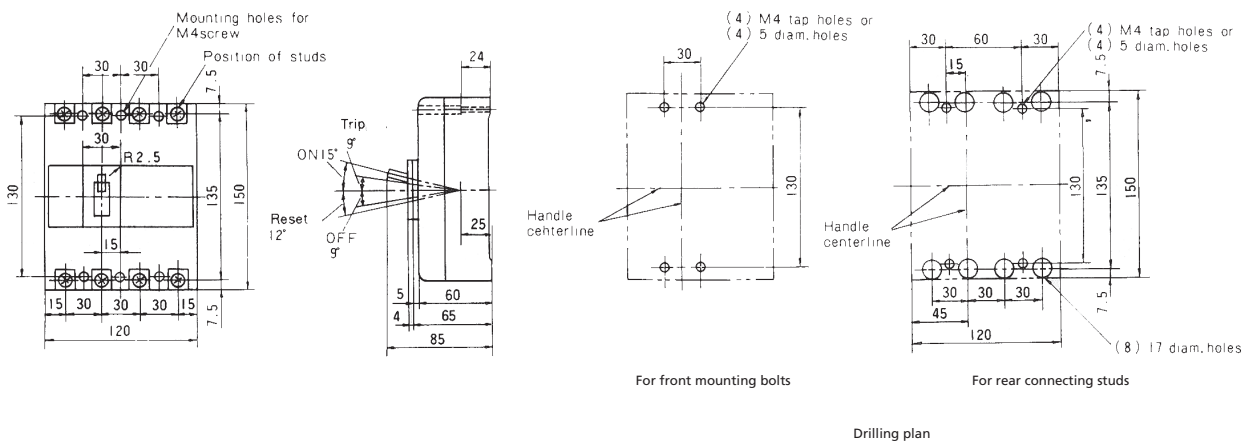


# DIMENSIONS OF 4 POLE BREAKERS

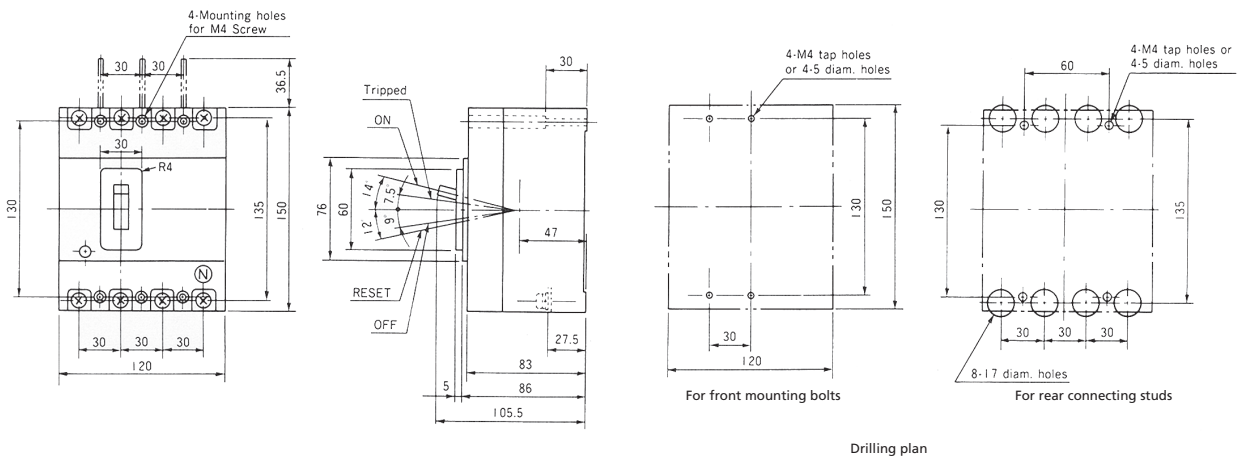
## F-60R 4 pole



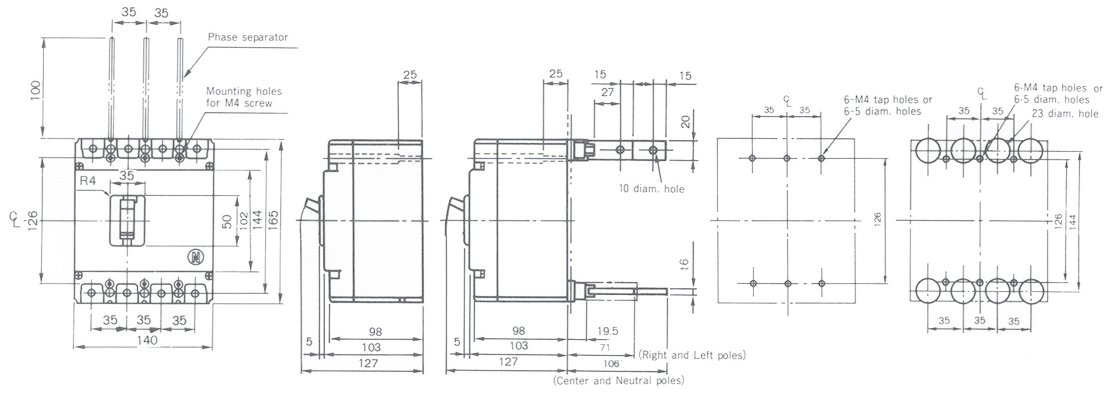
## F-100S 4 pole



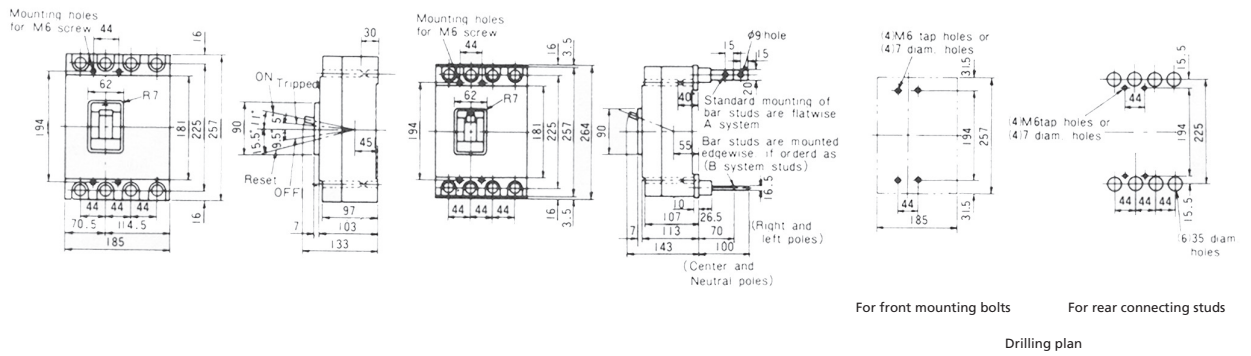
## F-100KB 4 pole



## F-250FB / F-250KC 4 pole

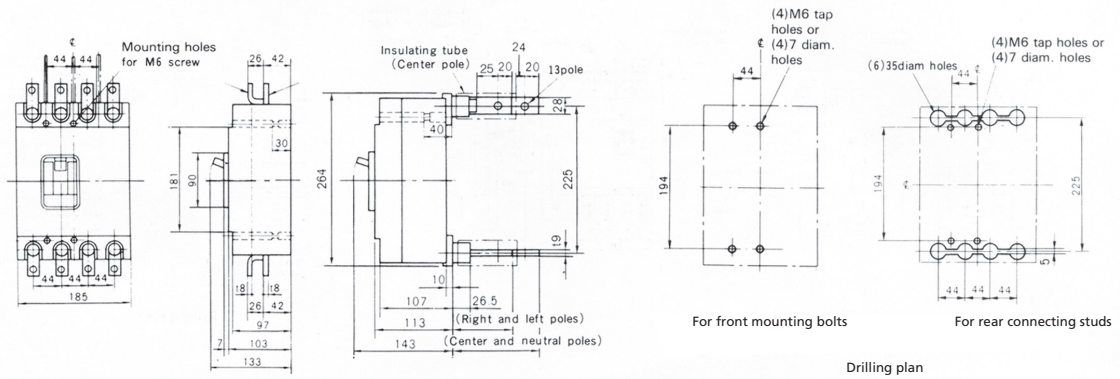


## L-225E 4 pole



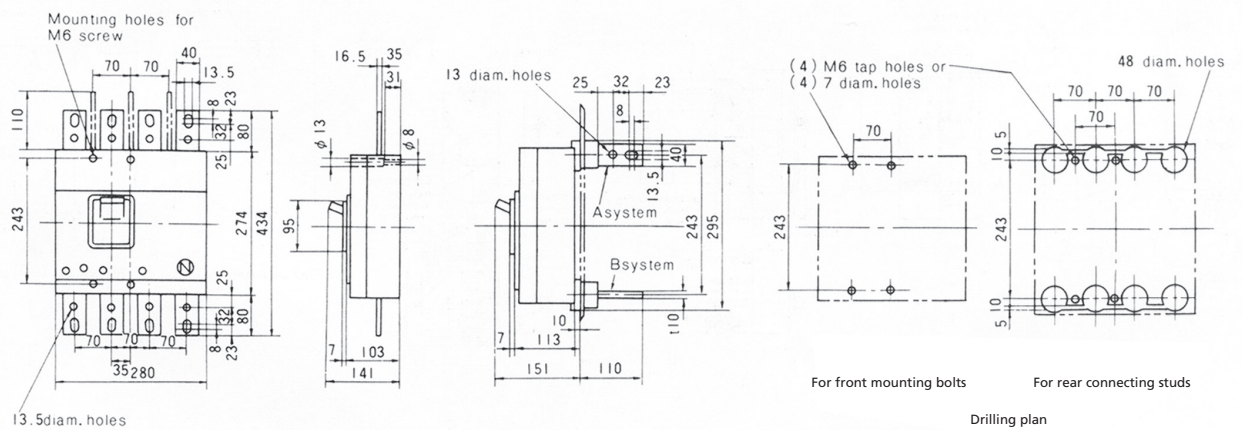
For front mounting bolts For rear connecting studs  
Drilling plan

## F-400R / L-400E 4 pole



For front mounting bolts For rear connecting studs  
Drilling plan

## F-600F / L-600E 4 pole



For front mounting bolts For rear connecting studs  
Drilling plan



# EARTH LEAKAGE BREAKERS AND EARTH LEAKAGE RELAYS

This is a combination of a Fuse-Free Breaker and a leakage current detector for preventing fire or electric shock due to deterioration of electric insulation. It will provide perfect protection of a circuit against overload, short-circuit, or earth leakage.

## ■ Principle of operation

This device is composed of a zero phase current transformer for detecting leakage current, a control circuit, and a Fuse-Free Breaker with a shunt trip.

As shown in Fig. 37, magnetic fluxes cancel each other, inducing no output voltage in the secondary coil while no leakage is present in the load circuit.

$$i_1 + i_2 + i_3 = 0$$

If leakage current ( $I_g$ ) occurs in the load circuit, magnetic flux  $\Phi_g$  is induced, producing a certain voltage across the secondary coil.

$$i_1 + i_2 + i_3 = I_g$$

The induced voltage is supplied to the shunt trip coil of the Fuse-Free Breaker, through a control circuit composed of diodes and semiconductor control elements, to break the circuit.

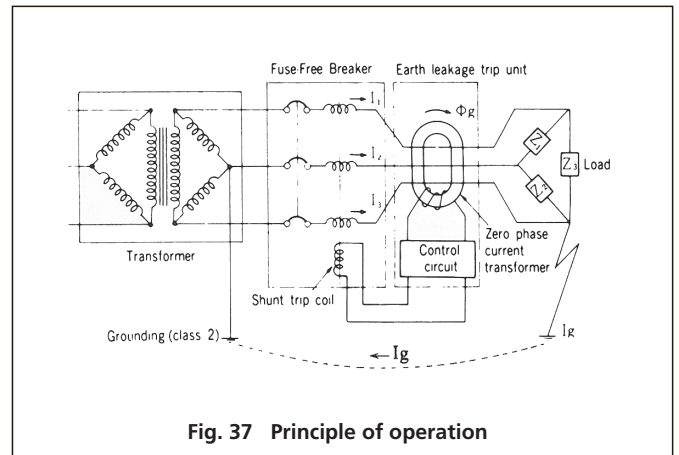


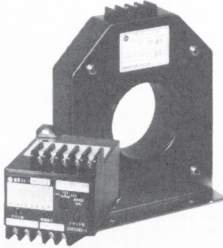








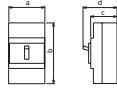
Fig. 37 Principle of operation

## CLASSIFICATION AND COMPOSITION

<b>E series</b> Standard Breaker	<b>R series</b> High Interrupting Breaker	<b>Earth Leakage Relay Series</b>
		
30A – 800A frame	100A – 1200A frame	–









# RATINGS AND SPECIFICATIONS

Table 19 **E series**

Type			EB-50E	EB-100E	EX30	EX50	EX50B	EX50C	
Appearance									
Phase-wiring Sysytem			1ø2W 3ø3W 1ø3W 1ø2W	3ø3W 1ø3W 1ø2W	3ø3W 1ø3W 1ø2W	3ø3W 1ø3W 1ø2W	3ø3W 1ø3W 1ø2W	3ø3W 1ø3W 1ø2W	
Number of poles			2 3	3	3	3	3	3	
Rated Voltage (AC V)			100 – 200	100 – 200	200 – 440	200 – 440	100 – 200	200 – 440	
Rated Current (A) (Base ambient temperature 40°C)			5 10 15 20 30 40 50	60 75 100	5 10 15 20 30	5 10 15 20 30 40 50	5 10 15 20 30 40 50	5 10 15 20 30 40 50	
Rated Impulse withstand Voltage Uimp (kV)			4	4	6	6	6	6	
High Speed Type	Rated Sensitivity Current (mA)		(15) 30 (100)	30 100	30 100-200-500	30 100-200-500	(15) 30 100 (200)	30 100-200-500	
	Operating time (sec. or less)		0.1	0.1	0.1	0.1	0.1	0.1	
Time Delay Type	Rated Sensitivity Current (mA)		—	—	—	—	—	(100-200-500)	
	Operating time (sec. or less)		—	—	—	—	—	(0.3)	
	Limiting non-actuating time (sec. or more)		—	—	—	—	—	(0.1)	
Indication of Earth Leakage			Mechanical (button)	Mechanical (button)	Mechanical (button)	Mechanical (button)	Mechanical (button)	Mechanical (button)	
Rated Breaking Capacity (kA)	JIS C 8201-2-2 Ann2 (Icu/Ics)	AC	440V	—	—	2.5/1	2.5/1	—	10/3
			415V	—	—	2.5/1	2.5/1	—	10/3
			400V	—	—	2.5/1	2.5/1	—	10/3
			240V	—	—	5/2	5/2	—	35/9
			200V	5/2	5/2	5/2	5/2	10/3	35/9
			100V	5/2	5/2	—	—	10/3	—
Dimensions (mm)		a	50	75	75	75	75	75	
		b	96	97.5	130	130	130	130	
		c	60	60	60	60	60	60	
		d	76	76	84	84	84	84	
Net Weight (kg)			0.3	0.4	0.6	0.7	0.7	0.7	
Standard Connection Type			Front Terminal	Front Terminal	Front Terminal	Front Terminal	Front Terminal	Front Terminal	
Phase Separator for Line Side			—	—	○	○	○	●(*2)	
Interior Accessories	Test Button Lead Wire	TBL	○	○	○	○	○	○	
	Alarm Switch	AL	○	○	○	○	○	○	
	Auxiliary Switch	AUX	○	○	○	○	○	○	
	Earth Leakage Alarm Sw.	EAL	—	—	—	—	—	—	
	Terminal Block	TB	—	—	○	○	○	○	
TB2		○	○	○	○	○	○		
Exterior Accessories	Rear-connecting Stud	STB	—	—	STB-2M	STB-2M	STB-2M	STB-2M	
		BSD	—	—	—	—	—	—	
	Flush Mounting Base Assembly	GKW (STB)	—	—	○	○	○	○	
		GK-GKW (BSD)	—	—	—	—	—	—	
	Plug-in Mounting Base Assembly	PK	—	—	—	—	—	—	
	Mechanical Interlock	MIW	—	—	MIW-2E	MIW-2E	MIW-2E	MIW-2E	
	Motor-operating Mechanism	MMK-S	—	—	—	—	—	—	
		MMK-C	—	—	—	—	—	—	
	Lock Cover	LC	LC-03	LC-03	LC-2G	LC-2G	LC-2G	LC-2G	
	Handle Lock	HL	—	—	HL-2G	HL-2G	HL-2G	HL-2G	
	Handle Operating Mechanism	HA	—	—	HA-108	HA-108	HA-108	HA-108	
		HM	—	—	HM-S12	HM-S12	HM-S12	HM-S12	
	Terminal Cover	Front Type	TMC	TMC-0G	TMC-0H	TMC-1	TMC-1	TMC-1	TMC-1
			Short type	—	—	TMC-1S	TMC-1S	TMC-1S	TMC-1S
			Long type	—	—	TMC-2D	TMC-2D	TMC-2D	TMC-2D
	Rear Type	BTC	—	—	BTC-1	BTC-1	BTC-1	BTC-1	
IEC Rail 35 mm			●	●	○	○	○	○	
Automatic Tripping Device			Full Magnetic	Full Magnetic	Full Magnetic	Full Magnetic	Full Magnetic	Full Magnetic	
Trip Button			—	—	—	—	—	—	

## Attention




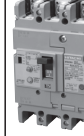
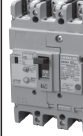




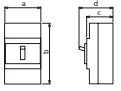
- : Standard ○ : Option
- Please use right and left poles in case of using ELBs of 3 poles 200V to 1ø2W 200V wiring system.
- Please connect neutral line to middle pole of ELBs in case of using ELBs of 3 poles 200V to 1ø3W100/200V distribution system.
- Standard flush mounting base assembly of up to 400AF are GKW and GK is standard in case of 600AF or more.
- Installation of phase separators is required in case of types marked (\*2)
- IEC rail is standard installation in case of EB-50E and EB-100E, so installation screws and metal fittings are not attached.
- The accessories marked (\*3) can be installed by customers
- Please state frequency 50 or 60Hz in case of RF-800KN, RF-1000KN, RF-1200KN.

EX100	EX100B	EX225	EXK225	EX400	EX400B	EX600B	EX800B
							
3ø3W 1ø3W 1ø2W	3ø3W 1ø3W 1ø2W	3ø3W 1ø3W 1ø2W	3ø3W 1ø3W 1ø2W	3ø3W 1ø3W 1ø2W	3ø3W 1ø3W 1ø2W	3ø3W 1ø3W 1ø2W	3ø3W 1ø3W 1ø2W
3	3	3	3	3	3	3	3
100 – 200	200 – 440	200 – 440 (100 – 200)	200 – 440 (100 – 200)	200 – 440 (100 – 200)	200 – 440	200 – 440	200 – 440
50 60 75 100	50 60 75 100	125 150 175 200 225	125 150 175 200 225	250 300 350 400	200/225/250 300/350/400 adjustable	300/350/400 500/600 adjustable	400/450/500 600/700/800 adjustable
6	6	6	6	8	8	8	8
(15) 30 100 (200)	30 100·200·500	30 100·200·500	30 100·200·500	(30) 100·200·500	(30) 100·200·500	100·200·500	100·200·500
0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
—	(100·200·500)	(100·200·500)	(100·200·500)	(100·200·500)	(100·200·500)	(100·200·500)	(100·200·500)
—	(0.3)	(0.3 0.6 1.2)	(0.3 0.6 1.2)	(0.3 0.6 1.2)	(0.3 0.6 1.2)	(0.3 0.6 1.2)	(0.3 0.6 1.2)
—	(0.1)	(0.1 0.2 0.5)	(0.1 0.2 0.5)	(0.1 0.2 0.5)	(0.1 0.2 0.5)	(0.1 0.2 0.5)	(0.1 0.2 0.5)
Mechanical (button)	Mechanical (button)	Mechanical (button)	Mechanical (button)	Mechanical (button)	Mechanical (button)	Mechanical (button)	Mechanical (button)
—	10/3	15/8	15/8	36/18	36/18	36/18	36/18
—	10/3	15/8	15/8	36/18	36/18	36/18	36/18
—	10/3	15/8	15/8	36/18	36/18	36/18	36/18
—	35/9	35/18	35/18	50/25	50/25	50/25	50/25
10/3	35/9	35/18	35/18	50/25	50/25	50/25	50/25
10/3	—	—	—	—	—	—	—
75	75	105	105	140	140	210	210
130	130	165	165	257	257	274	274
60	60	60	68	103	103	103	103
84	84	85	93	133	133	141	141
0.8	0.9	2.2	2.2	6.6	6.5	10.6	12.9
Front Terminal	Front Terminal	Front Terminal	Front Terminal	Front Bar Terminal	Front Bar Terminal	Front Bar Terminal	Front Bar Terminal
○	●(*2)	●(*2)	●(*2)	●(*2)	●(*2)	●(*2)	●(*2)
○	○	○	○	○	○	○	○
○	○	○	○(*3)	○	○(*3)	○(*3)	○(*3)
○	○	○	○(*3)	○	○(*3)	○(*3)	○(*3)
—	—	—	—	—	—	—	—
○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○
STB-3K (50A:STB-2M)	STB-3K (50A:STB-2M)	—	—	—	—	—	—
—	—	○	○	○	○	○	○
○	○	—	—	—	—	—	—
—	—	○	○	○	○	○(GK)	○(GK)
—	—	—	—	—	—	—	—
MIW-2E	MIW-2E	MIW-4F	MIW-4L	○	MIW-5F	MIW-5G	MIW-5G
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
LC-2G	LC-2G	LC-4E	LC-2F	—	—	—	—
HL-2G	HL-2G	HL-4E	HL-2F	HL-5	HL-5	HL-6	HL-6
HA-108	HA-108	HA-207	HA-209	HA-405	HA-406	HA-402	HA-402
HM-S12	HM-S12	HM-S22	HM-S23	—	—	—	—
TMC-1	TMC-1	TMC-4K	TMC-4J	TMC-5B	TMC-5B	TMC-5D	TMC-5D
TMC-1S	TMC-1S	TMC-4JS	TMC-4JS	—	—	—	—
TMC-2D	TMC-2D	—	—	—	—	—	—
BTC-1	BTC-1	BTC-4G	BTC-4J	BTC-5B	BTC-5B	—	—
○	○	—	—	—	—	—	—
Full Magnetic	Full Magnetic	Thermal-Magnetic	Thermal-Magnetic	Thermal-Magnetic	Electric Relay	Electric Relay	Electric Relay
—	—	—	●	—	●	●	●

9. Applicable voltage range

Rated voltage	Applicable circuit voltage	Permissible range of voltage
100 – 200V	100 · 110 · 200 · 220V	80 – 242V
440V	400 · 415 · 440V	320 – 484V
200 – 440V	200 · 220 · 240 380 · 400 · 415 · 440V	160 – 484V





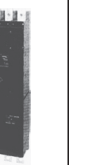


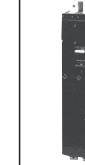


**Table 20 R series**

Type			RXK125-S	RXK125-H	RX100	RXK250-S	RXK250-H	RG-225BN	RG-225BH	RX400	RX400B	
Appearance												
Phase-wiring System			3ø3W 1ø3W 1ø2W	3ø3W 1ø3W 1ø2W	3ø4W	3ø3W 1ø3W 1ø2W	3ø3W 1ø3W 1ø2W	3ø4W		3ø3W 1ø3W 1ø2W	3ø3W 1ø3W 1ø2W	
Number of poles			3	3	4	3	3	4		3	3	
Rated Voltage (AC V)			200 – 440	200 – 440	200 – 440	200 – 440	200 – 440	200 – 440		200 – 440 (100 – 200)	200 – 440	
Rated Current (A) (Base ambient temperature 40°C)			15 20 30 40 50 63 75 100 125	16 20 30 40 50 63 75 100 125	5 10 15 20 30 40 50 60 75 100	125 150 175 200 225 250	125 150 175 200 225 250	125 150 175 200 225		250 300 350 400	200/225/250 300/350/400 adjustable	
Rated Impulse withstand Voltage Uimp (kV)			8	8	8	8	8	8		8	8	
High Speed Type	Rated Sensitivity Current (mA)		30 100-200-500	30 100-200-500	30 100-200-500	30 100-200-500	30 100-200-500	100-200 500	30	(30) 100-200-500	(30) 100-200-500	
	Operating time (sec. or less)		0.1	0.1	0.1	0.1	0.1	0.1		0.1	0.1	
Time Delay Type	Rated Sensitivity Current (mA)		(100-200-500)	(100-200-500)	(100-200-500)	(100-200-500)	(100-200-500)	(100-200-500)	—	(100-200-500)	(100-200-500)	
	Operating time (sec. or less)		(0.3-0.6-1.2)	(0.3-0.6-1.2)	(0.3-0.6-1.2)	(0.3-0.6-1.2)	(0.3-0.6-1.2)	(0.3-0.6-1.2)	—	(0.3-0.6-1.2)	(0.3-0.6-1.2)	
	Limiting non-actuating time (sec. or more)		(0.1-0.2-0.5)	(0.1-0.2-0.5)	(0.1-0.2-0.5)	(0.1-0.2-0.5)	(0.1-0.2-0.5)	(0.1-0.2-0.5)	—	(0.1-0.2-0.5)	(0.1-0.2-0.5)	
Indication of Earth Leakage			Mechanical (button)	Mechanical (button)	Mechanical (button)	Mechanical (button)	Mechanical (button)	Mechanical (button)		Mechanical (button)	Mechanical (button)	
Rated Breaking Capacity (kA)	JIS C 8201-2-2 Ann2 (Icu/Ics)	AC	440V	30/15	50/25	50/25	30/15	50/25	42/21		50/50	50/50
			415V	30/15	50/25	50/25	30/15	50/25	42/21		50/50	50/50
			400V	30/15	50/25	50/25	30/15	50/25	42/21		50/50	50/50
			240V	50/25	100/50	85/43	50/25	100/50	85/43		100/100	100/100
			200V	50/25	100/50	85/43	50/25	100/50	85/43		100/100	100/100
100V	—	—	—	—	—	—		—	—			
Dimensions (mm)		a	90	90	120	105	105	185		140	140	
		b	150	150	150	165	165	345		275	275	
		c	68	68	103	68	68	103		103	103	
		d	94	94	123	95	95	133		133	133	
Net Weight (kg)			2.1	2.1	2.8	2.0	2.0	9.3		6.6	6.6	
Standard Connection Type			Front Terminal	Front Terminal	Front Terminal	Front Terminal	Front Terminal	Front Terminal		Front Bar Terminal	Front Bar Terminal	
Phase Separator for Line Side			●(*2)	●(*2)	○	●(*2)	●(*2)	●(*2)		●(*2)	●(*2)	
Interior Accessories	Test Button Lead Wire		TBL	○	○	○	○	○		○	○	
	Alarm Switch		AL	○(*3)	○(*3)	○	○(*3)	○		○	○(*3)	
	Auxiliary Switch		AUX	○(*3)	○(*3)	○	○(*3)	○		○	○(*3)	
	Earth Leakage Alarm Sw.		EAL	—	—	—	—	—		—	—	
	Terminal Block		TB	○	○	○	○	○		○	○	
		TB2	○	○	○	○	○		○	○		
Exterior Accessories	Rear-connecting Stud		STB	STB-2S (Up to 50A)	STB-2S (Up to 50A)	○	—	—		—	—	
			BSD	BSD-3S (60A or more)	BSD-3S (60A or more)	—	○	○		○	○	
	Flush Mounting Base Assembly		GKW (STB)	○ (Up to 50A)	○ (Up to 50A)	○	—	—		—	—	
			GK-GKW (BSD)	○ (60A or more)	○ (60A or more)	—	○	○ (GK)		○	○	
	Plug-in Mounting Base Assembly		PK	○	○	—	—	—		—	—	
	Mechanical Interlock		MIW	MIW-3H	MIW-3H	MIW-3F	MIW-4M	MIW-4M		MIW-5DE	○	MIW-5F
	Motor-operating Mechanism		MMK-S	—	—	—	—	—		—	—	
			MMK-C	—	—	—	—	—		—	—	
	Lock Cover		LC	○	○	LC-2C	LC-4J	LC-4J		—	—	
	Handle Lock		HL	○	○	○	HL-4J	HL-4J		HL-5	HL-5	HL-5
	Handle Operating Mechanism		HA	—	—	HA-106	HA-210	HA-210		HA-405	HA-405	HA-406
			HM	HM-S13	HM-S13	HM-S11	HM-S25	HM-S25		—	—	
			TMC	TMC-2C	TMC-2C	TMC-3C	TMC-4J	TMC-4J		TMC-5B	TMC-5B	TMC-5B
	Terminal Cover	Front Type	Short type	—	—	—	TMC-4JS	TMC-4JS		—	—	—
Long type			—	—	—	—	—		—	—	—	
Rear Type		BTC	BTC-2C	BTC-2C	BTC-3C	BTC-4J	BTC-4J		BTC-5B	BTC-5B	BTC-5B	
IEC Rail 35 mm			—	—	—	—	—		—	—	—	
Automatic Tripping Device			Thermal-Magnetic	Thermal-Magnetic	Full Magnetic	Thermal-Magnetic	Thermal-Magnetic		Thermal-Magnetic	Thermal-Magnetic	Electronic Relay	
Trip Button			●	●	—	●	●		—	—	●	

**Attention**

- : Standard ○ : Option
- Please use right and left poles in case of using ELBs of 3 poles 200V to 1ø2W 200V wiring system.
- Please connect neutral line to middle pole of ELBs in case of using ELBs of 3 poles 200V to 1ø3W100/200V distribution system.
- Standard flush mounting base assembly of up to 400AF are GKW and GK is standard in case of 600AF or more.
- Installation of phase separators is required in case of types marked (\*2)
- IEC rail is standard installation in case of EB-50E and EB-100E, so installation screws and metal fittings are not attached.
- The accessories marked (\*3) can be installed by customers
- Please state frequency 50 or 60Hz in case of RF-800KN, RF-1000KN, RF-1200KN.



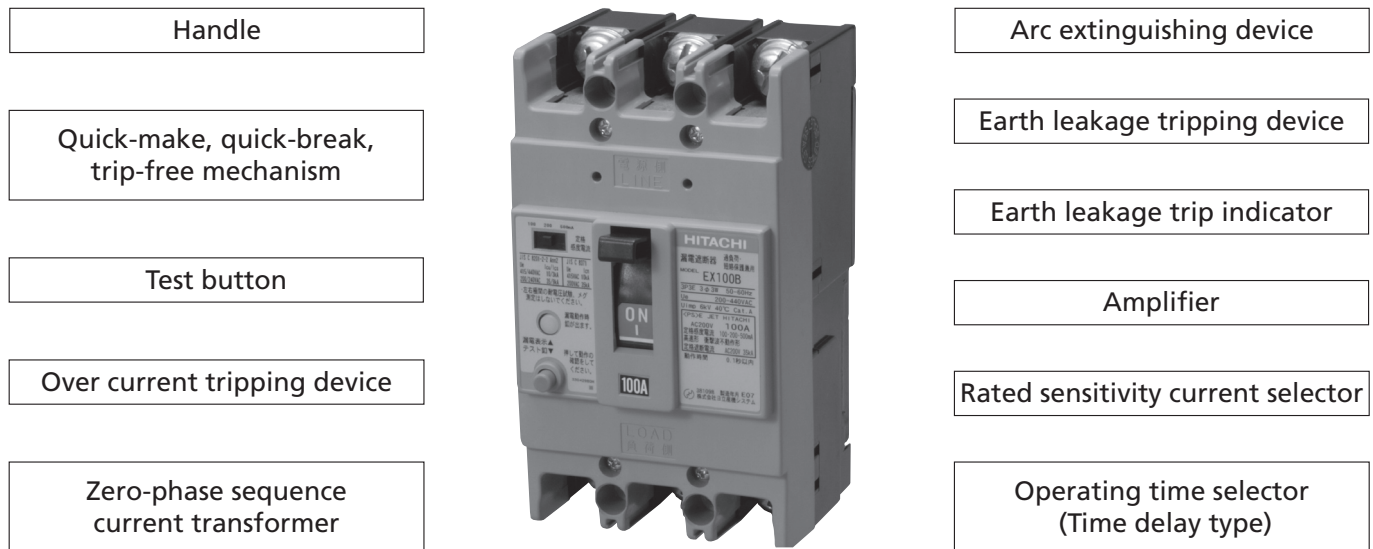
RG-400BN	RG-400BH	RX600B	RF-600FN	RX800B	RF-800KN	RF-1000KN	RF-1000CBN	RF-1200KN	RF-1200CBN
									
3ø4W	3ø3W 1ø3W 1ø2W	3ø4W	3ø3W 1ø3W 1ø2W	3ø4W	3ø3W 1ø3W 1ø2W	3ø4W	3ø3W 1ø3W 1ø2W	3ø3W 1ø3W 1ø2W	3ø4W
4	3	4	3	4	3	4	3	3	4
200 – 440	200 – 440	440 (200)	200 – 440	440 (200)	440 (200)	440 (200)	440 (200)	440 (200)	440 (200)
250 300 350 400	300/350/400 500/600 adjustable	500 600	400/450/500 600/700/800 adjustable	700 800	1000	500/600/700 800/900/1000 adjustable	1200	600/700/800 1000/1200 adjustable	8
8	8	8	8	8	8	8	8	8	8
100-200-500	100-200-500	50-100-200 500-1000	100-200-500	50-100-200 500-1000	50-100-200 500-1000	50-100-200 500-1000	50-100-200 500-1000	50-100-200 500-1000	50-100-200 500-1000
0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
(100-200-500)	(100-200-500)	(100-200-500)	(100-200-500)	(100-200-500)	(100-200-500)	(100-200-500)	(100-200-500)	(100-200-500)	(100-200-500)
(0.3 0.6 1.2)	(0.3 0.6 1.2)	(0.3 1.2)	(0.3 0.6 1.2)	(0.3 1.2)	(0.3 1.2)	(0.3 1.2)	(0.5 1.2)	(0.3 1.2)	(0.5 1.2)
(0.1 0.2 0.5)	(0.1 0.2 0.5)	(0.1 0.5)	(0.1 0.2 0.5)	(0.1 0.5)	(0.1 0.5)	(0.1 0.5)	(0.2 0.5)	(0.1 0.5)	(0.2 0.5)
Mechanical (button)	Mechanical (button)	Mechanical (button)	Mechanical (button)	Mechanical (button)	Mechanical (button)	Mechanical (button)	Mechanical (button)	Mechanical (button)	Mechanical (button)
42/21	50/50	42/21	50/50	85/22	85/22	85/22	85/22	85/22	85/22
42/21	50/50	42/21	50/50	85/22	85/22	85/22	85/22	85/22	85/22
42/21	50/50	42/21	50/50	125/32	125/32	125/32	125/32	125/32	125/32
85/43	100/100	85/43	100/100	125/32	125/32	125/32	125/32	125/32	125/32
85/43	100/100	85/43	100/100	—	—	—	—	—	—
185	210	280	210	280	210 280	210	210 280	210	210
345	274	580	274	800	800	800	800	800	800
103	103	141	103	185	185	185	185	185	185
133	141	179	141	225	225	225	225	225	225
10.2	10.6	23.0	12.9	50.0	41.0 60.0	41.0	41.0 60.0	41.0	41.0
Front Bar Terminal	Front Bar Terminal	Front Bar Terminal	Front Bar Terminal	Front Bar Terminal	Front Bar Terminal	Front Bar Terminal	Front Bar Terminal	Front Bar Terminal	Front Bar Terminal
● (*2)	● (*2)	● (*2)	● (*2)	● (*2)	● (*2)	● (*2)	● (*2)	● (*2)	● (*2)
○	○	○	○	○	○	○	○	○	○
○ (*3)	○ (*3)	○	○ (*3)	○	○	○ (*3)	○	○ (*3)	○ (*3)
○	○ (*3)	○	○ (*3)	○	○	○ (*3)	○	○ (*3)	○ (*3)
—	—	●	—	●	●	●	●	●	●
○	○	○	○	○	○	○	○	○	○
—	○	○	○	○	○	○	○	○	○
—	—	—	—	—	—	—	—	—	—
○	○	○	○	○	○	○	○	○	○
—	—	—	—	—	—	—	—	—	—
○ (GK)	○ (GK)	○ (GK)	○ (GK)	○ (GK)	○ (GK)	○ (GK)	○ (GK)	○ (GK)	○ (GK)
—	—	—	—	—	—	—	—	—	—
MIW-5DE	MIW-5G	○	MIW-5G	○	○	○	○	○	○
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
HL-5	HL-6	HL-6	HL-6	○	○	○	○	○	○
HA-405	HA-402	HA-402	HA-402	HA-801	HA-801	HA-801	HA-801	HA-801	HA-801
—	—	—	—	—	—	—	—	—	—
TMC-5B	TMC-5D	TMC-5D	TMC-5D	TMC-6	TMC-6	TMC-6B	TMC-6	TMC-6	TMC-6B
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
BTC-5B	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
Thermal-Magnetic	Electronic Relay	Thermal-Magnetic	Electronic Relay	Thermal-Magnetic	Thermal-Magnetic	Electronic Relay	Thermal-Magnetic	Electronic Relay	Electronic Relay
—	—	●	●	●	●	●	●	●	●

9. Applicable voltage range

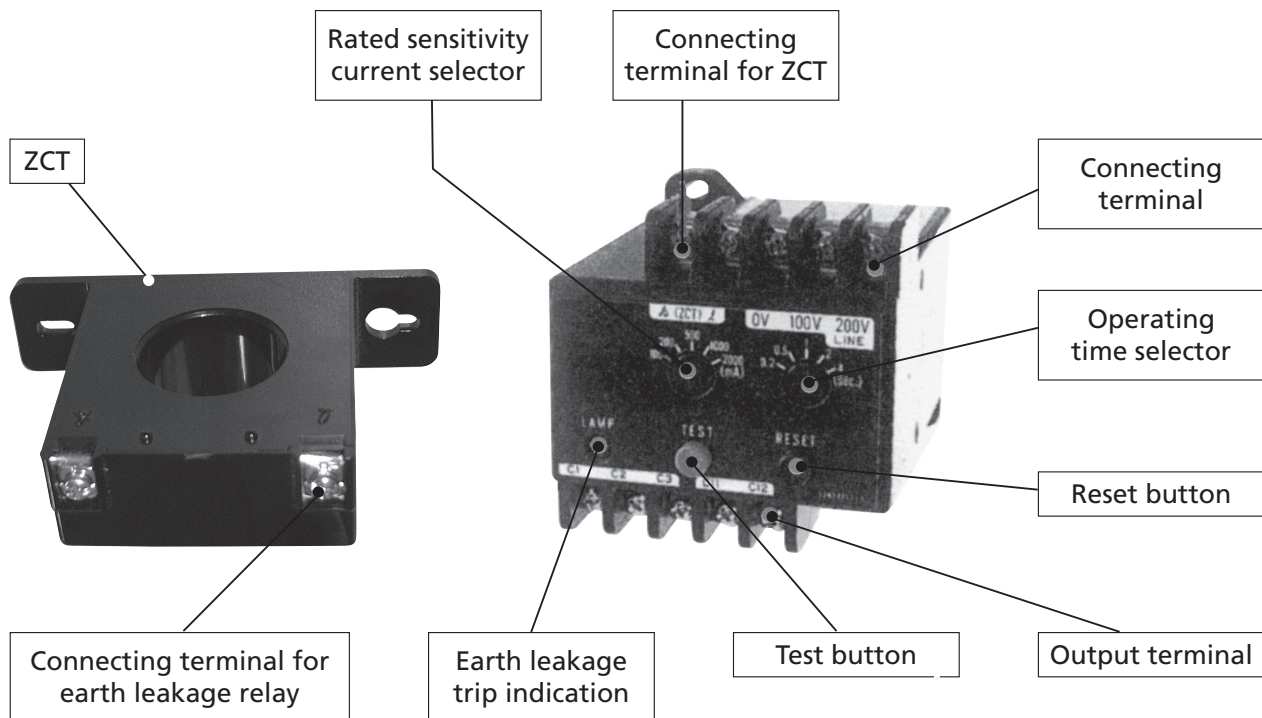
Rated voltage	Applicable circuit voltage	Permissible range of voltage
100 – 200V	100 · 110 · 200 · 220V	80 – 242V
200V	200 · 220V	160 – 220V
440V	400 · 415 · 440V	320 – 484V
200 – 440V	200 · 220 · 240 380 · 400 · 415 · 440V	160 – 484V

# CONSTRUCTION

The Earth Leakage Circuit Breakers (ELB) consists of circuit breaker unit composed by a switching mechanism, arc extinguishers, an over-current tripping device, etc., zero-phase sequence current transformer, amplifier and others for detecting earth leakage current. These components are accommodated in a heat-proof and arc-proof molded case and cover. A typical example of its construction is shown in the diagram below.



Typical construction of Earth leakage breaker for power supply



Typical construction of Earth leakage relays

**Table 21 Applicability of interior accessories**

Frame		EB-50E	EB-50E EB-100E	EX30 EX50 EX50B EX50C EX100 EX100B	EX225 ★EXK225 ★RXK125-S ★RXK125-H ★RXK250-S ★RXK250-H	RG-225B(N) ★EX400B ★RX400B	★EX600B ★RX600B ★EX800B ★RX800B	RF-800KN RF-1000KN RF-1200KN ★RF1000CBN ★RF1200CBN	RF-600FN
Poles									
Accessories		2	3	3	3	3, 4	3	3, 4	3
Alarm Switch	AL								
Auxiliary Switch	AUX								
Alarm + Auxiliary	AL + AUX	—							
Earth Leakage Alarm Switch	EAL	—	—	—	—	—	—		
Alarm + Auxiliary + EAL Switch	AL + AUX + EAL	—	—	—	—	—	—		
Test Button Lead Wire	TBL								

Remarks: (1) Handle of breaker  
(2) 2C: 1C is also available



**Table 22 Earth Leakage Relays**

Function	Standard type				
	High Speed Type	Time Delay Type	Automatic Reset Type	Latched Type	Relay: Automatic Reset Lamp: Latched
Type-Form	R-NZB	R-NZBT	R-NZBK	R-NZBL	R-NZBR
Appearance					
Rated Voltage (AC V)	100, 200, 240, 380, 415				
Frequency (Hz)	50, 60				
Rated Sensitivity Current (mA)	50/100/200/500/1000 (1) (30)	100/200/500/1000/2000(1)		50/100/200/500/1000 (1) (30)	100/200/500/1000 /2000(1)
Operating Time (sec.)	0.1 or less	0.3 (0.2/0.5/2/4 (1))		0.1 or less 0.3	0.3 (0.2/0.5/2/4 (1))
Alarm Contact	1c + 1a				
Dimensions (mm)		a	80		
		b	80		
		c	115		
Weight (kg)	0.45				

Notes: (1) Interchangeable by manual operation.  
(2) Rating with ( ) are manufactured by customer's order.

Rated Voltage	Applicable Circuit Voltage	Remarks
100V	100 · 110V	Interchangeable by tap changing
200V	200 · 220V	
240V	230 · 240V	
380V	380V	
415V	400 · 415 · 440 · 460V (60Hz)	







**Table 23 Contact Specifications**

Load		Resistive Load $\cos\phi = 1$	Inductive Load $\cos\phi = 0.3, L/R = 7ms$
Rated Thermal Current (A)		3	
Rated Current (A)	AC 120V	3	2
	AC 240V	3	1.5
	AC 415V	1	0.5
	DC 24V	3	1.5
	DC 100V	0.2	0.2

**Table 24 Zero-phase-sequence Current Transformer**

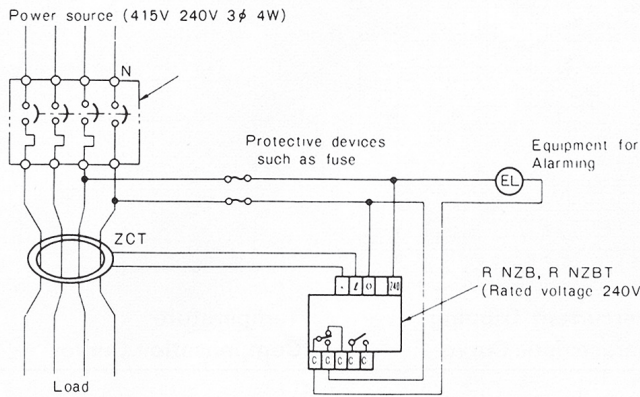
Type	Aperture Diameter	Maximum Available Wire Size					
		Vinyl-insulated 600V Wire (IV)			Polyethylene-Insulated 600V Wire (CV)		
		2-wire	3-wire	4-wire	2-wire	3-wire	4-wire
ZR-15	ø15	14mm <sup>2</sup> (88A)	8mm <sup>2</sup> (61A)	8mm <sup>2</sup> (61A)	2mm <sup>2</sup> (33A)	2mm <sup>2</sup> (33A)	—
ZR-30B	ø30	60mm <sup>2</sup> (217A)	50mm <sup>2</sup> (190A)	38mm <sup>2</sup> (162A)	38mm <sup>2</sup> (190A)	22mm <sup>2</sup> (135A)	14mm <sup>2</sup> (105A)
ZR-58B	ø58	250mm <sup>2</sup> (556A)	200mm <sup>2</sup> (469A)	150mm <sup>2</sup> (395A)	200mm <sup>2</sup> (560A)	150mm <sup>2</sup> (480A)	100mm <sup>2</sup> (365A)
ZR-65	ø65	325mm <sup>2</sup> (650A)	250mm <sup>2</sup> (556A)	200mm <sup>2</sup> (469A)	250mm <sup>2</sup> (655A)	200mm <sup>2</sup> (560A)	150mm <sup>2</sup> (480A)
ZR-80	ø80	500mm <sup>2</sup> (842A)	500mm <sup>2</sup> (842A)	325mm <sup>2</sup> (650A)	400mm <sup>2</sup> (870A)	325mm <sup>2</sup> (760A)	250mm <sup>2</sup> (655A)
ZR-100	ø100	500mm <sup>2</sup> x 4 (1,684A)	400mm <sup>2</sup> x 6 (1,490A)	500mm <sup>2</sup> (842A)	600mm <sup>2</sup> (1,140A)	600mm <sup>2</sup> (1,140A)	400mm <sup>2</sup> (870A)
ZR-120	ø120	—	350mm <sup>2</sup> x 9 (1,950A)	400mm <sup>2</sup> x 8 (1,490A)	1000mm <sup>2</sup> (1,600A)	800mm <sup>2</sup> (1,370A)	600mm <sup>2</sup> (1,140A)

**Table 25 ZCT with Primary Conductors**

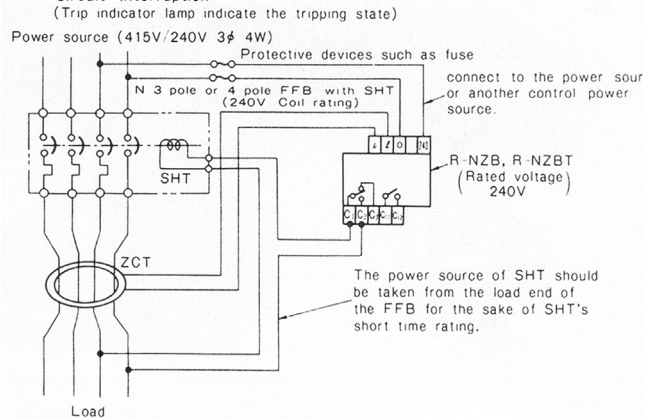
Type	Z-400B		Z-600B		Z-800B		Z-1000B		Z-1200B		Z-2000B		
Appearance													
Number of Poles	3	4	3	4	3	4	3	4	3	4	3	4	
Continuous Thermal Current (A)	400		600		800		1000		1200		2000		
Rated Voltage (AC V)	600												
Frequency (Hz)	50, 60												
Rated withstand Current (kA)	100 (peak value)										150 (peak value)		
Rated Sensitivity Current	Refer to Earth Leakage Relays												
Operating Time (sec.)	Ditto												
Dimensions (mm)	A	220	315	220	315	240	320	240	320	240	320	310	380
	B	348	348	348	348	380	380	380	380	380	380	300	300
	B <sub>1</sub>	400	400	460	460	480	480	480	480	480	480	600	600
	C	187	214	187	214	214	239	214	239	214	239	242	284
Weight (kg)	11	15	11.2	16	12.3	17	12.3	17	13	18	30	42	

# APPLICATION OF EARTH LEAKAGE RELAYS

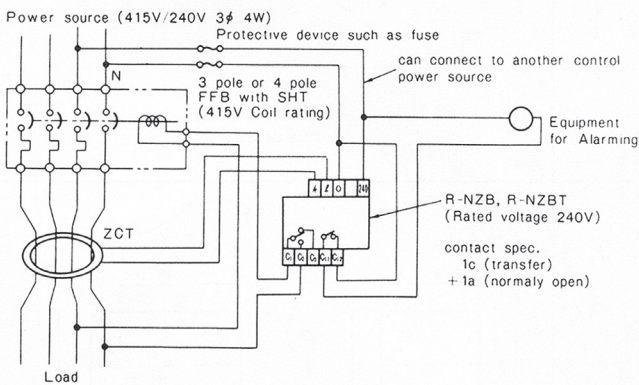
## Alarming



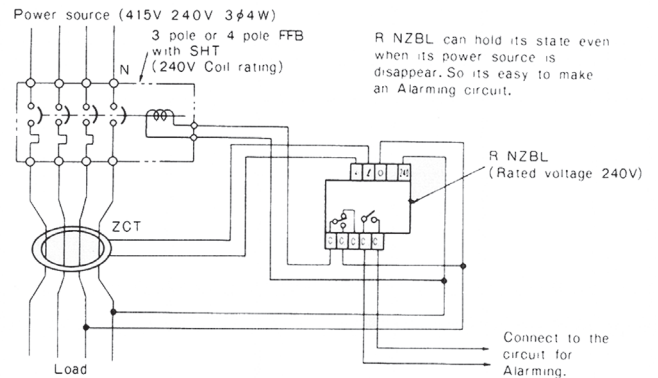
## Circuit Interruption



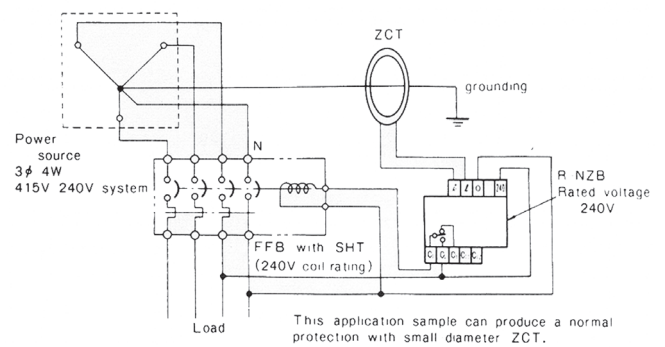
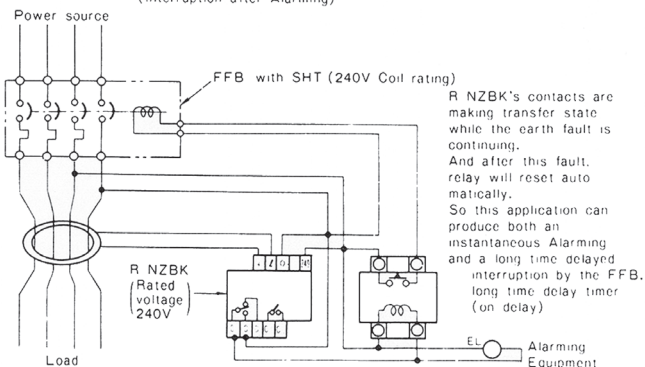
## Circuit Interruption + Alarming



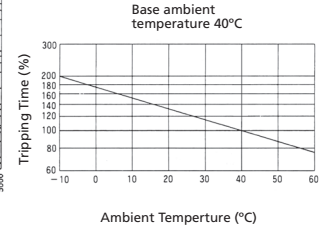
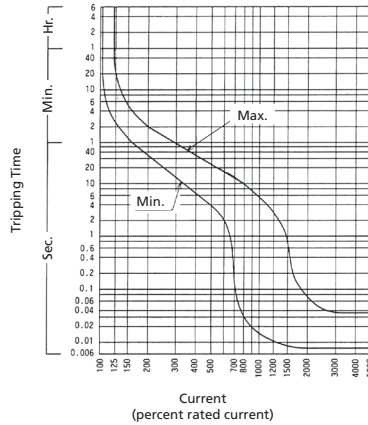
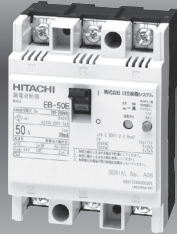
## Circuit Interruption - Alarming



## Long time monitor (Interruption after Alarming)



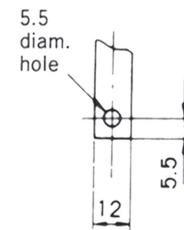
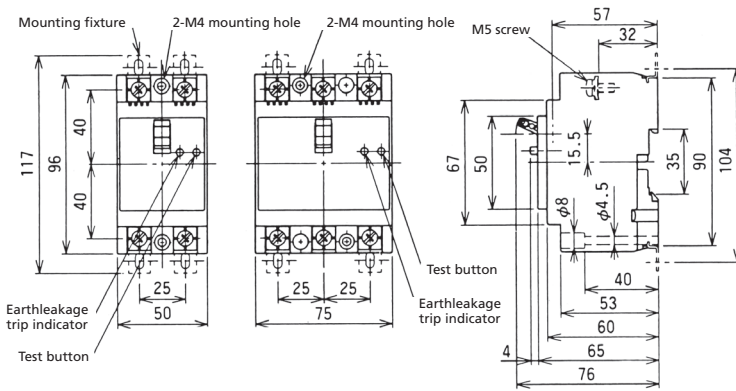
## EB-50E



**Overcurrent Tripping Characteristic Curve**

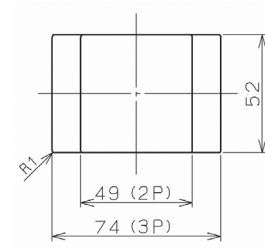
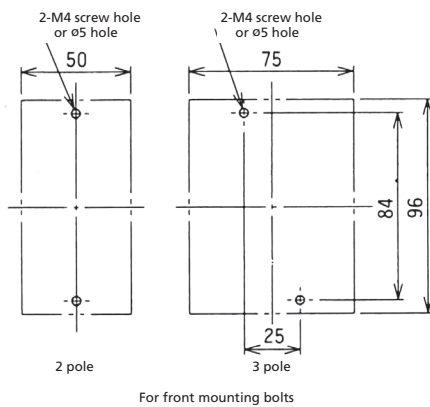
**Temperature Compensation Curve**

### ■ Dimensions



Direct-connected bus drilling

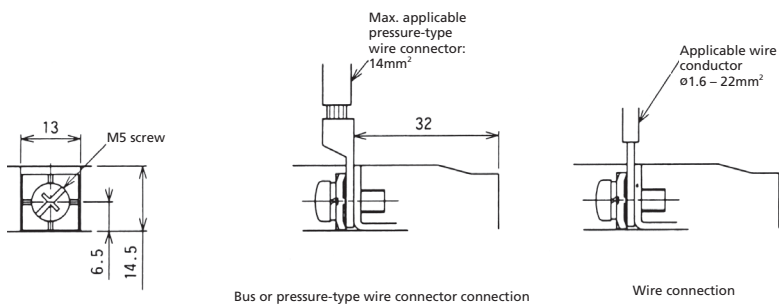
### ■ Drilling Plan



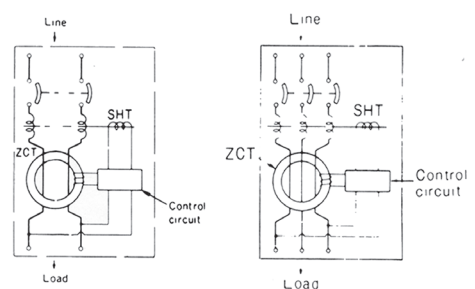
1mm clearance on each side of handle

Frontplate cutout

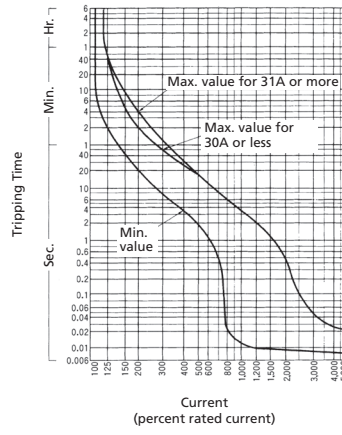
### ■ Terminal Arrangement



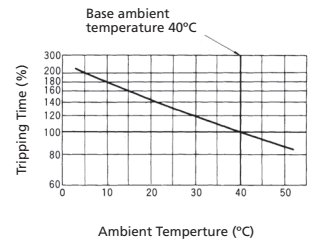
### ■ Internal Diagram Connection



# EX30/EX50/EX50B

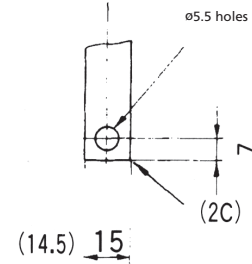
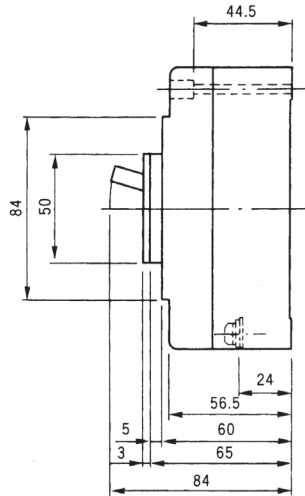
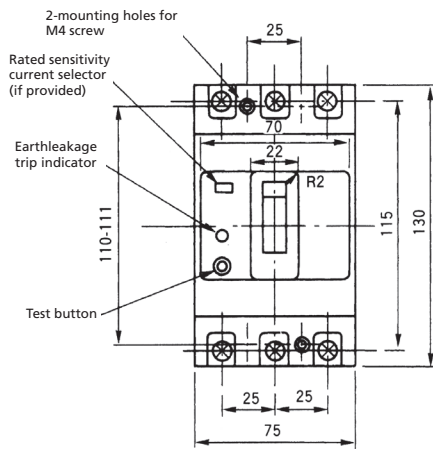


**Overcurrent Tripping Characteristic Curve**



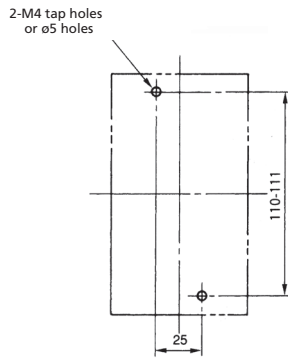
**Temperature Compensation Curve**

## ■ Dimensions

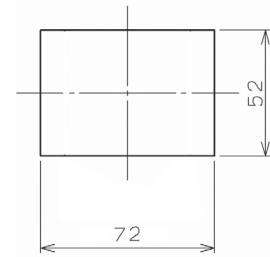


Direct-connected bus drilling

## ■ Drilling Plan



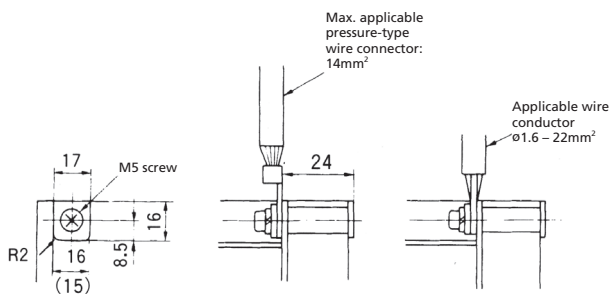
For front mounting bolts



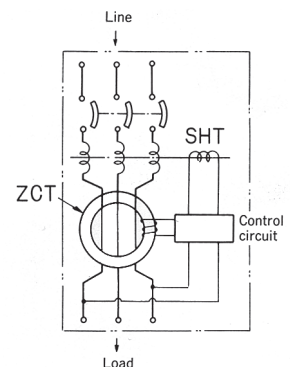
1mm clearance on each side of handle

Frontplate cutout

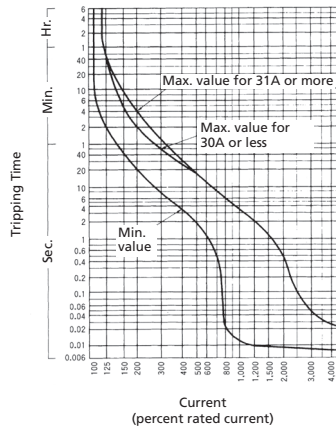
## ■ Terminal Arrangement



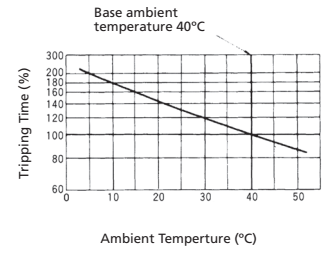
## ■ Internal Diagram Connection



# EX50C

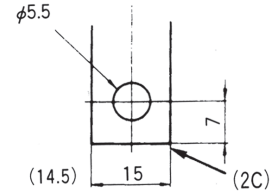
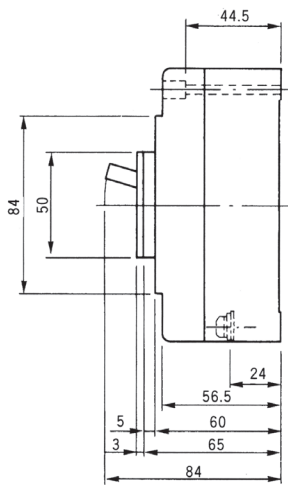
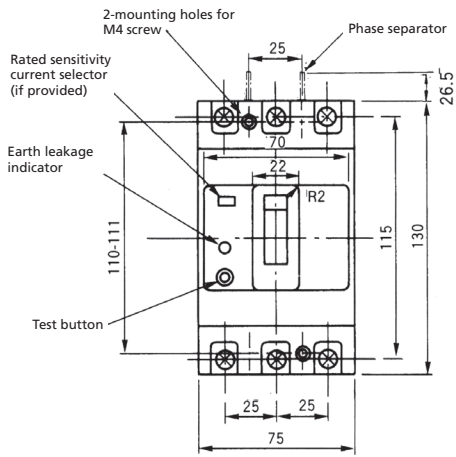


**Overcurrent Tripping Characteristic Curve**



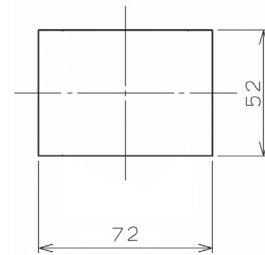
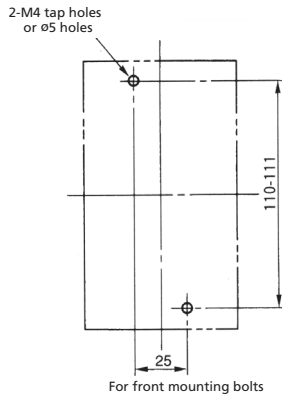
**Temperature Compensation Curve**

## ■ Dimensions



Direct-connected bus drilling

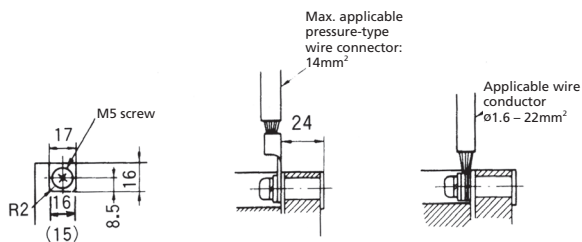
## ■ Drilling Plan



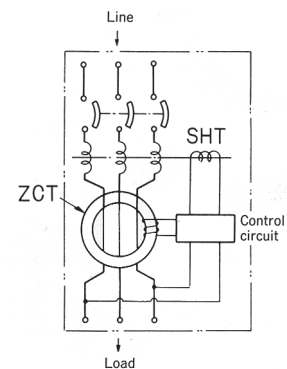
1mm clearance on each side of handle

Frontplate cutout

## ■ Terminal Arrangement

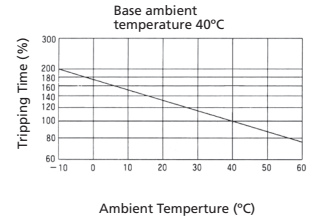
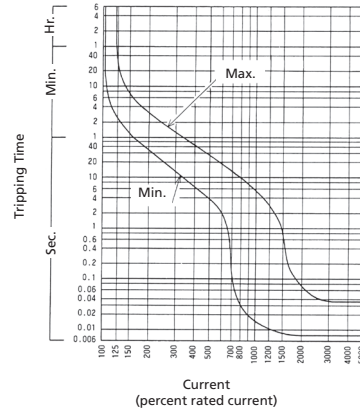


## ■ Internal Diagram Connection





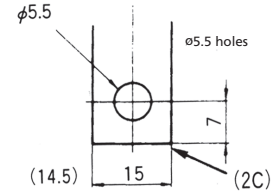
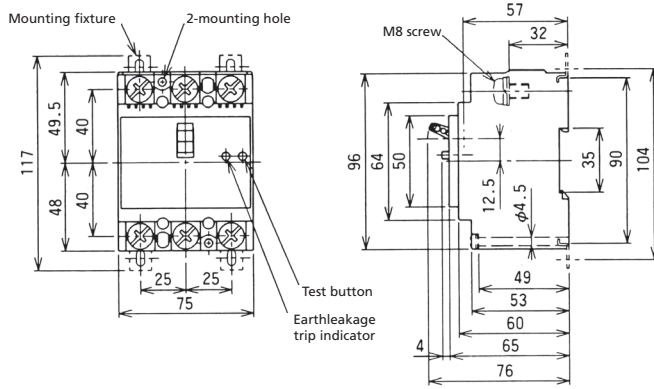
# EB-100E



**Overcurrent Tripping Characteristic Curve**

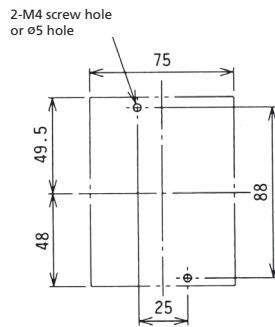
**Temperature Compensation Curve**

**■ Dimensions**

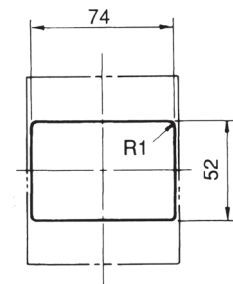


Direct-connected bus drilling

**■ Drilling Plan**

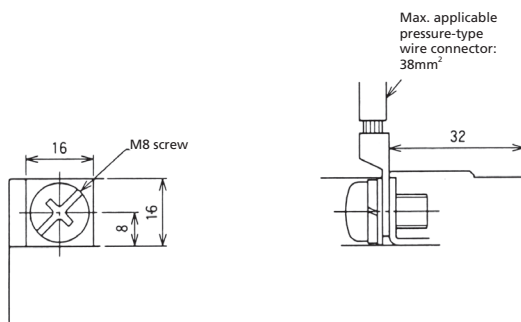


For front mounting bolts

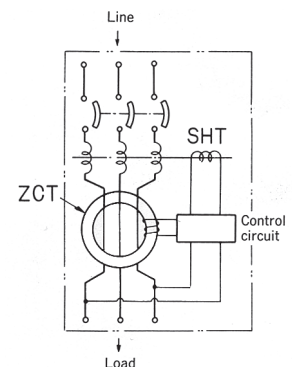


Frontplate cutout

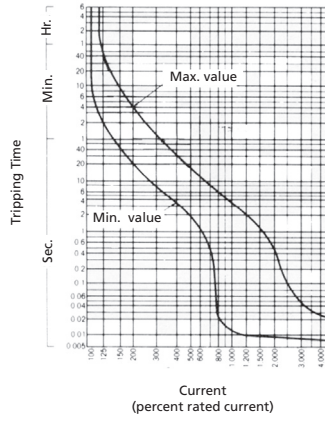
**■ Terminal Arrangement**



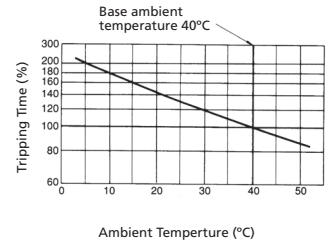
**■ Internal Diagram Connection**



# EX100

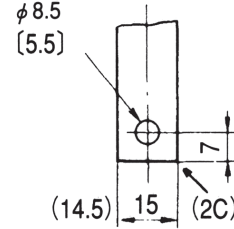
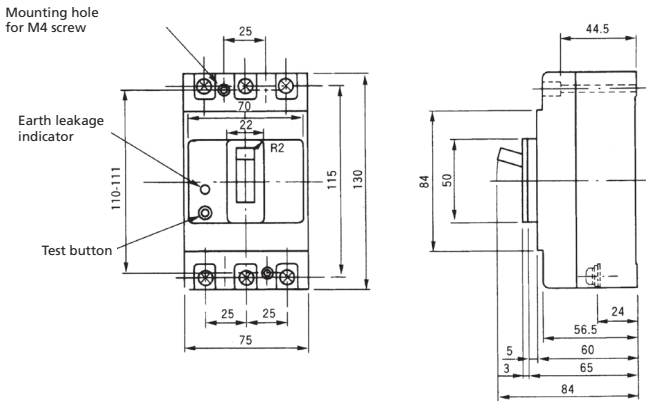


**Overcurrent Tripping Characteristic Curve**



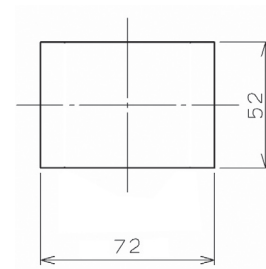
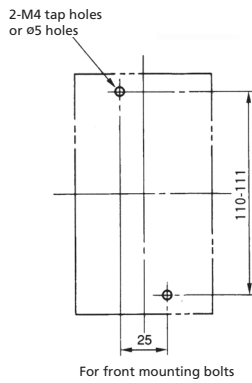
**Temperature Compensation Curve**

## ■ Dimensions



Direct-connected bus drilling

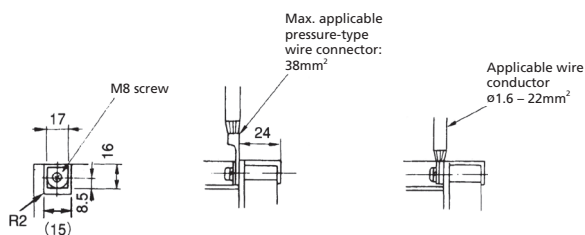
## ■ Drilling Plan



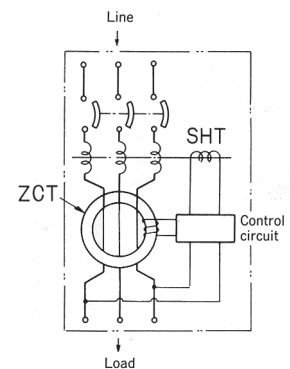
1mm clearance on each side of handle

Frontplate cutout

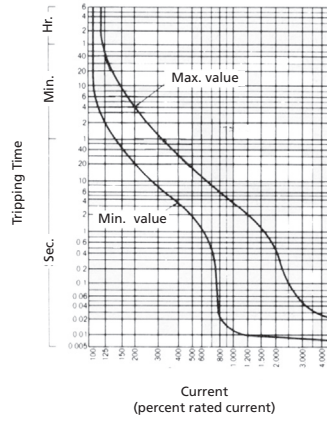
## ■ Terminal Arrangement



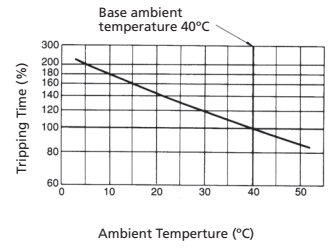
## ■ Internal Diagram Connection



# EX100B

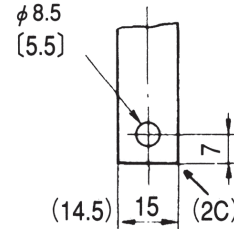
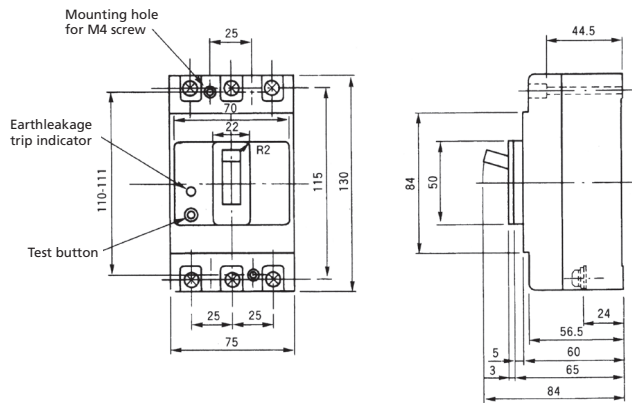


**Overcurrent Tripping Characteristic Curve**



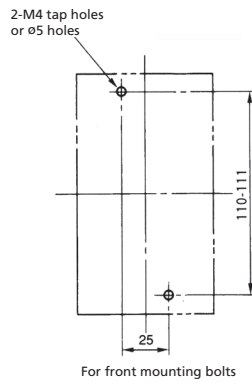
**Temperature Compensation Curve**

## ■ Dimensions

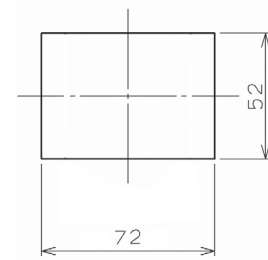


Direct-connected bus drilling

## ■ Drilling Plan



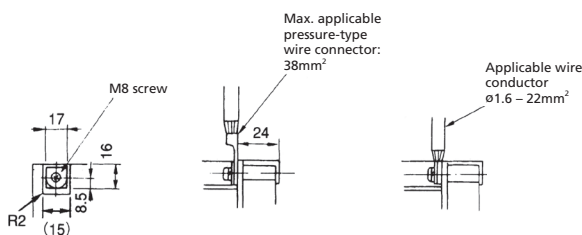
For front mounting bolts



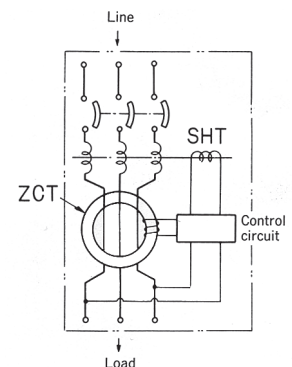
1mm clearance on each side of handle

Frontplate cutout

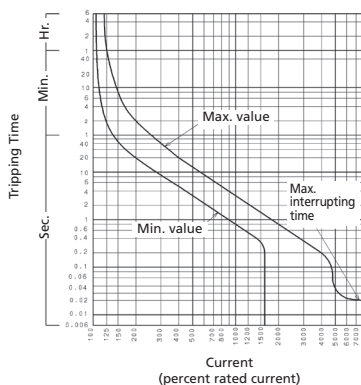
## ■ Terminal Arrangement



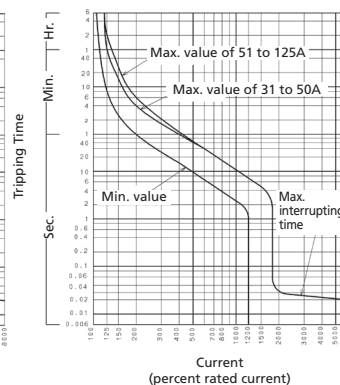
## ■ Internal Diagram Connection



# RXK125-S/RXK125-H

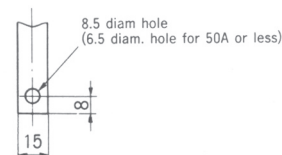
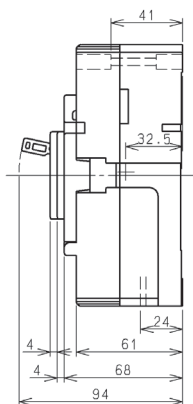
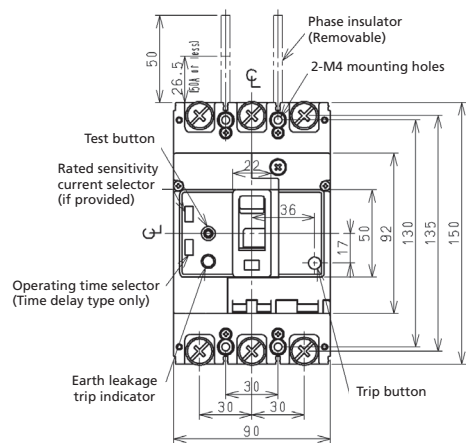


**Overcurrent Tripping Characteristic Curve (15-30A)**



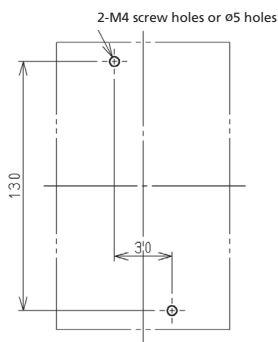
**Overcurrent Tripping Characteristic Curve (31-125A)**

## ■ Dimensions

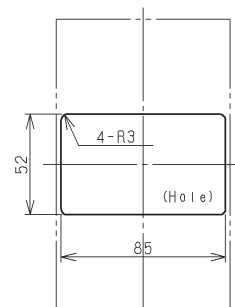


Direct-connected bus drilling

## ■ Drilling Plan

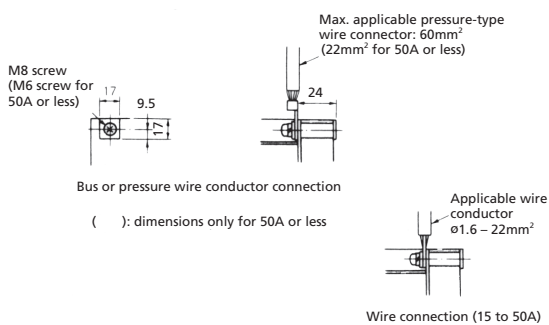


For front mounting bolts

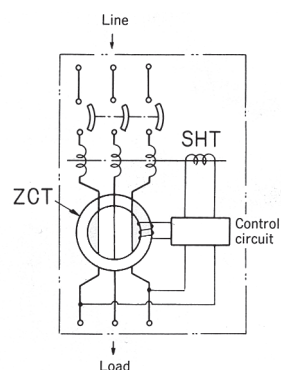


Frontplate cutout

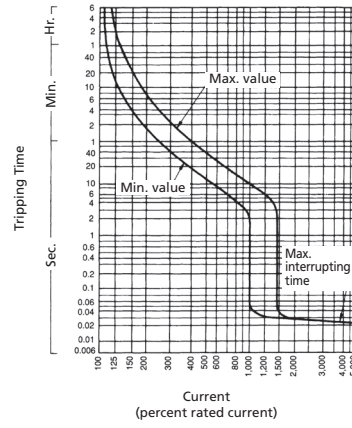
## ■ Terminal Arrangement



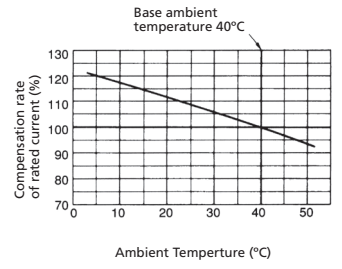
## ■ Internal Diagram Connection



# EX225

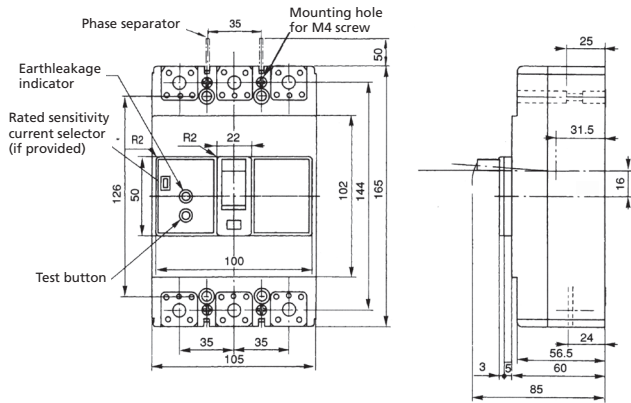


**Overcurrent Tripping Characteristic Curve**



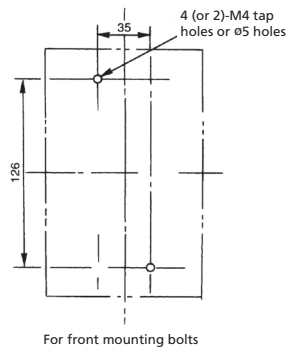
**Temperature Compensation Curve**

## ■ Dimensions

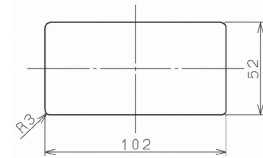


Direct-connected bus drilling

## ■ Drilling Plan



For front mounting bolts

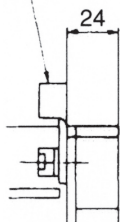


1mm clearance on each side of handle

Frontplate cutout

## ■ Terminal Arrangement

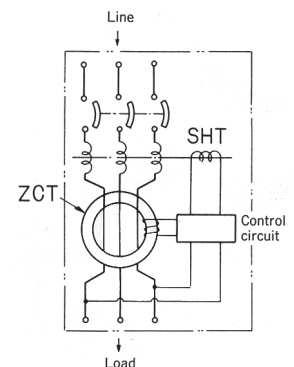
Maximum applicable pressure-type wire connector = 60mm<sup>2</sup>  
Special pressure type wire connector is attached for 175 – 225A as shown on the right table



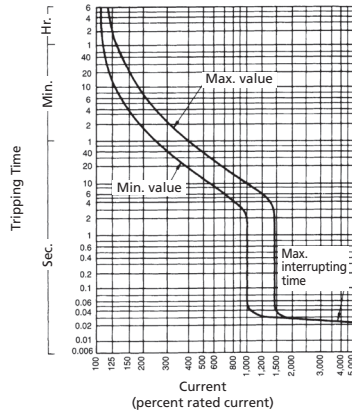
Pressure-type wire connector directly connected

Rated current (A)	Applicable wire size of pressure-type wire connector (mm <sup>2</sup> )
175 – 225	Pressure-type wire connector 80, 100, 125 (mm)

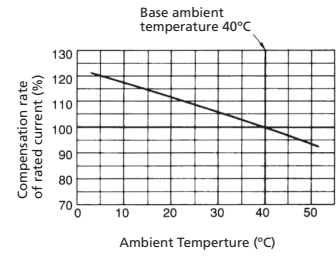
## ■ Internal Diagram Connection



# EXK225

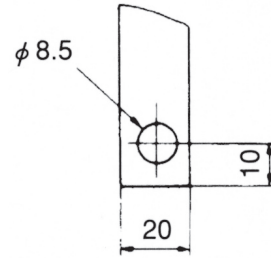
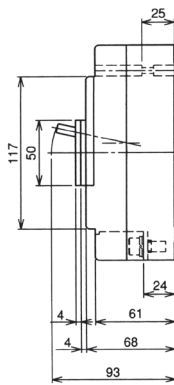
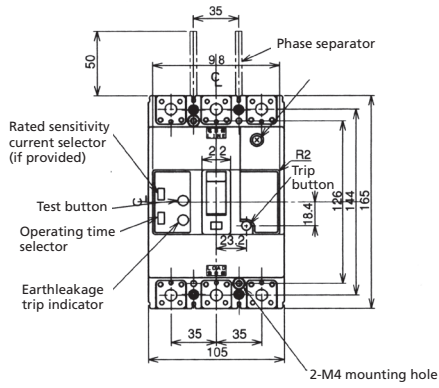


**Overcurrent Tripping Characteristic Curve**



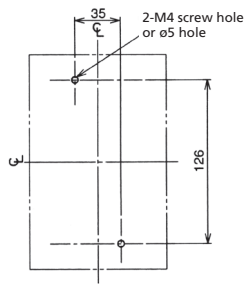
**Temperature Compensation Curve**

■ **Dimensions**

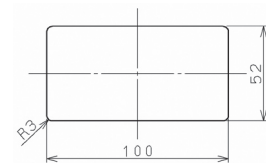


Direct-connected bus drilling

■ **Drilling Plan**



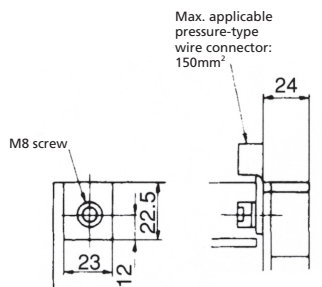
For front mounting bolts



1mm clearance on each side of handle

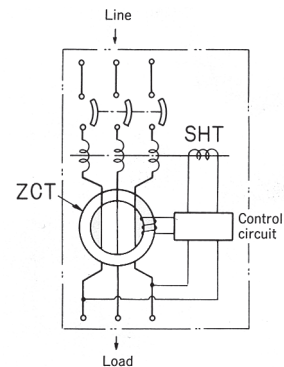
Frontplate cutout

■ **Terminal Arrangement**

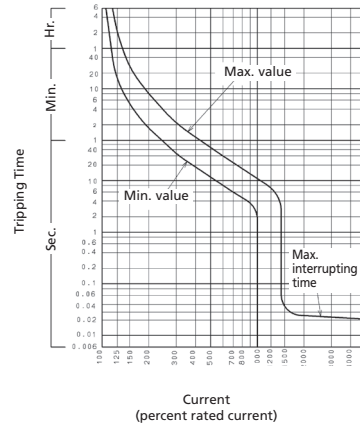
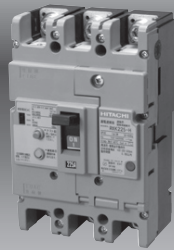


Pressure-type wire connector directly connected

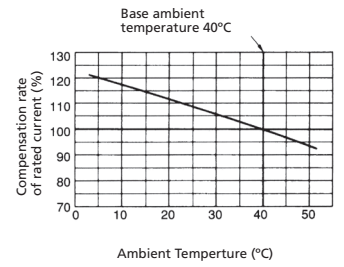
■ **Internal Diagram Connection**



# RXK250-S/RXK250-H

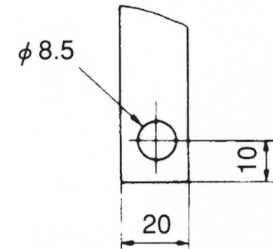
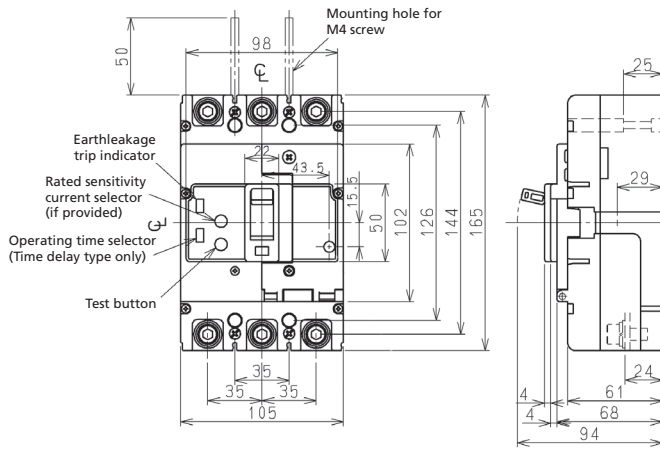


**Overcurrent Tripping Characteristic Curve**



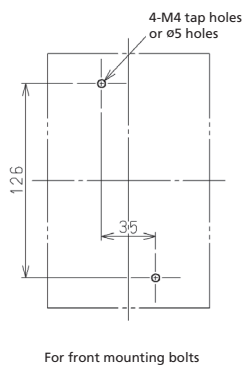
**Temperature Compensation Curve**

## ■ Dimensions

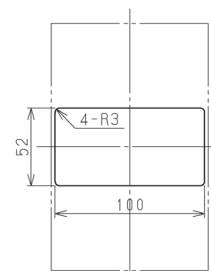


Direct-connected bus drilling

## ■ Drilling Plan



For front mounting bolts

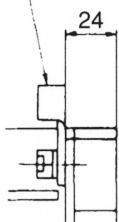


1mm clearance on each side of handle

Frontplate cutout

## ■ Terminal Arrangement

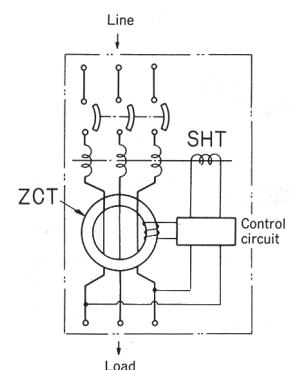
Maximum applicable pressure t-type wire connector = 60mm<sup>2</sup>  
Special pressure type wire connector is attached for 175 – 225A as shown on the right table



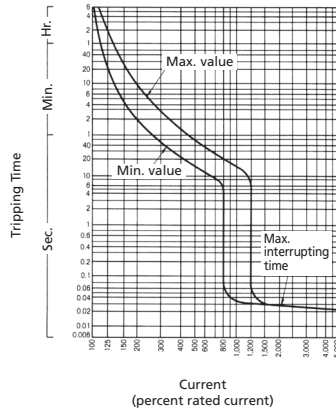
Pressure type wire connector directly connected

Rated current (A)	Applicable wire size of pressure-type wire connector (mm <sup>2</sup> )
175 – 225	Pressure-type wire connector 80, 100, 125 (mm)

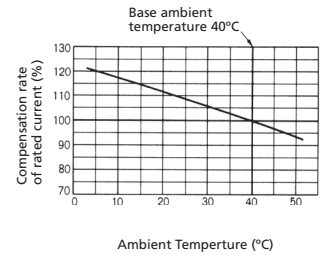
## ■ Internal Diagram Connection



# EX400/RX400

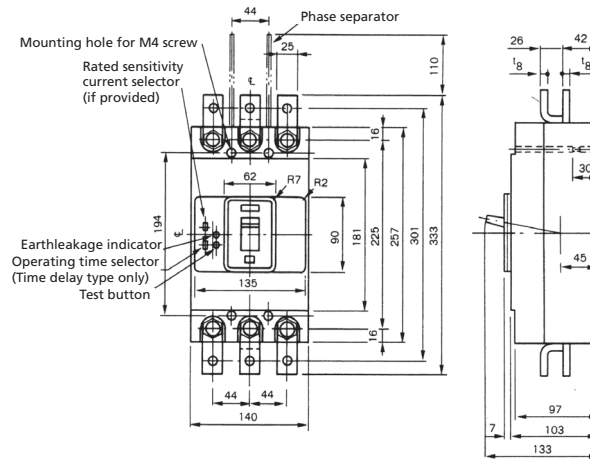


**Overcurrent Tripping Characteristic Curve**

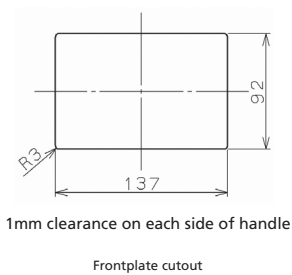
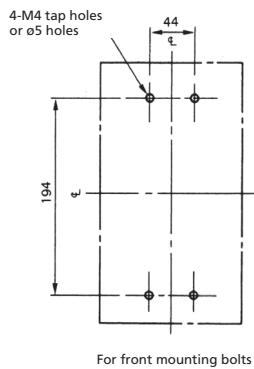


**Temperature Compensation Curve**

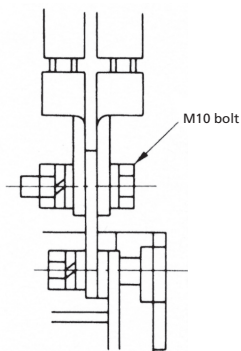
## ■ Dimensions



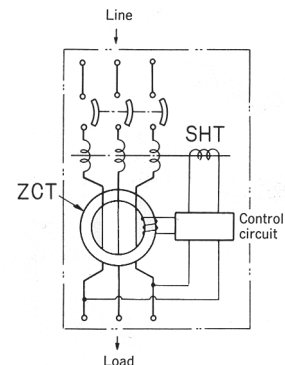
## ■ Drilling Plan



## ■ Terminal Arrangement

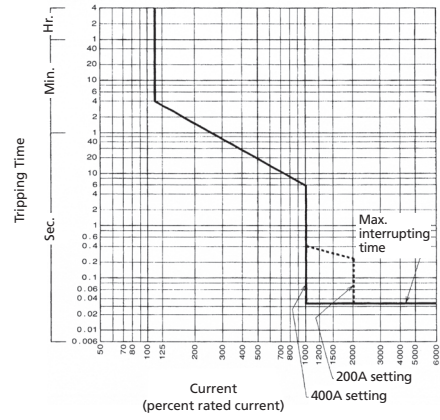


## ■ Internal Diagram Connection



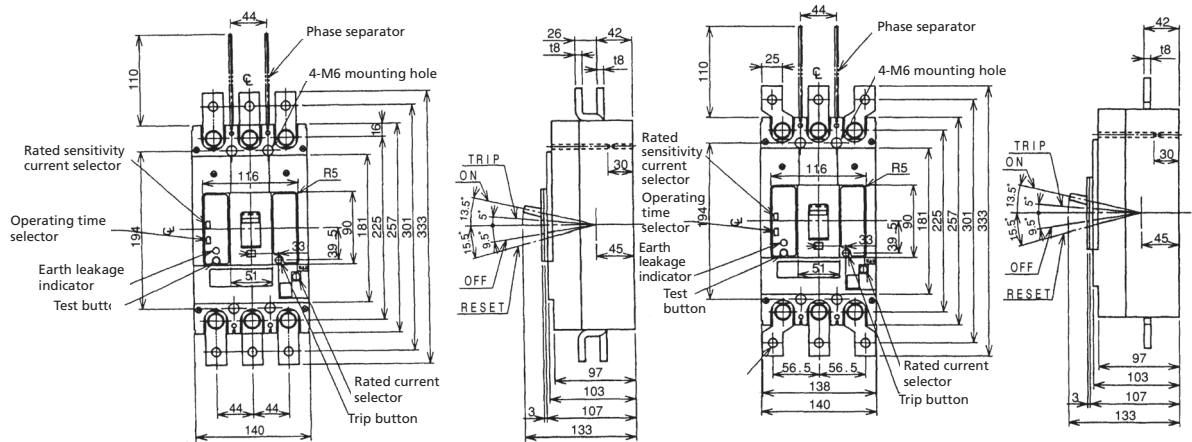


# EX400B/RX400B

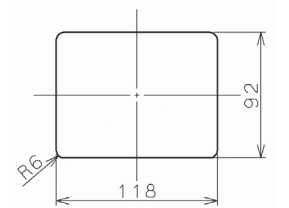
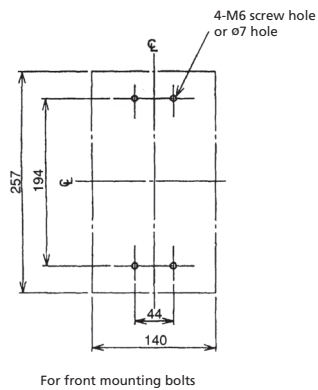


Overcurrent Tripping Characteristic Curve

## ■ Dimensions



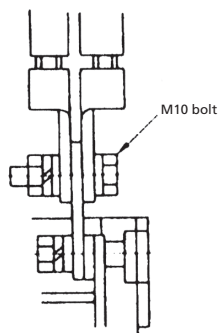
## ■ Drilling Plan



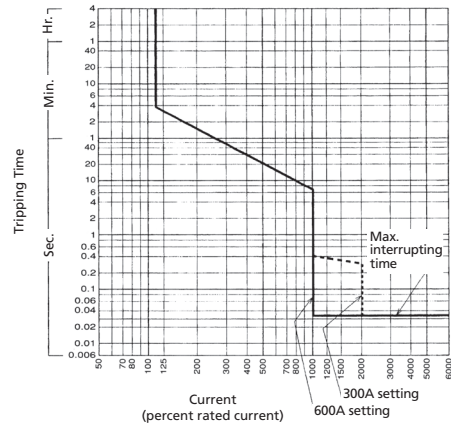
1mm clearance on each side of handle

Frontplate cutout

## ■ Terminal Arrangement

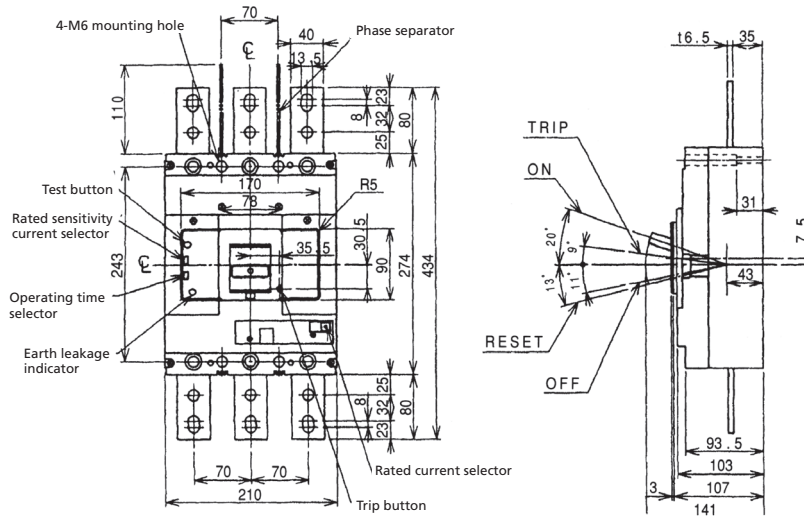


# EX600B/RX600B

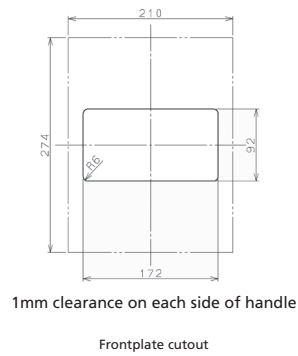
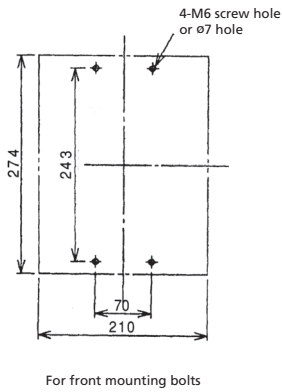


**Overcurrent Tripping Characteristic Curve**

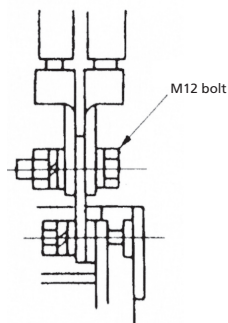
## ■ Dimensions



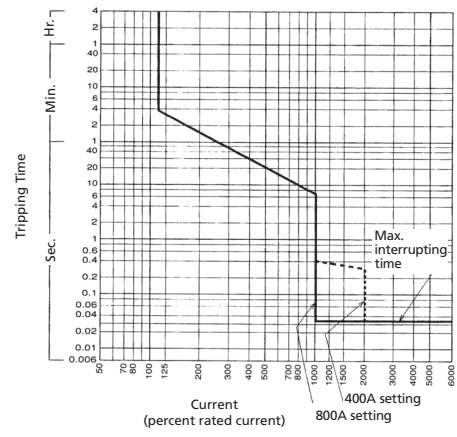
## ■ Drilling Plan



## ■ Terminal Arrangement

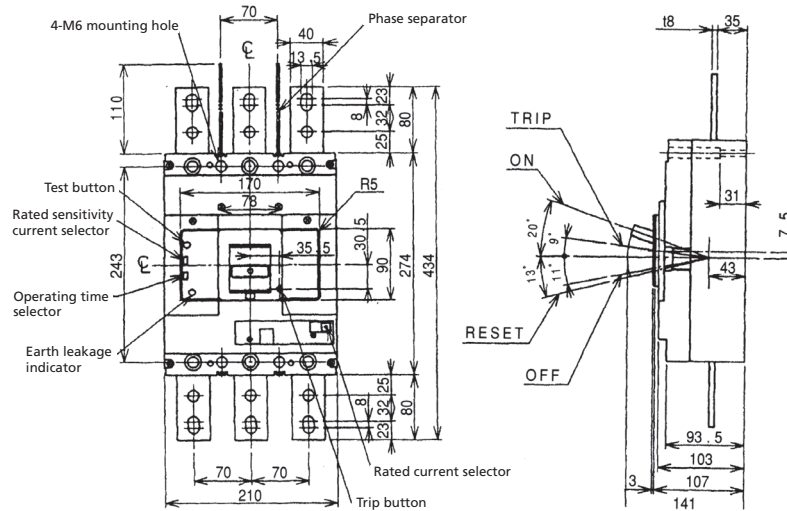


# EX800B/RX800B

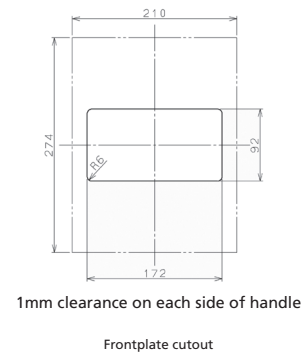
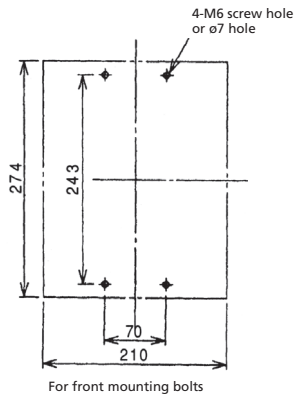


**Overcurrent Tripping Characteristic Curve**

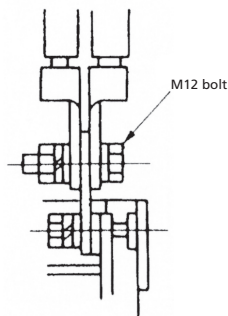
## ■ Dimensions



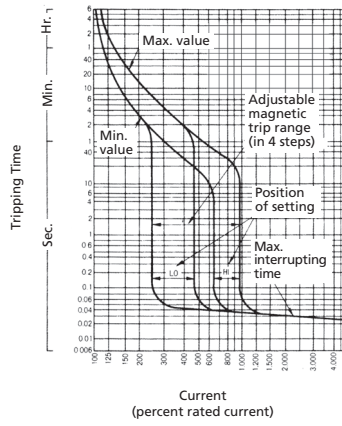
## ■ Drilling Plan



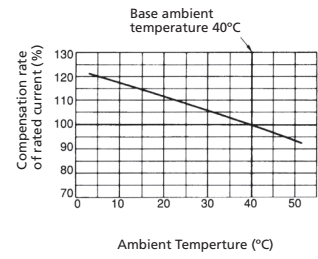
## ■ Terminal Arrangement



# RF-1000KN

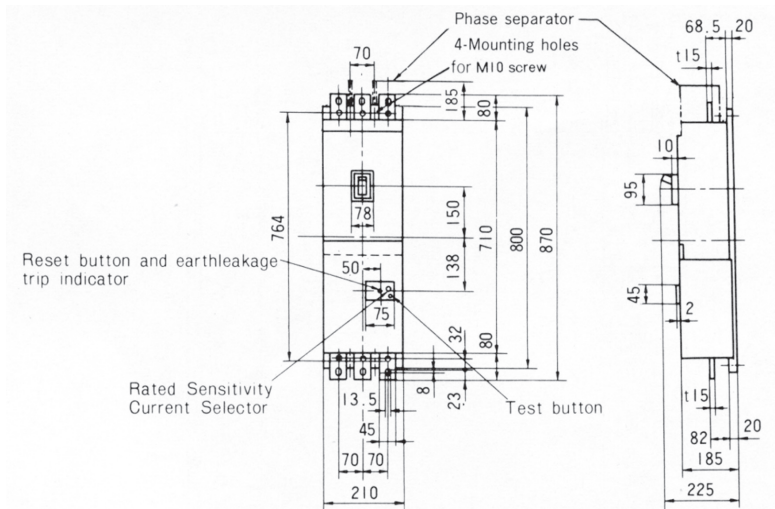


**Overcurrent Tripping Characteristic Curve**

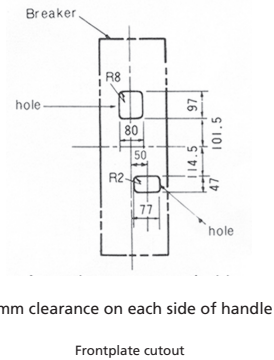
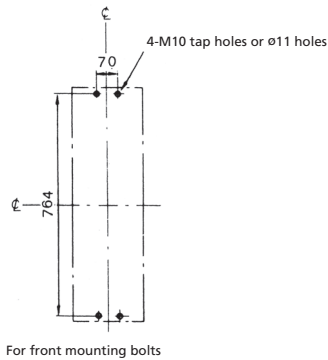


**Temperature Compensation Curve**

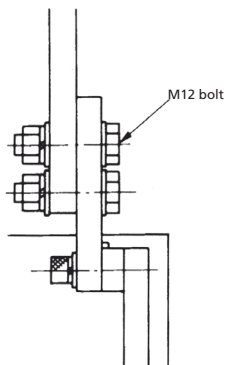
■ **Dimensions**



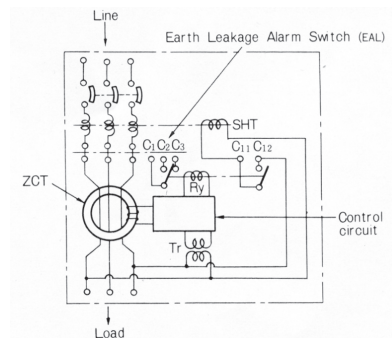
■ **Drilling Plan**



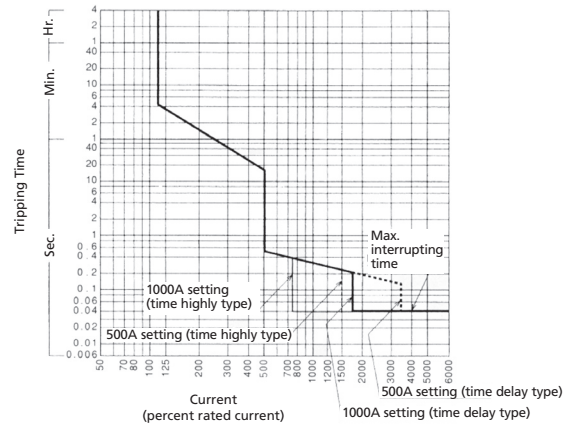
■ **Terminal Arrangement**



■ **Internal Diagram Connection**

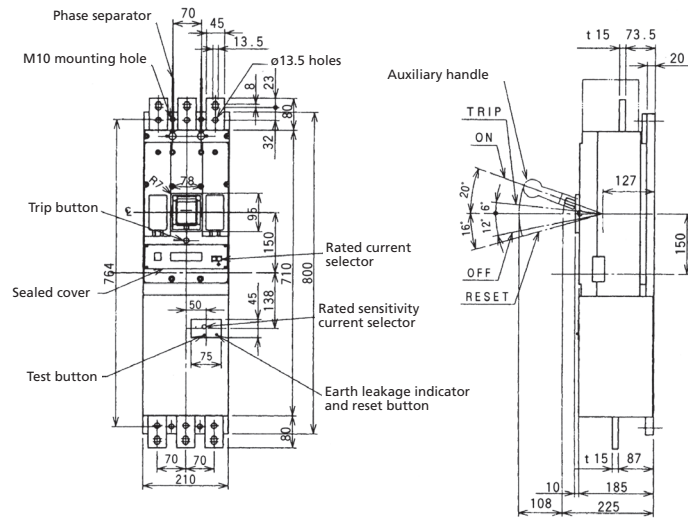


# RF-1000CBN

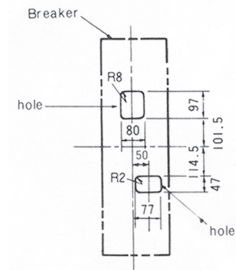
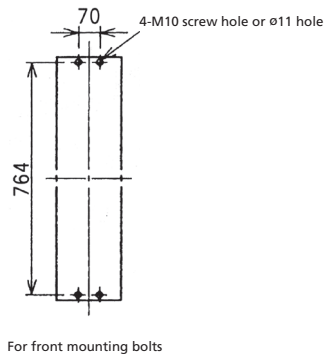


**Overcurrent Tripping Characteristic Curve**

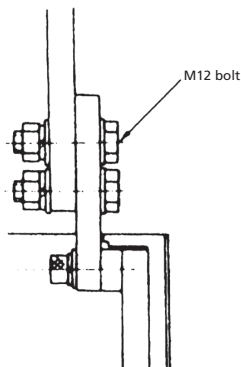
## ■ Dimensions



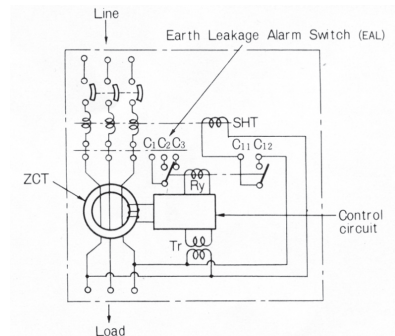
## ■ Drilling Plan



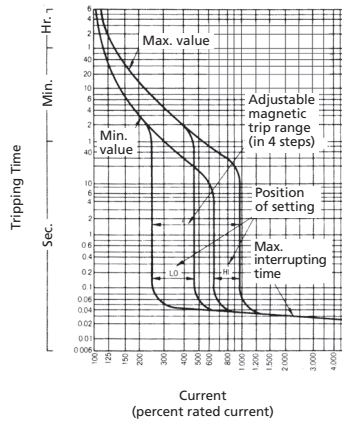
## ■ Terminal Arrangement



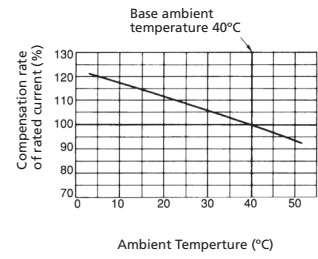
## ■ Internal Diagram Connection



# RF-1200KN

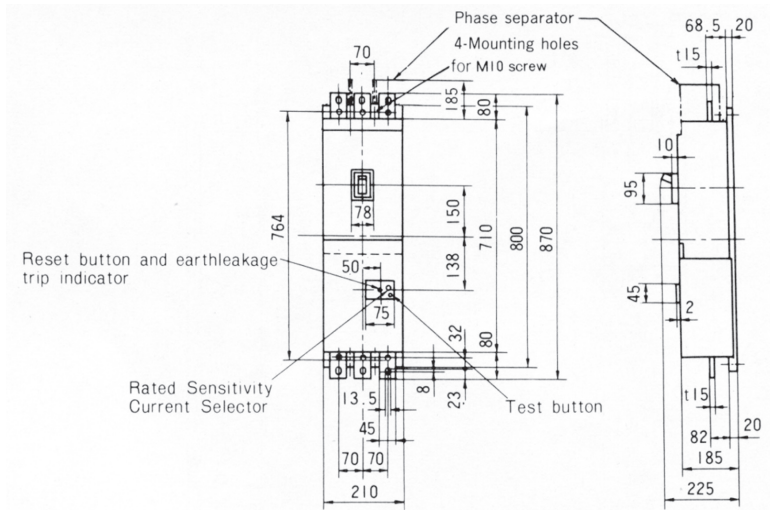


**Overcurrent Tripping Characteristic Curve**

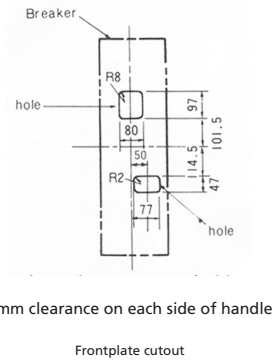
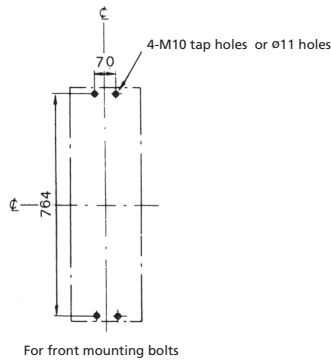


**Temperature Compensation Curve**

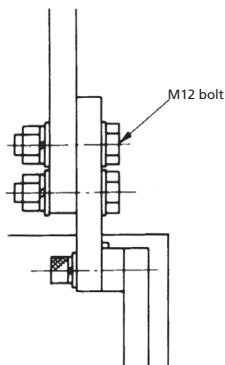
■ **Dimensions**



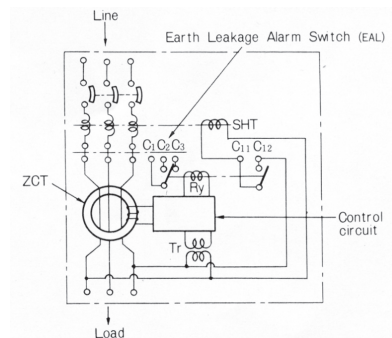
■ **Drilling Plan**



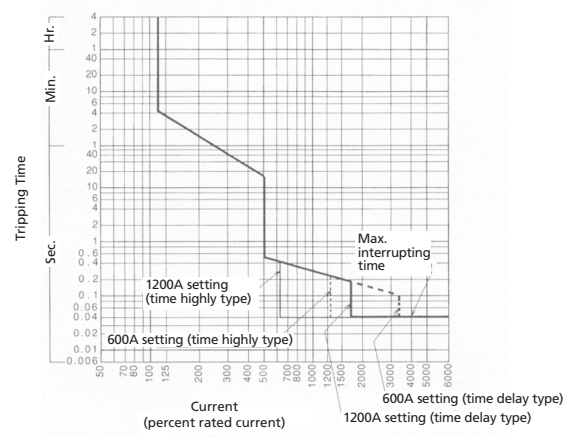
■ **Terminal Arrangement**



■ **Internal Diagram Connection**

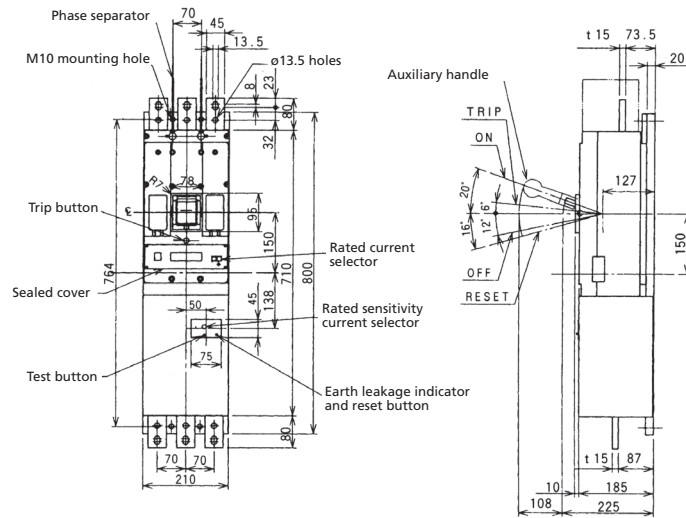


# RF-1200CBN

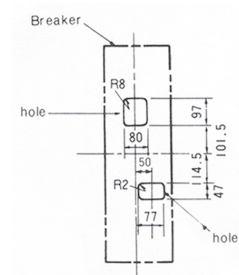
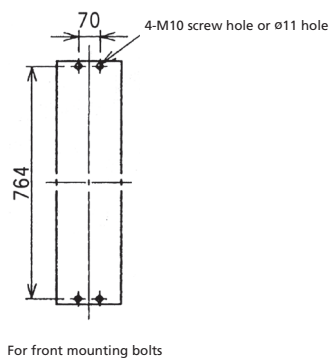


**Overcurrent Tripping Characteristic Curve**

## ■ Dimensions



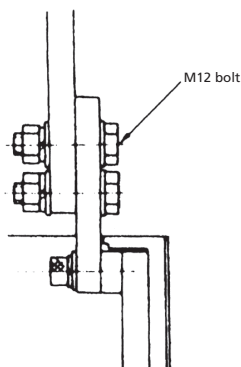
## ■ Drilling Plan



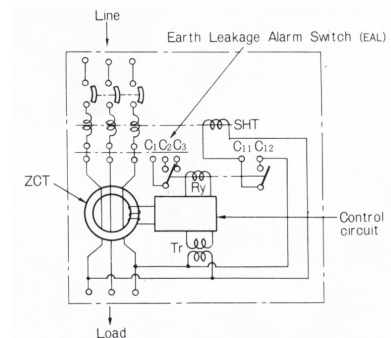
1mm clearance on each side of handle

Frontplate cutout

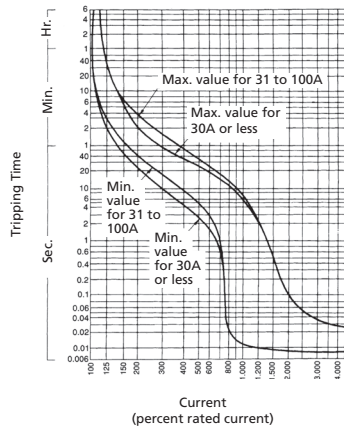
## ■ Terminal Arrangement



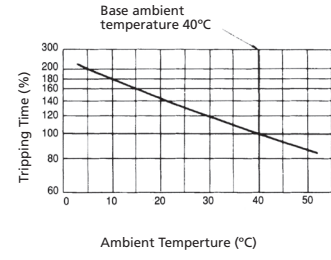
## ■ Internal Diagram Connection



# RX100 4P

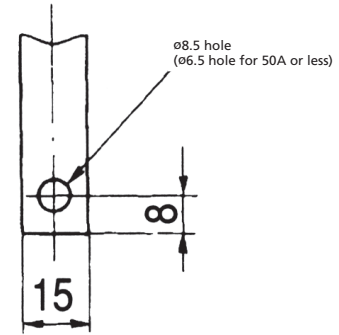
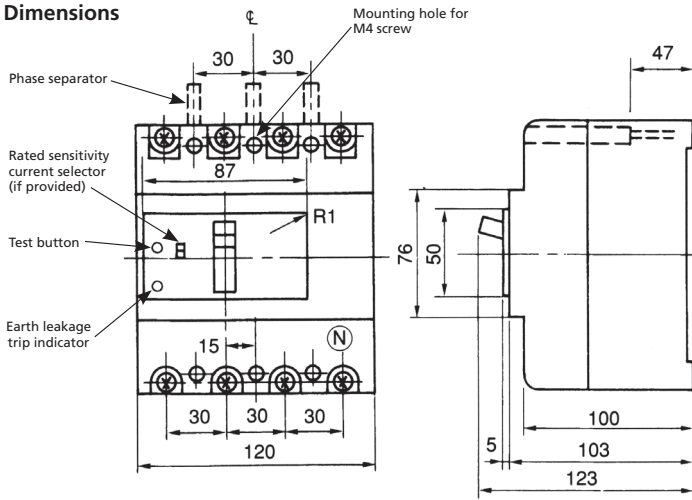


**Overcurrent Tripping Characteristic Curve**



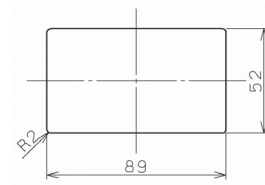
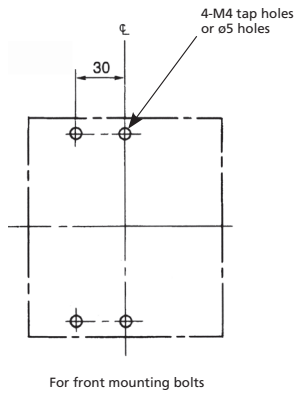
**Temperature Compensation Curve**

**■ Dimensions**



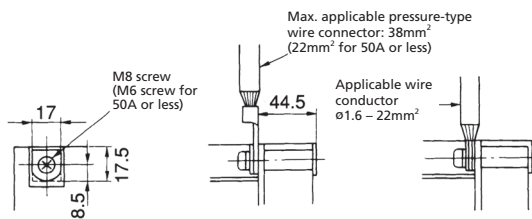
Direct-connected bus drilling

**■ Drilling Plan**

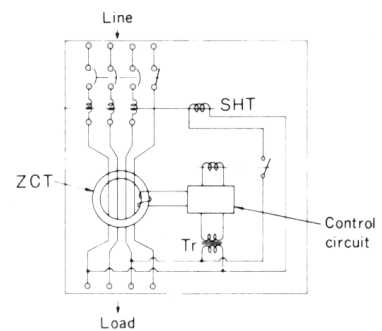


Frontplate cutout

**■ Terminal Arrangement**

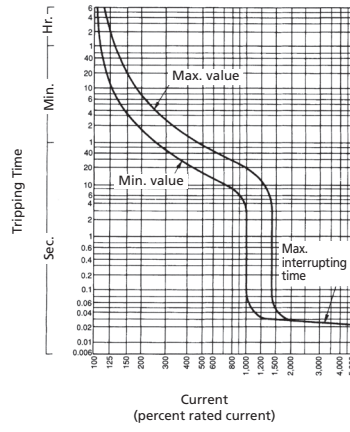


**■ Internal Diagram Connection**

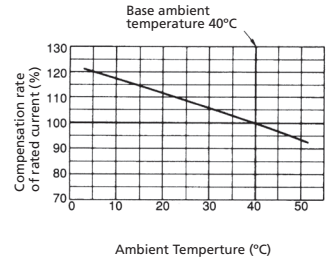




# RG-225BH 4P RG-225BN 4P

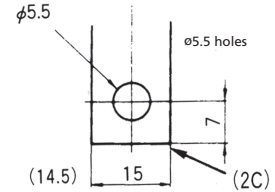
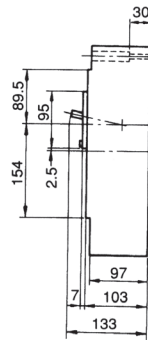
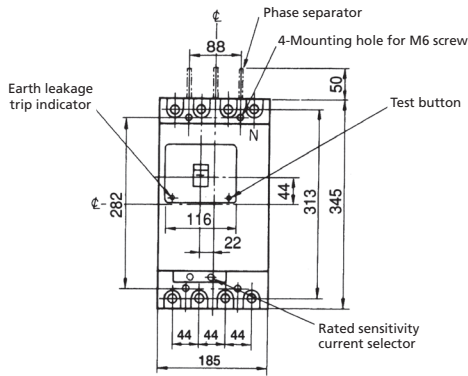


**Overcurrent Tripping  
Characteristic Curve**



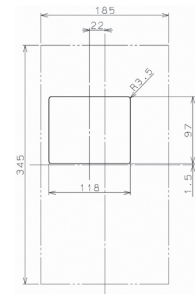
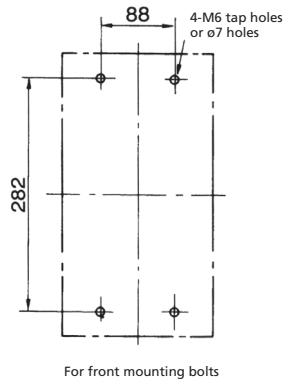
**Temperature  
Compensation Curve**

**■ Dimensions**



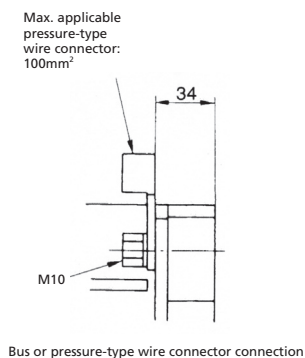
Direct-connected bus drilling

**■ Drilling Plan**

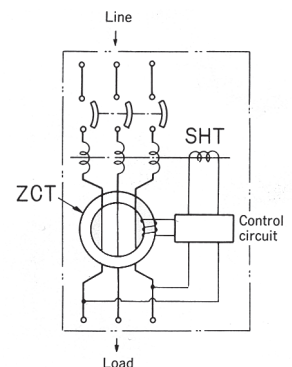


1mm clearance on each side of handle  
Frontplate cutout

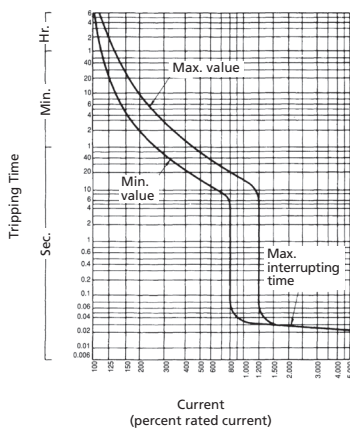
**■ Terminal Arrangement**



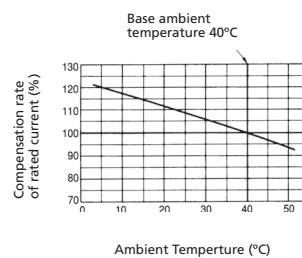
**■ Internal Diagram Connection**



# RG-400BN 4P RG-400BH 4P

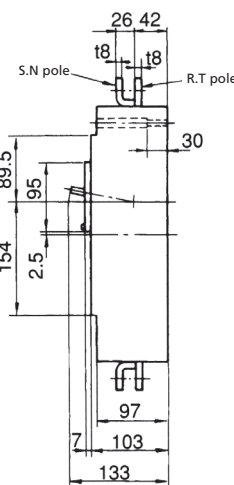
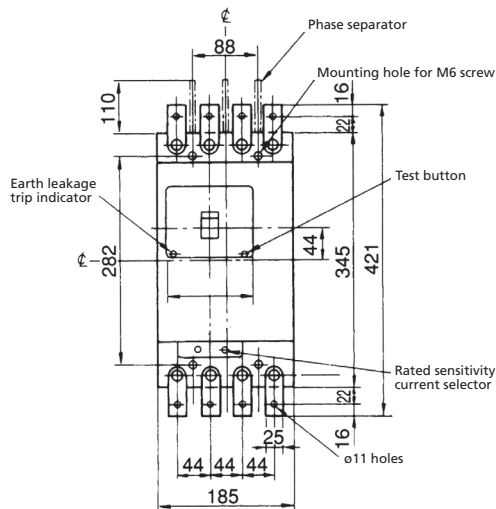


**Overcurrent Tripping Characteristic Curve**

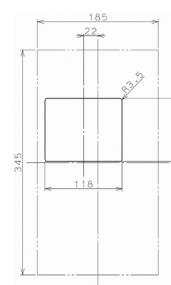
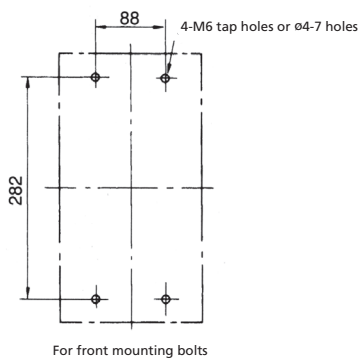


**Temperature Compensation Curve**

■ **Dimensions**

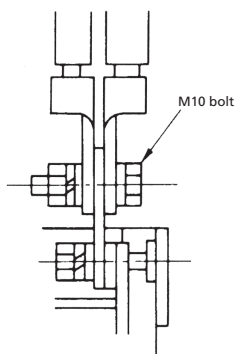


■ **Drilling Plan**

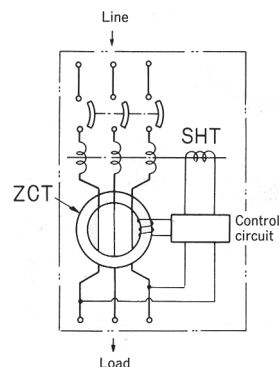


1mm clearance on each side of handle  
Frontplate cutout

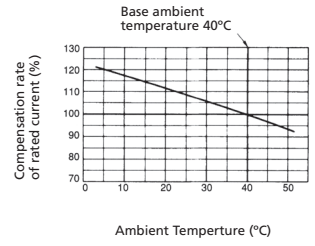
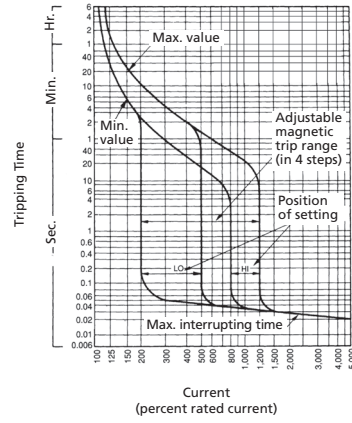
■ **Terminal Arrangement**



■ **Internal Diagram Connection**



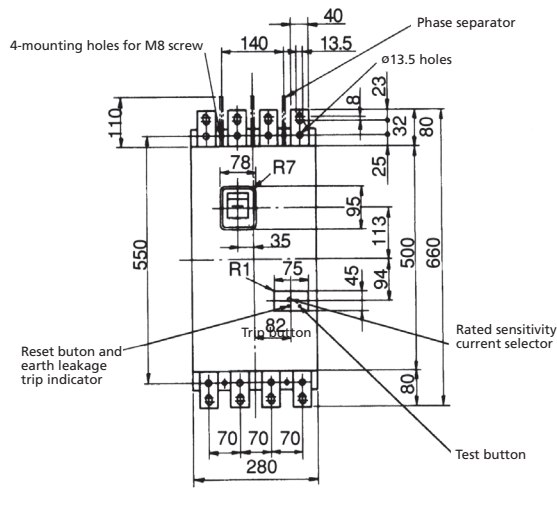
# RF-600FN 4P



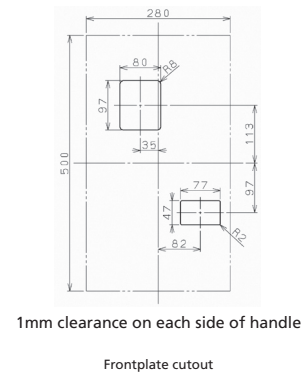
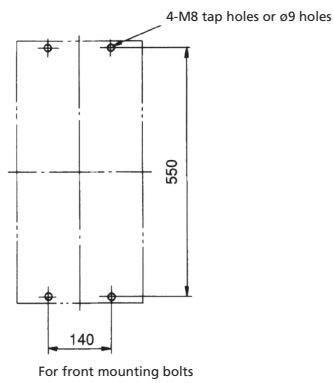
**Overcurrent Tripping Characteristic Curve**

**Temperature Compensation Curve**

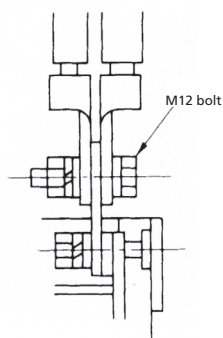
## ■ Dimensions



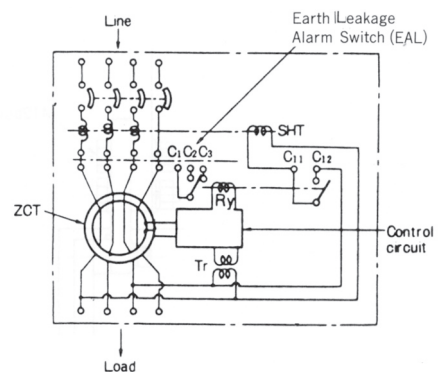
## ■ Drilling Plan



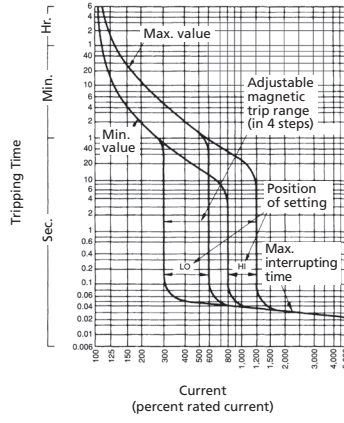
## ■ Terminal Arrangement



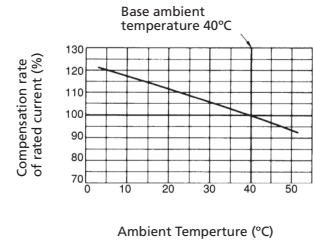
## ■ Internal Diagram Connection



# RF-800KN 4P

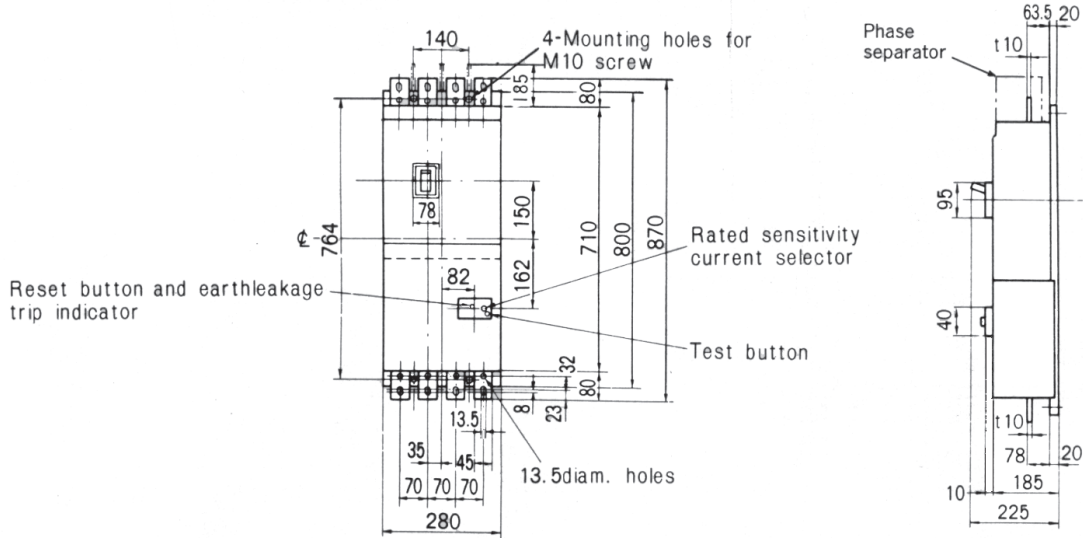


**Overcurrent Tripping Characteristic Curve**

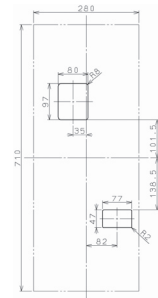
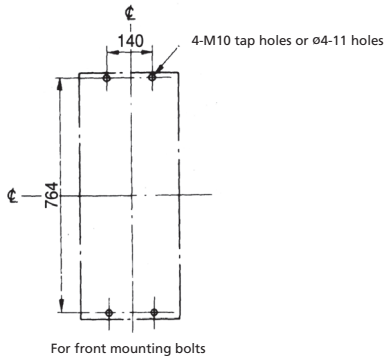


**Temperature Compensation Curve**

■ **Dimensions**

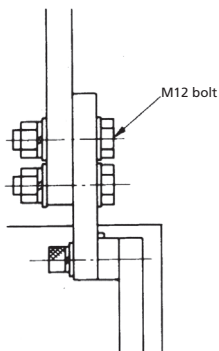


■ **Drilling Plan**

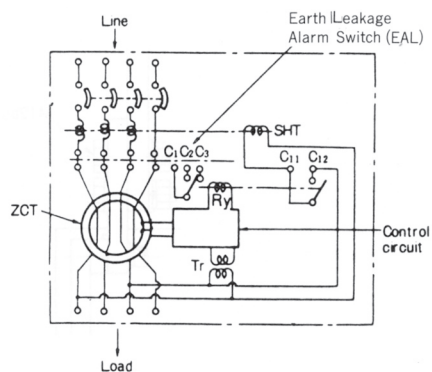


1mm clearance on each side of handle  
Frontplate cutout

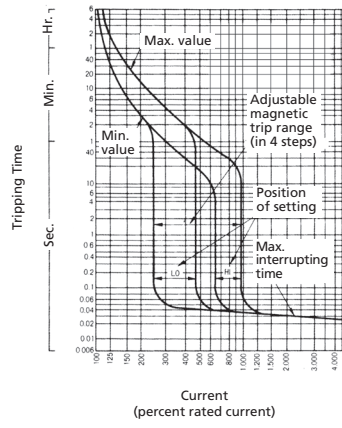
■ **Terminal Arrangement**



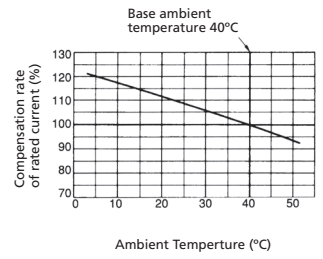
■ **Internal Diagram Connection**



# RF-1000KN 4P RF-1200KN 4P

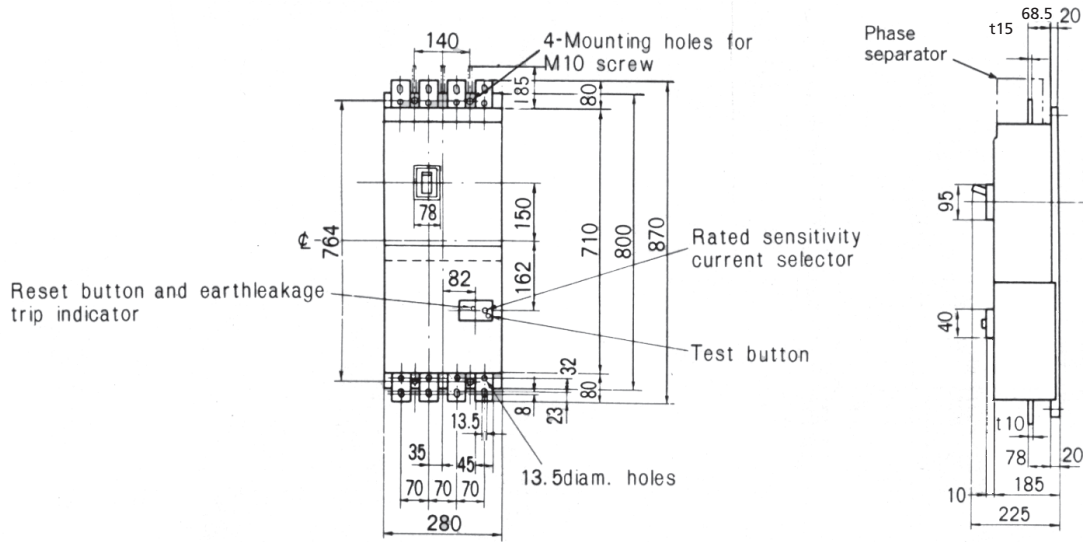


**Overcurrent Tripping Characteristic Curve**

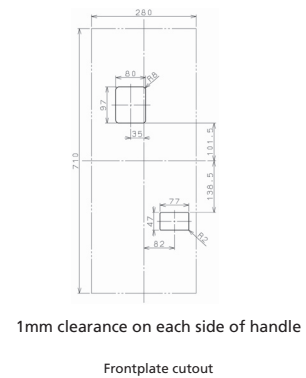
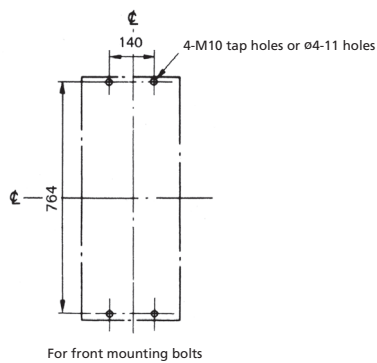


**Temperature Compensation Curve**

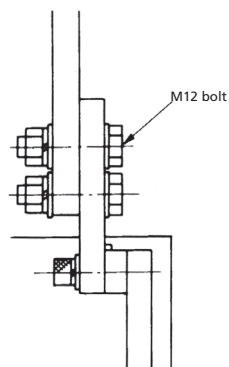
■ **Dimensions**



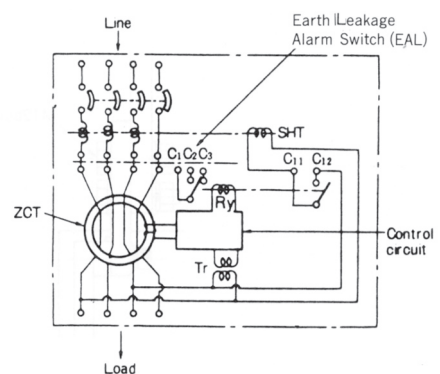
■ **Drilling Plan**



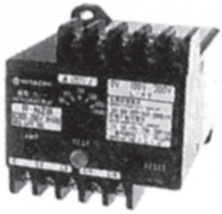
■ **Terminal Arrangement**



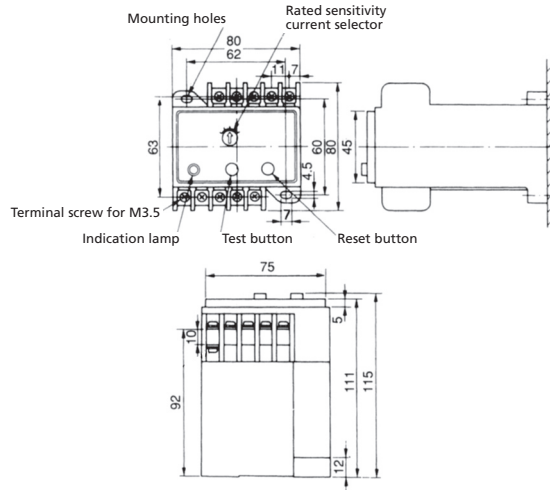
■ **Internal Diagram Connection**



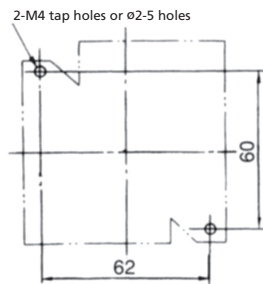
# R-NZB



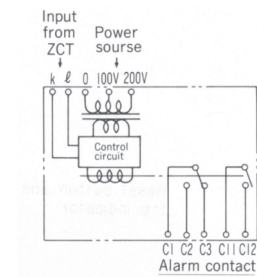
## ■ Dimensions



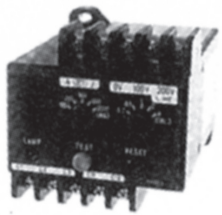
## ■ Drilling Plan



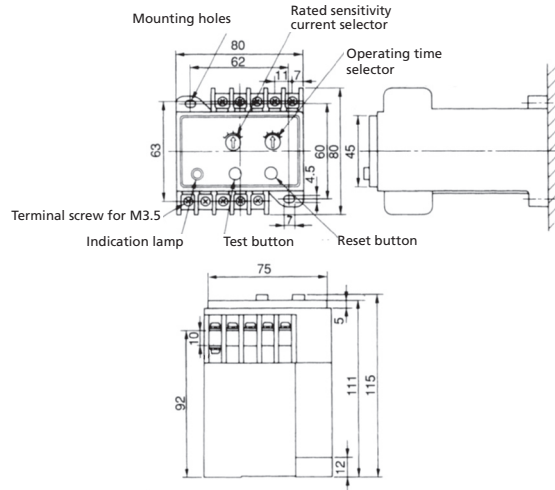
## ■ Internal Diagram Connection



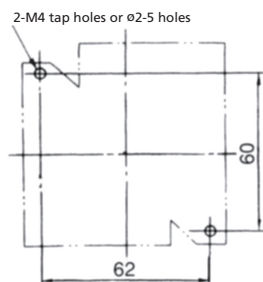
# R-NZBT



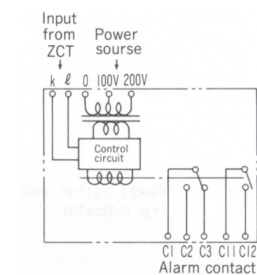
## ■ Dimensions



## ■ Drilling Plan



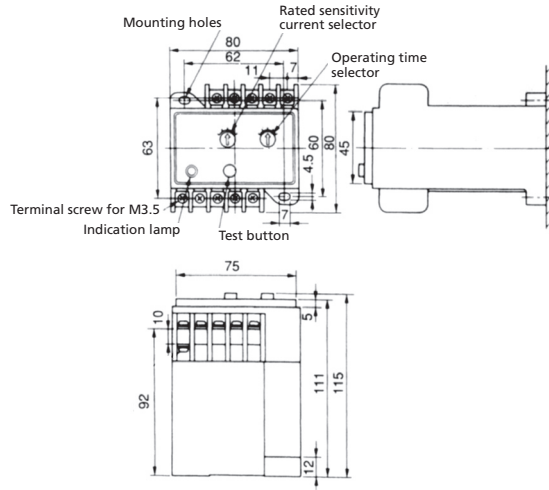
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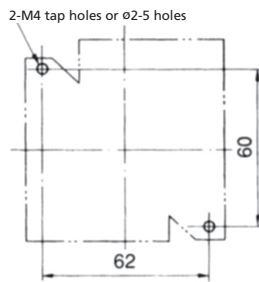
# R-NZBK



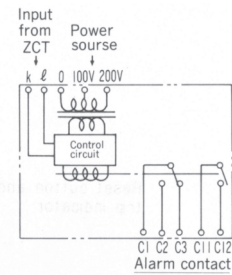
## ■ Dimensions



## ■ Drilling Plan



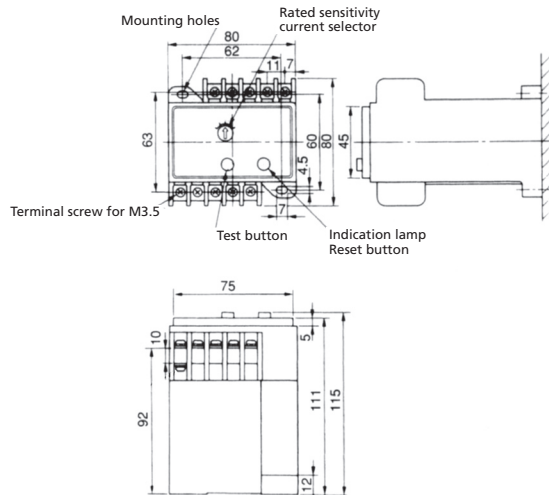
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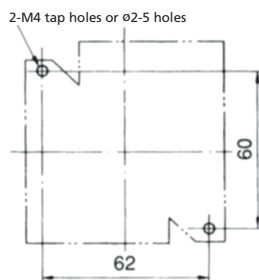
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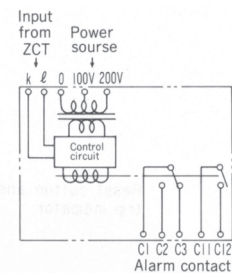
## ■ Dimensions



## ■ Drilling Plan



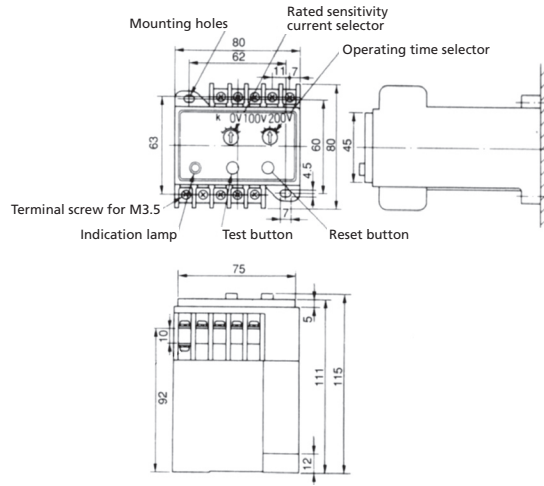
## ■ Internal Diagram Connection



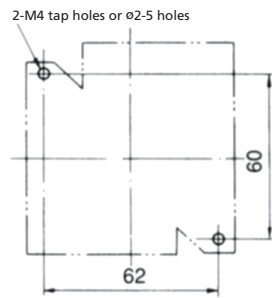
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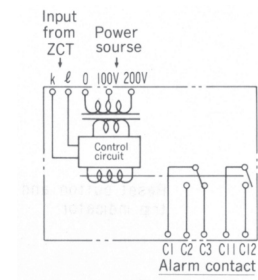
## ■ Dimensions



## ■ Drilling Plan



## ■ Internal Diagram Connection

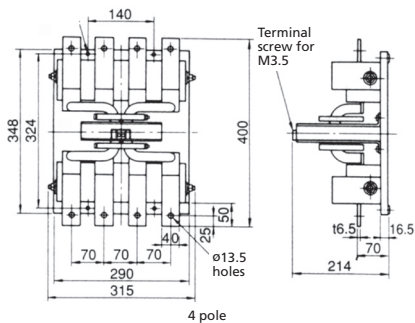
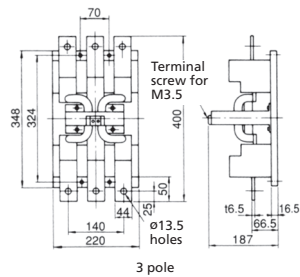




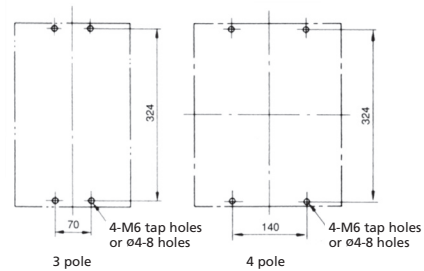
# Z-400B



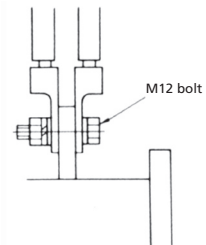
## ■ Dimensions



## ■ Drilling Plan



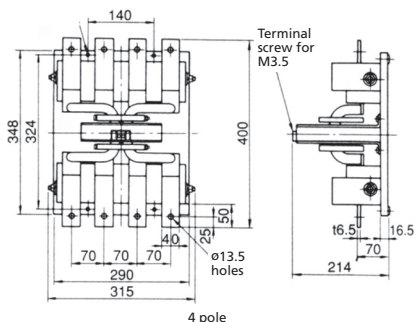
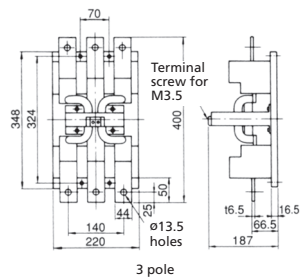
## ■ Terminal Arrangement



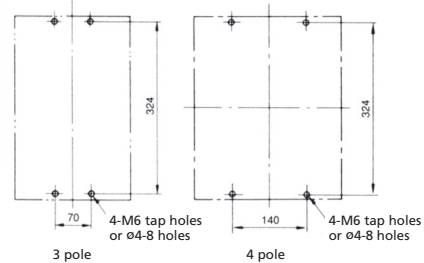
# Z-600B



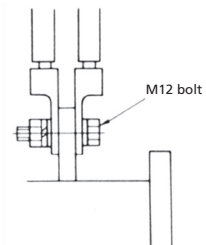
## ■ Dimensions



## ■ Drilling Plan



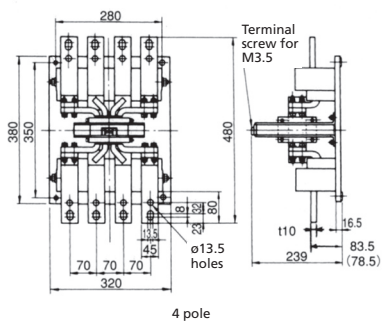
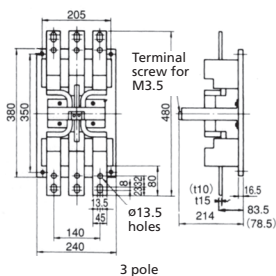
## ■ Terminal Arrangement



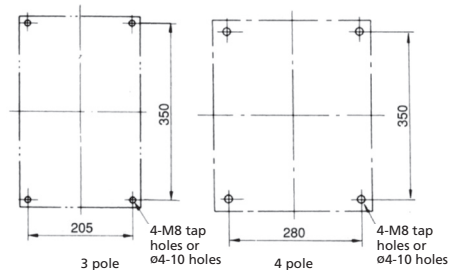
# Z-800B



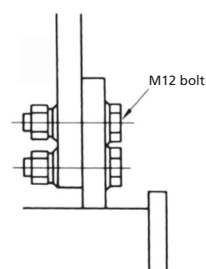
## ■ Dimensions



## ■ Drilling Plan



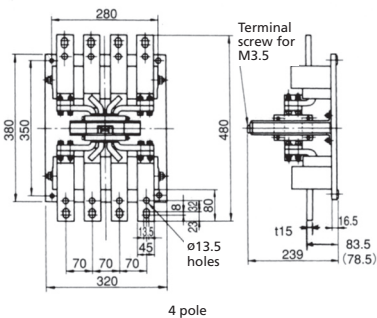
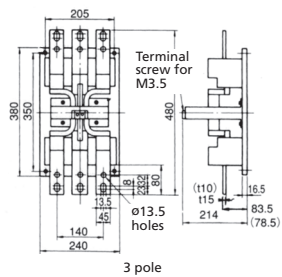
## ■ Terminal Arrangement



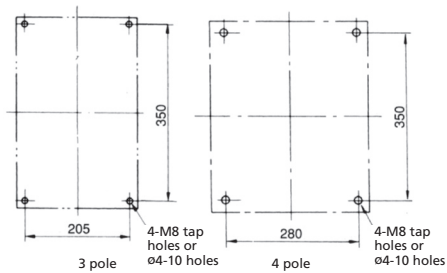
# Z-1000B



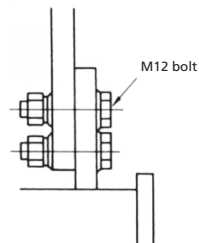
## ■ Dimensions



## ■ Drilling Plan



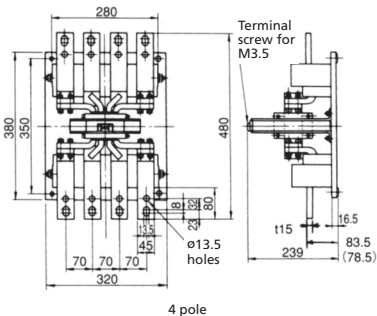
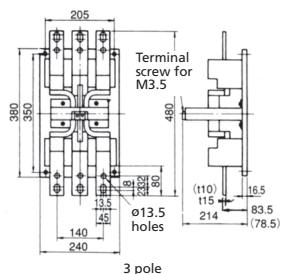
## ■ Terminal Arrangement



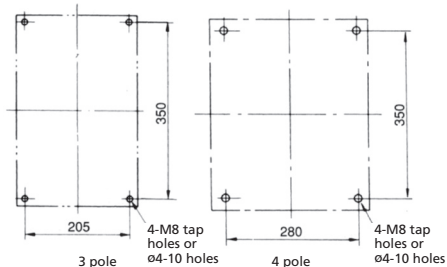
# Z-1200B



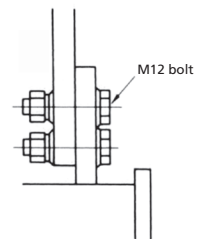
## ■ Dimensions



## ■ Drilling Plan



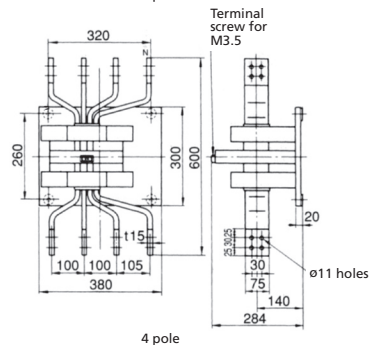
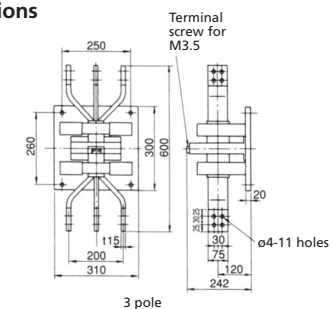
## ■ Terminal Arrangement



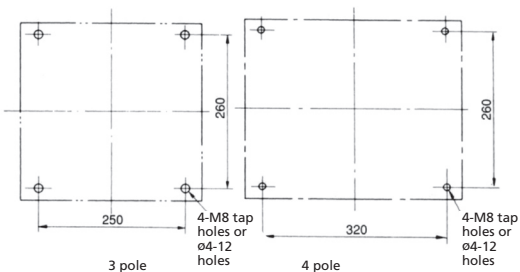
# Z-2000B



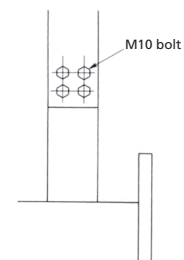
## ■ Dimensions



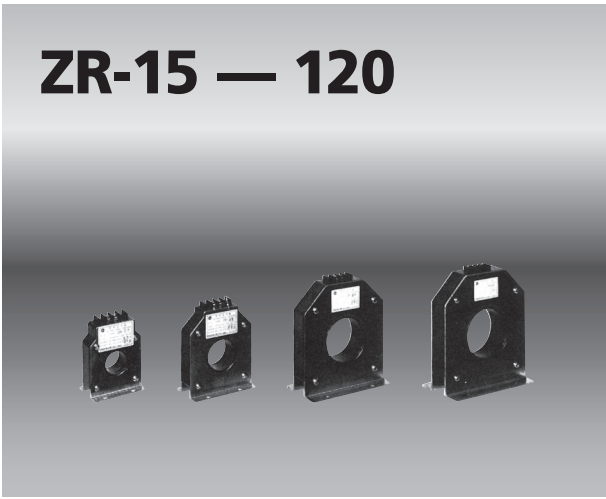
## ■ Drilling Plan



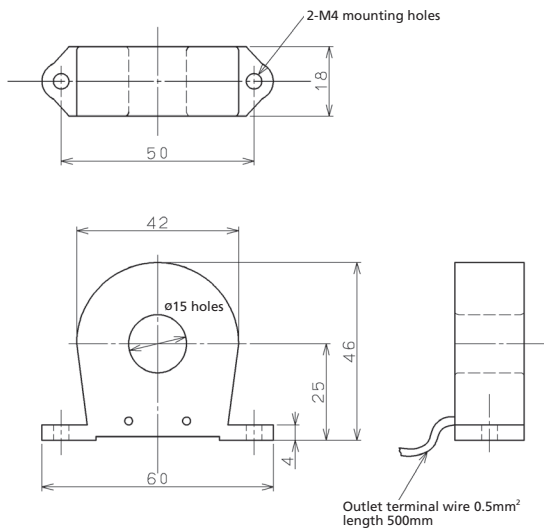
## ■ Terminal Arrangement



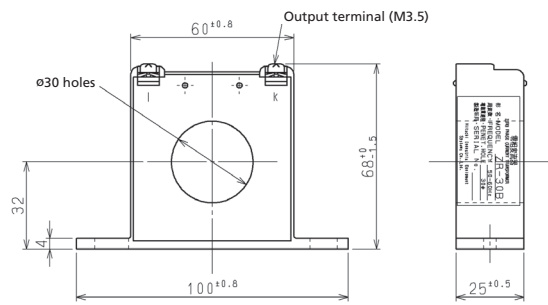
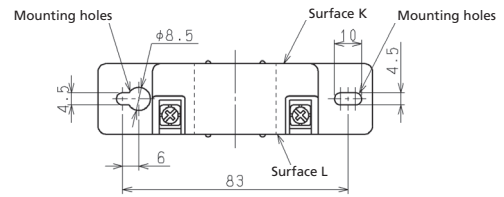
# ZR-15 — 120



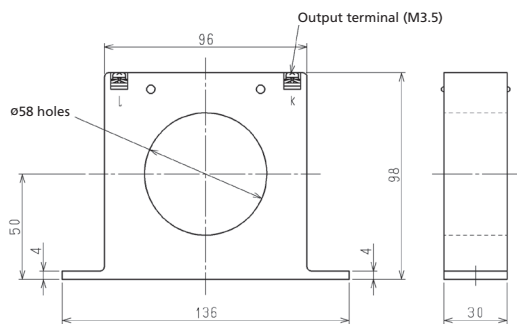
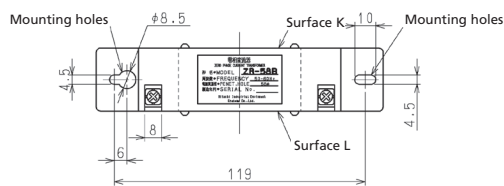
## ■ Dimensions



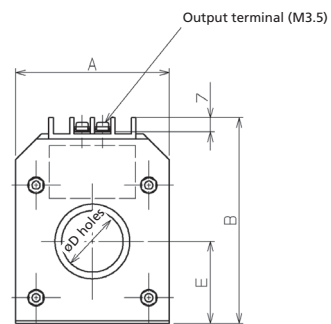
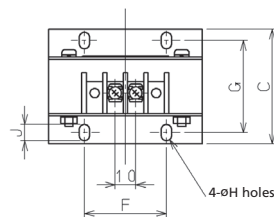
ZR-15



ZR-30B



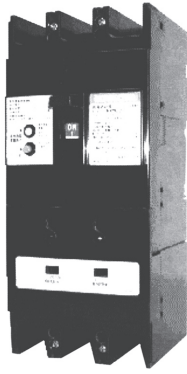
ZR-58B



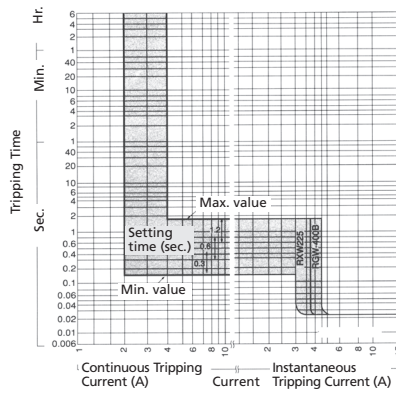
ZR-65 — 120

Type	A	B	C	D	E	F×G	H	J	(kg)
ZR-65	145	170	79	Ø65	75	80×60	Ø6	6	1.6
ZR-80	172	198	89	Ø80	90	100×65	Ø6	6	2.0
ZR-100	185	222	90	Ø100	100	110×65	Ø8	8	2.5
ZR-120	226	264	95	Ø120	120	140×70	Ø9.5	9.5	3.0

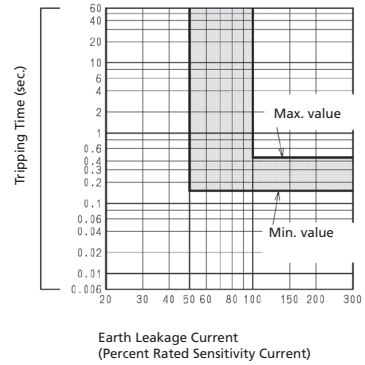
# EARTH LEAKAGE BREAKERS FOR WELDERS



RXW225



Overcurrent Tripping Characteristic Curve



Earth Leakage Tripping Characteristic Curve (at 0.3 sec.)

## ■ Ratings and Specifications

Type		RXW225	RGW-400B
Number of Poles		2	
Rated Voltage (AC V)		200, 415	
Rated Sensitivity Current (mA)		100 · 200 · 500*	
Operating Time (sec.)		**0.3 · 0.6 · 1.2* (0.1 · 0.2)*	
Rated Current (kA)		225	400
Instantaneous Tripping Current (kA)		3 — 4	3.6 — 4.4
Interrupting Capacity (kA) sym.	AC200V	85	
	AC415V	42	
Continuous Current Protection	Setting Current (A)	3 ± 1	
	Setting Time (sec.)	**0.3 · 0.6 · 1.2(3)*	
	Release Time (sec.)	0.1	
Terminal		For pressure-type wire connector terminal	Front bar terminal
Net Weight (kg)		7.4	8.3

Note:

\* Interchangeable by manual operation.

\*\* Earth leakage tripping time and continuous current tripping time are interlocked.

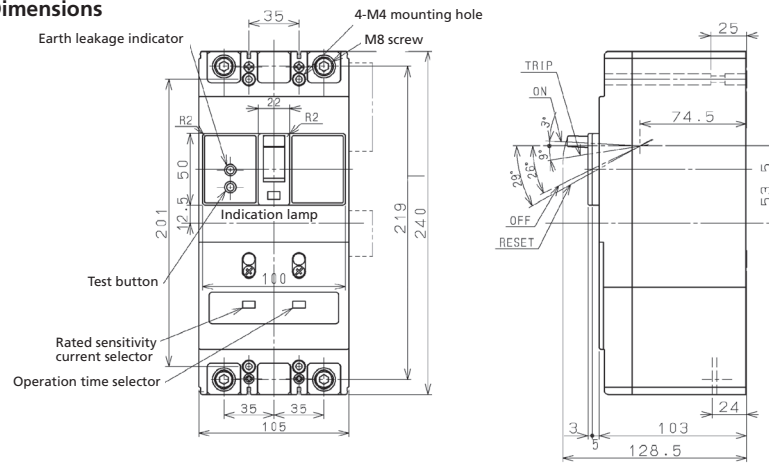
## ■ Selection

Rated Voltage (AC V)	Specifications of Welder		Rated Current of ELCB (A)	Setting Current of Instantaneous Tripping Current (A)
	Rated Capacity (kVA)	Maximum Input (typ.)(kVA)		
200	35	111	225	1200
	50	106	225	1200
	75	219	400	2250
	100	330	400	3500
415	35	111	225	600
	50	106	225	600
	75	219	225	1200
	100	330	225	1700
	125	(395)	400	2250
	150	(475)	400	2500
	200	(630)	400	3500

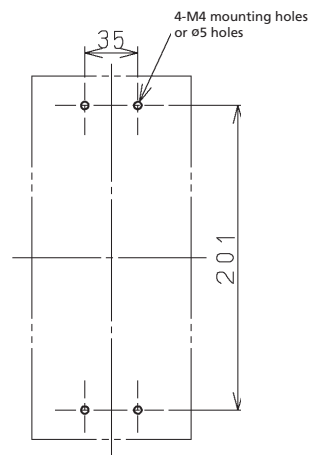
( ): for reference value

# RXW225

## ■ Dimensions

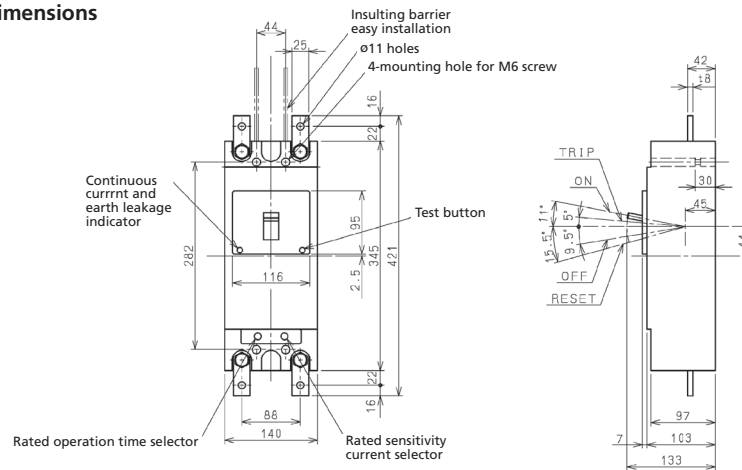


## ■ Drilling Plan

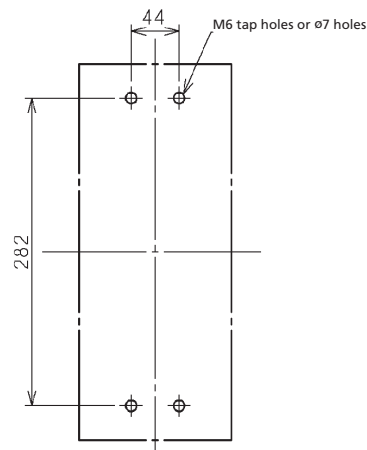


# RGW-400B

## ■ Dimensions



## ■ Drilling Plan

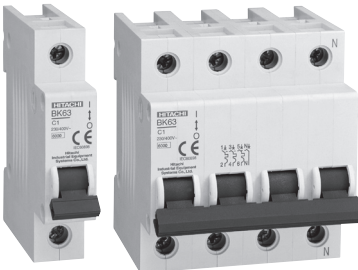
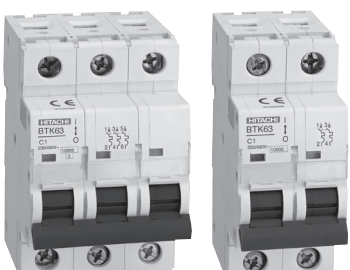


# MINIATURE CIRCUIT BREAKERS

MCB is applicable to electric circuit with rated voltage 230/400V, 240/415V AC, frequency 50/60Hz and rated current is up to 63A.

The product provides against overload and short circuit and equipments in household and commercial installations.

MCB is also used as non-frequent changeover of electric circuit.

<b>BK63 series</b>	<b>BTK63 series</b>	<b>Alarm switch</b> (for BK63)	<b>Auxiliary switch</b>
			

## TRIPPING CHARACTERISTICS

- **Type B**  
Instant tripping characteristics : 3–5I<sub>n</sub>  
Application : computers and electronic equipments
- **Type C**  
Instant tripping characteristics : 5–10I<sub>n</sub>  
Application : general load such as bulbs , motors
- **Type D**  
Instant tripping characteristics : 10–20I<sub>n</sub>  
Application : high current surge device such as transformers, motors with heavy load

## APPROVAL


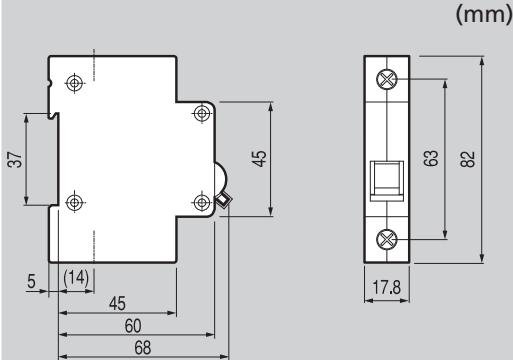
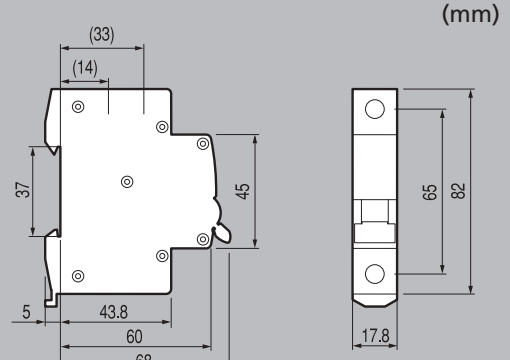
- CE marking
- CB Certificate

## COLORED HANDLES

Easy to distinguish the rated current of the MCB by means of colored handle.

1A	Black
2A	Pink
3A	Pink
4A	Brown
6A	Green
10A	Red
16A	Grey
20A	Blue
25A	Yellow
32A	Purple
40A	Black
50A	White
63A	Copper-colored

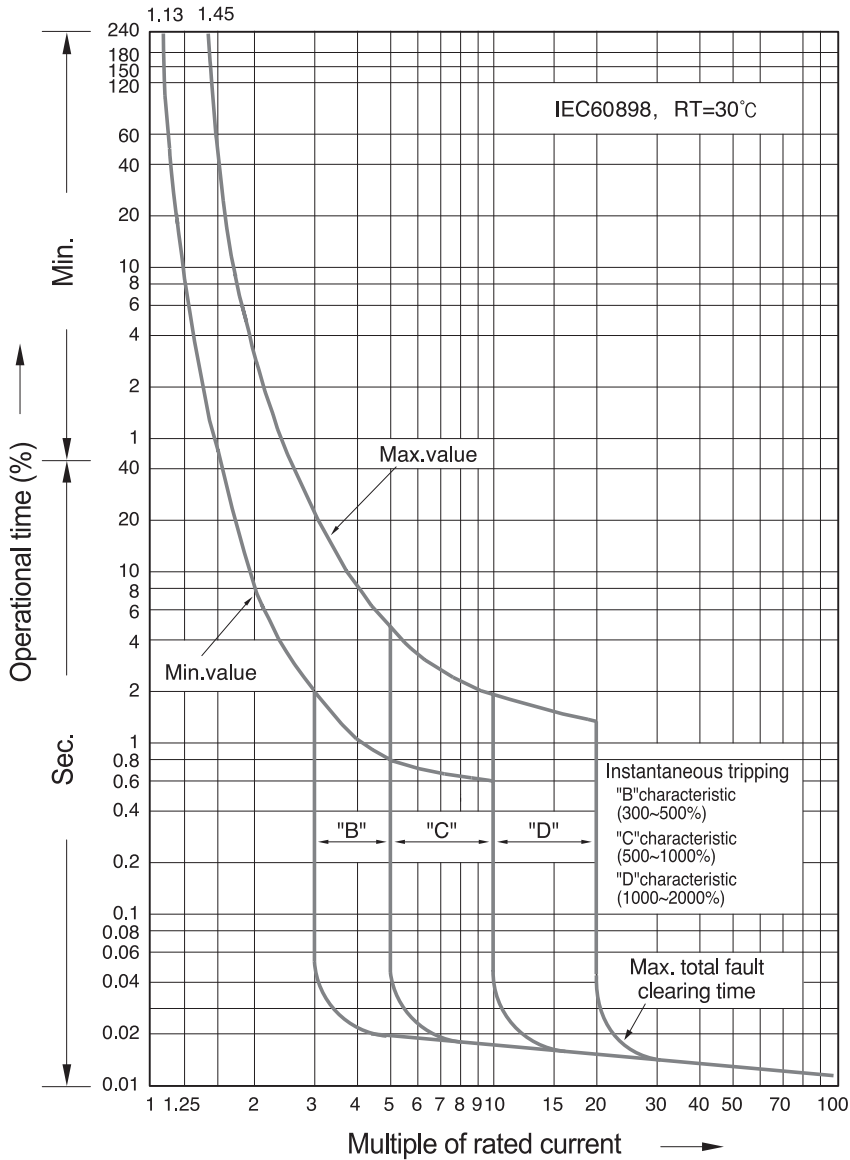
# SPECIFICATIONS

Type	BK63		BTK63	
Protection	Overload and short circuit			
Rated current	1, 2, 3, 4, 6, 10, 16, 20, 25, 32, 40, 50, 63A			
Characteristics	B, C, D curve			
Number of poles	1P, 1P+N, 2P, 3P, 3P+N, 4P			
Breaking capacity	1P	2, 3, 4P	1P	2, 3, 4P
	6kA at 230/400VAC	6kA at 400VAC	10kA at 240/415VAC	10kA at 415VAC
Standards	IEC60898			
Approval	SEMKO CB scheme		KEMA CB scheme	
Type of trip	Thermal magnetic release			
Electrical endurance	6,000 operations		8,000 operations	
Installation	35mm DIN rail			
Width	17.8mm per pole			
Type of terminal	Lug type (Cable up to 25mm <sup>2</sup> )			
Alarm switch (Optional)	 <p><b>1 changeover contact</b> 6A at 230VAC, 3A at 415VAC (AX) 6A at 230VAC, 3A at 415VAC (AL) 2A at 48VAC, 1A at 125VAC</p> <p><b>Lug terminal</b> Cable capacity 2.5mm<sup>2</sup> <b>9mm wide</b></p>		Not applicable	
Dimension	 <p>(mm)</p>		 <p>(mm)</p>	

# CHARACTERISTIC CURVE AND COMPENSATION CURVE

## ■ Characteristic curve For type BK63, BTK63

Operating curves



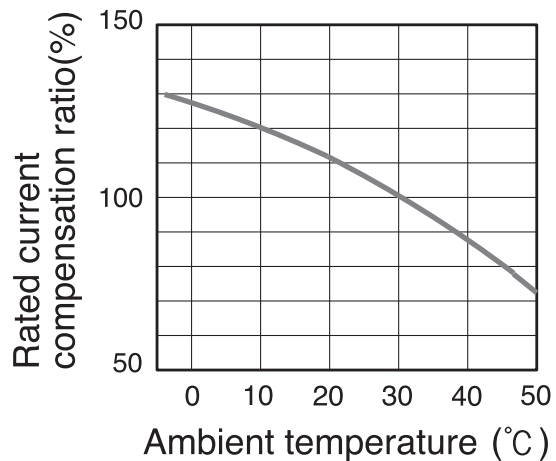
## ■ Compensation table

[Temperature compensation table](IEC60898-1)

In(A)	20°C	25°C	30°C	35°C	40°C	45°C	50°C	55°C	60°C
1	1.05	1.02	1.0	0.98	0.95	0.93	0.9	0.89	0.85
2	2.03	2.04	2.0	1.96	1.92	1.88	1.84	1.8	1.74
3	3.18	3.09	3.0	2.91	2.82	2.7	2.61	2.49	2.37
4	4.24	4.12	4.0	3.88	3.75	3.64	3.52	3.36	3.24
6	5.24	6.12	6.0	5.88	5.76	5.64	5.52	5.4	5.3
10	10.6	10.3	10.0	9.7	9.3	9.0	8.6	8.2	7.8
16	16.8	16.5	16.0	15.5	15.2	14.7	14.2	13.8	13.3
20	21.0	20.6	20.0	19.4	19.0	18.4	17.8	17.4	16.8
25	26.2	25.7	25.0	24.2	23.7	23.0	22.2	21.5	20.7
32	33.5	32.9	32.0	31.4	30.4	29.8	28.4	28.2	27.5
40	42.0	41.2	40.0	38.8	38.0	36.8	35.6	34.4	33.2
50	52.5	51.5	50.0	48.5	47.4	45.5	44.0	42.5	40.5
63	66.2	64.9	63.0	61.0	58.0	56.7	54.2	51.7	49.2

[1:113% In 12:145% In according to IEC60898-1]

## ■ Compensation curve





# RESIDUAL CURRENT CIRCUIT BREAKERS

RCCB is applicable to electric circuits with rated voltage 240/415VAC, frequency 50/60Hz and rated current up to 63A. The RCCBs provides indirect protection to the operator's body under such condition that the exposed live parts should be connected to a proper earthing pole. The RCCB also provides protection against the fire danger caused by earth fault current due to function failure of over current protection device.

## RK63 series



## FEATURES

- RCCBs with rated sensitivity up to 30mA can be used as supplementary protecting device in case other protecting device fails its protection against electric shock.
- RCCBs designed for household installation and other similar application, is for non-professional operation, and no maintenance is required.
- RCCBs provides no protection against electric shock resulted from direct contacts of both protected lines, or leakage current between these two lines.
- Particular devices such as surge protective devices, surge arresters etc are recommended to installation at upstream line to RCCBs as precaution against potential surge voltage and current occurring at its power input side.
- Satisfying conditions and applications as mentioned above, RCCBs with ON-OFF indicating device is considered suitable for isolation function.

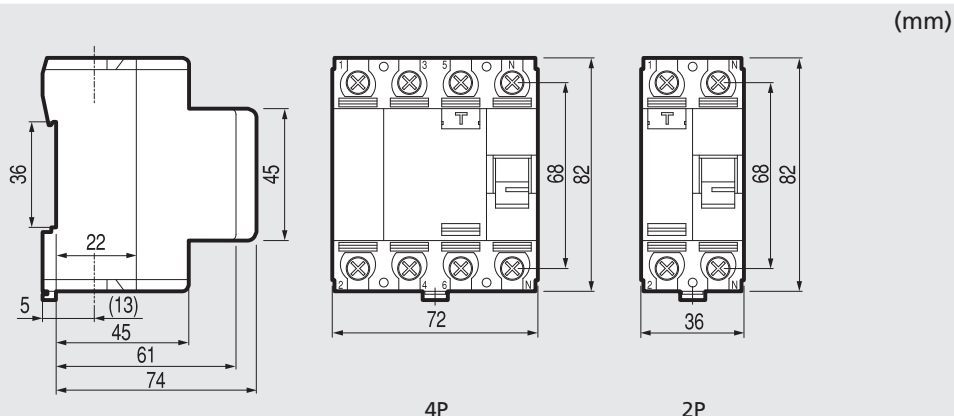
## APPROVAL

- CE marking
- CB Certificate

## COLORED HANDLES

- Black only.

# SPECIFICATIONS

Type	RK63
Protection	Ground fault
Rated current	25, 32, 40, 63A
Operating $I\Delta n$	30, 100, 300mA (non-adjustable)
Non operating $I\Delta n$	$0.5I\Delta n$
Number of poles	2, 4 pole
Rated voltage	240VAC (2P), 240/415VAC(4P)
Residual current off time	$\leq 0.1$ sec.
Standards	IEC61008
Approval	SEMKO CB scheme
Type of trip of grand fault	Electro-magnetic (No over current relay)
Conditional short circuit capacity ( $I_{nc}$ )	6kA
Rated making capacity ( $I_m$ )	500A for $I_n=25,32,40A$ 630A for $I_n=63A$
Electrical endurance	6,000 times
Installation	35mm DIN rail
Width	17.8mm per pole
Type of terminal	Lug type (Cable up to 35mm <sup>2</sup> )
Dimension	 <p style="text-align: right;">(mm)</p>

## MIN. SALES LOT

### ■ MCBs

Type		Min. sales lot (pcs.)
BK63 1P	BTK63 1P	120
BK63 2P	BTK63 2P	60
BK63 3P	BTK63 3P	40
BK63 4P	BTK63 4P	30

### ■ RCCBs

Type	Min. sales lot (pcs.)
RK63 2P	60
RK63 4P	30

# AIR CIRCUIT BREAKERS

## ORDERING ACB & Accessories

**AKH**

**10**

**D**

**3**

**10**

**J**

Type
AKH
AKS
AKN



		Ampere frame	
AKH	AKN	-	-
		06	630AF
		08	830AF
		10	1000AF
		13	1250AF
	AKS	20	2000AF

		Frame size & phase array	
D	3P/4P Standard type RST (N)	D	3P (D)
		W	4P (D, W)
W	4P Reverse phase type NRST	D	3P (E)
		W	4P (E, X)

		No. of pole	
3	3P (D)	D	3P (D)
		W	4P (D, W)
4	4P (E, X)	D	3P (E)
		W	4P (E, X)

		Rated current (CT Spec.)	
10	J	00	Without OCR & CT
		02	200A
		04	400A
		06	630A
		04	400A
		06	630A
		08	800A
		10	1000A
		13	1250A
		16	1600A
20	2000A		

		Connections	
		Draw-out type	
J	Manual connection	H	Horizontal type
		V	Vertical type
A	Automatic connection	M	Mixed type Line: Horizontal Load: Vertical
		N	Mixed type Line: Vertical Load: Horizontal
P	Front type		



		Ampere frame	
AKH	AKS	20	2000AF
		25	2500AF
		32	3200AF
		40	4000AF

		Frame size & phase array	
D	3P/4P Standard type RST (N)	D	3P (E)
		W	4P (E, X)
W	4P Reverse phase type NRST	D	3P (F)
		W	4P (F, Y)

		No. of pole	
3	3P (E)	D	3P (E)
		W	4P (E, X)
4	4P (E, X)	D	3P (F)
		W	4P (F, Y)

		Rated current (CT Spec.)	
10	J	06	630A
		08	800A
		10	1000A
		13	1250A
		16	1600A
		20	2000A
		25	2500A
		32	3200A
		40	4000A



		Ampere frame	
AKS		40	4000AF
		50	5000AF

		Frame size & phase array	
D	3P/4P Standard type RST(N)	D	3P (F)
		W	4P (F, Y)
W	4P Reverse phase type NRST	D	3P (G)
		W	4P (G, Z)

		No. of pole	
3	3P (F)	D	3P (F)
		W	4P (F, Y)
4	4P (F, Y)	D	3P (G)
		W	4P (G, Z)

		Rated current (CT Spec.)	
10	J	40	4000A
		50	5000A

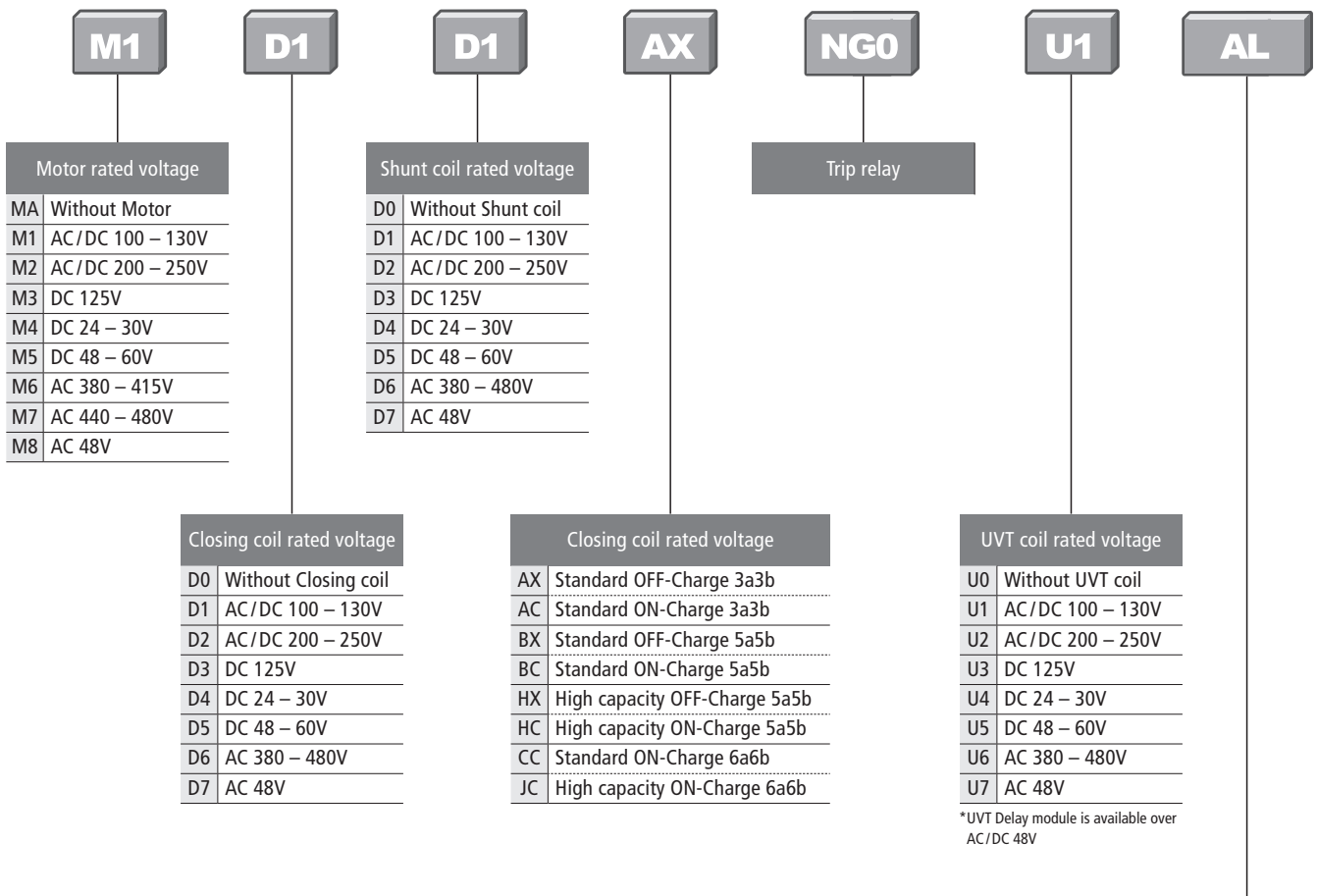


		Ampere frame	
AKH	AKS	40	4000AF
		50	5000AF
		63	6300AF

		Frame size & phase array	
D	3P/4P Standard type RST(N)	D	3P (G)
		W	4P (G, Z)
W	4P Reverse phase type NRST	D	3P (G)
		W	4P (G, Z)

		No. of pole	
3	3P (G)	D	3P (G)
		W	4P (G, Z)
4	4P (G, Z)	D	3P (G)
		W	4P (G, Z)

		Rated current (CT Spec.)	
10	J	40	4000A
		50	5000A
		63	6300A

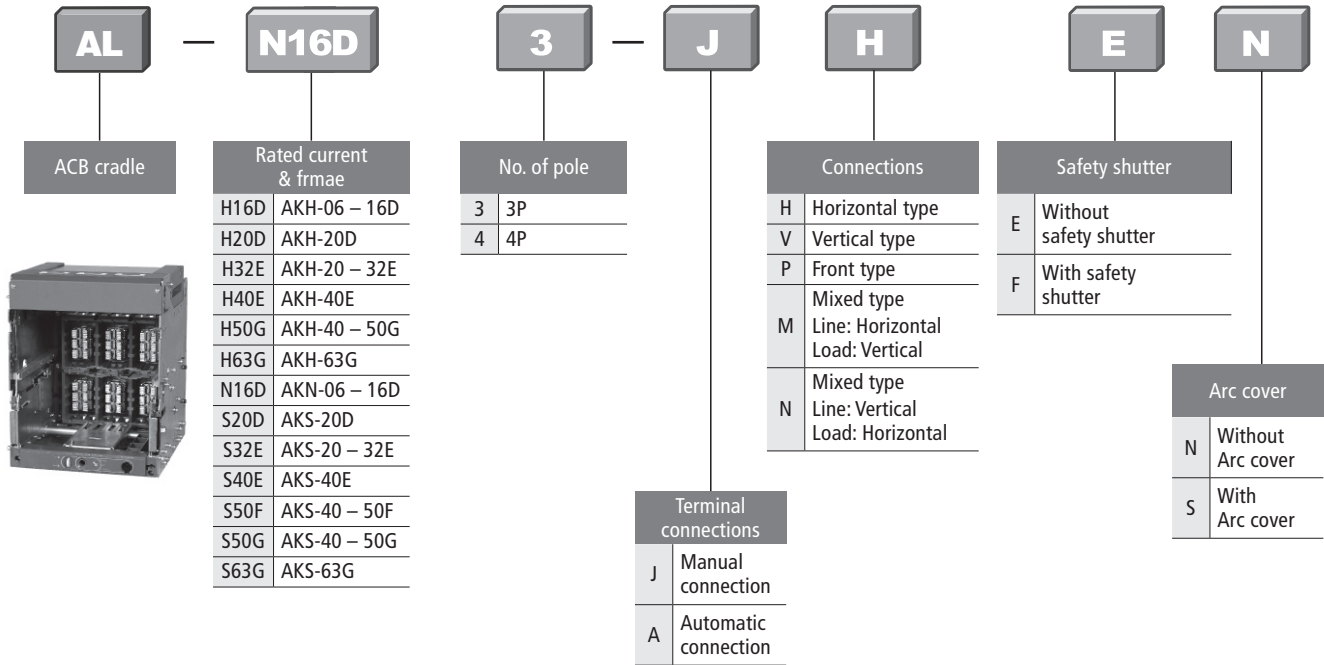


Accessories		
AL	AL1 + MRB	Trip alarm contact 1a + Manual reset button
A2	AL1 + AL2 + MRB	Trip alarm contact 2a + Manual reset button
A3	AL1 + MRB + RES (AC/DC 100 – 130V)	Trip alarm contact 1a + Manual reset button + Remote reset switch
A4	AL1 + MRB + RES (AC/DC 200 – 250V)	Trip alarm contact 1a + Manual reset button + Remote reset switch
A5	AL1 + MRB + Auto reset	AL + Auto reset type
A6	AL1 + AL2 + MRB + Auto reset	A2+ Auto reset type
A7	AL1 + MRB + RES (AC/DC 100 – 130V) + Auto reset	A3 + Auto reset type
A8	AL1 + MRB + RES (AC/DC 200 – 250V) + Auto reset	A4 + Auto reset type
C	C	Counter
S	CS2	Charge switch communication
B	B	ON/OFF button lock
M	MI	Mechanical Interlock
D	DI or MOC	Door Interlock or Mechanical Operated Cell Switch
K	K1	Key Lock
K2	K2	Key Interlock set
K3	K3	Key Lock double
R	RCS	Ready to close switch
T	TM	Temperature Alarm
H 1)	SHT2	Double Shut Coil

Note) 1. UVT and SHT2 are alternative.  
2. Other accessories should be ordered separately.

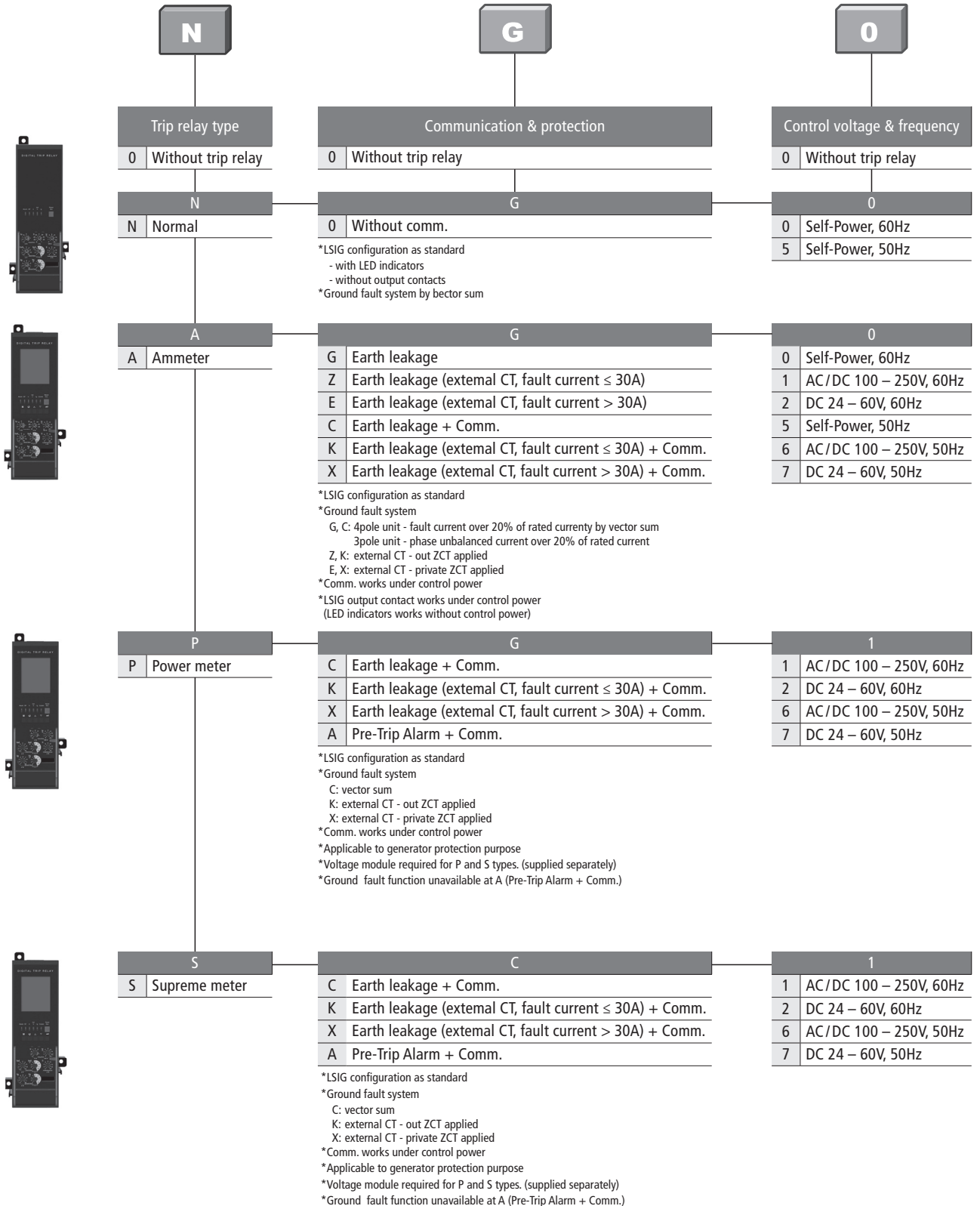
# ORDERING

## Cradle



# ORDERING

## Trip relay




Note) The function like Metering, Communication, ZSI, Remote Reset and DO control are not available only under Self-Power condition.

# RATINGS

## AKH series



Type			AKH-06D	AKH-08D	AKH-10D	AKH-13D	AKH-16D	AKH-20D
Ampere frame	(AF)		630	800	1000	1250	1600	2000
Rated current (A)	(in max)	at 40°C	200	400				
			400	630	1000	1250	1600	2000
			630	800				
Setting current (A)*	Control trip relay (... x in max)		(0.4 – 1.0) x in max					
Rated current of neutral pole (A)			400	400	1000	1250	1600	2000
			630	630				
				800				
Rated insulation voltage (V)	(Ui)		1,000					
Rated operating voltage (V)	(Ue)		690					
Rated impulse withstand voltage (kV)	(Uimp)		12					
Frequency (Hz)			50 / 60					
Number of poles (P)			3, 4					
Rated breaking capacity (kA sym) AC 50/60Hz	(Icu)	IEC 60947-2	220V/230V/380V/415V			85		
		JISC 8201-2-1	460V/480V/500V			85		
			550V/600V/690V			65		
Rated service breaking capacity (kA)	(Ics)		...% x Icu			100%		
Rated making capacity (kA peak) AC 50/60Hz	(Icm)	IEC 60947-2	220V/230V/380V/415V			187		
		JISC 8201-2-1	460V/480V/500V			187		
			550V/600V/690V			143		
Rated short-time withstand current (kA)	(Icw)		1 sec			65		
			2 sec			60		
			3 sec			50		
Operating time (ms)		Maximum total breaking time			40			
		Maximum closing time			80			
Life cycle (time)	Mechanical	Without maintenance			20,000			
		With maintenance			30,000			
	Electrical	Without maintenance			5,000			
		With maintenance			10,000			
Connections**	Draw-out / Fixed	Horizontal connection		●				-
		Vertical connection		○				●
		Front connection		○				-
		Mixed connection		○				-
Weight (kg) (3P/4P)	Draw-out type	Main body (With cradle)	Motor charging type		63/74		70/85	
			Manual charging type		61/72		68/83	
		Cradle only				29/32		33/40
	Fixed type	Motor charging type		34/44		38/47		
		Manual charging type		32/42		36/45		
External dimensions (mm) (H x W x D)		Draw-out type	3P		430 x 334 x 375			
			4P		430 x 419 x 375			
		Fixed type	3P		300 x 300 x 295			
			4P		300 x 385 x 295			
Trip relay			N, A, P, S type					
Certificate & Approval			KEMA					

\*Refer to trip relay specification. \*\*●: Standard, ○: Option





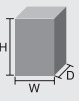
AKH-06E	AKH-08E	AKH-10E	AKH-13E	AKH-16E	AKH-20E	AKH-25E	AKH-32E	AKH-40E
630	800	1000	1250	1600	2000	2500	3200	4000
630	800	1000	1250	1600	2000	2500	3200	4000
(0.4 – 1.0) x In max								
630	800	1000	1250	1600	2000	2500	3200	4000
1,000								
690								
12								
50/60								
3, 4								
100								
100								
85								
100%								
220								
220								
187								
85								
75								
65								
40								
80								
15,000								
20,000								
5,000								
10,000								
●								○
○								●
○								-
○								-
87/103								104/147
85/101								102/145
44/55								58/70
44/55								63/100
42/53								61/98
430 x 412 x 375								
430 x 527 x 375								
300 x 378 x 295								
300 x 493 x 295								
N, A, P, S type								
KEMA								

AKH-40G	AKH-50G	AKH-63G
4000	5000	6300
4000	5000	6300
(0.4 – 1.0) x In max		
4000	5000	6300
1,000		
690		
12		
50/60		
3, 4		
150		
150		
100		
100%		
330		
330		
220		
100		
100		
100		
40		
80		
10,000		
15,000		
2,000		
5,000		
○		○
●		●
-		-
-		-
181/223		186/230
179/221		184/228
97/117		102/124
98/123		103/130
96/121		101/128
460 x 785 x 375		
460 x 1,015 x 375		
300 x 751 x 295		
300 x 981 x 295		
N, A, P, S type		
KEMA		

# RATINGS

## AKN·AKS series



Type			AKN-06D	AKN-08D	AKN-10D	AKN-13D	AKN-16D	AKS-20D
Ampere frame	(AF)		630	800	1000	1250	1600	2000
Rated current (A)	(in max)	at 40°C	200	400				
			400	630	1000	1250	1600	2000
			630	800				
Setting current (A)*	Control trip relay (... x in max)		(0.4 – 1.0) x in max					
Rated current of neutral pole (A)			400	400	1000	1250	1600	2000
			630	630				
				800				
Rated insulation voltage (V)	(Ui)		1,000					
Rated operating voltage (V)	(Ue)		690					
Rated impulse withstand voltage (kV)	(Uimp)		12					
Frequency (Hz)			50/60					
Number of poles (P)			3, 4					
Rated breaking capacity (kA sym) AC 50/60Hz	(Icu)	IEC 60947-2	220V/230V/380V/415V		65			70
		JISC 8201-2-1	460V/480V/500V		65			70
			550V/600V/690V		50			65
Rated service breaking capacity (kA)	(Ics)		...% x Icu		100%			100%
Rated making capacity (kA peak) AC 50/60Hz	(Icm)	IEC 60947-2	220V/230V/380V/415V		143			154
		JISC 8201-2-1	460V/480V/500V		143			154
			550V/600V/690V		105			143
Rated short-time withstand current (kA)	(Icw)		1 sec		50			65
			2 sec		42			55
			3 sec		36			50
Operating time (ms)			Maximum total breaking time		40			
			Maximum closing time		80			
Life cycle (time)	Mechanical		Without maintenance		20,000			
			With maintenance		30,000			
	Electrical		Without maintenance		5,000			
			With maintenance		10,000			
Connections**	Draw-out / Fixed		Horizontal connection		●			-
			Vertical connection		○			●
			Front connection		○			-
			Mixed connection		○			-
Weight (kg) (3P/4P)	Draw-out type	Main body (With cradle)	Motor charging type		63/74			70/85
			Manual charging type		61/72			68/83
		Cradle only		29/32			33/40	
	Fixed type		Motor charging type		34/44			38/47
			Manual charging type		32/42			36/45
External dimensions (mm) (H x W x D)		Draw-out type	3P		430 x 334 x 375			
			4P		430 x 419 x 375			
		Fixed type	3P		300 x 300 x 295			
			4P		300 x 385 x 295			
Trip relay			N, A, P type					
Certificate & Approval			KEMA					

\*Refer to trip relay specification. \*\*●: Standard, ○: Option



AKS-20E	AKS-25E	AKS-32E	AKS-40E
2000	2500	3200	4000
630, 800 1000, 1250 1600, 2000	2500	3200	4000
(0.4 – 1.0) x In max			
630, 800 1000, 1250 1600, 2000	2500	3200	4000
1,000			
690			
12			
50/60			
3, 4			
85			
85			
85			
100%			
187			
187			
187			
85			
75			
65			
40			
80			
15,000			
20,000			
5,000			
10,000			
●		○	
○		●	
○		-	
○		-	
87/103		104/147	
85/101		102/145	
44/50		58/70	
44/55		63/100	
42/53		61/98	
430 x 412 x 375			
430 x 527 x 375			
300 x 378 x 295			
300 x 493 x 295			
N, A, P type			
KEMA			

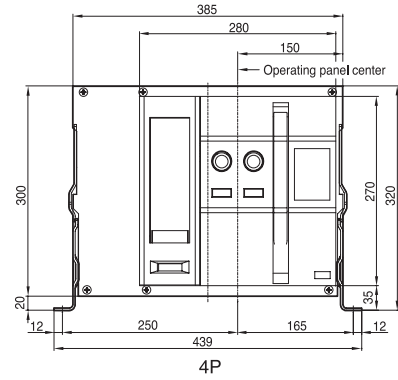
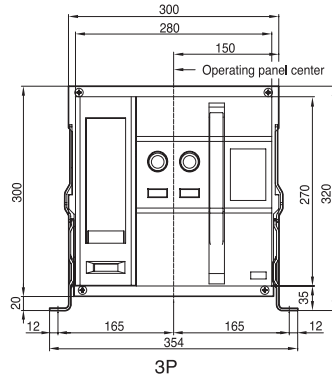
AKS-50F	
4000	5000
4000	5000
(0.4 – 1.0) x In max	
4000	5000
1,000	
690	
12	
50/60	
3, 4	
100	
100	
85	
100%	
220	
220	
187	
85	
75	
65	
40	
80	
10,000	
15,000	
2,000	
5,000	
○	
●	
-	
-	
145/173	
143/171	
78/90	
76/94	
74/92	
460 x 629 x 375	
460 x 799 x 375	
300 x 597 x 295	
300 x 767 x 295	
N, A, P type	
KEMA	

AKS-40G	AKS-50G	AKS-63G
4000	5000	6300
4000	5000	6300
(0.4 – 1.0) x In max		
4000	5000	6300
1,000		
690		
12		
50/60		
3, 4		
120		
120		
100		
100%		
264		
264		
220		
100		
90		
85		
40		
80		
10,000		
15,000		
2,000		
5,000		
○		
●		
-		
-		
181/223		186/230
179/221		184/228
97/117		102/124
98/123		103/130
96/121		101/128
460 x 785 x 375		
460 x 1,015 x 375		
300 x 751 x 295		
300 x 981 x 295		
N, A, P type		
KEMA		

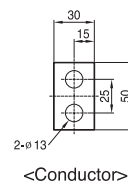
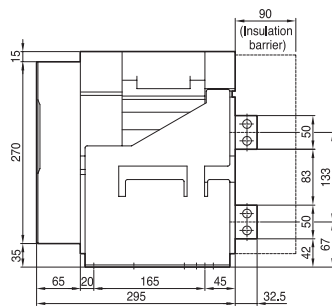
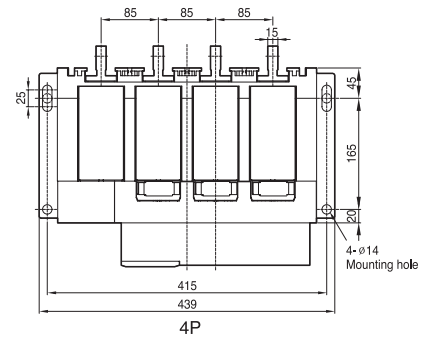
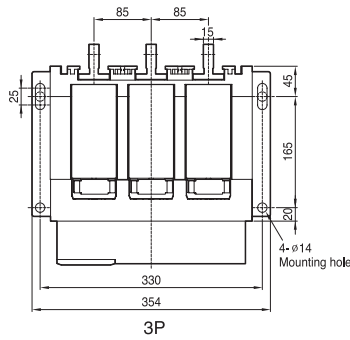
## Fixed type 2000AF

630 – 1600A:  
AKH/AKN/AKS-06 – 16D

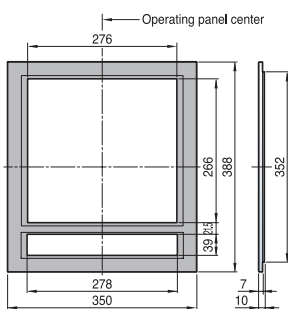
### Front view



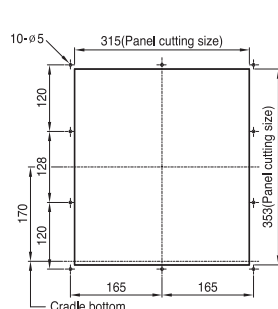
### Vertical type



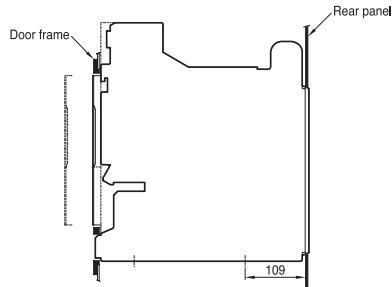
### Door Frame: DF (AKH/AKN/AKS-D/E)



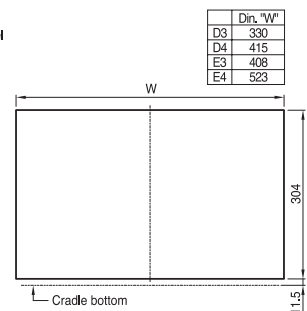
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<Mounting hole>



<Side hole>

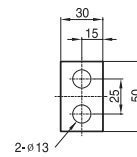
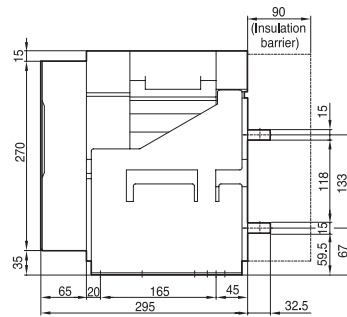
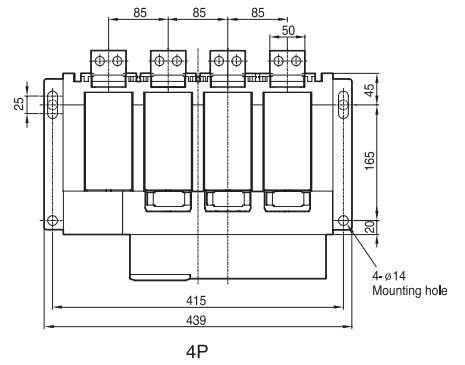
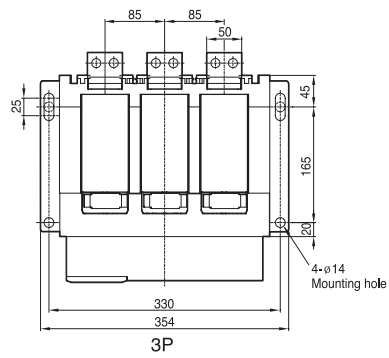


<Panel cutting >

	Din. "W"
D3	330
D4	415
E3	408
E4	523

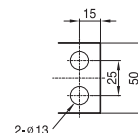
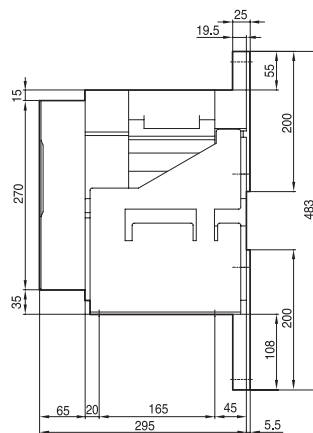
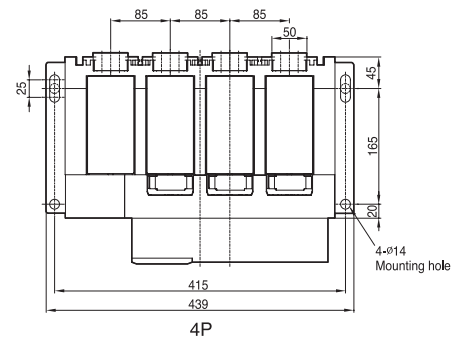
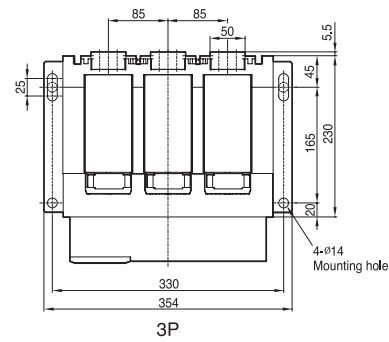
Note) The dimensions are for drawout type.

## Horizontal type



<Conductor>

## Front connection type

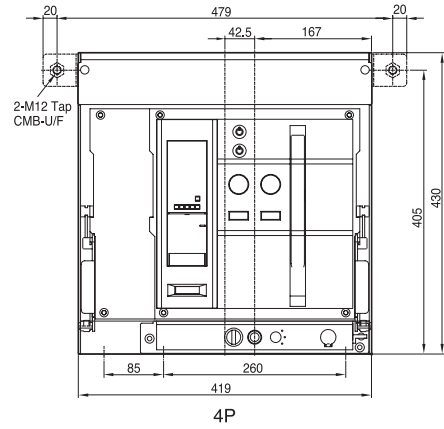
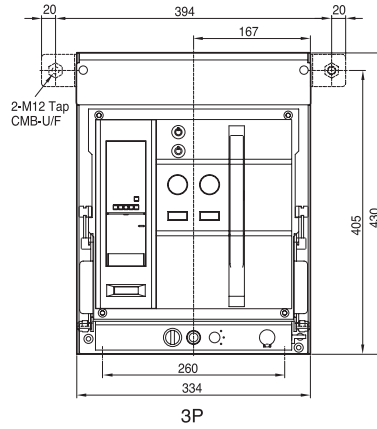


<Conductor>

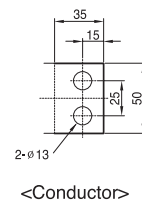
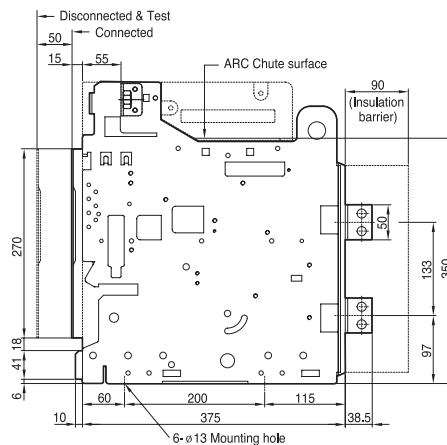
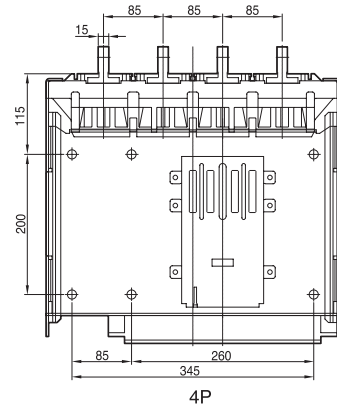
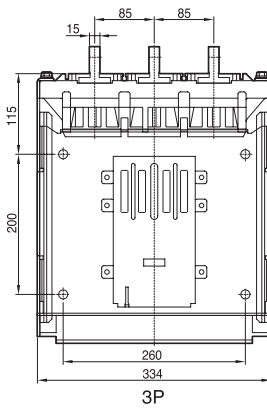
# Draw-out type 2000AF

630 – 1600A:  
AKH/AKN/AKS-06 – 16D

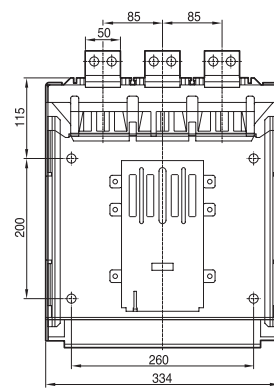
## Front view



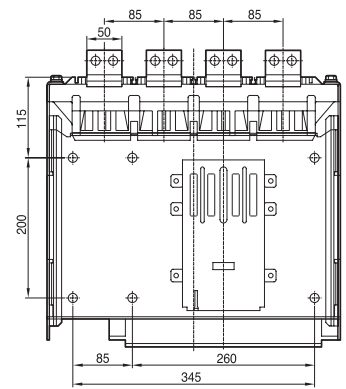
## Vertical type



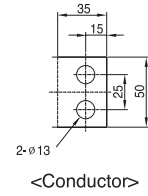
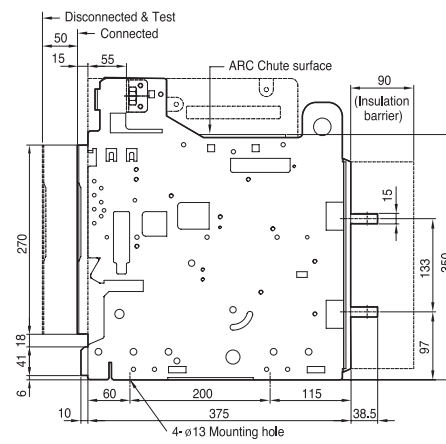
## Horizontal type



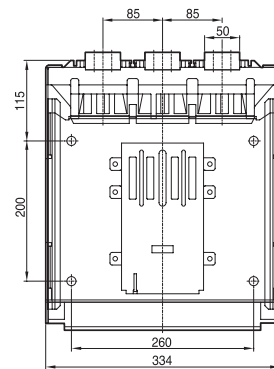
3P



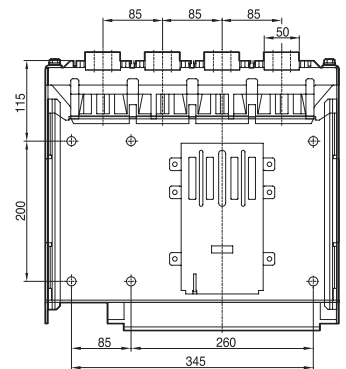
4P



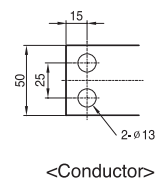
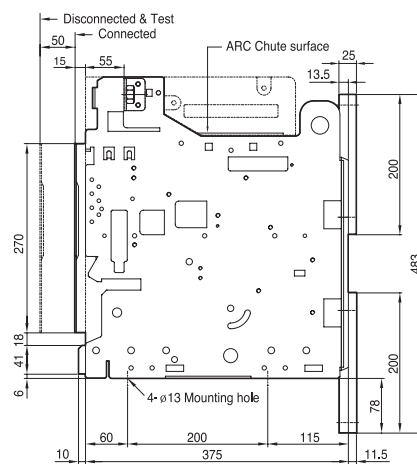
## Front connection type



3P



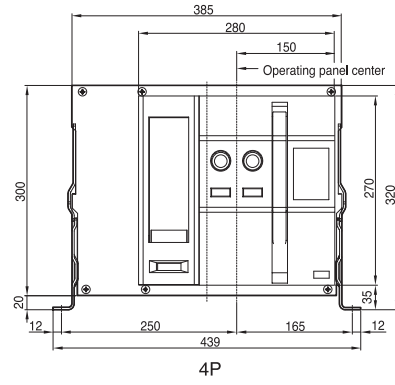
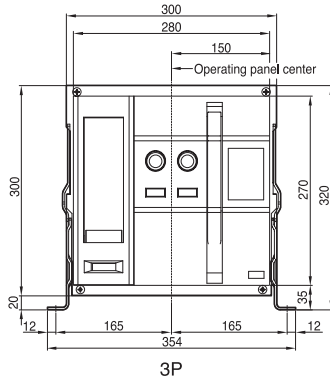
4P



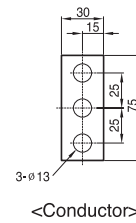
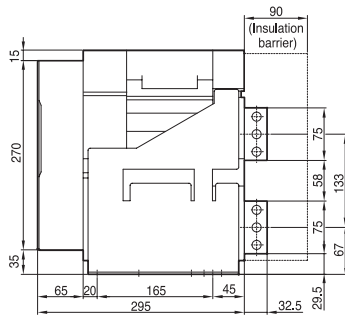
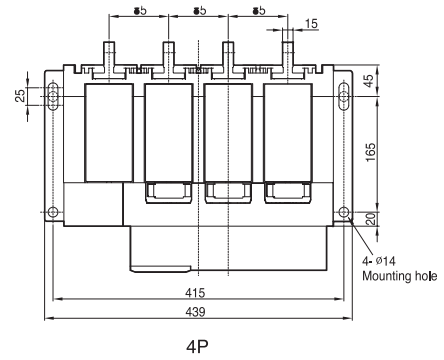
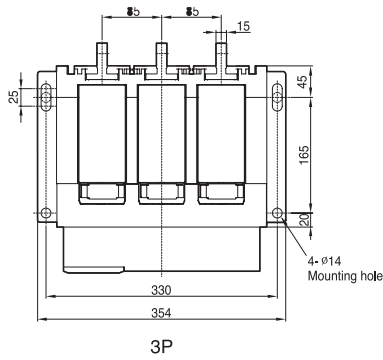
# Fixed type 2000AF

2000A:  
AKH / AKS-20D

## Front view



## Vertical type

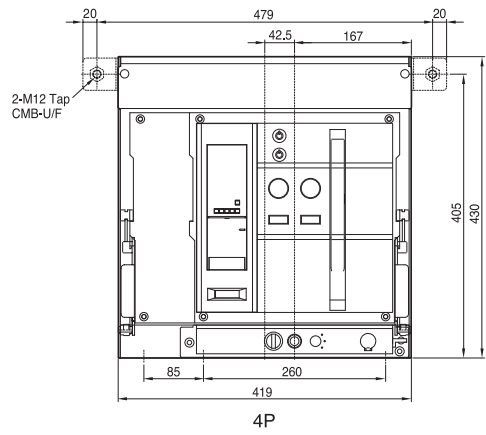
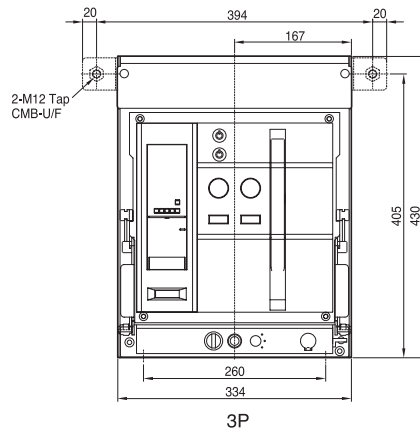




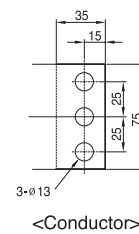
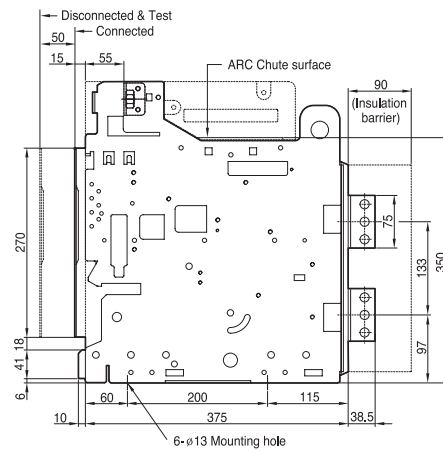
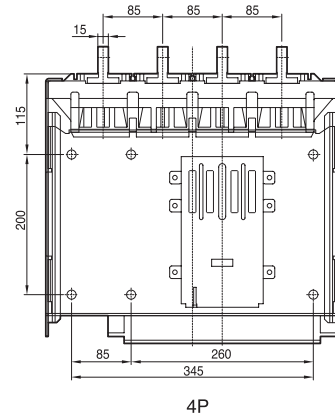
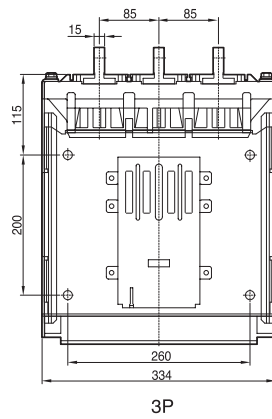
# Draw-out type 2000AF

2000A:  
AKH / AKS-20D

Front view



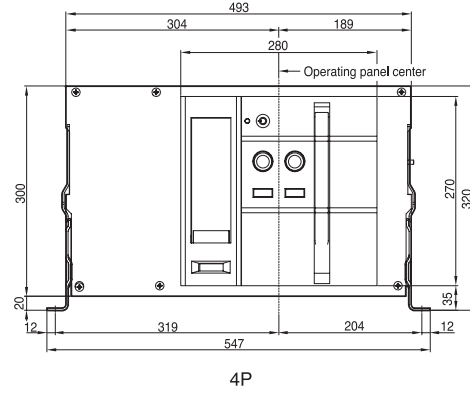
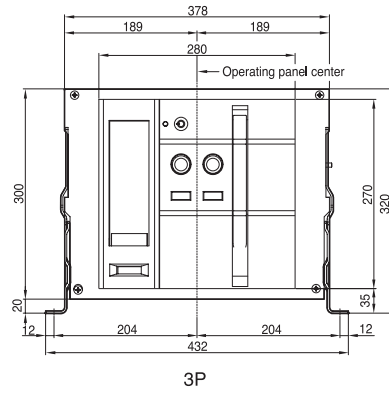
Vertical type



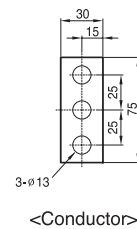
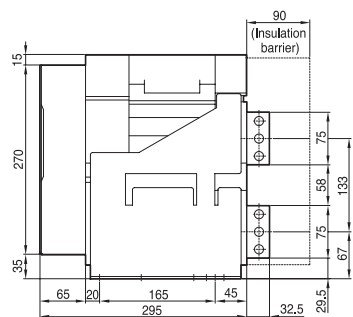
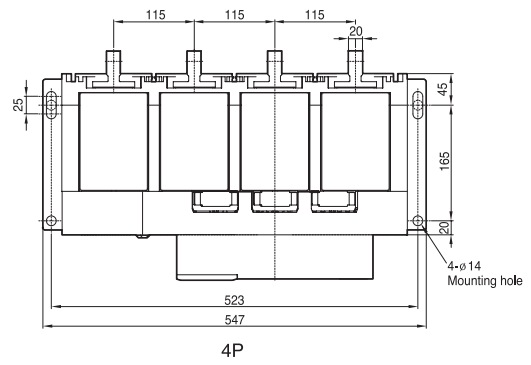
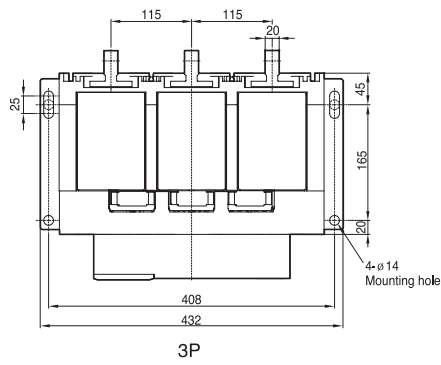
# Fixed type 4000AF

2000 – 3200A:  
AKH/AKN/AKS-20 – 32E

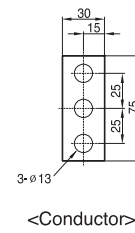
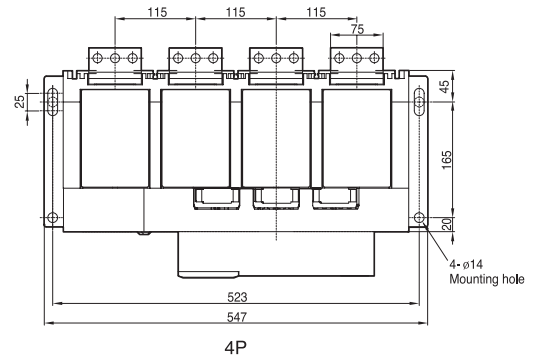
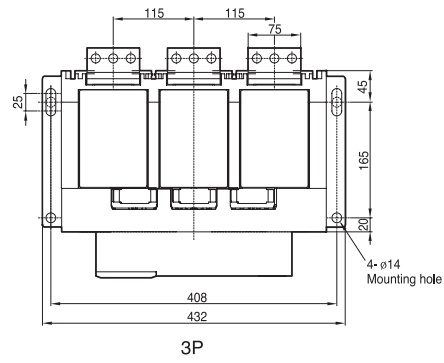
## Front view



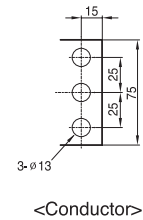
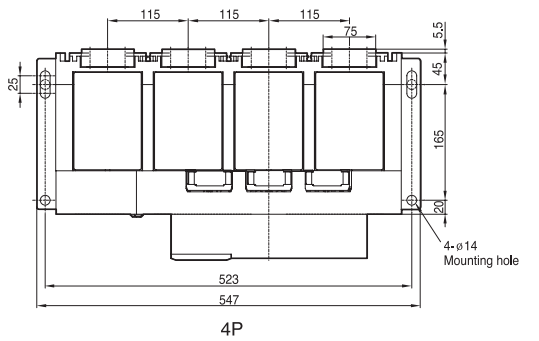
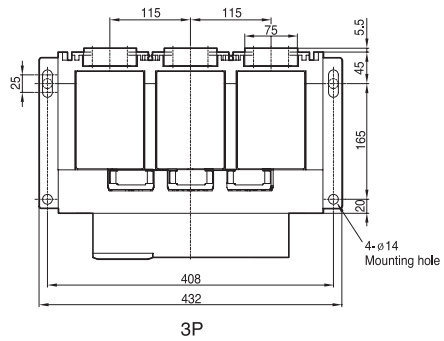
## Vertical type



## Horizontal type



## Front connection type

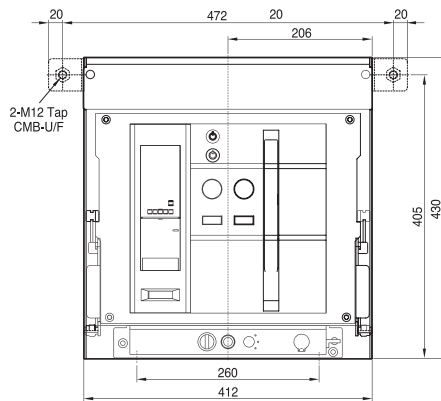


# Draw-out type 4000AF

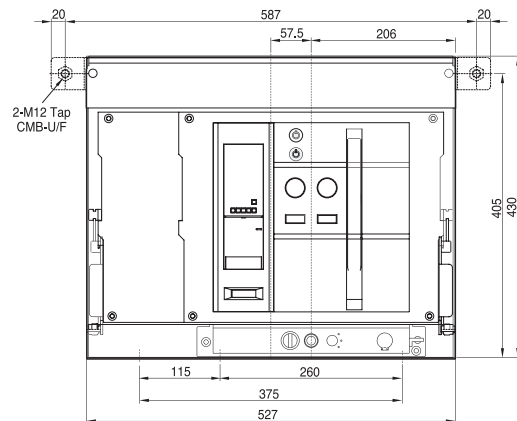
2000 – 3200A:

AKH/AKN/AKS-20 – 32E

## Front view

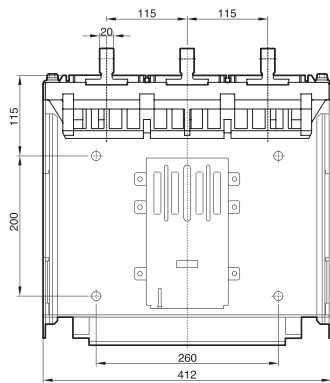


3P

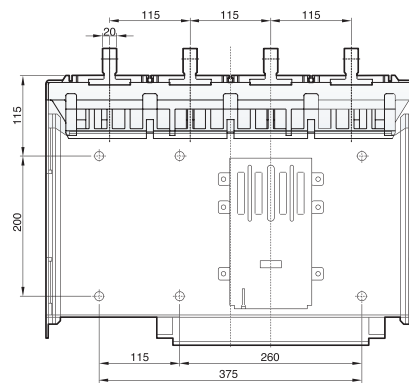


4P

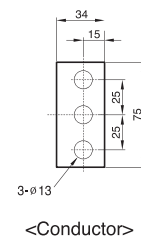
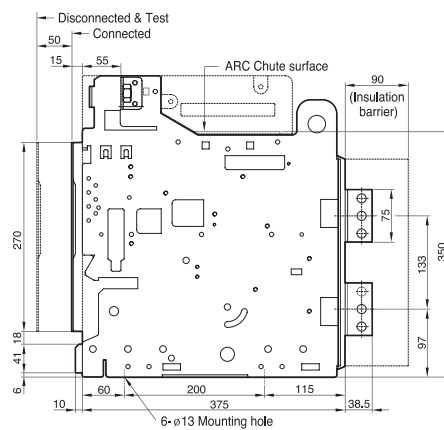
## Vertical type



3P



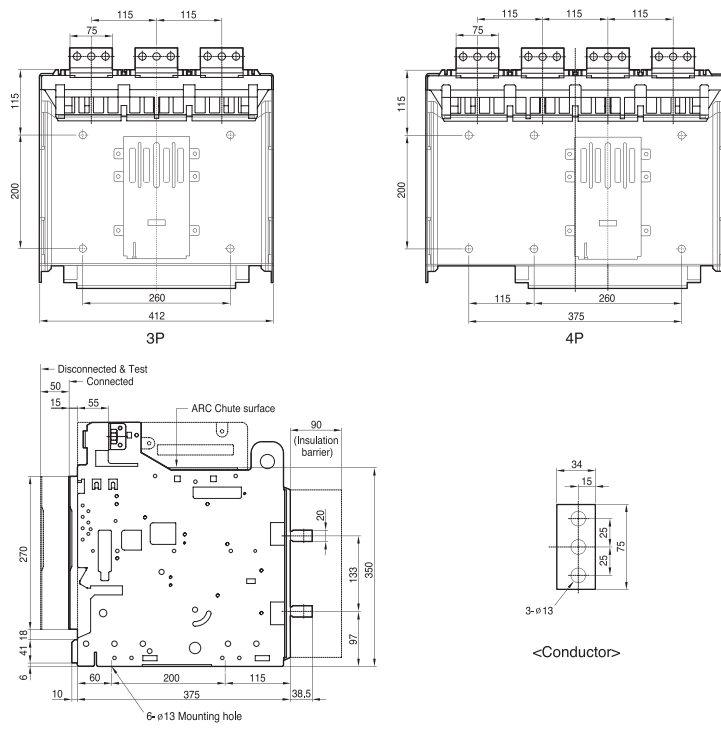
4P



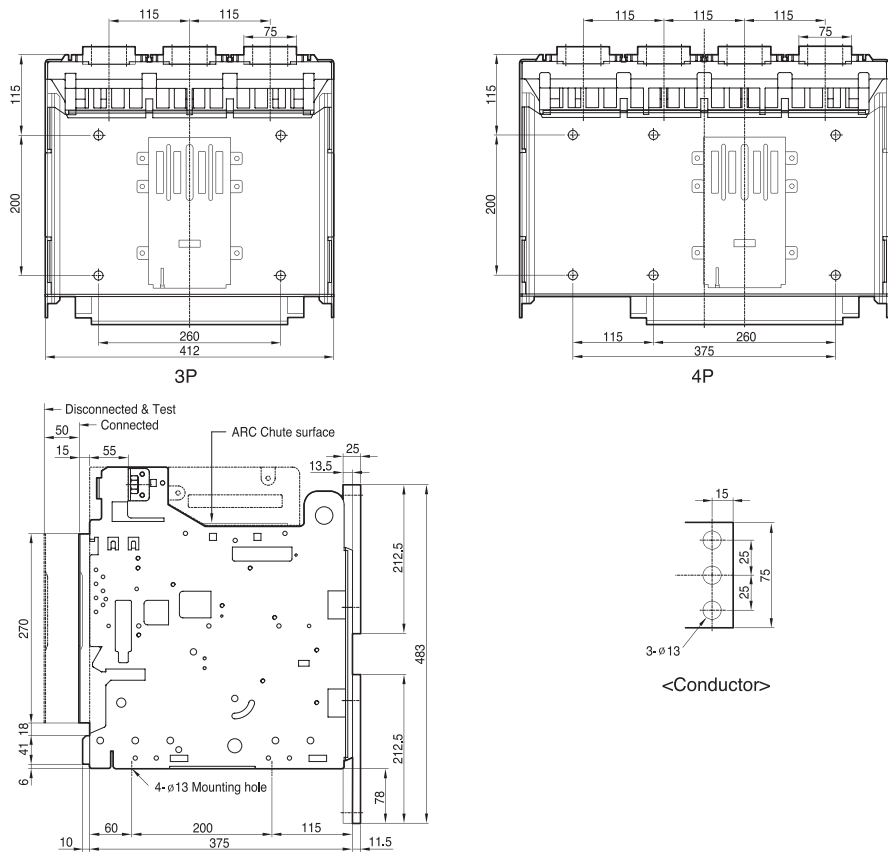
3-φ13

<Conductor>

## Horizontal type



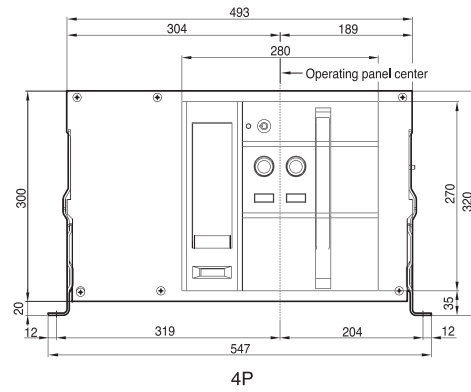
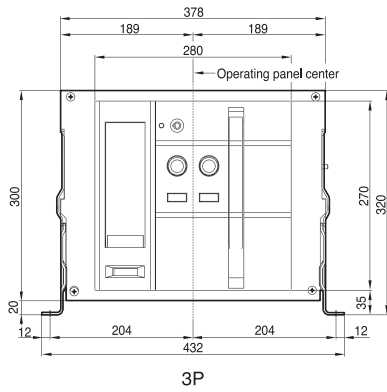
## Front connection type



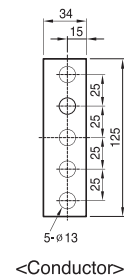
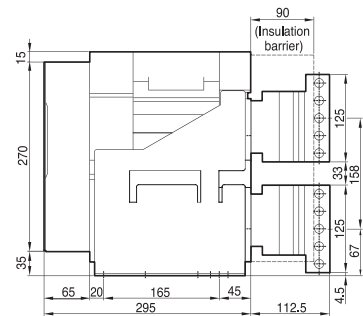
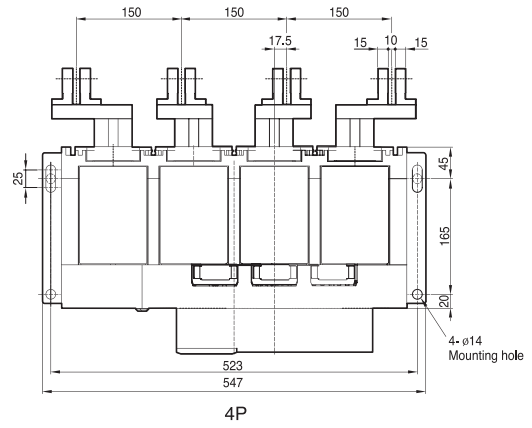
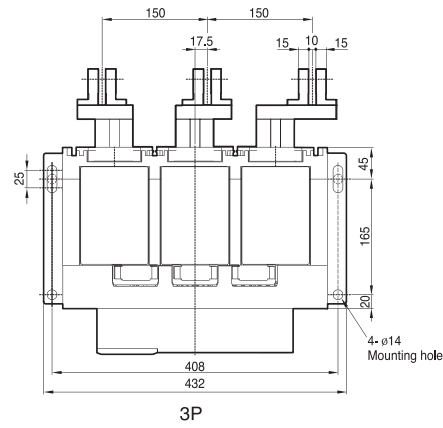
# Fixed type 4000AF

4000A:  
AKH / AKS-40E

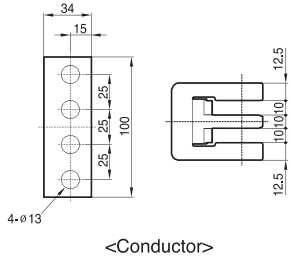
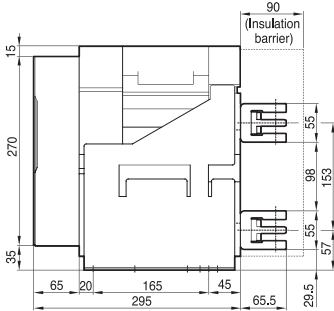
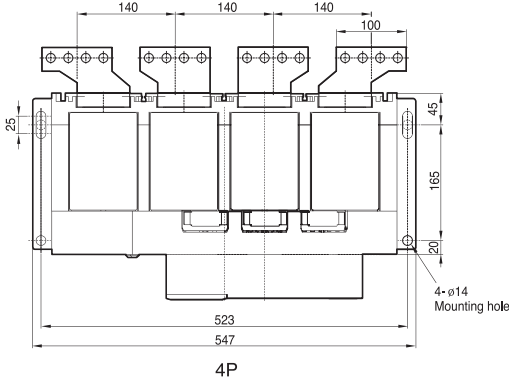
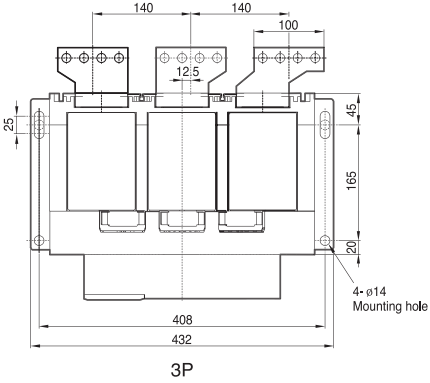
## Front view



## Vertical type



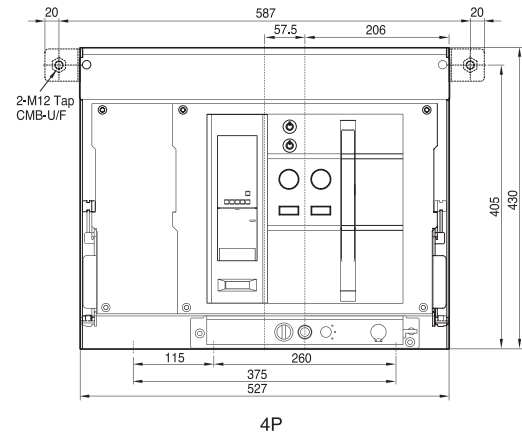
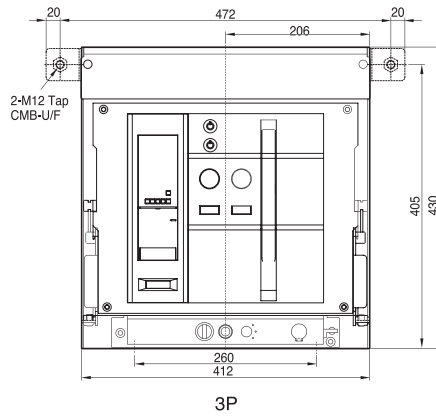
# Horizontal type



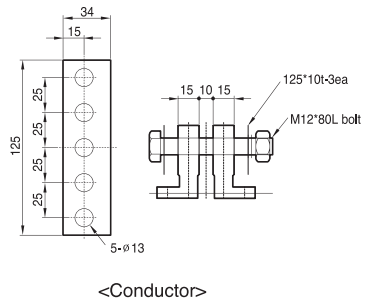
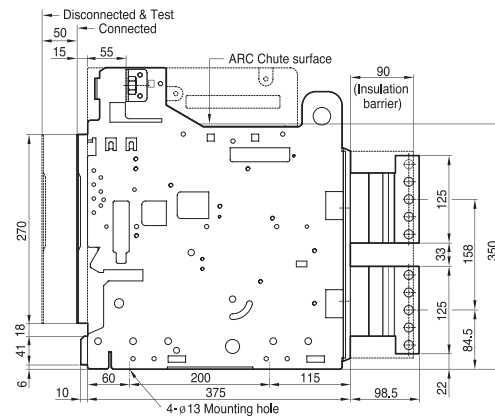
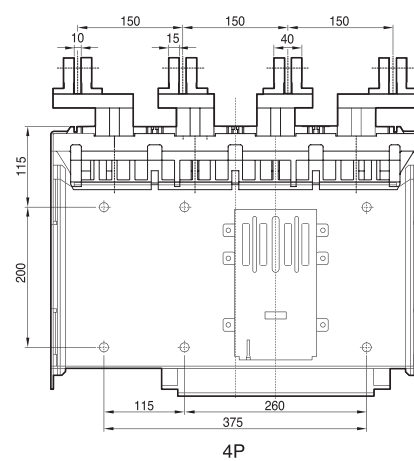
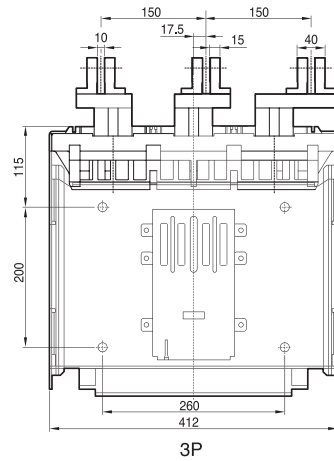
# Draw-out type 4000AF

4000A:  
AKH / AKS-40E

## Front view

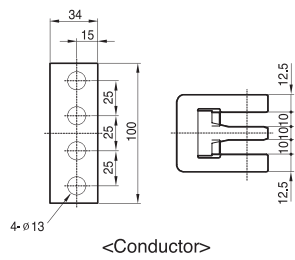
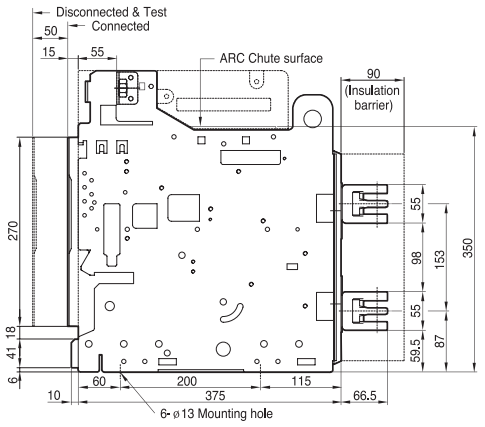
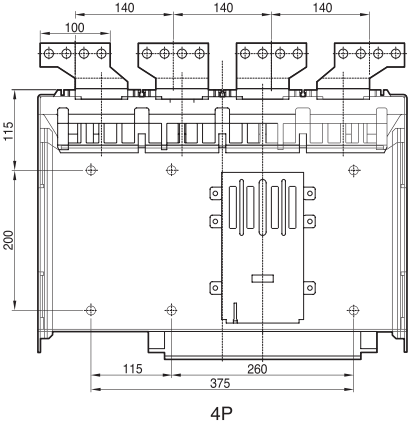
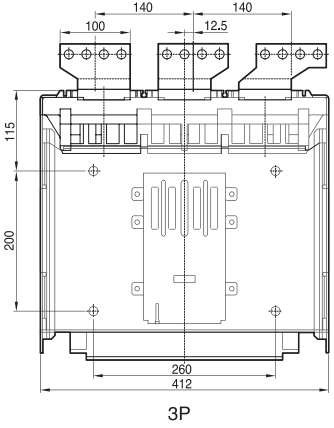


## Vertical type





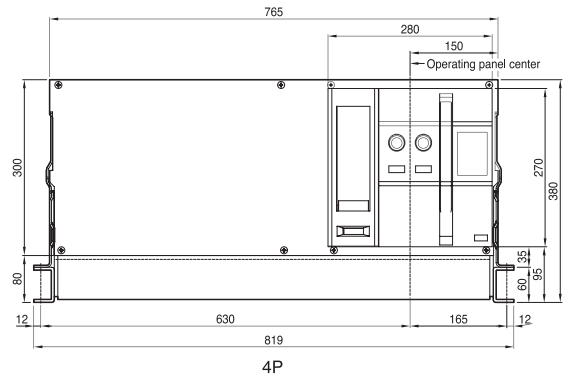
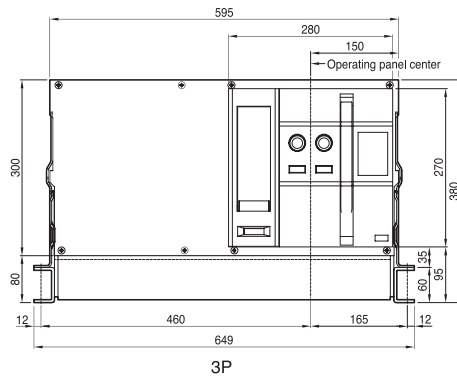
Horizontal type



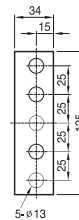
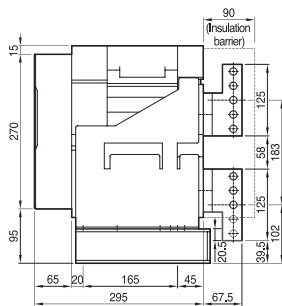
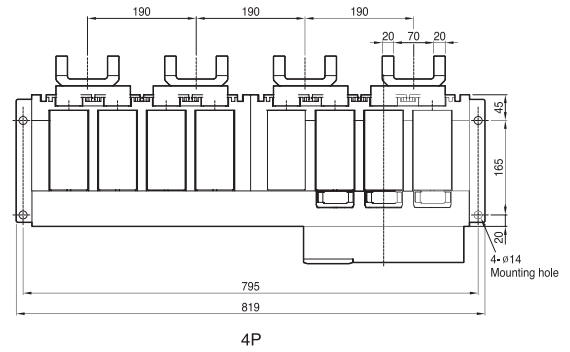
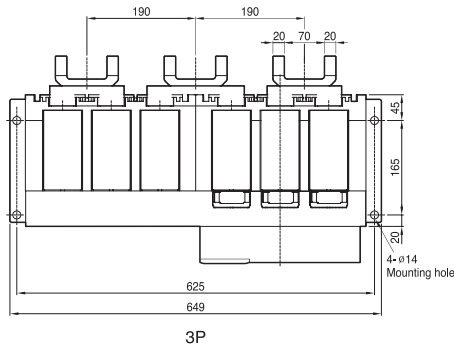
# Fixed type 5000AF

4000 – 5000A:  
AKS-40 – 50F

## Front view

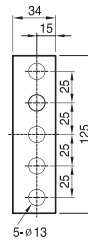
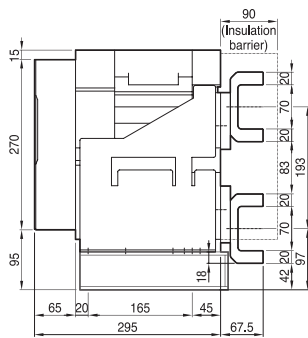
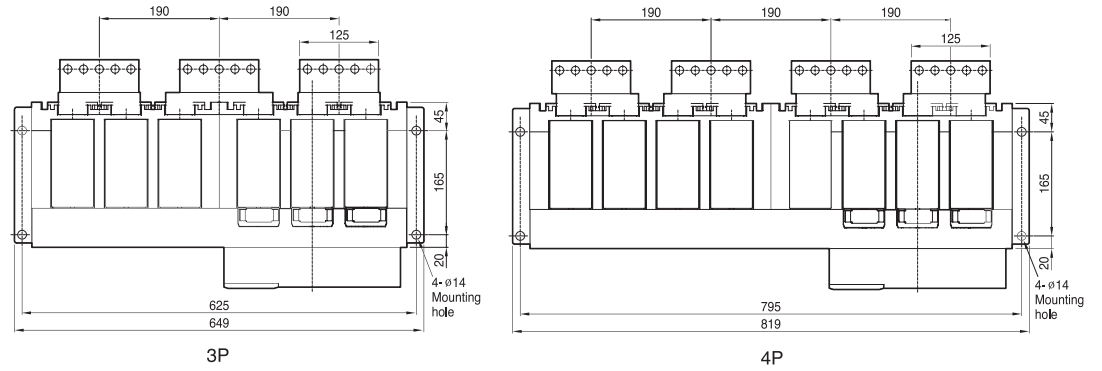


## Vertical type



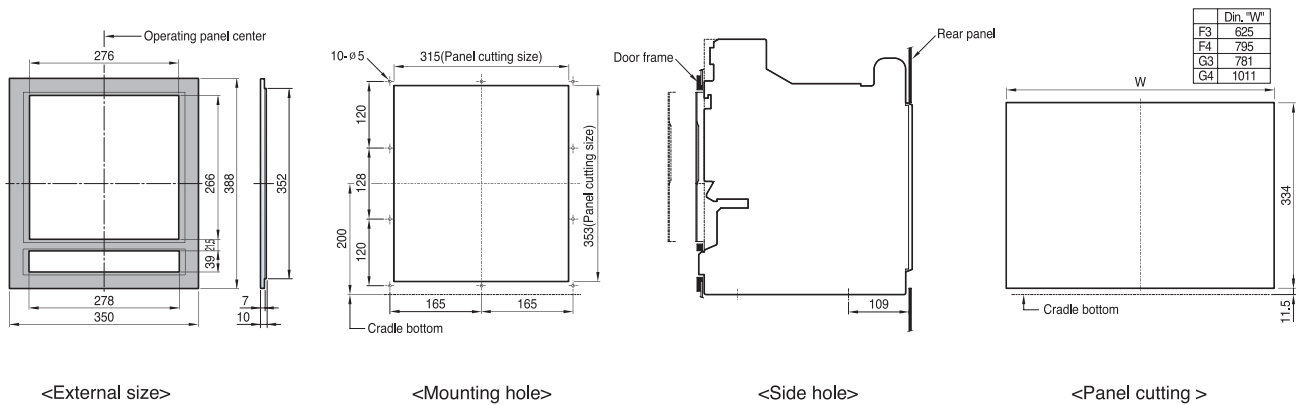
<Conductor>

## Horizontal type



<Conductor>

## Door Frame: DF (AKH-G, AKS-F)

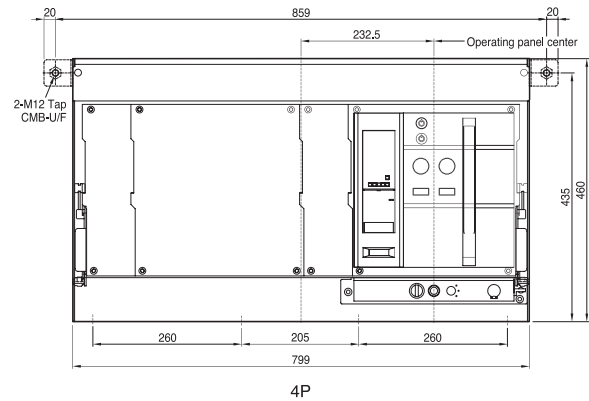
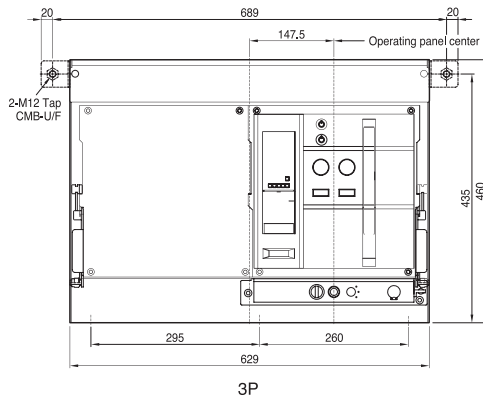


Note) The dimensions are for drawout type.

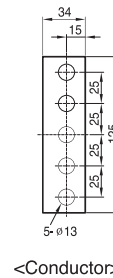
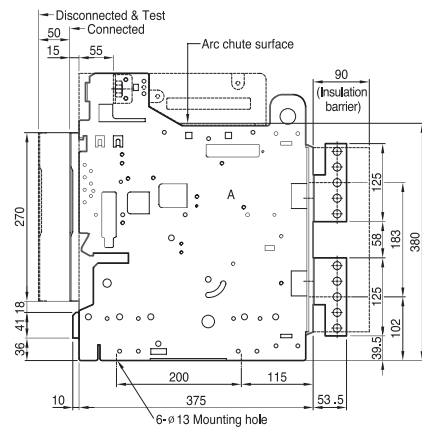
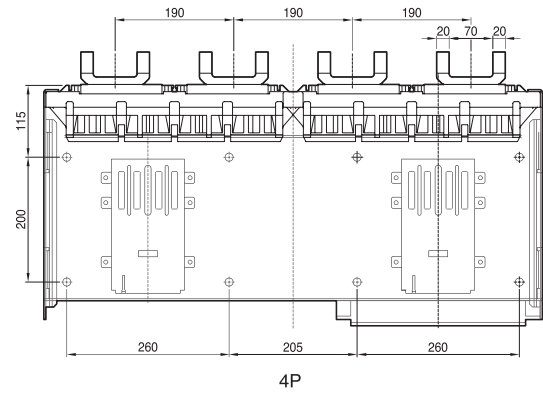
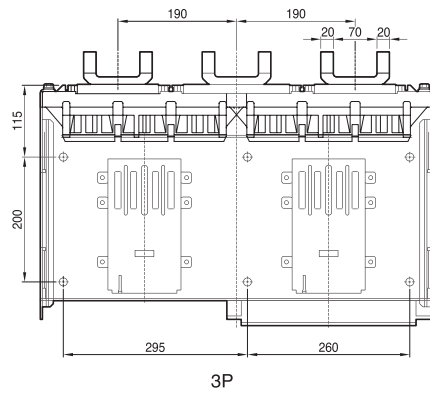
# Draw-out type 5000AF

4000 – 5000A:  
AKS-40 – 50F

## Front view



## Vertical type



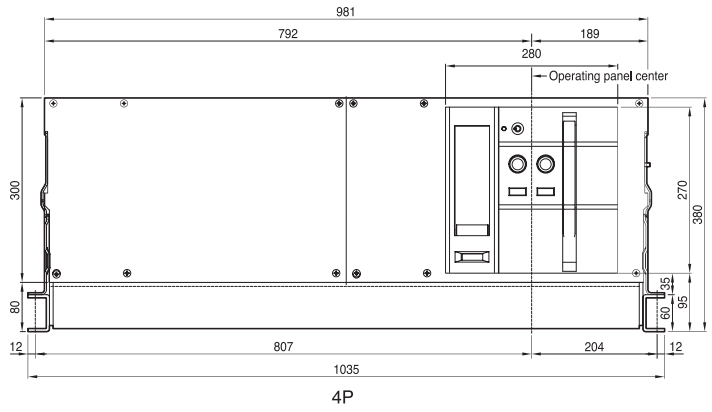
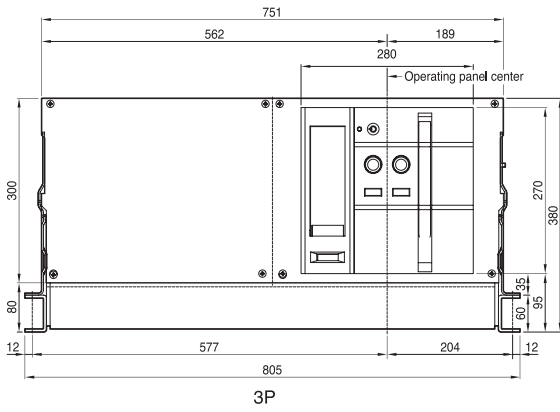
<Conductor>



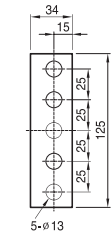
# Fixed type 6300AF

4000 – 6300A:  
AKH/AKS-40 – 50G

## Front view

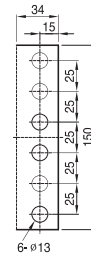


4000A – 5000A



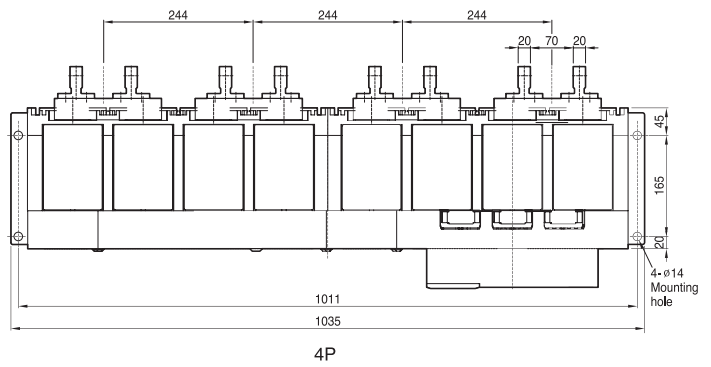
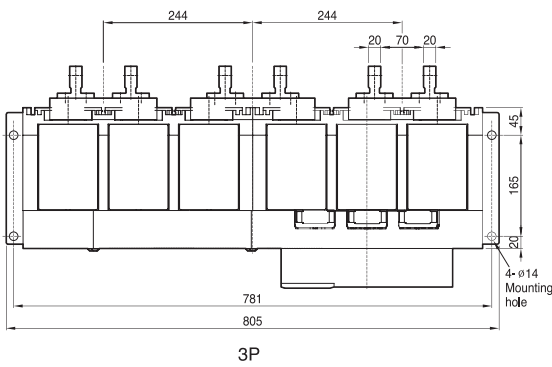
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6300A

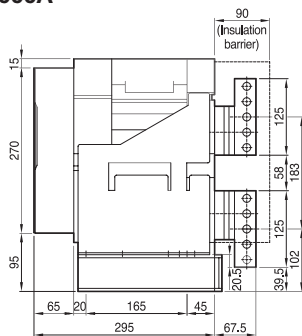


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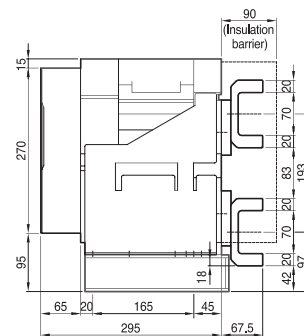
## Vertical type



4000A – 5000A

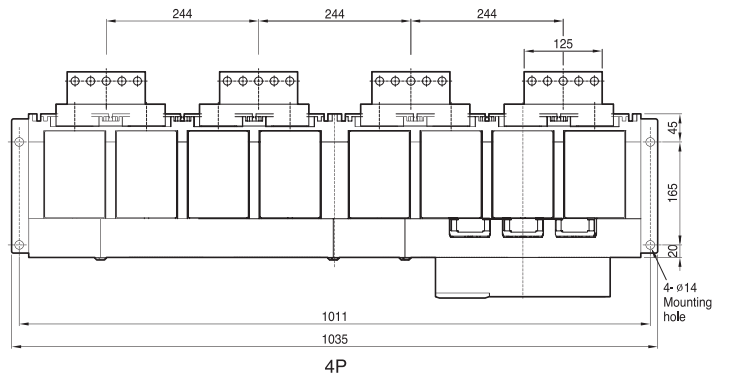
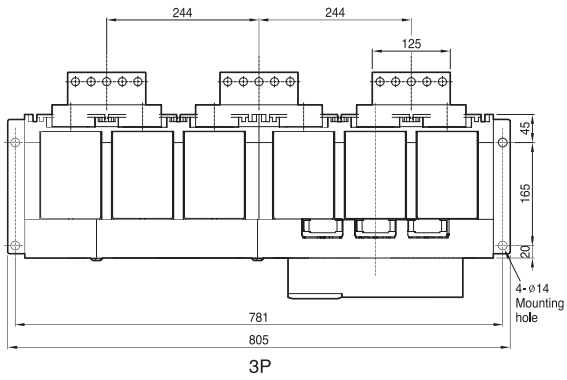


6300A

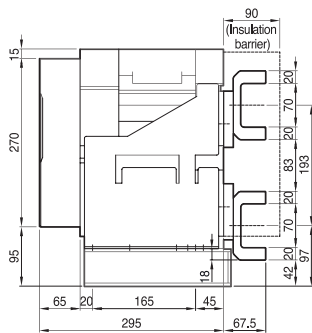
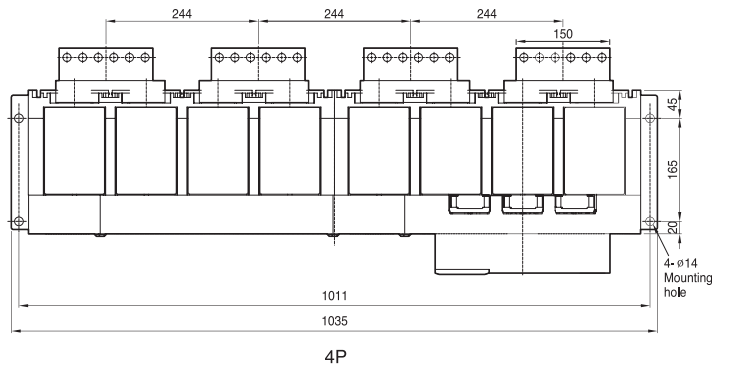
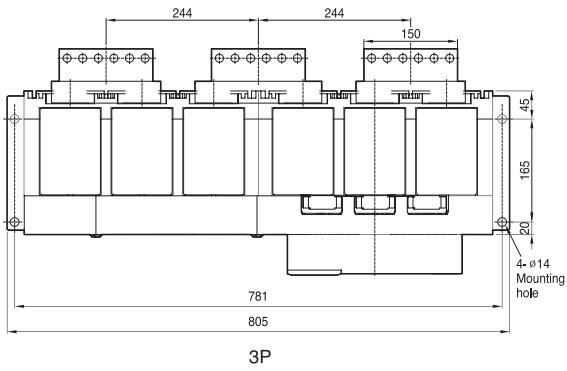


## Horizontal type

### 4000A – 5000A



### 6300A

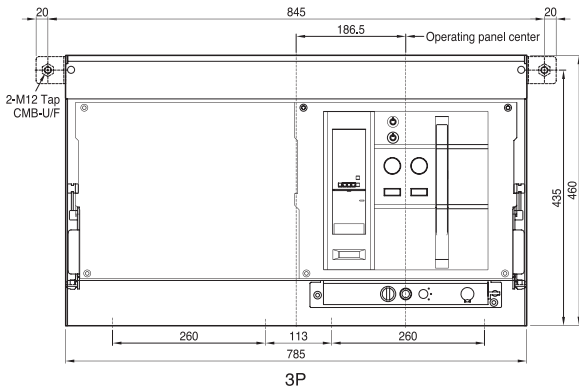


# Draw-out type 6300AF

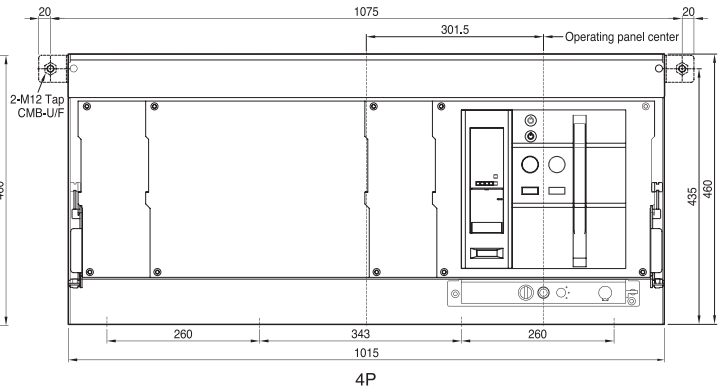
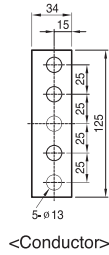
4000 – 6300A:

AKH/AKS-40 – 50G

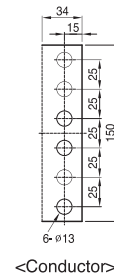
## Front view



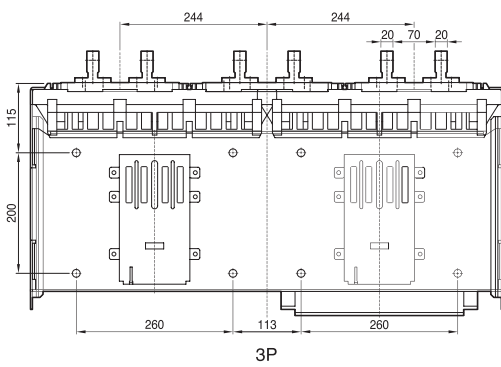
4000A – 5000A



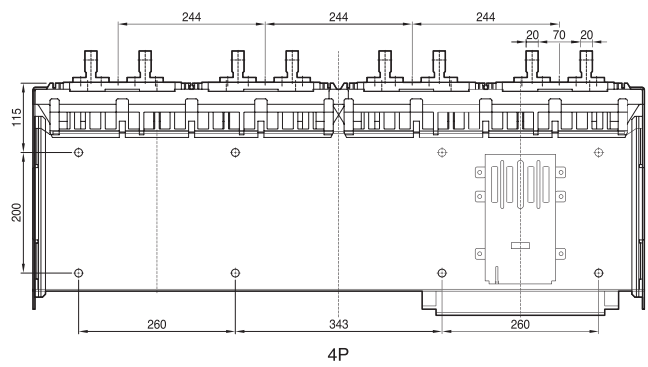
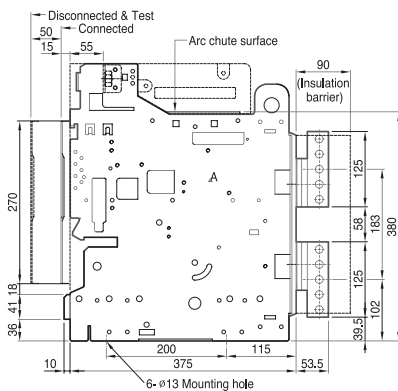
6300A



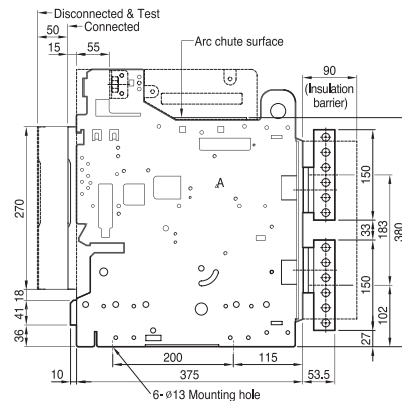
## Vertical type



4000A – 5000A



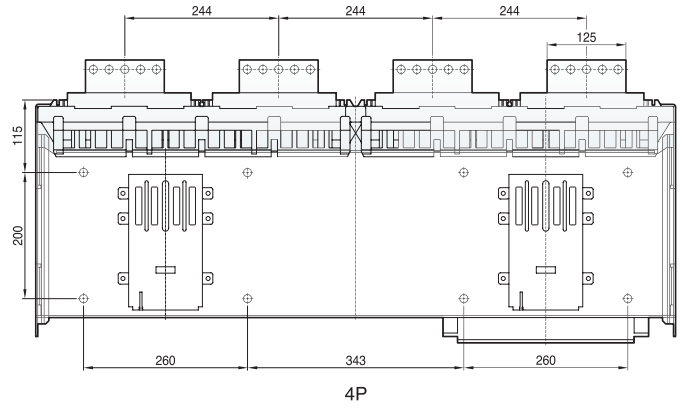
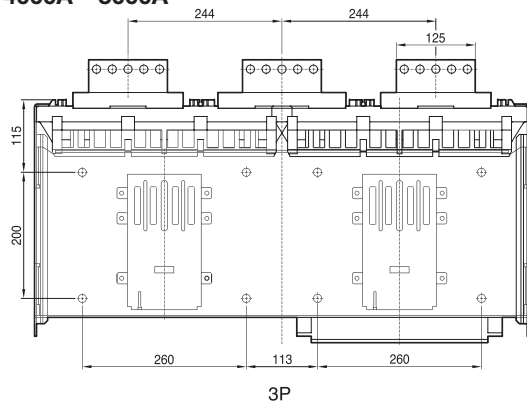
6300A





## Horizontal type

### 4000A – 5000A



### 6300A

