HSS® vs. Other Solutions

This section compares K-Rated and Zig-Zag transformers to Harmonics Limited's **TransMax**® product, a premium transformer integrated with patented **Harmonic Suppression System** technology (**HSS**). While other types of traditional transformers are in common use, none are technologically equivalent to either of Harmonic Limited's product offerings: the **TransMax** for new installations and the **SysteMax**® which retrofits onto existing overloaded or overheating transformers to prevent the 3rd harmonic current from ever forming. In fact, both the K-Rated and Zig-Zag transformers merely accommodate the harmonic currents in electrical systems. They do not recapture wasted capacity nor yield energy cost savings nor reduce carbon output, as does Harmonics Limited's HSS technology.

Harmonics Limited's patented Harmonic Suppression System (HSS®) is the only technology available on the market today which truly eliminates third harmonic currents from occurring in power distribution systems.

The **TransMax** transformer is a TP1 rated, high impedance (4 - 7%), copper wound, low, 115°C rise unit with electrostatic shielding. Its integrated HSS works in conjunction with the transformer to prevent the flow of 3rd harmonic currents in the electrical distribution system in the phases and the system neutral. The system works to full capacity with a single neutral and does not require over-sizing in order to accommodate the excess heat generated by the 3rd harmonic. Harmonics Limited's **TransMax** product uniquely frees up wasted capacity, saves energy and reduces carbon emissions by eliminating the generation and flow of 3rd harmonic currents in the distribution system. No other competing transformer on the market today can legitimately make this claim.

K- Rated transformers are typically premium, high efficiency transformers but they do not mitigate harmonic currents in any way. By nature of their design, their impedance is typically lower than standard transformers like those used in the **TransMax**. Lower impedance results in slightly higher harmonic currents throughout the system. This causes higher harmonic heat losses, decreased useable capacity, increased neutral-to-ground voltage and increased energy usage. K–Rated transformers do not mitigate or eliminate third harmonic currents and do not save the energy wasted by these currents. They are simply designed not to fail when subjected to harmonic overheating from the heat produced by these extra currents. Do not be misled by the false claims of so called "harmonic mitigating" transformers.

Zig-Zag designs, also known as phase shift transformers, are high efficiency as well. They are sometimes referred to as "harmonic mitigating" because they have a low secondary impedance to zero sequence harmonic currents. These types of transformers operate by canceling the 3rd harmonic currents in the transformer secondary winding. This prevents the harmonic currents from circulating in the delta primary winding, but has no effect on the phase and neutral currents flowing in the electrical system on the load side of the transformer. The 3rd harmonic currents flow in every phase and neutral

wire, every circuit breaker and to every outlet in the system. The harmonic currents are mitigated only within the transformer itself. Therefore double neutrals are required for this system as they are with the K-Rated transformer. Zig-Zag transformers do not eliminate or even mitigate 3rd harmonic currents and thus do not save the energy wasted by the 3rd harmonic currents.

Contact us at CustomerService@HarmonicsLimited.com or 800-892-3755 to schedule a demonstration comparing the technical aspects of these different types of transformers.