



HPS Centurion P

Passive Harmonic Filter Typical Specifications

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1 GENERAL

1.1 SCOPE

- A Provide design and engineering, labor, material, and equipment for low voltage passive harmonic filters as required for the complete performance of the work, as herein specified.
- B The work specified in this section includes, the characteristics for a continuous duty passive harmonic filter designed to reduce the total voltage/current harmonic distortions (THD_v and THD_i) and to improve the system power factor (PF).

1.2 REFERENCES, CODES, and STANDARDS

- A General: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest date as of the date of the contract documents, unless otherwise specified.
- B Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - i ANSI/IEEE 519-2014, "Guide for Harmonic Control in Electrical Power Systems."
 - ii ANSI/IEEE C62.41-1991, "Guide for Surge Voltages in Low AC Power Circuits"
 - iii ANSI/IEEE C-84.1-1995 "Electric Power Systems and Equipment – Voltage Ratings"
- C Canadian Standards Association (CSA):
 - i CSA C.22.2 No. 14, "Industrial Control Equipment."
- D Underwriters Laboratories, Inc. (UL):
 - i UL 508, "Standard for Industrial Control Equipment."

1.3 SYSTEM DESCRIPTION

- A Performance Requirements:
 - i General: The passive harmonic filter shall incorporate reactors and capacitors and is designed to reduce harmonic voltage and current distortion produced by a single or multiple VFD's connected to the filter output as follows:
 - 1.3.A.i.1 Limit the total voltage distortion (THD_v) so as not to exceed the limits defined in Table 10-2 of IEEE-519 (2014) immediately to the line side of the filter installation point with up to 1 percent voltage unbalance as defined in ANSI C-84.1-1995. The Point of Common Coupling (PCC) shall be the input terminals of the harmonic filter.
 - 1.3.A.i.2 Limit the total current harmonic distortion (THD_i) to less than 5% at the Point of Common Coupling (PCC) over the range of 55% to 100% load.
 - 1.3.A.i.3 If the voltage unbalance is greater than 1 percent but less than 3% then total current harmonic distortion shall not exceed full load THD_i by more than 50% (i.e. if the limit is 5% THD_i at full load then THD_i shall not be more than 7.5% at light load).
 - 1.3.A.i.4 The passive filter supplier shall not be responsible for pre-existing voltage distortion caused by other harmonic sources.
 - 1.3.A.i.5 The power factor shall be >95%, in the operating range from 40% load to full load.
 - 1.3.A.i.6 Voltage Regulation: Voltage regulation of the filter shall not exceed 5%.
 - 1.3.A.i.7 The passive filter shall not resonate with the power distribution system nor sink harmonic currents from other sources.
 - 1.3.A.i.8 The capacitive kVAR in the passive filter shall not exceed 20% of its kVA rating to assure compatibility on a generator power supply.
 - ii Note: The passive filter shall not correct for distortion caused by equipment installed upstream of the system installation point or for incoming utility voltage distortion. The passive filter installation point shall be defined as the installation point for the system input wiring.
- B Environmental Service Conditions
 - i Ambient Operation Temperature: Up to 50°C

- ii Humidity: 0 to 95%, non-condensing
- iii Altitude: Operate up to 1000 M (de-rated at higher altitudes)

1.4 SUBMITTALS

- A Action Submittals
 - i Technical brochure detailing the features of the passive filter
 - ii Dimensional drawings with the size, installed weight, and heat dissipation for each passive filter size provided
 - iii Installation wiring diagram for each passive filter provided

1.5 QUALITY ASSURANCE

- A Third Party Certification: The passive filter shall have the third party certification by Underwriters Laboratories (UL listing)
- B Manufacturer Qualifications: The manufacturer shall have been engaged in the production of low voltage magnetic components for a minimum of 10 years.

1.6 DELIVERY, STORAGE, AND HANDLING

- A The passive filter is to be delivered to the project site in the supplier's or manufacturer's original containers, labeled with the supplier's or manufacturer's name or product brand name.
- B Store the passive filter and accompanying materials in their original, undamaged packages and containers, inside a well-ventilated area, which is protected from weather, moisture, extreme temperatures, and humidity.
- C Storage Temperature: -20°C to 60°C

1.7 PROJECT CONDITIONS

- A Environmental Requirements: Prior to the installation of passive filter ensure that workplace is weatherproof, environmental conditions are within specifications for the passive filter, and all significant construction in the area of the passive filter is completed.

1.8 WARRANTY

- A General: Standard factory warranty shall be at least 3 years from the date of shipment. This warranty covers defects in material and workmanship.

2 **PRODUCTS**

2.1 MANUFACTURERS

- A Basis of Design: The passive filter specified shall be manufactured by Hammond Power Solutions. This specification is to establish a standard of quality for the design, function, materials and appearance of the systems.
- B Acceptable Manufacturers:
 - i Hammond Power Solutions
 - ii No substitutions

2.2 EQUIPMENT SIZE & RATINGS

- A Passive harmonic filter shall be designed to operate from an input voltage of 480 or 600 VAC, +/- 10%, 3-phase, 3 or 4 wire system.
- B Passive filter shall be designed to operate with a supply frequency of 60 Hz, ± 2 Hz.

- C Passive filter efficiency shall be no less than 98% at full load.

2.3 PASSIVE HARMONIC FILTER SYSTEM

- A Enclosure:
 - i Passive filter shall be provided in a Type 3R enclosure or in open style format.
 - ii All units shall be provided with a grounding lug.
- B Capacitors
 - i Capacitors shall be rated to handle nominal system voltage plus 10% continuously. Capacitors shall be rated to operate at a case temperature of at least 65 degrees C. The tolerance on the capacitance shall not be more than +/-10%. Capacitors shall be UL recognized.
 - ii Capacitors shall discharge to reduce residual voltage to less than 50V within one minute of de-energization (NEC article 460-6).
- C Inductors
 - i The inductors shall be UL recognized and shall be built to comply with UL 508. The inductors shall have 220 degrees C class insulation with maximum temperature rise of 130 degrees C. Coil conductors shall be copper windings.
- D Capacitor Contactor
 - i The capacitor contactor shall be UL recognized. The contactor option shall allow the user to open and close a contact that will remove the capacitors from the circuit. Operation shall be controlled by a contact from the customer's equipment.

2.4 SOURCE QUALITY CONTROL

- A The manufacturer shall energize the passive filter at full voltage in addition to performing bill of material checks, continuity checks and insulation resistance check with hi-pot.

3 EXECUTION

3.1 INSTALLATION

- A Preparation and installation of the passive filter shall be in accordance with reviewed product data, final shop drawings, and manufacturer's written recommendations.
 - i Install low voltage passive harmonic filters in accordance with the NEC and applicable local codes.

3.2 FIELD QUALITY CONTROL

- A Field inspection start up and testing shall be performed by a qualified technician from the owner, the contractor or the manufacturer.
- B Perform equipment start up and testing in accordance with the manufacturer's instruction manual using qualified personnel.
- C Document equipment nameplate information and startup/testing data on the manufacturer's recommended startup/test report including insulation resistance for future reference.