

TECHNICAL SPECIFICATION FOR EDF IMPACT HARMONIC FILTERS

1. General Requirements

The harmonic filter shall be designed to meet IEEE 519 guidelines for harmonic export on to the utility system at the point of common coupling. For EDF IMPACT series filters the point of common coupling shall be considered to be the input terminals to the VSD disconnect.

The harmonic filter shall consist of a series connected three phase iron core line reactor connected to the VSD input terminals, a separate parallel connected three phase iron core 5th harmonic filtering reactor, a soft switching contactor for the 5th harmonic filter, three phase capacitors for the 5th harmonic filter, and HRC fuses for the entire 5th harmonic filter.

The 5th harmonic filter shall be connected to the load side of the line reactor.

The parallel connected 5th harmonic filter shall include HRC fusing to allow the VSD to operate with the parallel components removed from the filter circuit for maintenance or failures. The windings for the 5th harmonic reactor shall make use of a completely separate three phase iron core from the line reactor. Windings for the line reactor and 5th harmonic filter on the same core are not acceptable. This is will allow replacement of the 5th harmonic filtering reactor without having to also replace the line reactor should there be a failure on the 5th harmonic filtering reactor coils. Inability to operate the VSD circuit in the event of a coil failure on the 5th harmonic filter also rules out a common core for both the line reactor and 5th harmonic filtering reactor.

Soft switching contactors will switch the 5th harmonic filter on when the VSD run contact is closed. The contactors will be located on the load side of the 5th harmonic filter fuses such that both the 5th harmonic filter reactor and 5th harmonic filter capacitors are switched. 5th harmonic filters without soft switching contactors are not acceptable due to excessive voltage rise under no load conditions.

2. VSD Size / Ratings

The filter shall be provided for the following variable speed drives. In no case shall the combined power factor of the motor/VSD/harmonic filter be leading more than 95% at 100% speed and load.

System Voltage_____ (Ph-Ph)
VSD H.P.

3. Line Reactors

Line reactors shall be low loss design suitable for the VSD H.P.

Line reactors shall be three phase iron core. Reactor maximum continuous rms amperage shall be capable of minimum 50% distortion from the VSD.

Minimum total line reactor impedance at 100% VSD speed and load shall be a minimum 5%.

4. Filter Capacitors

Individual capacitors shall be CSA and UL approved, 3 phase, gas or oil filled under vacuum, and of a self-healing design utilizing a low loss metallized polypropylene film dielectric system with a pressure sensitive circuit interrupter. Metallized paper is not acceptable due to higher operating losses. Capacitor casing shall be of a seamless aluminum design. Electrical losses shall be less than 0.25w/kVAr. Dielectric fluid shall be high flash point, biodegradable, non-toxic and contain

no PCB's. Capacitors shall include internal fusing for short circuit protection to 10kA, and include a grounding / mounting stud at the bottom of the capacitor cell for easy replacement.

Capacitors shall be rated for a minimum of 130% continuous current overload and 110% continuous voltage overload based on the nameplate voltage rating of the capacitors. Individual capacitor cells shall not exceed 25 kVAr at the system voltage to keep replacement costs at a minimum.

Capacitors shall be suitable for -40°C to +60°C ambient temperature.

Dry type capacitors and / or capacitors without a pressure sensitive circuit interrupter are not acceptable.

Single phase capacitors are not acceptable.

Capacitor nameplate voltage shall be minimum 999 Volts.

5. Capacitor Discharge Resistors

Adequate discharge resistors shall be provided for each capacitor cell to reduce the voltage to 50 Volts or less within one minute after disconnection of supply voltage.

6. Harmonic Filtering Reactors

Harmonic filtering reactors shall be low loss, minimum 90 Q Factor.

Harmonic filtering reactors shall be three phase iron core. Reactor insulation shall be rated at 220°C. The maximum temperature of the reactor at maximum continuous rms amperage shall be no higher than 145°C with a 45°C ambient. Reactor maximum continuous rms amperage shall be sized to match the maximum rms amperage of the capacitors.

Reactors shall be equipped with snap action thermostats which trip at 145°C and are wired to terminals for remote alarm indication.

In no case shall the harmonic filtering reactor size exceed 75 kVAr at the system voltage to allow for ease of replacement.

7. Soft Switching Contactors

Contactors shall be 3 phase, IEC rated, and rated for capacitor switching duty. Contactors must be capable of switching the maximum continuous rms amperage rating of the capacitors.

Soft switching contactors with pre-charge coils are mandatory. Contactors without soft switching pre-charge coils are not acceptable. Contactor coils shall be 120 Volt, 60 Hz.

8. HRC Fusing

3 HRC fuses shall be included for each contactor. This will allow the motor/VSD to operate in the event of a 5th harmonic filter failure. HRC fuses shall have a minimum interrupting rating of 200 kA. Fast acting fuses shall be sized for at least 180% of the nominal amperage of the capacitors. Time delay / dual element fuses shall be sized for a minimum 140% of the nominal amperage of the capacitors.

9. Termination

Two suitably sized three phase terminal blocks shall be provided for feeder termination. One terminal for input from the VSD disconnect, and one terminal for output to the VSD terminals. Ground terminals shall be provided for ground wire terminations.

Terminal requirements for the input and output terminals are:
VSD H.P. _____ Feeder size: _____ per phase

10. Enclosure

Enclosures shall be of at least the minimum gauge steel as required by code. Enclosures shall suitable for the installation location. NEMA 1 enclosures shall be easily field changeable to NEMA 2, NEMA 3R, and NEMA 12.

NEMA 3R enclosures shall include thermostatically controlled anti-condensation heaters to maintain at least -20°C inside the enclosure based on the extreme low ambient temperature. Thermostatically controlled ventilation shall be sized to maintain a maximum temperature of 45°C inside the enclosure at the extreme high ambient temperature. Dripshields, air filters for dust, moisture, and vermin shall also be included for NEMA 3R enclosures. Dripshields and air filters for dust shall be included for NEMA 12 enclosures. Dripshields shall be included for NEMA 2 enclosures.

Adequately sized control transformer and control fuses shall be provided for all controls including heating and cooling.

All components must be suitably mounted to provide ease of replacement with front access only. All enclosure mounting hardware and framework shall be either galvanized steel or zinc plated steel for grounding continuity. Painted mounting hardware and framework with paint removed for grounding is not acceptable. All enclosure parts other than mounting hardware and framework shall be powder coated ASA 61 Grey.

The enclosure door shall have a lockable handle.

Enclosure rating required: NEMA 1, 3R or 12
Minimum ambient temperature: °C
Maximum ambient temperature: °C
Feeder Cable Entry Location: Top

11. Labelling

A "Wait one minute after disconnection from supply" label shall be located on the enclosure door. A "Wait five minutes after disconnection from supply" label shall be provided loose for the VSD disconnecting device. Both labels shall be worded as per code requirements.

12. Testing

Testing shall be performed as per CSA and UL standards. All assemblies must be bear a certification label for both Canadian and USA standards. A confirmation of the filter tuning frequencies must be performed prior to shipment.

13. Approved Manufacturers

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