

HYM1L

Series Earth Leakage Circuit Breaker



I. Scope of Application

The HYM1L Series Earth Leakage Circuit Breaker (hereinafter referred to as “earth leakage circuit breaker”) is one of the new earth leakage circuit breakers designed and developed by our company with international advanced technology. This series of products is suitable for the circuits with AC 50 Hz, rated isolation voltage of 800 V, rated working voltage of 400 V, and rated current up to 630 A and below, which can provide indirect contact protection for people with fatal electric shock, and can also be used to prevent major fire hazard caused by grounding fault current caused by equipment insulation damage. It can be used to protect the overload, short circuit and undervoltage of the line, and can also be used for infrequent transfer of lines.

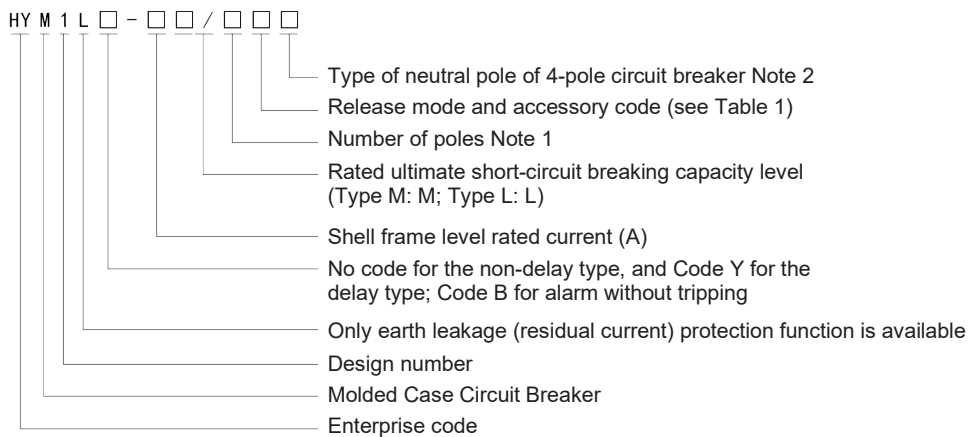
The earth leakage circuit breaker is characterized by small size (equal to that of the corresponding molded case circuit breaker), high breaking current, short flashover and adjustable residual current operating time. It can be equipped with alarm contact, shunt trip, undervoltage release, auxiliary contact, handle rotation operating mechanism, electric operating mechanism and other accessories, and can adopt the wiring in front of the plate, behind the plate and of the plug-in type, which is an ideal product for users.

The product complies with the requirements of GB 14048.2.

II. Normal Working Conditions

- 1 The altitude of the installation location shall not exceed 2,000 m.
- 2 The ambient air temperature shall be -5°C~+40°C. The average temperature within 24 hours shall not exceed +35°C.
- 3 The relative atmospheric humidity shall not exceed 50% when the ambient air temperature is +40°C. The average maximum relative humidity of the wettest month is 90%, and the average minimum temperature of that month is +20°C.
- 4 Installation category: III.
- 5 Contamination grade: Grade 3.
- 6 The installation place shall have no significant shaking and impact vibration.
- 7 The magnetic field near the installation site shall not exceed 5 times of the geomagnetic field in any direction.
- 8 The earth leakage circuit breaker shall generally be installed vertically.

III. Model Description



Note: (1) 2P is denoted by 2; 3P is denoted by 3; and 3P+N and 4P are denoted by 4.

(2) The type of neutral pole (N pole) of the 4-pole circuit breaker is divided into:

Type A: The N pole is not equipped with an overcurrent tripping element and is normally on, and is not closed/opened with the other three poles (Code: A).

Type B: The N pole is not equipped with an overcurrent tripping element, and is closed/opened with the other three poles (Code: B).

Where the Type A 4-pole circuit breaker is 3P+N type.

Where the shell frame level rated current of Inm=400 A and 630 A is not followed by L or M, and the outline dimensions and technical parameters are the same as those of Type M.

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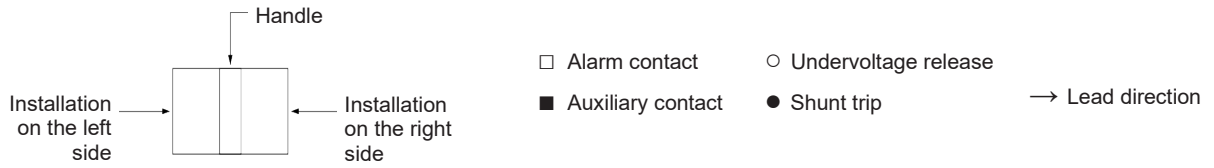


Table 1 Release mode and accessory code

Release mode and internal accessory code	Model	HYM 1L- 125 HYM 1L-250		HYM 1L-400		HYM 1L-630	
		Number of poles and N-pole form					
		Accessory name		3-pole, 4-pole Type A	4-pole Type B	3-pole, 4-pole Type A	4-pole Type B
208, 308	Alarm contact						
210, 310	Shunt trip						
220, 320	Auxiliary contact						
230, 330	Undervoltage release						
240, 340	Shunt trip, auxiliary contact	—		—		—	
250, 350	Shunt trip, undervoltage release	—		—		—	
260, 360	2 sets of auxiliary contacts	—	—	—		—	
270, 370	Auxiliary contact, undervoltage release	—	—	—		—	
218, 318	Shunt trip, alarm contact	—		—		—	

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Table 1 (continued) Release mode and accessory code

Release mode and internal accessory code	Model	HYM1L-125 HYM 1L-250		HYM 1L-400		HYM 1L-630	
		Number of poles and N-pole form		Number of poles and N-pole form		Number of poles and N-pole form	
		Accessory name		3-pole, 4-pole Type A	4-pole Type B	3-pole, 4-pole Type A	4-pole Type B
228, 328	Auxiliary contact, alarm contact						
238, 338	Undervoltage release, alarm contact	—	—	—	—		
248, 348	Shunt trip, auxiliary contact, alarm contact	—		—		—	
268, 368	2 sets of auxiliary/alarms contacts	—	—	—		—	
278, 378	Auxiliary contact, undervoltage release, alarm contact	—	—	—	—	—	

- Note: 1. In the release mode and internal accessory code: The first digit 2 indicates electromagnetic (instantaneous) release, and 3 indicates thermal-electromagnetic (complex) release. The last two digits indicate the internal accessory code, or 00 if there is no accessory.
2. In HYM1L-400 and 630, the auxiliary contacts of sizes 228, 328, 248 and 348 are a pair of contacts (i.e. one normally-open contact and one normally-closed contact), and the auxiliary contacts of sizes 268 and 368 are three pairs of contacts (i.e. three normally-open contacts and three normally-closed contacts). The configuration of other auxiliary contacts is shown in Table 2.
3. The auxiliary contacts of sizes 220, 320, 240 and 340 in HYM1L-125 and 250 can be provided with two pairs of contacts (i.e. two normally-open contacts and two normally-closed contacts), which however, must be noted when ordering.
4. If the HYM1L series is equipped with earth leakage alarm unit module (that is, earth leakage alarm without tripping), only the accessories of the specification with ▲ are provided.

IV. Main Technical Parameters

1. See Tables 2, 3 and 4 for basic specifications and technical parameters of the earth leakage circuit breaker.

Tables 2 Basic specifications and technical parameters

Model	Rated working voltage U_n (V)	Number of poles	Rated current I_n (A)	Rated ultimate short-circuit breaking capacity I_{cu} (kA)	Rated operating short-circuit breaking capacity I_{cs} (kA)	Flashover distance	Rated residual operating current $I_{\Delta n}$ (mA)	Rated residual non-operating current $I_{\Delta no}$ (mA)	Rated residual short-circuit making/breaking capacity	Residual current operation type				
HYM1L-125L	230	2	16, 20, 25, 32, 40, 50, 63, 80, 100, 125	30	22	≤50	30 (Non-delay type only) 50, 100, 200, 300, 500	1/2 $I_{\Delta n}$	1/4 I_{cu}	Type A Type AC				
HYM1L-125M	230	2		50	35									
HYM1L-250L	230	2	100, 125, 160, 180, 200, 225, 250	35	25									
HYM1L-250M	230	2		50	35									
HYM1L-400M	400	3, 4	225, 250, 315, 350, 400	50	35						≤100	100, 300, 500		
HYM1L-630M	400	3, 4	400, 500, 630	50	35							300, 500, 1,000		

Note: The adjustment of the three-gear residual operating current can be selected by the user.

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Table 3 Breaking time of the non-delay earth leakage circuit breaker

Residual current	$I\Delta n$	$2I\Delta n$	$5I\Delta n$	$10I\Delta n$
Maximum breaking time (s)	0.2	0.1	0.04	0.04

Table 4 Breaking time of the delay-type earth leakage circuit breaker (the limit non-actuating time Δt at $21\Delta n$ is 0.2 s, 0.5 s and 1 s)

t (s)	$I_{nm}(A)$ $t_n(s)$	125, 250, 400, 630			400, 630
		0.2	0.4	1	2
$I\Delta n$		<0.2	<0.6	<1.2	<2.2
$2I\Delta n$		$0.1 < t < 0.2$	$0.2 < t < 0.5$	$0.5 < t < 1.1$	$1 < t < 2.1$
$5I\Delta n$		$0.1 \leq t \leq 0.15$	$0.2 < t < 0.44$	$0.5 < t < 1.04$	$1 < t < 2.04$
$10I\Delta n$		$0.1 \leq t \leq 0.15$	$0.2 < t < 0.44$	$0.5 < t < 1.04$	$1 < t < 2.04$

Note: t_n is the delay setting value. Only two-gear delay is provided for $I_{nm} = 125 A$ and $250 A$, and three-gear delay is provided for $I_{nm} = 400 A$ and $630 A$.

2. See Table 5 for the interruption characteristics of the inverse time operation of the circuit breaker for the power distribution.

Table 5

Test current name	Set current multiple I_n	Conventional time h		Initial state
		$I_n \leq 63A$	$I_n > 63A$	
Conventional non-tripping current	$1.05I_n$	≥ 1	≥ 2	Cold state
Conventional tripping current	$1.30I_n$	<1	<2	Thermal state

3. See Table 6 for the interruption characteristics of the inverse time operation of the earth leakage circuit breaker for the motor protection.

Table 6

Test current name	Set current multiple	Conventional time	Initial state
Conventional non-tripping current	$1.0I_n$	$\geq 2h$	Cold state
Conventional tripping current	$1.2I_n$	<2h	Thermal state

4. The instantaneous operation characteristic of the earth leakage circuit breaker for power distribution is set to $10 I_n$, and the instantaneous operation characteristic of the earth leakage circuit breaker for motor protection is set to $12 I_n$, and the setting accuracy is $\pm 20\%$.

5. See Table 7 for mechanical and electrical operation performance.

Table 7 Number of operation cycles

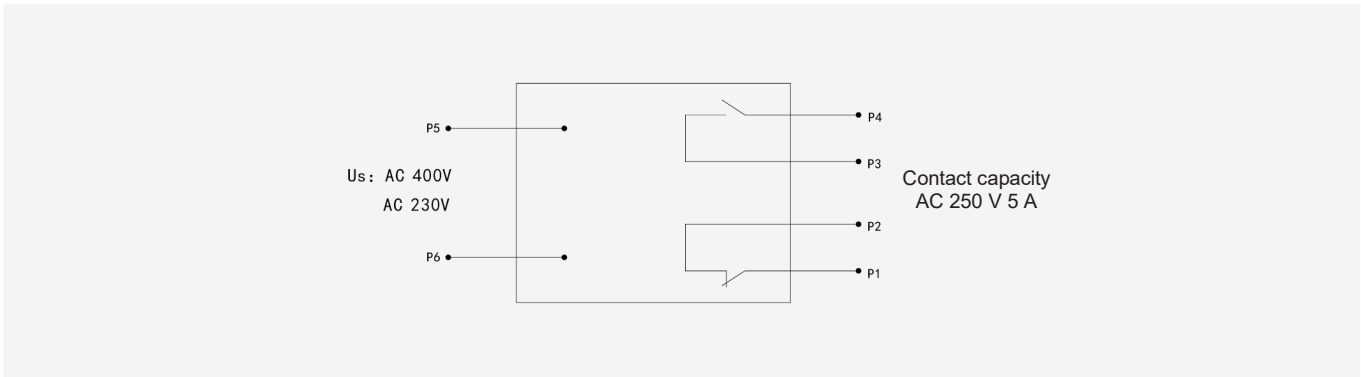
Shell frame level rated current $I_{nm} (A)$	Number of operation cycles per hour	Number of operation cycles		
		Energizing	De-energizing	Total times
125	120	1,500	8,500	10,000
250	120	1,000	7,000	8,000
400	60	1,000	4,000	5,000
630	60	1,000	4,000	5,000

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6. Electric operating mechanism
When the electric operating mechanism is used for the earth leakage circuit breaker, reliable closing and opening of the circuit breaker shall be ensured at any voltage between 85% and 110% of the rated control power supply voltage.
7. Shunt trip
When the power supply voltage is equal to any voltage between 70% and 110% of the rated control power supply voltage, the circuit breaker can be reliably interrupted by operating the shunt trip.
8. Undervoltage release
When the power supply voltage drops to 70% ~ 35% of the rated power supply voltage, the undervoltage release shall act to interrupt the earth leakage circuit breaker. When the power supply voltage is lower than 35% of the rated power supply, the undervoltage release shall prevent the earth leakage circuit breaker from closing. When the power supply voltage is equal to or greater than 85% of the rated power supply voltage, reliable closing of the earth leakage circuit breaker shall be ensured.
9. LB earth leakage alarm module (see Figure 1)
The HYM1LB Earth Leakage Circuit Breaker is plugged with LB earth leakage alarm module on the right side of the open circuit. Terminals P5-P6 of this module are externally connected with AC 400 V or AC 230 V power supply. When earth leakage occurs in the main circuit of the earth leakage circuit breaker and $I\Delta \geq I\Delta n$, the circuit breaker does not trip, the relay in the alarm module acts, and terminals P1-P2 and P3-P4 are internally connected with relay contacts to send out alarm signals.

Figure 1 Wiring diagram of the LB earth leakage alarm module



Where P1-P2 are normally-closed contacts and P3-P4 are normally-open contacts:

- A. When $I\Delta < I\Delta n$, the earth leakage indicator light is not on, and P1-P2 is closed and P3-P4 is open.
- B. When $I\Delta \geq I\Delta n$, the earth leakage indicator light is on, and P1-P2 is open and P3-P4 is closed.
- C. Under the condition that the earth leakage indicator light is on:
If $I\Delta < I\Delta n$, the alarm state can be released by pressing the "Reset" button, then the earth leakage indicator light will go out, the alarm state will be released, and the module will return to the "A" state.
If after the "Reset" button is pressed, the earth leakage indicator will go out, and it will light up immediately after the "Reset" button is released, which indicates that $I\Delta \geq I\Delta n$, the alarm state is not released, and the module will remain in the "B" state all the time and will not return to the "A" state until $I\Delta < I\Delta n$.

Attention: The HYM1LB Earth Leakage Circuit Breaker will not trip due to earth leakage fault even if it is not connected to the auxiliary power supply Us. Whether P1-P2 and P3-P4 are closed in each working state can be detected by a multimeter.

10. See Table 8 and Table 9 for the cross-section area of the connecting conductor of the earth leakage circuit breaker.

Table 8

Rated current In (A)	16 20	25	32	40 50	63	80	100	125	160	180 200 225	250	315 350	400
Cross-section area of conductor S (mm ²)	2.5	4	6	10	16	25	35	50	70	95	120	185	240

Table 9

Rated current In (A)		500	630
Copper conductor	Pcs	2	2
	Cross-section area (mm ²)	150	185
Copper busbar	Pcs	2	2
	Cross-section area (mm ²)	30×5	40×5

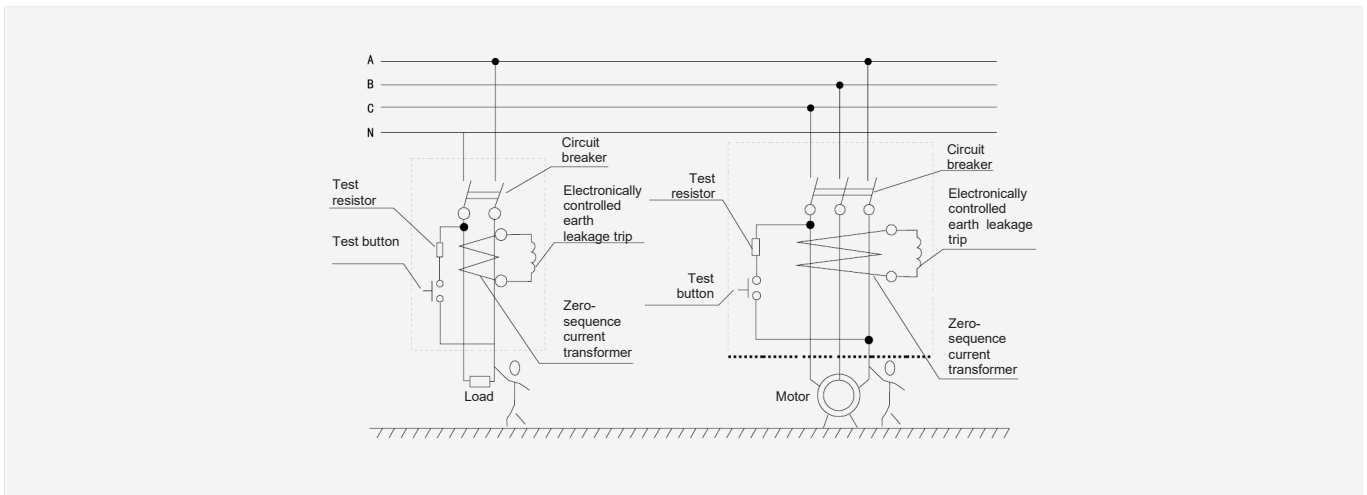
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V. Structure and Principle of Operation

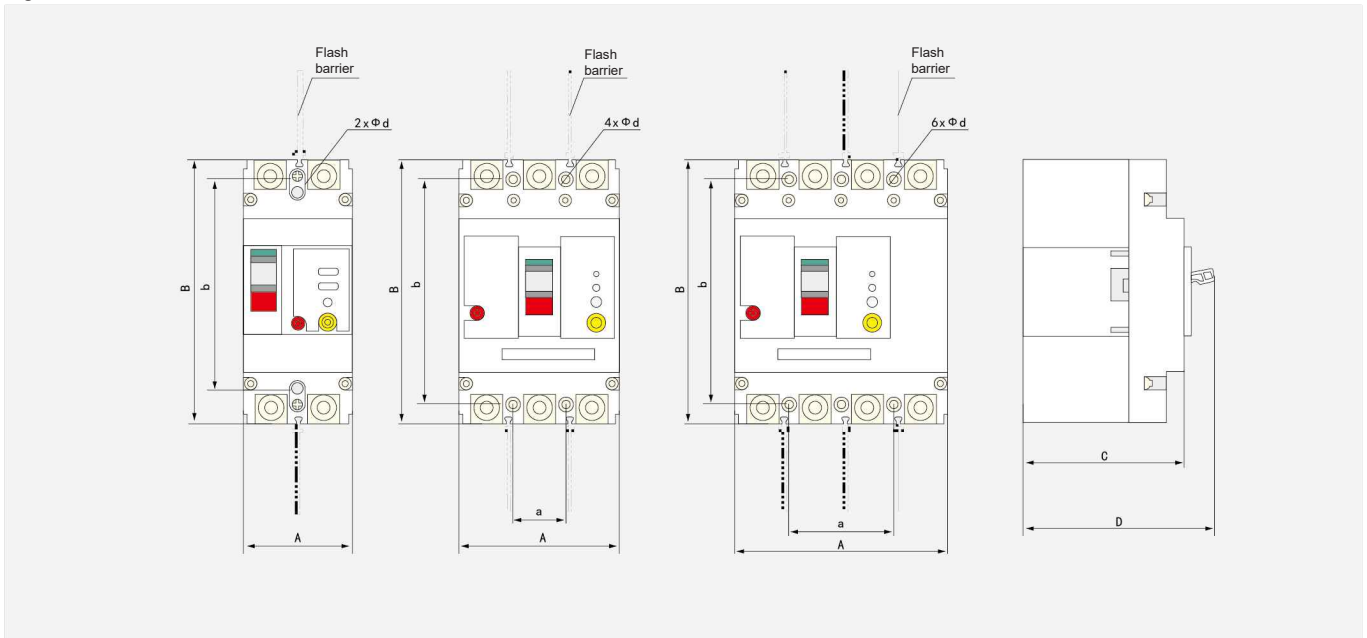
1. This series of earth leakage circuit breakers is electronic circuit breakers, which are mainly composed of zero-sequence current transformers, electronically controlled earth leakage trips and circuit breakers with overload and short-circuit protection. All parts are installed in a pair of molded cases.
2. When earth leakage or electric shock occurs in the protected circuit, as long as the earth leakage current reaches the set earth leakage operating current value, the output signal of the secondary winding of the zero-sequence current transformer will trigger the thyristor to conduct, and the earth leakage trip will be energized and pulled in, so that the earth leakage breaker will be tripped, thus cutting off the power supply to protect against earth leakage and electric shock. See Figure 2 for the principle of operation.
3. When the protected circuit is overloaded or short-circuited, the thermal-magnetic trip completes the delay or instantaneous tripping to make the earth leakage circuit breaker operate, thus cutting off the power supply to protect against overload or short-circuit.

Figure 2 Principle of operation



VI. Outline and Installation Dimensions (see Figure 3 and Table 10)

Figure 3 Outline and installation dimensions



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Table 10

Model	Number of poles	Overall dimension				Installation dimension		
		A	B	C	D	a	b	φd
HYM1L-125L	2	62	150	75	94	-	129	4.5
	3	92	150	75	94	30	129	4.5
	4	122	150	75	94	60	129	4.5
HYM1L-125M	2	62	150	92	110	-	129	4.5
	3	92	150	92	110	30	129	4.5
	4	122	150	92	110	60	129	4.5
HYM1L-250L	2	75	165	72	94	-	127	4.5
	3	107	165	72	94	35	127	4.5
	4	142	165	72	94	70	127	4.5
HYM1L-250M	2	75	165	90	110	-	127	4.5
	3	107	165	90	110	35	127	4.5
	4	142	165	90	110	70	127	4.5
HYM1L-400	3	150	257	106.5	146.5	44	194	7
	4	198	257	106.5	146.5	94	194	7
HYM1L-630	3	210	280	115.5	155	70	243	7
	4	280	280	115.5	155	140	243	7

VII. Use and Maintenance

- Fix the earth leakage circuit breaker vertically (please use a Phillips screwdriver to prevent damage to the housing). The appearance of the earth leakage circuit breaker is in good condition, and no-load operation works normally. The rated values of the earth leakage circuit breaker and its accessories shall be consistent with the working conditions of the installation site. As the earth leakage circuit breaker is equipped with electronic circuit board, it is forbidden to measure the same insulation resistance between the outgoing line terminals of the earth leakage circuit breaker to avoid damaging electronic elements. If the insulation test is carried out, it's required to
 - Use a 500 V megger.
 - Measure the insulation resistance between terminals 1-2, 3-4 and 5-6 when the earth leakage circuit breaker is switched off.
 - Measure the insulation resistance between the terminals of the main circuit and the shell (covered with metal foil) when the earth leakage circuit breaker is closed.
 - Ensure the measured insulation resistance shall not be less than 1.5 MΩ.
- The incoming line of the power supply must be directly above the earth leakage circuit breaker, that is, the side marked with "1, 3, 5, N", and the load conductors (including the neutral wires) must pass through the earth leakage circuit breaker, and the load neutral wires must be insulated from the ground.
- The handle of the earth leakage circuit breaker can be in three positions: "closed", "open" and "tripped". When the handle is in the trip position, it shall be pulled in the "open" direction to make the circuit breaker trip again, and then the "closing" operation can be carried out.
- If the earth leakage circuit breaker is opened due to the failure of the protected line, the reason shall be found out, and the closing operation can only be carried out after troubleshooting.
- Various characteristics of the earth leakage circuit breaker and its accessories are set by our company according to the order requirements, and cannot be adjusted freely during use.
- As required by the user, the rated residual operating current $I_{\Delta n}$ and earth leakage operating time shall be set (HYM1L non-delay earth leakage operating time is not adjustable, while HYM1LY earth leakage operating time is adjustable).
- According to Chapter 2 "Normal Working Conditions" of this instruction and the above articles of this chapter, the circuit breaker can be closed and put into operation. During the operation of the circuit breaker, the testing device shall be operated at least once a month to confirm that the earth leakage protection function of the circuit breaker is normal.

VIII. Attention

- The earth leakage circuit breaker cannot protect human body from electric shock caused by contact with two load lines at the same time, and therefore users shall pay attention to the electricity safety.
- Do not test the device by means of short circuit between phase wires and the ground, so as not to affect the service life of the device.

IX. Ordering Information

When ordering, users must indicate:

- Name and model of the earth leakage circuit breaker
- Rated current (A)
- Rated residual operating current (mA)
- Special specifications will be discussed separately
- Example of ordering: Product model name: HYM1L-125L/4300A earth leakage circuit breaker, with rated current of 125 A, rated residual operating current of 100/300/500 mA, non-delay type, and 100 sets.