

3.5 Protection of motor:

3.5.1 AC Motor Protection:

- HRC or rewirable fuse is normally used as protective device for motors.
- Rewirable fuse is used for motors ranging from FHP to 5 HP
- HRC fuses are used for motors ranging above 5 HP
- But HRC fuse cannot provide protection for overloading, single phasing and earth faults.
- Thermal overloading relays are used for protection against overloading.
- For high capacity induction motors, a comprehensive motor protection is used

3.5.2 Protection Scheme for Motors:

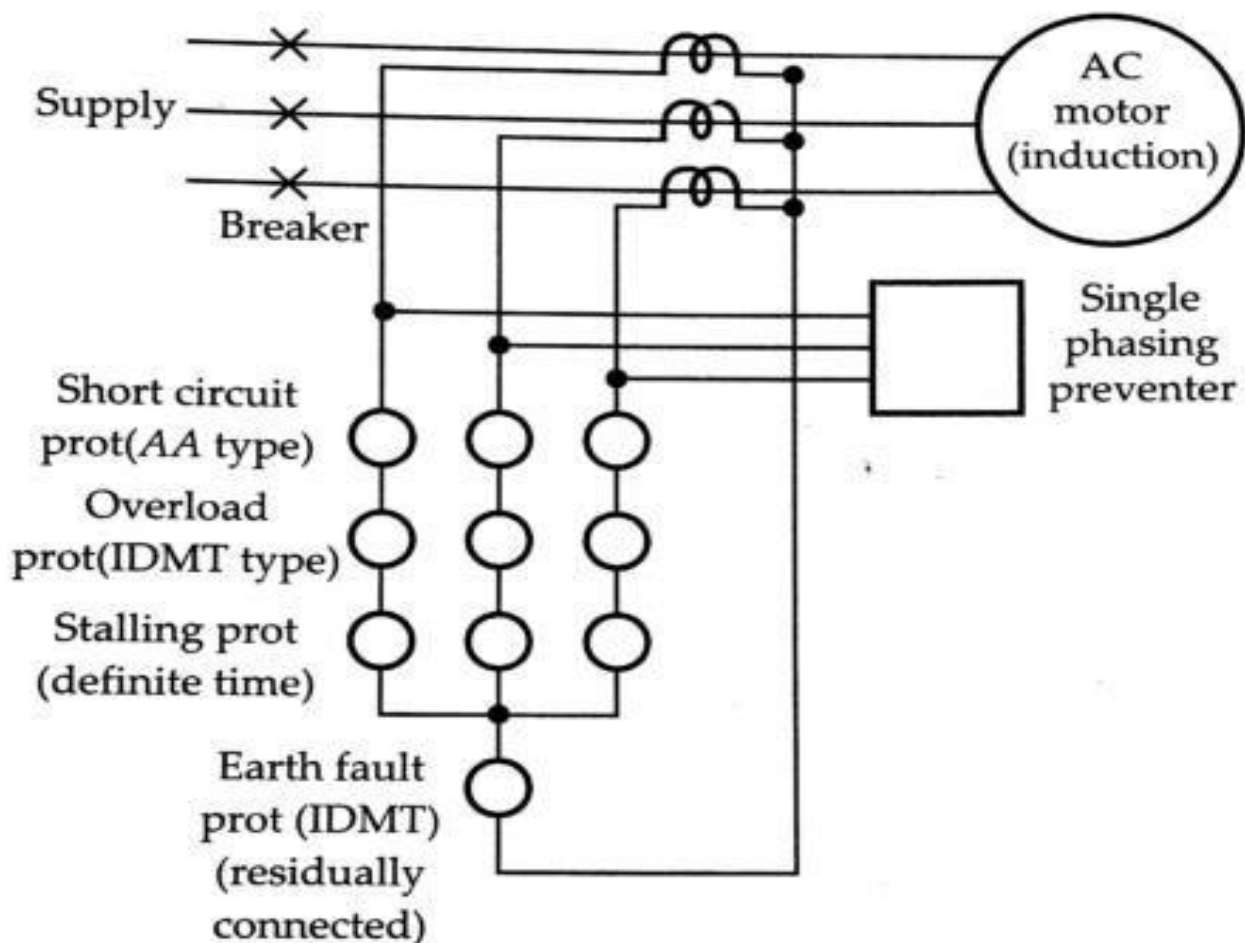


Figure: 3.5.1 Protection of AC Motor

[Source: "Principles of Powersystem" by V.K.Mehta, Page: 328]

Short Circuit Protection:

- Attracted armature type relay is connected in each phase.
- Starting current during DOL starting may be 4-5 times full load current.
- Normally the fault current will be 7 times the full load current.
- Hence the relays are set to operate for currents of 5-7 times full load current.

Earth Fault Protection:

- Earth fault relays (IDMT type) with a setting of 10% to 40% of the rated current is used.
- This is a single relay for all the 3 phases.
- IDMT type over current relays are connected in each phase with setting of 110% - 125% of rated current.

Stalling Protection:

- Due to some mechanical problem or overload, the motors may refuse to start.
- Motor will draw a heavy current for an indefinite period. This is really dangerous and undesirable.
- Definite time relays with a current setting equal to the starting current at stall are used to protect the motors for this case.

Single Phasing Protection:

- It is undesirable to run the motor when one of the phases is disconnected.
- It is called single phasing and it needs to be identified so that the motor should be disconnected from supply.

- It is done by single phasing preventer circuits.

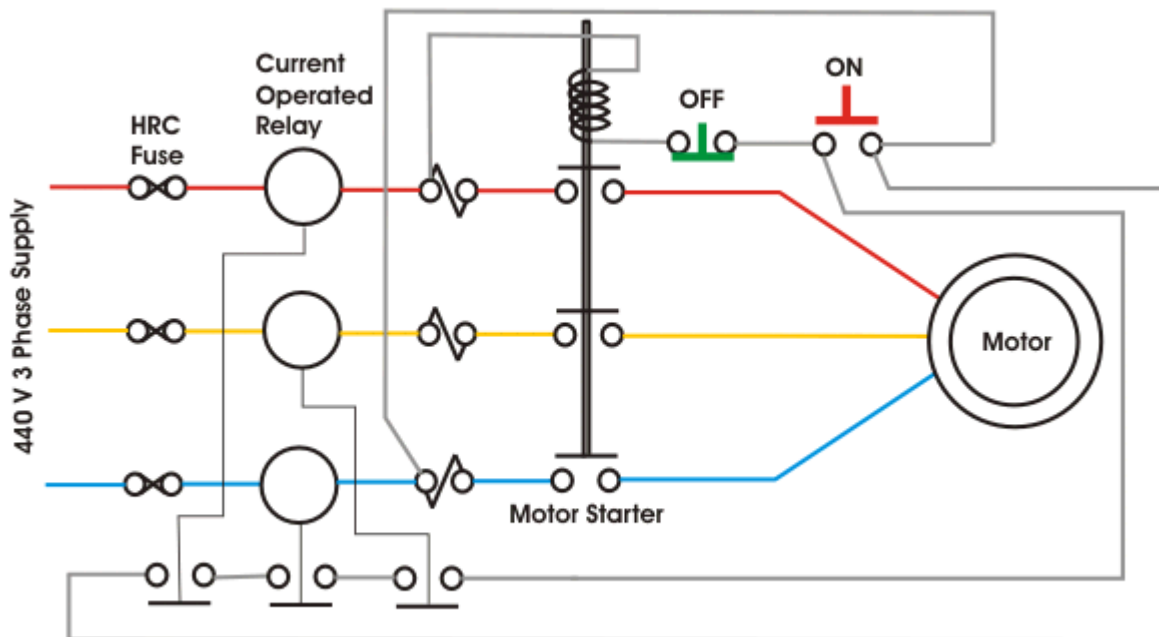


Figure: 3.5.2 Different Protection of AC Motor

[Source: "Principles of Powersystem" by V.K.Mehta, Page: 330]

Undervoltage Protection:

- Operation of motor on undervoltage generally cause overcurrent which can be sensed by overload devices or temperature sensitive devices.
- But still a separate undervoltage relay is used to protect against a 3 phase voltage drop.
- A time delay is given for the relay operation to prevent tripping by a transient voltage drop.

Phase Reversal Relay Protection:

- Phase reversal occurs when the supply connections are changed after repairs. The motor will run in wrong direction.
- In applications like elevators, cranes & hoists, the phase reversal is dangerous.
- A phase reversal relay working based on the electromagnetic principle is

used.

- For a correct phase sequence (RYB), the disc present in the relay produces a Positive torque so that its contacts are closed. Hence motor runs
- When phase reversal happens (RBY), the disc present in the relay produces an Opposite torque so that its contacts are opened
- Hence the magnetic coil of the started is de-energized or circuit breaker can be tripped

