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Using Trapped Key Interlocking to Enhance Lockout / Tagout

Lockout / Tagout (LOTO) is a method of controlling hazardous energy in machinery safety used mostly for significant interventions and maintenance tasks, especially those which require dismantling the machine or removal of risk reduction measures in order to carry out the task. Although LOTO is a popular means of controlling hazardous energy and is required for many tasks by OSHA regulations in the USA (see OSHA 29 CFR 1910.147) it is in fact an administrative control, or information for use, which is the last option in the hierarchy of controls (see here for more information on hierarchy of controls).

LOTO relies on personnel to accurately follow what can sometimes be a complicated, multi step process of isolating and discharging energy sources before carrying out the required task. Due to this complicated, and sometimes, long-winded process, personnel may miss steps or fail to follow the procedure at all, accidentally or otherwise. In most LOTO procedures there's no guarantee the procedure will be carried out correctly every time regardless of how much training is given or how great threat of disciplinary action.

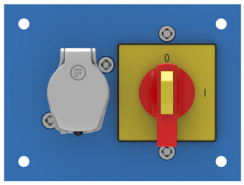
Using Trapped Key Interlocking to enhance a LOTO procedure can give peace of mind to both personnel and their superiors that a machine has had all energy sources isolated, and ***all*** residual energy correctly discharged ***before*** access to the hazardous area is possible, they can further be reassured that the process cannot be reversed while someone is working inside the area.

ANSI/ASSE Z244.1 2016 (Annex T) and BS 14100 (Clause 6.3.2) both suggest enhancing a LOTO programme with trapped key as it forces the process, providing a mechanical link between the guard access locks and the isolator reducing the risk of human error that could lead to unexpected start-up.

ANSI/ASSE Z244.1 explains the 2 main ways of isolation of energy sources using Trapped Key Interlocks

1. Directly driving the contacts via a trapped key fitted to the shaft. This method would work on units that are small enough to allow the trapped key to drive directly. E.g. a key switch for electrical or fluid power where the key is released only when the power is in the off position.

2. Having a cam mechanism and bolt lock module for units that are too large for the trapped key to directly drive. E.g. a Switch Control Unit that allows a key to be released only when the energy source is switched off, or the use of a bolt module to retrofit on an existing disconnect or fluid valve.



Once the key has been released from any one of these isolation devices, a Lockout padlock can be applied either directly to the isolation device or to a cover over the keyhole which can be padlocked closed.

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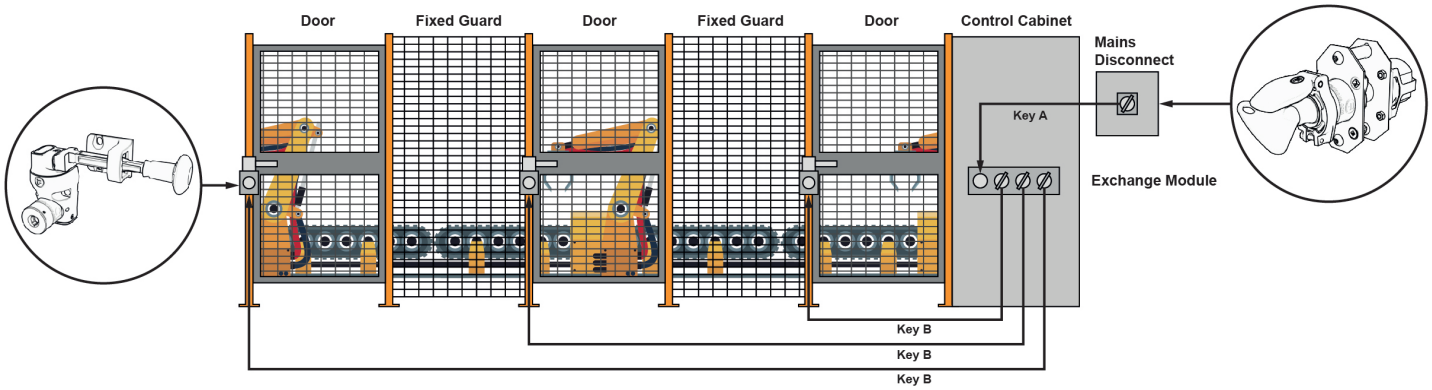
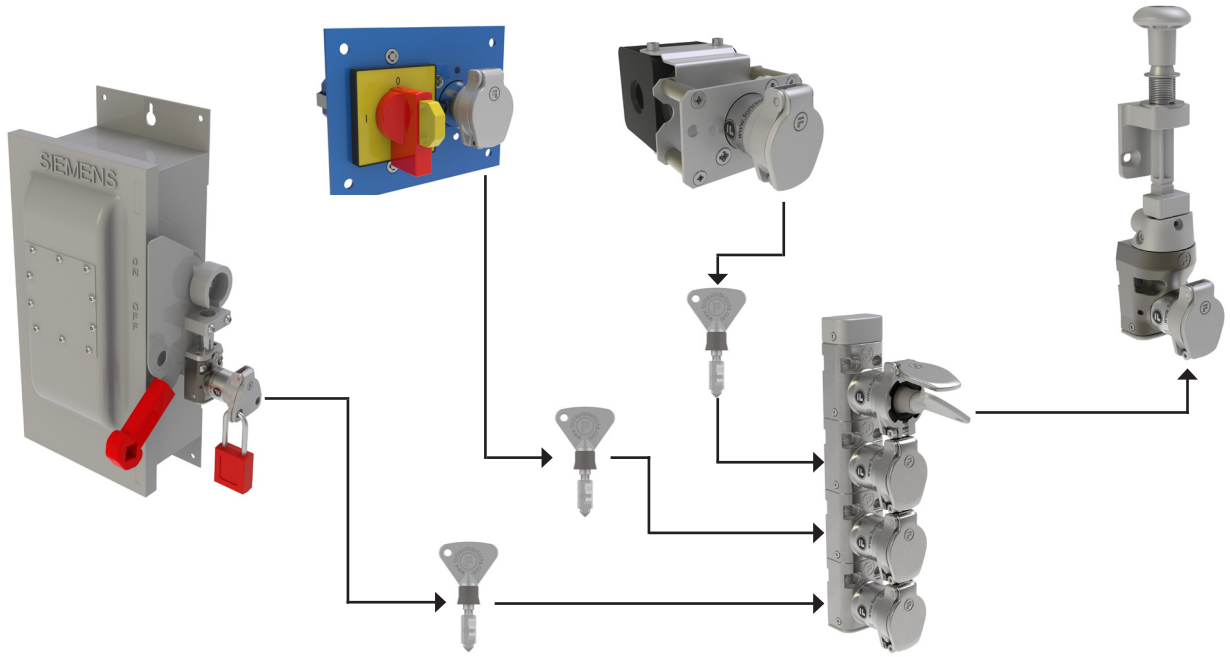
In very simple applications the released key can be used directly to open a door interlock and gain access to the hazardous area, knowing that while the door is open, the key is locked in the interlock and therefore cannot be used to turn the energy source back on.

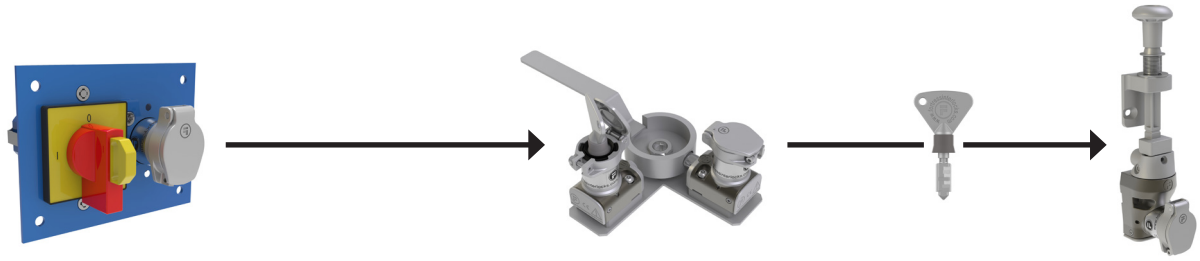


More complex systems will have a key exchange unit to take keys released from all energy source isolators. Only when all the energy sources have been isolated would one or more access keys be released as required to perform the task. Again, while any doors are open, the access keys will be trapped and no isolation key can be released again to turn power on until every door is closed and locked and the key returned to the exchange unit.



It is of course possible to add in more complex logic to the system, where more steps are required. For example:

- A hydraulic power source may require both isolation and then draining with the drain valve locked open before access can safely be granted, this can be achieved with the sequential use of keys.



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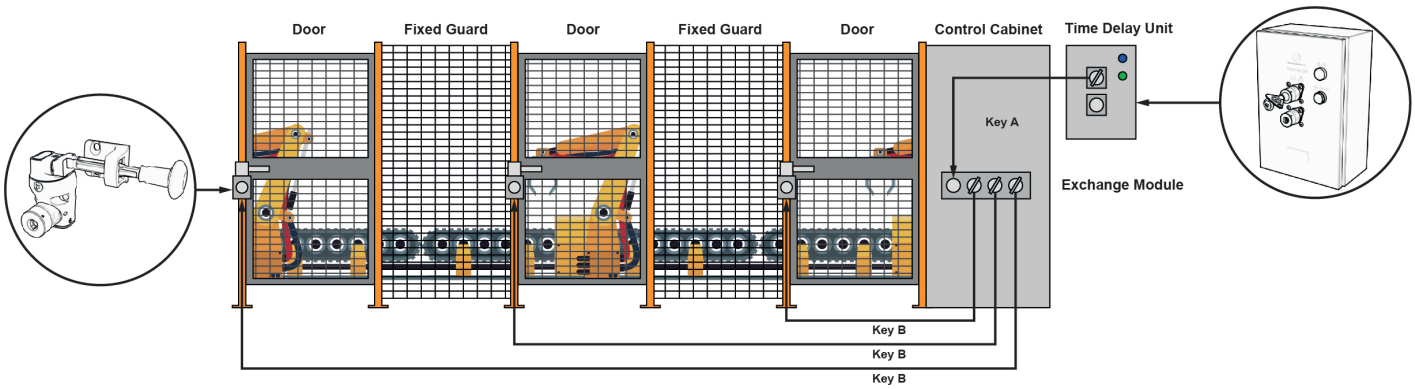
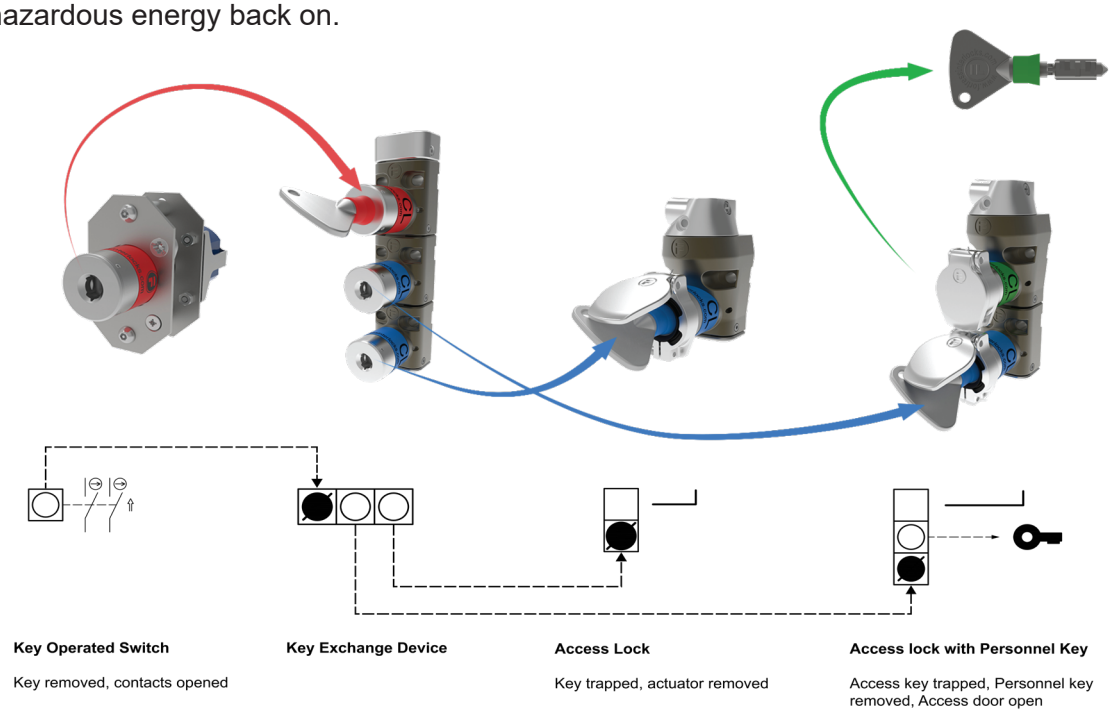
- A machine with a run-down time which can remain hazardous for some time after isolation, a time delay or reverse EMF sensing unit can be incorporated to force a delay between isolation of power and access to the hazardous space. (See article here for more information on incorporating time delay units into LOTO)



- When whole body access is required into the hazardous area one or more safety (or personnel) keys can be incorporated into the system to prevent personnel becoming trapped inside – while they have the safety key on their person the door cannot be locked and therefore the isolation key cannot be released to turn the hazardous energy back on.



Fortress excels in solving complex energy control applications using trapped key systems. Please contact your local representative for advice and help with designing a customised solution for your Hazardous Energy Control Program.

References: BS 14100:2020, ANSI/ASSE Z244.1 2016

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Deebar (Pty) Ltd, 15 Main Reef Road, Primrose, Germiston, South Africa, Tel: 011 873 4332, Web: www.deebar.co.za

Created by
Fortress Interlocks Ltd, 2 Inverclyde Drive, Wolverhampton, WV4 6FB, United Kingdom, Tel: +441902349000, Web: www.fortressinterlocks.com

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