



TECHNICAL SPECIFICATION  
FOR 600V, 480V & 208V  
DETUNED AUTOMATIC  
POWER FACTOR  
CORRECTION BANKS

Version 1.0 – August 24, 2018





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## Equipment Size / Ratings

### 600V

System operating voltage (line-to-line): 600V, 3-phase, 60Hz. Capacitors shall be rated minimum 690V to protect against current and voltage overload due to harmonic distortion.

**kVAr range:** 60 to 1080 kVAr

**Steps size:** Standard: 60 kVAr (e.g. 180 kVAr = 3\*60 kVAr), also available: 20 and 40 kVAr (e.g. 180 kVAr = ((1\*20 kVAr)+(1\*40 kVAr)+(2\*60 kVAr)) for sensitive or seasonal loads.

### 480V

System operating voltage (line-to-line): 480V, 3-phase, 60Hz. Capacitors shall be rated minimum 600V to protect against current and voltage overload due to harmonic distortion.

**kVAr range:** 50 to 950 kVAr

**Steps size:** Standard: 50 kVAr (e.g. 150 kVAr = 3\*50 kVAr).

### 208V

System operating voltage (line-to-line): 208V, 3-phase, 60Hz. Capacitors shall be rated minimum 230V to protect against current and voltage overload due to harmonic distortion.

**kVAr range:** 20 to 420 kVAr

**Steps size:** Standard: 20 kVAr (e.g. 200 kVAr = 10\*20 kVAr).

## Capacitors

Individual capacitors shall be, 3-phase, delta connected, gas filled under vacuum, and of a self-healing design utilizing a low loss metallized polypropylene film dielectric system with an over-pressure internal disconnect. Metallized paper is not acceptable. Capacitor casing shall be of a seamless aluminum design. Electrical losses shall be less than 0.25w/kVAr. Dielectric fluid shall be high flash point, biodegradable, non-toxic and contain no PCB's. Capacitors shall include a grounding/mounting stud at the bottom of the capacitor cell for easy replacement.

Capacitors shall be rated for a minimum of 135% continuous current overload and 110% continuous voltage overload based on the 690 Volt rating of the capacitors. Individual capacitor cells shall not exceed 25 kVAr at the system voltage to keep replacement costs at a minimum.

Capacitors shall be suitable for -50°C to +65°C ambient temperature.

Dry type capacitors and / or capacitors without a pressure sensitive circuit interrupter are not acceptable.



## Discharge Resistors

Adequate discharge resistors shall be provided for each capacitor cell to reduce the voltage to 50 Volts or less in one minute after disconnection of supply voltage.

## Detuning Reactors (Filters/Chokes)

Filter tuning frequency shall be  $3.78 \times 60$  Hz (227 Hz). Filtering factor shall be 7% by default, or 14% upon request (e.g. systems with high harmonic distortion).

Harmonic filtering reactors shall be three phase iron core. Reactor maximum continuous RMS amperage shall be sized to match the maximum continuous RMS amperage of the capacitors.

In no case shall the harmonic filtering reactor size exceed 60 kVAr at the system voltage to allow for ease of replacement.

## Contactors

Contactors shall be 3 phase, IEC rated, and rated for capacitor switching duty. Contactors must be capable of switching 135% of the nominal amperage of the capacitors being switched. The contactors shall be capable of switching the maximum continuous rms amperage rating of the capacitors. Contactor coils shall be 120 Volt, 60 Hz. Contactors must include a current limiting resistor kit.

## A4J Fusing

3 A4J fuses shall be included for each contactor. A4J fuses shall have a minimum interrupting rating of 100 kA. Fast acting fuses shall be sized for at least 135% of the nominal amperage of the capacitors to prevent clearing on inrush.

## Digital Microprocessor Controller

The digital microprocessor controller shall be a minimum 8 step controller, which includes the following features:

1. adjustable target power factor from 0.5 IND to 0.5 CAP
2. automatic free selection or LIFO logic of step insertion
3. automatic or manual switching of steps
4. option of selecting switched steps as fixed steps
5. selectable step reconnection time of 1-30.000 seconds
6. selectable sensitivity delay of 1-1000 seconds
7. manual selection of CT ratio, primary 1-30,000A, secondary 5A
8. automatic detection of CT polarity
9. option for 3 CTs to measure all phase current
10. measuring voltage range of 100 - 600 Volts without potential transformer on 3 phases
11. aux. power supply of 120V



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12. multimeter capability including waveform, system power (kW, kVA, kVA<sub>r</sub>), Voltage (L-L & L-N) Amperage (L1, L2, L3), energy meter (kWh, kVA<sub>r</sub>h, kVAh) and harmonic measurement to 31<sup>st</sup> order
13. Time and date settings
14. temperature sensor adjustable from 0 to 212°C and output relay for fan control
15. alarm relay for temperature above set point, individual harmonic current distortion above set point, total harmonic current distortion above set point, power factor below target set point
16. selection of activation or deactivation of individual alarms.
17. display shows error code for alarms when in alarm status and dry alarm contact closes in alarm condition
18. no voltage release switches out all capacitors in case of interruption of supply voltage
19. monitors and displays quantity of individual step operations for determining contactor wear
20. monitors and displays quantity of individual step operating hours for determining capacitor wear
21. displays a fault when any step current is reduced to zero indicating faulty step components
22. communications via optical programming interface standard (USB/Wifi programming dongle available as price adder)
23. key board locking feature to prevent unauthorized tampering

## Split Core Current Transformer

A split core current transformer of adequate size, ratio, and burden shall be supplied.

## Termination

A suitably sized three phase terminal block shall be provided for feeder termination. Ground terminals shall be provided for ground wire termination.

Standard feeder cable entry location is on top. Other locations can be specified during the quoting phase.

## Enclosure

Enclosures shall be of at least the minimum gauge steel as required by code. Enclosures shall be made suitable for the installation location. NEMA 12 style enclosures will be used by default, NEMA 3R style available. Thermostatically controlled ventilation shall be sized to maintain a maximum temperature of 45°C inside the enclosure at the extreme high ambient temperature.

Dripshields, air filters for dust, moisture, and vermin shall also be included for NEMA 3R enclosures. Air filters for dust shall be included for NEMA 12 style enclosures. The controller shall be semi-flush mounted on the door for NEMA 1 applications. The controller shall be mounted behind a hinged safety glass cover and the display visible for NEMA 3R.

Adequately sized control transformer and control fuses shall be provided for all controls including heating and cooling.

All components must be suitably mounted to provide ease of replacement with front access only. All enclosure mounting hardware and framework shall be either galvanized steel or zinc plated steel for grounding continuity. Painted mounting hardware and framework with paint removed for grounding is not acceptable. All enclosure parts other than mounting hardware and framework shall be powder coated RAL 7035.



The enclosure door shall have a lockable handle. One double-bit key is supplied with every enclosure.

Minimum ambient temperature: -20°C Maximum ambient temperature: 35°C

To maintain warranty in a >35°C ambient environment, an air conditioner unit will be installed.

## Labelling

A “Wait one minute after disconnection from supply” label shall be located on the enclosure door. A “Wait five minutes after disconnection from supply” label shall be provided loose for the disconnecting device. Both labels shall be worded as per code requirements.

## Testing

Testing shall be performed as per CSA and ESA standards. All assemblies must bear a certification label. For filtered units, a confirmation of the filter tuning frequencies must be performed prior to shipment.

## Approved Manufacturers

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