ELECTROMAGNET: THE CIRCUIT

GROUP 3 (3K1 & 3K2)

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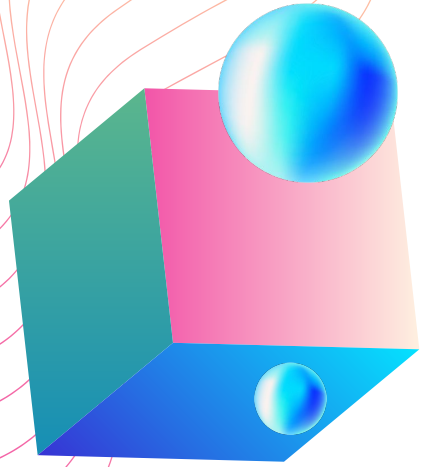


01

OVERVIEW OF THE CIRCUIT BREAKER

Meaning, Differences and Types of Circuit Breakers

WHAT IS A CIRCUIT BREAKER?

- A circuit breaker (CB) is an electrical power system device
- It can be controlled manually or remotely
- It automatically breaks a circuit in the event of a fault condition such as overcurrent, overload or short circuit.

TYPES OF CIRCUIT BREAKERS

Miniature Circuit Breakers (MCB)

Earth Leakage Circuit Breaker (ELCB)

Molded Case Circuit Breakers (MCCB)

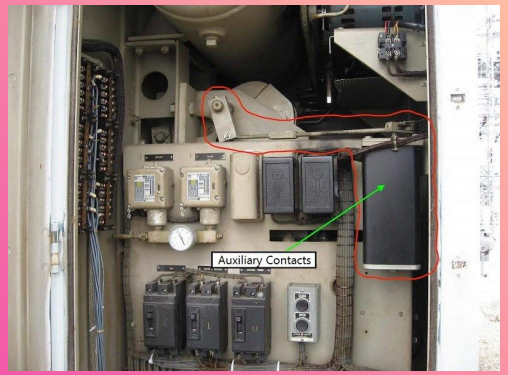
Residual Current Circuit Breakers (RCCB)

02

STRUCTURE OF THE CIRCUIT BREAKER

What is inside a circuit breaker?

STRUCTURE OF THE CIRCUIT BREAKER



Internal Accessories

Auxiliary Contact

- Contact between the opening and closing mechanism of the main circuit
- mainly used for the display of the opening and closing status of the circuit breaker.
- Connected to the control circuit to control or interlock its related electrical appliances through the opening and closing of the circuit breaker.
- Molded case circuit breaker (MCCB) -current 100A - has a single breakpoint conversion circuit.

STRUCTURE OF THE CIRCUIT BREAKER

Internal Accessories

Alarm Contact

- Mainly used for the circuit breaker accident, will only act when the circuit breaker trips and breaks
- When there is an overload,, the circuit breaker will trip freely and the alarm contact will move from the original open position to the closed position
- The life of alarm contact is 1/10 of the life of the circuit breaker
- Working current of the alarm contact generally does not exceed 1A

STRUCTURE OF THE CIRCUIT BREAKER

Internal Accessories

Under-Voltage Trip

- A type of trip that allows the circuit breaker to be opened with delay or without delay
- Operates when the power supply voltage drops to the range of 70% to 35% of the rated operating voltage
- Power supply = or > 85% , it should be able to ensure the circuit breaker is reliably closed under hot conditions.
- When a certain voltage drop occurs in the power supply voltage in the protected circuit, the circuit breaker can be automatically cut off

STRUCTURE OF THE CIRCUIT BREAKER

Internal Accessories

Shunt Trip

- A trip that is excited by a voltage source, whose voltage is independent of the main circuit voltage.
- The circuit breaker can be reliably broken if the power supply voltage is equal to any voltage between 70% - 110% of the rated control power supply voltage.
- A microswitch is connected in series with the shunt trip coil
- When the shunt trip is pulled in by the armature, the microswitch is switched from normally closed to normally open.

STRUCTURE OF THE CIRCUIT BREAKER

External Accessories

ELECTRIC OPERATING MECHANISM

- Accessory for long-distance automatic opening and closing circuit breakers
- It creates and stores energy to operate the circuit breaker.
- Their pull-in and rotation directions are the same.
- The circuit breaker should be able to close at any voltage between 85% and 110% of the rated control voltage.

STRUCTURE OF THE CIRCUIT BREAKER

External Accessories

ROTATION HANDLE

- Its mechanism is installed on the cover of the circuit breaker
- Enables the operator to rotate the handle clockwise or counterclockwise outside the door to ensure the closing or opening of the circuit breaker.

STRUCTURE OF THE CIRCUIT BREAKER

External Accessories

EXTENSION HANDLE

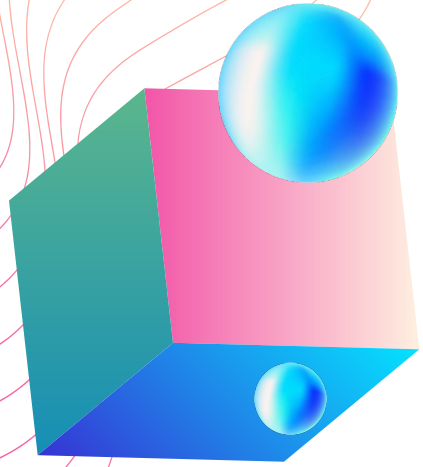
- An external extension handle which is directly mounted on the handle of the circuit breaker
- Generally used for large capacity circuit breakers of 600A and above for manual opening and closing operations.

STRUCTURE OF THE CIRCUIT BREAKER

External Accessories

HANDLE LOCKING DEVICE

- When the circuit breaker is closed, the handling locking device can stop others from cutting the power off.
- When the load side of the circuit breaker needs to be repaired or power is not allowed, it can prevent the circuit breaker from being mistakenly closed



03

FUNCTION OF EACH COMPONENT

Let’s learn the function of each components!

FUNCTION OF EACH COMPONENT

Although low and medium voltage circuit breakers have distinct designs based on amperage, voltage, and application, there are five main components that are shared by all circuit breakers

Molded Frame

- Protects internal parts of the circuit breaker from outside materials

Arc Extinguisher

- Extinguishes an arc when the circuit breaker interrupts a fault

Contacts

- When the circuit breaker is closed, it allows current to flow through it

Operating Mechanism

- Provides a means of opening and closing the circuit breaker

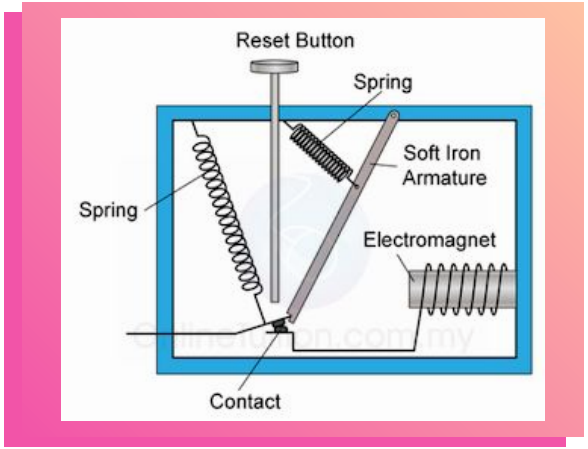
Trip Unit

- In the event of an overcurrent/overload or short circuit, the trip unit detects the abnormal current flow and causes the operating mechanism to open the contacts

04

WORKING PRINCIPLE OF THE CIRCUIT BREAKER

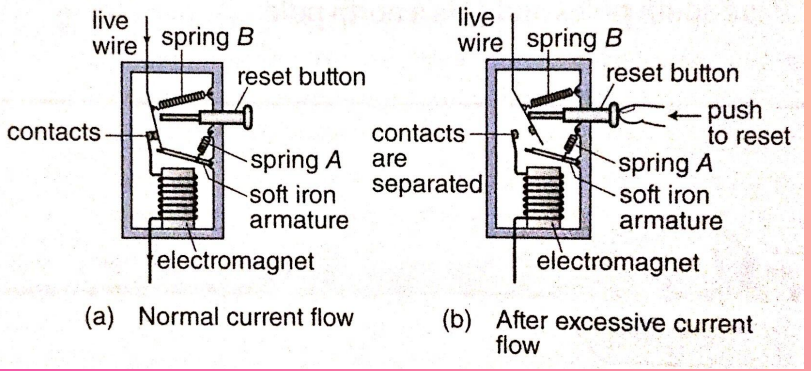
How does the circuit breaker actually work?



WHOA!

The figure above shows the structure of a circuit breaker.

WORKING PRINCIPLE



- Live wire carries **normal operating current** → Force of the electromagnet is **not strong enough** to separate the contacts
- The **current gets too high** → Increased magnetic force becomes **strong enough** to push over the soft iron armature
- **Contacts are separated, current is stopped**
- Spring B = keeps the contacts apart
- Spring A = brings the armature back to its original position
- **System can be reset → reset button is pressed**

THANK YOU!

That's all from us