Operating Instructions: XM & XMS

Description	XM	XMS
The XM unit is used as a key interchange, exchanging one or more keys for one or more other keys. This device forms the link between a source of isolation and access to safeguarded openings and spaces. • Over 200,000 unique lock differs managed by Fortress Interlocks in accordance with ISO/TS 19837. • Robust Metal Alloy or Stainless casing. • No product handing issues. • Any combination of isolation/access keys possible. • Possible to add modules to existing configurations. • Mounted front of board or back of board (M-BOB accessory Req).	(Normal State) Metal Alloy	(Normal State) Stainless Steel

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 mis-application 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	XM	XMS
Housing Materials Body	Die-cast zinc body with pearl bronze finish	Full stainless steel to S316
Lock Mechanism	Die-cast zinc body with stainless operating mechanism to S316 (selected seperatly)	Full stainless steel
Key	Full stainless steel to S316 (selected separately)	
Internals	All stainless steel components	
Maximum Key Retention Force	30Nm	

| 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

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.

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

XM3-2-1-...

Normally In Locks
Number of keys inserted
when in normal state

Normally Out Locks
Number of keys free when in
normal reference state
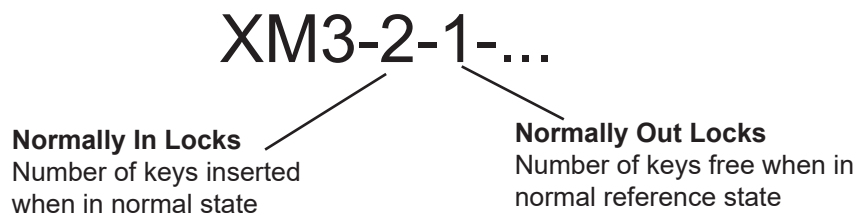
The other reference point used to describe our units is the "Opposite State", which means all the locks, switches and actuators will be in the opposite state to the Normal State. The schematics below represent the two reference states using the symbols defined in the Trapped Key Interlocking standard 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.

XM3-2-1... (Normal)
Standard Sequence

XM3-2-1... (Opposite)
Standard Sequence
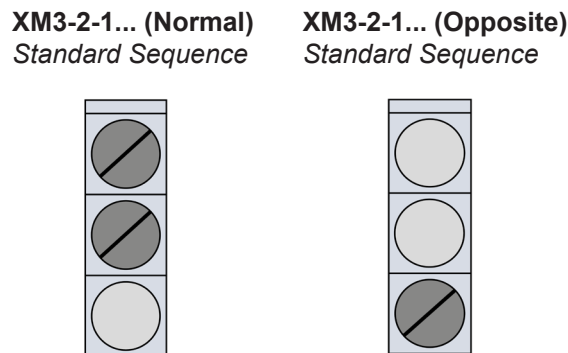
When defining the state of an XM, the product is always described in the orientation shown in the diagram above where the cap is at the top of the unit.

For the XM standard sequence (Y):
- The Normally In locks will always be closest to the cap at the top of the XM unit.
- Keys within a group can be removed from their locks in any order. Similarly, when returning keys within one group, keys can be inserted into locks in that group in any order. 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.
- A rear mounted "R" switch is operated by the lock closest to the head.
- A bottom mounted "L" switch is operated by the top most NOL.

To add switching to your key exchange product, visit our XMR/BMR/DMR Operating Instructions.
Alternative sequences are available and will be indicated in the part number.

Standard Functionality

Keys in NIL are mechanically trapped until (all) the key(s) is (/are) inserted and turned into NOL. Only when all NOL have keys inserted and turned can keys be removed from NIL(s). Removing a key from the first NIL key mechanically traps the key(s) in NOL in place.

Figure 1: Dimensional Drawing - XM & XMS
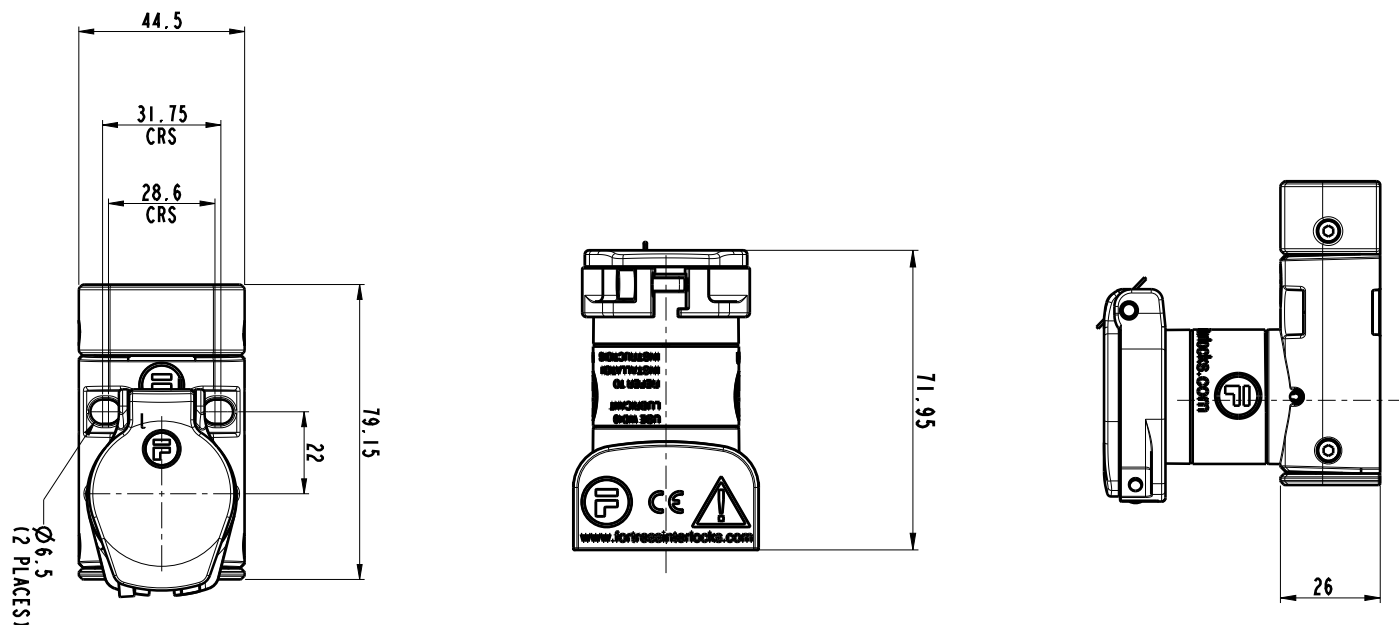
Tools and Fixings Required

• 2 x Cap head / hexagonal head bolts for each module.
Front of Board mounting:
• M6 x 25mm
Back of Board mounting:
• M6 x 55mm
Suitable driver for above.
If using through holes:
• 1 x Drill Ø6.5
• 2 x M6 Full nuts per module.
If using threaded holes:
• 1 x Drill Ø5
• 1 x M6 Tap and wrench.

All fixings must be used.
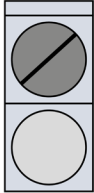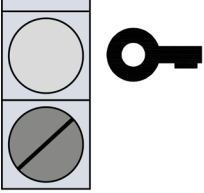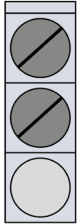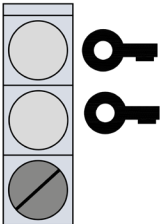
Operating Instructions: XM & XMS
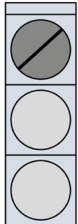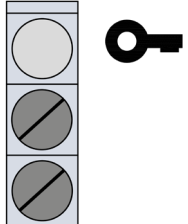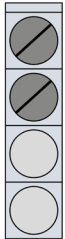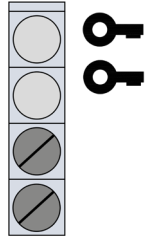
Mounting
Mount this unit well away from sources of vibration or use anti-vibration mountings in order to avoid the effects of vibration, shock and bump. Mount the unit only in its correctly assembled condition to flat steel plate of minimum thickness 3.0mm or 6.0mm if aluminium. XM / XMS can be mounted in any orientation, observing the following rules:
1. Locate the unit so that all the locks are within easy reach. **2.** Mount the unit to the panel using the chosen fixings. **3.** Tighten the fixings to a Torque of 8 to 10Nm (5.9 to 7.4 lbf.ft) **4.** All fixing screws must be permanently prevented from removal, either by vibration or by personnel using standard tools.

Commissioning

Mechanical Function Test

1. Start with all keys inserted into NIL and all keys removed from NOL
2. Check no keys can be removed from the NIL

Number of NIL	Number of NOL	Sequence Type	Test Sequence	Normal State	Opposite State
1	1	Y	• Enter the key into the NOL and turn 120°. Ensure key can be removed from NIL. • With the key in the NIL removed, check key in NOL cannot be fully turned and removed.		
2+	1	Y	• Enter the key into the NOL and turn 120°. Ensure any key can be removed from NIL in any order. • With one key removed from the NIL, check key in NOL cannot be fully turned and removed. • Repeat with other keys.		
1	2+	Y	• Enter all keys into the NOL and turn 120°. Ensure the key can be removed from the NIL. • With the key removed from the NIL, check no keys in NOL can be fully turned and removed. • Re-enter the key into the NIL, check the first key can be removed from the NOL and return to turned position. • Repeat with next NOL position(s).		
2+	2+	Y	• Enter one key into any NOL position and turn 120°. Check no NIL can be removed. Remove this key • Repeat with remaining NOL lock positions. • Enter keys into all NOL locks. • Rotate and free key from first NIL to check it is now free. • Check no keys can be freed from NOL. • Return the key to the NIL position. • Repeat the last three steps will all remaining NIL positions		

Alternative Sequencing

Y Sequence – (standard sequencing); lock closest to the cap is a NIL, NOL are furthest from the cap. Both Lock groups operate non-sequentially.

Non sequential is defined where a group of locks (i.e. NOL or NIL) can be operated in any order; such that keys can be inserted and rotated into any position first.

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.

Alternative 'non-standard' key sequences
Z sequence – In this sequence both NIL and NOL are partially sequential, such that the first lock in the group must be operated first, followed by any remaining lock within that group.

W Sequence – this is a non-standard sequence where NIL are partially sequential, however NOL are sequential; this means the locks 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'.
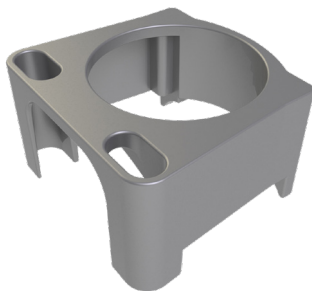
Extending a Key Exchange

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 an XM / XMS module. If damage or wear is found, the whole module must be replaced.

Disposal

The XM/XMS does not contain any certified hazardous materials so should be disposed of as industrial waste.

Liability coverage is voided under the following conditions:

1. If these instructions are not followed.
2. Non-compliance with safety regulations.
3. Installation not performed by authorised personnel.
4. 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.

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