

4.3 Three Single Phase Inverter (120° conduction)

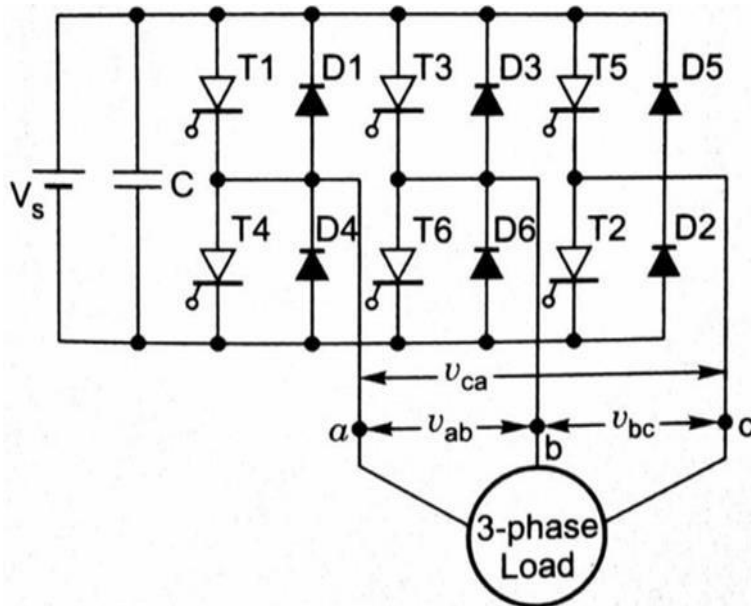


Figure 4.3.1 Three-phase inverter

[Source: "Power Electronics" by P.S.Bimbra, Khanna Publishers Page: 338]

The power circuit diagram of this inverter is the same as that 180 ° mode.

- For the 120-degree mode VSI, each thyristor conducts for 120° of a cycle.
- Like 180° mode, 120° mode inverter also requires six steps, each of 60° duration, for completing one cycle of the output ac voltage.
- For this inverter a table giving the sequence of firing the six thyristors is prepared as shown in the top of Fig.
- In 120-degree mode VSI, each thyristor conducts for 120° of a cycle. Like 180° mode, 120° mode inverter also requires six steps, each of 60° duration, for completing one cycle of the output ac voltage.

- T1 conducts for 120° and for the next 60° , neither T1 nor T4 conducts. Now T4 is turned on at $\omega t = 180^\circ$ and it further conducts for 120° , i.e. from $\omega t = 180^\circ$ to $\omega t = 300^\circ$. This means that for 60° interval from $\omega t = 120^\circ$ to $\omega t = 180^\circ$, series connected SCRs T1, T4 do not conduct. At $\omega t = 300^\circ$, T4 is turned off, then 60° interval elapses before T1 is turned on again at $\omega t = 360^\circ$.
- In the second row, T3 is turned on at $\omega t = 120^\circ$ as in 180° mode inverter. Now T3 conducts for 120° , then 60° interval elapses during which neither T3 nor T6 conducts. At $\omega t = 300^\circ$, T6 is turned on, it conducts for 120° and then 60° interval elapses after which T3 is turned on again.
- The third row- is also completed similarly. This table shows that T6, T1 should be gated for step I; T1, T2 for step II ; T2, T3 for step III and so on.
- The sequence of firing the six thyristors is the same as for the 180° mode inverter.
- During each step, only two thyristors conduct for this inverter - one from the upper group and one from the lower group ; but in 180° mode inverter, three thyristors conduct in each step.
- Load is assumed to be resistive and star connected.
- During step I, thyristors 6, 1 are conducting and as such load terminal a is connected to the positive bus of dc source whereas terminal b is connected to negative bus of dc source, Fig. 8.23 (a). Load terminal c is not connected to dc bus.

- It is seen from Fig. that phase voltages have one positive pulse and one negative pulse (each of 120° duration) for one cycle of output alternating voltage. The line voltages, however, if, have six steps per cycle of output alternating voltage.

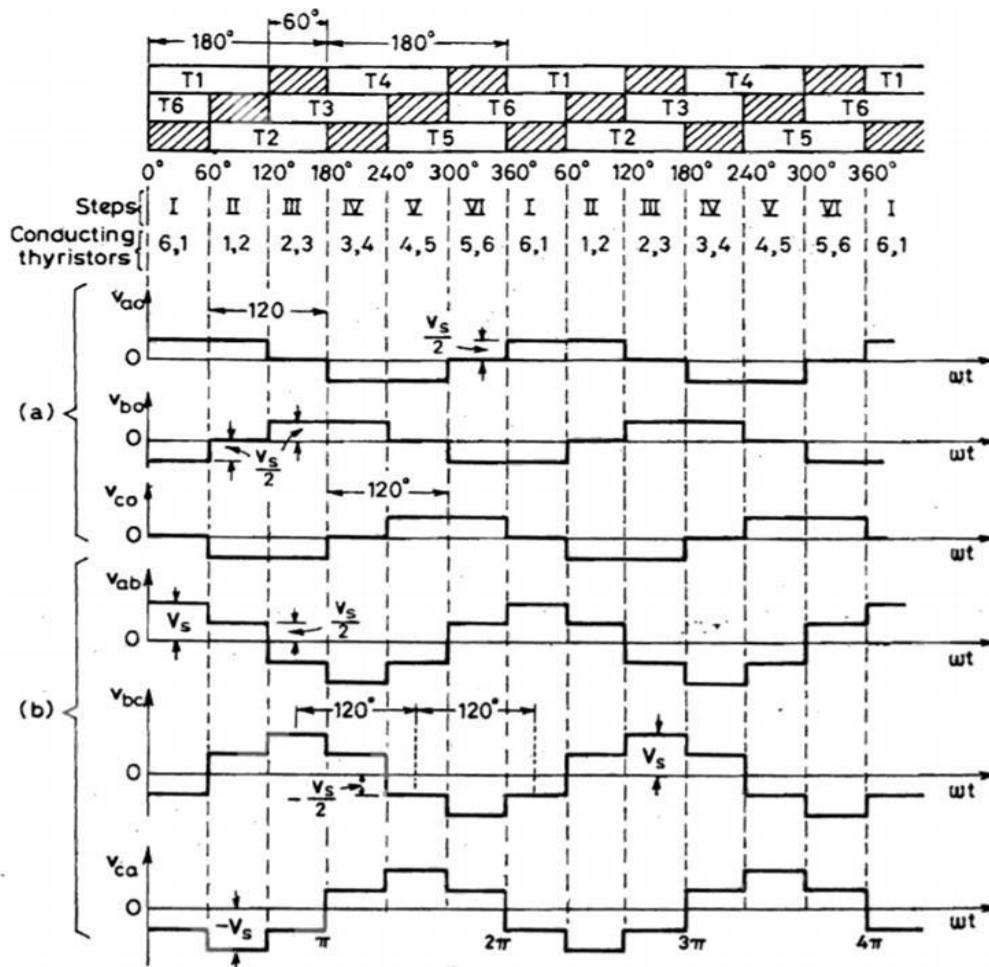


Figure 4.3.2 Three-phase inverter wave forms(120 mode)

[Source: "Power Electronics" by P.S.Bimbra, Khanna Publishers Page: 339]