Safety Controllers & Modules

SC22-3 Safety Controller page 76

- Configurable monitoring of multiple safety devices including E-stop buttons, interlocking switches, safety light screens, two-hand controls, muting, safety mats and rope pull switches
- 3 pairs of independent solid-state safety outputs
- Configurable auxiliary outputs for tracking inputs, outputs, lockout, I/O status and other functions
- Reduces the complexity of interfacing multiple safety functions and devices
- Front panel control for configuration and real-time system status without a PC
- Configure offline using PC; replicate configuration to memory card, email or export as PDF or DXF files
- Models for direct connection to EtherNet/IP and Modbus TCP industrial networks
- Meets Safety Integrity Level (SIL) 3 per IEC 61508, SIL CL3 per IEC 62061 and Category 4 Performance Level (PL e) per ISO 13849-1

PICO-GUARD™ page 80

- Features non-contact fiber optic technology for personnel safety and equipment protection
- Monitors multiple safety points
- Replaces mechanical safety interlock switches
- Eliminates electrical wiring to switchpoints

E-Stop & Guard page 81

- Monitors contact failure or wiring fault
- Self-monitors to eliminate risk if module fails
- Installs easily

Universal page 89

- Monitors contact failure or wiring fault
- Used with one or two solid-state PNP safety or non-safety devices

Safety Mat page 91

- Monitors a single mat or a series of connected mats
- Used with any standard 4-wire safety mat or edge triggered by a short in a contact plate or strip

Muting page 94

- Suspends safeguarding during hazard-free times in the machine's cycle
- Allows material to move into or from the process, without tripping the primary safeguard
- Monitors two or four hard-relay contact safety devices

Safe Speed page 103

- Monitors two sensors with PNP outputs for rotation and linear movements
- Allows safety switches to release and safety gates to be opened when the speed drops below the dangerous level

Extension page 105

- Provides additional safety outputs for a primary safety device
- Offers two output channel options, depending on model: one channel, or one or two channel

Interface page 107

- Increases the switching current capacity of low voltage primary safety devices to 6 amps
- Serves as a relay for primary safety devices with solid-state or hard contact outputs and external device monitoring

Model			Catalog Page	Safety Category	Functional Stop Category	Input Device	Supply Voltage	
Safety Controller	SC22-3-...		76	2, 3 or 4	0 & 1	Mechanical & Solid Sate	24V dc	
	SC22-3E-...							
Fiber Optic	SFCDT-4A1		80	4	0	Optical, Mechanical & Solid State	24V dc	
	SFCDT-4A1C							
	SFCDT-4A1CM1							
E-Stop & Guard Safety Modules	GM-FA-10J		82	2, 3 or 4	0	Magnetic & Mechanical	24V ac/dc	
	ES-FA-9AA		82	2, 3 or 4	0	Mechanical	24V ac/dc	
	ES-FA-11AA							
	ES-UA-5A		82	2, 3 or 4	0	Mechanical	115V ac & 12-24V dc	
	ES-VA-5A						230V ac & 12-24V dc	
	ES-TN-1H1 to ES-TN-1H12		82	2, 3 or 4	0 & 1	Mechanical	24 V dc	
	ES-TN-14H5		82	2, 3 or 4	0 & 1	Mechanical	24V dc	
	ES-TN-14H6							
	ES-FA-6G		82	2	0	Mechanical	24V ac/dc	
UM Modules	UM-FA-9A		89	2, 3 or 4	0	Mechanical & Solid Sate	24V ac/dc	
	UM-FA-11A							
Safety Mat Modules	SM-GA-5A		91	3 with mat	0	Safety Mat & Safety Edge (4-wire)	115V ac & 24V dc	
	SM-HA-5A						230V ac & 24V dc	
Muting Modules	MM-TA-12B		94	4	0	Mechanical & Solid State	24V dc	
	MM2-TA-12B			2				
	MMD-TA-12B		94	2, 3 or 4	0	Mechanical & Solid State	24V dc	
	MMD-TA-11B							
Safe Speed Modules	SSM-FM-11A10		103	3	0	Solid Sate	24V ac/dc	
	SSM-FM-11A20							
Extension Modules	EM-T-7A		105	2 or 4	—	Safety Output	24V dc	
	EM-F-7G						24V ac/dc	
	EM-FD-7G2							
	EM-FD-7G3							
	EM-FD-7G4							
Interface Modules	IM-T-9A		107	2 or 4	—	Safety Output	24V dc	
	IM-T-11A							

NC = Normally Closed Relay, NO = Normally Open Relay

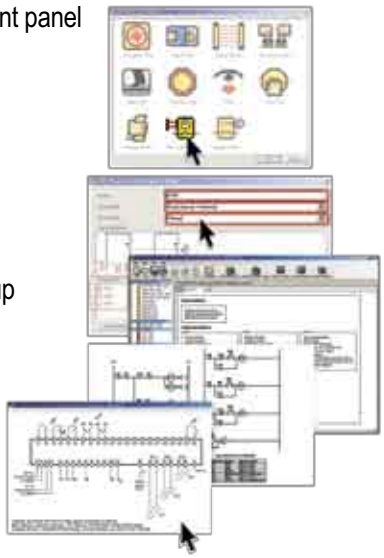
	Inputs	Safety Outputs	Output Rating	Auxiliary Outputs	Output Response Time	Delay	Housing Width
	22 Safety & Non-Safety	**6 PNP (3 pair)**	0.75 amps ea.	10 Discrete Status Outputs	10 ms	ON delay: 5 min max OFF delay: 5 min max	131 mm
			0.5 amps ea.	10 Discrete Status Outputs & EtherNet/Modbus TCP			
	4 Optical Channels & 2 NC USSI (dual) x2	**2 PNP OSSD**	0.5 amps	3 Solid-State (Aux., Fault, Weak)	13 ms (optical channels) 7 ms (USSIs)	—	132 mm
				7 Solid-State (Aux., Fault, Weak & Ch 1-4)			
	4 Optical Channels, 1 Mute Device, 1 Mute Enable			7 PNP (Aux./Mute lamp, Fault, Weak & Ch 1-4)	13 ms (optical channels)		
	1 NC & 1 NO (single or dual)	**2 NO**	6 amps	—	35 ms	—	22.5 mm
	1 NC (single) or 2 NC (dual)	**3 NO**	6 amps	—	25 ms	—	22.5 mm
		2 NO	7 amps	1 NC			
	1 NC (single) or 2 NC (dual)	**4 NO**	6 amps	1 NC & 2 PNP	25 ms	—	45 mm
	1 NC (single) or 2 NC (dual)	**2 NO & 2 NO w/delay**	4 amps	1 NC (delayed) & 1 NC (immediate)	50 ms	0 - 200 sec., depending on model	45 mm
	1 NC (single) or 2 NC (dual)	**4 NO & 4 NO w/delay**	4 amps	1 NC (delayed) & 1 NC (immediate)	50 ms	0 - 20 sec.	67.5 mm
						0-200 sec.	
	1 NC (single)	**3 NO**	6 amps	1 NC	35 ms	—	22.5 mm
	1 NC (single) or 2 NC (dual)	**3 NO**	6 amps	—	25 ms	—	22.5 mm
		2 NO		1 NC			
	1 (or multiple in series) 4-wire Safety Mat	**4 NO**	6 amps	1 NC & 2 PNP	50 ms	—	45 mm
	2 NC Muteable (dual) & 2 NC USSI (dual)	**2 PNP OSSD**	0.5 amps	1 PNP	10 ms	—	60 mm
							60 mm
	2 NC Muteable (dual) & 2 NC SSI (dual)	**2 PNP OSSD**	0.5 amps	1 PNP	10 ms	—	67.5 mm
		2 NO	6 amps	1 NC	20 ms		
	2 PNP	**2 NO**	5 amps	1 NC	700 ms	—	45 mm
					350 ms		
	1 NC (single) or 2 NC (dual)	**4 NO**	6 amps	—	20 ms	—	22.5 mm
	1 NC (single)				35 ms	—	22.5 mm
		4 NO w/delay			30 ms	0.5 sec.	
						1.0 sec.	
						2.0 sec.	
	1 NC (dual)	**3 NO**	6 amps	—	20 ms	—	22.5 mm
		2 NO		1 NC			

SC22-3
Safety Controller

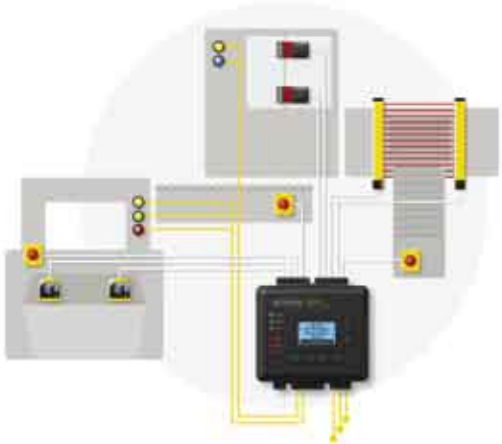
- Totally configurable and flexible safety controller that can easily replace multiple dedicated safety modules.
- Controller monitors up to 22 inputs for proper operations.
- Each input can be configured for Control Reliability for Category 2, 3 or 4 safety circuit performance per OSHA/ANSI or ISO 13849-1, or for a non-safety input.
- Input terminals can monitor both contact-based or PNP solid-state outputs.
- 3 pairs of solid-state safety outputs
- Safety outputs can be used with selectable one- or two-channel external device monitoring.
- 10 configurable auxiliary status outputs track inputs, outputs, lockout, I/O status and other functions.
- SC22-3E models provide diagnostic information using EtherNet/IP or Modbus TCP.
- Configuration is extremely intuitive with the built-in front panel LCD display or using a PC Interface.
- Controller is designed to meet stringent standards including Safety Integrity Level (SIL) 3 per IEC 61508, SIL CL 3 per IEC 62061 and Category 4 Performance Level (PL e) per EN ISO 13849-1.

Intuitive free software for point-and-click configuration

1. Select the type of safety input device
2. Map functions and properties from a pull down list
3. Wiring and ladder logic diagrams autopopulate along with configuration summary
   - View and track status using front panel display or PC "Live Display"
   - Includes fault history with time/date stamp
   - Use INFO button to link to software and manual for quick reference to devices and safety category 2, 3 or 4 hookup



22 input terminals for monitoring safety and non-safety devices



Versatile input circuitry accommodates a wide range of inputs from Banner devices or any other manufacturer, including:

- E-stop Buttons
- Safety Light Screens
- Safety Mats and Edges
- Muting Sensors
- Interlocking Switches
- Two-Hand Controls
- Rope Pulls
- Enabling Devices
- Bypass Switches
- Laser Scanners

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SC22-3 Safety Controllers

- 24V dc supply voltage
- 3 redundant PNP safety outputs
- Auto and manual reset
- Output delay options (ON or OFF)
- EtherNet/IP and Modbus TCP connectivity
- 10 status outputs
- LCD display and LED status indicators
- Toggle switches for onboard interface
- External memory card
- Pluggable terminal strips

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SC22-3 Safety Controller, 24V dc

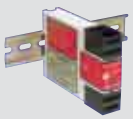
Model	Terminal Type	Safety Outputs	USB Cable	Output Rating	Aux. Outputs	XM Card	XM Programming Tool	Communication Protocol	Data Sheet
SC22-3-SU1	Screw	6 PNP (3 pairs)	1.8 m	0.75 amps each output	10 status (I/O, mute, lockout, fault and reset)	Yes	Yes	—	133487
SC22-3-CU1	Clamp								
SC22-3-S	Screw		—				—	—	
SC22-3-C	Clamp								
SC22-3E-SU1	Screw		1.8 m	0.5 amps each output			Yes	EtherNet/IP & Modbus TCP	133487
SC22-3E-CU1	Clamp								
SC22-3E-S	Screw		—				—	EtherNet/IP & Modbus TCP	
SC22-3E-C	Clamp								

SC22-3 Interface Modules

Model	Description	Supply Voltage	Inputs (Safety Controller Outputs)	Safety Outputs	Output Rating	EDM Contacts	Data Sheet
SC-IM9A	For use with 1-dual channel SC22-3 safety output	24V dc (Controller supplied)	2 (SO1)	3 NO	10 amps	1 NC pair per output	131845
SC-IM9B	For use with 2-dual channel SC22-3 safety outputs		4 (SO1 and SO2)	Total of 6 (3 NO per output)			
SC-IM9C	For use with 3-dual channel SC22-3 safety outputs		6 (SO1, SO2 and SO3)	Total of 9 (3 NO per output)			

NOTE: External device monitoring (EDM) is required to be wired separately to the NC contacts to comply with ISO 13849-1 categories and ANSI/OSHA control reliability.

Additional Interfacing Products

Models			Description	Product Information	Data Sheet
Interface Modules & Controllers		**IM-T-9A** (3 NO) **IM-T-11A** (2 NO/1 NC)	• Interface modules provide two or three normally open force-guided relay outputs rated at 6 A. • Convenient plug-in terminal blocks on a 22.5 mm DIN-rail mountable housing are included.	Page 107	62822
Mechanically Linked Contactors		**11-BG00-31-D-024** **BF1801L-024**	• Contactors add 10 or 18 amp current carrying capability to any safety system. • Suppressors extend the life of an actuating device that uses a contactor. • Modular design simplifies assembly and installation.	Page 191	111881

NC = Normally closed, NO = Normally open

Accessories SC22-3 Safety Controllers

Cordsets

Length	Model	
	Shielded	Cat5e Crossover
2.1 m	**STP07**	**STPX07**
7.6 m	**STP25**	**STPX25**
15.5 m	**STP50**	**STPX50**
23 m	**STP75**	**STPX75**

Miscellaneous

Model	Description
SC-SC22-3	SC22-3 replacement controller (without terminals)
SC-SC22-3E	SC22-3E replacement controller (without terminals)
SC-XM1	External memory card (XM card)
SC-TS1	Screw terminal replacement set
SC-TC1	Clamp terminal replacement set
SC-USB1	USB A/B cable, 1.8 m
SC-XMP	XM card USB programming tool

SC22-3 Safety Controller Specifications

Power	24V dc, ± 20% **SC22-3 models:** 0.4 A (controller only), 5.9 A (all outputs ON @ full rated load) **SC22-3E models:** 0.4 A (controller only), 4.4 A (all outputs ON @ full rated load) **The Controller should be connected only to a SELV (safety extra-low voltage, for circuits without earth ground) or a PELV (protected extra-low voltage, for circuits with earth ground) power supply.**
Safety and Non-Safety Inputs (22 terminals)	**Input ON threshold:** > 15V dc (guaranteed on), 30V dc max. **Input OFF threshold:** < 5V dc (guaranteed off with any 1 fault), –3V dc min. **Input ON current:** 8 mA typical @ 24Vdc, > 2 mA (guaranteed with 1 fault) 50 mA peak contact cleaning current @ 24V dc **Sourcing current:** 30 mA minimum continuous (3V dc max. drop) **Input lead resistance:** 300 Ω max. (150 Ω per lead) **Input requirements for a 4-wire safety mat:** **Max. capacity between plates:** 0.5 µF **Max. capacity between bottom plate and ground:** 0.5 µF **Max. resistance between the 2 input terminals of one plate:** 20 Ω
Safety Outputs (6 terminals, 3 redundant outputs)	**Rated output current: SC22-3 models:** 0.75 A max. each output (1.0V dc max drop) **SC22-3E models:** 0.5 A max. each output (1.0V dc max drop) **Output OFF threshold:** 0.6V dc typical (1.2V dc max. guaranteed with 1 fault) **Output leakage current:** 50 µA max. with open 0V **Load:** 0.1 µF max., 1 H max., 10 Ω max. per lead
Status Outputs (10 terminals)	**Rated output current:** 0.5A @ 24V dc (individual), 1.0 A @ 24V dc (total of all outputs) **O1 to O8 (General Purpose) — Output OFF voltage:** < 0.5V dc (no load), 22 KΩ pull down to 0V **O9 and O10 (General Purpose or Monitored Mute Lamp) —** **Output OFF voltage:** Internal 94 KΩ pull up to 24V dc supply **Output ON/OFF threshold:** 15V dc +/−4V dc @ 24V dc supply NOTE: For O9 and O10, if a short circuit or other fault condition causes the output to drop below this threshold while the output is ON, a lockout will occur. If an open circuit or other fault condition causes the output to rise above this threshold while the output is OFF, a lockout will occur.
Network Interface (SC22-3E only)	Ethernet 10/100 Base-T/TX, RJ45 modular connector, shielded or unshielded cable Auto negotiate or manual rate and duplex Auto MDI/MDIX (Auto cross) **Protocols:** Ethernet/IP (with PCCC), Modbus TCP **Data:** 32 configurable virtual status outputs Fault diagnostic codes and messages Access to fault log ... and more
Response and Reaction Times	**Response time (ON to OFF):** 10 milliseconds max. (with standard 6 milliseconds debounce; this can increase if debounce time increases. Refer to the configuration summary for actual response time.) **Reaction time (OFF to ON):** 400 milliseconds max. (with manual reset option) **Reaction time (OFF to ON):** 400 milliseconds max. plus input debounce time (auto reset)

More on next page

SC22-3 Safety Controller Specifications (con't)

Onboard LCD Information Display—Password Requirements	**Password is not required:** Run mode (I/O status) Fault (I/O fault detection and remedial steps) Review configuration parameters (I/O properties and terminals)	**Password is required:** Configuration mode (create/modify/confirm/download configurations)
Environmental Rating	NEMA 1 (IP20), for use inside NEMA 3 (IP54) or better enclosure	
Operating Conditions	**Temperature range:** 0° to +55° C	
Mechanical Stress	**Shock:** 15g for 11 milliseconds, half sine, 18 shocks total (per IEC 61131-2) **Bump:** 10g for 16 milliseconds, 6000 cycles total (per IEC 61496-1) **Vibration:** 3.5 mm occasional / 1.75 mm continuous @ 5Hz to 9Hz, 1.0g occasional and 0.5g continuous @ 9Hz to 150Hz: (per IEC 61131-2) and 0.35 mm single amplitude / 0.70 mm peak-to-peak @ 10 to 55Hz (per IEC 61496-1), all @ 10 sweep cycles per axis	
EMC	Meets or exceeds all EMC requirements in IEC 61131-2, IEC 61496-1 (Type 4), and IEC 62061 Annex E, Table E.1 (increased immunity levels)	
Removable Terminals	**Screw terminals** **Wire sizes:** 16, 18, 20, 22 or 24 AWG (0.20 – 1.31 mm^2) **Wire strip length:** 5.00 mm **Tightening torque:** 0.23 Nm (2 in. lbs) nominal **Tightening torque:** 0.34 Nm (3.0 in. lbs) maximum **Clamp terminals** **Wire size:** 16, 18, 20, 22, or 24 AWG (0.20 – 1.31 mm^2) **Wire strip length:** 9.00 mm **Important: Clamp terminals are designed for 1 wire only. If more than 1 wire is connected to a terminal, a wire could loosen or become completely disconnected from the terminal, causing a short.**	
Design Standards	• SIL CL 3 per IEC 62061 • SIL 3 per IEC 61508 • Category 4 per ISO 13849-1 (EN954-1) Safety of Machinery. Safety Related Parts of Control Systems • Performance Level (PL) e • IEC 61131-2 • UL 508 • UL 1998 • ANSI NFPA 79 • IEC 60204-1 • ISO 13851 • ISO 13850	
Certifications	CE UL c UL LISTED Auxiliary Device US	
Wiring Diagrams	WD029, WD030, WD031, WD031, WD032 (pp. 235-237).	

PICO-GUARD™

Fiber Optic Controllers page 60

- Flexible and easy to install, the controller is a low-cost alternative to cumbersome and costly methods required for machine safeguarding.
- Four optical channels to protect personnel from hazardous equipment and to protect critical tooling or processes.
- Controller signals the machine control circuit to stop when the system detects a loss in light signal or receives a safety stop request from its Universal Safety Stop Interface (USSI) input.
- Each channel can control several optical elements in the same fiber loop.
- Each channel can monitor a separate part of a machine, such as doors, points of entry and sensors.
- USSI connects multiple PICO-GUARD Controllers and other safety devices in a single safety circuit, when required.
- Models with muting suspend safeguarding during hazard-free time in the machine's cycle.
- Diverse-redundant and self-checking design exceeds control reliability and meets Safety Category 4 per EN 954-1 and IEC 61496-1 Type 4 requirements.

Advanced solid-state controller with four optical channels.

Use with optical elements including:

Point Systems

- 12 or 30 mm threaded barrel housings
- Use multiple points for a customized grid system
- Three integral fiber types in five lengths
  Page 63

Grid Systems

- 2-, 3- or 4-beam systems
- Protected heights of 500 to 1066 mm
- Five lengths of fiber
  Page 61

Interlock Systems

- Six housing styles
- Non-contact fiber optic safety switches
- Models with integral fibers or quick-release fiber connectors
  Page 64

PICO-GUARD™ Optical E-Stop Buttons

- Push-to-stop, twist-to-release optical E-Stop button
- IP65-rated housing
- Fiber connection ports (same side or opposite sides, depending on model)
  Page 66

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FIBERS PAGE 68

E-Stop & Guard

Safety Modules

- Modules monitor external devices for proper operation, contact failure or wiring faults.
- Module goes into lockout mode if fault is detected
- Available voltages include 24V ac/dc; 24V dc; 115V ac or 12-24V dc; or 230V ac or 12-24V dc.
- Modules serve to monitor positive-opening E-stop and interlocking switches.
- Offers reset options: Automatic, manual and monitored manual (depending on model)
- Ratings are NEMA 1 and at least IEC IP20.

E-Stop & Guard Safety Modules

- Easy-to-see red and green LED status indicators
- Rugged polycarbonate housing
- Plug-in or fixed terminal blocks
- Standard 35 mm DIN rail track mounting

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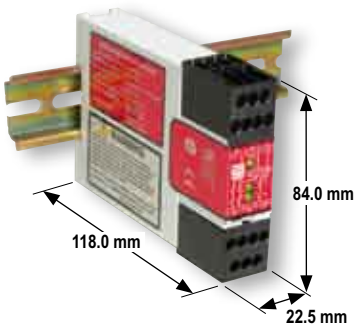
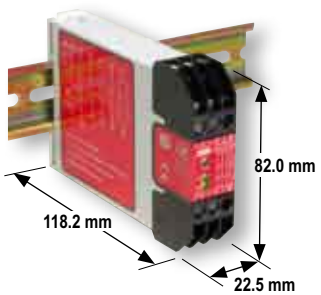
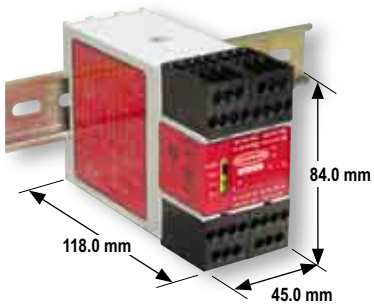


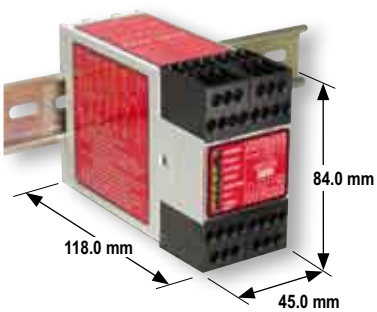
ES-FA-..AA & GM-FA-10J Models



ES-FA-6G Models



ES-..A-5A Models



ES-TN-1H.. Models

ES-TN-14H.. Models

BRACKETS
PAGE 165

E-Stop & Guard Safety Modules

Model	Functional Stop Category	Supply Voltage	Inputs	Safety Outputs	Output Rating	Aux. Outputs	Output Response Time	Delay	Data Sheet
GM-FA-10J	0	24V ac/dc	1 NC & 1 NO (single or dual)	**2 NO**	6 amps	—	35 ms	—	60998
ES-FA-9AA	0	24V ac/dc	1 NC (single) or 2 NC (dual)	**3 NO**	6 amps	—	25 ms	—	60606
ES-FA-11AA				**2 NO**	7 amps	1 NC			113496
ES-UA-5A	0	115V ac & 12-24V dc	1 NC (single) or 2 NC (dual)	**4 NO**	6 amps	1 NC & 2 PNP	25 ms	—	122365
ES-VA-5A		230V ac & 12-24V dc							
ES-TN-1H5	0 & 1	24V dc	1 NC (single) or 2 NC (dual)	**2 NO & 2 NO w/delay**	4 amps	1 NC (immediate) & 1 NC (delayed)	50 ms	0 - 20 sec.	58697
ES-TN-1H6								0 - 200 sec.	
ES-TN-1H1								0.25 sec.	61061
ES-TN-1H2								0.5 sec.	
ES-TN-1H3								1.0 sec.	
ES-TN-1H4								2.0 sec.	
ES-TN-1H7								4.0 sec.	
ES-TN-1H8								6.0 sec.	
ES-TN-1H9								8.0 sec.	
ES-TN-1H10								10.0 sec.	
ES-TN-1H11								15.0 sec.	
ES-TN-1H12								20.0 sec.	
ES-TN-14H5	0 & 1	24V dc	1 NC (single) or 2 NC (dual)	**4 NO & 4 NO w/delay**	4 amps	1 NC (immediate) & 1 NC (delayed)	50 ms	0 - 20 sec.	68436
ES-TN-14H6								0 - 200 sec.	
ES-FA-6G	0	24V ac/dc	1 NC (single)	**3 NO**	6 amps	1 NC	35 ms	—	55581

NC = Normally Closed Relay, NO = Normally Open Relay

GM-FA-10J Guard Monitoring Module Specifications

Supply Voltage and Current	24V ac/dc ± 20% **Power consumption:** approx. 3 VA / 3 W
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Output Configuration	Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2. **Contacts:** AgNi, 5 µm gold-plated **Low Current Rating:** **Caution: The 5 µm gold-plated contacts allow the switching of low current/low voltage.** To preserve the gold plating on the contacts, do not exceed the following max. values at any time: **Min. voltage:** 1V ac/dc **Max. voltage:** 60V **Min. current:** 5 mA ac/dc **Max. current:** 300 mA **Min. power:** 5 mW (5 mVA) **Max. power:** 7 W (7 VA) **High Current Rating:** If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to: **Min. voltage:** 15V ac/dc **Max. voltage:** 250V ac/dc **Min. current:** 30 mA ac/dc **Max. current:** 6 A **Min. power:** 5 W (5 VA) **Max. power:** 200 W (1,500 VA) **Mechanical life:** 50,000,000 operations **Electrical life:** 150,000 cycles typical, @ 200 W (1,500 VA) switched power, resistive load **NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.**
Output Response Time	35 milliseconds
Input Requirements	**Input switch** must have a normally closed contact and a normally open contact capable of switching 5 to 50 mA @ 15 to 30 V dc. **Reset switch** must have one normally open contact capable of switching 5 to 50 mA @ 15 to 30V dc. Max. external resistance between terminals S11/S12, S11/S13, S21/S22 and S21/S23: 270 Ω each.
Simultaneity Monitoring	**2-Channel operation:** 3 seconds **1-Channel operation:** infinite
Status Indicators	**4 green LEDs:** Power: power is supplied to Safety Module **Channel 1:** inputs satisfied (guard closed) **Channel 2:** inputs satisfied (guard closed) **Output:** K1 and K2 energized, safety outputs closed **1 red LED:** Fault
Construction	Polycarbonate housing
Environmental Rating	Rated NEMA 1; IP40, Terminals IP20
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 55 Hz @ 0.35 mm displacement per 60068-2-6
Operating Conditions	**Temperature:** 0° to +50° C **Relative humidity:** 90% @ +50° C (non-condensing)
Design Standards	Designed to comply with Category 3 or 4 per ISO 13849-1 (EN 954-1) (depending on application)
Certifications	CE c UL us LISTED
Wiring Diagrams	**1-Channel Coded Magnet Switches:** WD035 (p. 239) **2-Channel Positive Opening Switches:** WD036 (p. 239) **1-Channel (Multiple Guards):** WD035 (p. 239) **2-Channel (Multiple Guards):** WD036 (p. 239) **Guarded Machine:** WD027 (p. 240)

ES-FA-..AA Safety Module Specifications

Supply Voltage and Current	24V ac/dc, +/- 10%; 50/60Hz **Power consumption:** **ES-FA-9AA:** approx. 2 W/2 VA **ES-FA-11AA:** approx. 2 W/2 VA
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Output Configuration	**ES-FA-9AA:** 3 normally open output channels **ES-FA-11AA:** 2 normally open output channels and 1 normally closed auxiliary output channel Each normally open output channel is a series connection of contacts from two forced-guided (positive-guided) relays, K1-K2. The normally closed contact 31-32 is a parallel connection of contacts from K1-K2. **Contacts:** AgNi, 5 µm gold-plated **Low Current Rating:** **Caution: The 5 µm gold-plated contacts allow the switching of low current/low voltage.** To preserve the gold plating on the contacts, the following max. values should not be exceeded at any time: **Min. voltage:** 1V ac/dc — **Max. voltage:** 60V **Min. current:** 5 mA ac/dc — **Max. current:** 300 mA **Min. power:** 5 mW (5 mVA) — **Max. power:** 7 W (7 VA) **High Current Rating:** If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to: **Min. voltage:** 15V ac/dc — **Max. voltage:** 250V ac/dc **Min. current:** 30 mA ac/dc — **Max. current:** 6 A (**ES-FA-9AA**) and 7 A (**ES-FA-11AA**) **Min. power:** 5 W (5 VA) — **Max. power:** 200 W (1,500 VA) on **ES-FA-4AA** 200 W (1,750 VA) on **ES-FA-11AA** **Mechanical life:** 50,000,000 operations **Electrical life: ES-FA-9AA:** 150,000 operations (typical, @ 200 W (1,500 VA) switched power, resistive load) **ES-FA-11AA:** 130,000 operations (typical, @ 200 W (1,750 VA) switched power, resistive load) **NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.**
Output Response Time	25 milliseconds typical
Input Requirements	**Input switch** must have one or two normally closed contacts capable of switching 10 to 20 mA @ 8 to 12V dc. **Reset switch** must have one normally open contact capable of switching 10 to 15 mA @ 8 to 12V dc.
Minimum OFF-State Recovery Time	250 milliseconds
Status Indicators	**3 green LEDs:** Power ON K1 energized K2 energized
Construction	Polycarbonate housing
Environmental Rating	Rated NEMA 1; IP40, Terminals IP20
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 55Hz @ 0.35 mm displacement per IEC 68-2-6
Operating Conditions	**Temperature:** 0° to +50° C — **Relative humidity:** 90% @ +50° C (non-condensing)
Certifications	CE UL LISTED Emergency Stop Device
Wiring Diagrams	**1-Channel:** WD038 (p. 241) — **2-Channel:** WD039 (p. 242)

ES-..A-5A Safety Module Specifications

Supply Voltage and Current	**ES-UA-5A:** 115V ac (A1-A2), 12-24V dc, ± 15%, 10% max. ripple (B1-B2) **ES-VA-5A:** 230V ac (A1-A2), 12-24V dc, ± 15%, 10% max. ripple (B1-B2) **Power consumption:** approx. 7 VA/4 W
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Output Configuration	**Outputs (K1 & K2):** four redundant (total of eight) safety relay (forced-guided) contacts – AgNi, 5 µm gold-plated, plus 1 normally closed auxiliary monitor output - AgNi, 5 µm gold-plated. **Low Current Rating:** **Caution: The 5 µm gold-plated contacts allow the switching of low current/low voltage.** To preserve the gold plating on the contacts, the following max. values should not be exceeded at any time: **Min. voltage:** 1V ac/dc — **Max. voltage:** 60V **Min. current:** 5 mA ac/dc — **Max. current:** 300 mA **Min. power:** 5 mW (5 mVA) — **Max. power:** 7 W (7 VA) **High Current Rating:** If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to: **Min. voltage:** 15V ac/dc — **Max. voltage:** 250V ac/dc **Min. current:** 30 mA ac/dc — **Max. current:** 6 A **Min. power:** 5 W (5 VA) — **Max. power:** 200 W (1,500 VA) **Mechanical life:** 50,000,000 operations **Electrical life:** 150,000 operations (typical, @ 1,500 VA switched power, resistive load) 150,000 operations (typical, @ 200 W switched power, resistive load) **NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.** **Solid-State Monitor Outputs:** - Two non-safety solid-state dc outputs - Output at Y32 monitors state of outputs – conducts (output high) when both K1 and K2 are energized - Output at Y35 conducts (output high) when internal power supply is OK - Output circuits require application of +12-24V dc ±15% at terminal Y31; dc common at Y30 - Maximum switching current: 100 mA at 12-24V dc - Both outputs are protected against short circuits
Output Response Time	25 milliseconds typical
Input Requirements	**Input switch** must have normally closed contacts each capable of switching 20 to 50 mA @ 12 to 30V dc; and must be open ≥10 milliseconds for a valid stop command. **Reset switch** must have one normally open contact capable of switching 20 to 50 mA @ 12 to 30V ac/dc.
ON-Time Delay	80 milliseconds; time from the E-stop contacts to close (Auto Reset) or the reset button to open (Manual Reset) and the safety outputs to close.
Status Indicators	**3 green LEDs:** Power ON K1 energized K2 energized **1 red LED:** Fault (internal power supply, ground fault, short across the input channels or other internal failures)
Construction	Polycarbonate housing
Environmental Rating	Rated NEMA 1; IP20
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 55Hz @ 0.35 mm displacement per IEC 60068-2-6
Operating Conditions	**Temperature:** 0° to +50° C — **Relative humidity:** 90% @ +50° C (non-condensing)
Certifications	CE c UL us LISTED
Wiring Diagrams	**1-Channel:** WD040 (p. 243) — **2-Channel:** WD041 (p. 244)

ES-TN-1H.. Safety Module Specifications

Supply Voltage and Current	24V dc, ±20% **Power consumption:** approx. 5 W
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Output Configuration	**Outputs K1& K2:** Two redundant (total of four) safety relay (forced-guided) contacts – AgNi, gold flashed one auxiliary normally closed contact – AgNi, gold flashed **Outputs K3 &K4:** Two redundant (total of four) delayed relay (forced-guided) contacts – AgNi, gold flashed one auxiliary normally closed contact – AgNi, gold flashed **Contact ratings (all normally open and normally closed output contacts):** **Max. voltage:** 250V ac or 250V dc **Max. current:** 4 A ac or dc **Min. current:** 30 mA @ 24V dc **Max. power:** 1000 VA, 200 W **Mechanical life:** 50,000,000 operations **Electrical life:** 100,000 at full resistive load **NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.**
Output Response Time	**K1 &K2:** 50 milliseconds typical **K3 &K4 (ES-TN-1H1):** 0.25 second **K3 &K4 (ES-TN-1H2):** 0.5 second **K3 &K4 (ES-TN-1H3):** 1.0 second **K3 &K4 (ES-TN-1H4):** 2.0 seconds **K3 & K4 (ES-TN-1H5):** 0, 0.5, 1, 2, 4, 6, 8, 10, 15, 20 seconds **K3 & K4 (ES-TN-1H6):** 0, 5, 10, 20, 30, 50, 70, 100, 150, 200 seconds **K3 &K4 (ES-TN-1H7):** 4.0 seconds **K3 &K4 (ES-TN-1H8):** 6.0 seconds **K3 &K4 (ES-TN-1H9):** 8.0 seconds **K3 &K4 (ES-TN-1H10):** 10.0 seconds **K3 &K4 (ES-TN-1H11):** 15.0 seconds **K3 &K4 (ES-TN-1H12):** 20.0 seconds **Delayed Output Timing Tolerance:** Set time ±100 milliseconds or ±2%, whichever is greater
Input Requirements	**Input switch** must have a normally closed contact capable of switching 20 mA @ 24V dc. **Reset switch** must have one normally open contact capable of switching 20 mA @ 24V dc. NOTE: Inputs must be voltage-free, dry contacts.
ON-Time Delay	≥ 100 milliseconds; time from the E-stop contacts to close (Auto Reset) or the Reset button to open (Manual Reset) and the safety outputs to close.
Status Indicators	**6 green LEDs:** Power — Monitor E-Stop — Out (K1 &K2 ON/OFF) Reset — Timed-Out (K3 & K4 ON/OFF) **1 red LED:** Fault
Construction	Polycarbonate housing
Environmental Rating	Rated NEMA 1; IP40, Terminals IP20, max. terminal torque 0.8 Nm
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 55Hz @ 0.35 mm displacement per IEC 60068-2-6
Operating Conditions	**Temperature:** 0° to +50° C **Relative humidity:** 90% @ +50° C (non-condensing)
Certifications	c SP® us (except ES-TN-1H1) CE (except ES-TN-1H1) **Important Notice:** **European Community Machinery Directive 2006/42/EC** The ES-TN-1H.. Modules comply with Machine Directive 98/37/EC. After December 29, 2009, when Machine Directive 2006/42/EC will be in force, the ES-TN-1H.. Modules can only be installed as a replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767.
Wiring Diagrams	**2-Channel:** WD042 (p. 245)

ES-TN-14H.. Safety Module Specifications

Supply Voltage and Current	24V dc, ±20% **Power consumption:** approx. 5 W
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Output Configuration	**Outputs K1 & K2:** four redundant (total of eight) safety relay (forced-guided) contacts – AgNi, gold flashed one auxiliary normally closed contact – AgNi, gold flashed **Outputs K3 & K4:** four redundant (total of eight) delayed relay (forced-guided) contacts – AgNi, gold flashed one auxiliary normally closed contact – AgNi, gold flashed **Contact ratings (all normally open and normally closed output contacts):** **Max. voltage:** 250V ac or dc **Max. current:** 4 A ac or dc **Min. current:** 30 mA @ 24V dc **Max. power:** 1000 VA, 200 W **Mechanical life:** 50,000,000 operations **Electrical life:** 100,000 at full resistive load **NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.**
Output Response Time	**K1 & K2:** 50 milliseconds typical **K3 & K4 (ES-TN-14H5):** 0, 0.5, 1, 2, 4, 6, 8, 10, 15, 20 seconds **K3 & K4 (ES-TN-14H6):** 0, 5, 10, 20, 30, 50, 70, 100, 150, 200 seconds **Delayed Output Timing Tolerance:** Set time ±100 milliseconds or ±2%, whichever is greater
Input Requirements	**Input switch** must have a normally closed contact capable of switching 20 mA @ 24V dc. **Reset switch** must have one normally open contact capable of switching 20 mA @ 24V dc. NOTE: Inputs must be voltage-free, dry contacts.
ON-Time Delay	≥ 100 milliseconds; Time from the E-stop contacts to close (Auto Reset) or the Reset button to open (Manual Reset) and the safety outputs to close
Status Indicators	**6 green LEDs:** Power — Monitor E-Stop — Out (K1 &K2 ON/OFF) Reset — Timed-Out (K3 & K4 ON/OFF) **1 red LED:** Fault
Construction	Polycarbonate housing
Environmental Rating	Rated NEMA 1; IP40, Terminals IP20, max. terminal torque 0.8 Nm
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 or IP54, or better.
Vibration Resistance	10 to 55Hz @ 0.35 mm displacement per IEC 60068-2-6
Operating Conditions	**Temperature:** 0° to +50° C **Relative humidity:** 90% @ +50° C (non-condensing)
Certifications	**Important Notice:** **European Community Machinery Directive 2006/42/EC** The ES-TN-14H.. Modules comply with Machine Directive 98/37/EC. After December 29, 2009, when Machine Directive 2006/42/EC will be in force, the ES-TN-14H.. Modules can only be installed as a replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767.
Wiring Diagrams	**2-Channel:** WD043 (p. 246)

ES-FA-6G Safety Module Specifications

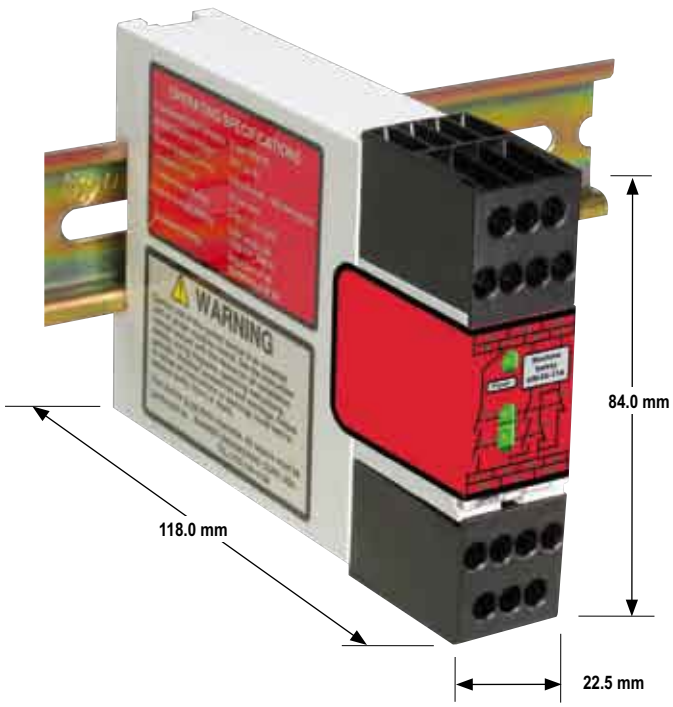
Supply Voltage and Current	24V ac/dc, +/- 10%; 50/60Hz **Power consumption:** approx. 2 W/0.75 VA
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Output Configuration	**Outputs (K1& K2):** three redundant (total of six) safety relay (forced-guided) contacts – $AgSnO_2$ one auxiliary non-safety monitor output (open when both K1 and K2 are energized; closed when either K1 or K2 are de-energized) **Contact ratings:** **Max. voltage:** 250V ac or 250V dc **Max. current:** 6 A ac or dc **Min. current:** 30 mA @ 10V dc **Max. power:** 1500 VA, 150 W **Mechanical life:** 10,000,000 operations **Electrical life:** 100,000 at full resistive load **NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.**
Output Response Time	35 milliseconds typical
Input Requirements	**Input switch** must have a normally closed contact capable of switching 40 to 100 mA @ 13 to 27V ac/dc. **Reset switch** must have one normally open contact capable of switching 20 to 30 mA @ 13 to 27V ac/dc.
Status Indicators	**3 green LEDs:** Power ON K1 energized K2 energized
Construction	Polycarbonate
Environmental Rating	Rated NEMA 1; IP40, Terminals IP20
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 55Hz @ 0.35 mm displacement per IEC 60068-2-6
Operating Conditions	**Temperature:** 0° to +50° C **Relative humidity:** 90% @ +50° C (non-condensing)
Certifications	UL LISTED Emergency Stop Device, CSA®
Wiring Diagrams	**1-Channel:** WD044 (p. 247)

Universal Safety
Input Modules

- Modules monitor one or two solid-state PNP outputs or relay contact outputs from safety or non-safety devices, such as sensors, safety light screens, or one or two mechanical contacts.
- Category 2, 3 or 4 hookup of input devices is possible.
- Module offers two reset options: Automatic and monitored manual.
- Modules are an excellent choice for monitoring safety devices with external device monitoring (EDMs) function.
- Module goes into lockout mode if fault is detected.
- Models are available with 3 normally open safety contacts, or 2 normally open safety and 1 normally closed auxiliary contact.
- Output contacts are rated 6 amps.
- Modules are rated NEMA 1 and at least IP20.
- Module can be configured to monitor one or two contacts using DIP switches under removable terminals.

Universal Safety Modules

- 24V ac/dc operation
- Easy to see green LED status indicators
- Rugged polycarbonate housing
- Removable terminal blocks
- Standard 35 mm DIN rail track mounting



UM-FA-..A Models

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Universal Safety Input Modules

Model	Functional Stop Category	Supply Voltage	Inputs	Safety Outputs	Output Rating	Aux. Output	Output Response Time	Data Sheet
UM-FA-9A	0	24V ac/dc	1 NC (single) or 2 NC (dual)	**3 NO**	6 amps	–	25 ms	141249
UM-FA-11A				**2 NO**		1 NC		

NC = Normally Closed Relay, NO = Normally Open Relay

Universal Safety Input Module Specifications

Supply Voltage and Current	24V ac/dc, +/- 10%; 50/60Hz **Power consumption:** approx. 2 W/2 VA
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Output Configuration	**UM-FA-9A:** 3 normally open output channels **UM-FA-11A:** 2 normally open output channels and 1 normally closed auxiliary output channel Each normally open output channel is a series connection of contacts from two forced-guided (positive-guided) relays, K1-K2. **Contacts:** AgNi, 5 µm gold-plated **Low Current Rating:** **Caution:** **The 5 µm gold-plated contacts allow the switching of low current/low voltage.** To preserve the gold plating on the contacts, the following max. values should not be exceeded at any time: **Min. voltage:** 1V ac/dc **Max. voltage:** 60V **Min. current:** 5 mA ac/dc **Max. current:** 300 mA **Min. power:** 5 mW (5 mVA) **Max. power:** 7 W (7 VA) **High Current Rating:** If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to: **Min. voltage:** 15V ac/dc **Max. voltage:** 250V ac/dc **Min. current:** 250 mA ac/dc **Max. current:** 6 A **Min. power:** 5 W (5 VA) **Max. power:** 200 W (1,500 VA) **Mechanical life:** 20,000,000 operations **Electrical life: UM-FA-9A:** 150,000 operations (typical, @ 200 W (1,500 VA) switched power, resistive load **UM-FA-11A:** 150,000 operations (typical, @ 200 W (1,500 VA) switched power, resistive load **NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.**
Output Response Time	25 milliseconds typical
Input Requirements	**Safety input switch:** one or two normally closed contacts capable of switching 10 to 20 mA @ 8 to 12V ac/dc. **Reset switch:** one normally open contact capable of switching 10 to 15 mA @ 8 to 12V dc. **Solid-state input signal source:** 18 to 28V dc sourcing (PNP); 10 mA min. current; < 2 mA leakage current
Minimum OFF-State Recovery Time	250 milliseconds
Indicators	**3 green LEDs:** Power ON K1 energized K2 energized
Construction	Polycarbonate housing
Environmental Rating	Rated NEMA 1; IP40, Terminals IP20
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 55 Hz @ 0.35 mm displacement per IEC 60068-2-6
Operating Conditions	**Temperature:** 0° to +50° C **Max. Relative Humidity:** 90% @ +50°C (non-condensing)
Certification	CE UL **(pending)**
Wiring Diagrams	**WD045, WD046, WD047 (pp. 248-250)**

Safety Mat
Modules

- Module monitors a single mat or a series of connected mats.
- Use with standard 4-wire safety mat or edge triggered by a short in a contact plate or strip.
- Available voltages include 115V ac or 24V dc, and 230V ac or 24V dc.
- Output contacts are rated 6 A.
- Reset options are Automatic or Monitored Manual.
- LED indicators show power on, output and fault.

Safety Mat Monitoring Modules

- Removable terminal blocks
- 4 redundant forced-guided output contacts
- Polycarbonate 45 mm housing
- Maximum 50 milliseconds response time
- Standard 35 mm DIN rail track mounting

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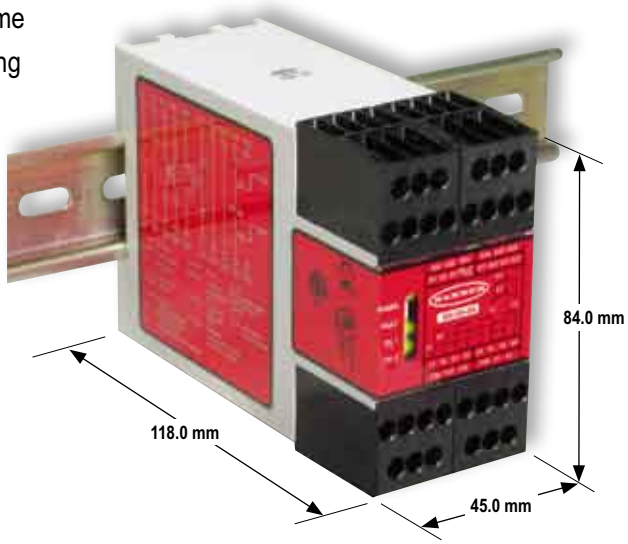

SM-..A-5A Models

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Safety Mat Monitoring Modules

Model	Supply Voltage	Inputs	Safety Outputs	Output Rating	Aux. Outputs	Output Response Time	Data Sheet
SM-GA-5A	115V ac & 24V dc	1 (or multiple in series) 4-wire Safety Mat	**4 NO**	6 amps	1 NC & 2 PNP	50 ms	122364
SM-HA-5A	230V ac & 24V dc						

NC = Normally Closed Relay, NO = Normally Open Relay

Safety Mat Monitoring Module Specifications

Supply Voltage and Current	**SM-GA-5A:** 115V ac (A1-A2), 24V dc, ±15%, 10% max. ripple (B1-B2) **SM-HA-5A:** 230V ac (A1-A2), 24V dc, ±15%, 10% max. ripple (B1-B2) **Power consumption:** approx. 7 VA/4 W
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Output Configuration	**Outputs (K1 & K2):** four redundant (total of eight) safety relay (forced-guided) contacts – AgNi, 5 µm gold-plated, plus 1 normally closed auxiliary monitor output - AgNi, 5 µm gold-plated. **Low Current Rating:** **Caution: The 5 µm gold-plated contacts allow the switching of low current/low voltage.** To preserve the gold plating on the contacts, the following max. values should not be exceeded at any time: **Min. voltage:** 1V ac/dc — **Max. voltage:** 60V **Min. current:** 5 mA ac/dc — **Max. current:** 300 mA **Min. power:** 5 mW (5 mVA) — **Max. power:** 7 W (7 VA) **High Current Rating:** If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to: **Min. voltage:** 15V ac/dc — **Max. voltage:** 250V ac/dc **Min. current:** 30 mA ac/dc — **Max. current:** 6 A **Min. power:** 5 W (5 VA) — **Max. power:** 200 W (1,500 VA) **Mechanical life:** 50,000,000 operations **Electrical life:** 150,000 operations (typical, @ 1,500 VA switched power, resistive load) 150,000 operations (typical, @ 200 W switched power, resistive load) **NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.** **Solid-State Monitor Outputs:** - Two non-safety solid-state dc outputs - Output at Y32 monitors state of outputs – conducts (output high) when both K1 and K2 are energized - Output at Y35 conducts (output high) when internal power supply is OK - Output circuits require application of 24V dc ±15% at terminal Y31; dc common at Y30 - Maximum switching current: 100 mA at 24V dc - Both outputs are protected against short circuits
Output Response Time	50 milliseconds typical
Input Requirements	Mat contacts must be capable of switching 12-30V dc @ 200 mA. Resistance on inputs S11-S12 and S21-S22 must not exceed 10 ohms (ac supply) or 28 ohms (dc supply). Resistance between mat layers must not exceed 10 ohms. Reset switch must have one normally open contact capable of switching 20 to 50 mA @ 12 to 30V dc.

More on next page

Safety Mat Monitoring Module Specifications (cont'd)

Status Indicators	**3 green LEDs:** Power ON; K1 energized; K2 energized **1 red LED:** Step on Mat or Fault (internal power supply, ground fault, or other internal failures)
Construction	Polycarbonate housing
Environmental Rating	Rated NEMA 1; IP20
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54) or better.
Vibration Resistance	10 to 55 Hz @ 0.35 mm displacement per IEC 60068-2-6
Operating Conditions	**Temperature:** 0° to +50° C **Relative humidity:** 90% @ +50° C (non-condensing)
Certifications	
Wiring Diagrams	**4-Wire Safety Mat:** WD048 (p. 251)

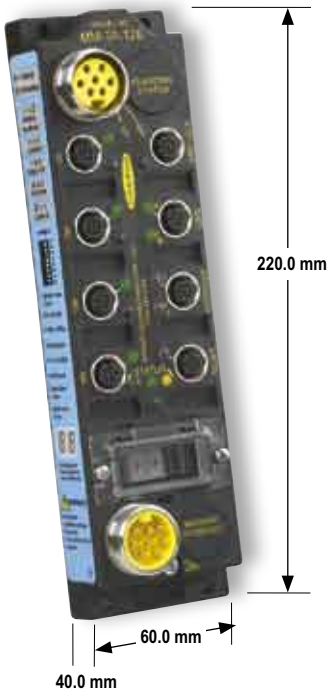
Muting

Modules and Dual Controllers

- Suspends safeguarding during non-hazardous times in the machine's cycle
- Allows material to move into or from the process, without tripping the muted safeguard
- Monitors hard-relay contact or PNP output safety devices
- Offers two reset options: Automatic and Monitored Manual
- Uses diverse redundancy and self-checking, for reliability
- Mounts outside a control panel, near the muted safeguard, or inside the control panel
- Installs easily
- Connects to supplemental safeguarding devices or E-stops
- Can be used as a Dual Controller for safety devices, such as Safety Light Screens when the muting function is not used

Muting Modules

- Three LEDs to indicate operating status
- 2-digit diagnostic display
- Maximum 10 or 20 milliseconds response time
- Quick-disconnect cordsets
- DIN-rail mounted or compact IP65-rated housing
- Models for Type 2 and Type 4 applications



MM-TA-12B & MM2-TA-12B Muting Modules (MM-TA-12B shown)

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MMD-TA-11B & MMD-TA-12B Muting Modules (MMD-TA-12B shown)

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Muting Modules

Model	Safety Category	Input Device	Supply Voltage	Inputs	Safety Outputs	Output Rating	Aux. Outputs	Output Response Time	Data Sheet
MM-TA-12B	4	Mechanical & Solid State	24V dc	2 NC Muteable (dual) & 2 NC USSI (dual)	**2 PNP OSSD**	0.5 amps	1 PNP	10 ms	63517
MM2-TA-12B	2						1 PNP		123894
MMD-TA-12B	2, 3 or 4	Mechanical & Solid State	24V dc	2 NC Muteable (dual) & 2 NC SSI (dual)	**2 PNP OSSD**	0.5 amps	1 PNP	10 ms	116390
MMD-TA-11B					**2 NO**	6 amp	1 NC	20 ms	

NC = Normally Closed Relay, NO = Normally Open Relay

Accessories

Cordsets

See page 163 for a complete list of accessories

Light Screen with Euro-style QDs

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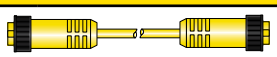
Length	8-pin Euro QD to 7-pin Mini QD
2.5 m	DESE4-508D
4.5 m	DESE4-515D
7.6 m	DESE4-525D

Grid and Point with Mini-style QDs



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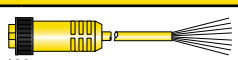
Length	8-pin Mini QD to 7-pin Mini QD
2.5 m	DES4-508C
4.5 m	DES4-515C
7.6 m	DES4-525C

Grid and Point with Chamber



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Length	7-pin Mini to Flying Leads
4.5 m	QDS-715C
7.6 m	QDS-725C
15.2 m	QDS-750C

Mini QD to Flying Leads

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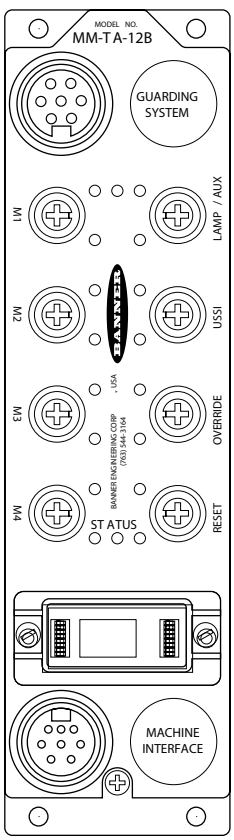
Length	8-Pin Mini to Flying Leads
4.5 m	QDS-815C
7.6 m	QDS-825C
15.2 m	QDS-850C



Euro (Female) QD to Flying Leads

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Length	4-Pin Straight	4-Pin Right-Angle
2 m	MQDC-406	MQDC-406RA
5 m	MQDC-415	MQDC-415RA
9 m	MQDC-430	MQDC-430RA
15 m	MQDC-450	MQDC-450RA

Euro (Male) QD to Flying Leads

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Length	4-Pin Straight	4-Pin Right-Angle
2 m	MQDMC-406	MQDMC-406RA
5 m	MQDMC-415	MQDMC-415RA
10 m	MQDMC-430	MQDMC-430RA
15 m	MQDMC-450	MQDMC-450RA

Euro QD–Double Ended

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Length	Straight	Straight/Right-Angle
0.9 m	MQDEC-403SS	MQDEC-403RS
1.8 m	MQDEC-406SS	MQDEC-406RS
3.6 m	MQDEC-412SS	MQDEC-412RS
6.1 m	MQDEC-420SS	MQDEC-420RS
9.2 m	MQDEC-430SS	MQDEC-430RS
15.2 m	MQDEC-450SS	MQDEC-450RS

Important Note: Verify pinout of cordset and sensor(s) vs. function before ordering I/O cordsets.

MM-TA-12B Muting Module Specifications

Supply Voltage and Current	+24V dc ±15% @ 400 mA max (not including draw of the MSSI power, AUX, ML, M1-M4 and OSSD connections)
Supply Protection Circuitry	All inputs and outputs are protected from short circuit to +24V dc or dc common.
Output Response Time	Muteable Safety Stop Interfaces (MSSI) and the Universal Safety Stop Interfaces (USSI) are less than or equal to 10 milliseconds.
Safety Outputs	**Two diverse-redundant solid-state safety outputs:** 24V dc, 0.5A sourcing OSSD (output signal switching device). Compatible with Banner "Safety Handshake" protocol. **ON-State voltage:** ≥V in-1.5V dc **Max. leakage current:** 1.2 mA; inclusive of faults (including open 0V dc wire) **OFF-State voltage:** 1.2V dc max. **Max. load capacitance:** 0.1 µF **Non-safety auxiliary output:** PNP solid-state output, rated at +24V dc @ 250 mA. **OSSD test pulse width:** 100 to 300 microseconds **OSSD test pulse period:** 12 microseconds
MSSI Power Connections	+24V dc ±15% @ 2.5A max. output (dependent on System power input). Resettable 2.5A fuse
Status Indicators	**3 Status Indicator LEDs (Red, Green and Yellow):** indicate Power ON/OFF, operating mode, lockout, override, and OSSD status **Green LEDs** adjacent to individual inputs/interfaces indicate status (ON = active/closed)
Diagnostic Code Display	Diagnostic Display is a two-digit numeric display that indicates the cause of lockout conditions and the amount of time, in seconds, remaining for the backdoor timer.
Muting Lamp Output	A monitored or non-monitored (selectable) sinking output. If monitoring has been selected, the current draw must be 10 mA to 360 mA. Interconnect wire resistance < 30 Ω. **Max. switching voltage:** 30V dc **Max. switching current:** 360 mA **Min. switching current:** 10 mA **Saturation voltage:** ≤ 1.5V dc @ 10 mA; ≤ 5V dc @ 360 mA
Controls and Adjustments	**All configured on two redundant banks of DIP switches:** Manual/auto reset One-way/two-way muting Monitored/non-monitored mute lamp output One-channel/two-channel/no EDM Backdoor timer Mute on power-up enable Mute enable functional/disabled
Inputs	The MSSI and the USSI can be interfaced with external safety devices that have either hard contact outputs or solid-state OSSD safety outputs with Safety Handshake protocol. Maximum external resistance must not exceed 1000 Ω per channel. **Operating Range for MSSI and USSI Inputs** **OFF State:** 0-3V, 0-2 mA **ON State:** 12-30V, 10-50 mA **Muteable Safety Stop Interface (MSSI)** This input consists of two channels (MSSI-A and MSSI-B), and can be muted when the requirements for a mute cycle have been met. When muted, the OSSDs remain ON, independent of the MSSI status. If not muted, when one or both channels open, the OSSD outputs will go OFF. **Universal Safety Stop Interface (USSI)** This input consists of two channels (USSI-A and USSI-B), and is always active. When one or both channels open, the OSSD Outputs will go OFF.
External Device Monitoring (EDM)	Two pairs of terminals are provided to monitor the state of external devices controlled by the OSSD outputs. Each device must be capable of switching 15-30V dc at 10-50 mA.
Muting Device Inputs	The muting devices work in pairs (M1 and M2, M3 and M4) and are required to be "closed" within 3 seconds of each other (simultaneity requirement) to initiate a mute (assuming all other conditions are met). Sensor connected to M1 (and M3) must have contacts or PNP output. Sensor connected to M2 (and M4) must have contacts or NPN output. Each muting device must be capable of switching 15-30V dc at 10-50 mA.

More on next page

MM-TA-12B Muting Module Specifications (cont'd)

Mute Enable Input	When Mute Enable is selected (functional), this input must have +24V dc applied in order to start a mute; opening this input after mute has begun has no effect. If Mute Enable is disabled, this input will be ignored and a mute cycle can occur regardless of the state of the mute enable input. The switching device must be capable of switching 15-30V dc at 10-50 mA.
Override Inputs	The two-channel inputs must be closed within 3 seconds of each other (simultaneity requirement) and held closed during the 10-second Override. To initiate a subsequent Override, open both channels, wait 3 seconds, and then re-close both channels (within 3 seconds). The switching devices must be capable of switching 15-30V dc at 10-50 mA.
Reset Input	Terminals must be closed for a minimum of 0.25 seconds and not more than 2.0 seconds in order to guarantee a reset. The switching device must be capable of switching 15-30V dc at 10-50 mA.
Mounting	4 mounting holes, 5.5 mm dia.
Construction	**Housing:** Glass-filled Nylon (Black) **Connectors:** Nickel-plated brass All circuitry epoxy-encapsulated
Environmental Rating	NEMA 4, 13; IP65
Connections	1 each 8-pin Mini-style male 1 each 7-pin Mini-style female 8 each 5-pin Euro-style female (4-pin, if earth ground connection is not used)
Vibration Resistance	**Vibration:** **Frequency range:** 10 to 55 Hz **Sweep rate:** 1 octave/minute **Amplitude:** 0.35 mm (interpreted as 0.70 mm peak to peak) **Number of sweeps:** 20 sweeps (10 cycles) per axis, for 3 axes (no delay at resonance) **Bump:** **Acceleration:** 10 g **Duration of pulse:** 16 milliseconds **Number of bumps:** 1000 +/- 10 for each axis, for 3 axes **Time between bumps:** 2 seconds
Operating Conditions	**Temperature range:** 0° to +50° C **Relative humidity:** 95% (non-condensing)
Design Standards	Designed to comply with Safety Category 4 per ISO 13849-1 (EN 954-1)
Certifications	CE cULus LISTED AOPD 10GH **Important Notice:** **European Community Machinery Directive 2006/42/EC** The MM-TA-12B Muting Module complies with Machine Directive 98/37/EC. After December 29, 2009, when Machine Directive 2006/42/EC will be in force, the MM-TA-12B Muting Module can only be installed as a replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767.
Wiring Diagrams	WD049, WD050 (p. 252)

MM2-TA-12B Muting Module Specifications

Supply Voltage and Current	+24V dc ±15% @ 400 mA max (not including draw of the MSSI power, AUX, ML, M1-M4 and OSSD connections)
Supply Protection Circuitry	All inputs and outputs are protected from short circuit to +24V dc or dc common.
Output Response Time	Muteable Safety Stop Interfaces (MSSI) and the Safety Stop Interfaces (SSI) are less than or equal to 10 milliseconds.
Safety Outputs	**Two diverse-redundant solid-state safety outputs:** 24V dc, 0.5A sourcing OSSD (output signal switching device). **ON-State voltage:** ≥V in-1.5V dc **Max. leakage current:** 1.2 mA; inclusive of faults (including open 0V dc wire) **OFF-State voltage:** 1.2V dc max. **Max. load capacitance:** 0.1 µF **Non-safety auxiliary output:** PNP solid-state output, rated at +24V dc @ 250 mA. **OSSD test pulse width:** 100 to 300 microseconds **OSSD test pulse period:** 12 milliseconds
MSSI Power Connections	+24V dc ±15% @ 2.5A max. output (dependent on System power input). Resettable 2.5A fuse
Status Indicators	**3 Status Indicator LEDs (Red, Green and Yellow):** indicate Power ON/OFF, operating mode, lockout, override, and OSSD status **Green LEDs** adjacent to individual inputs/interfaces indicate status (ON = active/closed)
Diagnostic Code Display	Diagnostic Display is a two-digit numeric display that indicates the cause of lockout conditions and the amount of time, in seconds, remaining for the backdoor timer.
Muting Lamp Output	A monitored or non-monitored (selectable) sinking output. If monitoring has been selected, the current draw must be 10 to 360 mA. Interconnect wire resistance < 30 Ω. **Max. switching voltage:** 30V dc **Max. switching current:** 360 mA **Min. switching current:** 10 mA **Saturation voltage:** ≤ 1.5V dc @ 10 mA; ≤ 5V dc @ 360 mA
Controls and Adjustments	**All configured on two redundant banks of DIP switches:** Manual/auto reset One-way/two-way muting Monitored/non-monitored mute lamp output One-channel/two-channel/no EDM Backdoor timer Mute on power-up enable Mute enable functional/disabled
Inputs	The MSSI and the SSI can be interfaced with external safety devices that have either hard contact outputs or solid-state OSSD safety outputs. Maximum external resistance must not exceed 1000 Ω per channel. **Operating Range for MSSI and SSI Inputs** **OFF State:** 0-3V, 0-2 mA **ON State:** 12-30V, 10-50 mA **Muteable Safety Stop Interface (MSSI)** This input consists of two channels (MSSI-A and MSSI-B), and can be muted when the requirements for a mute cycle have been met. When muted, the OSSDs remain ON, independent of the MSSI status. If not muted, when one or both channels open, the OSSD outputs will go OFF. **Safety Stop Interface (SSI)** This input consists of two channels (SSI-A and SSI-B), and is always active. When one or both channels open, the OSSD Outputs will go OFF.
External Device Monitoring (EDM)	Two pairs of terminals are provided to monitor the state of external devices controlled by the OSSD outputs. Each device must be capable of switching 15-30V dc at 10-50 mA.
Muting Device Inputs	The muting devices work in pairs (M1 and M2, M3 and M4) and are required to be “closed” within 3 seconds of each other (simultaneity requirement) to initiate a mute (assuming all other conditions are met). Sensor connected to M1 (and M3) must have contacts or PNP output. Sensor connected to M2 (and M4) must have contacts or NPN output. Each muting device must be capable of switching 15-30V dc at 10-50 mA.

More on next page

MM2-TA-12B Muting Module Specifications (cont'd)

Mute Enable Input	When Mute Enable is selected (functional), this input must have +24V dc applied in order to start a mute; opening this input after mute has begun has no effect. If Mute Enable is disabled, this input will be ignored and a mute cycle can occur regardless of the state of the mute enable input. The switching device must be capable of switching 15-30V dc at 10-50 mA.
Override Inputs	The two-channel inputs must be closed within 3 seconds of each other (simultaneity requirement) and held closed during the 10-second Override. To initiate a subsequent Override, open both channels, wait 3 seconds, and then re-close both channels (within 3 seconds). The switching devices must be capable of switching 15-30V dc at 10-50 mA.
Reset Input	Terminals must be closed for a minimum of 0.25 seconds and not more than 2.0 seconds in order to guarantee a reset. The switching device must be capable of switching 15-30V dc at 10-50 mA.
Mounting	4 mounting holes, 5.5 mm dia.
Construction	**Housing:** Glass-filled Nylon (Black) **Connectors:** Nickel-plated brass All circuitry epoxy-encapsulated
Environmental Rating	NEMA 4, 13; IP65
Connections	1 each 8-pin Mini-style male 1 each 7-pin Mini-style female 8 each 5-pin Euro-style female (4-pin, if earth ground connection is not used)
Vibration Resistance	**Vibration:** **Frequency range:** 10 to 55 Hz **Sweep rate:** 1 octave/minute **Amplitude:** 0.35 mm (interpreted as 0.70 mm peak to peak) **Number of sweeps:** 20 sweeps (10 cycles) per axis, for 3 axes (no delay at resonance) **Bump:** **Acceleration:** 10 g **Duration of pulse:** 16 milliseconds **Number of bumps:** 1000 +/- 10 for each axis, for 3 axes **Time between bumps:** 2 seconds
Operating Conditions	**Temperature range:** 0° to +50° C **Relative humidity:** 95% (non-condensing)
Design Standards	Designed to comply with Safety Category 2 per EN 954-1
Certifications	CE cULus LISTED AOPD 10GH
Wiring Diagrams	WD049, WD050 (p. 252)

MMD-TA-12B & MMD-TA-11B Muting Modules Specifications

System Power Requirements	**MMD-TA-11B:** +24V dc ±15% @ 300 mA max (SELV/PELV) **MMD-TA-12B:** +24V dc ±15% @ 250 mA max (SELV/PELV) (not including draw of the MSSI power, AUX, ML, M1-M4 and OSSD connections). The external voltage supply must be capable of buffering brief mains interruptions of 20 milliseconds, as specified in IEC/EN 60204-1.
Overvoltage Category	III (IEC 60664-1)
Pollution Degree	2
Supply Protection Circuitry	All inputs and outputs are protected from short circuit to +24V dc or dc common.
Response Time (MSSI and SSI)	Muteable Safety Stop Interfaces (MSSI) and the Safety Stop Interfaces (SSI) are less than or equal to 10 milliseconds (MMD-TA-12B) or 20 milliseconds (MMD-TA-11B).
Safety Outputs	**MMD-TA-11B:** **2 normally open contact output channels and 1 normally closed auxiliary contact output channel:** Each normally open output channel is a series connection of contacts from two forced-guided (positive-guided) relays, K1-K2. The normally closed AUX contact (non-safety) 31-32 is a parallel connection of contacts from K1-K2. **MMD-TA-12B:** **Two diverse-redundant solid-state safety outputs:** 24V dc, 0.5 A sourcing OSSD (output signal switching device). **ON-State voltage:** ≥V in-1.5V dc **OFF-State voltage:** 1.2V dc max. (0-1 2V dc) **Max. load capacitance:** 0.1 µF **Max. load inductance:** 10 H **Leakage current:** 0.50 mA max. **Cable resistance:** 10 Ω max. **OSSD test pulse width:** < 100 microseconds **OSSD test pulse period:** > 100 milliseconds **Switching current:** 0-0.5 A **Low Current Rating:** **Caution: The 5 µm gold-plated contacts allow the switching of low current/low voltage.** In these low-power applications, multiple contacts can also guarantee reliable switching, the following values should be kept within the min. and max. ranges shown below. **Min. voltage:** 1V ac/dc — **Max. voltage:** 60V **Min. current:** 5 mA ac/dc — **Max. current:** 300 mA **Min. power:** 5 mW (5 mVA) — **Max. power:** 7 W (7 VA) **Contacts:** AgNi, 5 µm gold-plated **High Current Rating:** If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to: **Min. voltage:** 15V ac/dc — **Max. voltage:** 120V ac/dc **Min. current:** 30 mA ac/dc — **Max. current:** 6 A **Min. power:** 0.45 W (0.45 VA) — **Max. power:** 160 W (720 VA) **Mechanical life:** 50,000,000 operations **Electrical life:** 120,000 operations (typical at 144 W/[1380 VA] switched power) **NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts**
Non-Safety Outputs	**Model MMD-TA-11B:** Aux. output 31–32 is a parallel connection of two N.C. contacts from internal relays K1 and K2. **Contact:** AgNi, 5 µm gold-plated **Low Current Rating:** **Caution: The 5 µm gold-plated contacts allow the switching of low current/low voltage.** To preserve the gold plating on the contacts and also guarantee reliable switching, the following values should be kept within the min. and max. ranges shown below: **Min. Voltage:** 1V ac/dc — **Max. Voltage:** 24V ac/dc **Min. Current:** 5 mA ac/dc — **Max. Current:** 250 mA ac/dc **Min. Power:** 5 mW (5 mVA) — **Max. Power:** 6 W (6 VA)

More on next page

MMD-TA-12B & MMD-TA-11B Muting Modules Specifications (cont'd)

Non-Safety Outputs	**High Current Rating:** For higher loads, the min. and max. values of the contact(s) changes to: **Min. Voltage:** 15V ac/dc **Min. Current:** 30 mA ac/dc **Min. Power:** 0.45 W (0.45 VA) **Max. Voltage:** 24V ac/dc **Max. Current:** 250 mA ac/dc **Max. Power:** 6 W (6 VA) **Mechanical Life:** 50,000,000 operations **Electrical Life:** >10 x 10^6 cycles
	Model MMD-TA-12B: Z4–Z3 = Aux. 24V / 250 mA PNP output follows the two OSSD safety outputs.
Status Indicators	**3 Status LEDs (Red, Green and Yellow):** indicate waiting for Reset, Lockout, Override, and OSSD status **Yellow and Green LEDs** adjacent to individual inputs/interfaces indicate status (ON = active/closed)
Diagnostic Code Display	Diagnostic Display is a two-digit numeric display that indicates the cause of lockout conditions and the amount of time remaining for the backdoor timer.
Muting Lamp Output	A monitored or non-monitored (selectable) sinking output. If monitoring has been selected, the current draw must be 10 to 360 mA. Interconnect wire resistance < 30 Ω. **Max. switching voltage:** 30V dc **Max. switching current:** 360 mA **Min. switching current:** 10 mA **Saturation voltage:** ≤ 1.5V dc @ 10 mA; ≤ 5V dc @ 360 mA
Controls and Adjustments	**All configured on two redundant banks of DIP switches:** Manual/auto reset One-way/two-way muting Monitored/non-monitored mute lamp output One-channel/two-channel/no EDM Backdoor timer Mute on power-up enable
Inputs	The MSSI and the SSI can be interfaced with external safety devices that have either hard contact outputs or solid-state sourcing outputs. When connecting the MSSI (S11-S12, S21-S22) or SSI (X5-X6, X7-X8) inputs to safety relay outputs or hard contacts, these contacts must be capable of switching 15 to 30 V dc at 10-50 mA. **Operating Range for MSSI and SSI Inputs** **OFF State:** -3V to +5V, 0 to 2 mA **ON State:** 15-30V, 10-50 mA **Muteable Safety Stop Interface (MSSI)** This input consists of two channels (MSSI-A and MSSI-B), and can be muted when the requirements for a mute cycle have been met. When muted, the OSSDs remain ON, independent of the MSSI status. If not muted, when either or both channels open, the OSSD outputs will go OFF. *Maximum external resistance per channel must not exceed 400 Ω.* **Safety Stop Interface (SSI)** This input consists of two channels (SSI-A and SSI-B), and is always active. When one or both channels open, the OSSD Outputs will go OFF. *Maximum external resistance per channel must not exceed 400 Ω.*
External Device Monitoring (EDM)	Two pairs of terminals are provided to monitor the state of external devices controlled by the OSSD outputs. Each device must be capable of switching 15-30V dc at 10-50 mA.
Muting Device Inputs	The muting devices work in pairs (M1 and M2, M3 and M4) and are required to be "closed" within 3 seconds of each other (simultaneity requirement/synchronous actuation) to initiate a mute (assuming all other conditions are met). Each muting device must be capable of switching 15-30V dc at 10-50 mA.
Mute Enable Input	This mute enable input must have +24V dc applied in order to start a mute; opening this input after mute has begun has no effect. The switching device must be capable of switching 15-30V dc at 10-50 mA.
Override Inputs	The two-channel inputs must be closed within 3 seconds of each other (simultaneity/synchronous action requirement) and held closed during the 30-second Override. To initiate a subsequent Override, open both channels, wait 3 seconds, and then re-close both channels (within 3 seconds). The switching devices must be capable of switching 15-30V dc at 10-50 mA.
Reset Input	Terminals must be closed for a minimum of 0.25 seconds and not more than 2.0 seconds in order to guarantee a reset. The switching device must be capable of switching 15-30V dc at 10-50 mA.

More on next page

MMD-TA-12B & MMD-TA-11B Muting Modules Specifications (cont'd)

Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Construction	Polycarbonate housing
Connections	Removable terminal blocks
Environmental Rating	NEMA 1; IP20
Operating Conditions	**Temperature range:** 0° to +50° C **Relative humidity:** 95% (non-condensing)
Design Standards	Designed to comply with Safety Category 4 per SIL 3 (IEC 61508); SIL CL3 (IEC 62061); Category 4, Performance Level (PL) e (ISO 13849-1)
Certifications	CE c UL LISTED AOPD 10GH US
Wiring Diagrams	**MMD-TA-12B:** WD051, WD053, WD054 (pp. 253-255) **MMD-TA-11B:** WD052 (p. 253)

Safe Speed

Safety Modules

- Monitors redundant devices, such as two sensors with PNP outputs, for rotation and linear movements.
- Allows locked gates or guards to be opened when speed drops below the dangerous speed
- Provides two normally open safety contacts and one normally closed auxiliary contact, each rated at 5 amps
- Offers choice of two models with adjustable RPM ranges
- Rated NEMA 1 and at least IP20

SSM Safe Speed Monitoring Modules

- 24V ac/dc operation
- Easy to see green LED status indicators
- Rugged polycarbonate housing
- Removable terminal blocks
- Standard 35 mm DIN rail track mounting

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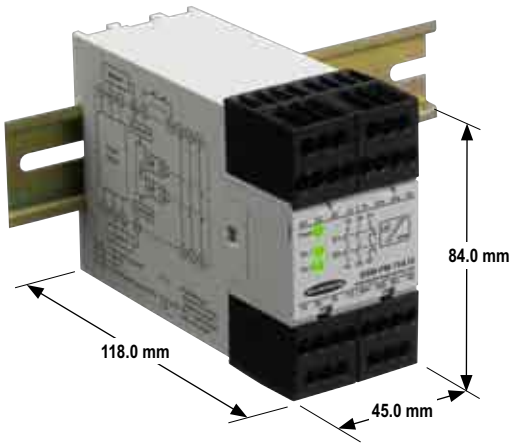

SSM-FM-11A... Models

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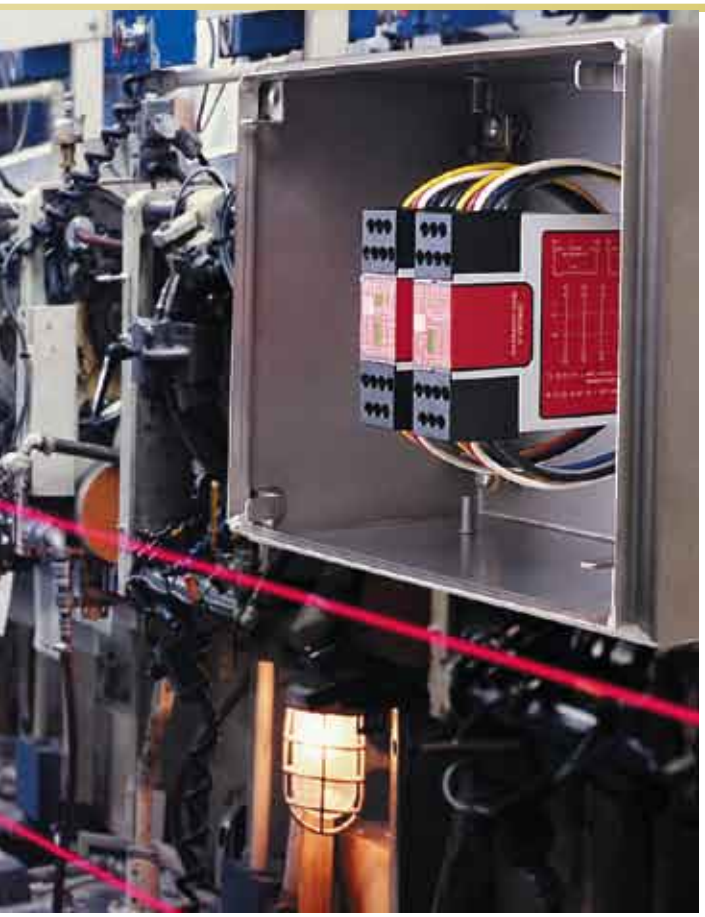
SSM Safe Speed Monitoring Modules

Model	Functional Stop Category	Supply Voltage	Inputs	Safety Outputs	Output Rating	Aux. Outputs	Ranges (lpm)	Data Sheet
SSM-FM-11A10	0	24V ac/dc	2 PNP	**2 NO**	5 amps	1 NC	5 - 40, 35 - 340, 300 - 2700, 1200 – 10500	140782
SSM-FM-11A20							10 - 80, 80 - 650, 600 - 5300, 2400 - 20000	

NC = Normally Closed Relay, NO = Normally Open Relay

SSM Safe Speed Monitoring Module Specifications

Supply Voltage and Current	24V ac/dc; 50/60 Hz **AC:** +10/-15% **DC:** ±10% **Power Consumption:** approx. 4 VA/ 2.5 W
Output Configuration	Outputs (K1 & K2): Two redundant (total of four) safety relay (forced-guided) contacts – AgNi, 5 µm gold-plated, plus 1 NC Auxiliary Monitor output AgNi, 5 µm gold-plated **Low Current rating: Caution: The 5 µm gold-plated contacts allow switching of low current/low voltage. In these low-power applications, multiple contacts can also be switched in series (e.g., "dry switching")** To preserve the gold plating on the contacts, the following max. values should not be exceeded at any time: **Min. voltage:** 1V ac/dc **Max. voltage:** 60V **Min. current:** 5 mA ac/dc **Max. current:** 300 mA **Min. power:** 5 mW (5 mVa) **Max. power:** 200 W (1380 VA) **High Current Rating:** If higher loads must be switched through one or more of the contacts, the minimun and maximum values of the contact(s) to: **Min. voltage:** 15V ac/dc **Max. voltage:** 230V ac/dc **Min. current:** 250 mA ac/dc **Max. current:** 4 A **Min. power:** 5 W (5 VA) **Max. power:** 200 W (920 VA) **Mechanical life:** 50,000,000 operations **Electrical life:** 150,000 operations (typical, @ 920 VA switching power, resistive load) 150,000 operations (typical, @ 200 W switching power, resistive load) **NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.**
Adjustable Setting Ranges	**SSM-FM-11A10:** 5 to 40, 35 to 340, 300 to 2700, 1200 to 10500 lpm (Impulses per minute) **SSM-FM-11A20:** 10 to 80, 80 to 650, 600 to 5300, 2400 to 20000 lpm (Impulses per minute)
Response Time	**Standstill/Underspeed:** (60 seconds/adjusted IPM value) + 2.5 seconds = tDS tDS = output ON-delay after detection of standstill **Overspeed:** **5 to 10500 lpm models:** tr = 700 milliseconds typical **10 to 20000 lpm models:** tr = 350 milliseconds typical
Input Requirements	Input switches must have PNP solid-state output capable of of switching 3 to 25 mA @ 24V dc
ON-Time Delay	1.5 seconds
Hysteresis	6% typical
Status Indicators	**3 green LEDs:** Power ON K1 energized K2 energized
Construction	Polycarbonate housing
Environmental Rating	Rated NEMA 1; IP20
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 55 Hz @ 0.35 mm displacement per IEC 60068-2-6
Operating Conditions	**Temperature:** 0° to +50° C **Relative humidity:** 90% @ +50° C (non-condensing)
Certifications	CE c UL US (pending)
Wiring Diagrams	WD056: (p. 256)



Extension
Relay Modules

- Provides additional safety outputs for a primary safety device with relay outputs
- Offers four safety output channels
- Provides delayed or immediate outputs, depending on model
- Requires no adjustments
- If malfunctioning, signals primary safety device to react
- Responds in less than 35 milliseconds
- Mounts on DIN rail

Extension Modules

- Narrow 22.5 mm polycarbonate housing
- 24V dc or 24V ac/dc operation, depending on model
- Three green LED indicators
- Plug-in or fixed terminal blocks

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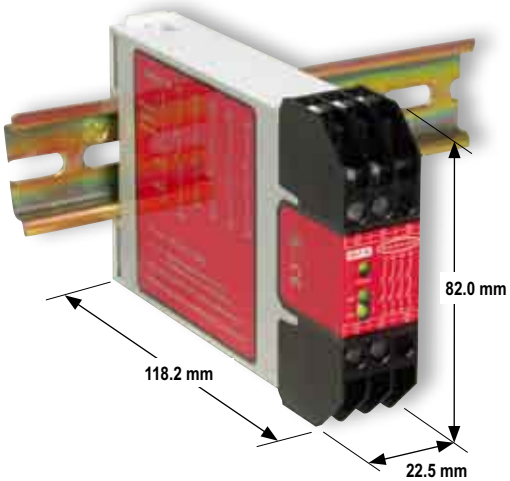

EM-F..-7G Models

EM-T-7A Models

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Extension Modules

Model	Supply Voltage	Inputs	Safety Outputs	Output Rating	Aux. Outputs	Output Response Time	Delay	Data Sheet
EM-T-7A	24V dc	1 NC (single) or 2 NC (dual)	**4 NO**	6 amps	—	20 ms	—	54208
EM-F-7G	24V ac/dc	1 NC (single)				35 ms	—	55799
EM-FD-7G2			**4 NO w/delay**			30 ms	0.5 sec.	56968
EM-FD-7G3							1.0 sec.	
EM-FD-7G4							2.0 sec.	

NC = Normally Closed Relay, NO = Normally Open Relay

Extension Module Specifications

Supply Voltage and Current	**EM-T-7A model:** A1-A2: 24V dc, +/-15%, 10% max. ripple **EM-F/FD-7G.. models:** A1-A2: 24V ac/dc, +/-10%, 10% max. ripple on dc
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Output Configuration	**Four output channels:** **EM-T-7A:** Each channel is a series connection of two forced-guided (positive-guided) relay contacts – AgNi, gold flashed **EM-F/FD-7G.. :** Each channel is a series connection of two forced-guided (positive-guided) relay contacts – $AgSnO_2$ **Contact ratings:** **Max. voltage:** 250V ac/dc **Max. current:** 6 A ac/dc **Min. current:** 30 mA @ 24V dc **Max. power:** 1500 VA, 200 W **Mechanical life: EM-T-7A model:** 50,000,000 operations **EM-F/FD-7G.. models:** 10,000,000 operations **Electrical life:** 100,000 at full resistive load **Feedback contact rating (Y1-Y2): EM-T-7A:** 24V dc @ 0.5A **EM-F/FD-7G..:** 250V ac/dc @ 3A **NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.**
Output Response Time	**EM-T-7A:** 20 milliseconds max. (if channel u-k fails, maximum response time is 200 milliseconds) **EM-F-7G:** 35 milliseconds typical **EM-FD-7G..:** **Delay OFF:** 0.5 seconds ±30% for **EM-FD-7G2**, 1 seconds ±30% for **EM-FD-7G3**, 2 seconds ±30% for **EM-FD-7G4**, as measured from the time when the supply voltage to A1 is interrupted **Delay ON:** 30 milliseconds for all models
Input Requirements	**EM-T-7A:** Inputs from Primary Safety Device must each be capable of switching 30 to 250 mA @ 13 to 28V dc. **EM-F/FD-7G..:** Input from Primary Safety Device must be capable of switching 40 to 100 mA @ 13 to 27V ac/dc.
Status Indicators	**3 green LEDs:** Power ON K1 energized K2 energized
Construction	Polycarbonate housing.
Environmental Rating	Rated NEMA 1; IP20
Mounting	Mounts to standard 35 mm DIN rail track. Extension Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 55Hz @ 0.35 mm displacement per IEC 60068-2-6
Operating Conditions	**Temperature:** 0° to +50° C **Relative humidity:** 90% @ +50° C (non-condensing)
Design standards	Designed to comply with EN 292-1, ISO 12100-1, EN 292-2, ISO 12100-2, EN 954-1, EN 20604-1, EN 60335-1
Certifications	UL LISTED Emergency Stop Device
Wiring Diagrams	**EM-T-7A 1-Channel EDM:** WD056 (p. 257) **EM-T-7A 2-Channel EDM:** WD057 (p. 257) **EM-F-7G:** WD058 (p. 258) **EM-FD-7G:** WD059 (p. 258)

Interface
Relay Modules

- Increases the switching current capacity of low-voltage primary safety devices to 6 amps
- Serves as a relay for primary safety devices with OSSD solid-state or hard contact outputs and external device monitoring, such as the EZ-SCREEN®
- Uses two green LEDs to indicate the output status of internal relays K1 and K2
- Responds in 20 milliseconds maximum

Interface Modules

- 22.5 mm polycarbonate housing
- Plug-in terminal blocks
- DIN rail mounting

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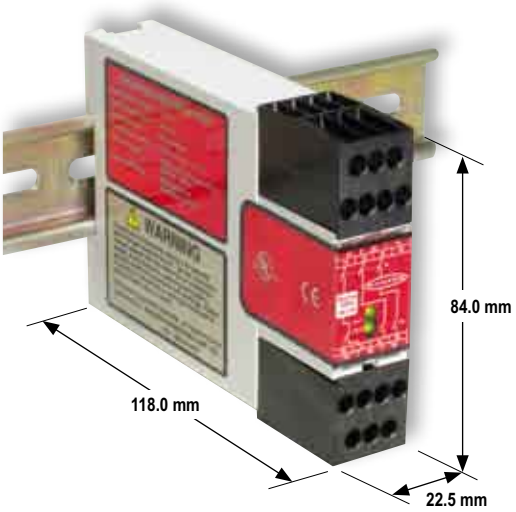

Interface Models

BRACKETS
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Interface Modules

Model	Supply Voltage	Inputs	Safety Outputs	Output Rating	Aux. Outputs	Output Response Time	Data Sheet
IM-T-9A	24V dc	2 NC (dual)	**3 NO**	6 amps	—	20 ms	62822
IM-T-11A			**2 NO**		1 NC		

NC = Normally Closed Relay, NO = Normally Open Relay

Interface Modules Specifications

Input Voltage and Current	24V dc, +/-15% no polarity, 10% max. ripple; 50 mA per input channel **Power consumption:** approx. 2.4 W
Supply Protection Circuitry	Protected against transient voltages.
Output Configuration	**IM-T-9A:** 3 normally open output channels **IM-T-11A:** 2 normally open output channels and 1 normally closed auxiliary output channel. Each normally open output channel is a series connection of contacts from two forced-guided (positive-guided) relays, K1-K2. The normally closed contact 31-32 is a parallel connection of contacts from K1-K2. **Contacts:** AgNi, 5 µm gold-plated **Low Current Rating:** **Caution: The 5 µm gold-plated contacts allow the switching of low current/low voltage.** To preserve the gold plating on the contacts, the following max. values should not be exceeded at any time: **Min. voltage:** 1V ac/dc **Max. voltage:** 60V **Min. current:** 5 mA ac/dc **Max. current:** 300 mA **Min. power:** 5 mW (5 mVA) **Max. power:** 7 W (7 VA) **High Current Rating:** If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to: **Min. voltage:** 15V ac/dc **Max. voltage:** 250V ac/dc **Min. current:** 30 mA ac/dc **Max. current:** 6 A **Min. power:** 5 W (5 VA) **Max. power:** 200 W (1,500 VA) **Mechanical life:** 50,000,000 operations **Electrical life:** 150,000 operations (typical, @ 200 W (1,500 VA) switched power, resistive load) **Feedback contact rating (Y1-Y2, Y3-Y4):** **Min. voltage:** 1V ac/dc **Max. voltage:** 60V **Min. current:** 5 mA ac/dc **Max. current:** 300 mA **Min. power:** 5 mW (5 mVA) **Max. power:** 7 W (7 VA) **NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.**
Output Response Time	20 milliseconds max.
Status Indicators	**2 green LED indicators:** K1 energized K2 energized
Construction	Polycarbonate housing.
Environmental Rating	Rated NEMA 1; IP20.
Mounting	Mounts to standard 35 mm DIN rail track. Interface Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 55Hz @ 0.35 mm displacement per IEC 60068-2-6
Operating Conditions	**Temperature:** 0° to +50° C **Relative humidity:** 90% @ 50° C (non-condensing)
Certifications	CE c UL LISTED Auxiliary Device US
Wiring Diagrams	**2-Channel, 2 FSDs, 2 EDM:** WD060 (p. 259) **2-Channel, 2 PNP, 1 EDM:** WD061 (p. 259) **2-Channel, 2 FSDs, 1 EDM:** WD062 (p. 260) **1-Channel, 1 Relay, 1 EDM:** WD062 (p. 260)

Two-Hand Control

DUO-TOUCH® SG page 111

- Monitors STB buttons or other actuators
- Delivers highest level of safety for two-hand controls by meeting or exceeding OSHA/ANSI control reliability requirements
- Designed to meet Safety Category 4 per ISO 13849-1 (EN 954-1) and Type IIIC two-hand control per ISO 13351 (EN 574)
- Offers choice of operating voltages, functions and outputs

STB Self-Checking Touch Buttons page 117

- Delivers highest level of safety for two-hand controls
- Self-checks for internal problems
- Features ergonomic design to prevent repetitive motion stress

DUO-TOUCH® SG Run Bars page 120

- Provides convenient economical means for two-hand control actuation
- Simplifies installment
- Includes two STB self-checking touch buttons

DUO-TOUCH® SG Selection Chart

Model		Catalog Page	Type	Supply Voltage	Inputs	Safety Outputs	Output Rating	Auxiliary Outputs	Housing Width
AT-FM-10K		112	IIIC	24V ac/dc	2 STB*	**2 NO**	6 amps	—	22.5 mm
AT-GM-13A		112	IIIC	115V ac/ 24V dc	2 STB*	**4 NO**	6 amps	1 NPN, 1 PNP & 1 NC	45 mm
AT-HM-13A		112	IIIC	230V ac/ 24V dc	2 STB*	**4 NO**	6 amps	1 NPN, 1 PNP & 1 NC	45 mm
AT-GM-11KM		112	IIIC	115V ac/ 24V dc	2 STB* & Muting	**2 NO**	6 amps	1 NPN, 1 PNP & 1 NC	67.5 mm
AT-HM-11KM		112	IIIC	230V ac/ 24V dc	2 STB* & Muting	**2 NO**	6 amps	1 NPN, 1 PNP & 1 NC	67.5 mm

NC = Normally Closed, NO = Normally Open

* May also use two mechanical push buttons, each with one normally open (NO) and one normally closed (NC) contact (Form C). See data sheets for details.

DUO-TOUCH® SG

Two-Hand Control Modules, STB Compatible

- Modules work with Banner STB self-checking touch buttons or can be retrofitted with existing mechanical palm buttons to create a complete, ergonomic two-hand control system (see page 117).
- To ensure OSHA/ANSI Control Reliability, modules have a diverse-redundant microcontroller circuit and multiple redundant, force-guided (mechanically linked) output contacts.
- Anti-tiedown logic requires that both touch buttons are activated within one-half second of each other.
- Designed to meet Safety Category 4 per ISO 13849-1 (EN 954-1) and functional Type IIIC two-hand control per ISO 13851 (EN 574).
- Removable terminal blocks allow convenient wiring and exchanging of modules without rewiring.
- Optional mute inputs allow release of actuating buttons during the non-hazardous portion of the machine cycle.
- Available kits include module and two STB touch buttons.
- Modules easily interface with DUO-TOUCH® Run Bars with STBs for an economical, convenient means for actuation.
- Available in ac and dc voltages: 24V ac/dc, 115V ac/24V dc or 230V ac/24V dc.

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AT-GM/HM-11KM Models
- 115V ac/24V dc (GM)
- 230V ac/24V dc (HM)
- 2 NO/NC inputs
- 2 muting inputs
- 1 safety stop interface
- 2 safety outputs
- Auxiliary outputs

Page 113

AT-GM/HM-13A Models
- 115V ac/24V dc (GM)
- 230V ac/24V dc (HM)
- 2 dual NO/NC inputs
- 4 safety outputs, 6 amps
- Auxiliary outputs

Page 113

AT-FM-10K Models
- 24V ac/dc
- 2 dual NO/NC inputs
- 2 safety outputs, 6 amps

Page 113

DUO-TOUCH® SG Run Bar

Page 120

- Provides convenient economical means for two-hand control actuation
- Simplifies installment
- Includes two STB self-checking touch buttons

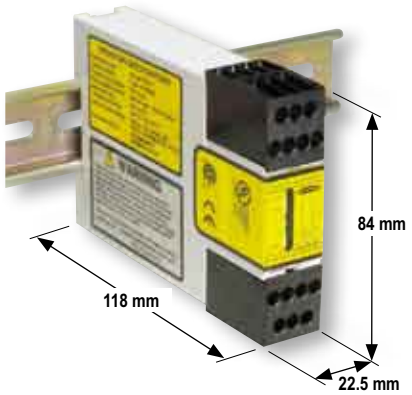
STB Self-Checking Touch Buttons

Page 117

- Delivers highest level of safety for two-hand controls
- Self-checks for internal problems
- Features ergonomic design to prevent repetitive motion stress

DUO-TOUCH® SG Two-Hand Control Modules, STB Compatible

- 24V ac/dc, 115V ac/24V dc or 230V ac/24V dc
- Four green and one red LED indicators
- Minimum NEMA 3 (IP20) polycarbonate housing
- Muting optional
- 35 millisecond output response time



AT-FM-10K Model

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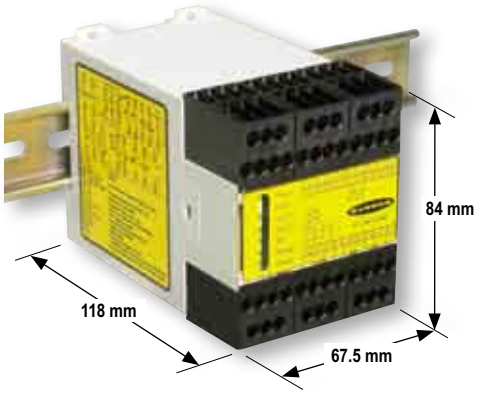
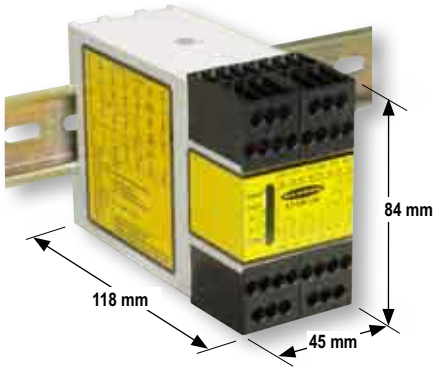


AT-GM-11KM & AT-HM-11KM Models
(AT-GM-11KM shown)



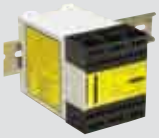
AT-GM-13A & AT-HM-13A Models
(AT-GM-13A shown)

DUO-TOUCH® SG Two-Hand Control Modules

Model	Supply Voltage	Inputs	Safety Outputs	Output Rating	Auxiliary Outputs	Muting	Terminals	Data Sheet
AT-FM-10K	24V ac/dc	2 STB*	**2 NO**	6 amps	—	—	Removable	64137
AT-GM-13A	115V ac/24V dc	2 STB*	**4 NO**		1 NPN, 1 PNP & 1 NC	—	Removable	67241
AT-HM-13A	230V ac/24V dc							
AT-GM-11KM	115V ac/24V dc	2 STB* & Muting	**2 NO**		1 NPN, 1 PNP & 1 NC	Yes	Removable	109782
AT-HM-11KM	230V ac/24V dc							

NC = Normally Closed, NO = Normally Open
* May also use two mechanical push buttons, each with one normally open (NO) and one normally closed (NC) contact (Form C). See data sheets for details.
NOTE: Kits are available which include one DUO-TOUCH SG Safety Module and two STB Touch Buttons. STB Touch Buttons are also available separately. See page 117.

DUO-TOUCH® SG Kits — Solid-State STB Touch Buttons (Meets Category IIIC)

Kit	Kit Components†					
Includes 2 STB Touch Buttons & a DUO-TOUCH® SG Safety Module	DUO-TOUCH® SG Safety Module	Supply Voltage	Safety Outputs	Auxiliary Outputs	STB Touch Buttons (see page 118)	
					Model	Cable*
ATK-VP6	 AT-FM-10K	24V ac/dc	2 NO	–	STBVP6	2 m
ATK-VP6Q					STBVP6Q	4-Pin Mini QD
ATK-VP6Q5					STBVP6Q5	4-Pin Euro QD
ATGMK-VP6	 AT-GM-13A	115V ac/24V dc	4 NO	1 NPN, 1 PNP & 1 NC	STBVP6	2 m
ATGMK-VP6Q					STBVP6Q	4-Pin Mini QD
ATGMK-VP6Q5					STBVP6Q5	4-Pin Euro QD
ATHMK-VP6	 AT-HM-13A	230V ac/24V dc	4 NO	1 NPN, 1 PNP & 1 NC	STBVP6	2 m
ATHMK-VP6Q					STBVP6Q	4-Pin Mini QD
ATHMK-VP6Q5					STBVP6Q5	4-Pin Euro QD
ATGMKM-VP6	 AT-GM-11KM	115V ac/24V dc	2 NO	1 NPN, 1 PNP & 1 NC	STBVP6	2 m
ATGMKM-VP6Q					STBVP6Q	4-Pin Mini QD
ATGMKM-VP6Q5					STBVP6Q5	4-Pin Euro QD
ATHMKM-VP6	 AT-HM-11KM	230V ac/24V dc	2 NO	1 NPN, 1 PNP & 1 NC	STBVP6	2 m
ATHMKM-VP6Q					STBVP6Q	4-Pin Mini QD
ATHMKM-VP6Q5					STBVP6Q5	4-Pin Euro QD

NC = Normally Closed, NO = Normally Open

* For 9 m cable, add suffix **W/30** to the 2 m model number (example, **ATK-VP6 W/30**). A model with a QD requires a mating cordset. Order QD cordsets separately (see page 119).

† Contact factory for DUO-TOUCH SG kits with e/m relay STB Buttons.

DUO-TOUCH® SG AT-FM-10K Modules Specifications

Supply Voltage and Current	24V ac/dc ±15% @ 150 mA
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Safety Outputs	**Outputs (K1 and K2):** two redundant (total of four) forced-guided safety relay contacts **Contacts:** AgNi, 5 µm gold-plated **Low Current Rating:** **Caution: The 5 µm gold-plated contacts allow the switching of low current/low voltage.** To preserve the gold plating on the contacts, the following max. values should not be exceeded at any time: **Min. voltage:** 1V ac/dc — **Max. voltage:** 60V **Min. current:** 5 mA ac/dc — **Max. current:** 300 mA **Min. power:** 5 mW (5 mVA) — **Max. power:** 7 W (7 VA) **High Current Rating:** If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to: **Min. voltage:** 15V ac/dc — **Max. voltage:** 250V ac/dc **Min. current:** 30 mA — **Max. current:** 6 A ac or dc (resistive load) **Min. power:** 5 W (5 VA) — **Max. power:** 200 W (1,500 VA) **Mechanical life:** 50,000,000 operations **Electrical life:** 150,000 operations typical, @ 200 W (1,500 VA) switched power, resistive load. **NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.**
Output Response Time	35 milliseconds max. ON/OFF
Input Requirements	Outputs from actuating devices (1 NO and 1 NC) must each be capable of switching 20 mA @ 12V dc.
Simultaneity Monitoring Period	≤ 500 milliseconds
External Device Monitoring (EDM)	One pair of terminals (Y1 and Y2) are provided to monitor the state of external devices controlled by the safety outputs. Each device must be capable of switching 15 to 30V dc at 10-50 mA.
Status Indicators	**4 green LEDs:** Power ON Input 1 energized Input 2 energized Output **1 red LED:** Fault
Environmental Rating	Polycarbonate. Rated NEMA 1; IP20
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 55 Hz @ 0.35 mm displacement per IEC 60068-2-6
Operating Conditions	**Temperature:** 0° to +50° C **Relative humidity:** 90% @ +50° C (non-condensing)
Design Standards	Designed to comply with Category 4 per ISO 13849-1; Type IIIC per ISO 13851 (EN 574)
Certifications	CE c UL us LISTED
Wiring Diagrams	WD064 (p. 261)

DUO-TOUCH® SG AT-..M-13A Modules Specifications

Supply Voltage and Current	**AT-GM-13A:** 115V ac, ±15%; 50/60 Hz & 24V dc, ±15%, 10% max. ripple **AT-HM-13A:** 230V ac, ±15%; 50/60 Hz & 24V dc, ±15%, 10% max. ripple
Power Consumption	Appox. 4 W/7 VA
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Safety Outputs (including Auxiliary NC output 5/52)	**Outputs (K1 and K2):** four redundant (total of eight) forced-guided safety relay contacts **Contact ratings:** **Min. voltage:** 15V ac/dc — **Max. voltage:** 250V ac or 250V dc **Min. current:** 30 mA — **Max. current:** 6A ac or dc (resistive load) **Min. power:** 5 VA, 5 watts — **Max. power:** 1500 VA, 200 watts **Mechanical life:** 50,000,000 operations **Electrical life:** 150,000 cycles (typically @ 1.5 kVA switching power) **NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.**
Auxiliary Supply Voltage (for Solid-State outputs)	24V dc @ 1A (between Y30 & Y31)
Auxiliary Solid-State Output Current	500 mA max., short circuit protected (Y32 or Y31)
Output Response Time	35 milliseconds max. ON/OFF
Input Requirements	Outputs from actuating devices (1 NO and 1 NC) must each be capable of switching 20 mA @ 12V dc.
Simultaneity Monitoring Period	≤ 500 milliseconds
Z1/Z2 Courtesy Voltage	24V dc @ 150 mA (for STB button power)
External Device Monitoring (EDM)	One pair of terminals (Y1 and Y2) are provided to monitor the state of external devices controlled by the safety outputs. Each device must be capable of switching 15 to 30V dc at 10-50 mA.
Status Indicators	**4 green LEDs:** Power ON Input 1 energized Input 2 energized Output **1 red LED:** Fault
Environmental Rating	Polycarbonate. Rated NEMA 1; IP20
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 55 Hz @ 0.35 mm displacement per IEC 68-2-6
Operating Conditions	**Temperature:** 0° to +50° C **Relative humidity:** 90% @ +50° C (non-condensing)
Design Standards	Designed to comply with Category 4 per ISO 13849-1 (EN 954-1); Type IIIC per ISO 13851 (EN 574)
Certifications	CE **Important Notice:** **European Community Machinery Directive 2006/42/EC** The DUO-TOUCH SG AT-..M-13A Two-Hand Control Modules comply with Machine Directive 98/37/EC. After December 29, 2009, when Machine Directive 2006/42/EC will be in force, the DUO-TOUCH SG AT-..M-13A Two-Hand Control Modules can only be installed as a replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767.
Wiring Diagrams	**AT-..M-13A models:** WD067 (p. 263) **AT-..M-13A to STB Buttons:** WD069 (p. 264)

DUO-TOUCH® SG AT-..M-11KM with Muting Specifications

Supply Voltage and Current	**AT-GM-11KM:** 115V ac, ± 15%; 50/60Hz & 24V dc, +/- 15%, 10% max. ripple **AT-HM-11KM:** 230V ac, ± 15%; 50/60Hz & 24V dc, +/- 15%, 10% max. ripple
Power Consumption	Approx. 4 W / 7 VA
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Safety Outputs	**Outputs (K1 and K2):** two redundant (total of four) safety relay (forced-guided) contacts **Contact ratings:** **Min voltage:** 15V ac/dc — **Max. voltage:** 250V ac or 250V dc **Min. current:** 30 mA — **Max. current:** 6A ac or dc (resistive load) **Min. power:** 5 W (5 VA) — **Max. power:** 1500 VA, 200 watts **Mechanical life:** 50,000,000 operations **Electrical life:** 150,000 cycles (typically @ 1.5 kVA switching power) **NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.**
Auxiliary Supply Voltage (for solid-state outputs)	24V dc @ 1A (applied between Y30 & Y31)
Auxiliary Solid-State Output Current	500 mA max., short circuit protected, Y32 is a PNP output, Y33 is an NPN output
Output Response Time	35 milliseconds max. ON/OFF
Input Requirements	Outputs from actuating devices must each be capable of switching up to 20 mA @ 12V dc.
Simultaneity Monitoring Period	≤ 500 milliseconds
Z1/Z2 Courtesy Voltage	24V dc @ 150 mA (for STB button power, separate from Auxiliary output, unregulated)
External Device Monitoring (EDM)	One pair of terminals (Y1 and Y2) are provided to monitor the state of external devices controlled by the safety outputs. Each device must be capable of switching 15 to 30V dc at 10-50 mA.
Muting Device Inputs (M1, M2)	The muting devices work as a pair (M1 and M2). The simultaneity requirement is that they be "closed" within 3 seconds of each other to initiate a mute condition or allow a mute cycle, assuming all other conditions are met. Each muting device must be capable of switching 15 to 30V dc at 10-50 mA.
Mute Enable Input (ME)	Mute Enable input must be closed in order to start a mute cycle. Opening this input after a mute cycle has begun has no effect. The switching device must be capable of switching 15 to 30V dc at 10-50 mA.
Safety Stop Interface (SSI)	This input consists of two concurrent channels (SSI-A and SSI-B) and is always active. Any time either or both channels open, the Safety Outputs will go OFF. When using the SSI, the external device must be capable of switching 15 to 30V dc at 10-50 mA.
Status Indicators	**6 green LED indicators** Power ON Input 1 energized Input 2 energized SSI inputs closed Muting activated Output **1 red LED indicator** Fault
Environmental Rating	Polycarbonate. Rated NEMA 1; IP20
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 55 Hz @ 0.35 mm displacement per IEC 60068-2-6
Operating Conditions	**Temperature:** 0° to +50° C — **Relative humidity:** 90% @ +50° C (non-condensing)
Design Standards	Designed to comply with Category 4 per ISO 13849-1 (EN 954-1); Type IIIC per ISO (EN 574)
Certifications	For certification information, please call 1-888-373-6767.
Wiring Diagrams	**AT-..M-11KM:** WD068 (p. 263) **AT-..M-11KM to STB Buttons:** WD069 (p. 264)

STB

Self-Checking Touch Buttons

- Provides highest level of safety for two-hand control input devices, per independent certification tests
- Provides redundant microprocessor and optical path
- Responds to a finger blocking light rather than to pressure
- Features ergonomic design to prevent repetitive motion stress
- Includes yellow field cover to prevent unintended switching
- Immune to ambient light, EMI and RFI
- Available with e/m relays rated for 1 amp switch capacity or solid-state outputs rated for 150 mA
- Withstands exposure to a variety of chemicals, depending on model
- For safety applications, STB buttons must be used with DUO-TOUCH® SG Two-Hand control modules, SC22-3.. Safety Controller or comparable control system

DUO-TOUCH® SG MODULES
STB BUTTONS
DUO-TOUCH® Run Bars
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STB Self-Checking Touch Buttons

- LED power, output and fault indicators
- 10 to 30V dc or 20 to 30V ac/dc
- 2 m or 9 m integral cable, or quick-disconnect fitting
- Housing sealed to IP66
- Optional field cover colors

STB models

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STB models with cover

STB Self-Checking Buttons – Solid-State Outputs, 10-30V dc

Models	Cable*	Upper Housing	Solid-State Outputs	Data Sheet
STBVP6	2 m	Polyetherimide	**2 Complementary PNP (1 ON, 1 OFF)**	64136
STBVP6Q	4-Pin Mini QD			
STBVP6Q5	4-Pin Euro QD			

STB Self-Checking Buttons – e/m Relay Outputs, 20-30V ac/dc

Models	Cable*	Upper Housing	e/m Relay Outputs	Data Sheet
STBVR81	2 m	Polyetherimide	**2 Complementary SPST (1 NC, 1 NO)**	64136
STBVR81Q	5-Pin Mini QD			
STBVR81Q6	5-Pin Euro QD			

NC = Normally Closed, NO = Normally Open

* For 9 m cable, add suffix **W/30** to the 2 m model number (example, **STBVP6 W/30**). A model with a QD requires a mating cordset (see page 119).

STB Self-Checking Buttons Specifications

Supply Voltage and Current	**STBVP6 Models:** 10 to 30V dc; Power Consumption: approx. 1.8 W @ 24V dc (with no output load) **STBVR81 Models:** 20 to 30V ac/dc; Power Consumption: approx. 1.8 W/1.8 VA @ 24V ac/dc
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Output Configuration	**STBVP6 Models:** Complementary PNP (sourcing) open-collector transistors **STBVR81 Models:** Complementary electromechanical relay
Output Rating	**STBVP6 Models (solid-state outputs):** **Max. load:** 150 mA **ON-state saturation voltage:** ≤ 15V @ full load **OFF-state leakage current:** less than 1 µA **STBVR81 Models (electromechanical relay):** **Max. switching voltage:** 150V dc, 125V ac **Max. switching current:** 1A @ 24V dc; 0.4A @ 125V ac (resistive loads) **Max. resistive load power:** 24 W dc; 50 VA ac **Mechanical life of relay:** 10^9 cycles **Electrical life of relay:** 1.5 x 10^5 cycles at 1 amp 24V resistive
Output Protection	All models protected against false pulse on power-up. Models with solid-state outputs have overload and short-circuit protection.
Output Response Time	20 milliseconds ON/OFF
Indicators	**2 green LED indicators:** **Power:** ON –power applied OFF –power off **Output/fault:** ON –button is activated OFF –button is deactivated Flashing –internal fault or blocked button on power-up detected
Construction	Totally encapsulated, non-metallic enclosure. Black Polyetherimide (PEI); fiber-reinforced PBT polyester base. Electronics fully epoxy-encapsulated. Supplied with polypropylene (TP) field cover.
Environmental Rating	Meets NEMA standards 1, 3, 4, 4X, 12 and 13; IP66
Connections	PVC-jacketed 2 m cables standard on integral-cable kits; QD fitting, depending on model. Accessory QD mating cordsets required for QD models. QD cordsets are ordered separately. See page 119. **STBVP6:** 4-wire (4-pin Mini-style QD, add suffix **Q** or 4-pin Euro-style QD, add suffix **Q5**) **STBVR81:** 5-wire (5-pin Mini-style QD, add suffix **Q** or 5-pin Euro-style QD, add suffix **Q6**) Integral 9 m cables are also available by adding suffix **W/30** to the 2 m model number.

More on next page

STB Self-Checking Buttons Specifications (cont'd)	
Ambient Light Immunity	Up to 100,000 lux
EMI/RFI Immunity	Immune to EMI and RFI noise sources per IEC 60947-5-2 and IEC 61496-1 Type 4 requirements
Operating Conditions	**Temperature:** 0° to +50° C **Relative humidity:** 90% @ +50° C (non-condensing)
Application Notes	**Environmental considerations for models with Polyetherimide (PEI) upper housings:** The Polyetherimide upper housing will become brittle with prolonged exposure to outdoor sunlight. Window glass effectively filters ultraviolet light and provides excellent protection from sunlight. Avoid contact with strong alkalis hydrocarbons and fuels. Clean periodically using mild soap solution and a soft cloth.
Certifications	CE c UL us LISTED
Hookup Diagrams	**STB Solid State (PNP):** WD065 (p. 262) **STB e/m Relay:** WD066 (p. 262)

Accessories

STB Self-Checking Touch Buttons

STB Self-Checking Button Field Covers

Models	Description		Data Sheet
OTC-1-BK	Black cover		28436
OTC-1-GN	Green cover		
OTC-1-RD	Red cover		
OTC-1-YW	Yellow cover		

Field covers are designed to prevent inadvertent activation of buttons due to objects (loose clothing, debris, etc.) which might accidentally block their sensing beams. Field covers are constructed of rugged polypropylene and are highly resistant to abrasion and to damage by most chemicals. Standard model numbers are shipped with a yellow cover.

Cordsets

Euro-Style to Flying Leads

pg. 177

Length	4-Pin	5-Pin
2 m	MQDC-406	MQDC1-506
5 m	MQDC-415	MQDC1-515
9 m	MQDC-430	MQDC1-530
15 m	MQDC-450	–

Euro-Style to Flying Leads

pg. 177

Length	4-Pin	5-Pin
2 m	MQDC-406RA	MQDC1-506RA
5 m	MQDC-415RA	MQDC1-515RA
9 m	MQDC-430RA	MQDC1-530RA
15 m	MQDC-450RA	–

Mini-Style QD to Flying Leads

pg. 183

Length	4-Pin	5-Pin
2 m	MBCC-406	MBCC-506
4 m	MBCC-415	MBCC-515
10 m	MBCC-430	MBCC-530

Brackets

STB

 pg. 173	 pg. 173	 pg. 173	 pg. 173	 pg. 174
SMB30A	SMB30MM	SMB30SC	SMBAMS30P	SMBAMS30RA

Run Bar

DUO-TOUCH® Run Bar with STBs

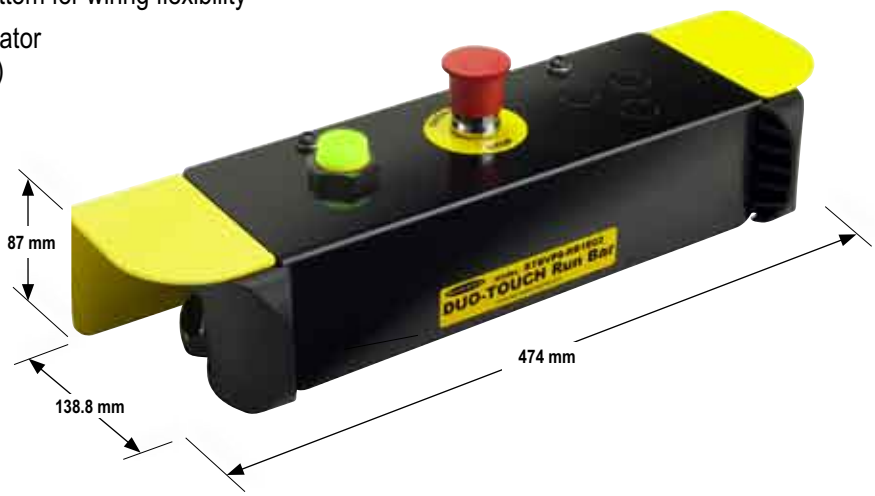
- Minimizes risk of defeat and accidental machine actuation
- Provides a convenient and economical means for safeguarding when interfaced with DUO-TOUCH® SG Two-Hand Control Modules or comparable control systems
- Offers ergonomic design for reduced hand, wrist and arm stress
- Provides two diverse-redundant microcontroller-based photoelectric STB Touch Buttons with continuous internal self-checking
- Features bright LED power, output and fault indicators on STBs
- Provides immunity to ambient light, EMI and RFI interference
- Offers optional telescoping stands and brackets
- Provides knockouts for wiring flexibility and installation of accessory EZ-LIGHT™ indicators

CORDSETS PAGE 122
BRACKETS PAGE 122
STANDS PAGE 198
INDICATORS PAGE 192

DUO-TOUCH® Run Bar with STB Self-Checking Touch Buttons

ONLINE
AUTOCAD, STEP, IGES & PDF

- ANSI B11.19 and ISO 13851 (EN 574) compliant
- Pre-installed STB optical touch buttons
- Robust, 13-gauge cold-rolled steel construction
- Emergency stop button on some models
- Knockouts on top, back and bottom for wiring flexibility
- Knockout for EZ-LIGHT™ indicator (sold separately, see page 192)
- Models with Mini-style QD or terminal strip connection
- IP20 & IP65 models



DUO-TOUCH® Run Bars with STB Self-Checking Touch Buttons

Models*	Connection	STB Touch Buttons		Environmental Rating	E-Stop Button	Data Sheet
		Model	Output			
STBVP6-RB1	Terminal Strip	STBVP6	**Solid-State Complementary PNP**	IP20	Not included	131634
STBVP6-RB1Q8	8-pin Mini* QD**				Not included	
STBVP6-RB1E02	Terminal Strip				Model **SSA-EBM-02L** E-stop button (two NC safety contacts)	
STBVP6-RB2	Terminal Strip			IP65	Not included	
STBVP6-RB2Q8	8-pin Mini QD**				Not included	
STBVP6-RB2E02	Terminal Strip				Model **SSA-EBM-02L** E-stop button (two NC safety contacts)	

* DUO-TOUCH Run Bar kits available with two-hand control module. Contact factory for combinations.
** Order QDS-8..C cordsets separately, see page 122.

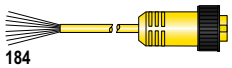
DUO-TOUCH® Run Bars with STB Self-Checking Touch Buttons

Supply Voltage and Current	10 to 30V dc **Power consumption:** approx. 1.8W @ 24V dc (with no output load), for each STB
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Output Configuration	Complementary PNP (sourcing) open-collector transistors
Output Rating	**Maximum load:** 150 mA **ON-state saturation voltage:** ≤ 15V @ full load **OFF-state leakage current:** < 1 µA
Output Protection Circuitry	Protected against false pulse on power-up; overload and short-circuit protection.
Output Response Time	20 milliseconds ON/OFF
STB Indicators	**2 green LEDs:** **Power:** ON–power applied **Output/fault:** ON–button is activated OFF–button is deactivated Flashing internal fault or blocked button on power-up detected
Construction	**STB Buttons:** Totally encapsulated, non-metallic enclosure; black polyetherimide yoke housing; fiber-reinforced polyester base; electronics fully epoxy-encapsulated. **E-Stop Button:** Polyamide red button with metal base. **Run Bar Housing:** 13 ga. cold rolled steel with powder coat paint; polypropylene copolymer STB mount.
Environmental Rating	**STBVP6-RB1** Run Bar models meet IP20 **STBVP6-RB2** Run Bar models meet IP65
Connections	**Models STBVP6-RB1/RB2 and -RB1E02/RB2E02:** Terminal strip connections inside run bar housing (STBs are pre-wired). E-stop button and EZ-LIGHT indicator (if used) are wired separately. **Models STBVP6-RB1Q8/RB2Q8:** 8-pin Mini-style quick-disconnect fitting. Accessory QD mating cordsets required for QD models. QD cordsets are ordered separately. See page 122.
Ambient Light Immunity	Up to 100,000 lux
EMI/RFI Immunity	Immune to EMI and RFI noise sources, per IEC 60947-5-2
Operating Conditions	**Temperature:** 0° to +50° C **Relative humidity:** 90% @ +50° C (non-condensing)
Certification	STB Buttons: CE cULus LISTED STBVP6-RB2 Run Bar models: CE (pending)
Wiring Diagrams	WD070, WD071 (p. 265)

Accessories

DUO-TOUCH® Run Bar

Cordsets

Mini-Style QD to Flying Leads	
 pg. 184	
Length	8-Pin
4.5 m	QDS-815C
7.6 m	QDS-825C
15.2 m	QDS-850C
22.8 m	QDS-875C

Brackets

Run Bar		
 pg. 175	 pg. 175	 pg. 175
Used with STBVP6-RB1 models		
STBA-RB1-MB1	STBA-RB1-MB2	STBA-RB1-MB3
Used with STBVP6-RB2 models		
STBA-RB1-MB1	STBA-RB2-MB2	STBA-RB2-MB3

Stands

Telescoping	
 pg. 199	 pg. 199
Used with STBVP6-RB1 models	
STBA-RB1-S1	STBA-RB1-S2
Used with STBVP6-RB2 models	
STBA-RB2-S1	STBA-RB2-S2

Indicators

EZ-LIGHT™	
 pg. 192	 pg. 192
T30...	K50L...