

Trapped Key Interlock Safety Systems: Enhanced Safety Beyond LOTO

By Kirk Key Interlock Company

Trapped key interlock [TKI] safety systems can enhance the well-known lockout tagout procedures common in today's industry and go above and beyond ensuring safety procedures are followed. Lockout tagout procedures alone can be defeated intentionally or through forgetfulness. A padlock omitted from one switch or machine guard, a missing tag, or the premature removal of a padlock before the associated circuit or equipment can be safely de-energized or isolated, may result in a serious accident. With trapped key interlocks mounted permanently on the equipment, operation is not possible, the key is trapped and unavailable for the purpose of the next step in the safety procedure, until the equipment renders that operation is safe. The lock and key relationship prevents hazardous conditions, by maintaining a safe operational sequence. When properly applied, a trapped key interlock safety system makes a significant contribution to worker safety.

Construction of a Trapped Key Interlock

To fully understand a trapped key interlock safety system, it is necessary to appreciate how a TKI operates and how it works in conjunction with the equipment on which it is mounted.

A typical trapped key interlock consists of a lock cylinder, a support housing, a moveable 5/8" diameter locking bolt, and a cam arranged to move the locking bolt in response to the correct key. Various styles of interlock housing are available and each style is designed to mount in a different way depending on the requirements of the equipment on which it will be installed.

One of the most important features of a trapped key interlock is that the key is trapped; it cannot be removed from the cylinder until the locking bolt is in a predetermined position. A conventional lock may allow free removal of the key at any position of the locking bolt. However, with a trapped key interlock, possession of the key ensures that the associated interlock has been locked in a known predetermined safe position within a sequence of safety operations.

What is an Interlock System?

When two or more trapped key interlocks are used in a safety application, an interlock system is formed. An interlock system is a group or series of trapped key interlocking devices applied to associated equipment or guarding in a way that allows operation of the equipment only in a safe, predetermined sequence of operations. TKI safety systems can be designed for both linear and non-linear sequential safety operations. When properly applied, interlock systems are applied to two or more moveable parts, allowing movement of one part only when another part is locked in a predetermined position.

Trapped key interlock safety systems are used to eliminate human error by preventing an operator from performing an unauthorized or unsafe operation. A TKI safety system can be applied to practically any field where a human life or property could be endangered by an improper operation or sequence of operations. TKI safety systems are implemented to protect valuable lives, equipment, operating processes, and production.

Trapped Key Interlock Applications Overview

Trapped key interlocks and interlock safety systems can be classified into three main application groups, based on the type of safety application they are protecting against. These three groups of safety applications are; isolation [of energy], access [into hazardous areas], exchange [of sequential operation keys]. Each application can be as simple as two interlocks or may be many interlocks sequentially keyed, forming a comprehensive safety system.

Isolation applications ensure that energy has been properly isolated and or de-energized before operations can be performed.

Access applications ensures energized areas where full body access is required are properly guarded to control entry only under safe circumstances.

Exchange applications create a comprehensive system of both isolation and access applications ensuring complete operational safety.

General Classification of Trapped Key Interlocks

Trapped key interlocks can be either mechanical or electro-mechanical, based on the type of interconnection the interlock has with the equipment. Both types of interlocks have their advantages when designed within an interlock safety system and properly applied.

Mechanical interlocks are reliable and, when properly installed, difficult to defeat. They are fixed mounted to the equipment and designed for a specific application and or safety system.

Electro-Mechanical interlocks, while also fixed mounted to equipment, are applicable for applications in which the next equipment within the sequence of safety operations is separated by any distance. Suitable electrical circuits between the equipment are then required to carry signals from the electro-mechanical interlock communicating the state of operation.

The degree of safety provided in a trapped key interlock safety system depends on the accuracy of the operational procedure, the equipment specifications, and the specific interlocks chosen for the application. Trapped key interlocks therefore must meet certain basic requirements distinct from the normal commercial type of lock.

1. All keys and locks of each combination must be interchangeable, i.e. any key will operate all locks having the same combination, regardless of the year or date of the shipment of the locks and keys.
2. No key will operate any lock other than those having the same combination as that key.
3. The key should be removable only in a predetermined position depending on the requirement of the equipment where the interlock is to be mounted and the design of the overall interlock system.

Locks for interlocking purposes must meet certain basic requirements that place them in an exclusive class. They must meet and pass numerous strict specifications and inspection far greater than those

required for ordinary commercial locks. Trapped key interlocks become high-quality, specialized safety locks, designed for a unique purpose and application.

Coordination of TKI Safety Systems & End Users

Trapped key interlock companies must maintain complete records of all interlock devices furnished to each end user, as well as their location and general application. Kirk company records date back to the 1940's and because each TKI application and system are unique, individual treatment is necessary to provide the correct information should there be needed for future shipments within the same interlock system. The accuracy and completeness of the TKI records are a major factor in being able to coordinate with the interlock system in the future if needed. These records also guarantee that only those lock and key combinations are used at that location and the risk of duplication of a combination is avoided. These historic records maintained by Kirk are an intangible value to Kirk's existing customers, enabling them to be serviced properly, to expand or modify their TKI safety systems in a timely manner and without danger of subsequent incorrect safety operations.

Conclusion

Trapped key interlock safety systems can prevent and or eliminate human errors that could potentially lead to destructive or sometimes fatal hazards. Continued focus on overall work place safety within safety legislation and insurance firms further incentivizes companies to have the best safety program in place. It is the goal of every company to create a safe working environment for their employees and a TKI safety system can be an instrumental part of the safety procedures.

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