AC Voltage Controllers

AC-to-AC converters have a wide range use in the industry. Applications such as light dimmers, AC motor controllers, heat controllers, uninterruptable power supplies are some examples for AC-AC converters. There are many different types of AC converters but basically, they produce an output voltage at the same frequency as input AC signal with variable amplitudes. These converters are also known as AC voltage controllers.

The anti-parallel connection of SCR thyristors gives the opportunity to control current in both positive and negative directions. This switch combination is a called bidirectional switch. You have seen in the first experiment that the triac has this bidirectional property. The anti-parallel SCR thyristors in Figure 1 can be replaced by a triac, but for simplicity of understanding thyristors will be used while giving general information.
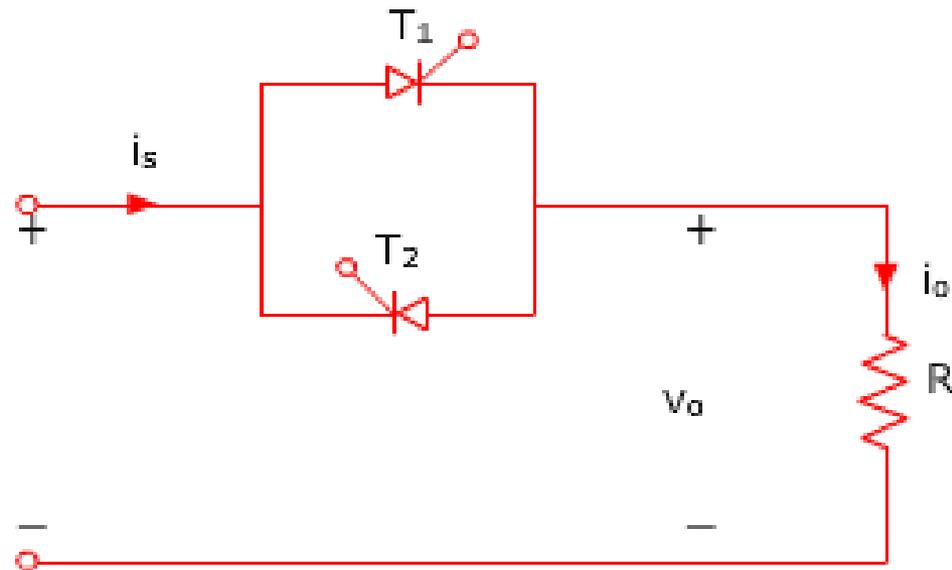
Principle of Phase Angle Control

In phase-angle control, each SCR of the back-to-back pair is turned on for a variable portion of the half-cycle that it conducts. Power is regulated by advancing or delaying the point at which the SCR is turned ON within each half cycle. Light dimmers are an example of phase-angle control.

Phase-angle control provides a very fine resolution of power and is used to control fast responding loads such as tungsten-filament lamps or loads in which the resistance changes as a function of temperature. Phase-angle control is required if the load is transformer-coupled or inductive.

Principle of ON-OFF cycle Control

The basic principle of on-off control technique is explained with reference to a single phase full wave ac voltage controller circuit as shown. The thyristor switches and are turned on by applying appropriate gate trigger pulses to connect the input ac supply to the load for 'n' number of input cycles during the time interval .

The thyristor switches and are turned off by blocking the gate trigger pulses for 'm' number of input cycles during the time interval . The ac controller ON time usually consists of an integral number of input cycles.

R=R_L= Load Resistance