



## **Unisin 3100 Broad Band Harmonic Filter Impacts of VFD and UPS**

**Application Note      May 2003      AN402.1**

### **Background**

VFD (Variable Frequency Drives) or VSD (Variable Speed Drives) and UPS (Uninterrupted Power Supplies) have been widely utilized in industry to achieve greater reliability and control. Unfortunately, they produce harmonics.

The adverse effects of harmonics have been well studied and documented for many years. IEEE Standard 519 has a section entitled "Effects of Harmonics" which describes the impact of harmonics on electrical and electronic equipment. Adverse effects of harmonics include, but are not limited to: heating; interference; derating of major equipment such as motors, generators, transformers, etc.; malfunction of a variety of electrical and electronic components, including digital circuits and microprocessors.

Furthermore, excessive flow of harmonic currents into the utility grid is not permitted and can result in penalties. Thus elimination of harmonics is desirable and sometimes necessary.

### **Application**

Generally speaking for VFD and UPS, the harmonics generated depend on the type of rectifier used to convert AC to DC. For 3 phase units the harmonic of highest magnitude is the 5<sup>th</sup> harmonic, which is typically about 20% and may be up to 80% of rated power frequency current. For single-phase type UPS the 3<sup>rd</sup> harmonic is the highest magnitude and may be up to 90% of rated power frequency current.

Our unique Broad Band Harmonic filter, the Unisin 3100, can be designed based on user's requirement to reduce THD (Total Harmonic Distortion) as desired. The Unisin 3100 contains an L-C type filter that can filter out over 95% of the highest magnitude harmonic (either 5<sup>th</sup> or 3<sup>rd</sup>) and can also filter out at least 65% of the other harmonics. It includes a series reactor to prevent the flow of harmonics towards upstream (the source end) and also prevent the flow towards the filter of harmonics from upstream and other branches that could overload and subsequently burnout the filter.

The unique features of the Unisin 3100 are:

1. Designed to meet the User's Requirements for even Severe Harmonics (80% or more)
2. Guaranteed Limits for THD and each Harmonic per IEEE 519 or User Specification
3. Constant THD reduction from no load to full load
4. Very reliable for long life (passive design)
5. Valid for 3 phase or single phase applications at any voltage level: 120V to 13.8kV
6. No adverse impacts on electrical systems such as system resonance.

The Unisin 3100 can also be applied to other types of harmonic generating devices or equipment such as: furnaces, medical equipment, military radar, gaming machines, computing equipment, fluorescent lighting, etc.

### **Conclusion**

The Unisin 3100 Broad Band Harmonic Filter can mitigate the harmonics from VFD and UPS and from a wide variety of other sources.

### **Power Quality Consultation**

Please feel free to contact us for free consultation.