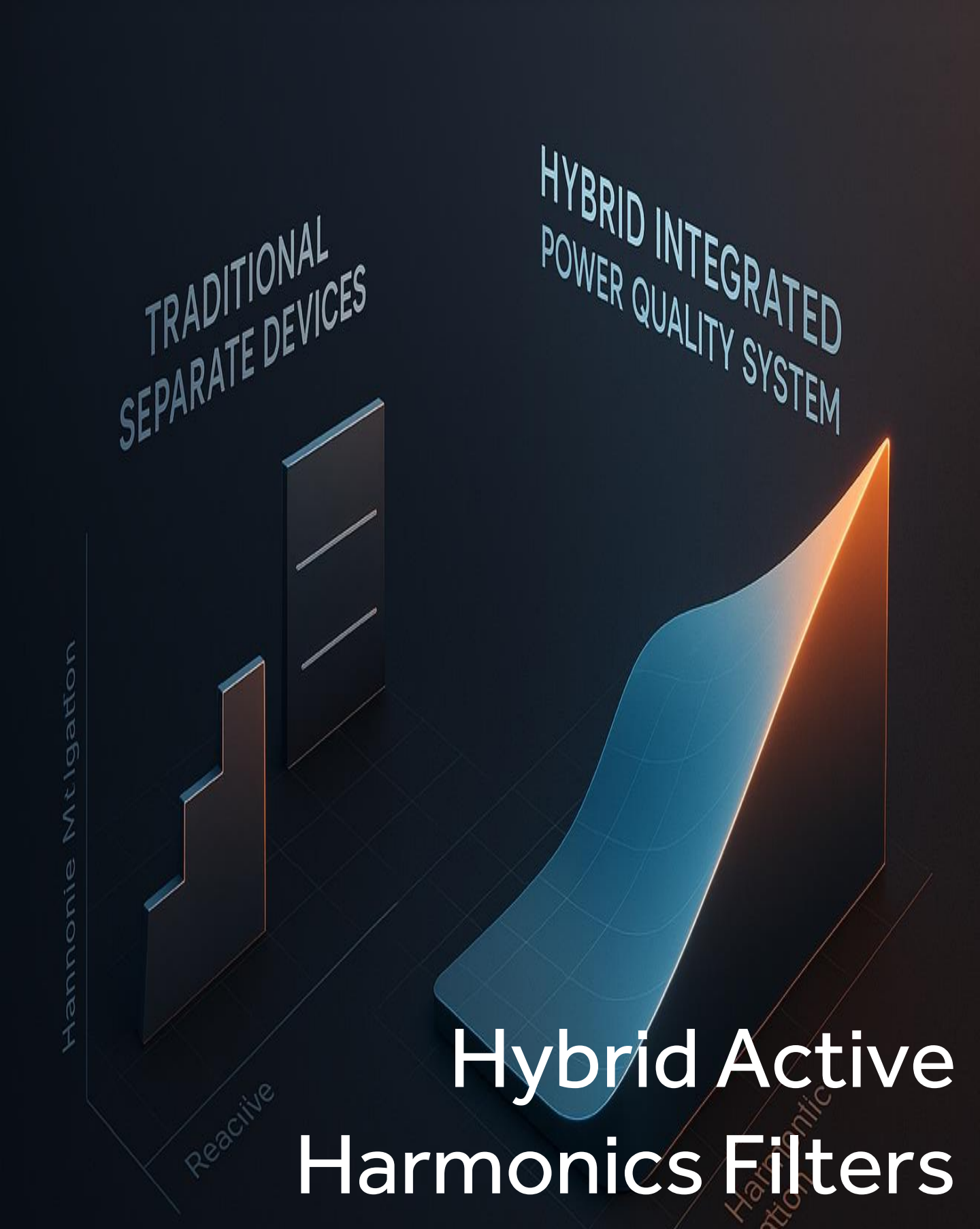


Hybrid Active Harmonics Filters

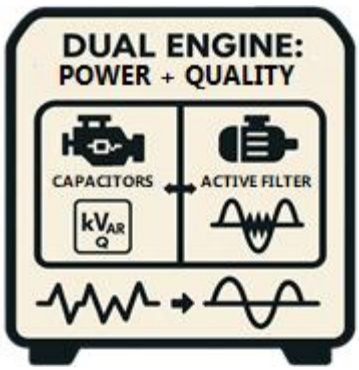
The all-in-one solution for Power Quality and Energy efficiency.

Hybrid Active Harmonics Filters

What is hybrid active filtering?

Traditionally, poor power quality has been addressed through the integration of different dedicated and targeted device to solve the specific problem:

- A power factor correction unit is used if the **power factor** is inadequate.
- A harmonic filter (active or passive) is used if **harmonics** are identified as a problem.



Advances in diagnostic technology have led to the recognition that power quality problems arise from a combination of different causes and that a more flexible - **hybrid** - solution is needed. A device that can solve the different problems into a **single equipment**.

How does it works ?

The **HAHF (Hybrid Active Harmonic Filter)** system acts on the power supply of the loads, selectively mitigating harmonics from the 2nd to the 50th order in real time.
Power factor optimisation is handled by traditional capacitor banks.

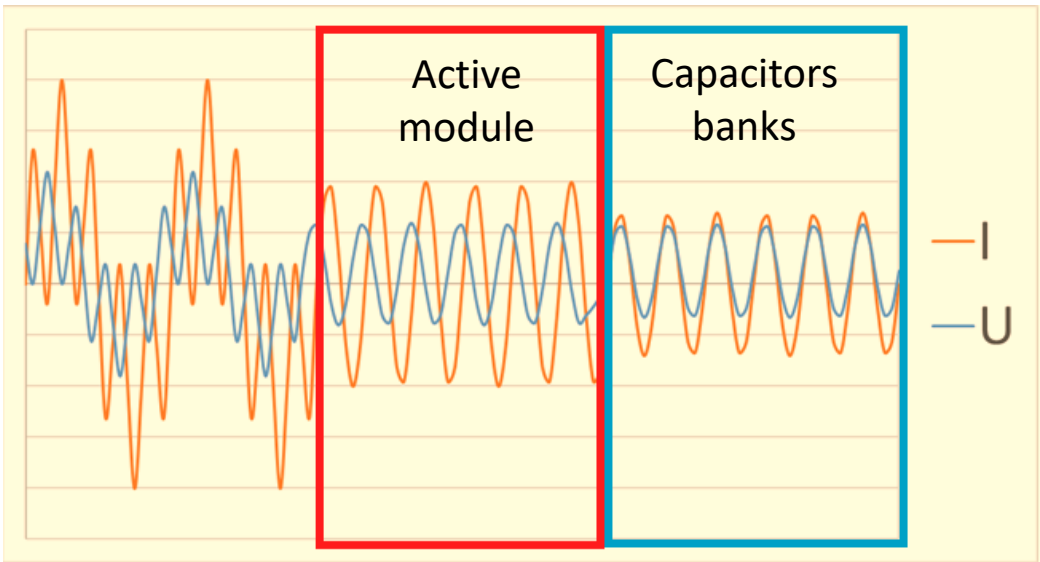
The HAHF unit integrates three functions within a single device:

- an **active module** that filters harmonics and, with the residual power, can fine-tune the reactive power drawn or fed in;
- **capacitor banks**, managed by contactors or thyristors, which provide the capacitive reactive power required by the loads;
- an integrated logic that coordinates the two systems, ensuring optimal performance in every situation.

The result is improved power quality through simultaneous, real-time compensation of **harmonic disturbances, voltage fluctuations, flicker and low power factor**.

Highlights

Versatility: corrects harmonics, reactive power, current unbalance, and flicker in a single system.
Efficiency: the fundamental reactive load is corrected by the traditional capacitor banks, while rapid variations are managed in real time and with maximum precision by the active module.
Flexibility: the modular concept can adapt to different scenarios of growth or implementation of the system.



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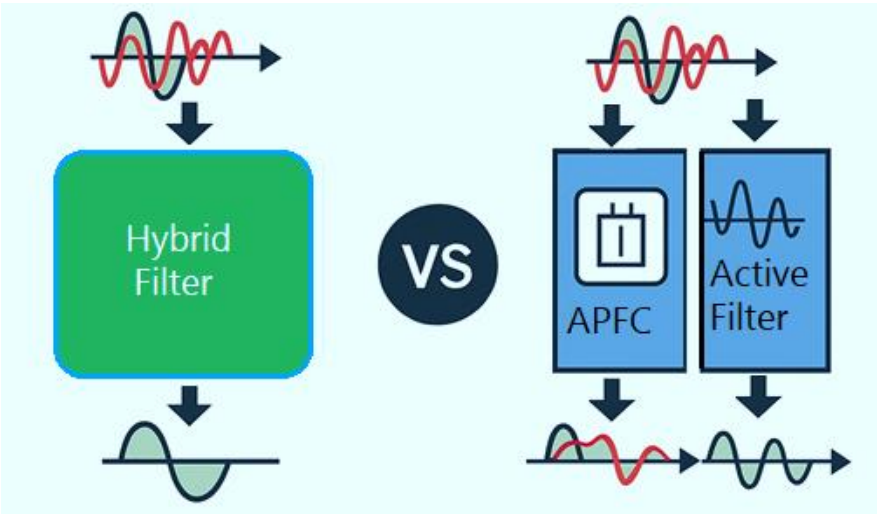
Hybrid Active Harmonics Filters

Benefits

Hybrid technology offers the following additional advantages compared to a "pure" active filter

- Reduced purchase costs. It is not necessary to oversize the filter to fully correct the power factor
- Reduced operating costs: dissipation losses in capacitor banks are lower than in active equipment
- Compactness: a single machine doesn't only means less space, but also lower installation costs: power cables and amperometric signals do not need to be duplicated on multiple machines.
- The residual power of the active module can be used to compensate the inductive or capacitive energy during periods of low production.
- The Human-Machine-Interface display allows for intuitive and simple consultation.



Where is it necessary?

- **Industry with highly variable and non-linear loads**

inverter driven machines, welding machines, induction furnaces, robotics, automated production lines.
Advantages: the active filter manages harmonics and phase unbalance and quickly adjusts the power factor, capacitors banks supply the reactive power base need.

- **Tertiary sector installations with mixed and variable loads**

airports, shopping centres, hospitals, data centres.
Advantages: the active part dynamically compensates for unpredictable disturbances, the capacitors are designed to compensate for slowly varying loads.

- **Energy-intensive industries subject to penalties from the energy provider**

cement factories, paper mills, steelworks.
Advantages: improves cosφ even in the presence of harmonics and phase unbalances, avoiding overcurrents and reactive power penalties.

- **Revamping of existing electrical systems**

Advantages: compact and versatile system that replaces or integrates existing power factor correction devices, adapting to the new loads requirements.

Hybrid Active Harmonics Filters

HAHF are available in the Comar detuned equipment **series AAR/138, AAR/600, AAR/D20**.

The installation is similar to that of conventional power factor correction units, with the only additional need to carry the amperometric (CT) signals of 2 phases; L1(R) and L3(T)

The equipment leaves the factory already fully configured and therefore does not require any setting by the installer

GENERAL TECHNICAL DATA COMMON TO ALL SERIES

Enclosure	Made of steel sheet, protected against corrosion by phosphating and epoxy powder coating. Colour RAL 7035. External degree of protection: IP31 Internal degree of protection: panels with interlocked switch-disconnector IP20 live parts; IP 20 protection in additional modules Capacitor banks are assembled on drawers that can be pulled out from the front of the cabinet for quick maintenance Cabinets are equipped with eyebolts for lifting
Installation	Indoor installation, in a well ventilated position free from solar radiation. Pollution degree 1 Working temperature: -5 / +40 °C; Relative humidity RH50% @40°C (EN61435-1) Altitude: <1000 asl
Main Disconnector	Three-phase off-load disconnector with door interlock.
Wiring	Internal connections are made with FS17-450/750V insulated, flame-retardant low smoke emission cables. On non-preinsulated cable lugs, the connection point is covered with a durable heat-shrink sleeve. Auxiliary circuits are appropriately identified in accordance with current standards.
Bank insertion	The banks are driven by three-phase contactors (Class AC6-b).
Fuses	The capacitive banks are protected by high breaking capacity fuses (100kA). The protection system for the power circuits uses NH-00 curve gG fuses; for the auxiliary circuits sectionable fuse holders and 10.3x38 fuses.
Auxiliary circuits	230 Vac Internal transformer
Capacitors	Single-phase Heavy Duty double element capacitors made of self-healing metallised polypropylene (MKP), equipped with over-pressure device and discharge resistance. Impregnated with PCBs-free vegetable oilf. Delta connection. Continuous duty type. - overvoltage: 1.1 x Un (8h / 24h) - current overload: 1.3 x In - capacitance tolerance: -5% / +10%. - Dielectric losses: ≤0.2 W/kvar; total dissipation losses: ≤0.4 W/kvar - temperature category: -25 / D
Tuning reactor (where present)	Iron core with oriented crystals; aluminium windings Resin impregnation Dissipation loss (average): 6W/kvar Over-temperature control probe
Active module	• High efficiency Mosfest SiC technology • Real-time correction of harmonics and reactive power. 99% efficiency • Connection: 3-phase Response time: 20ms
Controllers	• HPR+HMI 7'' interconnected controllers with three-phase measurement • amperometric signals: by means of 2 current transformers with 5A secondary (not included) • Settable response time
Safety	Automatic unit shut-down for high THDi, THDu, over-temperature >50°C, under and overvoltage. Capacitor bank shut-down for reactor overtemperature, low capacitance Dry contact NC for extreme internal temperature (>70°C)
Testing	100% of the equipment undergoes visual inspection, phase-to-phase and phase-to-ground insulation tests, filtering efficiency, capacitor bank power and ventilation circuit checks. Capacitors undergoes capacitance, tan(δ), insulation tests in 3 times during manufacturing process
Standards	Capacitors: IEC/EN 60831-1 / 2 certified by IMQ (V1927) Equipment: IEC/EN 61439-1 / 2, IEC/EN 61921; 2014/35/EC Electromagnetic compatibility: 2014/30/EC.

Hybrid Active Harmonics Filters

AAR/600-HAHF

DATI DI PERFORMANCE

- **Rated Voltage** 400 Vac
- **Rated Frequency** 50 Hz
- **Insulation voltage** 690 Vac
- **Voltage overload** 1,1 Un (tensione nominale)
- **Capacitors** Un=500V; Umax=550V
- **Impulse withstand** 8 kV

HARMONICS CONTENT

THD(I)max. = 100% In the grid

THD(U)max. = 6% In the grid

p = 7%

PATENT PENDING

The **AAR/600-HAHF** series hybrid active filtering systems are particularly suitable for three-phase networks with **high harmonic** content.
This equipment guarantees accurate filtering of harmonics, as well as accurate compensation of reactive power, even in the presence of **impulsive and unbalanced loads**, thanks to intelligent logic that manages the AHF and the multi-step traditional system.
The AAR/600-HAHF systems are capable of filtering and compensate **inductive and capacitive** loads.

STANDARD CONFIGURATIONS

Code	Type	Qn (kvar)	AHF current (A)	Cable entry	In (A)	Bank power (kvar)	Disconnector (A)	Dimension (LxPxH) (mm)	Weight (Kg)
8550100400HA0	G6E	100	**100**	↓	244	2x50	400	600x600x1660	200
8550125400HA0	G6E	125	**100**	↓	280	50+75	500	600x600x1660	220
8550150400HA0	G6E	150	**100**	↓	316	2x75	500	600x600x1660	240
8550225400HA0	G8E	225	**100**	↓	425	3x75	630	600x600x2070	270
8550300400HA0	G8E(II)	300	**100**	↓	535	4x75	800	1200x600x2070	370

Legenda
for cable entry (power supply) ↑ from below, ↙ side up, ↓ from above,
Rated power is expressed at rated voltage (Un)

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Any other question ?

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