

# ENERSINE™ APF

## THE NEW GENERATION OF COMPACT ACTIVE FILTERS FOR HARMONICS & REACTIVE CURRENT COMPENSATION

- ✓ **3-Level IGBT with DSP control**
- ✓ **No risk of harmonic resonance**
- ✓ **Significantly reduce the voltage waveform distortion**
- ✓ **Reduce voltage drop and temperature rise on transformers & cables**
- ✓ **Improve Power Factor**

### ESP-34W APF



Wall-Mount System

#### ESP-34W APF Key Features

- High Density and Scalable System Architecture.
- Universal Voltage: 400V or 480V or 208V (with transformer)
- Harmonic compensation for 3-wire or 4-wire system selectable

#### Powerful Performance

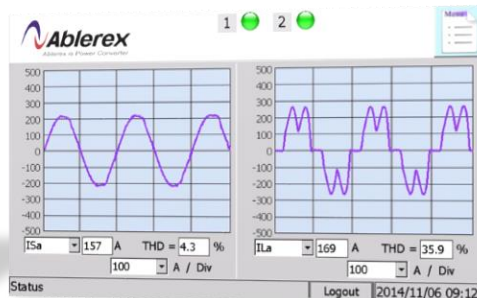
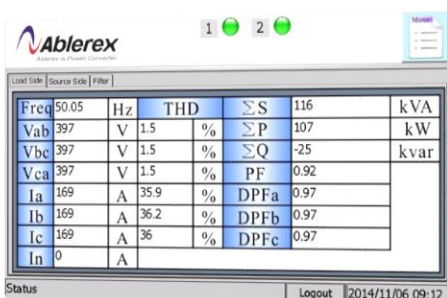
- Eliminates harmonics current from 2<sup>nd</sup> to 51<sup>st</sup> order.
- Close / Open Loop Selectable Control.
- Ultra-fast response to load changes within 1 microsecond.
- Load balancing between phases and unload neutral wire.
- Programmable Harmonics Compensation and Power Factor Correction.

#### Expandable Capabilities

- Easy upgradable without extra accessories.
- Same or Different rated current filter system can be wired in Parallel with common coupling CT.

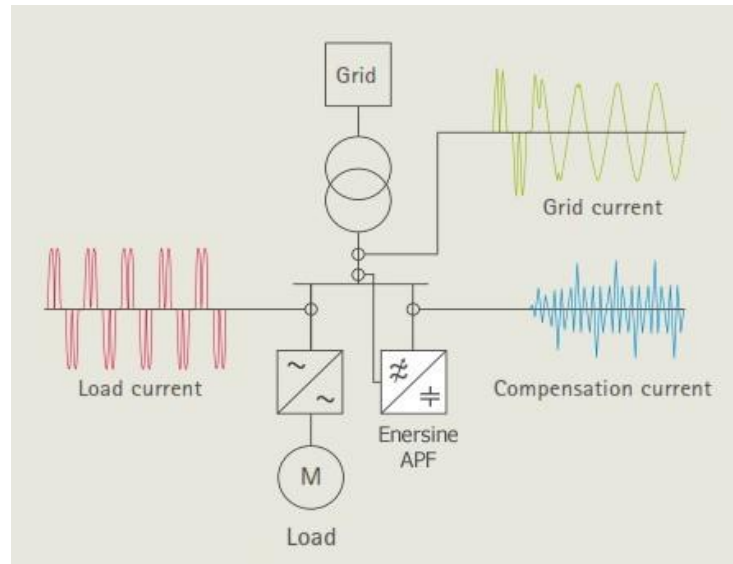
#### Intuitive Human Machine Interface

- HMI utilizing 7inch Coloured LCD Touch Screen for advanced control and monitoring.
- Clear menu structure and display data in both tables and diagrams.
- Export and archive event logs to SD memory card.
- Intuitive operation and password protection.
- Waveforms are displayed side by side making it easy to compare and identify sinusoidal current and output current of the active filter.



## Operating Principle

Enersine™ APF measures and monitors the entire load current through external auxiliary coupling current sensing transformers (CT) mounted on the AC line, removes the fundamental frequency component and injects opposite phase harmonic current to cancel harmonic current in the electrical distribution system.



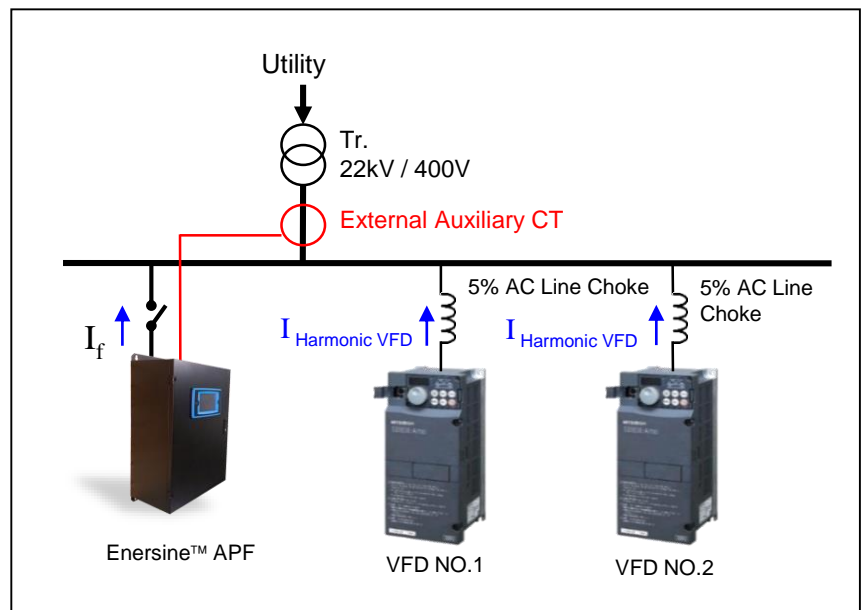
## Numerous Connection Options

External auxiliary coupling current sensing transformers (CT) are the essential components in all active filter applications and generally all Active Filters are classified as source sensing or load sensing types depending on the point of coupling of the auxiliary CT.

Enersine™ APF is designed to have selective CT sensing configurations and numerous connection options. Different rated current of Enersine™ APF can be wired in parallel while connecting to the common external auxiliary coupling CT.

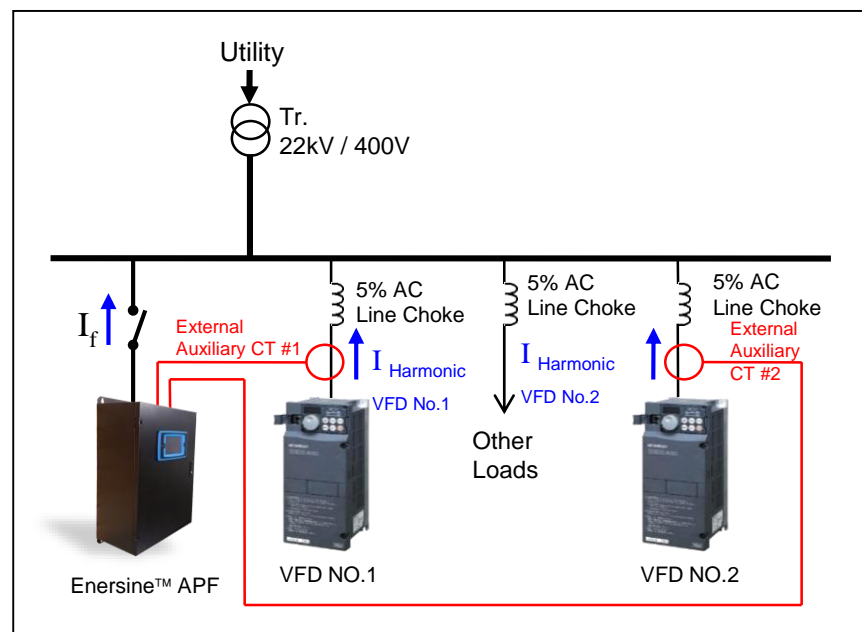
### SOURCE SENSING (Close Loop)

Source-sensing require the external auxiliary CT to be coupled at the input supply source common to both the active harmonic filter and the harmonic generating equipment.



### LOAD SENSING (Open Loop)

Load-sensing require the external auxiliary CT to be located nearest to the point of common coupling in the direction of the harmonic generating equipment.



## Compact & Extendable Architecture

### Space-saving high density wall-mount design

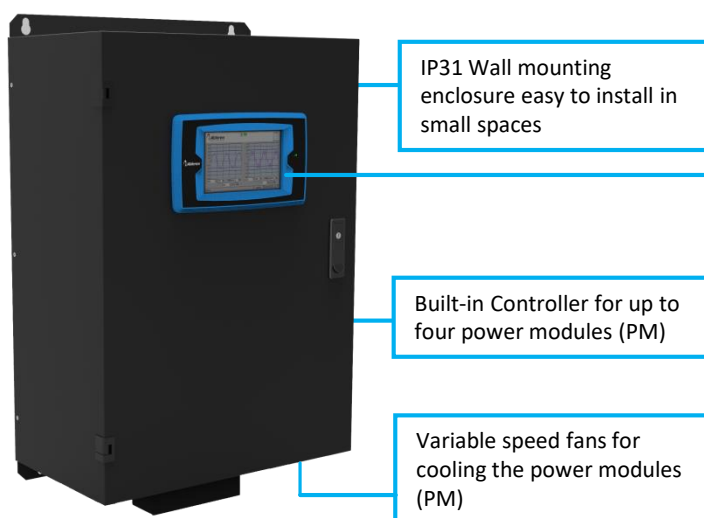
Like all Enersine™ APF series, the compensation power electronics are packed in compact enclosed modules with forced air cooling designed for wall-mount installations where space is at a premium and harmonic mitigation current is high.

These ESP-34W power modules (PM) each 35A<sub>RMS</sub>, 60A<sub>RMS</sub>, 90A<sub>RMS</sub> rated and extendable, can be easily installed in small and confined areas, as well as the required “out of reach” locations.

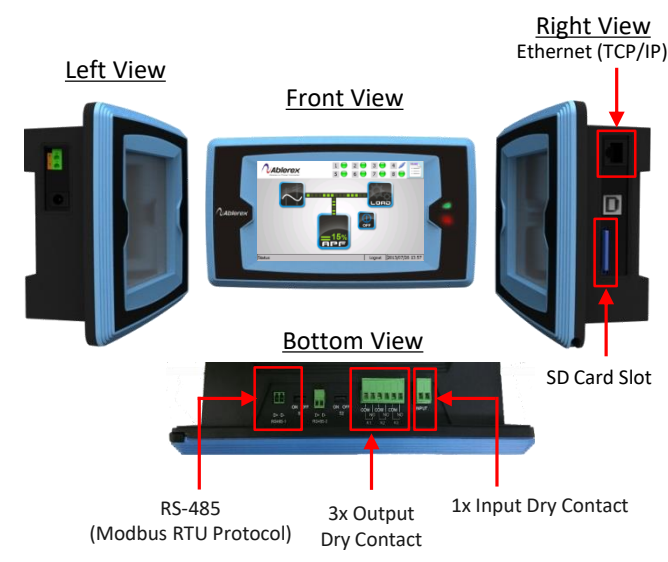
Each power modules is fully HMI integrated with built-in controller is capable of compensating harmonics and phase displacements independently. Remote monitoring using Building Management System (BMS) via Modbus over RS485 RTU or Ethernet interface is available. Commissioning and maintenance can be easily performed with a laptop and Ethernet port.

High density design allow these modules to connect in parallel to achieve higher compensation power.

ESP-34W Power Modules with HMI and Controller Built-in



7inch Coloured LCD Touch Screen HMI with direct access and control of APF parameters, status and waveforms.



## Extendable Capabilities

### Connect in parallel to achieve higher Rated Current

Featuring a nominal compensation of 60A<sub>RMS</sub> and 90A<sub>RMS</sub>, higher compensation power can be easily attained by paralleling additional power modules (PMs).

This is particularly useful when considering future expansion or changes to the electrical networks which increases harmonics levels and requiring greater harmonic mitigation current.

Parallel up to 4 units of 90A modules to achieve 360A

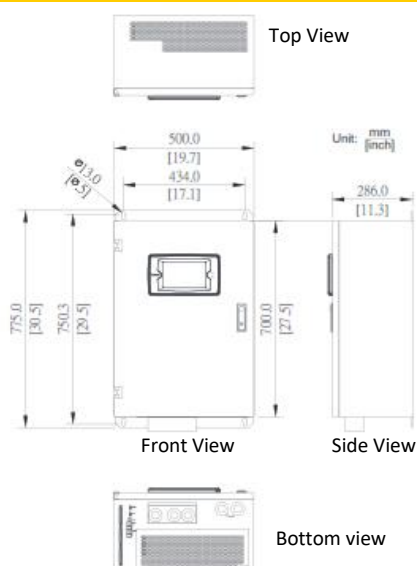


- Easy parallel up to 4 wall mounted power modules per system.
- Rated current can be extended up to 360A Filter Systems.
- 3-Level IGBT DSP control with Low losses.
- Dynamic compensation of reactive power, harmonics, and flicker, as well as load balancing in one system.

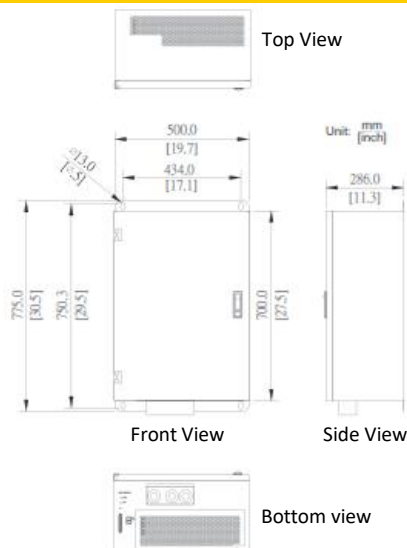
MODEL	ESP34W-35	ESP34W-60	ESP34W-90
Maximum Compensating Current Per Phase*	35A <sub>RMS</sub> (per power module)	60A <sub>RMS</sub> (per power module)	90A <sub>RMS</sub> (per power module)
Maximum Neutral Compensating Current	3 times of Phase Current (400V version only)		
Maximum Scalable Current Per Phase	35A <sub>RMS</sub>	240A <sub>RMS</sub>	360A <sub>RMS</sub>
Voltage Tolerance	400V or 440V +15% / -20% , 480V +10% / -20% (208V and other Voltages available with transformer)		
Phase/Wires	3 phase 3 wires or 4wires selectable for 400V version. 3phase 3 wires only for 440V and 480V version		
Nominal Frequency	50/60Hz ± 5% (Auto Sensing)		
Compensated Harmonic Orders	Global Mode: From 2 <sup>nd</sup> to 51 <sup>st</sup> order, including Even orders Selective Mode : Up to 30 orders simultaneously		
Power Factor Correction (Reactive Current)	Power factor correction is programmable from 0.6 lagging to 0.6 leading		
Load Balancing	Both phase to phase and phase to neutral		
Programmable Filtering Mode	<ol style="list-style-type: none"> <li>1. Harmonic compensation only.</li> <li>2. Power Factor (Reactive Current) compensation only</li> <li>3. Harmonic compensation priority + Power Factor compensation</li> <li>4. Power Factor compensation priority + Harmonic compensation</li> <li>5. Harmonic compensation priority + Power Factor compensation + Load Balancing</li> </ol>		
CT Ratio	Programmable Primary Current: 100A~10000A Programmable Secondary Current: 1A/5A		
CT Location	Programmable: Source Side: Close Loop Control or Load Side: Open Loop Control		
Response Time	Harmonic Compensation <1ms , Reactive Current Injection <20ms		
Inrush Current	Less than rated current		
Current Limitation	Yes, at full correcting		
Maximum Heat losses	≤5% at full capacity		
Compensation Ratio	10:1 typical		
Power Electronics	3-Level IGBT Technology with DSP control		
Cooling	Forced air cooling with speed-controlled fans		
Noise Level	< 65 dBA		
Interfaces	Ethernet (TCP/IP), RS-485 (Modbus RTU Protocol), USB, 3x Output Dry Contact and 1x Input Dry Contact, 1x EPO		
Environment	Indoor installation in clean environment up to 1000m altitude (higher altitudes with suitable derating).		
Operating Ambient Temperature	0°C to 40°C (Up to 50°C with suitable derating)		
EMC Class Compliance	EN 61000-6, EN 55011, Class A1, IEC 61000-3, EN 61000-4		
Safety & Design Standard	Complies to EN 50178, EN 60146		
Power Module Dimension (WxDxH)	500 x 286 x 775 mm (with HMI and built-in controller)		
Protection Index	IP31, other IP options available upon request		

*\*the current rating may be derated automatically depending on load conditions for ambient temperature higher than 30 degree C.*

Enersine™ ESP-34W Power module with HMI and controller built-in Dimension Overview



Enersine™ ESP-34W Power module Dimension Overview



Designed & Engineered by:

