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## DC CONTACTOR OPERATION

An **electrical contactor** is a switching device, widely used for the switching of motors, capacitors (for power factor correction) and lights. As the name indicates contactors are used to make or break contacts like an ordinary on-off switch. The only difference is that the contactors have an electromagnet that holds the contacts when energized whereas switches do not have it. The basic operation of a contactor is similar to that of a relay but contactor contacts can carry much more current than relays. Relays cannot be directly used in circuits where current exceeds 20 amperes. In such conditions contactors can be used. Contactors are available in a wide range of ratings and forms. Contactors are available up to the ampere rating of 12500A. Contactors cannot provide short circuit protection but can only make or break contacts when excited.

The operating principle of a contactor is very simple. Whenever the electromagnetic coil is energized, an electromagnetic field is produced. This electromagnetic field attracts the metallic rod (armature) towards the gap in the hollow cylindrical magnet. In contactors with split electromagnets, the movable half of the electromagnet is attracted towards the fixed electromagnet. This action

closes the contacts. The contacts remain closed as long as the electromagnet remains excited. When the coil is energized, moving contact is pushed back to its normal position by the spring. Contactors are designed to open and close contacts rapidly. Moving contacts may bounce as they rapidly make contacts with the fixed contacts. Bifurcated contacts are used in some contactors to avoid bouncing.

The input to the contactor coil may be AC or DC (available in various voltage ranges starting from 12Vac/ 12Vdc to 690Vac). A small amount of power is drained by the contactor coil during its operation. Economiser circuits are used to reduce the power consumed by the contactor during its operation.

Contactors with AC coils have shading coils. Otherwise, the contactor may chatter every time the alternating current crosses zero. Shading coils delay demagnetization of the magnetic core and avoid chattering. Shading is not required in DC coils as the flux produced is constant.

Arc occurs between the contacts every time when contacts are closed or opened under load. Arc formed during the breaking of a load is more destructive and may damage the contacts, hence reducing the life of the contactor. In addition to that high temperature of arc degrades the gases surrounding the contacts and forms harmful gases such as carbon mono-oxide, ozone, etc. This may affect the mechanical durability of the contactors.

In DC contactors magnetic blowouts are used to propagate the arcs towards specially designed arc chutes and extinguishing them by splitting. Contactors are used in low voltage AC applications (690 volt or less), atmospheric air surrounding the contacts extinguishes the arc. For medium voltage and high voltage applications vacuum contactors are used to avoid the risk of arc.