

Instrumentation & TEST

Setting up a people-safe product-safety workstation

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Test station layout using dual remote test switches.

In setting up a safe workstation for conducting electrical safety tests that must be performed to meet the requirements of agency standards as specified by UL, CSA, EN or other bodies, addressing operator safety during a test is just as important as ensuring the safety of the end-product user.

The first challenge a manufacturer faces is finding where to go to find guidelines on how test stations should be set-up. It is also common to find that the individual responsible for setting up the test station may not have a basic understanding of electricity or the hazards involved.

The lack of awareness of the potential

hazards involved makes it very difficult to build in the necessary safeguards to protect the operator against potential shock hazards. Most often the focus is on setting up the test area for maximum productivity.

Assembly operations may also be performed at the same workstation to balance the production line. This makes it even more critical to set up a safe workstation. Assemblers not involved with the electrical aspects of manufacturing the product could inadvertently be exposed to electrical safety hazards.

Qualified personnel must have the skills and techniques necessary to distinguish exposed live parts from other parts of electrical equipment amid the hazards involved. Exposed live parts are considered to be parts of the product which are energized and which the operator may come into contact with during the test.

Individuals responsible for setting up the workstation must be aware of the proper clearance distances for corresponding voltage levels. The operator should be trained in safety related work practices and procedures, and in emergency procedures required to release victim from contact with exposed live parts or circuits.

A person setting up test stations must be able to determine the degree and extent of the hazard and the personal protective equipment and job planning necessary to perform the task safely.

For example, standards specifically call out that conductive materials and jewelry should not be worn by anyone working on or near energized equipment, yet it is commonplace to see personnel working at electrical testing workstations wearing anti-static clothing and jewelry.

A test station cannot be considered safe without the proper training of any individuals involved in or exposed to the testing. In addition, the station needs to be configured to provide the operator with every possible protection against exposure to



Operator uses a pistol style high voltage probe with the capability to automatically initiate the test by depressing the trigger. Activation of high voltage requires a two step action of retracting the probe shield and depressing trigger.

hazardous voltages.

For guidelines regarding the proper set up of an electrical testing workstation, turn to the proposed European Norm Standard prEN 50191 Erection and Operation of Electrical Test Equipment. It is an excellent source document that is scheduled to be accepted and published as a European Standard and as an identical British National Standard.

While not a standard in North America, it has guidelines that are much easier to understand as they specifically address the set-up and operation of electrical test equipment.

EN 50191 differentiates between test stations with positive protection against direct contact and those without. In a test

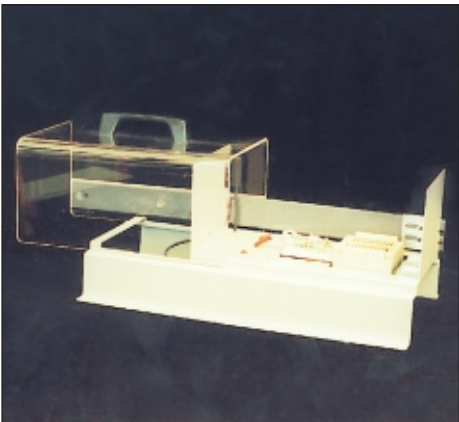
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Operator tests stators with dual retractable test probes. Once released the high-voltage probes retract to prevent user contact with high voltage.

station with positive protection against direct contact, the device under test (DUT) and all live parts of the test apparatus have positive and full protection against direct contact while the equipment is in an energized condition.

An example of full protection would be a test hood that covers the entire product and the test instruments, making it impossible for the operator to contact either during a test without de-activating the high voltage. Test stations without positive



Enclosure prevents the operator from coming in contact with DUT while test is in progress.

protection against direct contact should only be used if it is not practicable to achieve positive protection.

Some common reasons for setting up test stations without positive protection may be due to the physical size of the DUT or requirements to manually test multiple points which could prohibit the use of an enclosure. However, testing of multiple points does not necessarily mean that positive protection cannot be used.

Several new safety-testing instruments are available with scanning matrixes that can automatically apply voltage to multiple points of a DUT without operator intervention.

EN 50191 recommends a number of safeguards:

- Barriers or walls to separate the test area from assembly areas. The distance between the barriers and any parts that could become live are specified in the standard in relation to the maximum test voltage.
- Insulated enclosures or covers to prevent access to the DUT. These covers should be interlocked with the test instrument.
- Indicator lamps and warning signs. These would provide visual indications that could be incorporated in the test area to indicate the operating status of the equipment within view of all operators.
- Positive protection to guard against residual voltage must be incorporated. This basically means that output shorting devices should be used to discharge any energy which may be stored in the DUT.

To protect operators at stations that do not incorporate positive protection against direct contact, here are some suggestions:

- Test station should be separated from work areas. The use of walls and barriers should be constructed to protect the people standing outside the test area. The barriers should be constructed so visual contact with the test operator can be maintained from outside the test area.
- Test apparatus must be guarded against unauthorized use, or unintentional operation. A lockout device should be incorporated into the design.
- Emergency switching equipment. This provides operators with a quick way to cut off all voltages that could result in danger. At least one of the devices should be located outside the danger area.
- Test bench should be made of non-conductive material. This is required to isolate the DUT during the test.

US information sources

If you are a manufacturer with a test location in the US, the first place you may look for guidance is to the US Occupational Safety and Health Act (OSHA) 29 CFR Part 1910, subpart S, Electrical Safety Related Work Practices. This standard used the US National Fire Protection Association (NFPA 70E) Electrical Safety Requirements for Employee Workplaces as its source document in the development of the final standard.

Both standards provide background information on electrical shock hazards, nature of electrical accidents, and some protective measures. They stipulate general requirements for employee training, and advise that the personnel performing these tests must be qualified, thoroughly trained and be familiar with required safety related work practices.

- Two-hand controls. If an insulated enclosure cannot be incorporated in the design of the workstation, the use of two-handed controls may be an alternative.
- Two safety probes. The operator can either apply voltage to the probes by manual operation or release the live probes, which must at a minimum safely insulate the user from the test voltage if it remains active. Some probes may include an automatic switching circuit which would de-activate high voltage when the probe is released. Two safety probes are specified which require the operator to use both hands to test the DUT. This prevents the operator from contact to the device under test while the test is in progress.



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