

Safety Switches

Guard Locking Switches

TLS-GD2



Description

The TLS-GD2 is a positive mode, tongue operated guard locking interlock switch that locks a machine guard closed until power is isolated and ensures that it remains isolated while the guard is open. It has three safety (N.C.) contacts and two auxiliary (N.O.) contacts. The TLS-GD2 head has two entry slots and it can be rotated to provide four actuator entry points. A blanking plug is provided to seat the unused slot.

The guard may only be opened when a signal is applied to the TLS-GD2's internal solenoid which releases the lock mechanism. This signal can be via CU1 electronic timer relays or CU2 stopped motion detectors. Therefore the TLS-GD2 is ideal for machines which do not stop immediately or where premature interruption of the machine could cause damage to tooling and components or cause an additional hazard.

The TLS-GD2 is available in three types. The TLS-1 GD2 and TLS-3 GD2 incorporate a power-to-release function. Two manual release points with security screws allow the locked TLS-GD2 to be released in emergencies. An optional lid-mounted key-release style can also be supplied. The TLS-2 GD2 has a power-to-lock function. Each type of switch has five sets of contacts of various forms and are suitable for use with PLCs.

The TLS-1 GD2 and TLS-3 GD2 are both available with escape release options. They are intended for machine guarding with full body access. The switch is installed so that the escape release push button on the rear side is accessible from inside the hazardous area. This allows the intentional unlocking of the TLS-GD2 from inside a hazardous area, providing a means of escape for a person who may become trapped.

A stainless-steel actuator guide is fitted to protect the unit from actuator damage due to poor guard alignment or guard wear.

TLS-GD2 has an ingress protection rating of IP69K making it suitable for harsh washdown applications as found in the food and beverage, pharmaceutical, solar and semiconductor industries.



**IMPORTANT:** With the TLS-2 GD2 "power to lock" style, provisions may be required to ensure that a dangerous situation can not result from open circuit faults or power cuts.

Features

- Power to release or power to lock
- High locking force  $\leq 2000$  N (450 lb)
- Five contacts: 2 N.C. & 1 N.O. for door position monitoring 1 N.C. & 1 N.O. or 2 N.C. for lock monitoring
- Rotatable head: 4 possible key entry slots
- Conforms to EN 1088 & EN 60947-5-1
- Escape Release version available
- IP69K, suitable for high pressure, high temperature washdown

Specifications

Safety Ratings					
Standards	EN954-1, ISO13849-1, IEC/EN60204-1, NFPA79, EN1088, ISO14119, IEC/EN60947-5-1, ANSI B11.19, AS4024.1				
Safety Classification	Cat. 1 device per EN 954-1 dual channel interlocks suitable for Cat. 3 or 4 systems				
Functional Safety Data (related to Safety Contacts) *	B10d: $> 2 \times 10^6$ operations at min. load PFH <sub>D</sub> : $< 3 \times 10^{-7}$ MTTFd: $> 385$ years May be suitable for use in performance levels Ple or Pld systems (according to ISO 13849-1:2006) and for use in SIL2 or SIL3 systems (according to IEC 62061) depending on the architecture and application characteristics				
Certifications	CE Marked for all applicable directives, cULus, TÜV, and CCC				
Outputs					
Safety Contacts *	(TLS-1 & -2) 3 N.C. direct opening action (TLS-3) 4 N.C. direct opening action				
Auxiliary Contacts	(TLS-1 & -2) 2 N.O. (1 solenoid monitoring) (TLS-3 1 N.O.)				
Thermal Current <sub>I<sub>th</sub></sub>	10 A				
Rated Insulation Voltage	(Ui) 500V				
Switching Current @ Voltage, Min.	5 mA @ 5V DC				
Utilization Category					
A600/AC-15	(Ue)	600V	500V	240V	120V
	(Ie)	1.2 A	1.4 A	3.0 A	6.0 A
DC-13	(Ue)	24V			
	(Ie)	2 A			
Solenoid Characteristics					
Locking Type	TLS-1 & -3 Power-to-Release TLS-2 Power-to-Lock				
Holding Force, Max.	2000 N (450 lbf)				
Releasable Load, Max.	100 N (22.5 lbf)				
Power Supply	24V AC/DC or 110V AC or 230V AC (solenoid)				
Solenoid Power	Typically 7 W 100% ED				
Escape Release Button	Force max.: 50 N (11.25 lbs)				
Operating Characteristics					
Break Contact Force, Min.	20 N (4.5 lbf)				
Actuation Speed, Max.	160 mm (6.29 in.)/s				
Actuation Frequency, Max.	1 cycle/s				
Operating Radius, Min	160 mm (6.3 in.) [80 mm (3.15 in.) with flexible actuator]				
Operating Life @ 100 mA load	1,000,000 operations				
Environmental					
Enclosure Type Rating	IP66, IP67 and IP69K				
Operating Temperature [C (F)]	-20...+60° (-4...+140°)				
Physical Characteristics					
Housing Material	UL Approved glass-filled PBT				
Actuator Material	Stainless Steel				
Weight [g (lb)]	400 (0.88)				
Color	Red				

\* Usable for ISO 13849-1:2006 and IEC 62061. Data is based on the B10d value given and:

- Usage rate of 1op/10mins., 24hrs/day, 360 days/year, representing 51840 operations per year
- Mission time/Proof test interval of 38 years

\* The safety contacts are described as normally closed (N.C.) i.e., with the guard closed, actuator in place (where relevant) and the machine able to be started.



**Product Selection**

Type	Contacts		Solenoid		Actuator Type	Cat. No.			
	Safety	Auxiliary	Contacts	Voltage		Conduit		Connector§	
						M20	1/2 inch NPT Adaptor	12-Pin M23	8-Pin Micro (M12)*
TLS-1 GD2 Power to Release	2 N.C.	1 N.O.	1 N.C. & 1 N.O.	24V AC/DC	—	<b>440G-T27121</b>	—	440G-T27233	440G-T2NBBPH-1R
					GD2 Standard	440G-T27251	440G-T27169	440G-T27234	—
					Fully Flex	440G-T27252	<b>440G-T27171</b>	440G-T27235	—
				110V AC/DC	—	440G-T27124	—	—	—
					GD2 Standard	440G-T27253	440G-T27172	—	—
					Fully Flex	440G-T27254	440G-T27174	—	—
				230V AC/DC	—	440G-T27123	—	—	—
TLS-2 GD2 Power to Lock	2 N.C.	1 N.O.	1 N.C. & 1 N.O.	24V AC/DC	—	<b>440G-T27127</b>	—	440G-T27239	440G-T2NBBPH-1L
					GD2 Standard	440G-T27255	440G-T27175	440G-T27240	—
					Fully Flex	440G-T27256	<b>440G-T27177</b>	440G-T27241	—
				110V AC/DC	—	440G-T27132	—	—	—
					GD2 Standard	440G-T27257	440G-T27178	—	—
					Fully Flex	440G-T27258	440G-T27180	—	—
				230V AC/DC	—	440G-T27129	—	—	—
TLS-3 GD2 Power to Release	2 N.C.	1 N.O.	2 N.C.	24V AC/DC	—	<b>440G-T27134</b>	—	440G-T27245	440G-T2NBBPH-2R
					GD2 Standard	440G-T27259	440G-T27181	440G-T27246	—
					Fully Flex	440G-T27260	440G-T27183	440G-T27247	—
				110V AC/DC	—	440G-T27138	—	—	—
					GD2 Standard	440G-T27261	440G-T27184	—	—
					Fully Flex	440G-T27262	440G-T27186	—	—
				230V AC/DC	—	440G-T27136	—	—	—
TLS-1 GD2 Power to Release with Escape Release	2 N.C.	1 N.O.	1 N.C. & 1 N.O.	24V AC/DC	—	440G-T21BNPM-1B	440G-T21BNPT-1B	440G-T21BNPL-1B	440G-T2NBNPH-1B
					GD2 Standard	440G-T21BGPM-1B	440G-T21BGPT-1B	440G-T21BGPL-1B	—
				110V AC/DC	—	440G-T21BNPM-4B	440G-T21BNPT-4B	—	—
					GD2 Standard	440G-T21BGPM-4B	440G-T21BGPT-4B	—	—
TLS-3 GD2 Power to Release with Escape Release	2 N.C.	1 N.O.	2 N.C.	24V AC/DC	—	440G-T21BNPM-2B	440G-T21BNPT-2B	440G-T21BNPL-2B	440G-T2NBNPH-2B
					GD2 Standard	440G-T21BGPM-2B	440G-T21BGPT-2B	440G-T21BGPL-2B	—
				110V AC/DC	—	440G-T21BNPM-5B	440G-T21BNPT-5B	—	—
					GD2 Standard	440G-T21BGPM-5B	440G-T21BGPT-5B	—	—

3-Interlock Switches

§ For connector ratings, see page 3-9.

\* With an 8-pin micro connector, not all contacts are connected. See page 3-45 for wiring details.

	<p><b>WARNING:</b> To monitor <b>independently</b> the safety contact(s) and the solenoid feedback (TLS 1, 2 and 3):</p> <ul style="list-style-type: none"> <li>• The 12-wire cordset 889M-F12AH-* must be used</li> <li>AND</li> <li>• For the TLS1 and TLS2: the jumper between 12 and 41 must be removed</li> <li>• For the TLS3: the jumpers between 12 and 41 and 22 and 51 must be removed</li> </ul>
	<p>Monitoring of safety contact(s) and the solenoid feedback (in series) is available, when jumpers are in place:</p> <p>AND</p> <ul style="list-style-type: none"> <li>• For the TLS1 and TLS2: by using pins 4 and 6 on the 12-pin, M23 receptacle or Pink and Yellow wires on the 12-wire cordset (889M-F12AH-*)</li> <li>• For the TLS3: by using pins 4 and 6 and pins 7 and 8 on the 12-pin, M23 receptacle or Pink and Yellow and White and Red/Blue wires on the 12-wire cordset (889M-F12AH-*)</li> </ul>

\* Replace symbol with 2 (2 m), 5 (5 m), or 10 (10 m) for standard cable lengths.

## Safety Switches

## Guard Locking Switches

## TLS-GD2

## Recommended Logic Interfaces

Description	Safety Outputs	Auxiliary Outputs	Time Delay	Terminals	Reset Type	Power Supply	Cat. Page No.	Cat. No.
<b>Single-Function Safety Relays</b>								
MSR127RP	3 N.O.	1 N.C.	—	Removable (Screw)	Monitored Manual	24V AC/DC	5-26	440R-N23135
MSR127TP	3 N.O.	1 N.C.	—	Removable (Screw)	Auto./Manual	24V AC/DC	5-26	440R-N23132
MSR126T	2 N.O.	None	—	Fixed	Auto./Manual	24V AC/DC	5-24	440R-N23117
MSR30RT	2 N.O. Solid State	1 N.O. Solid State	—	Removable	Auto./Manual or Monitored Manual	24V DC	5-16	440R-N23198
<b>Specialty Safety Relays</b>								
MSR178	3 N.O.	2 N.C.	0.5 s...30 min	Removable	Automatic	24V AC/DC, 115V AC or 230V AC	5-40	440R-M23227
CU2	2 N.O.	1 N.C.	0.1 s...40 min	Fixed	—	24V AC/DC	5-56	440R-S07281
CU3	2 N.O.	1 N.C.	—	Fixed	Automatic/Manual	110V AC	5-64	440R-S35002
<b>Modular Safety Relays</b>								
MSR210P Base 2 N.C. only	2 N.O.	1 N.C. and 2 PNP Solid State	—	Removable	Auto./Manual or Monitored Manual	24V DC from the base unit	5-82	440R-H23176
MSR220P Input Module	—	—	—	Removable	—	24V DC	5-86	440R-H23178
MSR310P Base	MSR300 Series Output Modules	3 PNP Solid State	—	Removable	Auto./Manual Monitored Manual	24V DC	5-102	440R-W23219
MSR320P Input Module	—	2 PNP Solid State	—	Removable	—	24V DC from the base unit	5-106	440R-W23218

**Note:** For additional Safety Relays connectivity, see page 5-12.

For additional Safety I/O and Safety PLC connectivity, see page 5-116.

For application and wiring diagrams, see page 10-1.

## Connection Systems

Description	8-Pin Micro (M12)	12-Wire, 12-Pin M23	9-Wire, 12-Pin M23§
Cordset	889D-F8AB-*	889M-F12AH-*	889M-FX9AE-*
Patchcord	889D-F8ABDM-*	889M-F12AHMU-‡	—

\* Replace symbol with 2 (2 m), 5 (5 m), or 10 (10 m) for standard cable lengths.












§ Replace symbol with 1 (1 m), 2 (2 m), 3 (3 m), 5 (5 m), or 10 (10 m) for standard cable lengths.

‡ Replace symbol with 0M3, (0.3 m), 0M6 (0.6 m), 1 (1 m), 2 (2 m) or 3 (3 m) for standard lengths.

§ The 9-wire cordset can be used only with the TLS3 versions.

**Note:** For additional information, see page 7-1.

**Accessories**

	Description	Dimensions	Cat. No.
	GD2 standard actuator	3-50	<b>440G-A27011</b>
	GD2 flat actuator	3-51	<b>440K-A11112</b>
	Extended flat actuator	3-51	<b>440K-A17116</b>
	Fully flex actuator	3-50	<b>440G-A27143</b>
	Sliding bolt actuator not to be used with the Escape Release	3-55	440G-A27163
	Cover for TLS-1 with external override key for series D and earlier	—	440G-A27140
	Cover for TLS-3 with external override key for series D and earlier		440G-A27142
	Cover for TLS-1 with override key attached for series D and earlier		440G-A27207
	Cover for TLS-3 with override key attached for series D and earlier		440G-A27208
	Cover for TLS-1 with external override key for series E and later		440G-A27371
	Cover for TLS-3 with external override key for series E and later		440G-A27372
	Cover for TLS-1 with override key attached for series E and later		440G-A27373
	Emergency Override Key (See Warning below.)	—	440G-A36026
	Flexible Release—1 m (3.28 ft) Cable	3-54	440G-A27356
	Flexible Release—3 m (9.84 ft) Cable		440G-A27357
	Dust Cover	—	440K-A17183
	Sliding Bolt	3-55	440K-AMDS
	Mounting Plate	3-55	440K-AMDSSMPB

**3-Interlock  
Switches**



**WARNING:** Do not attach the Emergency Override Key to the TLS-GD2 switch.

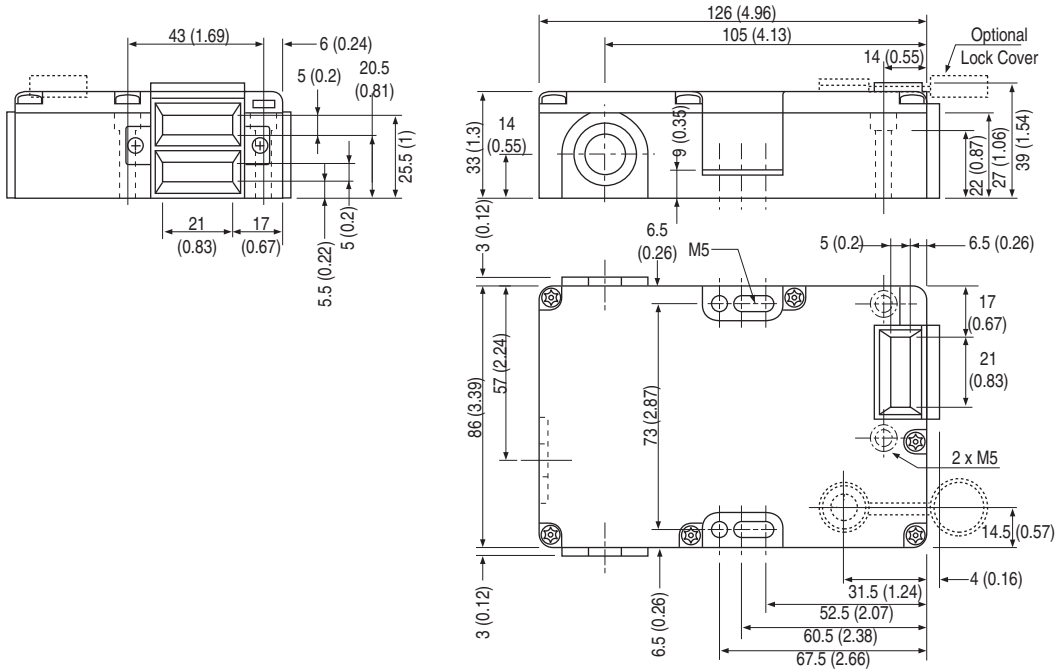
Safety Switches

Guard Locking Switches

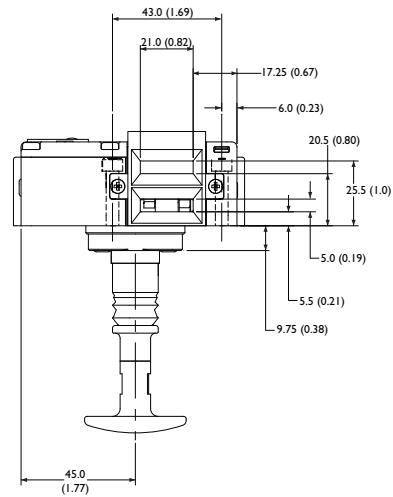
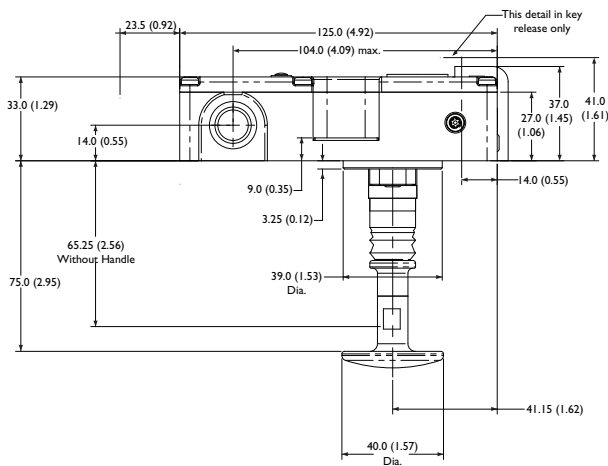
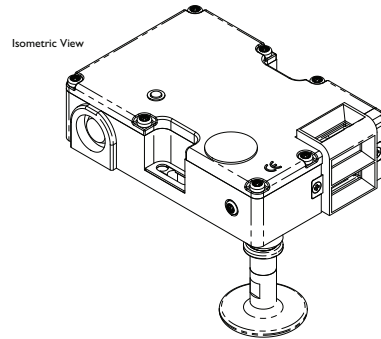
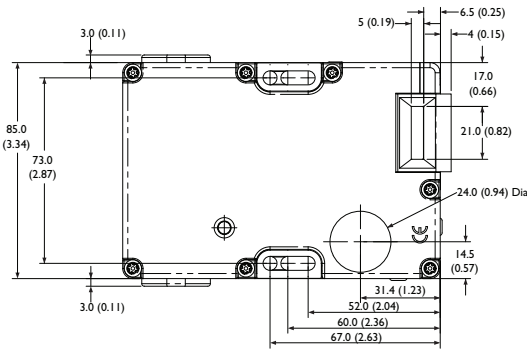
TLS-GD2

Approximate Dimensions

Dimensions are shown in mm (in.). Dimensions are not intended to be used for installation purposes.



TLS-GD2 Escape Release



Note: 2D, 3D and electrical drawings are available on [www.ab.com](http://www.ab.com).

3-Interlock Switches

**Typical Wiring Diagrams**


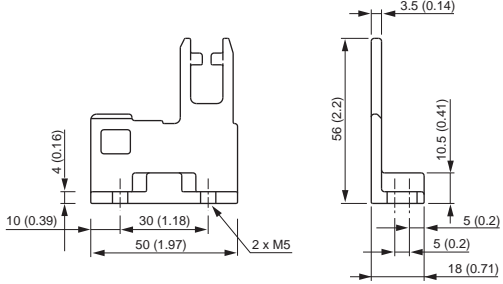

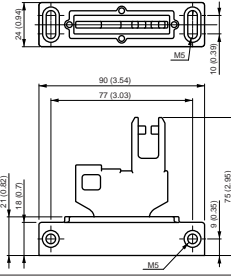

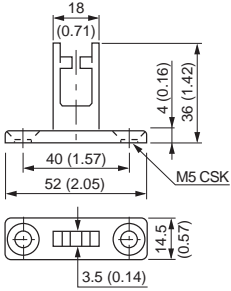

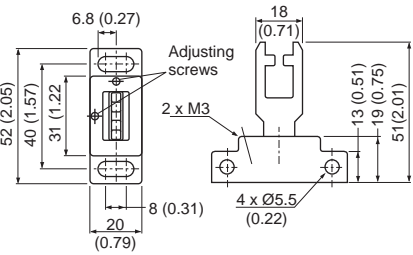

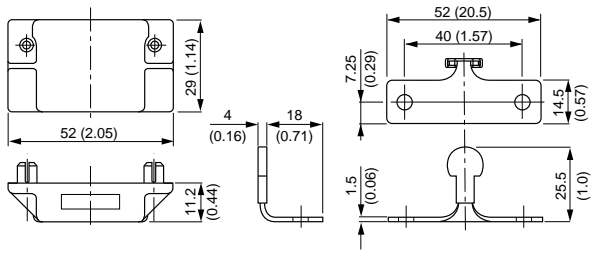
Red Switches	TLS1	TLS2	TLS3																								
Contact Configuration	<p style="text-align: center;">Jumper between 12 &amp; 41</p>		<p style="text-align: center;">Jumper between 12 &amp; 41 and 22 &amp; 51</p>																								
Contact Action	<p style="text-align: center;">□ Open ■ Closed</p>		<p style="text-align: center;">BBM</p>																								
8-Pin Micro (M12)	<p style="text-align: center;">No jumper on 12-41.</p>		<p style="text-align: center;">Jumper on 12-41 and 22-51.</p>																								
12-Pin M23		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>1 and 3</td><td>Solenoid Power</td></tr> <tr><td>4 and 12</td><td>Safety A ❖</td></tr> <tr><td>7 and 8</td><td>Safety B</td></tr> <tr><td>9 and 10</td><td>Aux A</td></tr> <tr><td>6 and 11</td><td>Solenoid A ❖</td></tr> <tr><td>2 and 5</td><td>Solenoid B</td></tr> </table>	1 and 3	Solenoid Power	4 and 12	Safety A ❖	7 and 8	Safety B	9 and 10	Aux A	6 and 11	Solenoid A ❖	2 and 5	Solenoid B	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>1 and 3</td><td>Solenoid Power</td></tr> <tr><td>4 and 12</td><td>Safety A ❖</td></tr> <tr><td>7 and 5</td><td>Safety B ❖</td></tr> <tr><td>9 and 10</td><td>Aux A</td></tr> <tr><td>6 and 11</td><td>Solenoid A ❖</td></tr> <tr><td>2 and 8</td><td>Solenoid B ❖</td></tr> </table>	1 and 3	Solenoid Power	4 and 12	Safety A ❖	7 and 5	Safety B ❖	9 and 10	Aux A	6 and 11	Solenoid A ❖	2 and 8	Solenoid B ❖
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\* Replace symbol with 2 (2 m), 5 (5 m) or 10 (10 m) for standard cable lengths.  
❖ See **WARNING** notes on page 3-41.

**Safety Switches**  
**Accessories**  
**Actuators**

**Accessories for Interlock and Guard Locking Switches**


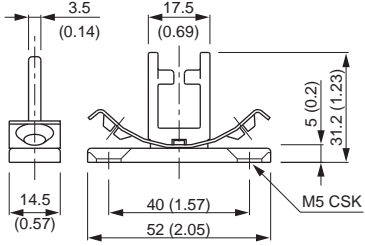

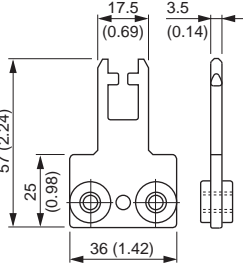

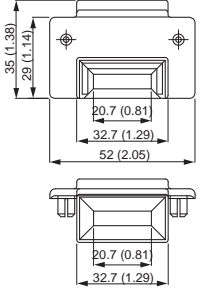

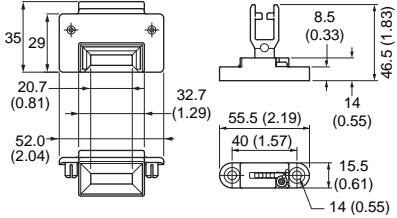

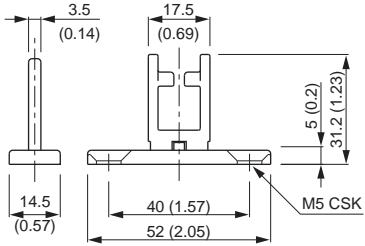

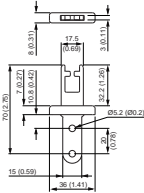
**Actuators\***

Item	Description	Approximate Dimensions [mm (in.)]	Cat. No.
	Standard actuator	 <p>Dimensions: 4 (0.16), 10 (0.39), 30 (1.18), 50 (1.97), 2 x M5, 3.5 (0.14), 56 (2.2), 10.5 (0.41), 5 (0.2), 5 (0.2), 18 (0.71)</p>	440G-A07136
	Fully flex actuator	 <p>Dimensions: 24 (0.94), 90 (3.54), 77 (3.03), 10 (0.39), 21 (0.83), 18 (0.71), 9 (0.35), 75 (2.95), M5</p>	440G-A07269
	GD2 standard actuator	 <p>Dimensions: 18 (0.71), 4 (0.16), 36 (1.42), 40 (1.57), 52 (2.05), M5 CSK, 14.5 (0.57), 3.5 (0.14)</p>	440G-A27011
	Fully flex actuator	 <p>Dimensions: 6.8 (0.27), 18 (0.71), 52 (2.05), 40 (1.57), 31 (1.22), Adjusting screws, 2 x M3, 13 (0.51), 19 (0.75), 51 (2.01), 8 (0.31), 4 x Ø5.5 (0.22), 20 (0.79)</p>	440G-A27143
	Catch and Retainer Kit	 <p>Dimensions: 52 (2.05), 29 (1.14), 4 (0.16), 18 (0.71), 7.25 (0.29), 52 (20.5), 40 (1.57), 14.5 (0.57), 1.5 (0.06), 25.5 (1.0), 11.2 (0.44)</p>	440K-A11094

\* See page 3-8 for Switch Compatibility table.

3-Interlock Switches

Actuators\* (continued)


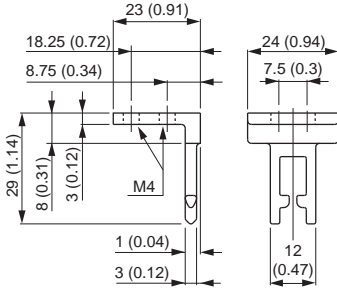

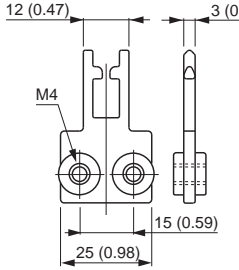

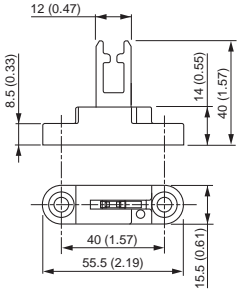

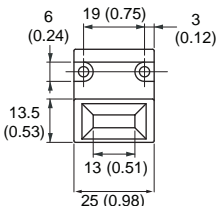
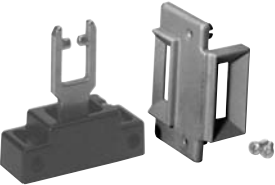
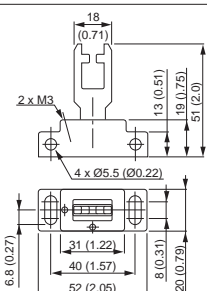
Item	Description	Approximate Dimensions [mm (in.)]	Cat. No.
	Standard actuator		440K-A11095
	GD2 flat actuator		440K-A11112
	Replacement Alignment Guide		440K-A11115
	Alignment guide with semi-flexible actuator		440K-A11144
	Standard actuator		440K-A11238
	Extended flat actuator		440K-A17116

\* See page 3-8 for Switch Compatibility table.



Safety Switches  
**Accessories**  
 Actuators












Actuators\* (continued)

Item	Description	Approximate Dimensions [mm (in.)]	Cat. No.
	90° actuator, not to be used with metal alignment guide		440K-A21006
	Flat actuator, not to be used with metal alignment guide		440K-A21014
	Metal alignment guide with semi-flexible actuator		440K-A21030
	Metal Alignment Guide		440K-A21069
	Alignment guide with fully-flexible actuator		440K-A27010







\* See page 3-8 for Switch Compatibility table.

3-Interlock Switches

Beacons and Bulbs

Item	Description	Cat. No.
	Indicator, M20 Conduit Pilot Light—Amber Lens T-3 1/4 Insert Use T-3 1/4 Bulb (Sold Separately)	440A-A19001
	Indicator, M20 Conduit Pilot Light—Red Lens T-3 1/4 Insert Use T-3 1/4 Bulb (Sold Separately)	440A-A19002
	Indicator, 1/2 inch NPT Conduit Pilot Light—Amber Lens T-3 1/4 Insert Use T-3 1/4 Bulb (Sold Separately)	440A-A19005
	Indicator, 1/2 inch NPT Conduit Pilot Light—Red Lens T-3 1/4 Insert Use T-3 1/4 Bulb (Sold Separately)	440A-A19007
	Bulb, 24V for Conduit Pilot Light 2.8W T-3 1/4 Bulb, Miniature Screw Base	440A-A09056
	Bulb, 110V for Conduit Pilot Light 2.6W T-3 1/4 Bulb, Miniature Screw Base	440A-A09055
	Bulb, 240V for Conduit Pilot Light 0.75W T-3 1/4 Bulb, Miniature Screw Base	440A-A09054
	Red LED Bulb, 24V AC/DC for Conduit Pilot Light Bayonet Style Insert	800T-N319R
	Amber LED Bulb, 24V AC/DC for Conduit Pilot Light Bayonet Style Insert	800T-N319A
	Red LED Bulb, 120V AC for Conduit Pilot Light Bayonet Style Insert	800T-N320R
	Amber LED Bulb, 120V AC for Conduit Pilot Light Bayonet Style Insert	800T-N320A

Conduit Accessories















Item	Description	Cat. No.
	Blanking plug, M20 conduit	440A-A07265
	Cable Grip, M16 Conduit, Accommodates Cable Diameter 4...7 mm (0.27...0.16 in.)	440A-A09004
	Cable grip, M20 conduit, accommodates cable diameter 7...10.5 mm (0.27...0.41 in.)	440A-A09028
	Adaptor, conduit, M20 to 1/2 inch NPT, plastic	440A-A09042
	Adaptor, Conduit, 1/2 inch NPT to M16, Brass	440A-A09093
	Adaptor, Conduit, M16 to 1/2 inch NPT, Brass	440A-A09094

Safety Switches





Accessories

Replacement and Dust Covers, Emergency Override, and Flex Release


Replacement Covers

Item	Description	Cat. No.
	Elf™	440A-A33085
	Cadet™	440A-A21115
	Trojan T15	440A-A11499
	Trojan 5 Standard Models Only	440A-A11495
	Trojan T5 GD2	440A-A11496
	Trojan T6 Standard Models Only	440A-A11497
	Trojan T6 GD2	440A-A11498
	440G-MT No LED, No Override	440G-MT47120
	440G-MT LED and Override	440G-MT47123
	Cover for TLS-1 with external override key for series D and earlier	440G-A27140
	Cover for TLS-3 with external override key for series D and earlier	440G-A27142
	Cover for TLS-1 with override key attached for series D and earlier	440G-A27207
	Cover for TLS-3 with override key attached for series D and earlier	440G-A27208
	Atlas Replacement End Cap	440G-A07180

Dust Covers

Item	Applicable Switch	Cat. No.
	Elf Cadet	440K-A17182
	Trojan T15, T5, and T6 All Models MT G2 440G-MT	440K-A17180
	TLS-GD2	440K-A17183
	Atlas 5	440K-A17181


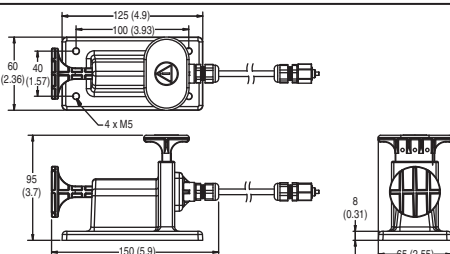
Emergency Override

Item	Description	Cat. No.
	TLS-GD2/440G-MT Solenoid Emergency Override (See Warning below.)	440G-A36026





**WARNING:** Do not attach the Emergency Override Key to the TLS-GD2/440G-MT switch.


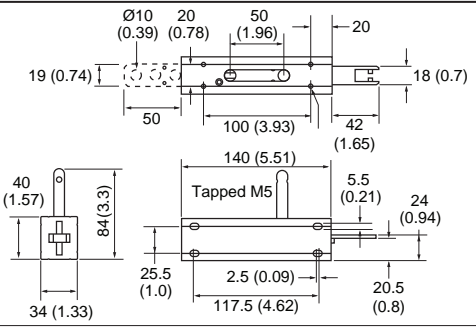

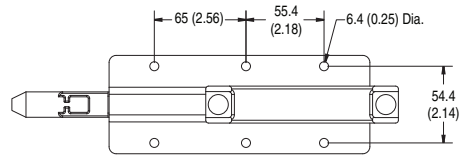
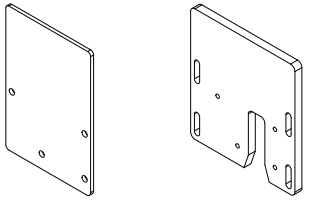
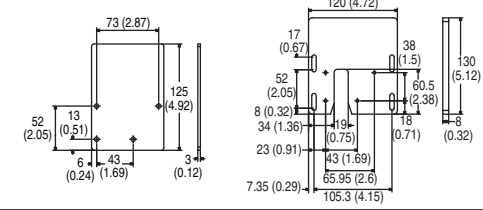
Flex Release

Item	Description	Approximate Dimensions [mm (in.)]	Cat. No.
	Flexible Release—1 m (3.28 ft) Cable		440G-A27356
	Flexible Release—3 m (9.84 ft) Cable		440G-A27357

**Tools**

Item	Description	Cat. No.
	Security Bit	440A-A09015
	Screwdriver Including Security Bit	440A-A09018

**Door Handles**

Item	Description	Dimensions [mm (in.)]	Cat. No.
	Sliding bolt actuator		440G-A27163
	Sliding Bolt		440K-AMDS
	Sliding Bolt Mounting Plate for TLS-GD2		440K-AMDSSMPB

**3-Interlock Switches**