“True Harmonics Solution”

High harmonics escalate complications which affect all power distribution networks in industrial, commercial, telecom and medical applications.

Most of the power converting equipment or facilities can generate harmonic current. Axpert-i-Sine, the Multi-Functional Active Harmonic Filter, designed with intelligent control algorithm, dynamically changes the switching frequency to optimize the performance and efficiency of these equipments. The performance of Axpert-i-Sine AHF is less affected by supply voltage harmonic distortion and it provides selective harmonic attenuation up to 51st order.

Amtech offers both 3-Phase, 3-Wire as well as 3-Phase, 4-Wire Active Harmonic Filters. Whenever there are single phase non-linear loads like computers, there is an accumulation of triplen harmonic current in neutral. Our 3-Phase, 4-Wire Active Harmonic Filters are the best choice for such applications.
AXPERT-i-Sine AHF provides 3-Phase harmonic current compensation. Figs. 1 and 2 show the operational principle of the active filter, with which a rectifier load is connected.

As shown in Fig. 1, the active filter is inserted between the load and the source, in parallel to the load. For a six-pulse rectifier load, the load current $I_L$ appears in a form of rectangular waves, as illustrated in Fig. 2. This can be considered a result of synthesis of the fundamental current $I_F$ and the harmonic current $I_H$ (Fig. 2). ($I_L = I_F + I_H$)

The compensation current $I_C$ of the active filter is controlled, so that its intensity is the same as that of the above-mentioned $I_L$, and its polarity is just reversed ($I_C = -I_L$). As a result, components of harmonic currents in the load current are cancelled by the effect of active filter and source current $I_S$, which is a sinusoidal wave (Fig. 2).

This can be clearly explained by the expression below:

\[ I_L = I_F + I_H = -I_C \]
\[ I_S = I_C = (I_F + I_H) + (-I_H) = I_L \]

**Monitoring & Signaling**

Axpert-i-Sine AHF is equipped with a user-friendly control panel. Self-explanatory full parameter names, easy navigation of parameters through well organized parameter sets and functional keys with 8-selectable parameters on single screen make it easy to operate and program.

The optional TFT panel with special white back light offers access to all parameters, waveforms and spectrums for management of both AHF and system power quality. The graphics TFT display and control panel give easy access to:

- Load, source & Axpert-i-Sine AHF
- Monitoring of all metering parameters like V, I, F, kVA, PF, THD
- Control commands & settings
- Waveforms & harmonics spectrum (optional touch screen TFT panel)
- Status & alarms

**Why Axpert- i-Sine Active Harmonic Filter?**

**FEATURES**
- Fast Fourier transform based harmonic compensation
- Operates with closed loop control
- Reactive power compensation
- Ability of parallel operation to increase power capacity
- Voltage-independent harmonic current tracking
- Inherent current limiting
- Shunt connection
- Backlit user interface (optional TFT with touch screen)
- Modbus RTU communication compatible
- Advanced programmable digital I/O interface
- Intelligent control algorithm which dynamically changes the switching frequency to optimize the performance

**BENEFITS**
- Programmable selective harmonics elimination Prevents possible harmonic resonance
- Best accuracy. Does not require detailed network analysis
- Automatic PF compensation, leading as well as lagging, optimum utilization of power capacity and reduction in kVA demand
- Adaptive to increase in harmonics current due to additional loads being added
- More immunity to input voltage distortion
- Overload condition is prevented
- Easy maintenance
- User-friendly operation
- Facilitates networking ability and remote monitoring
- Selective harmonics elimination by digital programming
- Minimum insertion loss resulting in efficient operation
## Electrical

<table>
<thead>
<tr>
<th>Input power source</th>
<th>230/415 VAC, 3-p, 3-Wire, 50 Hz</th>
<th>230/415 VAC, 3-p, 4-Wire, 50 Hz</th>
<th>500/600 VAC, 3-p, 3-Wire, 50 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage ±15% &amp; ±10%, Frequency ±5%</td>
<td>300</td>
<td>600</td>
<td>1500</td>
</tr>
</tbody>
</table>

## Control Functions

### Digital Operation Panel
- 128 x 64 Graphical LCD with backlight LED
- 8-key keypad
- 3-Status indicating LED for Run, Stop, Fault

### Network connectivity
- RS-485 for PC interface with Modbus-RTU protocol and Wi-Fi connectivity as standard (DeviceNet, Profibus DP (Slave), CANopen, Ethernet, ControlNet are optional)

## Protective Specifications

### Protective function
- 1. Over Current
- 2. Adjustable over current
- 3. Timed over current
- 4. DC bus over voltage
- 5. DC bus under voltage
- 6. Over temperature
- 7. Phase loss fault
- 8. Ground fault
- 9. External fault
- 10. Charging fault
- 11. EEPROM fault
- 12. CT Detection fault

## Installation location
- Indoor (consult Amtech for outdoor applications)

## Protective Specifications

### Protection class
- IP 31 (consult Amtech for higher protection requirements)

### Dimensions
- A = 515 X 410 X 975 [20.3 X 16.1 X 38]
- B = 600 X 600 X 1995 [23.6 X 23.6 X 78.5]
- C = 800 X 600 X 2195 [31.5 X 23.6 X 86.4]

### Protection Standard
- IEEE 519-2014, GS/4.1, GB/T 14549-93, IEC 61000-3-2, IEC 61000-3-4, IEC 61000-3-12

### Safety
- IEC 50178

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1. Products for 60 Hz power supply frequency are also available on request.
2. Above 300 A requirement, multiple units will be connected in parallel. Up to 40 units can be connected in parallel. Contact Amtech for any other requirement and more details.
3. The -1N in the part number defines the neutral current capacity equal to the rated filter current; for higher neutral current rating, consult Amtech. This is only applicable for the 3-Phase, 4-Wire system.
4. The -1N in the part number defines the neutral current capacity equal to the rated filter current; for higher neutral current rating, consult Amtech. This is only applicable for the 3-Phase, 4-Wire system.
5. Minimum 3 % line reactor is required in series with higher di/dt load.
6. All performance specifications are valid at nominal ratings.
Applications

Amtech’s Multi-Functional Active Harmonic Filter can compensate for reactive currents of fundamental waves, harmonic currents etc. It finds applications in various scenarios with combination of its multi functions.

- **Intelligent buildings:** Office Automation equipment, air conditioners, lighting, UPS, elevators, pumping facilities etc.
- **Factories:** Crane facilities, press machine, machine tools, high frequency induction heating equipment, inverter-incorporated facilities, printing machines, paper machines etc.
- **Public facilities and others:** City water and sewage pumping facilities, harbor cranes, facilities, crane facilities at waste incineration plants, ropeway hoisting machines, amusement parks etc.

Case Study

Normally 3-Phase large UPS with 6-Pulse rectifier feeds back heavy harmonics current of 30%~40% THD into mains or emergency generator. It can cause line voltage distortion or generator malfunction. Axpert-i-Sine AHF is well adapted to operate with large UPS to perform very low harmonic feedback, generating less than 5% current THD.

We also offer following services related to Power Quality

- Detailed harmonic audit of plants
- Total solution for harmonic mitigation
- Design, supply & commissioning of harmonic filters
- Training on harmonic causes, effects and mitigation technique