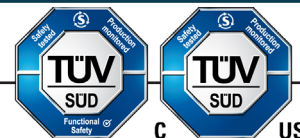


Operating Instructions: tGard Summary



Description

tGard provides compact integrated safety and standard control elements. Its construction allows the configuration of electrical interlocks, mechanical trapped keys, machine controls or combinations of all three. tGard elements can be configured to produce many different functional products, which can be integrated into safety and / or machine control systems.



Important:

The tGard products and systems are designed for use according to the installation and operating instructions enclosed. It must be installed by competent and qualified personnel who have read and understood the whole of this document prior to commencing installation. If the device or guarded machinery equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired. **Any modification to or deviation from these instructions invalidates all warranties.** The device interlock contacts are not to be used as a Mains Isolator or Emergency Stop. The device is a component to be added to a permanent electrical installation meeting the requirements of the applicable standards. All the voltages used within the connected circuits must be derived from a Safety Extra Low Voltage or Protected Extra Low Voltage power supply (SELV or PELV). The device meets the requirements of the standard ISO 14119 – Safety of machinery, interlocking devices associated with guards - Principles for design and selection.

DO NOT LEAVE AUXILIARY RELEASE (OVERRIDE) TOOL IN PLACE!

Access to the Auxiliary Release Driver Bit and the availability of any spare tGard Actuator assemblies must be securely controlled as they could make it possible to bypass the safety Devices and allow access to areas that may have a residual hazard or may result in incorrect operation of some Devices.

BEWARE OF INTENTIONAL MISUSE CAUSED BY OPERATORS WANTING TO BYPASS SAFETY SYSTEMS.

THE INSTALLER SHOULD ASSESS THE RISKS AND MITIGATE AGAINST THEM.

The installation and operation of the tGard device and the complete machine guarding application must take into account the requirements of ISO 14119:2013, Clause 7 - Design to minimise defeat possibilities of interlocking devices.

In order to maintain device safety rating, overall system must be validated to ISO 13849-2 and/or evaluated in accordance with IEC 62061. **It is the user's responsibility to implement proper management controls and risk assessment for master and spare keys, without which they can be used to defeat trapped key interlock systems; ISO/TS 19837 can offer further guidance.**

Fortress Interlocks Ltd accepts no liability whatsoever for any situation arising from misuse or misapplication of the device.

IF YOU HAVE ANY QUESTIONS OR QUERIES OF ANY NATURE WHATSOEVER PLEASE CONTACT THE SUPPLIER WHO WILL BE PLEASED TO ADVISE AND ASSIST.

Part Numbers can be defined by the tGard configurator on www.fortress-safety.com.

tGard Technical Specification	Solenoid Interlock	Non-Solenoid Interlock	Control Only
Housing Materials	Painted die cast aluminium		
Mechanical life	1,000,000 Switching Operations		
Holding Force F	2500 N	2500 N*	N/A
Holding Force F_{Zh}	2620 N	2620 N*	N/A
Maximum Holding Force, F_{1max}	3430 N	3430 N*	N/A
*Holding forces only applicable if product contains a Safety or Access Key Lock.			

Operating Instructions: tGard Summary

tGard Elements & Safety Related Functions		Part No.		
Actuators				
Function 1	Provides link from interlock to guard	TAF	TAH / TAS	TEN / TEH
Function 2	Internal handle allows escape			TEH
Function 3	Provides RF link from interlock to guard			TNH
Heads				
Function 1	Transfer motion of actuator removal into opening of safety contacts	THM		
Function 2	Retain actuator for locking interlocks			
Escape Release				
Function 1	Holds interlock locked when escape release is not used	TRX	TRZ	
Function 2	On activation unit releases locking mechanism allowing egress			
Function 3	Mechanism opens safety contacts to initiate stop command			
Locks				
Function 1	Does not allow safety contacts to be closed unless personnel (safety) key is inserted in lock	TSN / TGN	TAB / TQB	
Function 2	Opens safety contacts when access key inserted in lock			
Interlock				
Function 1	Transfers mechanical movement of head / lock into operation of safety contacts	Switches	Solenoid Switches	
Function 2	Solenoid mechanism holds guard locked			
High Level Coded				
Function 1	Monitor safety inputs are high	OSSD - TNB / TNC / TNS / TNT	SSR - TNA / TNR	
Function 2	Monitor guard is closed using RFID			
Function 3	Monitor safety contacts from associated tGard elements, are closed			
Safe State 1	One safety output is low			
Safe State 2	One safety circuit is open		SSR - TNA / TNR	
Control				
Function 1	Provides E-Stop function	Emergency Stop		
Function 2	Provides complimentary switching of NC and NO contacts for reset		Reset	
Base				
Function 1	Provides electrical safety outputs	All terminal wired or quick disconnect connector options		

Operating Instructions: tGard Summary

Safety Data

Performance Level (ISO 13849-1)	Up to PLd, Up to PLe where tGard High Level Coded element is used
Category (ISO 13849-1)	Up to Cat 3, Up to Cat. 4 where tGard High Level Coded element is used
SIL (ISO 13849-1)	Up to SIL 2, Up to SIL 3 where tGard High Level Coded element is used
Demand Mode (IEC 62061)	High
Device Type (According to ISO 14119)	2 or 4
Functional Safety Data	B10d (for whole tGard device, which will contain multiple elements)/ 5,000,000
Certifications	CE marked for all applicable directives, cTUVus
Applied Standards	BS EN ISO 13849-1:2015 BS EN ISO 13849-2:2012 BS EN ISO 14119:2013 UL 508/R:2013-10 CAN/CSA-C22.2 No.14-13:2013-03

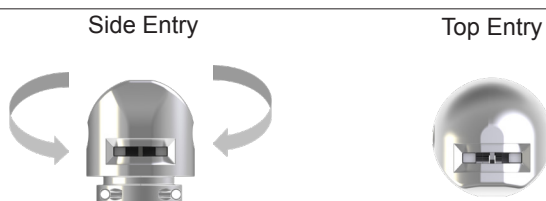
Mechanical Mounting Instructions

Tools / Fixings / Cables Required:

2 x M5 screw (refer to mounting diagrams for lengths).
 1 x Hex driver to suit M5 head screws (3mm across flats) to change head orientation.
 Thread locking compound Loctite 276.
 2 x M5 Nuts / tapped holes and screws per actuator (Refer to mounting diagrams for screw lengths).
 1 x Electrical (approx. 3mm X 0.5mm) flat screwdriver (required when using terminal wired option).
 Ø 5.5mm Drill (when fixing to plate with nuts) or Ø 4.2mm Drill (when tapping plate).
 M5 tap when fixing to a plate and not using nuts.

Mounting tGard:

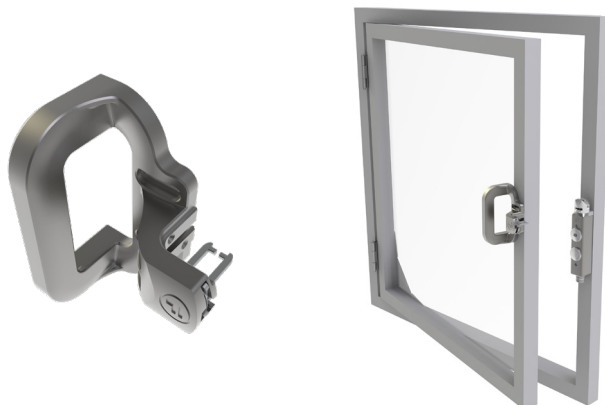
- Choose optimal mounting position:
 tGard should be mounted in an environment within the specifications stated on Page 7.
 The mounting location should also be away from or protected against influences such as mechanical collision (door stop required), machine vibration, debris, direct sunlight and sources of electrical interference. Make sure that the gap around the perimeter of the guard, when closed (Safety Circuits Closed), does not exceed the limits specified in ISO 13857 & ISO 14120.
 When used to lock a guard, the maximum retention force is 2500N.
- If the configuration incorporates a locking head and guard actuator go to step 3 otherwise skip to step 4.
- Remove 2 x Head screws and rotate the head into the desired orientation. Replace head screws and tighten to 2.0Nm.



- 3.1. The TAF actuator suits internal mounting on guards. It can be used in all mounting positions, but brackets may be required. The actuator must not be easily defeatable. Measures of permanent fixing must be used to prevent tampering. Loctite 276 must be used on all fixings to prevent loosening.



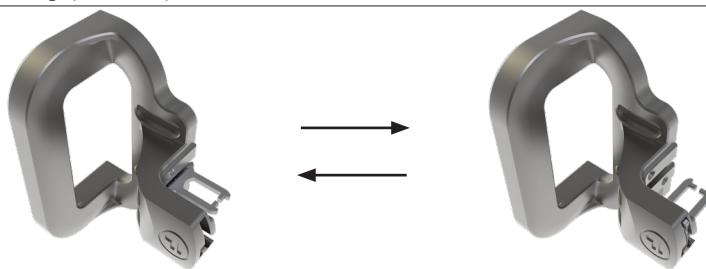
3.2. The **TAH** actuator is designed to be utilised for hinged guard applications, without the need for additional brackets.



3.3. The **TAS** actuator is designed to be utilised for sliding guard applications, without the need for additional brackets.



3.4. A **TAS** can be converted into a **TAH** on site (and vice versa). Remove the actuator fixings and take off the actuator and back plate spring. Replace the actuator, back plate and spring and fixings. Ensure actuator fixings are securely locked against loosening and tampering (see 3.1)



3.5. The **TEH** actuator is designed for hinged guard applications, without the need for additional brackets.



Note: The TAH, TAS, TEH and TEN handle actuators have misalignment of 4mm with the actuators sprung to give flexibility in right/left/up/down. The TAF actuator is fixed with little to no misalignment.

3.6. TEH Handing

This unit can have the handing changed on site by following this procedure below:

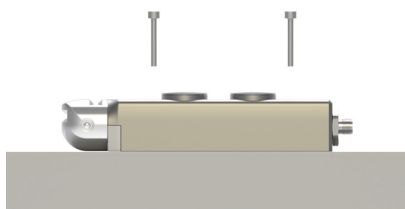
1. Remove the 3 x M3 pozi-drive screws retaining the silver handle.
2. Remove the handle, the rose plate that retains the handle and its associated drive coupler.
3. Repeat steps 1 & 2 for the silver knob ensuring the drive couplers are not mixed up (they must stay with their handle).
4. Refit the silver handle to the opposite side taking care to ensure that when the handle is horizontal the actuator is out.
5. Now refit the silver knob. Rotate the drive coupler 90° so that the silver knob can withdraw the actuator but cannot push the actuator back out.

It is essential to use Loctite 276 on the 3 x M3 pozi-drive screws holding on the silver knob and the silver handle.

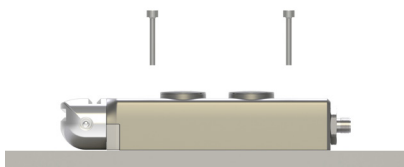
4. Prepare panel / guard frame for mounting

When plate mounting, the plate must be solid metal and a minimum thickness of 3mm.

4.1. For front of panel mounting



• **For aluminium extrusion or plate mounting:** Use suitable fastenings, if required drill Ø5.5 mm element & actuator fixing holes if fixing with nuts or drill Ø4.2 mm fixing holes if tapping the plate (plate must be >6mm thick if tapping), as per drilling diagram.



4.2. When an Escape Release element is incorporated in the device a 10mm clearance hole must be drilled to accommodate the push release post at the back of the unit. To remove the red pushbutton, pull down the spring away from the red pushbutton and fit a 5mm spanner across the flats. You can now unscrew the red pushbutton. Once the unit has been inserted through a 10mm hole the red pushbutton should be refitted with Loctite 276.

In applicants where there is little support for the post (for example, when fitted to flat plate guarding) it is recommended that additional support is provided for the post to prevent it becoming damaged in the event of a sideways impact (with for example with a tool trolley). This is not necessary when the post escape passes through guarding material of 25 mm or thicker (for example 40mm Aluminium extrude fencing). The unit should be installed so that it is not possible to reach the escape release button from outside the safeguarded area.

4.3. Ensure mounting screws are securely locked against loosening and tampering (see 3.1)

5. All fixings (including push ER extension coupler) must be torque tightened to 2.5 Nm.

Operating Instructions: tGard Summary

Functional Checking

The following checks must be made during system commissioning:

1. Check all safety functions; Access to a guarded area is only granted when hazards have reached a safe state. Any E-Stop brings the machine to an Emergency Stop.
2. Check that every electrical I/O element activates or indicates the machine controls as desired. Including machine cannot run with guard open.

Electrical Connection

Make sure that the electrical supply is isolated prior to connecting to it. tGard incorporates safety circuits and standard I/O in a single product. The safety circuits and control circuits (standard I/O) are separate through all of the element. There is a selection of different connection "base" elements that enable the connection of just the safety circuits, just control circuits or both the safety and the control circuits, in a variety of configurations.

Installation

Check that the voltage of the machine's power supply (control circuits) is 24V DC (SELV or PELV). tGard will work at +/-10% of the nominal supply voltage. The electrical system must incorporate circuit protection for the supply circuit, using a quick acting (F) device (rating 1.6A).

Electrical Data

Operating Voltage, U_e	24 DC (+/- 10%)
Rated Insulation Voltage, U_i	60V DC
Rated Operating Currents	Solenoid 350mA, 20mA per Lamp
Minimum Switch Operational Current	5mA at 24V

Safety Circuit Description and I/O Allocation

The safety circuits are made up of two, independent, normally closed (N/C) circuits. They are both closed when the machine is in operation. There are a number of elements that can open these safety circuits. All of these elements use positively driven contacts. The safety circuits must be connected to a safety relay or safety PLC in accordance with the installation instructions of the manufacturer, to provide the safety function. The voltage on the safety circuits should always be sourced from a PELV/ SELV supply. Both safety circuits must include over-current protection, via 200mA fast blow fuses. Non-safety functions in core elements, such as pushbutton and lamp elements operate with a common power supply.

A pushbutton in the device will have an output (from the device) associated with it, whilst a lamp in the device will have an input to the device to drive it. The I/O pins on the connector are set to either inputs or outputs, depending on the elements used on the device.

Please note that an external monitor has to perform a diagnostic function (compare both channels), in order to fulfil the safety requirements of CAT. 4/PLe and SIL 3.

Switch Ratings

Safety Switches	DC13: $I_e=0.5A$, $U_e=24V$ DC
	AC15: $I_e=1A$, $U_e=24V$ AC
Monitoring Switches	DC13: $I_e=0.5A$, $U_e=24V$ DC
Pushbuttons	Maximum operating current 100mA & 24V

Operating Instructions: tGard Summary

Service and Inspection

Regular (minimum) monthly inspection of the following is necessary to ensure trouble-free, lasting operation:

- Correct switching function
- Loose cable connections
- Material degradation
- Debris and accelerated wear
- Sealing
- Alignment

If lubrication of a head or mechanical lock is required use WD40. Do not use dry lubricant. The frequency of lubrication / cleaning will depend on the environment. Any mechanical element must be replaced after 1 million operations.

Illuminating element must be replaced after 100,000 hours that the lamp has been on for.

tGard contains no user serviceable parts.

Disposal

tGard does not contain any certified hazardous materials so should be disposed of as industrial waste and recycled wherever possible. Electrical items should not be disposed of in general waste and must be appropriately recycled.

Liability Coverage is Voided Under the Following Conditions:

- If these instructions are not followed.
- Misapplication or use outside of recommended specifications in this sheet.
- Non-compliance with safety standards.
- Installation not carried out by competent personnel.
- Non-implementation of functional checks.
- Tampering.

Environmental Specification

Environment Type: Indoor

Maximum Altitude: 2000m

Ambient Temperature: -25°C to 40°C (-13°F to 104°F)

Maximum Relative Humidity: 93(+/-3)% @ 40°C

Ingress Protection: IP65

Vibration: Tested in accordance with GS-ET-19, in compliance with EN 60068-2-6

Shock: Tested in accordance with GS-ET-19, in compliance with EN 60068-2-27

Protection Against Environmental Influences

The unit is to be mounted away from the machine, or by the use of anti-vibration mountings, in order to avoid the effects of vibration, shock and bump, and be protected against the ingress of foreign bodies.


















































Use in corrosive environments is not allowed.

Fortress Interlocks Ltd. reserves the right to modify the design at any time and without notice.

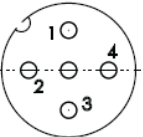
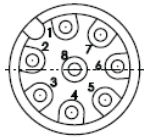

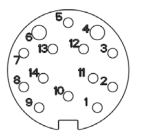
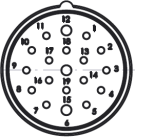
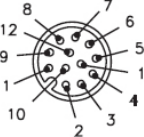






This guide should be retained for future reference.

Operating Instructions: tGard Summary

Table 1. Pin Assignments for Quick Disconnect & Mating Cable Pin Assignments




















Pin Assignment	Pins																					
	Part No.	Wire Colour	TQ1	TEBB4/8	Wire Colour	TQ2	TQ3	TQG*	Wire Colour	TQL	TQM	TQO*	Wire Colour	TQ4	TQ5	TQH*	Wire Colour	TQ7				
	Number of Pins		5			8				12				12				14				
	Connector Size		M12			M12				M12				M23				7/8" UN2				
	# of Safety Circuits		0	-		0	2	2		0	2	2		0	2	2		2				
	# of Control I/O		0	-		5	1	3		9	5	7		9	5	7		7				
1	Key SC = Safety Circuit I/O = Input or Output	Brown 	SC1 in	AS-i +	White 	I/O 0	SC1 in	I/O 1	White 	I/O 0	SC1 in	I/O 5	Brown 	+24V	+24V	+24V	Grey/ Pink 	I/O 3				
2		White 	SC2 in	Aux -	Brown 	+24V	+24V	+24V	Brown 	+24V	+24V	+24V	Brown/ White 	I/O 0	SC1 in	I/O 5	White/ Green 	I/O 2				
3		Blue 	SC1 out	AS-i -	Green 	Earth	Earth	Earth	Green 	Earth	Earth	Earth	Blue 	0V	0V	0V	White/ Yellow 	I/O 1				
4		Black 	SC2 out	Aux +	Yellow 	I/O 1	SC2 in	I/O 2	Yellow 	I/O 1	SC2 in	I/O 6	White 	I/O 1	SC2 in	I/O 6	Brown 	+24V				
5		Grey 	Earth	Earth	Grey 	I/O 2	SC1 out	SC1 out	Grey 	I/O 2	SC1 out	SC1 out	Green 	I/O 2	SC1 out	SC1 out	Brown/ Yellow 	SC 2				
6						Pink 	I/O 3	SC2 out	SC2 out	Pink 	I/O 3	SC2 out	SC2 out	Yellow 	I/O 3	SC2 out	SC2 out	Blue 	0V			
7						Blue 	0V	0V	0V	Blue 	0V	0V	0V	Grey 	I/O 4	I/O 0	I/O 0	Yellow 	I/O 6			
8						Red 	I/O 4	I/O 0	I/O 0	Red 	I/O 4	I/O 0	I/O 0	Pink 	I/O 5	I/O 1	I/O 1	Green 	I/O 5			
9										Orange 	I/O 5	I/O 1	I/O 1	Red 	I/O 6	I/O 2	I/O 2	Pink 	I/O 4			
10										Tan 	I/O 6	I/O 2	I/O 2	Black 	I/O 7	I/O 3	I/O 3	White 	SC1			
11										Black 	I/O 7	I/O 3	I/O 3	Violet 	I/O 8	I/O 4	I/O 4	Red/ Blue 	I/O 0			
12										Violet 	I/O 8	I/O 4	I/O 4	Green/ Yellow 	Earth	Earth	Earth	Brown/ Green 	SC2			
13																					Grey 	SC1
14																					Red 	Earth
15																						
16																						
17																						
18																						
19																						

* New options require an OSSD RF module option.

Part No.	TQ1/TEBB4/8	TQ2/3	TQ4/5	TQ7	TQ8/9	TQL/M
Receptacle						
Pin Heads						

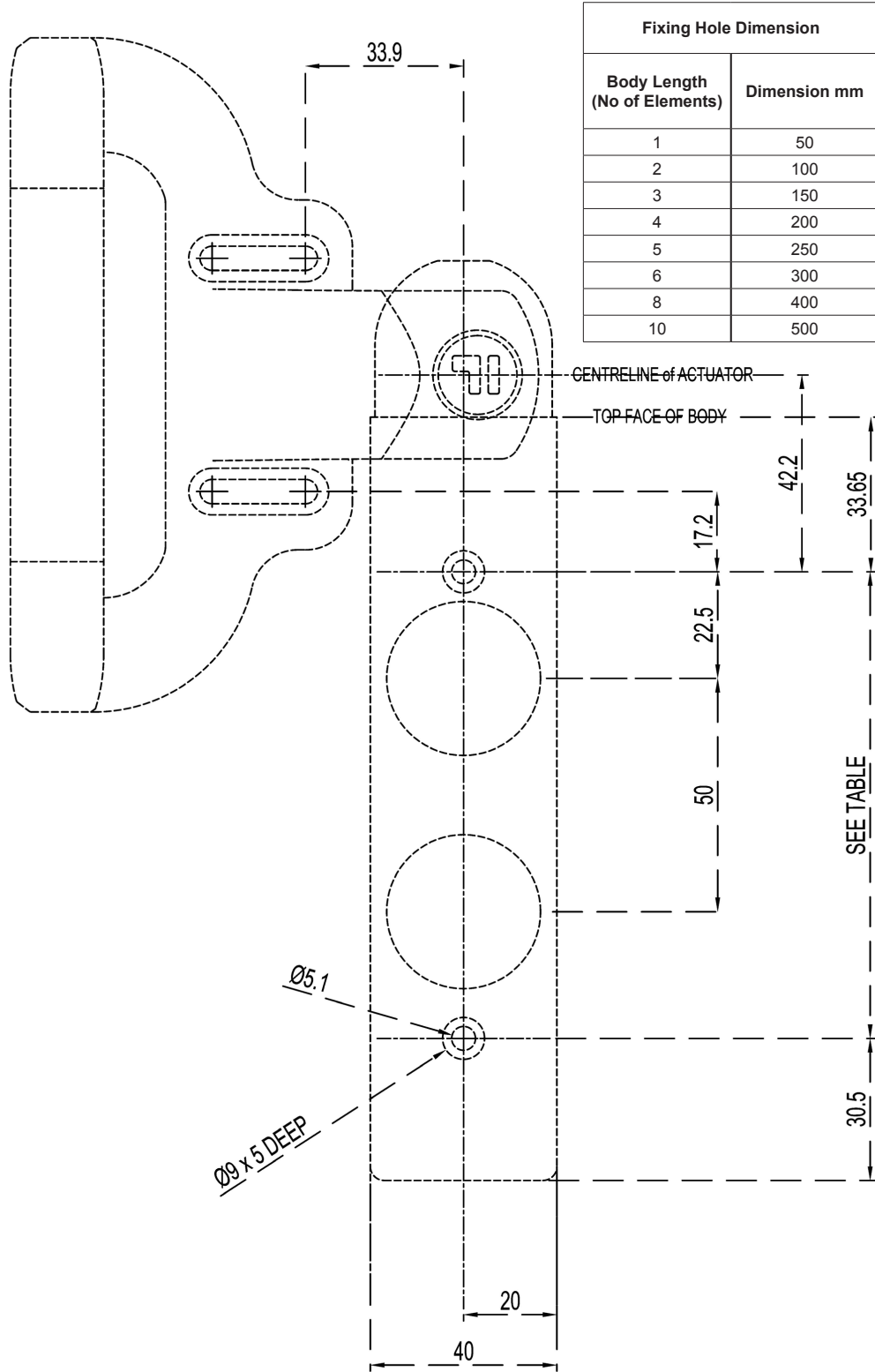
Operating Instructions: tGard Summary

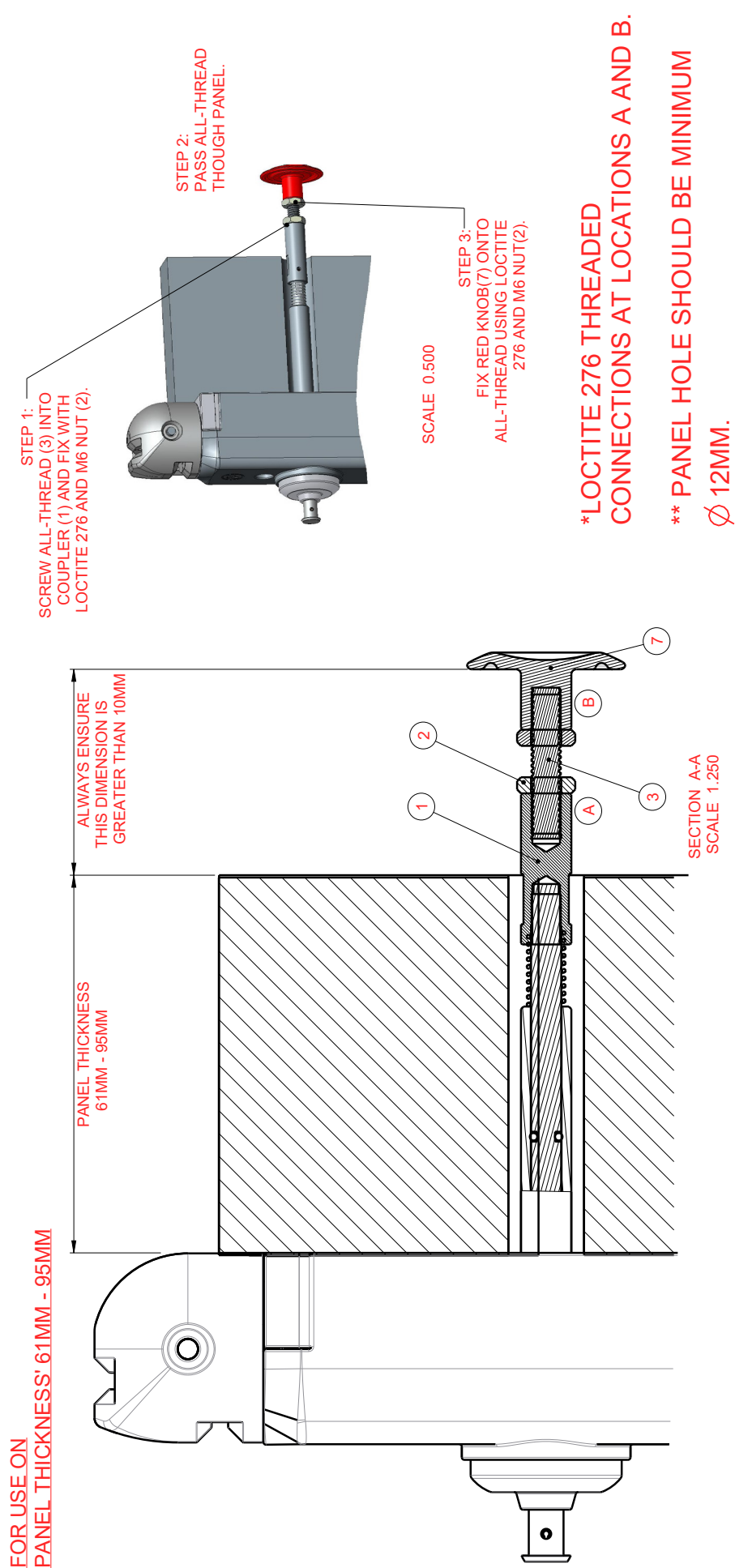
Table 2. Pin Assignments for Quick Disconnect & Mating Cable Pin Assignments

Table 2. Pin Assignments for Quick Disconnect & Mating Cable Pin Assignments													
Pin Assignment	Pins												
	Part No.	Wire Colour	TQ8	TQJ*	TQ9	TQQ*	TW1	TW7*	TW3	TW8*	TW4	TW9*	
	Number of Pins		19		19		12 + Earth		24 + Earth		24 + Earth		
	Connector Size		M23		M23		-		-		-		
	# of Safety Circuits		2	2	4	4	2	2	4	4	6	6	
	# of Control I/O		12	14	8	10	6	8	14	16	10	12	
1	<div>Key</div> <div>SC = Safety Circuit</div> <div>I/O = Input or Output</div>	Violet		SC1 in	I/O 13	SC1 in	I/O 9	+24V	+24V	+24V	+24V	+24V	+24V
2		Red		SC2 in	I/O 14	SC2 in	I/O 10	0V	0V	0V	0V	0V	0V
3		Grey		SC1 out	SC1 out	SC1 out	SC1 out	SC1 in	I/O 6	SC1 in	I/O 14	SC1 in	I/O 10
4		Red/Blue		SC2 out	SC2 out	SC2 out	SC2 out	SC2 in	I/O 7	SC2 in	I/O 15	SC2 in	I/O 11
5		Green		I/O 0	I/O 0	I/O 0	I/O 0	SC1 out	SC1 out	SC1 out	SC1 out	SC1 out	SC1 out
6		Blue		0V	0V	0V	0V	SC2 out	SC2 out	SC2 out	SC2 out	SC2 out	SC2 out
7		Grey/Pink		I/O 1	I/O 1	I/O 1	I/O 1	I/O 0	I/O 0	I/O 0	I/O 0	I/O 0	I/O 0
8		White/Green		I/O 2	I/O 2	I/O 2	I/O 2	I/O 1	I/O 1	I/O 1	I/O 1	I/O 1	I/O 1
9		White/Yellow		I/O 3	I/O 3	I/O 3	I/O 3	I/O 2	I/O 2	I/O 2	I/O 2	I/O 2	I/O 2
10		White/Grey		I/O 4	I/O 4	I/O 4	I/O 4	I/O 3	I/O 3	I/O 3	I/O 3	I/O 3	I/O 3
11		Black		I/O 5	I/O 5	I/O 5	I/O 5	I/O 4	I/O 4	I/O 4	I/O 4	I/O 4	I/O 4
12		Green/Yellow		Earth	Earth	Earth	Earth	I/O 5	I/O 5	I/O 5	I/O 5	I/O 5	I/O 5
13		Yellow/Brown		I/O 6	I/O 6	I/O 6	I/O 6	Earth	Earth	I/O 6	I/O 6	I/O 6	I/O 6
14		Brown/Green		I/O 7	I/O 7	I/O 7	I/O 7			I/O 7	I/O 7	I/O 7	I/O 7
15		White		I/O 8	I/O 8	SC3 in	SC3 in			I/O 8	I/O 8	I/O 8	I/O 8
16		Yellow		I/O 9	I/O 9	SC4 in	SC4 in			I/O 9	I/O 9	I/O 9	I/O 9
17		Pink		I/O 10	I/O 10	SC3 out	SC3 out			I/O 10	I/O 10	SC5 in	SC5 in
18		Grey/Brown		I/O 11	I/O 11	SC4 out	SC4 out			I/O 11	I/O 11	SC6 in	SC6 in
19		Brown		+24V	+24V	+24V	+24V			I/O 12	I/O 12	SC5 out	SC5 out
20										I/O 13	I/O 13	SC6 out	SC6 out
21										SC3 in	SC3 in	SC3 in	SC3 in
22								SC4 in	SC4 in	SC4 in	SC4 in		
23								SC3 out	SC3 out	SC3 out	SC3 out		
24								SC4 out	SC4 out	SC4 out	SC4 out		
25								Earth	Earth	Earth	Earth		

* New options require an OSSD RF module option.

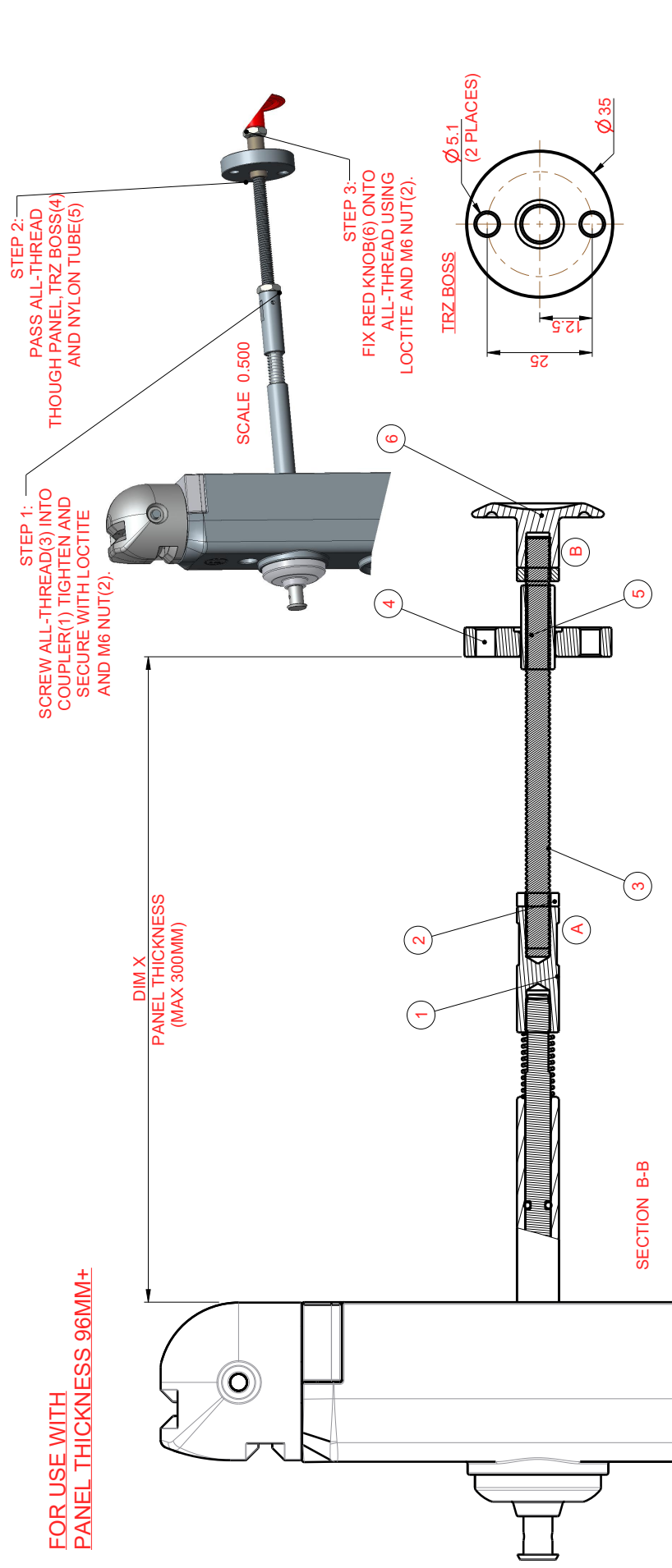
Figure 1: Dimensional Drawing





ITEM	DESCRIPTION	FORTRESS PART NO.	QTY.
7	TGARD PUSH IR RED KNOB	G25-00002	1
3	M6 ALL THREAD	---	1
2	M6 NUT	---	2
1	M6 EXTENSION COUPLER	G05-00003	1

PANEL THICKNESS (MM)	RECOMMENDED ALL-THREAD LENGTH (MM)
61-70	30
71-80	40
81-95	50



*LENGTH OF ALL-THREAD REQUIRED
IS EQUAL TO PANEL THICKNESS
MINUS 50MM.

**LOCTITE THREADED CONNECTIONS
AT LOCATIONS A AND B.

***PANEL HOLE SHOULD BE MINIMUM
Ø 12MM.

6	TGARD PUSH IR RED KNOB	G25-00002	1
5	NYLON RUNNING TUBE	G28-00009	1
4	TGARD TRZ BOSS	G05-00002	1
3	M6 ALL THREAD	---	1
2	M6 NUT	---	2
1	M6 EXTENSION COUPLER	G05-00003	1
ITEM	DESCRIPTION	FORTRESS PART NO.	QTY.