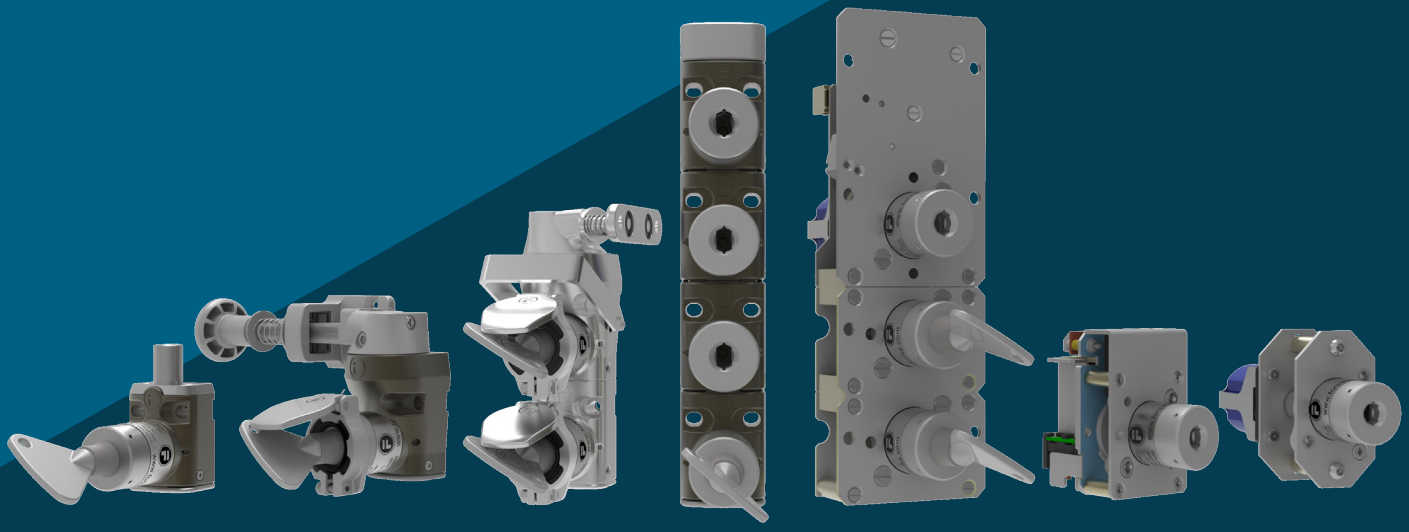
FORTRESS



Mechanical Trapped Key Interlocks Certified to PLe

mGard

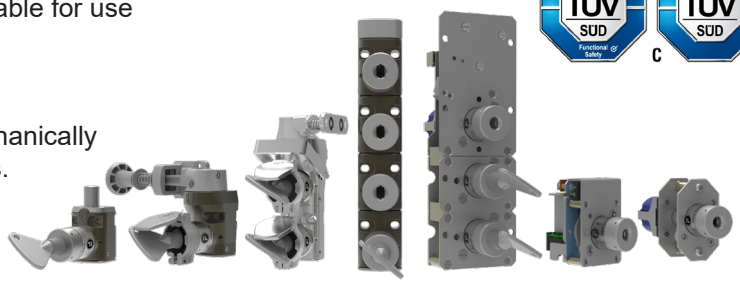
THE QUEEN'S AWARDS FOR ENTERPRISE: INTERNATIONAL TRADE 2018

C US

Introduction to mGard

mGard is the only range of trapped key interlocks 3rd party approved as meeting PLe and is perfect for heavy duty applications. Fortress' mGard is suitable for use up to SIL3 (EN/IEC 62061), Category 4 and PLe (EN/ISO 13849-1).

Trapped key interlocking is a tried and tested method of mechanically safeguarding dangerous machines and hazardous processes. Mechanical keys eliminate most of the electrical wiring associated with other types of interlocks making it cost effective to install and maintain.



Why Interlocks?

Interlocking is a method of controlling two or more interdependent operations which must take place in a predetermined sequence, if necessary remotely controlled or time delayed. The need for this sequence may be safety to personnel and equipment, or it may be to control processes and productivity.

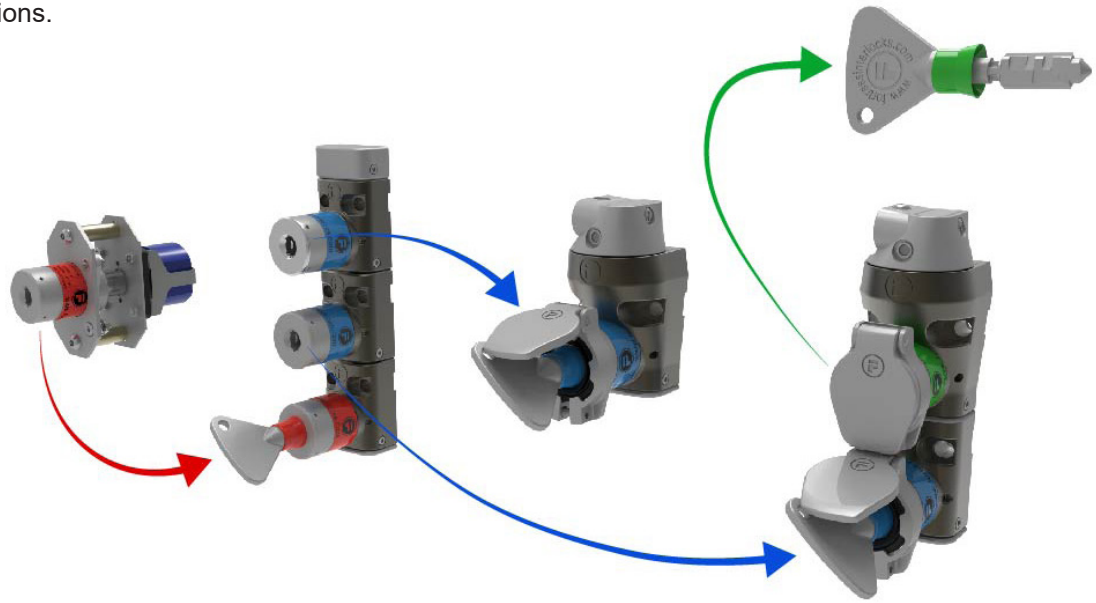
For Reference-

- ISO 14119 is the interlocking standard that forms part of the machinery directive.

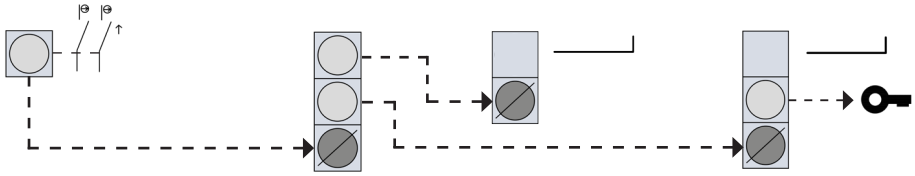
- ISO/TS 19837:2018 is the technical specification relevant to trapped key interlocking.

Why Mechanical?

- One power isolator can be used for multiple doors through the use of a key exchange unit.
- This reduces any fault masking risks and wiring installation required.
- In addition mechanical interlocking is the only method of safeguarding solutions for multiple energy sources.
- Personnel keys can be used to prevent unexpected start up of machinery as per ISO 14118, removing the necessity for escape functions.



Key Operated Switch | **Key Exchange Device** | **Access Lock** | **Access lock with Personnel Key**

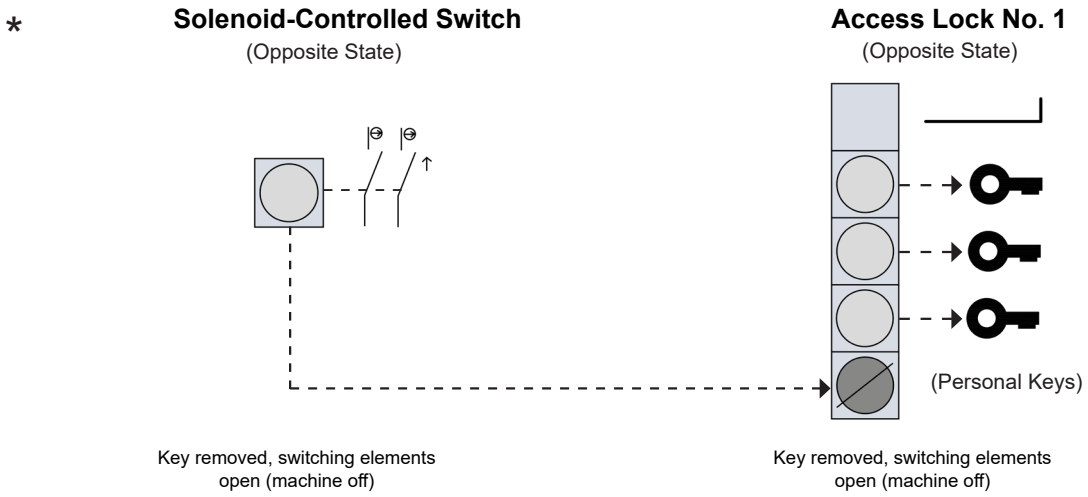


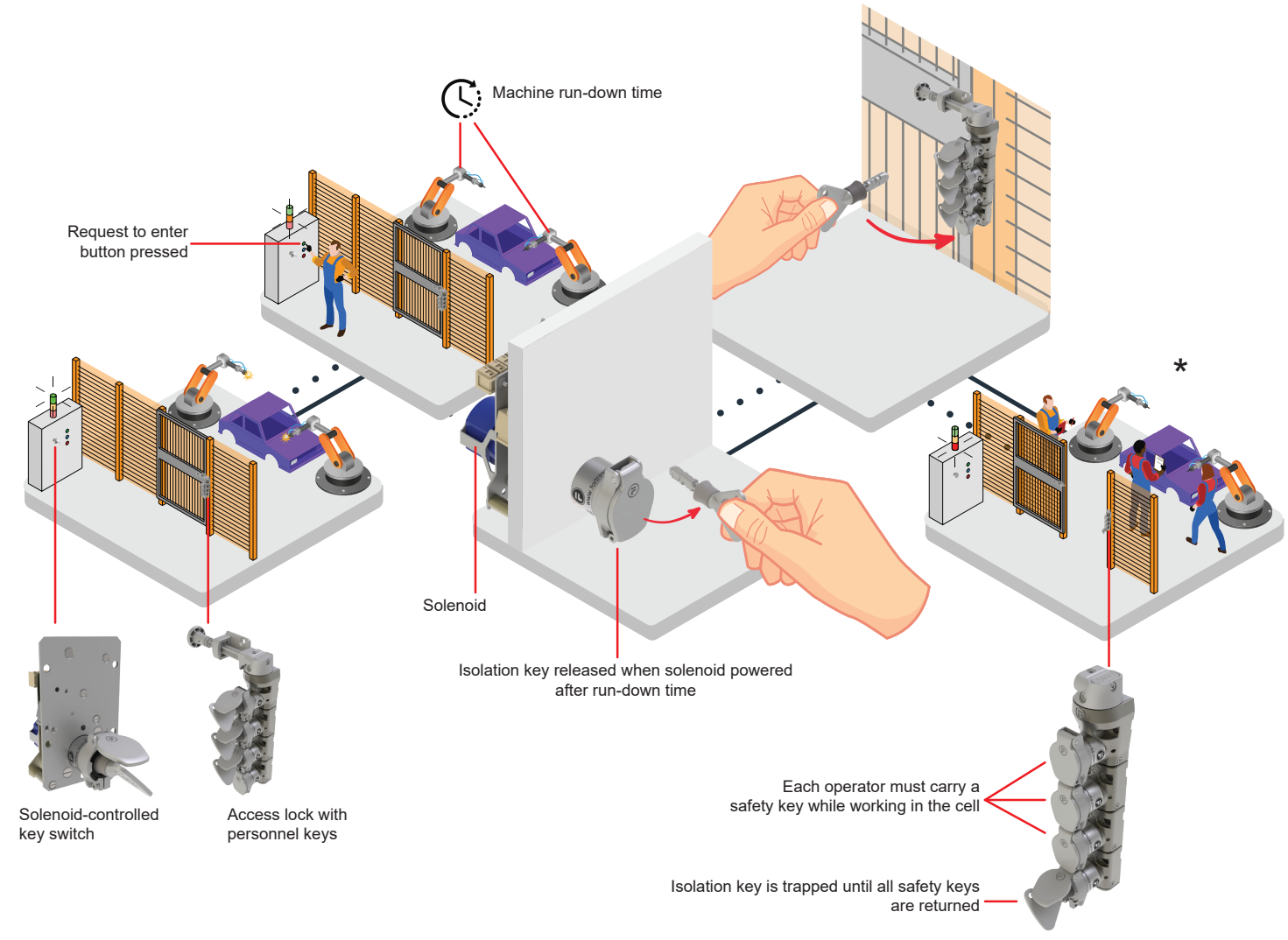
Key removed, contacts opened

Key trapped, actuator removed

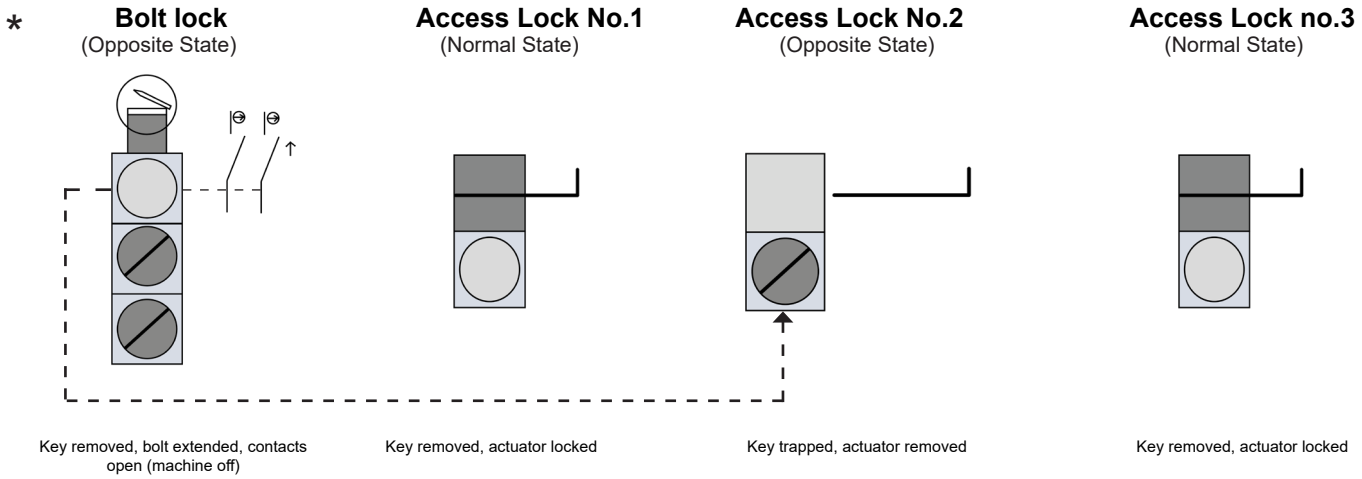
Access key trapped, Personnel key removed, Access door open

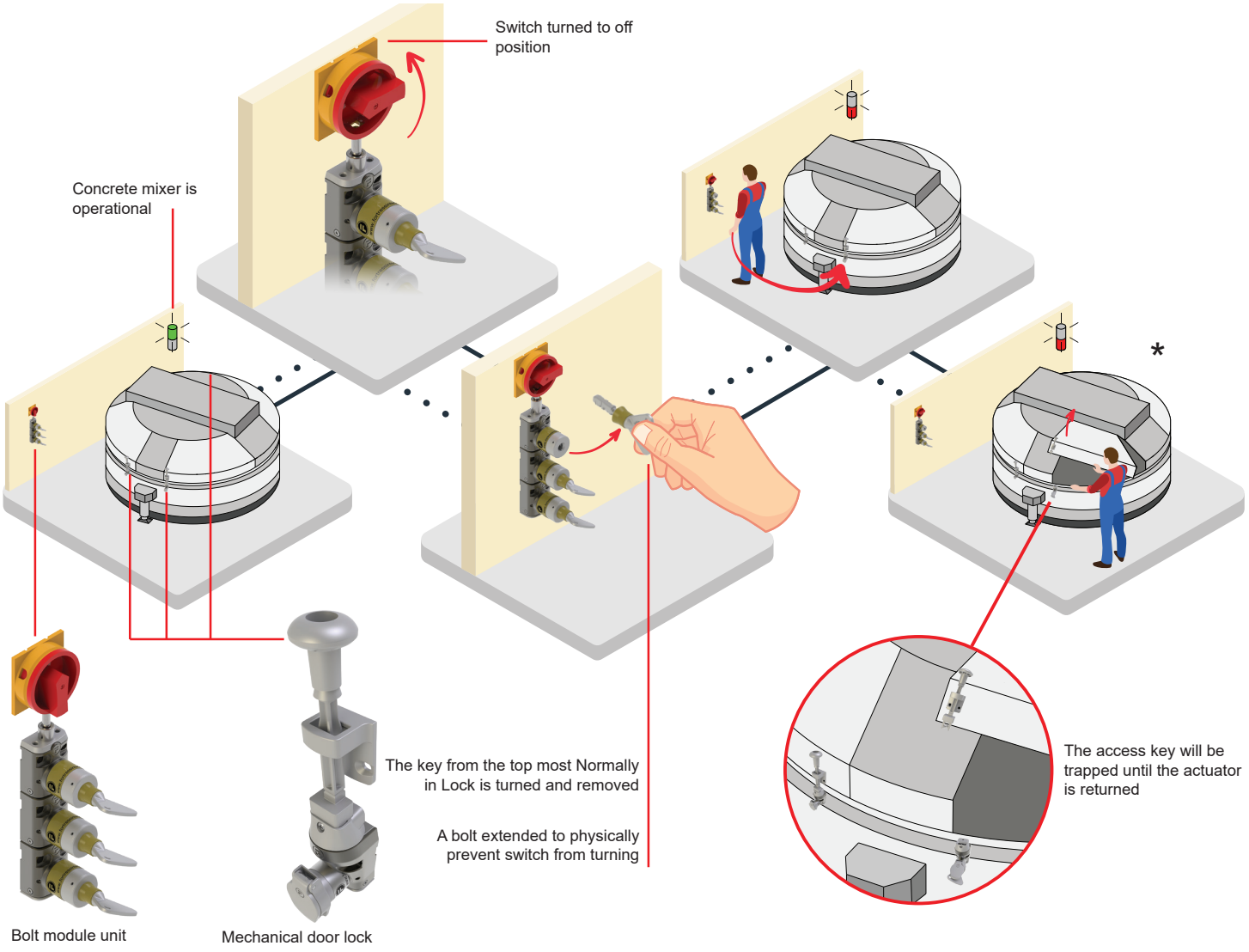
Application Requirement:
This robot welding cell's safety system must only allow operators to enter the cells when power to the cell has been isolated and the machinery has come to a controlled stop after a defined run-down time. After access, the system prevents unexpected start up when multiple operators are performing maintenance, via Personnel Keys.



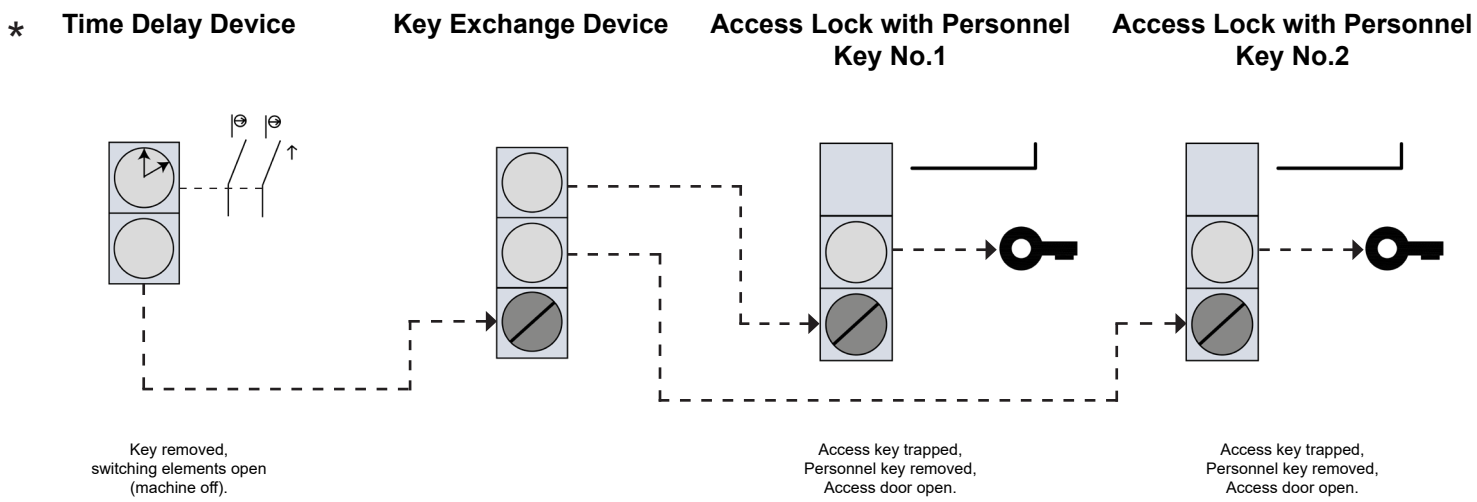


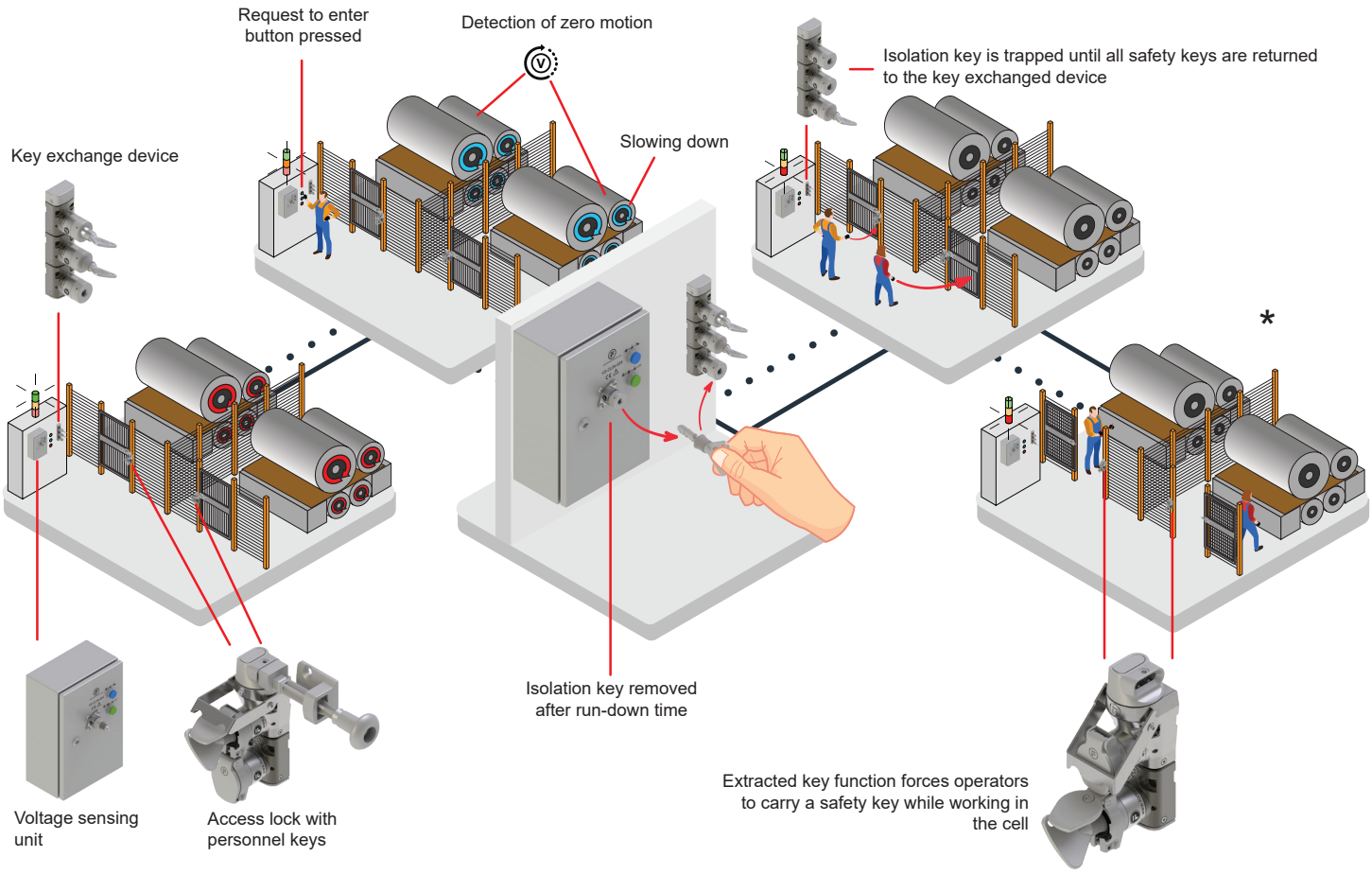
Application Requirement:
Industrial concrete mixers have multiple access hatches that are safeguarded by mechanical interlocks. These access hatches are opened for scheduled cleaning under the protection of the installed safety system. Access is only allowed once the power switch to the mixer has been mechanically isolated.





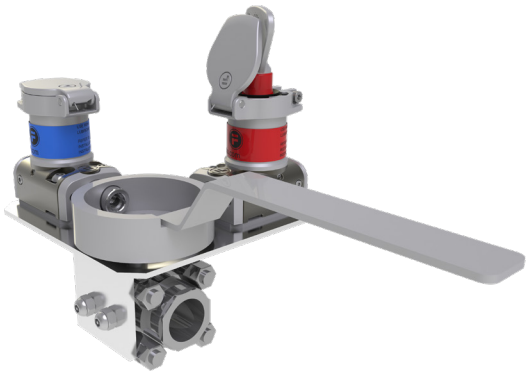
Application Requirement:
The double backer machines enclosed in two cells requires extensive safeguarding. A safety system for the cells should ensure operators and maintenance personnel can only enter the areas once power to all of the machinery has been isolated and has come to a controlled stop.



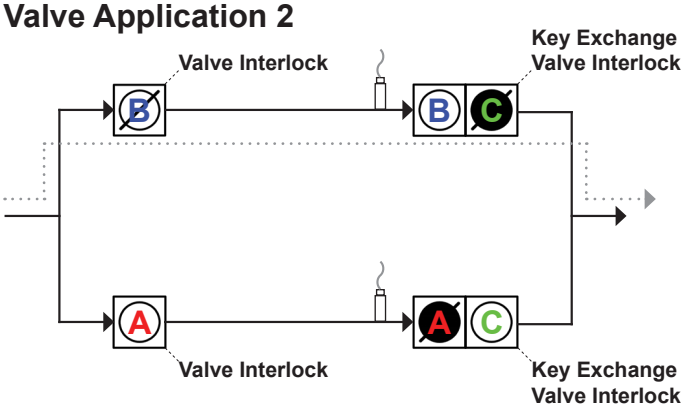


Valves & Pneumatic Interlocks

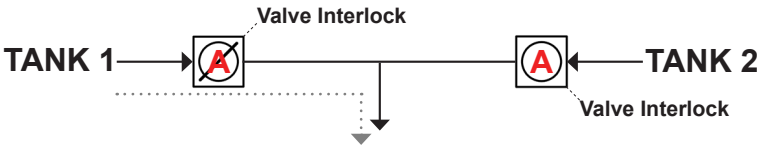
Fortress supplies a range of interlocks suitable for valve applications and for pneumatic isolation. With the incorporation of a mechanical module and key to a valve, Fortress has created a simplified solution for controlling the position of the valve and isolating the valve movement without the need of levers or hand-wheels in other forms of valve interlocking/lockout.



Valve Application 2



Valve Application 1



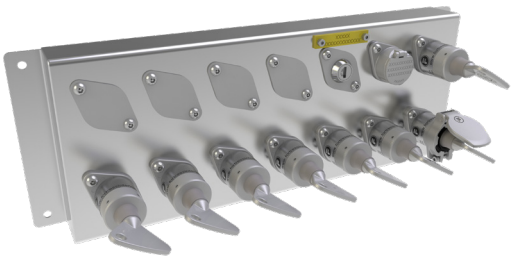
In this application, only one of the tanks can feed into the supply at once. The use of Valve Interlocks insures only one of the lines can be open because the two interlocks share a single key. Each valve can only be opened while a key is trapped to the locked position in the interlock.

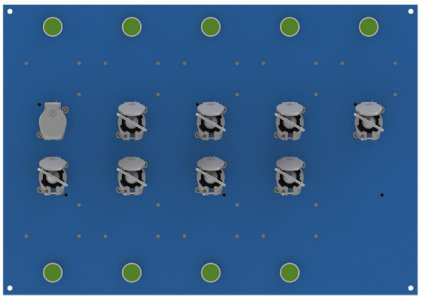
In this application, at least one pressure release line must be open at all times. The use of the Valve Interlocks insures at least one line will always be open because the independent interlocks A and B require their corresponding key to be turned to the locked position to close the valve. The two Key Exchange Interlocks share one key for the two locks marked C. The key for the two C locks is transferred between the units to always trap either the A or B key.

Specials and Custom Units for Applications

Over the years, Fortress has produced many special-purpose units designed to meet the specific needs of its customers and applications within their industries. Some of these units include: standalone time delay/voltage sensing and elaborate key sequencing exchange boxes. Some of these units have been added to the mGard range as their popularity in applications has grown throughout the years, but are considered non-standard or specials solutions due to the extended lead time required to design and manufacture. Fortress have recently developed a trapped key range with third party approved ATEX and IECEx approval for safe use in explosive atmospheres and hazardous locations.

Fortress has also helped customers create completely custom units that were specific to one individual application. These units were created in collaboration with engineers between both parties to better understand the needs and constraints of the application. Fortress is pleased to offer advice and assist without obligation; although a simpler solution may be proposed through standard mGard units or the other ranges Fortress has to offer.



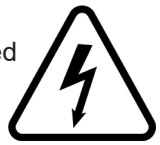


Definitions & Sequencing

Fortress trapped key solutions are designed to allow a multitude of sequencing options to match your specific applications. Before we discuss some different sequences, there are some definitions which help understand the 'state' of a product at a given moment.

Definitions

Product State - the condition a product is in relating to locks (and if applicable) switch contacts.



Normal State – is a condition of a 'device' which the part number will describe. Typically, Normal State is referred to as the machine is running, switches are in their 'normal' position (normally closed and normally open), and access is any hazardous space is not permitted.

Opposite State – is the opposite of the normal state. Typically, opposite state is defined as machine isolated, with any access doors opened with operators performing whole or partial body access.

Transition State – is any point within the transition of a product being operated from its Normal State to reach its Opposite state.

Lock States - the condition of a lock relating to operable keys.

The mGard range of products allows keys to be transferred from different devices to perform specific functions. In this sequence, the operation of a key can change. A key could be used for both isolating a switch, and to access the entryway to a safeguarded space.

Lock Group – All locks of one state within a product (i.e., all Normally In Locks, or all Normally Out Locks).

Normally In Locks (NIL) – Locks with a key inserted and trapped (rotated clockwise 120°) in position.

Normally Out Locks (NOL) – Locks with no key inserted or trapped (empty locks).

Sequences - The order of operation of locks within a given product

Fully Sequenced – Locks of a given Lock Group must operate in order starting by removing the key from the top-most lock, followed by the adjacent lock and so on. (When keys are inserted, the keys must be entered into the bottom most lock first, and inserted in order, with the key entered into the top-most lock of the given group last).

Partially Sequenced – The top-most lock of a given Lock Group must be operated first (key removed), followed by any remaining locks in that group in any order. (When keys are inserted, the top-most lock must be operated last).

Non-Sequenced - Locks within a given Lock Group can be operated in any order. No specific lock must be operated first.

Standard Sequence Types - How the NIL and NOL locks operate for a given product. In this brochure, the standard sequence will be listed for each product type.

Sequencing

Sequence Letter	Normally In Locks	Normally Out Locks	Type of Lock at top of product
Z	Partially Sequential	Partially Sequential	Normally In Lock (NIL)
Y	Non-Sequential	Non-Sequential	Normally In Lock (NIL)
W	Partially Sequential	Non-Sequential	Normally In Lock (NIL)
V	Fully Sequential	Fully Sequential	Normally In Lock (NIL)
Historical Fortress Sequencing – Sequence 'X' swaps the positions of the Normally In and Normally Out Locks. If you are trying to match an existing Fortress 'XM' product, you may require sequence 'X'.			
X	Non-Sequential	Non-Sequential	Normally Out Lock (NOL)

Power Isolation

Control Interlocking

Panel Mounted

Panel Mounted Weatherproof

In Enclosure

Key Switch(es)

Knob Operated Switch Control Unit

Mini Solenoid Controlled Key Switch(es)

Key Operated Switch Control Unit

Solenoid Controlled Key Switch(es)

Electronic Time Delay Unit

ATEX and IECEX Approved Solenoid Controlled Switch

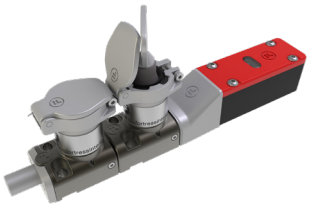
ATEX and IECEX Approved Key Switch

Voltage Sensing Unit

Power Interlocking

Mechanical Bolt Interlock

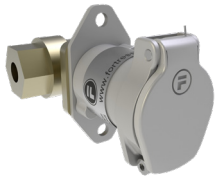
Bolt Interlock with Limit Switch



Bolt Interlock with Switch

Circuit Breakers

Valve & Pneumatic Interlocks



Key Exchange

Modular Key Exchange Unit

Modular Key Unit with Switch(es)

Keys & Locks

Standard

Masterable

Accessories

Extension Module

Door Locks

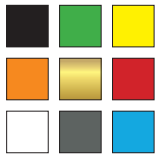
Single Door Interlock

Multiple Modular Door Interlock

Forced Safety Key Door Interlock

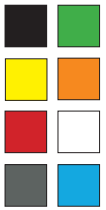
All in One Door Interlocks

Colours available for key seal and lock label.

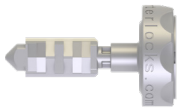


3 lines of 10 characters available for engravings.

Colours available for key bow and dustcovers.



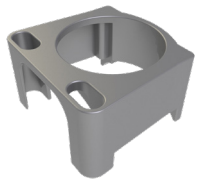
Low Profile



Dustcovers (Available as Standard & Padlockable)

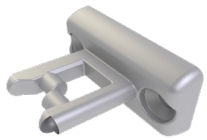
Lockout Hasps (For 3x Padlocks)

Back of Board Mounting Kit

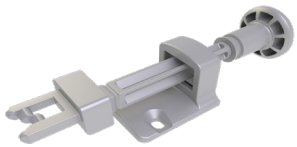


Actuators

Fixed Actuator



Handle Operated Actuator



Spring Released Handle Operated Actuator

Compressible Actuator

Self Aligning Actuator

Bolt Module Unit

Standard Sequence	
Z	Normally In Locks - Partially sequential Normally Out Locks - Partially sequential

XMA Unit

Additional modules fitted when multiple locks are selected.

BM	Bolt module

	Blank, mazak case (standard)
S	Stainless steel body

	Blank
R	Switch contact block mounted to back of first Normally In Lock

1-5	Total locks for BMS (stainless steel)
1-10	Total locks for BM

The sum of Normally In and Normally Out Locks should equal the total number of locks.

0-10	Number of Normally In Locks

Normally In Locks directly affect the positioning of the bolt.

0-10	Number of Normally Out Locks

CL	Standard lock
ML	Master lock

IN	No dustcover (standard)
IS	Dustcover
IL	Padlockable dustcover
SS	Stainless steel with dustcover, BMS body only
SL	Stainless steel with padlockable dustcover, BMS body only

The Normally Out Locks positioning is dependent of the chosen key sequencing for the bolt module unit.

A	Normally In Lock(s) free bolt shot, Normally Out Lock(s) trapped
D	Normally In Locks) free bolt withdrawn, Normally Out Lock(s) trapped

	Leave blank for BM, BMS, BML or BMSL
02022	20Amp 2xNO 2xNC switch, BMR or BMSR only
02040	20Amp 4xNC switch, BMR or BMSR only
Other switches available upon request	

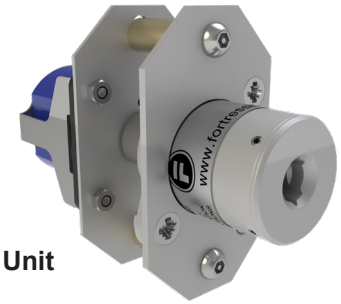
006-022	Standard, bolt length of 6mm (retracted)
003-019	Bolt length of 3mm (retracted)
013-029	Bolt length of 13mm (retracted)
030-046	Bolt length of 30mm (retracted)
050-066	Bolt length of 50mm (retracted)
150-166	Bolt length of 150mm (retracted)

	Blank, no mounting plate
MP	Mounting plate

Blank squares and additional "-" should be removed from the final part number.

BM | | | | - | | - | | - | | | - | Z | - | | - | | - | | - | |

Key Operated Switch



S Unit

S	Key operated switch

CL	Standard lock
ML	Master lock

IN	No dustcover (standard)
IS	Dustcover
IL	Padlockable dustcover
SS	Stainless steel with dustcover
SL	Stainless steel with padlockable dustcover

A02022	20Amp 2xNO 2xNC switch
A02040	20Amp 4xNC switch
Other switches available upon request	

	Panel mounted (standard)
WP	Weather (IP67) proof back of board mounting
EM	Metal enclosure

S	-			-		-	

S-WP Unit

The lock on a S-WP must be comprised of either SS or SL.

S-EM Unit

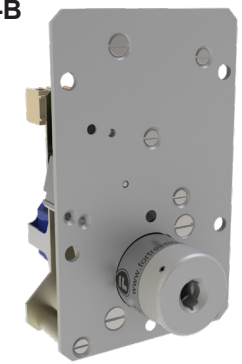
The lock used in the switch determines the enclosure. IN, IS and IL for zinc alloy or mild steel. SS and SL for stainless steel.

Larger switches will be in a larger enclosure.

Blank squares and additional "-" should be removed from the final part number.

Solenoid Controlled Key Switch

SS1-B



SS1-WP

SS1-F

Standard Sequence	
V	Normally In Locks - Fully sequential Normally Out Locks - Fully sequential

The number of Normally Out Locks (NOL) is typically '0'.

The sum of Normally In and Normally Out Locks should equal the total number.

Add-on lock modules are fitted to the solenoid if multiple keys are released by the solenoid.

SS	Solenoid controlled key switch
1-10	Total number of locks
1-10	Number of keys freed when solenoid is energised (Normally In)
0-9	Number of keys trapped when solenoid is energised (Normally Out)
CL	Standard lock
ML	Master lock
IN	No dustcover (standard)
IS	Dustcover
IL	Padlockable dustcover
SS	Stainless steel with dustcover
SL	Stainless steel with padlockable dustcover
A	Switch only on solenoid lock
B	Switch on solenoid lock & first Add-on lock
02022	20Amp 2xNO 2xNC switch
02040	20Amp 4xNC switch
Other switches available upon request	
A	AC
D	DC
024	24v (DC only)
048	48v (DC only)
110	110v (DC or AC)
230	230v (AC only)
PU	Power-to-Unlock solenoid
V	Locks arranged vertically
01	1 row
C	Cam sequence
B	Back of board mounting
WP	Weather (IP67) proof back of board mounting
FB	Mild steel painted blue fabrication
FR	Mild steel painted red fabrication
FRAL#	Mild steel painted to specific RAL number
FS	Stainless steel IP66 fabrication

Blank squares and additional "-" should be removed from the final part number.

SS		-		-		-			-	V	-			-			PU	-	V	01	C	

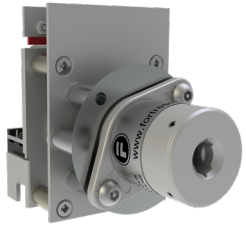
Mini Solenoid Controlled Key Switch

MSS Unit

MSS	Solenoid controlled key switch
1	One key freed when solenoid is energised
0	Zero keys trapped when solenoid is energised
CL	Standard lock
ML	Master lock
IN	No dustcover (standard)
IS	Dustcover
IL	Padlockable dustcover
SS	Stainless steel with dustcover
SL	Stainless steel with padlockable dustcover
A00302	3amp 2xnc switch
A	AC
D	DC
024	24v (DC only)
048	48v (DC only)
110	110v (DC or AC)
230	230v (AC only)
PU	Power-to-Unlock solenoid
	Panel mounted (standard)
WP	Weather (IP67) proof back of board mounting
EM	Metal enclosure (option pod), 24v DC solenoid only

The contact block in the mini solenoid controlled key switch are only available as a 3Amp 2xNC switch.

MSS-WP Unit



The solenoid used in the mini solenoid controlled key switch are all Power-to-Unlock.

MSS-WP panel thickness must be 1.5 - 3.5 mm.

Blank squares and additional "-" should be removed from the final part number.

MSS	-	1	-	0	-			-	A00302	-			PU	-	

Time Delay and Voltage Sensing

VS	Voltage sensing unit
TD	Timer delay device - key initiated timer
TS	Timer delay device - switch initiated timer
TR	Timer delay device - input initiated timer

CL	Standard lock
ML	Master lock

IN	No dustcover (standard)
IS	Dustcover
IL	Padlockable dustcover
SS	Stainless steel with dustcover
SL	Stainless steel with padlockable dustcover

024	24v DC solenoid
110	110v DC solenoid
230	230v DC solenoid
PU	Power-to-Unlock solenoid

All solenoids used in the time delay and voltage sensing units are Power-to-Unlock.

	Leave blank for VS
30-300	30-300 seconds (5 minutes) adjustable timer delay, 110 / 230v only
60-600	60-600 seconds (10 minutes) adjustable timer delay, 24v only

Blank squares and additional "-" should be removed from the final part number.

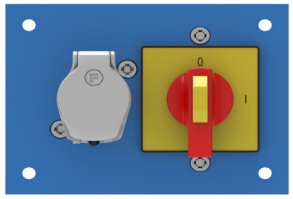
	-			-		PU	-	

VS Unit

TD Unit

Solenoid Controlled Key Switch

SCU1-B Unit



LCU4-B Unit

SCU	Knob operated switch control
LCU	Lock operated switch control

1-7	Total number of locks for SCU
2-8	Total number of locks for LCU

The sum of Normally In and Normally Out Locks should equal the total number of locks.

1-7	Number of keys trapped in a LCU (NIL)

0-7	Number of keys freed in a SCU/LCU (NOL)

The number of Normally Out Locks (NOL) is typically '0'.

CL	Standard lock
ML	Master lock

IN	No dustcover (standard)
IS	Dustcover
IL	Padlockable dustcover
SS	Stainless steel with dustcover
SL	Stainless steel with padlockable dustcover

Standard Sequence	
V	Normally In Locks - Fully sequential Normally Out Locks - Fully sequential

A	Switch only on control lock/knob
B	Switch on control lock/knob and Normally In Locks

02022	20Amp 2xNO 2xNC switch
02040	20Amp 4xNC switch
Other switches available upon request	

H	Locks arranged horizontally
V	Locks arranged vertically

01	1 row (standard)

C	Cam sequence, not available on 2 row units
R	Runner bar sequence

B	Back of board mounting
FB	Mild steel painted blue fabrication
FR	Mild steel painted red fabrication
FRAL#	Mild steel painted to specific RAL number
FS	Stainless steel IP66 fabrication

Blank squares and additional "-" should be removed from the final part number.

		-		-		-			-	V	-				-				

Key Exchange Units

Blank squares and additional "-" should be removed from the final part number.

XM2 Unit

XMR2 Unit

XM-LINK-ST401 unit

XMA Unit

Additional modules fitted when multiple locks are selected.

The sum of Normally In and Normally Out Locks should equal the total number of keys.

Normally In Locks are inserted into an XM unit to release Normally Out Locks.

The number of Normally Out Locks (NOL) is typically '0'.

XM	Modular key exchange unit

	Blank, mazak case (standard)
S	Stainless steel body

	Blank
R	Switch contact block mounted to back of Normally In Lock

2-5	Total locks for XMS (stainless steel)
2-10	Total locks for XM (mazak case)

1-10	Number of Normally In Locks

1-9	Number of Normally Out Locks

CL	Standard lock
ML	Master lock

IN	No dustcover (standard)
IS	Dustcover
IL	Padlockable dustcover
SS	Stainless steel with dustcover, XMS body only
SL	Stainless steel with padlockable dustcover, XMS body only

Standard Sequence	
Y	Normally In Locks - Non-sequential Normally Out Locks - Non-sequential

02022	20Amp 2xNO 2xNC switch
02040	20Amp 4xNC switch
Other switches available upon request	

	Blank, panel mounted
MP	Mounting plate, not available with metal enclosure

	Blank, no switch
LINK-ST401	Monitoring switch (monitors normally out locks)

XM				-		-		-			-	Y	-		-		-	

Door Locks

DM	Door module

	Blank, mazak case (standard)
S	Stainless steel body
SK	All in one stainless steel body

1-2	Total locks for DMSK (single cast stainless steel body)
1-5	Total locks for DMS (stainless steel)
1-10	Total locks for DM (mazak case)

The sum of Normally In and Normally Out locks equals the total number of locks.

	No extracted key function
E	Extracted key function added to the top Normally In Lock (DMS only)

0-9	Number of keys free when actuator is released (Normally In)

1-10	Number of keys trapped when actuator is released (Normally Out)

CL	Standard lock
ML	Master lock

IN	No dustcover (standard), mazak only, can be selected with DMS#E
IS	Dustcover, mazak only, can be selected with DMS#E
IL	Padlockable dustcover, mazak only, can be selected with DMS#E
SS	Stainless steel with dustcover, DMS or DMSK Only
SL	Stainless steel with padlockable dustcover, DMS or DMSK Only

DM1

DMS1

DMSK1

	Blank, no actuator
H	DM hand actuator
A	DM hand actuator with spring return
C	DM compressible actuator
F	DM fixed actuator
S	DM self-aligning actuator

XMA Unit

Additional modules fitted when multiple locks are selected.

	Blank, no actuator
LE	Actuator left entry
TE	Actuator top entry, default for A and H actuators
BE	Actuator rear entry, default for C, F, and S actuators
FE	Actuator front entry
RE	Actuator right entry

The head unit on the door lock modules have two access holes, and can rotate 360° at 90° intervals.

	Blank, no mounting plate
MP	Mounting plate

Blank squares and additional "-" should be removed from the final part number.

DM				-		-		-			-	Z	-		-		-	

Standard Sequence	
Z	Normally In Locks - Partially sequential Normally Out Locks - Partially sequential

Keys & Accessories

CLK	Standard key
MLK	Masterable key

SU	Uni directional

N	No seal (low profile keys only)
S	Silver seal, (CLK standard)
G	Gold seal, (MLK Standard)
C	Coloured seal and/or bow

S	Standard cut
M	Master cut, masterable key only (MLK)

	Standard colour seal / no seal
V	Viton (black) seal, (only if C is selected)
L	Green seal, (only if C is selected)
Y	Yellow seal, (only if C is selected)
O	Orange seal, (only if C is selected)
R	Red seal, (only if C is selected)
W	White seal, (only if C is selected)
B	Blue seal, (only if C is selected)

	Blank, no colour for bow (standard)
VB	Black bow, (only if C is selected)
GB	Green bow, (only if C is selected)
YB	Yellow bow, (only if C is selected)
OB	Orange bow, (only if C is selected)
RB	Red bow, (only if C is selected)
WB	White bow, (only if C is selected)
BB	Blue bow, (only if C is selected)
LP	Low profile bow, only if n (no seal) is selected

	-	SU			-		

CLK-SUSS

MLK-SUGS

MLK-SUCS-VYB

CLK-SUNS-LP

Blank squares and additional "-" should be removed from the final part number.

Keys & Accessories

Stainless Steel Dust Cover

Part Number
CLDC

Stainless Steel Padlockable Dust Cover

Part Number
PLDC

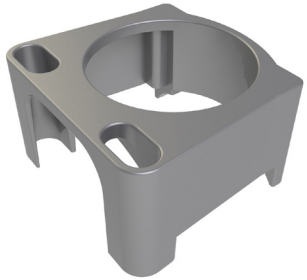
Lockout Scissor Hasp

Part Number
LOS3

Lockout Scissor Hasp with Cable

Part Number
LOS3C

Back of Board Adaptor



Part Number
M-BOB

Add-On Lock Module

Part Number
XMA-CLIN: Mazak body, no dustcover
XMA-CLIS: Mazak body, dustcover
XMA-CLIL: Mazak body, padlockable dustcover

Stainless Steel Add-On Lock Module

Part Number
XMSA-CLSS: Stainless steel body, dustcover
XMSA-CLSL: Stainless steel body, padlockable dustcover

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Fortress Global Offices

www.fortress-safety.com

Fortress Interlocks Ltd
+44 (0)1902 349000
sales@fortress-safety.com

Fortress Interlocks USA
+1 (859) 578 2390
us@fortress-safety.com

Fortress Interlocks China
+86 (021) 6167 9002
china@fortress-safety.com

Fortress Interlocks Europe
+31 (0)10 7536060
europe@fortress-safety.com

Fortress Interlocks Pty Ltd
+61 (0)3 9771 5350
australia@fortress-safety.com

Fortress Interlocks India
+91 7042358818
india@fortress-safety.com

A Halma company

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