

The Bolt Module (BM) is used to interlock circuit breakers, valves, and earth switches etc. It is used where hazards need to be indirectly interlocked.

**A – NIL Trapped, Bolt Withdrawn**

**D – NIL Trapped, Bolt Shot**



## Reference States of Units

BM 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.

**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.



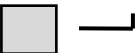


In the Normal State:

- 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)

	BM Bolt retracted and Bolt thrown
	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

BM1-1-0-CLIN-Z-A-006-022

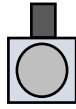


(Opposite State)

(Normal State)

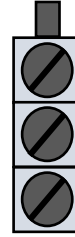


(Opposite State)

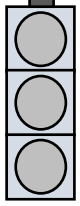


BM3-3-0-CLIN-Z-D-006-022

(Normal State)



(Opposite State)



## FORTRESS BMR/ BMSR – Monitored Bolt Module

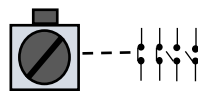
The Bolt Module with monitoring (BMR) is used to monitor the release of a key when interlocking circuit breakers, valves, and earth switches etc. It is used where hazards need to be indirectly interlocked.

BMR1-1-0-CLIN-Z-A-006-022

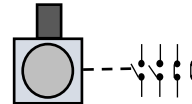


(Opposite State)

(Normal State)



(Opposite State)



## FORTRESS BM-LINK-Switch

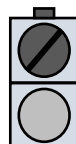
The Bolt Module with safety switch allows the sequence of the bolt module to be monitored. The safety switch will change state on the rotation of the key into the top lock of the NOL. Where there are no NOL, this will operate on the top lock of the NIL group.



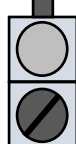
(Opposite State)

BM2-1-1-CLIS-Z-A-006-022-LINK-ST401

(Normal State)



(Opposite State)



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

All BM units

Part Number

BM3-2-1-...A

Normally Out Locks

Total Locks

Normally In Locks

Closest to bolt

Bolt position in Normal State:

- Bolt withdrawn (A)

- Bolt shot (D)

Standard Key Sequence – “Z”

NIL: Partially Sequential  
NOL: Partially Sequential

Switch Operation

Rear mounted “R”: Always lock closest to the head

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

Bottom mounted “L”: Always the top lock in the lowest group

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

Example

BML4-2-2-CLSS-Z-A-003-019

- NIL partially sequential
- NOL partially sequential
- 2NC/1NO switch
- L switch operated by top NOL
- Bolt normally withdrawn (3mm withdrawn)
- Bolt actuated by top lock

Normal state

NIL

NIL

NOL

NOL

3

4

2

1

Key Sequence

3

4

2

1

2. I need to match an existing system:

contact our team to discuss your enquiry at [partnumbergroup@fortressinterlocks.com](mailto: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

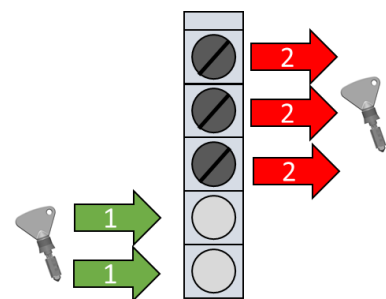
#### Partially Sequential:

- 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

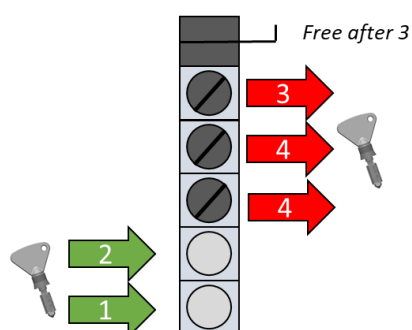
#### Fully Sequential:

- 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

