

4.11 UPS – UNINTERRUPTIBLE POWER SUPPLY

A UPS is an uninterruptible power supply. It is a device which maintains a continuous supply of electrical power, even in the event of failure of the mains (utility) supply. A UPS is installed between the mains supply and the equipment to be protected.

UPS are used to safeguard various types of equipment. One of the common uses is computers, particularly in data centres and the critical equipment of large organizations.

A UPS works by converting the mains alternating current (a.c.) supply to a direct current (d.c.) voltage. The part of the UPS which does this is called the rectifier. Output from the rectifier is then used to charge batteries, which can supply power during a mains failure. The d.c. voltage from the rectifier (or batteries during mains failure) is converted back to a.c. by the UPS inverter and supplies power to the equipment.

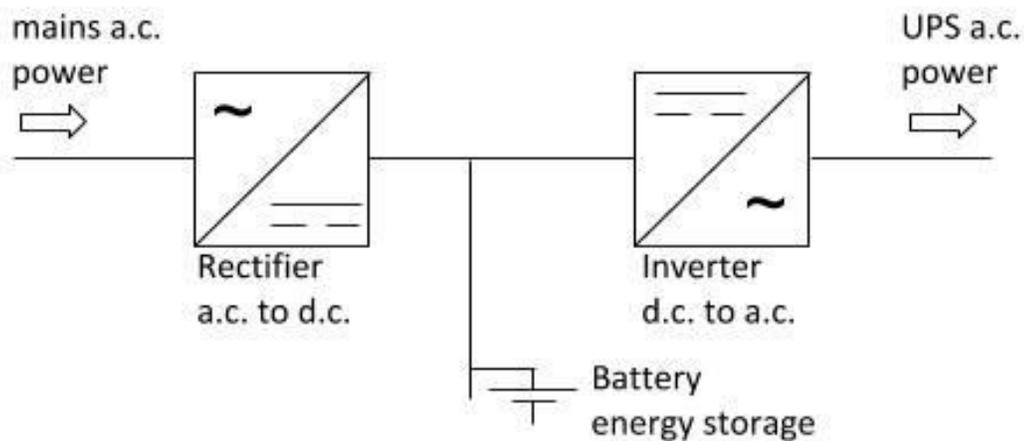


Figure 4.11.1 CIRCUIT DIAGRAM

[Source: "Power Electronics" by P.S.Bimbra, Khanna Publishers Page: 452]

In addition to protecting equipment in the event of mains failure, because the first convert the a.c. to d.c, a UPS has the added benefit of being able to solve other problems related to power supply quality. These include voltage dips, harmonics, frequency variations, etc.

UPS units and systems come in various sizes, from 1 or 2 kVA all they way to the MVA range. On of the problems and limiting factors with how large a UPS can be is the amount of batteries required. These can become substantial, costing a lot and taking up significant amounts of space. For smaller UPS the batteries are normally internal to the device, while for larger systems the batteries are mounted externally on racks or in cabinets.

Another element to batteries is the discharge time. Any battery backed UPS will only be rated for a certain period (5 minutes, 15 minutes, 30 minutes, etc.). For this reason, most UPS applications are centred around providing sufficient power for a limited time to enable any necessary actions - safely shut down the equipment, change over to generator power, etc.

UPS Configurations

The arrangement of rectifier, inverter, battery and other components can be carried out in different ways. Each arrangement has advantages and disadvantages. Normally the more robust the configuration, the more expensive the UPS.

UPS are classified in two basic ways - standby and on-line. In a standby UPS, power is normally supplied directly from the mains and the inverter only switched in if the mains fails. This can have the advantages of cheaper cost and higher efficiencies. On-line UPS always supply the load via the inverter. These are more expensive, but because the inverter is always used they can resolve many power quality issues.

