

Type A Standards

Type A standard specify basic concepts, terminology and design principles applicable to all categories of machinery for correct application of the Machinery Directive.

ISO 12100 - Safety of Machinery is the starting point of safeguarding plants and machinery

Vibrating Equipment	Dust (emissions)	Live Electrical Parts	Moving Elements	Gravity, stability	Objects or material with a high or low temperature	Posture	Noisy manufacturing process	Gravity (bulk material solidified)	Location of control Devices	Laser beam	Fumes	Approach of a moving element to a fixed part	Rotating or moving elements

Type B Standards

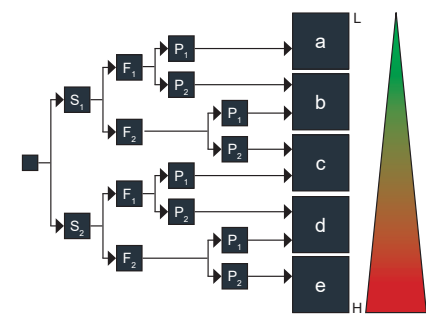
Deals with one or more safety aspect(s), or one or more type(s) of safeguards that can be used across a wide range of machinery. These Include:

ISO 13849 - ISO 14120 - ISO 14118 - ISO 14119 - ISO 13855 - ISO/TS 19837

ISO 13849 Safety of Machinery: Safety-Related Parts of Control Systems

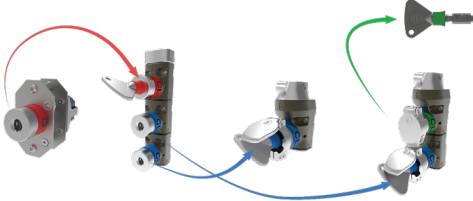
Provides guidance in the design and assessment of control systems. The ability of safety-related parts of control systems to perform a safety function can be allocated one of five performance levels (PL_a-PL_e).

(Cat.B- Cat.4) Behavior under fault conditions drives possibility of danger. Cat. 4 behavior is defined by a single fault not leading to a loss of safety function



- Severity of Injury:
 - S1 Slight injury, (bruise).
 - S2 Severe injury, (Amputation or death).
- Frequency of exposure to injury:
 - F1 Seldom.
 - F2 Frequent to continuous (Frequent to continuous are not defined in the standard).
- Possibility of avoiding the hazard:
 - P1 Possible.
 - P2 Less possible.
- Based on the speed of approach of the hazard and the ability of the operator to avoid the hazard. If the operator can avoid the hazard then you would choose (P₁).

To achieve PL_e with the Fortress, our mGard range offers mechanical trapped key interlocks which enforces keys are returned before isolation contacts can change state.



This removes the risk of fault masking that occurs with series wired I/O at every access point and avoids the cost of network diagnostic (OSSD) solutions.

Our amGardpro actuators provide locking forces greater than guarding itself ensuring broken actuators do not limit the safety function, making redundant safety devices such as RFID not necessary.



ISO 14120 Safety of Machinery: General requirements for the design and construction of fixed and movable guards

Specifies general requirements for the design, construction and selection of guards. Fixed guards are only openable with tool or by destruction of the means by which the guard is fitted. Moveable guards can be opened without the use of tools.

Interlocked guards are those that:

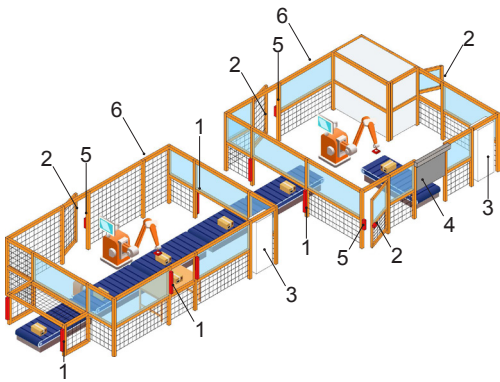
- Ensures a machine cannot operate until a guard is closed.
- Provides a stop command if the guard is opened while machine is operating
- Allows hazardous functions to operate when the guard is closed.

Lockout/tagout (LOTO) procedures are popular additions to interlocked guards to ensure functions cannot restart by closing a guard behind a person entering a hazardous area.

Providing a trapped key mechanism within the interlock is an enhanced version of the LOTO procedure.

A personnel key (a key released upon unlocking guard) is always available at the door, it cannot be forgotten. Procedure must always be followed as operating the isolation key is required to open the guard.

Fortress Interlocks also offers LOTO additional accessories to all ranges.



- Image Key:
- 1: Active optoelectronic protective device (AOPD)
 - 2: Interlocking Guard
 - 3: Electrical Cabinet
 - 4: Interlocked movable guard with pressure-sensitive edge
 - 5: Reset device
 - 6: Distance guard



ISO 14118 Safety of Machinery: Prevention of unexpected start-up

Specifies designed-in means aimed at preventing unexpected machine start-up to allow safe human interventions in dangerous zones. Such as automated robot cells.

- Applies to unexpected start-up from all types of energy sources:
- Power-supply, e.g., electrical, pneumatic
 - Stored Energy due to, e.g., gravity, compressed springs
 - External influences, e.g., wind

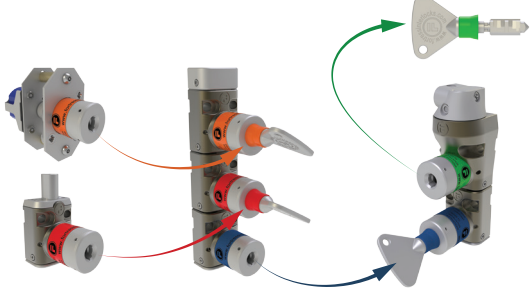
NOTE: Start-up by the normal operation of automatic machinery is not to be considered as unexpected start-up, but can be unexpected from the point of view of the operator.

The standard also specifies the major difference between Isolating verses locking.

- Isolating (disconnecting, separating) the machine (or defined parts of the machine) from all power supplies.
- Locking (securing) all the isolating units in the "isolated" position.

The mGard range offers units that work in conjunction between Isolating devices and Locking devices.

For example, a Panel Mounted Key Switch can disconnect a contact block isolating power to a machine. While a Bolt Module unit can lock a Safety Switch handle in the isolated position. The mGard range also offers power isolation of multiple energy sources before access can be granted through the use of an intermediate transfer unit, such as a multi key exchange unit. The access control unit can release a personnel safety key that should be retained to reduce the possibility of an inadvertent machine restart.



ISO 14119 Safety of Machinery: Interlocking devices associated with guards - Principles for design and selection

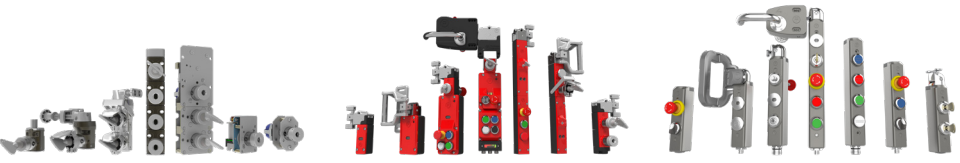
The standard describes the selection and usage of interlocking devices.

It also introduces an assessment of actuator coding and provides guidance for installation to prevent defeat. The actuator coding does not affect the safety categorization of the device. The achievable Performance Level is not affected by this issue.

Fortress offers a range of products which incorporate the functions outlined in the standard. For example, ncGard range features the new ATOM, an RFID coded guard locking switch. While the amGardpro and tGard range features a configurable guard locking switch to meet customers' needs.

Types of Interlocking	
Type 1	Uncoded mechanically actuated position switch
Type 2	Coded mechanically actuated position switch
Type 3	Uncoded non-contact position switch
Type 4	Coded non-contact position switch

Levels of Actuator coding	
Low	Up to 9 different actuators are available
Medium	10 to 1000 different actuators are available
High	More than 1000 different actuators are available



ISO 13855 Safety of Machinery: Positioning of safeguards with respect to the approach speeds of parts of the human body

Methodology to determine the minimum distances a hazard in a zone is from the detection devices of safeguarding the hazard.

Safeguards considered in ISO13855 includes:

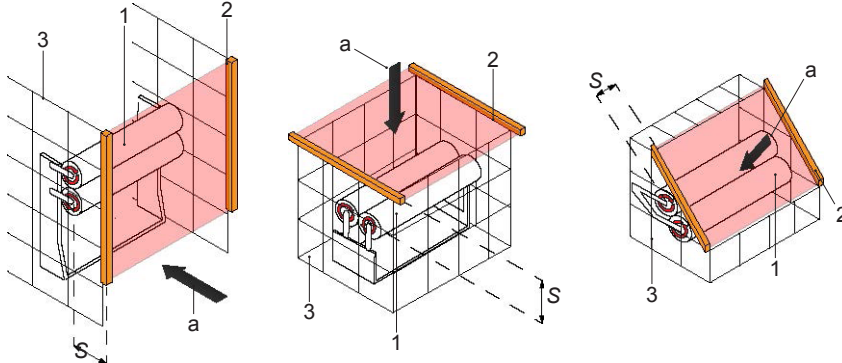
- Interlocked Guards
- Two Hand Control Devices
- Pressure Sensitive Equipment
- Light Curtains & Laser Scanners

When calculating distances for light curtains, laser scanners, and pressure sensors, the detection response time and the stopping time of machinery must be considered.

However, interlocked guarding that remains locked until a machine has stopped or has been isolated negates the need to consider the possibility of human approach speeds.

This saves valuable floor space in new facilities, it also can be the only method of safeguarding when adding to existing layouts.

- Image Key:
- 1 - Hazard zone
 - 2 - Detection zone
 - 3 - Fixed guard
 - S - Minimum distance
 - a - Direction of approach



ISO/TS 19837:2018 Safety of Machinery: Trapped Key Interlocked Devices

This standard specifies principles for the design, selection, and application of trapped key interlocking devices. ISO/TS 19837 is recommended reading when implementing Fortress Interlock products. ISO 14119 always applies unless an expectation is given in this document. Major points this standard identifies are the difference sub functions of a Trapped Key Interlocking System:

