

AC Source Overload Capability for Testing Inrush Current Conditions for Motor Drives, and More

Introduction

In many real-world electrical and power electronics applications, peak/inrush current conditions are unavoidable. These inrush conditions can arise due to start up, transient power demands, or sudden changes in load conditions.

Current inrush conditions commonly occur in motor and electrical product test and testing applications. For instance, electric motors experience a high inrush current during startup, often several times their rated operating current. Similarly, medical imaging (MRI) or radar systems, may require short bursts of high current without causing voltage fluctuations or shutdowns.

Key Applications:

- Electric motor drives
- Medical imaging equipment
- Radar systems
- Industrial automation
- Electrical pump systems

The Cost of Oversizing a Power Supply

Selecting a power supply that can handle overload conditions presents several challenges, including cost, thermal management, and long-term reliability. One of the primary concerns is unnecessarily oversizing the power supply to accommodate short-duration current demands.

While a higher-rated power supply ensures stability and prevents shutdowns, it also increases cost, size, and energy consumption.

Engineers must balance the need for overload capability with the cost and space constraints of their application.

In cases where brief overloads occur, selecting a power supply with temporary surge or peak current ratings may be a more cost-effective alternative to oversizing the supply.

“The AGX is designed to handle overload conditions with its capability of providing 130% of its rated current for a duration of 2 seconds.”

Another critical factor is thermal performance and component stress. Repeated or prolonged overloads generate excess heat, which can lead to component degradation and reduced lifespan if not managed properly. Power supplies designed for overload conditions should have adequate heat dissipation, robust protection circuits, and derating considerations to prevent overheating.

Improper selection of a programmable power supply can result in voltage sags, instability, or premature shutdown of a unit under test. Engineers will need to evaluate many factors (e.g. peak inrush current, duty cycle, etc.) to ensure seamless operation during overload events.

Case Study:

AGX Series Provides Overload Capability for Avionics Inductive Motor Testing

To illustrate the real-world benefits of the AGX Series overload capability, below is an example of a customer provided scenario, where they evaluated the AGX for powering and testing their inductive motor.



CUSTOMER APPLICATION

A large aerospace company needed to test a high-power motor for an aerospace application up to 180kW at a frequency of 60Hz at a steady state of 120V.

OUR SOLUTION

Pacific Power Source's AGX Series is beneficial for applications involving sourcing inrush and overload conditions. Back EMF is applicable when braking or slowing down an AC motor. It will return energy to the source and without bidirectional capability, a programmable AC source will shut down to protect itself.

The AGX Series is designed to handle overload conditions with its capability of providing 130% of its rated current for a duration of 2 seconds.

This provides exceptional value and ability in reducing the need to select oversized power supplies while accommodating common and real-world conditions of overload and inrush currents.

Instead of oversizing the programmable AC source to account for the initial inrush current that occurs during start-up, they selected the **AGX Series cabinet with 21kW modules paralleled up to 189kW** in a cabinet.

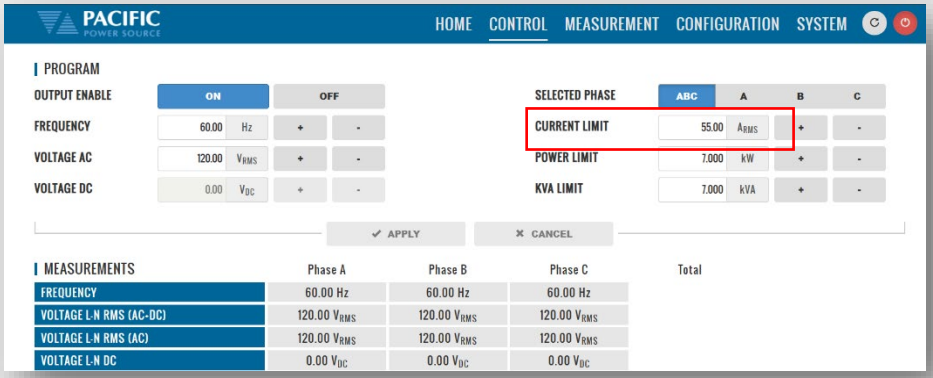


Figure 1 - AGX 189kVA/kW

USE CASE

In this scenario, we tested the motor drive with the AGX Series using **2 seconds of overload at 0.2 power factor**, increasing to 0.9 at a steady state current.

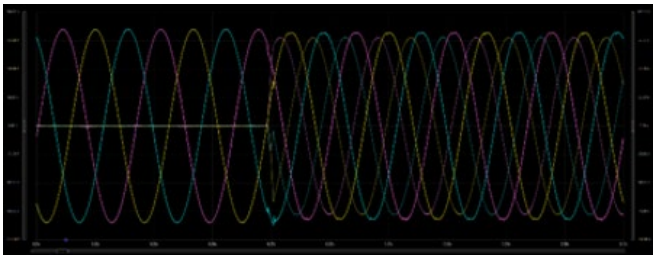
A 21kVA AGX Series was used for this demonstration which has a max current 42A per phase. With 'Current Overload' enabled, the current limit was increased to 55A.



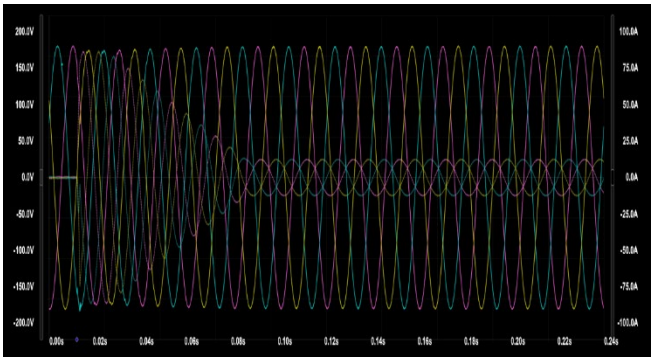
SmartSource Suite Remote Control Platform - View



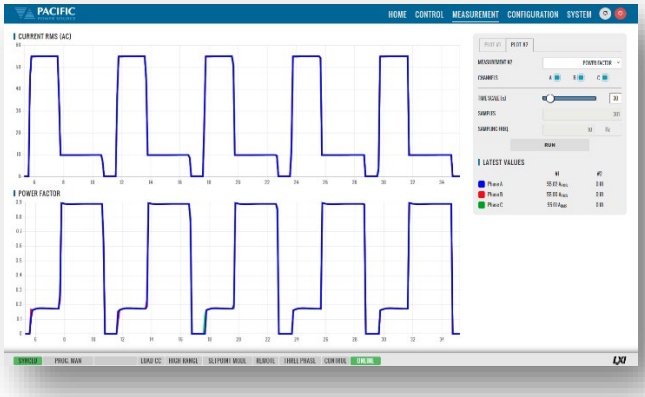
Test of motor drive running for 2s at 55A at .2 PF (inductive)



Test of motor drive running for two seconds at 55A at .2 PF (inductive) - Waveform Capture



Waveform Capture of motor set back to steady state after 2s at .9 PF.



This diagram illustrates the condition of starting, stopping, then restarting the motor repeatedly.

SUMMARY

This case study demonstrates the AGX Series overload capability to manage the inrush current of their motor without using an oversized AC power source for testing. The AGX simplifies the system design by reducing the need to oversize power supply, thereby reducing cost, space, reliability and efficiency.

Overload capability is available on the **AGX Series All-in-1 AC/DC Power Source**, and **RGS Series Regenerative Grid Simulator**. For additional information, please contact sales@pacificpower.com.