Tongue Switches

Cadet™ 3

Description

The Cadet 3 is a tongue-operated (or key-operated) safety interlock switch designed to fit at the leading edge of sliding, hinged or lift-off guards. With its dual entry slots and rotatable head, the versatile Cadet 3 can offer up to eight different actuator entry options. The unique compact housing (90.5 x 31 x 30.4 mm (3.56 x 1.22 x 1.19 in.)) has industry standard DIN 50047 fixing centers for ease of mounting.

Operation of the switch is achieved through the insertion of a specially-profiled stainless-steel key that is permanently mounted to the guard door. A semi-flexible key allows the Cadet 3 to be used on small-radii doors (60 mm or 2.36 in.).

Available with a variety of contact configurations, the Cadet 3 is sealed to IP67. A blanking plug is supplied for the unused key entry.

Features

- Compact size
- Ideal for small, lightweight guards
- Contacts, 2 N.C. and 1 N.O. or 3 N.C.
- Sealed to IP67
- Eight possible actuator entry points, easy to install
- Industry standard fixing centres to DIN 50047
- GD2 style available for demanding applications

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			
Certifications		CE Marked for all applicable directives, cULus, TÜV, and CCC			
Outputs					
Safety Contacts ❄ Direct Opening Action		2 N.C.		3 N.C.	
Auxiliary Contacts		1 N.O.		None	
Thermal Current I_{th}		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			
Operating Characteristics					
Break Contact Force, Min.		15 N (3.37 lbf)			
Actuation Speed, Max.		160 mm (6.29 in.)/s			
Actuation Frequency, Max.		2 cycles/s			
Operating Radius, Min		150 mm (5.90 in.) [60 mm (2.36 in.) with GD2 kit]			
Operating Life @ 100 mA load		1 x 10^6 operations			
Environmental					
Enclosure Type Rating		IP67			
Operating Temperature [C (F)]		-20…+ 80° (-4…+176°)			
Physical Characteristics					
Housing Material		UL Approved glass-filled PBT			
Actuator Material		Stainless Steel			
Weight [g (lb)]		80 (0.176)			
Color		Red			

∗ Usable for ISO 13849-1:2006 and IEC 62061. Data other than B10d is based on:
- Usage rate of 1op/10 mins., 24 hrs/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

Contact			Actuator Type	Cat. No.			
				M16 Conduit		Connector§	
Safety	Auxiliary	Action		M16	1/2 inch NPT Adaptor	Connect to Distribution Box 6-Pin Micro (M12)	Connect to ArmorBlock Guard I/O 5-Pin Micro (M12)♣
3 N.C.	—	—	Flat	440K-C21096	440K-C21048	440K-C21090	440K-C2NNFPS
			90°	440K-C21097	440K-C21057	440K-C21091	—
			GD2 Metal alignment guide w/semi-flex actuator	—	440K-C21062	440K-C21092	440K-C2NNAPS
			—	440K-C21070	—	—	—
2 N.C.	1 N.O.	BBM	Flat	440K-C21098	440K-C21050	440K-C21054	—
			90°	**440K-C21061**	440K-C21058	440K-C21067	—
			GD2 Metal alignment guide w/semi-flex actuator	—	**440K-C21074**	**440K-C21088**	—
			—	440K-C21055	—	—	—
		MBB	Flat	440K-C21052	440K-C21093	440K-C21060	—
			90°	440K-C21065	440K-C21094	440K-C21068	—
			GD2 Metal alignment guide w/semi-flex actuator	—	440K-C21095	440K-C21089	—
			—	440K-C21080	—	—	—

§ For connector ratings see page 3-9.
§ With a 5-pin micro (M12) connector, not all contacts are connected. See *Typical Wiring Diagram* on page 3-17 for wiring details.

Recommended Logic Interfaces

Description	Safety Outputs	Auxiliary Outputs	Terminals	Reset Type	Power Supply	Cat. Page No.	Cat. No.
Single-Function Safety Relays							
MSR127RP	3 N.O.	1 N.C.	Removable (Screw)	Monitored Manual	24V AC/DC	5-24	440R-N23135
MSR127TP	3 N.O.	1 N.C.	Removable (Screw)	Auto./Manual	24V AC/DC	5-24	440R-N23132
MSR126T	2 N.O.	None	Fixed	Auto./Manual	24V AC/DC	5-22	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
Modular Safety Relays							
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	5-74	440R-H23176
MSR220P Input Module	—	—	Removable	—	24V DC	5-78	440R-H23178
MSR310P Base	MSR300 Series Output Modules	3 PNP Solid State	Removable	Auto./Manual Monitored Manual	24V DC	5-94	440R-W23219
MSR320P Input Module	—	2 PNP Solid State	Removable	—	24V DC from the base unit	5-98	440R-W23218

Note: For additional Safety Relays connectivity, see the Safety Relays section (page 5-8) of this catalog.
For additional Safety I/O and Safety PLC connectivity, see the Programmable Safety System section (page 5-107) of this catalog.
For application and wiring diagrams, see the Safety Applications section (page 10-1) of this catalog.

Connection Systems

Description	6-Pin Micro (M12)	5-Pin Micro (M12)
Cordset	889R-F6ECA-✶	—
Patchcord	889R-F6ECRM-❄	889R-F5ECRM-✶
Distribution Box	898R-P68MT-A5	—
Shorting Plug	898R-P61MU-RM	—
T-Port	NA	—

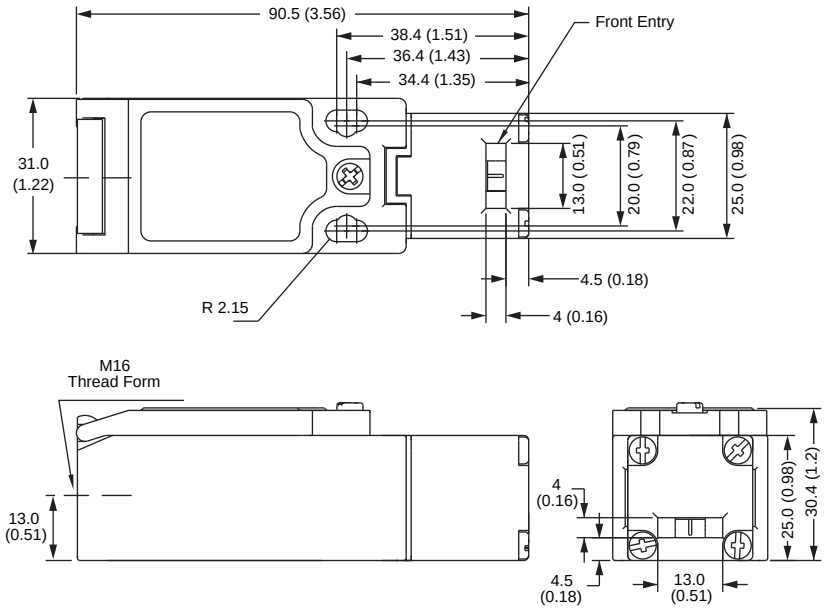
✶ Replace symbol with 2 (2 m), 5 (5 m), or 10 (10 m) for standard cable lengths.
❄ Replace symbol with 1 (1 m), 2 (2 m), 3 (3 m), 5 (5 m), or 10 (10 m) for standard cable lengths.
Note: For additional information, see the Safety Connection System section (page 7-1) of this catalog.

Accessories

Description		Dimensions	Cat. No.
	Flat actuator, not to be used with metal alignment guide	3-52	**440K-A21014**
	90° actuator, not to be used with metal alignment guide		**440K-A21006**
	Metal alignment guide with semi-flexible actuator		440K-A21030
	Replacement Cover	—	440A-A21115
	Dust Cover	—	440K-A17182

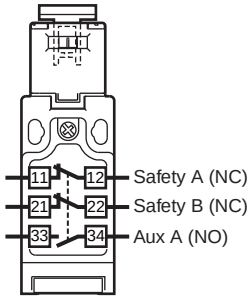
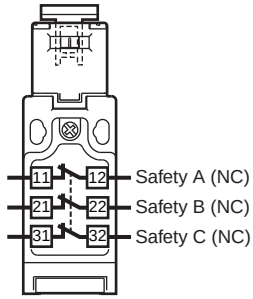
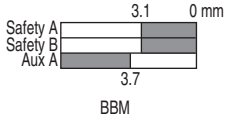
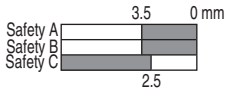
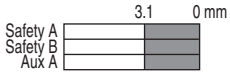
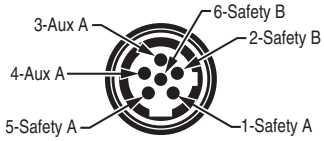
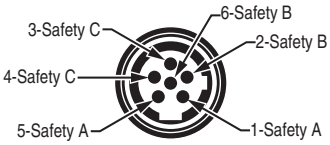
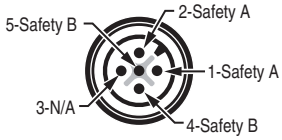
Approximate Dimensions

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



***Note**: 2D, 3D and electrical drawings are available on www.ab.com.*

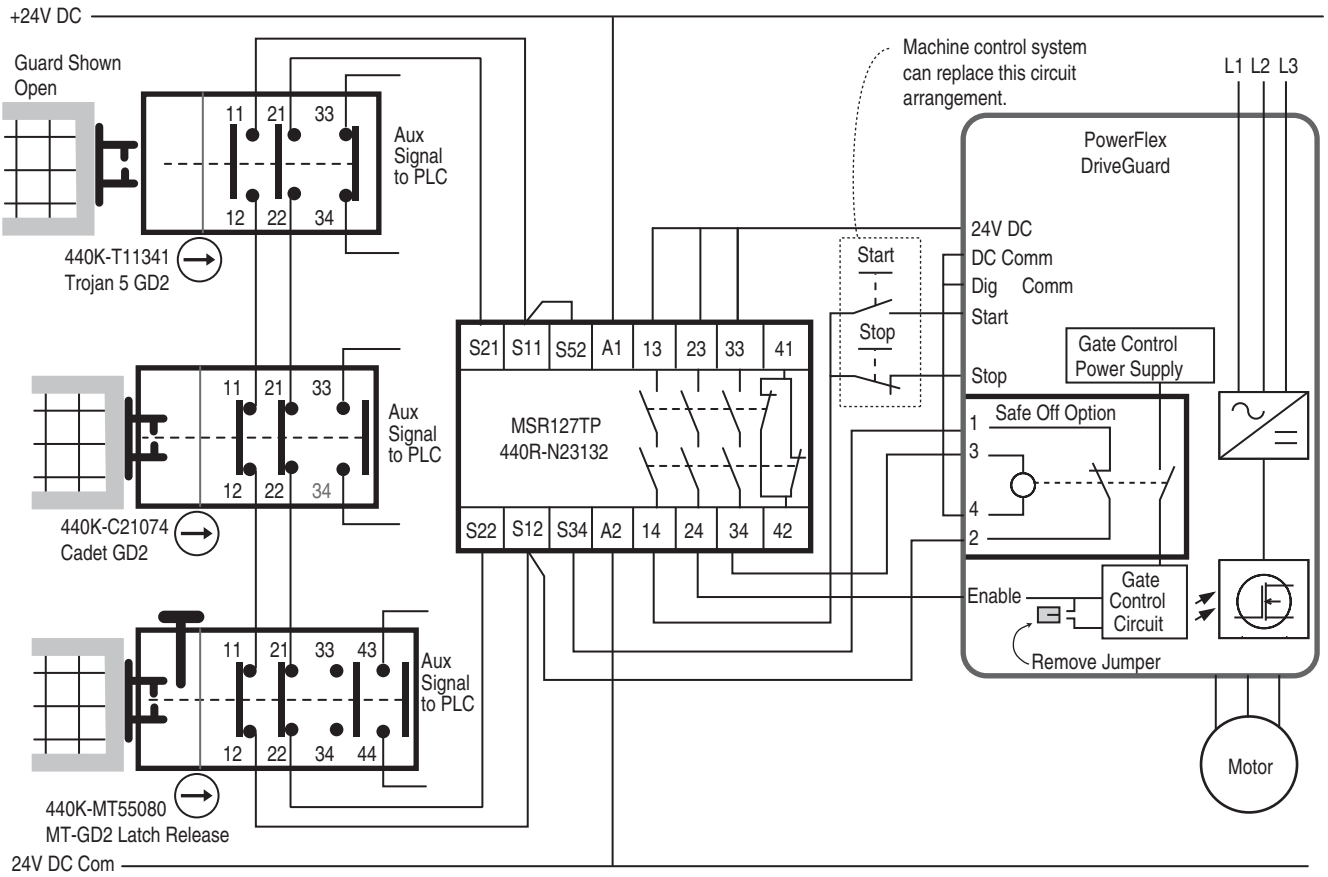
Typical Wiring Diagrams

Description		2 N.C. & 1 N.O.	3 N.C.
Contact Configuration			
Contact Action □Open ■Closed		 BBM  MBB	
6-Pin Micro (M12)			
5-Pin Micro (M12)		—	
Cordset 889R-F6ECA-∗	Red/White	Safety A	Safety A
	Red/Black		
	Red	Safety B	Safety B
	Red/Blue		
	Green	Aux A	Safety C
	Red/Yellow		

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

Drive—Multiple Gate Access

Trojan 5 GD2, Cadet GD2, MT-GD2, MSR127, PowerFlex DriveGuard



Circuit Status

One of the gates is open. The safety outputs of the MSR127 are de-energized. The PowerFlex with DriveGuard is de-energized and not enabled. The motor is off.

Operating Principle

STARTING: When the last gate closes, the safety outputs of the MSR127 close and apply power to the drive enable circuit, Safe-Off option, Start and Stop buttons. Pressing the Start and Stop buttons turns the motor on and off. The motor is controlled by parameters set within the PowerFlex drive.
STOPPING: Opening any of the guard doors causes the MSR127 safety outputs to de-energize. This removes power to the PowerFlex enable, Safe-Off, Start, and Stop circuits. The motor performs a coast to stop.

Fault Detection

Upon power-up the PowerFlex drive and MSR127 perform internal checks. The MSR127 then looks for dual signals from the gate interlocks. With the gates closed, the MSR127 checks the wiring of the drive Safe-Off option. If closed, then the MSR127 energizes its outputs and the motor can be started. A single open circuit fault at the gate interlocks will be detected immediately, and the motor will coast to a stop. A crossfault (channel 1 to channel 2) at the gate interlocks will be detected immediately. A short across one gate interlock contact will be detected when an attempt to re-start is made. This type of short can be masked by opening and closing another gate interlock and may result in a loss of the safety function due to an accumulation of contact shorts. The MSR127 is rated for Category 4 and will not lose the safety function due to an accumulation of faults. The PowerFlex 70 DriveGuard is rated at Category 3, as it will perform the safety function in the presence of a single internal fault.

Ratings

The safety function intiated by gate interlocks meets the safety performance requirements of SIL CL 2 per IEC 62061:2005 and has a Category 3 structure that can be used in systems requiring Performance Levels up to PLd per ISO 13849-1:2006. This circuit executes a Category 0 stop.