

## Matrix® APAX Harmonic Filter Specification

- 1.0 The harmonic filter shall be a Matrix APAX Filter as manufactured by MTE Corporation.
- 2.0 The harmonic filter shall treat all characteristic low frequency harmonics generated by a three phase full wave converter load (5<sup>th</sup>, 7<sup>th</sup>, 11<sup>th</sup>, 13<sup>th</sup>, etc.)
- 3.0 The characteristic harmonics shall be suppressed without need for individual tuning or the requirement to phase shift against other harmonic sources.
- 4.0 The harmonic filter shall be a passive series connected low pass filter consisting of an inductor capacitor network. Active electronic components shall not be used.
- 5.0 The harmonic filter model supplied shall be capable of feeding a three phase input rectifier with or without line reactors, with or without a DC link choke, with or without a combination line reactor and DC link choke.
- 6.0 The harmonic filter model supplied shall be capable of feeding a rectifier composed of diodes, thyristors or any combination thereof.
- 7.0 The harmonic filter shall not resonate with the power distribution system nor attract harmonics from other sources.
- 8.0 The filter shall be suitable for use with either a single nonlinear load or multiple nonlinear loads
- 9.0 UL and cUL listed to UL508 Type MX, CSA-C22.2 No 14-95, and CE marked to conform to EN50178:1997 per revisions of the Low Voltage Directive 2006/95/ec issued 12/12/2006, and the RoHS2 Directive 2011/65/EU issued 6/8/2011.
- 10.0 The magnetic coil of the harmonic filter should be UL 508 compliant for Class 200 (N) insulation systems, and have a maximum temperature rise of 125°C in a 50°C ambient environment.

- 11.0 THiD shall be no more than 8% at full load and must be less than 12% at 40% load with DC Link Choke and/ or Line reactor line impedance = > 6%. THiD shall be no more than 12% at full load and must be less than 17% at 40% load without DC Link Choke and have no additional impedance. System power conditions at rated power: THVD<2%, line voltage unbalance <1% with and without Link Choke.
- 12.0 The harmonic filter shall suppress the characteristic harmonics to the levels specified in paragraph 11.0 provided that the line voltage unbalance is between 0% and 1%. If the line voltage unbalance is between 1% and 3% per ANSI C84.1-1995 the total harmonic input current distortion at any reduced load or speed condition shall not exceed the full load THiD by more than 50% (i.e. if 8%THiD required at full load, then not more than 12% THiD at reduced load when voltage unbalance is more than or equal to 1% and less than or equal to 3%.)
- 13.0 When fed from a power distribution system operating at the nominal distribution voltage, the harmonic filter output voltage at no load shall not be more than 5.0 percent of the nominal RMS and peak distribution voltage.
- 14.0 When fed from a power distribution system operating at the nominal distribution voltage, the harmonic filter output voltage at full load shall not be less than the nominal RMS utilization voltage.
- 15.0 All wiring shall be copper.
- 16.0 To assure that voltage source PWM inverters do not experience over voltage trips, the harmonic filter shall not cause the inverter bus voltage to increase by more than 5% when the filter is operating from the nominal distribution voltage.
- 17.0 To assure that the filter will not reduce the life of a voltage source inverter's bus capacitor, the output current waveform of the harmonic filter and the input current waveform of the inverter shall be consistent with the input waveform of an inverter fed from a drive equipped with a 3% minimum impedance line reactor.
- 18.0 The harmonic filter shall be handled, stored and installed in accordance with the manufacturer's recommended installation practices as found in the manufacturer's User Manual. Installation shall comply with all applicable local codes.

- 19.0 To assure quality control and proper performance, the filter shall be manufactured by an ISO9001 supplier in the supplier's own manufacturing facility, and not by a contract manufacturer. Filters shall be subject to rigorous quality control checks prior to shipment.
- 20.0 The harmonic filter shall be warranted to be free of defects in materials and workmanship for a period of one year from the date of shipment when applied in accordance with the manufacturer's recommended installation procedures.
- 21.0 An integrated series and shunt reactor shall be used in the construction of the harmonic filter.
- 22.0 To ensure generator compatibility, the harmonic filter must never introduce a capacitive reactive power (KVAR), which is greater than 20% of its KVA rating.
- 23.0 The harmonic filter shall be rated to operate in ambient temperatures from -40°C to 50°C under open panel conditions and stored in enclosed conditions from -40°C to 90°C. Filter can be derated up to 55°C ambient temperature.
- 24.0 Filters shall be mounted on a single panel for easy back-plate mounting.
- 25.0 REACH Compliant – Communication of Substances of Very High Concern in Articles  
REACH Regulation 1907/2006

RoHS Compliant

Restriction of Hazardous Substances (RoHS)

As described in DIRECTIVE 2002/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 January 2003