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# HSL1 Series
# Residual Current Circuit Breaker

## 1 Application

HSL1 Series Residual Current Operated Molded Case Circuit Breakers (RCCB in brief hereinafter) are suitably applied in AC 50Hz electric grids with rated insulation voltage 500V, rated working voltage 400V or below and rated current 10A ~ 800A for protection of person and equipment from electric shock and earth leakage to avoid fire risk generated from earth fault. It also can be used for infrequent open/close (switchover) of circuit and motor (400A and below). When there is an overload or short circuit occurred in a circuit or motor, it will protect circuit and motor as well as turn off electric circuit automatically.

The RCCB complies with Standards IEC 60947 - 2, GB 14048.2 and others.

There is J Series RCCB which gives alarm only without tripping derived from this kind of RCCB. When residual current is greater than the specified, the alarm relay in J Type RCCB operates but without tripping, only to give hint to operators for reparation of circuit in time. As the alarming residual current is over 100mA, personal safety cannot be ensured. And furthermore, this kind of RCCB only gives out residual current alarm without time delay, no counter time limit protective feature generally, i.e., it cannot automatically trip because of overload. Only when short circuit occurs can it trips automatically. It is suitably used in those places where there is not appropriate to shut off electricity at general faults such as fire control system and electric lift.

There is also Z Series Intelligent RCCB derived, featuring residual current display, residual current pre-alarm, adjustable residual operated current and operating time, alarm without tripping functions. It acts as a general RCCB or J Type RCCB.

## 2 Working conditions:

2.1 Installation location not over an altitude of 2000 meters above sea level;

2.2 Ambient temperature not higher than + 40℃ nor lower than - 5℃ with an average temperature in 24 hours not over + 35℃;

2.3 Atmosphere conditions

The relative humidity at max. ambient temperature of + 40℃ is not over 50%. Under lower temperature, higher humidity is acceptable. In the most humid months of the year, the max. monthly average relative humidity may be 90% if the minimum temperature is + 25℃. Special measures should be taken for the occasional condensation due to temperature fluctuation;

2.4 Pollution Grade 3. For internal accessories, the pollution grade is 2.

2.5 Installation category

For primary circuit of RCCB, there is III and for auxiliary and control circuit there is II.

2.6 The external magnetic field in installation place should not be greater than 5 times of earth magnetic field in any directions.

2.7 Installation mode

Basically vertical installation. Horizontal installation is also acceptable with exception for frame level 63A RCCB.

## 3 Classification

3.1 In terms of application:

a. Distribution protection;

b. Motor protection.

3.2 In terms of pole number:

a. 2 - pole (Only for Inm=200)

b. 3-pole

b. 4-pole;

c. 3 - pole 4 wire

For four-pole RCCBs, there are 2 types of neutral pole (N pole):

Type A: No overcurrent trip on N pole, and the N pole doesn't close and open with other 3 poles all the time;

Type B: No overcurrent trip on N pole, and the N pole closes and opens with other 3 poles interactively;

3.3 In terms of operation mode:

a. Handle operation;

b. Motor-driven operation (code No.:CD);

c. Rotary handle operation (code No.:CZ).

3.4 In terms of RCCB connection mode:

a. Panel front wiring(code No.:Q);

b. Panel rear wiring (code No.:H);

c. Plug-in mode(code No.: R);

d. Withdrawable mode (code No.: C).

3.5 In terms of overcurrent tripping mode of RCCB:

a. Instantaneous tripping (code No. 2);

b. Composite tripping (code No. 3).

3.6 In terms of setting mode of operated residual current and operating time:

a. General type (Set by manufacturer as per customer's requirement. The time setting mode may be both non time delay and time delay);

b. Adjustable type (The residual operated current and delay time may be set by customer);

c. Intelligent type (Residual current may be displayed. Residual operated current and operating time may be adjustable)

## 4 Type and its designation

HS L 1-□□/□□ □ □ □ □/□,□

- Rated current
- Operation mode code (See Classification 3.3, no mark for handle operation)
- Wiring mode code (See Classification 3.4, no mark for panel front wiring)
- N pole code(see Classification 3.2)
- Code of setting mode for operated residual current and time (no code for general, KT for adjustable, J for alarming, and Z for intelligent)
- Application code(no code for distribution protection and 2 for motor protection)
- Trip mode and accessory code (see Classification 3.5 and Table 9)
- Pole number (2P,3P or 4P)
- Short circuit breaking capacity level (no code for general type, H for high breaking type)
- Rated current in frame level
- Design serial No.
- Molded case circuit breaker
- Hangshen Group, manufacturer

## 5 Specification, performance and parameter

5.1 Specification, performance and parameter of primary circuit of RCCB

a. The circuit breaker is AC Type (AC sine current) residual current operated one;

b. Ratings in primary circuit: For general type and KT Type, please refer to Table 1. Those for J Type RCCB and Z Type RCCB are shown in Table 2 and Table 3 respectively.

Table 1 Main parameters and types of General Type and KT Type RCCBs

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Overalls and specifications | | |  | | | | |  | | | |
| Frame current A | | | 63 | 100 | 100H | 200 | 200H | 400 | 400H | 800(630) | 800H |
| Rated current A | | | 10, 16, 20, 25, 32, 40, 50, 63, | 20, 32, 40, 50, 63, 80, 100 | | 100, 125, 160, 200 | | 200, 250, 315, 350, 400 | | 400, 500, 630, 700, 800 | |
| Pole number | | | 3, 4 | | | 2, 3, 4 | | 3, 4 | | 4 | |
| Rated voltage V | | | 380 (400) / 220 (230) | | | | | | | | |
| Rated impulse withstand voltage kV | | | 6 | | | | | | | | |
| Rated frequency Hz | | | 50 | | | | | | | | |
| Protection trip | Overload long delay+short circuit Ins (3) | | Magnetic | Thermal - magnetic | | | | | | | |
| | Short circuit Inst(2) | | Magnetic | Magnetic | | | | | | | |
| Protection | Not adj. | Operating current mA | 30, 100, 300 | 30, 100, 300 | | 30, 100, 300 | | 100, 300, 500 | | 100, 300, 500, 1000 | |
| | | Time No delay | ≤ 0.2 | ≤ 0.2 | | ≤ 0.2 | | ≤ 0.2 | | ≤ 0.2 | |
| | | Time Delay | 0.06, 0.2 | 0.2, 0.3 | | 0.2, 0.3 | | 0.3, 0.5 | | 0.3, 1 | |
| | Adj. | Operating current mA | 30-100 -300 | 30-100 -300 | | 30-100 -300 | | 100-300 -500 | | 300-500-1000 | |
| | | Delay s | - | 0.2-0.3-0.5 | | 0.2-0.3-0.5 | | 0.3-0.5-1 | | 0.3-0.5-1 | |
| Breaking capacity | I cu | | 15 kA | 40kA | 65kA | 40kA | 70kA | 50kA | 70kA | 50kA | 70kA |
| | I cs | | 10 kA | 20kA | 50kA | 20kA | 50kA | 30kA | 50kA | 30kA | 50kA |
| Connect. mode | Front Q | | √ | √ | | √ | | √ | | √ | |
| | Rear H | | √ | √ | | √ | | √ | | √ | |
| | Plug-in R | | √ | √ | | √ | | - | | - | |
| | Withdraw C | | - | - | | - | | √ | | √ | |
| Accees. | Aux. cont. FC | | √ | √ | | √ | | √ | | √ | |
| | Alarm cont BC | | √ | √ | | √ | | √ | | √ | |
| | Shunt trip FT | | √ | √ | | √ | | √ | | √ | |
| Motor-driven operating mechanism CD | | | √ | √ | | √ | | √ | | √ | |
| Rotary handle mechanism | | | √ | √ | | √ | | √ | | √ | |

Note: (1) The rated current for N pole in pole RCCB (400A and over) is 50% of that for RCCB.

(2) The flashover distance of the RCCB is ≤ 50mm.

Table 2 Main parameters and types of J Type RCCBs

| Overalls and specifications |  | | | | |  | | | |
|---|---|---|---|---|---|---|---|---|---|
| Frame current A | 63 | 100 | 100H | 200 | 200H | 400 | 400H | 800(630) | 800H |
| Rated current A | 10, 16, 20, 25, 32, 40, 50, 63, | 20, 32, 40, 50, 63, 80, 100 | | 100, 125, 160, 200 | | 200, 250, 315, 350, 400 | | 400, 500, 630, 700, 800 | |
| Pole number | 3, 4 | | | | | | | 4 | |
| Rated voltage V | 380 (400) / 220 (230) | | | | | | | | |
| Rated impulse withstand voltage kV | 6 | | | | | | | | |
| Rated frequency Hz | 50 | | | | | | | | |
| Protection trip — Overloadlong delay short circuit Ins(3) | Note 2 | | | | | | | | |
| Protection trip — Short circuit Inst(2) | Magnetic | | | | | | | | |
| Alarm non-tripping — Alarm residual current (mA) | 100, 300,500 | | | | | | | | |
| Alarm non-tripping — Alarm indication | Red LED indication | | | | | | | | |
| Alarm non-tripping — Alarm output | NO contact | | | | | | | | |
| Alarm non-tripping — Assembly mode | External mounting | | | | | Built-in type | | | |
| Alarm non-tripping — Reset method | Manual button reset | | | | | Manual switch reset | | | |
| Breaking capacity — I cu | 15 kA | 40kA | 65kA | 40kA | 70kA | 50kA | 70kA | 50kA | 70kA |
| Breaking capacity — I cs | 10 kA | 20kA | 50kA | 20kA | 50kA | 30kA | 50kA | 30kA | 50kA |
| Connect. mode — Front Q | √ | √ | | √ | | √ | | √ | |
| Connect. mode — Rear H | √ | √ | | √ | | √ | | √ | |
| Connect. mode — Plug-in R | √ | √ | | √ | | - | | - | |
| Connect. mode — Withdraw C | - | - | | - | | √ | | √ | |
| Accees. — Aux. cont. FC | √ | √ | | √ | | √ | | √ | |
| Accees. — Alarm cont BC | √ | √ | | √ | | √ | | √ | |
| Accees. — Shunt trip FT | - | - | | - | | √ | | √ | |
| Motor-driven operating mechanism CD | √ | √ | | √ | | √ | | √ | |
| Rotary handle mechanism CZ | √ | √ | | √ | | √ | | √ | |

Note: (1) The rated current for N pole in pole RCCB (400A and over) is 50% of that for RCCB.
(2) J type RCCB usually only has short-circuit protection, no overload long-time delay protection. If the user needs , please note.
(3) The flashover distance of the RCCB is ⩽ 50mm.

Table 3 Main parameters and types of Z Type RCCB

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Overalls and specifications | |  | | | | | | | | |
| Frame current A | | 63 | 100 | 100H | 200 | 200H | 400 | 400H | 800(630) | 800H |
| Rated current A | | 10, 16, 20, 25, 32, 40, 50, 63, | 20, 32, 40, 50, 63, 80, 100 | | 100, 125, 160, 200 | | 200, 250, 315, 350, 400 | | 400, 500, 630, 700, 800 | |
| Pole number | | 3, 4 | | | | | | | 4 | |
| Rated voltage V | | 380 (400) / 220 (230) | | | | | | | | |
| Rated impulse withstand voltage kV | | 6 | | | | | | | | |
| Rated frequency Hz | | 50 | | | | | | | | |
| Over-load Protection | Overload long delay+short circuit Ins (3) | Magnetic | Thermal - magnetic | | | | | | | |
| | Short circuit Inst(2) | Magnetic | Magnetic | | | | | | | |
| Residual current Protection | Display | 3-bits LED 10mA~600mA | | | | | | | | |
| | Setting value | Rated residual current $I_{\Delta n}$ :30-100-200-300-500mA Adjustable | | | | | | | | |
| | | Pre-alarm residual current $I_{\Delta EB}$ :0.65I (Audible alarm) | | | | | | | | |
| | | Limiting non-actuating time $\Delta t$ :≤0.1-0.2-0.3-0.5-1s adjustable | | | | | | | | |
| | Alarm mode | Audible alarm | | | | | | | | |
| | Alarm output | One NO contact, capacity:AC400Vx0.3A / DC230Vx0.15A | | | | | | | | |
| | Assembly mode | External mounting | | | | | | | | |
| Breaking capacity | I cu | 15 kA | 40kA | 65kA | 40kA | 70kA | 50kA | 70kA | 50kA | 70kA |
| | I cs | 10 kA | 20kA | 50kA | 20kA | 50kA | 30kA | 50kA | 30kA | 50kA |
| Connect. mode | Front Q | √ | √ | | √ | | √ | | √ | |
| | Rear H | √ | √ | | √ | | √ | | √ | |
| | Plug-in R | √ | √ | | √ | | - | | - | |
| | Withdraw C | - | - | | - | | √ | | √ | |
| Accees. | Aux. cont. FC | √ | √ | | √ | | √ | | √ | |
| | Alarm cont BC | √ | √ | | √ | | √ | | √ | |
| | Shunt trip FT | √ | √ | | √ | | √ | | √ | |
| Motor-driven operating mechanism CD | | √ | √ | | √ | | √ | | √ | |
| Rotary handle mechanism | | √ | √ | | √ | | √ | | √ | |

Note: (1) The rated current for N pole in pole RCCB (400A and over) is 50% of that for RCCB.

(2) When $\Delta t$ is ≤0.1s, Residual current protection to non-delay type. (Show in Table 4 and Table 5.)

(3) The flashover distance of the RCCB is ≤ 50mm.

c.  Table 4 shows the breaking time for non time delay RCCB

Table 4

| Residual current | $I_{\triangle n}$ | $2\ I_{\triangle n}$ | $5I_{\triangle n}$ 1) | $10I_{\triangle n}$ 2) |
|---|---|---|---|---|
| Max. breaking time s | 0.2 | 0.1 | 0.04 | 0.04 |
| Note 1) 0.25A substitutes the $5I_{\triangle n}$ for $I_{\triangle n} \leqslant$ 30mA RCCB;<br>2) 0.5A substitutes the $10I_{\triangle n}$ for $I_{\triangle n} \leqslant$ 30mA RCCB | | | | |

d.  The time delay RCCB may be divided into fixed type and adjustable type:

(1)  The fixed time delay RCCB is delivered with a fixed time delay set for residual current operation as per customer's requirement. Preferential selection of not adjustable delay time specified in Table 1 is recommended with actual operating time scope shown in Table 5.

(2)  Adjustable delay time RCCB contains adjustable operated residual current and time function in three steps respectively. Selection of adjust values in Table 1 is recommended. By the way, RCCB in frame current level 63A is not an adjustable delay time one.

Table 5

<table>
<tr><th>Setting value(limited time of non operation)</th><th>Residual current</th><th>$I_{\triangle n}$</th><th>$2\ I_{\triangle n}$</th><th>$5I_{\triangle n}$</th><th>$10I_{\triangle n}$</th><th>Remarks</th></tr>
<tr><td rowspan="2">0.06s</td><td>Max. breaking time s</td><td>0.5</td><td>0.2</td><td>0.15</td><td>0.15</td><td rowspan="4">Recom-mended for HSL1 - 63, 100 and 200</td></tr>
<tr><td>limited time of non operation</td><td colspan="4">0.06</td></tr>
<tr><td rowspan="2">0.2s</td><td>Max. breaking time s</td><td>1</td><td>0.5</td><td>0.3</td><td>0.3</td></tr>
<tr><td>limited time of non operation</td><td colspan="4">0.2</td></tr>
<tr><td rowspan="2">0.3s</td><td>Max. breaking time s</td><td>2</td><td>1</td><td>0.8</td><td>0.8</td><td rowspan="4">Recom-mended for HSL1 - 400 & 800</td></tr>
<tr><td>limited time of non operation</td><td colspan="4">0.3</td></tr>
<tr><td rowspan="2">0.5s</td><td>Max. breaking time s</td><td>3</td><td>2</td><td>1.5</td><td>1.5</td></tr>
<tr><td>limited time of non operation</td><td colspan="4">0.5</td></tr>
<tr><td rowspan="2">1s</td><td>Max. breaking time s</td><td>4.5</td><td>3</td><td>2</td><td>2</td><td rowspan="2">Recom-mended for HSL1 - 800</td></tr>
<tr><td>limited time of non operation</td><td colspan="4">1</td></tr>
</table>

e. Counter time limit breaking performance of RCCB for distribution shown in Table 6

Table 6

| Test current | Multiple of setting current | Conventional time | | Initial status |
|---|---|---|---|---|
| | | $I_n \leqslant$ 63A | 63A $< I_n \leqslant$ 800A | |
| Conventional non tripping current | 1.05 | ⩾ 1 h | ⩾ 2 h | Cold |
| Conventional tripping current | 1.30 | < 1 h | < 2 h | Heat |
| Reset performance current | 3.0 | Reversal time | | Cold |
| | | 5s | 8s ~ 12s | |

f. Counter time limit breaking performance of RCCB for motor protection shown in Table 7

Table 7

| Test current | Multiple of setting current | Conventional time | | Initial status |
|---|---|---|---|---|
| | | $I_n \leqslant$ 100A | 100A $< I_n \leqslant$ 400A | |
| Conventional non tripping current | 1.0 | ⩾ 2 h | | Cold |
| Conventional tripping current | 1.2 | < 2 h | | Heat |
| | 1.5 | ⩽ 2 min | ⩽ 4 min | Heat |
| Reset performance current | 7.2 | 2s<Tp⩽10s | 4s<Tp⩽10s | Cold |

g. Breaking performance at short circuit of overcurrent trip

Setting current of short circuit protection: 10 In for distribution (8 In in 700A and 800A RCCBs), 12 In for motor protection (400A in HSL1 - 1000 RCCB with rated current 40A and below both for distribution and motor protection. The accuracy for all frame levels is ±20％).

h. Operation cycles of RCCB shown in Table 8.

Table 8

| Rated current of frame level Inm A | Operation cycles per hour | Operation cycle | | |
|---|---|---|---|---|
| | | Energized | Not energized | Total |
| 63 | 120 | 6000 | 4000 | 10000 |
| 100 | 120 | 3000 | 7000 | 10000 |
| 200 | 120 | 1500 | 6500 | 8000 |
| 400 | 60 | 1000 | 4000 | 5000 |
| 800 (630) | 20 | 500 | 2500 | 3000 |

## 5.2 Accessories for RCCB

Available accessories and codes in a single RCCB may be mounted as shown in Table 9.

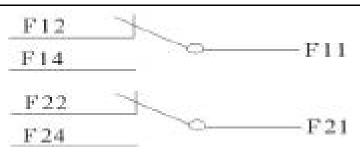
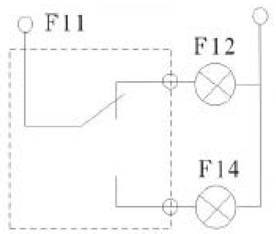
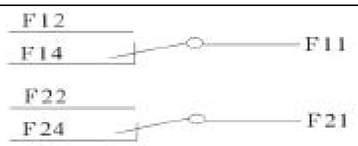
Table 9

| Code | Accessories | Frame level 63 ~ 200A | Frame level 400A and 800A |
|---|---|---|---|
| 00 | Not any accessory | √ | √ |
| 10 | Shunt trip | √ | √ |
| 20 | Auxiliary contact | √ | √ |
| 40 | Shunt trip + auxiliary contact | √ | √ |
| 60 | Double auxiliary contacts | √ | √ |
| 80 | Shunt trip + double auxiliary contacts | √ | √ |
| 08 | Alarm contact | √ | √ |
| 18 | Shunt trip + alarm contact | √ | √ |
| 28 | Auxiliary contact + alarm contact | √ | √ |
| 48 | Shunt trip + auxiliary contact + alarm contact | √ | √ |
| 68 | Double auxiliary contacts + alarm contact | | √ |
| 88 | Shunt trip + double auxiliary contact + alarm contact | | √ |
| 09 | Double alarm contacts | | √ |
| 19 | Shunt trip + double alarm contacts | | √ |
| 29 | Auxiliary contact + double alarm contacts | | √ |
| 49 | Shunt trip + aux. contact + double alarm contacts | | √ |
| 69 | Double auxiliary contacts + double alarm contacts | | √ |
| 89 | Shunt trip + double auxiliary contacts + double alarm contacts | | √ |

Note: The accessory lead direction is on left side of the RCCB.

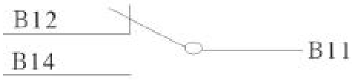
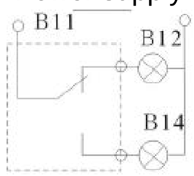
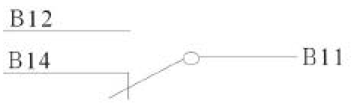
a. Wiring diagram of auxiliary contact shown in Table 10

Table 10

<table>
<tr><th>RCCB status</th><th>Aux. contact status</th><th>Groups of aux.contacts</th><th>Wiring diagram for one group of auxiliary contacts</th></tr>
<tr><td rowspan="2">Open position</td><td></td><td>2</td><td rowspan="4">Power supply<br><br>OFF<br>ON</td></tr>
<tr><td></td><td>1</td></tr>
<tr><td rowspan="2">Closed position</td><td></td><td>2</td></tr>
<tr><td></td><td>1</td></tr>
</table>

b. Wiring diagram for alarm contact shown in Table 11

Table 11

| RCCB status | Alarm contact status | Wiring diagram |
|---|---|---|
| Open and closed position |  | Power supply  OFF/ON<br>Free tripping |
| Free tripping position |  | |

c. Ratings of aux. contact and alarm contact shown in Table 12

Table 12

| Conventional thermal current $I_{th}$ A | Rated insulating voltage Ui V | Rated working current Ie A | |
|---|---|---|---|
| 3 | 380 (400) | AC 380 (400) V | DC 220 (230) V |
| | | 0.30 | 0.15 |

d. Shunt trip

1) The shunt trip with frame level 200A and below (for remote tripping of RCCB) is connected in parallel with residual current test button shown in Fig. 1. As there exists a power supply, there is no need to establish another power supply. AC 220 (230) V for 4-poles and AC 380(400) for 3-poles. If our customer requires a DC 24V shunt trip, there is still no need to establish an additional power supply shown in Fig. 2 and connect RCCB to DC 24V relay NC contacts only with the relay coil connected to DC 24V power supply through a pushbutton. Attention: Shunt trips for mutiple RCCBs should connect a pair of their own contacts separately and connection from each other is not allowed.

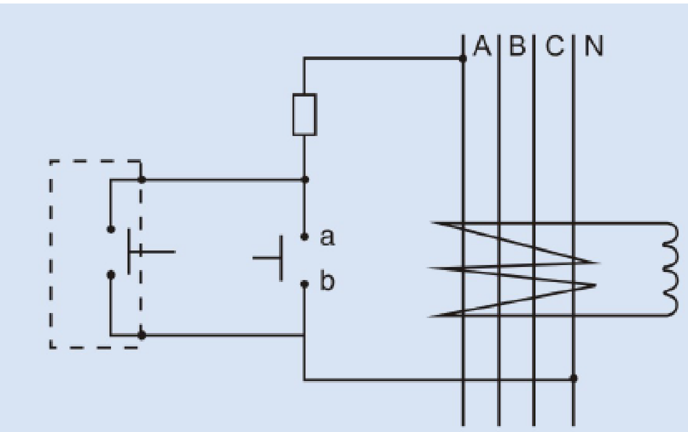



Fig. 1 Wiring diagram for AC 220 (230) V / AC 380 (400) V shunt trip

In Fig. 1, connections between a and b contact points is made by the manufacturer. A pushbutton in dotted lines should be supplied by customer.

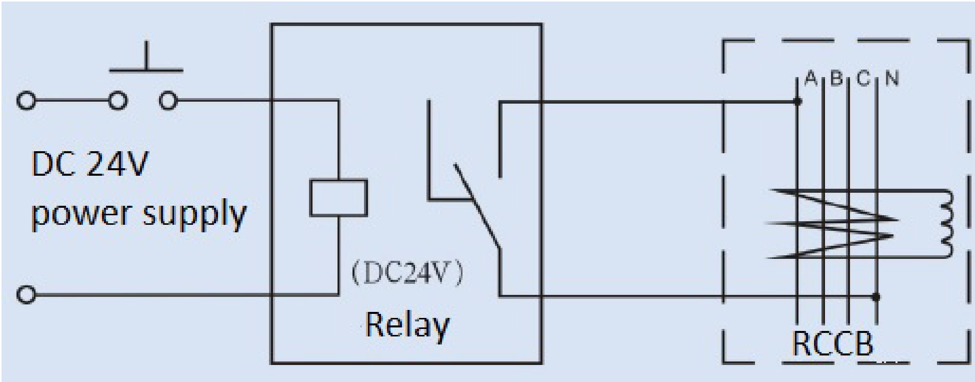



Fig. 2 Wiring diagram of a DC 24V shunt trip

2) A shunt trip with frame level of 400A and over should be connected to an external power supply with rated voltage of AC 380(400)V, AC 220 (230)V, DC 220 (230) V and DC 110V. If our customer needs DC 24V shunt trip, the wiring diagram is shown in Fig. 3 with an external AC 220 (230)V power supply and a DC 24V relay for control.

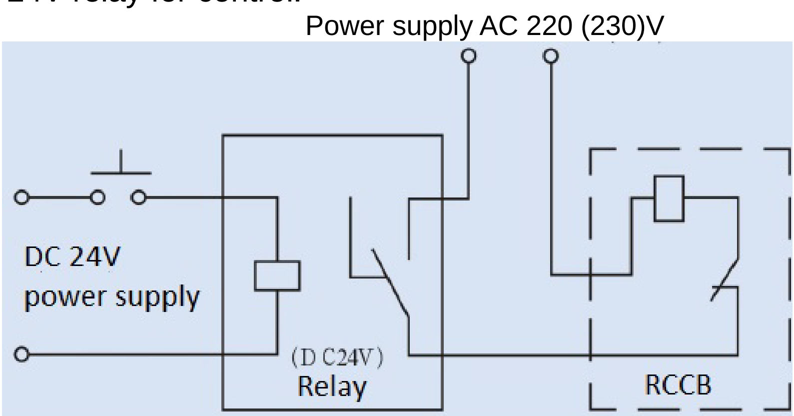



Fig. 3 Wiring diagram for shunt trip

e. This series of RCCB may work with CD2 Motor-driven Operating Mechanism for remote control of open and closed operation on RCCB. The rated control voltage may be divided into AC 220 (230) V, AC110V, DC 220 (230) V and DC 110V.

## 6 Working principle of RCCB

If there is an earth fault or personal electric shock occurred in a load circuit connected in downstream of RCCB and the earth fault current or electric shock current $I_{\triangle}$ comes to residual operating current, the zero sequence current transformer will give out a signal from its secondary winding and the residual current trip will disconnect its power supply within 0.2 second. According to the customer, a time delay RCCB will disconnect the power supply through a certain time delay.

The time delay residual current operated circuit breaker may form step protection with other circuit breakers such as non time delay ones which operates within 0.2 second so as to boost reliability of power supply and safety. If there is an earth fault occurred in a branch circuit, the RCCB in the branch circuit will disconnect the fault circuit without influence on other circuits. If the RCCB in branch circuit is in damage and no response at all, or even there is an earth fault in primary circuit , the time delay operated RCCB will function to shut power.

Working principle of J Type RCCB: If there is an earth fault in a circuit and the leakage current comes to the value of operating residual current, a relay will operate an alarm contact to closed position from its original normally open position. The wiring terminals of the two closed contacts on alarm contact are wired to duty place by the customer. Meanwhile, an alarm lamp or electric ring (or buzzer) is mounted in the circuit to hint the fault for the convenience of reparation in time.

Beside the above described function, the Z Type RCCB possesses earth fault current display and earth fault pre-alarm function. The earth fault current in load circuit is displayed through a three-digit tube. When the earth fault current comes to 65% rated operating residual current, the buzzer will begin to alarm to give a hint and let duty people to repair the circuit in time. In this way, tripping and breakdown time will reduced substantially, and safety and reliability of power supply is ensured.

Caution: The RCCB cannot protect those persons from electric shock who contact two phase lines to be protected (AB, BC or CA) simultaneously.

The working principle of RCCB can be also shown in Fig. 4.

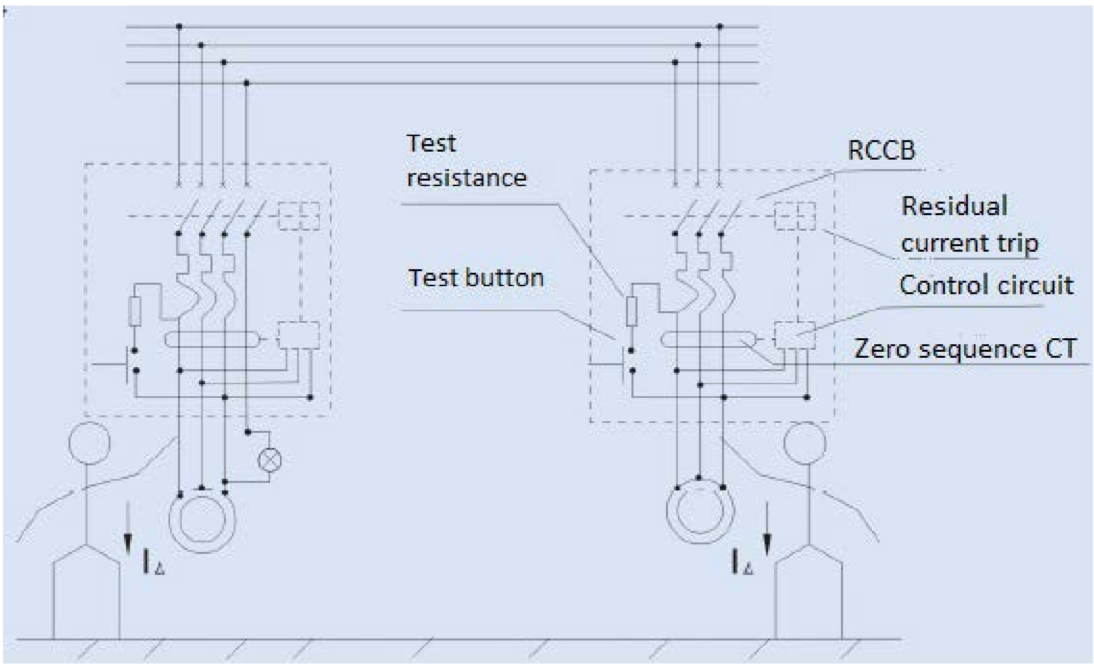
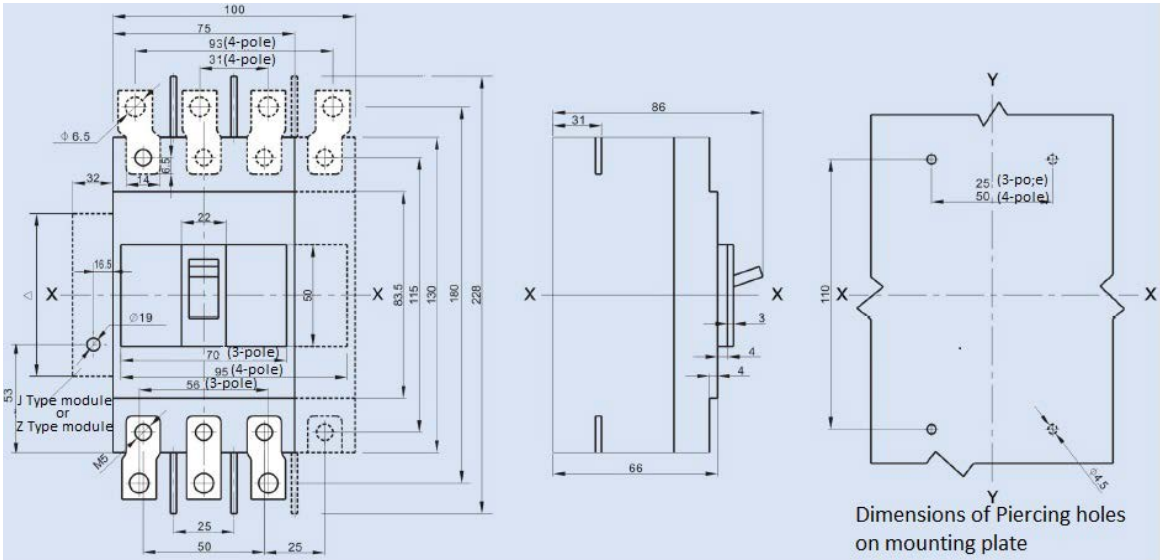



Fig. 4 Working principle of RCCB

# 7 Overalls and installation dimensions of RCCB (mm)

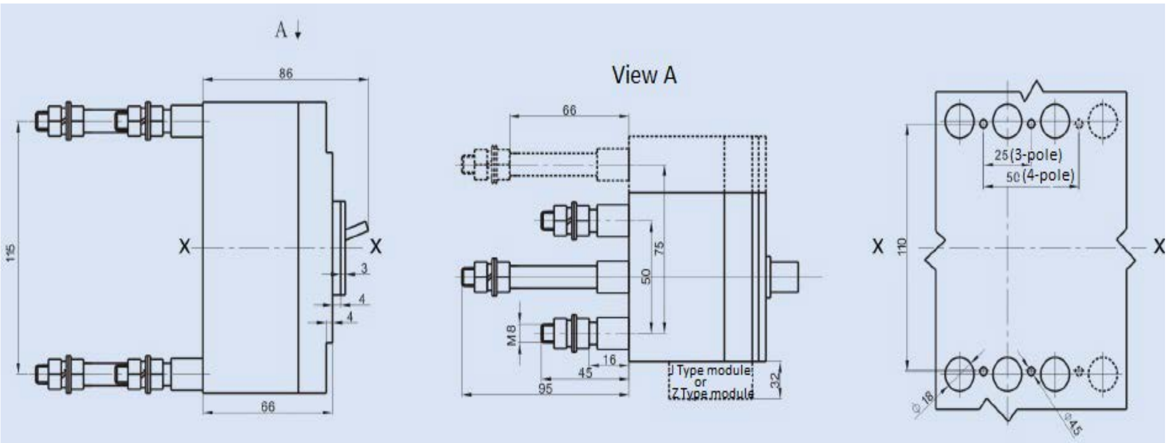
## 7.1 Overalls and installation piercing dimensions of HSL1 -63 panel front wiring shown in Fig. 5 (3-pole and 4-pole)




Note: X-X and Y-Y are central lines of RCCB
△: 81 for those with alarm but without tripping and 121 for intelligent ones)

Fig. 5

## 7.2 Overalls and installation piercing dimensions of HSL1-63 panel rear wiring shown in Fig. 6 (3-pole and 4-pole)

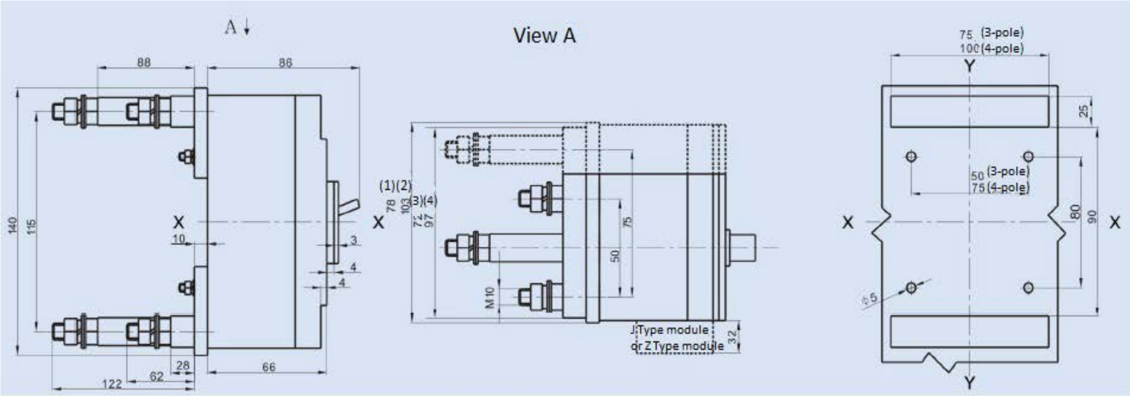



Dimensions of piercing holes on mounting plate

Note: X-X and Y-Y are central lines of RCCB

Fig. 6

7.3 Overalls and installation piercing dimensions of HSL1-63 plug-in panel rear wiring shown in Fig. 7 (3-pole and 4-pole)

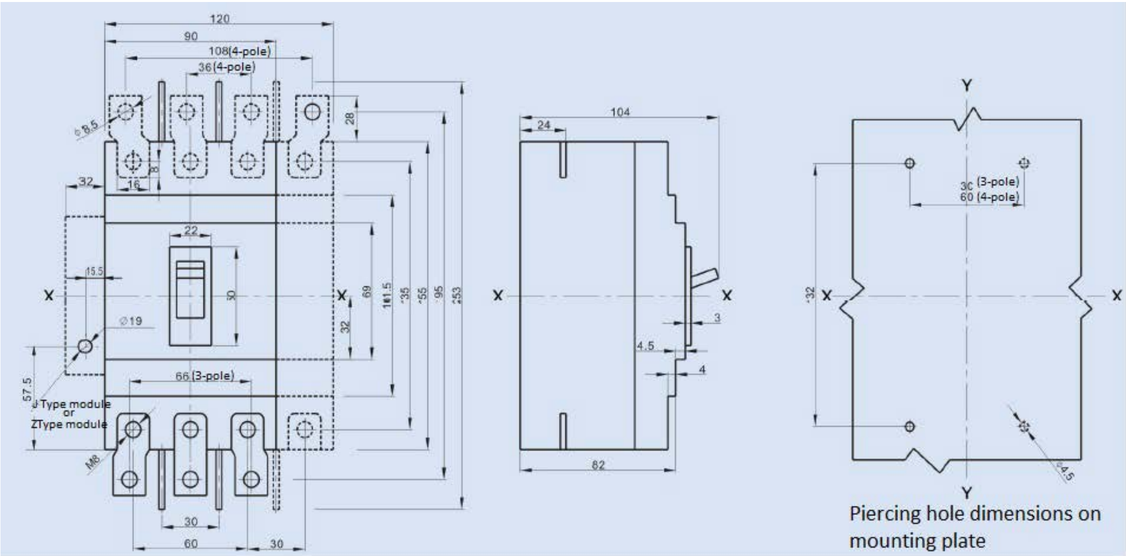



Dimensions of piercing holes on mounting plate

Note: In the figure, (1) = (3-pole), (2) = (4-pole), (3) = (3-pole), (4) = (4-pole).
X-X and Y-Y are central lines of RCCB

Fig. 7

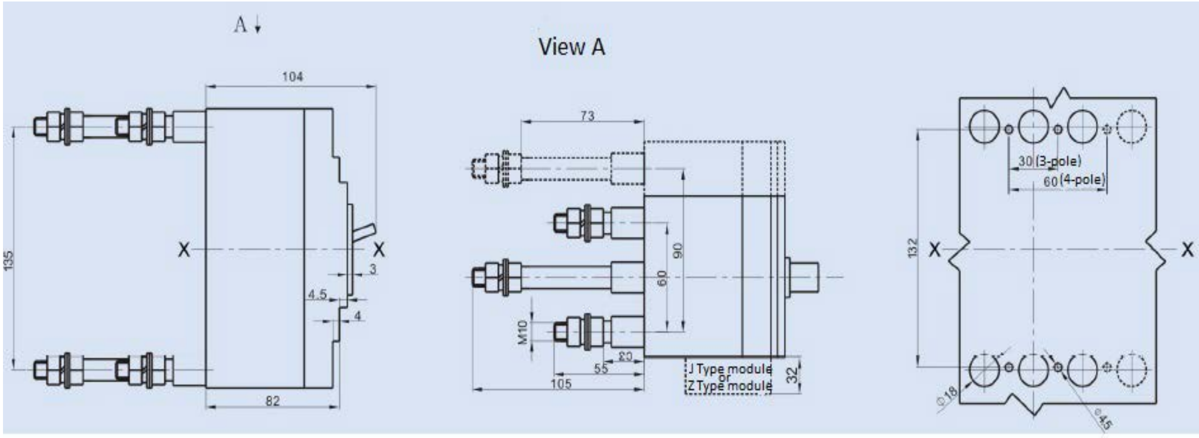
7.4 Overalls and installation piercing dimensions of HSL1-100 panel front wiring shown in Fig. 8 (3-pole and 4-pole)




Note: X-X and Y-Y are central lines of RCCB

Fig. 8

7.5 Overalls and installation piercing dimensions of HSL1 -100 panel rear wiring shown in Fig. 9 (3-pole and 4-pole)

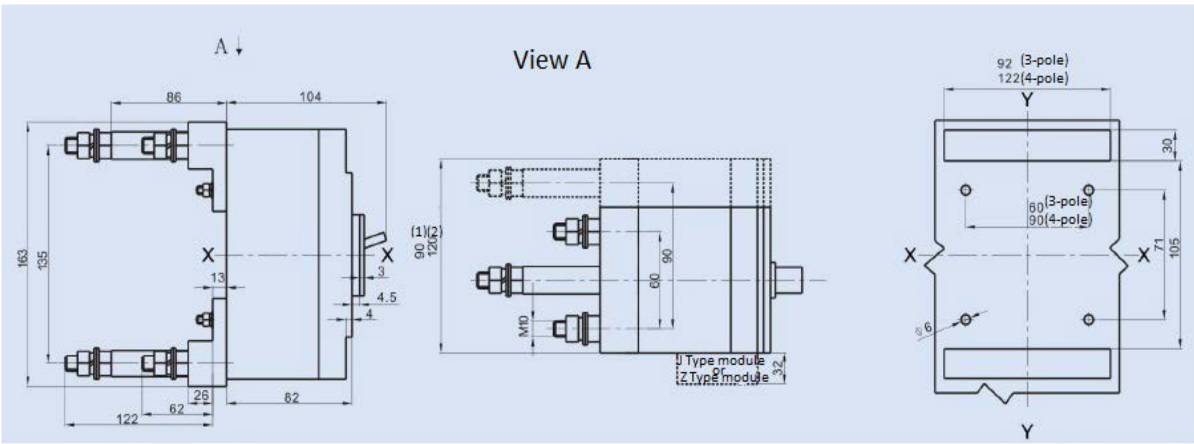



Dimensions of piercing holes on mounting plate

Note: X-X and Y-Y are central lines of RCCB

Fig. 9

7.6 Overalls and installation piercing dimensions of HSL1-100 plug-in panel rear wiring shown in Fig. 10 (3-pole and 4-pole)

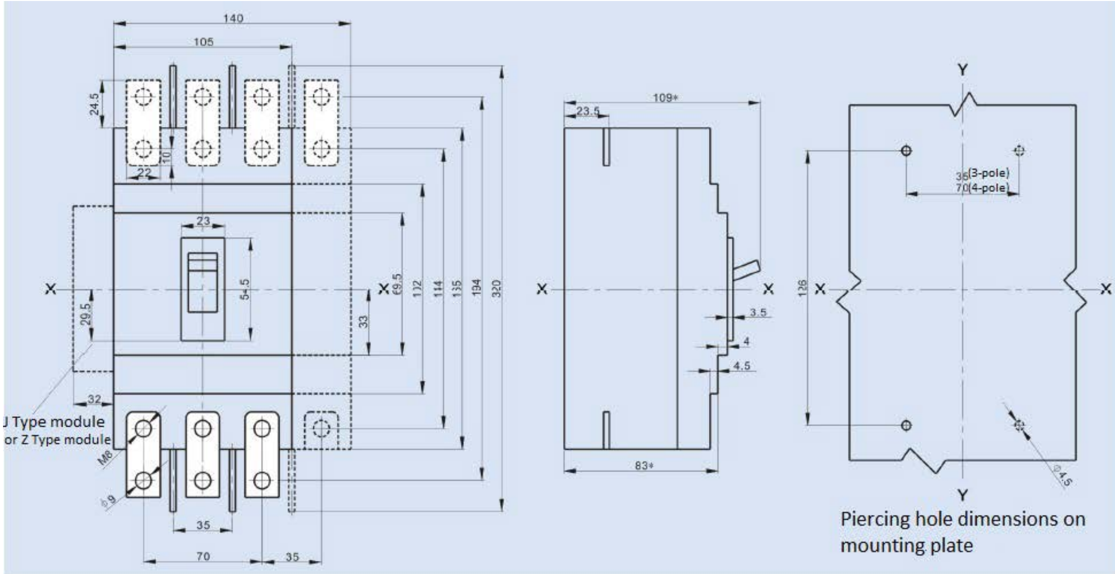



Dimensions of piercing holes on mounting plate

Note: In the figure, (1) = (3-pole), (2) = (4-pole).
X-X and Y-Y are central lines of RCCB

Fig. 10

7.7 Overalls and installation piercing dimensions of HSL1-200 panel front wiring shown in Fig. 11 (3-pole and 4-pole)

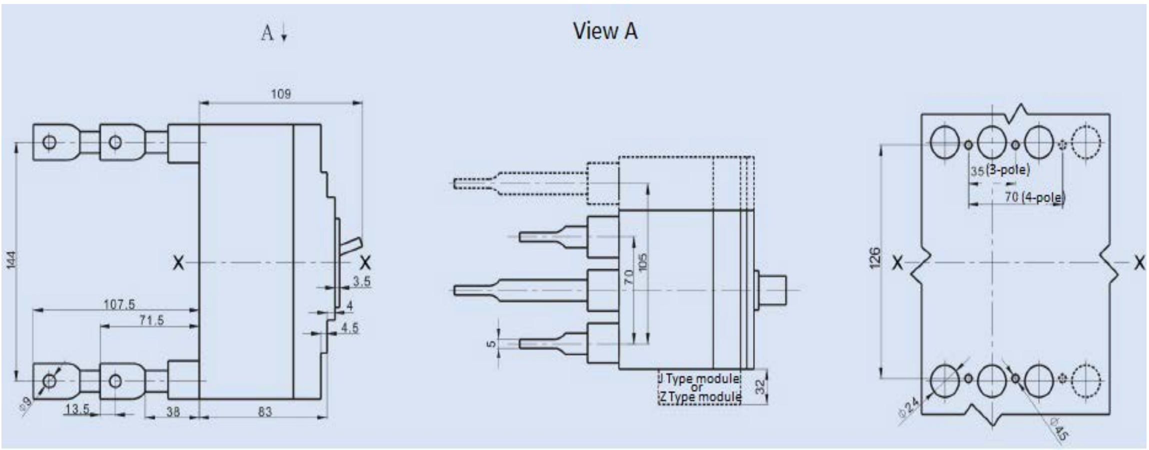



Dimensions of piercing holes on mounting plate

Note: X-X and Y-Y are central lines of RCCB
* 17 mm should be added in length dimensions for XHTM1L1-200 RCCB

Fig. 11

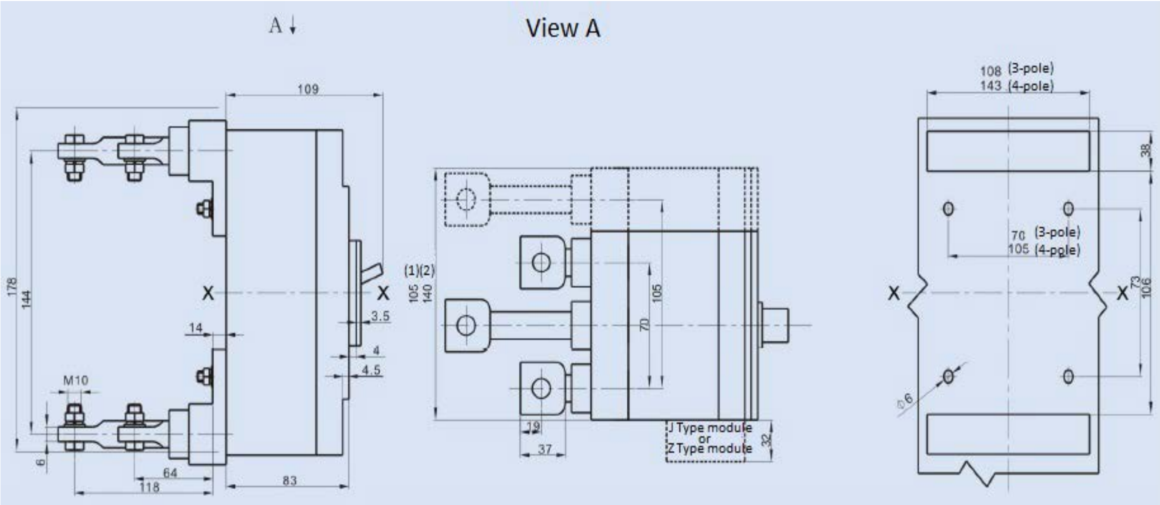
7.8 Overalls and installation piercing dimensions of HSL1-200 panel rear wiring shown in Fig. 12 (3-pole and 4-pole)




Note: X-X and Y-Y are central lines of RCCB

Fig. 12

7.9 Overalls and installation piercing dimensions of HSL1-200 plug-in panel rear wiring shown in Fig. 13 (3-pole and 4-pole)

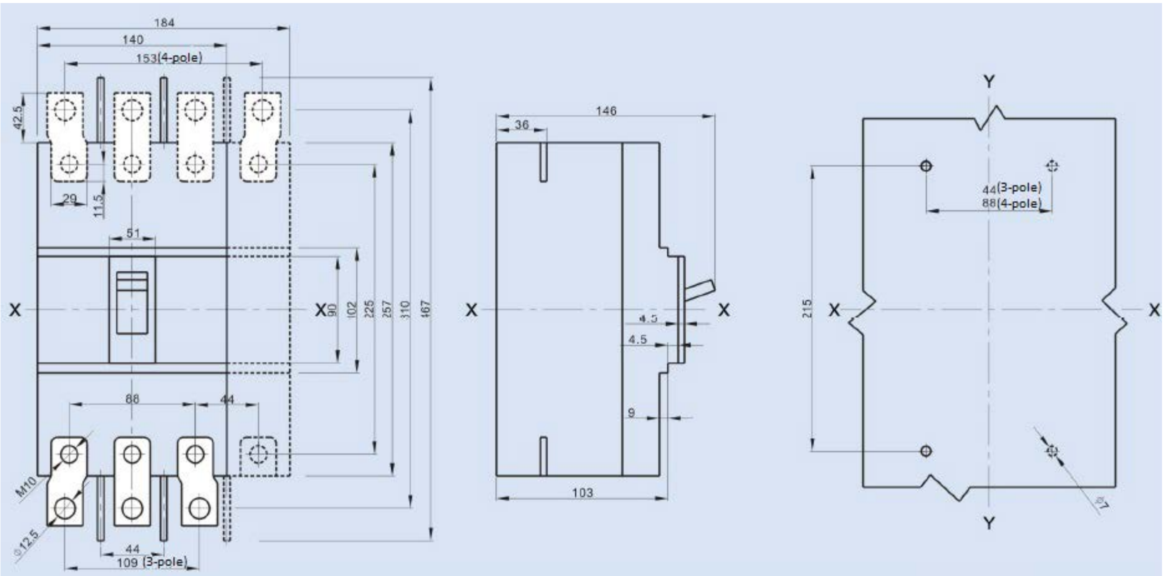



Dimensions of piercing holes on mounting plate

Note: X-X and Y-Y are central lines of RCCB

Fig. 13

7.10 Overalls and installation piercing dimensions of HSL1-400 panel front wiring shown in Fig. 14 (3-pole and 4-pole)

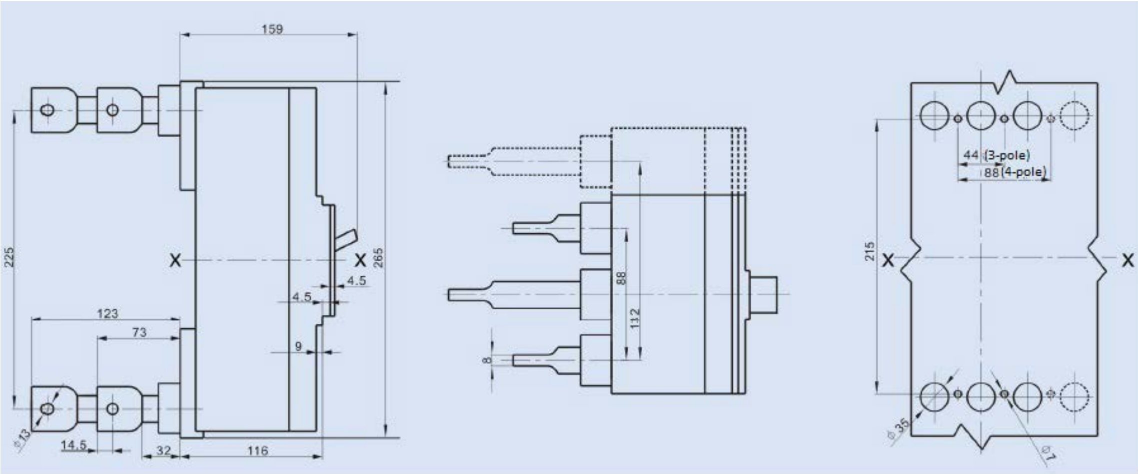



Dimensions of piercing holes on mounting plate

Note: X-X and Y-Y are central lines of RCCB

Fig. 14

7.11 Overalls and installation piercing dimensions of HSL1-400 panel rear wiring shown in Fig. 15 (3-pole and 4-pole)

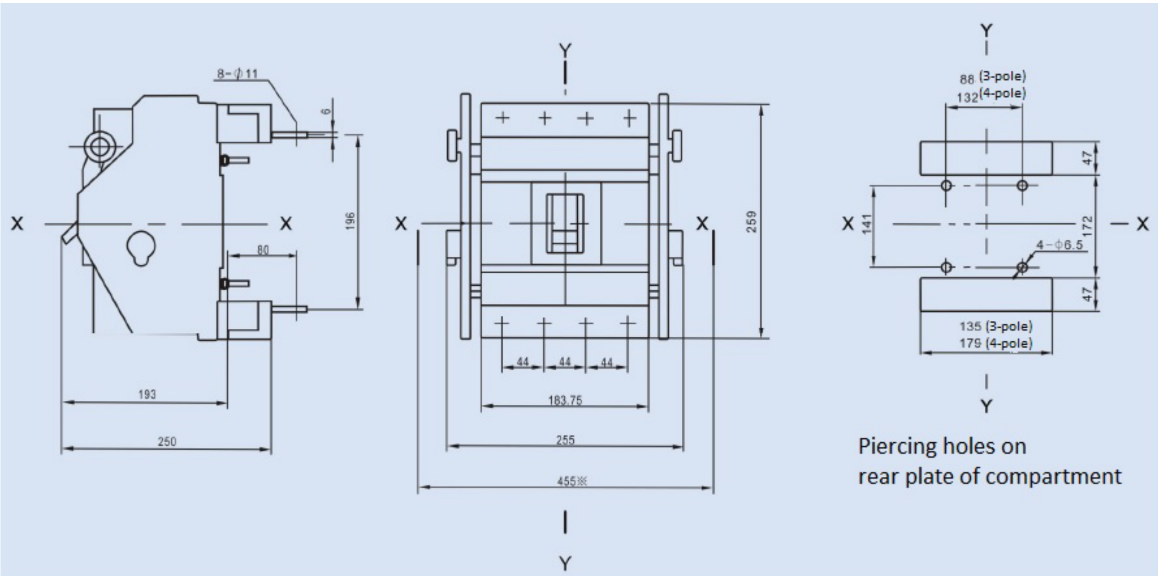



Dimensions of piercing holes on mounting plate

Note: X-X and Y-Y are central lines of RCCB

Fig. 15

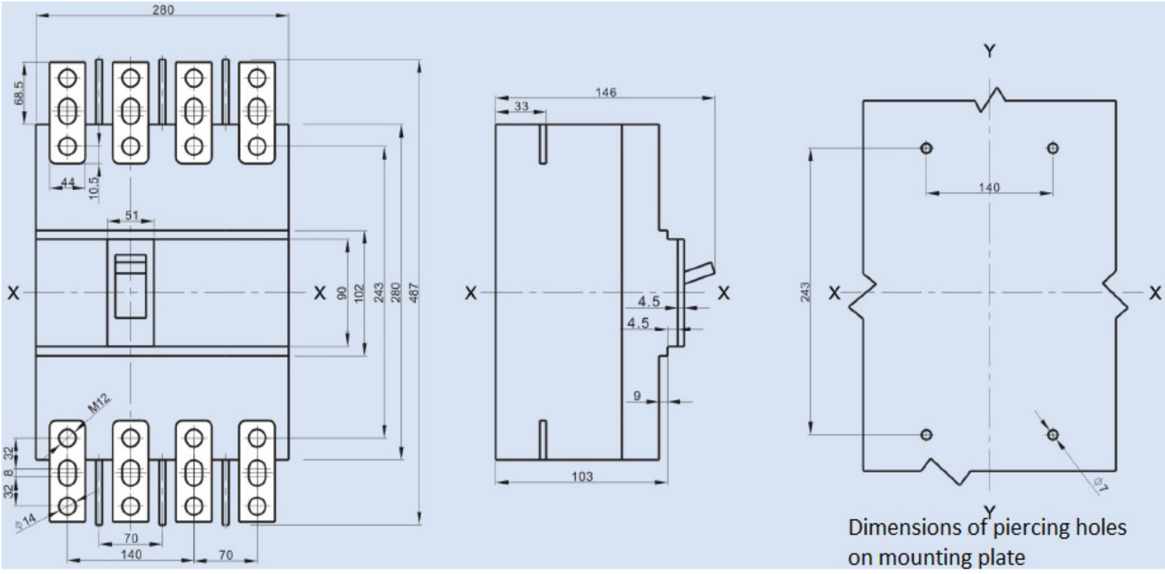
7.12 Overalls and installation piercing dimensions of HSL1-400 withdrawout panel rear wiring shown in Fig. 16 (3-pole and 4-pole)




Note: X-X and Y-Y are central lines of RCCB

Fig. 16

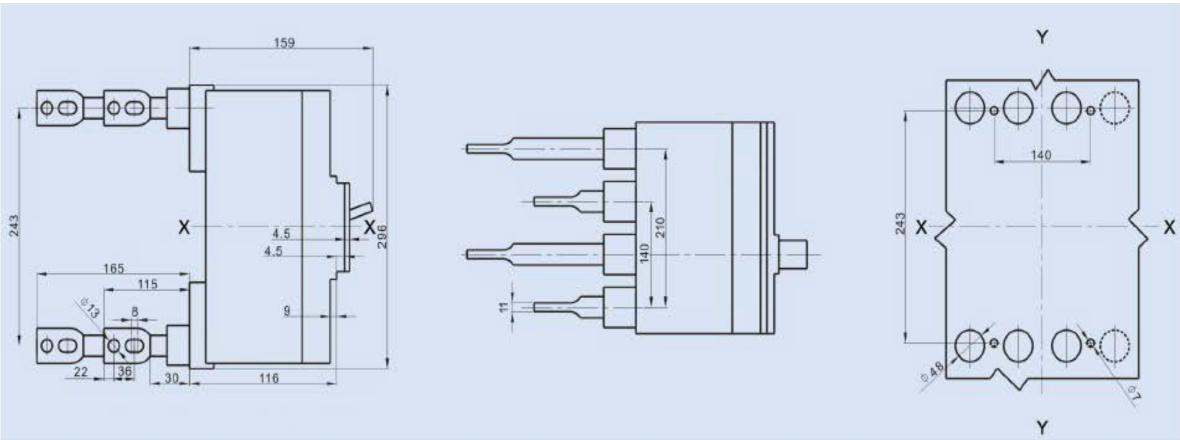
7.13 Overalls and installation piercing dimensions of HSL1-800 panel front wiring shown in Fig. 17 (4-pole)




Note: X-X and Y-Y are central lines of RCCB

Fig. 17

7.14 Overalls and installation piercing dimensions of HSL1-800 panel rear wiring shown in Fig. 18 (4-pole)

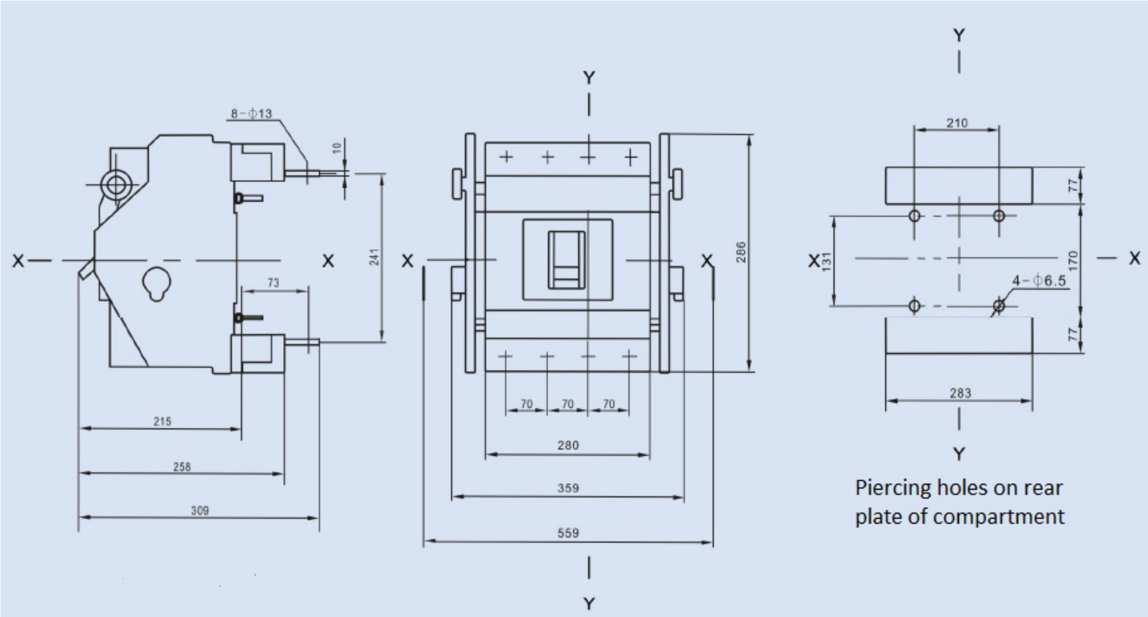



Dimensions of piercing holes on mounting plate

Note: X-X and Y-Y are central lines of RCC*B*

Fig. 18

7.15 Overalls and installation piercing dimensions of HSL1 -800 withdrawout panel rear wiring shown in Fig. 19 (4-pole)




Note: X-X and Y-Y are central lines of RCC*B*

Fig. 19

7.16 Crossing area of copper conductor for correspondent temperature rise current at RCCB's rated current shown in Table 13

Table 13

| Crossing area $mm^2$ | 2.5 | 4 | 6 | 10 | 16 | 25 | 35 | 50 | 70 | 95 | 120 | 185 | 240 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test current A | 12.5<br>20 | 25 | 32 | 40<br>50 | 63 | 80 | 100 | 125 | 160 | 200<br>225 | 250 | 315<br>350 | 400 |

| Crossing area $mm^2$ | Copper wire | 150 2 wires | 185 2 wires | 240 2 wires |
|---|---|---|---|---|
| | Copper bar | 30×5 2 bars | 40×5 2 bars | 50×5 2 bars |
| Test current A | | 500 | 630 | 700<br>800 |

7.17 Link plate of external conduct connection on panel front for customer (optional) with its dimensions shown in Fig. 20 and Table 14.

Link plate (optional)

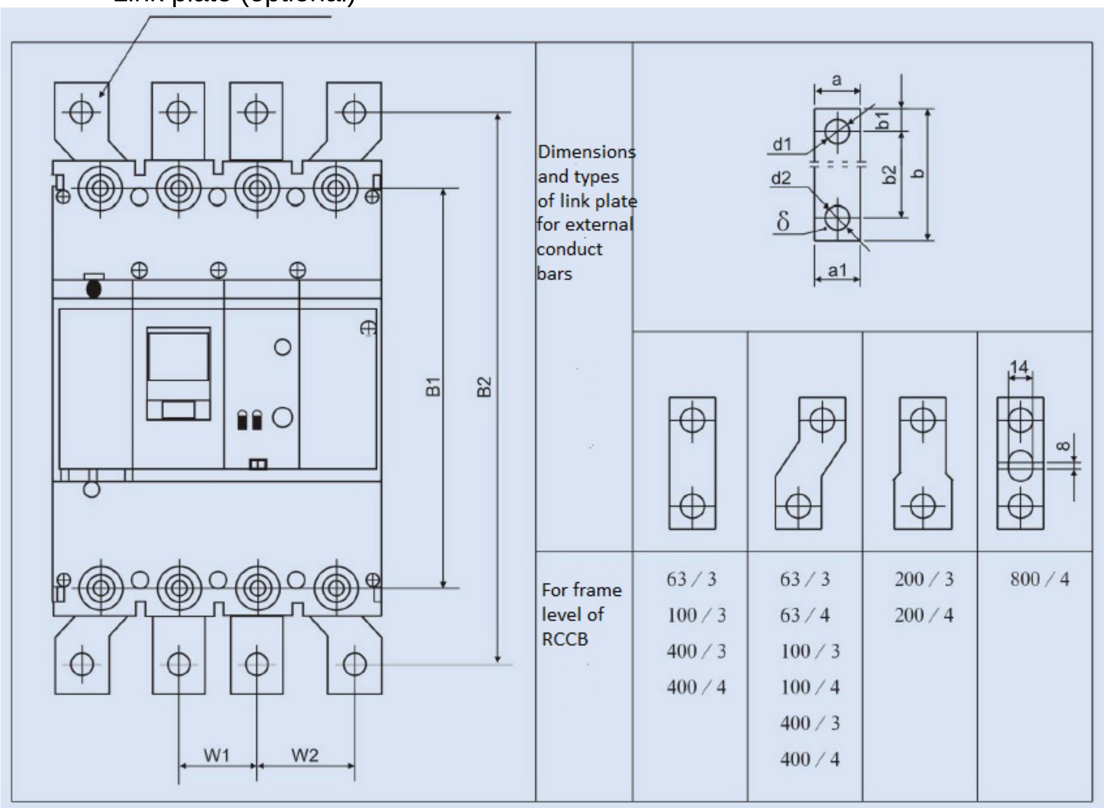



Fig. 20

Table 14

| Type | a | a1 | b | b1 | b2 | d1 | d2 | B1 | B2 | W1 | W2 | δ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 63/3 | 14 | 14 | 46 | 6.5 | 32.5 | Φ5.5 | Φ6.5 | 115 | 180 | 34 | 34 | 4 |
| 63/4 | 14 | 14 | 46 | 6.5 | 32.5 | Φ5.5 | Φ6.5 | 115 | 180 | 31 | 31 | 4 |
| 100/3 | 16 | 16 | 46 | 8 | 30 | Φ8.5 | Φ8.5 | 135 | 195 | 39 | 39 | 4 |
| 100/4 | 16 | 16 | 46 | 8 | 30 | Φ8.5 | Φ8.5 | 135 | 195 | 36 | 36 | 4 |
| 200/3 | 20 | 22 | 45 | 10 | 25 | Φ 9 | Φ 9 | 144 | 194 | 35 | 35 | 6 |
| 200/4 | 20 | 22 | 45 | 10 | 25 | Φ 9 | Φ 9 | 144 | 194 | 35 | 35 | 6 |
| 400/3 | 29.5 | 29.5 | 70 | 16 | 42.5 | Φ12.5 | Φ10.5 | 225 | 310 | 54.5 | 54.5 | 8 |
| 400/4 | 29.5 | 29.5 | 70 | 16 | 42.5 | Φ12.5 | Φ10.5 | 225 | 310 | 44 | 54.5 | 8 |
| 800/4 | 44 | 44 | 97.5 | 15 | 71.8 | Φ14 | Φ14 | 243 | 386.6 | 70 | 70 | 10(7) |

# 8 Overalls and installation dimensions of external accessories (mm)

## 8.1 Rotating operating handle

a. This series of RCCB is working with CZ2 Central Rotating Operating Handle which may be divided into Type A (square) and Type B (circle) for customer's selection.

b. The overalls and installation dimensions of CZ2 Rotating Operating Handle are shown in Fig.21 and Table 15.

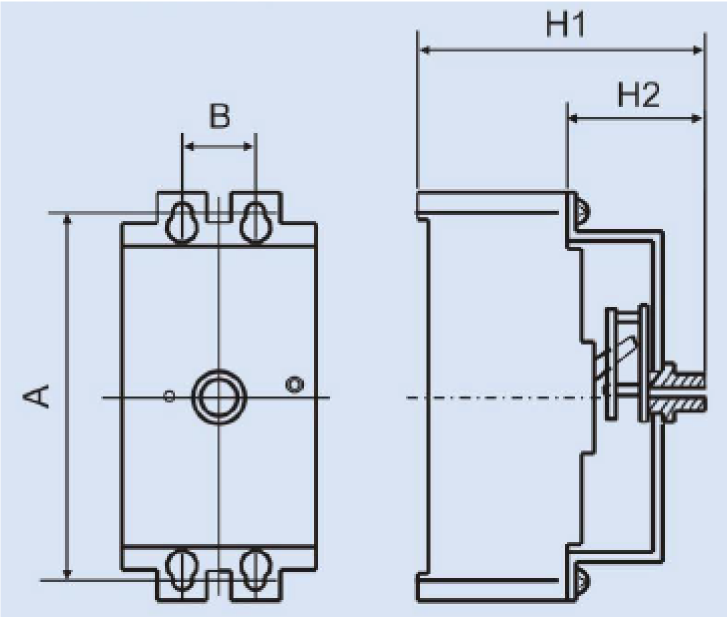
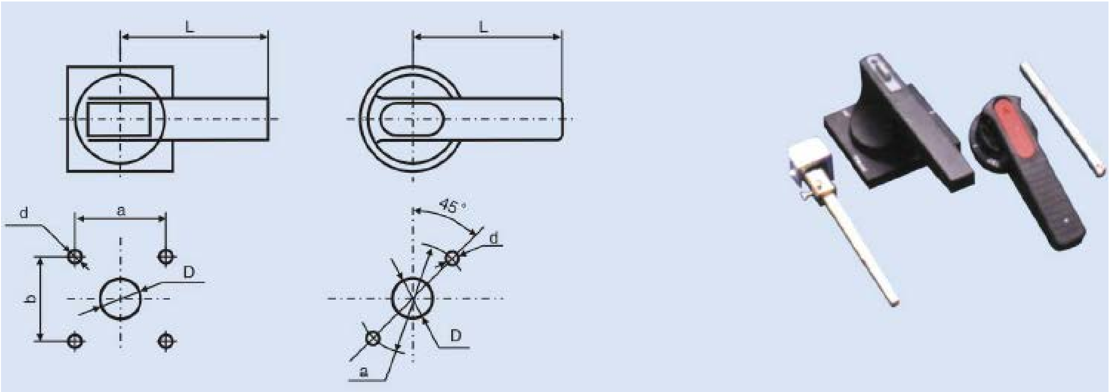



Fig. 21

Table 15

| Frame level A | Manual operating mechanism | A | B | H1 | H2 |
|---|---|---|---|---|---|
| 63 | CZ2 - 63 - 1338 | 110 | 25 | 115 | 53 |
| 100 | CZ2 - 100 - 1339 | 132 | 30 | 135 | 51 |
| 200 | CZ2 - 200 - 1340 | 126 | 35 | 137 | 58 |
| 400 | CZ2 - 400 - 2335 | 215 | 44 | 182 | 87 |
| 800 | CZ2 - 800 - 2336 | 243 | 70 | 182 | 87 |

c. Overalls and piercing holes on panel of CZ2 Operating Handle are shown in Fig. 22 and Table 16.




Type A Type B

Fig. 22

Table 16

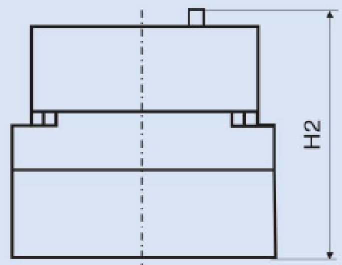
| Type / Description | A1 | A2 | B1 | B2 |
|---|---|---|---|---|
| D | φ42 | φ63 | φ33 | φ33 |
| d | φ4.5 | φ5.5 | φ4.5 | φ4.5 |
| a | 65 | 88 | φ53 | φ53 |
| b | 65 | 88 | | |
| L | 60 | 140 | 65 | 126 |

Note: A1 and B1 are short handles whereas A2 and B2 are long ones.

8.2 Overalls and height dimensions of motor-driven operating mechanism are shown in Table 17 and Fig. 23 with its wiring diagram shown in Fig. 24.

Table 17

| Frame A / Height(mm) | 63 | 100 | 200 | 400 | 800 |
|---|---|---|---|---|---|
| D | 160 | 172 | 178 | 238 | 246 |



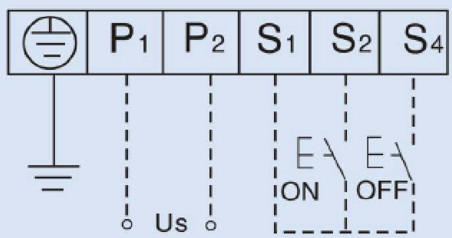




Fig. 23 Fig. 24

Note: The rated control voltage of motor-driven operating mechanism are AC220(230)V, AC110V, DC220(230)V and DC 110V.

# 9 Application and maintenance

## 9.1 Operating characteristics of RCCB and their selection

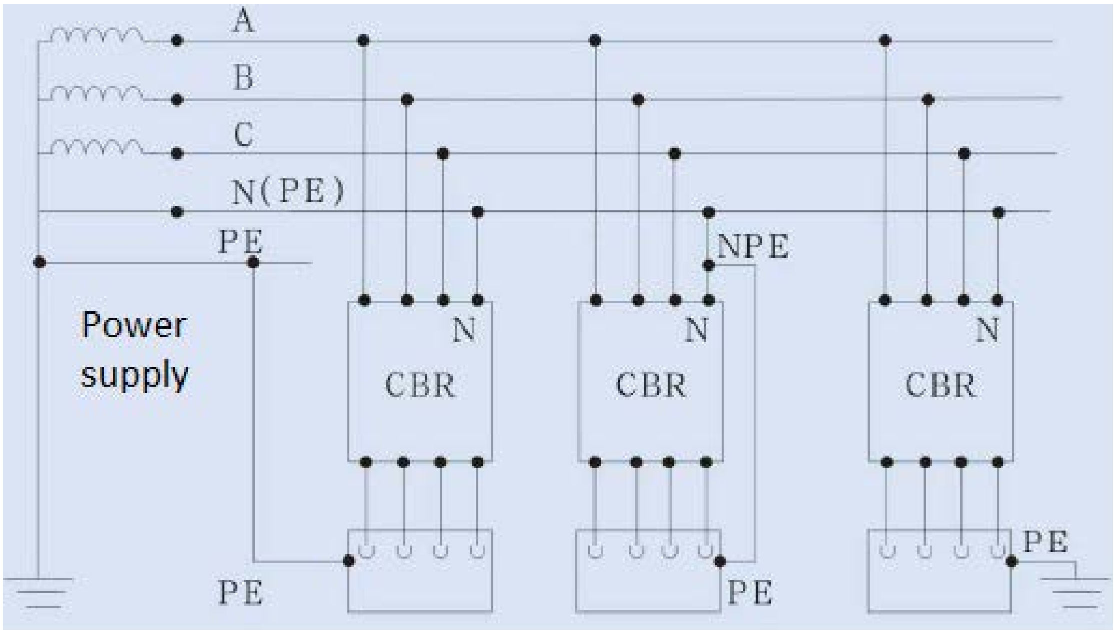
The operating characteristics of RCCB may be selected as per GB 13955 Installation and Operation of Residual Protecting Device.

(1) For protection of power supply sockets in terminal circuit and hand-held moving electric appliances, selection of $I_{\triangle n}$ = 30mA RCCB is necessary. This may be specially noted when ordering. The residual current operated time of $I_{\triangle n}$ = 30mA RCCB is ≤ 0.2s without time delay.

(2) The rated residual operated current $I_{\triangle n}$ for comprehensive distribution in non terminal protection may be selected as per one thousandth of circuit working current. Time delay type may be preferentially selected.

(3) For 3-phase 4-wire load circuits, 3-pole 4-wire (or 4-pole) RCCB may be adopted with 3-pole 4-wire one in preferential place.

## 9.2 Wiring mode shown in Fig. 25



TN-S System TN-C-S System TT System

Fig. 25

Note for wiring:

(1) This series of RCCBs is suitably applied in neutral line earthed systems such as TT, TN-C-S and TN-S ones as well as in neutral line not earthed systems. To TN-C-S system, the N pole in Fig. 25 is connected to N line which is separated with PE line. To TN-S system, N line is connected directly to N pole. Connection of NPE line or PE line to N pole on load side

of RCCB is absolutely not allowed under any conditions so as to avoid wrong action or refusal action.

(2) For frame level 200A and below RCCBs, incoming from up is reasonable and incoming from down is not impossible (i.e., power lines connected to 1, 3 and 5 and load connected to 2, 4 and 6). For frame level 400A and over RCCBs, power comes from up generally. However, power comes from down is also acceptable if customer has special requirement with information given when ordering.

(3) As power is connected from AC phases (380V, 400V) for residual trip on 3-pole RCCBs and from AN phases (220V, 230V) for 4-pole RCCBs, power frequency withstand voltage test cannot be performed by customer or electronic components will damage possibly.

(4) For frame level 63A RCCBs, installation can be made vertically only. Horizontal installation is not possible. For other levels RCCBs, installation may be made both vertically or horizontally.

(5) Press down the test button in closed position when the RCCB is energized to test whether the RCCB is normal. However, the test button is not a professional tool to open the RCCB. It cannot be operated frequently nor at excessive long time it is pressed down. Otherwise, the test resistor will be burnt down.

(6) If J Type RCCB is applied, sound and light alarm device should be prepared by customers themselves. The alarm circuit should be connected to wire terminals P1 and P2 on external hanging on the left side of RCCB.

(7) When the residual current alarm lamp or sound goes on, customers should inspect the reason by pressing down the reset button to  position or put the reset switch to 0 letting the alarm stop. When the fault is cleared away, press the reset button to  position or put back the reset switch to 1 for next alarm.

9.3 Maintenance and cautions

(1) The residual current operating characteristics for general type of RCCB is already set before delivery and customers do not need to adjust at will in operation. For adjustable and intelligent types of RCCBs, the residual current operation current and delay time may be regulated on cover plate or on intelligent module in actual need.

(2) Newly installed RCCB or after a certain period of operation (generally every month), press down the test button under closed position of RCCB to inspect whether the residual current protection function is normal and reliable.

(3) If the RCCB is tripped due to residual current fault by protective circuit, the earth leakage indication is projected and the operating handle is in middle position. Cause must be reasoned out before re-closing operation. After the earth fault is cleared away, re-latch the RCCB and close the RCCB.

(4) If the RCCB is tripped due to short circuit by the protective circuit, open the cover to check contacts and make maintenance and treat properly.

(5) When in power frequency withstand voltage test or insulating resistance measurement, de-energize the electronic circuit in RCCB first to make sure that there is no voltage between input and output terminals of electronic components.

## 10 Information needed for ordering

Respected customers, this series of RCCB is mainly used as a master switch for grid circuits and seldom used in end terminals for load protection directly. According to quality feedback from our customers recent years, leapfrogged tripping is quite a troublesome for customers as there are many kinds of causes in motor startup tripping. From now on, RCCB is generally provided in form of fixed type and time delayed operation. Customers who need non time delay operated RCCBs are supposed to give special remarks when ordering.

For ordering, information must be given as follows:

(1) Type and specification of the RCCB;

(2) Operating residual current value. Limited non operation time △t (delay time) should be noted for time delay RCCBs with exception for Z Type RCCBs;

(3) Specifications of accessories;

(4) The link plate for external panel front conduct bar is an optional item which is needed to point out when ordering. If our customers prepare such plates themselves, please refer to Fig. 10 and Table 18 for their dimensions.

(5) Quantity.

For example, if you want to order 20 sets of 4-pole RCCBs with a residual operating current 100mA, rated current 100A and one group of auxiliary contacts in panel front wiring mode, you may write:

HSL1 - 100 / 4320 100A 100mA delay time 0.2s 20sets.