Door modules or 'DM/DMS' are designed for preventing access to safeguarded opening and areas until safe conditions are met through sequential means. The door module will trap an actuator (remain closed) until the correct key is inserted and rotated into the lock barrel. Where more than one lock is present, additional sequential processes can be administered.

Reference States of Units

DM/ DMS/ DMSE devices can be in two distinct states; normal and opposite.

Normal State is defined for machine guarding applications as the required unit state while machine is running. Any safety circuits will be closed in this state. The actuator in the door module is trapped.

Opposite State is the exact opposite of the *Normal State* (for example where the machine is isolated, and machine access is performed). Referenced safety circuits will be open in this state. The actuator is free.
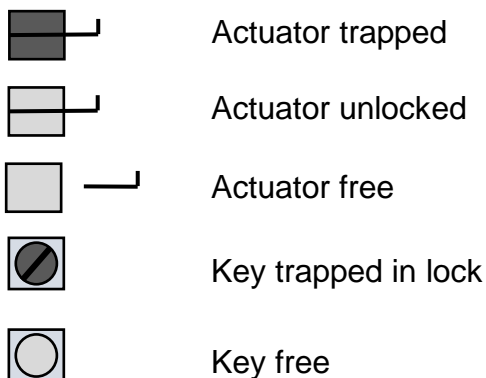
In the Normal State:

- All locks **with** keys in are referred to as "**Normally In Locks"** (NIL)

- All locks **without** keys in are referred to as "**Normally Out Locks"** (NOL)
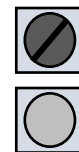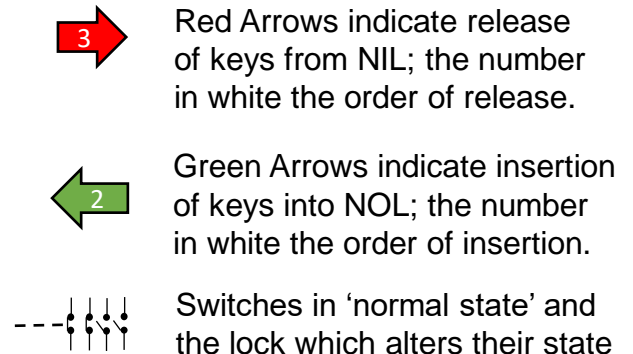
ISO/TS 19837 (2018) Safety of Machinery – Trapped Key Interlocking Devices – Principles for design and selection provides useful guidance on designing trapped key systems below shows the key used within this standard, with some Fortress-specific additions.
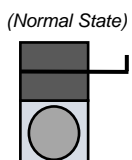
Key (ISO/TS 19837(2018))

Actuator trapped

Actuator unlocked

Actuator free

Key trapped in lock

Key free

Key (Fortress Additions)

Red Arrows indicate release of keys from NIL; the number in white the order of release.

Green Arrows indicate insertion of keys into NOL; the number in white the order of insertion.

Switches in 'normal state' and the lock which alters their state
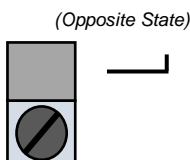
DM1-0-1-CLIN-Z-C-LE

(Normal State)

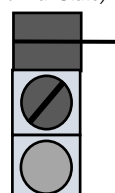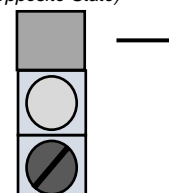*(Normal State)*   *(Opposite State)*
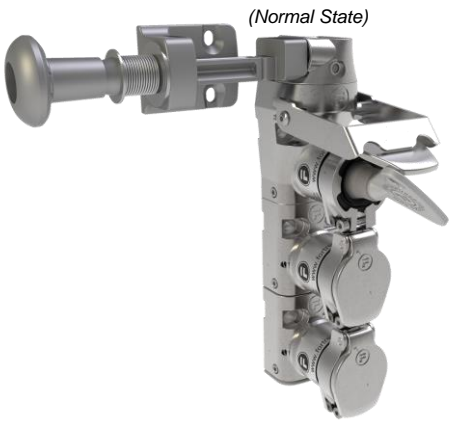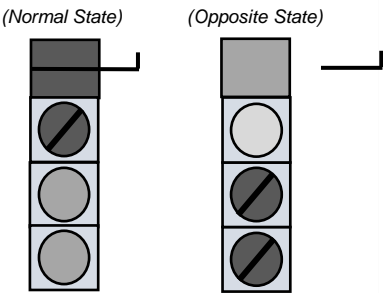
DMS2-1-1-CLSS-Z-H-TE

(Normal State)

(Normal State)   *(Opposite State)*

DMSE devices include a further 'forced extraction' function to the top NIL to ensure operators remove this key prior to safeguard entry.

DMS3E-1-2-CLSS-Z-H-LE

*(Normal State)*   *(Opposite State)*

(Normal State)

## DMR & DMSR Door Access Modules

Door modules with switching or 'DMR/DMSR' are designed for preventing access to safeguarded opening and areas until safe conditions are met through sequential means AND monitoring the insertion or removal of keys during this action. The door module will trap an actuator (remain closed) until the correct key is inserted and rotated into the lock barrel. Where more than one lock is present, additional sequential processes can be administered.

(Normal State)

DMR2-1-1-CLIN-Z-F-LE-02022

(Normal State)   *(Opposite State)*
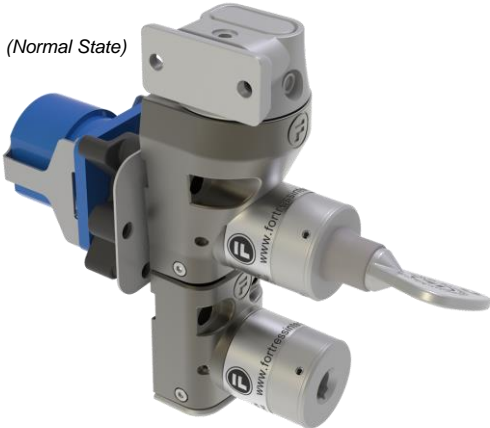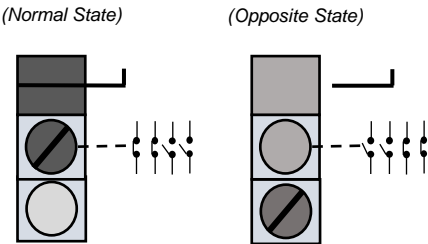
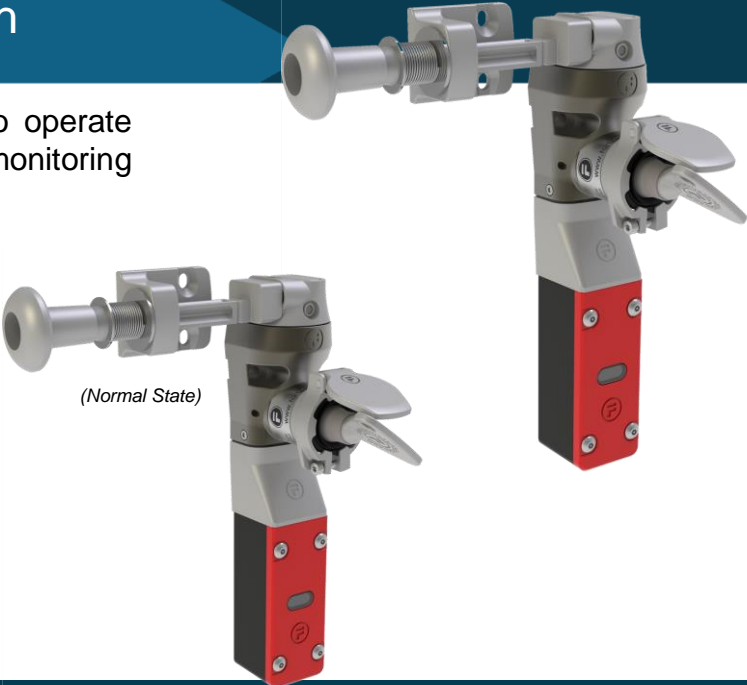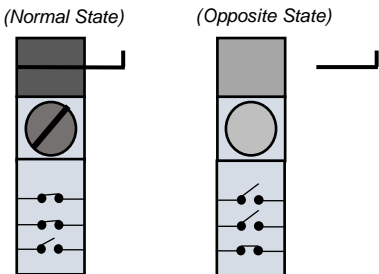## DM-LINK-Switch, DMS-LINK-Switch

Door modules can be linked to a safety switch to operate 2NC dual channel safety contacts and 1 NO monitoring contact.

DM1-1-0-CLIS-Z-A-LE-LINK-ST401

(Normal State)   *(Opposite State)*

(Normal State)

1. I'm defining a new system, how will this product operate?

All DM units

Part Number

DM3-2-1-...

Total Locks

Normally In Locks
Closest to head

Normally Out Locks

Standard Key Sequence – "Z"
NIL: Partially Sequential
NOL: Partially Sequential

Switch Operation

Rear mounted "R": Always lock closest to the head (shown in example)

- *The NIL operated first when transitioning from Normal to Opposite state (if both NIL & NOL present)*

The switch in a -LINK- switch is always operated by the top lock in the lowest group of locks.
The NOL operated last when transitioning from Normal to Opposite state *(if both NIL & NOL present)*

Example

DMR4-3-1-CLSS-Z-02022
- NIL partially sequential
- NOL partially sequential
- 2NC/2NO switch
- R switch operated by top NIL
- Actuator free after top NIL removed

Normal state

Key Sequence

NIL — 2
NIL — 3
NIL — 3
NOL — 1

2. I need to match an existing system:

contact our team to discuss your enquiry at
partnumbergroup@fortressinterlocks.com

Key Sequences:

For each group of locks (NIL and NOL) on a unit, all keys must be inserted in the group before any keys from the other group can be removed

e.g. On a gate unit, all NOL must have keys in before the personnel keys can be removed from the NIL (and the gate be unlocked).

The order the keys in a group can be removed are:

Non-Sequential:
- The keys in the group can be removed/inserted in any order
- This is never relevant where a switch is present

Partially Sequential:
- The key from the top lock in the group is removed first, with the other keys able to be removed in any order
- When inserting keys, the top lock must have the key inserted last
- If the group of locks controls a switch, the switch will be actuated by the top lock in the group
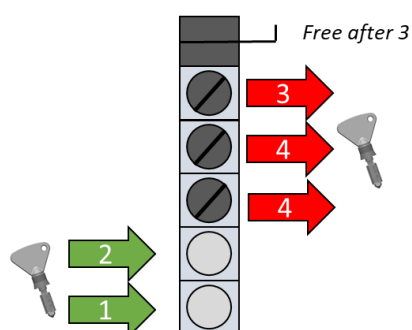
Fully Sequential:
- The keys are removed from the locks top to bottom
- This is where insertion or removal of keys from locks is required in a specific order
- In the example below, to remove key 5 from the top NIL, keys for the NOL must be inserted in order from bottom to top.
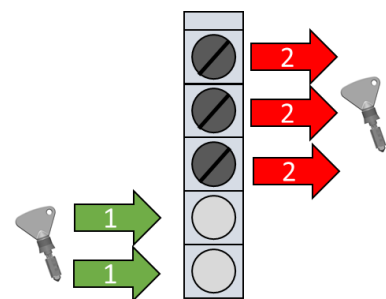
Non-Sequential   **Partially Sequential**   **Fully Sequential**

Free after 3   *Free after 5*