



Liebert® AF3

Next Generation
Active Harmonic Filter





We helped some of the largest names in the industry bring new capacity online faster and at a lower cost when search and social media increased demand for storage and computing.



We were the first to introduce an integrated enclosure system to distributed networks.



Our portfolio spans power, thermal and infrastructure management products, software and solutions.

Protecting your critical technologies takes more than just great software and equipment. It takes a level of experience that only comes from years of finding solutions when the industry needed them most. We were the first to protect mainframes with precision cooling systems.



And now as challenges and demands grow, we continue to find better ways to help you strengthen your most vital applications. Formerly the Network Power business of Vertiv, we've brought together the most trusted and experienced names in critical infrastructure.



Complemented by a network of nearly 250 service centers worldwide. It's a combination of experience and resources that allow us to better adapt to what's needed, anticipate what's next and continue to find solutions in ways other companies simply can't.

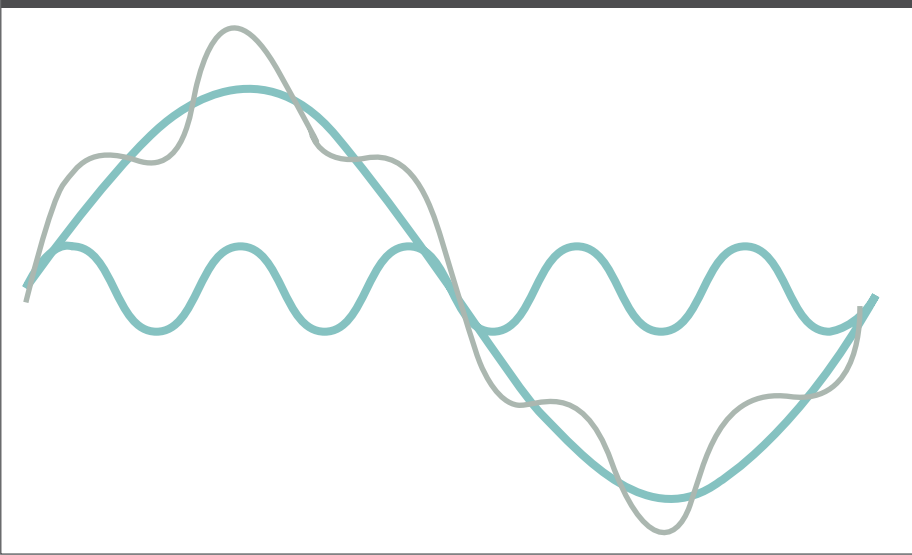


You Need To Be Aware Of Harmonics

During the last few years industries has witnessed an increasing awareness of clean power, power system harmonics and associated problems in low-voltage systems, both in power utilities and consumer segment. Harmonics being one of the major contributors of poor power quality, a better understanding is essential to minimize it's effects.

What are Harmonics?

Fundamental - 5TH Harmonic Waveform



Harmonics are periodic, sinusoidal & integer multiples of fundamental frequency (50 or 60Hz), current or voltage components, present in nonsinusoidal waveform.

It distorts pure sinusoidal waveform and turns it to a non-sinusoidal waveform.

Harmonics can only be measured by electronic measurement devices

Effect of Harmonics:

- Overheating of Generator, motor, transformer.
- Overvoltage conditions on supply system.
- Increased transformer losses (need to over-size)
- Nuisance tripping of circuit breakers
- Improper operation of microprocessor-based equipment
- Overheating and possible resonance with capacitors
- Re-injection of harmonic currents into the utility network.
- Neutral burnout.
- Insulation breakdown.
- Decreasing Distribution Capacity due to hot cables.

Which Equipment in your facility is responsible?

Harmonics are the by-products of Modern facilities and Electronic equipment.

These are often called non-linear loads.

Examples of such loads are:

- Servers, Computers, PCs, Printers and other IT Equipment (Having Switch Mode Power Supplies)
- Controlled Rectifiers, Battery Chargers, Uninterrupted Power Supply (UPS) systems
- Phase controlled AC voltage regulators
- Compact Fluorescent Lamps, Fan regulators
- Traction Equipment
- Arc Furnaces or Induction Furnaces, Welding Machines
- Adjustable Speed AC and DC Variable speed motor drives
- PLC, DCS and SCADA systems (SMPS)
- Solid State Heater Controls
- HVDC sending and receiving end equipment





Operating Principle

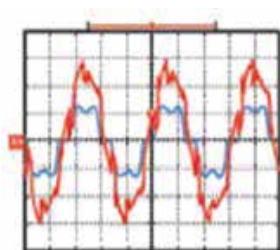
Liebert AF3 latest technology to eliminate harmonic injected into the mains supply by non linear loads, as well supplies inductive power demanded by the load, so as to correct input power factor to near unity.

Current harmonic elimination is achieved by sensing load current & extracting harmonic current signal. This and the reactive current signal, together are used to generate a reference for the controlled current source connected at the PCC(point of common connection) of source and load. This results in mains supplying only real power for the load and reactive & harmonics being sourced from the AF3. This is carried out dynamically, so that any change in the load pattern or its nature is immediately responded without any manual intervention.

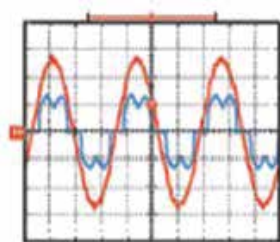
In the following example first figure shows the recorded input current waveform of a six pulse thyristorised rectifier.

Bottom figure shows considerable improvement in the waveform due to AF3 connected in shunt.

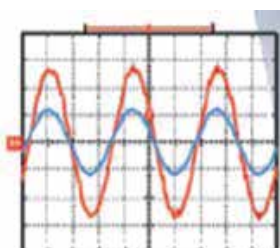
One is with only harmonic correction and the other is with power factor & harmonic correction.



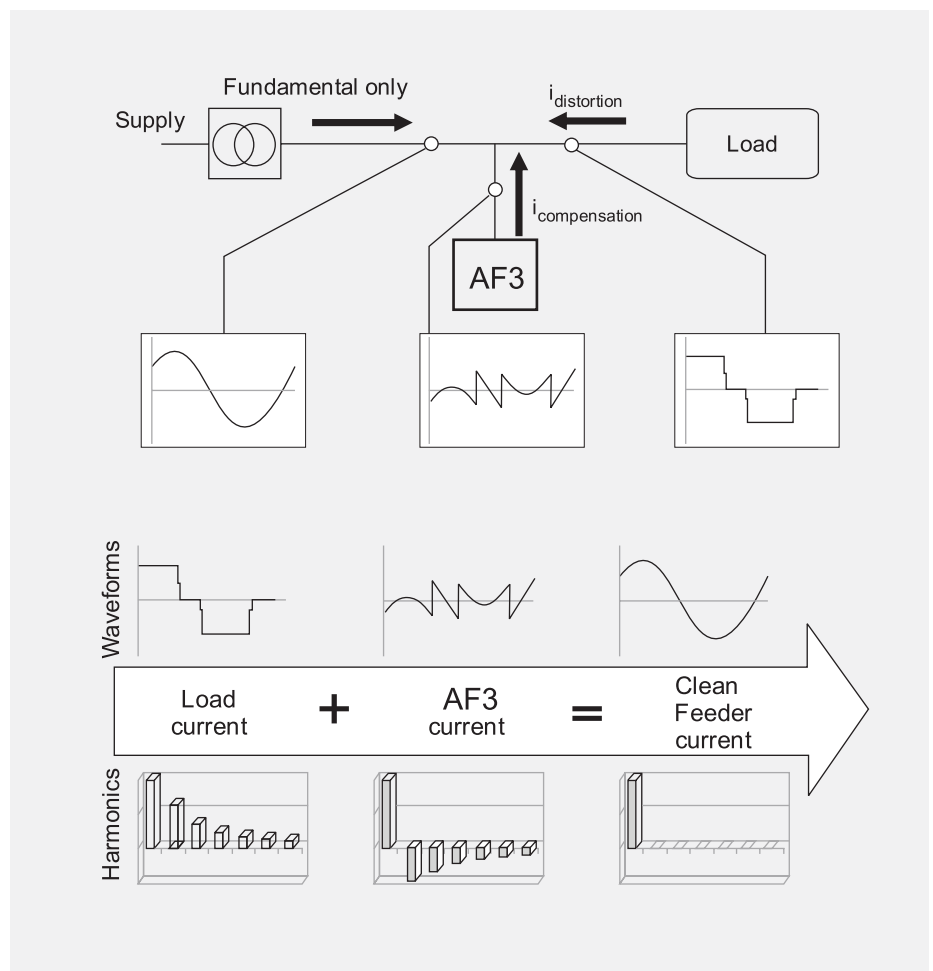
Without Active Filter
THDi = 27.4% PF = 0.87



Only Harmonic Correction
THDi = 4.0% PF = 0.92



PF+Harmonic Correction
THDi = 5.0% PF = 0.99



FEATURES

- Synchronous Rotating Reference Frame principle
- 32 bit, DSP control
- PF compensation, leading as well as lagging
- Employees high speed IGBTs in power circuit
- Internal CAN Communication
- Closed loop active filter with source current sensing
- Programmable selective harmonic elimination
- Required PF can be set from 0.7 to unity
- Selection between PF and harmonic compensation
- Remote monitoring and diagnosis
- Self current limiting, under overloading condition
- Automatic current limit modification with respect to ambient temperature
- Alarm log with date and time stamp for fault diagnosis.
- User friendly PC Interface
- CE marking for 60A, 150A

VALUE TO CUSTOMER

- Improves reliability of the electrical system, reduces cable and transformer losses.
- Better utilization of distribution Transformer & Generator
- Increases efficiency, capacitor life, PF, uptime.



Ratings Available

30, 60, 100, 150, 200 & 300 A

Liebert AF3 is a state-of-the-art active filter that dynamically cleans up the harmonics and improves the power factor for all types of electrical installations. It comes with dynamic control features and has no resonance effects, no reactive power circulation, and no passive components.



Freedom from Harmonic Pollution

Application area: At the input side of Rectifier, AC Drive#, UPS, and PF Compensation.

Harmonic & PF Compensation

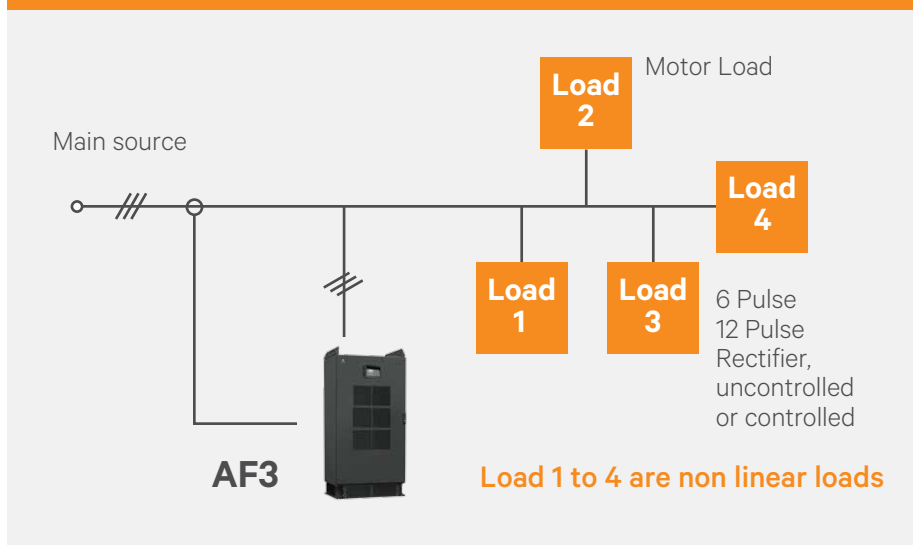
- To reduce harmonics and improve the power factor of UPS, Rectifiers, AC & DC Drives# etc.
- To improve PF of motor loads (i.e., inductive loads).
- Can be used at the output of UPS, to reduce harmonic effects on UPS and increase available capacity. The UPS will supply only fundamental and active power.
- Can be used as Hybrid filter i.e., it can be used along with passive filter and capacitor filter, resulting in reduction of cost and rating of active filter.
- A single unit can be used at the input of multiple UPS.

Remote monitoring & Diagnosis

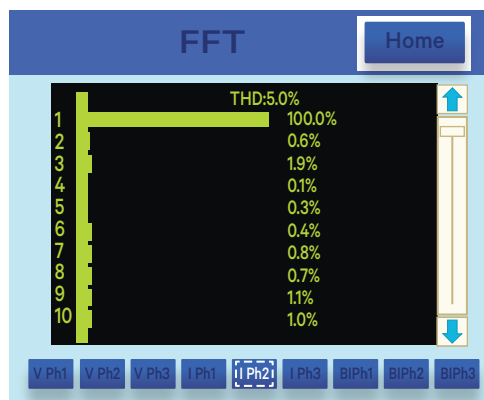
- All front display parameters including wave forms can be monitored through PC.
- Supports MODBUS protocol.
- Potential free contacts for monitoring the status of filter.
- Inbuilt Ethernet based TCP/IP, HTTP, SNMP Support*.

*optional

At the source input



Contact Application / Technical Team for this type of load and it's ITHD compensation



ITHD INPUT CURRENT

Graphic display

- Harmonic spectrum up to 64th harmonic of line current.
- True measurement of line voltage, current, kVA, kW, pf.
- Waveform showing real time display visual of line current and voltage.
- Harmonics and pf configuration.

SPECIFICATION

Model	AF3 30	AF3 60	AF3 100	AF3 150	AF3 200	AF3 300
Input Voltage range	400 V, 3 Ph + N (+10%, - 15%)					
Input Frequency range	50 Hz (±10%) (60 Hz, Optional)					
Phase / Wires	3 Phase 4 Wire, (3 Phase, 3 Wire optional)					
Compensation Current Capacity	30 A	60 A	100 A	150 A	200 A	300 A
Harmonic Filtering	Non-zero Sequence 2 nd to 50 th Harmonic compensation (Any 20 Harmonics individually selectable) Attenuation ratio up to 96 %					
Power Loss in filter @ nominal voltage and rated current	< 1000 W	< 2200 W	< 3600 W	< 5100 W	< 7200 W	< 7200 W
Enclosure Protection	IP 30 (IP 40/41 optional)					
Approx Weight	120 kg	180 kg	285 kg	285 kg	600 kg	600 kg
Colour [#]	RAL 7021					
Installation	Floor / Wall mounted	Floor mounting				
	Cable entry from Bottom, Front Side (top entry optional)					
Acoustic Noise Level	< 65 dBA @ 1.0 meter (Ref. ISO 3746)				<72dBA	<72dBA
Operating Temperature	0 to 40°C					
Relative Humidity	Upto 95% (Non-condensing)					
Interface (Optional)	Remote monitoring through MODBUS, SNMP, Web Browser, Ethernet based monitoring through AHFMON					
Reference Standards	Meets IEEE 519 for compensated harmonic. IEC / EN 62040-2 Category C3, EN 50178					
Potential free contacts	Filter Trip and Filter ON					
Dimensions in mm (W x D x H) + Plinth	600 x 350 x 800 + 100	800 x 600 x 1000 + 150	800 x 600 x 1600 + 150	800 x 600 x 1600 + 150	1200 x 900 x 1600 + 150	1200 x 900 x 1600 + 150
Current Transformer	500A:5A 15 VA, Class 1 with short link	1000A:5A 15 VA, Class 1 with short link	3000A:5A 15 VA, Class 1 with short link	3000A:5A 15 VA, Class 1 with short link	3000A:5A 15 VA, Class 1 with short link	3000A:5A 15 VA, Class 1 with short link

Note : Consider AF3 N model (available up to 200A) for Zero Sequence triplen harmonic compensation. Please contact Technical Support Group.
- Specifications subject to change without prior notice.

For other colour, please contact sales representative



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