

# Earth faults

A transformer circuit consists of a number of subscribers connected to a distribution transformer. The number of subscribers varies depending on size and power output per subscriber. Most instances of earth faults in a transformer circuit are due to insulation faults in the electrical installation of the individual subscriber. Common earth faults include:

- Earth faults in water heaters
- Earth faults in old stoves
- Faults in lighting equipment
- Faults in the fixed installation in the building
- Faults as a result of incorrect connection

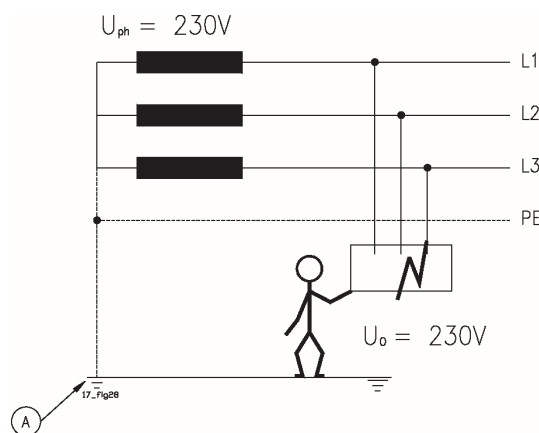
A direct earth fault at a given subscriber in a transformer circuit will not normally affect the other subscribers connected to the same circuit provided that the earthing system for the individual installation satisfies current requirements.

The individual owner/user is responsible for reporting the fault and having it repaired by an authorised electrical contractor. There is a requirement for earth fault reporting/protection in all new installations carried out after 1st January 1991.



The LF-GY transformer from Noratel has a galvanic partition between the primary and secondary windings, making it what is known as an isolating/separating transformer. Transformers generate "a new system" in which any earth faults are eliminated.

A new 230/400 V TN system has a nominal voltage of 230 V between phase and earth. If an exposed part without an earth connection is placed in direct contact with a phase owing to an insulation fault, the exposed part will have full phase voltage to earth. To avoid high contact voltages it is therefore a requirement that all exposed parts must be connected to the system's earthed point via a continuous PE or PEN conductor.



In the event of an earth fault in a 230/400 V TN system, an exposed part will have a 230 V voltage to earth unless it has an earth connection.

## Responsibility

The local power station is responsible for its system as far as the supply point of the individual subscriber in accordance with current power supply terms and conditions.

The individual house owner/subscriber is re-sponsible for his own electrical installation from the supply point to the individual piece of equipment in accordance with the regulations in force when the installation was put in.

The supplier and/or importer is responsible for the equipment he supplies in accordance with the test regulations and manufacturer's declaration, if any, used as a basis for approval.

# Transients

## Noise/Transients/Overtages

Different types of interference or "noise" in a distribution system expose sensitive electronics to extreme stress. Computer equipment in particular requires a low-noise voltage in order to work without problems. Typical causes of noise in the system include transients, voltage drops and system outages. Transients are voltage waves which occur as a result of atmospheric discharges, faults in nearby electronic equipment, flashovers or connection and disconnection of electronic equipment such as fluorescent lamps, contactors and welding machines. Transients are of short duration, have rapid rise times and can be up to several thousand volts. Transients which are not damped can in many cases be interpreted as data in control systems for computers and other sensitive electronics with catastrophic consequences. Sensitive electronic equipment has to be protected against such "noise". This can be done either by building noise reduction equipment into the apparatus or connecting perturbation attenuation transformers in incoming circuit.

## Filters/Line filters

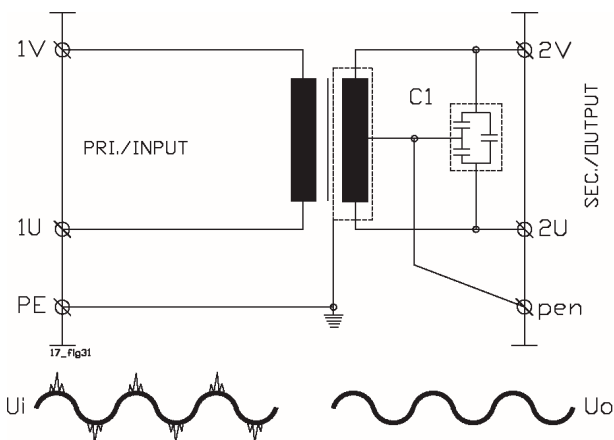
The simplest form of protection against transients and voltage spikes is to use what is known as a line noise filter. Such a filter only has a damping effect on frequencies in excess of approx. 50 kHz and does not provide protection against voltage fluctuations. Usually the filter

contains varistors or "comgaps", which to some extent remove transients which can damage or disrupt electronics, but there is still a risk that the "residual noise" will be large enough to harm sensitive electronics. Line noise filters normally have an insulation voltage of between 600 and 1400 V. This means that, if such a filter is connected to the power supply system the insulation level is reduced where the system filter is connected and there is then a risk that the noise will be generated towards this point. A line filter does not provide protection against earth faults, only transients.

## Perturbation attenuation transformers

Perturbation attenuation transformers are particularly suitable for protecting computer equipment and sensitive electronics against transients, voltage spikes and earth faults, and they provide effective damping of interference from approx.

1 kHz to MHz and above. A perturbation attenuation transformer consists of a transformer with built-in shielding which traps, absorbs and discharges noise. It is normally also equipped with a protective earth on the primary side and what is known as a data earth on the output. Personal safety in the event of an insulation fault in the connected equipment is maintained by fitting a miniature circuit-breaker in types with outputs of less than 1 kVA. A perturbation attenuation transformer has an insulation voltage of 4 kV, which satisfies the requirements of the power supply system with regard to external equipment in this category.



The working principles of a perturbation attenuation transformer. The voltage coming in on the primary side contains noise and transients which may be harmful to electronics, for example. The perturbation attenuation transformer damps the interference and protects equipment connected to the secondary side.

A selection of perturbation attenuation transformers from Noratel.