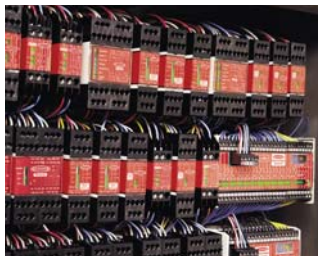




# Safety Modules

## PICO-GUARD™ ..... page 108

- Monitors multiple safety points.
- Replaces mechanical safety interlock switches.
- Eliminates electrical wiring to switchpoints.
- Installs easily.



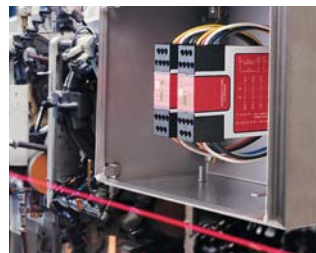
## E-Stop & Guard Monitoring ..... page 112

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



## Safety Mat ..... page 120

- 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.



## Extension ..... page 130

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



## Muting ..... page 123

- 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.



## Interface ..... page 132













- 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,

# SAFETY MODULES

## Selection Chart

SAFETY MODULES

# SAFETY MODULE SELECTION

Type	Model	Catalog Page	Safety Category	Functional Stop Category	Input Device	Supply Voltage	
Fiber Optic	SFCDT-4A1		Page 108	4	0	Optical & Mechanical & Solid State	24V dc
	SFCDT-4A1C						
E-Stop & Guard Monitoring	GM-FA-10J		Page 112	2 or 4	0	Magnetic & Mechanical	24V ac/dc
	ES-FA-9AA		Page 112	2 or 4	0	Mechanical	24V ac/dc
	ES-FA-11AA						
	ES-UA-5A		Page 112	2 or 4	0	Mechanical	115V ac & 12-24V dc
	ES-VA-5A						230V ac & 12-24V dc
	ES-TN-1H5		Page 112	2 or 4	0 & 1	Mechanical	24 V dc
	ES-TN-1H6						
	ES-TN-1H1						
	ES-TN-1H2						
	ES-TN-1H3						
	ES-TN-1H4						
	ES-TN-1H7						
	ES-TN-1H8						
	ES-TN-1H9						
	ES-TN-1H10						
	ES-TN-1H11						
	ES-TN-1H12						
	ES-TN-14H5		Page 112	2 or 4	0 & 1	Mechanical	24V dc
	ES-TN-14H6						
	ES-FA-6G		Page 112	2	0	Mechanical	24V ac/dc
Safety Mat Monitoring	SM-GA-5A		Page 120	4	0	Safety Mat & Safety Edge	115V ac & 24V dc
	SM-HA-5A						230V ac & 24V dc
Muting Modules	MM-TA-12B		Page 123	4	0	Mechanical & Solid State	24V dc
	MM2-TA-12B			2			
	MMD-TA-12B		Page 123	2 or 4	0	Mechanical & Solid State	24V dc
	MMD-TA-11B						
Extension Modules	EM-T-7A		Page 130	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		Page 132	2 or 4	—	Safety Output	24V dc
	IM-T-11A						

NC = Normally Closed Relay, NO = Normally Open Relay

Inputs	Safety Outputs	Output Rating	Aux. Outputs	Output Response Time	Delay	Housing Width
4 Optical Channels & 2 NC USSI (dual) x2	<b>2 PNP OSSD</b>	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)			
1 NC (single) or 1 NC & 1 NO (dual)	<b>2 NO</b>	6 amps	—	35 ms	—	22.5 mm
1 NC (single) or 2 NC (dual)	<b>3 NO</b>	6 amps	—	25 ms	—	22.5 mm
	<b>2 NO</b>		1 NC			
1 NC (single) or 2 NC (dual)	<b>4 NO</b>	6 amps	1 NC & 2 PNP	25 ms	—	45 mm
1 NC (single) or 2 NC (dual)	<b>2 NO &amp; 2 NO w/delay</b>	4 amps	1 NC (delayed) & 1 NC (immediate)	50 ms	0 - 20 sec.	45 mm
					0 - 200 sec.	
					0.25 sec.	
					0.5 sec.	
					1.0 sec.	
					2.0 sec.	
					4.0 sec.	
					6.0 sec.	
					8.0 sec.	
					10.0 sec.	
15.0 sec.						
20.0 sec.						
1 NC (single) or 2 NC (dual)	<b>4 NO &amp; 4 NO w/delay</b>	4 amps	1 NC (delayed) & 1 NC (immediate)	50 ms	0 - 20 sec.	67.5 mm
					0 - 200 sec.	
1 NC (single)	<b>3 NO</b>	6 amps	1 NC	35 ms	—	22.5 mm
1 (or multiple in series) 4-wire Safety Mat	<b>4 NO</b>	6 amps	1 NC & 2 PNP	50 ms	—	45 mm
2 NC Muteable (dual) & 2 NC USSI (dual)	<b>2 PNP OSSD</b>	0.5 amps	1 PNP	10 ms	—	60 mm
						60 mm
2 NC Muteable (dual) & 2 NC SSI (dual)	<b>2 PNP OSSD</b>	0.5 amps	1 PNP	10 ms	—	67.5 mm
	<b>2 NO</b>	6 amps	1 NC	30 ms		
1 NC (single) or 2 NC (dual)	<b>4 NO</b>	6 amps	—	20 ms	—	22.5 mm
1 NC (single)				35 ms		
				30 ms		
				1.0 sec.		
					2.0 sec.	
1 NC (dual)	<b>3 NO</b>	6 amps	—	20 ms	—	22.5 mm
	<b>2 NO</b>		1 NC			



# PICO-GUARD™ Fiber Optic Controllers

- Flexible and easy to install, the controller is a low-cost alternative to cumbersome and costly methods required for machine safeguarding.
- Each of the four channels controls multiple inputs to protect personnel from hazardous equipment, and to protect critical tooling or materials in process.
- 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 fiber optic Safety Interlock Switches in the same fiber loop.
- Each channel can monitor a separate part of a machine, such as doors, entry gates and sensors.
- USSI connects multiple PICO-GUARD Controllers and other safety devices in a single safety circuit, when required.
- Diverse-redundant and self-checking design exceeds control reliability and meets Safety Category 4 per ISO 13849 (EN 954-1) and IEC 61496-1 Type 4 requirements.



**SAFETY MODULES**

PICO-GUARD CONTROLLERS

E-STOP/GUARD MONITORING

SAFETY MAT MONITORING

MUTING MODULES

EXTENSION MODULES

INTERFACE MODULES



## 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 38.**

### Grid Systems

- 2-, 3- or 4-beam systems
- Protected heights of 500 to 1066 mm
- Three integral fiber types in five lengths

**Page 37.**

### Interlock Systems

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

**Page 137.**



## PICO-GUARD™ Controller

- Bi-color LED indicators for easy status monitoring
- Four optical channels
- Removeable terminal blocks
- Quick-disconnect fiber optic interface
- Three options for fiber optic cables
- DIN rail or panel/wall mounting
- Two Universal Safety Stop Input (USSI), one trip and latch with reset input



**PICO-GUARD Controller**

## PICO-GUARD™ Controller Models



Model	Supply Voltage	Inputs	Safety Outputs	Output Rating	Aux. Outputs	Output Response Time	Data Sheet
SFCDT-4A1	24V dc	4 Optical Channels & 2 NC USSI (dual) x2	2 PNP OSSD	0.5 amps	3 PNP (Aux., Fault, Weak)	13 ms (optical channels)	69761
SFCDT-4A1C					7 PNP (Aux., Fault, Weak & Ch 1-4)	7 ms (USSIs)	

NOTE: A complete system requires a controller and optical elements, such as Interlocking Switches (see page 137), Grids and Points (see page 36).

## PICO-GUARD™ Interfacing Products



	Models	Description	Product Information	Data Sheet
<b>Interface Modules</b>	IM-T-9A (3 NO)	<ul style="list-style-type: none"> <li>• Interface modules provide two or three normally open force-guided relay outputs rated at 6 A.</li> <li>• PICO-GUARD monitors these interface modules when they are connected to the PICO-GUARD External Device Monitoring (EDM) inputs.</li> <li>• Convenient plug-in terminal blocks on a 22.5 mm DIN-rail mountable housing are included.</li> </ul>	Page 132	62822
	IM-T-11A (2 NO/1 NC)			
<b>Muting Modules</b>	MM-TA-12B	<ul style="list-style-type: none"> <li>• The Muting Module can be used with PICO-GUARD systems and can temporarily inhibit a Grid or Point so materials can safely pass through the beams without stopping the machinery.</li> <li>• The module uses redundant microcontroller-based logic.</li> </ul>	Page 123	63517
	MMD-TA-12B			116390
	MMD-TA-11B			

**SAFETY MODULES**

PICO-GUARD CONTROLLERS

E-STOP/GUARD MONITORING

SAFETY MAT MONITORING

MUTING MODULES

EXTENSION MODULES

INTERFACE MODULES



## PICO-GUARD™ Interfacing Products (cont'd)

Models		Description	Product Information	Data Sheet
<b>Contactors</b> 	<b>Mechanically Linked Contactors</b>	<ul style="list-style-type: none"> <li>• Pairs of contactors create safety stop circuits with two normally open contacts in series.</li> <li>• PICO-GUARD can monitor the circuit because of the contacts' force-guided mechanically linked design.</li> <li>• Contactors add 10 or 16 amp current carrying capability to any safety system.</li> <li>• Auxiliary contacts add 3 or 4 normally open contacts.</li> <li>• Suppressors extend the life of an actuating device that uses a contactor.</li> <li>• Modular design simplifies assembly and installation.</li> </ul>	Page 186	111881
	11-BG00-31-D-024			
	11-BF16C01-024			
	<b>Aux. Contacts</b>			
	11-BGX10-40			
	11-G484-30			
	<b>Suppressors</b>			
	11-BGX77-048			
11-G318-48				

## PICO-GUARD™ Remote Display

Models	Description	Data Sheet
	<b>SFA-RD</b> <ul style="list-style-type: none"> <li>• The display provides the same ongoing operating status feedback as the PICO-GUARD controller.</li> <li>• Rated IEC IP67; NEMA 6, it can be conveniently mounted outside enclosure.</li> <li>• Convenient DIN-rail mountable housing; flat-mount and right-angle brackets are included.</li> </ul>	109374

## PICO-GUARD™ Controller Specifications

<b>System Power Requirements*</b>	24V dc $\pm$ 15%, 10% max. ripple; 250 mA max., exclusive of output loads.
<b>Short Circuit Protection</b>	All inputs and outputs are protected from short circuits to +24V dc or dc common.
<b>Response Time</b>	<p><b>Optical Channel:</b> 13 milliseconds max. (Time between the opening of an optical switch and the OSSD safety outputs turning off.)</p> <p><b>USS1 Inputs:</b> 7 milliseconds max. (Time between actuation of the safety stop input device and the OSSD safety outputs turning off.)</p>
<b>Safety Rating</b>	Type 4 per IEC 61496-1; Category 4 per ISO 13849-1 (EN 954-1).
<b>External Device Monitoring (EDM) Input</b>	Two inputs for external device monitoring (EDM). Each input monitors the status of a normally closed, forced-guided monitor contact of an external safety device or MPCE. The EDM inputs must be high (10 to 30V dc) when the external device or MPCE is OFF, and must be low (less than 3V dc) when the external device or MPCE is ON. External devices or MPCEs must meet certain timing requirements, depending on the configuration setting.
<b>System Reset Input</b>	The Reset input must be high (10 to 30V dc) for 0.25 to 2 seconds and then low (less than 3V dc) to reset the system from a manual power-up, optical channel latch or system lockout condition.
<b>USS1 Reset Input</b>	The Reset input must be high (10 to 30V dc) for 0.25 to 2 seconds and then low (less than 3V dc) to reset the system from a USS1 1 latch condition.

\* External supply must be in accordance with IEC 61558 (EN 60742).

## PICO-GUARD™ Controller Specifications (cont'd)

<b>USS1 1 Input</b>	Dual-channel, redundant inputs for monitoring output contacts or “handshake” compatible safety solid-state outputs of other safety stop devices. OFF (stop) signals cause the PICO-GUARD OSSDs to latch OFF (Latch condition).
<b>USS1 2 Input</b>	Dual-channel, redundant inputs for monitoring output contacts or “handshake” compatible safety solid-state outputs of other safety stop devices. OFF (stop) signals cause the PICO-GUARD OSSDs to turn OFF (Trip condition).
<b>Safety Outputs</b>	Two redundant solid-state 24V dc, 0.5A max. sourcing OSSD (Output Signal Switching Device) safety outputs. (Use optional interface modules for ac or larger dc loads.) Capable of the Banner “Safety Handshake”. <b>ON-state voltage:</b> $\geq$ Vin-1.5V dc <b>OFF-state voltage:</b> 1.2V dc max. <b>Max. load resistance:</b> 1,000 ohm <b>Max. load capacitance:</b> 0.1 $\mu$ F <b>OSSD test pulse width:</b> 100 to 300 microseconds <b>OSSD test pulse period:</b> 6 milliseconds
<b>Non-Safety Outputs</b> (Aux., Weak Signal, Fault, Ch1-4)	Solid state 24V dc ( $\geq$ Vin – 1.5V dc), 0.25A max. sourcing (PNP) non-safety outputs
<b>Remote Status Interface</b>	Isolated RS-232 non-safety output (4800 Baud rate) for setup or monitoring the system status. Connections provided for a Remote Display unit. See Interfacing Products on pages 109-110.
<b>Controls and Adjustments</b>	Redundant switches for Auto/Manual power-up, Trip/Latch output operation and 1- or 2-channel EDM operation. Redundant switches for ON/OFF of each optical channel. (NOTE: At least one optical channel must be ON.)
<b>Ambient Light Immunity</b>	> 10,000 lux at 5° angle of incidence
<b>Strobe Light Immunity</b>	Totally immune to one Federal Signal Corp. “Fireball” model FB2PST strobe
<b>Emitter Element</b>	Visible red LED, 660 nm at peak emission
<b>Status Indicators</b>	<b>System Status (bi-color Red/Green):</b> overall status of the PICO-GUARD system <b>System Reset (bi-color Yellow/Red):</b> status of the input; indicates system reset needed <b>Channel (4 bi-color Red/Green):</b> each shows the status of one optical channel <b>USS1 (2 bi-color Red/Green):</b> status of the USS1 input channels (a-b and c-d) <b>USS1 1 Reset (bi-color Yellow/Red):</b> status of USS1 1 reset input; indicates USS1 1 reset needed <b>EDM (2 bi-color Red/Green):</b> status of the EDM input channels <b>OSSD (2 bi-color Red/Green):</b> status of the OSSD outputs <b>Config (bi-color Red/Green):</b> status of the system configuration
<b>Enclosure Rating</b>	IEC IP20
<b>Operating Conditions</b>	<b>Temperature:</b> 0° to +50° C <b>Relative humidity:</b> 95% maximum (non-condensing)
<b>Certifications</b>	For a list of certifications see page 237.
<b>Wiring Diagrams</b>	WD040, WD041, WD042 (p. 269-270)

## PICO-GUARD™ Optical Element Specifications

<b>Grids</b>	See page 41.
<b>Points</b>	See page 41.
<b>Interlock Switches</b>	See page 140.



# E-Stop & Guard Monitoring Modules

- Modules monitor external devices for 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.
- Ratings are NEMA 1 and at least IEC IP20.



SAFETY MODULES

PICO-GUARD CONTROLLERS

E-STOP/GUARD MONITORING

SAFETY MAT MONITORING

MUTING MODULES

EXTENSION MODULES

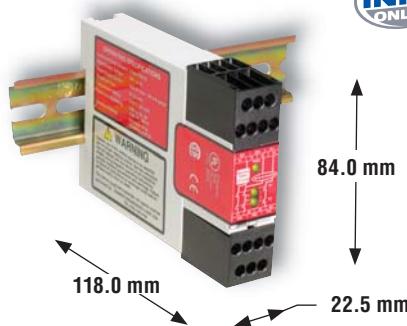
INTERFACE MODULES

*GM-FA-10J Specifications* . . . . . Page 114  
*ES-FA-..AA Specifications* . . . . . 115  
*ES-..A-5A Specifications* . . . . . 116  
*ES-TN-1H.. Specifications* . . . . . 117  
*ES-TN-14H.. Specifications* . . . . . 118  
*ES-FA-6G Specifications* . . . . . 119

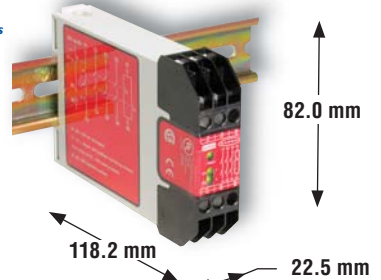


## E-Stop & Guard Monitoring Modules

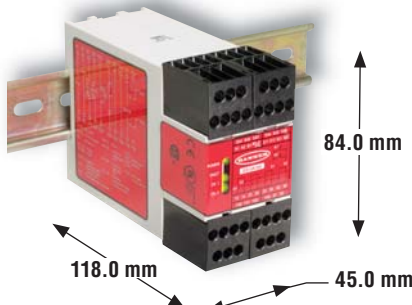
- Easy-to-see red and green LED status indicators
- Rugged polycarbonate housing
- Plug-in or fixed terminal blocks
- Standard 35 mm DIN rail track mounting



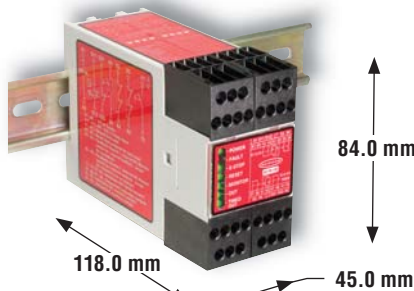
**ES-FA-..AA & GM-FA-10J Models**



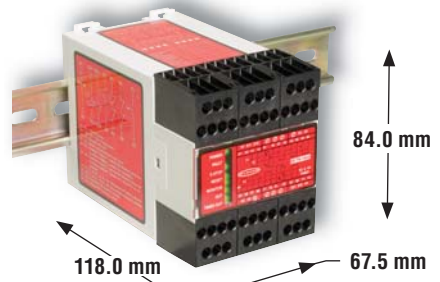
**ES-FA-6G Models**



**ES-..A-5A Models**



**ES-TN-1H.. Models**



**ES-TN-14H.. Models**





## E-Stop &amp; Guard Monitoring 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 (single) or 1 NC & 1 NO (dual)	<b>2 NO</b>	6 amps	—	35 ms	—	60998
ES-FA-9AA	0	24V ac/dc	1 NC (single) or 2 NC (dual)	<b>3 NO</b>	6 amps	—	25 ms	—	60606
ES-FA-11AA				<b>2 NO</b>		1 NC			
ES-UA-5A	0	115V ac & 12-24V dc	1 NC (single) or 2 NC (dual)	<b>4 NO</b>	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)	<b>2 NO &amp; 2 NO w/delay</b>	4 amps	1 NC (delayed) & 1 NC (immediate)	50 ms	0 - 20 sec.	61061
ES-TN-1H6								0 - 200 sec.	
ES-TN-1H1								0.25 sec.	
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)	<b>4 NO &amp; 4 NO w/delay</b>	4 amps	1 NC (delayed) & 1 NC (immediate)	50 ms	0 - 20 sec.	68436
ES-TN-14H6								0 - 200 sec.	
ES-FA-6G	0	24V ac/dc	1 NC (single)	<b>3 NO</b>	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 $\pm$ 20% <b>Power consumption:</b> approx. 3 VA / 3 W												
Supply Protection Circuitry	Protected against transient voltages and reverse polarity												
Output Configuration	<p>Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2.</p> <p><b>Contacts:</b> AgNi, 5 <math>\mu</math>m gold-plated</p> <p><b>Low Current Rating:</b></p> <p><b>Caution: The 5 <math>\mu</math>m gold-plated contacts allow the switching of low current/low voltage.</b></p> <p>To preserve the gold plating on the contacts, do not exceed the following max. values at any time:</p> <table> <tr> <td><b>Min. voltage:</b> 1V ac/dc</td> <td><b>Max. voltage:</b> 60V</td> </tr> <tr> <td><b>Min. current:</b> 5 mA ac/dc</td> <td><b>Max. current:</b> 300 mA</td> </tr> <tr> <td><b>Min. power:</b> 5 mW (5 mVA)</td> <td><b>Max. power:</b> 7 W (7 VA)</td> </tr> </table> <p><b>High Current Rating:</b></p> <p>If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to:</p> <table> <tr> <td><b>Min. voltage:</b> 15V ac/dc</td> <td><b>Max. voltage:</b> 250V ac/dc</td> </tr> <tr> <td><b>Min. current:</b> 30 mA ac/dc</td> <td><b>Max. current:</b> 6 A</td> </tr> <tr> <td><b>Min. power:</b> 5 W (5 VA)</td> <td><b>Max. power:</b> 200 W (1,500 VA)</td> </tr> </table> <p><b>Mechanical life:</b> 50,000,000 operations <b>Electrical life:</b> 150,000 cycles typical, @ 200 W (1,500 VA) switched power, resistive load</p> <p><b>Note: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.</b></p>	<b>Min. voltage:</b> 1V ac/dc	<b>Max. voltage:</b> 60V	<b>Min. current:</b> 5 mA ac/dc	<b>Max. current:</b> 300 mA	<b>Min. power:</b> 5 mW (5 mVA)	<b>Max. power:</b> 7 W (7 VA)	<b>Min. voltage:</b> 15V ac/dc	<b>Max. voltage:</b> 250V ac/dc	<b>Min. current:</b> 30 mA ac/dc	<b>Max. current:</b> 6 A	<b>Min. power:</b> 5 W (5 VA)	<b>Max. power:</b> 200 W (1,500 VA)
<b>Min. voltage:</b> 1V ac/dc	<b>Max. voltage:</b> 60V												
<b>Min. current:</b> 5 mA ac/dc	<b>Max. current:</b> 300 mA												
<b>Min. power:</b> 5 mW (5 mVA)	<b>Max. power:</b> 7 W (7 VA)												
<b>Min. voltage:</b> 15V ac/dc	<b>Max. voltage:</b> 250V ac/dc												
<b>Min. current:</b> 30 mA ac/dc	<b>Max. current:</b> 6 A												
<b>Min. power:</b> 5 W (5 VA)	<b>Max. power:</b> 200 W (1,500 VA)												
Output Response Time	35 milliseconds												
Input Requirements	<p><b>Input switch</b> must have a normally closed contact and a normally open contact capable of switching 5 to 50 mA @ 15 to 30 V dc.</p> <p><b>Reset switch</b> 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 <math>\Omega</math> each.</p>												
Simultaneity Monitoring	<p><b>2-Channel operation:</b> 3 seconds</p> <p><b>1-Channel operation:</b> infinite</p>												
Status Indicators	<table> <tr> <td><b>4 green LEDs:</b></td> <td><b>1 red LED:</b></td> </tr> <tr> <td>Power: power is supplied to Safety Module</td> <td>Fault</td> </tr> <tr> <td>Channel 1: inputs satisfied (guard closed)</td> <td></td> </tr> <tr> <td>Channel 2: inputs satisfied (guard closed)</td> <td></td> </tr> <tr> <td>Output: K1 and K2 energized, safety outputs closed</td> <td></td> </tr> </table>	<b>4 green LEDs:</b>	<b>1 red LED:</b>	Power: power is supplied to Safety Module	Fault	Channel 1: inputs satisfied (guard closed)		Channel 2: inputs satisfied (guard closed)		Output: K1 and K2 energized, safety outputs closed			
<b>4 green LEDs:</b>	<b>1 red LED:</b>												
Power: power is supplied to Safety Module	Fault												
Channel 1: inputs satisfied (guard closed)													
Channel 2: inputs satisfied (guard closed)													
Output: K1 and K2 energized, safety outputs closed													
Construction	Polycarbonate housing												
Environmental Rating	Rated NEMA 1; IEC IP40, Terminals IP20												
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IEC IP54), or better.												
Vibration Resistance	10 to 55 Hz @ 0.35 mm displacement per IEC 68-2-6												
Operating Conditions	<b>Temperature:</b> 0° to +50° C <b>Relative humidity:</b> 90% @ +50° C (non-condensing)												
Safety Category	4 per ISO 13849-1 (EN954-1) (depending on application)												
Certifications	For a list of certifications see page 237.												
Wiring Diagrams	<p><b>1-Channel Coded Magnet Switches:</b> WD043 (p. 271)</p> <p><b>2-Channel Positive Opening Switches:</b> WD044 (p. 271)</p> <p><b>1-Channel (Multiple Guards):</b> WD045 (p. 272)</p> <p><b>2-Channel (Multiple Guards):</b> WD046 (p. 272)</p> <p><b>Guarded Machine:</b> WD047 (p. 274)</p>												

## ES-FA-..AA Safety Module Specifications

<b>Supply Voltage and Current</b>	24V ac/dc, +/- 10%; 50/60Hz <b>Power consumption:</b> approx. 2 W/2 VA												
<b>Supply Protection Circuitry</b>	Protected against transient voltages and reverse polarity												
<b>Output Configuration</b>	<p><b>ES-FA-9AA:</b> 3 normally open output channels <b>ES-FA-11AA:</b> 2 normally open output channels and 1 normally closed auxiliary output channel.</p> <p>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.</p> <p><b>Contacts:</b> AgNi, 5 µm gold-plated <b>Low Current Rating:</b> <b>Caution: The 5 µm gold-plated contacts allow the switching of low current/low voltage.</b> To preserve the gold plating on the contacts, the following max. values should not be exceeded at any time:</p> <table border="0"> <tr> <td><b>Min. voltage:</b> 1V ac/dc</td> <td><b>Max. voltage:</b> 60V</td> </tr> <tr> <td><b>Min. current:</b> 5 mA ac/dc</td> <td><b>Max. current:</b> 300 mA</td> </tr> <tr> <td><b>Min. power:</b> 5 mW (5 mVA)</td> <td><b>Max. power:</b> 7 W (7 VA)</td> </tr> </table> <p><b>High Current Rating:</b> If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to:</p> <table border="0"> <tr> <td><b>Min. voltage:</b> 15V ac/dc</td> <td><b>Max. voltage:</b> 250V ac/dc</td> </tr> <tr> <td><b>Min. current:</b> 30 mA ac/dc</td> <td><b>Max. current:</b> 6 A (ES-FA-9AA) and 7A (ES-FA-11AA)</td> </tr> <tr> <td><b>Min. power:</b> 5 W (5 VA)</td> <td><b>Max. power:</b> 200 W (1,500 VA)</td> </tr> </table> <p><b>Mechanical life:</b> 50,000,000 operations <b>Electrical life: ES-FA-9AA:</b> 150,000 operations (typical, @ 200 W (1,500 VA) switched power, resistive load) <b>ES-FA-11AA:</b> 130,000 operations (typical, @ 200 W (1,750 VA) switched power, resistive load)</p> <p><b>Note: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.</b></p>	<b>Min. voltage:</b> 1V ac/dc	<b>Max. voltage:</b> 60V	<b>Min. current:</b> 5 mA ac/dc	<b>Max. current:</b> 300 mA	<b>Min. power:</b> 5 mW (5 mVA)	<b>Max. power:</b> 7 W (7 VA)	<b>Min. voltage:</b> 15V ac/dc	<b>Max. voltage:</b> 250V ac/dc	<b>Min. current:</b> 30 mA ac/dc	<b>Max. current:</b> 6 A (ES-FA-9AA) and 7A (ES-FA-11AA)	<b>Min. power:</b> 5 W (5 VA)	<b>Max. power:</b> 200 W (1,500 VA)
<b>Min. voltage:</b> 1V ac/dc	<b>Max. voltage:</b> 60V												
<b>Min. current:</b> 5 mA ac/dc	<b>Max. current:</b> 300 mA												
<b>Min. power:</b> 5 mW (5 mVA)	<b>Max. power:</b> 7 W (7 VA)												
<b>Min. voltage:</b> 15V ac/dc	<b>Max. voltage:</b> 250V ac/dc												
<b>Min. current:</b> 30 mA ac/dc	<b>Max. current:</b> 6 A (ES-FA-9AA) and 7A (ES-FA-11AA)												
<b>Min. power:</b> 5 W (5 VA)	<b>Max. power:</b> 200 W (1,500 VA)												
<b>Output Response Time</b>	25 milliseconds typical												
<b>Input Requirements</b>	<b>Input switch</b> must have one or two normally closed contacts capable of switching 40 to 100 mA @ 13 to 27V ac/dc. <b>Reset switch</b> must have one normally open contact capable of switching 20 to 30 mA @ 13 to 27V ac/dc.												
<b>Minimum OFF-State Recovery Time</b>	250 milliseconds												
<b>Status Indicators</b>	<b>3 green LED indicators:</b> Power ON K1 energized K2 energized												
<b>Construction</b>	Polycarbonate housing												
<b>Environmental Rating</b>	Rated NEMA 1; IEC IP40, Terminals IP20												
<b>Mounting</b>	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IEC IP54), or better.												
<b>Vibration Resistance</b>	10 to 55Hz @ 0.35 mm displacement per IEC 68-2-6												
<b>Operating Conditions</b>	<b>Temperature:</b> 0° to +50° C <b>Relative humidity:</b> 90% @ +50° C (non-condensing)												
<b>Certifications</b>	For a list of certifications see page 237.												
<b>Wiring Diagrams</b>	<b>1-Channel:</b> WD048 (p. 275) <b>2-Channel:</b> WD049 (p. 276)												

## ES-..A-5A Safety Module Specifications

Supply Voltage and Current	<b>ES-UA-5A:</b> 115V ac (A1-A2), 12-24V dc, $\pm 15\%$ , 10% max. ripple (B1-B2) <b>ES-VA-5A:</b> 230V ac (A1-A2), 12-24V dc, $\pm 15\%$ , 10% max. ripple (B1-B2) <b>Power consumption:</b> approx. 7 VA/4 W												
Supply Protection Circuitry	Protected against transient voltages and reverse polarity												
Output Configuration	<p><b>Outputs (K1 &amp; K2):</b> four redundant (total of eight) safety relay (forced-guided) contacts – AgNi, 5 <math>\mu</math>m gold-plated, plus 1 normally closed auxiliary monitor output - AgNi, 5 <math>\mu</math>m gold-plated.</p> <p><b>Low Current Rating:</b>  <b>Caution: The 5 <math>\mu</math>m gold-plated contacts allow the switching of low current/low voltage.</b>  To preserve the gold plating on the contacts, the following max. values should not be exceeded at any time:</p> <table> <tr> <td><b>Min. voltage:</b> 1V ac/dc</td> <td><b>Max. voltage:</b> 60V</td> </tr> <tr> <td><b>Min. current:</b> 5 mA ac/dc</td> <td><b>Max. current:</b> 300 mA</td> </tr> <tr> <td><b>Min. power:</b> 5 mW (5 mVA)</td> <td><b>Max. power:</b> 7 W (7 VA)</td> </tr> </table> <p><b>High Current Rating:</b>  If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to:</p> <table> <tr> <td><b>Min. voltage:</b> 15V ac/dc</td> <td><b>Max. voltage:</b> 250V ac/dc</td> </tr> <tr> <td><b>Min. current:</b> 30 mA ac/dc</td> <td><b>Max. current:</b> 6 A</td> </tr> <tr> <td><b>Min. power:</b> 5 W (5 VA)</td> <td><b>Max. power:</b> 200 W (1,500 VA)</td> </tr> </table> <p><b>Mechanical life:</b> 50,000,000 operations  <b>Electrical life:</b> 150,000 operations (typical, @ 1,500 VA switched power, resistive load)  150,000 operations (typical, @ 200 W switched power, resistive load)</p> <p><b>Note: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.</b></p> <p><b>Solid-State Monitor Outputs:</b></p> <ul style="list-style-type: none"> <li>- Two non-safety solid-state dc outputs</li> <li>- Output at Y32 monitors state of outputs – conducts (output high) when both K1 and K2 are energized</li> <li>- Output at Y35 conducts (output high) when internal power supply is OK</li> <li>- Output circuits require application of +12-24V dc <math>\pm 15\%</math> at terminal Y31; dc common at Y30</li> <li>- Maximum switching current: 100 mA at 12-24V dc</li> <li>- Both outputs are protected against short circuits</li> </ul>	<b>Min. voltage:</b> 1V ac/dc	<b>Max. voltage:</b> 60V	<b>Min. current:</b> 5 mA ac/dc	<b>Max. current:</b> 300 mA	<b>Min. power:</b> 5 mW (5 mVA)	<b>Max. power:</b> 7 W (7 VA)	<b>Min. voltage:</b> 15V ac/dc	<b>Max. voltage:</b> 250V ac/dc	<b>Min. current:</b> 30 mA ac/dc	<b>Max. current:</b> 6 A	<b>Min. power:</b> 5 W (5 VA)	<b>Max. power:</b> 200 W (1,500 VA)
<b>Min. voltage:</b> 1V ac/dc	<b>Max. voltage:</b> 60V												
<b>Min. current:</b> 5 mA ac/dc	<b>Max. current:</b> 300 mA												
<b>Min. power:</b> 5 mW (5 mVA)	<b>Max. power:</b> 7 W (7 VA)												
<b>Min. voltage:</b> 15V ac/dc	<b>Max. voltage:</b> 250V ac/dc												
<b>Min. current:</b> 30 mA ac/dc	<b>Max. current:</b> 6 A												
<b>Min. power:</b> 5 W (5 VA)	<b>Max. power:</b> 200 W (1,500 VA)												
Output Response Time	25 milliseconds typical												
Input Requirements	<p><b>Input switch</b> must have normally closed contacts each capable of switching 20 to 50 mA @ 12 to 30V dc; and must be open <math>\geq 10</math> milliseconds for a valid stop command.</p> <p><b>Reset switch</b> must have one normally open contact capable of switching 20 to 50 mA @ 12 to 30V ac/dc.</p>												
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	<table> <tr> <td> <b>3 green LED indicators:</b>  Power ON  K1 energized  K2 energized </td> <td> <b>1 Red LED indicator:</b>  Fault (internal power supply, ground fault, short across the input channels or other internal failures) </td> </tr> </table>	<b>3 green LED indicators:</b> Power ON K1 energized K2 energized	<b>1 Red LED indicator:</b> Fault (internal power supply, ground fault, short across the input channels or other internal failures)										
<b>3 green LED indicators:</b> Power ON K1 energized K2 energized	<b>1 Red LED indicator:</b> Fault (internal power supply, ground fault, short across the input channels or other internal failures)												
Construction	Polycarbonate housing												
Environmental Rating	Rated NEMA 1; IEC IP20												
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IEC IP54), or better.												
Vibration Resistance	10 to 55Hz @ 0.35 mm displacement per IEC 68-2-6												
Operating Conditions	<b>Temperature:</b> 0° to +50° C <b>Relative humidity:</b> 90% @ +50° C (non-condensing)												
Certifications	For a list of certifications see page 237.												
Wiring Diagrams	<b>1-Channel:</b> WD050 (p. 277) <b>2-Channel:</b> WD051 (p. 278)												



## ES-TN-1H.. Safety Module Specifications

<b>Supply Voltage and Current</b>	24V dc, ±20% <b>Power consumption:</b> approx. 5 W									
<b>Supply Protection Circuitry</b>	Protected against transient voltages and reverse polarity									
<b>Output Configuration</b>	<p><b>Outputs K1 &amp; K2:</b> Two redundant (total of four) safety relay (forced-guided) contacts – AgNi, gold flashed one auxiliary normally closed contact – AgNi, gold flashed</p> <p><b>Outputs K3 &amp; K4:</b> Two redundant (total of four) delayed relay (forced-guided) contacts – AgNi, gold flashed one auxiliary normally closed contact – AgNi, gold flashed</p> <p><b>Contact ratings (all normally open and normally closed output contacts):</b></p> <p><b>Max. voltage:</b> 250V ac or 250V dc  <b>Max. current:</b> 4 A ac or dc  <b>Min. current:</b> 30 mA @ 24V dc  <b>Max. power:</b> 1000 VA, 100 W  <b>Mechanical life:</b> 50,000,000 operations  <b>Electrical life:</b> 100,000 at full resistive load</p> <p><b>NOTE:</b> Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.</p>									
<b>Output Response Time</b>	<p><b>K1 &amp; K2:</b> 50 milliseconds typical  <b>K3 &amp; K4 (ES-TN-1H1):</b> 0.25 second  <b>K3 &amp; K4 (ES-TN-1H2):</b> 0.5 second  <b>K3 &amp; K4 (ES-TN-1H3):</b> 1.0 second  <b>K3 &amp; K4 (ES-TN-1H4):</b> 2.0 seconds  <b>K3 &amp; K4 (ES-TN-1H5):</b> 0, 0.5, 1, 2, 4, 6, 8, 10, 15, 20 seconds  <b>K3 &amp; K4 (ES-TN-1H6):</b> 0, 5, 10, 20, 30, 50, 70, 100, 150, 200 seconds  <b>K3 &amp; K4 (ES-TN-1H7):</b> 4.0 seconds  <b>K3 &amp; K4 (ES-TN-1H8):</b> 6.0 seconds  <b>K3 &amp; K4 (ES-TN-1H9):</b> 8.0 seconds  <b>K3 &amp; K4 (ES-TN-1H10):</b> 10.0 seconds  <b>K3 &amp; K4 (ES-TN-1H11):</b> 15.0 seconds  <b>K3 &amp; K4 (ES-TN-1H12):</b> 20.0 seconds</p> <p><b>Delayed Output Timing Tolerance:</b> Set time ±100 milliseconds or ±2%, whichever is greater</p>									
<b>Input Requirements</b>	<p><b>Input switch</b> must have a normally closed contact capable of switching 20 mA @ 24V dc.  <b>Reset switch</b> must have one normally open contact capable of switching 20 mA @ 24V dc.  <b>NOTE:</b> Inputs must be voltage-free, dry contacts.</p>									
<b>ON-Time Delay</b>	≥ 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.									
<b>Status Indicators</b>	<p><b>6 green LED indicators:</b></p> <table border="0"> <tr> <td>Power</td> <td>Monitor</td> <td><b>1 red LED indicator:</b></td> </tr> <tr> <td>E-Stop</td> <td>Out (K1 &amp; K2 ON/OFF)</td> <td>Fault</td> </tr> <tr> <td>Reset</td> <td>Timed-Out (K3 &amp; K4 ON/OFF)</td> <td></td> </tr> </table>	Power	Monitor	<b>1 red LED indicator:</b>	E-Stop	Out (K1 & K2 ON/OFF)	Fault	Reset	Timed-Out (K3 & K4 ON/OFF)	
Power	Monitor	<b>1 red LED indicator:</b>								
E-Stop	Out (K1 & K2 ON/OFF)	Fault								
Reset	Timed-Out (K3 & K4 ON/OFF)									
<b>Construction</b>	Polycarbonate housing									
<b>Environmental Rating</b>	Rated NEMA 1; IEC IP40, Terminals IP20, max. terminal torque 0.8 Nm									
<b>Mounting</b>	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IEC IP54), or better.									
<b>Vibration Resistance</b>	10 to 55Hz @ 0.35 mm displacement per IEC 68-2-6									
<b>Operating Conditions</b>	<b>Temperature:</b> 0° to +50° C <b>Relative humidity:</b> 90% @ +50° C (non-condensing)									
<b>Certifications</b>	For a list of certifications see page 237.									
<b>Wiring Diagrams</b>	<b>2-Channel:</b> WD052 (p. 279)									

## ES-TN-14H.. Safety Module Specifications

Supply Voltage and Current	24V dc, $\pm 20\%$ <b>Power consumption:</b> approx. 5 W							
Supply Protection Circuitry	Protected against transient voltages and reverse polarity							
Output Configuration	<p><b>Outputs K1 &amp; K2:</b> four redundant (total of eight) safety relay (forced-guided) contacts – AgNi, gold flashed one auxiliary normally closed contact – AgNi, gold flashed</p> <p><b>Outputs K3 &amp; K4:</b> four redundant (total of eight) delayed relay (forced-guided) contacts – AgNi, gold flashed one auxiliary normally closed contact – AgNi, gold flashed</p> <p><b>Contact ratings (all normally open and normally closed output contacts):</b></p> <p><b>Max. voltage:</b> 250V ac or dc  <b>Max. current:</b> 4 A ac or dc  <b>Min. current:</b> 30 mA @ 24V dc  <b>Max. power:</b> 1000 VA, 100 W  <b>Mechanical life:</b> 50,000,000 operations  <b>Electrical life:</b> 100,000 at full resistive load</p> <p><b>NOTE:</b> Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.</p>							
Output Response Time	<p><b>K1 &amp; K2:</b> 50 milliseconds typical</p> <p><b>K3 &amp; K4 (ES-TN-14H5):</b> 0, 0.5, 1, 2, 4, 6, 8, 10, 15, 20 seconds</p> <p><b>K3 &amp; K4 (ES-TN-14H6):</b> 0, 5, 10, 20, 30, 50, 70, 100, 150, 200 seconds</p> <p><b>Delayed Output Timing Tolerance:</b> Set time <math>\pm 100</math> milliseconds or <math>\pm 2\%</math>, whichever is greater</p>							
Input Requirements	<p><b>Input switch</b> must have a normally closed contact capable of switching 20 mA @ 24V dc.</p> <p><b>Reset switch</b> must have one normally open contact capable of switching 20 mA @ 24V dc.</p> <p>NOTE: Inputs must be voltage-free, dry contacts.</p>							
ON-Time Delay	$\geq 100$ 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	<p><b>6 green LED indicators:</b></p> <table border="0"> <tr> <td>Power</td> <td>Monitor</td> <td rowspan="3"><b>1 red LED indicator:</b> Fault</td> </tr> <tr> <td>E-Stop</td> <td>Out (K1 &amp; K2 ON/OFF)</td> </tr> <tr> <td>Reset</td> <td>Timed-Out (K3 &amp; K4 ON/OFF)</td> </tr> </table>	Power	Monitor	<b>1 red LED indicator:</b> Fault	E-Stop	Out (K1 & K2 ON/OFF)	Reset	Timed-Out (K3 & K4 ON/OFF)
Power	Monitor	<b>1 red LED indicator:</b> Fault						
E-Stop	Out (K1 & K2 ON/OFF)							
Reset	Timed-Out (K3 & K4 ON/OFF)							
Construction	Polycarbonate housing							
Environmental Rating	Rated NEMA 1; IEC 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 IEC IP54, or better.							
Vibration Resistance	10 to 55Hz @ 0.35 mm displacement per IEC 68-2-6							
Operating Conditions	<b>Temperature:</b> 0° to +50° C <b>Relative humidity:</b> 90% @ +50° C (non-condensing)							
Certifications	For a list of certifications see page 237.							
Wiring Diagrams	<b>2-Channel:</b> WD053 (p. 280)							

## ES-FA-6G Safety Module Specifications

<b>Supply Voltage and Current</b>	24V ac/dc, +/- 10%; 50/60Hz <b>Power consumption:</b> approx. 2 W/0.75 VA
<b>Supply Protection Circuitry</b>	Protected against transient voltages and reverse polarity
<b>Output Configuration</b>	<b>Outputs (K1 &amp; K2):</b> three redundant (total of six) safety relay (forced-guided) contacts – AgSnO <sub>2</sub> one auxiliary non-safety monitor output (open when both K1 and K2 are energized; closed when either K1 or K2 are de-energized) <b>Contact ratings:</b> <b>Max. voltage:</b> 250V ac or 250V dc <b>Max. current:</b> 6 A ac or dc <b>Min. current:</b> 30 mA @ 10V dc <b>Max. power:</b> 1500 VA, 150 W <b>Mechanical life:</b> 10,000,000 operations <b>Electrical life:</b> 100,000 at full resistive load  <b>NOTE:</b> Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.
<b>Output Response Time</b>	35 milliseconds typical
<b>Input Requirements</b>	<b>Input switch</b> must have a normally closed contact capable of switching 40 to 100 mA @ 13 to 27V ac/dc. <b>Reset switch</b> must have one normally open contact capable of switching 20 to 30 mA @ 13 to 27V ac/dc.
<b>Status Indicators</b>	<b>3 green LED indicators:</b> Power ON K1 energized K2 energized
<b>Construction</b>	Polycarbonate
<b>Environmental Rating</b>	Rated NEMA 1; IEC IP40, Terminals IP20
<b>Mounting</b>	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IEC IP54), or better.
<b>Vibration Resistance</b>	10 to 55Hz @ 0.35 mm displacement per IEC 68-2-6
<b>Operating Conditions</b>	<b>Temperature:</b> 0° to +50° C <b>Relative humidity:</b> 90% @ +50° C (non-condensing)
<b>Certifications</b>	For a list of certifications see page 237.
<b>Wiring Diagrams</b>	<b>1-Channel:</b> WD054 (p. 281)

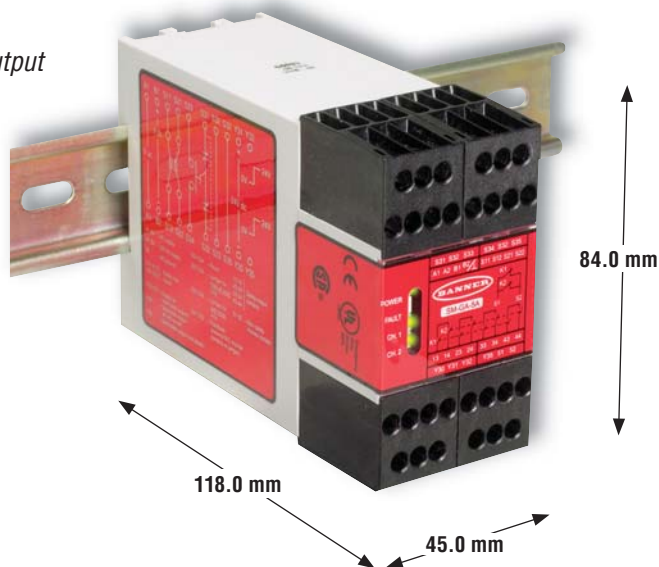
# Safety Mat Monitoring Modules

- 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



SM-..A-5A Models







## 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	112364
SM-HA-5A	230V ac & 24V dc						

NC = Normally Closed Relay, NO = Normally Open Relay

### Safety Mat Monitoring Module Specifications

<b>Supply Voltage and Current</b>	<p><b>SM-GA-5A:</b> 115V ac (A1-A2), 24V dc, <math>\pm 15\%</math>, 10% max. ripple (B1-B2)</p> <p><b>SM-HA-5A:</b> 230V ac (A1-A2), 24V dc, <math>\pm 15\%</math>, 10% max. ripple (B1-B2)</p> <p><b>Power consumption:</b> approx. 7 VA/4 W</p>												
<b>Supply Protection Circuitry</b>	Protected against transient voltages and reverse polarity												
<b>Output Configuration</b>	<p><b>Outputs (K1 &amp; K2):</b> four redundant (total of eight) safety relay (forced-guided) contacts – AgNi, 5 <math>\mu</math>m gold-plated, plus 1 normally closed auxiliary monitor output - AgNi, 5 <math>\mu</math>m gold-plated.</p> <p><b>Low Current Rating:</b>  <b>Caution: The 5 <math>\mu</math>m gold-plated contacts allow the switching of low current/low voltage.</b>            To preserve the gold plating on the contacts, the following max. values should not be exceeded at any time:</p> <table border="0"> <tr> <td><b>Min. voltage:</b> 1V ac/dc</td> <td><b>Max. voltage:</b> 60V</td> </tr> <tr> <td><b>Min. current:</b> 5 mA ac/dc</td> <td><b>Max. current:</b> 300 mA</td> </tr> <tr> <td><b>Min. power:</b> 5 mW (5 mVA)</td> <td><b>Max. power:</b> 7 W (7 VA)</td> </tr> </table> <p><b>High Current Rating:</b>            If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to:</p> <table border="0"> <tr> <td><b>Min. voltage:</b> 15V ac/dc</td> <td><b>Max. voltage:</b> 250V ac/dc</td> </tr> <tr> <td><b>Min. current:</b> 30 mA ac/dc</td> <td><b>Max. current:</b> 6 A</td> </tr> <tr> <td><b>Min. power:</b> 5 W (5 VA)</td> <td><b>Max. power:</b> 200 W (1,500 VA)</td> </tr> </table> <p><b>Mechanical life:</b> 50,000,000 operations  <b>Electrical life:</b> 150,000 operations (typical, @ 1,500 VA switched power, resistive load)            150,000 operations (typical, @ 200 W switched power, resistive load)</p> <p><b>Note: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.</b></p> <p><b>Solid-State Monitor Outputs:</b></p> <ul style="list-style-type: none"> <li>- Two non-safety solid-state dc outputs</li> <li>- Output at Y32 monitors state of outputs – conducts (output high) when both K1 and K2 are energized</li> <li>- Output at Y35 conducts (output high) when internal power supply is OK</li> <li>- Output circuits require application of 24V dc <math>\pm 15\%</math> at terminal Y31; dc common at Y30</li> <li>- Maximum switching current: 100 mA at 24V dc</li> <li>- Both outputs are protected against short circuits</li> </ul>	<b>Min. voltage:</b> 1V ac/dc	<b>Max. voltage:</b> 60V	<b>Min. current:</b> 5 mA ac/dc	<b>Max. current:</b> 300 mA	<b>Min. power:</b> 5 mW (5 mVA)	<b>Max. power:</b> 7 W (7 VA)	<b>Min. voltage:</b> 15V ac/dc	<b>Max. voltage:</b> 250V ac/dc	<b>Min. current:</b> 30 mA ac/dc	<b>Max. current:</b> 6 A	<b>Min. power:</b> 5 W (5 VA)	<b>Max. power:</b> 200 W (1,500 VA)
<b>Min. voltage:</b> 1V ac/dc	<b>Max. voltage:</b> 60V												
<b>Min. current:</b> 5 mA ac/dc	<b>Max. current:</b> 300 mA												
<b>Min. power:</b> 5 mW (5 mVA)	<b>Max. power:</b> 7 W (7 VA)												
<b>Min. voltage:</b> 15V ac/dc	<b>Max. voltage:</b> 250V ac/dc												
<b>Min. current:</b> 30 mA ac/dc	<b>Max. current:</b> 6 A												
<b>Min. power:</b> 5 W (5 VA)	<b>Max. power:</b> 200 W (1,500 VA)												
<b>Output Response Time</b>	50 milliseconds typical												
<b>Input Requirements</b>	<p>Mat contacts must be capable of switching 12-30V dc @ 200 mA.</p> <p>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.</p>												
<b>Status Indicators</b>	<p><b>3 green LED indicators:</b></p> <ul style="list-style-type: none"> <li>Power ON</li> <li>K1 energized</li> <li>K2 energized</li> </ul> <p><b>1 red LED indicator:</b></p> <ul style="list-style-type: none"> <li>Step on Mat or Fault (internal power supply, ground fault, or other internal failures)</li> </ul>												
<b>Construction</b>	Polycarbonate housing												

**Safety Mat Monitoring Module Specifications (cont'd)**

<b>Environmental Rating</b>	Rated NEMA 1; IEC IP20
<b>Mounting</b>	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IEC IP54) or better.
<b>Vibration Resistance</b>	10 to 55 Hz @ 0.35 mm displacement per IEC 68-2-6
<b>Operating Conditions</b>	<b>Temperature:</b> 0° to +50° C <b>Relative humidity:</b> 90% @ +50° C (non-condensing)
<b>Certifications</b>	For a list of certifications see page 237.
<b>Wiring Diagrams</b>	<b>4-Wire Safety Mat:</b> WD055 (p. 282)

# Muting Modules



- 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 hard-relay contact or OSSD 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.

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*MM2-TA-12B Specifications . . . . . 126*  
*MM(2)-TA-12B Cordset Selection Guide . . . . . 285*  
*MMD-TA-1..B Specifications . . . . . 128*

**OD CABLES**  
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**BRACKETS**  
PAGE 190

**SAFETY MODULES**

- PICO-GUARD CONTROLLERS
- E-STOP/GUARD MONITORING
- SAFETY MAT MONITORING
- MUTING MODULES**
- EXTENSION MODULES
- INTERFACE MODULES

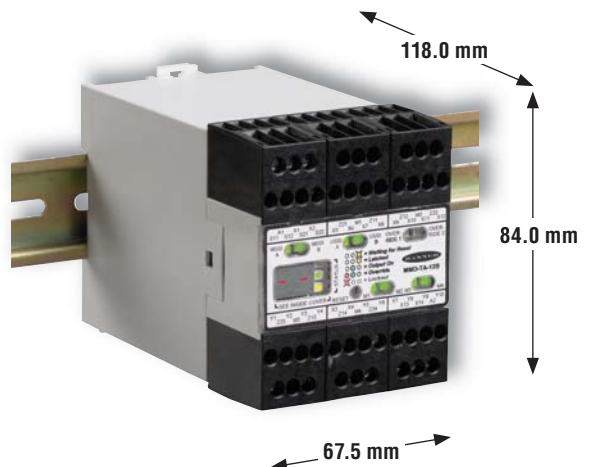
## Muting Modules

- Three LEDs to indicate operating status
- 2-digit diagnostic display
- Maximum 30 milliseconds response time
- Quick disconnect cables
- DIN-rail mounted or compact IP65-rated housing
- Models for Type 2 and Type 4 applications



40.0 mm      60.0 mm

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



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



## 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 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		

NC = Normally Closed Relay, NO = Normally Open Relay

## MM-TA-12B Muting Module Specifications

Supply Voltage and Current	+24V dc $\pm 15\%$ @ 400 mA max (not including draw of the MSSSI 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 (USSSI) are less than or equal to 10 milliseconds.
Safety Outputs	<p><b>Two diverse-redundant solid-state safety outputs:</b> 24V dc, 0.5A sourcing OSSD (output signal switching device). Compatible with Banner "Safety Handshake" protocol.</p> <p><b>ON-State voltage:</b> <math>\geq V</math> in -1.5V dc</p> <p><b>Max. leakage current:</b> 1.2 mA; inclusive of faults (including open 0V dc wire)</p> <p><b>OFF-State voltage:</b> 1.2V dc max.</p> <p><b>Max. load capacitance:</b> 0.1 <math>\mu</math>F</p> <p><b>Non-safety auxiliary output:</b> PNP solid-state output, rated at +24V dc @ 250 mA.</p> <p><b>OSSD test pulse width:</b> 100 to 300 microseconds</p> <p><b>OSSD test pulse period:</b> 12 microseconds</p>
MSSI Power Connections	+24V dc $\pm 15\%$ @ 2.5A max. output (dependent on System power input). Resettable 2.5A fuse
Status Indicators	<p><b>3 Status Indicator LEDs (Red, Green and Yellow):</b> indicate Power ON/OFF, operating mode, lockout, override, and OSSD status</p> <p><b>Green LEDs</b> adjacent to individual inputs/interfaces indicate status (ON = active/closed)</p>
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	<p>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 &lt; 30 <math>\Omega</math>.</p> <p><b>Max. switching voltage:</b> 30V dc</p> <p><b>Max. switching current:</b> 360 mA</p> <p><b>Min. switching current:</b> 10 mA</p> <p><b>Saturation voltage:</b> <math>\leq 1.5V</math> dc @ 10 mA; <math>\leq 5V</math> dc @ 360 mA</p>
Controls and Adjustments	<p><b>All configured on two redundant banks of DIP switches:</b></p> <ul style="list-style-type: none"> <li>Manual/auto reset</li> <li>One-way/two-way muting</li> <li>Monitored/non-monitored mute lamp output</li> <li>One-channel/two-channel/no EDM</li> <li>Backdoor timer</li> <li>Mute on power-up enable</li> <li>Mute enable functional/disabled</li> </ul>



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

<b>Inputs</b>	<p>The MSSSI and the USSSI can be interfaced with external safety devices that have either hard contact outputs or solid-state OSSD safety outputs with Safety Handshake protocol.</p> <p>Maximum external resistance must not exceed 1000 <math>\Omega</math> per channel.</p> <p><b>Operating Range for MSSSI and USSSI Inputs</b>  <b>OFF State:</b> 0-3V, 0-2 mA  <b>ON State:</b> 12-30V, 10-50 mA</p> <p><b>Muteable Safety Stop Interface (MSSSI)</b>  This input consists of two channels (MSSSI-A and MSSSI-B), and can be muted when the requirements for a mute cycle have been met. When muted, the OSSDs remain ON, independent of the MSSSI status. If not muted, when one or both channels open, the OSSD outputs will go OFF.</p> <p><b>Universal Safety Stop Interface (USSSI)</b>  This input consists of two channels (USSSI-A and USSSI-B), and is always active. When one or both channels open, the OSSD Outputs will go OFF.</p>
<b>External Device Monitoring (EDM)</b>	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.
<b>Muting Device Inputs</b>	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.
<b>Mute Enable Input</b>	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.
<b>Override Inputs</b>	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.
<b>Reset Input</b>	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.
<b>Mounting</b>	4 mounting holes, 5.5 mm dia.
<b>Construction</b>	<b>Housing:</b> Glass-filled Nylon (Black) <b>Connectors:</b> Nickel-plated brass All circuitry epoxy-encapsulated
<b>Environmental Rating</b>	NEMA 4, 13; IEC IP65
<b>Connections</b>	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)
<b>Vibration Resistance</b>	<p><b>Vibration:</b>  <b>Frequency range:</b> 10 to 55 Hz  <b>Sweep rate:</b> 1 octave/minute  <b>Amplitude:</b> 0.35 mm (interpreted as 0.70 mm peak to peak)  <b>Number of sweeps:</b> 20 sweeps (10 cycles) per axis, for 3 axes (no delay at resonance)</p> <p><b>Bump:</b>  <b>Acceleration:</b> 10 g  <b>Duration of pulse:</b> 16 milliseconds  <b>Number of bumps:</b> 1000 +/- 10 for each axis, for 3 axes  <b>Time between bumps:</b> 2 seconds</p>
<b>Operating Conditions</b>	<b>Temperature range:</b> 0° to +50° C <b>Relative humidity:</b> 95% (non-condensing)
<b>Safety Category</b>	Safety Category 4 per ISO 13849-1 (EN 954-1)
<b>Certifications</b>	For a list of certifications see page 237.
<b>Wiring Diagrams</b>	WD058 (p. 284)

## MM2-TA-12B Muting Module Specifications

<b>Supply Voltage and Current</b>	+24V dc $\pm 15\%$ @ 400 mA max (not including draw of the MSSSI power, AUX, ML, M1-M4 and OSSD connections)
<b>Supply Protection Circuitry</b>	All inputs and outputs are protected from short circuit to +24V dc or dc common.
<b>Output Response Time</b>	Muteable Safety Stop Interfaces (MSSSI) and the Safety Stop Interfaces (SSI) are less than or equal to 10 milliseconds.
<b>Safety Outputs</b>	<p><b>Two diverse-redundant solid-state safety outputs:</b> 24V dc, 0.5A sourcing OSSD (output signal switching device).</p> <p><b>ON-State voltage:</b> <math>\geq V</math> in-1.5V dc</p> <p><b>Max. leakage current:</b> 1.2 mA; inclusive of faults (including open 0V dc wire)</p> <p><b>OFF-State voltage:</b> 1.2V dc max.</p> <p><b>Max. load capacitance:</b> 0.1 <math>\mu</math>F</p> <p><b>Non-safety auxiliary output:</b> PNP solid-state output, rated at +24V dc @ 250 mA.</p> <p><b>OSSD test pulse width:</b> 100 to 300 microseconds</p> <p><b>OSSD test pulse period:</b> 12 milliseconds</p>
<b>MSSSI Power Connections</b>	+24V dc $\pm 15\%$ @ 2.5A max. output (dependent on System power input). Resettable 2.5A fuse
<b>Status Indicators</b>	<p><b>3 Status Indicator LEDs (Red, Green and Yellow):</b> indicate Power ON/OFF, operating mode, lockout, override, and OSSD status</p> <p><b>Green LEDs</b> adjacent to individual inputs/interfaces indicate status (ON = active/closed)</p>
<b>Diagnostic Code Display</b>	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.
<b>Muting Lamp Output</b>	<p>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 <math>&lt; 30 \Omega</math>.</p> <p><b>Max. switching voltage:</b> 30V dc</p> <p><b>Max. switching current:</b> 360 mA</p> <p><b>Min. switching current:</b> 10 mA</p> <p><b>Saturation voltage:</b> <math>\leq 1.5V</math> dc @ 10 mA; <math>\leq 5V</math> dc @ 360 mA</p>
<b>Controls and Adjustments</b>	<p><b>All configured on two redundant banks of DIP switches:</b></p> <ul style="list-style-type: none"> <li>Manual/auto reset</li> <li>One-way/two-way muting</li> <li>Monitored/non-monitored mute lamp output</li> <li>One-channel/two-channel/no EDM</li> <li>Backdoor timer</li> <li>Mute on power-up enable</li> <li>Mute enable functional/disabled</li> </ul>
<b>Inputs</b>	<p>The MSSSI and the SSI can be interfaced with external safety devices that have either hard contact outputs or solid-state OSSD safety outputs.</p> <p>Maximum external resistance must not exceed 1000 <math>\Omega</math> per channel.</p> <p><b>Operating Range for MSSSI and SSI Inputs</b></p> <p><b>OFF State:</b> 0-3V, 0-2 mA</p> <p><b>ON State:</b> 12-30V, 10-50 mA</p> <p><b>Muteable Safety Stop Interface (MSSSI)</b> This input consists of two channels (MSSSI-A and MSSSI-B), and can be muted when the requirements for a mute cycle have been met. When muted, the OSSDs remain ON, independent of the MSSSI status. If not muted, when one or both channels open, the OSSD outputs will go OFF.</p> <p><b>Safety Stop Interface (SSI)</b> 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.</p>
<b>External Device Monitoring (EDM)</b>	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.
<b>Muting Device Inputs</b>	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.

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

<b>Mute Enable Input</b>	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.
<b>Override Inputs</b>	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.
<b>Reset Input</b>	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.
<b>Mounting</b>	4 mounting holes, 5.5 mm dia.
<b>Construction</b>	<b>Housing:</b> Glass-filled Nylon (Black) <b>Connectors:</b> Nickel-plated brass All circuitry epoxy-encapsulated
<b>Environmental Rating</b>	NEMA 4, 13; IEC IP65
<b>Connections</b>	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)
<b>Vibration Resistance</b>	<b>Vibration:</b> <b>Frequency range:</b> 10 to 55 Hz <b>Sweep rate:</b> 1 octave/minute <b>Amplitude:</b> 0.35 mm (interpreted as 0.70 mm peak to peak) <b>Number of sweeps:</b> 20 sweeps (10 cycles) per axis, for 3 axes (no delay at resonance)  <b>Bump:</b> <b>Acceleration:</b> 10 g <b>Duration of pulse:</b> 16 milliseconds <b>Number of bumps:</b> 1000 +/- 10 for each axis, for 3 axes <b>Time between bumps:</b> 2 seconds
<b>Operating Conditions</b>	<b>Temperature range:</b> 0° to +50° C <b>Relative humidity:</b> 95% (non-condensing)
<b>Safety Category</b>	Safety Category 2 per EN 954-1
<b>Certifications</b>	For a list of certifications see page 237.
<b>Wiring Diagrams</b>	WD059 (p. 284)

## MMD-TA-12B &amp; MMD-TA-11B Muting Modules Specifications

<b>Supply Voltage and Current</b>	+24V dc $\pm 15\%$ @ 400 mA max (not including draw of the MSSSI power, AUX, ML, M1-M4 and OSSD connections)
<b>Supply Protection Circuitry</b>	All inputs and outputs are protected from short circuit to +24V dc or dc common.
<b>Output Response Time</b>	Muteable Safety Stop Interfaces (MSSSI) and the Safety Stop Interfaces (SSI) are less than or equal to 10 milliseconds (MMD-TA-12B) or 30 milliseconds (MMD-TA-11B).
<b>Safety Outputs</b>	<p><b>MMD-TA-12B:</b>  <b>Two diverse-redundant solid-state safety outputs:</b> 24V dc, 0.5A sourcing OSSD (output signal switching device).  <b>ON-State voltage:</b> <math>\geq V_{in} - 1.5V</math> dc  <b>Max. leakage current:</b> 1.2 mA; inclusive of faults (including open 0V dc wire)  <b>OFF-State voltage:</b> 1.2V dc max.  <b>Max. load capacitance:</b> 0.1 <math>\mu</math>F  <b>Non-safety auxiliary output:</b> PNP solid-state output, rated at +24V dc @ 250 mA.  <b>OSSD test pulse width:</b> 50 to 100 microseconds  <b>OSSD test pulse period:</b> 12 milliseconds</p> <p><b>MMD-TA-11B:</b>  <b>Output(K1 &amp; K2):</b> Two normally open OSSD (output signal switching device) output channels and one normally closed auxiliary output channel. Each normally open OSSD output channel is a series connection of contacts from two forced-guided (positive-guided) relays—AgNi, 5 <math>\mu</math>m gold-plated</p> <p><b>Low Current Rating:</b>  <b>Min. voltage:</b> 1V ac/dc  <b>Min. current:</b> 5 mA ac/dc  <b>Min. power:</b> 5 mW (5 mVA)  <b>Max. voltage:</b> 60V ac/dc  <b>Max. current:</b> 300 mA ac/dc  <b>Max. power:</b> 7 W (7 VA)</p> <p><b>High Current Rating:</b>  <b>Min. voltage:</b> 15V ac/dc  <b>Min. current:</b> 30 mA ac/dc  <b>Min. power:</b> 5 W (5 VA)  <b>Max. voltage:</b> 250V ac/dc  <b>Max. current:</b> 6 A ac/dc  <b>Max. power:</b> 200 W (1500 VA)</p> <p><b>Mechanical life:</b> 50,000,000 operations  <b>Electrical life:</b> 100,000 operations (typical at 200 W/1500 VA, resistive load)</p>
<b>MSSSI Power Connections</b>	+24V dc $\pm 15\%$ @ 2.5A max. output (dependent on System power input). Resettable 2.5A fuse
<b>Status Indicators</b>	<b>3 Status Indicator LEDs (Red, Green and Yellow):</b> indicate Power ON/OFF, operating mode, lockout, override, and OSSD status <b>Green LEDs</b> adjacent to individual inputs/interfaces indicate status (ON = active/closed)
<b>Diagnostic Code Display</b>	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.
<b>Muting Lamp Output</b>	A non-monitored sinking output. <b>Max. switching voltage:</b> 30V dc <b>Max. switching current:</b> 360 mA <b>Min. switching current:</b> 10 mA <b>Saturation voltage:</b> $\leq 1.5V$ dc @ 360 mA
<b>Controls and Adjustments</b>	<b>All configured on two redundant banks of DIP switches:</b> Manual/auto reset One-way/two-way muting One-channel/two-channel/no EDM Backdoor timer Mute on power-up enable

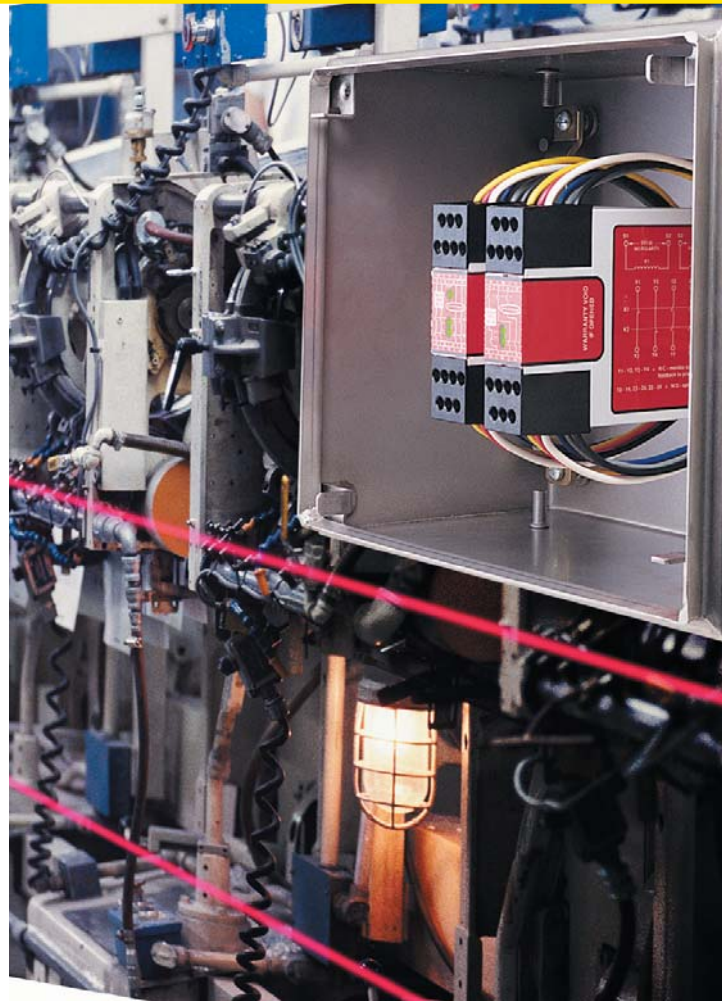
## MMD-TA-12B & MMD-TA-11B Muting Modules Specifications (cont'd)

<b>Inputs</b>	<p>The MSSSI and the SSI can be interfaced with external safety devices that have either hard contact outputs or solid-state OSSD safety outputs.</p> <p><b>Operating Range for MSSSI and SSI Inputs</b>  <b>OFF State:</b> 0-3V, 0-2 mA  <b>ON State:</b> 11-30V, 10-50 mA</p> <p><b>Muteable Safety Stop Interface (MSSSI)</b>  This input consists of two channels (MSSSI-A and MSSSI-B), and can be muted when the requirements for a mute cycle have been met. When muted, the OSSDs remain ON, independent of the MSSSI status. If not muted, when one or both channels open, the OSSD outputs will go OFF.</p> <p><b>Safety Stop Interface (SSI)</b>  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.</p>
<b>External Device Monitoring (EDM)</b>	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.
<b>Muting Device Inputs</b>	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.
<b>Mute Enable Input</b>	This 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.
<b>Override Inputs</b>	The two-channel inputs must be closed within 3 seconds of each other (simultaneity requirement) and held closed during the 30-second Override. To initiate a subsequent Override, open both channels, wait 0.5 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.
<b>Reset Input</b>	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.
<b>Mounting</b>	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IEC IP54), or better.
<b>Construction</b>	Polycarbonate housing
<b>Environmental Rating</b>	NEMA 1; IEC IP20
<b>Vibration Resistance</b>	<p><b>Vibration (per IEC 68-2-6: 1995):</b>  <b>Frequency range:</b> 10 to 55 Hz  <b>Sweep rate:</b> 1 octave/minute  <b>Amplitude:</b> 0.35 mm (interpreted as 0.70 mm peak to peak)  <b>Number of sweeps:</b> 20 sweeps (10 cycles) per axis, for 3 axes (no delay at resonance)</p> <p><b>Bump (per IEC 68-2-29: 1987):</b>  <b>Acceleration:</b> 10 g  <b>Duration of pulse:</b> 16 milliseconds  <b>Number of bumps:</b> 1000 +/- 10 for each axis, for 3 axes  <b>Time between bumps:</b> 2 seconds</p>
<b>Operating Conditions</b>	<b>Temperature range:</b> 0° to +50° C <b>Relative humidity:</b> 95% (non-condensing)
<b>Safety Category</b>	Safety Category 4 per EN 954-1
<b>Certifications</b>	For a list of certifications see page 237.
<b>Wiring Diagrams</b>	<b>MMD-TA-12B:</b> WD056 (p. 283) <b>MMD-TA-11B:</b> WD057 (p. 283)



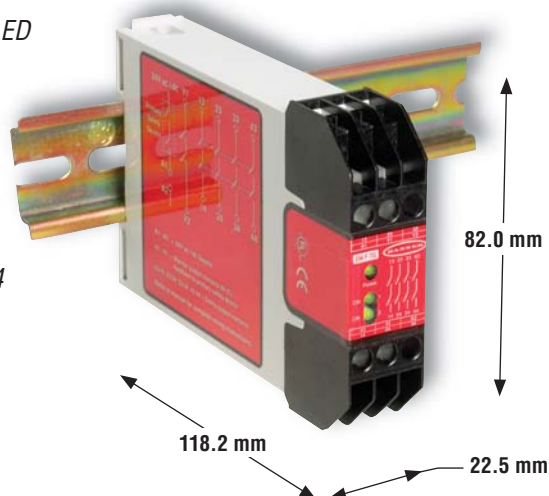
# Extension Modules

- Provides additional safety outputs for a primary safety device.
- 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 milliseconds.
- Mounts on DIN rail.

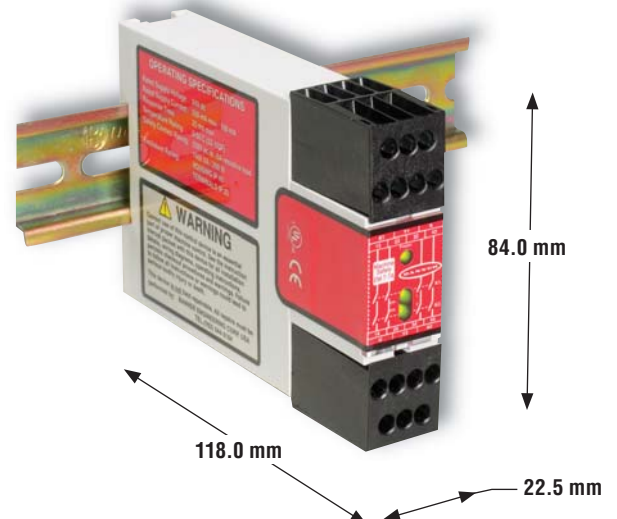


## Extension Modules

- 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
- Rates UL 991 and EN 60204



EM-F.-7G Models



EM-T-7A Models





## 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)	4 NO w/delay			35 ms	—	55799
EM-FD-7G2						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	<b>EM-T-7A model:</b> A1-A2: 24V dc, +/-15%, 10% max. ripple <b>EM-F/FD-7G.. models:</b> A1-A2: 24V ac/dc, +/-10%, 10% max. ripple on dc
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Output Configuration	<b>Four output channels:</b> <b>EM-T-7A model:</b> Each channel is a series connection of two forced-guided (positive-guided) relay contacts – AgNi, gold flashed <b>EM-F/FD-7G.. models:</b> Each channel is a series connection of two forced-guided (positive-guided) relay contacts – AgSnO <sub>2</sub> <b>Contact ratings:</b> <b>Max. voltage:</b> 250V ac/dc <b>Max. current:</b> 6 A ac/dc <b>Min. current:</b> 30 mA @ 24V dc <b>Max. power:</b> 1500 VA, 200 W <b>Mechanical life:</b> <b>EM-T-7A model:</b> 50,000,000 operations <b>EM-F/FD-7G.. models:</b> 10,000,000 operations <b>Electrical life:</b> 100,000 at full resistive load <b>Feedback contact rating (Y1-Y2):</b> <b>EM-T-7A model:</b> 24V dc @ 0.5A <b>EM-F/FD-7G.. models:</b> 250V ac/dc @ 3A <b>NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.</b>
Output Response Time	<b>EM-T-7A model:</b> 20 milliseconds max. (if channel u-k fails, maximum response time is 200 milliseconds) <b>EM-F-7G model:</b> 35 milliseconds typical <b>EM-FD-7G.. model:</b> <b>Delay OFF:</b> 0.5 seconds ±30% for <b>EM-FD-7G2</b> , 1 seconds ±30% for <b>EM-FD-7G3</b> , 2 seconds ±30% for <b>EM-FD-7G4</b> , as measured from the time when the supply voltage to A1 is interrupted <b>Delay ON:</b> 30 milliseconds for all models
Input Requirements	<b>EM-T-7A model:</b> Inputs from Primary Safety Device must each be capable of switching 30 to 250 mA @ 13 to 28V dc. <b>EM-F/FD-7G.. models:</b> Input from Primary Safety Device must be capable of switching 40 to 100 mA @ 13 to 27V ac/dc.
Status Indicators	<b>3 green LED indicators:</b> Power ON K1 energized K2 energized
Construction	Polycarbonate housing.
Environmental Rating	Rated NEMA 1; IEC IP20
Mounting	Mounts to standard 35 mm DIN rail track. Extension Module must be installed inside an enclosure rated NEMA 3 (IEC IP54), or better.
Vibration Resistance	10 to 55Hz @ 0.35 mm displacement per IEC 68-2-6
Operating Conditions	<b>Temperature:</b> 0° to +50° C <b>Relative humidity:</b> 90% @ +50° C (non-condensing)
Application Notes	There are no adjustments and no user-serviceable parts.
Certifications	For a list of certifications see page 237.
Wiring Diagrams	<b>EM-T-7A 1-Channel EDM:</b> WD060 (p. 286) <b>EM-T-7A 2-Channel EDM:</b> WD061 (p. 286) <b>EM-F-7G:</b> WD062 (p. 287) <b>EM-FD-7G:</b> WD063 (p. 287)

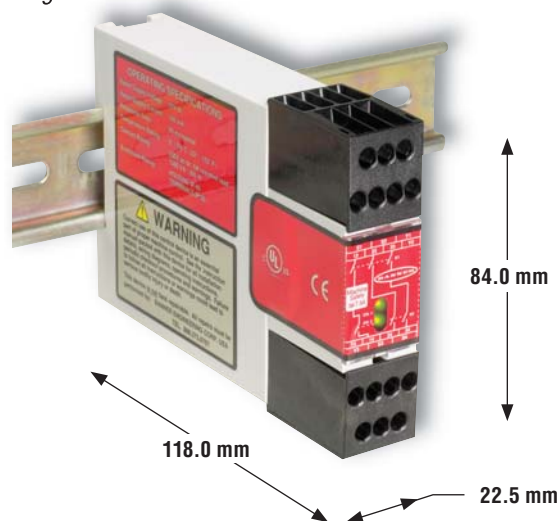
# Interface Modules

- 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



Interface Models





## 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

<b>Input Voltage and Current</b>	24V dc, +/-15% no polarity, 10% max. ripple; 50 mA per input channel <b>Power consumption:</b> approx. 2.4 W																		
<b>Supply Protection Circuitry</b>	Protected against transient voltages.																		
<b>Output Configuration</b>	<p><b>IM-T-9A:</b> 3 normally open output channels  <b>IM-T-11A:</b> 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.  <b>Contacts:</b> AgNi, 5 µm gold-plated</p> <p><b>Low Current Rating:</b>  <b>Caution: The 5 µm gold-plated contacts allow the switching of low current/low voltage.</b>            To preserve the gold plating on the contacts, the following max. values should not be exceeded at any time:</p> <table border="0"> <tr> <td><b>Min. voltage:</b> 1V ac/dc</td> <td><b>Max. voltage:</b> 60V</td> </tr> <tr> <td><b>Min. current:</b> 5 mA ac/dc</td> <td><b>Max. current:</b> 300 mA</td> </tr> <tr> <td><b>Min. power:</b> 5 mW (5 mVA)</td> <td><b>Max. power:</b> 7 W (7 VA)</td> </tr> </table> <p><b>High Current Rating:</b>            If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to:</p> <table border="0"> <tr> <td><b>Min. voltage:</b> 15V ac/dc</td> <td><b>Max. voltage:</b> 250V ac/dc</td> </tr> <tr> <td><b>Min. current:</b> 30 mA ac/dc</td> <td><b>Max. current:</b> 6 A</td> </tr> <tr> <td><b>Min. power:</b> 5 W (5 VA)</td> <td><b>Max. power:</b> 200 W (1,500 VA)</td> </tr> </table> <p><b>Mechanical life:</b> 50,000,000 operations  <b>Electrical life:</b> 150,000 operations (typical, @ 200 W (1,500 VA) switched power, resistive load)</p> <p><b>Feedback contact rating (Y1-Y2, Y3-Y4):</b></p> <table border="0"> <tr> <td><b>Min. voltage:</b> 1V ac/dc</td> <td><b>Max. voltage:</b> 60V</td> </tr> <tr> <td><b>Min. current:</b> 5 mA ac/dc</td> <td><b>Max. current:</b> 300 mA</td> </tr> <tr> <td><b>Min. power:</b> 5 mW (5 mVA)</td> <td><b>Max. power:</b> 7 W (7 VA)</td> </tr> </table> <p><b>Note: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.</b></p>	<b>Min. voltage:</b> 1V ac/dc	<b>Max. voltage:</b> 60V	<b>Min. current:</b> 5 mA ac/dc	<b>Max. current:</b> 300 mA	<b>Min. power:</b> 5 mW (5 mVA)	<b>Max. power:</b> 7 W (7 VA)	<b>Min. voltage:</b> 15V ac/dc	<b>Max. voltage:</b> 250V ac/dc	<b>Min. current:</b> 30 mA ac/dc	<b>Max. current:</b> 6 A	<b>Min. power:</b> 5 W (5 VA)	<b>Max. power:</b> 200 W (1,500 VA)	<b>Min. voltage:</b> 1V ac/dc	<b>Max. voltage:</b> 60V	<b>Min. current:</b> 5 mA ac/dc	<b>Max. current:</b> 300 mA	<b>Min. power:</b> 5 mW (5 mVA)	<b>Max. power:</b> 7 W (7 VA)
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<b>Min. power:</b> 5 mW (5 mVA)	<b>Max. power:</b> 7 W (7 VA)																		
<b>Output Response Time</b>	20 milliseconds max.																		
<b>Status Indicators</b>	<b>2 green LED indicators:</b> K1 energized K2 energized																		
<b>Construction</b>	Polycarbonate housing.																		
<b>Environmental Rating</b>	Rated NEMA 1; IEC IP20.																		
<b>Mounting</b>	Mounts to standard 35 mm DIN rail track. Interface Module must be installed inside an enclosure rated NEMA 3 (IEC IP54), or better.																		
<b>Vibration Resistance</b>	10 to 55Hz @ 0.35 mm displacement per IEC 68-2-6																		
<b>Operating Conditions</b>	<b>Temperature:</b> 0° to +50° C <b>Relative humidity:</b> 90% @ 50° C (non-condensing)																		

## Interface Modules Specifications (cont'd)

<b>Application Notes</b>	There are no adjustments and no user-serviceable parts. See data sheet p/n <a href="#">62822</a> for information regarding repair service.
<b>Certifications</b>	For a list of certifications see page 237.
<b>Wiring Diagrams</b>	<b>2-Channel, 2 FSDs, 2 EDM:</b> WD064 (p. 288) <b>2-Channel, 2 PNP, 1 EDM:</b> WD065 (p. 288) <b>2-Channel, 2 FSDs, 1 EDM:</b> WD066 (p. 289) <b>1-Channel, 1 Relay, 1 EDM:</b> WD067 (p. 289)