



# SIRIO PLANAR

## A NEW SERIES OF LOW-PROFILE POWER TRANSFORMERS

### BACKGROUND

High-frequency power conversion is aiming for ever-higher power density, typically by increasing the operating frequency. To follow the trend, the development of inductive components must focus on two key aspects: minimizing power losses and finding a suitable solution to dissipate the heat generated.

### SIRIO'S APPROACH

Electromagnetic simulations are primarily useful to estimate power losses and also essential for optimizing the transformer design. Sirio has been using FEM simulation software for decades, with the aim of defining the most efficient transformer, for a given operating point.

The cooling solution typically has to be carefully studied in cooperation with the customer, since every application has its own peculiarities. Sirio has recently established a dedicated power electronics laboratory, equipped with state-of-the-art instrumentation, targeting to measure electrical and thermal performance of transformers, with a particular focus on power losses.

### ANOTHER BRICK IN OUR PORTFOLIO

After months of research, laboratory testing and engineering we are ready to launch our new series of low-profile power transformers. While our existing power transformers series remains fully available and supported, this line offers new options for specific applications requiring compactness, efficient cooling, and higher operating frequencies.

### BENEFITS



Complements our existing power transformer family



Reduced component's height, ideal where vertical space is critical



Designed for higher switching frequency (typically >100 kHz)



Suitable for applications with limited ventilation



Efficient conduction cooling via heatsink



Flat core design improves cooling, enabling higher flux density



Sirio reliability and quality



Robust design, fully engineered for harsh industrial environments



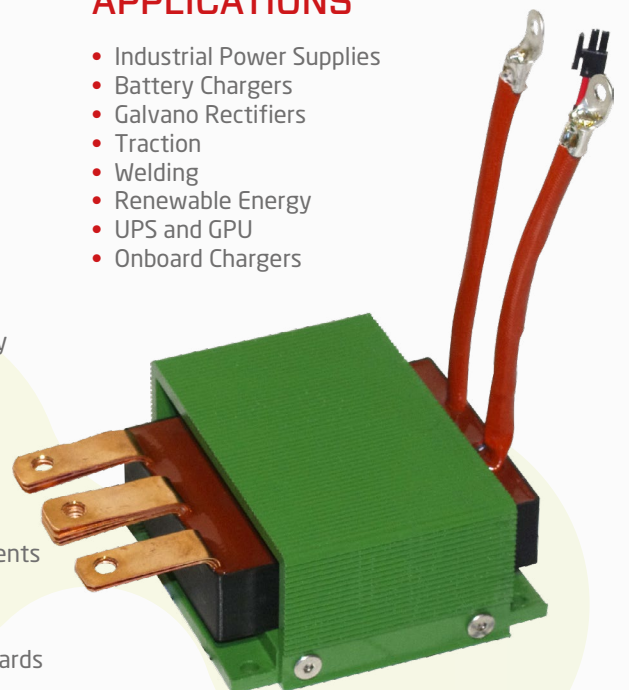
Enhanced insulation features exceeding current market standards

### KEY FEATURES

- Power range from 5 to 25 kW
- Working frequencies above 50 kHz
- Operating voltage up to 1500 V
- Insulation voltage from 4 kVrms
- REACH and RoHS compliant
- UL certification pending

### APPLICATIONS

- Industrial Power Supplies
- Battery Chargers
- Galvano Rectifiers
- Traction
- Welding
- Renewable Energy
- UPS and GPU
- Onboard Chargers



# SIRIO POWER ELECTRONICS LABORATORY

## Finding a solution to measure power losses of hf inductive components.

Electromagnetic simulations are for sure an extremely powerful tool: during the development stage, magnetic designers can utilize the theoretical results provided by the simulator to support the most important choices of the design, such as the magnetic core and the winding type, size and arrangement.

The definition of the model is one of the most crucial aspects. The model has to be reasonably simple to allow fast computation and, at the same time, sufficiently accurate to offer reliable information.

Then, clearly, any result requires a careful interpretation.

In parallel with the theoretical analysis, a comparison with reality is needed: a specific validation process has to be implemented by laboratory tests.

Our customers, in this regard, have been truly invaluable, confirming the correctness of the simulation results through electrical and thermal measurements in real applications, during the approval process of our transformers used in their machines.

Due to the fast rising edges of current and voltage signals in high-frequency power converters, the measurement transformer's power losses is not feasible using power meters.

Although power meters can process high-frequency signals and properly calculate power losses, the current and voltage probes are not capable to perform such an accurate measurement, which needs to be very precise in terms of both amplitude (as power is given by the product of voltage and current amplitudes) and time (as the current vs voltage phase shift determines the instant at which the signal amplitude is measured).



Therefore a different approach was chosen.

Taking into consideration the physical principles related to heat, we ascertained that it is possible to measure transformer losses, while it is operating in a high-frequency circuit, by using a calorimeter.

The transformer is placed in the calorimeter chamber, that is thermally isolated from the environment. Dedicate cables connect the transformer primary winding to a full bridge high-frequency power converter and the secondary winding to a rectifier of a dedicated DC/DC converter. Input and output voltage and current values are measured during the test.

At the present moment we can test high frequency transformers up to 15 kW, while we are adding instruments to our laboratory to test transformers up to 30 kW.

Air is stored at a fixed temperature in a preconditioned antechamber. The calorimeter chamber's inlet port draws air from the antechamber, and a flowmeter draws it through the outlet port on the opposite side.

Knowing the inlet temperature, outlet temperature, and air flow rate, it is possible to calculate the total losses of the device under test, i.e. the transformer itself, including all the cables required for connection to the high-frequency converter.

Depending on the purpose, Sirio can utilize different solutions for ventilating the transformer positioned in the calorimeter chamber, taking into account specific thermal considerations.

In addition to supporting the validation of our simulations, the calorimeter has allowed us to seamlessly launch the development of the new series of low-profile transformers and to optimize and improve the design step by step.



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