
FAQ

# Considerations When Selecting a Programmable Electronic Load

## Q1: What are programmable electronic loads and what is their primary use?

**A:** Programmable electronic loads emulate DC loads for testing and calibration purposes. Because it is impossible to provide the repeated and rapid changing of loads under test using manual methods, programmable electronic loads are incorporated to dynamically test and validate any DC power source. These include batteries, solar panels, ultra-capacitors and fuel cells, as well as DC power supplies, battery chargers, UPS systems, fuses and circuit breakers, and other power-electronics components in automotive, defense, aerospace and industrial markets. The devices are also used to demonstrate that important quality and safety features are met. They can be employed in a variety of locations including, but not limited to, laboratories and research facilities as well as maintenance, R&D and manufacturing facilities.

## Q2: What is the first thing to consider when selecting the right programmable electronic load for my application?

**A:** Think about where you'll want to use the device as well as the power rating you will need. These factors will help you decide on using either an air-cooled or water-cooled load. For example, air-cooled loads are self-contained and are more flexible as they can be moved easily from one location to another. While water-cooled loads might be smaller and less expensive for a given power rating, they need a water-cooling infrastructure to be installed. Air-cooled units are available from 800 kW to 7.5 kW of power. Water-cooled units are basically unlimited in their power rating and are often used when 6 kW to 36 kW capabilities are required. These ratings can be tailored to provide up to 250 kW of power.

## Q3: Could you speak more about the technology used and potential operation?

**A:** As expected, the technologies incorporated will vary depending on the manufacturer. One example would be AMETEK Programmable Power's Programmable Electronic Loads with RoHS 3-compliance. Their PLA (air-cooled) and PLW (water-cooled) series products employ FETs (field-effect transistors). With an air-cooled unit, the device uses about 50% of the capability of each FET. In water-cooled devices users can get up to 85% of each FETs capability. This is a 35% savings in the number of FETs needed for a given power level, which is less costly and takes up less space. Of course, this depends on the power, voltage and current ratings the application requires.

## Q4: That sounds great, but what type of plumbing would I need if I decide on a water-cooled programmable electronic load?

**A:** If you don't already have the infrastructure for a water-cooled system, you will have to consider the layout of your facility. You'll want to install a chiller and associated plumbing in a location that makes sense for your operation and chosen use. A chiller located outside your facility will require you to install the plumbing necessary to bring the water into the location of your load or loads. You should also think about your facility's growth and the possible future needs of the load, and buy a chiller that allows for that growth.

## Q5: Once I've determined whether I'm going to use an air-cooled or water-cooled programmable electronic load, what features will I need?

**A:** You'll want to consider what operating modes you'll need for your applications. Note that most programmable electronic loads offer four operating modes:

- **Constant Current Mode:** This operating mode is where the electronic load maintains a programmed constant current, regardless of input voltage. In this mode, the load will maintain a constant resistance by sinking a current linearly proportional to the input voltage. Also, if you need a load that can sink high currents at very low voltages, be sure your selected device can handle it.
- **Constant Voltage Mode:** This operating mode holds your voltage constant on its input regardless of what current is being drawn. In this mode, the load will adjust its current in response to changes in voltage in order to maintain a constant power level.
- **Constant Resistance Mode:** This operating mode holds to a constant resistance. This is done by sinking the current linearly proportional to the input voltage.
- **Constant Power Mode:** In this mode of operation, the load adjusts its current in response to a change in voltage so that a constant power level is maintained.

## Q6: What type of programming features might I need when using these electronic loads?

**A:** Every application is different, but you may wish to provide current versus time tests for a dynamically programmed stepping mode. To help test the transient recovery time of a constant voltage power supply, you might include pulse and toggle modes into your program. Another possibility includes a continuous transient mode that generates a repetitive pulse train to test a power supply's load regulation. In general, you'll want to determine the aspects of each application and be sure that the programmable electronic load you choose can supply those needs.


*The PLW water-cooled programmable electronic load.*

## Q7: With all these different types of operations, what protection circuitry would the device require?

**A:** Choose an electronic load that provides overvoltage, overcurrent, overpower, overtemperature and reverse-voltage protection as well as remote sense fault features to make sure your remote sensing leads are properly connected.

## Q8: Is there anything else I need to be concerned about when using a programmable electronic load?

**A:** Programmable electronic loads can offer fast response times, which can lead to instabilities due to the inductance of long leads between the load and the device under test. Make sure that your device offers oscillation protection with adjustable bandwidths to eliminate these instabilities or shut down once they are detected and exceed a preset threshold. Finally, recognize that FETs can be subject to cascading failures, so be sure that your electronic load provides individual FET protection.

## Q9: Are there any final needs I should consider?

**A:** You'll want to make sure the device offers software that is simple to operate as well as common interfaces that match your equipment. Also, be sure that the programmable electronic load you choose offers closed-case calibration through software rather than having to open the unit to manually adjust potentiometers.