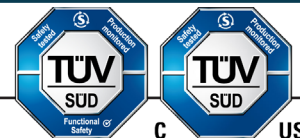





Operating Instructions: DM, DMS & DMSE



Door Locks

Description	DM	DMS	DMS2E
<p>Door Modules are designed for preventing access to safeguarded openings and areas until safe conditions are met by 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.</p> <ul style="list-style-type: none"> Over 200,000 unique lock differs managed by Fortress Interlocks in accordance with ISO/TS 19837 Robust Metal Alloy or Stainless casing <p>DM / DMS - Multiple Key Door Interlock</p> <ul style="list-style-type: none"> Head rotates 360° with 4 positions at 90° increments +/-5° fine adjustment Two actuator entry points in all positions All DM units have tamper-resistant stainless-steel heads Choice of five actuators available Any combination of safety / access keys possible <p>DMSE - Forced Safety Key Extraction Door Interlock</p> <ul style="list-style-type: none"> Door will not open until safety key has been removed and band lowered Extracted key mechanism module is always stainless-steel construction. <p>XM or XMS</p> <ul style="list-style-type: none"> XM(S) modules can be added for system expansion 			

Important:

This product is designed for use according to the installation and operating instructions enclosed. It must be installed by competent and qualified personnel who have read and understood the whole of this document prior to commencing installation. Any modification to, or deviation from these instructions invalidates all warranties. Fortress Interlocks Ltd accepts no liability whatsoever for any situation arising from misuse or misapplication of this product.

IF YOU HAVE ANY QUESTIONS OR QUERIES OF ANY NATURE WHATSOEVER PLEASE CONTACT THE SUPPLIER WHO WILL BE PLEASED TO ADVISE AND ASSIST.

It is the user's responsibility to implement proper management controls and risk assessment for master and spare keys, without which they can be used to defeat trapped key interlock systems; ISO/TS 19837 can offer further guidance

Technical Specifications	DM	DMS	DMSXE
Housing Materials	Die-cast zinc body with pearl bronze plated finish	Full Stainless Steel to 304	
Lock Mechanism	Die-cast zinc body with stainless operating mechanism (selected separately)		
Internals	Full Stainless Steel		
Temperature	Mechanical Components to 80°C		

Safety Data

Standards	ISO EN14119:2013 EN13849-1:2008 EN13849-2:2012 EN62061:2005		
Certifications	CE marked for all applicable directives		
Category	Cat. 4, PLe (EN/ISO 13849-1) and SIL3 (EN/IEC 62061)		
Functional safety data	B10d	5,000,000	

Operating Instructions: DM, DMS & DMSE

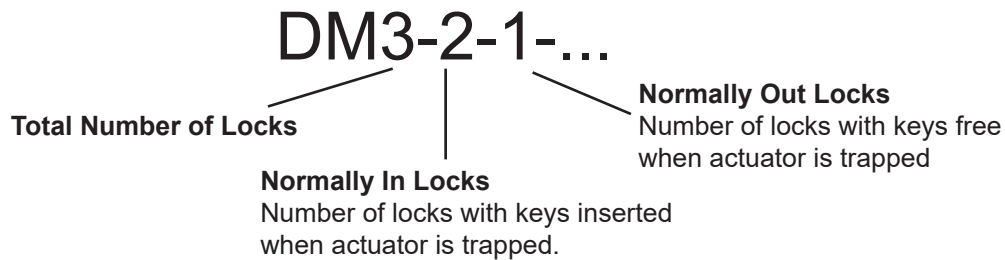
mGard Terminology

mGard part numbers describe their units in the reference state we call the “Normal State”, which means the following will be true:

- Switches will be in their described state, i.e. “Normally Closed” or “Normally Open”
- Any keys used as personnel keys will be inserted in a lock.
- For a DM, the actuator will be trapped.

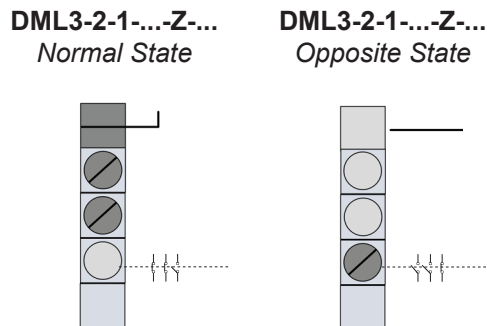
Locks are split into two groups, which are described in the part number as shown below:

- **Normally In Locks (NIL)** have keys inserted in the Normal State
- **Normally Out Locks (NOL)** do not have keys inserted in the Normal State



The other reference point used to describe our units is the “Opposite State”, which means all the locks, switches and actuators will be in the opposite state to the Normal State. The schematics below represent the two reference states using the symbols defined in the Trapped Key Interlocking standard ISO TS19837 (2018).

For a typical machine guarding system, the system will be described with all units in their Normal State (i.e. machine running). For more complicated systems like switch gear interlocking, the system might be described with some units in their Normal State, and others in their Opposite State. Similarly, the process to convert a system in its normal state to the system in its opposite state will result in steps where parts of the system are in Normal State, parts are in Opposite State.








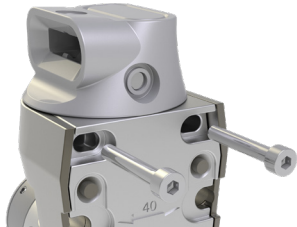


For the DM standard sequence (Z):

- The Normally In Locks will always be closest to the head of the DM unit
- The top key from a group must be removed first, followed by any of the lower keys in that group. This sequence is reversed when inserting keys. A group is defined as either NIL or NOL.
- When removing a key, all locks in the other group must have keys inserted before the key is releasable
- The actuator can only be removed when the lock closest to the head is in the Opposite State. Before returning this lock to its Normal State, the actuator must first be re-inserted
- A rear mounted “R” switch is operated by the lock closest to the head
- A bottom mounted “L” switch is operated by the top Normally Out Lock (or lock closest to the head if the unit only has Normally In Locks)

To add a switch onto this product to monitor lock operation, visit our XMR/DMR/BMR operating instructions.

Alternative sequences are available and will be indicated in the part number.

Standard Functionality
DM1 / DMS1
The key is inserted into the lock and turned, while the actuator is trapped in the head. The actuator is released allowing the door to be opened. The key remains trapped until the door is closed and the actuator is re-engaged.
DM2-10 / DMS2-5
The normally in locks (topmost) have keys trapped in the lock, while the actuator is trapped in the head. The normally out locks can then be inserted and turned, allowing the NIL(s) to be removed. The actuator is then disengaged to allow the opening of the door. Key for the NIL cannot be re-inserted until the door is closed and the actuator is re-engaged. Keys for the NOL(s) remain trapped until keys for the NIL are reinserted and turned. Multiple lock units offer variable key exchange sequences that require extra keys to be inserted, or removed before the door can be opened / locked door is open.
DMS2E (2-5)
The force extraction door lock offers the additional forced mechanical requirement to remove the key from the topmost lock (NIL) and lower the mechanical band before the actuator can be removed from the interlock. All other functionality mirrors that listed above in DMS2-5.

DM Head Fine Adjustment			
			
1. Start	2. Screws Out	3. Head Turned	4. Complete
Head Rotation			
			
1. Start	2. Screws Removed	3. Head Turned	4. Screws Re-fitted

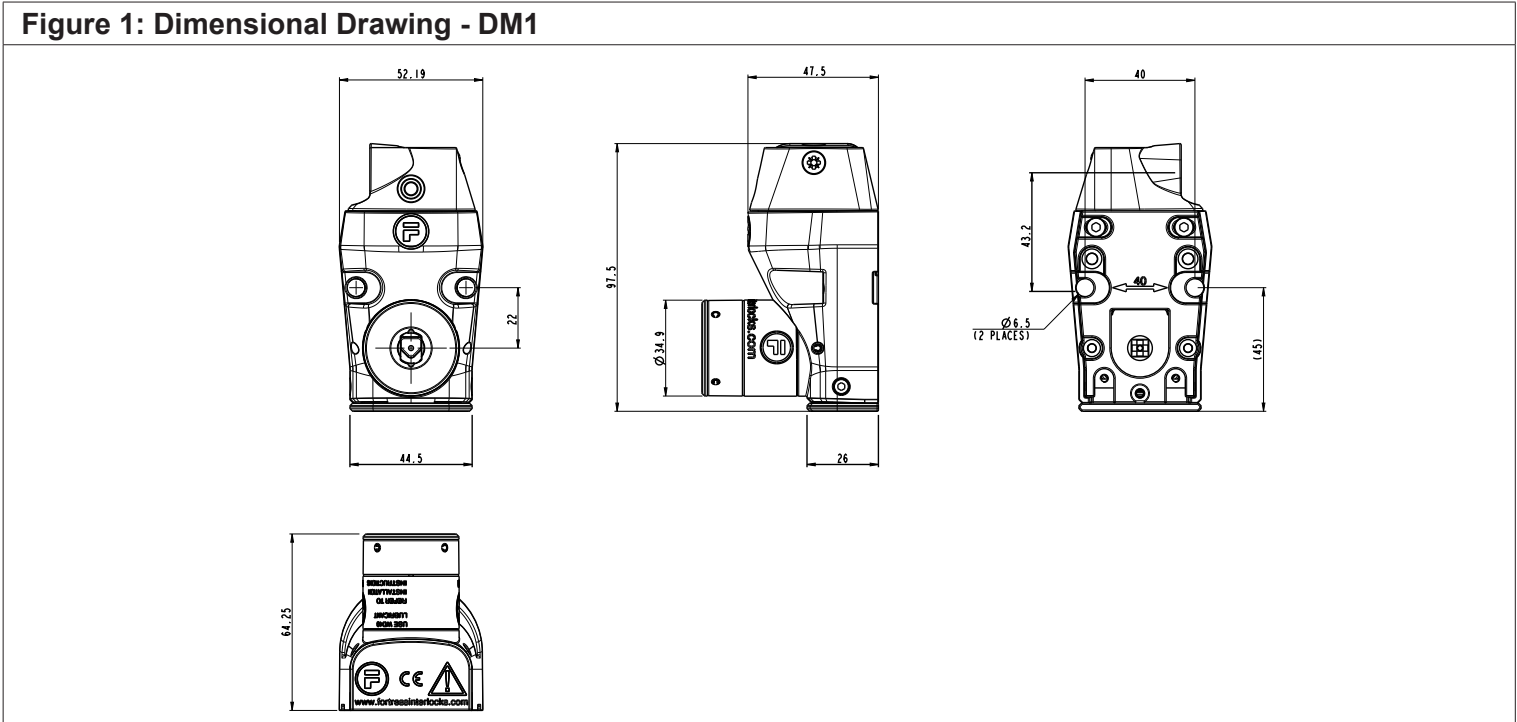


Figure 2: Dimensional Drawing - DMS2

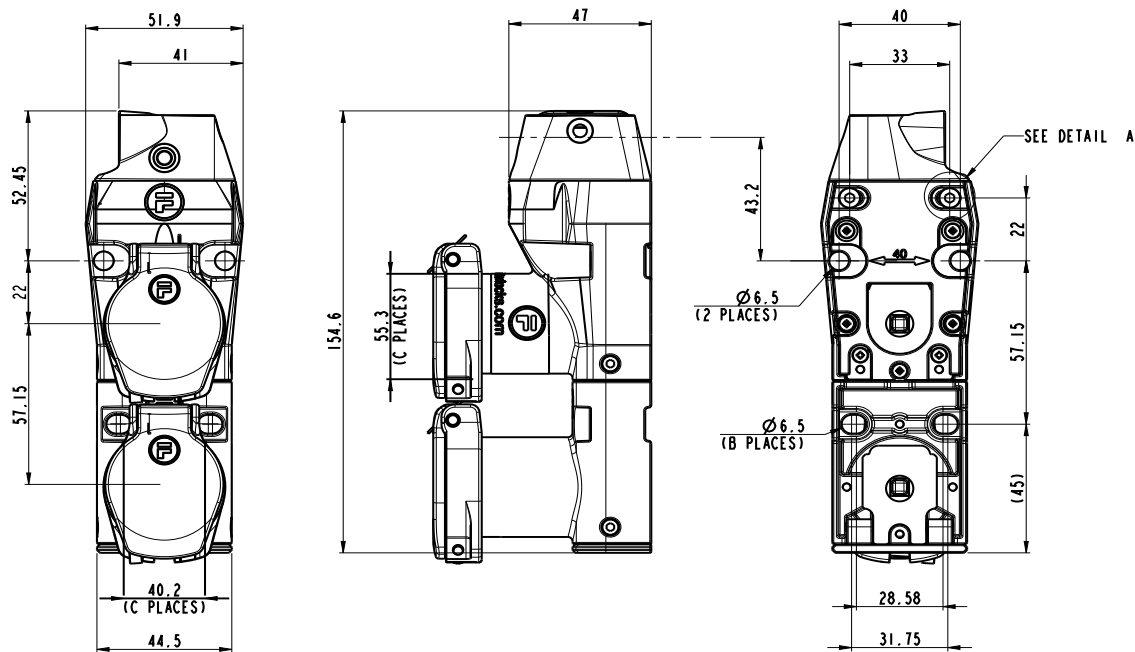


Figure 3: Dimensional Drawing - DMS2E

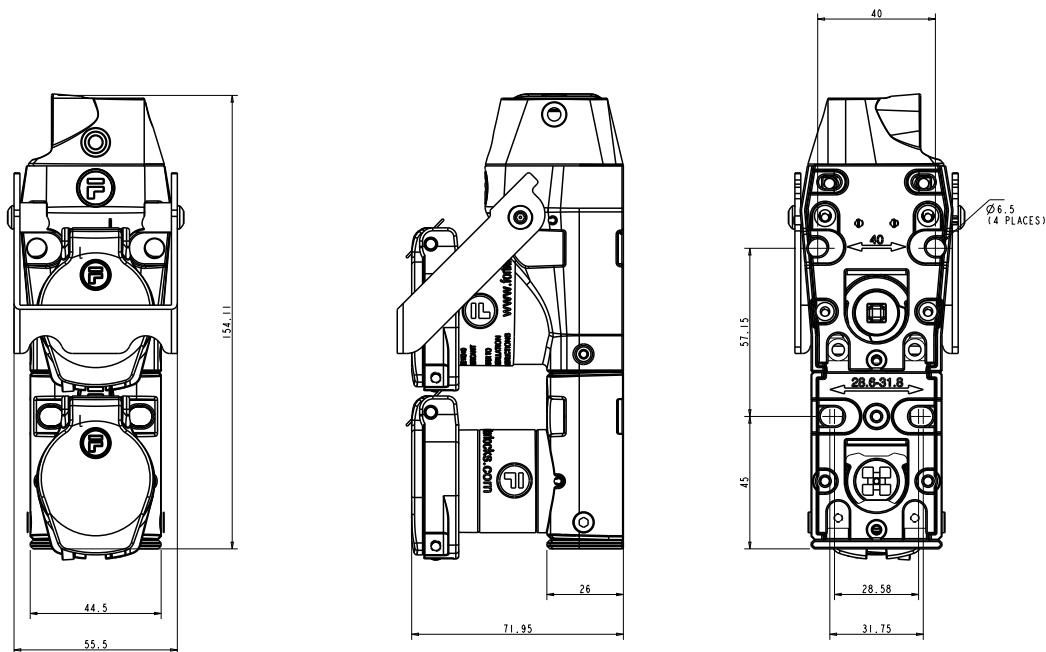
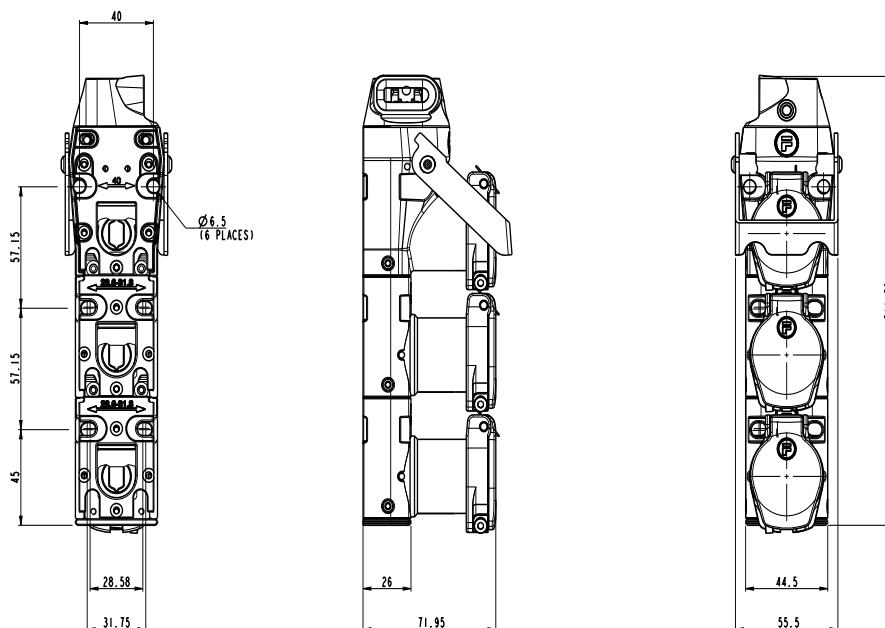


Figure 4: Dimensional Drawing - DMS3E



Tools & Fixings Required:

- 2 x Cap head / hexagonal

Front of Board mounting:

- M6 x 25

Suitable driver for above

If using through holes:

- 1 x Drill Ø6.5
- 2 x M6 nuts per module

If using threaded holes:

- 1 x Drill Ø5
- 1 x M6 Tap

All fixings must be used.

Mounting

Mount this unit well away from sources of vibration or use anti-vibration mountings in order to avoid the effects of vibration, shock and bump.

Mount the unit only in its correctly assembled condition to flat steel plate of minimum thickness 3.0mm or 6.0mm if aluminum. The product must be mounted in such a way as to ensure that the gap around the perimeter of the guard, when closed, confirms to relevant machinery safety standards. The head can be turned in 90° increments to suit a variety of mounting and handing configurations. It can also be adjusted by 5° in either direction, from the nominal position to suit guarding requirements.

To rotate the head through 90° increments:

1. Remove the two head adjustment screws (See Head Adjustment on Page 2).
2. Rotate the head to the desired position.
3. Refit the two head adjustment screws.

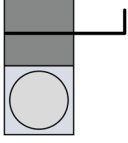
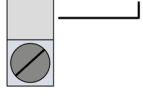
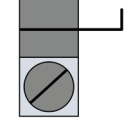
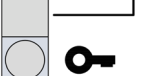
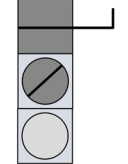
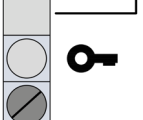
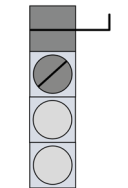
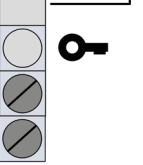
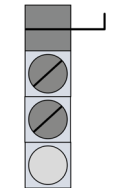
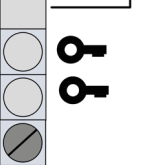
DM / DMS can be mounted in any orientation, observing the following rules:


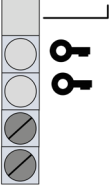
1. Locate the unit so that all the locks are within easy reach.
2. Choose the correct mounting configuration for the size and type of door.
3. Mount the unit using the chosen fixings.
4. Tighten the fixings to a Torque of 8 to 10Nm (5.9 to 7.4 lbf.ft).
5. All fixing screws must be permanently prevented from removal, either by vibration or by personnel using standard tools.

Operating Instructions: DM, DMS & DMSE

Commissioning

Mechanical Function Test (assuming standard Z sequence for the configurations tabulated below)

Part Number	Number of NIL	Number of NOL	Test Sequence	Normal Size	Opposite state
DM(S)1-0-1-...	0	1	<ul style="list-style-type: none"> Start with the actuator inserted and locked. Key should be removed. Insert the key into the lock and turn 120° clockwise. Check that the actuator can be removed. Ensure that when the actuator is removed from the head, the primary key cannot be fully turned 120°. 		
DM(S)1-1-0-...	1	0	<ul style="list-style-type: none"> Start with the actuator inserted and locked. Key should be inserted. Check the actuator cannot be removed whilst the Key is inserted and turned to 120°. Rotate the key and remove it. Check that the actuator can be removed. Ensure that the actuator remains free when inserting back into the DM head whilst the key is removed. 		
For all other DM(S): <ol style="list-style-type: none"> Start with all NIL locks with keys inserted and turned to 120°. All NOL locks should have keys removed. Check the actuator cannot be removed in this state. Check all keys in NIL positions remain trapped. The next action will depend on the number of NIL and NOL; see table below. 					
DM(S)2-1-1-...	1	1	<ul style="list-style-type: none"> Insert the key into the NOL; check the actuator remains trapped. Remove the key in the NIL and check the actuator is now freed. Do not return the key to the NIL; insert the actuator and check the key to the NOL cannot be removed. With the actuator removed, check the NIL key cannot be fully turned 120°. 		
DM(S)3+-1-2+-...	1	2+	<ul style="list-style-type: none"> Insert all keys into the NOLs starting at the top of the NOL group; check the actuator remains trapped. Remove the key in the NIL and check the actuator is now freed. Do not return the key to the NIL; insert the actuator and check the key to the NOL cannot be removed. With the actuator removed, check the NIL key cannot be fully turned 120°. 		
DM(S)3+-2+-1-...	2+	1	<ul style="list-style-type: none"> Insert the key into the NOL; check the actuator remains trapped. Remove keys from the NIL one by one, checking the NOL key cannot be removed. Check the actuator is now freed. Do not return any keys to the NIL; insert the actuator and check the key to the NOL cannot be removed. Insert the key into the first NIL only; insert the actuator and check the key to the NOL cannot be removed. With the actuator removed, check none of the NIL keys cannot be fully turned 120°. 		

DM(S)4+- 2+-2+...	2+	2+	<ul style="list-style-type: none">• Insert one key only into the NOL starting at the top of the NOL group; check no keys can be removed from the NIL.• Continue one by one inserting keys into the NOL until one NOL remains empty; check no keys can be removed from the NIL.• Insert final key into the NOL; check the actuator remains trapped.• Remove keys from the NIL one by one, checking the NOL keys cannot be removed• Check the actuator is now freed.• Do not return any keys to the NIL; insert the actuator and check the keys to the NOL cannot be removed.• Insert the key into the first NIL only; insert the actuator and check the key to the NOL cannot be removed.• With the actuator removed, check none of the NIL keys cannot be fully turned 120°.		
<p>DMS(2-5)E</p> <ul style="list-style-type: none">• Insert the key into the NOL: check the actuator remains trapped.• Remove keys from the NIL one by one, checking the NOL key cannot be removed.• Key the Band on the forced extract position up (topmost NIL). Check the actuator is trapped.• Lower this band on the topmost NIL: check the actuator is now freed.• Do not return any keys to the NIL: insert the actuator and check the key to the NOL cannot be removed.• Insert the key into the first NIL only: insert the actuator and check the key to the NOL cannot be removed.• With the actuator removed, check none of the NIL keys cannot be fully turned 120°.					

DMS(2-5)E

- Insert the key into the NOL; check the actuator remains trapped.
- Remove keys from the NIL one by one, checking the NOL key cannot be removed
- Key the Band on the forced extract position up (topmost NIL). Check the actuator is trapped.
- Lower this band on the topmost NIL; check the actuator is now freed.
- Do not return any keys to the NIL; insert the actuator and check the key to the NOL cannot be removed.
- Insert the key into the first NIL only; insert the actuator and check the key to the NOL cannot be removed.
- With the actuator removed, check none of the NIL keys cannot be fully turned 120°.

The table below lists the length of the product, number of mounting fixings, and the number of locks present in each type of door module.

Product	Overall Length	N° of slotted holes	N° of CL locks
DM(S)1	97.50	0	1
DM(S)2	154.60	2	2
DM(S)3	211.75	4	3
DM(S)4	268.90	6	4
DM(S)5	326.05	8	5
DMS2E	154.60	2	2
DMS3E	211.75	4	3
DMS4E	268.90	6	4
DMS5E	326.05	8	5
DM6	383.20	10	6
DM7	440.35	12	7
DM8	497.50	14	8
DM9	554.65	16	9
DM10	611.80	18	10

Alternative Sequencing

Z Sequence – standard sequencing; lock closest to the top is a NIL, NIL are partially sequential and NOL are partially sequential.

Partially sequential is defined where the top key from a group of locks (i.e. NOL or NIL) must be removed first, followed by any remaining keys within that group.

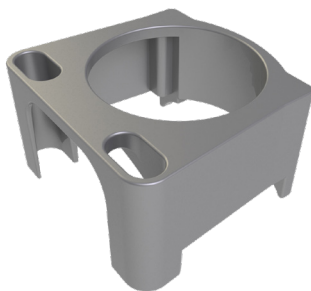
Y Sequence – this is a non-standard sequence where NIL and NOL are both non-sequential; this means the locks within each group (i.e. NOL or NIL) can be operated in any order.

W Sequence – this is a non-standard sequence where NIL are partially sequential, however NOL are sequential; this means the locks in must be operated in order starting with the top position, and finishing with the bottom most position.

V Sequence – this is a non-standard sequence where both NIL and NOL are sequential; this means the locks in each group must be operated in order starting with the top-most position and finishing with the bottom most position.

Installation back of board

For guidance installing this product to the back of a an enclosure, please see the 'M-BOB' section in the 'Operating Instructions: Accessories'.



Extending a Key Exchange

For guidance to extend your key exchange, please see the 'XMA/XMSA' section in the 'Operating Instructions: Accessories'.



Service and Inspection

Regular weekly inspection of the following is necessary to ensure trouble-free, lasting operation:

- Secure mounting of components.
- Debris and wear.

If lubrication/cleaning is required use WD40.

DO NOT USE DRY LUBRICANT.

The frequency of lubrication/cleaning will depend on the environment. There are no user serviceable parts in a DM / DMS module. If damage or wear is found, the whole module must be replaced.

Disposal

The DM unit does not contain any certified hazardous materials so should be disposed of as industrial waste.

Liability Coverage is voided under the Following Conditions:

- If these instructions are not followed.
- Non-compliance with safety regulations.
- Installation not performed by authorised personnel.
- Non-implementation of functional checks.

Fortress Interlocks Ltd reserves the right to modify the design at any time and without notice.

This guide should be retained for future reference.