FORTRESS
INTERLOCKS

tGard

Configurable Access & Control for Machine Guarding

THE QUEEN'S AWARDS FOR ENTERPRISE: INTERNATIONAL TRADE 2018

C US

Introduction to Fortress:

Fortress designs and manufactures customised safety equipment, protecting lives in hazardous workplaces. Our reputation is as a global provider of robust safety specifications for manufacturing environments.

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.

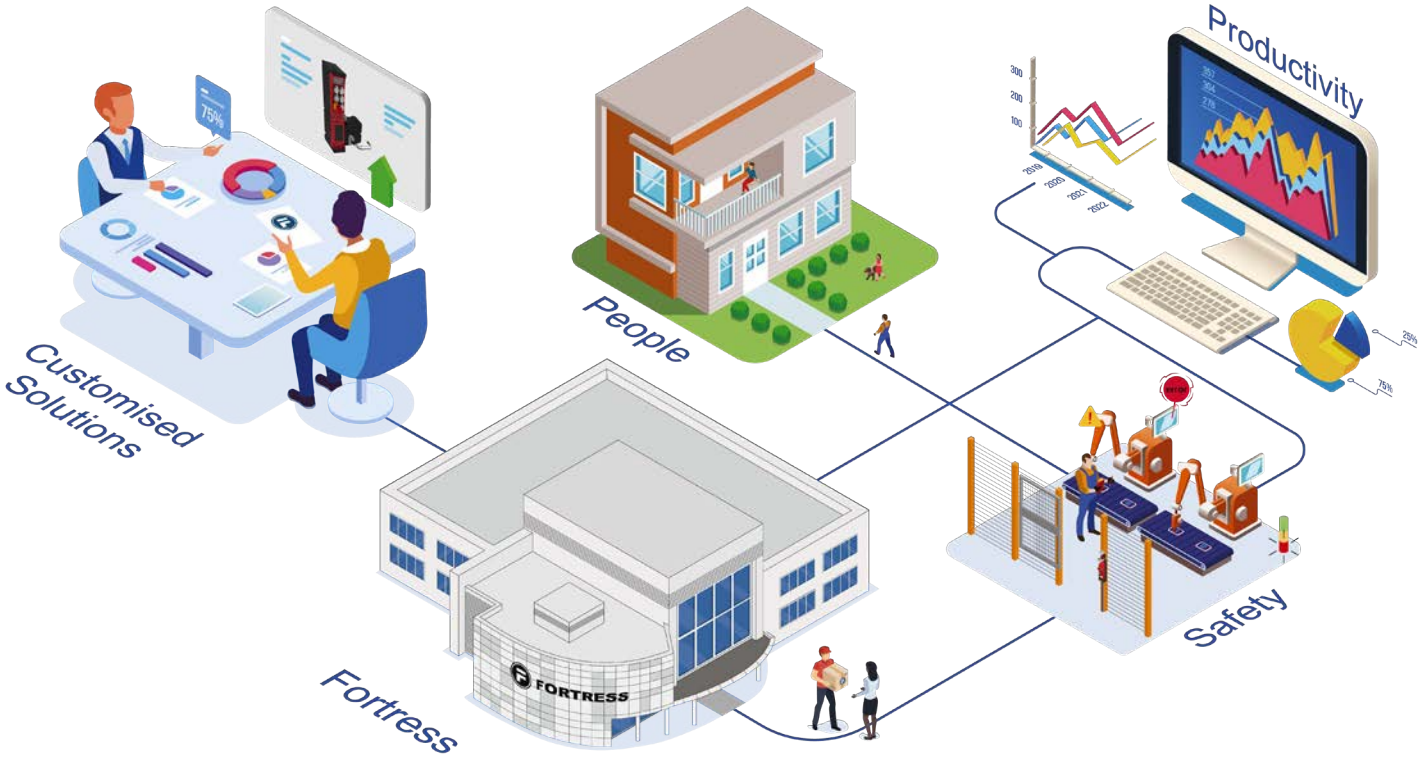
Over the last 40 years, Fortress has become well known in the industry for innovative design, robust engineering and reliability. Headquarters are in Wolverhampton (UK), with supporting offices and manufacturing facilities in the USA, Netherlands, Australia and China, further supported by a global network of trusted distributors and channel partners.

Fortress' current product portfolio includes:

- **mGard** - The only range of mechanical interlocks independently certified to PLe
- **amGard*pro*** - Heavy duty safety gate switches with connectivity and trapped key integration certified to PLe
- **amGard*S40*** - Stainless steel IP69K safety gate switches independently certified to PLe
- **tGard** - Medium duty interlocks with configurable built-in control functionality independently certified to PLd
- **ncGard** - A range of safety switches with non-contact technology

FORTRESS

Saving lives by providing the best safety solutions



Introduction to tGard

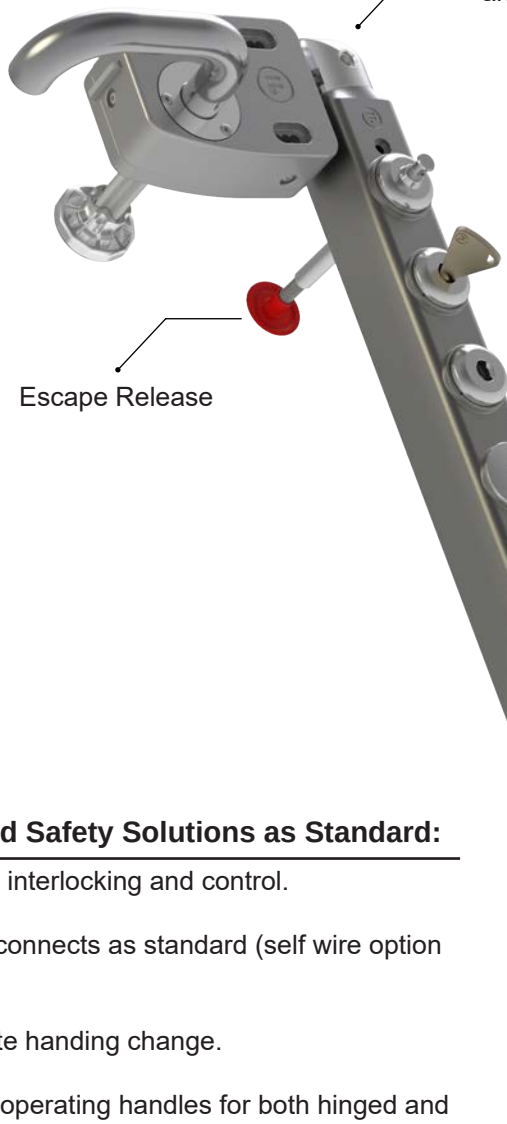
tGard is a compact metal bodied system that enables the configuration of various safety products including electrical safety gate switches (with or without guard locking), mechanical trapped key interlocks, and electrical operator controls either as separate devices or any combination of these three functions in one unit.

tGard offers “a customised safety solution, as standard”. Each order is defined by a range of tGard elements that include selector switches, safety switches (solenoid and non-solenoid), personnel keys, emergency release, pushbuttons, E-Stops, indicator lamps and a choice of operating handles for both hinged and sliding guard doors.

tGard’s metal body includes through-holes for quick installation on aluminium profiles, flat surfaces, doors and even back of panels without the need for mounting plates.

It is IP65 as standard and has been designed to be fully compliant with the machinery safety standards.

tGard Configuration Example



Customised Safety Solutions as Standard:

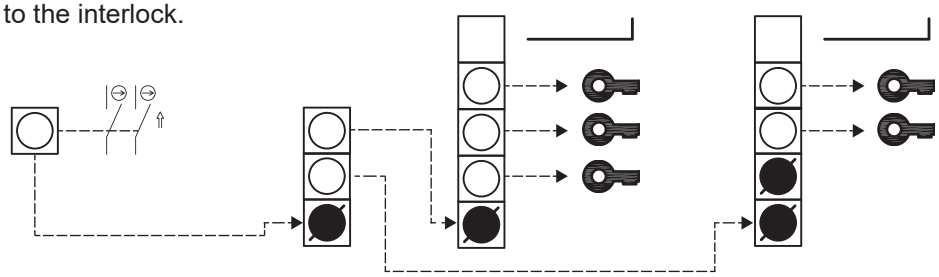
- Combines interlocking and control.
- Quick Disconnects as standard (self wire option available).
- Fast on site handing change.
- Choice of operating handles for both hinged and sliding guard doors.

Body Transfer Line

Application Requirement:

Due to the size of the safeguarded space surrounding body transfer lines in an automotive plant, there are blind spots where a maintenance personnel could be performing work unknowingly to a line operator requesting the line to run. This could lead to the line running while maintenance personnel are still working within the cell. Therefore, the transfer line must be safeguarded to ensure access into the line can only be permitted while power to the line has been isolated and the safety circuits remain open until all personnel have exited the safeguarded space returning their keys to the interlock.

*

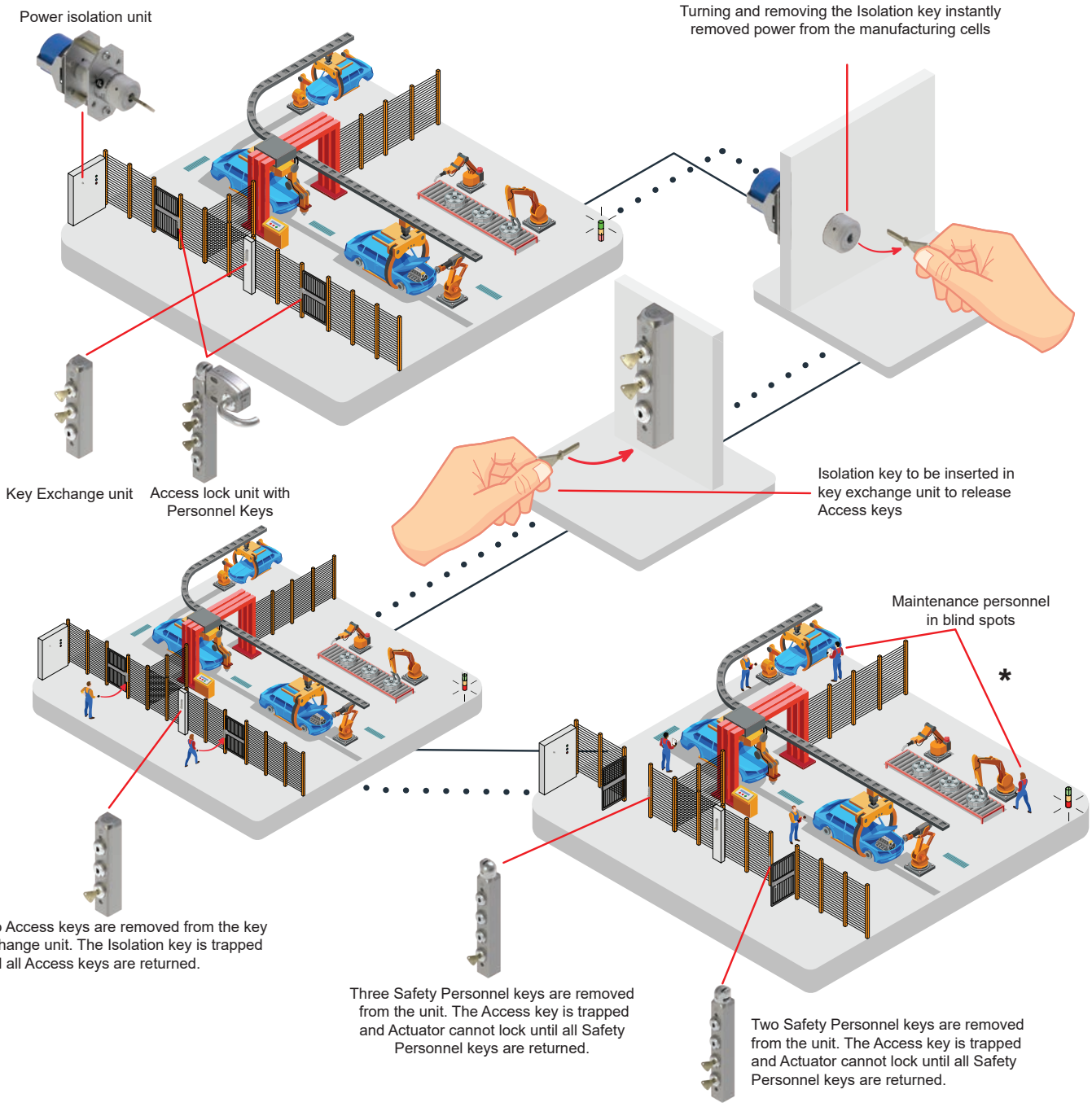


Isolator Off
Key released.

Key Exchange Unit
Isolation Key trapped, Access keys released.

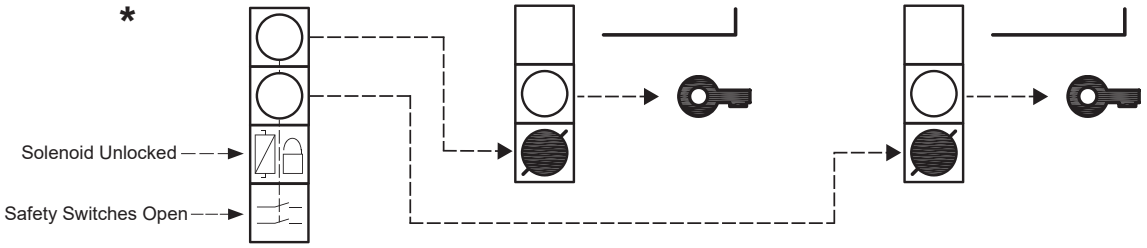
Access Lock No. 1
Access key trapped, Personnel keys released, Access door open.

Access Lock No. 2
Access key trapped, Personnel keys released, Access door open.



Robot Pallet Stacker

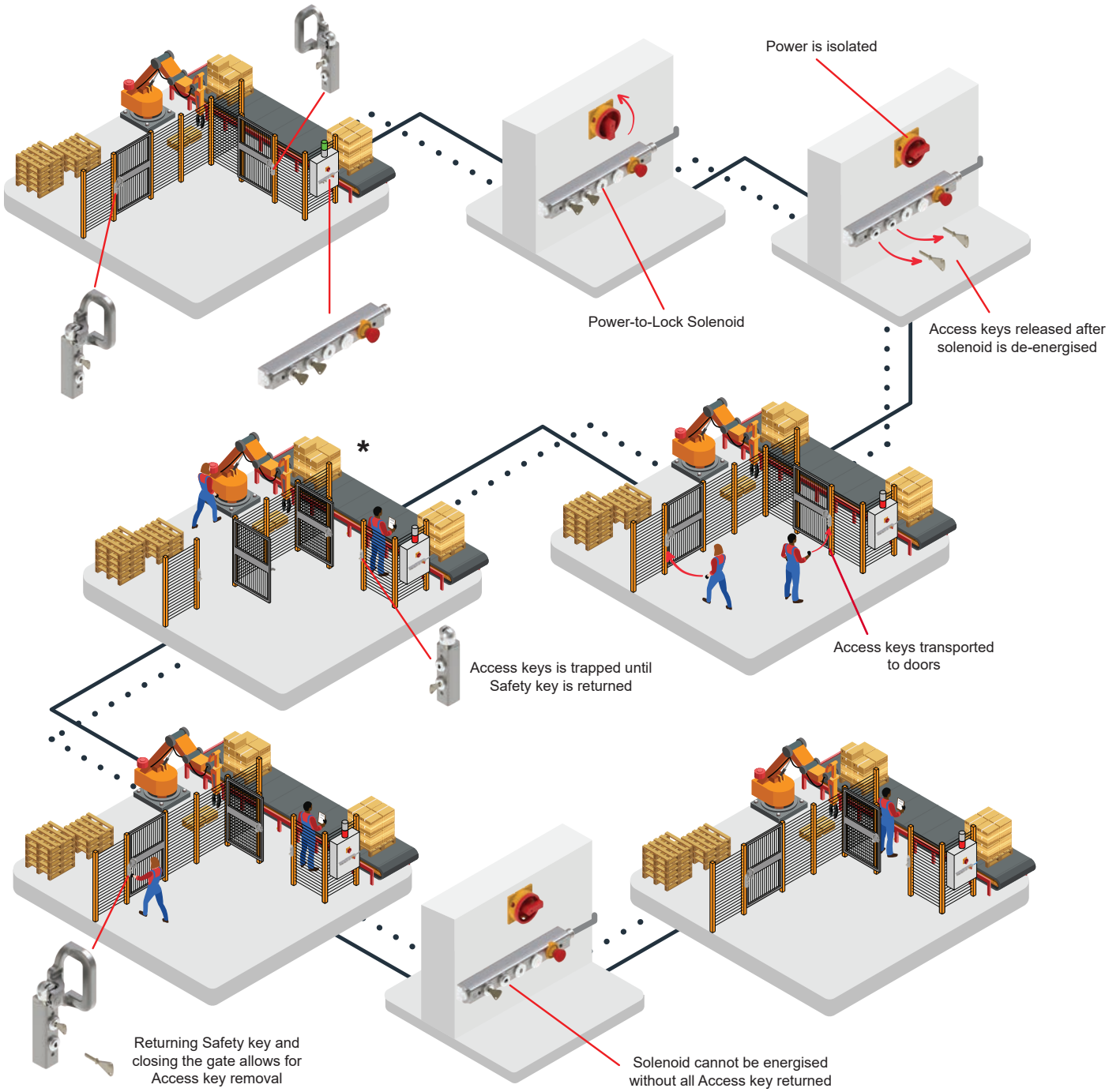
Application Requirement:
Robot arms require safeguarding measures during operation and when carrying loads. The robot pallet stacker below has two access points and a single central control panel. When mains power is isolated to the system, the Power-to-Lock solenoid is de-energised and Access keys for the access points are released. Mechanical only interlocks at the guard can be opened with an Access key whilst also providing a personnel key for the operator to take inside the cell to prevent restart.



Power-to-Lock Solenoid
Access keys unlocked, Safety switches open.

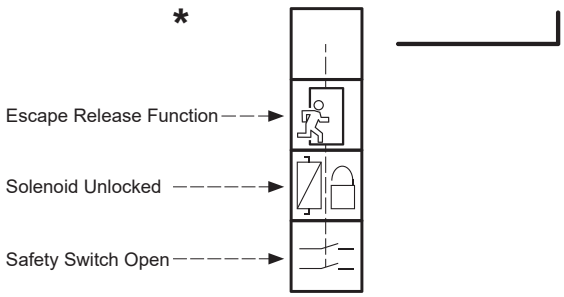
Access Lock No. 1
Access key trapped, Personnel key released, Access door open.

Access Lock No. 2
Access key trapped, Personnel key released, Access door open.



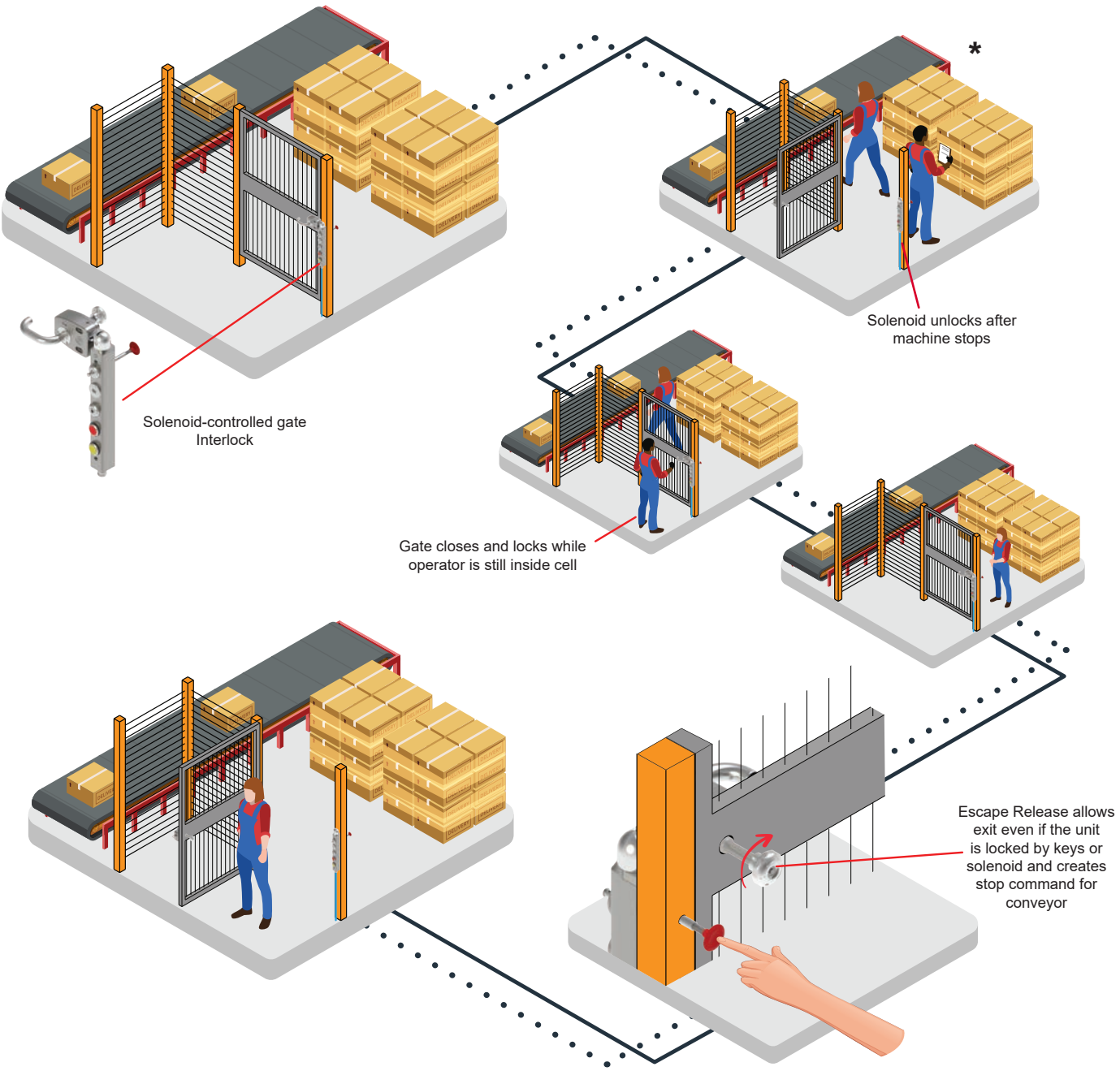
Conveyor System

Application Requirement:
The conveyor system in an automated warehousing application below is safeguarded by interlocked guards. Access is required to remove incorrect packages or clear blockages on the conveyor. The solenoid interlock keeps the guard locked until the conveyor stops, pushbutton functionality for additional control is included. The inclusion of an escape release mechanism allows any operator who finds them self behind a locked guard to override the keys and / or solenoid to exit.



Solenoid-controlled Gate Interlock

Actuator removed, door open, Safety switches open.



Guard Switch

2NC, 1NO Safety Switch

THENSMQ1

Guard Lock with Integrated Machine Control

Personnel key available for operator to carry

THHSNSMDUEMP6P7Q9

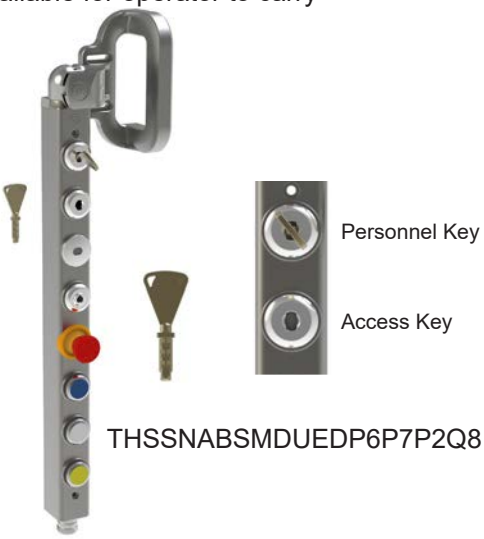
Guard Lock

Power-to-Unlock solenoid with safety switch

THFSMDUQM

Guard Lock with Trapped Key Integration

Access restricted to key holders,
personnel key available for operator to carry



THSSNABSMDUEDP6P7P2Q8

Guard Lock with Escape Release

Power-to-Unlock solenoid with safety switch. Escape release overrides locking mechanism and creates stop command

THERXSMDUQM

Control Station

Control Station with emergency stop, indicator lamp and pushbuttons

THCETLGP7P3P1Q8

FORTRESS INTERLOCKS

tGard Range Card

Actuators

Fixed Actuator

Hinged Actuator

Sliding Actuator

Handle Actuator (No Internal knob)

Handle Actuator

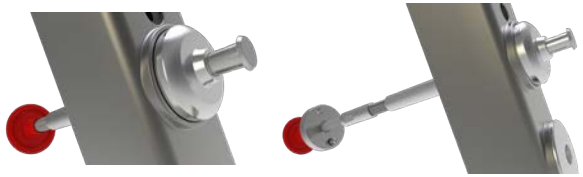
Heads

Cap

Head

Core Elements

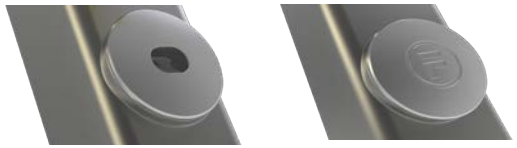
Escape Release



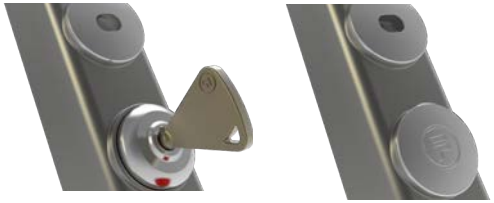
Safety Lock

Access Lock

Safety Switch



Safety Switch & Solenoid



Extension Blank Element

Emergency Stops

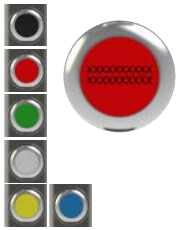
Safety Re-Start

Core Elements

Indicator Lamps

Non-Illuminating Switches

Pushbuttons



2 Position Selector Switch

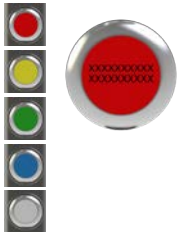
2 Position Selector Key Switch

Mushroom Pushbutton

3 Position Selector Switch

Illuminating Switches

Pushbuttons



2 Position Selector Switch

3 Position Selector Switch

Base Elements

Safety & Control Quick Disconnect Connectors

Foot

Self Wire

AS- interface

Keys & Accessories

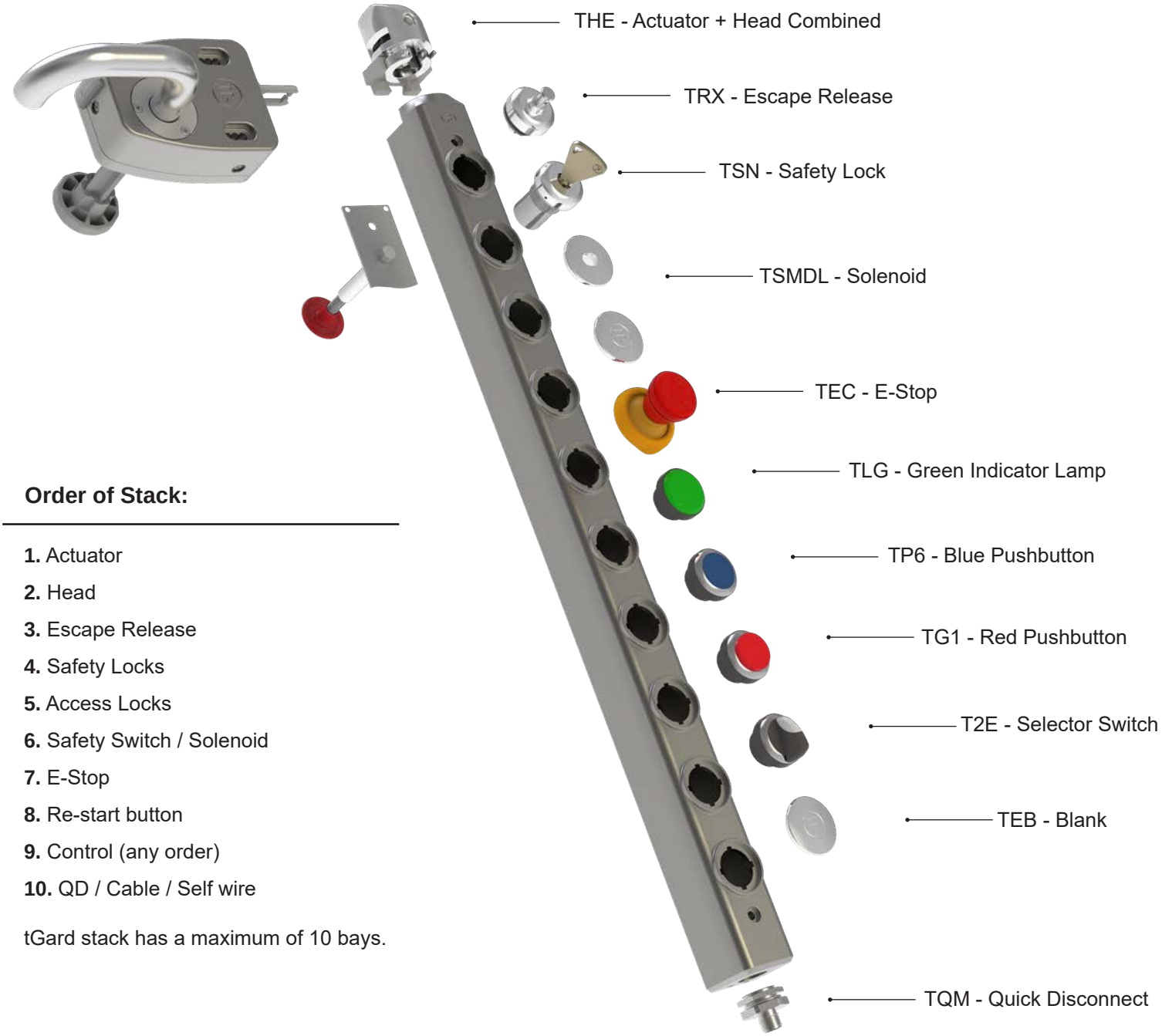
Keys

Lock-Out Clip

For more information on the Lock-Out Clip see Head & Cap Element Operating Instructions

How to Configure tGard

Configuration tools are available on the Fortress website, www.fortressinterlocks.com/tgard-configurator



Order of Stack:

1. Actuator
2. Head
3. Escape Release
4. Safety Locks
5. Access Locks
6. Safety Switch / Solenoid
7. E-Stop
8. Re-start button
9. Control (any order)
10. QD / Cable / Self wire

tGard stack has a maximum of 10 bays.

tGard Configuration Guideline

At the end of the selection process, the part numbers drop their “T”, except the first item. Example:

THE + TRX + TSN +TSMDL + TEC + TLG + TP6 + TG1 + T2E + TEB + TQM =
THERXSNSMDLECLGP6G12EEBQM

When creating a tGard stack, the wiring of connections follow these rules:

1. Safety circuits are in fixed positions on each connector and comprise of volt free circuits.
2. Inputs / outputs are allocated from the bottom of the stack, ascending.
3. On any one element, the input is assigned first, then the output(s).
4. Outputs are +24v, taken from the +24v supply.
5. Selection of the connector depends upon the wiring requirements for inputs / outputs / safety circuit of the total stack.

Actuators

Step 1: Actuators

TAF
Fixed Actuator

TAH
Handle Actuator - Hinged Door

TAS
Handle Actuator - Sliding Door

THB
Blank Handle

TEN
Handle Actuator - (no internal knob)

TEH
Handle Actuator

All Actuators to be used in combination with a THM head module

The internal knob on TEH handle doesn't override the solenoid or lock. A TRX/Z (emergency release element) must be used to deliver that functionality

Heads

Step 2: Head Modules

You can combine a actuator with a head to generate a single part number

THC
Cap

THM
Head

THM + TAF = THF
Head module including fixed actuator

THM + TAH = THH
Head module including hinged actuator

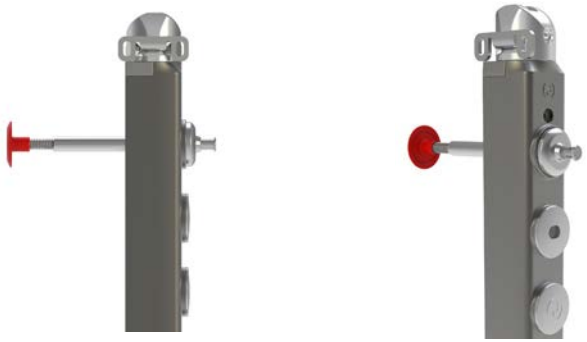
THM + TAS = THS
Head module including sliding actuator

THM + TEN = THN
Head module including handle actuator (No internal knob)

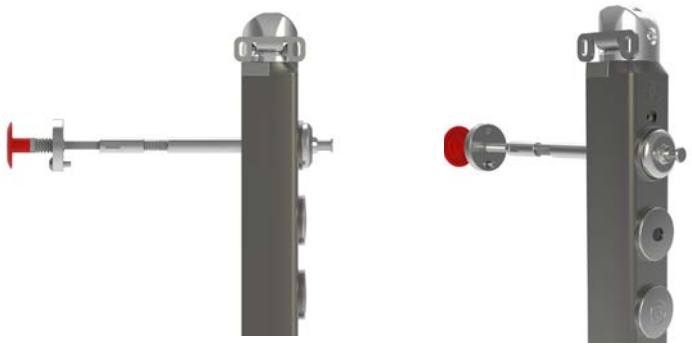
THM + TEH = THE
Head module including handle actuator

Core Elements

Step 3: Escape Release



TRX
Standard 60mm
Escape Release



TRZ
Variable length
Escape Release

Extended version available (TRZ) - < 300mm

Step 4: Safety & Access Lock Element

TSN
Standard Safety
Lock (No Key)*

TGN
Master Safety
Lock (No Key)*

TAB
Standard Access
Lock (No Key)*

TQB
Master Access
Lock (No Key)*

*All keys need to be ordered separately

Core Elements

Step 5: Safety Switches

TSM
Safety Switch

TSP
Safety Switch
with extra retention
force

TSS
Safety Switch -
No N/O monitor contact

Location of safety switch in stack is first element after all mechanical elements (Head, Internal Release and Locks)

Step 6: Solenoid Controlled Lock & Safety Switch Elements

90% of customers select TSMDU

TSMDU/L
Head & solenoid safety in series
TSMDU (Power-to-Unlock)
TSMDL (Power-to-Lock)

TSMEU/L
Safety on head element only
TSMEU (Power-to-Unlock)
TSMEL (Power-to-Lock)

TSSEL
Safety on head element only (no monitoring contact on head)
TSSEL (Power-to-Lock)

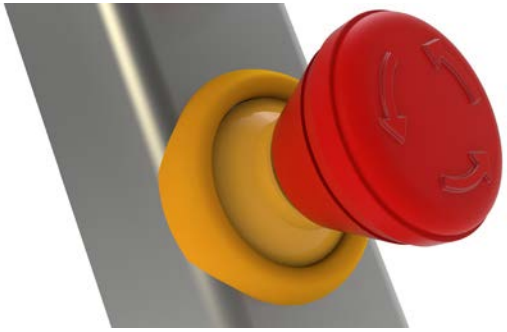
Core Elements

Step 7: Extension Blank Element

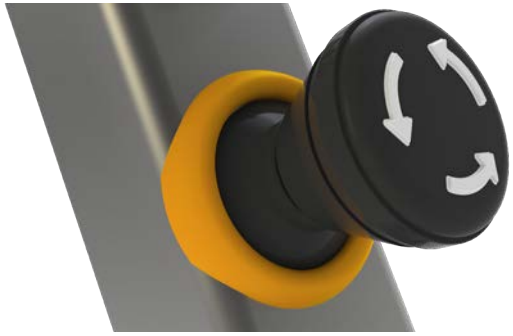
TEB
Extension Blank Element

Can be used to add extension bay to a configuration

Step 8: Emergency Stop Element



TEC, TET, TEM, TEP, TEI
Emergency stop element, version available with a monitoring contact or illumination



TES
TES is Black version of the TET

E-Stop always mounted at the top of any control elements, but below solenoid/head/ safety switches/locks. TEM & TEI E-Stops can be positioned at the bottom of the stack

Core Elements

Step 9: Safety Re-Start Switch

TSR
Safety Re-Start Switch - Blue

Location of Safety Re-Start Switch in stack is highest control element after E-Stop's

Step 10: Indicator Lamp Element

TLB
Indicator Lamp Element - Blue

TLG
Indicator Lamp Element - Green

TLR
Indicator Lamp Element - Red

TLW
Indicator Lamp Element - White

TLY
Indicator Lamp Element - Yellow

Core Elements

Step 11a: Non-Illuminating Switches

TPB
1 N/O Pushbutton - Black

TPR
1 N/O Pushbutton - Red

TPG
1 N/O Pushbutton - Green

TPW
1 N/O Pushbutton - White

TPY
1 N/O Pushbutton - Yellow

TPZ
1 N/O Pushbutton - Blue

T2A
2 Position Selector Switch - Latching

T2V
2 Position Selector Switch - 1 N/O & 1 N/C

TK5
2 Position Selector Key Switch - Latching

TMB
1 N/O Mushroom Pushbutton - Black

T3D
3 Position Selector Switches - Momentary

T3H
3 Position Selector Switches - Momentary/Latching

Step 11b: Illuminating Switches

TP1
Pushbutton - Red

TP2
Pushbutton - Yellow

TP3
Pushbutton - Green

TP6
Pushbutton - Blue

TP7
Pushbutton - White

T2E
2 Position Selector Switch - Latching

T3F
3 Position Selector Switches - Momentary

Please see Operating Instructions for a full range of options

Base Elements

Step 12a: Safety & Control Connectors

TQ1
5 Pin M12 QD

TQ2 / TQ3
8 Pin M12 QD

TQ4 / TQ5
12 Pin M23 QD

TQ7
14 Pin 7/8" UN2 QD

TQ8 / TQ9
19 Pin M23 QD

TQL / TQM
12 Pin M12 QD

Step 12b: Foot, Self Wire Connectors, AS-interface

TBF
Foot Element

TW1
12 Terminals

TW3
24 Terminals

TW4
24 Terminals

TEBB4
Up to 2 AS-i nodes

TEBB8
Up to 4 AS-i nodes

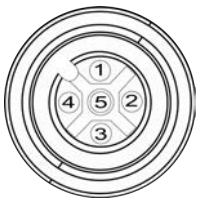
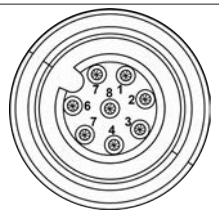
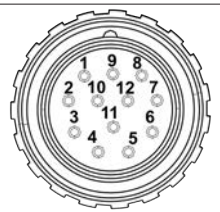
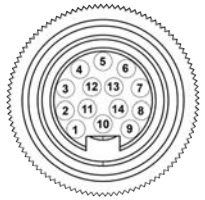
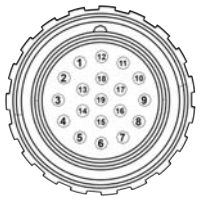
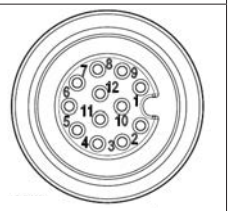
Step 13: Mating Cables for Quick Disconnect Connectors

Pin Assignments for Quick Disconnect & Mating Cable Pin Assignments

Pins

Pin Assignments	Part No.	Wire Colour	Cable-_M-TQ1	TEBB4 / 8	Wire Colour	Cable-_M-TQ2 / TQ3		Wire Colour	Cable-_M-TQ4 / TQ5		Wire Colour	Cable-_M-TQ7	Wire Colour	Cable-_M-TQ8	Cable-_M-TQ9	Wire Colour	Cable-_M-TQL	Cable-_M-TQM
	Number of Pins		5	5		8			12			14		19			12	
	Connector Size		M12	M12		M12			M23			7/8" UN2		M23			M12	
	# of Safety Circuits		2	-		0	2		0	2		2		2	4		0	2
	# of Control I/O		0	-		5	1		9	5		7		12	8		9	5
1		Brown	SC 1	AS-i +	White	I/O 0	SC 1	Brown	+ 24V	+ 24V	Grey/Pink	I/O 3	Violet	SC 1	SC 1	White	I/O 0	SC1
2		White	SC 2	Aux -	Brown	+24V	+24V	Brown/White	I/O 0	SC 1	White/Green	I/O 2	Red	SC 2	SC 2	Brown	+24V	+24V
3		Blue	SC 1	AS-i -	Green	Earth	Earth	Blue	0V	0V	White/ Yellow	I/O 1	Grey	SC 1	SC 1	Green	Earth	Earth
4		Black	SC 2	Aux +	Yellow	I/O 1	SC 2	White	I/O 1	SC 2	Brown	+ 24V	Red/Blue	SC 2	SC 2	Yellow	I/O 1	SC 2
5		Grey	Earth	Earth	Grey	I/O 2	SC 1	Green	I/O 2	SC 1	Brown/Yellow	SC 2	Green	I/O 0	I/O 0	Grey	I/O 2	SC 1
6					Pink	I/O 3	SC 2	Yellow	I/O 3	SC 2	Blue	0V	Blue	0V	0V	Pink	I/O 3	SC 2
7	**Key** SC = Safety Circuit I/O = Input or Output QD = Quick Disconnect (connector at base)				Blue	0V	0V	Grey	I/O 4	I/O 0	Yellow	I/O 6	Grey/Pink	I/O 1	I/O 1	Blue	0V	0V
8					Red	I/O 4	I/O 0	Pink	I/O 5	I/O 1	Green	I/O 5	White/Green	I/O 2	I/O 2	Red	I/O 4	I/O 0
9								Red	I/O 6	I/O 2	Pink	I/O 4	White/Yellow	I/O 3	I/O 3	Orange	I/O 5	I/O 1
10								Black	I/O 7	I/O 3	White	SC 1	White/Grey	I/O 4	I/O 4	Tan	I/O 6	I/O 2
11								Violet	I/O 8	I/O 4	Red/Blue	I/O 0	Black	I/O 5	I/O 5	Black	I/O 7	I/O 3
12								Green/Yellow	Earth	Earth	Brown/Green	SC 2	Green/Yellow	Earth	Earth	Violet	I/O 8	I/O 4
13											Grey	SC 1	Yellow/Brown	I/O 6	I/O 6			
14											Red	Earth	Brown/Green	I/O 7	I/O 7			
15													White	I/O 8	SC 3			
16													Yellow	I/O 9	SC 4			
17													Pink	I/O 10	SC 3			
18													Grey/Brown	I/O 11	SC 4			
19													Brown	+24V	+24V			

Cable Length	Cable Part No.
2M	Cable-2M-TQ1
5M	Cable-5M-TQ1
10M	Cable-10M-TQ1
20M	Cable-20M-TQ1
2M	Cable-2M-TQ3
5M	Cable-5M-TQ3
10M	Cable-10M-TQ3
20M	Cable-20M-TQ3
2M	Cable-2M-TQ5
5M	Cable-5M-TQ5
10M	Cable-10M-TQ5
20M	Cable-20M-TQ5
2M	Cable-2M-TQ7
5M	Cable-5M-TQ7
10M	Cable-10M-TQ7
20M	Cable-20M-TQ7
2M	Cable-2M-TQ8/9
5M	Cable-5M-TQ8/9
10M	Cable-10M-TQ8/9
20M	Cable-20M-TQ8/9
2M	Cable-2M-TQL/M
5M	Cable-5M-TQL/M
10M	Cable-10M-TQL/M
20M	Cable-20M-TQL/M

Part No.	TQ1 / TEBB4 / 8	TQ2 / TQ3	TQ4 / TQ5	TQ7	TQ8 / 9	TQL / M
Pin Heads						

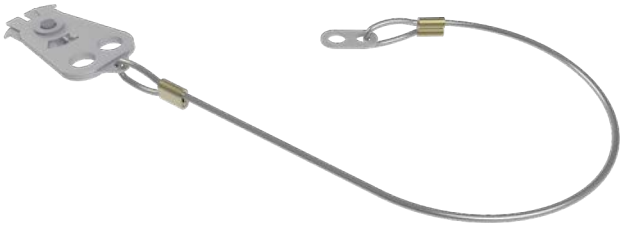
Keys & Accessories

Step 14: Keys

TKS
Standard Key

TKM
Master Key

Step 15: Accessories



TLO
Lock-Out Clip

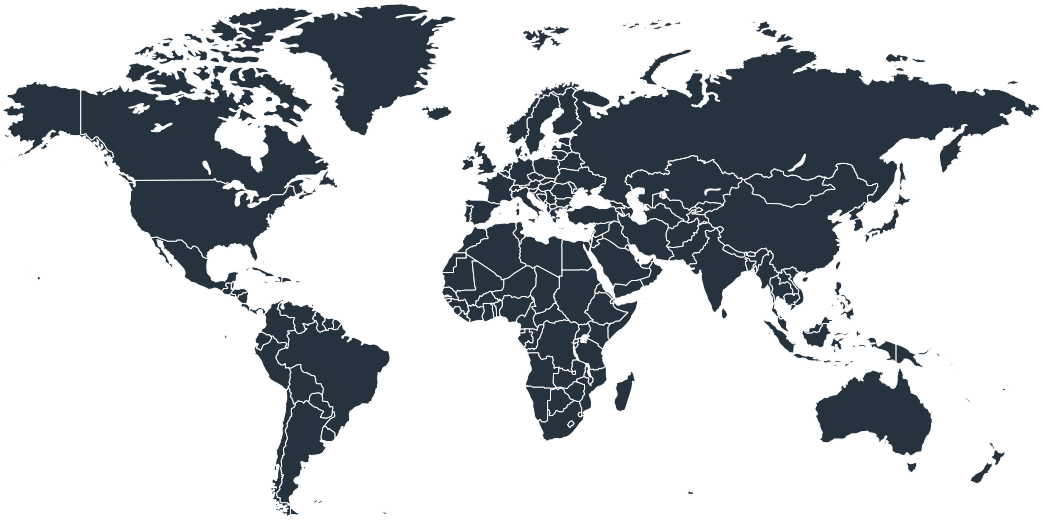
Allows tGard to be used as part of a Lock-Out / Tag-Out procedure. Holds for two padlocks / hasps

FORTRESS INTERLOCKS

tGard

Configurable Access & Control for Machine Guarding

A Halma company



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