

5.9 Comparison of different circuit breakers:

Factor	Oil Breakers	Air Breakers	Vacuum/SF6
Safety	Risk of explosion and fire due to increase in pressure during multiple operations	Emission of hot air and ionized gas to the surroundings	No risk of explosion
Size	Quite large	Medium	Smaller
Maintenance	Regular oil replacement	Replacement of arcing contacts	Minimum lubrication for control devices
Environmental factors	Humidity and dust in the atmosphere can change the internal properties and affect the dielectric		Since sealed, no effect due to environment
Endurance	Below average	Average	Excellent

Criteria	SF6 Circuit Breakers		Vacuum Circuit Breakers
	Puffer Circuit Breaker	Self-pressuring circuit-breaker	Contact material-Chrome-Copper

Operating energy requirements	Operating Energy requirements are high, because the mechanism must supply the energy needed to compress the gas.	Operating Energy requirements are low, because the mechanism must move only relatively small masses at moderate speed, over short distances. The mechanism does not have to provide the	Operating energy requirements are low, because the mechanism must move only relatively small masses at moderate speed, over very short distances.
Arc Energy	Because of the high conductivity of the arc in the SF6 gas, the arc energy is low. (arc voltage is between 150 and 200V.)		Because of the very low voltage across the metal vapour arc, energy is very low. (Arc voltage is between 50 and 100V.)

Contact Erosion	Due to the low energy the contact erosion is small.		Due to the very low arc energy, the rapid movement of the arc root over the contact and to the fact that most of the metal vapour re-condenses on the contact, contact erosion is extremely small.
Arc extinguishing media	The gaseous medium SF6 possesses excellent dielectric and arc quenching properties. After arc extinction, the dissociated gas molecules recombine almost completely to reform SF6. This means that practically no loss/consumption of the quenching medium occurs. The gas pressure can be very simply and permanently supervised. This function is not needed where the interrupters are sealed for life.		No additional extinguishing medium is required. A vacuum at a pressure of 10-7 bar or less is an almost ideal extinguishing medium. The interrupters are sealed for life' so that Supervision of the vacuum is not required.
Switching behavior in relation to current chopping	The pressure build-up and therefore the flow of gas is independent of the value of the current. Large or small currents are cooled with the same intensity. Only small values of high frequency, transient currents, if any, will be interrupted. The de-ionization of the contact gap proceeds very rapidly, due to the electro-negative characteristic of the SF6 gas and the arc products.	The pressure build-up and therefore the flow of gas is dependent upon the value of the current to be interrupted. Large currents are cooled intensely, small currents gently. High frequency transient currents will not, in general, be interrupted. The de-ionization of the contact gap proceeds very rapidly due to the electro-negative Characteristic of the SF6 gas and the products.	No flow of an extinguishing' medium needed to extinguish the vacuum arc. An extremely rapid de-ionization of the contact gap, ensures the interruption of all currents whether large or small. High frequency transient currents can be interrupted. The value of the chopped current is determined by the type of contact material used. The presence of chrome in the contact alloy with vacuum also.