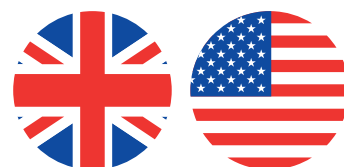
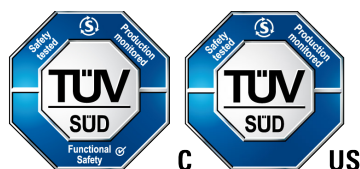


# Configurable Access & Control for Machine Guarding








## 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.

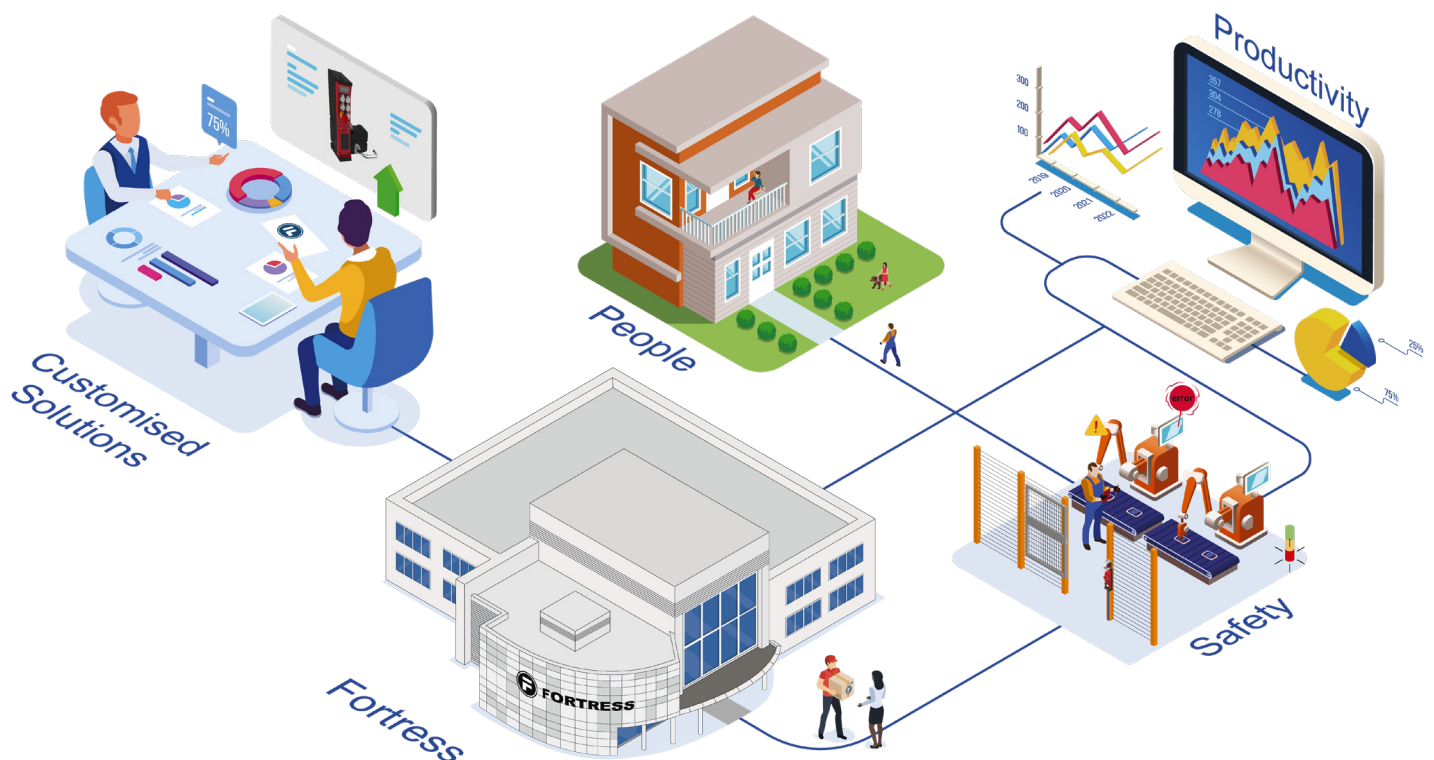
Over the last 40 years, Fortress has become well known in the industry for innovative design, robust engineering and reliability. Headquarters are in Wolverhampton (UK), with supporting offices and manufacturing facilities in the USA, Netherlands, Australia and China, further supported by a global network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

## Fortress' current product portfolio includes:

-  **mGard** - The only range of mechanical interlocks independently certified to PLe
-  **amGardpro** - Heavy duty safety gate switches with connectivity and trapped key integration certified to PLe
-  **amGardS40** - 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



Saving lives by providing the best safety solutions



# Introduction to Gard

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.

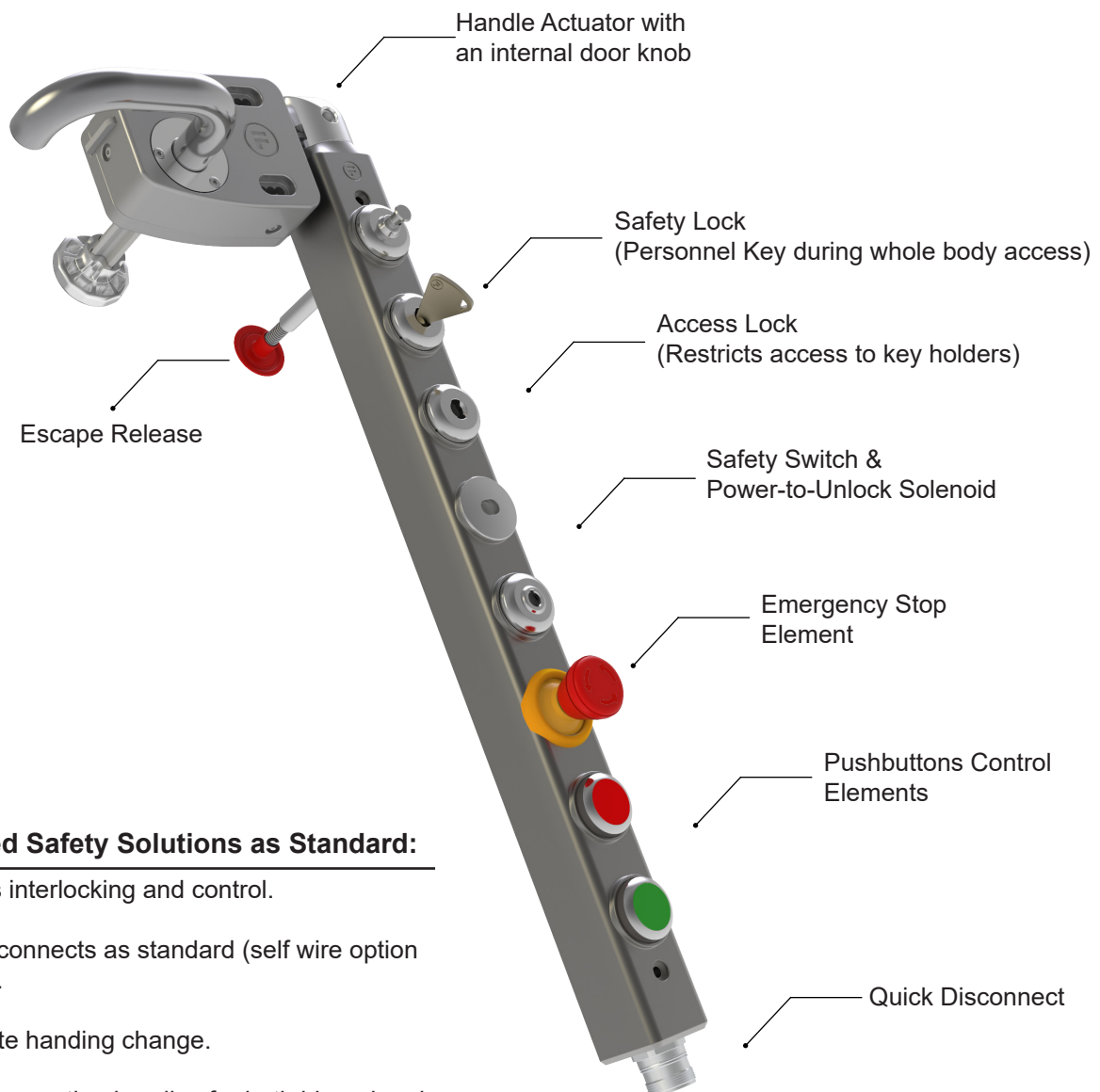
tGard offers “a customised safety solution, as standard”. Each order is defined by a range of tGard elements that include selector switches, safety switches (solenoid and non-solenoid), personnel keys, emergency release, pushbuttons, E-Stops, indicator lamps and a choice of operating handles for both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



## Gard Configuration Example



### Customised Safety Solutions as Standard:

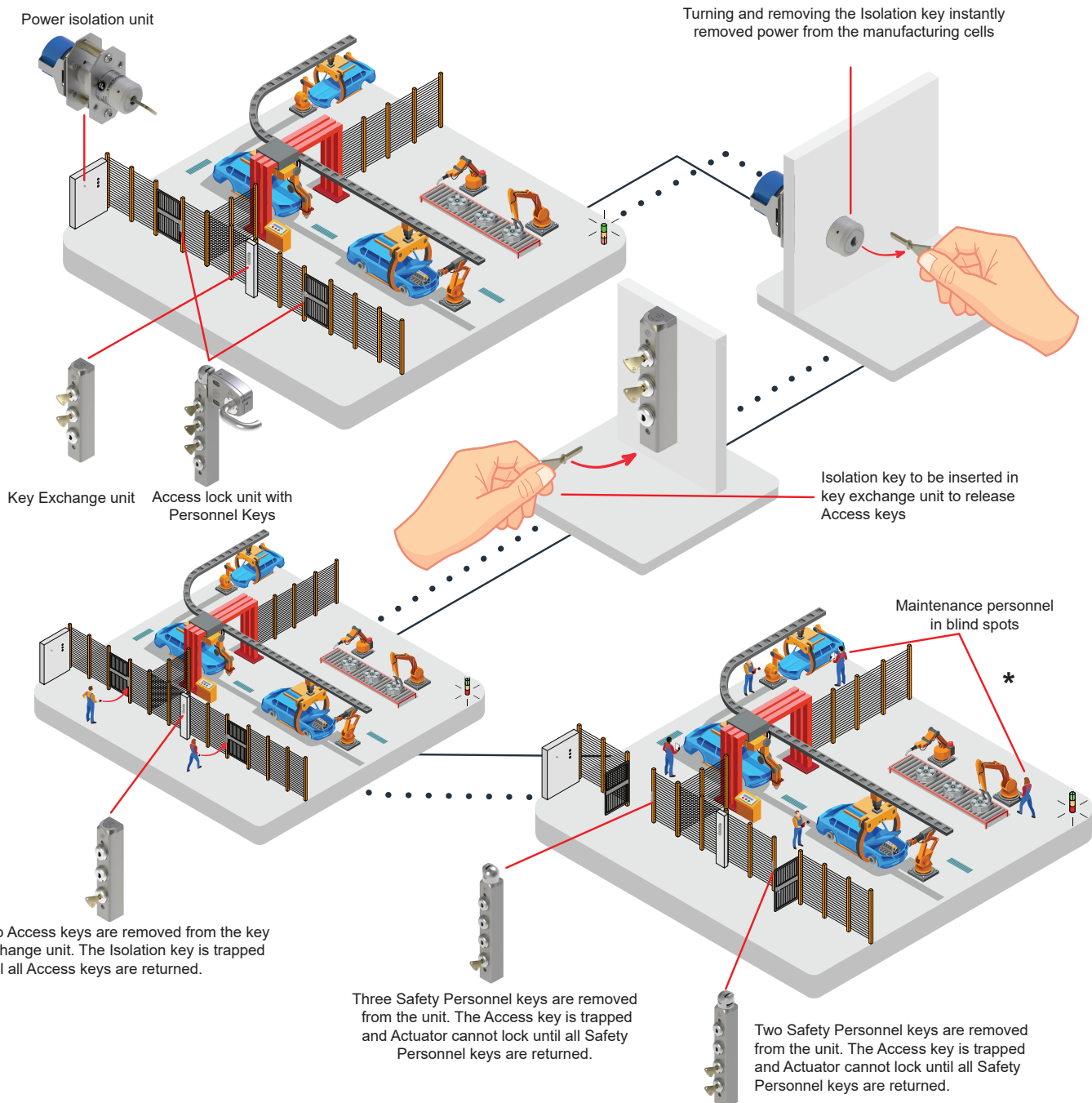
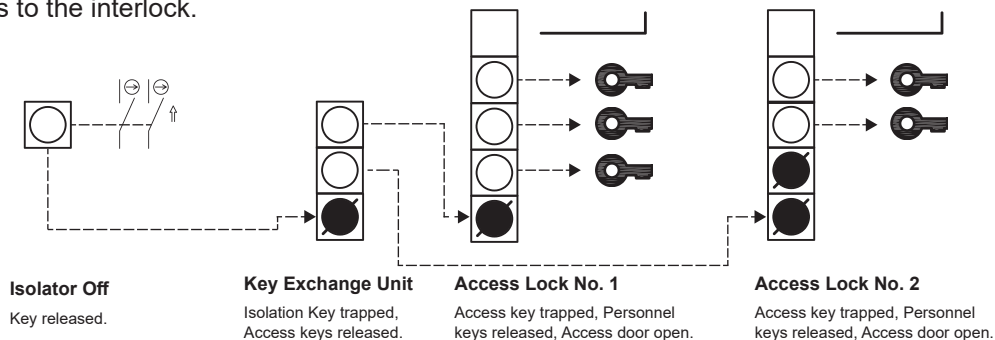
- Combines interlocking and control.
- Quick Disconnects as standard (self wire option available).
- Fast on site handing change.
- Choice of operating handles for both hinged and sliding guard doors.

# 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.

\*

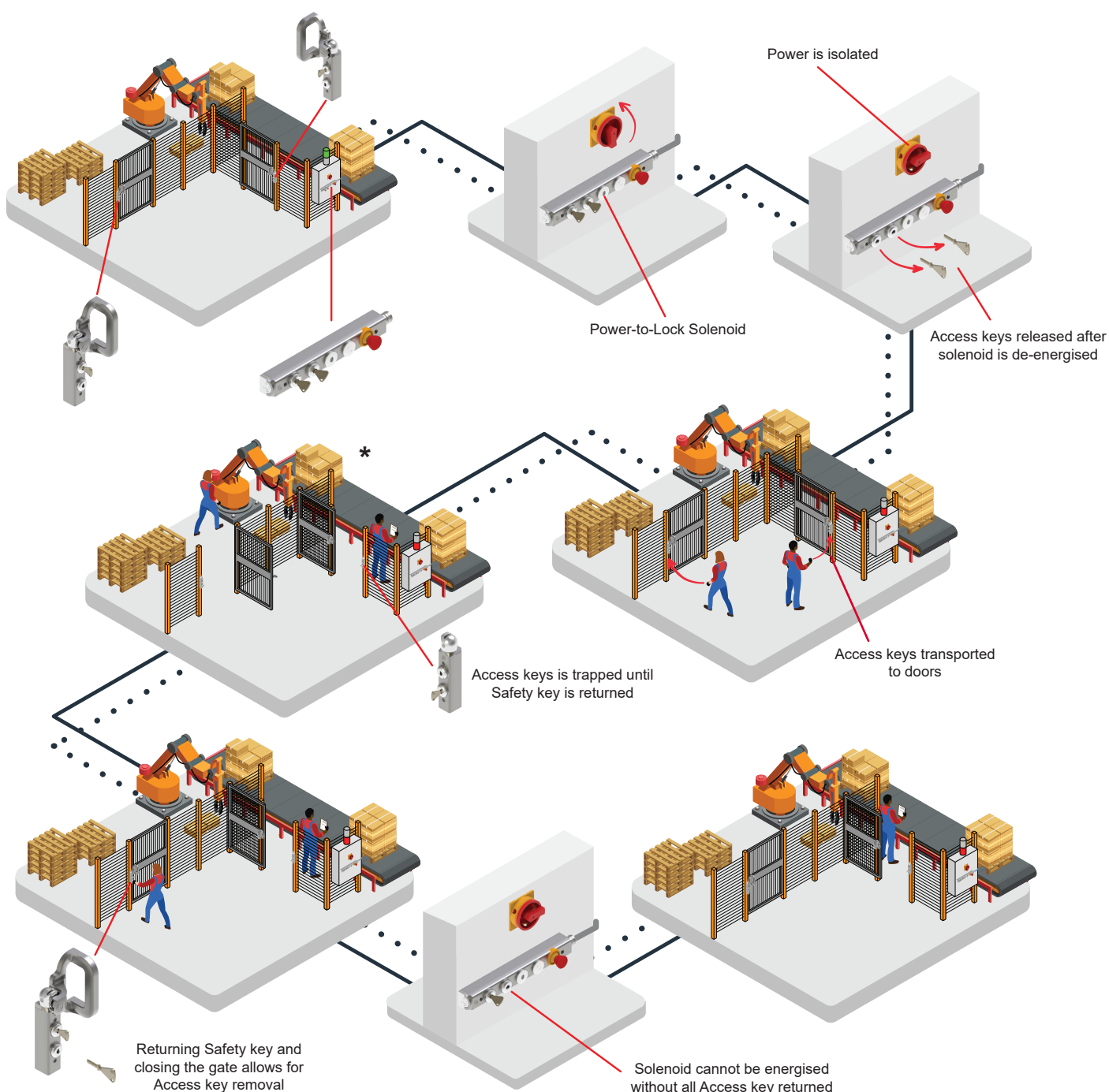
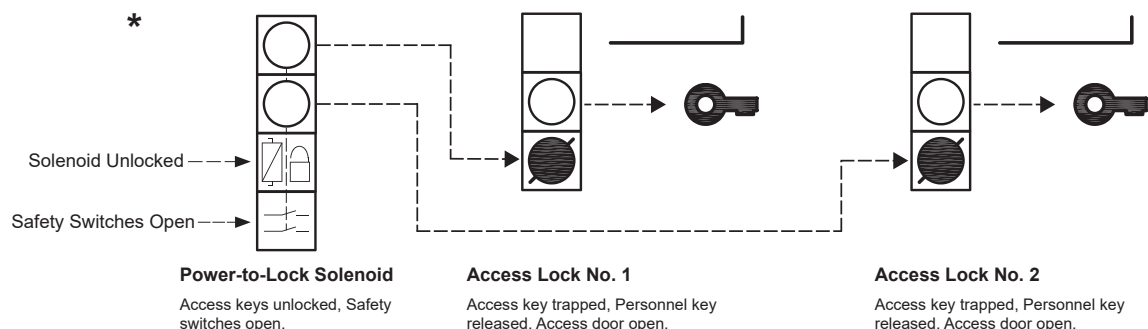




# Robot Pallet Stacker

## Application Requirement:

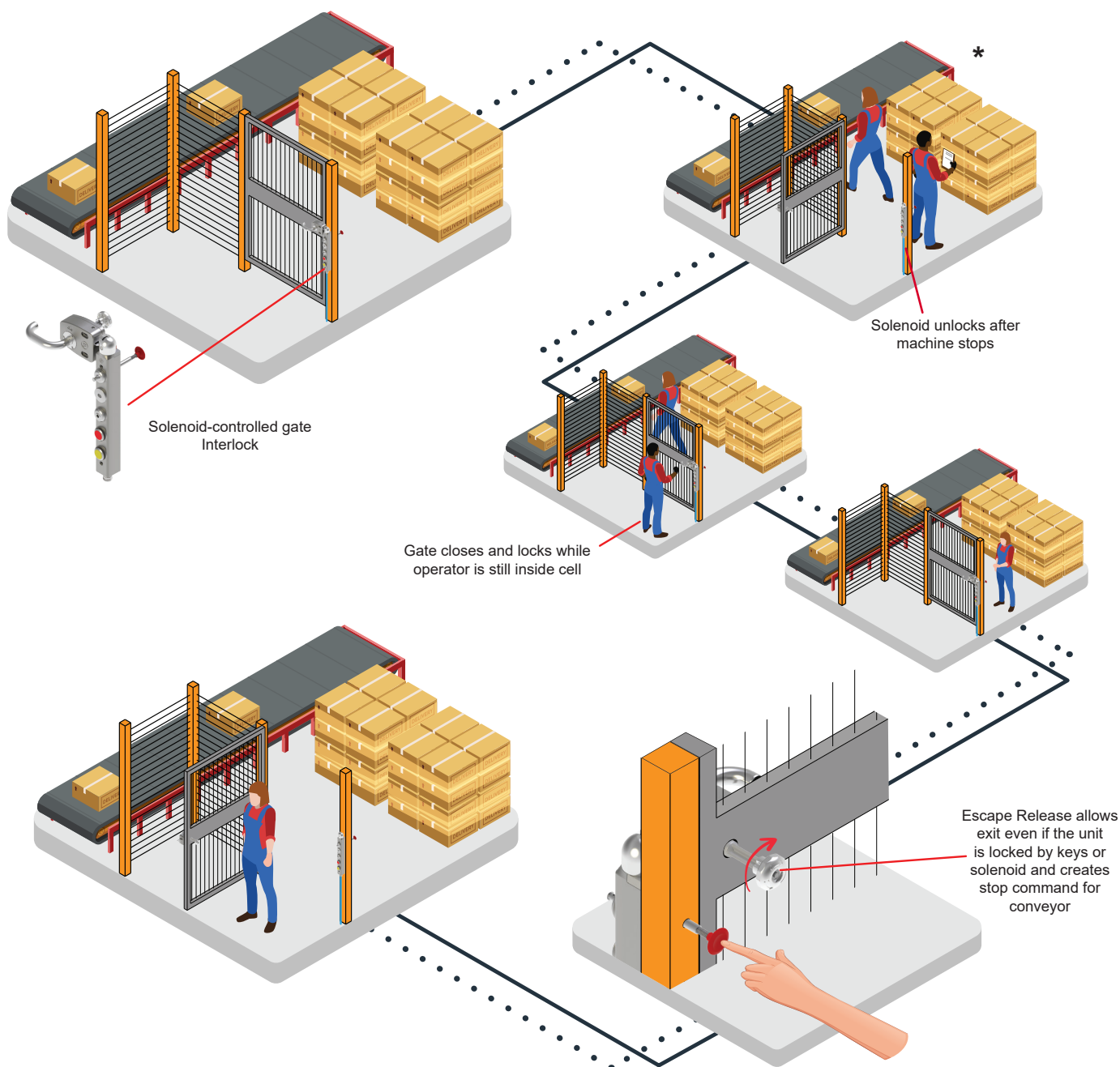
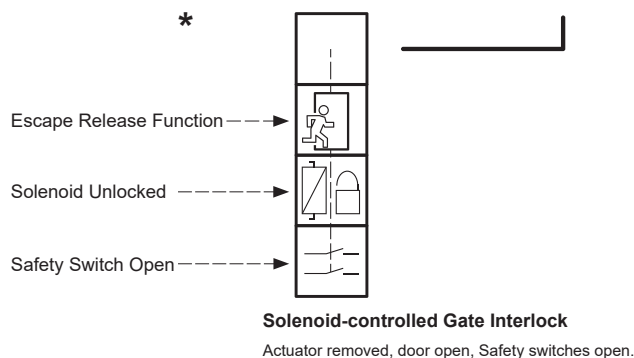
Robot arms require safeguarding measures during operation and when carrying loads. The robot pallet stacker below has two access points and a single central control panel. When mains power is isolated to the system, the Power-to-Lock solenoid is de-energised and Access keys for the access points are 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.



# 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.



## Guard Switch

2NC, 1NO Safety Switch



THNSMQ1

## 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

### Actuators

Fixed Actuator



Hinged Actuator



Sliding Actuator



Handle Actuator (No Internal knob)

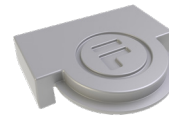


Handle Actuator



### Heads

Cap

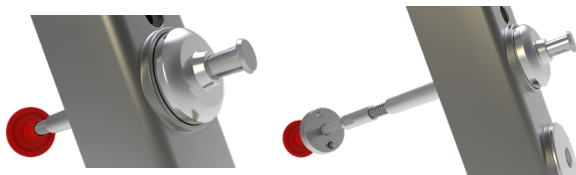


Head



### Core Elements

Escape Release



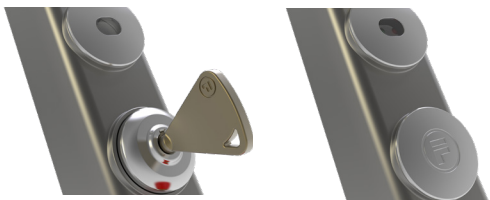
Safety Lock Access Lock



Safety Switch



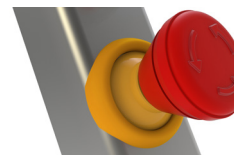
Safety Switch & Solenoid



Extension Blank Element



Emergency Stops

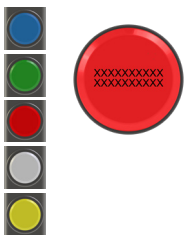


Safety Re-Start



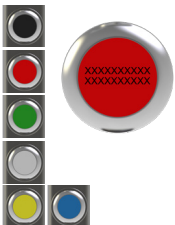
## Core Elements

### Indicator Lamps



### Non-Illuminating Switches

#### Pushbuttons



#### 2 Position Selector Switch



#### 2 Position Selector Key Switch



#### Mushroom Pushbutton

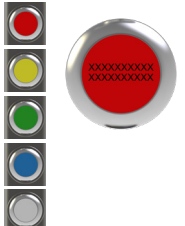


#### 3 Position Selector Switch



### 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



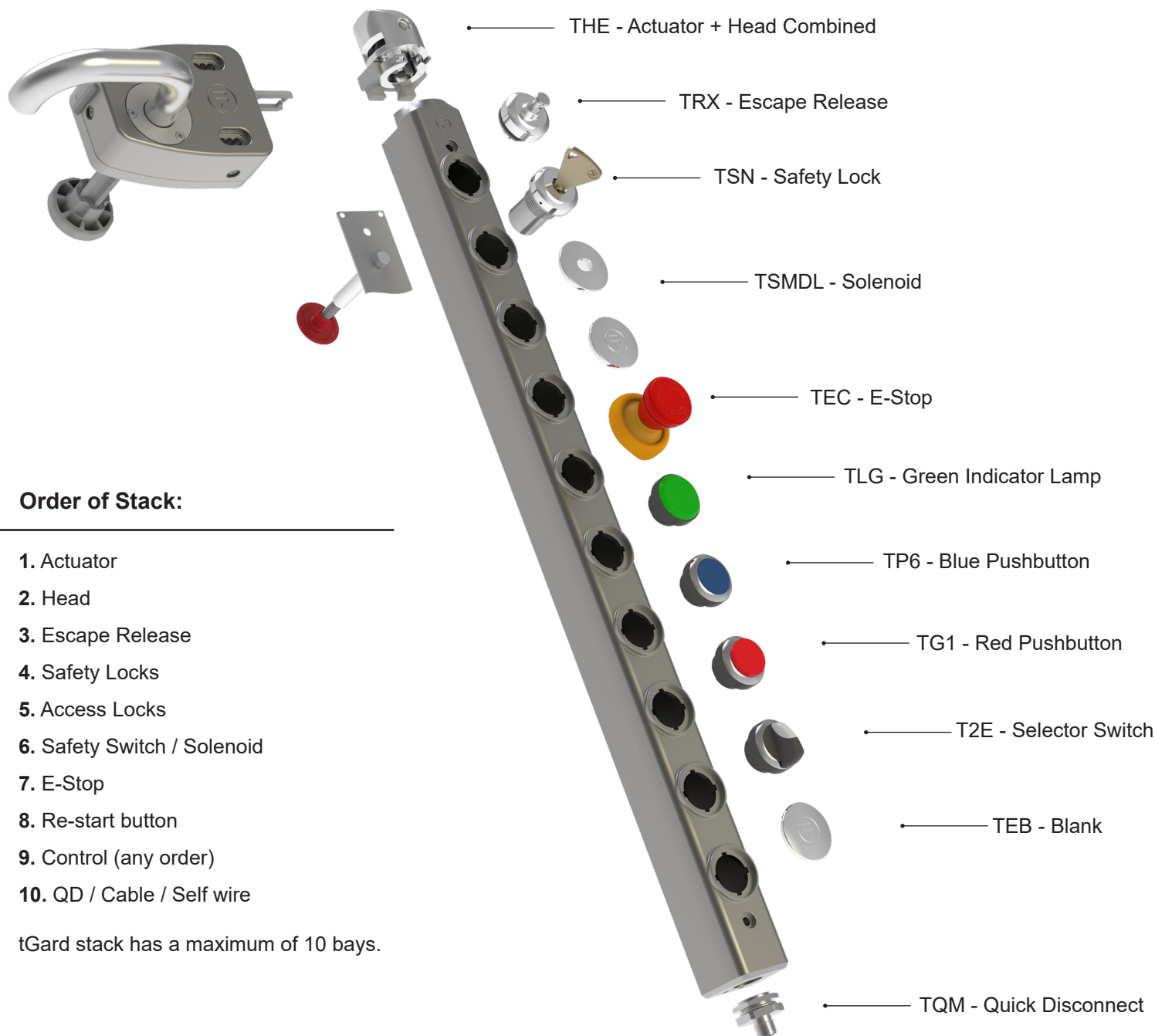
### Lock-Out Clip



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



Configuration tools are available on the Fortress website, [www.fortressinterlocks.com/tgard-configurator](http://www.fortressinterlocks.com/tgard-configurator)



## Gard 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



**THM + TAF = THF**  
Head module including  
fixed actuator



**THM + TAH = THH**  
Head module including  
hinged actuator



**THM + TAS = THS**  
Head module including  
sliding actuator

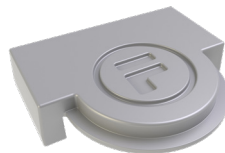


**THM + TEN = THN**  
Head module including handle  
actuator (No internal knob)



**THM + TEH = THE**  
Head module including  
handle actuator

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



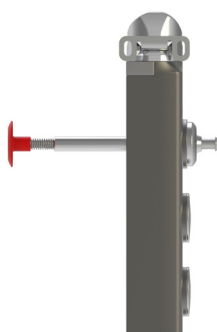
**THC**  
Cap



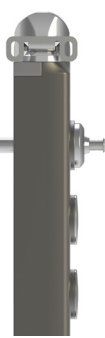
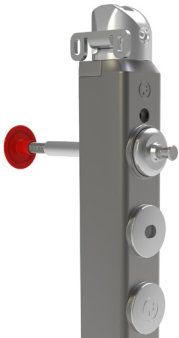
**THM**  
Head

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)\*



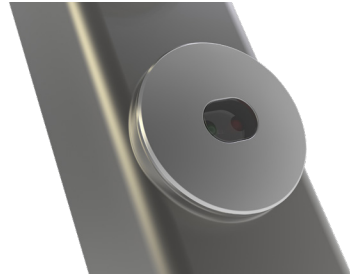
**TAB**  
Standard Access  
Lock (No Key)\*

**TQB**  
Master Access  
Lock (No Key)\*

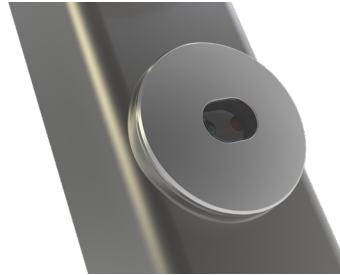
  
\*All keys need  
to be ordered  
separately

## Core Elements

### Step 5: Safety Switches



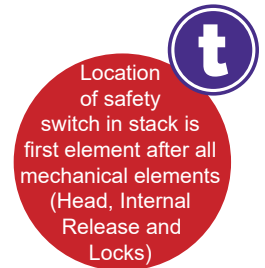
**TSM**  
Safety Switch



**TSP**  
Safety Switch  
with extra retention  
force



**TSS**  
Safety Switch -  
No N/O monitor contact



### Step 6: Solenoid Controlled Lock & Safety Switch Elements



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



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



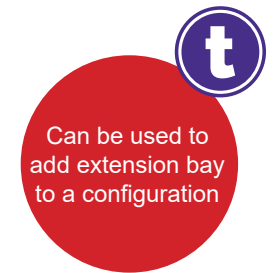
**TSSEL**  
Safety on head element only (no monitoring  
contact on head)  
TSSEL (Power-to-Lock)

## Core Elements

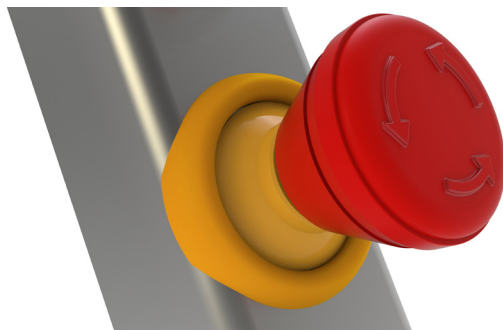
### Step 7: Extension Blank Element



**TEB**  
Extension Blank  
Element



### 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





## Core Elements

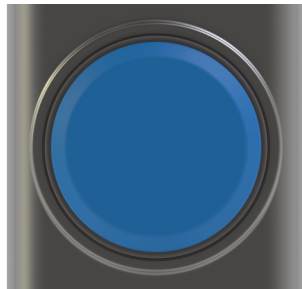
### Step 9: Safety Re-Start Switch



**TSR**  
Safety Re-Start Switch - Blue



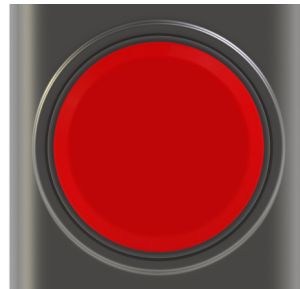
### Step 10: Indicator Lamp Element



**TLB**  
Indicator Lamp Element - Blue



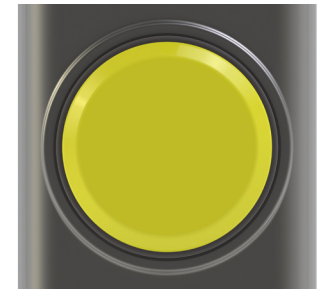
**TLG**  
Indicator Lamp Element - Green



**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**

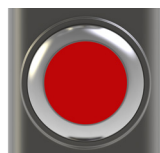
3 Position Selector  
Switches - Momentary



**T3H**

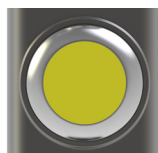
3 Position Selector Switches  
- Momentary/Latching

### 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

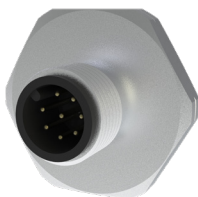


## Base Elements

### Step 12a: Safety & Control Connectors



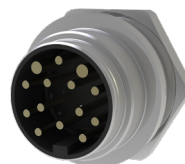
**TQ1**  
5 Pin M12 QD



**TQ2 / TQ3**  
8 Pin M12 QD



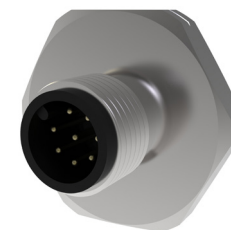
**TQ4 / TQ5**  
12 Pin M23 QD



**TQ7**  
14 Pin 7/8" UN2 QD



**TQ8 / TQ9**  
19 Pin M23 QD



**TQL / TQM**  
12 Pin M12 QD

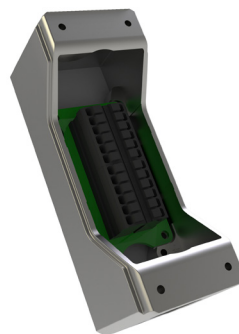
### Step 12b: Foot, Self Wire Connectors, AS-interface



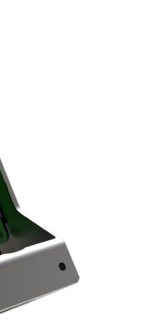
**TBF**  
Foot Element



**TW1**  
12 Terminals



**TW3**  
24 Terminals



**TW4**  
24 Terminals



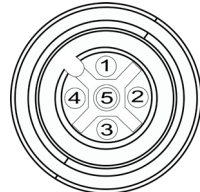
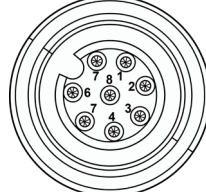
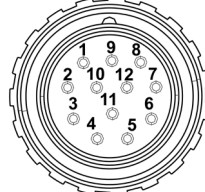
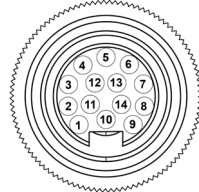
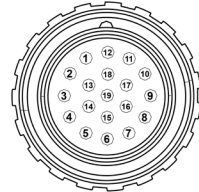
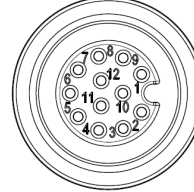
**TEBB4**  
Up to 2 AS-i nodes



**TEBB8**  
Up to 4 AS-i nodes

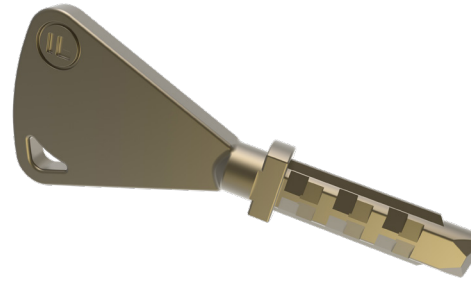
# Base Elements

## Step 13: Mating Cables for Quick Disconnect Connectors

Pin Assignments for Quick Disconnect & Mating Cable Pin Assignments																			Cable Length	Cable Part No.	
Pin Assignments	Pins																		2M	Cable-2M-TQ1	
	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	5M	Cable-5M-TQ1
	Number of Pins		5	5		8			12			14		19		12		10M	Cable-10M-TQ1		
	Connector Size		M12	M12		M12			M23			7/8" UN2		M23		M12		20M	Cable-20M-TQ1		
	# of Safety Circuits		2	-		0	2		0	2		2		2	4	0		2	2M	Cable-2M-TQ3	
	# of Control I/O		0	-		5	1		9	5		7		12	8	9		5	5M	Cable-5M-TQ3	
1	<div>Key</div> <div>SC = Safety Circuit</div> <div>I/O = Input or Output</div> <div>QD = Quick Disconnect</div> <div>(connector at base)</div>	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	10M <th>Cable-10M-TQ3</th>	Cable-10M-TQ3	
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	20M <th>Cable-20M-TQ3</th>	Cable-20M-TQ3	
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	2M <th>Cable-2M-TQ5</th>	Cable-2M-TQ5	
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	5M <th>Cable-5M-TQ5</th>	Cable-5M-TQ5	
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	10M <th>Cable-10M-TQ5</th>	Cable-10M-TQ5	
6					Pink	I/O 3	SC 2	Yellow	I/O 3	SC 2	Blue	0V	Blue	0V	0V	Pink	I/O 3	SC 2	20M <th>Cable-20M-TQ5</th>	Cable-20M-TQ5	
7					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	2M <th>Cable-2M-TQ7</th>	Cable-2M-TQ7	
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	5M <th>Cable-5M-TQ7</th>	Cable-5M-TQ7	
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	10M <th>Cable-10M-TQ7</th>	Cable-10M-TQ7		
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	20M <th>Cable-20M-TQ7</th>	Cable-20M-TQ7		
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	2M <th>Cable-2M-TQ8/9</th>	Cable-2M-TQ8/9		
12							Green/Yellow	Earth	Earth	Brown/Green	SC 2	Green/Yellow	Earth	Earth	Violet	I/O 8	I/O 4	5M <th>Cable-5M-TQ8/9</th>	Cable-5M-TQ8/9		
13											Grey	SC 1	Yellow/Brown	I/O 6	I/O 6				10M <th>Cable-10M-TQ8/9</th>	Cable-10M-TQ8/9	
14											Red	Earth	Brown/Green	I/O 7	I/O 7				20M <th>Cable-20M-TQ8/9</th>	Cable-20M-TQ8/9	
15													White	I/O 8	SC 3				2M <th>Cable-2M-TQL/M</th>	Cable-2M-TQL/M	
16		Yellow	I/O 9	SC 4									5M <th>Cable-5M-TQL/M</th>	Cable-5M-TQL/M							
17		Pink	I/O 10	SC 3									10M <th>Cable-10M-TQL/M</th>	Cable-10M-TQL/M							
18		Grey/Brown	I/O 11	SC 4									20M <th>Cable-20M-TQL/M</th>	Cable-20M-TQL/M							
19		Brown	+24V	+24V																	
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



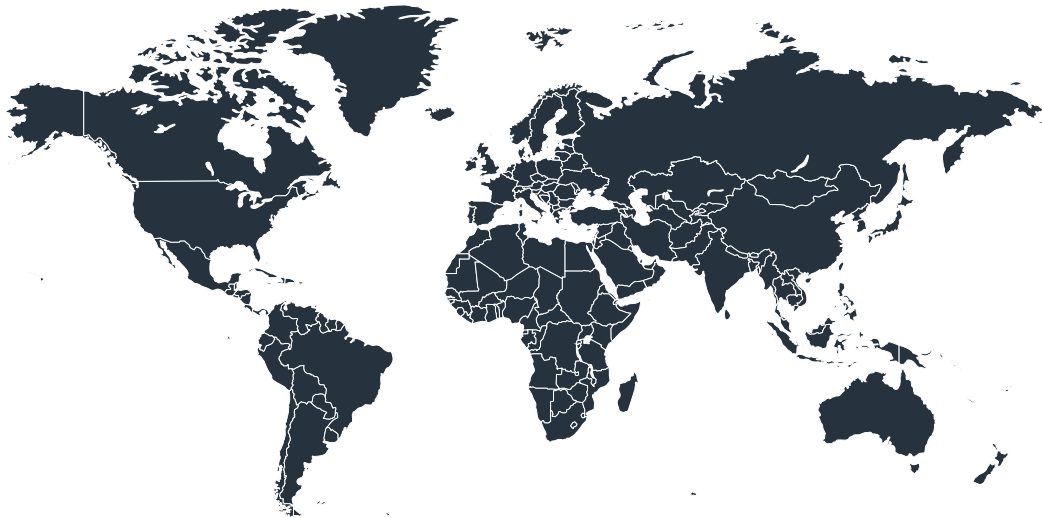
**TLO**  
Lock-Out Clip

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





## Configurable Access & Control for Machine Guarding



A **Halma** company

Fortress Interlocks Ltd

☎ +44 (0)1902 349000

✉ [sales@fortressinterlocks.com](mailto:sales@fortressinterlocks.com)

Fortress Interlocks Europe

☎ +31 (0)10 7536060

✉ [europe@fortressinterlocks.com](mailto:europe@fortressinterlocks.com)

Fortress Interlocks USA

☎ +1 (859) 578 2390

✉ [us@fortressinterlocks.com](mailto:us@fortressinterlocks.com)

Fortress Interlocks Pty Ltd

☎ +61 (0)3 9771 5350

✉ [australia@fortressinterlocks.com](mailto:australia@fortressinterlocks.com)

Fortress Interlocks China

☎ +86 (021) 6167 9002

✉ [china@fortressinterlocks.com](mailto:china@fortressinterlocks.com)

Fortress Interlocks India

☎ +91 7042358818

✉ [india@fortressinterlocks.com](mailto:india@fortressinterlocks.com)

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1300 TEKSAL | [sales@teskal.com.au](mailto:sales@teskal.com.au)

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