



**Autometers Alliance Ltd**

**VARCON<sup>®</sup>**



**Dynamic  
Power Quality  
Customised  
Solutions**

**VARCON<sup>®</sup>** is registered for Uninterruptible Supply, Power Supplies, Power Compensators, Converters, Inverters, Battery Chargers, Cyclo Converter, Capacitors, Fibre Optics, Parts and Fittings manufactured by Autometers Alliance Limited, Noida.

## Introduction to Autometers Alliance Ltd

Autometers Alliance Ltd. (AAL) is an ISO9001, ISO14001, ISO45001 certified Indian company manufacturing high technology products to international standards. The company ranks amongst the country's premier hi-tech engineering solutions provider for Switchgear, Data Acquisition, Power Electronics, Audio & Display Systems, Escalators, and UPS Systems for Metro and Railway networks and for industrial applications.

## Research & Development

Advanced MATLAB software R2018a for simulation of Power Systems to offer an appropriate solution to the customers

Research and Development Centre, recognized by Department of Science and Industrial Research (DSIR), Government of India, Ministry of Science and Technology

Advanced CAD / CAM software for mechanical designing including 3D and surface modelling

In-house multilayer PCB designing employing fine pitch component

Competence in development of embedded software on different platforms

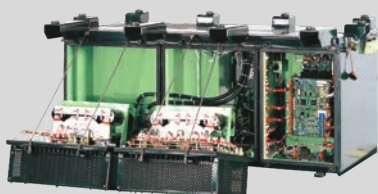
Thermal management and system design capability

Conversant with International Standards such as IEC, DIN, IEEE, EN, MIL etc. and competent to develop products in compliance



## Power Products

**Underslung Converter  
25kVA SGC**



**Static Converter  
180kVA**



**Auxiliary Converter  
3×130kVA**



**Hotel Load Converter  
2×500kVA**



## Manufacturing & Quality Assurance

ISO 9001 certified since 1994

Comprehensive manufacturing facility for assembly and testing of multilayer PCBs both with surface mount and through-hole technologies

ESD-protected Kardex Shuttle and Environmental chambers for temperature and humidity cycling

State-of-art measuring and test equipment like CRO, Harmonic Analysers, Temperature Scanners, Power supplies, Multi-meters etc.

In-house calibration facility having traceability with National Accredited Test Labs, full compliance with National and International Standards

Quality assurance and enhancement plans for all products according to International quality standards and collaborators / customer specifications

Well defined Quality audits for in-process & final stages of production

Product prototypes testing facility, including load test, high voltage / di-electric test, environmental test, heat test, dust test, water-ingress level test and more

State-of-the-art instruments and gauges for testing of electronic, electrical and mechanical components

Computerized profile projector with magnifying capability up to 100 times for fine measurements of mechanical components

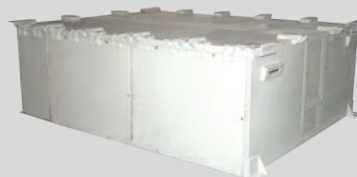


## of AAL

**Underslung Converter  
5kW**



**Underslung Converter  
50kVA**



**Underslung Converter  
100kVA**

**Battery Charger  
Pre-Cooling 30kVA**





## Why is Power Quality important?

Power Quality in simple words defines deviation of basic power parameters viz. voltage, current, and frequency from the normal waveform or values. Thus, deviation of voltage from its nominal value and sinusoidal waveform, deviation of supply current from its sinusoidal waveform, and deviation of supply frequency from its nominal value become measures of the power quality. The basic power quality issues normally observed are as under;

Voltage variation
Voltage flicker, sag and swell
Voltage transients
Voltage unbalance
Voltage or supply interruption
Voltage distortion (mainly caused by distortion of the current drawn and limited short circuit capacity or higher short circuit impedance at the Point of Common Coupling(PCC))
Frequency variation
Grounding and earthing

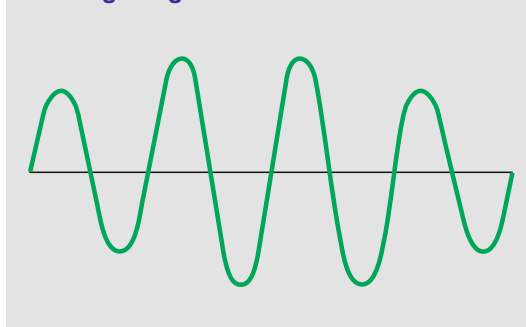
### Some examples of quality problems given in graphs below;

The world loses over Billions of US Dollars on power quality. The estimated direct cost of downtime in India due to bad power quality is beyond INR 20,000 Crores per annum. The indirect costs could be very high compared to this figure. These include Production loss and reduced life time power connected equipment. Power quality, hence, is an area of great concern for every country including India and the research is basically concentrated in overcoming or mitigating the power quality issues reliably and economically.

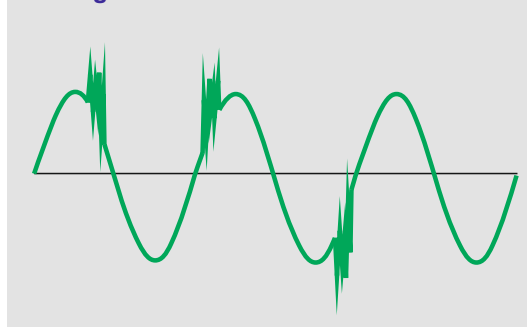
There are over 700 international publications per annum in power quality from 2007 to 2017 which reflects the gravity of situation in power quality faced by the world. There are number of national and international standards including IEC, IEEE, EN etc., which cover the power quality issues with certain guidelines that can help the supply network to remain in healthy condition despite fast changing complex and non-linear loads. Maintaining power quality and hence the health of supply power system, especially with proliferation non-linear loads, is not only essential for the utilities but is also equally essential for the customers.

## Power

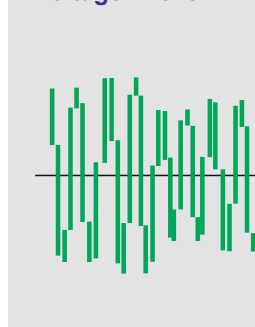
Voltage Sag & Swell



Voltage Transients



Voltage Flicker



## What are the Power Quality issues in India?

Addressing Power Quality Issues need an understanding of supply short circuit capacity, short circuit impedance and supply short circuit ratio is prime important. These parameters define the load current effect on voltage distortion, and current distortion absorption strength of the supply network. Similarly, the incoming voltage distortion, already existing, defines the impact on connected load inclusive of power factor correction capacitor banks.

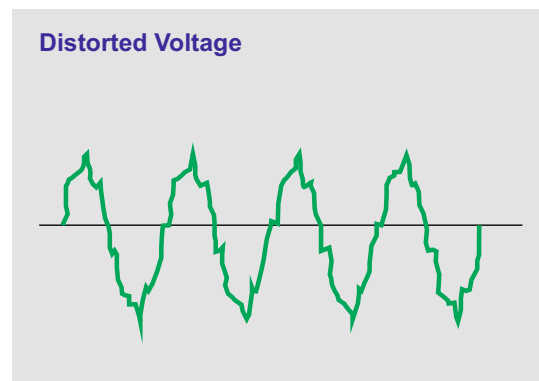
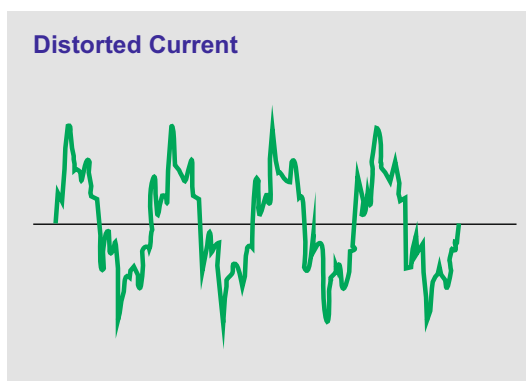
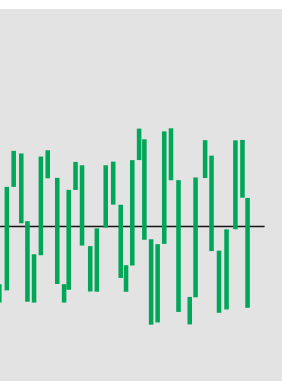
The non-linear loads produce current harmonics which can result in harmonic amplification or resonance with capacitor banks inclusive of those employed for harmonic filtration or for power factor correction. Thus, employing APFC or TSC with number of capacitor banks can lead to ill effects already stated unless the systems are modelled in Matlab and studied for harmonic amplification or resonance with each capacitor step or combination of different capacitor banks which get switched in and out.

IGBT based four quadrant Voltage Source Converters can answer the current harmonic filtering, dynamic reactive power compensation and voltage distortion issues but these come at a cost, require qualified manpower and is associated with difficult maintenance. However, all these products fall short of the performance requirement if short circuit capacity or impedance is not accounted properly during execution.

In addition, there are issues related to sudden voltage dips / rises of the voltage, neutral currents, monthly power factor linked to incentive / penalty by the utilities, customer worries of current harmonic measurements, its correlation with IEEE 519 standard and subsequent levying of the penalty. The customer suffers heavily on account of all these issues, man hours lost due to the issues he faces, and for getting a proper solution.

In a way, the customer has only worries on power quality problems and needs an assurance from the solution provider to address his worries. He is also right on his part to expect the solution provider to not only address all his worries but also provide a very economical, reliable, and viable solution to his power quality problems.

## Quality Issues



## How can AAL provide Power Quality Solutions?

- In depth and long experience in design / development of many Power Quality and electronic products / systems
- Integrated approach to understand clearly the Power Quality issues of the customer, find out the root causes and develop right solution
- Does not believe in offering any product on an ad hoc basis which may not offer right remedies but can deteriorate the system with additional problems such as more voltage distortion, harmonic amplification, resonance etc.”.

**Transparency is the key for AAL's approach while dealing with the customer**

### Integrated approach

#### Preparation

- Study the plant SLD
- Check / find the Short Circuit Capacity at the Point of Coupling
- Understand load dynamics and load current distortion
- Check incoming supply connections and voltage distortion
- Understand details of filter banks or capacitor banks, if already employed

#### Solution development

- Take necessary measurements with power analyser
- Study and analyze the data
- Simulate the system model in Matlab (without and with mitigating system)
- Confirm that the mitigation system offers necessary remedy for the power quality issues faced by the customer

**AAL follows both the above steps to deal with customer's exact power quality issues**

**New solutions developed by AAL for power factor improvement, harmonic mitigation, and other issues**

#### Switched Reactor concept

- Which does not produce any inrush currents
- Free from harmonic amplification and resonance with supply short circuit impedance (as can happen with APFC or TSC), as the system becomes inductive in nature with this solution

## Power Quality

**Railway / Metro**



**Utilities**



**Steel / Paper / Cement / Chemical**



### Ongoing development

- AAL is also developing low cost and reliable solutions to mitigate other issues like voltage distortions, sudden under and overvoltage etc. faced by the customers and which demand very high costs in the present scenario

### The solutions offered

With due considerations to all system parameters, earthing / grounding and any other specific issue worrying the customer, solutions offered broadly cover the following areas (HV and LV)

Current and voltage distortion as per IEEE 519
Harmonic amplification and resonance
Power factor improvement with due considerations to incentives and penalties
Neutral current issues arising out of unbalanced loading
Other solutions specific to system requirements

AAL has the technology of IGBT based four quadrant converters (visible from the power products) which can be easily used to provide dynamic reactive power compensation and active current harmonic filtering, but will offer it only if there is a real need for the same based on understanding with customer.

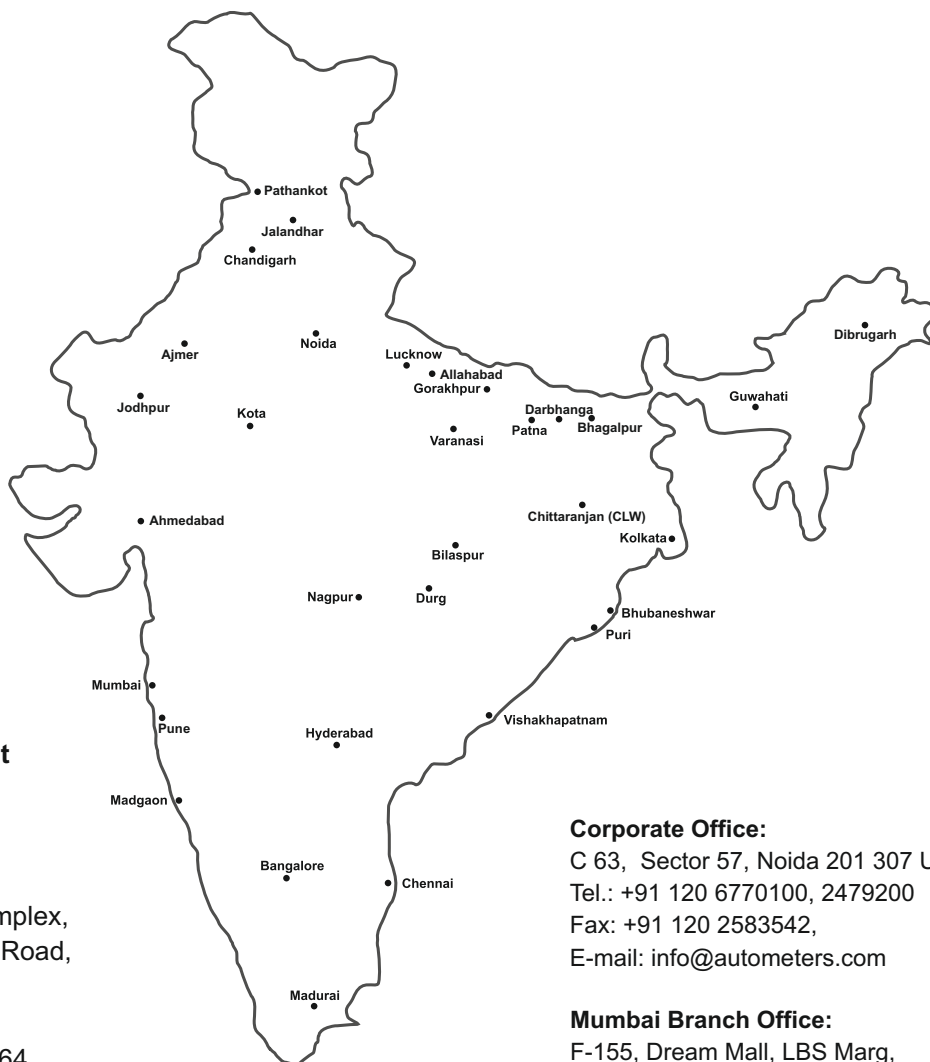
## Expected Payback Period ?

In most cases, within a period of 4 to 12 months based on nature of solution provided.

## Applications







**For enquiry please contact**



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