TRAK® MACHINE TOOLS

SOUTHWESTERN INDUSTRIES, INC.

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White Paper

Electrical Grounding of Machines

Machine electrical grounding requirements and symptoms of improper grounding

Grounding Requirements

Machine Grounding is required for computer-based machine tools. Since these machines have many electrical subsystems that connect to various locations inside and outside of the machine, it is imperative that customers comply with electrical codes in order to ensure the safety of their employees, the protection of their facility and the proper operation of the CNC.

Two fundamental requirements for grounding machines:

- Machine tools must be Earth Grounded
- Certified electricians must conduct all grounding

Earth Ground

An Earth Ground is an electrical connection to earth, which allows the current to return to the earth. The part that is directly in contact with the earth is usually a copper rod that is driven into the earth. Most buildings have one Earth Ground. As machines are installed, it is sometimes required to add a more direct path to ground, which is usually a ground rod.

Symptoms of ground-related problems

If customers experience any of the following, they must contact a certified electrician to check their electrical wiring:

- Electrical Shock. If you touch a machine tool and feel even the slightest sensation throughout your body, you have been electrically shocked. Because our bodies consist of 70% water, we will become a conductor for the current to return to earth—the path of least resistance. This is a serious problem. The shop owner should prohibit the use of this equipment until a certified electrician has examined and resolved the problem.

- Automatic Rebooting or a history of keyboard lockups. If a machine is not grounded properly, the system will automatically reboot. Be alert when attempting to connect an external computer to the control's RS232 port. If the ground is not connected between the computer and the CNC, the current rushes from the control to the computer via the RS232 cable, which causes it to reboot.

- Frequent parts replacement. The customer might have a grounding problem if the pendant or a computer module has been replaced several times.

Wire Observations

- Determine if the customer has installed his own wiring. If so, the wiring might not comply with electrical codes.

- If the shop uses extension cables to run our machines, the socket might not be grounded properly. The use of extension cables is NOT acceptable in most states.

- A tag or sticker should be attached to the main panel, which indicates that a certified company has tested it. Most states require that all businesses have a ground test performed before they have permission to operate.

- If the cover plate is removed from the disconnect or junction box, ensure that the normal wiring bundle includes a separate green wire.

Wire Corrections

An electrician must perform wiring corrections in order to comply with electrical codes. We only provide the connection points to our equipment. We can, however, suggest realistic corrections, such as adding a ground bar near our equipment and also ensuring that the main electrical panel has the same grounding scheme so that the machine and the building's ground have the same reference.

Relevant Web sites

Visit the following links for assistance in understanding ground:

www.poweredgetech.com/GroundingFrame1Source1.htm for a company that specializes in Machine Shop Groundings

www.amasci.com/amateur/whygnd.html for easily understood explanations about power and grounds

www.copper.org/applications/electrical/pq/casestudy/grounding.html for a company's experience connecting networks to all of its shop machines

www.en.wikipedia.org/wiki/Ground_(electricity) for definitions