

## Electrical Discharges in MV Switchgear

Compiled by John Sherriff | January 2019 | Rev 1

### The scope

Electrical discharges (ED) in MV switchgear circuits are (1) Partial Discharges (PD) and (2) Partial Arcing (PA).

1. Partial electrical breakdown occurs in an insulation system between electrodes energised by the system supply voltage. The breakdown does not bridge the electrodes. i.e. Voids, cracks, contamination etc.
2. Partial electrical current flow in the form of an intermittent arc between two conductive components in the same conductor circuit. This can be in the active load circuit or cable shield and earth circuit. There is no sustained plasma. i.e. High resistant connections or current flow through earth system of the terminations.

Section	Component	Defect type	Progression	End result
Low voltage	Control-gear contacts/wiring	Hiring resistance connections	Overheating	Eroded/Burnt insulation
Bus bar	Connections	Contamination	Surface tracking	Erosion Electrical tree Failure Fusing, welding or full arc flash
	Insulators	Cracked/broken	Partial discharge	
	Cable to VT's	Loose connection	Overheating	
Voltage transformers	Not aligned	Incorrect air gap	Partial discharge	
	Connections	Bad contact	Overheating	
Current Transformers	Not aligned	Incorrect air gap	Partial discharge	
	Connections	Bad connect	Overheating	
	Earth wire	Incorrect air gap	Partial discharge	
Switchgear	Contacts	Bad contact	Overheating	Explosion, toxic by-products
	SF6	Contamination, decomposition, SF6 loss	Sustained arcing	
	Oil	Contamination/decomposition		Explosion, fire
Surge suppressors, arrestors	Connections	Bad contact	Overheating	Fusing welding or full arc flash
	Installation	Wire touching earth	Air gap discharge	Dielectric breakdown with full arc flash

Partial discharge - Tracking



Partial discharge - Insulation



Partial arcing – Earth system

