

dV/dT GUARD V1k
MOTOR-PROTECTING PWM OUTPUT FILTER
SAMPLE BIDDING SPECIFICATIONS

1.0 GENERAL

- 1.1 The V1k dampened low pass filter, (hereafter also known as "dV/dTGuard" or "PWM Output Filter"), minimizes motor failures due to IGBT-based drives that are connected by long leads. Motors controlled by variable frequency drives that are installed some distance away often fail as a result of high voltage-induced insulation breakdown. The extremely fast switching time of the IGBT drive is reflected by the steep edges (dV/dT's) of the PWM voltage waveform. When uncontrolled, these high dV/dT's result in voltage wave reflections which can become additive at the pulse level yielding a voltage overshoots or spikes. These voltage overshoots damage the motor and cable insulation and lead to motor failure as the length of the motor cables increase. The combined inductance, capacitance and resistance of the PWM Output Filter shall be specifically designed to reduce voltage waveform dV/dT. In so doing, the dV/dTGuard shall also minimize parasitic resonance interaction between the inductive and the capacitive elements within the long leads. Left unguarded, this conductor resonance phenomenon would likewise contribute to the formation of motor-damaging voltage spikes.
- 1.2 The V1k dampened, low pass filter consists of a gapped, three phase, iron core inductor; AC-rated, polypropylene capacitors; and wire-wound resistors. The filter shall be rated for application at a maximum fundamental system frequency of 60Hz at nominal system voltages up to 600V. The filter shall operate at a maximum carrier frequency of 8kHz at 40% of fundamental voltage. The ambient temperature of operation shall be 40°C. The maximum distance from the drive to the input terminals of the V1k filter shall be 20 ft. V1k filter application shall be effective for lead distances between the drive and the motor that range from 50 ft. to 3,000 ft., depending on the application details (consult factory). Leads should not be electrically oversized more than four cable sizes or the mechanical limitations of the cable connectors.

2.0 COMPONENTS

2.1 INDUCTORS

- 2.1.1 The three phase inductors shall be designed for harmonic filtering service and for slowing the rate of rapid current changes. The inductors shall be UL component-recognized and shall be built to comply with UL 508A standard. Construction shall be of copper wire wound on magnetic grade steel. Inductors shall be sized appropriately for the total connected load. The design maximum temperature rise for reactors shall be 115° C or 155° C depending on frame size at rated current.
- 2.1.2 The core shall be made of laminated, electrical steel (grade M50 or better).
- 2.1.3 Brackets shall be ASTM structural steel or structural aluminum. Coils shall be wedged in place and the core shall be locked in place using vertical ties or rods.
- 2.1.4 Windings shall consist of copper wire or of copper foil. Terminations shall be copper alloy ring lugs, UL-recognized terminal blocks, or solid copper bus. Sheet insulation shall be Tufquin or Cequin IF or Dupont Nomex 410 of the thickness as required for UL insulation systems.
- 2.1.5 Inductors shall be air-gapped to control saturation. Inductance shall be measured under full load and shall be within ±10% of design value.

dV/dTGUARD Vlk
MOTOR-PROTECTING PWM OUTPUT FILTER
SAMPLE BIDDING SPECIFICATIONS

2.1.6 Completed inductors shall be impregnated with 100% solid epoxy resin. All insulation varnish systems shall be rated class R (220° C) or H (180°C), 600V.

2.1.7 Inductance shall remain above 50% of nominal for any overload up to 200% of rated current. Inductors shall not sustain any thermal damage for levels up to 150% of rated current for a minimum period of five minutes. Inductors shall be Hi-Pot tested (2,640V, 60 Hz, 1 second) line-to-line and line-to-ground.

2.2 CAPACITORS

2.2.1 Capacitors shall be constructed of metallized polypropylene film material.

2.2.2 Capacitors shall be Y(Wye)-connected and ungrounded neutral. Each capacitor element shall be rated at minimum of 700V AC.

2.3 RESISTORS

2.3.1 Resistors shall consist of wire-wound cement construction and incorporate thermal insulating terminations.

2.3.2 Resistors shall be derated to operate at twice the calculated worst case requirements for watts loss.

3.0 PROTECTION

3.1 Enclosure (optional) shall be designed to conform to NEMA 1 standards. Enclosure shall be constructed from steel with enamel finish. Enclosure openings shall be provided to allow for air flow convection cooling. Provisions shall be made to allow for permanent conduit entry sites. Enclosure shall have a removable cover that shall not at any time disrupt the conduit connections.

4.0 WARRANTY

4.1 The dV/dTGuard Vlk output filter shall be warranted free from defects in both materials and in workmanship for a period of one year from the date of installation or for a maximum of two years from the date of purchase, whichever comes first.