



2 Channel Sine Wave (VST) Dimmer Module

Consultants Specification

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1 General

1.1 Dimmer Module

The dimmer module shall comprise of 2 discrete sinewave channels. The dimmer channel shall be controlled via a central processor contained within the same PCB assembly.

1.2 Dimmer Technology

The dimmer shall utilise Variable Sinewave Technology (VST) to reduce the amplitude of the output waveform.

1.3 Control Technique

The dimmer shall use a Pulse Width Modulated (PWM) control technique. The PWM output shall have a minimum resolution of 1024 steps, at a frequency of not less than 46 kHz.

2 Performance

2.1 Dimmer Output Waveform

The dimmer output waveform shall maintain the frequency and shape of the input voltage waveform (usually sinusoidal) during all dimmer output levels between 0% and 100%.

2.2 Dimmer Output Response

A dimmer output shall begin to respond to any requested change in output level within 20ms.

2.3 Mains Input Frequency

The dimmer shall be capable of operating with a mains frequency range of 45Hz to 66Hz. Fluctuations of frequency shall not affect the operation of the dimmer rack. Operator intervention to select operating frequency shall not be required.

2.4 Load Types

Each dimmer output shall be able to drive resistive, inductive or capacitive loads, or any combination of loads. This shall occur without any modification to the dimmer output or the addition of any external circuits (other than that provided by the load).

Each dimmer output shall be capable of controlling inductive loads down to a power factor of 0.650 and capacitive loads down to a power factor of 0.750.

2.5 Over Current Protection

Each dimmer output shall limit its output current up to the maximum of 20Amps RMS (software settable to lower values). Loads greater than the maximum dimmer output current shall be limited to the maximum dimmer output current by the reduction of the output voltage (sinewave output). Dimmer output shall detect and respond to an over-current within 20ms (milliseconds).

- On detection of a light overload condition, the dimmer output shall fluctuate between the nominal operating current and the overload current to indicate to the operator that an overload condition exists.

2.6 Short Circuit

Dimmer output shall be able to detect a short circuit and shut itself down. Short circuits shall be detected within 50ms (milliseconds). Dimmer output current shall be limited to not more than 50Amps-peak during a short circuit detection period.

Dimmer output shall automatically be restored from short-circuit shutdown if the short-circuit has been removed within 5 seconds.

Dimmer output shall be permanently disabled if short-circuit remains for longer than 5 seconds.

Indication of the short circuit shall be provided via the Fault LED (short on long off time). Operator intervention shall be required to clear a dimmer output short circuit by cycling power to the dimmer channel or reducing the control level to zero.

2.7 Load Sharing

Each dimmer output connected to the same mains input phase shall be capable of being connected in parallel to each other to form a single dimmer output of a higher current rating.

2.8 Efficiency

Each dimmer output shall achieve an efficiency of not less than 96% into a resistive load at a level of 100%.

2.9 Harmonics

The output of each dimmer shall contain no more than 1% harmonic content with respect to the fundamental for resistive loads, over the full dimming range of 0% to 100%.

2.10 Power Factor

Each dimmer output shall maintain its line input reflected power factor within the range of 1 and 0.900 for a resistive load over the full dimming range of 0% to 100%.

3 Environmental and cooling

3.1 Operating Temperature

The dimmer shall operate at full rated loading in an ambient temperature between 0 degrees Celsius and 40 degrees Celsius.

3.2 Temperature Control

The dimmer module shall monitor the heat sink temperature. In the event of over-temperature detection, the dimmer shall disable the dimmer output. Indication of the over-temperature shall be provided via the Fault LED (permanently on).

3.3 Cooling Fan Control

The dimmer cooling fans shall vary in speed as determined by the heat sink temperatures.

4 Status Indication

4.1 CPU LED

The dimmer shall indicate Dimmer working state as

- Normal working condition: The LED shall flash at a 1 Hz rate

4.2 Fault LED

The dimmer shall indicate Dimmer heat sink temperature as

- Normal working condition: LED off.
- Over-temperature: LED on
- Over-current: LED Flashing, Long on time - Short off time.
- Short Circuit: LED Flashing, Short on time - Long off time

4.3 Output LED

The Output LED shall vary in brightness to indicate the relative dimmer output level.

5 Electrical

5.1 Continuous Output Current Rating

Dimmer output shall have a current carrying capacity up to 22 Amps RMS (5kW @ 230V) and 44A RMS (10kW @ 230V) for the single channel module.

5.2 Mains Input Voltage Rating

The dimmer rack shall be suitable for connection to the nominal mains RMS voltage in the range of 100 Volts minimum to 240 Volts maximum, line to neutral, with an additional variation of $\pm 10\%$ to allow for line fluctuations.

5.3 Neutral Referencing

Each dimmer output shall be neutral referenced to the mains input neutral.

5.4 Power Switching Devices

The dimmer shall use IGBT power transistor technology as primary and secondary power switching devices to control each dimmer output.

6 Mechanical

6.1 Construction

The dimmer shall have a structural housing, dual sinewave PCB assemblies, filter chokes, a heat sink and MCB/RCD devices.

6.2 Finish

The module finish shall match and complement the rack finish.

6.3 Dimension

The module dimension shall be 380mm x 230mm x 25mm.

7 Standards Compliance

7.1 EMC Compliance

The dimmer shall comply with the European and Australian EMC directive requirements: