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Q&A: 80 PLUS

adds no-load and 5% load tests

Introduction

Since its inception in 2004, the 80 PLUS initiative has played a crucial role in driving improvements in power supply efficiency and sustainability. The program initially focused on achieving 80% efficiency at three load levels, which significantly surpassed existing efficiency standards. Over the years, 80 PLUS has expanded its specifications and gained widespread industry recognition. As a result, ENERGY STAR® and the European Union (EU) Energy-related Products Directive (ErP) have adopted its standards.

The addition of no-load and 5% load tests is the latest development in the 80 PLUS program. These new tests provide a more comprehensive evaluation of power supply efficiency by addressing idle power consumption and efficiency at light loads. These advancements in testing ensure that certified power supplies meet higher standards and deliver improved energy efficiency across a broader range of usage scenarios.

Benefits of testing at lower load levels:
Testing power supplies at a 5% load offers valuable insights into efficiency at increasingly lighter loads. The results will enable manufacturers to optimize power management strategies and select suitable components for enhanced performance and durability. Measuring power consumption and efficiency at a 5% load will help manufacturers fine-tune how they can minimize wasted energy, especially since many computer systems operate at low loads during idle or rest mode periods.

Testing progress and future plans:
Testing for no-load and 5% load conditions started in May, 2023. So far, a total of 92 power supplies have already been tested. Moving forward, the plan is to continue testing all power supplies under these conditions, potentially leading to the development of new criteria for 80 PLUS certification, ENERGY STAR certification or the EU's ErP.

Considerations for consumers and manufacturers:
Consumers would be wise to prioritize energy efficiency when selecting power supplies, considering the long-term cost-effectiveness and environmental impact. Likewise, manufacturers should ensure their products meet or exceed desired efficiency levels and comply with safety standards as well as system compatibility requirements. Both consumers and manufacturers have a responsibility to stay informed about product updates or new requirements that arise from this new type of testing because the findings may influence purchasing decisions and product development.

The new addition of no-load and 5% load tests to the 80 PLUS program represents another milestone in the pursuit of more energy-efficient power supplies. These new tests provide a more comprehensive evaluation and promote increasingly environmentally friendly power supply designs. Consumers can make more informed choices and manufacturers can align their products with evolving industry expectations by embracing these new standards. The 80 PLUS initiative continues to shape the power supply market, fostering efficiency and sustainability across various categories.

The evolution of 80 PLUS
The 80 PLUS initiative debuted in 2004 with the launch of the Generalized Test Protocol for Calculating the Energy Efficiency of Internal AC-DC and DC-DC Power Supplies. Crafted by the Electric Power Research Institute (EPRI) and Ecos, this protocol aimed to standardize the approach for gauging the energy efficiency of internal power supplies. The protocol, funded by the California Energy Commission and the Public Interest Energy Research (PIER) Program, also intended to simplify the existing standards for efficiency testing which many felt were confusing and contradictory at the time. This innovative protocol specified three load levels (20%, 50%, and 100%) as clear efficiency profiles during routine operations.

In 2005, the 80 PLUS initiative marked its first significant achievement with the certification of the first market-ready 80 PLUS power supply. The aim of the program was bold yet simple—to inspire action towards achieving 80% efficiency at the three designated load levels with a power factor of 0.9 or better at 100% of rated load. This goal inspired the program's name, hence 80 PLUS. This was a transformative step forward compared to existing power supplies that operated at efficiencies as low as 60%.

The initiative expanded further in 2007 with the introduction of a server test protocol backed by a coalition of energy providers, including: Bonneville Power Administration, Pacific Gas & Electric (PG&E), Natural Resources Canada, The Energy Trust of Oregon, Northwest Energy Efficiency Alliance (NEEA), Snohomish PUD, and PacifiCorp. Their combined efforts fostered an environment dedicated to promoting energy efficiency across North America, especially in its western regions. As a result, ENERGY STAR V4.0 internal desktop power supplies adopted the 80 PLUS standard—a testament to the program's growing recognition and influence.

In 2008, 80 PLUS went a step further by launching three new specifications: Bronze, Silver and Gold. These progressive standards encouraged manufacturers to strive beyond the base 80% efficiency and pursue higher performance levels in a systematic and scalable way. Then, in 2009, it introduced the Platinum specification, designed for both desktop and server applications. ENERGY STAR V5.0 soon adopted the Bronze equivalent for desktop power supply requirements and V1.0 adopted Silver and Gold for servers, cementing the 80 PLUS specifications as the industry standards.

80 PLUS continued its trajectory of improvement in 2011, incorporating a 10% load into its testing methodology to gain a more in-depth understanding of efficiency at lower operational levels. It also introduced the Titanium criteria for server specifications, signaling another leap in energy efficiency standards.

In 2014, 80 PLUS broadened its global reach by adding the 230V EU internal non-redundant power supply certification for European-based products, tested at 230V and 50Hz. The same year saw the introduction of the 80 PLUS Titanium desktop specification, raising the bar yet again for desktop energy efficiency.

By 2015, the EU's ErP directive required desktops to meet the ENERGY STAR V8.0 standard and servers to align with ENERGY STAR V3.0, reinforcing the influence of the 80 PLUS program and its specifications. Next, 80 PLUS introduced the 380V DC-DC internal redundant power supply specification in 2021, broadening its portfolio of energy-efficient power supply standards.

The momentum continued in 2022 with the relaunch of the Industrial Power Supply Unit (PSU) Workshop which was hosted at the Electric Power Research Institute (EPRI). This event served as a pivotal platform for industry professionals, offering a wealth of insights and updates on the latest trends and technologies in power supply efficiency. During that same year, 80 PLUS specifications were adopted to shape the conformance of the ENERGY STAR V4.0 Server. By April 2023, the finalized ENERGY STAR V4.0 rolled out its four-tiered efficiency standards for 115V and 230V power supplies for servers, setting specific criteria based on whether the units are above or below 750W. For multi-rail 115V non-redundant power supplies, those with a capacity of less than 750W were expected to meet the 115V Internal 80 PLUS Gold efficiency requirements. Meanwhile, those with a capacity exceeding 750W had to achieve the more rigorous 115V Internal 80 PLUS Platinum efficiency level. What's more, single output 230V redundant power supplies with less than 750W capacity were required to achieve the 80 PLUS Gold 230V Internal certification as well as a 10% load condition of 65%. And finally, those with a capacity over 750W had to achieve the more rigorous 230V Internal 80 PLUS Platinum efficiency level as well as a 10% load condition of 80%.

As of May 2023, the 80 PLUS standards further encompass no-load and 5% load, improving the efficiency spectrum for idle, standby, and rest mode periods. These improvements exemplify the continuous evolution of the 80 PLUS initiative, a beacon for energy efficiency in power supplies.

Today, 80 PLUS has not just fulfilled its mission but exceeded expectations by fostering higher efficiency standards that reach up to an impressive 96% efficiency. Over the years, it has become a globally recognized brand, transforming the power supply market by endorsing efficiency and sustainability. The program's achievements are significant with thousands of certified models across various categories.

What levels did 80 PLUS previously test at? Why the addition now of no-load and 5%?
In the past, the 80 PLUS certification programs focused on testing power supplies at various load levels to determine their efficiency. The certification levels have been based on four load conditions (10, 20%, 50%, and 100%) of the power supply's maximum rated output since 2011. These load levels were chosen to represent typical usage scenarios for desktop computers and servers.

The need to address additional aspects of power supply efficiency emerged as technology and consumer demands evolved. The addition of no-load and 5% load tests to the 80 PLUS certification process is a response to these market changes. Both no-load and 5% load tests of a power supply are beneficial and essential for evaluating the efficiency of the power supply and identifying potential energy waste.

The no-load test provides insight into the power supply's power consumption when regulating its voltage rails without any load going to the components. This test identifies potential inefficiencies and promotes energy-efficient power supply designs.

The addition of these tests provides a more comprehensive evaluation of a power supply's efficiency, addressing both idle power consumption and efficiency at light loads. This expansion of the certification criteria ensures that power supplies certified under the 80 PLUS program meet higher standards and deliver improved energy efficiency across a broader range of usage scenarios. Ultimately, this benefits consumers by reducing energy waste and promoting the use of more environmentally friendly power supply solutions.

What are the benefits of testing at these lower load levels?
The introduction of 5% load and no-load points will provide a more comprehensive view of efficiency during different operational modes, such as idle, standby or rest periods. These differ from the conventional operation tests conducted at 10%, 20%, 50%, and 100% load levels. So, what advantages do these lower load level tests offer?

Testing at a 5% load level measures the power supply's efficiency under extremely light loads. Generally, power supplies tend to be less efficient at lower loads. Therefore, conducting a test at a 5% load offers insight into the lowest efficiency level one might expect under such conditions. This kind of evaluation can be used to create energy regulatory standards, enhance power management as well as inform the appropriate components to maximize performance and durability.

Measuring power consumption and efficiency at a 5% load provides valuable data on power usage, especially when it comes to computer systems since many operate at low loads,

especially during idle, standby or rest mode periods. The importance of no-load and 5% load tests cannot be overstated. They're vital for assessing power supply efficiency, advocating for energy-efficient power supply designs, adhering to energy regulations, enhancing power management, and selecting the right components to achieve optimum performance and longevity.

How many power supplies have been tested at the new level? And what's the plan going forward?

Testing of power supplies at the lower load levels began in May 2023. As of August 2023, a total of 92 power supplies have been tested under no-load and 5% load conditions. The breakdown of these power supplies is as follows: 49 are 115V Internal Non-Redundant, 32 are 230V Internal Redundant, and 11 are 230V EU Internal Non-Redundant. Moving forward, the plan is to continue testing all power supplies under the no-load and 5% load conditions. This new data may lead to the development of new criteria for the 80 PLUS certification or ENERGY STAR.

Anything else consumers or power supply manufacturers should be aware of when it comes to this new testing?

There are a few more aspects that consumers and power supply manufacturers should be aware of in addition to the information provided about the new testing for power supplies,:

1. Energy Efficiency: The new testing aims to assess the power consumption at no-load and energy efficiency of power supplies at 5% load conditions. It is important to note that currently, there is no specific 80 PLUS criteria for no-load or 5% load efficiency at the moment. However, it is still crucial to consider the efficiency of power supplies at these load conditions. Even though the certification may not cover these specific levels, evaluating efficiency in real-world usage scenarios, such as idle or light loads, can provide insights into energy savings and performance.
2. Cost-effectiveness: With the focus on energy efficiency, consumers should consider the long-term cost-effectiveness of power supplies. While more efficient models may have a higher upfront cost, they can save significant amounts of energy and reduce electricity bills over time.
3. Size Fitting: Matching the wattage capacity of your power supply to the power requirements of your PC is essential. Aim for a target point of around 50% load, as this is where most power supplies operate at peak efficiency. It is crucial to avoid choosing a power supply with excessive wattage, as this can lead to inefficiencies. Selecting the right wattage capacity ensures optimal performance and efficiency for your specific PC.
4. 80 PLUS Certification: The new data obtained from the testing may lead to the development of updated criteria for the 80 PLUS certification. Both consumers and manufacturers should stay informed about any changes or new requirements that may arise from this testing to ensure compliance and make informed purchasing decisions.

Being aware of these additional factors helps consumers make informed choices when purchasing power supplies, and helps manufacturers align their products with the evolving standards and expectations.