

CIRCUIT BREAKER

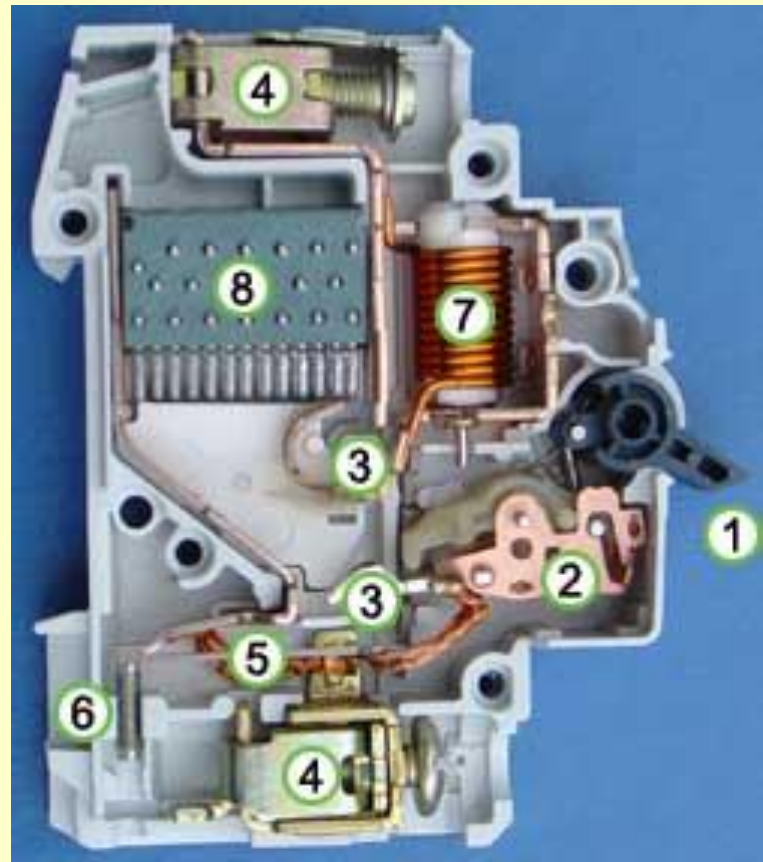
Ramadoni Syahputra

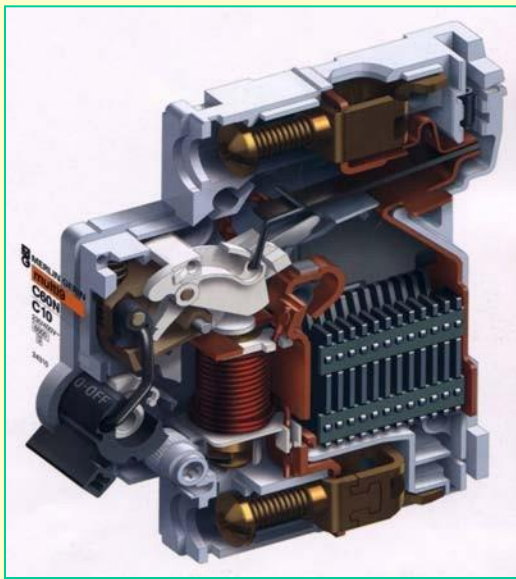
Jurusan Teknik Elektro FT UMY

Circuit Breaker (CB)

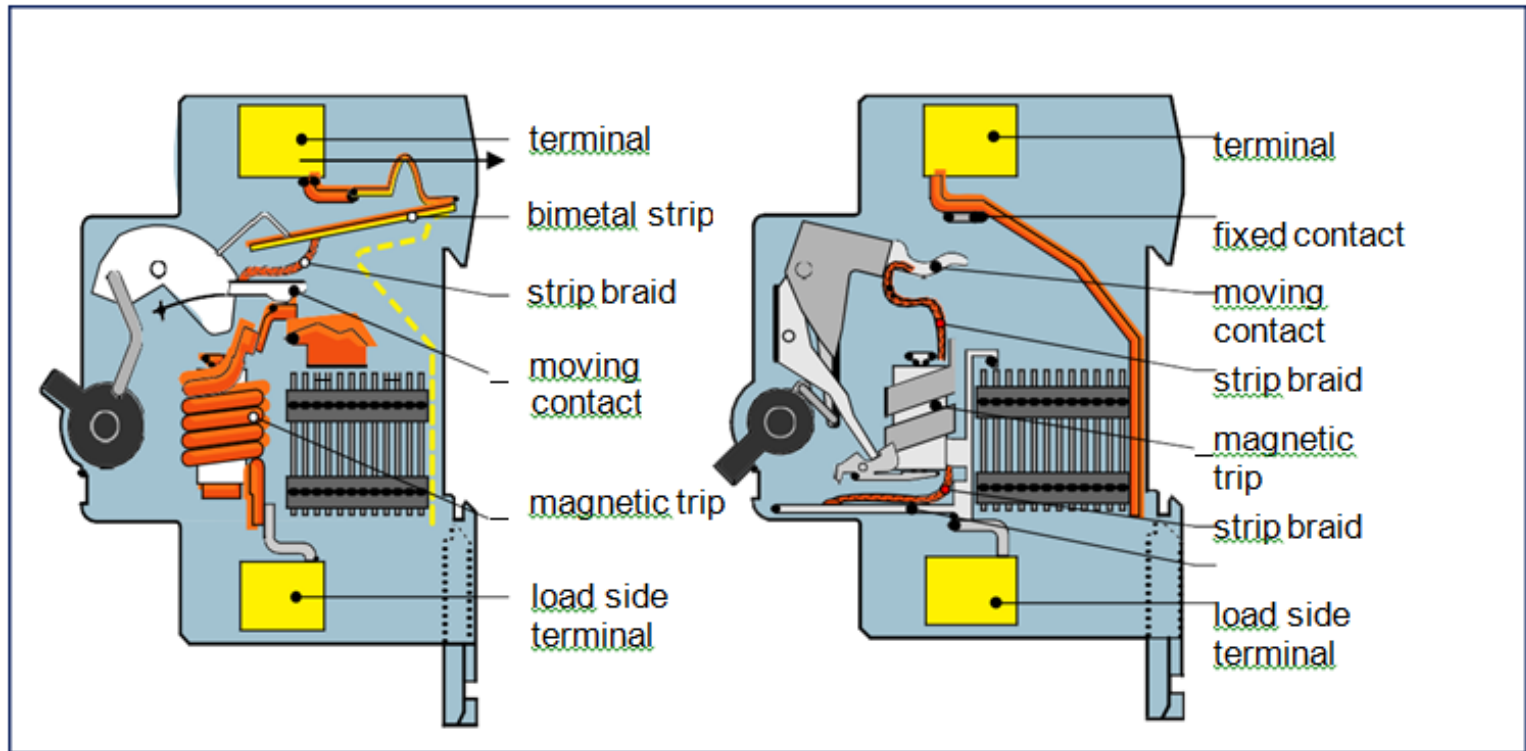


Miniatur Circuit Breakers (MCB)





MCB



MCB

- Thermal tripping curve
- the "thermal" part of the tripping curve must be in accordance with the standard

Legend:

I_n = rated current

I_{nd} = no tripping current

I_d = tripping current

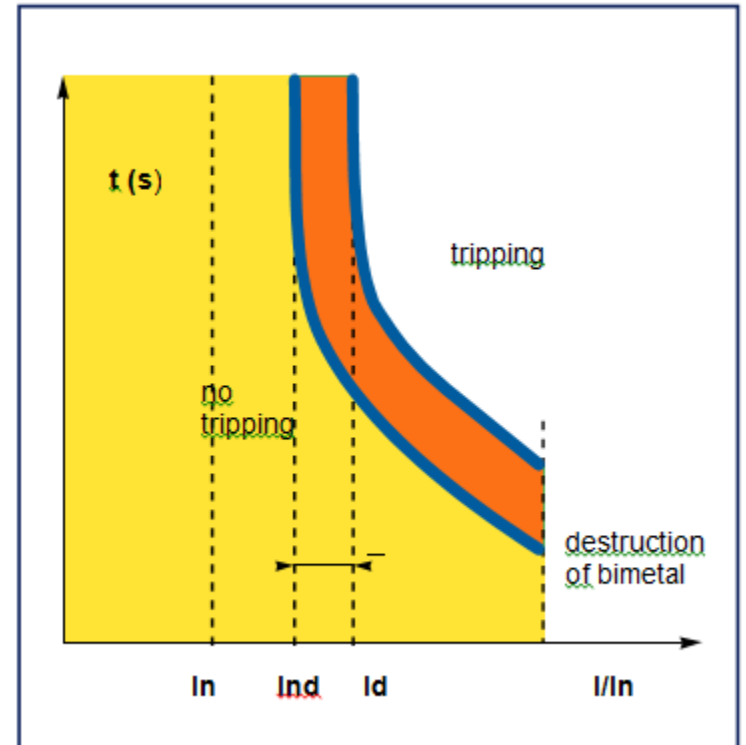


Fig. 16/12
3RV16 voltage transformer circuit-breaker

Tipe-tipe Circuit Breaker Dalam Sistem Tenaga Listrik

- Di dalam system tenaga listrik peralatan pemutus, yang berfungsi untuk memutus rangkaian listrik dalam keadaan berbeban (berarus) adalah Circuit Breakers.
- Karena pada saat bekerja, CB mengeluarkan (menyebabkan timbulnya) busur api, maka pada CB dilengkapi dengan pemadam busur api yaitu , minyak, udara dan gas.

Oil Circuit Breaker

- **Keuntungan**

- Tidak dipengaruhi udara luar
- Minyak adalah isolasi yang baik

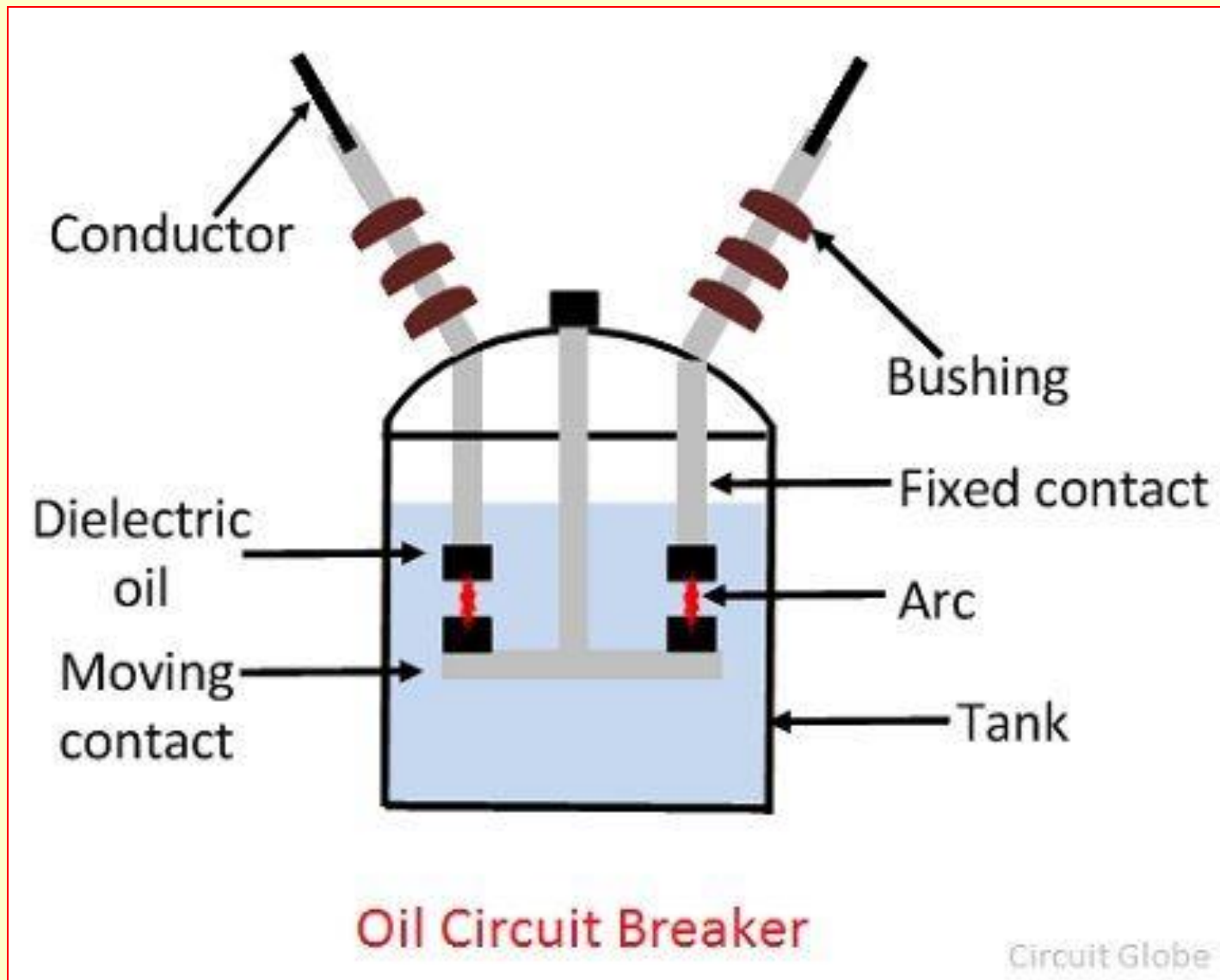
- **Kerugian**

- Dapat meledak dan terbakar
- Pemeliharaan yang periodik
- Ukuran yang relatif besar, karena minyak mengisi semua ruang CB

Oil Circuit Breaker



Oil Circuit Breaker



Minimum Oil Circuit Breaker

- **Keuntungan**

- Minyak hanya mengisi alat kontak
- Kemungkinan kebakaran lebih kecil
- Minyak adalah isolasi yang baik
- Ukuran lebih kecil

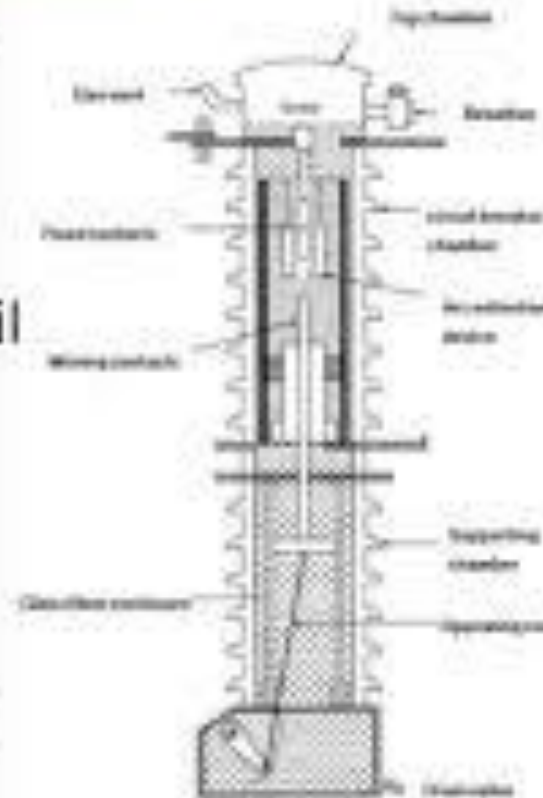
- **Kerugian**

- Pemeliharaan yang lebih sering dan periodik
- Setiap kali bekerja, volume minyak akan berkurang

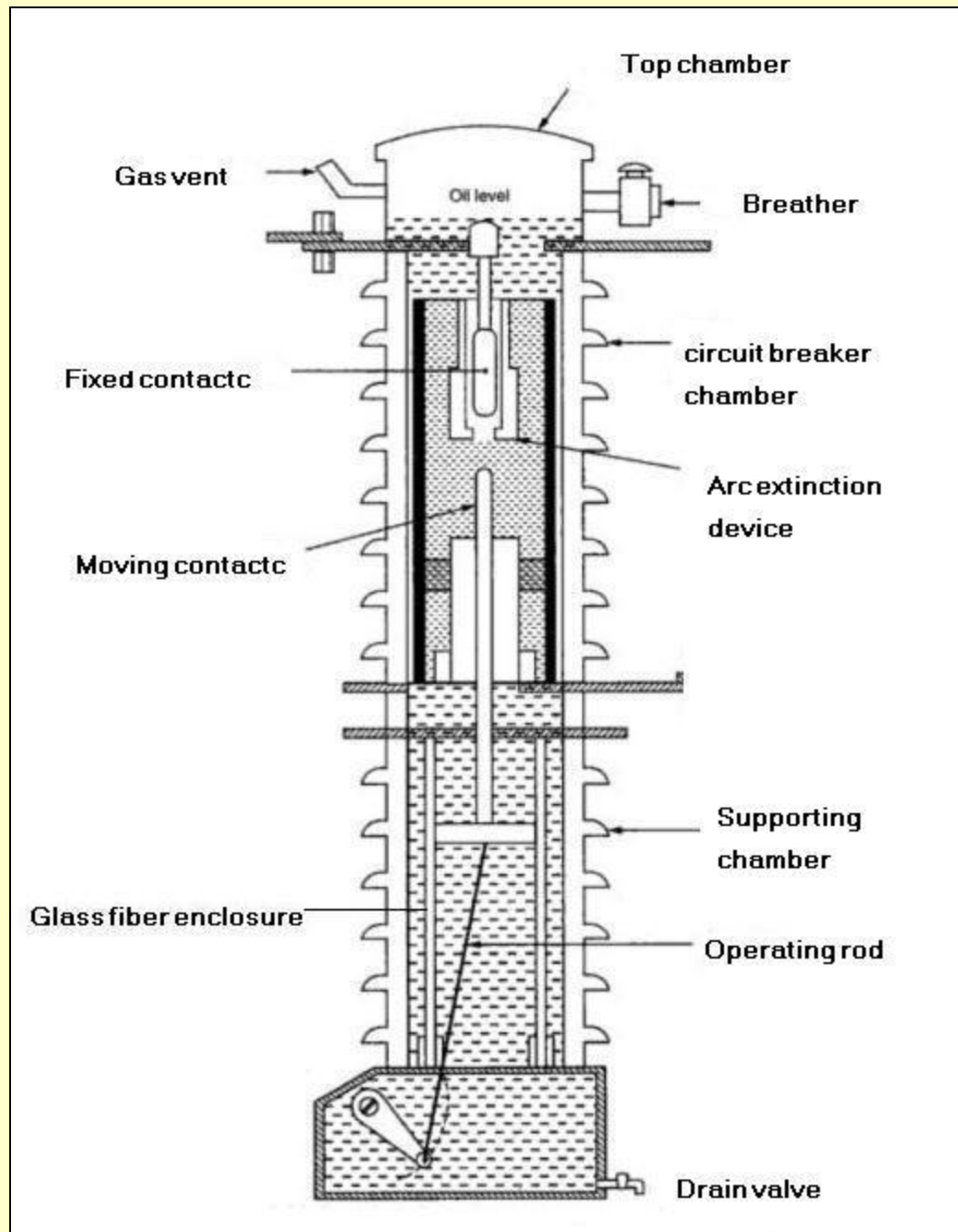
Minimum Oil Circuit Breaker

OIL CIRCUIT BREAKER

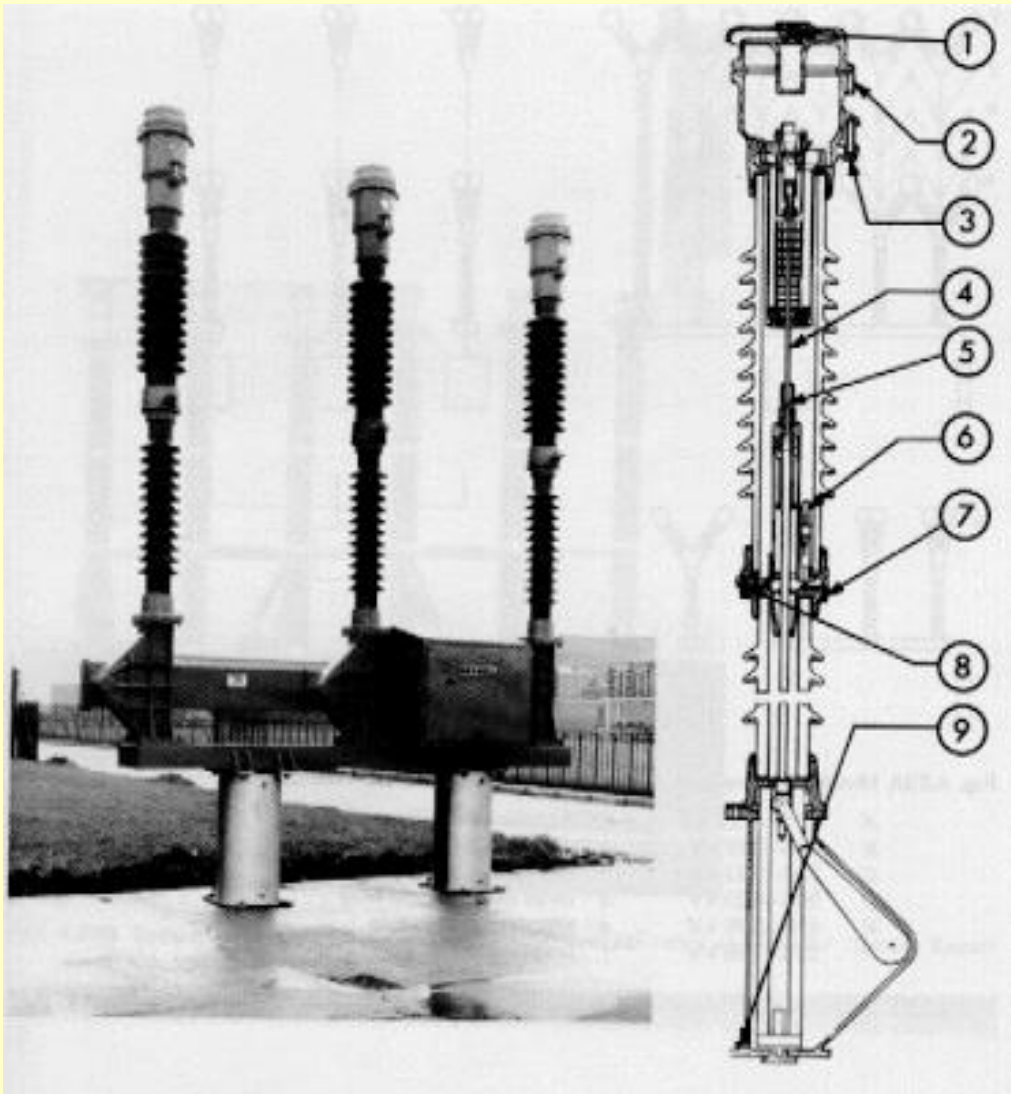
- It is designed for 11kv-765kv.
- These are of two types
 - BOCB (Bulk oil Circuit Breaker)
 - MOCB (Minimum oil Circuit Breaker)
- The contacts are immersed in oil bath.
- Oil provides cooling by hydrogen created by arc.
- It acts as a good dielectric medium and quenches the arc.



Minimum Oil Circuit Breaker 170 KV 3500 MVA

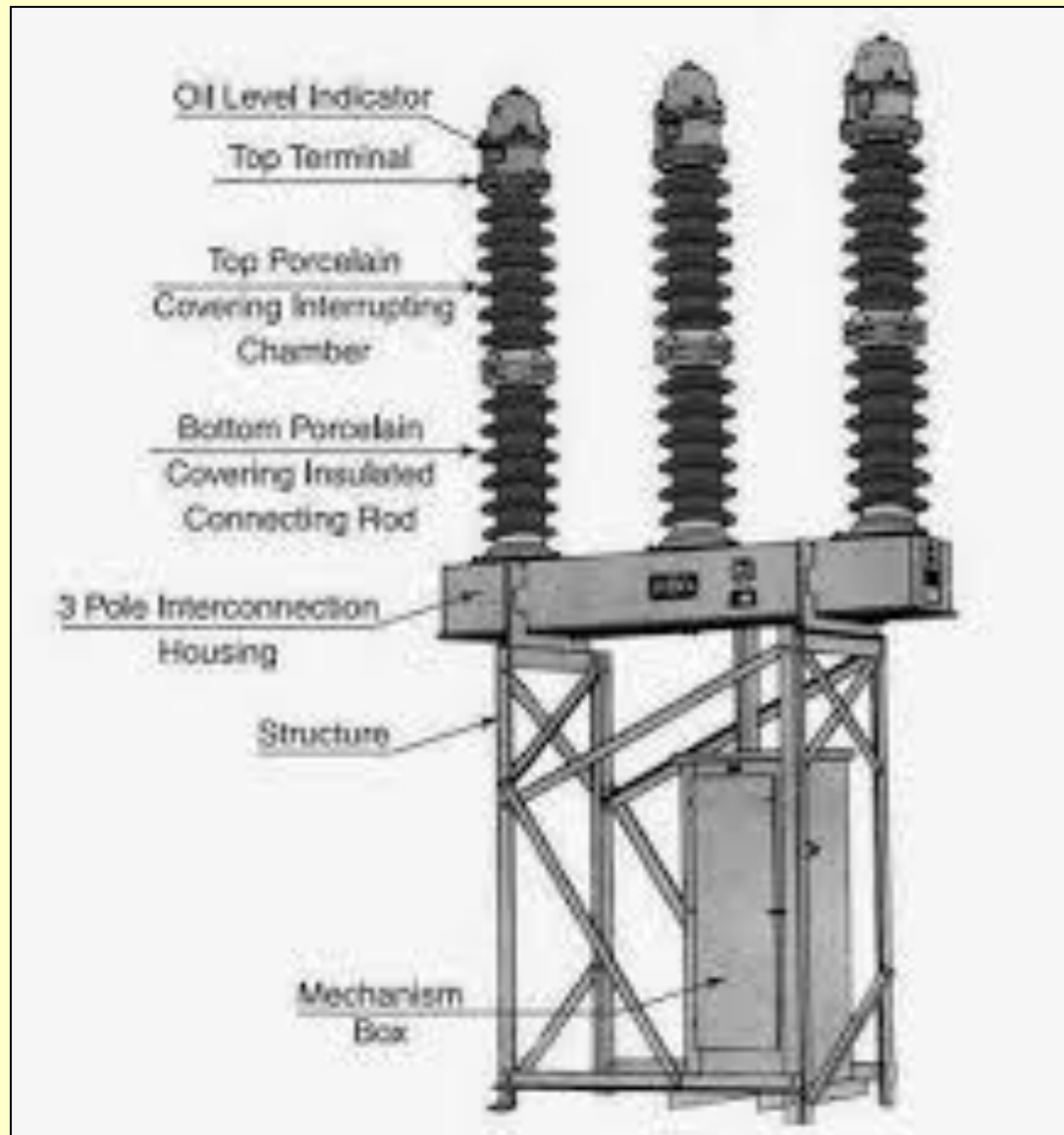


Minimum Oil Circuit Breaker



- 1 vent valve
- 2 terminal pad
- 3 oil level indicator
- 4 moving contact
- 5 lower fixed contact
- 6 separating piston
- 7 terminal pad
- 8 upper drain valve
- 9 lower drain valve

Minimum Oil Circuit Breaker



Air-blast Circuit Breaker

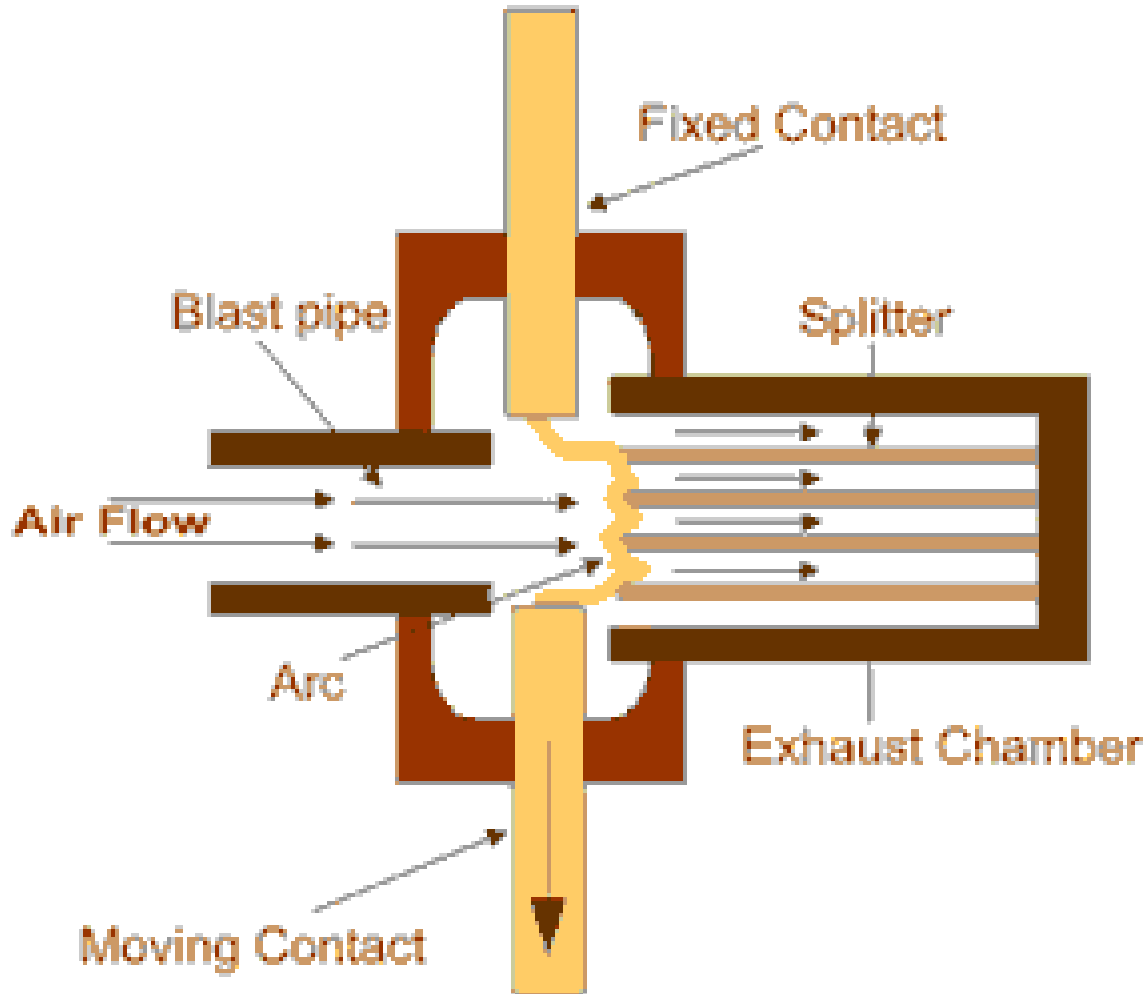
- **Keuntungan**

- Bebas resiko kebakaran
- Pemeliharaan yang mudah

- **Kerugian**

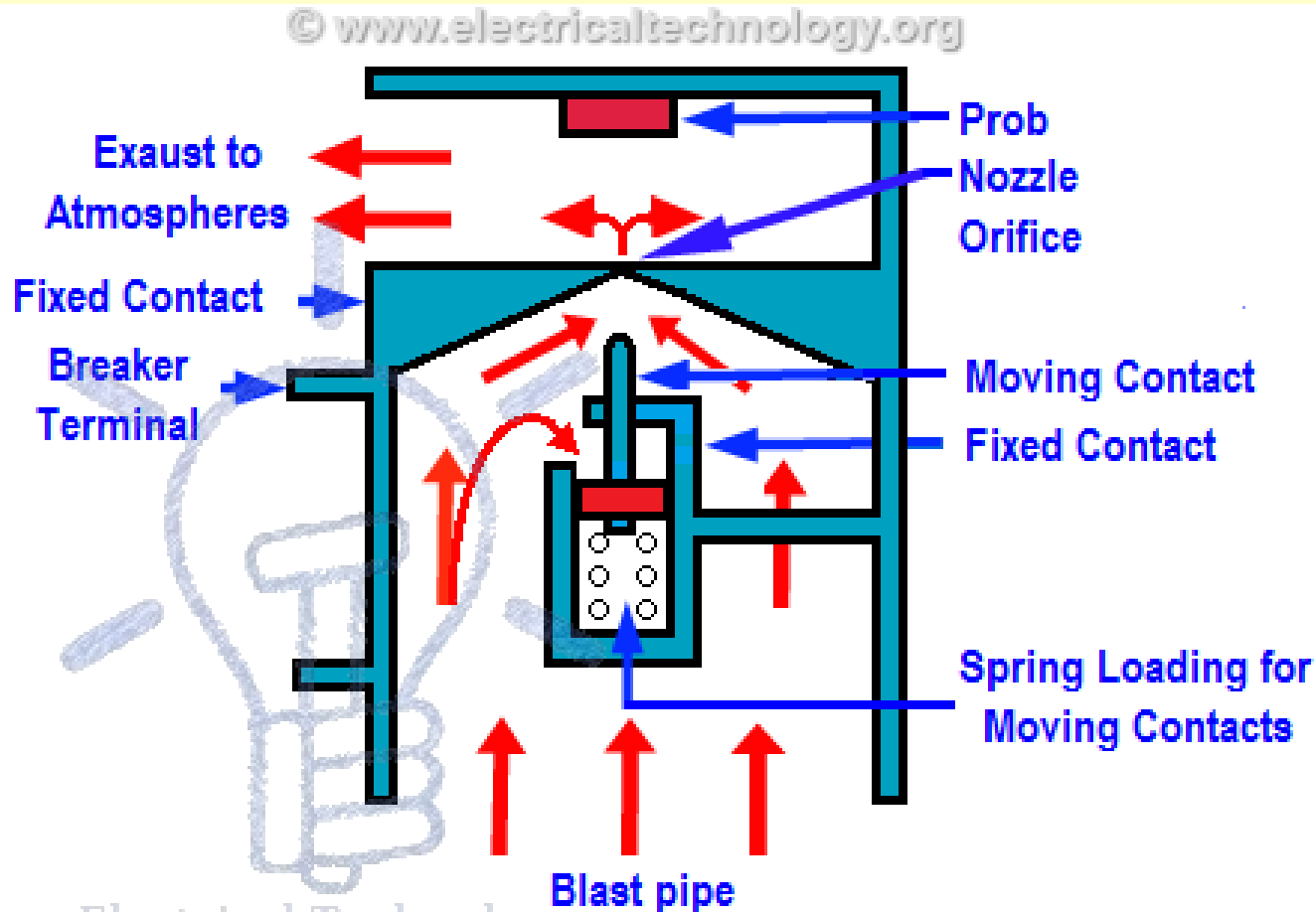
- Dipengaruhi oleh atmosfer
- Memerlukan peralatan untuk udara tekan
- Suaranya cukup keras

Air-blast Circuit Breaker



Principle of Cross Blast Air Circuit Breaker

Air-blast Circuit Breaker



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<http://www.electricaltechnology.org/>

Schematic Diagram of Axial Blast Air Circuit Breaker



Air-blast Circuit Breaker

Vacuum Circuit Breaker

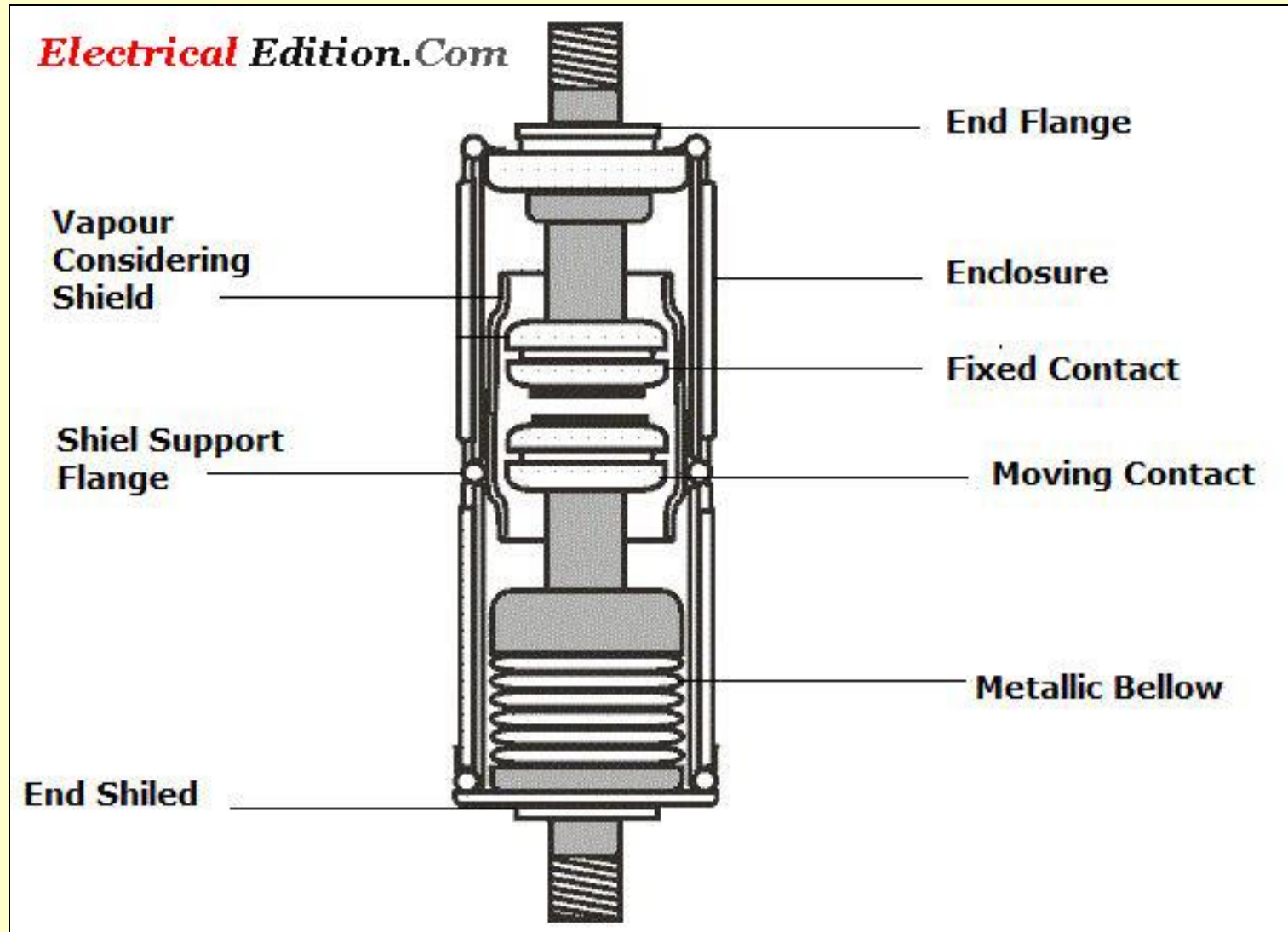
- **Keuntungan**

- Kekuatn isolasi yang tinggi
- Suara yang tidak keras
- Pemeliharaan yang mudah dan ringan

- **Kerugian**

- Perlu pengecekan kebocoran tekanan udara

Vacuum Circuit Breaker



Vacuum Circuit Breaker



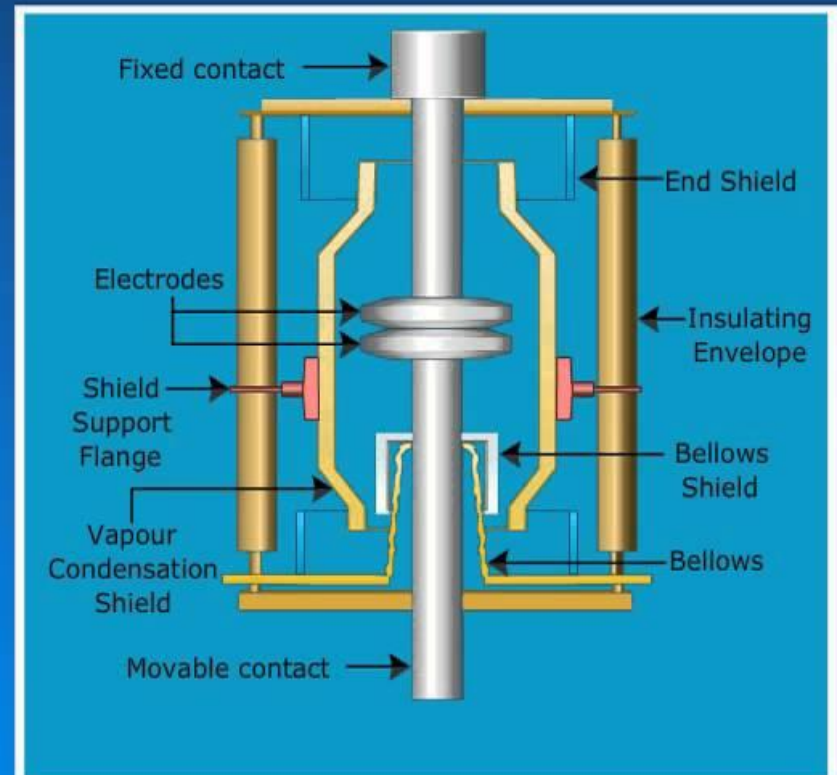
Vacuum Circuit Breaker



Vacuum Circuit Breaker

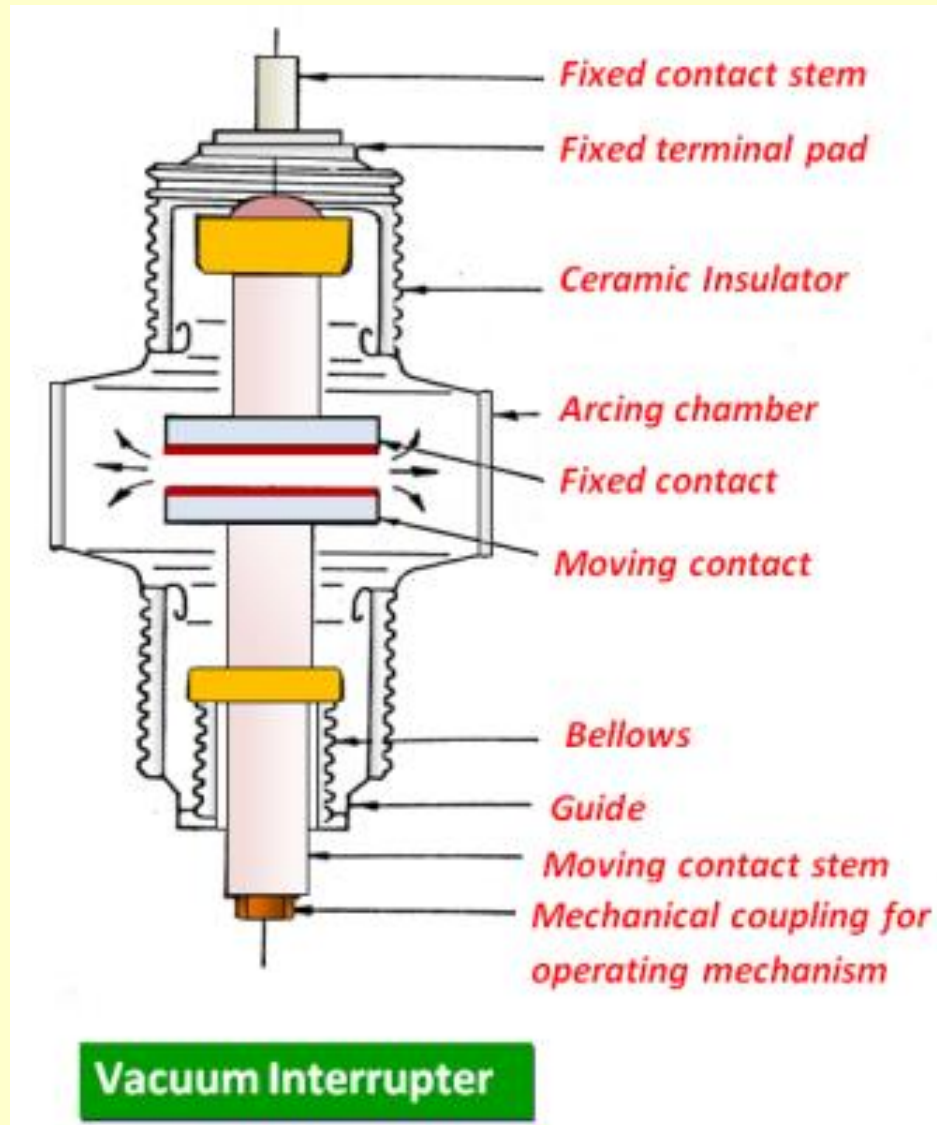
Vacuum Circuit Breakers

- A vacuum circuit breaker is a sealed vacuum pot or flask, with the contacts
- A vacuum acts a medium of insulation and arc extinguishing
- The moving contact is moved by a particular mechanism and the arc gets extinguished at "first crossing of current" through zero amplitude
- In such breakers, vacuum (the degree of vacuum ranges from 10^{-7} to 10^{-5} torr) is the medium used for *arc quenching*



Representation of Vacuum Circuit Breaker

Vacuum Circuit Breaker



Tank Type Vacuum Circuit Breaker



SF6 Circuit Breaker

- **Keuntungan**

- Kekuatan isolasi yang sangat tinggi dan lebih baik dari isolasi minyak
- Tidak terbakar
- Tidak beracun
- Pemeliharaan yang ringan

- **Kerugian**

- Lebih mahal dari minyak



A photograph of an SF6 circuit breaker in a substation. The breaker is a large, cylindrical metal unit mounted on a metal frame. It has four long, ribbed insulators extending upwards from the top. The background shows other electrical equipment and a clear sky.

SF6 Circuit Breaker

Construction, Working and Advantages



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ITE SF6 345 KV Circuit Breaker

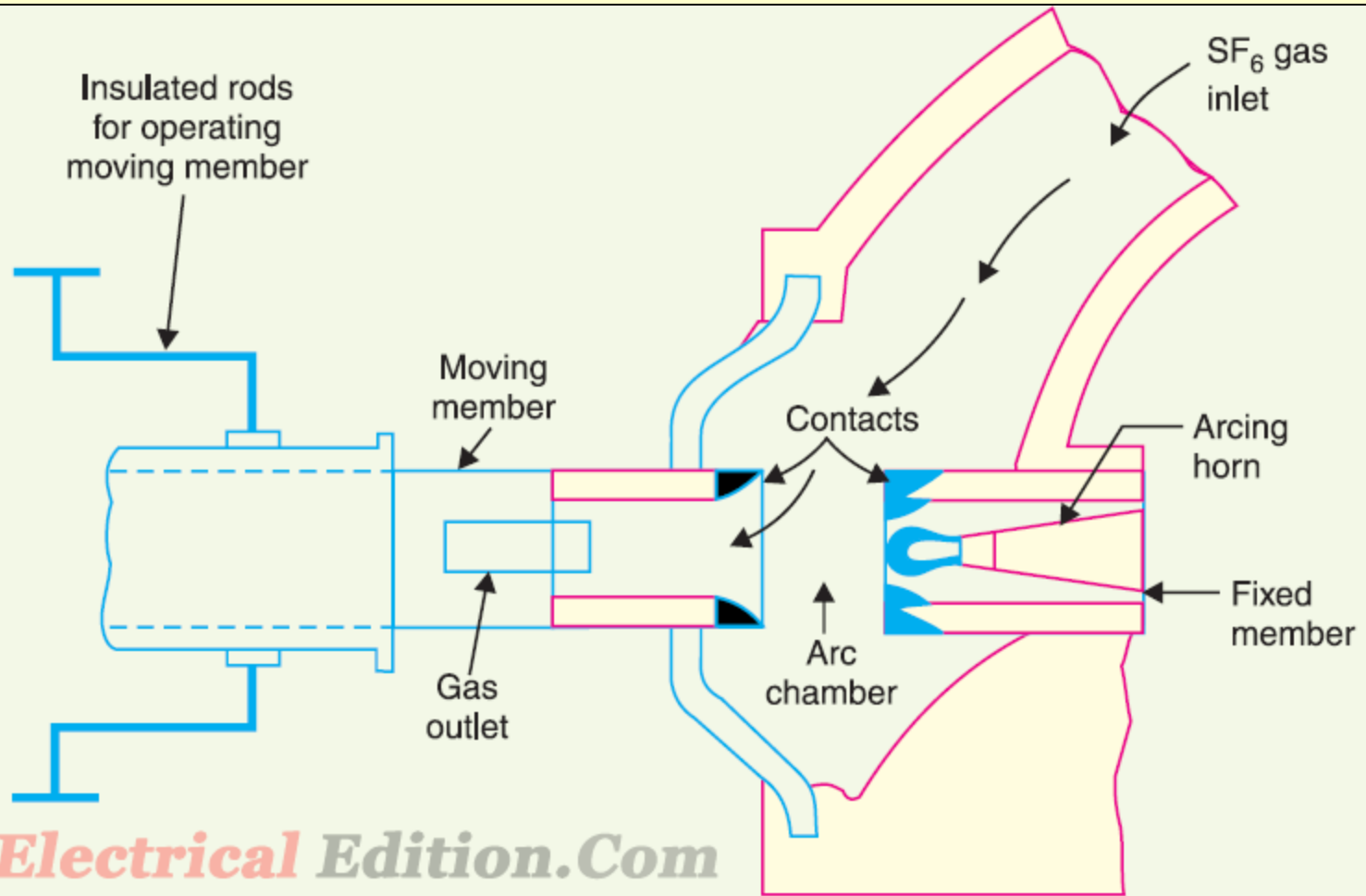


SF6 Circuit Breaker
Construction and Operation
of
SF6 Circuit Breaker

SF6 Circuit Breaker



SF6 Circuit Breaker



Terima Kasih