Agile Magnetics

MAGNETICS IN POWER SUPPLIES FAQ:

Frequently Asked Questions Regarding Magnetics in Power Supplies

Power supplies — also referred to as electric power converters — receive electrical energy from outside sources such as electricity grids, generators, or batteries and then transfer it to an electrical load. (Power supplies do not store energy, only receive it.) Power Supply Units (PSUs) only conduct current in one direction.

The main function of PSUs, as with a simple transformer, is to change voltage levels from the available voltage source, so the voltage required by the circuit. While different power supplies have distinct features for different applications, they all share the same basic construction: an input transformer to change voltage, a rectifier to convert AC to DC voltage, a capacitor to smooth the signal, and a regulator to provide consistent output voltage.

We've put together this FAQ to address common inquiries we receive from customers about power supply capabilities — everything from isolation and cooling to shielding and load compatibility. Below, we'll delve into magnetics and power supply 101.

Power Shielding and Isolation

What level of isolation can be achieved between the windings?

Isolation Power Transformers are designed specifically to isolate primary windings from secondary windings in order to meet safety standards. Using special isolation materials such as tape, plastic, or insulated wires, these transformers can typically achieve dielectric isolations between 2500VAC (volts of alternating current) and 4000VAC. For higher isolation requirements, users should look into custom design options.

What can we achieve from isolation?

Used in a wide range of applications and industries, Isolation Power Transformers primarily serve to protect both equipment and users from dangerous electric shocks. These transformers isolate the end user circuit from the primary circuit by magnetically coupling and isolating input and output voltages in the dually wound core without any direct wire connection.

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Can Agile Magnetics meet specific voltage isolation?

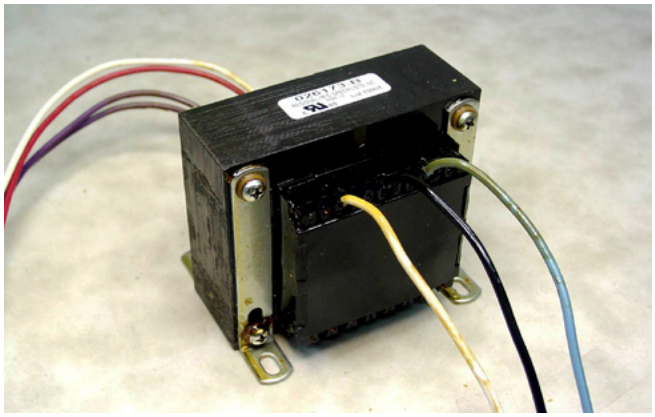
Isolation Power Transformers from Agile Magnetics serve as integral components in applications requiring isolation between two AC circuits without any voltage transformation or current reduction. In these types of applications, Isolation Power Transformers use voltage ratios of 1:1.

To prevent signal interference in applications with higher voltage levels, we also offer High Voltage Isolation Transformers to direct electricity between independent circuits without the use of direct wire connections. And for applications that pass varying levels of voltage, we've designed Flexible Buck-Boost transformers to decrease ("buck") or increase ("boost") line voltage as needed to meet these unique power requirements.

Power Supply and Circuit Cooling

How hot will the power supply get?

No matter the power level of an application, the smaller the power supply, the hotter it will get; smaller power supplies provide less area and thermal mass in which heat can dissipate through conduction and convection. A design with a smaller core and smaller wire for any give power level will result in higher core losses, and high losses in the copper wire which result in more heat being dissipated in the transformer. It's not uncommon for a transformer to run in excess of 100 degree Celsius.



For what temperatures are the transformers rated? How hot can they operate?

Temperature ratings for transformers are based on the ratings of the materials and are broken up into UL insulation system ratings of 155C, 180C, 200C, or 220C.

When transformers heat up, they undergo what is referred to as "transformer thermal loading," a state that may or may not be harmful depending on the intended utility and overall rise in heat. Environmental factors — such as being contained in a box versus out in the open, or enduring a scorching summer — can influence the operating temperature of the transformer.

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Spatial and Physical Limitations

What determines how small the transformer can be?

Transformer size is based on power rating and frequency. For any given frequency, higher power levels call for larger transformers and, for any given power level, higher frequencies call for smaller transformers.

Transformer size corresponds with the kVA [Kilo (Volt x Amps)] rating; for safe operation, the transformer kVA should be greater than or equal to the load kVA. To determine kVA, use the following formulas.

For single-phase transformers:

$$kVA = \frac{V \times A}{1000}$$

For three-phase transformers:

$$kVA = \frac{V \times A \times 1.732}{1000}$$

Connectivity

What options are available for making electrical connections to my circuit?

If the transformer is small enough, connections can be made via PC pins, flying leads with connectors, or terminal blocks.

Reliability, Repeatability, and Responsiveness with Agile Magnetics

We hope you've found this power supply and magnetics FAQ helpful and informative. Still have lingering questions about power supplies and transformers? Visit our blog for more information on magnetics and their applications across a variety of industries.

As a global leader in custom OEM magnetics, Agile is both ISO 9001:2008 and AS9100 certified and maintains a UL E160724 insulation listing. Our units can be built to CE, cUL, UL, and VDE standards, with UL and cUL markings available upon request.

For more information about our product offerings, contact us today and a team member will be in touch shortly.

To learn more about Agile Magnetics' capabilities, download our eBook,

A Guide to High Frequency Transformers

Contact Us to Learn More

At Agile Magnetics, we offer complete custom design and manufacturing services for high frequency transformers, specifically specializing in applications requiring limited space and noise reduction. Working with the most advanced materials, our engineers can design a transformer to meet all of the requirements of your specific application. To learn more about our capabilities or to get a quote, please contact us today.

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