

NAFLIC

National Association For Leisure Industry Certification

Standards & Related Documents Committee

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167. Position Detection of Passenger Restraints, etc.

It has been noted recently on many (particularly imported) rides, that manufacturers are using limit or position switches in the negative mode. This is particularly apparent in the position detection of seat restraints and associated locking mechanisms, but applies also to systems such as sliding platforms, etc. which may need to be detected as being safely positioned before a ride is allowed to start.

In **negative mode switching** the final movement to the closed (safe) position closes the switch's contacts allowing motion to begin. After the ride ends, the actuating cam is moved away and the switch contacts are opened by the action of the switch return spring. This mode of operation may be unreliable because if the return spring weakens or breaks (which some of them do), or the switch stem jams, or the contacts become welded together, the circuit could remain closed after the safety device has been opened. Moreover, by depressing the switch stem manually, or by securing it permanently in that position, it is possible to operate the ride with the safety device not properly closed. This arrangement, in which the switch is set to operate in the negative mode, would therefore fail to danger and can be readily defeated.

In **positive mode switching** the switch stem is held depressed when the safety device is in any position other than fully closed (safe). In this case, the final closing movement of the safety device is arranged to release the switch stem allowing the contacts to close by the action of the return spring, i.e. the contacts are normally closed when the ride is in use and after the ride, when the safety device is opened, the contacts are positively opened by the cam. The arrangement is safer than negative mode switching because it does not rely on a spring to return it to the safe condition and it cannot be defeated by depressing the switch stem. It can, however, ultimately fail to danger if the components of the guard are not properly maintained, e.g. excessive wear or misalignment of the actuating cam in relation to the switch can result in the switch stem not being depressed far enough to open the contacts.

It is generally thought that positive mode switching has advantages over negative mode switching. But when a higher level of certainty is required, the use of dual position switches operating in opposite modes can be considered.

For further explanation of the underlying principles please refer to, for instance, BS5304.

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