

## dV Sentry® Filter Specification

### 1. GENERAL

- 1.1 The dV Sentry dampened low pass filter is designed to reduce motor failures caused by IGBT-based drives connected by long leads of up to 1,000 feet. This filter also significantly reduces the common mode current available that can damage motor bearings and produce unwanted signals in control and other analog signals.

### 2. BACKGROUND

- 2.1 Motors run by variable frequency drives at some distance away can fail due to high voltage insulation breakdown caused by the fast switching time of the drive IGBT output. When left unmitigated, the high rate of change in voltage can result in spikes that add to any reflected voltage wave. This can add to the peak voltage in a way that produces a large voltage overshoot or spike. These voltage spikes can and will damage motors and or cable insulation over time and may lead to premature motor failure. The problem gets worse as the length of the motor cables increase.

### 3. PRODUCT OVERVIEW

- 3.1 Construction of the dV Sentry filter shall not include any capacitive components.
- 3.2 The dV Sentry filter design shall include a damping resistor element to reduce ringing or resonating between filter inductance and cable capacitance. This damping shall be present and effective for both differential and common mode operations.
- 3.3 The PWM Output Filter shall be specifically designed to accomplish three major functions:
  - 3.3.1 Reduce peak voltage waveform voltage at the motor windings.
  - 3.3.2 Reduce the dV/dt or "rise time" at the motor terminals.
  - 3.3.3 Attenuate the common mode current to reduce the stress from bearing currents and reduce those stray common mode signals that can corrupt the control circuits and analog signal references.

### 4. DESIGN SPECIFICATIONS

- 4.1 The filter shall have both common mode and differential mode inductances. This can be accomplished by separate common and differential mode inductors, or by an integrated single core construction. The filter shall contain wire-wound resistors.
- 4.2 The filter core shall be constructed of non-laminated powdered iron material.
- 4.3 Resistors shall be designed to run up to 1/2 of the power wattage rating.
- 4.4 The filter shall be rated for a maximum fundamental system frequency of 90Hz at nominal system voltages up to 600V, and up to 120 Hz with a de-rating factor of 0.85.
- 4.5 The filter shall operate at a maximum carrier frequency of 10kHz for units up to 110 amps and 5kHz for units above 110 amps.

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- 4.6 The ambient temperature of operation shall be 50° C for enclosed units and 60° C for open panel mounted units.
- 4.7 Filter shall be capable of operating at 150% current for one minute, repeated every 10 minutes.
- 4.8 Insertion losses shall be no more than 1.7% at 60 Hz and 2.6% at 90 Hz 480volts.

### 5. OPERATIONAL LIMITS

- 5.1 The maximum distance from the drive to the input terminals of the dV Sentry filter shall be 50 ft.
- 5.2 Application shall be effective for lead distances between the drive and the motor that range from 30 ft. to 1,000 ft. Consult factory if outside these parameters.
- 5.3 Sound Pressure shall be less than 65 dB at one meter.

### 6. CONSTRUCTIONS

- 6.1 The filter shall be UL component-recognized and shall be built to comply with UL508A.
- 6.2 Construction shall be of copper wire.
- 6.3 Inductors shall be sized appropriately for the total connected load. The design maximum temperature shall be 200° C class N insulation.
- 6.4 Brackets shall be painted structural steel.
- 6.5 Coils shall be wedged in place and the core shall be locked in place using steel banding.
- 6.6 Windings shall consist of copper wire or of copper foil.
- 6.7 Terminations shall be copper alloy taps or UL-recognized terminal blocks.
- 6.8 Sheet insulation shall be Dupont Nomex.
- 6.9 Completed inductors shall be vacuum dipped and baked with epoxy resin.

### 7. PROTECTION

- 7.1 Enclosure options shall conform to NEMA 1, 2 or 3R standards as selected.
- 7.2 Enclosure shall be constructed from steel with baked enamel finish.
  - 7.2.1 ANSE 49 Gray for NEMA 1,2
  - 7.2.2 High Endurance White for NEMA 3R
- 7.3 Openings shall be provided to allow for air flow convection cooling.
- 7.4 Fans shall not be required for cooling enclosed units.

### 8. WARRANTY

- 8.1 The dV Sentry output filter shall be warranted free from defects in both materials and in workmanship for a period of three years from the date of purchase.