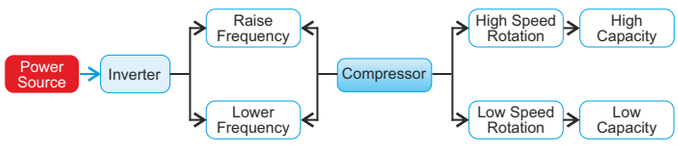
Inverter AC Technology

The inverter technology (DC) is an evolution of technology concerning the electro motors of the compressor in AC. An inverter is used to control the speed of the compressor motor to continuously regulate the temperature of the cooling space. The DC inverter unit has a variable-frequency drive that comprises of an adjustable electrical inverter. This can control the speed of the compressor electromotor, which can regulate cooling and heating output.

As power is supplied to the system, the drive converts the incoming AC signal to DC signal and through a modulation in an electrical inverter; it produces the desired current frequency. A microcontroller in the inverter can sample each ambient air temperature and adjust the compressor speed accordingly. As the air-conditioner adjusts the speed of the compressor, the refrigerant (gas) flow rate is also adjusted. Thereby, running the compressor at nominal speeds for better energy-saving and eliminate any temperature fluctuations.

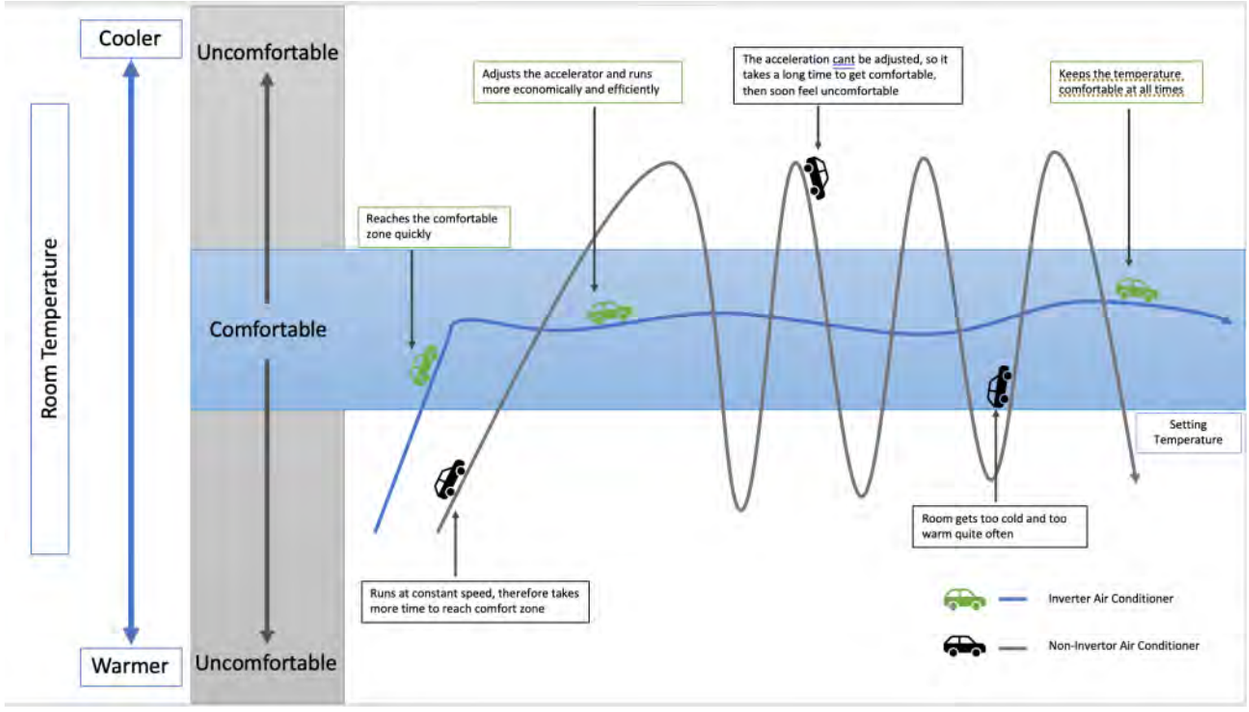


Non-inverter air-conditioners are conventional AC's that have a fixed cooling capacity and can control the indoor temperature by starting or stopping the compressor. For instance, when the thermostat senses the desired temperature, the compressor shuts down and the AC runs on fan mode. Once the thermostat temperature changes, the compressor starts running again.

Whereas, inverter type AC can run at variable speeds, even more than its cooling capacity to achieve the desired indoor temperature. Once, the AC can achieve the desired temperature at a faster speed, it slows down the compressor output and maintains the required temperature.

The repetition of the start and stop cycle in non-inverter AC's draw more power and consumes more electricity in comparison to the inverter technology.

From the car-hill analogy displayed above, the green car is Inverter AC whereas the black car is Non-Inverter AC. We can observe that the green car uses its peak energy to get in a comfortable zone whereas the black car always uses its peak energy to reach a comfort zone and beyond. After reaching the comfort zone, the green car reduces its energy to stay in the comfort zone. On the other hand, after reaching the peak, the speed of the black car goes back to 0 until it uses its peak power again to try to get in the comfort zone. This way non-inverter AC consumes a lot of energy to bounce between the comfortable and uncomfortable zone.



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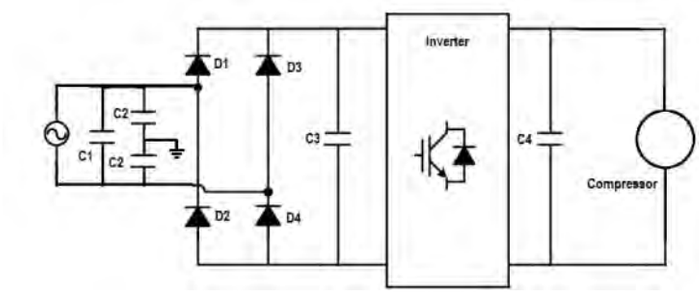
Whereas, the Inverter AC uses almost the same power after reaching the comfort zone and stays in it.



C1: X2 Capacitor C2: Y2 Capacitor
C3: DC Link Capacitor C4: Snubber Capacitor

In an AC inverter, the input signal is adjusted according to the compressor needs to save energy. An EMI filter suppresses the incoming electromagnetic interference from the mains line by using X2 and Y2 capacitors. Then the rectifier converts the AC signal into pulsating DC signal and the PFC circuit also maintains the power factor. Next, the DC link capacitor links the power switching and High-Frequency inverter. Next, the inverter converts DC signal to AC signal, and all the transients generated from the switching device are absorbed by the snubber capacitor. The output signal regulates the motor speed of the compressor.

Deki Capacitors Range for Inverter AC Application

Series Name	Deki Series Code	Capacitance Range	Rated Voltage
Interference Suppression Capacitor Class X2	07, 20	0.01 to 10 µF	275 VAC, 310 VAC
High Capacitance Stability Interference Suppression Capacitor Class X2 High Humidity Resistant Grade	151	0.01 to 10 µF	275 VAC, 310 VAC
Interference Suppression Capacitor Class Y2	33, 133	0.00022 to 0.033 µF	305 VAC
Metallized Polypropylene DC Link Capacitor	91	1 to 120 µF	450 VDC - 1100 VDC
Metallized Polypropylene IGBT Snubber Capacitor	121, 150	0.047 to 10 µF	700 VDC - 3000 VDC

For details regarding Deki's electric energy meter capacitors, please contact shariq@dekielectronics.com