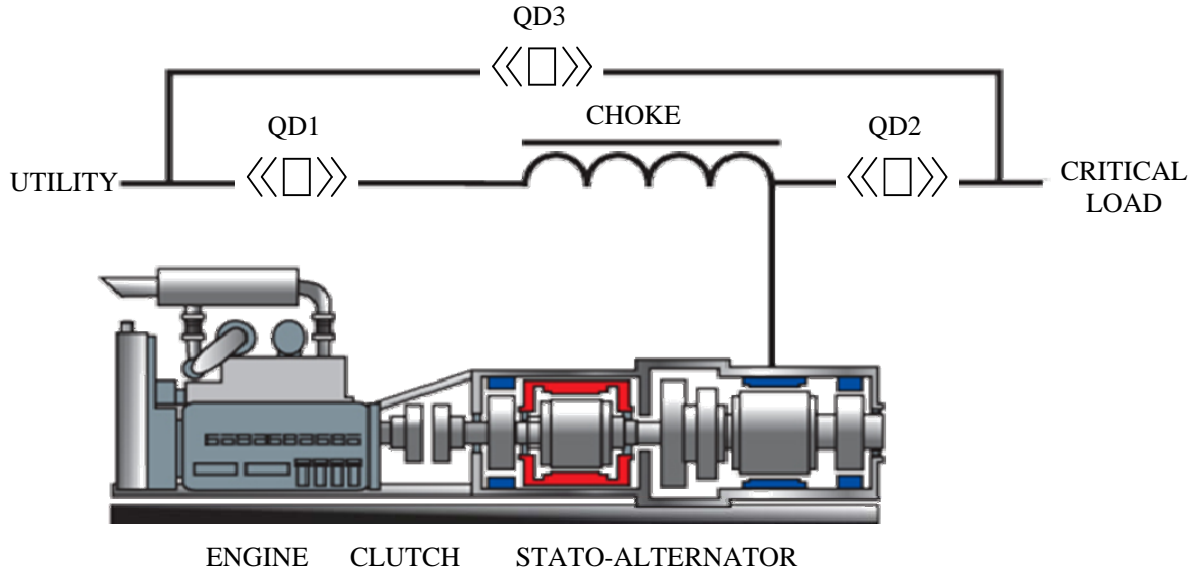




NO-BREAK E1

Harmonics Filtering



The figure above shows the standard topology of a No-Break E1 system.

**GENERAL DESCRIPTION**

The impedance of the choke is about 30%, whereas the Stato-Alternator is characterized by its sub-transient reactance of approximately 5% and its zero-sequence reactance approximately 2%.

During Conditioning Mode with Utility Available the combined efforts of the Choke Impedance and the Stato-Alternator Reactance of the No Break E1 effortlessly provides significant Voltage Harmonics Attenuation from the Utility, and protects against Current Harmonics of Non Linear Loads from being sent back to the Utility Grid.

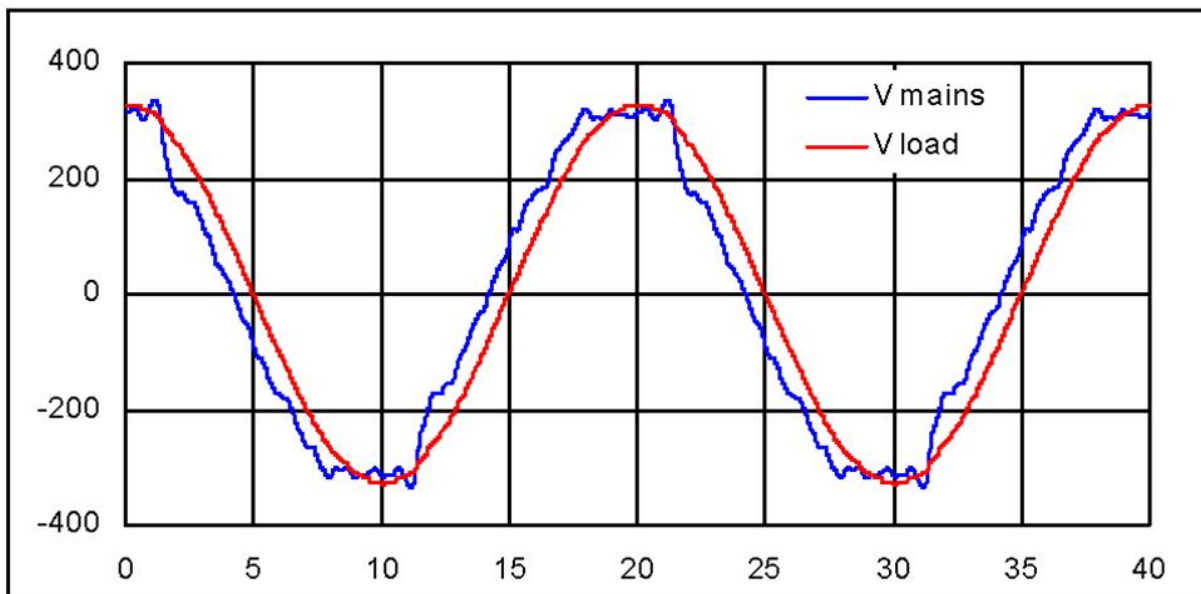
This filtering also reduces the amount of reactive power required by the utility, reduces any consequential harmonic related issues (transformers overheating, parasitic resonance, noise in cable trays, etc...) and can prevent customers from paying high penalties to the local utilities for excessive harmonic rejection.

**The Net Result is such that the output, and even the input, of the No Break E1 are of higher quality than that provided by the direct utility.**

### A. Filtering Voltage Harmonics Present in the Utility

By using the No-Break E1 system, the critical load is supplied with a constant amplitude and virtually perfect voltage. Voltage Harmonics present on Utility are reduced by the inherent effects of the “inductive series divider” made up of the choke impedance and of the Stator-Alternator sub-transient reactance. These voltage harmonics, and all sub order harmonics are reduced by a factor of 7.

The following example was recorded on a customer site exposed to significant voltage harmonics resulting from large non-linear loads present upstream of the installation. The Blue Curve is Utility Voltage, measured between phase and neutral, upstream of the No-Break E1 system. The Red Curve shows the voltage measured at the load terminals downstream of the No-Break E1 system.

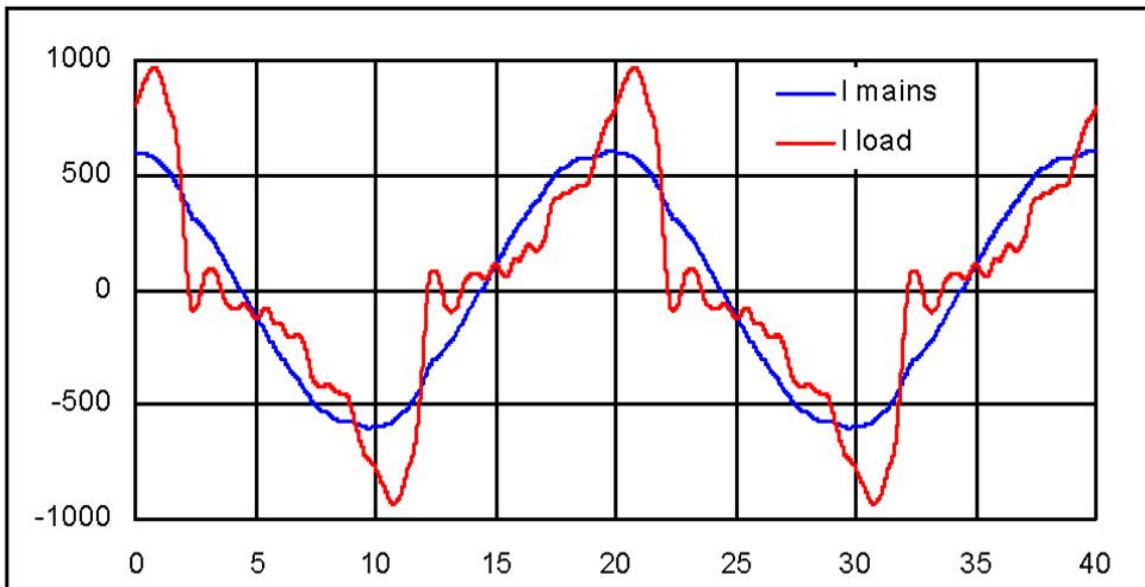


This improvement in the voltage provides enhanced operation of the load as well as an increased equipment lifespan. No load should be without the benefits of the E1 Filtering Capabilities.

## B. Filtering Load Current Harmonics

The No-Break E1 system virtually eliminates any current harmonics generated by the load from being returned to the Utility Grid. Current Harmonics created at the loads are reduced by the cleverly designed “inductive shunt divider” made up of the choke impedance and of the Stato-Alternator sub-transient reactance. These current harmonics, and all sub order harmonics are also reduced by a factor of 7.

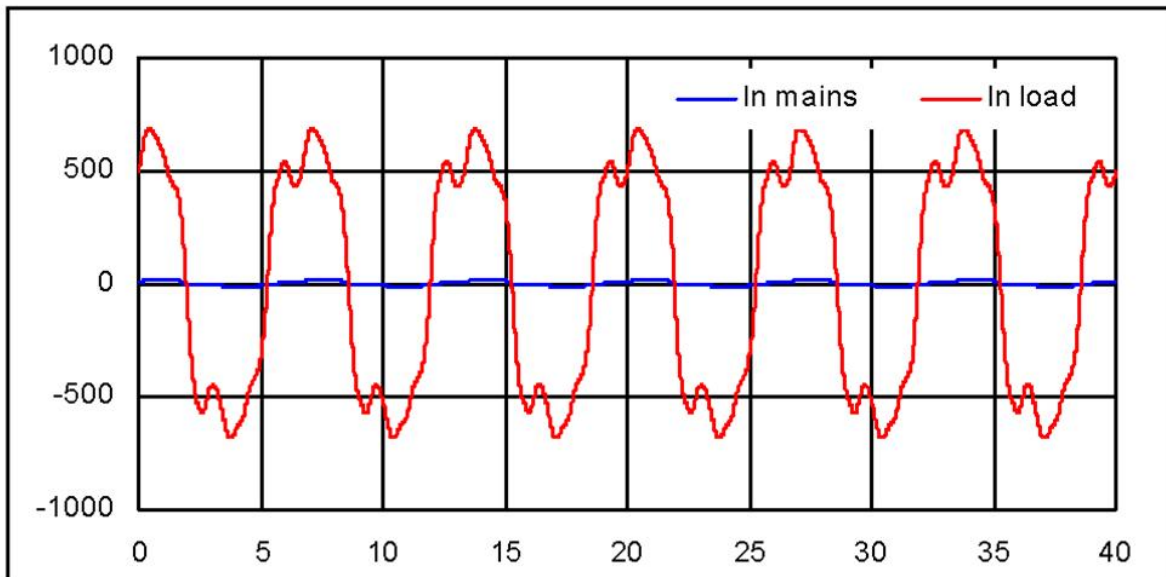
The following example was recorded on a customer site where the load current is highly distorted (see red curve). The blue curve shows the current measured upstream of the No-Break E1 system: this is the current supplied by Utility. It clearly is very much improved and again almost perfectly sinusoidal.



### C. Filtering Zero-Sequence Current (load neutral current)

The No-Break E1 system also significantly reduces the zero-sequence current generated by the load which is normally rejected to Utility. The “inductive shunt divider” made up of the choke impedance and the Stator-Alternator zero-sequence reactance is responsible for this beneficial attenuation. The Zero-Sequence current reduction to the Utility is a factor of 15.

The following example concerns the same site as in Section B. The Red Curve shows the neutral (zero-sequence) current measured downstream on the load. The Blue Curve shows the neutral (zero-sequence) current measured upstream of the No-Break E1 system.



Thanks to the No-Break E1 system, the neutral current supplied by the mains is considerably lower than the one flowing to the load. Therefore, Joule losses are reduced and smaller neutral cables can be used.

#### ADDITIONAL BENEFITS OF THE NO BREAK E1:

- Regulation of Output Voltage +/-1% w/ input voltages of ±10% - See E1 Voltage Control
- Power Factor Correction and Leading Power Factor Capabilities - See E1 PF Correction
- The Ability to Provide Short Circuit Current Clearing - See E1 Short Circuits
- The High Reliability of the System and Redundancy - See E1 Reliability
- Simplicity of Preventive Maintenance - See E1 Preventive Maintenance