



TECHNOLOGY NOTE

W38 ULTRA-FAST CIRCUIT BREAKER

Maximum short-circuit
current limiter

To ensure proper operation and safety of expensive installations, such as BEBC, etc. an emergency power plant, using motor-generators, has been installed.

The emergency network is in parallel with the normal network and must be protected if a power failure occurs on the normal network.

In order to avoid undesired excitations the circuit-breaker has to withstand small voltage variations $\leq 20\%$ or voltage drops of short durations $> 20\% \leq 50$ ms on the normal network.

As the short-circuit power in each network differs, it was necessary that it respects the following parameters :

Normal network HT = 18 kV
Rated Power = 90 MVA
Short-circuit Power = 750 MVA

Emergency network HT= 18 kV
Rated Power = 7.7 MVA
Short-circuit Power = 30 MVA

Two solutions can be found:

1. Reactance coil :

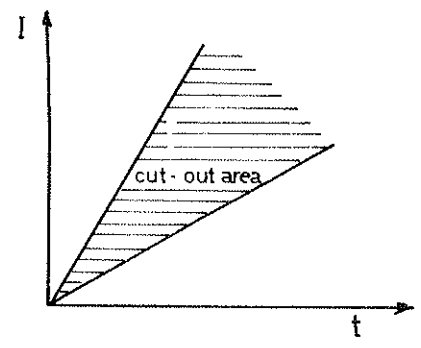
Fault V = 0% on the normal network
Parameters V = 80% on the emergency network

The inductance of such a coil will be too important and consequently, the coil will be rather costly with large volume and heavy power losses.

2. Circuit-breakers of conventional type are too slow, only explosive types can therefore be considered. The last type was chosen.

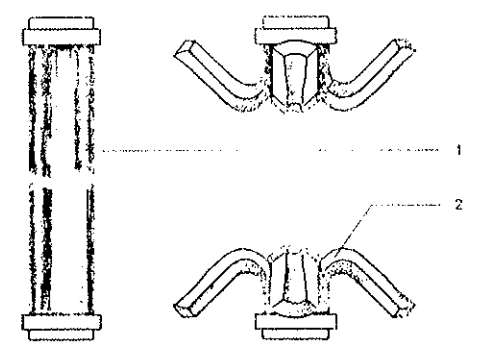
Explosion-type circuit breaker

1. Cut-out : this occurs as soon as a fault appears on the normal network, and is effected by analyzing the short-circuit current $\frac{dI}{dt}$ and a threshold relay set at 80 %.



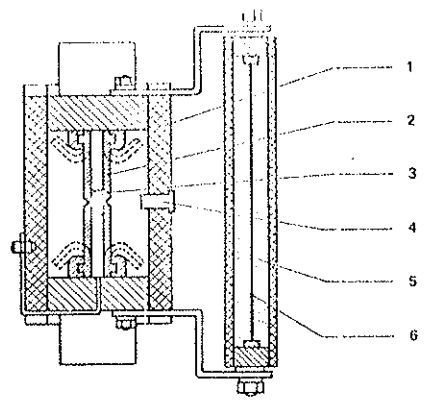
2. Explosion type : the energy stored in a capacitor is suddenly released to fire an explosive charge ($t = 0.5$ ms).

3. Interruption of power supply : the explosion breaks the main circuit (explosive section) ; the current then passes through the fuse which limits the over-voltage.



1. Explosive section
2. Explosive section opened up by explosion

4. The time required for operations 1, 2, 3 is of the order of 8 to 20 ms. The desired objective is achieved.



1. Isolating tube
2. Explosive section
3. Explosive charge
4. Operation indicator
5. Extinguisher
6. Fuse-wire

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Manufacturer : CALOR EMAG, RATINGEN (D).

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