

## MAXIMUM EFFICIENCY FOR HARMONIC MITIGATION

### WHAT IS HARMONIC DISTORTION?

Harmonics are voltages and currents that integrate frequency components, which pollute the pure sinusoidal waveform in an AC circuit, ultimately distorting the main voltage. Harmonic interference affects the reliability of the grid itself, productivity, increases costs, and impacts the overall product quality. It can also lead to possible penalties for non-compliance with national grid codes. **Mitigating the influence of harmonics**, ensuring that the system operates as efficiently as possible, can be achieved with BDF Digital solutions.

### HOW DOES THE AHF<sub>plus</sub> ACTIVE FILTER WORK?

The active filter detects the harmonics present on the power line and generates antagonistic waveforms to the harmonics to be canceled. BDF Digital's AHF<sub>plus</sub> filters are **easy to install in existing plants**, are delivered pre-configured, adjusted directly on-site, and ready-to-use. This simplifies commissioning and reduces installation time. The AHF<sub>plus</sub> natively integrates the ability to filter harmonic disturbances relative to the fundamental network component (up to the 17<sup>th</sup> simultaneously), and to compensate for inductive/capacitive reactive power component. The **power factor** is continuously variable, making the AHF<sub>plus</sub> active filter a convenient and valid alternative to the traditional capacitor bank (where the power factor is instead varied fractionally).

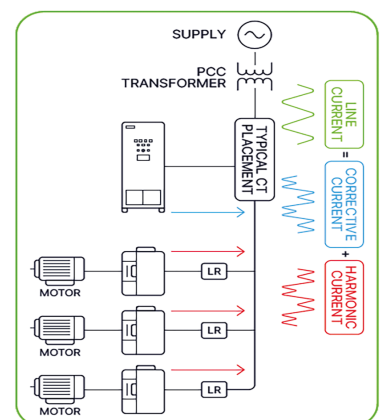


### APPLICATION SECTORS:

- WATER AND WASTEWATER TREATMENT
- NAVAL SECTOR
- OIL/ GAS/ MINING INDUSTRIES
- HVACR FIELD
- AIRPORTS
- HOSPITALS
- EXISTING INDUSTRIAL PLANTS with power factor correction and harmonic distortion (THD) issues

### ADVANTAGES - AHF<sub>plus</sub>

|   |
|---|
| RESONANCE CONTROL: DETECTION AND MITIGATION   |
| COMPACT (REDUCED EXTERNAL DIMENSIONS), ROBUST IN HARSH ENVIRONMENTS, AND LONGER UNIT LIFE |
| EFFICIENT OPERATION, FEWER REQUIRED COMPONENTS, LESS COMPLEXITY                           |
| EASY MAINTENANCE: FEW SPARE PARTS AND REDUCED TIME AND COST FOR MAINTENANCE               |
| REDUCED OPERATING EXPENSES AND TOTAL COST OF OWNERSHIP                                    |
| POWER FACTOR CORRECTION   |
| IMBALANCE COMPENSATION  |
| SHORT-TERM RETURN ON INVESTMENT   |



PCC: POINT OF COMMON COUPLING  
CT: CURRENT TRANSFORMER  
LR: LINE REACTOR

# AHF<sub>plus</sub>

## Active Harmonic Filter (AHF)



| ELECTRICAL / CONTROL FEATURES                |   | Grid frequency (+/- 5%)            | 40-60 Hz                                     |
|--|---|------------------------------------|--|
| Connection method                            | 3-wire/4-wire   | Modularity / Parallel / Redundancy | Yes  |
| Current rating                               | See table below   |                                    |  |
| Inverter topology                            | 2L-VSI  | Harmonic range                     | 5th to 35th                                  |
| Switching frequency (fPwm)                   | 5-18 kHz  | Harmonic attenuation factor        | More than 95% or nominal value               |
| Grid voltage (+/- 10%)                       | 208-480Vac  | Reactive power compensation        | Continuous from 0.7 (inductive / capacitive) |
| INSTALLATION                                 |   |                                    |  |
| Altitude                                     | Up to 1000 m altitude with 1% derating for each 100m above 1000 m. (Max.2000 m) |                                    |  |
| Temperature                                  | Normal: -10 °C to 40 °C   |                                    |  |
| Humidity                                     | Max. 95% non-condensing during operation  |                                    |  |
| IP protection                                | IP20/IP34   |                                    |  |
| PROGRAMMING/ COMMUNICATION                   |   |                                    |  |
| Supervisor/Device predefined comm.           | Modbus RTU and/or Modbus TCP-IP   |                                    |  |
| Fieldbus                                     | CanOpen, EtherCAT & ProfiNet, Profibus  |                                    |  |
| HMI  | xx-inch TFT screen (800 x 480 pixels) l x b x h mm IP65 etc....                 |                                    |  |
| CERTIFICATIONS AND COMPLIANCE WITH STANDARDS |   |                                    |  |
| Certification                                | CE  |                                    |  |
| EMC immunity                                 | EN/ IEC 61000-6-2, Industrial level   |                                    |  |
| EMC emissions                                | EN/ IEC 61000-6-4, Class A  |                                    |  |

### AHF<sub>plus</sub> FILTER and the OPDE<sub>plus</sub>

BDF Digital's AHF active filter raises power quality and increases system efficiency

| OPDE <sub>plus</sub><br>Size   Model | Only PF factor correction                          | Only harmonic compensation                | POWER FACTOR correction + harmonic compensation |
|--------------------------------------|--|---|---|
|                                      | Continuous reactive power <sup>(1)</sup><br>[kVAR] | Typical load power <sup>(2)</sup><br>[kW] | Typical load power <sup>(3)</sup><br>[kW]       |
| XL   40A                             | 30   | 48  | 24  |
| XL   48A                             | 35   | 55  | 28  |
| XL   60A                             | 44   | 69  | 35  |
| BF1   70A                            | 51   | 80  | 41  |
| BF1   90A                            | 66   | 104                                       | 53  |
| BF1   110A                           | 76   | 120                                       | 61  |
| BF1   150A                           | 107  | 168                                       | 86  |
| BF2   175A                           | 126  | 198                                       | 101   |
| BF2   220A                           | 160  | 252                                       | 129   |
| BF2   250A                           | 183  | 286                                       | 147   |
| BF3   310A                           | 226  | 353                                       | 181   |
| BF3   370A                           | 269  | 420                                       | 215   |
| BF3   460A                           | 339  | 452                                       | 232   |

<sup>(1)</sup> It is the continuous reactive power the active filter is able to compensate when used only as correction of power factor (main supply voltage 400Vac).

<sup>(2)</sup> The active filter is able to compensate the harmonics generated by the load which has the input part made by an input choke (3% of drop voltage) and a rectifier bridge. Main supply voltage 400Vac, 3% of maximum unbalancing of phases.

<sup>(3)</sup> The active filter is able to correct the PF and to compensate the harmonics generated by the load with  $\cos\phi=0,7$  and line currents THD= 52%. PF correction at  $\cos\phi=0,95$ . Main supply voltage 400Vac, 3% of maximum unbalancing of phases.