

POWER QUALITY SOLUTIONS:  
ACTIVE HARMONIC FILTERS

# ACTIVEmatic FA40

New Series

# ICAR: products and solutions

Founded in 1946, ICAR is a leading manufacturer of capacitors and power factor correction systems in low and medium voltage; it controls with its own companies all production phases: the polypropylene/paper film, metallization, winding, manufacturing of the finished product.

The entire process is checked in order to obtain a product of high quality level that guarantees its functioning even in the most burdensome plant configurations.

The ICAR Group has 6 plants, all located in Europe.

For details on the individual families, download the full catalogs on the website, [www.icar.com](http://www.icar.com). Here are all equipment and the solutions ICAR proposes.



LV Bank for power factor correction



MV Capacitors and power factor correction systems



Power electronics capacitors



Active filters



LV voltage stabilizers



EMI RFI filters



Motor run capacitors



Capacitors for energy storage and rapid discharge



Lighting capacitors



Reactors and LV/LV special transformers



# Our Power Quality Services

For many companies, the electricity is an important cost element, and a part of the amounts is due to the consumption of reactive energy and poor Power Quality.

With proper assistance and maintenance you can avoid wasting money and unnecessary power dissipation in the electric plant cables and transformers that undergoes premature aging.



Startup and  
commissioning



Make your own  
measurement  
and let us know



Scheduled  
maintenance



Power Quality  
Assessment



Power Quality  
analysis for specific  
issues, including  
ongoing analysis

# ACTIVEmatic FA40

Loads operated by electronic devices are increasingly adopted in more and more industrial and commercial applications such as: Variable Speed Drives, rectifiers, UPS systems, DC power supplies, welding machines, computers, TV, energy efficient lamps, photocopiers. These loads generate waveform distortions that become threat for network components.

In particular voltage and current harmonics, where the latter is the more dangerous, generate a series of problems, like:

- Cable overheating
- Undue tripping of circuit breakers
- Blowing of fuses
- Capacitor overloading and network resonance
- Neutral cable overload
- Transformer premature ageing
- Electronic appliances disturbance.

These effects are seldom related to harmonic current and voltage distortion, while effective remedy for harmonics are passive and active filters.

Active filters achieve much higher levels of efficiency in harmonics cleaning the first does not.

ICAR has developed the ACTIVEmatic FA40 ACTIVE HARMONIC FILTER to combine a high level of efficiency with flexibility of installation.

## What an active filter can do?

Active harmonic filter, pulse invert for current or voltage injection:



**Harmonic current compensation**



**Reactive power compensation**



**Load balancing**



**Flicker compensation**



Modular design permits to be prepared for future power requirements: up to 5 module of 60A in each cabinet.



# Main features

ACTIVEmatic FA40 ACTIVE HARMONIC FILTER is a solid-state power converter which measures the harmonics current generated by the non-linear load.

It generates opposite phase shifted harmonics current of the same amplitude, and so it cancels the loads harmonic current and then obtains a sinusoidal current in the utility, also improving power quality and compensating unbalanced currents.

**Harmonic compensation** up to 50th harmonic, individually selectable.

**Modular system extendable** (from 60A to 600A) permits low life cycle costs and low losses.

**Easy installation & commissioning**, touch screen interface with installation assistant.

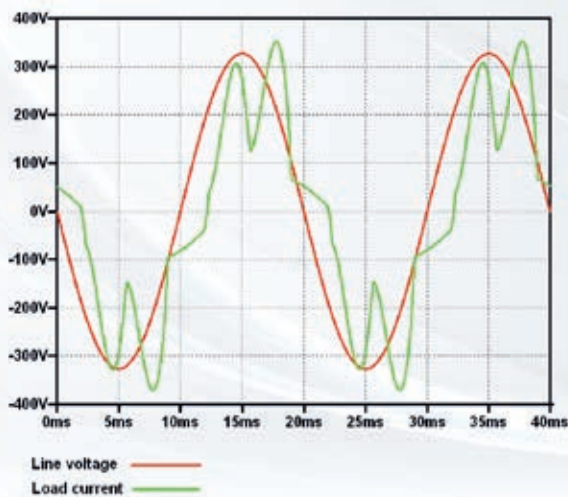
**Highest performance:** reaction time < 21 $\mu$ s, very fast steady state time < 300  $\mu$ s.

**Less power dissipation** due to 3 level NPC topology: low loss < 15 Watt / Amp.

**Flicker compensation.**

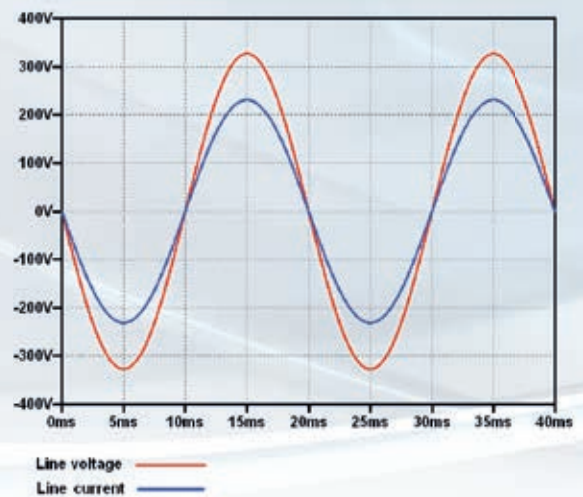
## WITHOUT ACTIVE FILTER FA40

Harmonic disturbances caused by e.g. non linear loads.



## WITH ACTIVE FILTER FA40

Harmonic oscillations are actively compensated.



# Advantages of 3-level NPC topology

## The FA40 series range operates on the basis of a 3-level Neutral-Point-Clamped (NPC) topology circuit.

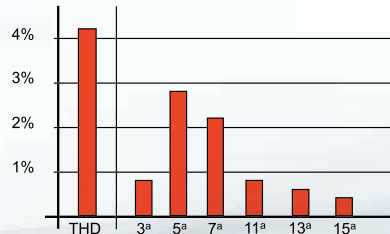
This topology can produce three voltage levels at the output: the DC bus plus voltage, zero voltage and DC bus negative voltage. The two-level topology can only connect the output to either the plus bus or the negative bus.

## Main advantages of the 3-level NPC topology:

- **Lower losses:** only half of the voltage has to be switched, thus reducing the switching losses in the transistor. Three-level solutions are characterized by reduced circuit losses and higher efficiency
- **Smaller output current ripple:** the NPC 3-level topology has a lower ripple in the output current and half of the output voltage transient thanks to a higher quality output voltage. This improves performance and reduces the internal filter requirement.

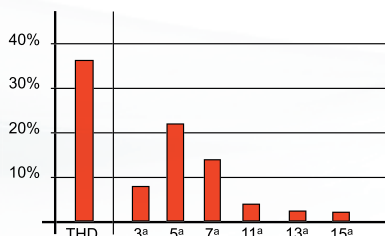
## Without Active Filter FA40

Sensitive load voltage distortion



Sensitive load  
(eg. office computers)

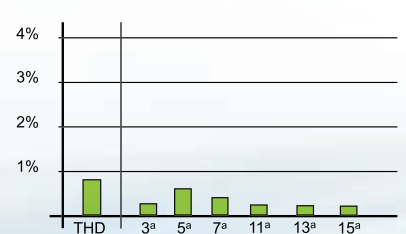
Current distortion  
due to non-linear load



Non-linear load  
(eg. welding machine, crane)

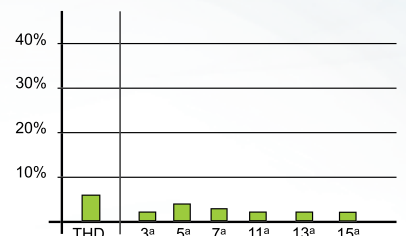
## With Active Filter FA40

Residual voltage distortion



Sensitive load  
(eg. office computers)

Residual current distortion  
with active filter



ACTIVEmatic  
FA40

Non-linear load  
(eg. welding machine, crane)

# ACTIVEmatic

## Application fields

As the Power Electronic operated loads are widely used in any field of energy consumption, the need for Active Harmonic Filtration is spreading in Industrial as well as Private and Tertiary applications.

The flexibility of ACTIVEmatic compensation allows their selection and implementation even at the design stage, without knowing the actual load profiles.

ACTIVEmatic can also efficiently compensate harmonic currents along with other Power Quality devices, such as Power Factor Correction Banks and Voltage Stabilizers, that ICAR makes and offer as a comprehensive package.

- Variable Speed Drives
- (UPSs) Uninterrupted Power Supplies
- Building automation
- Welding
- Tunnel ventilation
- Data centers
- Marine propulsion
- Large elevators and cranes
- Oil and gas
- Wind turbines
- Paper mills
- Steel industry
- Cement industry
- Automotive industry
- Water treatment.

The awareness of harmonic pollution consequences, is leading Energy Authorities in many countries to rule the maximum and allowed harmonic pollution generated by Energy Users; consumers are then led to monitor, to keep under control, and offer to take measures to respect limits and avoid penalties.

ACTIVEmatic is a valid remedy to improve power quality in most of the critical parameters.

The following standards applies for harmonics limits in electric networks:

EN 61000-2-2, EN 61000-2-4, EN 61000-3-2,  
EN 61000-3-12, EN 61000-3-3, IEEE STD 519-2014.





# Technical Characteristics FA40



## TECHNICAL CHARACTERISTICS:

Main voltage:	Ue=200V - 480V $\pm$ 10%
Rated frequency:	50Hz / 60 Hz $\pm$ 3Hz
System input / number of phases:	3 phases 3 or wires or 3 phases 4 wires
Main network distribution:	TN or TT
Harmonic compensation:	Up to 50°, individually selectable
Reactive power factor compensation cos $\phi$ :	- 0.7 $\div$ - 0.7
Dynamic load balancing between phases:	prevents neutral overloading
Rated current:	60 A for each module
Parallel units:	Up to 5 in the same cabinet, 300 A total
Response time:	< 200 $\mu$ s
Overload capability:	2.5 In (x 10ms)
Cooling type:	air cooled system
Ambient temperature:	-10°C to +45° C full performance, derating up to 55°
Relative Humidity:	<95%, non condensing
Altitude:	2000 m without derating, 4000 m max with derating
Switching frequency:	24 kHz
Inverter topology:	3 levels IGBT switch for low losses
Controller topology:	Floating point 32 bit DSP and FPGA integrated; selective direct control algorithm
Current limitation:	nominal current
Highest safety and reliability	including protections against overload, shortcircuit, overheating, overvoltage and undervoltage
Grid resonancy detection	with blocking resonancy currents
Current transformers:	n° 3 rated from 100A/1A to 2500A/1A (not supplied)
Protection degree:	IP43 for floor mount cabinet, IP 20 for wall mount version, IP 54 optional for floor mount
User interface:	7" display touch screen unit for commissioning and monitoring. Includes Ethernet interface
Certificates:	CE, ROHS
Cabinet color:	RAL 7035 (floor mount), RAL XX (wall mount)

## Wall-mounted panels

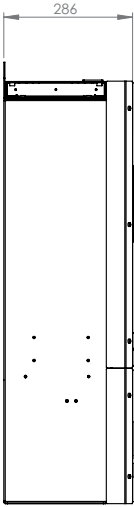
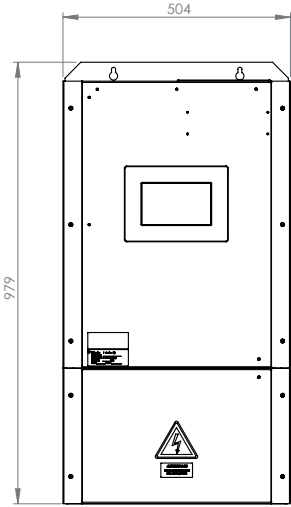
Part number	Description	Compensation Current [A]			Working Voltage [V] (50Hz/60Hz)	Losses [W]		
		Wires	Phase	Neutral		Full load	Stand by	Weight [kg]
FA43W060XXA0000	ACTIVEmatic FA43 W 60A - 3 wires	3	60		200 V ... 480 V ( $\pm$ 10%)	900	50	96
FA43W120XXA0000	ACTIVEmatic FA43 W 120A - 3 wires	3	120		201 V ... 480 V ( $\pm$ 10%)	1800	100	160
FA44W060XXA0000	ACTIVEmatic FA44 W 60A - 4 wires	4	60	180	200 V ... 415 V ( $\pm$ 10%)	900	50	96
FA44W120XXA0000	ACTIVEmatic FA44 W 120A - 4 wires	4	120	360	200 V ... 415 V ( $\pm$ 10%)	1800	100	160

## Floor-mounted panels

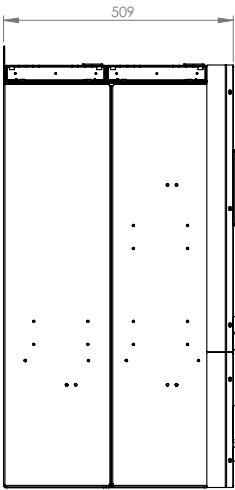
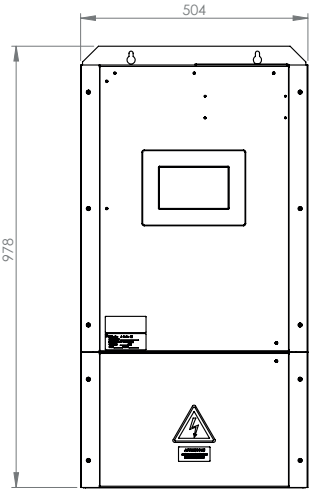
Part number	Description	Compensation Current [A]			Working Voltage [V] (50Hz/60Hz)	Losses [W]		
		Wires	Phase	Neutral		Full load	Stand by	Weight [kg]
FA43F060XXA0000	ACTIVEmatic FA43 F 60A - 3 wires	3	60		200 V ... 480 V ( $\pm$ 10%)	900	50	95
FA43F120XXA0000	ACTIVEmatic FA43 F 120A - 3 wires	3	120		200 V ... 480 V ( $\pm$ 10%)	1800	100	158
FA43F180XXA0000	ACTIVEmatic FA43 F 180A - 3 wires	3	180		200 V ... 480 V ( $\pm$ 10%)	2700	150	410
FA43F240XXA0000	ACTIVEmatic FA43 F 240A - 3 wires	3	240		200 V ... 480 V ( $\pm$ 10%)	3600	200	470
FA43F300XXA0000	ACTIVEmatic FA43 F 300A - 3 wires	3	300		200 V ... 480 V ( $\pm$ 10%)	4500	250	530
FA44F060XXA0000	ACTIVEmatic FA44 F 60A - 4 wires	4	60	180	200 V ... 415 V ( $\pm$ 10%)	900	50	96
FA44F120XXA0000	ACTIVEmatic FA44 F 120A - 4 wires	4	120	360	200 V ... 415 V ( $\pm$ 10%)	1800	100	160
FA44F180XXA0000	ACTIVEmatic FA44 F 180A - 4 wires	4	180	540	200 V ... 415 V ( $\pm$ 10%)	2700	150	413
FA44F240XXA0000	ACTIVEmatic FA44 F 240A - 4 wires	4	240	720	200 V ... 415 V ( $\pm$ 10%)	3600	200	474
FA44F300XXA0000	ACTIVEmatic FA44 F 300A - 4 wires	4	300	900	200 V ... 415 V ( $\pm$ 10%)	4500	250	535



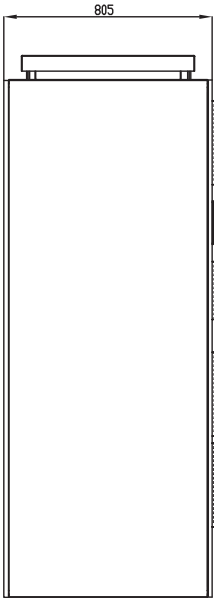
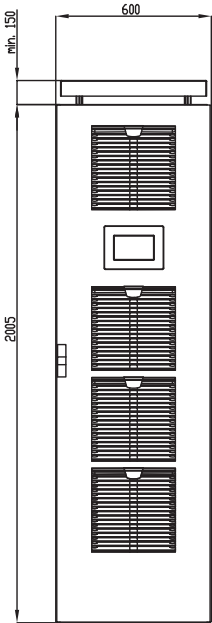
# Drawings



ACTIVEmatic wall mounted 60A



ACTIVEmatic wall mounted 120A



ACTIVEmatic floor mounted



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