

UNDERSTANDING SINGLE PHASE AND THREE PHASE ELECTRICAL POWER

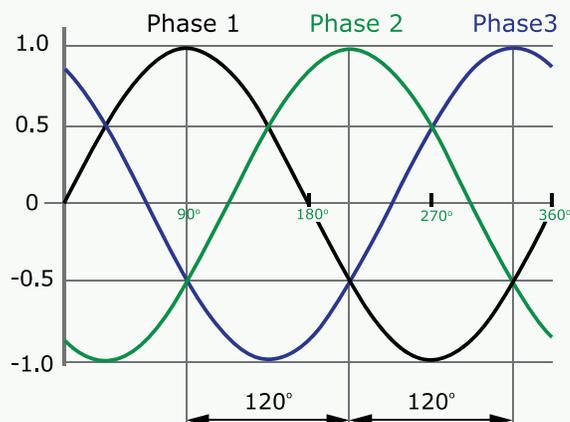
BENEFITS, RISKS AND HOW TO PROTECT

The electrical power grid for the United States and Canada is designed to transmit three phase electrical power to a carefully designed network of generators, transmission lines and substations. Utility end-use customers typically have a choice of three phase or single (split) phase electrical supply options based upon the size of their home or design of their commercial facility.

This article is intended to help readers understand the difference between three phase and single phase electrical supply feeds to end use customers. We will also discuss needs relating to surge protection and loss of phase protection to critical customer infrastructure.

THREE PHASE POWER:

Three phase power consists of three energized conductors with output wave-forms that are 120 degrees apart (see diagram below). Selection of a particular three phase voltage will depend on the operating needs of a particular facility.



Three Phase voltage options include:

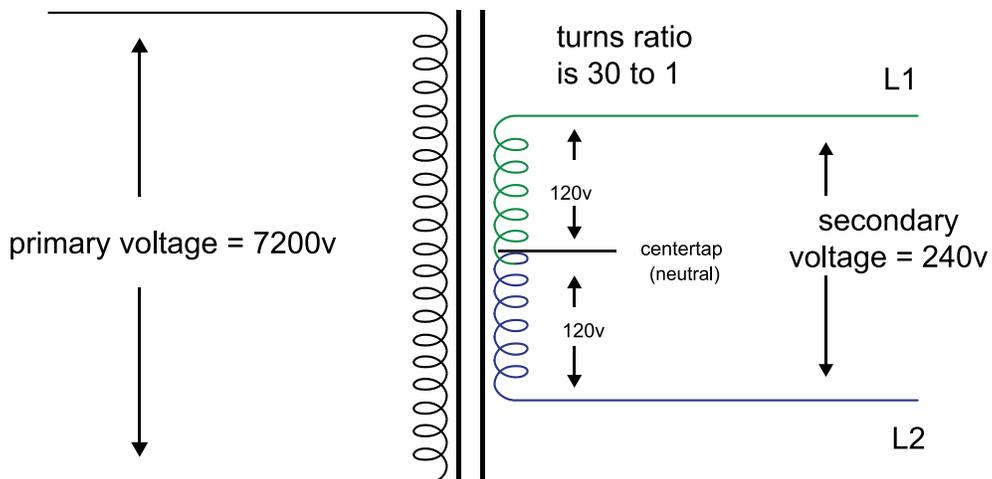
| Typical Application | |
|---------------------------|--|
| 120/208Y | Commercial office buildings |
| 120/240D (High Leg Delta) | Machine shops/Repair facilities. |
| 277/480Y | Large warehouses/ Large factories/Large condo towers |
| 480 Delta | Rock crushers/ Car crushers/Smelting Operations |
| Primary Service | Very large facilities that own their transformers. |

Customer facility design engineers should work closely with the local electric utility to make sure that adequate utility capacity and infrastructure is readily available prior to starting a new facility or adding equipment upgrades to an existing facility.

SINGLE PHASE POWER

Most residential and many small commercial customers are supplied with single phase power. Though rare, certain large homes may qualify for three phase power based upon their size and electrical demand needs.

Single phase electric power to a home includes two energized conductors and a neutral conductor. Rather than be called “two-phase”, this electrical service option would better be called “split-phase” due to its transformer secondary windings creating the two energized conductors and a center-tap neutral from a single-phase distribution line. (See diagram below.)



RISKS AND PROTECTION NEEDS

Although three phase equipment has a higher initial cost, this type of electrical service is typically more efficient than single phase service, especially for large facilities.

To ensure long term operation of critical equipment, we would recommend that all electrical service “main disconnects” have an appropriate Metal Oxide Varistor™ surge protector installed.

Single phase electrical services are susceptible to damage from a loss of neutral condition. Based upon this risk, it would behoove the customer to have a qualified and licensed electrician (wearing and using all appropriate safety gear) check and tighten all panel and supply feed neutral connections (including neutral “block”) every 2 to 3 years.

Three phase equipment should also have “loss of phase” protection installed to shut off the motor, pump or compressor should one or more phases become de-energized. Without loss of phase protection, high value equipment is at serious risk for damage or destruction during a loss of phase event.

ABOUT KENICK, INC.

KENICK, Inc. has been providing surge protection products and solutions to the electric utility industry for over 32 years. Their manufacturing facility includes a state-of-the-art research laboratory, allowing them to test surge protection products to see how they respond to small, medium, large and “oh my gosh... what was that!” transient surge events.

ABOUT THE AUTHOR

Peter Jackson has been responding to the needs of electric utility clients and their customers for over 25 years. His knowledge and expertise in mitigating transient surge damage events has been gained through hundreds of field reviews and their successful outcomes.

Questions?

Please contact us if you have questions about this article or a particular issue that you need help with.

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