Low Voltage Capacitor and Filters

Power Quality Solutions in Different Applications

Application
Low voltage capacitors and filters can provide power quality solutions in reactive compensation and harmonic filtering, widely used in a variety of applications, including railway, mining, metallurgy, petrochemical engineering, wind farm, and commercial buildings.

CELC/CELCR series low voltage capacitors feature the latest design innovation dry type design, low losses, long life, self healing, over pressure separator, over current protection, heavy duty enclosure, light weight, highly reliable, and environmentally friendly.

Ratings
- Capacity: 30 ~ 120 kVAR
- Rated voltage: 480 V, 525 V, 900 V
- Frequency: 50 Hz, 60 Hz
- Loss: Dielectric losses <0.1 W/kVAR, total losses <0.25 W/kVAR
- Dielectric material: Self-healing, Metallized polypropylene film
- Temperature category: -40 °C ~ +55 °C
- Discharge device: Discharge to 50 V or less from rated voltage within 1 minute
- Standard: IEC/GB

Eaton
Powering Business Worldwide
CEL series low voltage reactors adopt the latest technology: polyester resin vacuum casting process with alternative conductor (iron-core and aluminum-core).

**Ratings**
- Rated voltage: 220 V, 400 V, 690 V
- Frequency: 50 Hz, 60 Hz
- Reactance rate: 6%, 7%, 12%, 14%
- Tolerance: -3/+3%
- Temperature degree: F
- Insulation capability: 4 kV
- Standard: IEC/GB

The CELP series controller provides effective functioning in measuring and monitoring the reactive power and auto-switch on/off.

**Ratings**
- Rate voltage: 380 V ± 20%
- Frequency: 50 Hz / 60 Hz
- Current inputs: AC 0-5 A
- Communication: RS485 Modbus
- Accuracy: 0.5 class
- Operation accuracy: 100 mA
- Dimension: 144x144x110mm
- Installation: 138x138mm

Eaton’s Cooper Power Systems low voltage detuning capacitor bank consists of a capacitor and de-tuning reactor. Contactor and thyristor switched banks with an Eaton’s Cooper Power Systems controller make it easy to improve energy efficiency.

**Ratings**
- System voltage: 220 V-750 V
- Rate capacity: 120 kVAR – 444 kVAR
- Reactance rate: 6%, 7%, 14%
- Tuned frequency: 204 Hz, 189 Hz, 133 Hz (Customizable)
- Standard: IEC60831, IEC60289, VDE0532
- Color: RAL7035 (Customizable)
- Dimension: 144x144x110mm
- Installation: 138x138mm

Eaton’s Cooper Power Systems low voltage filter capacitor bank can be designed in terms of compensation capacity and harmonics, to eliminate the harmonic and improve the quality of the power system.

**Ratings**
- System voltage: 220 V-750 V
- Rate capacity: 60 kVAR – 300 kVAR
- Harmonic: 3rd, 5th, 7th, 11th
- Standard: IEC60831, IEC60289, VDE0532
- Color: RAL7035 (Customizable)
Active Power Filter

The Principle of Low Voltage Active Power Filter

- The Eaton’s Cooper Power Systems low voltage active power filter, is the latest professional harmonic elimination equipment, integrating advanced power electronics and DSP technology. It is composed of the arithmetic circuit and compensation current generation circuit.

- The arithmetic circuit keeps sampling the current and outputting the digital signal through the AD converter in real-time. The DSP calculates the digital signal to separate the fundamental waves and harmonics. Then the PWM waves are based on the calculation result and generated to control the IGBT power module. Thereby the compensation current is emitted to the circuit to eliminate the harmonics actively.

Product Features

- Storage temperature: -40 °C ~ +70 °C
- Operating temperature: -10 °C ~ +50 °C
- Related humidity: < 95%
- Input voltage: 400 V±20%
- Frequency: 50/60±10Hz (automatic detection)
- 2-51st harmonics
- CT ratio primary current 100 A~9999 A, secondary current 5A (optional 1A)
- Power outage release < 20 ms
- Open-loop control
- 5" Color LCD display panel
- DSP digital control technology
- Improving power factor, compensation automatically
- Elastic expansion
- Outstanding compensation of unbalanced three-phase
- Communication adapter: RS485
- Communication protocol: Modbus RTU
- Standard: EN61000-3-4, IEEE519-1992
- Design standard EN60146
- Electromagnetic compatibility standard: EN50178
User-friendly HMI
Cooper APF is equipped with friendly HMI that includes power-on/power-off, active alarm control and system status checking. It can read electrical data and show the wave of current and voltage, spectrum of harmonic, etc. This can be easy and helpful to manage the data base of APF and power system, and read the data from the filter, load, and power source site. It can be operated via LCD display and operation panel.
- Complete data: voltage, current, frequency, power factor, power, harmonic
- Wave and harmonic spectrum
- Control command and setting
- Event record
- Multi-language

Ease of Installation and Maintenance
Cooper APF offers standard enclosed module and bank, it comes standard with a digital interface module for control, diagnostics and programming. Verification prior to installation that all APF modules prerequisites have been met. This can be stacked directly while installing with no upper limit of modules connected in parallel.
- Fixed by screws for ease of remove and installation
- Reduce installation time
- Fully assembled, completely self-contained, test and ready to install
- Low profile and easily accessible to field maintenance crews
- Regular inspection and cleaning

Rating based on Service Entrance Ampacity and optional parallel operation.
Consult factory for special connections

Sizing and Product Selection

<table>
<thead>
<tr>
<th>MODULE</th>
<th>VOLTAGE</th>
<th>AMPERES (RMS)</th>
<th>HxWxD IN MM</th>
</tr>
</thead>
<tbody>
<tr>
<td>CELA50</td>
<td>400</td>
<td>50</td>
<td>440x523x174</td>
</tr>
<tr>
<td>CELA75</td>
<td>400</td>
<td>75</td>
<td>440x523x174</td>
</tr>
<tr>
<td>CELA100</td>
<td>400</td>
<td>100</td>
<td>605x625x220</td>
</tr>
</tbody>
</table>

Notes:
- CELA is housed in an air-conditioned floor standing enclosure and include a main disconnect.
- Additional CTs required for parallel operation for CELAs.
- Rating based on Service Entrance Ampacity and optional parallel operation, consult factory for ratios and additional information.

CT Location
CTs for current detection located on the side of the harmonic source is recommended to feed the detection signal to the APF, see following figure.

If capacitators are in the system for power factor corrections, CTs located between capacitor feeder and load is recommended as below.

Notes:
- CTs (5A/1A) is required for APF module.
- 5A is standard design, consult factor for 1A module.

Consult factory for any special cases.
## CELC Series Capacitor and Reactor (50/60 Hz)

<table>
<thead>
<tr>
<th>Capacitor</th>
<th>Rated Voltage (V)</th>
<th>Rated Capacity (kVAR)</th>
<th>Current (A)</th>
<th>Reactor</th>
<th>Reactance Rate (%)</th>
<th>Rated Voltage (V)</th>
<th>Output Capacity (kVAR)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Delta Connection Capacitor</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>CELC480-40/48</td>
<td>480</td>
<td>40/48</td>
<td>48/58</td>
<td>CELR30(36)/400-6</td>
<td>6</td>
<td>400</td>
<td>30/36</td>
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<td>CELC480-50/60</td>
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<td>50/60</td>
<td>60/72</td>
<td>CELR37(44)/400-6</td>
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<td>CELC480-60/72</td>
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<td>60/72</td>
<td>72/87</td>
<td>CELR44(53)/400-6</td>
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<td>44/53</td>
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<tr>
<td>CELC480-70/84</td>
<td>480</td>
<td>70/84</td>
<td>84/101</td>
<td>CELR52(62)/400-6</td>
<td>6</td>
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<td>52/62</td>
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<tr>
<td>CELC480-80/96</td>
<td>480</td>
<td>80/96</td>
<td>96/115</td>
<td>CELR59(71)/400-6</td>
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<td>400</td>
<td>59/71</td>
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<td>CELC480-100/120</td>
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<td>100/120</td>
<td>120/144</td>
<td>CELR74(89)/400-6</td>
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<td>CELC525-50/60</td>
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<td>55/66</td>
<td>CELR34(41)/400-14</td>
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<td>34/41</td>
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<tr>
<td>CELC525-60/72</td>
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<td>60/72</td>
<td>66/79</td>
<td>CELR41(49)/400-14</td>
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<tr>
<td>CELC525-80/96</td>
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<td>CELC525-100/120</td>
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<td>110/132</td>
<td>CELR68(82)/400-14</td>
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<td>400</td>
<td>68/82</td>
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<tr>
<td>CELC900-80/96</td>
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<td>80/96</td>
<td>51/62</td>
<td>CELR50(60)/690-6</td>
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<td>690</td>
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<tr>
<td>CELC900-100/120</td>
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<td>64/77</td>
<td>CELR62(74)/690-6</td>
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<td>62/74</td>
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<tr>
<td>CELC900-120/144</td>
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<td>120/144</td>
<td>77/92</td>
<td>CELR75(90)/690-6</td>
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<tr>
<td>CELCN480-70/84</td>
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<td>70/84</td>
<td>84/101</td>
<td>CELR52(62)/400-6-1W*3</td>
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<td>52/62</td>
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<tr>
<td>CELCN525-75/90</td>
<td>525</td>
<td>75/90</td>
<td>83/99</td>
<td>CELR51(61)/400-14-1W*3</td>
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<td>400</td>
<td>51/61</td>
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## CELCR Series Capacitor and Reactor (50/60 Hz)

<table>
<thead>
<tr>
<th>Capacitor</th>
<th>Rated Voltage (V)</th>
<th>Rated Capacity (kVAR)</th>
<th>Current (A)</th>
<th>Reactor</th>
<th>Reactance Rate (%)</th>
<th>Rated Voltage (V)</th>
<th>Output Capacity (kVAR)</th>
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<tbody>
<tr>
<td><strong>Delta Connection Capacitor</strong></td>
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<tr>
<td>CELCR480-33.5/40-R</td>
<td>480</td>
<td>33.5/40</td>
<td>41/48</td>
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<td>67/80</td>
<td>81/96</td>
<td>CELR50(60)/400-7</td>
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<tr>
<td>CELCR525-30/36-R</td>
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<td>30/36</td>
<td>33/40</td>
<td>CELR20(24)/400-14</td>
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<tr>
<td>CELCR525-30/36-R*2</td>
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<td>60/80</td>
<td>66/80</td>
<td>CELR40(48)/400-14</td>
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<td>40/48</td>
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<tr>
<td><strong>Star Connection Capacitor</strong></td>
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<tr>
<td>CELCR280-20/24-R*3</td>
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<td>72/86</td>
<td>CELR45(54)/400-7-1W*3</td>
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<td>CELCR280-10/12-R*3</td>
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<td>36/43</td>
<td>CELR22.5(27)/400-7-1W*3</td>
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## CELP Power Factor Controller

<table>
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<tr>
<th>Type</th>
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<tr>
<td>CELP-12</td>
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<tr>
<td>CELPT-12</td>
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</table>

**Consult factory for special type**

## CELA Active Power Filter

<table>
<thead>
<tr>
<th>AMPERES (RMS)</th>
<th>System Voltage (V)</th>
<th>Frequency (Hz)</th>
<th>Module Type</th>
<th>Required Cabinet DIM. (WxDxH)(mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>400</td>
<td>50/60</td>
<td>CELA50+1xLCM</td>
<td>1000x1000x2200</td>
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<tr>
<td>100</td>
<td></td>
<td></td>
<td>CELA100+1xLCM</td>
<td></td>
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<tr>
<td>150</td>
<td></td>
<td></td>
<td>1xCELA50+1xCELA100+1 x LCM</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td></td>
<td>50/60</td>
<td>2xCELA100+1xLCM</td>
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<tr>
<td>250</td>
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<td>50/60</td>
<td>1xCELA50+2xCELA100+1 x LCM</td>
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</tr>
<tr>
<td>300</td>
<td>400</td>
<td>50/60</td>
<td>3xCELA100+1xLCM</td>
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<tr>
<td>350</td>
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<td>50/60</td>
<td>1xCELA50+3xCELA100+1 x LCM</td>
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<td>400</td>
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<td>50/60</td>
<td>4xCELA100+1xLCM</td>
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<td>450</td>
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<td>50/60</td>
<td>1xCELA50+4xCELA100+1 x LCM</td>
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<tr>
<td>500</td>
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<td>50/60</td>
<td>5xCELA100+1xLCM</td>
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</tr>
</tbody>
</table>

**Consult factory for other ratings**

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