

Specification of Intelligent - APFC System

Design, manufacture, assembly, testing, delivery and commissioning of APFC System suitable for 415V / 440V, 50Hz, AC system.

SYSTEM – CAPABILITIES & OBJECTIVES.

1. System should be capable of switching the capacitor banks through suitable rating of Capacitor duty contactor
2. System should be capable for Harmonic Resonance control, reduction of Harmonic amplification and sustain capacitor banks life through 7% Detuned Block Reactors.
3. APFC controller should be capable to control unity PF, avoiding Leading PF, 3 phase current sensing.
4. Manual Selection through Push button, ON-OFF indication on each Bank.
5. Relay, capacitor, reactor should be of same make.

Enclosure Construction & panel specification

Supplying, installation, testing & commissioning of Indoor Type Floor Mounted Free Standing Type APFC System with type test certificate complying latest IEC: 61921 or IS: 16636 of following Rating with harmonic suppression (7% detuned reactor) suitable for 415V/440V, 3 Phase, 4 Wire 50 Hz AC supply system having fabricated design from CRCA sheet steel of 2mm thick for frame work and covers, 3mm thick for gland plates i/c cleaning & finishing complete with 9 tank process for powder coating in approved siemens grey RAL-7032 shade, having Aluminum bus bars of high conductivity, DMC/SMC busbar supports, fabrication shall be done in transportable sections, entire panel shall have 1 Run of common Aluminum earth bar of suitable size. Enclosure shall have IP-42 protection.

Banking Configuration for Capacitors

Banking system has to be designed with of three phase banks of 5,10, 15,25 KVAR, 50 KVAR and 100 KVAR. All these units shall be connected in a parallel by means of copper Flexible wire of adequate current carrying capacity. The combination of capacitor unit shall be such as not to exceed permissible over voltage across the healthy capacitor units in case of failure of one or more units.

Harmonic Block Reactors – Three Phase Detuned Harmonic Block Reactors of 7% detuning (inductance tolerance $\pm 3\%$) iron core type with single layer Al strip wound should be used with proper air channels between winding and Core. Reactors shall be installed in series with Capacitor Banks. Reactor should be designed, low temperature rise, low losses, high linearity of 200% ($L > 0.95 \times L_n$). It shall have thermal disconnection switch if temperature of Reactor exceeds above 155°C. Reactors with aluminum strip winding should be only considered with proper air space between various two-phase windings. Reactor should comply the IEC 61558-2-20 or IS: 5553

Capacitor Bank - Capacitor Bank should be of Super Heavy Duty cylindrical type with U_n of 525V, 50Hz. Capacitor Bank should be capable of withstanding high peak currents upto $4 \times I_n$. They should be capable of withstanding upto 70°C temperature on its surface without any deration in its lifespan. The capacitor bank rating at 525V has to be so chosen so as to offer desired KVAR output at network voltage. Capacitor banks shall be suitable for operation at 110% of rated RMS voltage and 150% of rated RMS current. Capacitor should comply IEC 60831-1&2 or IS:13340 with valid test certificate.

Controller for Power Factor section

Controller technology should be intelligent with digital signal processor (DSP). Controller should be capable of switching Banks to maintain unity PF, (144x144 mm with IP54 on front) frame size and have LED display wherein each phase data can be seen separately for eg. Power factor of all the 3 phases can be viewed simultaneously. In order to have complete system and network control with analysis, it should have 7 input channels, 4 voltages inputs for L-1, L-2, L-3 and Neutral, 3 current inputs from 3 CT's of L-1, L2, L-3. Controller should have inbuilt Load and Power Quality Manager to view all electrical parameters like Currents, Voltages, Power Factor, Cos Phi, Active Power, Reactive Power, Apparent Power, programmable option for taking inputs from .../5A or .../1A CT's. .

Capacitor Switching Contactor

3 phase capacitor duty contactors of suitable rating, confirming IS/IEC 60947-4-1, coil voltage 230V, 50 Hz, AC with add on NO/NC Block.

APFC System - BOM

KVAR APPFC Panel with 7% detuned reactor and Super heavy duty 525V Capacitor

A.	<u>Incomers</u> Suitable rating of Incomer (Panel rating x 1.4 x 2) of the current ACB or MCCB, TPN , 50KA or 36 KA, TM/ Microprocessor base, O/C, S/C, E/L release, ON, OFF, Trip, R, Y, B Indicating Lamp
B.	<u>Instruments & Indications</u> 3-Phase current sensing, advance microprocessor Controller capable to show Phase wise V, A, PF, Cos-Phi, Kw, Kva, Kvar, THD-V, THD-I, harmonics up to 31 level, 12 stage. Auto Manual Selector switch, auxiliary contactors with timer for delay in manual mode.
C.	<u>Bus Bars</u> 0.8 Amp per Sq.mm, FP, Electrolytic grade AL. bus bar <u>Outgoings (APFC Section)</u> 100 KVAR 3phase banks. Each bank shall have following components: As required 100A MCCB – TP -25 KA, TM base with O/L & S/C protection. 100 KVAR Capacitor Duty Contactor or 210A,AC-3type Power contactor 142 KVAR 3 phase, 525V, 50 Hz Super Heavy Duty Capacitor Bank. 100 KVAR 3 phase, 415V, 7% detuned Harmonic Block Reactor with discharge resistor. ON -OFF Indication Lamp with push button 50 KVAR 3phase banks. Each bank shall have following components: As required 100A MCCB – TP -25 KA, TM base with O/L & S/C protection. 50 KVAR Capacitor Duty Contactor 71.2 KVAR 3 phase, 525V, 50 Hz Super Heavy Duty Capacitor Bank. 50 KVAR 3 phase, 415V, 7% detuned Harmonic Block Reactor with discharge resistor. ON -OFF Indication Lamp with push button. 25 KVAR 3phase banks. Each bank shall have following components: As required 63 A MCCB – TP -25 KA, TM base with O/L & S/C protection. 25 KVAR Capacitor Duty Contactor 35.6 KVAR 3 phase, 525V, 50 Hz Super Heavy Duty Capacitor Bank. 25 KVAR 3 phase, 415V, 7% detuned Harmonic Block Reactor with discharge reactor. ON -OFF Indication Lamp with Push button 10 KVAR 3phase banks. Each bank shall have following components: As required 32 A MCB – TP -10 KA, with O/L & S/C protection. 12.5 KVAR Capacitor Duty Contactor 14.2 KVAR 3 phase, 525V, 50 Hz Super Heavy Duty Capacitor Bank. 10 KVAR 3 phase, 415V, 7% detuned Harmonic Block Reactor with discharge reactor. ON -OFF Indication Lamp with push button 5 KVAR 3phase banks. Each bank shall have following components: As required 16A MCB – TP -10 KA, with O/L & S/C protection 12.5 Kvar Cap Duty Contactor. 7.1 KVAR 3 phase, 525V, 50 Hz super heavy duty Capacitor Bank. 5 KVAR 3 phase, 415V, 7% detuned Harmonic Block Reactor with discharge resistor ON – OFF Indication Lamp with push button
D.	

SELECTION OF CAPACITOR BANKING FOR DESIGNING

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