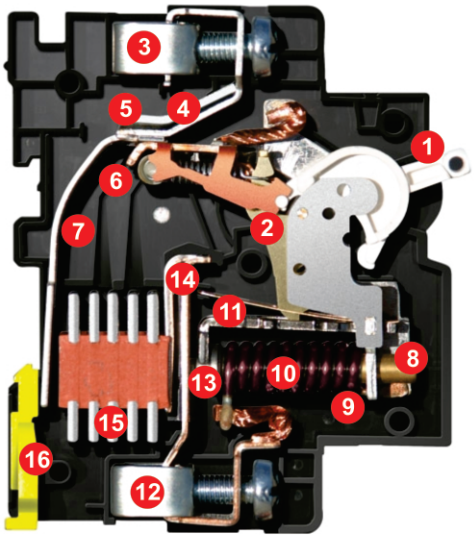
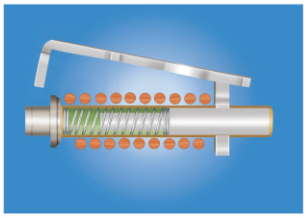
The Principle of Hydraulic-Magnetic Precision Circuit Breakers



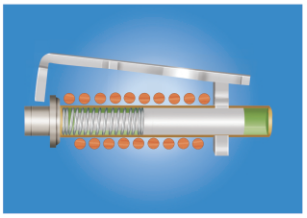
1. Handle
2. Mechanism assembly
3. Line terminal
4. Fixed contact
5. Contact tips
6. Moving contact
7. Arc runner line side
8. Hermetically sealed tube
9. Magnetic frame
10. Solenoid coil
11. Armature
12. Load terminal
13. Pole piece
14. Arc runner load side
15. Arc grids
16. Clip-in springs



Hydraulic-Magnetic circuit breakers operate on the magnetic force produced by the load current flowing through a series connected solenoid coil which is wound around a hermetically sealed tube containing an iron core, a spring and a dampening fluid.

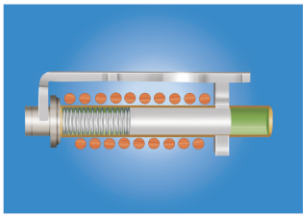
At currents below the circuit breaker rating, the magnetic flux in the solenoid is insufficient to attract the core toward the pole piece, due to the spring pressure.

Where an overload occurs, i.e. currents above the circuit breaker rating, the magnetic flux in the solenoid produces sufficient pull on the core to commence it's movement toward the pole piece.

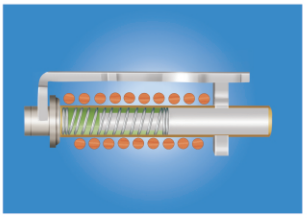


During this movement the dampening fluid regulates the core's speed of travel, thereby creating a controlled time delay, which is inversely proportional to the magnitude of the current.

The time delay is useful in that if the overload is of short duration i.e. start up of motors etc, the core return to it's rest position once the overload disappears.



If the overload persists, the core reaches the pole piece after a time delay particular to the current. In so doing, the reluctance of the magnetic circuit drops considerably so that the armature is attracted to the pole face with sufficient force to collapse the latch mechanism (toggle) and consequently "trip" the breaker. The contacts separate, current ceases to flow and the core returns to it's rest position.



With high levels of overloads or short circuit, the magnetic flux produced by the coil is sufficient to attract the armature to the pole face and "trip" the breaker even though the core has not moved.

This is called the instantaneous trip region of the circuit breaker characteristic.

Energy Efficient

GBelectric
low voltage

Precision Breakers

The trip point of the Hydraulic-Magnetic circuit breaker is unaffected by ambient temperature variations, unlike that of the thermal-magnetic circuit breaker, which is affected by internal and external temperature variations.

The trip point of the Hydraulic-Magnetic circuit breaker is dependent only on the load current that passes through the solenoid coil. After tripping, the breaker may be re-closed immediately once the overload has been removed, since there is no cooling down necessary. By nature of the principle of operation, it is possible to obtain a variety of time / current characteristics.