

Controllix Corporation

Medium Voltage Harmonic Filter Banks



**Metal-Enclosed
Filter Banks Reduce
Harmonic Distortion
and Improve
Power Factor**

**Available in
Fixed, Switched
& Multi-Step
Arrangements**

Controllix Corporation Medium Voltage Harmonic Filter Banks reduce harmonic distortion and improve power factor, increasing system performance and resulting in significant cost savings. Consisting of capacitors, reactors and sometimes resistors, harmonic filter banks provide a low impedance path out of the system for harmonics. The series capacitor/reactor combination prevents resonance by tuning the network below the first dominant harmonic (usually the 5th or 300hz). Since three phase networks typically have little or no harmonic current below the fifth, there is no energy available to resonate. Distortion is reduced to the required levels. The metal-enclosed design provides maximum environment protection and safety, while maintaining a compact installation footprint.

Controllix Filter Banks accommodate 2.4kV to 34.5kV requirements and are available in single-tuned, multi-tuned and high-pass filter banks. Single-stage or multi-stage configurations can be obtained with iron core or air core reactors.

Controllix has furnished hundreds of custom-designed passive shunt harmonic filter packages in its 40-year history. Filter banks can be built to a customer's specifications or designed by the Controllix Engineering Department, which is available to perform harmonic studies and collect necessary data. Controllix utilizes the latest computer software for system simulation and design purposes. With accurate modeling techniques, the optimum solution can be quickly and reliably found. Controllix designs and manufactures turnkey systems and through its partners can offer installation and startup.



Medium Voltage
Harmonic Filter Banks

Leading in Power Quality for Over 40 Years

Medium Voltage Metal-Enclosed Harmonic Filter Banks



Controllix Harmonic Filter Banks are typically used when reactive power is required, but the installation of conventional capacitor banks would risk amplifying existing distortion to excessive levels. Controllix understands the critical role harmonic mitigation and power factor correction play in optimizing the efficiency of power distribution systems. Installation of Controllix filter banks will protect a plant's distribution system and equipment, as well as the utility's distribution system. Reduced harmonic distortion will improve a plant's productivity by preventing the following problems:

- Motor inefficiency
- Blown capacitor fuses
- False operation of breakers and fuses
- Abnormal heating of equipment (e.g., transformers, switchgear)
- Excessive copper losses within transformers
- Worn conductor insulation
- Measurement errors by utility meters
- Neutral bus bar and lugs overloading
- Phone line interference
- Noise
- Problematic operation of drives and power supplies

Ratings: Standard voltage ratings are 2.4kV through 34.5kV. Units comply with NEC, IEEE and ANSI standards.

Construction: Enclosures feature fully welded construction of sturdy 11-gauge carbon steel with a structural steel base. Enclosures are also available in Galvanneal, stainless steel and aluminum. Doors are internally hinged and have 3-point latching with provisions for padlocking. The enclosure is processed to inhibit rust with a phosphate base preparation, followed with primer and ANSI #61 gray enamel finish (for indoor applications) or ANSI #70 (for outdoor installations). Other colors are available upon request. The base of outdoor enclosures is undercoated. Ventilation and heaters are provided to meet environmental requirements.

Harmonic Filter Reactors: Reactors are air core, iron core or oil-filled and are sized for tuning (or detuning) to a specific harmonic order and percentage of the harmonic order current. Reactor placement may be part of the capacitor section(s) or may require its own section.

Disconnect Switch: The incoming compartment typically contains an externally operated, non-load break, three-pole disconnect switch. This device is used as a means to disconnect the capacitor unit from the power system and provide the "visible break" required by the National Electrical Code (NEC). Line fuses can be added in the incoming compartment for additional protection. The disconnect switch is typically interlocked with the ground switch.

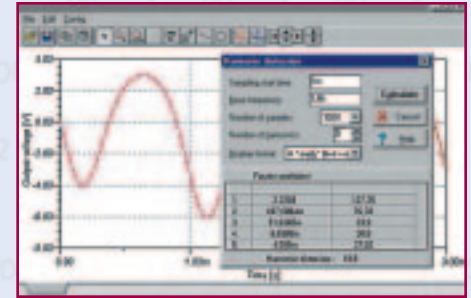
Capacitors: Single-phase or three-phase capacitors with one, two or three bushings are used. Capacitors comply with IEC, IEEE and CSA standards. Each capacitor is easily removed for ease of inspection and maintenance. Capacitors are equipped with discharge resistors to drain residual voltage within five minutes of de-energizing. The dielectric is biodegradable, environmentally friendly and non-toxic. The capacitors are usually rated at about 115% of the system's nominal voltage rating to account for the fundamental voltage rise and harmonic voltages.



Capacitor Fuses: Each capacitor is provided with a properly coordinated current limiting fuse equipped with blown fuse indication.

Controls: A variety of control technologies are available, including automatic controllers that can bring on stages based on power factor, current, VAR loading or time-of-day. Blown fuse alarms, neutral unbalance protection and networking are also available. A remote current transformer is required for VAR control.

Switching Devices: In switched applications stages are controlled by low maintenance vacuum switches, vacuum contactors, circuit breakers or other approved switching options.



Ground Switch: A manually operated, interlocked ground switch assures additional personnel safety by discharging stored energy from the capacitors and/or main bus. The ground switch is designed for quick, easy operation and is located so that switch position can be confirmed through the compartment viewing window.

Interlock System: Units are provided with a key interlock system preventing entrance into the unit while the unit is energized.

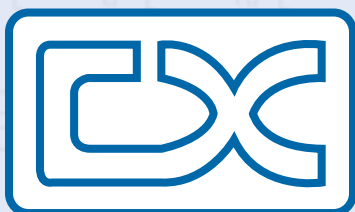
Bus Systems: Copper or aluminum main bus and ground bus are utilized, along with polymer or porcelain support insulators.

Unbalance Detection Scheme: Harmonic filter banks are connected in either delta or ungrounded wye to prevent harmonics from contributing to system ground problems.
PT (Neutral to Ground) for Ungrounded Wye Banks
CT (Between Neutrals) for Split Wye Banks
CT on phases for Delta Connections

OPTIONS:

- Top or Bottom Entry
- Control Power Transformer
- Remote Alarm Relay
- Main Incoming Line Fuses
- Surge Arresters
- Roof Bushings
- Zero Voltage Closing Vacuum Switches
- Metering or Circuit Monitoring

Current Transformer: A separately mounted CT is required and is available as an option.



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