

## Protecting People, Protecting Productivity



**Medium duty interlocks  
independently certified to PLd**



THE QUEEN'S AWARDS  
FOR ENTERPRISE:  
INTERNATIONAL TRADE  
2018



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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.

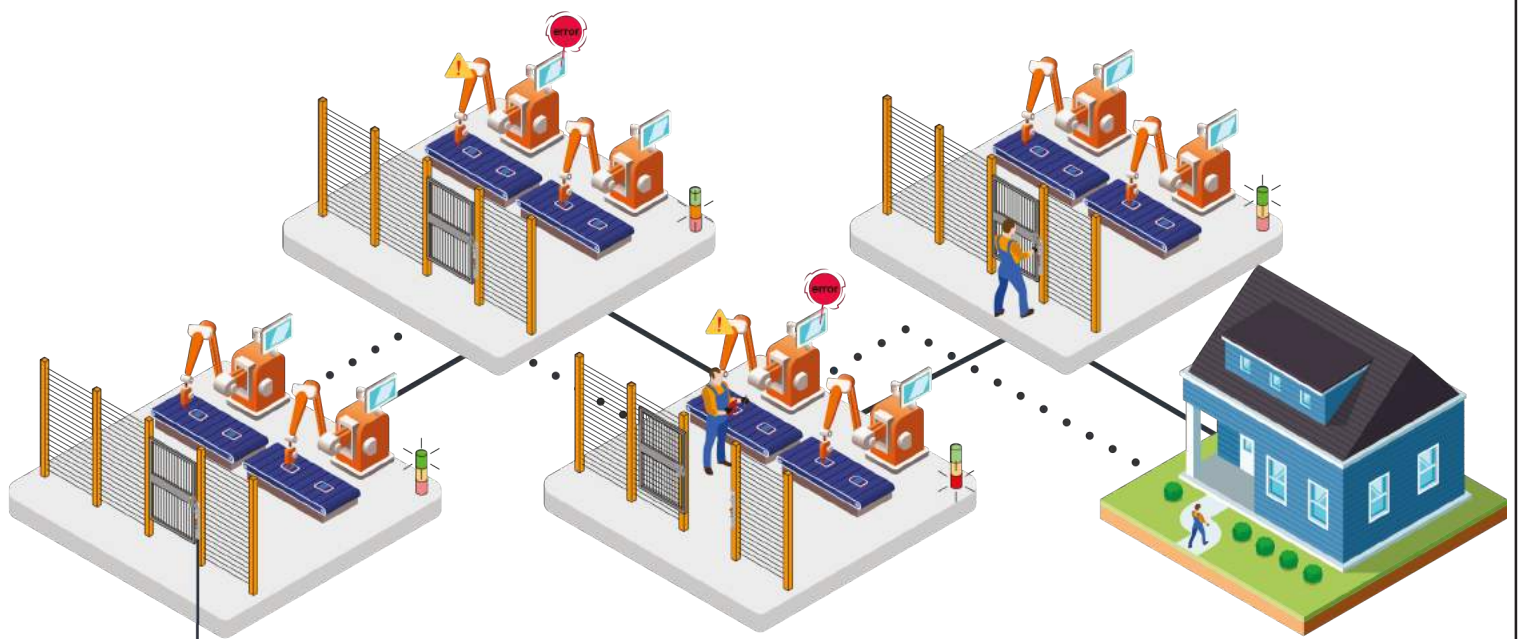
**Why Interlocks?** Interlocking is a method of controlling two or more interdependent operations which must take place in a predetermined sequence, if necessary remotely controlled or time delayed. The need for this sequence may be safety to personnel and equipment, or it may be to control processes 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 PL<sub>e</sub>
-  **amGard<sup>pro</sup>** - Heavy duty safety gate switches with connectivity and trapped key integration certified to PL<sub>e</sub>
-  **amGardS40** - Stainless steel IP69K safety gate switches independently certified to PL<sub>e</sub>
-  **tGard** - Medium duty interlocks with configurable built-in control functionality independently certified to PL<sub>d</sub>
-  **ncGard** - A range of safety switches with non-contact technology

# FORTRESS



*Protecting People, Protecting Productivity.  
Ensuring Everyone Working in Dangerous Environments Returns Safely Home Every Day.*

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.

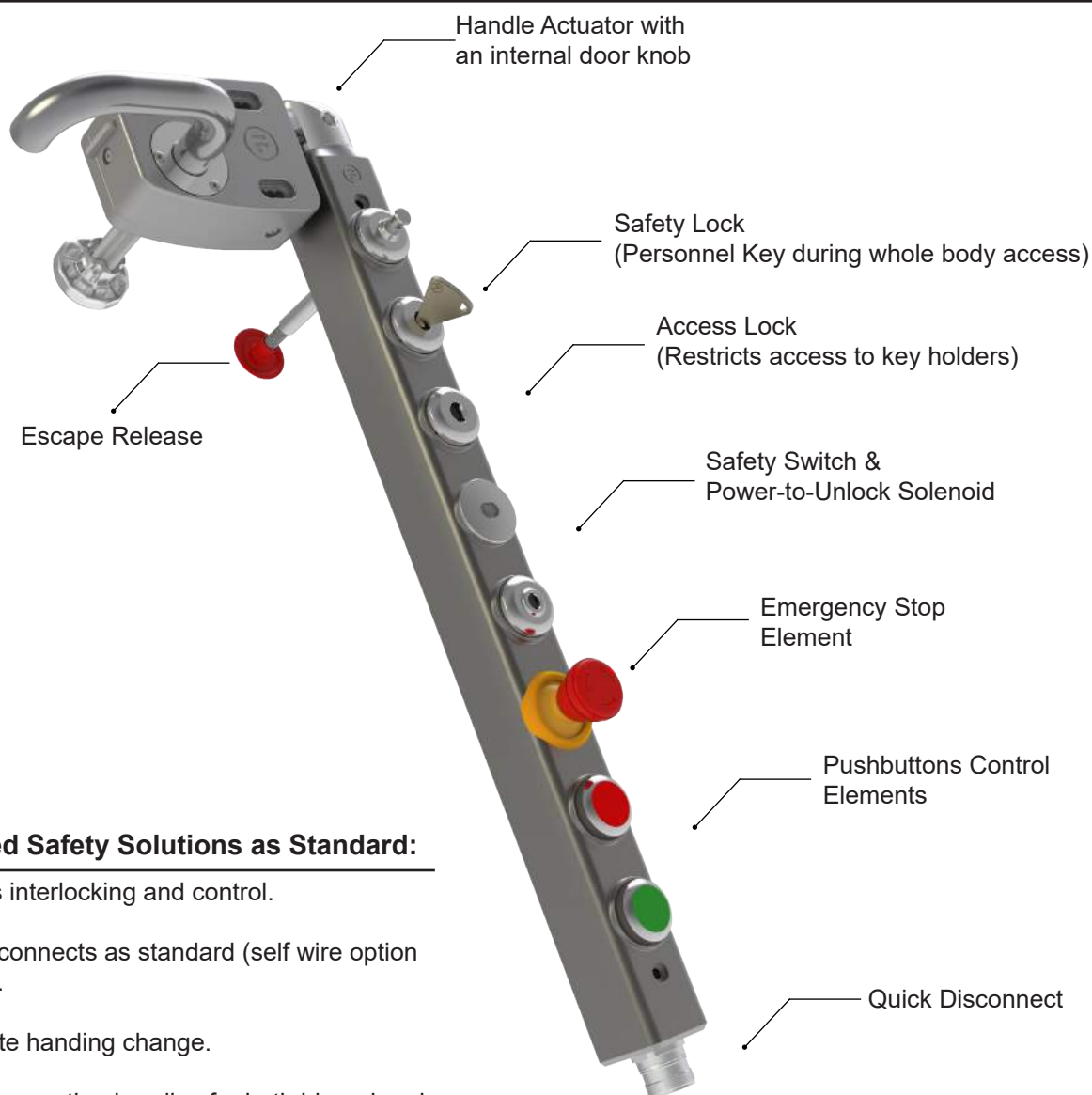
tGard offers “a customised safety solution, as standard”. Each order is defined by a range of tGard elements that include selector switches, safety switches (solenoid and non-solenoid), personnel keys, emergency release, pushbuttons, E-Stops, indicator lamps and a choice of operating handles for both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

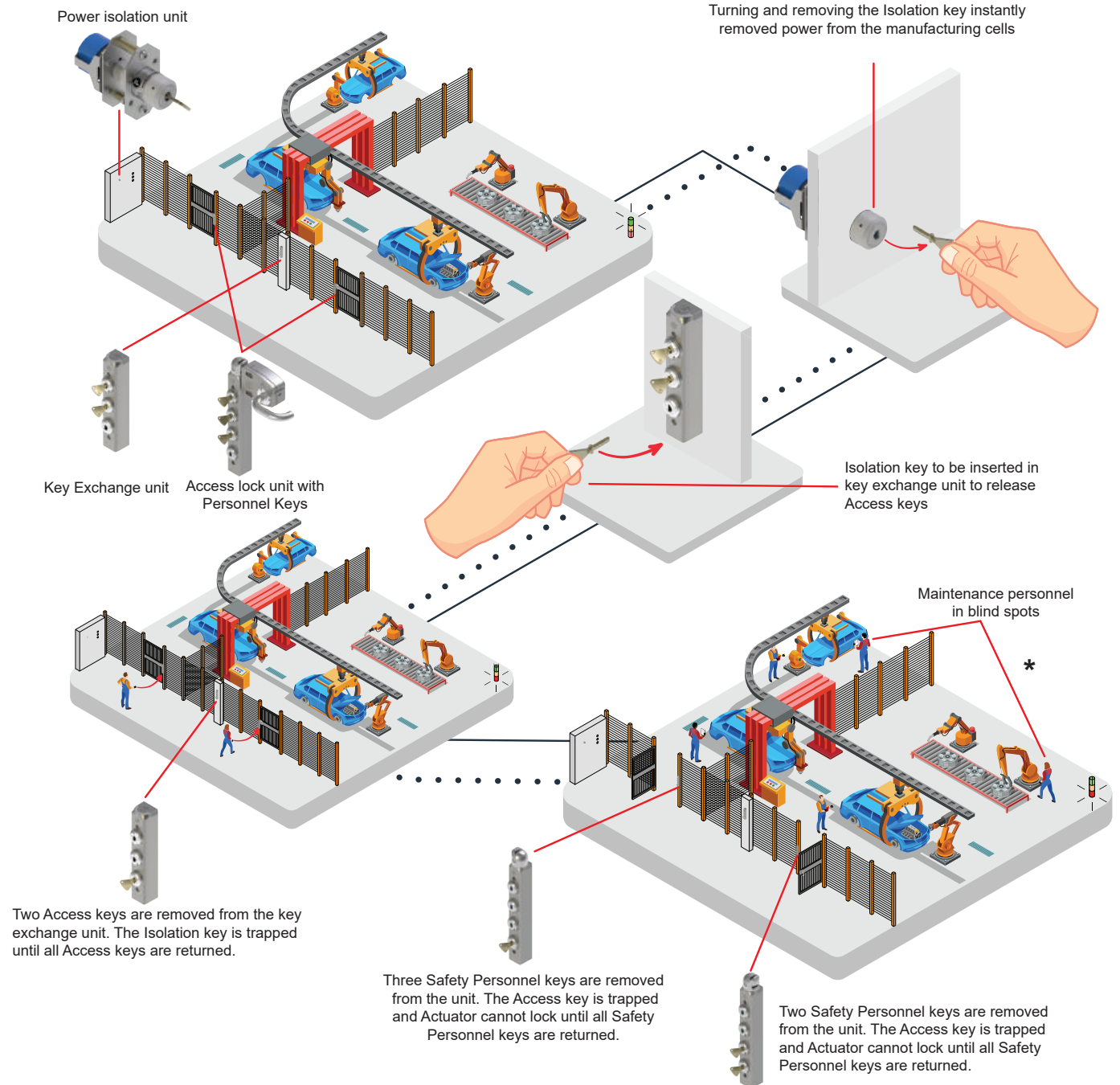
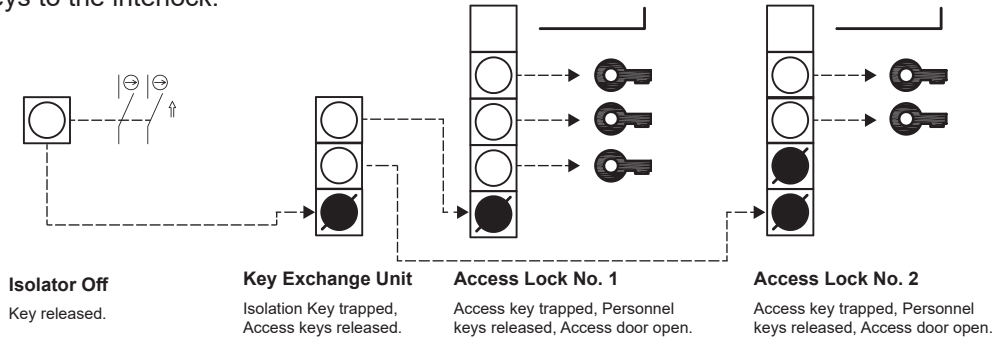
- Combines interlocking and control.
- Quick Disconnects as standard (self wire option available).
- Fast on site handing change.
- Choice of operating handles for both hinged and sliding guard doors.

# 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.

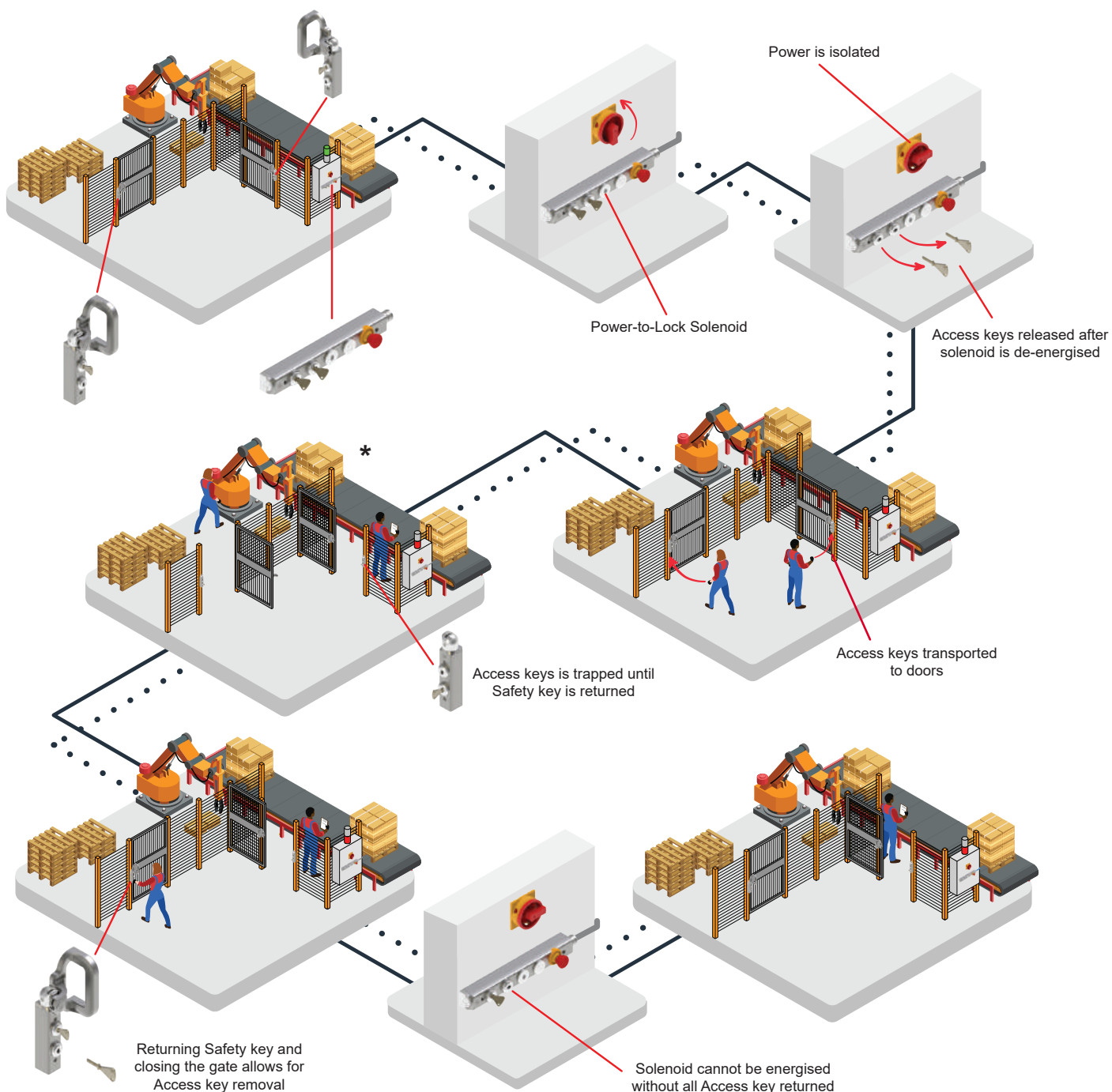
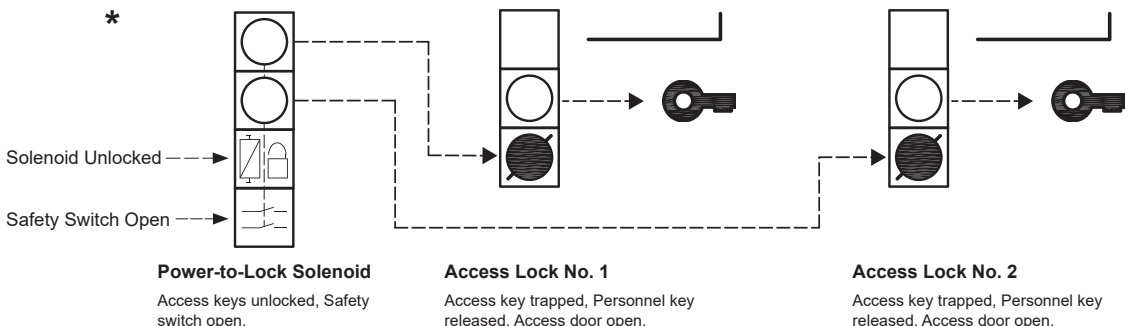
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# Robot Pallet Stacker

## Application Requirement:

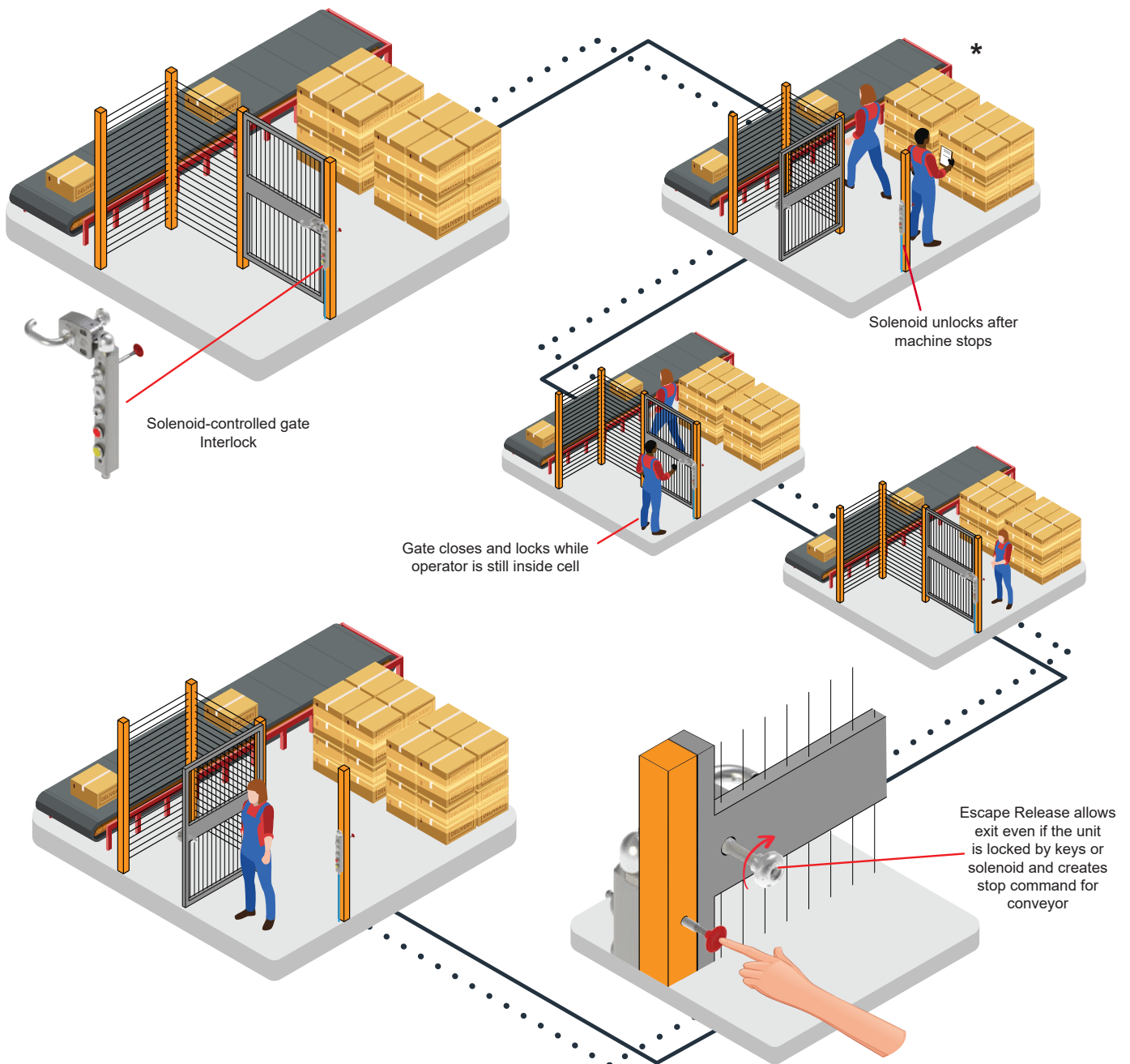
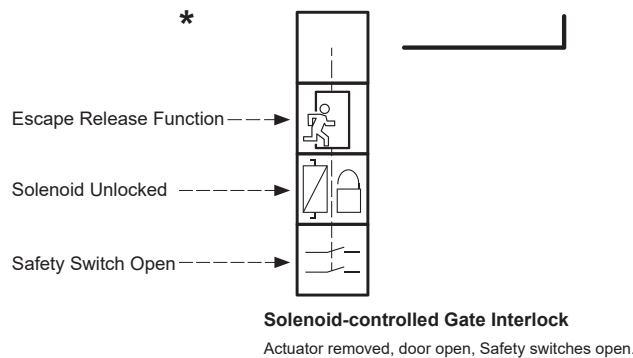
Robot arms require safeguarding measures during operation and when carrying loads. The robot pallet stacker below has two access points and a single central control panel. When mains power is isolated to the system, the Power-to-Lock solenoid is de-energised and Access keys for the access points are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



THFSMDUQ5

## 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



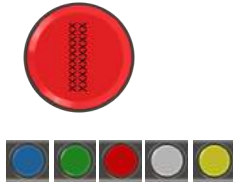
Safety Re-Start



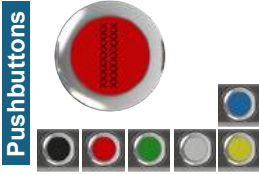


## Core Elements

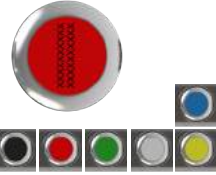
### Indicator Lamps



### Non-Illuminating Switches



### Pushbuttons



### 2 Position Selector Switch



### 2 Position Selector Key Switch



### Mushroom Pushbutton



### 3 Position Selector Switch



## Base Elements

### Illuminating Pushbuttons



### 2 Position Selector Switch



### 3 Position Selector Switch



## Keys & Accessories

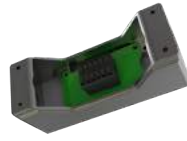
### Safety & Control Quick Disconnect Connectors



### Foot



### Self Wire



### AS- interface



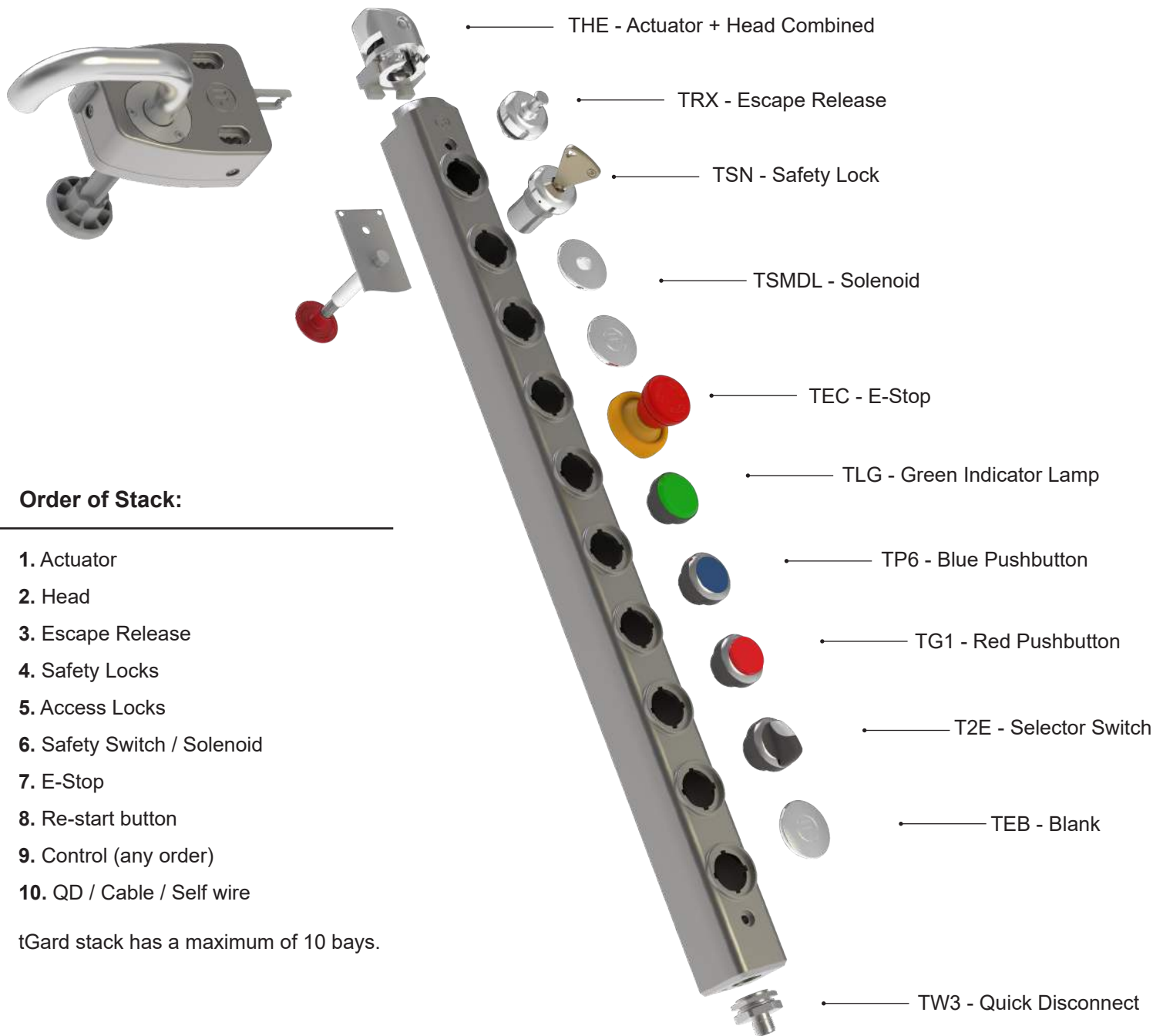
### Keys



### Lockout Clip



For more information on the Lockout Clip see Head & Cap Element Operating Instructions



### 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 + TW3 =  
THERXSNSMDLECLGP6G12EEBW3

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



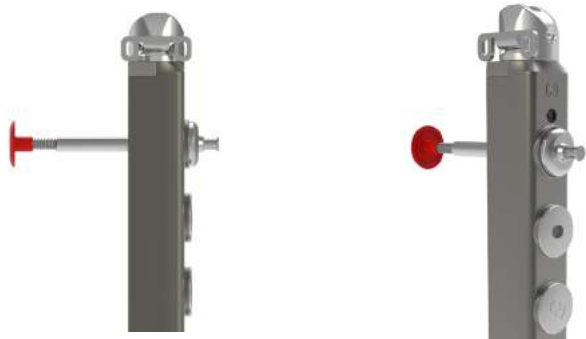
**THM + TEN = THN**  
Head module including handle actuator (No internal knob)



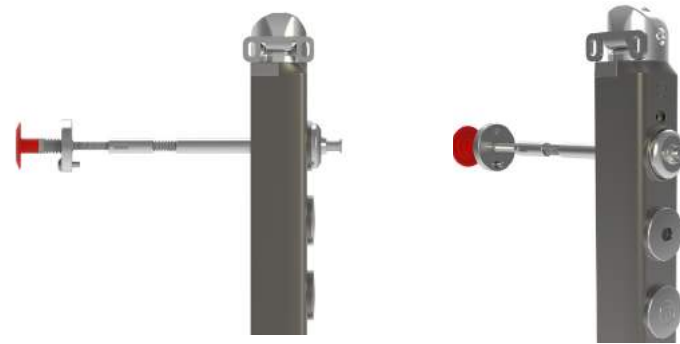
**THM + TEH = THE**  
Head module including handle actuator

# 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)

## 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

## 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



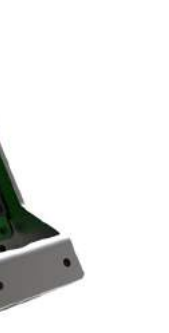
**TBF**  
Foot Element



**TW1**  
12 Terminals



**TW3**  
24 Terminals



**TW4**  
24 Terminals



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



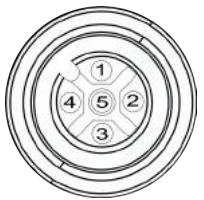
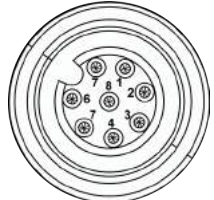

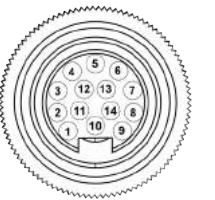
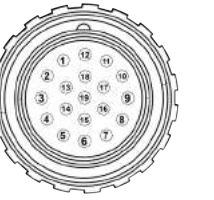
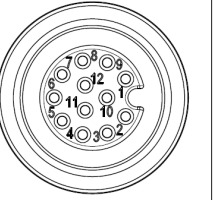
**TEBB8**  
Up to 4 AS-i nodes

# 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																						
	Part No.	Cable_M-TQ1	TEBB4 / 8	Wire Colour	Cable_M-TQ2 / TQ3		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		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	2M	Cable-2M-TQ1
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	2M	Cable-2M-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	5M	Cable-5M-TQ3				
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	10M	Cable-10M-TQ3				
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	20M	Cable-20M-TQ1				
6	<b>Key</b> SC = Safety Circuit I/O = Input or Output QD = Quick Disconnect (connector at base)			Pink ●	I/O 3	SC 2	Yellow ●	I/O 3	SC 2	Blue ●	0V	Blue ●	0V	0V	Pink ●	I/O 3	SC 2	20M	Cable-20M-TQ3				
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	Blue ●	0V	2M	Cable-2M-TQ5		
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	Red ●	I/O 4	5M	Cable-5M-TQ5		
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	Orange ●	I/O 5	I/O 1	Orange ●	I/O 5	I/O 1	10M	Cable-10M-TQ5	
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	Tan ●	I/O 6	I/O 2	Tan ●	I/O 6	I/O 2	20M	Cable-20M-TQ5	
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	Black ●	I/O 7	I/O 3	Black ●	I/O 7	I/O 3	20M	Cable-20M-TQ5	
12				Green/Yellow ●	Earth	Earth	Brown/Green ●	SC 2	Green/Yellow ●	Earth	Earth	Violet ●	I/O 8	I/O 4	Violet ●	I/O 8	I/O 4	Violet ●	I/O 8	I/O 4	2M	Cable-2M-TQ7	
13				Grey ●	SC 1	Yellow/Brown ●	I/O 6	I/O 6	Yellow/Brown ●	I/O 6	I/O 6	Yellow/Brown ●	I/O 6	I/O 6	Yellow/Brown ●	I/O 6	I/O 6	Yellow/Brown ●	I/O 6	I/O 6	5M	Cable-5M-TQ7	
14				Red ●	Earth	Brown/Green ●	I/O 7	I/O 7	Brown/Green ●	I/O 7	I/O 7	Brown/Green ●	I/O 7	I/O 7	Brown/Green ●	I/O 7	I/O 7	Brown/Green ●	I/O 7	I/O 7	10M	Cable-10M-TQ7	
15				White ○	I/O 8	SC 3	White ○	I/O 8	SC 3	White ○	I/O 8	SC 3	White ○	I/O 8	SC 3	White ○	I/O 8	SC 3	White ○	I/O 8	SC 3	20M	Cable-20M-TQ7
16				Yellow ●	I/O 9	SC 4	Yellow ●	I/O 9	SC 4	Yellow ●	I/O 9	SC 4	Yellow ●	I/O 9	SC 4	Yellow ●	I/O 9	SC 4	Yellow ●	I/O 9	SC 4	2M	Cable-2M-TQ8/9
17				Pink ●	I/O 10	SC 3	Pink ●	I/O 10	SC 3	Pink ●	I/O 10	SC 3	Pink ●	I/O 10	SC 3	Pink ●	I/O 10	SC 3	Pink ●	I/O 10	SC 3	5M	Cable-5M-TQ8/9
18	Grey/Brown ●	I/O 11	SC 4	Grey/Brown ●	I/O 11	SC 4	Grey/Brown ●	I/O 11	SC 4	Grey/Brown ●	I/O 11	SC 4	Grey/Brown ●	I/O 11	SC 4	Grey/Brown ●	I/O 11	SC 4	10M	Cable-10M-TQ8/9			
19	Brown ●	+24V	+24V	Brown ●	+24V	+24V	Brown ●	+24V	+24V	Brown ●	+24V	+24V	Brown ●	+24V	+24V	Brown ●	+24V	+24V	20M	Cable-20M-TQ8/9			

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

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

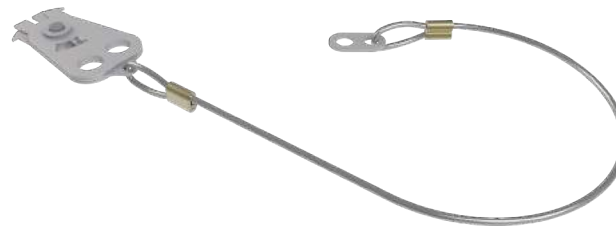
## Step 14: Keys



**TKS**  
Standard Key

**TKM**  
Master Key

## Step 15: Accessories



**TLO**  
Lockout Clip

Allows tGard to be used as part of a Lockout / Tagout procedure. Holds for two padlocks / hasps





# FORTRESS

## Protecting People, Protecting Productivity



A **Halma** company

Fortress Interlocks Ltd

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