

Protecting People, Protecting Productivity



**Medium duty interlocks
independently certified to PLd**



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



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



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.

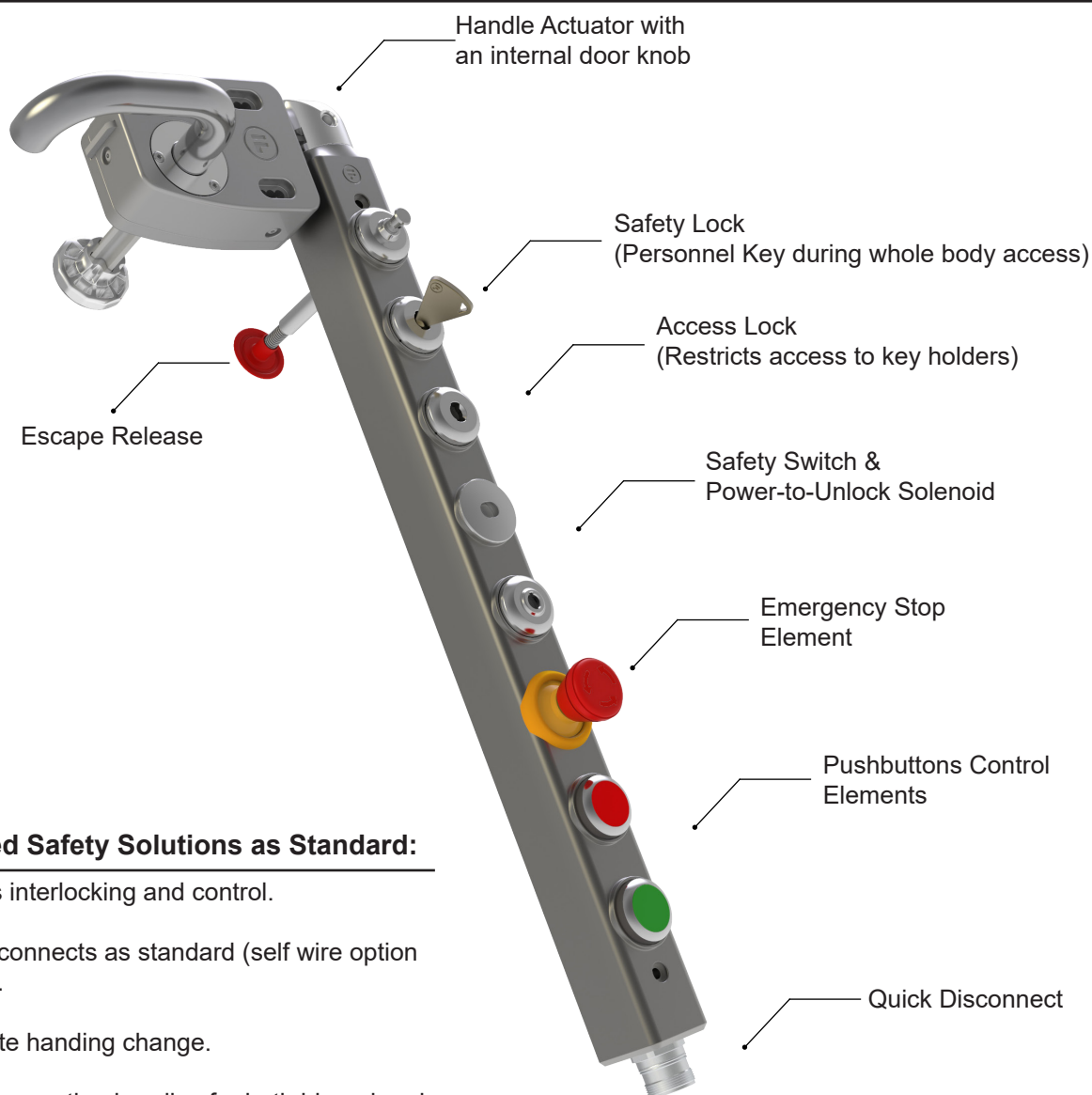
tGard offers “a customised safety solution, as standard”. Each order is defined by a range of tGard elements that include selector switches, safety switches (solenoid and non-solenoid), personnel keys, emergency release, pushbuttons, E-Stops, indicator lamps and a choice of operating handles for both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

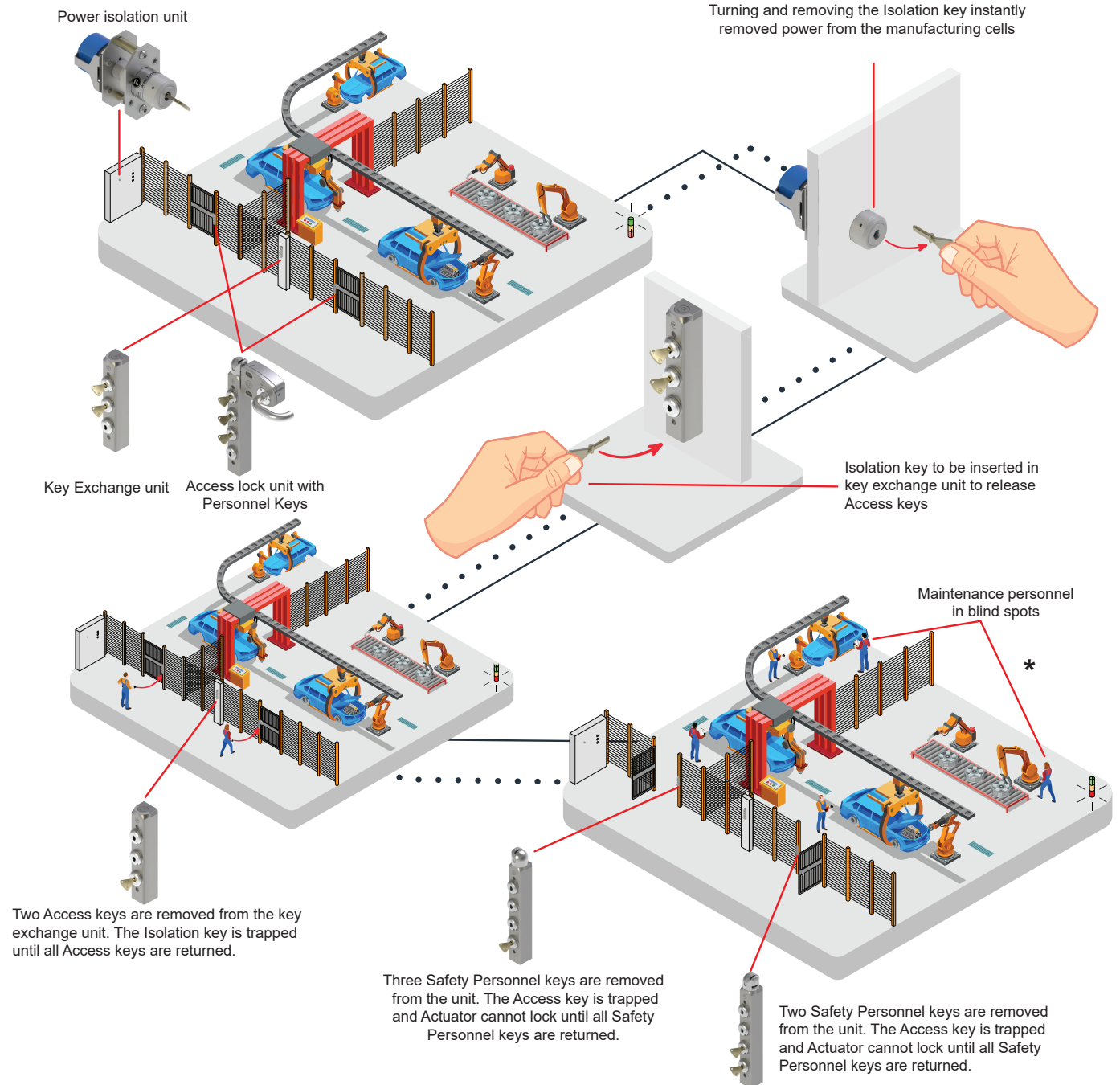
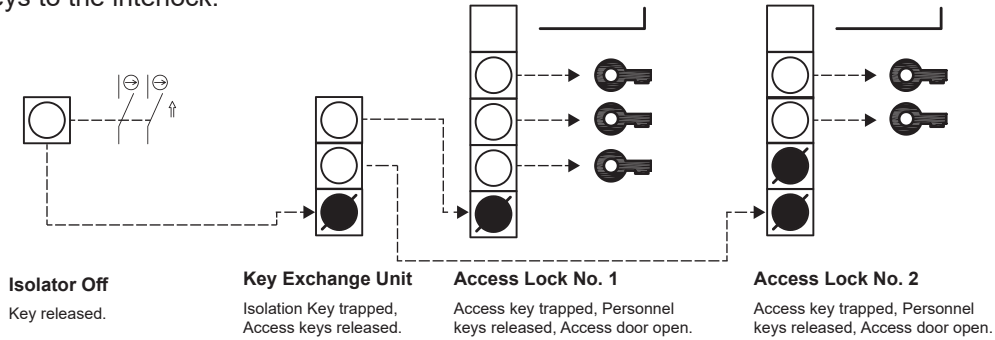
- Combines interlocking and control.
- Quick Disconnects as standard (self wire option available).
- Fast on site handing change.
- Choice of operating handles for both hinged and sliding guard doors.

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.

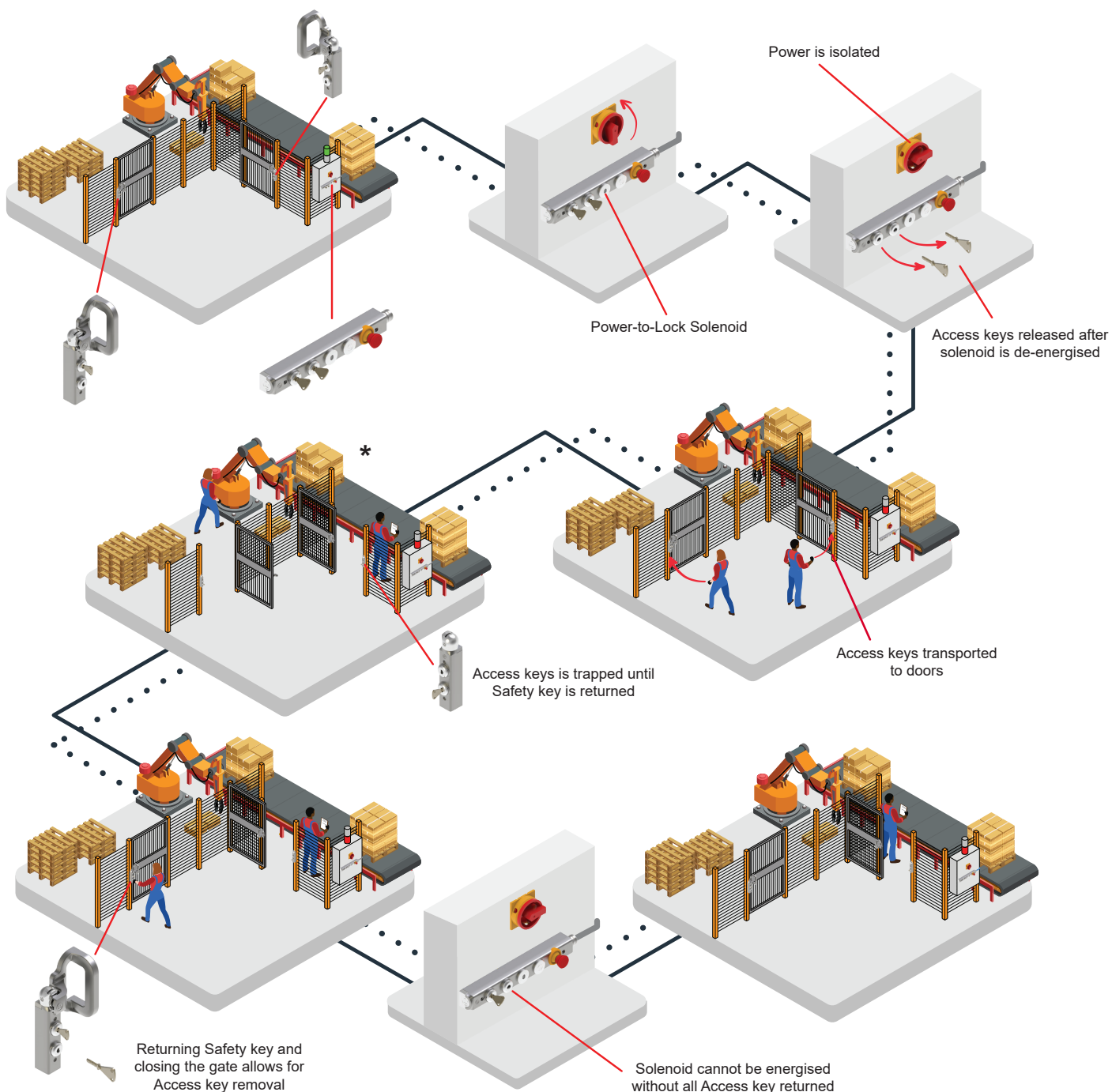
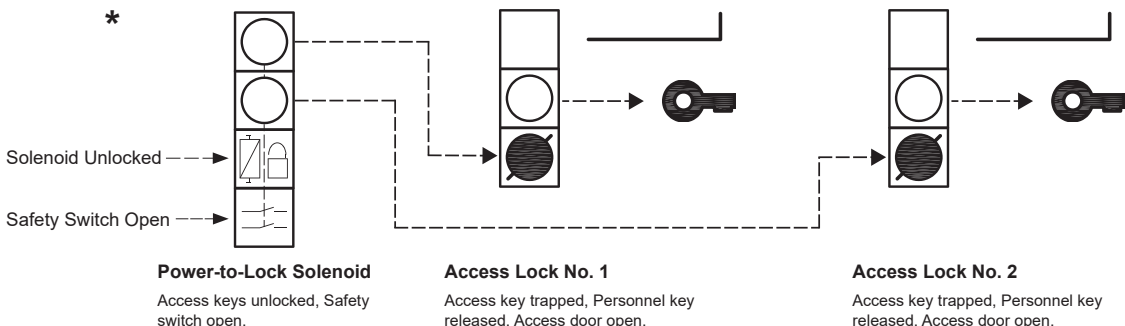
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Robot Pallet Stacker

Application Requirement:

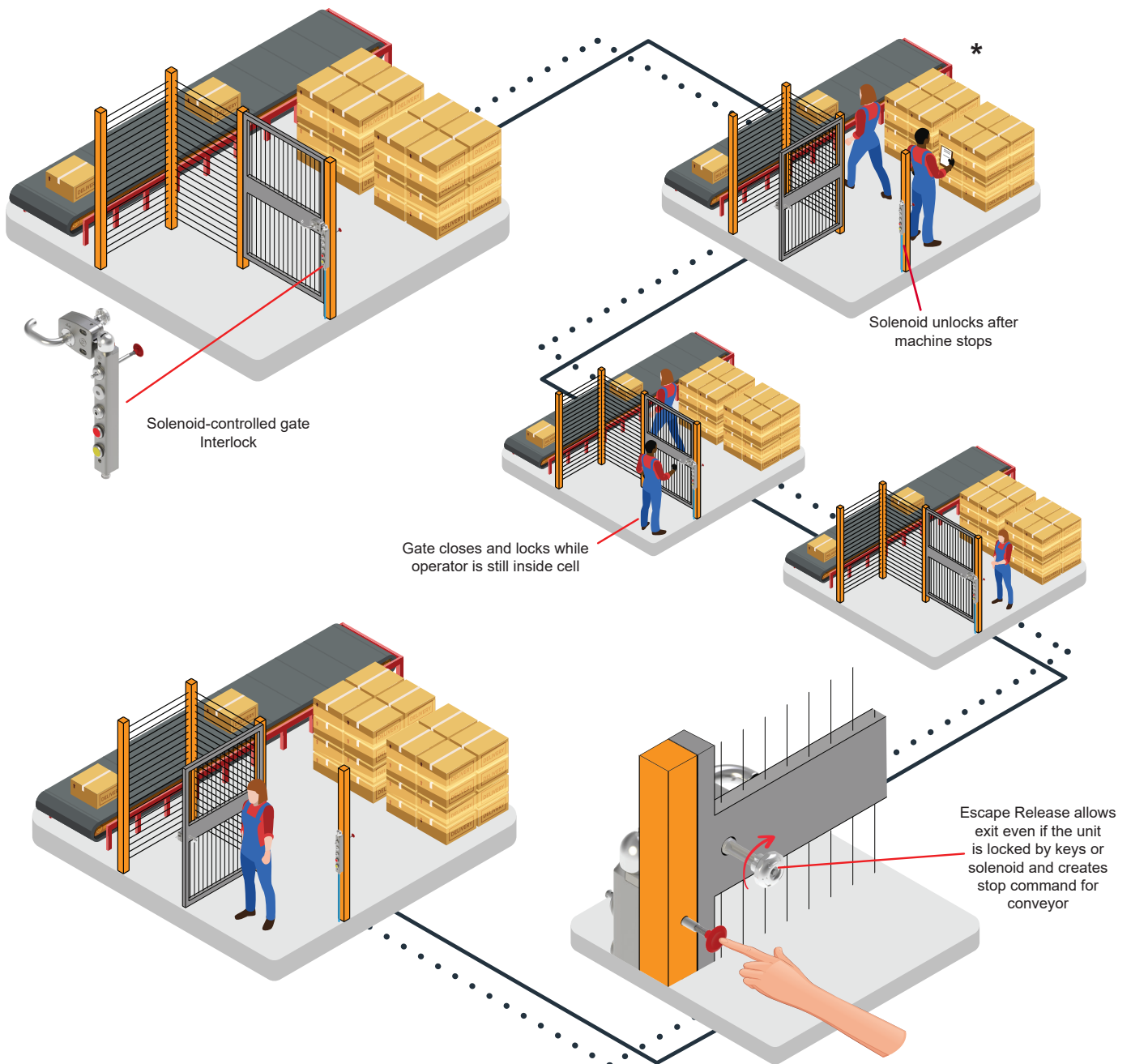
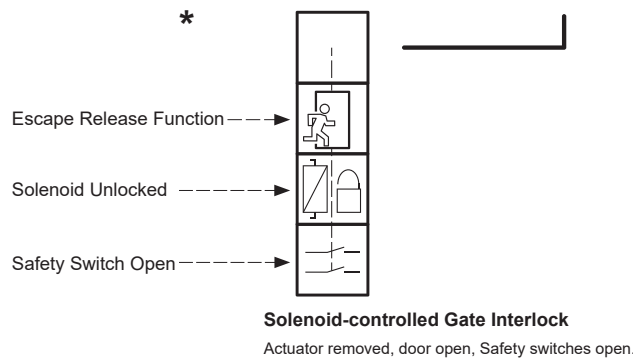
Robot arms require safeguarding measures during operation and when carrying loads. The robot pallet stacker below has two access points and a single central control panel. When mains power is isolated to the system, the Power-to-Lock solenoid is de-energised and Access keys for the access points are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

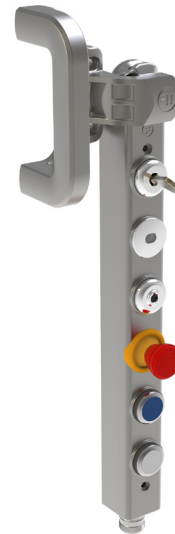
2NC, 1NO Safety Switch



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



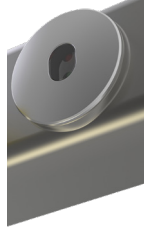
Safety Lock



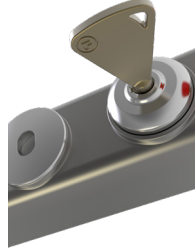
Access Lock



Safety Switch



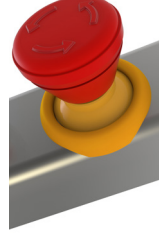
Safety Switch & Solenoid



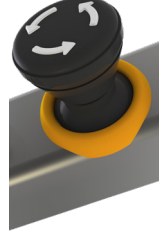
Extension Blank Element



Emergency Stops

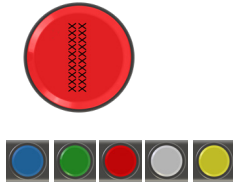


Safety Re-Start

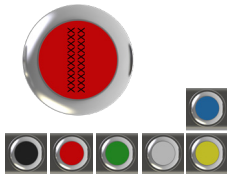


Core Elements

Indicator Lamps



Non-Illuminating Pushbuttons



2 Position Selector Switches



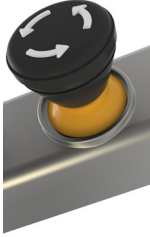
3 Position Selector Switch



2 Position Selector Key Switch



Mushroom Pushbutton

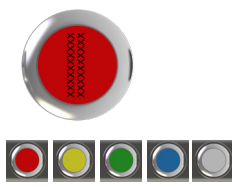


3 Position Selector Switch



Base Elements

Illuminating Pushbuttons



2 Position Selector Switch



3 Position Selector Switch

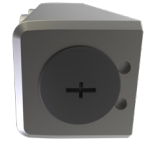


Keys & Accessories

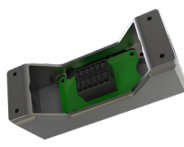
Safety & Control Quick Disconnect Connectors



Foot



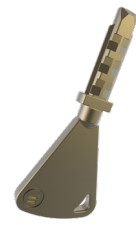
Self Wire



AS- interface



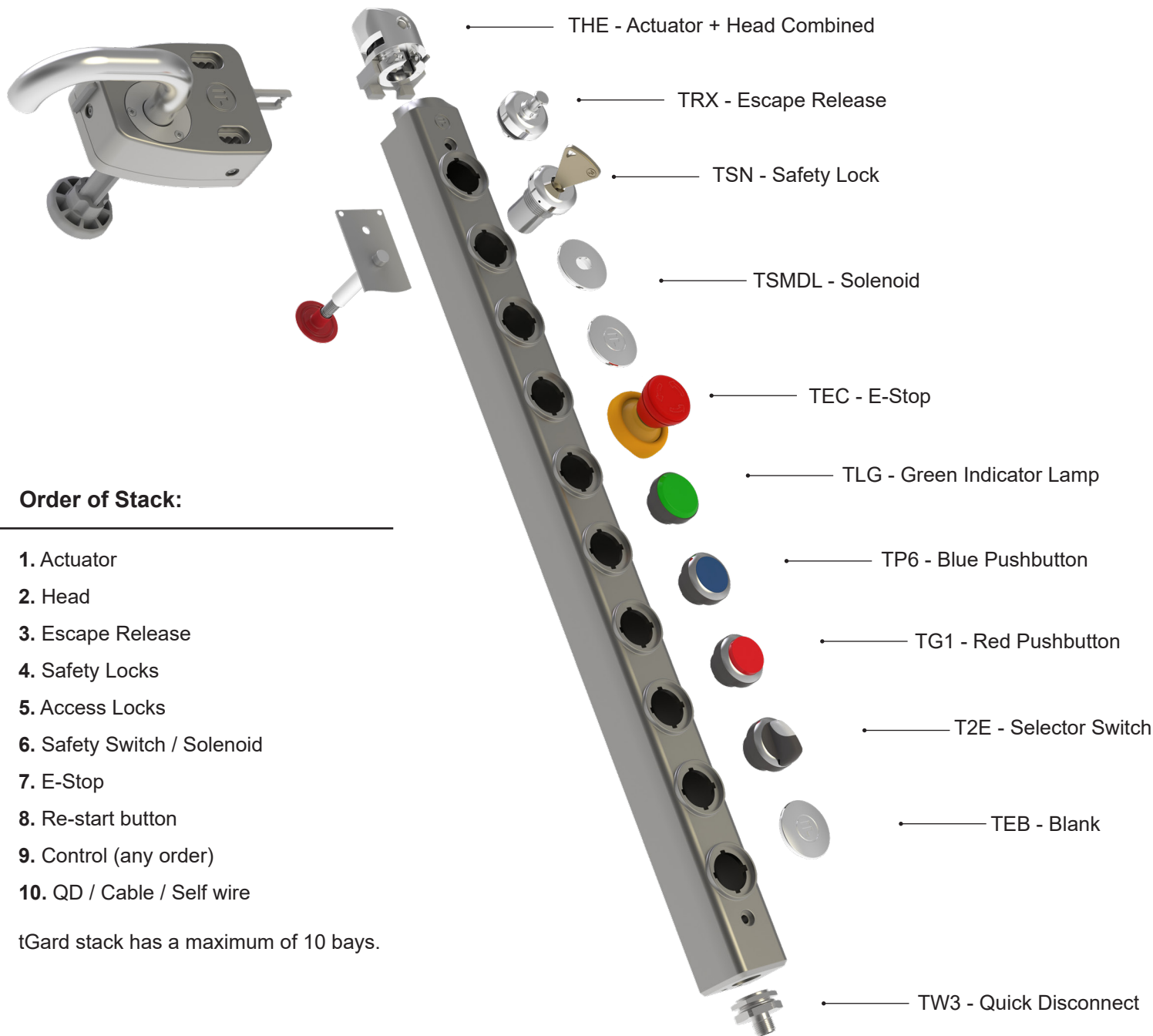
Keys



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

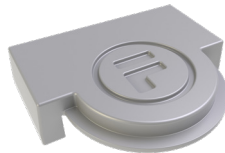
All Actuators to be used in combination with a THM head module

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



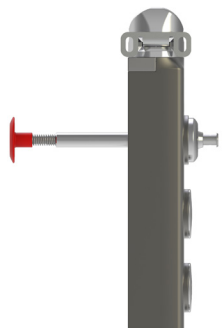
THM + TEN = THN
Head module including handle actuator (No internal knob)



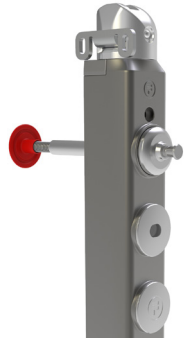
THM + TEH = THE
Head module including handle actuator

Core Elements

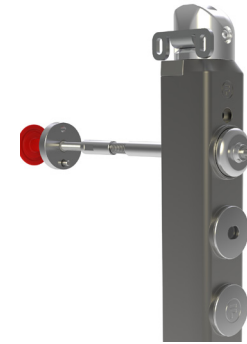
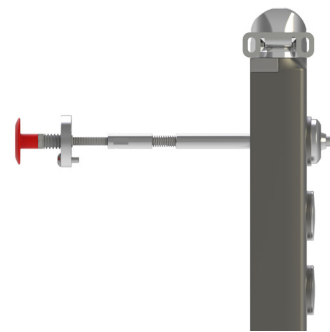
Step 3: Escape Release




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)*



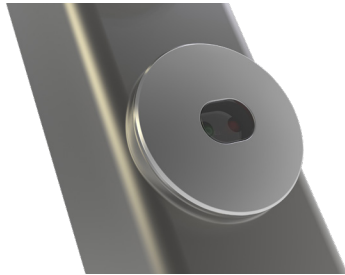
TAB
Standard Access
Lock (No Key)*

TQB
Master Access
Lock (No Key)*

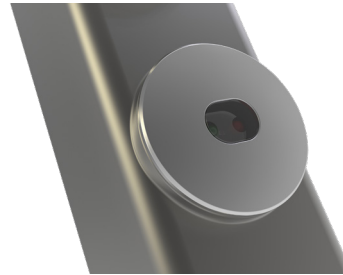

*All keys need
to be ordered
separately

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)

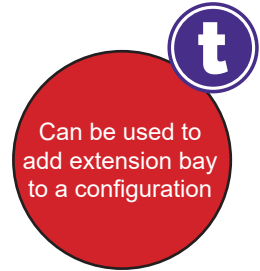


TSSEL
Safety on head element only (no monitoring contact on head)
TSSEL (Power-to-Lock)

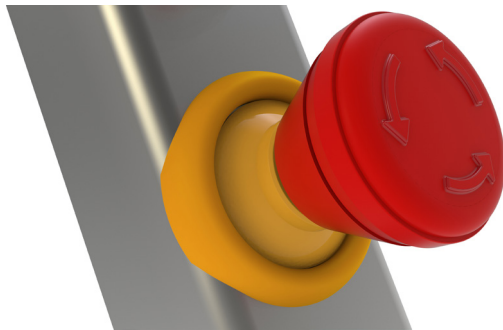
Step 7: Extension Blank Element



TEB
Extension Blank
Element



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



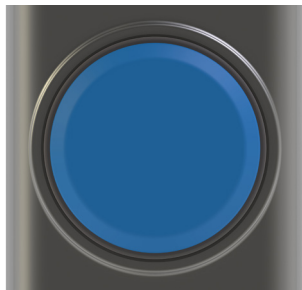
Step 9: Safety Re-Start Switch



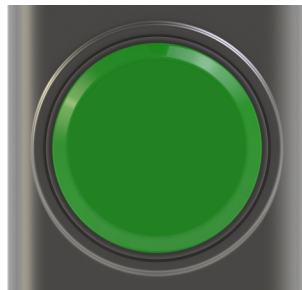
TSR
Safety Re-Start Switch - Blue



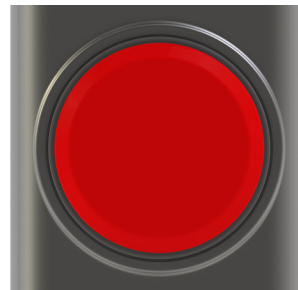
Step 10: Indicator Lamp Element



TLB
Indicator Lamp Element - Blue



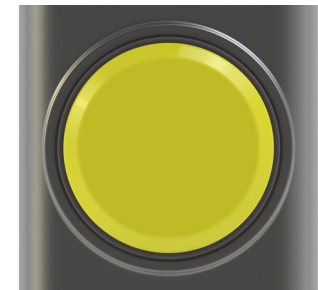
TLG
Indicator Lamp Element - Green



TLR
Indicator Lamp Element - Red



TLW
Indicator Lamp Element - White



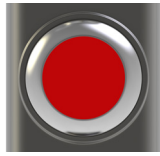
TLY
Indicator Lamp Element - Yellow

Core Elements

Step 11a: Non-Illuminating Switches



TPB
1 N/O Pushbutton -
Black



TPR
1 N/O Pushbutton -
Red



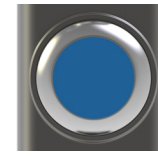
TPG
1 N/O Pushbutton -
Green



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

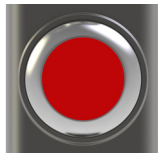


T3D
3 Position Selector
Switches - Momentary

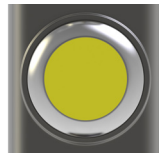


T3H
3 Position Selector
Switches - Momentary/Latching

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

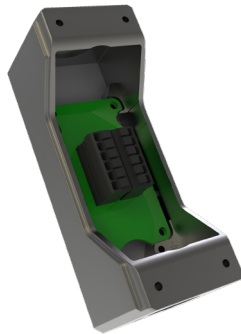


TQL / TQM
12 Pin M12 QD

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



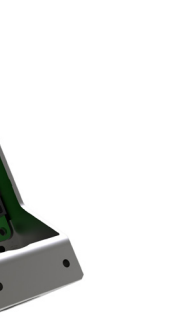
TBF
Foot Element



TW1
12 Terminals



TW3
24 Terminals



TW4
24 Terminals



TEBB4
Up to 2 AS-i nodes

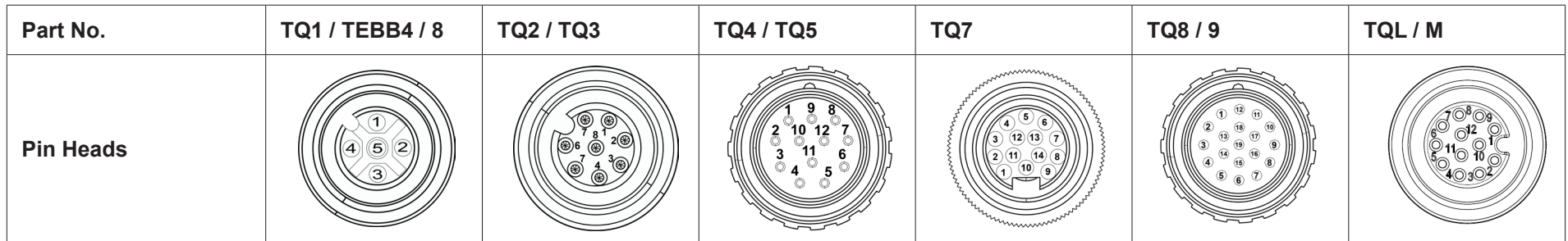


TEBB8
Up to 4 AS-i nodes

Base Elements

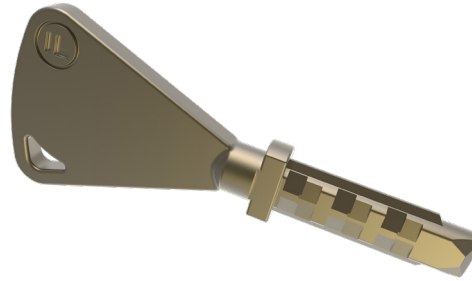
Step 13: Mating Cables for Quick Disconnect Connectors

Pin Assignments for Quick Disconnect & Mating Cable Pin Assignments																		Cable Length	Cable Part No.	
Pin Assignments	Pins																	Cable Length	Cable Part No.	
	Part No.	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	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	Key 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	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	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	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	10M	Cable-10M-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	20M	Cable-20M-TQ5	
12							Green/Yellow ●	Earth	Earth	Brown/Green ●	SC 2	Green/Yellow ●	Earth	Earth	Violet ●	I/O 8	I/O 4	2M	Cable-2M-TQ7	
13										Grey ●	SC 1	Yellow/Brown ●	I/O 6	I/O 6					5M	Cable-5M-TQ7
14										Red ●	Earth	Brown/Green ●	I/O 7	I/O 7					10M	Cable-10M-TQ7
15												White ○	I/O 8	SC 3					20M	Cable-20M-TQ7
16												Yellow ●	I/O 9	SC 4					2M	Cable-2M-TQ8/9
17												Pink ●	I/O 10	SC 3					5M	Cable-5M-TQ8/9
18											Grey/Brown ●	I/O 11	SC 4					10M	Cable-10M-TQ8/9	
19											Brown ●	+24V	+24V					20M	Cable-20M-TQ8/9	



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



Protecting People, Protecting Productivity



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