

**Solar PV Fuse (Easy Safe Series)**

Safe Protection It's So Easy!



Nowadays, with more and more shortage of energy in world, solar energy is undoubtedly the most clean, safe, and reliable. All countries are focusing on the development and utilization of solar energy and regarding it as main task and long-term goal during the energy revolution, Meanwhile, the pacing of developing solar industry has been quickened.

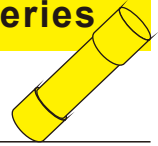
Photovoltaic power generation is a kind of technique to directly transfer light energy to electricity with the usage of "photovoltaic effect" on semiconductor interface. After cascading of packaging protection for solar cell, a large area of solar cell module can be formed. Finally the electric energy will enter into public grid system after getting through the equipments such as combiner box, controller, inverter, electric cabinet.

Very high DC voltage (Max Voltage: 1000Vdc)

can be formed when the PV cell has been cascaded. Among the whole system of photovoltaic power generation, especially in the combiner box, fuse has more advantages such as high breaking capacity, good characteristics of limit flow, reliable performance and economy compared to DC circuit breaker.

CFriend has been striving in developing and investing in new energy industry for many years, after years' effort and practice, CFriend released the first generation of solar PV products in the second half of year 2011.

In 2013, catering for the requirement of market, especially the high quality requirement from overseas market, CFriend developed the second generation solar PV products (Easy Safe Series) with new design and a new level has been reached for safe protection of PV system.



## Solar PV Fuse (Easy Safe Series)

### 【Brief Introduction】



### Product Parameter:

- ▶ Model: PV(size)-Rated Current(A)
- ▶ Class of Operation: gPV and UL PV fuses
- ▶ Size: 10x38mm / 14x51mm /PVNH
- ▶ Rated Voltage: 1000Vdc
- ▶ Current: 1-20A/15-32A/32-160A
- ▶ Breaking Capacity: 1-6A: 40KAcd      8-15A: 33KAcd  
20-32A: 10KAcd      32-160A: 50KAcd

### Product Description:

- ▶ Conforms to the requirement of IEC 60269-6 (gPV) GB/T 13539-2013
- ▶ Meeting the requirement of PV industry
- ▶ Economic protection solution for PV

### Product Characteristics:

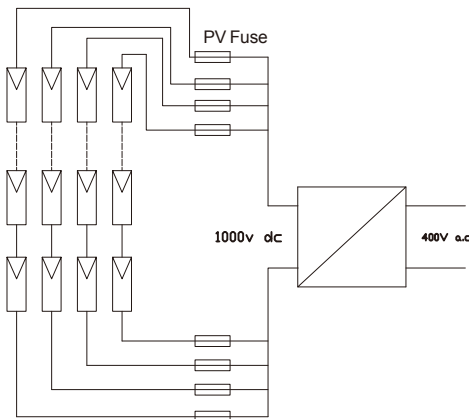
- ▶ 1000V DC loading capacity
- ▶ High breaking capacity
- ▶ Low overloading protection capacity and 1.35 times of rated current
- ▶ The highest applicable ambient temperature reached 120°C
- ▶ Compact overall dimension: 10 X 38mm
- ▶ Easy installation

### Matched Bases:

- ▶ PCB fuse clip: SP101/SP102 (See Page 65)
- ▶ The modular fuse base: SC101PV (See Page 7)

Patent No. 201420536925.3

### Product Selection:



- ▶ The conditions for necessity and function of fuse protection:  
if the fault current caused by short circuit in PV array can not be effectively broke, which will be harmful for PV panel and cable, strong DC arc will formed in the circuit.
- ▶ Main parameter of PV system:
  1. Maximum output voltage:  $V_{pm}$
  2. Maximum open circuit voltage:  $V_{oc}$
  3. Maximum operating current:  $I_{pm}$
  4. Rated current、 voltage:  $V_R$ 、  $I_R$
  5. Short Circuit Current:  $I_{sc}$
  6. Breaking range and utilization category: The protection for gPV system DC breaking capacity at a full range
- ▶ Common sense for selection:
  1. The maximum short circuit current (ISC) caused by PV cell panel is 1.25 times of rated current.
  2. According to the latest IEC and GB standard, gPV fuse will be fused in one hour when 1.35 times of rated current as agreed, the current can't be fused should be corrected as 1.05 times.
  3. According to NEC , the provisions of UL, the rated current of fuse should be more than  $1.56I_{sc}$ , according to the standard of IEC, more or equal to  $1.45I_{sc}$  is recommended.

\* Remarks: The above is for your reference only, standards from IEC and UL are still improving

Solar PV Fuse

Easy Safe Serie

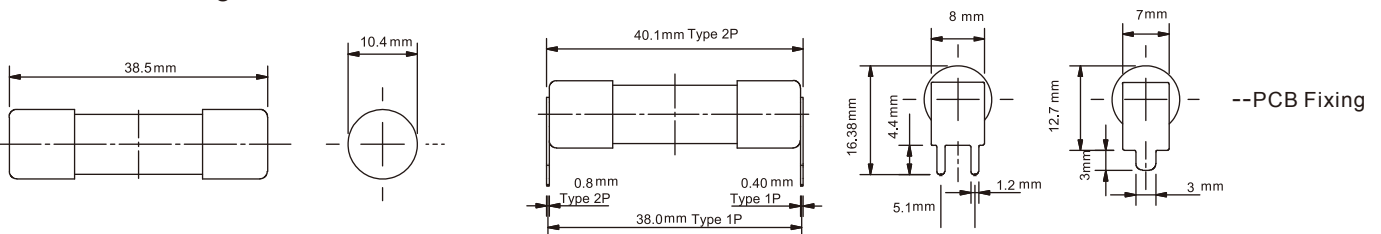
Product Features:

- ▶ Made with new ceramic material, ensuring the short circuit energy sealed in the fuse element in high voltage , which is safe and reliable.
- ▶ In order to make sure the melting core can be fused in fault condition, it is made of pure silver of 99.99% .
- ▶ The strictly elected quartz sand is regarded as inner filling material, which is effectively absorbing short circuit DC arc.
- ▶ The metal parts of two ends in fuses are made of 100% red copper, the outer layer is silver plated, no matter which kind of bases are chosen, it can ensure good conductivity and reduce the temperature rise and power losses.

【Selection Table】 1000V DC 10x38mm/14x51mm 1-32A

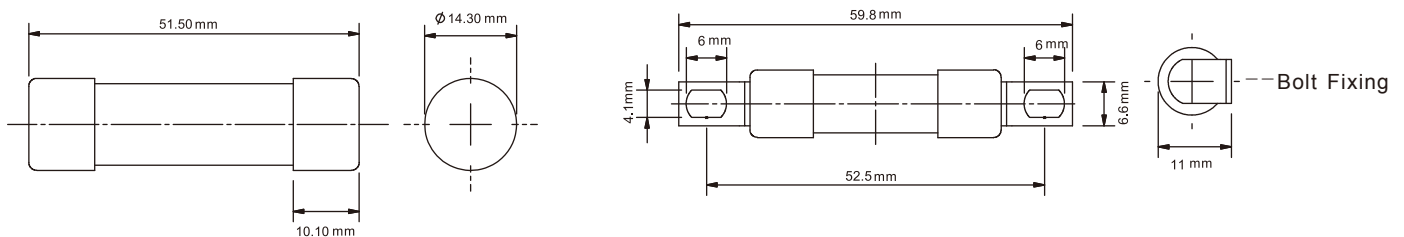
Size	Current	Without Fixing		PCB Fixing		Bolt Fixing		Min Packing Qty	Packing Weight	Fig. No.
		Model	Ordering No.	Model	Ordering No.	Model	Ordering No.			
10X38	1	PV10-1A	RN218810	PV10-1AT	RN118920	PV10-1AP	RN119030	20	0.2	Without Fixing 【fig.-1A1A】  PCB Fixing 【fig.-1A1B】  Bolt Fixing 【fig.-1A1C】
	2	PV10-2A	RN218820	PV10-2AT	RN118930	PV10-2AP	RN119040			
	3	PV10-3A	RN218830	PV10-3AT	RN118940	PV10-3AP	RN119050			
	4	PV10-4A	RN218840	PV10-4AT	RN118950	PV10-4AP	RN119060			
	5	PV10-5A	RN218850	PV10-5AT	RN118960	PV10-5AP	RN119070			
	6	PV10-6A	RN218860	PV10-6AT	RN118970	PV10-6AP	RN119080			
	8	PV10-8A	RN218870	PV10-8AT	RN118980	PV10-8AP	RN119090			
	10	PV10-10A	RN218880	PV10-10AT	RN118990	PV10-10AP	RN119100			
	12	PV10-12A	RN218890	PV10-12AT	RN119000	PV10-12AP	RN119110			
	15	PV10-15A	RN218900	PV10-15AT	RN119010	PV10-15AP	RN119120			
14X51	20	PV10-20A	RN218910	PV10-20AT	RN119020	PV10-20AP	RN119130	10	0.25	【fig.-1A2A】
	25	PV14-15A	RN119140	PV14-15AT	RN119180	PV14-15AP	RN119220			
	25	PV14-20A	RN119150	PV14-20AT	RN119190	PV14-20AP	RN119230			
	25	PV14-25A	RN119160	PV14-25AT	RN119200	PV14-25AP	RN119240			
	32	PV14-32A	RN119170	PV14-32AT	RN119210	PV14-32AP	RN119250			

【Dimension Figure】



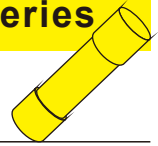
【fig. -1A1A】 : PV10(10X38mm)

【fig. -1A1B】 : PV10(PCB Fixing)



【fig. -1A2A】 : PV14(14X51mm)

【fig. -1A1C】 : PV10 (Bolt Fixing)



Solar PVNH Fuse (Easy Safe Series)



Standard information: IEC 60269-6 GB/T13539-6 UL2579

Product Features:

- ▶ First manufacturer of designing dual indication with two choice of plug-in and bolt, which can meet different install requirements.
- ▶ Design of anti-skid screw and Embossing aluminum plate, which making the whole structure safer.
- ▶ 99.99% pure silver of fuse element, red copper contacts, which showing excellent performance and super low power consumption.

Product Characteristics:

- ▶ Rated Voltage: 1000Vdc 50KA
- ▶ Rated Amperage: 32-400A
- ▶ Time Parameter: 1-3ms

Matched Bases:

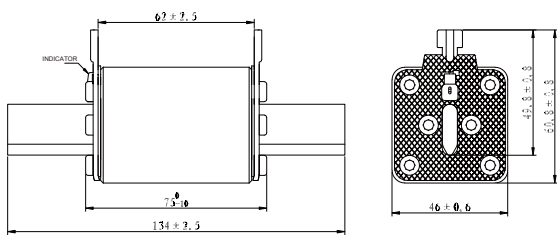
- ▶ SN11SPV (RN219399)
- ▶ SN21SPV (RN219429)
- ▶ SN31SPV (RN219459)

Patent No. 201420536985.5

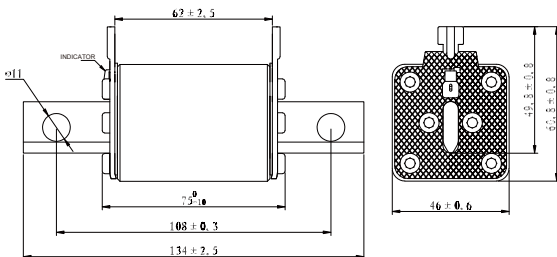
【Selection Table】 1000V DC NH 32-160A

Size	Current	Blade without bolt holes		Blade with bolt holes		I <sup>2</sup> t(A <sup>2</sup> S)		Watts loss		Min Packing Qty	Packing Weight	Fig. No.
		Model	Ordering No.	Model	Ordering No.	Pre-arcing	Total at 1000V	0.8In	In			
NH1	32	PVNH-32A	RN219260	PVNH-32AH	RN219261	90	730	4.5	8.6	3	1.85	【fig.- 1A3A】 【fig.- 1A3B】
	40	PVNH-40A	RN219270	PVNH-40AH	RN219271	185	1680	4.8	9.5			
	50	PVNH-50A	RN219280	PVNH-50AH	RN219281	410	3650	5.7	11.2			
	63	PVNH-63A	RN219290	PVNH-63AH	RN219291	475	4350	6.5	12.5			
	80	PVNH-80A	RN219300	PVNH-80AH	RN219301	650	5900	8.1	16.3			
	100	PVNH-100A	RN219310	PVNH-100AH	RN219311	1310	11800	8.8	17.8			
	125	PVNH-125A	RN219320	PVNH-125AH	RN219321	2700	23450	9.2	19.2			
	160	PVNH-160A	RN219330	PVNH-160AH	RN219331	5300	47500	12.5	26			
	200	PVNH-200A	RN219335	PVNH-200AH	RN219336	10300	83000	14	29			
NH2	250	PVNH-250A	RN219332	PVNH-250AH	RN219337	26100	129500	24	42	3	2	Pls contact with CFriend
NH3	400	PVNH-400A	RN219333	PVNH-400AH	RN219338	86000	425000	32	52	3	2.6	

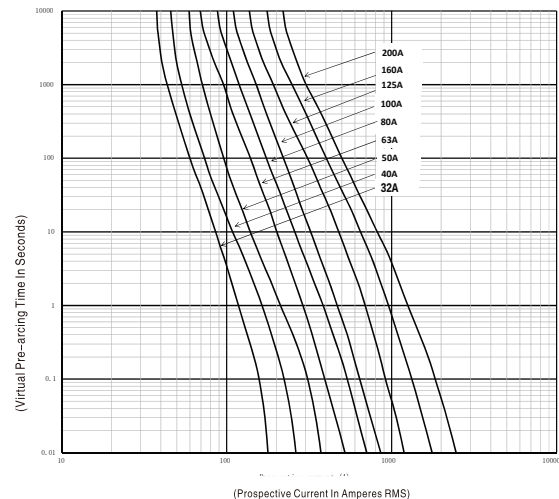
【Dimension Figure】



【fig. - 1A3A】 : PVNH



【fig. - 1A3B】 : PVNH(Bolt Fixing)



【fig. - 1A3C】 : PVNH( Time-Current Curve)

【Brief Introduction】



Product Model: SC101PV

Conformed Standard:

- ▶ IEC 60269-6 GB/T13539-6 UL4268-18

Product Characteristics:

- ▶ Rated voltage : 1000Vdc 33KA
- ▶ Rated current : 30A UL 32A IEC
- ▶ Applied size : 10X38
- ▶ Temperature range : -30℃ - 120℃

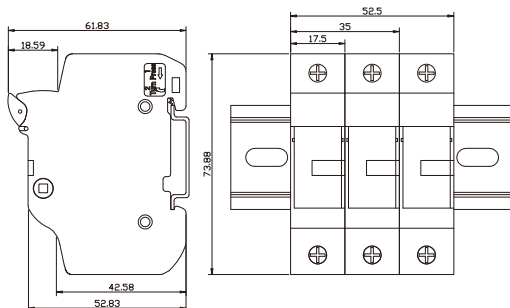
Top Ten Features of New Bases:



- ▶ Imported engineering plastics, better features of antflaming, high and low temperature
- ▶ The metal piece made of pure copper silver plated, and one-shot stamping molding, with lower resistance ( $\leq 9m\Omega$ ; 20℃)
- ▶ To ensure tightly contact with the melting core, it's made of strong spring material with higher clamping strength
- ▶ Non-slip design for the screws, more reliable connection
- ▶ Inner structure has been improved, arc protection performance has been greatly enforced.
- ▶ Using multiple locks to eliminate false switching, making absolutely safe protection.
- ▶ Label slot has been added, making more convenient marking
- ▶ Multipolar connection is allowed (accessory can be chosen), it's convenient to make the selection
- ▶ Design of finger safe
- ▶ Ergonomic shape and make you feel better

【fig.-1B1A】 3D drawing of PV bases

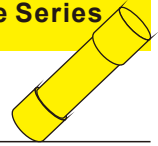
Patent No. 201420537121.5



【fig.-1B1B】 Overall drawing of PV bases



【fig.-1B1C】 Mounting illustration of PV bases



# Cylindrical Fuse

## 【Brief Introduction】



### Product Description:

- ▶ Conforms to IEC 60269-2
- ▶ CE and CCC certification, meeting the requirements of various designs

### Product Characteristics:

- ▶ In a compact size and spare little space
- ▶ Standard Voltage 500V/690Vac
- ▶ Three kinds of features: g G / a M / aR
- ▶ Modular bases are easy to install

### Model Illustration:

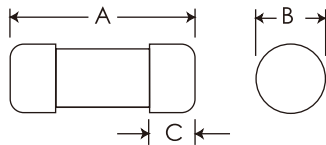
Sample: **R 10 H 15**

- Size ————
- 10:10x38mm
- 14:14x51mm
- 22:22x58mm
- Rated current
- Class
- H: High Speed Fuse
- G: gG protection
- M:aM protection

### Product Parameter:

- ▶ Model: R(size) G(current)  
R(size) M(current)  
R(size) H(current)
- ▶ Operating Class: gG /aM /aR
- ▶ Dimension of Fuse: 10x38mm/14x51mm/22x58mm
- ▶ Rated Voltage: 500V(gG/aM)  
690V (High Speed Fusing)
- ▶ Current: 0.5-125A
- ▶ Rated Breaking Capacity: 80KA (gG/aM)  
200KA (High Speed Fusing)

### Dimension Figure:



【fig. -1C1A】 : cylindrical series

### Matched Bases:

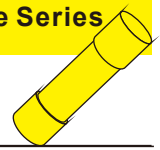
- ▶ Modular fuse base: SC\*\*\*D ("I" means indicating)  
The function of indicating can be chosen

### Dimension Table Unit: mm

Specification	Current Class	Dimensions		
		A	B	C
10 x 38	0.5-32	38.1	10.3	9.5
14 x 51	1-50	50.8	14.3	15.5
12 x 58	2-125	58	22.2	15

**【Selection Table】 500V gG/aM Fuse&690V High Speed Fuse 0.5-125A**

Size	Current	500V gG Protection		500V aM Protection		690V High Speed Fusing		Min Packing Qty	Packing Weight	Fig. No.
		Model	Ordering No.	Model	Ordering No.	Model	Ordering No.			
10X38	0.5	R10G0-5	RN220420	R10M0-5	RN220830	R10H0-5	RN221240	20	0.2	【fig.-1C1A】 Refer to Dimension Table
	1	R10G1	RN220430	R10M1	RN220840	R10H1	RN221250			
	2	R10G2	RN220440	R10M2	RN220850	R10H2	RN221260			
	4	R10G4	RN220450	R10M4	RN220860	R10H4	RN221270			
	6	R10G6	RN220460	R10M6	RN220870	R10H6	RN221280			
	8	R10G8	RN220470	R10M8	RN220880	R10H8	RN221290			
	10	R10G10	RN220480	R10M10	RN220890	R10H10	RN221300			
	12	R10G12	RN220490	R10M12	RN220900	R10H12	RN221310			
	16	R10G16	RN220500	R10M16	RN220910	R10H16	RN221320			
	20	R10G20	RN220510	R10M20	RN220920	R10H20	RN221330			
	25	R10G25	RN220520	R10M25	RN220930	R10H25	RN221340			
	32	R10G32	RN220530	R10M32	RN220940	R10H32	RN221350			
14X51	1	R14G1	RN120540	R14M1	RN120950	R14H1	RN121360	10	0.22	【fig.-1C1A】 Refer to Dimension Table
	2	R14G2	RN120550	R14M2	RN120960	R14H2	RN121370			
	4	R14G4	RN120560	R14M4	RN120970	R14H4	RN121380			
	6	R14G6	RN120570	R14M6	RN120980	R14H6	RN121390			
	8	R14G8	RN120580	R14M8	RN120990	R14H8	RN121400			
	10	R14G10	RN120590	R14M10	RN121000	R14H10	RN121410			
	12	R14G12	RN120600	R14M12	RN121010	R14H12	RN121420			
	16	R14G16	RN120610	R14M16	RN121020	R14H16	RN121430			
	20	R14G20	RN120620	R14M20	RN121030	R14H20	RN121440			
	25	R14G25	RN120630	R14M25	RN121040	R14H25	RN121450			
	32	R14G32	RN120640	R14M32	RN121050	R14H32	RN121460			
	40	R14G40	RN120650	R14M40	RN121060	R14H40	RN121470			
	50	R14G50	RN120660	R14M50	RN121070	R14H50	RN121480			
22X58	2	R22G2	RN120670	R22M2	RN121080			10	0.45	【fig.-1C1A】 Refer to Dimension Table
	4	R22G4	RN120680	R22M4	RN121090					
	6	R22G6	RN120690	R22M6	RN121100					
	8	R22G8	RN120700	R22M8	RN121110					
	10	R22G10	RN120710	R22M10	RN121120					
	12	R22G12	RN120720	R22M12	RN121130					
	16	R22G16	RN120730	R22M16	RN121140					
	20	R22G20	RN120740	R22M20	RN121150	R22H20	RN121560			
	25	R22G25	RN120750	R22M25	RN121160	R22H25	RN121570			
	32	R22G32	RN120760	R22M32	RN121170	R22H32	RN121580			
	40	R22G40	RN120770	R22M40	RN121180	R22H40	RN121590			
	50	R22G50	RN120780	R22M50	RN121190	R22H50	RN121600			
	63	R22G63	RN120790	R22M63	RN121200	R22H63	RN121610			
	80	R22G80	RN120800	R22M80	RN121210	R22H80	RN121620			
	100	R22G100	RN120810	R22M100	RN121220	R22H100	RN121630			
125	R22G125	RN120820	R22M125	RN121230						



## Bases: Cylindrical Fuse Base

### SP Series-10x38mm PCB Clip for Cylindrical Fuse use

Product Model: SP101/SP102

Rated Voltage: DC 1000V

Rated Current: 32A

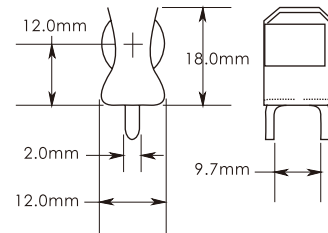
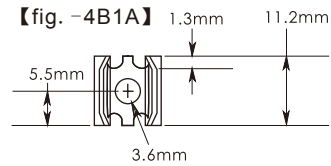
Applied Size: 10X38mm

Way of Mounting: PCB

Applied Series: Solar PV series, Cylindrical R Series



Size	Pole	Model	Ordering No.	Material	Fig. No.
10x38	1	SP101	RN119340	phosphor bronze	【fig. -4B1A】
	1	SP102	RN119350	beryllium bronze	

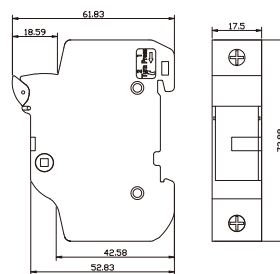
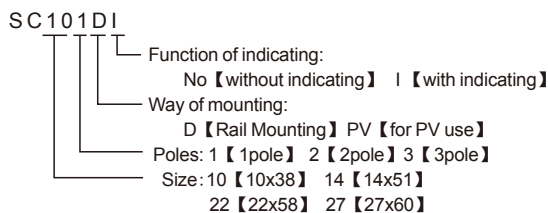


### SC Series- Cylindrical Closed Base

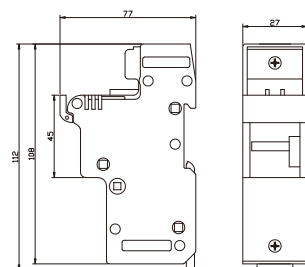


Size	Pole	Without Indicator Light		With Indicator Light		Solar PV		Fig. No.
		Model	Ordering No.	Model	Ordering No.	Model	Ordering No.	
10x38	1	SC101D	RN319660	SC101DI	RN319690	RT14-20	RN119664	【fig. -4B2A】
	2	SC102D	RN319670	SC102DI	RN319700	RT19-25	RN119729	
	3	SC103D	RN319680	SC103DI	RN319710			
14x51	1	SC141D	RN319720	SC141DI	RN319750	RT14-32	RN119724	【fig. -4B2B】
	2	SC142D	RN319730	SC142DI	RN319760	RT19-40	RN119729	
	3	SC143D	RN319740	SC143DI	RN319770			
22x58	1	SC221D	RN319780	SC221DI	RN319810	RT14-63	RN119784	【fig. -4B2C】
	2	SC222D	RN319790	SC222DI	RN319820	RT19-125	RN119789	
	3	SC223D	RN319800	SC223DI	RN319830			

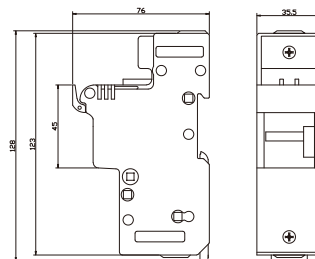
Product Model: Coding Illustration as follows



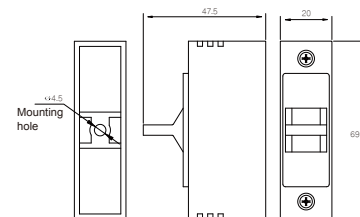
【fig. -4B2A】



【fig. -4B2B】



【fig. -4B2C】



【fig. -1D1D】 RT14- 20

Rated Voltage: IEC690V

Rated Current: 32A/63A/125A

Applied Size: 10X38/14X51/22X58/27X60mm

Way of Mounting: Rail (35mm)

Applied Series: Cylindrical R Series

Standards that conformed: IEC60269-2-1

UL4248-18

IEC60947-3

Temperature Range: Without Indicating -30℃~130℃

With Indicating -30℃~100℃

Product Characteristics: Flame Resistant Material

Finger Safe Protection

Special Design, Low Temperature Rise

Compact Structure, Easy to Install