

Your Power Quality Specialists

Harmonic Analysis • Problem Diagnosis • Filter Design

Power Quality Components • Power Quality Seminars

Our Goal
is to help you
Solve or Prevent
Power Quality
Problems



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Power Quality Technical Services

PQ Help for your Technical Team

Harmonic Analysis / Power Quality Studies

Using computer simulation software and other engineering tools, we can perform analysis for electrical systems or products to predict harmonic distortion levels, power factor, harmonic resonance, transformer loading and to quantify other electrical power quality concerns. Our typical analysis includes a written report complete with waveforms, spectra, harmonic data to the 100th harmonic, an explanation of the results plus our recommendations to meet your power quality objectives.



Single Line Diagram

This service is valuable for checking your compliance with an engineering specification or utility requirement, or to obtain a benchmark of your electrical system power quality. We can also help you to evaluate alternative power quality solutions by simulating the “before and after” scenarios for the various techniques under consideration.

Information typically needed from you to perform this analysis:

- Single Line Diagram (SLD)
- Specification; Limits for harmonic distortion (voltage and current)
- Ratings and impedance of all power sources and ratings of major loads
- Manufacturer and model of adjustable speed drives where possible

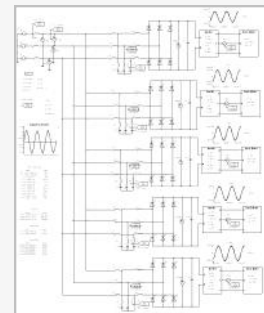
Power Quality Problem Diagnosis

With over thirty years of experience, we have found that many problems can be resolved over the phone. If more in-depth analysis is needed, then we use computer simulation to help diagnose electrical power quality problems within a facility. We can help to identify the root cause of power quality problems and evaluate alternative techniques to resolve the problems.

Our standard written reports demonstrate the problem, identify the probable cause and provide an explanation of our observations along with our recommendations to resolve the problem.

Information typically needed from you to perform this analysis:

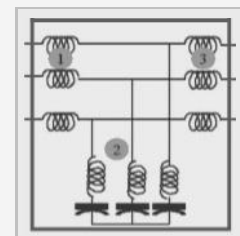
- Single Line Diagram (SLD) including power source and load data
- Explanation of the problem
- Power quality data previously collected from site
- Statement of your objectives



Power System Model

Power Quality Filter Design or Optimization

For power quality equipment manufacturers (OEMs), we can design complete product ranges for a variety of power quality filters. Our typical designs include circuit diagrams with key component specifications along with computer simulations to demonstrate the expected performance. Consider this unique service for a variety of filters including harmonic filters, PWM to sinewave voltage filters and input filters for grid-tied (renewable energy) inverters.



Filter Circuit

Power Quality Components

World Class Electrical Products

Mangoldt Filter Reactors

Mangoldt offers standard and custom filter reactors for use in harmonic filters, PWM filters, power factor equipment and renewable energy inverter systems. Precise inductance, balanced in all three phases, gives optimum filter performance. PolyGap® core construction minimizes losses and stray flux, especially those associated with harmonics or PWM frequencies.

Our VPI varnish system achieves a complete impregnation of reactors, minimizes noise and maintains high dielectric capability throughout the lifetime of the reactor. Mangoldt offers complete product type testing, with harmonic currents, using a programmable harmonic current generator.



Low and Medium Voltage up to 35kV
1ph, 3ph and DC

Frako Power Factor & Filter Capacitors

FRAKO offers standard dry type AC power capacitors for power factor and harmonic filter systems. High harmonic duty capacitors with safer, stronger specifications are designed and built for real world applications. Dual voltage ratings are convenient for use with or without series reactors. Capacitors handle up to 165% of nominal capacitor current for high harmonic duty, and are suitable for extra high ambient temperatures (up to 60°C) without de-rating.

Convenient 3-phase ratings from 240V up to 800V. For 50Hz or 60Hz systems, with ratings for alternative voltage and frequency identified on the nameplate.



Power Factor & Filter Capacitors
Capacitor Duty Contactors
Power Factor Controllers

Enclosures for Capacitors or Reactors

GenMet offers *standard* ventilated enclosures rated for indoor or outdoor use as well as *custom* enclosures that are designed and built to meet your specific needs.

Series E2 enclosures are available for Type 1 or Type 3R applications and include weldnuts (M12) for direct mounting of cylindrical capacitors. An optional panel is available for mounting fuse base, terminals, etc.

Series E1 enclosures are general purpose industrial enclosures and are available for either Type 1 or Type 3R applications. Series E1 enclosures are available with a variety of optional internal panels for mounting electrical or electronic equipment (vertical or horizontal). Enclosures will also accept din rail for easy component mounting. Series E1 enclosures are ideal for reactors, capacitors, adjustable speed drives and other electrical power or control equipment.



Type 1 or Type 3R
Ventilated Metal Enclosures

Seminars & Training

All Seminars are Non-Commercial

Educational Power Quality Seminars & Training for Electrical Professionals

We are committed to increasing awareness and understanding of power quality problems and practical solutions to help participants make informed decisions about power quality.

Power Quality Training Programs (private in-house)

Select a seminar topic below or we can tailor a power quality training program to your specific interests and needs. These personalized training programs are presented at our client's facility or venue of their choice and are a convenient and cost effective way to provide training for a group of participants from a single company.



Cost Effective In-House Training

Power Quality Seminars (open to the public)

We offer a wide range of educational seminars which focus on various aspects of electrical power quality. Seminars are available for fundamental and intermediate levels. Visit the *events page* of our website for the current seminar schedule. Public seminars are offered regularly at various locations throughout the country. Seminars range from two hours to three days.

Power Quality Seminar Topics

*PQ 102 4 Hours DSPS # 14846	Power Factor Seminar Explanation of power factor Causes of low power factor Impact of power factor on system Power factor vs. energy costs Remedies for low power factor	PQ 101 4 Hours	Intro to Power Quality Definition of power quality Types of electrical disturbances Sources / remedies for typical disturbances: <i>Sags, UV, Swells, OV, Transients, EMI, Harmonics, Power Factor</i>
*PQ 107 4 Hours DSPS # 17383	Fundamentals of Harmonics Explanation of harmonics Causes of harmonics Symptoms of harmonics Power quality standards Remedies for harmonics	PQ 106 2 Hours	PWM Voltage Seminar Nature of PWM voltage Implications of long motor leads Converting PWM to a sine wave Motor protection alternatives
*PQ 103 8 Hours DSPS # 14899	Harmonics Seminar Explanation of harmonics Problems associated with harmonics Impact on efficiency & power factor Methods of reducing harmonics 3ph & 1ph harmonics Basic harmonic analysis	PQ 162 6 Hours	Motor Controls & PQ Seminar Introduction to harmonics & PQ regulations PQ vs. motor drives (input & output sides) PFC capacitor considerations EMI/RFI, voltage reflection and more

This is not a complete list of Seminars. Please call us for more options.

*Seminars approved by the State of Wisconsin (DSPS) for credential types:

- Commercial Electrical Inspector Certification
- Industrial Journeyman Electrician License
- Journeyman Electrician License
- Master Electrician License



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