

High Voltage Passive Filter Banks

For Industrial & Power System Application

Why Harmonic Filter Banks Needed?

Harmonics in power systems are generated by non-linear loads such as:

- Variable Frequency Drives (VFDs)
- Arc Furnace
- Solar & Wind Farms with Inverter based System
- Rectifiers, inverters & Thyristors
- UPS System

Effects of Harmonics:

- Equipment overheating & failure
- Increased energy Losses
- Malfunction of protective devices
- Poor power quality & voltage distortion
- Premature failure of Power factor correction capacitors
- Amplification of harmonics and possible resonance with system and capacitors.



IEEE 519 Compliance:

IEEE 519 specify Total harmonic distortion (THD) limits at PCC of electrical network for the consumer of power to comply. Passive Filter banks is one of the best solutions to reduce the harmonics in their system and comply with THD levels and there by improve the power quality.

Types of Passive Filter Banks

Single-Tuned Filters

- Designed for specific harmonic frequency (e.g., 5th, 7th, 11th).
- Provides targeted harmonic reduction.

High-Pass Filters

- Attenuate high-order harmonics beyond a certain frequency.
- Suitable for suppressing resonances in power systems.

Band-Pass Filters

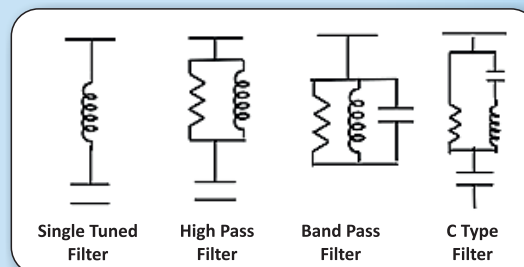
- Designed to attenuate a specific range of harmonics instead of just one harmonics instead of just one frequency.
- Typically used for filtering two or three nearby dominant harmonics.

C-Type Filters

- Used in transmission & industrial applications for reactive power compensation.
- Offers minimal losses at fundamental frequency with high filtering efficiency.

Detuned Filters

Used when THD values are within acceptable limits, but capacitors are required for power factor improvement. Detuned reactors (6%, 7%, 14%) prevent harmonic amplification and protect capacitors from overloading due to harmonics.



Why to Choose **UNISTAR®** Filters?

- ✓ Customised-designed solutions.
- ✓ Reliable dry-type series reactors with durability & safety.
- ✓ Precisely-designed capacitor banks for long-term performance.
- ✓ Type tested to meet industry and utility standards.

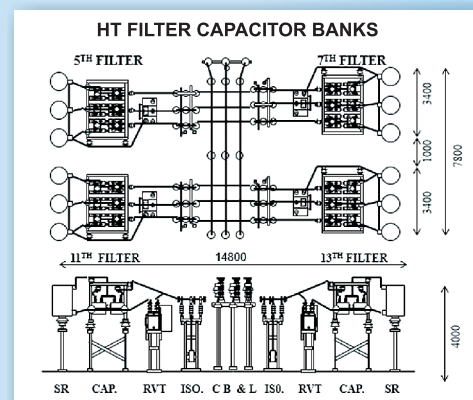
Performance of Single Tuned filter for Aluminium rolling Plant near Mumbai

Sr. No.	11KV, 1.35 MVAR 5 th Harmonic tuned filter	Individual order harmonics in%		Total harmonic Distortion (THD) in %	
		5th	7th	V THD	I THD
1.	Filter Bank OFF	18	8	2.1	8.4
2.	Filter Bank ON	4	3	1.3	4.4



Design Input Required to design optimum harmonic Filter solution

- **System Voltage & Frequency** (e.g., 11 kV, 33 kV, 50 Hz)
- **Total Load Power & Power Factor** (kW, KVAR)
- **Harmonic Spectrum & Existing THD** (Total Harmonic Distortion in % & specific harmonics)
- **Types of Load & Loading pattern** (VFDs, arc furnaces, DC drives, etc.)
- **Utility Grid Constraints** (Short-circuit level, impedance details)
- **Compliance Requirement** (IEEE 519 limits or other standards)
- **Capacitor Bank Rating & Reactor %** (If existing)



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