

Protection and Selectivity in UPS Networks

In today's world UPS (Uninterrupted Power Supply) has become integral part of power system irrespective of the application and it has become mandatory requirement to ensure continued power supply to some of the critical loads.

There are different configurations of UPS available in the market depending on application requirement. Protection philosophy also needs to be designed depending on type of configuration selected. The online UPS will be different configuration when compared to offline or standby UPS system.

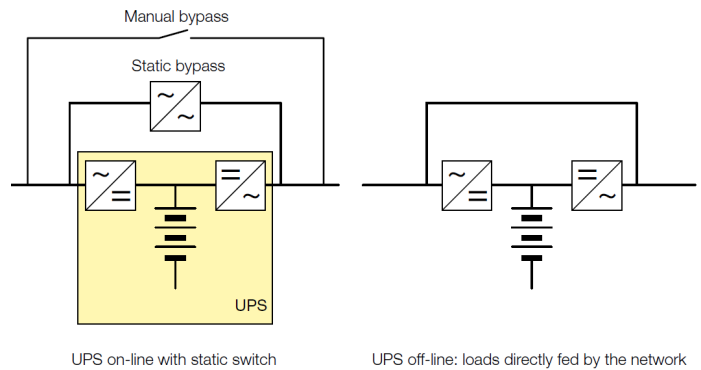
There is a possibility that UPS might have a possibility of accepting three different sources of power. The source one is from utility which supplies power to the battery charging source. Second source is the battery itself. Third source can be Generator.

In double conversion UPS (As name itself indicates conversion is twice – AC to DC and DC to AC), proper care is required to be taken to provide right protections. The following characteristics are to be noted in double conversion UPS.

- When utility source is available, Load is fed from utility through UPS
- When utility power is disrupted, critical loads are fed from battery
- When there is temporary overloading is required due to nature of loads. Power supply is guaranteed to the load from network through static switch which will exclude UPS during this phase

In this scenario it becomes very much necessary to know network characteristics to dimension and implement right protection. On input side of the UPS, circuit breakers to be selected matching to the requirement of network fault level. When it comes out put side of the UPS, it is very important to know current values of let through by the UPS.

We will analyze different scenarios of faults and see how we can implement protection system in place. The following diagram will provide overview of integral construction of UPS system.



The short circuit current in the event of fault is limited by the way power devices are dimensioned (For eg. Thyristors). Typically the fault contribution from UPS is around 200% of its rated value.

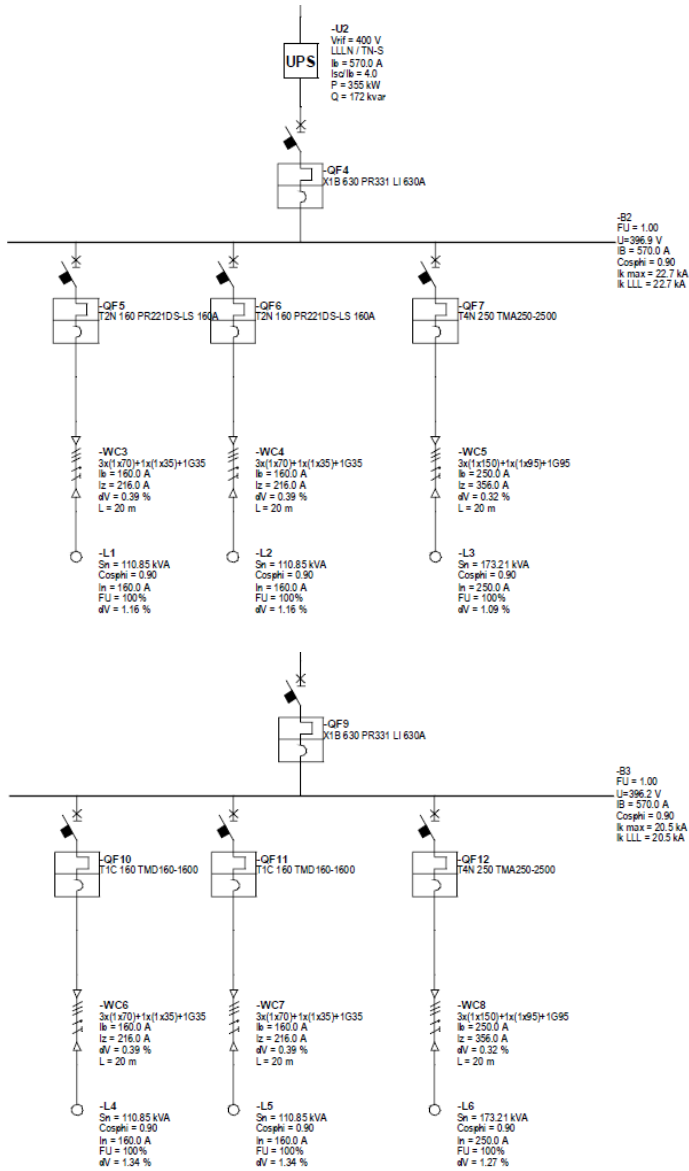
Selectivity of circuit breakers between input side of UPS and outgoing feeders of output side becomes very essential. If selectivity is not achieved between these circuit breakers, the purpose installing expensive UPS system is defeated.

In the above diagram of online UPS system, when the dimensioning of Power devices of bypass static switch and circuit protection implemented plays a crucial role to ensure continuity of power to loads. For circuit breakers to clear the fault, Power devices are dimensioned in such a way that it can carry 1000% of its rated current for a period of 100 milliseconds.

Similarly Battery will also be contributing to the fault current when there is fault on the battery. The main parameters which contribute to magnitude of the current are battery's internal resistance (this depends on plate surface area, internal plate spacing and electrolyte type) and its external circuit resistance. Implication here is predominantly on sizing of supply side circuit breakers. It is always advisable to obtain complete parameters of battery system prior to selection of circuit breakers.

The fault parameters of two networks below are 25kA. One of the networks is with UPS and another network without an UPS. The fault level at the bus is clearly higher in case of network with UPS due to contribution from the Power devices of the UPS system. Accordingly protection implementation also needs to be taken care.

ABB offers complete product portfolio to ensure perfectly coordinated protection system for UPS. ABB's solution covers protection solutions in AC as well DC networks.



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