Shreem Electric Limited a comprehensive power quality solution provider boasts world's leading technology in the power industry and has secured a competitive capability on par with that top competitors in reactive power compensation, harmonic filtering, auto contactor switched capacitor banks, dynamic power factor correction and harmonic filter business.

We always believe in offering best technology to industries and utilities as per national and international standards.

R & D

Shreem R & D identifies innovation, creation and expertise as core values and concentrates on world class R & D with a philosophy aspiring after customer satisfaction, quality priority and performance orientation.

Shreem's innovative approach to R & D coupled with dedicated customer service and support has ranked Shreem as a global leader in the power quality market.

Quality Assurance

Shreem strives for excellence. We believe excellence can only be achieved through absolute quality and value for customers.

In order to create quality products, we believe that all of the actions of every single employee must be focused in the highest level of quality work.

In order to achieve levels, we have implemented a quality assurance policy (QAP) and programs that make our philosophy into a reality.

We are committed to comprehensive and quality management through three quality strategies : quality management system, customer-focused management system, and concentration on core competencies.

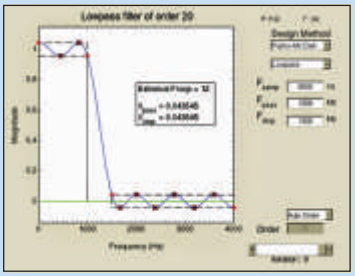
Strength

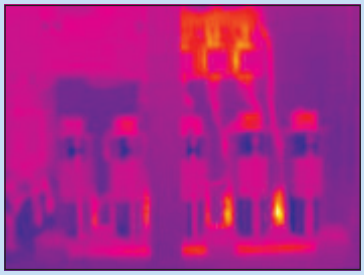
Our highly qualified and experienced engineering team is equipped with world class tools like Power Quality Analyzer, Oscilloscopes, Infrared Thermal Imager and design is based on mathematical modeling of electrical network with softwares like MATLAB & SKM Power tools for transient as well as steady state analysis which gives strong backbone for reliable design of products and system.

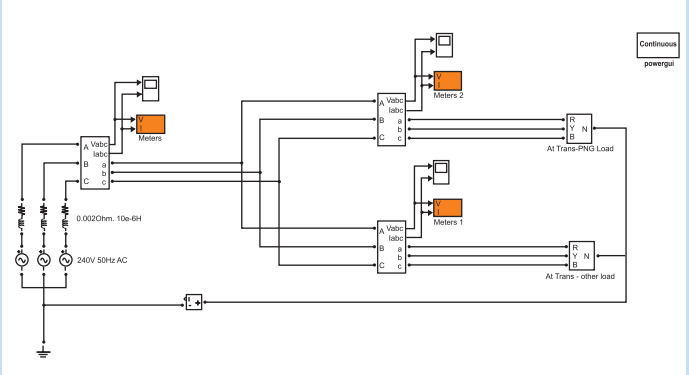
Our product reliability confirms with in-house state of art manufacturing & testing facilities.

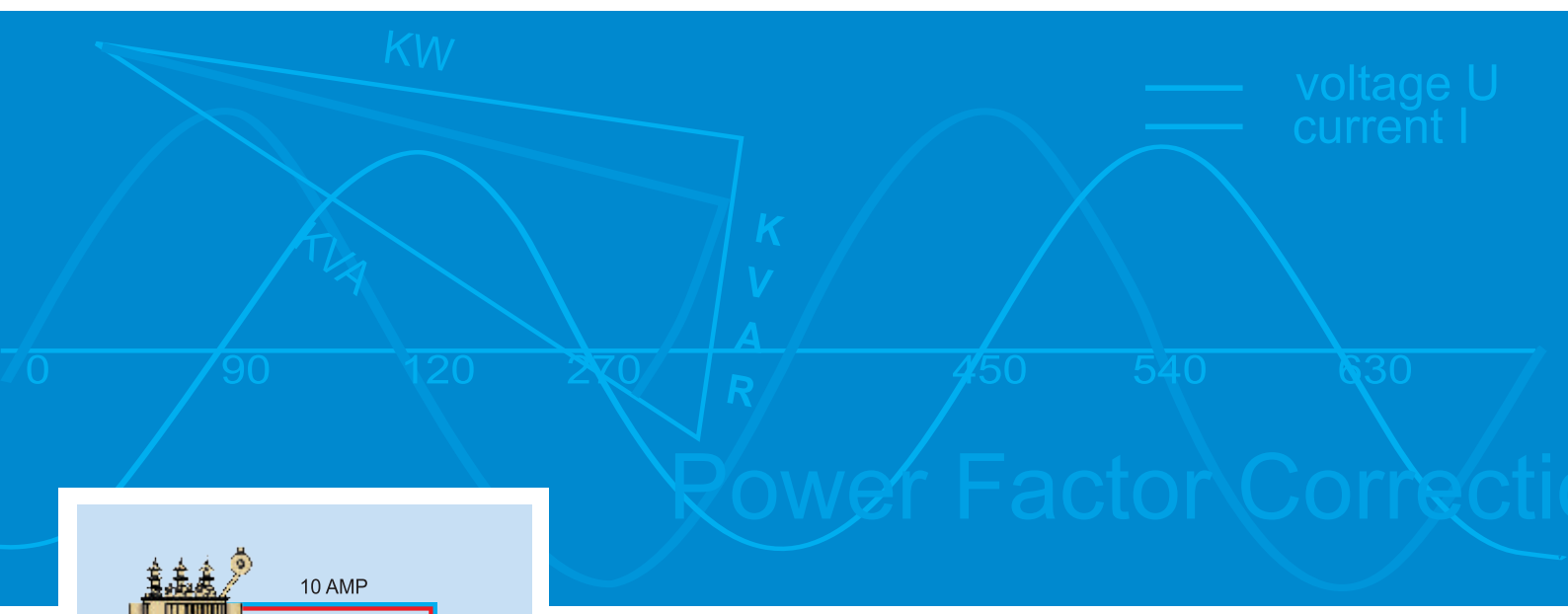
Our after sales service support like erection, commissioning, testing, Annual Maintenance Contract (AMC) helped our customer to gain long lasting trust on us.

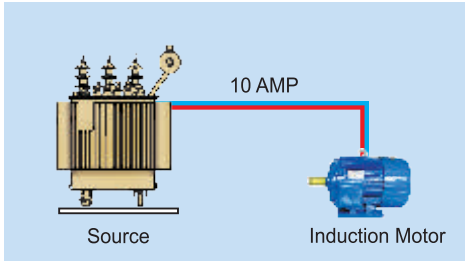
Over 38 years of experience in the industry has allowed us to develop advanced technologies that ensure Shreem products always deliver excellent cost performance.

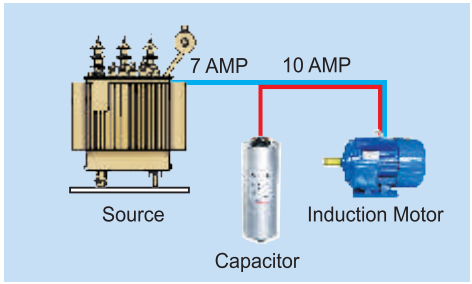


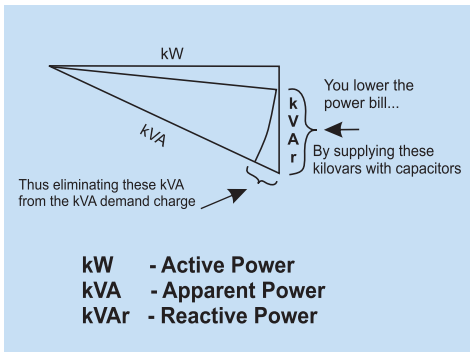


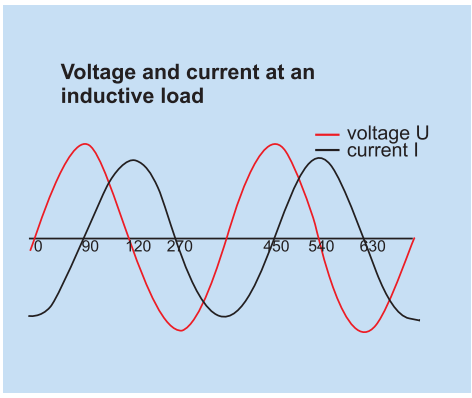












Power Factor

Power factor is measure of how efficiently electrical power is consumed.

The ideal Power Factor is unity or one. Anything less than one (100% efficiency), means that extra power is required to achieve the actual task at hand.

This extra energy is known as Reactive Power, which is necessary to provide a magnetising effect required by motors and other inductive loads to perform their desired characteristic functions.

Power Factor as close to unity is economically possible. The addition of capacitors compensate for the Reactive Power demand of the inductive load and thus reduce the burden on the source of power supply.

Power Factor Correction - Reactive Power Compensation

An inductive load requires a magnetic field to operate and in creating such a magnetic field causes the current to “lag” the voltage (i.e., the current is not in phase with the voltage).

Power Factor correction is the process of compensating for the “lagging” current by applying a “leading” current in the form of capacitors.

Power Factor is best expressed as ratio of Active Power (kW) / Apparent Power (kVA)

Benifits of Power Factor Correction

- Reduced power consumption
- Improved electrical energy efficiency
- Extra kVA availability from the existing supply in other world’s release of the system kVA capacity.
- Reduced transformer and distribution equipment losses.
- Reduction of voltage drop in long distance cable.

The multiplying factors for to calculate required kVAr are given in following table -

Original P. F.	Multiplication factor (tan Ø1 - tan Ø2) for a target power factor									
Cos Ø1	Cos Ø2									
	0.70	0.75	0.80	0.85	0.90	0.92	0.94	0.96	0.98	1.00
0.40	1.271	1.409	1.541	1.672	1.807	1.865	1.928	2.000	2.088	2.291
0.45	0.964	1.103	1.235	1.365	1.500	1.559	1.622	1.693	1.781	1.985
0.50	0.712	0.850	0.982	1.112	1.248	1.306	1.369	1.440	1.529	1.732
0.55	0.498	0.637	0.768	0.899	1.034	1.092	1.156	1.227	1.315	1.518
0.60	0.313	0.451	0.583	0.714	**0.849**	0.907	0.970	1.042	1.130	1.333
0.65	0.149	0.287	0.419	0.549	0.685	0.743	0.806	0.877	0.966	1.169
0.70		0.138	0.270	0.400	0.536	0.594	0.657	0.729	0.817	1.020
0.75			0.132	0.262	0.398	0.456	0.519	0.590	0.679	0.882
0.80				0.130	0.266	0.324	0.387	0.458	0.547	0.750
0.85					0.135	0.194	0.257	0.328	0.417	0.620
0.90						0.058	0.421	0.193	0.281	0.484
0.95								0.037	0.126	0.329

Auto Switched Contactor based Power Factor Correction System. (LVAS-C)

Shreem

Specifications

- Voltage : 415V/440V/550V/660V
- Frequency : 50 Hz
- Intelligent Power Factor Controller : 1 CT/3 CT sensing with parameter display
- Switching device : Capacitor Duty Contactor (AC 6b duty)
- Metal Cabinet (indoor/outdoor) powder coated
- Incomer : MCCB/ACB/SFU
- Equipped with ventilation system (Natural/Forced)
- IP protection : IP-40/55
- Cable entry : Top or Bottom

Capacitor

- All polypropylene film (APP) + foil design. (As per IS 13585)
- MPP (Metallised polypropylene film) design. (As per IS 13340)
- Reactor : 0.2%, 7%, 14% inrush current limiting & detuned reactors suitable for application. (As per IS 5553)

Features

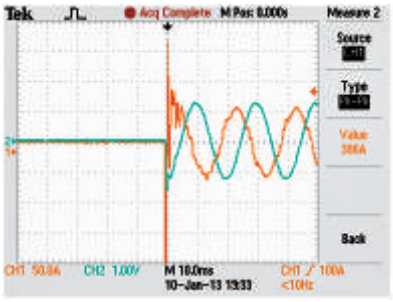
- Data downloading facility is available for 3 CT Power Factor Controller.
- **Current Free wheeling low wattage resistors across Series Reactor to reduce insulation stresses on components.**
- Available in compartmentalized & non-compartmentalized.

Applicable Standards

- IEC-61439-Part1 & Part2 (Control gear & Switch gear assembly)
- IEC-61921 (For capacitor bank)
- IS-8623 (Control gear & Switch gear assembly)

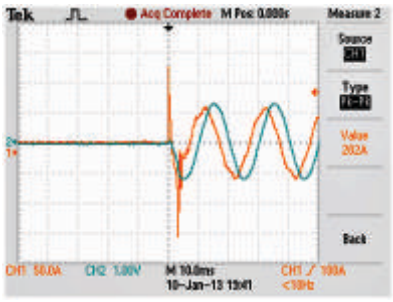
Applications:

- Automatic PF correction for variable industrial load like AC/DC drives, furnace, cement industry, paper mills, steel industry, distribution transformer carrying commercial loads, oil & gas industry, water industry, Sugar industry.



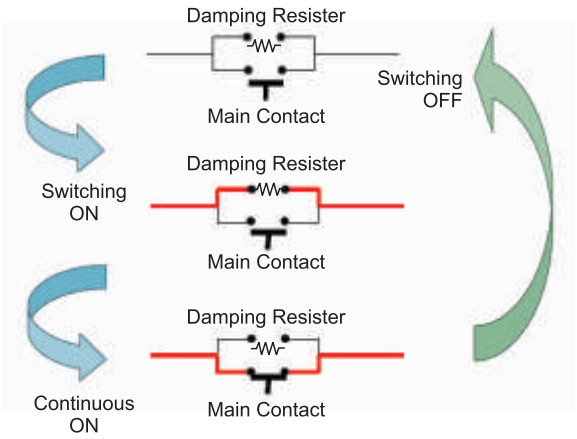
Capacitor Current

Inrush Current during capacitor switching using AC3 duty power contactor



Capacitor Current

Inrush Current during capacitor switching using AC6b capacitor duty contactor



Series		Size (With APP Capacitors) Width	Depth	Height	Size (With MPP Capacitors) Width	Depth	Height	Step Configuration
LVAS-C	150	1300	850	2300	1300	850	2000	25K x 6
LVAS-C	200	1300	850	2300	1300	850	2000	50K x 2 + 25K x 4
LVAS-C	300	1500	850	2300	1500	850	2000	50K x 4 + 25K x 4
LVAS-C	400	1700	850	2300	1700	850	2000	50K x 8
LVAS-C	500	1950	850	2300	1950	850	2000	100K x 2 + 50K x 6
LVAS-C	600	2100	850	2300	2300	850	2000	100K x 4 + 50K x 4
LVAS-C	700	2300	850	2300	2300	850	2000	100K x 6 + 50K x 2
LVAS-C	800	2300	850	2300	2300	850	2000	100K x 8

Note: Panel size & dimensions with kVAr ratings can be designed as per customer requirements.

Dynamic Power Factor Correction System (TSC) LVAS-T

Shreem

Specifications

- Voltage : 415V/440V/550V/660V/750V, 3 phase
- Frequency : 50 Hz/60 Hz
- Intelligent power factor correction upto 16 stages
- Switching device : Thyristors (SCR) module equipped with SCR, heat sink, firing module.
- Temperature : -5°C to +45°C
- Metal cabinet (indoor) powder coated with IP4X & forced cooling fan.
- Incomer : MCCB/ACB/SFU
- Equipped with ventilation system (Forced) with centrifugal backward curved type fan.

Capacitors:

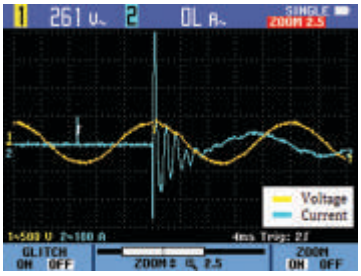
- All polypropylene film (APP) film + foil design
- MPP (Metallised polypropylene film) design
- Connection : Delta/Star

Features:

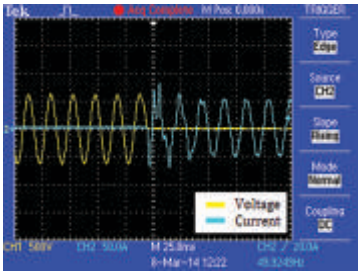
- Zero voltage switching terminology with intelligent electronic control.
- Smooth, surgeless, transient free switching of capacitor which will not cause disturbances to sensitive networks or neighbouring equipments.
- Fast & fine correction of Power Factor.
- Line chokes for thyristor, di/dt protection & detuned filter usage.
- Transient free switching causes long life of system components without limitations of number of switching operations.
- **Current free wheeling low wattage resistors across Series Reactor to reduce insulation stresses which forms RLC circuit.**

LVAS-T System

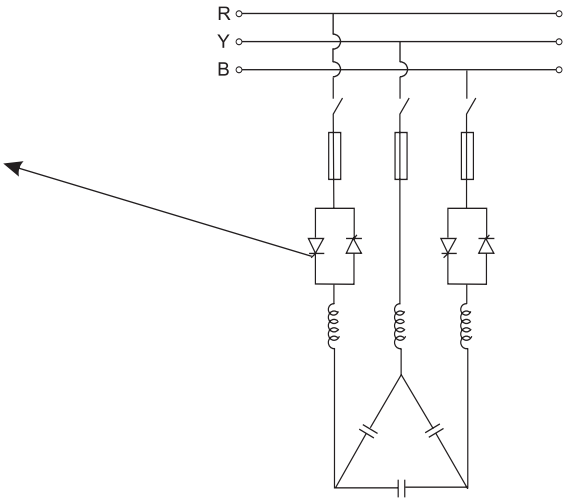
Thyristor module



Current waveform with switching Capacitor bank with contactors (transient)



Current waveform with switching Capacitor Bank with Thyristor (no transient)



Applications:

- Automobile industry & Steel industry
- Textile/Cement/Ceramic/Sugar/Refinery industry
- Wind mills, Escalator, Elevator & Conveyor system
- Multiplex, Commercial, Buildings, Offshore drilling, Harbour cranes

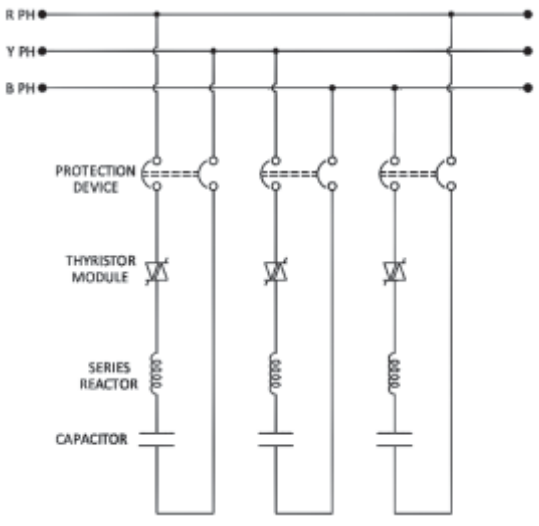
Applicable Standards

- IEC-61439-Part1 & Part2 (Control gear & Switch gear assembly)
- IEC-61921 (For capacitor bank)
- IS-8623 (Control gear & Switch gear assembly)

Series		Size (With APP Capacitors)			Size (With MPP Capacitors)			Step Configuration
		Width	Depth	Height	Width	Depth	Height	
LVAS-T	150	1300	850	2300	1500	850	2000	25K x 6
LVAS-T	200	1500	850	2300	1500	850	2000	50K x 2 + 25K x 4
LVAS-T	300	1750	850	2300	1750	850	2000	50K x 4 + 25K x 4
LVAS-T	400	1950	850	2300	1950	850	2000	50K x 8
LVAS-T	500	1950	850	2300	1950	850	2000	100K x 2 + 50K x 6
LVAS-T	600	2300	850	2300	2550	850	2000	100K x 4 + 50K x 4
LVAS-T	700	2550	850	2300	2550	850	2000	100K x 6 + 50K x 2
LVAS-T	800	2550	850	2300	2550	850	2000	100K x 8
LVAS-T	900	2750	850	2300	2750	850	2000	100K x 8 + 50K x 2
LVAS-T	1000	2750	850	2300	3200	850	2000	100K x 10

Note: Panel size & dimensions with kVAr ratings can be designed as per customer requirements.

Dynamic Reactive Power Compensation System (DRPC)



Typical Scheme for 2 phase welding load compensator

In automobile industry, major contribution is of two phase welding load having huge unbalance and dynamic fluctuations in all three phases of system. This rapid load fluctuation consumes large amount of reactive power causing large voltage drop which reduces the welding quality and efficiency.

Welding equipment draws high current for a very short time which may result in voltage dips. The normal three phase reactive power compensation system is not applicable for such types of loads because of unbalance power factor in each phase.

Specification

- Voltage : 230V/415V/440V, Frequency : 50 Hz, 1 Ph, 2 Ph, 3 Ph
- Advanced DSP Micro Processor controlled reactive power regulator
- Switching device : Thyristors equipped with SCR, heat sink, firing module.
- Metal cabinet (indoor) powder coated with IP4X & forced cooling fan.
- Incomer : MCCB/ACB/SFU
- Capacitors : All polypropylene film (APP) film + foil design,
  MPP (Metallised polypropylene film) design.
- Connection : Delta/Star

Features

- In this scheme, specially designed two phase or single phase capacitors are used. Each capacitor step is controlled by high speed thyristor switches.
- Detuned series reactors are used in series with each capacitor to avoid resonance and for harmonic blocking purpose.
- The change in Reactive Power during the packet of welding cycles is adjusted by Shreem-DRPC to maintain the Power Factor near to unity.
- This gives rise to reduced maximum demand, improved Power Factor, reduction of losses in the system due to reduction of line current.
- Minimizes voltage fluctuations & Improvement in welding process & productivity.
- Advanced DSP Micro Processor controlled reactive power regulator with 3-phase reactive power measuring and individual regulation of reactive power in three phases is used for switching of capacitor banks.
- Hybrid compensation with 2 Ph & 3 Ph possible with this system.
- **Current free wheeling low wattage resistors across Series Reactor to reduce insulation stresses.**

APFC Controller

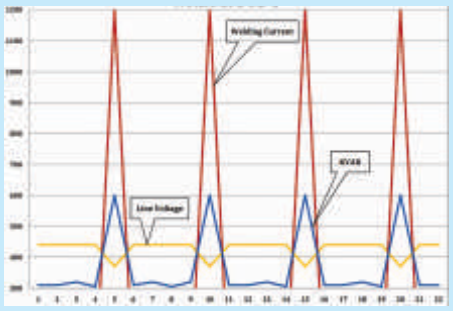
Advanced DSP Micro Processor controlled power regulator with 3-phase reactive power measuring and individual regulation of reactive power in three phases.

- Internal microcontroller : 16bit DSP Micro Processor.
- Display : LCD with backlight and clear text menu
- Programmable phase-offset 00 – 3450 in 150 steps
- Range of temperature measuring : 200-1000c
- Digital input : 50-250 V AC, programmable
- RS485 Modbus (optional)
- Data-logger for measuring + event recorder, real time clock and 2 digital input with 24V DC (optional)
- Automatic detection of capacitor, capacitor size and phase of capacitor
- Free sequence of the capacitors
- Permanently updating of the capacitor sizes to the actual values.
- The status of each capacitor is permanently displayed on LCD.
- 4 quadrant operation (import or export of active work).
- Best-Fit algorithm to get soon and exact results of regulation.
- 2nd parallel algorithm for fine-tuning.
- Regulation of fundamental wave reactive power, to be independent from harmonics, which cannot be compensated by switching capacitor steps.
- The reactive power for regulation is rated to nominal voltage for the best possible results.
- Programmable Under/Over voltage regulation.
- Programmable over-temperature protection.
- Fan control by using digital output (temp level 1).
- Overload alarm for current path.
- Automatic checking of current path when there is zero current and alarming.
- Programmable monitoring and alarm system with alarming in LCD. alarm contact, digital output, 2nd target PF, Freeze operation (all steps are frozen) or stopping operation (all steps are off) with the following alarms: -
  control alarm, over-under voltage alarm, internal function, zero current alarm, overload current path alarm, step failure alarm, step maintenance alarm, power factor alarm, THD U alarm, THD I alarm, overload kW alarm, over kVAr alarm, kW export alarm, temperature level 1 and 2, digital input alarm.
- Measuring system shows the following values: voltage, current, THD, kVA, kVAr, cosphi (DPF), Power Factor L1/L2/L3/total. Frequency, temperature, kWh imp/exp, kVArh cap/ind, Harm. U 2nd – 30th (even and odd), Harm. I L1/L2/L3 2nd – 30th (even and odd).

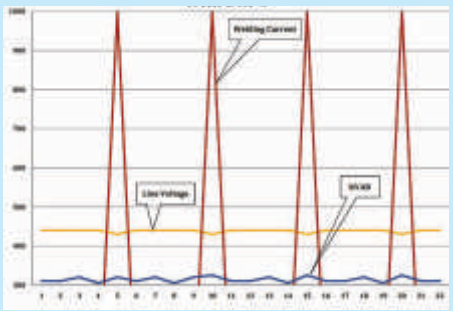
Dynamic Reactive Power Compensation System (DRPC)

Shreem

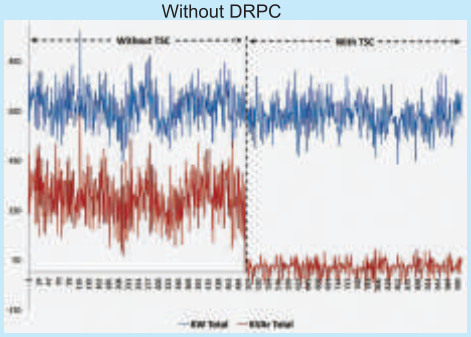
Waveforms for dynamic load PF correction for 2 phase spot welding load



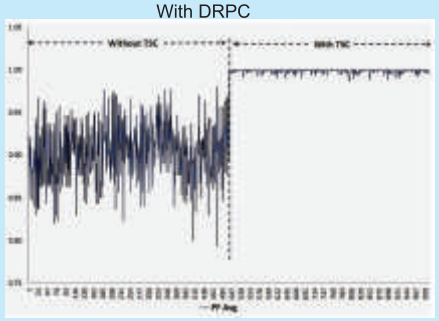
Without DRPC



With DRPC



Power Factor with & without DRPC



Active & Reactive Power with & without DRPC

Applications

- Single or two phase Robotic welding load in automobile industry, 3 phase CRM, HRM, Induction heating, Press machine load.
- Single phase traction/Railway load.

Fix / Semi Automatic Capacitor Bank

Specifications

- Voltage : 415V/440/525V/690V
- Frequency : 50 Hz/60 Hz
- KVAr : 9/18/27/36/50/75/100/125/150/300 kVAr.
- Capacitor : All polypropylene film (APP) film + foil design. MPP (Metallised polypropylene film) design.
- Protection : MCB/MCCB/SFU
- Natural / Forced cooled IP-4X cabinet.
- With & without Series Reactor.
- Mounting : Floor/Wall/Pole.

Applications

- Power Factor correction for fix load like motors, distribution transformer.

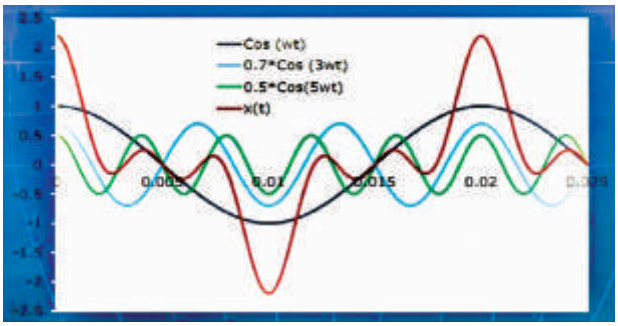
Micro APFC Panel

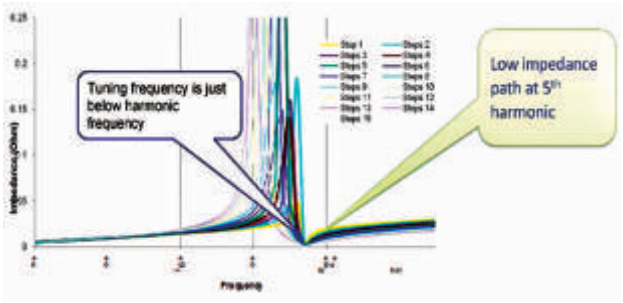
Specifications:

- Voltage : 415V/440V
- Frequency : 50 Hz/60 Hz
- PF Controller : Microprocessor based SPF-0X relay.
- Operation mode : Auto in maximum 5 steps.
- Switching : Contactor/Thyristor switch.
- Main protection : MCCB
- Feeder protection : MCB
- Range : 25 kVAr to 100 kVAr

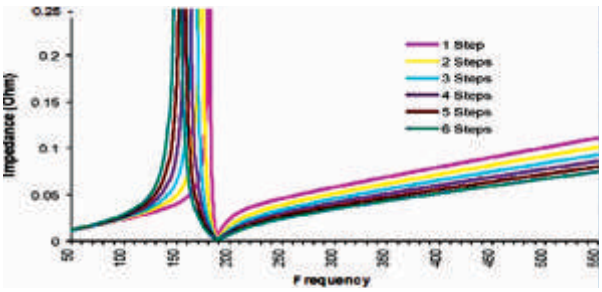
Applications:

- PF correction for small industries, commercial loads, Distribution transformer load.





Graph. No.1



Graph. No.2

Harmonics are the frequency components which are multiple of fundamental frequency in electric system.

Sources of Harmonics.

a) Electric Arc furnace
b) Electric Welding Equipment
c) Industrial Process Control
d) Adjustable Speed Drives
e) Personal Computer
f) Solid State Rectifier
g) Ups System
h) Solid State Elevator controls
i) Induction heating
j) Variable Frequency drives

Proper analysis of the system will help to design techniques to reduce the harmonics & to select proper combination of reactor & capacitor. Types of Harmonic filters:

1) Active harmonic filter.
2) Passive harmonic filter.

Passive Harmonic Filters:-

a) Tuned Filter
b) Partially tuned filter
c) Detuned Filter

Tuned Harmonic filter system:-

If the harmonic filter systems are being used only for reduction of harmonics then tuned passive filter should be used.

In this technique if suppose fifth harmonic is dominant then filter is tuned to frequency slightly below the filtered harmonic.4.9 tuning order.
It will provide low impedance path for particular harmonics to flow through the filter.

A tuned filter bank will require least amount of kVAr to bring the distortion within limit. It requires highest level of engineering design.
Capacitor & reactor are designed to carry this amount of harmonic current.

b) Partially Tuned Filter System:-

In some situation filter is required to improve the power factor & reduction of the harmonics in small amount then partially tuned filter system is used. In partially tuned filter system reactor & capacitor combination is tuned to tuning order of near below filtered harmonic (5th Harmonic) 4.2 (210Hz) so small amount of 5th harmonics flow through the filter & reduce Total Harmonic distortion.

(Refer Graph No.1 for this also only tuning frequency will be near below filtered harmonic.)

c) Detuned Filter System:-

If harmonic filter are being used only purpose of power factor correction then detuned harmonic filter system are used. Reactor that used series along with capacitor is 7% & tuned to order far below the filtered harmonic & frequency of 189 Hz so the circuit will provide low impedance path for this frequency.

Reactor will provide high impedance path for higher level harmonics so all the harmonics are blocked inside the harmonics only little amount of harmonics will flow through reactor& capacitor combination (2 to 3%).

Also this combination is used to avoid harmonic amplification as compare to bare capacitor & also avoids parallel resonance.

Zero Reactive Power Passive Current Harmonic Filter
ZRPPCHF - (Patent Applied)

Design is based on error estimation of filter impedance verses the Short Circuit impedance of the supply. The mathematical formulation is used in such a way that the filter can be design with Zero reactive power and always remains inductive for harmonic frequencies & hence never cause resonance. It is very economical and reliable alternative solution for harmonic filtering.

Harmonic Filter

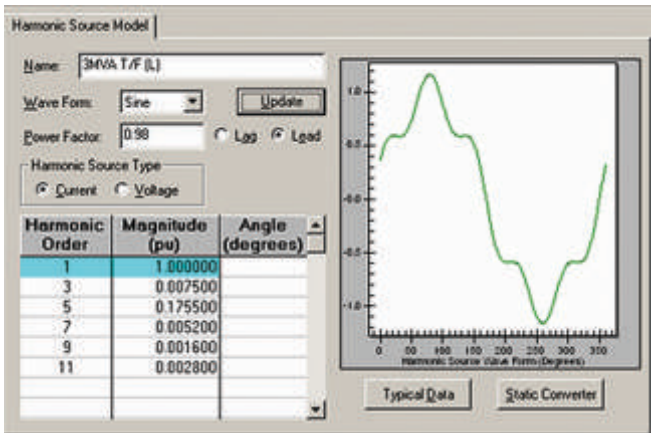
Specification:
- Auto / Fix configuration.
- Rated Voltage : 415/440/525/690 V, 3 Ph.
- Frequency : 50 Hz/60 Hz
- Intelligent Power Factor Controller.
- 2mm /1.6mm CRCA sheet metal cabinet with epoxy powder coating.
- Forced ventilation for proper heat dissipation with centrifugal backward curve fans.
- Heavy Duty/Capacitor Duty contactors for filter step switching fans.
- Step Protection - HRC fuse/MCCB/SFU.
- IP Protection class : IP-42

Features :
- Current Free wheeling low wattage resistors across Series Reactor to reduce insulation stresses.
- Suppress harmonics to customer requirement or as per IEEE-519 (2014).

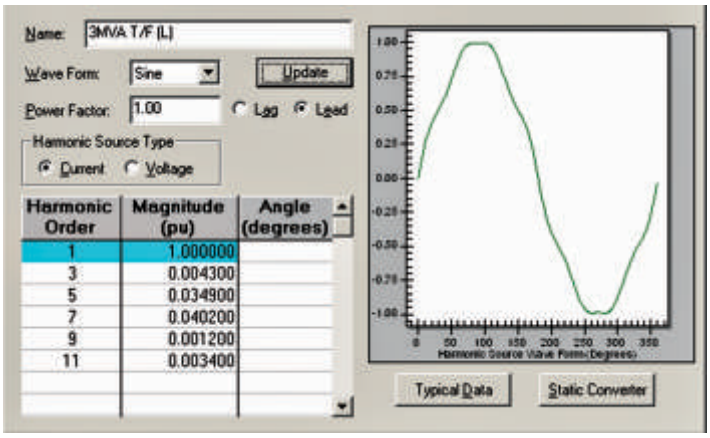
Capacitors :
- All polypropylene film (APP) film + foil design. (As per IS-13585)
- MPP (Metallised polypropylene film) design. (As per IS-13340)

Harmonic Filter Reactor (RLC) :
- Tuned frequency - 210 Hz, 250 Hz, 350 Hz
- Iron Core, cu-wound.
- Linearity 2 x in
- Class of insulation - F/H Class

Applications:
- Automobile industry & Steel industry.
- Textile/Cement/Ceramic/Sugar/Refinery industry.
- IT/Commercial complex.



Without Filter



With Filter

Series	kVAr	Size (With APP Capacitors) Width	Depth	Height	Size (With MPP Capacitors) Width	Depth	Height	Step Configuration
LVAS-F	150	1350	750	2200	1350	750	2200	25K x 6
LVAS-F	200	1350	750	2200	1350	750	2200	50K x 2 + 25K x 4
LVAS-F	300	2200	750	2200	1350	750	2200	50k x 4 + 25K x 4
LVAS-F	400	2200	750	2200	2200	750	2200	50K x 8
LVAS-F	500	2700	750	2200	2400	750	2200	100K x 2 + 50K x 6
LVAS-F	600	2700	750	2200	2400	750	2200	100K x 4 + 50K x 4
LVAS-F	700	2700	750	2200	2400	750	2200	100K x 6 + 50K x 2
LVAS-F	800	2700	750	2200	2400	750	2200	100K x 8

Note: Panel size & dimensions with kVAr ratings can be designed as per customer requirements.

Note: Shreem APFC system is type tested at ERDA, Vadodara.