# Low Voltage Power Factor Correction Equipment Specifications
## Fixed Capacitors, Fixed Capacitors withTuned/Detuned Filters

### Part 1 - General Scope and Product Description

1.0 This specification contains the minimum design and manufacture requirements, standards, general equipment type, warranty and installation for power factor correction and tuned power factor correction equipment. Equipment shall be intended for the improvement of power factor, for low voltage AC electrical power distribution systems. Reference specification Section 26 - 263533 or Section 16 – 16280.

1.1 Exception to any part of this specification shall be indicated by reference to each item number, when providing a project bid.

1.2 Manufacturer of power factor correction equipment shall have been engaged in the application, design and production of such equipment for a minimum of twenty years. Manufacturer specified shall be ISO 9001 certified. The finished product shall be engineered, assembled, tested, and shipped by manufacturer. Equipment provided in any other manner is not acceptable.

1.3 Power factor correction equipment shall be suitable for indoor or outdoor (NEMA rated) environments. Equipment shall be provided for low voltage classifications, with a range from 240vac to 600vac, suitable for fixed (non-automatic) configurations. In general, equipment shall be used on three phase, 3-wire, three phase 4-wire, grounded wye, ungrounded wye, or delta wire systems at 50 or 60 Hz. Equipment is designed for reliable, continuous operation in ambient temperatures of ° C to + ° C, up to 3300 feet (1000 meters) above sea level, with relative humidity of 70% at ° C. Other ratings may require the inclusion of thermostats, conditioned air, heaters and/or fans.

1.4 A power system analysis may be required to determine the harmonic content and requirement for filters, as part of the power factor correction equipment. It will be the responsibility of the owner, consultant, contractor or power quality service company to provide the manufacturer, at the time of request for quote, such data.

1.5 The finished power factor correction equipment shall be UL listed to 508A and cUL.

### Part 2 - Standards and References

2.0 American National Standards Institute (ANSI)

2.1 Institute of Electrical and Electronic Engineers (IEEE)

2.2 National Electrical Manufacturers Association (NEMA)

2.3 Underwriters Laboratories, Inc. (UL)

2.4 National Electrical Code (NEC)

2.5 Canadian Standards Association (CSA)

2.6 International Electrotechnical Commission (IEC)

2.7 European Standards, EN

## Part 3 - System Ratings

3.0 The voltage rating of the power factor correction equipment shall be _____ volts AC between phases.

3.1 The total capacity of the unit shall be_____kvar.

3.2 The filter shall be rated- tuned for 4.7; The filter shall be rated- detuned for 3.78.

3.3 Fuses and Blown Fuse Indication shall be_____; not be_____provided.

## Part 4 - Primary Component Description

4.0 Power Capacitors, shall comply with applicable industry standards IEEE Std. 18, NEMA CP-1, CSA 22.2, IEC 831, and UL 810. Each capacitor housing shall be aluminum, with an internal self healing, metalized polypropylene film, with “green, environmentally friendly” liquid impregnation. Capacitors shall include a safety overpressure device and discharge resistors, which reduce residual voltage to 50VAC or less, within one minute from de-energization. Capacitors shall be designed for proper overcurrent, overvoltage, low watt loss, and long life capabilities. A THD of up to 10% shall not affect the life of the capacitors.

4.1 Current limiting fuses (where applicable) shall be class J type rated at 100kaic, to 30 amperes and 200kaic, above 30 amperes. Fusing shall be for protection of major faults on all three phases. Fuse mounting arrangement shall be in such a manner to provide convenience for inspection and servicing.

4.2 Blown fuse indicating lights (where applicable) shall be provided as required, one per each phase.

4.3 Filter reactors (where applicable) shall be provided, integral to the complete assembly. Reactors provided in a separate enclosure shall not be acceptable. Reactors for tuned

systems shall be designed for harmonic mitigation for the 5th order and rated at 4.7 (282hz). Reactors for detuned systems shall be designed for the 4th harmonic order to provide protection from amplification and shall be rated at 3.78 (227hz). Reactors shall be three-phase, iron-core, ° C temperature rated, class H, air-cooled, with Poly-Gap core and include a thermal switch.

## Part 5 - Equipment Construction

5.0 Power factor correction equipment design and manufacture shall follow the most recent applicable ANSI, IEEE and NEMA standards and guidelines; and be neatly constructed and finished, meeting all APQ, LLC. quality and production control standards.

5.1 The enclosure assembly shall be a rigid steel formed structure using a minimum 16-gauge sheet steel. Enclosure shall not include knock-outs.

5.2 The complete assembly shall be painted using electrostatically applied powder coated paint, providing for enhanced durability and extended protection. Standard color shall be ANSI 61 grey, or color as specified. NEMA 1, 12, 3R and other ratings shall be available.

5.3 All internal power wiring shall have thermoplastic insulation rated for a minimum of 90° C at 600 volts. All wiring connections shall be mechanically fixed with a nut or screw. A grounding connection point shall also be included.

## Part 6 - Testing, Safety and Documentation

6.0 Capacitors shall be tested at point of construction. The power factor correction equipment shall be production tested for proper operation, prior to shipment. This shall include, at a minimum: wire connections, torque connections, mechanical functional operation, controller operation, visual inspection.

6.1 Nameplates, labels, and other decals, providing safety, general operation instruction and manufacturer data, shall be included with the equipment. Such markings shall be visually accessible and conveniently located, both internally and externally on the equipment.

6.2 A manual for the purpose of operation, maintenance, and service instruction shall be included with the finished equipment. A general bill-of-material list, external and internal outline mechanical and electrical drawings shall be included with the equipment. Documentation shall be provided in a CAD format for approval or reference.

## Part 7 - Installation and Service

7.0 Installation and operation of equipment is intended for general business, commercial, industrial, government and energy service providers.

7.1 Correct installation is required for proper performance and function of the equipment. Physical inspection of equipment for damage is suggested, prior to any installation. Indoor storage shall be in a clean, dry environment.

7.2 National Electrical Code (NEC), electric utility company or service provider codes shall be adhered to during the installation. Electrical connections shall also be in compliance with required codes

7.3 Installer/Contractor shall inspect and verify proper alignment, anchorage, leveling and grounding, proper connections and tightness of connections, prior to any start-up procedures.

7.4 Appropriate personnel shall start-up and operate equipment upon installation approval.

7.5 All maintenance and inspection of the power factor correction equipment shall be done with the system disconnect device in the open position.

7.6 Routine maintenance and inspections should be limited to 15-30 minutes, as to not disrupt utility billing practices.

7.7 An annual inspection of the capacitors, fuses, and reactors shall be performed.

## Part 8 - Equipment Warranty

The manufacturer shall provide its standard warranty for equipment of this type. The warranty shall provide for repair or replacement of the equipment, should it be found to be defective within twelve months from the date of being first energized, or eighteen months from date of shipment, or whichever occurs first.

## Approved Manufacturer

Power factor correction equipment designer and manufacturer shall be:

**APQ, LLC.**
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