

# Motor Protection

## V1K dv/dt Output Filter

The benefits of installing a Pulse Width Modulated (PWM) Drive, including increased energy savings and decreased maintenance, may make it seem like the perfect solution. But, these benefits can be offset by increases in motor failures.

Voltage wave reflection is a function of the voltage rise time (dv/dt) and the length of the motor cables.

The impedance on either end of the cable run does not match, causing voltage pulses to be reflected back in the direction from which it arrived. As these reflected waves encounter other waves, their values add, causing higher peak voltage.

As wire length or carrier frequency increases, the overshoot peak voltage also increases.

Peak voltages on a 480V system can reach 1,600V and 2,100V on a 600V system. These high peak voltages can cause a rapid breakdown of motor insulation, leading to motor failure.

### Typical Applications

- Oil and Gas Pumps
- Irrigation Field, Farms
- Wastewater Treatment Plants
- HVAC
- Pulp, Paper

### Superior Design, Proven Results

By combining a patented dampening circuit with a low pass filter, V1K filters increase the voltage rise time (dt out of dv/dt) thereby preventing voltage spikes from exceeding 1,000V, and protecting motor and cable insulation.

With thousands of successful applications worldwide, the V1K is a proven reliable solution with its industry leading performance and benefits:

- **Extend the life** of your motor & cable by reduction of harmful voltage spikes due to dv/dt.
- **Protect cable runs** and reduce motor heating, noise and vibration.
- **Prevent motor failure** with protection against motor insulation breakdown.
- **Reduce Common Mode** by a minimum of 30%.
- **Improve system productivity** and increase bearing life and up-time.
- **Protect long lead lengths** up to 3,000 feet (depending on cable and VFD size).



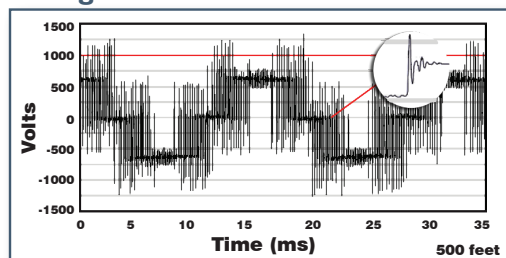
**Reliable**  **Advanced Power Quality**

Courtesy of Steven Engineering, Inc. - (800) 258-9200 - [sales@steveneng.com](mailto:sales@steveneng.com) - [www.stevenengineering.com](http://www.stevenengineering.com)

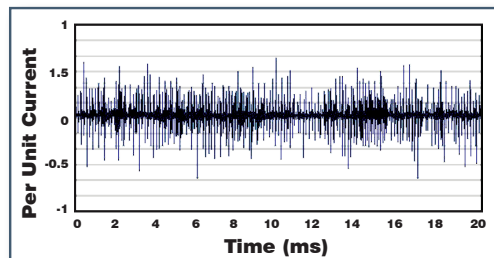
# Technical Specifications

Technical Characteristics	
Ratings	2 - 750 amps; 240 V - 600 V
Carrier Frequency	1 - 12 kHz
Insulation Rating	600 V Class
Insulation Class	Class H (180° C) or Class R (220° C)
Efficiency	≥ 98%
Lead Length	Specific applications can reach 3,000 feet (consult factory for applications above 1,500 feet)
Fundamental Frequency	0-60 Hz (consult factory for applications over 8 kHz and/or 60 - 120 Hz fundamental if the cable lengths exceed 400 feet)
Environmental Conditions	
Operating Temperature	Enclosed: 40° C (104° F)
Operating Altitude	2,000 m (6,000 ft) Derating necessary above 2,000 m
Reference Technical Standards	
Agency Approvals	UL & cUL
Protection (enclosure)	Open, UL Type I, UL Type 3R
Warranty	Three years from the date of original shipment
Operation possible up to 120 Hz output drive frequency with derating (contact factory for details).	

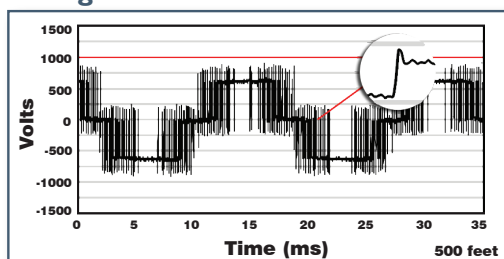
**Voltage Without Vlk**



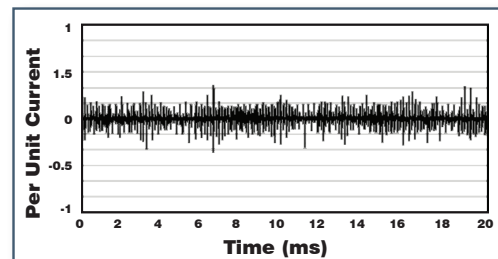
**Common Mode Without Vlk**



**Voltage With Vlk**



**Common Mode With Vlk**



## Multiple Motor Applications



## Performance Guarantee

Properly sized and applied, TCI guarantees that the Vlk will limit motor terminal peak input voltage to 150% of the bus voltage with a wire lead length of 1,000 feet and a carrier frequency of 4 kHz. Maximum lead length and carrier frequency can vary depending on wire lead type.

If a properly selected, installed and loaded Vlk filter fails to meet the guaranteed performance levels, TCI will provide the necessary components or replacement filter at no additional charge.

TCI does not take responsibility for additional installation or removal costs to include, but not limited to, replacement of third party equipment. Please see TCI's website for minimum requirements.

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