HRG

HIGH RESISTANCE GROUNDING

Post Glover™

"The Resistor Specialists"

1369 Cox Avenue
Erlanger, KY 41018 USA

Phone: 859-283-0778
Toll-Free: 800-537-6144
FAX: 859-283-2978
Web: www.postglover.com

Serving the Electrical Industry Since 1892
Quality System Certified to ISO 9001

Post Glover™

"The Resistor Specialists"

Table of Contents

Post Glover™

"The Resistor Specialists"

It is accepted in the electrical industry that 98% of all electrical system failures begin as ground faults. High Resistance Grounding (HRG) limits the fault current so that ground faults do not develop into a more serious equipment problem or potential safety hazard. With an HRG system:

1. There is no need to immediately trip the system, allowing continued process operation and calculated management of costly downtime.

2. Thermal damage to equipment is dramatically limited due to the low fault current.

3. Overall plant safety is improved since the Arc Flash Hazard is reduced by 98%.

4. Ground faults are easy to locate and repair, saving maintenance time and $.

What is Grounding?

The term "grounding" is commonly used in the electrical industry to mean both "equipment grounding" and "system grounding".

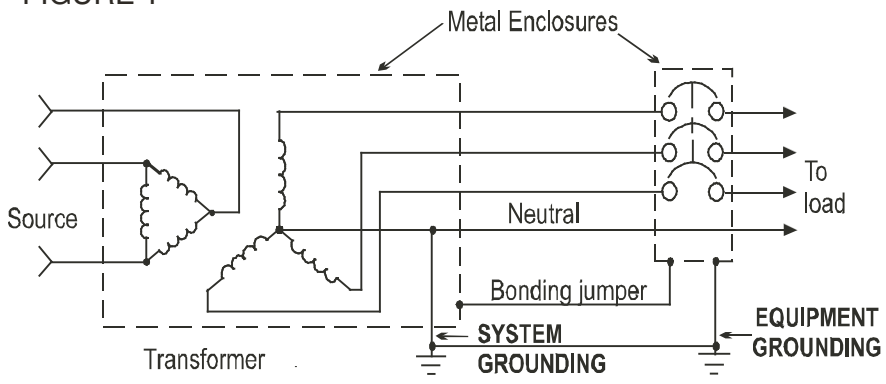
"Equipment grounding" means the connection of non-current carrying conductive materials such as conduit, cable trays, junction boxes, enclosures and motor frames to earth ground.

All power systems are grounded by one means or another. Some are intentionally grounded with or without grounding resistance while others are grounded only through system capacitance and are generally referred to as ungrounded systems.

Intentional system grounding means the connection of the neutral points of current carrying conductors such as the neutral point of a transformer, rotating machine, or a system, either solidly or with a current limiting resistance to earth ground.

Figure 1 illustrates the two types of grounding.

FIGURE 1



Post Glover™

"The Resistor Specialists"

What is a Grounded System? (IEEE 142-1991 1.2)

A grounded System has at least one conductor or point (the neutral point of the transformer or generator windings) intentionally grounded, either solidly or through impedance.

What is the Purpose of Intentional System Grounding?

Grounding the system provides a reference point of zero volts. This protective measure offers many advantages over an ungrounded system, including:

- Reduced magnitude of transient over-voltages
- Simplified ground fault location
- Improved system and equipment fault protection
- Reduced maintenance time and expense
- Greater safety for personnel
- Improved lightning protection
- Reduction in frequency of faults

What is a Ground Fault?

A ground fault is an unwanted connection between the system conductor(s) and ground.

Why are Ground Faults a Concern?

High energy ground faults can damage equipment and lead to power outages and lost production. Undetected ground faults pose potential health and safety risks and can lead to safety hazards such as equipment malfunctions, fire, and electric shock.

How Do You Limit Ground Faults?

Solidly grounded systems have no inherent fault limitation but the severity of ground faults can be reduced by fast-acting ground fault relaying. Even with appropriate relaying, large damaging currents can flow and large arc flash hazards exist to personnel.

With ungrounded systems, fault current that results from the initial ground fault is very low, but other problems such as severe over-voltage can result from arcing ground faults and cause extensive equipment damage.

High resistance grounding combines the fault current limitation of ungrounded systems with the voltage stability of solidly grounded systems and offers a safe and effective solution to the issue of ground faults.

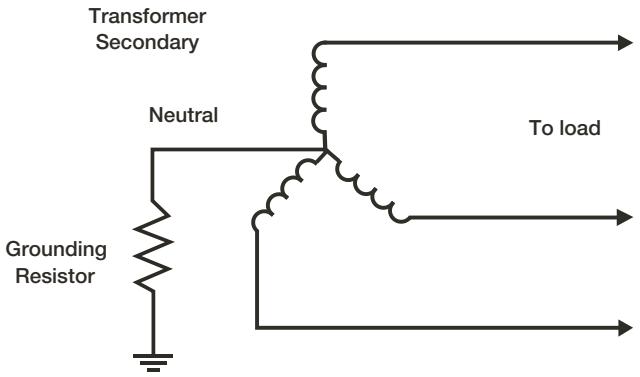
Post Glover™

"The Resistor Specialists"

What is High Resistance Grounding?

High resistance grounding is the grounding of the electrical system neutral through a resistance which limits the ground fault current to a level of 5 to 10 amps. Figure 2 below shows a typical high resistance grounding scheme.

FIGURE 2



The reason for limiting the current by resistance grounding may be one or more of the following, as indicated in IEEE Std. 142-1991, IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems, Section 1.4.3.

1. To reduce burning and melting effects in faulted electric equipment, such as switchgear, transformers, cables, and rotating machines.
2. To reduce mechanical stresses in circuits and apparatus carrying fault currents.
3. To reduce electric-shock hazards to personnel caused by stray ground fault currents in the ground return path.
4. To reduce arc blast or flash hazard to personnel who may have accidentally caused or who happen to be in close proximity to the ground fault.
5. To reduce the momentary line-voltage dip occasioned by the occurrence and clearing of a ground fault.
6. To secure control of transient over-voltages while at the same time avoiding the shutdown of a faulty circuit on the occurrence of the first ground fault.

Post Glover™

"The Resistor Specialists"

High Resistance Grounding Summary

No other grounding scheme offers the total benefit that HRG does. High Resistance Grounding is superior to other methods of grounding and should be the PREFERRED method of grounding in all newly designed and installed electrical systems. Existing systems can be easily upgraded to high resistance grounded systems with minimal downtime for a process.

COMPARISON OF GROUNDING METHOD CHARACTERISTICS

Characteristics	High Resistance Grounded	Low Resistance Grounded	Solidly Grounded	Ungrounded
Allows continuation of process upon occurrence of first ground fault	YES	NO	NO	YES
Controls transient over-voltage	YES	YES	YES	NO
Eliminates Arc Flash Hazards	YES	NO	NO	YES
Quick discovery of ground fault location	YES	NO	YES	NO
Limits thermal damage to equipment	YES	NO	NO	NO
Serves line-to-neutral loads	NO	NO	YES	NO

Note – For optimum results:

*Use of solid or low-resistance grounding method should include sensitive ground fault relaying.

**Use of high-resistance grounding method should include a method of alarming, tracing and removing the ground fault promptly. Above 5 kV, sensitive ground fault relaying should be included.

A summary of the electrical system, equipment and personnel benefits resulting from application of High Resistance Grounding is:

- Controlled process downtime to locate and repair the ground fault
- Reduced electrical system mechanical and thermal stress during ground faults
- Reduced maintenance time and expense to find the ground fault
- Arc flash hazard reduction for greater personnel safety

Visit our website at www.postglover.com for additional information on High Resistance Grounding, or call us at 1-800-537-6144.

Notes

324 Governor Road • Braeside, Victoria 3195 • AUS
Phone: +61 (0)3 9587 4099 • Fax: +61 (0)3 9587 4130
www.postgloverasia.com

1369 Cox Avenue • Erlanger, KY 41018 • USA
Phone: 800-537-6144 / 859-283-0778 • Fax: 859-283-2978
www.postglover.com

Post Glover™

"The Resistor Specialists"

Quality System Certified to ISO 9001

Serving the Electrical Industry Since 1892