

Harmonic Filter Calculation Spreadsheet

Filter Specification Tool

Industrial harmonic problems can be solved using a comprehensive approach including site surveys, harmonic measurements, and computer simulations. When mitigation of harmonic distortion is required, one of the options is to apply a filter at the source of harmonics, or at a location where the harmonic currents can be effectively removed from the system. The most cost effective filter is generally a single-tuned passive filter and this will be applicable for the majority of cases. Filters must be carefully designed to avoid unexpected interactions with the system.

The Harmonic Filter Calculations spreadsheet provides a convenient method for determining low voltage filter component values and duties. Electrotek Concepts® designed this spreadsheet for use with Microsoft® Excel. This spreadsheet approach provides you with a convenient method for entering required data. User specified data includes:

- Filter tuning specification
- Capacitor bank rating, voltage, and frequency
- Nominal bus rating
- Transformer nameplate rating and impedance
- Total harmonic load
- Utility background harmonic voltage distortion
- Capacitor and reactor tolerances

Calculations include capacitor derating, filter component values, capacitor duty with respect to IEEE Standard 18 (Shunt Power Capacitors), and impact of component tolerances on filter tuning.

CAPACITOR LIMITS: (IEEE Standard 18-2002)

	Limit	Contingency	Actual	Value
Peak Voltage:	100%	120%	93%	558
RMS Current:	100%	135%	96%	481
KVA:	100%	135%	81%	404
RMS Voltage:	100%	110%	84%	506

An example may be downloaded in Adobe Acrobat format at www.pqsoft.com/filter/index.htm.

Support Options

Supporting calculations and a low voltage harmonic filter design case study are also provided.

Electrotek provides support for this product through PQSoft® Support Service, a comprehensive support offering for power system simulation and analytical tools. Features include upgrades, specialized models, and online resources. To learn more, send e-mail to pqsoft@electrotek.com or call 865-470-9222.

Availability

The Harmonic Filter Calculations spreadsheet can be purchased directly from Electrotek. For more information, send e-mail to info@electrotek.com or call 865-470-9222.

SYSTEM INFORMATION:

Filter Specification (e.g., 5): th

Three-Phase Capacitor Bank Rating: kVAr
Rated Capacitor Bank Current: 481 Amps
Nominal Bus Voltage: Volts

Capacitor Bank Current (actual): 384.9 Amps

Filter Tuning Harmonic (e.g., 4.7): th

Capacitor Impedance (wye): 0.7200 Ω
Capacitor Impedance (delta): 2.1600 Ω
Filter Reactor Impedance: 0.0326 Ω

Filter Full Load Current (actual): 403.2 Amps
Filter Full Load Current (rated): 503.9 Amps
Transformer Nameplate Rating: kVA
Transformer Nameplate Impedance: %

Load Harmonic Current: % Fund

Utility Harmonic Current: 42.7 Amps

Power System Frequency: Hz

Capacitor Voltage Rating: Volts
Capacitor Frequency Rating: Hz
Derated Capacitor Size: 320 kVAr

Total Harmonic Load: kVA

Filter Tuning Frequency: 282 Hz

Capacitor Rating (wye): 3684.15 μ F
Capacitor Rating (delta): 1228.05 μ F
Filter Reactor Rating: 0.0865 mH

Fundamental Frequency Compensation: 335 kVAr

Utility Side Voltage Distortion (Vh): %
(Utility Harmonic Voltage Source)

Load Harmonic Current: 180.4 Amps

Maximum Total Harmonic Current: 223.1 Amps

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