AXPERT- i-Sine

MULTI-FUNCTIONAL ACTIVE HARMONIC FILTER

"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.

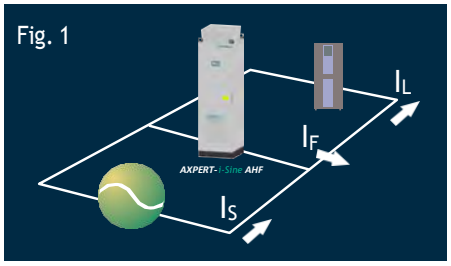
Amtech offers both 3-Phase, 3-Wire as well as 3-Phase, 4-Wire Active Harmonic Filters. Whenever there are single phase non-linear loads like computers, there is an accumulation of triplen harmonic current in neutral. Our 3-Phase, 4-Wire Active Harmonic Filters are the best choice for such applications.

Monitor Continuously - Attenuate Immediately

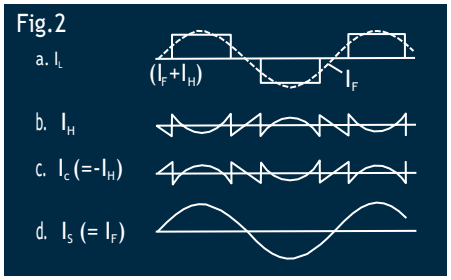
Principle of Harmonics Suppression

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). ($I_L = I_F + I_H$)

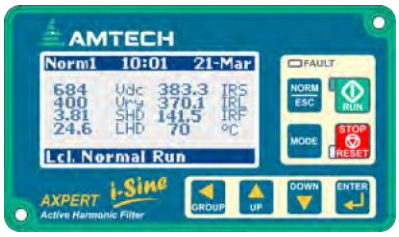


The compensation current I_C of the active filter is controlled, so that its intensity is the same as that of the above-mentioned I_H and its polarity is just reversed ($I_C = -I_H$).
As a result, components of harmonic currents in the load current are cancelled by the effect of active filter and source current I_S remains only to I_F, which is a sinusoidal wave (Fig. 2).
This can be clearly explained by the expression below:
$I_L = I_F + I_H$, $I_C = -I_H$
$I_S = I_L + I_C = (I_F + I_H) + (-I_H) = I_F$



Monitoring & Signaling

Standard Graphical LCD Display



Optional Touch Screen TFT Panel

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

Standard Specifications

Electrical Specifications & Frame size														
Input power source	230/415 VAC, 3-ϕ, 3-Wire, 50 Hz						230/415 VAC, 3-ϕ, 4-Wire, 50 Hz				480/600 VAC, 3-ϕ, 3-Wire, 50 Hz			
	Voltage -15 % & +10 %, Frequency ±5 %													
AMT-AHF-XXX-2/4/5/6-1N [2,3&4]	**030**	**060**	**100**	**150**	**200**	**300**	**060**	**100**	**150**	**200**	**100**	**150**	**200**	**220**
Filter current I_F (Arms)	30	60	100	150	200	300	60	100	150	200	100	150	200	220
Max peak filter current (Apk)	75	145	240	360	480	720	145	240	360	480	240	360	480	530
Heat loss (Watt)	645	1270	2095	3145	4165	6000	1300	2140	3200	4250	3065	4600	6190	7665
Frame Size	A	A	B	B	B	B	B	B	B	B	B	C	C	C
Approximate weight in kg [lb]	80 [176.4]	90 [198.4]	272 [599.6]	280 [617.2]	320 [705.4]	430 [948]	95 [209.4]	280 [617.3]	320 [705.5]	335 [738.5]	275 [606.3]	360 [793.7]	470 [1036]	470 [1036]
Control Functions														
Control method	Digital Fast Fourier Transform with Hysteresis current control													
Harmonic filtering	Harmonics orders up to 51st (Non Zero sequence), Including Zero sequence for 4-Wire configuration													
Harmonic order selection	Global / Selective compensation from 3rd to 51st order with settable amplitude													
Harmonic attenuation ratio [5]	Better than 97 % at rated current													
P.F. improvement / Load balancing	Automatic power factor improvement up to the unutilized capacity of filter/Load balancing between line-to-line													
Max. switching frequency	18 kHz													
Reaction time	78 uSec													
Transient response time	Less than one power cycle													
Operation Specifications														
Digital inputs	5-Programmable sequence inputs, sink / source and Active Close / Active Open selectable													
Digital outputs	4-Programmable sequence outputs, open collector type													
Potential free contacts	3-Programmable relays with 1-NO, 1-NC for 5 A @ 240 Vac | Programmable between 12 different options													
Analog outputs	2-Programmable analog outputs AO1 & AO2: Voltage (0...10) V / Current (4...20) mA with settable Gain, Bias, Min. and Max. scaling													
Soft-charge	Through resistor within 5 seconds.													
Auto start	Yes, AHF can start at power ON condition in local and serial mode.													
Auto restart	Adjustable up to ten times for fault like Over current fault, Timed over current fault, Adjustable over current fault, DC bus over voltage fault, DC bus under voltage fault, Earth fault, Temperature fault, External fault with individual enable or disable.													
Display Indications														
Display and Keypad module	Digital Operation Panel 128 x 64 Graphical LCD with back light LED, 8-Key keypad, 3-Status indicating LED for Run, Stop, Fault Real Time Clock.													
	THD$_V$, Line Frequency, DC bus voltage, PF, DPF, kW, kVA, kVAR, kWH, MWH, V_{LL}													
	Current of Filter / Load / Source side for each phase, THD$_I$ of Load and Source side													
TFT module (optional)	TFT Touch screen graphical display													
	Displays current waveform of Filter / Load / Source side for each phase.													
Communication														
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		7. Phase loss fault											
	2. Adjustable over current		8. Ground fault											
	3. Timed over current		9. External fault											
	4. DC bus over voltage		10. Charging fault											
	5. DC bus under voltage		11. EEPROM fault											
	6. Over temperature		12. CT Detection fault											
Fault history	Last 20 faults with status at time fault occurred stored in memory													
Electronic thermal overload	120 % Overload for 60 Seconds, above 100 % harmonic current is limited by software													
Environment														
Installation location	Indoor (consult Amtech for outdoor applications)													
Type of cooling	Forced Air Cooling													
Ambient temperature	-15...45 °C (5...113 °F), contact AMTECH for higher ambient temperature requirements.													
Storage temperature	-20...70 °C (-4...158 °F)													
Audible noise	< 72 dB @ 1m (3 ft)													
Altitude (above sea level)	1000 m (3300 ft)													
Humidity	0...95 % maximum, non condensing													
Mechanical Specifications														
Color	RAL 7035													
Protection class	IP 31 (consult Amtech for higher protection requirements)													
Frame size (W x D x H in mm [inch])	Wall/Floor mounting, A = 515 X 410 X 975 [20.3 X 16.1 X 38], Floor mounting, B = 600 X 600 X 1995 [23.6 X 23.6 X 78.5] Floor mounting, C=800 X 600 X 2195 [31.5 X 23.6 X 86.4]													
Reference Standard														
Harmonic	IEEE 519-2014, G5/4-1, GB/T 14549-93, IEC 61000-3-2, IEC 61000-3-4, IEC 61000-3-12													
Safety	IEC 50178													

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 -2 is for 230 V, - 4 is for 415 V, -5 is for 480 V and -6 is for 600 V input supply.
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. Panel plinth height is not included in above dimension table. Standard plinth height is 200 mm for A and 100 mm for B & C dimensions.
7. All models have bottom cable entry and front access.
8. All performance specifications are valid at nominal ratings.

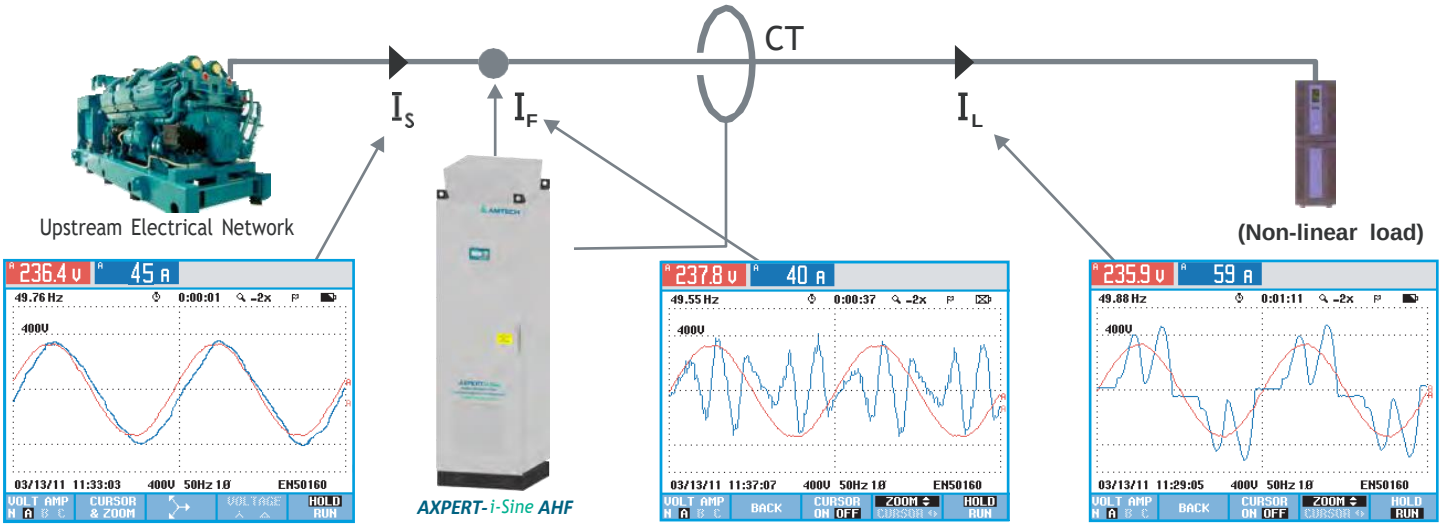
Applications

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

AMTECH

AMTECH ELECTRONICS

DRIVE FOR SUCCESS

Specifications in this catalog are subject to change without notice

CAT.NO. : AEIL/AHF/03-22