

Get More Out of an AC Power Source:
Using Over Current Foldback Technology to Deal with High Inrush Current
Associated Power Technologies

What is OC Foldback?

One of the biggest challenges when choosing a power source is determining how much power you need for the application. While steady state current values are commonly specified by the manufacturer, variable inrush or currents from inductive loads are more difficult to quantify. Inrush current values need to be considered because even if the source can handle the steady state current, the inrush current could cause the source to go into an over current or over power protection mode.

OC Foldback or “Over Current Foldback” is an APT feature that keeps output current constant. The power source does this by reducing, or “folding back”, the voltage in a linear fashion while maintaining a constant current. Figure 1 below shows a power source’s output voltage and current with OC Foldback enabled. The voltage maintains a constant value until it folds back to maintain a constant current. Once the inrush current stabilizes, the voltage will increase back to the nominal set value.

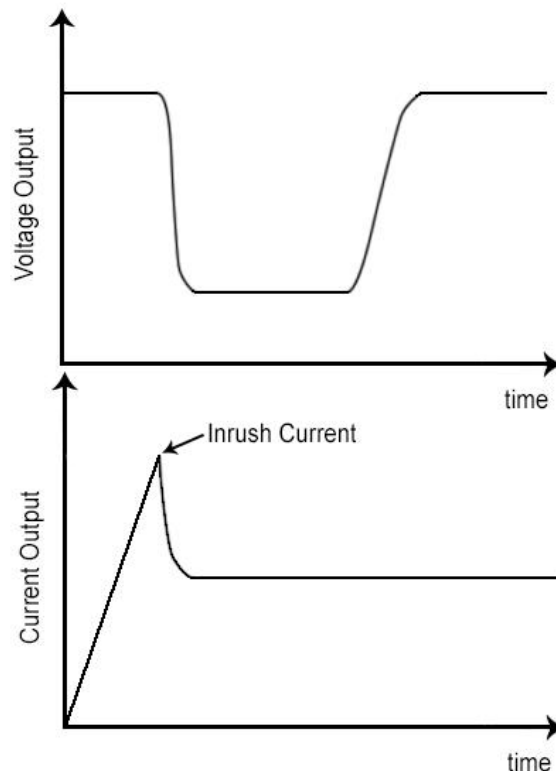


Figure 1: OC Foldback Output Voltage and Output Current Characteristic

High Inrush – No Problem

In certain applications the inrush current of a device can greatly exceed its steady state value. DUT's that contain transformers and motors usually have inrush current values several times greater than the steady state current. The user may need to spend hundreds or even thousands of dollars extra to step up to a larger source, simply due to the inrush current value.

As with any power source, the APT series has current limitations for each model. The APT 300XAC series current limits are shown in Table 1.

Instrument			310XAC	320XAC	340XAC	360XAC
Voltage			5 - 300 V		5 - 300 V	
Power			1 KVA	2 KVA	4 KVA	6 KVA
Max Current <i>Line to Neutral</i>	5 - 150 V	Low	9.2 A @ 110 V	18.4 A @ 110 V	36.8 A @ 110 V	55.2 A @ 110 V
	5 - 300 V	High	4.6 A @ 220 V	9.2 A @ 220 V	18.4 A @ 220 V	27.6 A @ 220 V

Table 1: 300XAC Current Output Specifications

While APT power sources can handle four times rated current value for a short period of time (milliseconds), products with motors and transformers require inrush levels that can last for several hundred milliseconds to seconds. In applications like this the power source would not be able to supply the necessary current to get the device started.

For example, an engineer uses a 320XAC to run a motor at 230VAC. The source must run in the high range (over 150VAC). The maximum current output in this range is 9.2A. The motor has an inrush current of 17A that lasts for approximately 2 seconds. Normally, the 320XAC would not be able to handle this level of inrush for 2 full seconds. The user would be forced to move up to a 4kVA unit. However, using OC Foldback, the voltage will clip as the inrush increases until the current stabilizes (Figure 2).

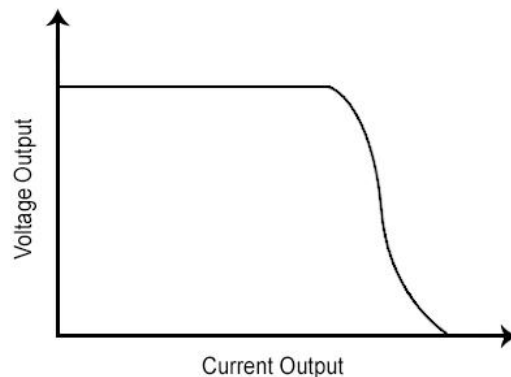
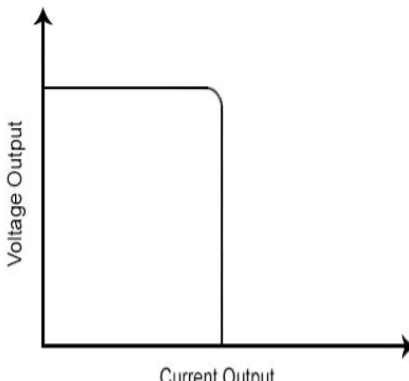


Figure 2: OC Foldback Voltage vs. Current Output

This allows a 2kVA source to power a motor that would normally need to be run by a 4kVA source.

<p style="text-align: center;">DID YOU KNOW? A TRICK TO USING OC FOLDBACK</p>	<p style="text-align: center;">FIGURE 3 - CC MODE</p>
<p>Another advantage of the OC Foldback feature is that it allows the APT power source to act as a constant current source, rather than a constant voltage source. The source can essentially be “tricked” into outputting a constant current value based on the current high limit setting. By setting the current high limit (A-HI) value and turning OC Foldback = ON, the source will regulate the current to the high limit value, thus acting as a constant current source as the voltage varies (Figure 3). While more limited than a dedicated constant current source, it gives the APT series another level of complexity to act as both constant voltage and constant current sources in one unit.</p>	 <p>The graph illustrates the CC Mode output characteristics. The vertical axis is labeled 'Voltage Output' and the horizontal axis is labeled 'Current Output'. The plot shows a constant voltage output for a range of current values, followed by a sharp drop to zero current at a specific high-current limit.</p>

Conclusion

The variable nature of inrush currents can make choosing a proper power source difficult. High inrush currents can cause a power source to go into a protective mode which shuts off the output. Using the OC Foldback feature allows the end user to compensate for these high transient current values. OC Foldback also allows the user to choose a power source based off of the steady state current value of the system under test, rather than having to purchase a more powerful source simply because of excessive inrush currents.