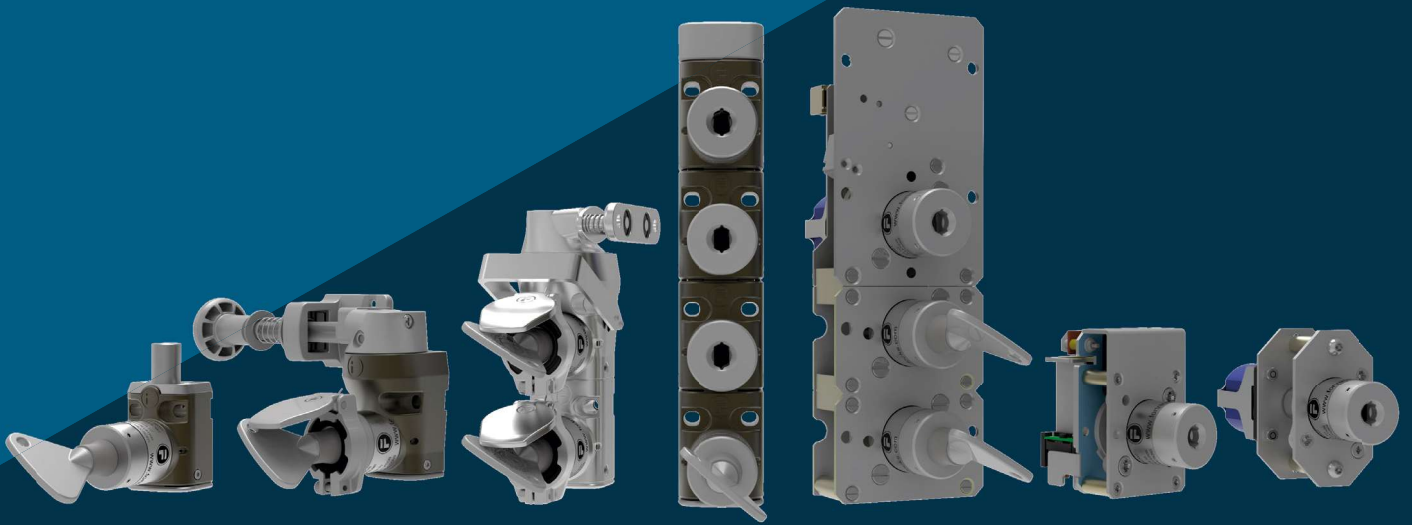




FORTRESS



Mechanical Trapped Key Interlocks Certified to PLe

 **Gard**

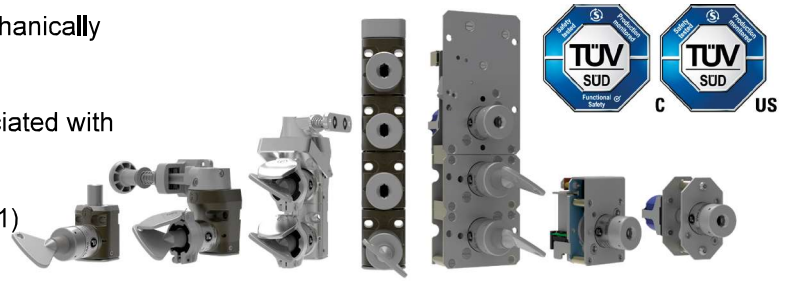


Introduction to mGard

Trapped key interlocking is a tried and tested method of mechanically safeguarding machines and processes.

Mechanical keys eliminate most of the electrical wiring associated with other types of interlocks making them cost effective to install.

The Fortress mGard is suitable for use up to SIL3 (IEC 62061) and Category 4 PLe (ISO 13849-1).



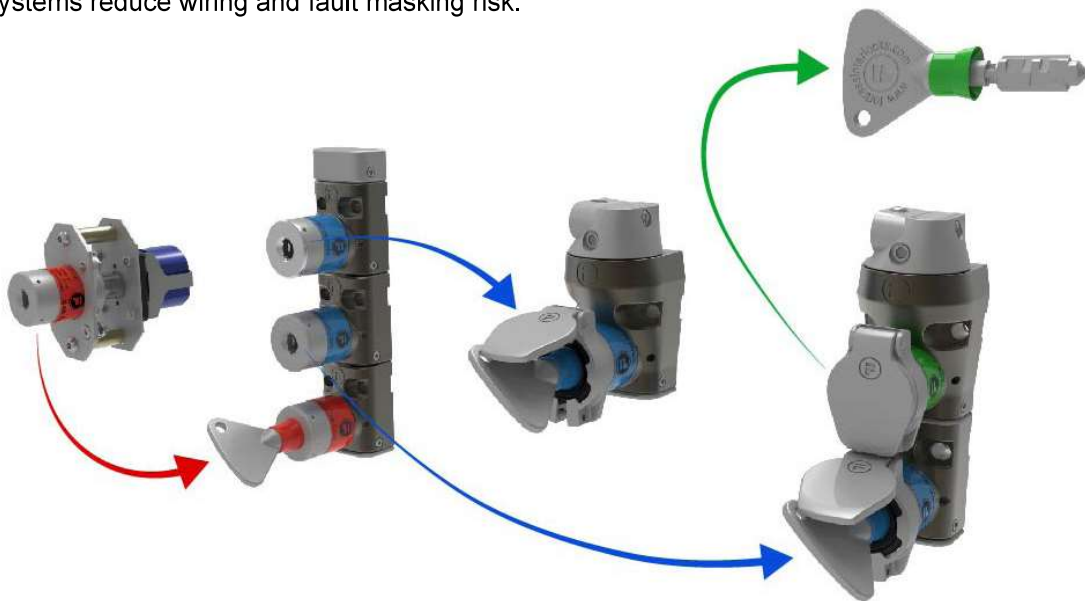
Why Interlocks?

Interlocks are mechanical, electrical or other types of devices, the purpose of which is to prevent the operation of hazardous machine functions under specified conditions. Interlocking can be used to help protect personnel and equipment, enforce processes, and improve productivity.

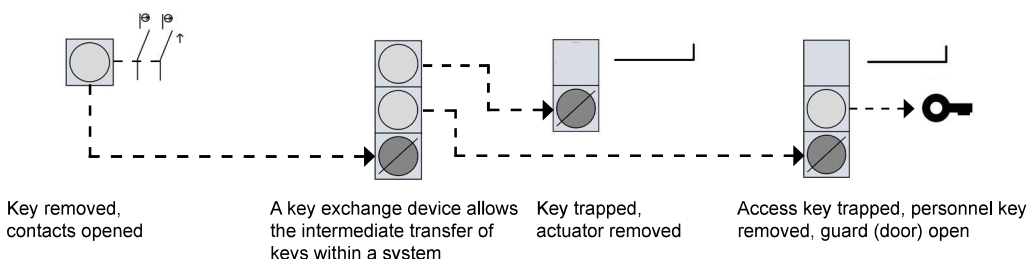
More information on interlock devices and their use on machinery can be found in ISO 14119, Safety of machinery - Interlocking devices associated with guards - Principles for design and selection. Further information on trapped key interlocking can be found in the technical specification ISO/TS 19837.

Why Mechanical?

- Mechanical interlocking can be used to control hazardous energy sources.
- A key from one isolation control device can be used in an intermediate transfer (key exchange) device to release keys for multiple guards.
- Personnel keys released from access locks can be used to proactively prevent unexpected start up of machinery as per ISO 14118.
- Mechanical systems reduce wiring and fault masking risk.



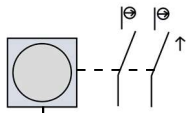
Key Operated Switch Key Exchange Device Access Lock Access Lock with Personnel Key



Application Requirement:

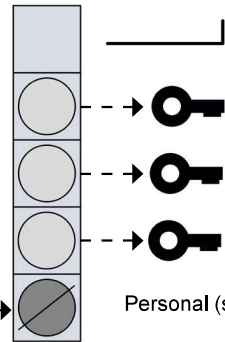
For this welding application, the machine design requires that operator access is only permitted after machinery has come to a controlled stop and power to the cell has been isolated. After access, the design prevents unexpected energisation and start up when multiple operators are performing maintenance through the use of Personnel (safety) Keys.

Solenoid-Controlled Switch (Machine Off State)



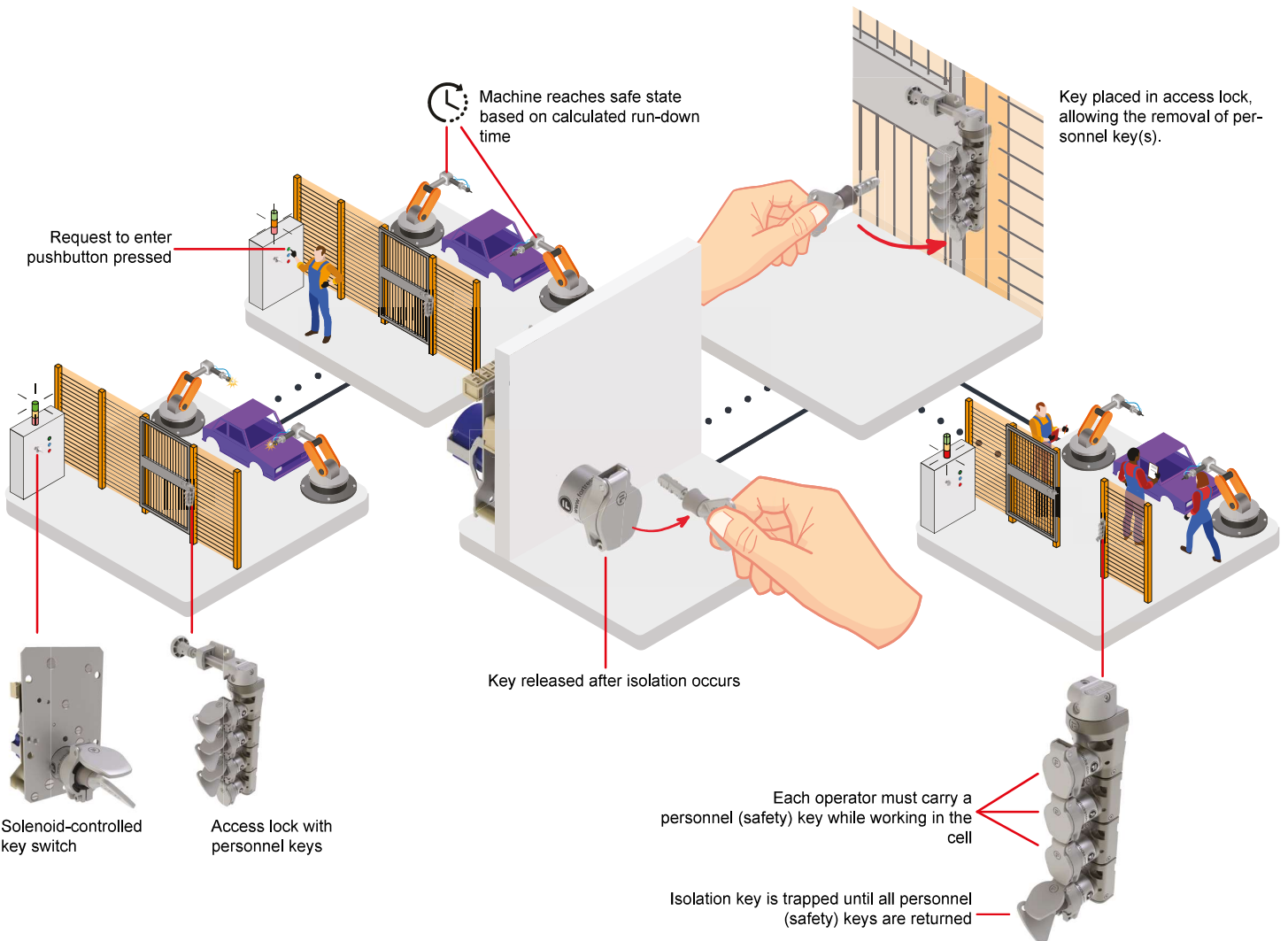
Key removed, switching elements open (machine off)

Access Lock No. 1 (Machine Off State)



Personal (safety) keys

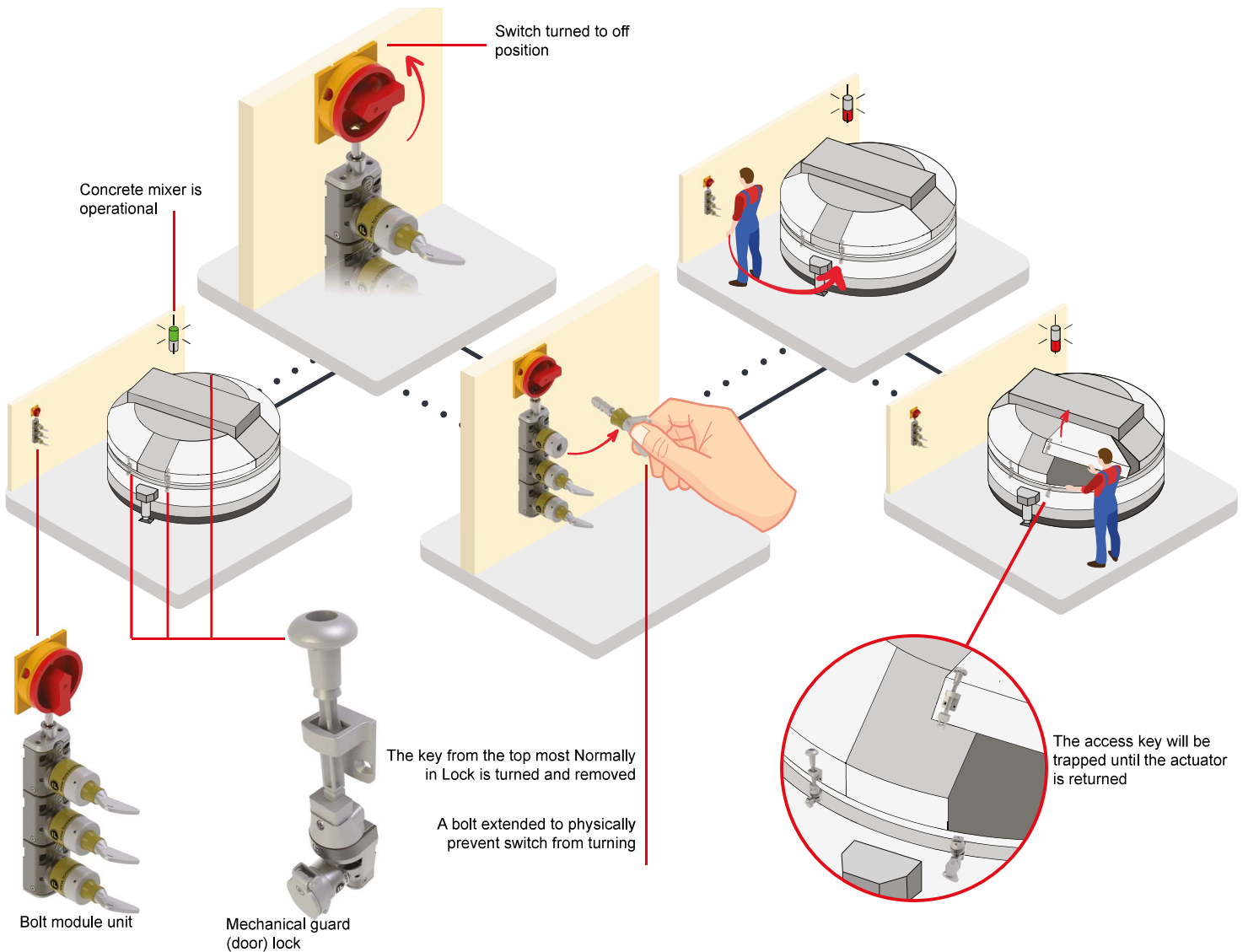
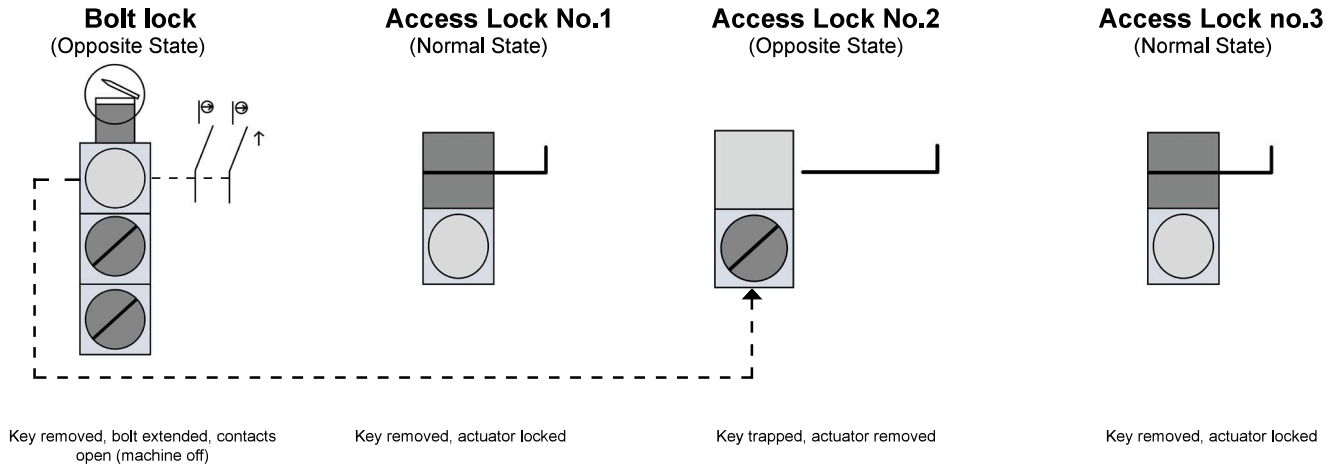
Key removed, switching elements open (machine off)



Mixer Application

Application Requirement:

Industrial concrete mixers have multiple access hatches that are safeguarded by mechanical interlocks. These access hatches are opened for scheduled cleaning. Access is only allowed once the power to the mixer has been isolated and mechanically secured.



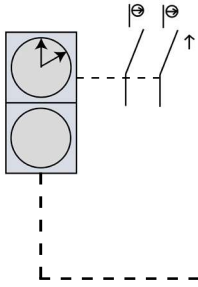
Double Backer Application

Application Requirement:

The double backer design needs hazards to come to a controlled stop before access is permitted. A time delay device ensures the time required to reach the controlled stop has elapsed before releasing a trapped key. Once release, a key is taken to an exchange, releasing access keys. Access keys are taken to the access locks, releasing personnel keys. Personnel keys are taken by personnel to prevent the movable guard from being closed whilst they are within the cell.

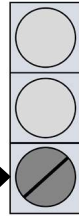
(Voltage sensing devices can also be used ensuring the target voltage indicating the controlled stop has been reached before releasing in a trapped key.)

Voltage Sensing or Time Delay Device

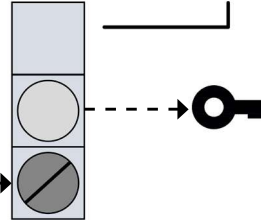


Key removed, switching elements open (machine off).

Key Exchange Device

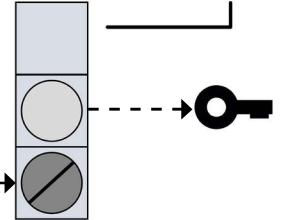


Access Lock with Personnel Key No.1

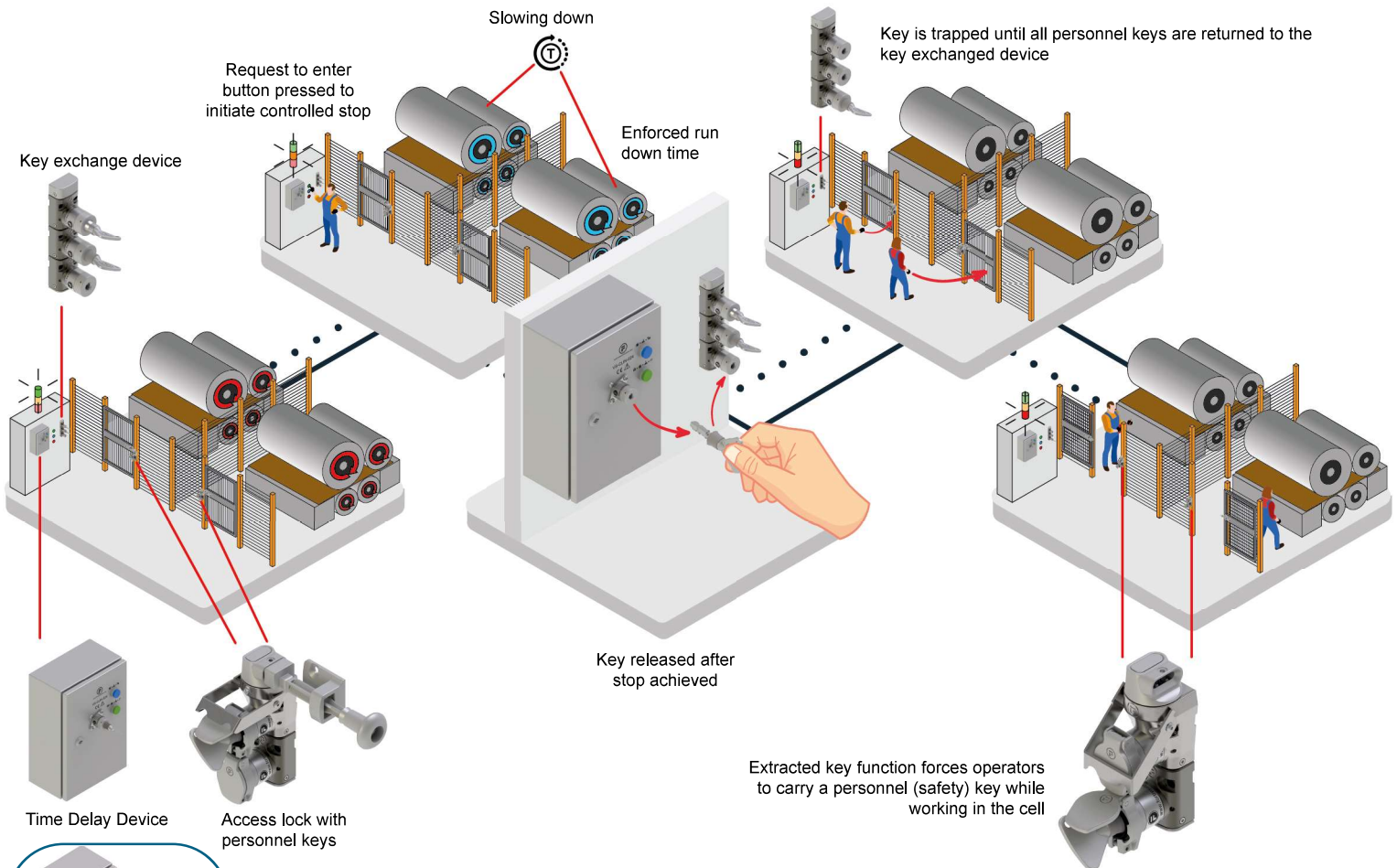


Access key trapped, Personnel (safety) key removed, Access Guard (door) open.

Access Lock with Personnel Key No.2



Access key trapped, Personnel (safety) key removed, Access Guard (door) open.



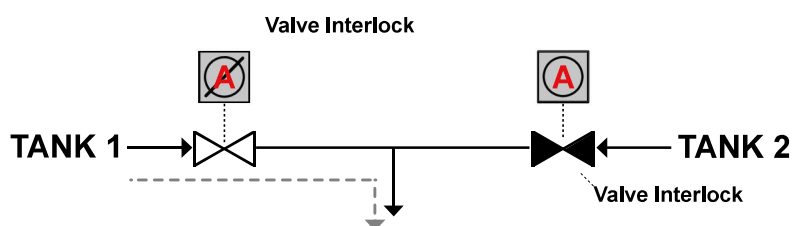
Alternatively, a voltage sensing device could be used

Valve 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 preventing the valve movement.



Valve Application



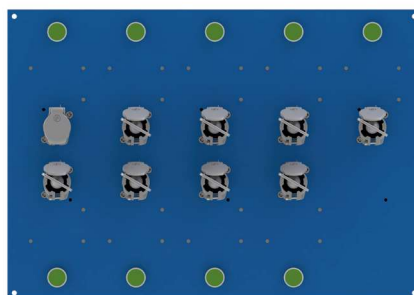
In this application, only one of the tanks can feed into the supply at once. The use of Valve Interlocks ensures only one of the lines can be open because the two interlocks share a single key. Each valve can only be opened while a key is trapped in the locked position in the lock.

The use of multiple trapped key interlocked valves can ensure that intermediate states are also controlled and enforced.

Specials and Custom Devices for Applications

Over the years, Fortress has produced many special-purpose devices designed to meet the specific needs of its customers and applications within their industries. Some of these devices include standalone time delay or voltage sensing devices and complex key sequencing exchange boxes. Some of these devices 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 has 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 devices that were specific to one individual application. These devices 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 devices 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 to any hazardous zone is not permitted.

Opposite State – is the opposite of the normal state. Typically, opposite state is defined as hazards in a safe state, with any guards opened with operators performing tasks.

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 in the normal state.

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

Sequence - The order of operation of locks within a given device.

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)

Devices may be applicable for Control Interlocking or Power Interlocking

Panel Mounted

Key Switch(es)



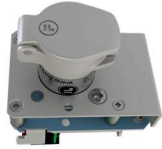
Panel Mounted Weatherproof



In Enclosure



Mini Solenoid Controlled Key Switch(es)



Solenoid Controlled Key Switch(es)



ATEX and IECEx Approved Solenoid Controlled Switch



ATEX and IECEx Approved Key Switch



Rotary Handle Operated Switch Control Unit



Key Operated Switch Control Unit



Electronic Time Delay Unit



Voltage Sensing Unit



Mechanical Bolt Interlock



Bolt Interlock with Switch



Valve & Pneumatic Interlocks



Bolt Interlock with Limit Switch



Circuit Breakers



Key Exchange

Modular Key Exchange Unit



Modular Key Unit with Switch(es)



Keys & Locks

Standard



Masterable



Accessories

Extension Module



Interlocking Device for Guards (Door)

Single Guard (Door) Interlock



Multiple Modular Guard (Door) Interlock



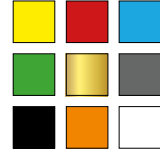
Forced Personnel (Safety) Key Guard (Door) Interlock



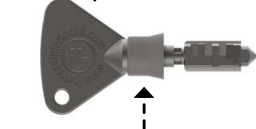
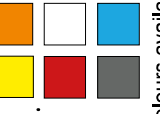
All in One Guard (Door) Interlock



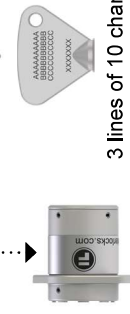
Colours available for key seal and lock label.



Colours available for key bow and dustcovers.



3 lines of 10 characters available for engravings.



Low Profile



Dustcovers (Available as Standard & Padlockable)



Padlockable 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

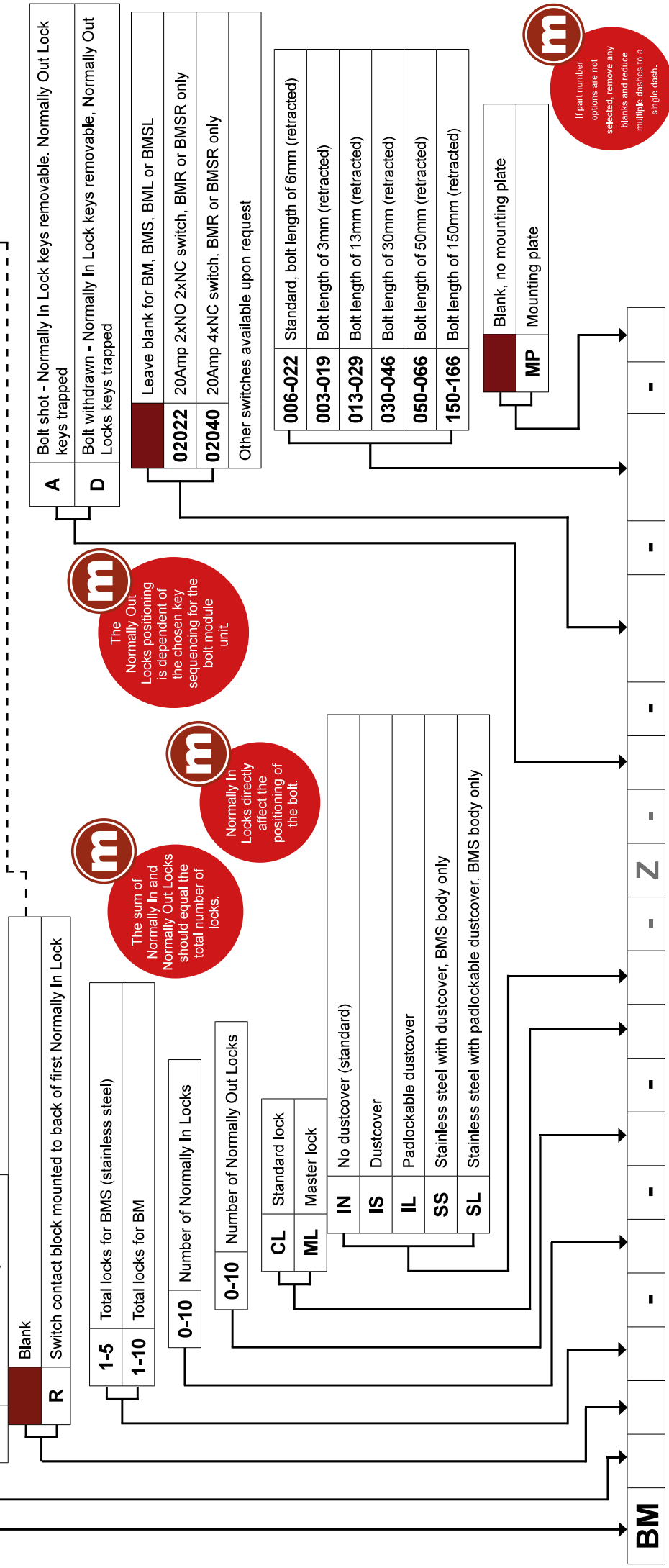
Standard Sequence	
Z	Normally In Locks - Partially sequential Normally Out Locks - Partially sequential



XMA Unit



m
Additional modules fitted when multiple locks are selected.



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

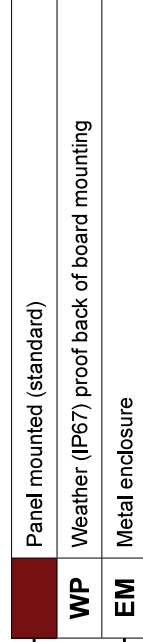
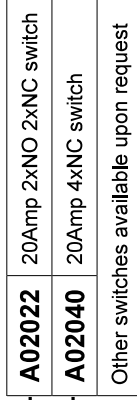
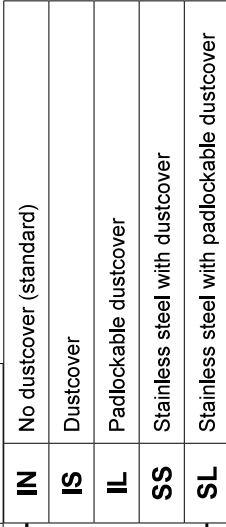
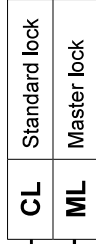
m
The sum of Normally In and Normally Out Locks should equal the total number of locks.

m
Normally In Locks directly affect the positioning of the bolt.

Key Operated Switch



S Unit



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

S-WP 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.

S-EM Unit



Larger switches will be in a larger enclosure.



If part number options are not selected, remove any blanks and reduce multiple dashes to a single dash.

Power Isolation: Control Interlocking

Solenoid Controlled Key Switch

SS1-B



m

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

m

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

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

Standard Sequence

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



m

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

SS1-WP



SS1-F



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

m

If part number options are not selected, remove any blanks and reduce multiple dashes to a single dash.

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

SS

-

-

-

-

V

-

-

PU

-

-

01

V

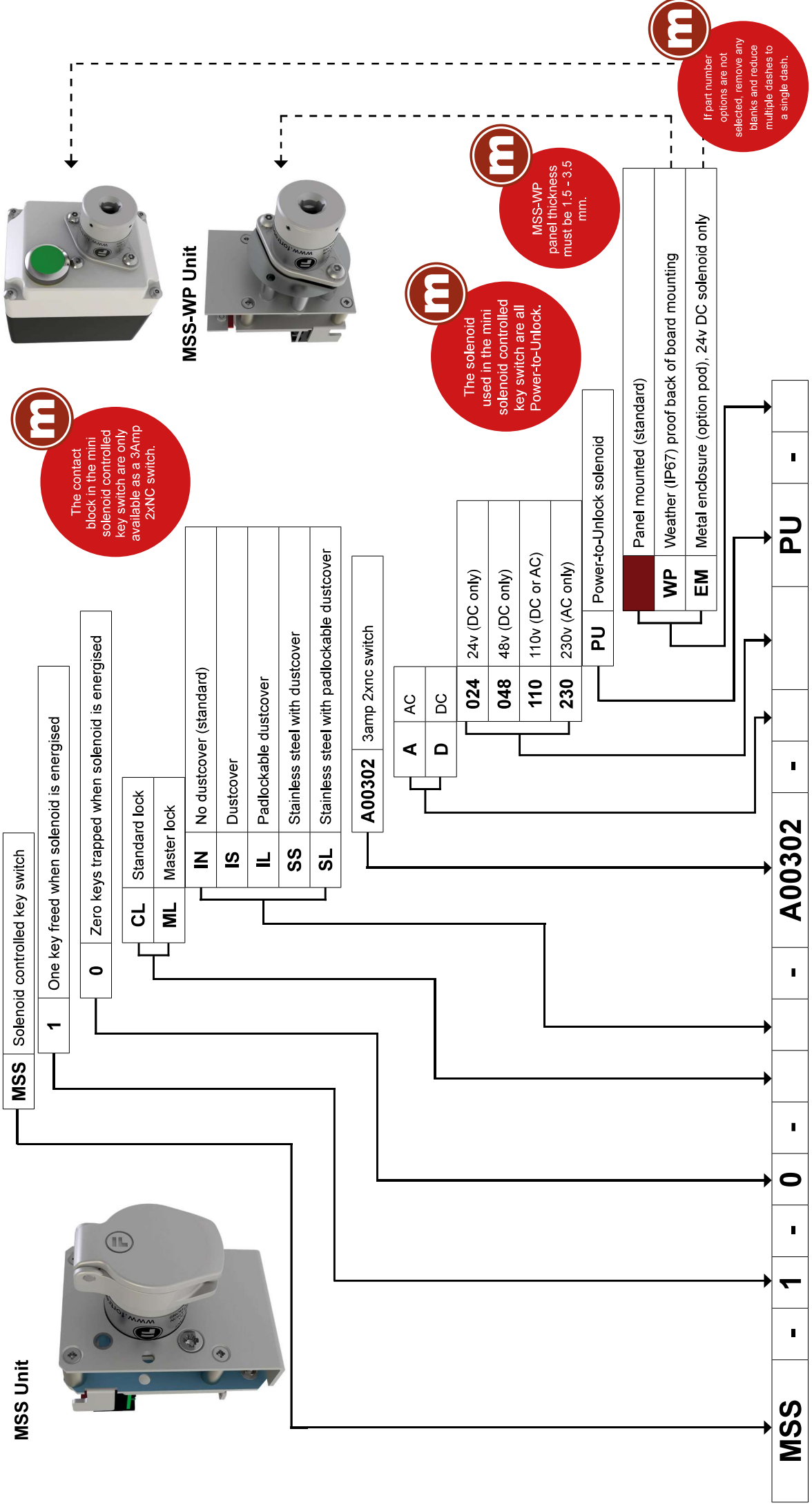
-

01

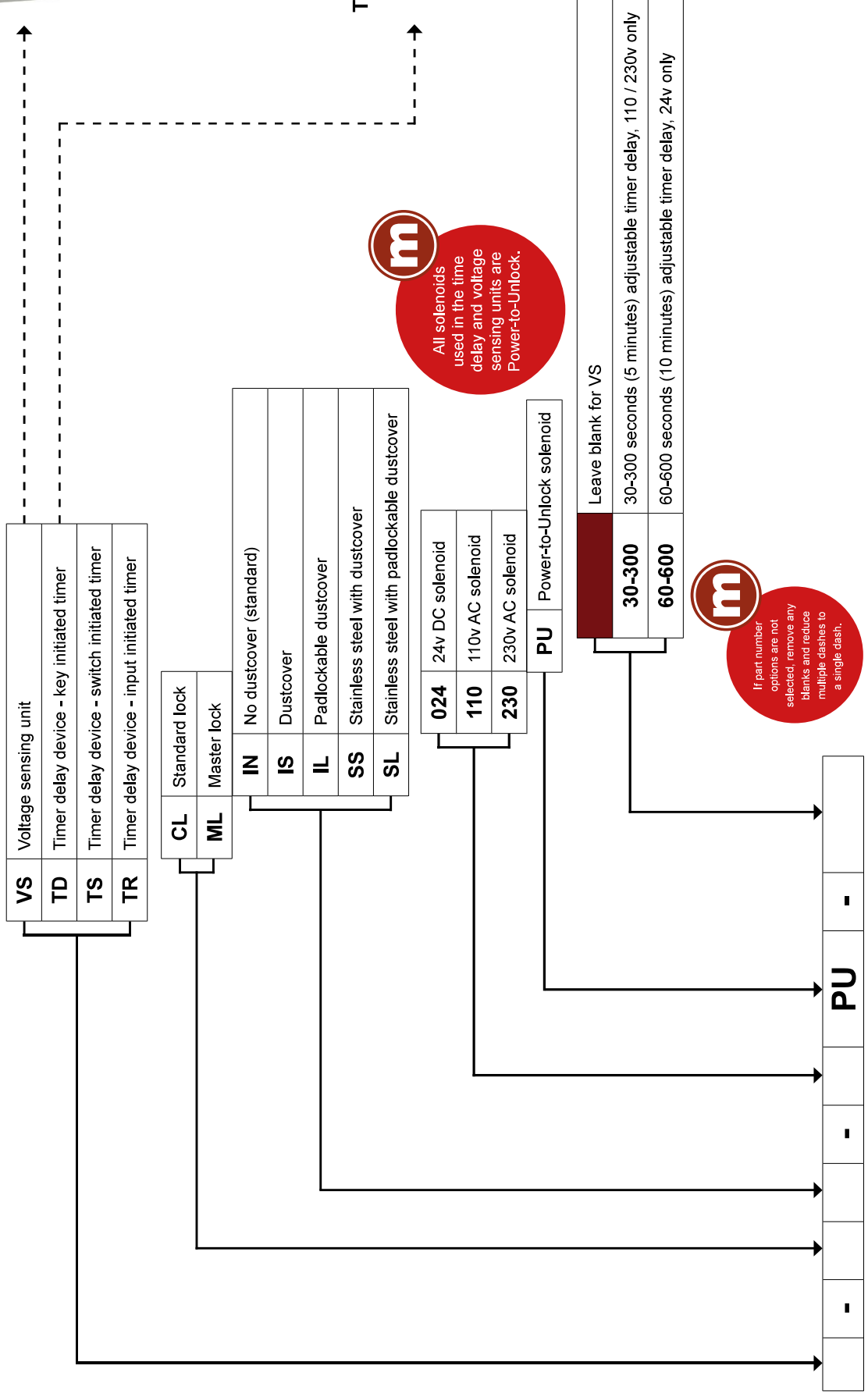
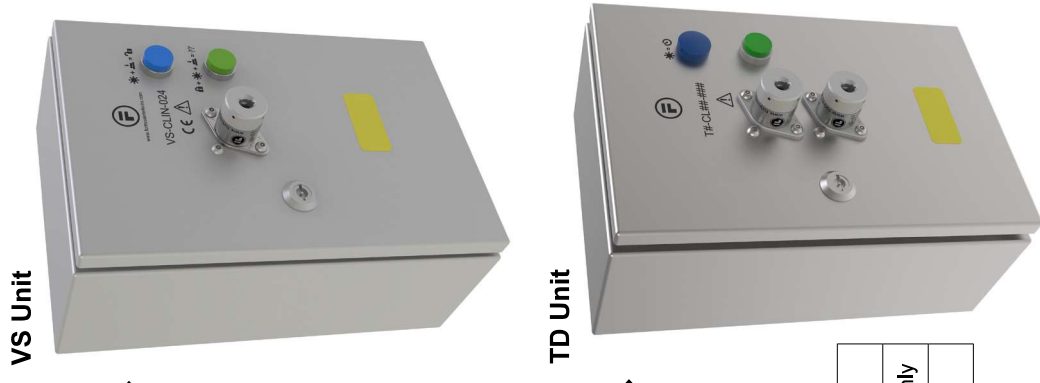
C

Power Isolation: Control Interlocking

Mini Solenoid Controlled Key Switch



Time Delay and Voltage Sensing

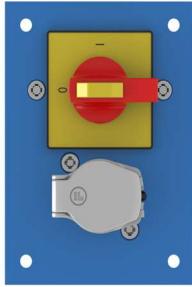


m
All solenoids used in the time delay and voltage sensing units are Power-to-Unlock.

m
If part number options are not selected, remove any blanks and reduce multiple dashes to a single dash.

Switch Control Unit

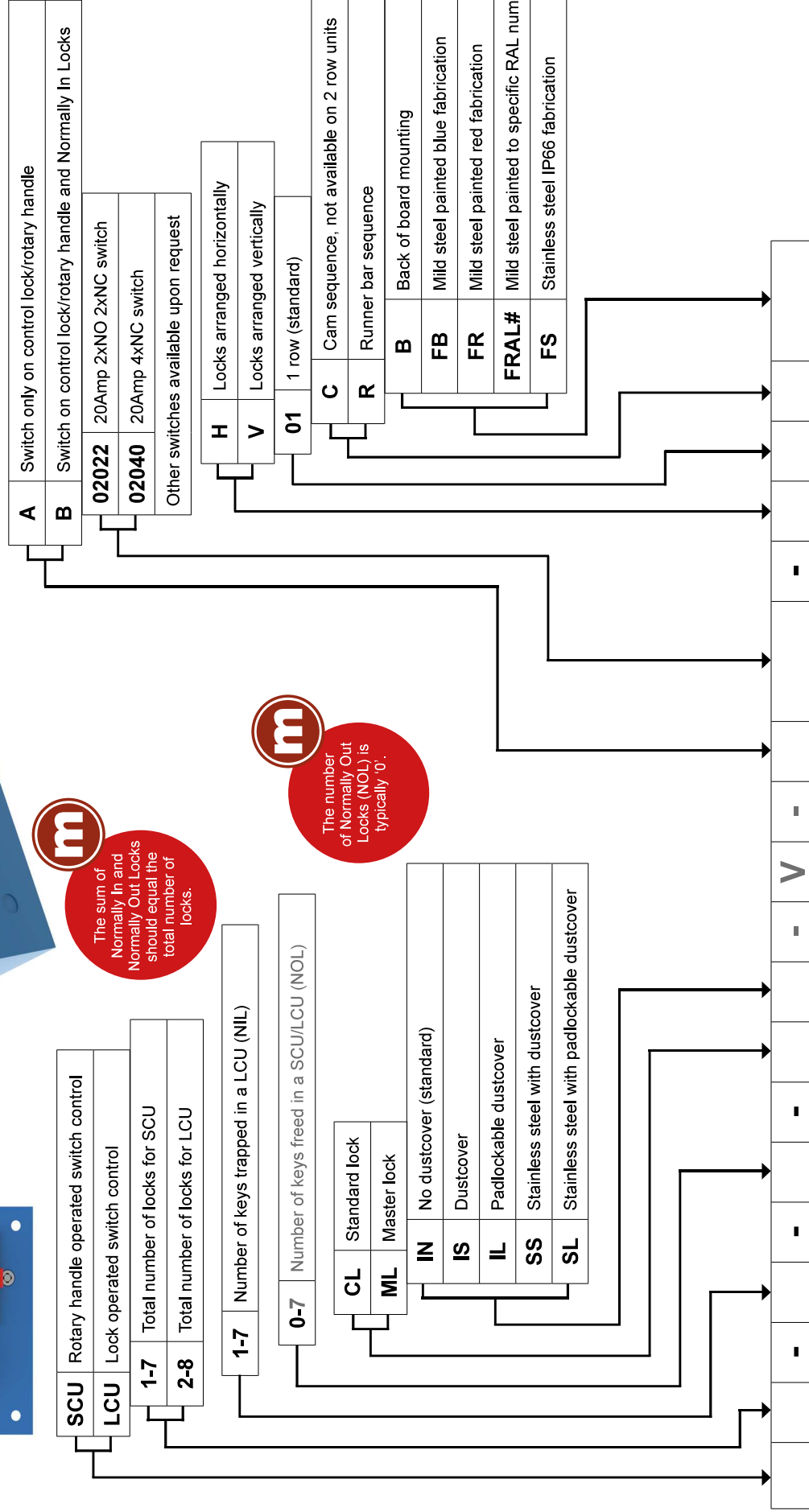
SCU1-B Unit



LCU4-B Unit



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



Key Exchange Units



XM2 Unit



If part number options are not selected, remove any blanks and reduce multiple dashes to a single dash.

XMR2 Unit



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

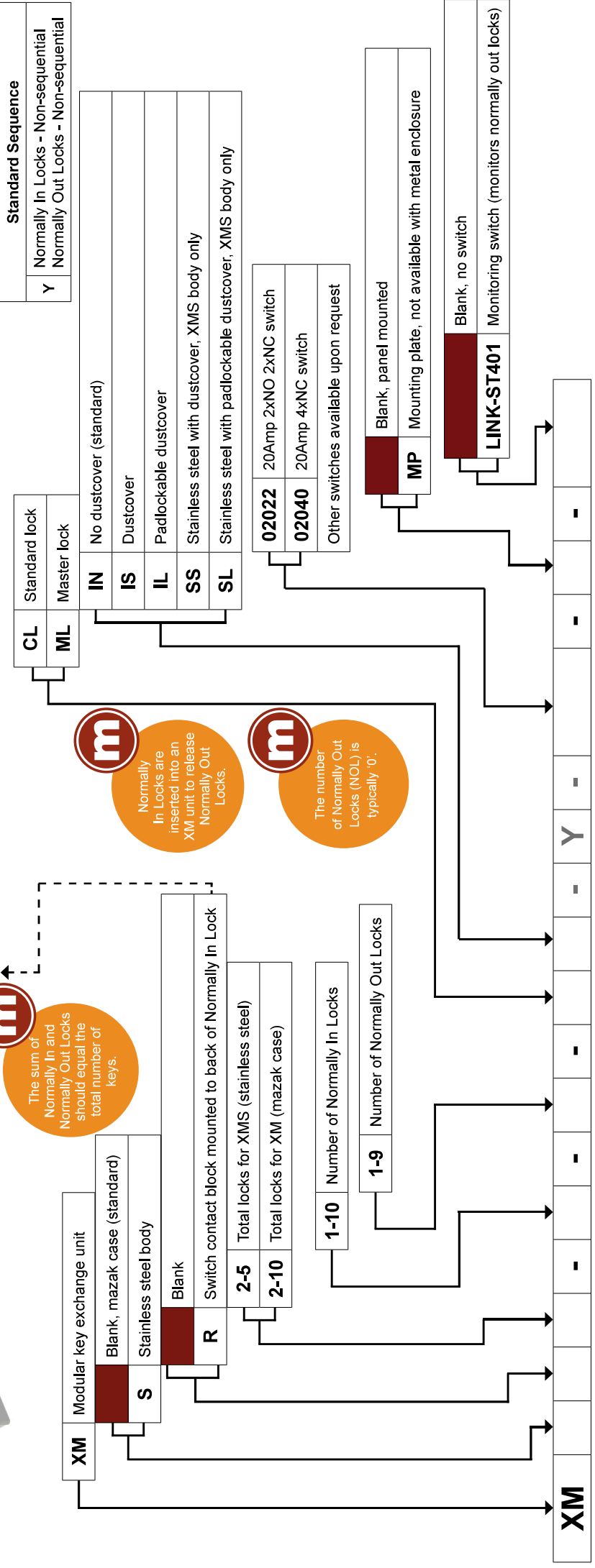
XM-LINK-ST401 unit



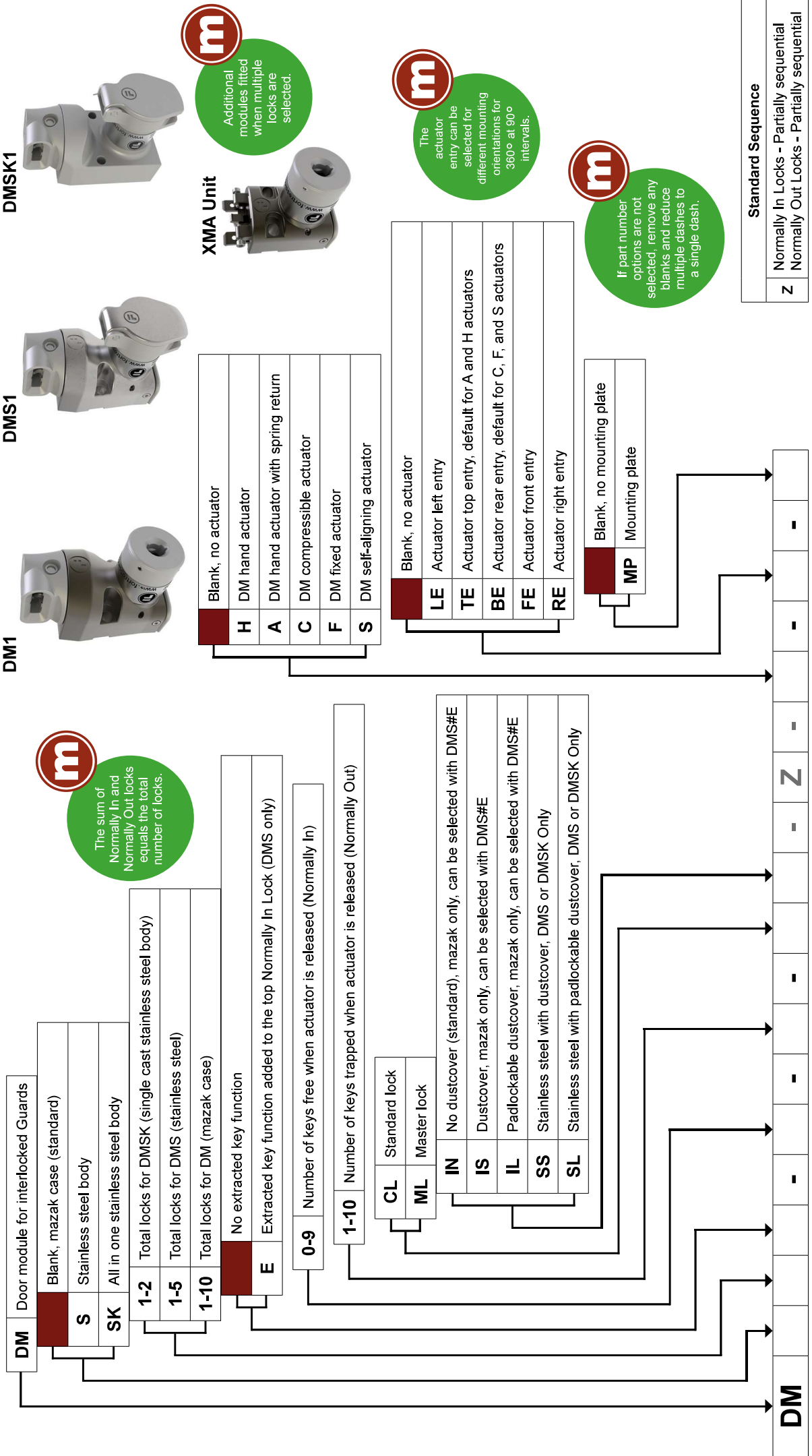
XMA Unit



Additional modules fitted when multiple locks are selected.



Interlocks for Guards (Door)



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)

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

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

m
Painted key bows require a seal to be selected.

m
Painted key bows allow for easy identification of keys on site.

CLK-SUSS



MLK-SUGS



MLK-SUCS-VYB



CLK-SUNS-LP



If part number options are not selected, remove any blanks and reduce multiple dashes to a single dash.

-	-	SU	-	-
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Keys & Accessories

Stainless Steel Dust Cover



Part Number

CLDC

Stainless Steel Padlockable Dust Cover



Part Number

PLDC

Padlockable Scissor Hasp



Part Number

LOS3

Padlockable 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



FORTRESS

FORTRESS

“ We have the peace of mind that our workers are safe and protected by Fortress equipment. ”



FORTRESS

“ Fortress’ best quality is providing each customer the most robust and safe solution - all while being completely customizable and retaining a high level of quality. ”



FORTRESS

“ Fortress is best at providing customised solutions at a rapid turnaround - reacting immensely to a challenge to put the customer’s needs first. ”



FORTRESS

“ We value suppliers that can help navigate the standards and provide guidance that is directly linked to our applications. ”



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Notes