COMPACT CORE

SGB-USA
Your dedicated partner
of the SGB-SMIT Group

Reshaping the Dry Transformer

Innovative Triangular Construction

SGB-USA revolutionizes the dry type transformer technology with the Compact Core VPI transformer. For many years, a standard transformer layout has been constructed in a planar view by having three coils together in a straight row. This conventional, yet effective method has always resulted in some deficiencies of the transformers performance. A triangular core construction provides a symmetrical pattern and also has a lack of joints between core laminations that create a dramatic effect on the characteristics of the transformer. This construction methodology provides savings in areas such as footprint, reduction in sound levels, weight, harmonic content, stray magnetic fields, improved efficiency levels, and life expectancy extension.

With power ratings up to 3000KVA and primary voltage class up to 27kV, SGB-USA can provide this unique solution for many markets such as utility, industrial and commercial applications and can be utilized in substations, factories, mines, windmills, large public buildings like high rise buildings, hospitals, shopping malls, and datacenters.

Compact = Smaller & Lighter

For more demanding environments where space can be a premium, the Compact Core features a reduced length. This allows the transformer to be placed in a wider variety of locations with length restrictions. Most commonly it is the length restriction which influences transformer installation, whereas width or depth is not a restricting parameter. Smaller Footprint will have a variance of approximately 15% to 35%, depending of design parameters and construction. This Compact Core transformer design will provide weight reduction by an average of 20 %. This can be a decisive factor for indoor installations due to the limitations often imposed by the load-bearing capacity of the floors and elevators.

Sound Level Reduction

Due to the reduced core mass and lack of joints, the sound level of the transformer is reduced by approximately 5 – 10dB when comparing against a traditional stacked core

Stray Magnetic Fields

In some installations, stray magnetic fields are highly critical as they can impair the functioning of sensitive equipment within the surrounding area (such examples = research facilities or data centers). The symmetrical structure of the Compact Core causes the stray fields of the individual phases to cancel each other out automatically to a degree. The reduced EMC relevant magnetic stray fields decay faster than the required clearance distance which can benefit the installation within these sensitive areas

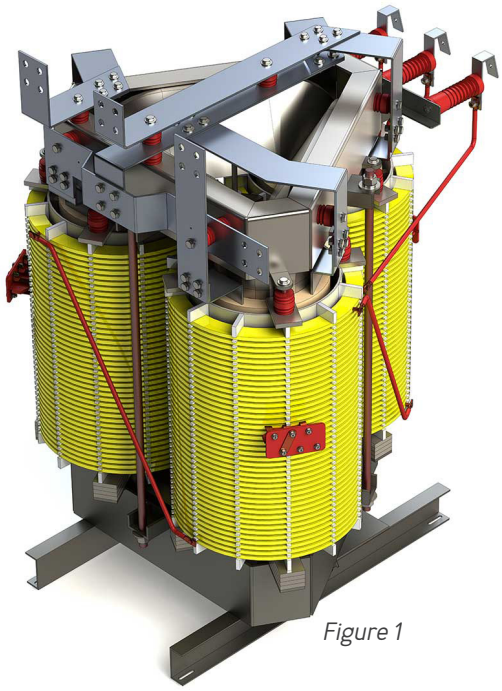

Figure 1

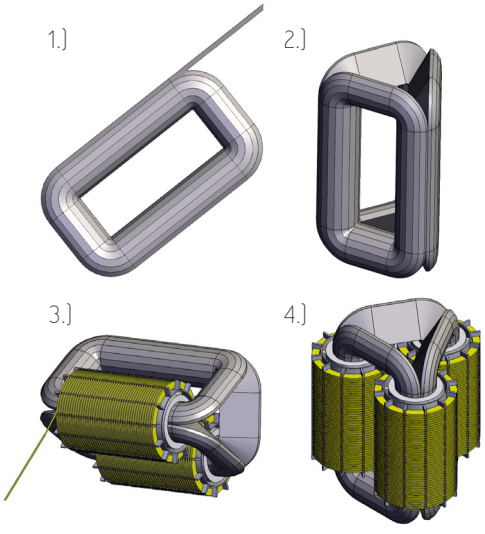

Figure 2

Manufacturing Process

1. Coil winding process (Wound Core Leg)
2. Assembly of 3 legs to form a triangular core
3. Coil windings directly on the core legs
4. Complete assembly into the varnish tank

Example Comparison of a 2500KVA Compact Core vs Conventional Core

Study based on 2500 KVA, 95 BIL, 13.8KV Delta / 480 Y with Aluminum Windings, and 150 degree temperature rise.

3 Phase Symmetry

The Magnetic Circuit is symmetrical within the Compact Core and this advantage provides shorter distances between phases. Likewise, the shorter core limbs can be compared with conventional stacked core (as depicted in Figure 3). The compact core consists of three main core pieces whereas the conventional stacked core consists of five. When comparing the conventional stacked core's magnetic circuit is asymmetrical. Limbs A-C is double compared to limbs A-B.

Energy-Efficient Advantages

Reduced No-Load Loss

- The annealing process of the core after manufacturing removes stress from the steel and helps to reduce Standard Core Losses by an additional 5%.
- No gaps in core magnetic circuit
- The magnetic flux directions are entirely consistent with comparison against silicon steel
- No burrs and seams during process of cutting the core laminations
- No manufacturing variations for gaps in yoke installations.

Performance Advantages

- Low Noise Level
  a. Reduction of (20-29) % noise level Vs IEEE Std C57.12.01 (68 Db)
     i. (tested Compact Core = 45.7 Db@ 2500 KVA, self-cooled)
- Very small leakage flux as compared to conventional stacked core
- Unique core structure assists in both size and weight
  a. Smaller overall footprint when comparing typical enclosure size against conventional stacked core. (As shown in Figure 4), an increase of 5% in the depth, but a reduction in 25% of length equates to an overall footprint savings of 20%
  b. Weight is reduced by 25 % with the reduction in core size and approximately 15% reduction in conductor using the same M4 Core materials compared with stacked core designs.

Safe and Reliable

- Strong Short Circuit Withstand Capability (Category II, per IEEE C57.12.01)
- Improved inrush current characteristics which can improve networked transformers relying on sensitive monitoring equipment (as depicted in Figure 5).
- Improved harmonic behavior, 3rd, 5th and 7th harmonics are reduced 7, 4.5 and 3.5 times as compared with conventional stacked core transformer (as depicted in Figure 6).
- Utilization of the proven and wide adopted VPI Technology in the industry. All coil materials and insulation techniques are utilized in the construction of the compact core
- The evenly distributed coils due to the construction of the compact core will allow equal heat distribution from the windings. Therefore, B phase will no longer run at a higher temperature and therefore may extend life of the transformer

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Figure 3

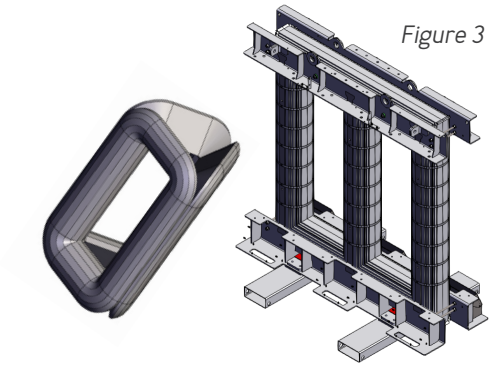


Figure 4

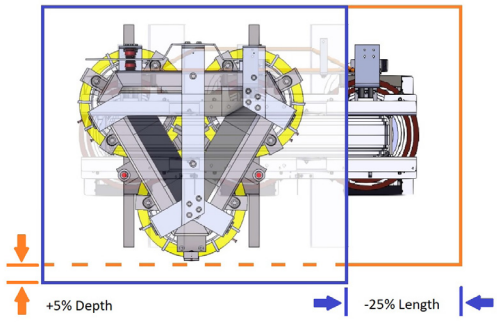


Figure 5

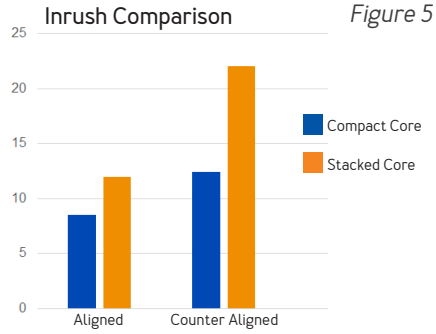
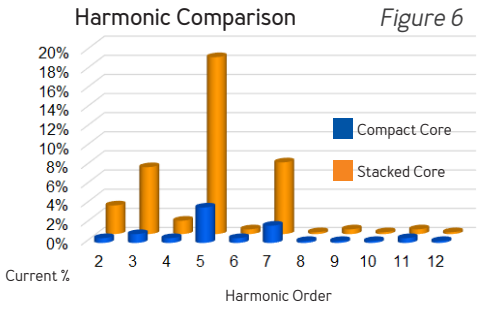


Figure 6



330-472-1187 | Tallmadge, Ohio
Email sgb@sgb-usa.com | www.sgbusa.com