

## 3SW68

Independent power supply with build-in power source, directly draws power from the incoming end to avoid the risk of protection function failure caused by supply failure.

- Overload protection
- Short circuit protection
- Isolation
- Controlling
- Used in residential building, non-residential building, industry, energy and infrastructure



## Overview

The 3SW68 air circuit breaker not only provides protections against overload, short circuit, undervoltage but also has a lot of advantages like optimized size, inner communication module and the function of measurement and management to just name a few.

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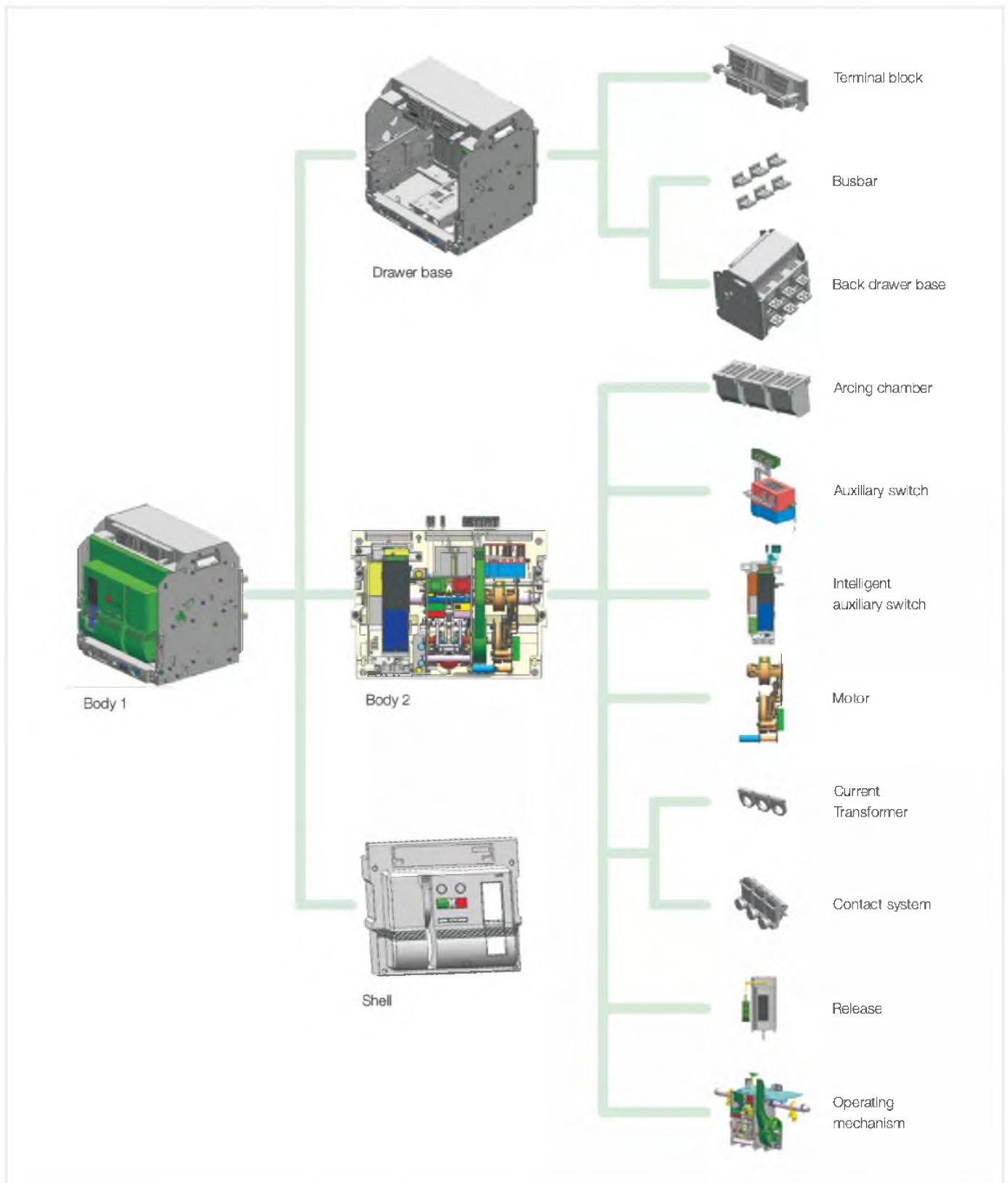
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## Applications and functions

- Distributing electricity and protecting loads from overload, short circuit, undervoltage, and residual current
- Providing high reliability of power supply by smart and optional protection
- Used as an isolator
- Operating the motor directly for occasionally starting and stopping when the rated current of the breaker is not higher than 630A

## Standards

- IEC60947-1: Low-voltage switchgear and controlgear - Part 1: General rules
- IEC60947-2: Low-voltage switchgear and controlgear - Part 2: Circuit-breaker

## Instruction of type code

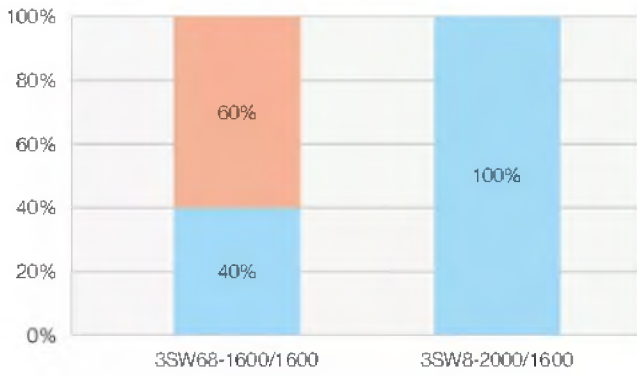
W68	A	F	3	N	1000	L3
Type of electronic trip unit						
Size A:						
AL3: Basic type LSI						
AL4: Basic type LSIg						
AM: Standard type LSIg, LCD display						
AH: Communicate type LSIg, LCD display, Communication function						
Size B, C, D:						
BL3: Basic type LSI						
BL4: Basic type LSIg						
BM3: Basic type LSI, LCD display						
BM4: Basic type LSIg, LCD display						
BHP: Communicate type LSIg, LCD display						
BHQ: Communicate type LSIg, LCD display, measurement function						
BHG: Communicate type LSIg, LCD display, measurement function, motor protection function						
Rated current						
Size A:      Size B:      Size C:      Size D:						
200          630          2000      4000						
400          800          2500      5000						
630          1000      2900      6300						
800          1250      3200						
1000      1600      3600						
1250      2000      4000						
1600      2500						
Short circuit breaking capacity Icu (kA) (400 V AC)						
N: Size A: 65; Size B: 70; Size C: 85; Size D: 100						
H: Size A: 65; Size B: 85; Size C: 120; Size D: 120						
S: Size D: 150						
Poles: 3: 3-pole; 4: 4-pole						
Installation type						
F: Fixed type						
D: Withdrawable type						
Frame code						
A: Size A, 3SW68-1600						
B: Size B, 3SW68-2500						
C: Size C, 3SW68-4000						
D: Size D, 3SW68-6300						
Series code						

## Features and benefits

- **Low space requirements**

3SW68 devices are very compact require very little space for installation. Frame A devices (up to 1600 A) fit into a 400 mm wide switchgear panel. Frame B, C, D devices (up to 6300 A) are the smallest of their kind and with their smallest construction width fit into a 800 mm wide switchgear panel.

- **Example of comparison with 3SW8 in measurement**



Four-pole circuit breaker with a drawer as an example

■ Actual body size
 ■ Reduction of body size

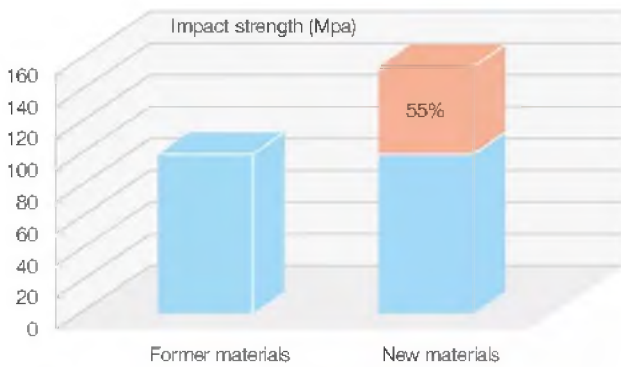
• **Modular design**

Components like auxiliary, motorized operating mechanisms, electronic releases, current sensors, auxiliary circuit signaling switches, automatic reset devices, interlocks and engagement operating mechanisms can all be exchanged or retrofitted in the back-ground, thus allowing the circuit breaker to be adapted to new, changing required.

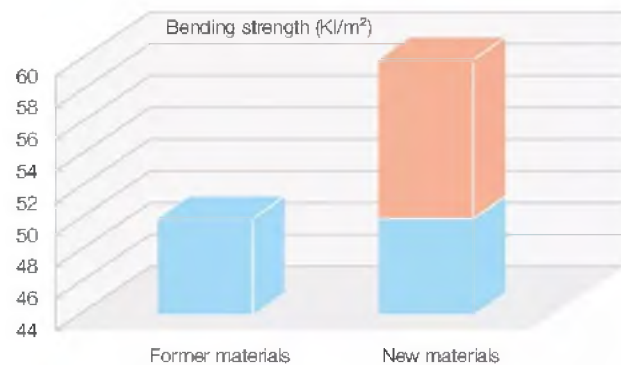
• **Communication**

The use of modern communication capable circuit breakers opens up completely new possibilities in terms of start-up, parameterization, diagnostic, maintenance and operation. This allows varieties of ways to reduce costs and to improve productivity in industrial plants, buildings and infrastructure projects.

• **Strength of new material**



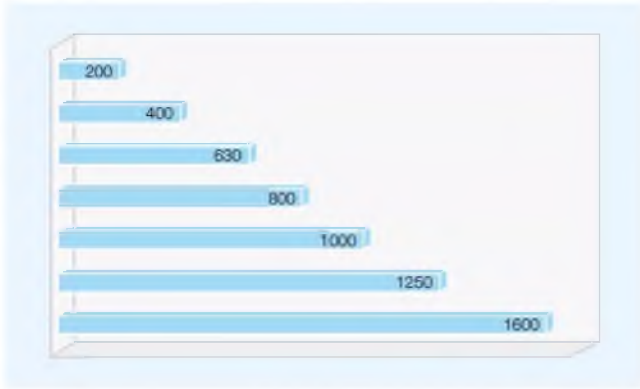
■ Strength of former insulation materials.  
■ Strength increased after adopting new insulation materials using nanotechnology.



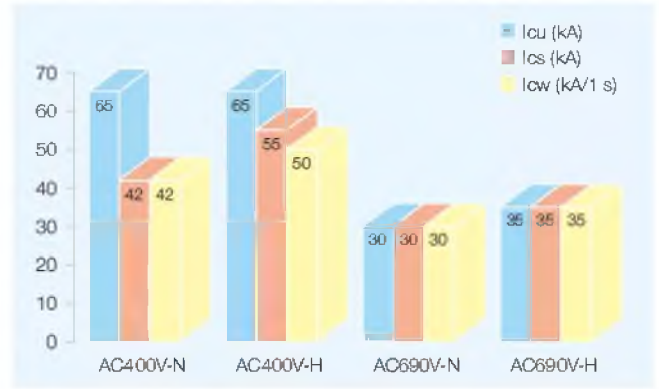
■ Strength of former insulation materials.  
■ Strength increased after adopting new insulation materials using nanotechnology.

## Complete current range and high breaking capacity

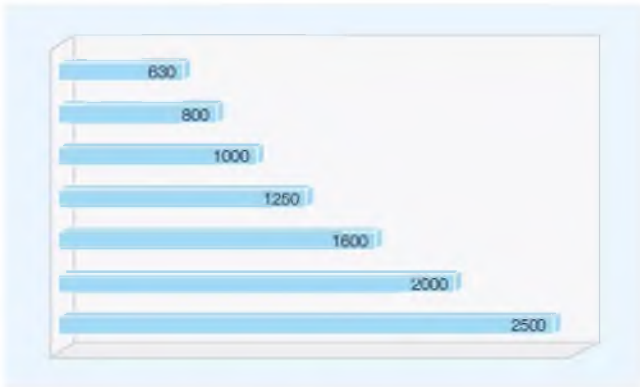
3SW68-1600 Rated current In (A)



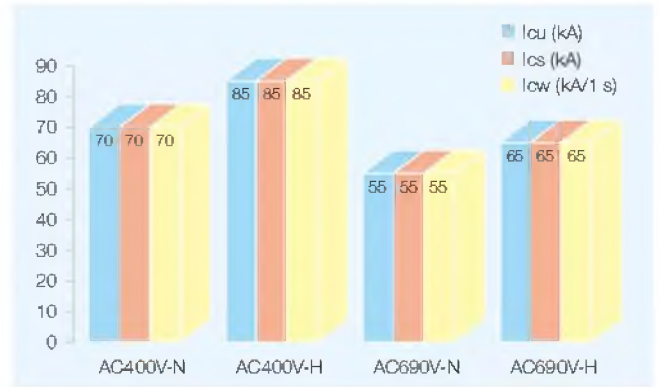
3SW68-1600 Breaking capacity



3SW68-2500 Rated current In (A)



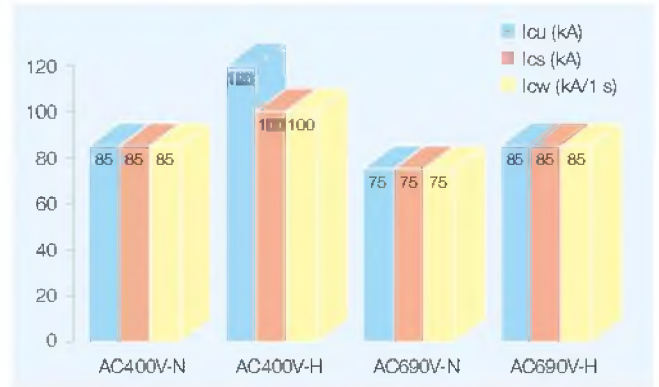
3SW68-2500 Breaking capacity



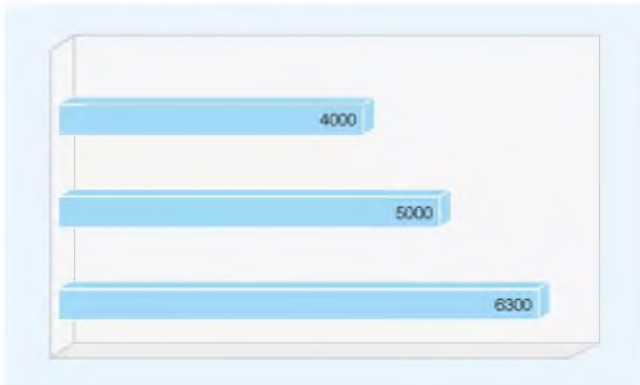
3SW68-4000 Rated current In (A)



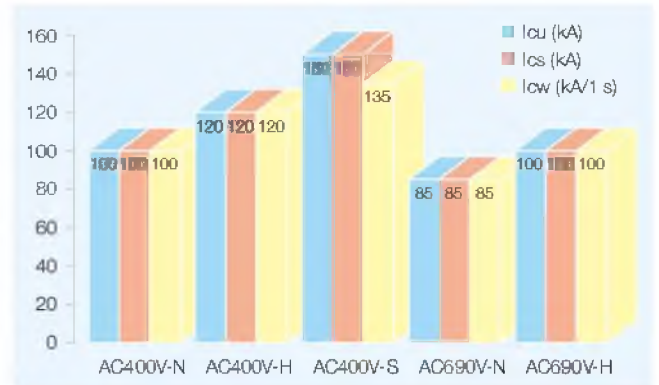
3SW68-4000 Breaking capacity



3SW68-6300 Rated current In (A)



3SW68-6300 Breaking capacity



## Technical specifications

Size				A	B	C	D				
Type				3SW68-1600	3SW68-2500	3SW68-4000	3SW68-6300				
Rated frame current I <sub>nm</sub>	A			1600	2500	4000	6300				
Rated current I <sub>n</sub>	A			200, 400, 630, 800, 1000, 1250, 1600	630, 800, 1000, 1250, 1600, 2000, 2500	2000, 2500, 2900, 3200, 3600, 4000	4000, 5000, 6300				
Rated operational voltage U <sub>e</sub>	V			400, 690	400, 690	400, 690	400, 690				
Rated insulating voltage U <sub>i</sub>	V			1000	1000	1000	1000				
Rated impulsive withstand voltage U <sub>imp</sub>	kV			12	12	12	12				
Power-frequency withstand voltage 1 min	V			3500	3500	3500	3500				
Poles	P			3, 4	3, 4	3, 4	3, 4				
Neutral pole current-carrying capacity for 4-pole CBs				100 % I <sub>n</sub>	100 % I <sub>n</sub>	100 % I <sub>n</sub>	100 % I <sub>n</sub>				
Breaking capacity			N	H	N	H	N	H	S		
Rated ultimate short-circuit breaking capacity I <sub>cu</sub>											
O-CO up to 400 V AC 50-60 Hz	kA		65	65	70	85	85	120	100	120	150
O-CO up to 690 V AC 50-60 Hz	kA		30	35	55	65	75	85	85	100	100
Rated operating short-circuit breaking capacity I <sub>cs</sub>											
O-CO-CO up to 400 V AC 50-60 Hz	kA		42	55	70	85	85	100	100	120	150
O-CO-CO up to 690 V AC 50-60 Hz	kA		30	35	55	65	75	85	85	100	100
Rated short-circuit making capacity I <sub>cm</sub>											
up to 400 V AC 50-60 Hz	kA		143	143	154	187	187	264	220	264	330
up to 690 V AC 50-60 Hz	kA		63	73	121	143	165	187	187	220	220
Rated short-time withstand current for 1 s I <sub>sw</sub>											
up to 400 V AC 50-60 Hz	kA		42	50	70	85	85	100	100	120	135
up to 690 V AC 50-60 Hz	kA		30	35	55	65	65	85	85	100	100
Breaking time	ms		25-30		25-30		25-30		25-30		
Closing time (max.)	ms		70		70		70		70		
Electrical life											
400 V	cycles		6500		5000		2000		1000		
690 V	cycles		3000		2500		1500		800		
Mechanical life											
Without maintenance	cycles		15000		12500		10000		5000		
With maintenance	cycles		30000		25000		20000		10000		
Available terminal type			Horizontal Vertical Front		Horizontal Vertical Front		Horizontal Vertical Front (1)		Horizontal (2) Vertical		
Versions			Withdrawable Fixed		Withdrawable Fixed		Withdrawable Fixed		Withdrawable Fixed		
Dimensions											
Withdrawable type	3-pole / 4-pole	W	mm	248 / 318		347 / 442		440 / 566		818 / 1070	
		H	mm	360		450		450		490	
		D	mm	310		406.5		406.5		406.5	
Withdrawable type	3-pole / 4-pole	W	mm	254 / 324		368 / 463		461 / 587		839 / 1091	
		H	mm	328.5		415.5		415.5		415.5	
		D	mm	217.5		308		308		308	

1. Front terminal is available for fixed version only.

2. Horizontal terminal is not available for circuit breaker with rated current 6300 A.

## Electronic trip unit

### Functions

Suitable size	A					B, C, D						
	3SW68-AL3	3SW68-AL4	3SW68-AM3	3SW68-AM4	3SW68-AH	3SW68-BL3	3SW68-BL4	3SW68-BM3	3SW68-BM4	3SW68-BHP	3SW68-BHQ	3SW68-BHG
Protection and alarm												
Overload protection	●	●	●	●	●	●	●	●	●	●	●	●
Short-time delayed short-circuit protection	●	●	●	●	●	●	●	●	●	●	●	●
Instantaneous short-circuit protection	●	●	●	●	●	●	●	●	●	●	●	●
Earth fault protection	-	●	-	●	●	-	●	-	●	●	●	●
Current leakage protection	-	-	○	○	○	-	-	-	-	○	○	○
Neutral pole protection	●	●	○	○	○	●	●	●	●	●	●	●
Thermal memory	●	●	●	●	●	●	●	●	●	●	●	●
Fault trip display	●	●	-	-	-	●	●	●	●	●	●	●
MCR & HSISC protection	○	○	●	●	●	○	○	○	○	○	○	○
Zone selective interlocking	-	-	○	○	○	-	-	○	○	○	○	○
Load monitoring display	○	○	●	●	●	○	○	○	○	○	○	○
Overload pre-alarm	-	-	●	●	●	-	-	○	○	○	○	○
Grounding alarm	-	-	●	●	●	-	-	-	-	○	○	○
Current imbalance protection	-	-	●	●	●	-	-	-	-	●	●	●
Required current protection	-	-	○	○	○	-	-	-	-	●	●	●
Phase loss protection	-	-	●	●	●	-	-	-	-	●	●	●
Undervoltage protection	-	-	○	○	○	-	-	-	-	○	○	○
Overvoltage protection	-	-	○	○	○	-	-	-	-	○	○	○
Voltage imbalance protection	-	-	○	○	○	-	-	-	-	○	○	○
Phase sequence protection	-	-	○	○	○	-	-	-	-	○	○	○
Under frequency protection	-	-	○	○	○	-	-	-	-	-	-	●
Over frequency protection	-	-	○	○	○	-	-	-	-	-	-	●
Inverse power protection	-	-	○	○	○	-	-	-	-	-	-	●
Measurement												
Current (three-phase, neutral, earth, current imbalance rate)	-	-	●	●	●	-	-	●	●	●	●	●
Voltage (line, phase, average, voltage imbalance rate)	-	-	○	○	○	-	-	-	-	●	●	●
power (active power, reactive power, power factors)	-	-	○	○	○	-	-	-	-	●	●	●
Frequency	-	-	○	○	○	-	-	-	-	●	●	●
Energy (active energy, reactive energy, apparent energy)	-	-	○	○	○	-	-	-	-	●	●	●
Heat capacity	-	-	●	●	●	-	-	-	-	●	●	●
Phase sequence	-	-	○	○	○	-	-	-	-	●	●	●
Required value (current, power)	-	-	○	○	○	-	-	-	-	●	●	●
Harmonic analysis	-	-	○	○	○	-	-	-	-	-	●	●
Waveform	-	-	-	-	-	-	-	-	-	-	●	●
Maintain												
Test function	●	●	-	-	-	●	●	●	●	●	●	●
Self-diagnostic function	●	●	●	●	●	●	●	●	●	●	●	●
Contact loss indicator	-	-	●	●	●	-	-	●	●	●	●	●
Operation times of trip unit on electricity	-	-	●	●	●	-	-	●	●	●	●	●
Remote reset	-	-	-	-	-	-	-	-	-	○	○	○
Historic record												
Historic fault record	●	●	●	●	●	●	●	●	●	●	●	●
Historic maximum current	-	-	●	●	●	-	-	●	●	●	●	●
Alarm record	-	-	●	●	●	-	-	-	-	●	●	●
Clock function (Y, M, D, h, m, s)	-	-	●	●	●	-	-	-	-	●	●	●
Communication												
Communication output	-	-	-	-	●	-	-	-	-	●	●	●
Modbus	-	-	-	-	-	-	-	-	-	○	○	○
Profibus	-	-	-	-	○	-	-	-	-	○	○	○
Devicenet	-	-	-	-	○	-	-	-	-	○	○	○

### Suitable for size A (3SW68-1600)

3SW68-AL electronic trip units are with LED displays, the protection value and delay time is set by dialing device.

- Type 3SW68-AL3: provides selective protections of long-time delayed protection, short-time delayed protection and instantaneous protection.
- Type 3SW68-AL4: provides additional selective earth fault protection and all protection functions of type 3SW68-AL3.



1. RESET button  
It pops up when fault tripping or test tripping. The circuit breaker can be switched on only when the button is pressed down, together with the fault indicator.
2. Indication of rated current ( $I_n$ )
3. MCU indicator  
It remains lit when the controller is under normal working.
4. Overvoltage indicator  
It lights up when current reaches  $1.15 I_n$ .
5. Current bar indicator  
To display the real time current as the percentage of  $I_R$ ; 10% each step.
6. Fault type indicator  
To show the fault type after tripping occurs.
  - If power supply works normally, it will indicate the fault type after fault tripping. Press RESET to quit.
  - If power supply is lost, press FAULT CHECK key to show the type of last tripping when power recovers.
7. Current settings adjustor
8. Time settings adjustor
9. FAULT CHECK key  
Press the key to check fault status when the electronic trip unit is under normal working.
10. TEST key  
Press TEST key, the breaker trips immediately, but no fault recorded. Press RESET and CLEAR after test.
11. CLEAR key

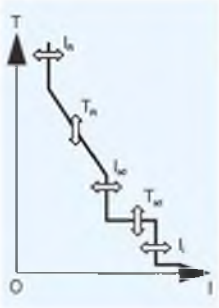
Note: Parameter setting  $I_R < I_{sd} < I_{II}$

## Characteristics

- Protection

Type 3SW68-AL3, suitable for size A 3SW68-1600

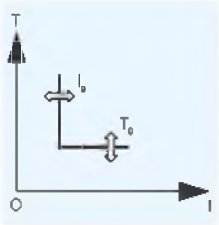


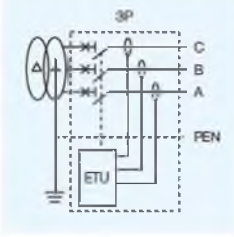
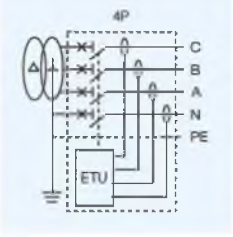
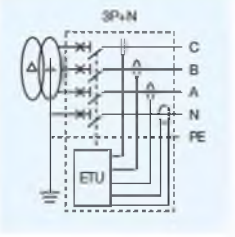
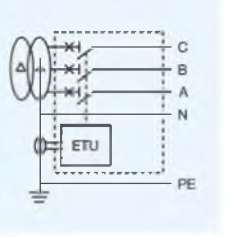


Long-time delayed protection											
Current setting $I_k$ (A)	$I_k = I_n \times \dots$	0.4	0.5	0.6	0.7	0.8	0.9	1	OFF		
Action characteristics		$\leq 1.05 I_k$ , >2 h no action; >1.3 $I_k$ (generator >1.2 $I_k$ ), <1 h action									
Time delay $t_k$ (s)	Accuracy $\pm 10\%$ (Original difference $\pm 40$ ms)	Time setting $t_k$ (s)	30	60	120	240					
		$I = 1.5 \times I_k$	30	60	120	240					
		$I = 2 \times I_k$	16.9	33.8	67.5	135					
		$I = 6 \times I_k$	1.88	3.75	7.5	15					
		$I = 7.2 \times I_k$	1.3	2.6	5.2	10					
$I = 10 \times I_k$	0.68	1.35	2.7	5.4							
Thermal memory		10 min cold reset or remove after trip unit out of electricity									
Short-time delayed protection											
Current setting $I_{sd}$ (A)	$I_{sd} = I_n \times \dots$	3	4	5	6	7	8	10	OFF		
Action characteristics		$\leq 0.9 I_{sd}$ no action; > 1.1 $I_{sd}$ action									
Time delay $T_{sd}$ (s)	Accuracy within 10% (Original difference $\pm 40$ ms)	Time setting $t_{sd}$ (s)	0.1	0.2	0.3	0.4					
		Return time (s)	0.06	0.14	0.23	0.35					
Instantaneous protection											
Current setting $I_i$ (A)	$I_i = I_n \times \dots$	3	4	6	8	10	12	15	OFF		
Action characteristics		$\leq 0.85 I_i$ no action; > 1.15 $I_i$ action									
Action time delayed		< 30 ms									

• Protection

Type 3SW68-AL4, suitable for size A 3SW68-1600



Long-time delayed protection: the same as type 3SW68-AL3											
Short-time delayed protection: the same as type 3SW68-AL3											
Instantaneous protection: the same as type 3SW68-AL3											
Earth fault protection											
Current setting $I_g$ (A)	$I_n \leq 1250$ A, $I_g = I_n \times \dots$	0.4	0.5	0.6	0.65	0.7	0.75	0.8	OFF		
	$I_n > 1250$ A, $I_g = \dots$	500	600	700	800	900	1000	1200	OFF		
Action characteristics		$\leq 0.9 I_g$ no action; > 1.1 $I_g$ action									
Time delay $T_g$ (s)	Accuracy within 10% (Original difference $\pm 40$ ms)	Time setting $t_g$ (s)	0.2	0.4	0.6	0.8					
Differential protection (type T)		Source ground return (type W)									
											

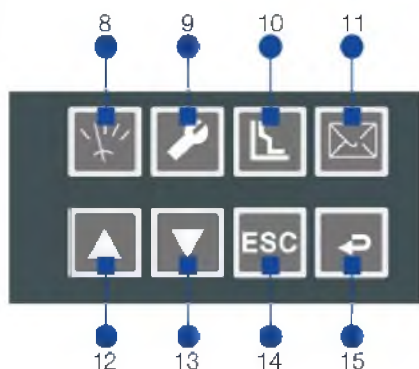
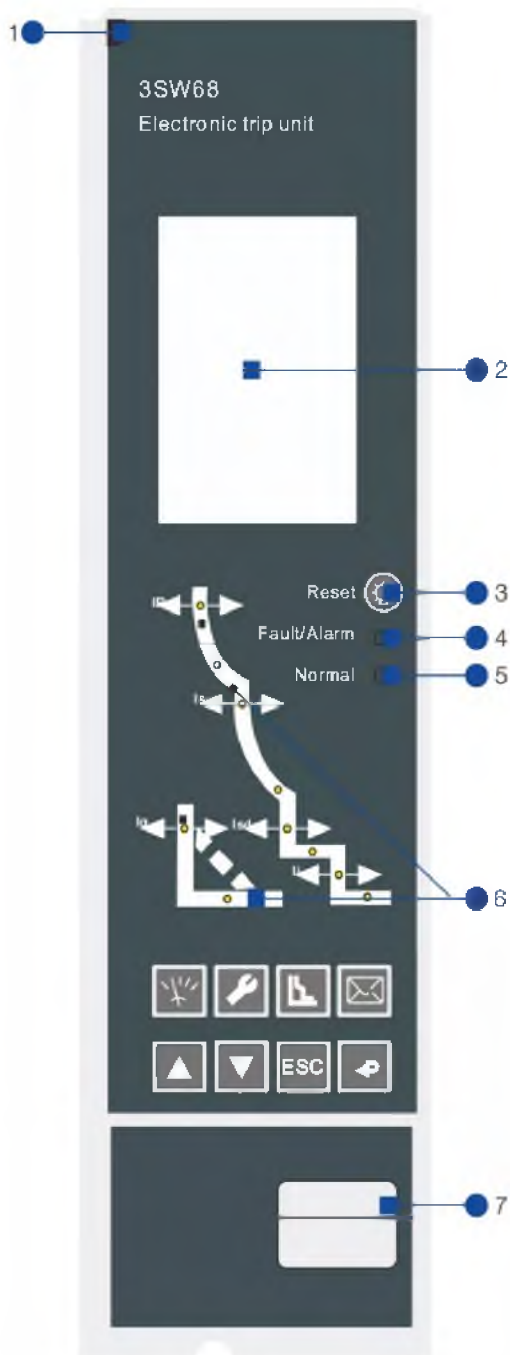
• Default settings

- $I = 1.0 I_n$ ,  $t = 15$  s;
- $I_{sd} = 3.0 I$ ,  $t_{sd} = 0.4$  s;
- $I_i = 10 I_n$ ;
- $I_g = \text{OFF}$ ,  $t_g = 0.8$  s.

**Suitable for size A (3SW68-1600)**

3SW68-AM and 3SW68-AH electronic trip unite quips with a LCD display, and all the operations can be conducted through function buttons.

- 3SW68-AM3: provides selective protections of long-time delayed protection, short-time delayed protection and instantaneous protection.
- 3SW68-AM4: provides additional selective earth fault protection and all protection functions of type 3SW68-AM3.
- 3SW68-AH: provides selective protections of long-time delayed protection, short-time delayed protection, instantaneous protection and earth fault protection, as well as the communication function to take remote measurement, control, setting and communication.



1. RESET button  
It pops up when fault tripping or test tripping. The circuit breaker can be switched on only when the button is pressed down, together with the fault indicator.
2. LCD display
3. Fault and alarm RESET key
4. FAULT/ALARM LED indicator  
The indicator is out when normal working; it flashes quickly when maintenance; it turns on in red when alarm.
5. NORMAL LED indicator  
It always flashes in green when the power is on and under normal working.
6. LED curve  
Red LED indicators are equipped in the curve.  
The corresponding indicator flashes to indicate the fault reason when fault tripping.  
The corresponding indicator remains lit to indicate the current setting when protection settings.
7. Test port  
A 16-pin test port is available on the bottom of front panel for plug-in portable power supply or inspection unit.

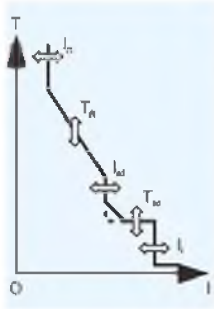
#### Keyboard

8. Measurement: For measuring (In password input interface, the LEFT key)  
Press to enter the measurement default menu to measure current "I", voltage "U", frequency "F", power "P", energy "E", and harmonic "H".
9. Settings: For system parameter settings (In password input interface, the RIGHT key)  
Press to enter the setting default menu to set "Clock settings", "Meter settings", "Test & Lock", "Communication settings", "I/O settings".
10. Protections: For protection parameter settings Press to set the parameters of "Current protection", "Load monitor", "Voltage protection", and "Other protection".
11. Information: For history record and maintenance Press to check "Current alarm", "Operation times", "Contact wear", "Product information", "Tripping record", "Alarm record", "Transposition record".
12. UP - To move up or change the parameters upwards.
13. DOWN - To move down or change the parameters downwards.
14. Esc - To exit and return to previous menu or cancel the current setting selection.
15. ENTER - To enter the next menu, select the current parameter, or save the updates.

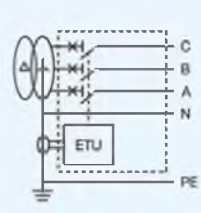
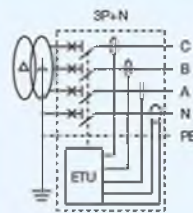
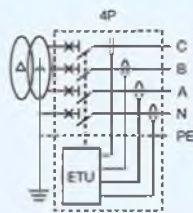
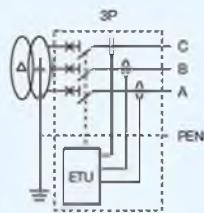
## Characteristics

- Protection

Type 3SW68-AM3, 3SW68-AM4, 3SW68-AH, suitable for size A 3SW68-1600



<b>Long-time delayed protection</b>			
Current setting $I_n$ (A)		$I_n = I_n \times \dots$	(0.4 ~ 1.0) + OFF, setting step: 1 A or 2 A < 1.05 $I_n$ , > 2 h no action; $\geq 1.2 I_n$ , < 1 h action selectable in menu Default setting is $I_n^t$ , the same as 3SW68-AL.
Action characteristics	SI: Standard Inverse curve VI: Very Inverse curve EI(G): Extremely Inverse curve (general power distribution) EI(M): Extremely Inverse curve (motor protection) HV: High-voltage fuse compatibility I2t: General inverse time protection		
Type of curves			
Time delay $t_n$ (s)	Accuracy within 10% (Original difference $\pm 40$ ms)	Time setting $t_n$ (s)	C1 ~ C16, selectable in menu
Thermal memory	(10, 20, 30, 45) min, (1, 2, 3) h reset or remove after trip unit out of electricity		
<b>Short-time delayed protection</b>			
Current setting $I_{sd}$ (A)		$I_{sd} = I_n \times \dots$	(1.5 ~ 15) + OFF, setting step: 1 A or 2 A < 0.9 $I_{sd}$ no action; $\geq 1.1 I_{sd}$ action
Action characteristics			
$I^2t$ : (OFF) (definite time)	Accuracy within 10% (Original difference $\pm 40$ ms)	Time setting $t_{sd}$ (s)	(0.1 ~ 0.4) s, setting step: 0.1 s
Time delay $t_{sd}$ (s)			
I2t: (ON) (inverse time)	Accuracy within 10% (Original difference $\pm 40$ ms)		
Time delay T (s)	The same as long-time delayed protection, the delayed action time is 1/10 of that long-time delayed.		
Thermal memory	5 min reset or remove after trip unit out of electricity		
<b>Instantaneous protection</b>			
Current setting $I_i$ (A)		$I_i = I_n \times \dots$	(1.0 ~ 20) + OFF, setting step: 1 A or 2 A < 0.85 $I_i$ no action; $\geq 1.15 I_i$ action < 30 ms
Action characteristics			
Action time delayed			
<b>Earth fault protection</b>			
Current setting $I_g$ (A)		$I_n \leq 1250$ A, $I_g = I_n \times \dots$ $I_n > 1250$ A, $I_g = \dots$	(0.4 ~ 0.8) + OFF, setting step: 1 A (500 A ~ 1200 A) + OFF, setting step: 2 A $\leq 0.8 I_g$ no action; $> 1.0 I_g$ action
Action characteristics			
Time delay $T_g$ (s)	Accuracy within 10% (definite time protection) (Original difference $\pm 40$ ms)	Time setting $t_g$ (s)	(0.1 ~ 1.0) s, setting step: 0.1 s
Differential protection (type T)	Source ground return (type W)		

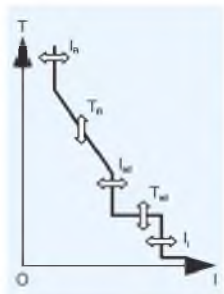


- Neutral pole protection
- Applications:
  - When the neutral line is thin, half value will be applied.
  - When the neutral line is the same as others, full value will be applied.
  - When harmonic wave is heavy, double or 1.6 times value will be applied.
- Setting range:
  - 50 %, 100 %, 160 %, 200 %, OFF

## Characteristics

- **Protection**

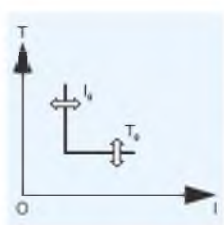
Type 3SW68-AL3, suitable for size A 3SW68-1600



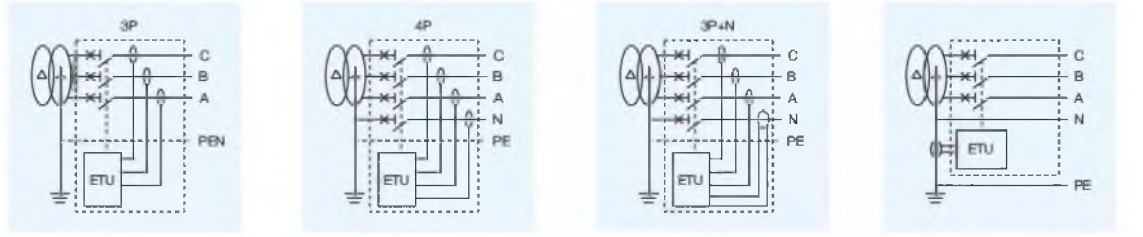
Long-time delayed protection												
Current setting $I_n$ (A)		$I_n = I_n \times \dots$	0.4	0.5	0.6	0.7	0.8	0.9	1	OFF		
Action characteristics			$\leq 1.05 I_n$ , >2 h no action; >1.3 $I_n$ (generator >1.2 $I_n$ ), <1 h action									
Time delay $t_n$ (s)	Accuracy $\pm 10\%$ (Original difference $\pm 40$ ms)	Time setting $t_n$ (s)	30	60	120	240						
		$I = 1.5 \times I_n$	30	60	120	240						
		$I = 2 \times I_n$	16.9	33.8	67.5	135						
		$I = 6 \times I_n$	1.88	3.75	7.5	15						
		$I = 7.2 \times I_n$	1.3	2.6	5.2	10						
		$I = 10 \times I_n$	0.68	1.35	2.7	5.4						
Thermal memory		10 min cold reset or remove after trip unit out of electricity										
Short-time delayed protection												
Current setting $I_{sd}$ (A)		$I_{sd} = I_n \times \dots$	3	4	5	6	7	8	10	OFF		
Action characteristics			$\leq 0.9 I_{sd}$ no action; > 1.1 $I_{sd}$ action									
Time delay $T_{sd}$ (s) (definite time protection)	Accuracy within 10% (Original difference $\pm 40$ ms)	Time setting $t_{sd}$ (s)	0.1	0.2	0.3	0.4						
		Return time (s)	0.06	0.14	0.23	0.35						
Instantaneous protection												
Current setting $I_i$ (A)		$I_i = I_n \times \dots$	3	4	6	8	10	12	15	OFF		
Action characteristics			$\leq 0.85 I_i$ no action; > 1.15 $I_i$ action									
Action time delayed			< 30 ms									

• Protection

Type 3SW68-AL4, suitable for size A 3SW68-1600



Long-time delayed protection: the same as type 3SW68-AL3												
Short-time delayed protection: the same as type 3SW68-AL3												
Instantaneous protection: the same as type 3SW68-AL3												
Earth fault protection												
Current setting $I_g$ (A)	Accuracy within 10% (Original difference $\pm 40$ ms)	$I_n \leq 1250$ A, $I_g = I_n \times \dots$	0.4	0.5	0.6	0.65	0.7	0.75	0.8	OFF		
		$I_n > 1250$ A, $I_g = \dots$	500	600	700	800	900	1000	1200	OFF		
Action characteristics			$\leq 0.9 I_g$ no action; > 1.1 $I_g$ action									
Time delay $T_g$ (s) (definite time protection)	Accuracy within 10% (Original difference $\pm 40$ ms)	Time setting $t_g$ (s)	0.2	0.4	0.6	0.8						
Differential protection (type T)												
												Source ground return (type W)



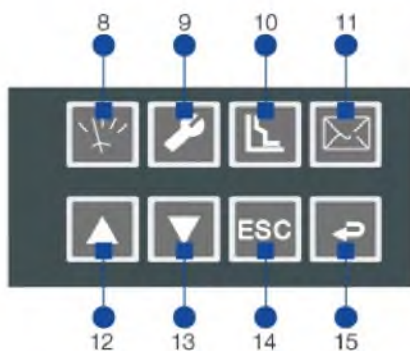
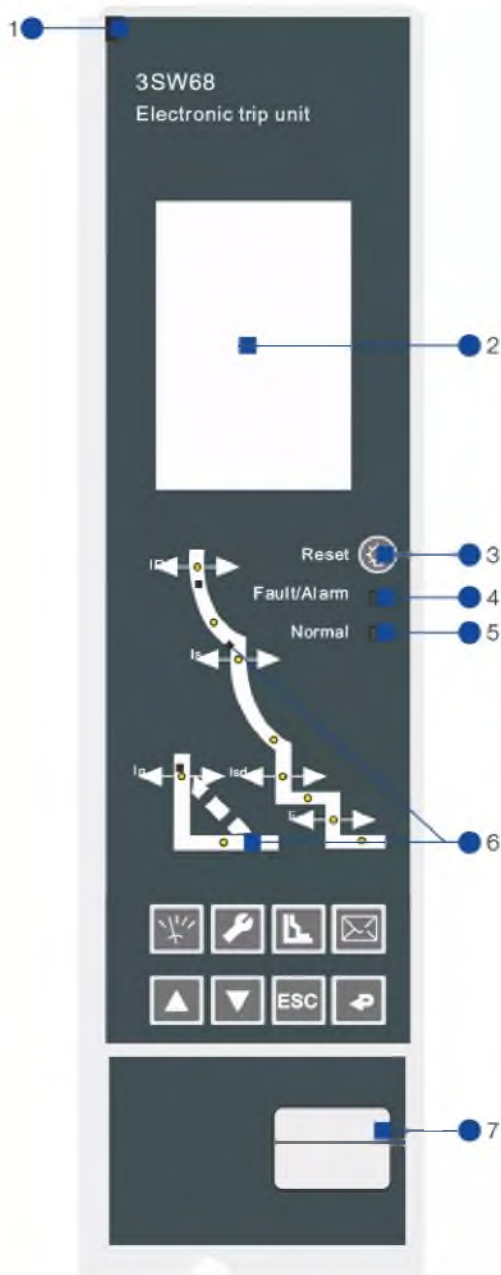
• Default settings

- $I = 1.0 I_n$ ,  $t = 15$  s;
- $I_{sd} = 3.0 I$ ,  $t_{sd} = 0.4$  s;
- $I_i = 10 I_n$ ;
- $I_g = \text{OFF}$ ,  $t_g = 0.8$  s.

**Suitable for size A (3SW68-1600)**

3SW68-AM and 3SW68-AH electronic trip unite quips with a LCD display, and all the operations can be conducted through function buttons.

- 3SW68-AM3: provides selective protections of long-time delayed protection, short-time delayed protection and instantaneous protection.
- 3SW68-AM4: provides additional selective earth fault protection and all protection functions of type 3SW68-AM3.
- 3SW68-AH: provides selective protections of long-time delayed protection, short-time delayed protection, instantaneous protection and earth fault protection, as well as the communication function to take remote measurement, control, setting and communication.



1. RESET button  
It pops up when fault tripping or test tripping. The circuit breaker can be switched on only when the button is pressed down, together with the fault indicator.
2. LCD display
3. Fault and alarm RESET key
4. FAULT/ALARM LED indicator  
The indicator is out when normal working; it flashes quickly when maintenance; it turns on in red when alarm.
5. NORMAL LED indicator  
It always flashes in green when the power is on and under normal working.
6. LED curve  
Red LED indicators are equipped in the curve.  
The corresponding indicator flashes to indicate the fault reason when fault tripping.  
The corresponding indicator remains lit to indicate the current setting when protection settings.
7. Test port  
A 16-pin test port is available on the bottom of front panel for plug-in portable power supply or inspection unit.

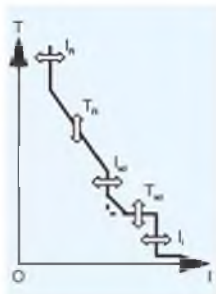
#### Keyboard

8. Measurement: For measuring (In password input interface, the LEFT key)  
Press to enter the measurement default menu to measure current "I", voltage "U", frequency "F", power "P", energy "E", and harmonic "H".
9. Settings: For system parameter settings (In password input interface, the RIGHT key)  
Press to enter the setting default menu to set "Clock settings", "Meter settings", "Test & Lock", "Communication settings", "I/O settings".
10. Protections: For protection parameter settings Press to set the parameters of "Current protection", "Load monitor", "Voltage protection", and "Other protection".
11. Information: For history record and maintenance Press to check "Current alarm", "Operation times", "Contact wear", "Product information", "Tripping record", "Alarm record", "Transposition record".
12. UP - To move up or change the parameters upwards.
13. DOWN - To move down or change the parameters downwards.
14. Esc - To exit and return to previous menu or cancel the current setting selection.
15. ENTER - To enter the next menu, select the current parameter, or save the updates.

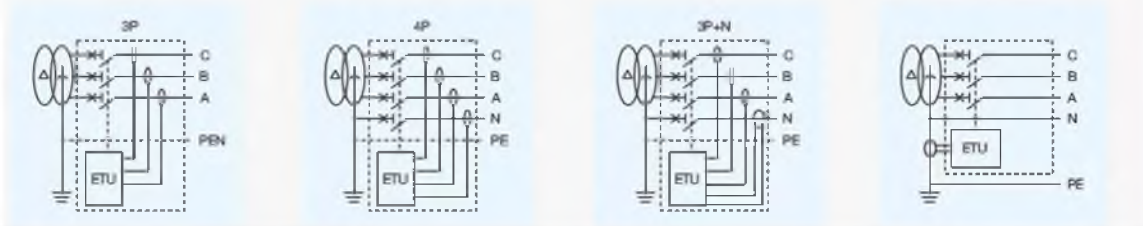
## Characteristics

- Protection

Type 3SW68-AM3, 3SW68-AM4, 3SW68-AH, suitable for size A 3SW68-1600



Long-time delayed protection			
Current setting $I_n$ (A)		$I_n = I_n \times \dots$	(0.4 ~ 1.0) + OFF, setting step: 1 A or 2 A
Action characteristics			< 1.05 $I_n$ , > 2 h no action; $\geq 1.2 I_n$ , < 1 h action selectable in menu
Type of curves	SI: Standard Inverse curve VI: Very Inverse curve EI(G): Extremely Inverse curve (general power distribution) EI(M): Extremely Inverse curve (motor protection) HV: High-voltage fuse compatibility I2t: General inverse time protection		Default setting is I <sup>2</sup> t, the same as 3SW68-AL.
Time delay $t_d$ (s)	Accuracy within 10% (Original difference $\pm 40$ ms)	Time setting $t_d$ (s)	C1 ~ C16, selectable in menu
Thermal memory			(10, 20, 30, 45) min, (1, 2, 3) h reset or remove after trip unit out of electricity
Short-time delayed protection			
Current setting $I_{sd}$ (A)		$I_{sd} = I_n \times \dots$	(1.5 ~ 15) + OFF, setting step: 1 A or 2 A
Action characteristics			< 0.9 $I_{sd}$ no action; $\geq 1.1 I_{sd}$ action
Pt: (OFF) (definite time)	Accuracy within 10% (Original difference $\pm 40$ ms)	Time setting $t_{sd}$ (s)	(0.1 ~ 0.4) s, setting step: 0.1 s
Time delay $T_{sd}$ (s)	Accuracy within 10% (Original difference $\pm 40$ ms)		
I2t: (ON) (Inverse time)	Accuracy within 10% (Original difference $\pm 40$ ms)		
Time delay T (s)			The same as long-time delayed protection, the delayed action time is 1/10 of that long-time delayed.
Thermal memory			5 min reset or remove after trip unit out of electricity
Instantaneous protection			
Current setting $I_i$ (A)		$I_i = I_n \times \dots$	(1.0 ~ 20) + OFF, setting step: 1 A or 2 A
Action characteristics			< 0.85 $I_i$ no action; $\geq 1.15 I_i$ action
Action time delayed			< 30 ms
Earth fault protection			
Current setting $I_g$ (A)		$I_n \leq 1250$ A, $I_g = I_n \times \dots$ $I_n > 1250$ A, $I_g = \dots$	(0.4 ~ 0.8) + OFF, setting step: 1 A (500 A ~ 1200 A) + OFF, setting step: 2 A
Action characteristics			$\leq 0.8 I_g$ no action; $> 1.0 I_g$ action
Time delay $T_g$ (s)	Accuracy within 10% (definite time protection) (Original difference $\pm 40$ ms)	Time setting $t_g$ (s)	(0.1 ~ 1.0) s, setting step: 0.1 s
Differential protection (type T)			Source ground return (type W)

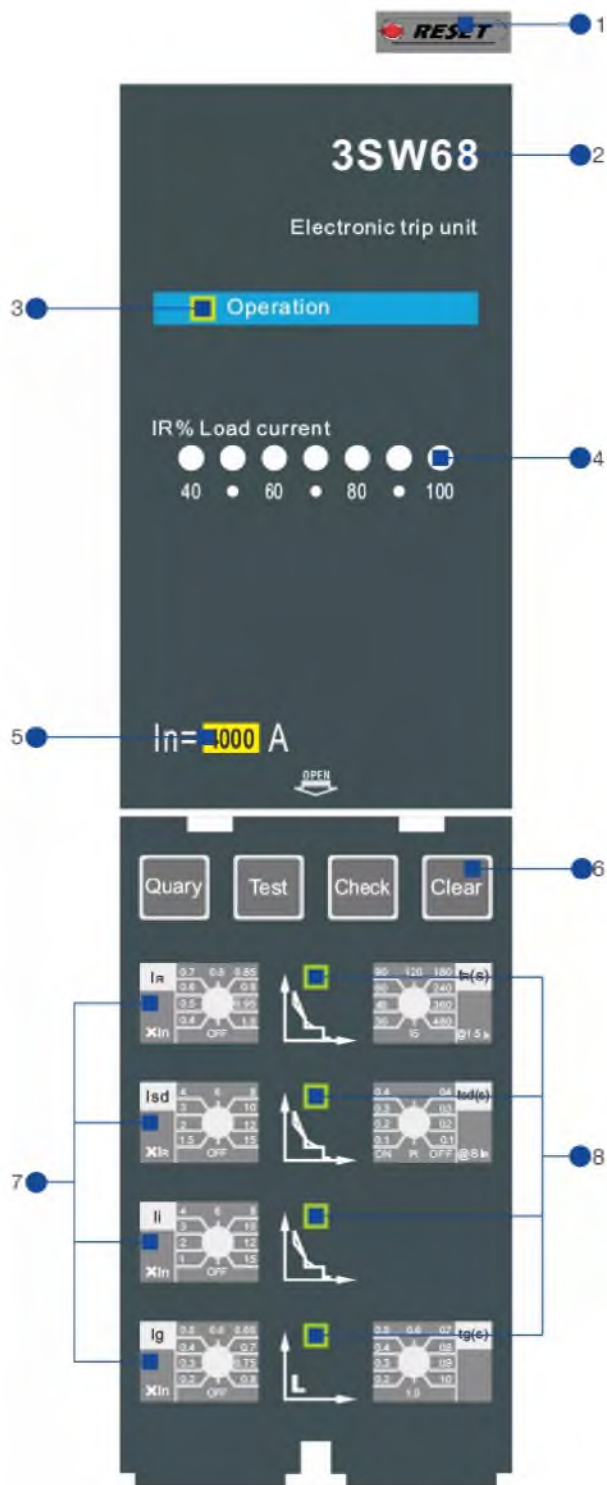


- Neutral pole protection
- Applications:
  - When the neutral line is thin, half value will be applied.
  - When the neutral line is the same as others, full value will be applied.
  - When harmonic wave is heavy, double or 1.6 times value will be applied.
- Setting range:
  - 50 %, 100 %, 160 %, 200 %, OFF

### Suitable for size B/C/D (3SW68-2500/4000/6300)

3SW68-BL electronic trip unit equips with LED displays, the protection value and delay time is set by knobs.

- 3SW68-BL3: provides selective protections of long-time delayed protection, short-time delayed protection and instantaneous protection.
- 3SW68-BL4: provides additional selective earth fault protection and all protection functions of type 3SW68-BL3.

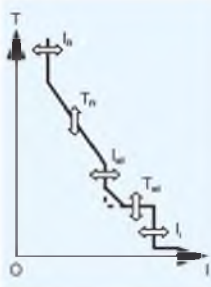


1. Mechanical RESET button  
It pops up after tripping. Manual reset is required.
2. Indication of electronic trip unit
3. Operation indicator  
It remains flashing when the electronic trip unit is under normal working.
4.  $I_R\%$   
40%-100% indicator:  
To display the real time current as the percentage of  $I_n$ .
5. Indication of rated current ( $I_n$ )
6. Simulation test area  
Query: check the last fault record (Record is shown as: one of the four fault indicators, IR, Isd, Ii, and Ig, becomes lighting. Press Clear button to clear indication).  
Test: When press Test Key under normal working status of controller, the breaker, commanded by the controller, trips instantaneously. Meanwhile, Ii fault indicator lights up, but no fault recorded.  
Check: self-diagnosis of inner working, each light will automatically scan, and will show a menu in one minute.  
Clear: clear the fault indicator.
7. Protect characteristic parameter setting area  
Default settings are as follows:  
 $I_n = 1.0 I_n$ ,  $t_n = 15$  s  
 $I_{sd} = 3 I_n$ ,  $t_{sd} = 0.4$  s  
(ON: inverse time status, OFF: definite time status)  
 $I_i = 10 I_n$   
 $I_g = 0.8 I_n$ ,  $t_g = 0.4$  s
8. Fault indicator: Lighting when fault occurs.

## Characteristics

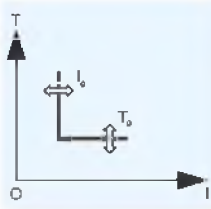
- Protection

Type 3SW68-BL3, suitable for size B/C/D 3SW68-2500/4000/6300




Long-time delayed protection															
Current setting $I_n$ (A)		$I_n = I_n \times \dots$	0.4	0.5	0.6	0.7	0.8	0.85	0.9	0.95	1	OFF			
Action characteristics			$\leq 1.05 I_n$ , >2 h no action; >1.3 $I_n$ (generator >1.2 $I_n$ ), <1 h action												
Time delay $t_n$ (s)	Accuracy $\pm 10\%$ (Original difference $\pm 40$ ms)	Time setting $t_n$ (s)	15	30	45	60	90	120	180	240	360	480			
		$I = 1.5 \times I_n$	15	30	45	60	90	120	180	240	360	480			
		$I = 2 \times I_n$	8.4	16.9	25.3	33.8	50.6	67.5	101.2	135	203	270			
		$I = 6 \times I_n$	0.94	1.88	3.81	3.75	5.62	7.5	11.3	15	22.5	30			
		$I = 7.2 \times I_n$	0.65	1.3	1.95	2.6	3.9	5.2	7.74	10	15.62	21			
		$I = 10 \times I_n$	0.34	0.68	1.01	1.35	2.03	2.7	4.05	5.4	8.1	10.8			
Thermal memory			10 min cold reset or remove after trip unit out of electricity												
Short-time delayed protection															
Current setting $I_{sd}$ (A)		$I_{sd} = I_n \times \dots$	1.2	2	3	4	6	8	10	12	15	OFF			
Action characteristics			$\leq 0.9 I_{sd}$ no action; > 1.1 $I_{sd}$ action												
$I^2t$ (OFF) (definite time)	Accuracy within 10% (Original difference $\pm 40$ ms)	Time setting $t_{sd}$ (s)	0.1			0.2			0.3			0.4			
		Return time (s)	0.06			0.14			0.23			0.35			
$I^2t$ (ON) $I > 8 I_n$ (definite time)	Accuracy within 10% (Original difference $\pm 40$ ms)	Time setting $t_{sd}$ (s)	0.1			0.2			0.3			0.4			
		Return time (s)	0.06			0.14			0.23			0.35			
$I^2t$ (ON) $I \leq 8 I_n$ (inverse time)	Accuracy within 10% (Original difference $\pm 40$ ms)	$8 I_n$ $t_{sd}$ (s)	0.1			0.2			0.3			0.4			
		Time delay $T$ (s)	$T = [(8 \times I_n) / I] \times [(8 \times I_n) / I] \times t_{sd}$												
Instantaneous protection															
Current setting $I_i$ (A)	Size B/C	$I_i = I_n \times \dots$	1	2	4	6	8	10	12	15	20	OFF			
	Size D	$I_i = I_n \times \dots$	1	2	3	4	6	8	10	12	15	OFF			
Action characteristics			$\leq 0.85 I_i$ no action; > 1.15 $I_i$ action												
Action time delayed			< 30 ms												

Type 3SW68-BL4, suitable for size B/C/D 3SW68-2500/4000/6300



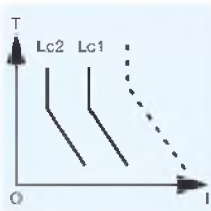
Long-time delayed protection: the same as type 3SW68-BL3															
Short-time delayed protection: the same as type 3SW68-BL3															
Instantaneous protection: the same as type 3SW68-BL3															
Earth fault protection															
Current setting $I_g$ (A)		$I_n \leq 1250$ A, $I_g = I_n \times \dots$	0.4	0.45	0.5	0.55	0.6	0.65	0.7	0.75	0.8	OFF			
		$I_n > 1250$ A, $I_g = \dots$	500	600	700	800	850	900	1000	1100	1200	OFF			
Action characteristics			$\leq 0.9 I_g$ no action; > 1.1 $I_g$ action												
Time delay $t_g$ (s)	Accuracy within 10% (Original difference $\pm 40$ ms)	Time setting $t_g$ (s)	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1			

• MCR & HSISC (Trip beyond limit) protection (selection function)



MCR & HSISC															
Current setting $I_{MCR}$ (A)		$I_{MCR} = I_n \times \dots$	10 (Other settings depend on requirement)										OFF		
Current setting $I_{HSISC}$ (A)		$I_{HSISC} = I_n \times \dots$	15 (Other settings depend on requirement)										OFF		
Action characteristics			$I_{MCR}: \leq 0.85 I_{MCR}$ , no action; > 1.15 $I_{MCR}$ , action; $I_{HSISC}: \leq 0.85 I_{HSISC}$ , no action; > 1.15 $I_{HSISC}$ , action;												
Action time delayed			< 20 ms												

• Load monitoring (selection function)



Load monitoring (discharge current $Lc1$ , discharge current $Lc2$ )															
Current setting $I_{c1}$ (A)		Setting is unavailable, $I_{c1}$ depends on $I_R = I_n \times \dots$	0.4	0.5	0.6	0.7	0.8	0.85	0.9	0.95	1	OFF			
Current setting $I_{c2}$ (A)		Setting is unavailable, $I_{c2}$ depends on $I_R = I_n \times \dots$	0.4	0.5	0.6	0.7	0.8	0.85	0.9	0.95	1	OFF			
Action characteristics $Lc1$			$\leq 1.05 I_{c1}$ , > 2 h no pick-up > 1.3 $I_{c1}$ (generator > 1.2 $I_{c1}$ ), < 1 h time delayed pick-up												
Action characteristics $Lc2$			$\leq 1.05 I_{c2}$ , > 2 h no pick-up > 1.3 $I_{c2}$ (generator > 1.2 $I_{c2}$ ), < 1 h time delayed pick-up												
Action time delayed			< 20 ms												
Time delay $T_{c1}$ (s)	Accuracy within 10% (Original difference $\pm 40$ ms)	Setting is unavailable, depends on $t_n$ (s)	15	30	45	60	90	120	180	240	360	480			
		$T_{c1} = 50\% t_n$													
Time delay $T_{c2}$ (s)	Accuracy within 10% (Original difference $\pm 40$ ms)	Setting is unavailable, depends on $t_n$ (s)	15	30	45	60	90	120	180	240	360	480			
		$T_{c2} = 25\% t_n$													

• Default settings

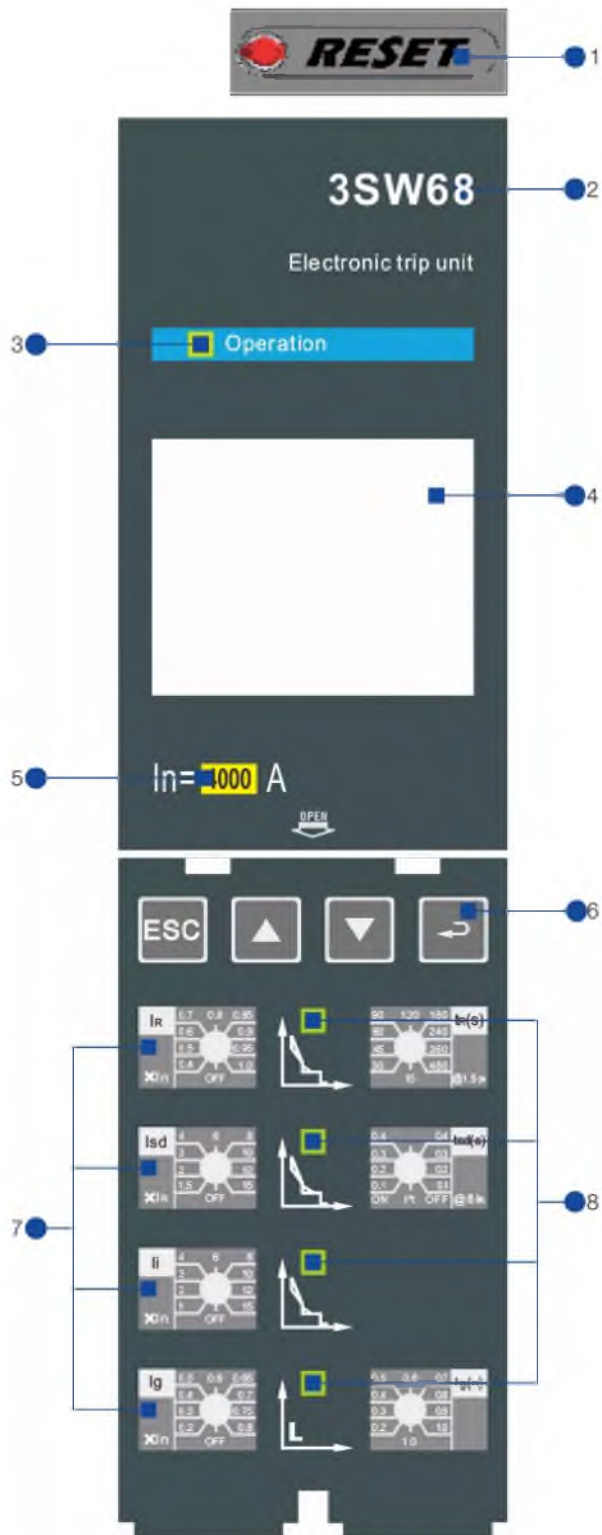
$I = 1.0 I_n$ ,  $t = 15$  s;  $I_{sd} = 3.0 I$ ,  $t_{sd} = 0.4$  s; ( $I^2t = \text{OFF}$ )  $I_i = 10 I_n$ ;  $I_g = \text{OFF}$ ,  $t_g = 0.8$  s.

**Suitable for size B/C/D (3SW68-2500/4000/6300)**

3SW68-BM electronic trip unit equips with a LCD displays, the protection value and delay time are set by knobs, some functions can be set by function keys.



- 3SW68-BM3: provides selective protections of long-time delayed protection, short-time delayed protection and instantaneous protection.
- 3SW68-BM4: provides additional selective earth fault protection and all protection functions of type 3SW68-BM3.



#### Function

Except the all functions of 3SW68-BL, 3SW68-BM is with additional or different functions as follows:

- Protection  
Protection value and delay time can be set by the knobs and be checked on the LCD display, some functions can be set by function keys.
- Fault trip display  
When circuit breaker trips due to any fault, the fault type is indicated by LED light accordingly, and the data is shown on the LCD display.
- Measure  
Current measurement.  
Without self- diagnosis  
Indicator of contact loss  
Show the percentage of the contact loss (based on breaking current equivalent and total life)
- Operation cycles when electronic trip unit on charge  
Record the total operation cycles
- Record of historical fault  
Check the latest 10 faults (display fault type and data)
- Historical maximum current  
Record the maximum current since running.
- Zone selective interlocking (ZSI) (selection function)  
ZSI connected with several breakers from upstream and downstream, to provides full selective protection of earth fault protection and short circuit protection, with instantaneous trip.
- Overload pre-alarm(selection function)  
When load current reach the overload setting values, the electronic trip unit give a DO alarm signal and indicate.

## Characteristics

### • Protection

Type 3SW68-BM3, suitable for size B/C/D 3SW68-2500/4000/6300

Long-time delayed protection: the same as type 3SW68-BL3

Short-time delayed protection: the same as type 3SW68-BL3

Instantaneous protection: the same as type 3SW68-BL3

### • Protection

Long-time delayed protection: the same as type 3SW68-BM3  
 Short-time delayed protection: the same as type 3SW68-BM3  
 Instantaneous protection: the same as type 3SW68-BM3  
 Earth fault protection: the same as type 3SW68-BL4

• **Protection**

Current (Continuous current measurement)

Measurement parameters:

$I_{a1}$ ,  $I_{b1}$ ,  $I_{c1}$ ,  $I_{g1}$ ,  $I_{N1}$

Measurement range:

$I_{a1}$ ,  $I_{b1}$ ,  $I_{c1}$ ,  $I_{N1}$  based on 25 In

Measurement accuracy:

$\leq 2I_n: \pm 1.5\%$ ;  $> 2 I_n: \pm 5\%$

- MCR & HSISC (Trip beyond limit) protection (selection function) - the same as type 3SW68-BL.
- Protection

Type 3SW68-BL3, 3SW68-BL4, suitable for size B/C/D 3SW68-2500/4000/6300

Zone selective interlocking (ZSI) (selection function)

Application:

Used to reduce the electrodynamic forces exerted on installation by shortening the time required to clear faults, while maintaining time discrimination between the various devices.

Including short-circuit interlocking and earth fault interlocking.

Settings requirements:

At least 1 DI of upstream circuit breaker is set to detect and receive signal from zone interlocking circuit breakers;

At least 1 DO of downstream circuit breaker is set to send signal upstream.

Operating mode

The electronic trip unit detecting a fault current sends a signal upstream and checks the signal arriving from downstream. If there is a signal from downstream, the circuit breaker remains closed for the full duration of its tripping-delay time. If there is no signal from downstream, the circuit breaker opens immediately, regardless of its tripping-delay setting.

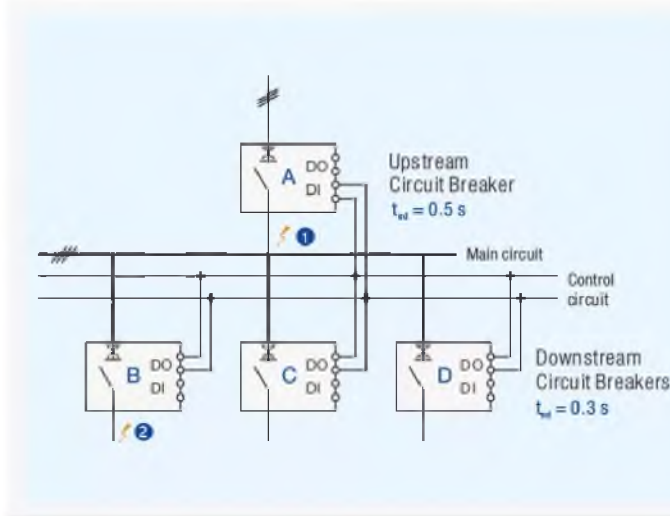
Example explanation

Fault 1:

Only circuit breaker A detect the fault. Because it does not receive signal from downstream, it opens immediately, regardless of its tripping-delay  $t_{sd}$  set to 0.5 s.

Fault 2:

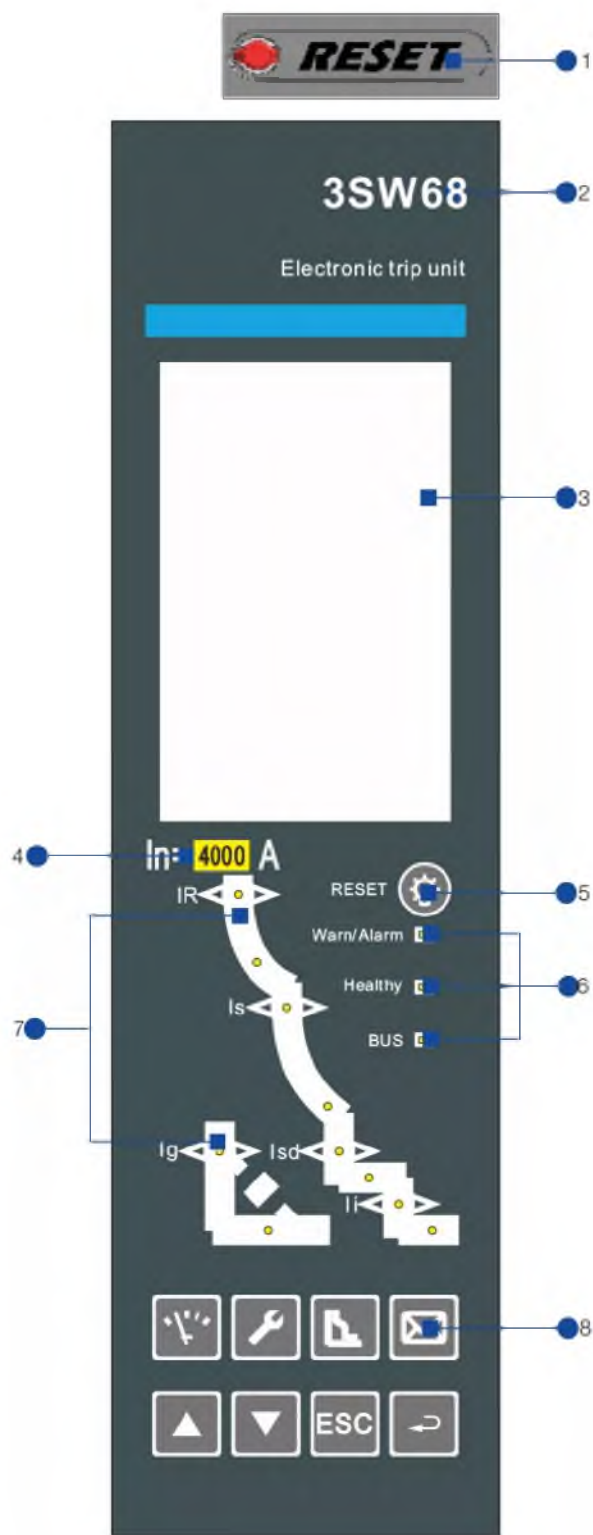
Both circuit breaks A and B detect the fault. Circuit breaker B does not receive a signal from downstream and opens immediately, in spite of its tripping-delay  $t_{sd}$  set to 0.3 s, meanwhile sends a signal to upstream circuit breaker A. Circuit breaker A receives the signal and remains closed for the full duration of its tripping-delay  $t_{sd}$  set to 0.5 s. If the fault current disappears within the duration 0.5 s, the circuit breaker A does not trip. If the fault current does not disappear within 0.5 s, the circuit breaker A trips also, to cut off the fault circuit.



- Load monitoring (selection function) - the same as type 3SW68-BL.
- Default settings
  - $I = 1.0 I_n$ ,  $t = 15$  s;
  - $I_{sd} = 3.0 I_R$ ,  $t_{sd} = 0.4$  s; ( $I t = OFF$ )
  - $I_i = 10 I_n$ ;
  - $I_g = OFF$ ,  $t_g = 0.8$  s.

**Suitable for size B/C/D (3SW68-2500/4000/6300)**

3SW68-BH electronic trip unit equips with a LCD displays, the protection value and delay time are set by function keys. Provides full selective protections of long-time delayed protection, short-time delayed protection, instantaneous protection and earth fault protection, as well as the communication function to take remote measurement, control, setting and communication.



## IFunction

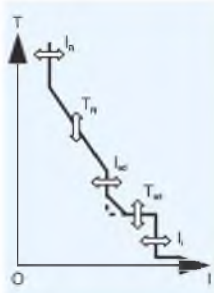
Except the allfunctions of 3SW68-BM, 3SW68-BM is with additional or different functions as follows:

- Protection
  - Protection value and delay time are set and checked by function keys.
- Overload protection
  - Based on true RMS and long-time delay multi-curve protection, can be switched OFF.
  - Thermal memory: The heat accumulation before or after trip.
- Short-circuit protection
  - Short-time delay (RMS) and instantaneous protection, can be switched OFF.
  - Short-time delay  $I^2t$  can be switched ON or OFF by function keys.
- Earth fault protection
  - Type T and type W both are available, type T is default setting, can be switched OFF.
  - Time-delay characteristic  $I^2t$  (definite time protection), can be selected by function keys.
- Neutral protection
  - Provide half, whole, 1.6 times and 2 times protection, can be switched ON or OFF.
- Current imbalance, current required, phase-loss protection
- Under frequency, over frequency, reverse frequency protection (only 3SW68-HG)
- Measurement
  - Provide measurement of current, voltage, power, frequency, electricity, heat capacity, phase sequence, value required. And type 3W68-BHQ and 3SW68-BHG have additional functions of harmonic analyze and wave display.
- Alarm record
  - Record the latest 10 alarms.
- Clock
  - Setting date and time.
- Communication
  - Provide outputs for communication functions.
- Residual current protection (selection function)
  - Sampling by zero sequence current to get high accuracy and sensitivity, applied for protection of lower current.
- Load monitor (selection function)
  - Can be used for pre-alarm, as well as the branch load control, act according to current and power.
- Earth alarm (selection function)
  - Send alarm signal, can be switched OFF.
- Undervoltage, over voltage, voltage imbalance, phase sequence protection (selection function)
- Remote reset (selection function)
  - Remote reset operational button, remove fault indication.
- Communicating (selection function)
  - Software support for remote measurement, control, setting and communication.
  - Modbus-RTU, Prodigus-DP and Devicenet are available.

## Characteristics

### ● Protection

Type 3SW68-BH, suitable for size B/C/D 3SW68-2500/4000/6300

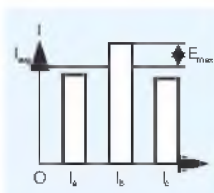


Long-time delayed protection		
Current setting $I_h$ (A)	$I_h = I_n \times \dots$	(0.4 ~ 1.0) + OFF, setting step: 1 A or 2 A
Action characteristics		< 1.05 $I_h$ , > 2 h no action; $\geq 1.2 I_h$ , < 1 h action selectable in menu
Type of curves	SI: Standard inverse time VI: Fast inverse time EI(G): Express inverse time (general power distribution) EI(M): Express inverse time (motor protection) HV: High-voltage fuse compatibility I <sup>t</sup> : General inverse time protection	Default setting is I <sup>t</sup> , the same as 3SW68-BL.
Time delay $t_h$ (s)	Accuracy within 10% (Original difference $\pm 40$ ms)	Time setting $t_h$ (s) C1 - C16, selectable in menu
Thermal memory		
(10, 20, 30, 45) min, (1, 2, 3) h reset or remove after trip unit out of electricity		
Short-time delayed protection		
Current setting $I_{sd}$ (A)	$I_{sd} = I_n \times \dots$	(1.5 ~ 15) + OFF, setting step: 1 A or 2 A
Action characteristics		< 0.9 $I_{sd}$ no action; $\geq 1.1 I_{sd}$ action
I <sup>t</sup> : (OFF) (definite time)	Accuracy within 10% (Original difference $\pm 40$ ms)	Time setting $t_{sd}$ (s) (0.1 ~ 0.4) s, setting step: 0.1 s
Time delay $T_{sd}$ (s)		
I <sup>t</sup> : (ON) (Inverse time)	Accuracy within 10% (Original difference $\pm 40$ ms)	The same as long-time delayed protection, the delayed action time is 1/10 of that long-time delayed.
Time delay T (s)		5 min reset or remove after trip unit out of electricity
Thermal memory		
(10, 20, 30, 45) min, (1, 2, 3) h reset or remove after trip unit out of electricity		
Instantaneous protection		
Current setting $I_i$ (A)	Size B/C, $I_i = I_n \times \dots$ Size D, $I_i = I_n \times \dots$	(1.0 ~ 20) + OFF, setting step: 1 A or 2 A (1.0 ~ 15) + OFF, setting step: 2 A
Action characteristics		< 0.85 $I_i$ no action; $\geq 1.15 I_i$ action
Action time delayed		< 30 ms
Earth fault protection		
Current setting $I_g$ (A)	$I_n \leq 1250$ A, $I_g = I_n \times \dots$ $I_n > 1250$ A, $I_g = \dots$	(0.4 ~ 0.8) + OFF, setting step: 1 A (500 A ~ 1200 A) + OFF, setting step: 2 A
Action characteristics		$\leq 0.8 I_g$ no action; $> 1.0 I_g$ action
Time delay $T_g$ (s)	Accuracy within 10% (Original difference $\pm 40$ ms)	Time setting $t_g$ (s) (0.1 ~ 1.0) s, setting step: 0.1 s
(definite time)		

#### • Neutral pole protection

Neutral pole protection	
Applications:	Setting range:
When the neutral line is thin, half value will be applied.	50 %, 100 %, 160 %, 200 %, OFF
When the neutral line is the same as others, full value will be applied.	
When harmonic wave is heavy, double or 1.6 times value will be applied.	

#### • Current imbalance protection



Current imbalance protection		
Current imbalance rate $I_{unbal}$ setting for protection start-up		(5 ~ 60) %, setting step: 1 %
Action characteristics		< 0.9 $I_{unbal}$ no action; $\geq 1.1 I_{unbal}$ action
Time delay (s)	Accuracy within 10% (Original difference $\pm 40$ ms)	Delayed action time setting (s) (0.1 ~ 40) s, setting step: 0.1 s
(definite time)		Definite time is the same as delay time.
Setting for protection return		5 % - start-up setting. Setting step: 1 % (available when ALARM mode only)
Return characteristics		$> 1.1 I_{unbal}$ no return; $\leq 0.9 I_{unbal}$ return
Time delay return (s)	Accuracy within 10% (Original difference $\pm 40$ ms)	Delayed return time setting (s) (10 ~ 200) s, setting step: 1 s (available when ALARM mode only); Definite time is the same as delay time.
(definite time)		
Mode		Alarm / Trip / OFF

#### • Required current protection

Required current protection		
Setting for protection start-up		(0.2 ~ 1) $I_n$ , setting step: 1 A or 2 A
Action characteristics		< 0.9 ( $I$ /setting) no action; $\geq 1.1$ ( $I$ /setting) action
Time delay (s)	Accuracy within 10% (Original difference $\pm 40$ ms)	Delayed action time setting (s) (15 ~ 1500) s, setting step: 1 s
(definite time)		Definite time is the same as delay time.
Setting for protection return		0.2 $I_n$ - start-up setting. Setting step: 1 A or 2 A (available when ALARM mode only)
Return characteristics		$> 1.1$ ( $I$ /setting) no return; $\leq 0.9$ ( $I$ /setting) return
Time delay return (s)	Accuracy within 10% (Original difference $\pm 40$ ms)	Delayed return time setting (s) (15 ~ 3000) s, setting step: 1 s (available when ALARM mode only); Definite time is the same as delay time.
(definite time)		
Mode		Alarm / Trip / OFF

## Characteristics

- Under frequency protection

	Under frequency protection			
	Setting for protection start-up			45 Hz ~ setting, setting step: 0.5 Hz
	Action characteristics			> setting +1 Hz no action; ≤ setting - 1 Hz action
	Time delay (s) (definite time)	Accuracy within 10% (Original difference ±40 ms)	Delayed action time setting (s)	{0.2 ~ 5.0} s, setting step: 1 s Definite time is the same as delay time.
	Setting for protection return			Start-up setting ~ 65 Hz. Setting step: 0.5 Hz (available when ALARM mode only)
Return characteristics			< setting - 1 Hz no return; ≥ setting + 1 Hz return	
Time delay return (s) (definite time)	Accuracy within 10% (Original difference ±40 ms)	Delayed return time setting (s)	{0.2 ~ 36} s, setting step: 0.1 s (available when ALARM mode only); Definite time is the same as delay time.	
Mode			Alarm / Trip / OFF	

- Over frequency protection

	Over frequency protection			
	Setting for protection start-up			Return setting ~ 65 Hz, setting step: 0.5 Hz
	Action characteristics			< setting - 1 Hz no action; ≥ setting + 1 Hz action
	Time delay (s) (definite time)	Accuracy within 10% (Original difference ±40 ms)	Delayed action time setting (s)	{0.2 ~ 5.0} s, setting step: 1 s Definite time is the same as delay time.
	Setting for protection return			45 Hz ~ start-up setting. Setting step: 0.5 Hz (available when ALARM mode only)
Return characteristics			> setting + 1 Hz no return; ≤ setting - 1 Hz return	
Time delay return (s) (definite time)	Accuracy within 10% (Original difference ±40 ms)	Delayed return time setting (s)	{0.2 ~ 36} s, setting step: 0.1 s (available when ALARM mode only); Definite time is the same as delay time.	
Mode			Alarm / Trip / OFF	

- Reverse power protection

	Reverse power protection			
	Setting for protection start-up			5 ~ 50 kW, setting step: 1 kW
	Action characteristics			< 0.9 (reverse power/setting) no action; ≥ 1.1 (reverse power/setting) action
	Time delay (s) (definite time)	Accuracy within 10% (Original difference ±40 ms)	Delayed action time setting (s)	{0.2 ~ 20} s, setting step: 1 s Definite time is the same as delay time.
	Setting for protection return			5 kW ~ start-up setting. Setting step: 1 kW (available when ALARM mode only)
Return characteristics			> 1.1 (reverse power/setting) no return ≤ 0.9 (reverse power/setting) return	
Time delay return (s) (definite time)	Accuracy within 10% (Original difference ±40 ms)	Delayed return time setting (s)	{1.0 ~ 360} s, setting step: 0.1 s (available when ALARM mode only); Definite time is the same as delay time.	
Mode			Alarm / Trip / OFF	

## Characteristics

- Measurement

Current (Continuous current measurement, applied to power system with 50 Hz or 60 Hz)		
Content: $I_A, I_B, I_C$ (three phase) $I_N$ (neutral pole), $I_g$ (earth current) $I_{unbal}$ (current imbalance rate)	Range: $I_A, I_B, I_C, I_N$ : 25 $I_n$	Accuracy: $\leq 2 I_n$ : $\pm 1.5\%$ $> 2 I_n$ : $\pm 5\%$
Current (Continuous current measurement, applied to power system with 50 Hz or 60 Hz)		
Content: Line voltage, phase voltage, average voltage, phase sequence, voltage imbalance rate	Range: Line voltage: 0 ~ 1200 V phase voltage: 0 ~ 600 V display the phase sequence	Accuracy: $\pm 5\%$
Power		
Content: Active power, reactive power, apparent power (not applied to three phase three line)	Range: Active power: - 32768 kW ~ + 32767 kW Reactive power: - 32768 kar ~ + 32767 kar Apparent power: 0 kVA ~ 65535 kVA	Accuracy: $\pm 2.5\%$
Power factor		
Content: System power factor, phase power factor (not applied to three phase three line)	Range: - 1.00 ~ + 1.00	Accuracy: $\pm 0.02$
Frequency		
Content: Frequency	Range: 40 Hz ~ 65 Hz	Accuracy: $\pm 0.05$ Hz
Energy		
Content: Input (output) active energy Input (output) reactive energy Total active (reactive, apparent) energy	Range: Active: 0 ~ 4294967295 kWh Reactive: 0 ~ 4294967295 karh Apparent: 0 ~ 4294967295 kVAh	Accuracy: $\pm 2.5\%$
Required value		
Content: Required current $I_A, I_B, I_C, I_N$ Required power P, Q, S	Range: The same as real-time measured value of current and power	Accuracy: The same as accuracy of current and power
Harmonic wave (available for type 3SW68-BHQ and 3SW68-BHG)		
Fundamental wave of current, voltage; Total harmonic distortion of current, voltage THD and thd; Latest 31 odd harmonics amplitude Pope;		
Waveform (available for type 3SW68-BHQ and 3SW68-BHG)		
Capture waveform display: 4 current $I_A, I_B, I_C, I_N$ ; 3 phase voltage $U_{AB}, U_{BC}, U_{CA}$		

- Residual current protection (selection function)

Residual current protection

Action current setting  $I_{\Delta n}$  : 0.5 ~ 30.0 A, setting step: 0.1 A

Action characteristics :  $< 0.8 (I_{\Delta n})$  no action;  $\geq 1.0 (I_{\Delta n})$  action

Time delay $t_{\Delta n}$ (s)	Accuracy within 10% (Original difference $\pm 40$ ms)	Time setting (s)	0.06	0.08	0.17	0.25	0.33	0.42	0.5	0.58	0.67	0.75	0.8	instantaneous
$I_{\Delta n}$		0.36	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5	0.04
$2 I_{\Delta n}$		0.18	0.25	0.5	0.75	1	1.25	1.5	1.75	2	2.25	2.5	2.5	0.04
$5 I_{\Delta n}$		0.07	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	0.04	
$10 I_{\Delta n}$														

Mode : Trip / OFF

Current transformer for differential protection

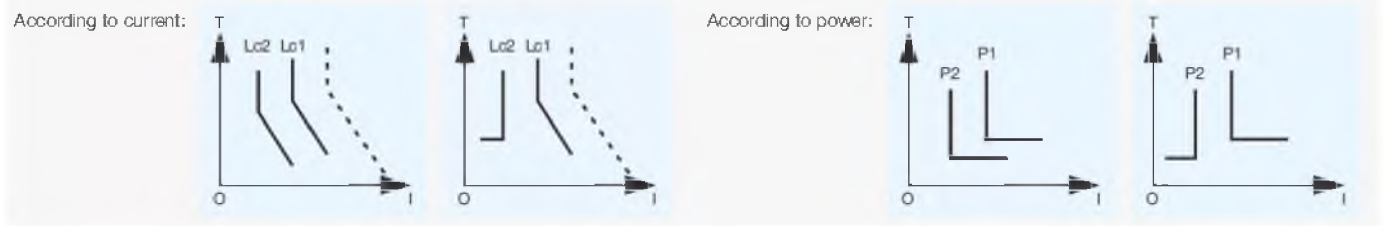
Current transformer for differential protection

- MCR & HSISC (Trip beyond limit) protection (selection function) - the same as type 3SW68-BL.
- Zone selective interlocking (ZSI) (selection function) - the same as type 3SW68-BL.

## Characteristics

- Load monitoring (selection function)

Load monitoring Action according to current or power	Mode 1: Control two loads independently, when actual value over setting value, load monitor DO action with time delay (DO function should be set accordingly), to break the branch load, ensure the main power supply.	Mode 2: Generally used for controlling one load, when value over setting start-up value, load monitor 1 DO action with time delay, open branch load; if actual values after breaking are lower than return value, after setting time delay, load monitor1 DO returns, load monitor 2 DO action, to close the circuit and recovery the supply power. Note: Load1 start-up value $\geq$ Load 2 return value
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• **Earth alarm (selection function)**

	Earth alarm		
	Current setting for alarm	$I_n \leq 1250$ A $I_n > 1250$ A	$\{0.4 \sim 0.8\} \times I_n$ + OFF, setting step: 1 A $\{500$ A ~ 1200 A) + OFF, setting step: 2 A
	Action characteristics		$< 0.8$ (I/setting value) no action; $\geq 1.0$ (I/setting value) action
	Time delay (s) (definite time)	Accuracy within 10% (Original difference $\pm 40$ ms)	Delay time setting (s) $\{0.1 \sim 1.0\}$ s, setting step: 0.1 s Definite time is the same as delay time.
	Current setting for alarm return (available when ALARM mode only)	$I_n \leq 1250$ A $I_n > 1250$ A	$\{0.4 \sim 0.8\} \times I_n$ , setting step: 0.1 s 500 A ~ 1200 A, setting step: 2 A
	Return characteristics		$> 1.0$ (I/setting value) no return; $\leq 0.9$ (I/setting value) return
	Time delay return (s) (definite time)	Accuracy within 10% (Original difference $\pm 40$ ms)	Delayed return time setting (s) $\{0.1 \sim 1.0\}$ s, setting step: 0.1 s (available when ALARM mode only) Definite time is the same as delay time.
	Mode		Alarm / OFF

• **Under voltage protection (selection function)**

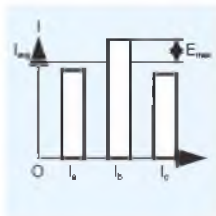
	Under voltage protection		
	Setting for protection start-up		100 V ~ return value, setting step: 1 V
	Action characteristics		$> 1.1$ ( $U_{max}$ /setting of action value) no action $\leq 0.9$ ( $U_{max}$ /setting of action value) action
	Time delay (s) (definite time)	Accuracy within 10% (Original difference $\pm 40$ ms)	Delay time setting (s) $\{0.2 \sim 60\}$ s, setting step: 0.1 s Definite time is the same as delay time.
	Setting for protection return		100 V ~ 1200 V, setting step: 1 V (available when ALARM mode only, setting value for return $\geq$ start-up value)
	Return characteristics		$< 0.9$ ( $U_{max}$ /setting of return value) no return $\geq 1.1$ ( $U_{max}$ /setting of return value) return
	Time delay return (s) (definite time)	Accuracy within 10% (Original difference $\pm 40$ ms)	Delayed return time setting (s) $\{0.2 \sim 60\}$ s, setting step: 0.1 s (available when ALARM mode only) Definite time is the same as delay time.
	Mode		Alarm / Trip / OFF

• **Over voltage protection (selection function)**

	Over voltage protection (setting value for under voltage protection must less than that for over voltage protection)		
	Setting for protection start-up		Return value ~ 1200 V, setting step: 1 V
	Action characteristics		$< 0.9$ ( $U_{min}$ /setting of action value) no action $\geq 1.1$ ( $U_{min}$ /setting of action value) action
	Time delay (s) (definite time)	Accuracy within 10% (Original difference $\pm 40$ ms)	Delay time setting (s) $\{0.2 \sim 60\}$ s, setting step: 0.1 s Definite time is the same as delay time.
	Setting for protection return		100 V ~ start-up value, setting step: 1 V (available when ALARM mode only, setting value for start-up $\geq$ return value)
	Return characteristics		$\geq 1.1$ ( $U_{min}$ /setting of return value) no return $< 0.9$ ( $U_{min}$ /setting of return value) return
	Time delay return (s) (definite time)	Accuracy within 10% (Original difference $\pm 40$ ms)	Delayed return time setting (s) $\{0.2 \sim 60\}$ s, setting step: 0.1 s (available when ALARM mode only) Definite time is the same as delay time.
	Mode		Alarm / Trip / OFF

**Characteristics**

• **Voltage imbalance protection (selection function)**



Voltage imbalance protection		
Voltage imbalance rate Unbal setting for protection start-up		(2 ~ 30) %, setting step: 1 %
Action characteristics		< 0.9 (actual voltage imbalance rate/setting value) no action ≥ 1.1 (actual voltage imbalance rate/setting value) action
Time delay (s) (definite time)	Accuracy within 10% (Original difference ±40 ms)	Delay time setting (s) (0.2 ~ 60) s, setting step: 0.1 s Definite time is the same as delay time.
Setting for protection return		2 % ~ start-up value, setting step: 1 % (available when ALARM mode only, setting value for return ≥ start-up value)
Return characteristics		> 1.1 (actual voltage imbalance rate/setting value) no return ≤ 0.9 (actual voltage imbalance rate/setting value) return
Time delay return (s) (definite time)	Accuracy within 10% (Original difference ±40 ms)	Delayed return time setting (s) (0.2 ~ 60) s, setting step: 0.1 s (available when ALARM mode only) Definite time is the same as delay time.
Mode		Alarm / Trip / OFF

- Phase sequence protection (selection function)

Phase sequence protection		Setting range: Δφ: A, B, C / Δφ: A, C, B
Action phase sequence		Alarm / Trip / OFF
Mode		

- Default settings

I = 1.0 In, t = 15 s;

Isd = 3.0 I<sub>s</sub>, tsd = 0.4 s; (definite time)

Ii = 10 In;

Ig = OFF, tg = 0.8 s.

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