Parallel Connection of Switched-Mode Power Supplies

The purpose of connecting switched-mode power supplies in parallel is to make the maximum total current available for a system. If a power supply fails, the total current may cease to be available and this can result in faults/the failure of functional units.

In principle, rather than using several power supplies to supply the total current it makes more sense to use one high-capacity power supply. However, there are still some very good reasons for opting for parallel operation such as
- Increased power
- Spatial distribution of the power supplies to avoid hot spots
- Neutral point supply concept so that loads can be isolated with the aim of reducing interference across common power supply paths
- Power supply redundancy (see next page)

The following rules should be observed when connecting power supplies in parallel
1. Only operate power supplies in parallel if the characteristic and rating class are identical.
2. Install the power supplies in locations with identical (or nearly identical) environmental conditions.
3. Ideally, power supplies should be arranged side by side rather than one on top of the other.
4. Align the output voltage of the power supplies for no-load operation (without connecting leads) so that the value is identical.
5. All connecting leads should be the same length and have the same cross-sectional area.
6. The leads should converge at the load, not at the power supplies. This improves the symmetry.
7. With the power supplies at operating temperature and under load, align the voltage value again to compensate for temperature drift.

Figure 1 - Parallel connection
Technical Description

**Special form of parallel connection: Switched-mode power supply redundancy**

The idea behind a redundant supply concept is to safeguard the entire system supply in the event of a switched-mode power supply failure, i.e. the maximum total current needs to remain available. This means that the total current has to be provided by several different power supplies.

In addition to these power supplies, at least one more power supply needs to be used as a back-up device in order for the total current to be kept available in the event of a power supply failure (n+1 redundancy). The greater the number of additional power supplies used, the greater the fault tolerance (n + m redundancy; m = the number of additional power supplies).

To achieve a reliable form of redundancy, the mains supply circuits of all the power supplies connected in parallel must be isolated by means of diodes. If one of the devices should fail, this prevents a short circuit from occurring and stops a fault current from flowing back into the defective power supply unit.

The following applies as when connecting power supplies in parallel. In addition, please ensure that the diodes have sufficient current carrying capacity and noise immunity.

![Figure 2 - Redundant operation](image-url)