

# P2 Power Solutions Pvt. Ltd.

An ISO 9001:2008 Company

Quality Power within your Reach



## P2 Power Magnetics



*Power your power*



P2 Power Solutions works to deliver Innovative Engineering solutions with specific focus on energy efficiency and power quality enhancement.

## P2 Power Solutions Pvt. Ltd.

P2 Power Solutions Pvt. Ltd. provides EMC and power quality solutions, to improve the quality of electricity and the availability of electrical supplies. P2 Power Solutions enable the widespread use of energy-efficient technologies like motor drives, eliminating their 'side-effects' and therefore contribute to a sustainable use of available resources.

P2 Power offers EMC/EMI filters and chokes for a wide range of industrial applications, enabling cost effective standard and customized solutions to improve the immunity and safety of electrical and electronic equipment and also meet the international compliance standards.

Promoted by IITians; we are associated with IIT Kharagpur, one of the top technical institutes in the world, through TIETS (Technology Incubation and Entrepreneurship Training Society) for all technical support and R&D. We are also associated with the Department of Science and Technology, Government of India. Our advisory board consists of eminent members with over 50 years experience in the electrical industry.

# Introduction to Magnetics

P2 Power solutions is Original Design Manufacturers for a wide range of Power Quality solutions. Some of our products are:

- ✚ Active Harmonic Filters
- ✚ Tuned Harmonic Filters
- ✚ Detuned APFCs
- ✚ Detuned RTPFCs
- ✚ Servo Stabilizers

When it comes to magnetics, everything from the core, the conductors, the insulation levels to strict quality control matters when it comes to ensuring the intended performance. Because of our long experience in dealing with Power Quality problems across a wide range of industries, we understand the need of high quality solutions.

## Power Quality

- ✚ Detuned reactors
- ✚ Shunt Reactors
- ✚ Harmonic Filters
- ✚ Isolation Transformers

## Automation

- ✚ Line reactors
- ✚ Output Chokes for VFDs
- ✚ Sinusoidal filters

## Custom magnetics

- ✚ Low Voltage Custom Transformers
- ✚ Medium Voltage custom transformers
- ✚ Custom Reactors and Filters

# Power Quality Applications

## Detuned Filter Reactors

Any device with nonlinear operating characteristics introduces current harmonics in the power system. Whenever power factor capacitors are installed in a harmonic rich environment, there will always be a frequency at which the capacitors form a resonating circuit with the overall network inductance. If this condition occurs then large harmonic currents can circulate between the supply network and power factor correction panel. Detuned filter reactors protect the power factor correction systems by suppressing the harmonics and reducing the risk of harmonic resonance. With the use of detuned filter reactors, the currents flowing through the capacitors are reduced by creating impedance in addition to capacitor impedance at harmonic frequencies (such as 250 Hz for 5th harmonic and 350 Hz for 7th harmonic).

### Features

- ✚ Air gap design that minimizes the enclosure grounding resistance
- ✚ Vacuum impregnated varnish method that improves efficiency by reducing heat losses, provides protection against humidity, and enables quiet operation
- ✚ Iron core with high magnetic permeability
- ✚ Thermal protection switch in the middle coil against overloading and overheating
- ✚ CE mark and compatibility with EN 61000-2-2 and EN 61558 2-20

### Benefits

- ✚ Capacitor heat is reduced because currents flowing at the harmonic currents entering the capacitors will reduce.
- ✚ Eliminates overloading risk due to resonance.
- ✚ Capacitor life improves because overheating and isolation failure risks are reduced.
- ✚ High current transients occurring during the switching of capacitor groups are prevented.
- ✚ Since harmonics will decrease throughout the establishment, it helps sensitive devices such as computers, medical systems and PLC to be protected against deforming effects caused by harmonics.

## Shunt Reactors

A shunt reactor is an absorber of reactive power, thus increasing the energy efficiency of the system. These reactors are high quality devices which are designed to meet the inductive load demands. Shunt reactors are designed to compensate the capacitive power used by long underground power lines, UPS, computers, electronic ballast, and energy saving lamps.

Shunt reactors are designed in European standards to have long operating lives and endure difficult operating conditions. These devices which are designed to provide inductive load requirements have the CE mark.

### Features

- ✚ Single or three-phase, highly conductive design with air gap
- ✚ High quality copper or aluminum windings (copper coated terminal on aluminum windings)
- ✚ Custom designs to meet customer specifications
- ✚ F isolation class insulation material on the windings resistant to 155 C
- ✚ Thermal protection against overload
- ✚ Vacuum impregnated varnish method that improves efficiency by reducing heat losses, provides protection against humidity, and enables quiet operation CE mark and compatibility with EN 61558 2-20

## Tuned Harmonic Filters

Harmonic Distortion has become a major concern for facility managers, users of automation equipment and specifying engineers alike. High harmonics not only increase energy wastage, but also reduce equipment life, electrical system reliability, system efficiency and overall productivity. Harmonics may result in Transformer and Distribution equipment overheating, spurious breaker tripping and sensitive equipment failure etc.

The power network can tolerate only a limited level of harmonics and other electrical disturbances.

### Benefits

- ✚ Higher power factor, improved voltage stability and lower network losses.
- ✚ Filtering of Harmonics in the system within acceptable limits.
- ✚ Lowering the risk of resonance and amplification of electrical disturbances.
- ✚ Eliminates the risk of nuisance tripping
- ✚ Increasing drive uptime

### Typical Applications

- ✚ Variable Frequency Drives
- ✚ Electronic Welders
- ✚ Battery Chargers
- ✚ Fans and Pumps
- ✚ Induction Heating Equipment
- ✚ Elevator Drives
- ✚ HVAC Systems
- ✚ Oil and Gas Industries
- ✚ Hospitals

## Isolation Transformers

Isolation transformers ensure the safe operation on the secondary side by isolating them from the primary voltage. Isolation transformers are a traditional solution for providing high isolation in electronic circuitry. Even with the increased use of efficient, switched-mode power supplies (SMPS), isolation transformers can improve the overall isolation of an electronic design without severe penalties in added size, weight, and cost. Isolation transformers enable a variety of electronic systems to meet safety requirements. Such systems include medical diagnostic equipment, computer systems, and telecommunications equipment.

Input output voltages of isolating transformers are fixed (230 or 400V). The electrical connection is done via terminal blocks, cross sections adequately selected for maximum currents. They are generally used at places requiring galvanic isolation and to obtain a star point in networks without star points. All isolation transformers have CE mark and are compatible with EN standards.

### Features

- ✚ Compatible with TS.EN 61558-2-2
- ✚ Iron core with high magnetic permeability
- ✚ High quality copper winding
- ✚ Vacuum impregnated varnish method that improves efficiency by reducing heat losses, provides protection against humidity, and enables quiet operation.
- ✚ Preserving its nominal output value up to 50°C ambient temperature
- ✚ Welding of sheet metal with air gap that minimizes the trunk enclosure resistance
- ✚ Class 1 transformer
- ✚ Minimum primary-secondary isolation voltage values: 4400 VAC for 400V transformers, 3600 VAC for 230V transformers
- ✚ Reducing instant current fluctuations

# Automation Applications

## Line Reactors

The term line reactor is fairly loosely applied to any inductive component that is used in a power line application. However, these components can be used for several purposes, not limited to the power input of a product or system. Line reactors are a formidable components in power system. These components are used in motor drives and other applications.

### Benefits

- ✚ Improved reliability, since power supply transients are less likely to damage the semiconductors and reduced peak currents will increase the lifetime of components
- ✚ Reduced downtimes, since utility overvoltage surges are less likely to cause nuisance trips
- ✚ Other users of the supply are pacified, since harmonic and commutation notch pollution is controlled
- ✚ Mitigation of harmonic heating resulting reduced line losses, leading to lower operating costs

A reactor in the power supply input will do two things: protect the load electronics from power disturbances and protect the power supply from the disturbances created by the load.

### Typical Applications

- ✚ Variable frequency drives
- ✚ Power supplies (SMPS, UPS converters)
- ✚ Lighting control systems
- ✚ Rectifiers
- ✚ Welding Equipment
- ✚ Electric arc furnaces
- ✚ Spark emission machines and so on.

## Output Chokes for VFDs

Reactors can be used in power drive system: as line reactor and at the drive output to the motor (dv/dt reactor). dv/dt Filters are designed to protect AC motors from the destructive effects of peak voltages facilitated by long cable runs between the inverter and motor. Depending on the switching time of the power semiconductor used in the inverter and the size of the motor, cable lengths as short as eight feet can result in peak motor voltages that exceed the rating of the motor's insulation system. The longer the cable, the greater the problem. These reactors increase inductivity and assist signal smoothing.

It protects the motor coil insulation from premature ageing and destruction and increases significantly the service life of electric motors.

### Benefits

- ✚ Efficient reduction of high output voltage dv/dt from IGBT motor drives.
- ✚ High reliability and secured production up time for mission critical applications.
- ✚ Reduced converter pulse load.
- ✚ Less interference propagation towards neighboring equipment of lines.
- ✚ Vacuum impregnation for reduced humming noise and high durability.
- ✚ Reduction of drive output voltage dv/dt
- ✚ Reduction of motor temperature
- ✚ Increase of motor service life
- ✚ Compact and economic open frame design
- ✚ Standard catalog reactors up to 1100 A
- ✚ UL rated materials used

### Typical Applications

- ✚ Servo drives
- ✚ Close loop vector drives
- ✚ Motor drive applications with short motor cables
- ✚ Machinery comprising servo or torque motors
- ✚ Robots
- ✚ Pick and place machines

## Sinusoidal Filters

Sine Wave Filters are designed to provide a smooth Sine Wave output voltage with low residual ripple, when driven with Variable Frequency Drives or other types of PWM inverters. For Variable Frequency Drive (VFD) applications, Sine Wave Filters eliminate the problem of motor/cable insulation failures, heating, and audible noise. Sine Wave Filters also reduce electromagnetic interference (EMI) by eliminating the high  $dv/dt$  associated with inverter output waveforms. As a result, insulation stress and losses in AC motors are reduced and motor lifetime is prolonged.

### Benefits

- ✚ Smoothing of PWM drive output voltages
- ✚ Production up-time for mission critical applications
- ✚ Increased service life of expensive high speed motors
- ✚ Elimination of motor bearing damages
- ✚ Reduction of audible motor noise
- ✚ Improvement in system reliability
- ✚ Efficient motor protection
- ✚ Improvement in EMC environment

### Typical Applications

- ✚ HVAC Applications
- ✚ Conveyors, compressors, elevators
- ✚ Motor drive with long motor cable
- ✚ Motor drive with multiple motors in parallel
- ✚ Retrofit installations with motor drives
- ✚ Step up transformers applications for LV drive control of MV Motors
- ✚ Motor drive applications with unshielded motor cables

# Custom Magnetics

## Low Voltage Custom Transformers

- ✚ Auto Transformers
- ✚ 1-phase transformers up to 500kVA
- ✚ 3-phase transformers up to 1500kVA
- ✚ Transformer Reactor combinations up to 1000kVA

## Medium Voltage Custom Transformers

- ✚ Distribution transformers
- ✚ Rectifier-duty transformers
- ✚ Wayside traction power
- ✚ Re-winding service

## Custom Reactors and Filters

- ✚ Special reactors for PV inverters
- ✚ Special  $dv/dt$  filters for wind turbines
- ✚ Special LCL filters
- ✚ Custom engineered as per specifications



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