Safety Controllers

Industrial safety controllers and modules provide an interface between safety devices and the machines; monitoring those devices for an easy-to-use safety control solution.

Series	Description	Inputs	Outputs	Dimensions H x W x D	Features	Power Supply
	**SC26-2** Easy to program, install and allows for more flexibility of how the controller is used and configured. page 714	26	2 pair (4 PNP)	110 x 45 x 128.4 mm	Programmable Logic Optional Ethernet Optional LCD screen	24 V dc
	**XS26-2** Easy to program, install and allows for up to eight expansion I/O modules page 718	Dependent on modules used	Dependent on modules used	110 x (varies) x 129 mm (base module is 45 mm each addition module adds 22.5 mm)	Explanable Programmable Logic Optional Ethernet Optional LCD screen	24 V dc
	**SC22-3** Completely configurable and flexible safety controller that can easily replace multiple dedicated safety modules. page 722	22	3 pair (6 PNP)	112 x 131 x 64 mm	Optional Ethernet Dedicated status outputs LCD screen	24 V dc

SC26-2
Safety Controller

The SC26-2 Controller is easy to program, install and allows for more flexibility of how the safety controller is used and configured. The SC26-2 Controller is a lower cost option for smaller jobs and applications.

- Safety Controller system monitors a variety of input devices such as E-stop buttons, rope pulls, enabling devices, protective safety stops, interlocked guards or gates, optical sensors, two-hand controls and safety mats
- Intuitive programming environment for easy implementation
- Configure inputs, outputs and functionality of the controller for more usability
- Base controller allows eight of the 26 inputs to be configured as status outputs for efficient terminal utilization
- Ethernet models available providing up to 64 virtual status outputs, fault diagnostic codes and messages
- Accessories see page 716

SC26-2 Safety Controller, 24 V DC

Description	Model
NO Display & NO Ethernet	**SC26-2**
Display	**SC26-2d**
Ethernet	**SC26-2e**
Display + Ethernet	**SC26-2de**

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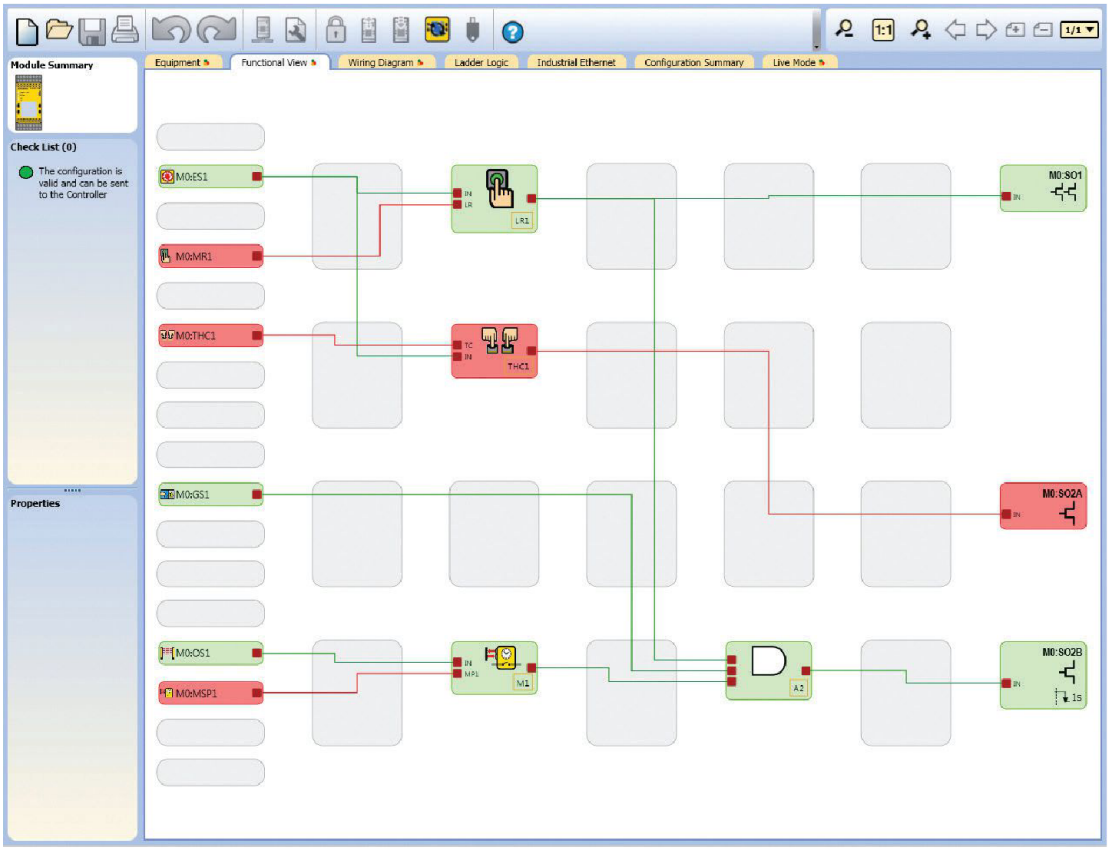
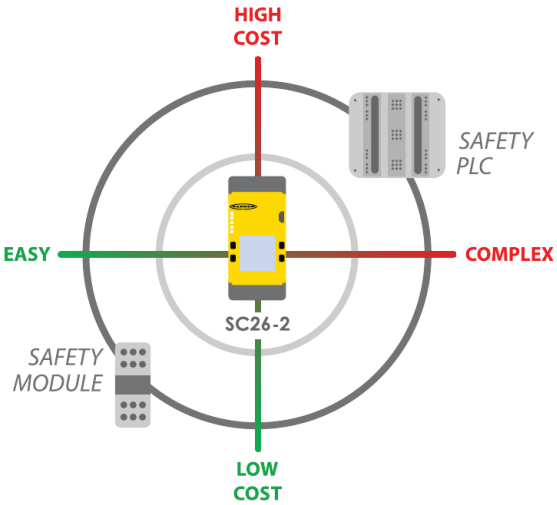
The next level in machine safety control...

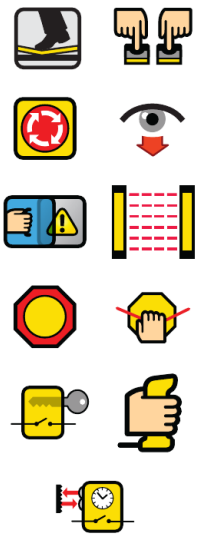


Target Equipment

- Welding stations
- Assembly machines
- Robotic automation
- End-of-line packaging equipment
- Safety retrofits



Safety Input Devices



Accessories

SC-XM2
Memory Card

SC-XMP2
Programming Tool

SC-USB2
USB Cable

SC-TC2
Spring Terminal Block Set

Additional Interfacing Products see page 725

SC26-2 Safety Controller Specifications

Power	24 V dc, ± 20% **Ethernet models:** add 40 mA **Display models:** add 20 mA
Safety Inputs (and Convertible I/O when used as inputs)	**Input On threshold:** > 15 V dc (guaranteed on), 30 V dc max. **Input Off threshold:** < 5 V dc and < 2 mA, –3 V dc min. **Input On current:** 5 mA typical at 24 V dc, 50 mA peak contact cleaning current at 24 V dc **Input lead resistance:** 300 Ω max. (150 Ω per lead) **Input requirements for a 4-wire Safety Mat:** • Max. capacity between plates: 0.22µF • Max. capacity between bottom plate and ground: 0.22µF • Max. resistance between the 2 input terminals of one plate: 20 Ω
Solid State Safety Outputs	0.5 A max. at 24 V dc (1.0 V dc max. drop) **Output OFF threshold:** 1.7 V dc typical (2.0 V dc max.) **Output leakage current:** 50 µ A max. with open 0V **Load:** 0.1 µ F max., 1 H max., 10 Ω max. per lead
Response and Recovery Times	See Configuration Summary in the data sheet
Environmental Rating	NEMA 1 (IEC IP20), for use inside NEMA 3 (IEC 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) **Vibration:** 3.5 mm occasional / 1.75 mm continuous @ 5Hz to 9Hz, 1.0g occasional and 0.5g continuous @ 9Hz to 150Hz: all at 10 sweep cycles per axis (per IEC 61131-2)
Removable Terminals	**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. **Wire size:** 24 to 16 AWG (0.20 to 1.31 mm²) **Wire strip length:** 8.00 mm (0.315 in)
Design Standards	• SIL CL 3 per IEC 62061 Safety of Machinery – Functional Safety of Safety-Related Electrical, Electronic and Programmable Electronic Control Systems • SIL 3 per IEC 61508 Functional Safety of Electrical/Electronic/Programmable Electronic Safety-Related Systems • Category 4 per ISO 13849-1 • Category 4 Performance Level (PL) e per ISO 13849-1 • Complies with Machinery Directive 2006/42/EC • IEC 61131-2 Programmable Controllers, Part 2: Equipment Requirements and Tests • UL 508 Industrial Control Equipment • ANSI NFPA 79 Electrical Standards for Industrial Machinery • IEC 60204-1 Electrical Equipment of Machines: General Requirements • ISO 13851 (EN574) Safety of Machinery – Two-Hand Control Devices – Functional Aspects and Design Principles • ISO 13850 (EN418) Emergency Stop Devices
Certifications	Approvals pending

XS26-2
Safety Controller

The XS26-2 Controller is easy to both program and install while providing scalable flexibility to meet your gorwing automation needs.

- Allows up to eight expansion modules
- Configuration software free of charge
- Real-time live display feedback
- Intuitive functional diagram configuration; logic function blocks including AND, OR, XOR, NAND, NOR, SR Flip-flop, RS Flip-flop
- 64 Virtual outputs (Ethernet version only)
- Accessories see page 716

XS26-2 Safety Controller, 24 V DC

Description	Model	
Expandable	**XS26-2**	NEW
Expandable + Display	**XS26-2d**	NEW
Expandable + Ethernet	**XS26-2e**	NEW
Expandable + Display + Ethernet	**XS26-2de**	NEW

Expansion Modules

Description	Output Configuration	Model*	
8 Pin Safety input module	NA	**XS8si**	NEW
16 Pin Safety input module	NA	**XS16si**	NEW
Safety output module	2 dual channel PNP	**XS2so**	NEW
Solid-state safety output module	4 dual channel PNP	**XS4so**	NEW
Solid-state safety relay output module	2 NO/1NC	**XS1ro**	NEW
Safety relay output module	4 NO/2 NC	**XS2ro**	NEW

* All models come with screw terminals

Build System and Select Equipment

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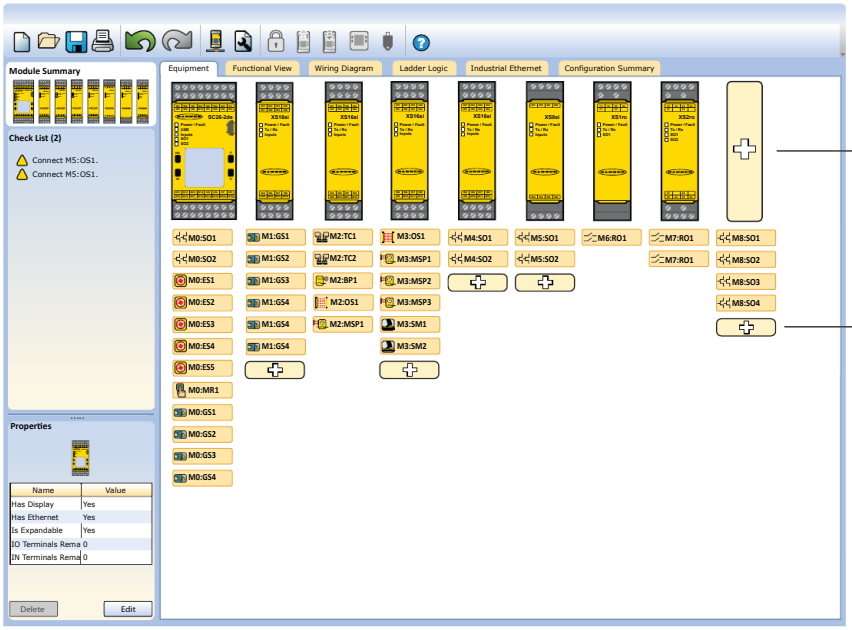
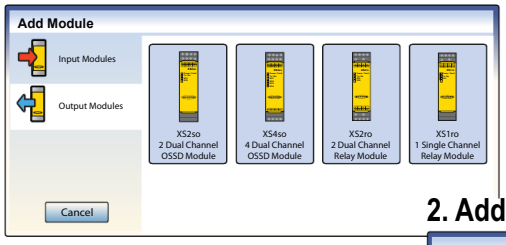
Equipment View

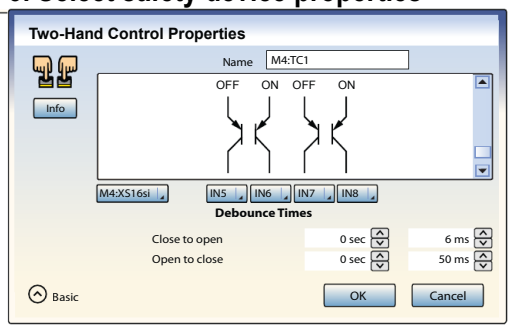


1. Add up to 8 modules



2. Add safety devices

3. Select safety device properties



Accessories

SC-XM2
Memory Card

SC-XMP2
Programming Tool

SC-USB2
USB Cable

SC-TC2
Spring Terminal Block Set

Additional Interfacing Products see page 724

XS26-2 Safety Controller Specifications

Power	24 V dc, ± 20% **Ethernet models:** add 40 mA **Display models:** add 20 mA **Expandable models**: add 3.6 A max. bus load
Safety Inputs (and Convertible I/O when used as inputs)	**Input On threshold:** > 15 V dc (guaranteed on), 30 V dc max. **Input Off threshold:** < 5 V dc and < 2 mA, –3 V dc min. **Input On current:** 5 mA typical at 24 V dc, 50 mA peak contact cleaning current at 24 V dc **Input lead resistance:** 300 Ω max. (150 Ω per lead) **Input requirements for a 4-wire Safety Mat:** • Max. capacity between plates: 0.22µF • Max. capacity between bottom plate and ground: 0.22µF • Max. resistance between the 2 input terminals of one plate: 20 Ω
Solid State Safety Outputs	**Input On threshold**: > 15 V dc (guaranteed on), 30 V dc max. **Input Off threshold**: < 5 V dc and < 2 mA, –3 V dc min. **Input On current**: 5 mA typical at 24 V dc, 50 mA peak contact cleaning current at 24 V dc **Input lead resistance**: 300 Ω max. (150 Ω per lead) **Input requirements for a 4-wire Safety Mat**: · Max. capacity between plates: 0.22 µF · Max. capacity between bottom plate and ground: 0.22 µF · Max. resistance between the 2 input terminals of one plate: 20 Ω
Response and Recovery Times	See Configuration Summary in the data sheet
Environmental Rating	NEMA 1 (IEC IP20), for use inside NEMA 3 (IEC 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) **Vibration:** 3.5 mm occasional / 1.75 mm continuous @ 5Hz to 9Hz, 1.0g occasional and 0.5g continuous @ 9Hz to 150Hz: all at 10 sweep cycles per axis (per IEC 61131-2)
Removable Terminals	**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. **Wire size:** 24 to 12 AWG (0.20 to 3.13 mm²) **Wire strip length**: 7 to 8 mm (0.275 in to 0.315 in)
Design Standards	Category 4, PL e (EN ISO 13849) SIL CL 3 (IEC 62061, IEC 61508)
Certifications	CE c UL LISTED IND. CONT. EQ. 3TJJ

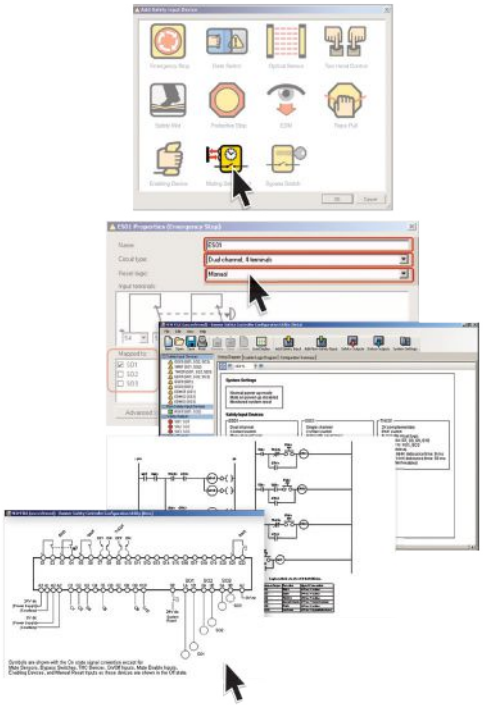
SC22-3/-3E
Safety Controller

The SC22-3 Safety Controller is a completely configurable and flexible safety controller that can easily replace multiple dedicated safety modules.

- Input terminals can monitor both contact-based or PNP solid-state outputs
- Ten configurable auxiliary status outputs track inputs, outputs, lockout, I/O status and other functions
- Three pairs of solid-state safety outputs with ON-Delay, OFF-Delay and cancel OFF-Delay
- SC22-3E models provide diagnostic information using EtherNet/IP, Modbus TCP and PCCC
- Safety 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
- Accessories see page 724

Intuitive free software for point-and-click configuration

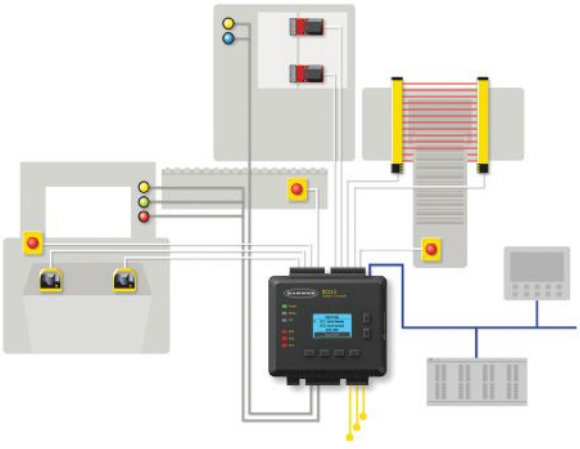
1. Select the type of safety input device
2. Map functions and properties from a pull down list
3. Wiring and ladder logic diagrams autopopulate along with configuration summary
   - View and track status using front panel display or PC "Live Display"
   - Includes fault history with time/date stamp
   - 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
- Two-Hand Controls
- Safety Light Screens
- Rope Pulls
- Safety Mats and Edges
- Enabling Devices
- Muting Sensors
- Bypass Switches
- Interlocking Switches
- Laser Scanners
- Value monitoring



SC22-3/-3E Safety Controller, 24 V DC

Terminal Type	Safety Outputs	USB Cable	Output Rating	Aux. Outputs	XM Card	XM Programming Tool	Communication Protocol	Model
Screw	3 pairs (6 PNP)	1.8 m	0.75 amps each output	10 status (I/O, mute, lockout, fault and reset)	Yes	Yes	—	SC22-3-SU1
Clamp								SC22-3-CU1
Screw		—				—	—	SC22-3-S
Clamp								SC22-3-C
Screw		1.8 m	0.5 amps each output	10 status (I/O, mute, lockout, fault and reset) plus 32 virtual status		Yes	EtherNet/IP (with PCCC) & Modbus/TCP	SC22-3E-SU1
Clamp								SC22-3E-CU1
Screw		—				—	EtherNet/IP & Modbus/TCP	SC22-3E-S
Clamp								SC22-3E-C

Cordsets

Ethernet Communication

See page 924

Length		Shielded	Shielded Crossover
2.13 m		STP07	STPX07
7.62 m		STP25	STPX25
15.2 m		STP50	STPX50
22.9 m		STP75	STPX75

Additional cordset information available.
See page 902

Brackets

SC22-3

See page 860

DIN-35..

Additional brackets and information available.
See page 852

Miscellaneous

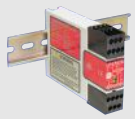
Description	Model
SC22-3 replacement controller (without terminals)	**SC-SC22-3**
SC22-3E replacement controller (without terminals), Ethernet compatible	**SC-SC22-3E**
External memory card (XM card)	**SC-XM1**
Bulk pack of 5 XM Cards	**SC-XM1-5**
Screw terminal replacement set	**SC-TS1**
Clamp terminal replacement set	**SC-TC1**
USB A/B cable, 1.8 m	**SC-USB1**
XM card USB programming tool	**SC-XMP**

SC22-3/-3E Interface Modules

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

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

		Description	Models	Product Information
Interface Modules		• 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	**IM-T-9A** (3 NO) **IM-T-11A** (2 NO/1 NC)	Page 746
Mechanically Linked Contactors		• 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	**11-BG00-31-D-024** **BF1801L-024**	Page 964

NC = Normally closed, NO = Normally open

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.

SC22-3/-3E Safety Controller Specifications

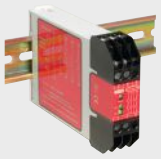
Power	24 V dc, ± 20% **SC22-3 models:** 0.4 A (controller only), 5.9 A (all outputs ON @ full rated load) **SC22-3E models:** 0.4 A (controller only), 4.9 A (all outputs ON @ full rated load) **The Controller should be connected only to a SELV (safety extra-low voltage, for circuits without earth ground) or a PELV (protected extra-low voltage, for circuits with earth ground) power supply**
Safety and Non-Safety Inputs (22 terminals)	**Input ON threshold:** > 15 V dc (guaranteed on), 30 V dc max. **Input OFF threshold:** < 5 V dc (guaranteed off with any 1 fault), –3 V dc min. **Input ON current:** 8 mA typical @ 24 V dc, > 2 mA (guaranteed with 1 fault) 50 mA peak contact cleaning current @ 24 V dc **Sourcing current:** 30 mA minimum continuous (3 V 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 (1.0 V dc max drop) **SC22-3E models:** 0.5 A max. each output (1.0 V dc max drop) **Output OFF threshold:** 0.6 V dc typical (1.2 V dc max. guaranteed with 1 fault) **Output leakage current:** 50 µA max. with open 0 V **Load:** 0.1 µF max., 1 H max., 10 Ω max. per lead
Status Outputs (10 terminals)	**Rated output current:** 0.5A @ 24 V dc (individual), 1.0 A @ 24 V dc (total of all outputs) **O1 to O8 (General Purpose) — Output OFF voltage:** < 0.5 V dc (no load), 22 KΩ pull down to 0 V **O9 and O10 (General Purpose or Monitored Mute Lamp) —** **Output OFF voltage:** Internal 94 KΩ pull up to 24 V dc supply **Output ON/OFF threshold:** 15 V dc +/−4 V dc @ 24 V dc supply NOTE: For O9 and O10 (if configured as monitored mute lamp output only), 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 Selectable 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
Response and Recovery 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.) **Recovery time (OFF to ON):** 400 milliseconds max. (with manual reset option) **Recovery time (OFF to ON):** 400 milliseconds max. plus input debounce time (auto reset)
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 erminals) **Password is required:** Configuration mode (create/modify/confirm/download configurations)
Environmental Rating	NEMA 1 (IEC IP20), for use inside NEMA 3 (IEC 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) **Tightening torque:** 0.23 Nm (2 in. lbs) nominal **Wire strip length:** 5.00 mm **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.**

SC22-3/-3E Safety Controller Specifications (cont'd)

Design Standards	• SIL CL 3 per IEC 62061 Safety of Machinery – Functional Safety of Safety-Related Electrical, Electronic and Programmable Electronic Control Systems • SIL 3 per IEC 61508 Functional Safety of Electrical/Electronic/Programmable Electronic Safety-Related Systems • Category 4 per ISO 13849-1 • Category 4 Performance Level (PL) e per ISO 13849-1 • Complies with Machinery Directive 2006/42/EC • IEC 61131-2 Programmable Controllers, Part 2: Equipment Requirements and Tests • UL 508 Industrial Control Equipment • UL 1998 Software in Programmable Components • ANSI NFPA 79 Electrical Standards for Industrial Machinery • IEC 60204-1 Electrical Equipment of Machines: General Requirements • ISO 13851 (EN574) Safety of Machinery – Two-Hand Control Devices – Functional Aspects and Design Principles • ISO 13850 (EN418) Emergency Stop Devices
Certifications	CE, UL LISTED, c UL LISTED Auxiliary Device US

Safety Modules

Industrial safety controllers and modules provide an interface between safety devices and the machines; monitoring those devices for an easy-to-use safety control solution.

Series	Description	Safety Rating	Safety Outputs	Aux Outputs	Power Supply
	**E-Stop & Guard** Modules monitor contacts of E-stop switches, guard interlock switches or the outputs of other safety modules. page 730	Category 2 or 4, depending on model	2 NO, 3 NO, 4 NO	1 NC, 1 NC & 2 PNP	24 V ac/dc, 115 V ac & 12-24 V dc, 230 V ac & 12-24 V dc or 24 V dc
	**Universal Input** Modules monitor one or two solid-state PNP or relay contact outputs from safety or non-safety devices, such as sensors or safety light screens. page 736	Category 2, 3 or 4 PLe	3 NO or 2 NO	1 NC, depending on model	24 V ac/dc
	**Safety Mat Monitoring** Modules monitor one 4-wire safety mat (or multiple connected in series). page 738	Category 3 (with mat)	4 NO	1 NC & 2 PNP	115 V ac & 12-24 V dc or 230 V ac & 12-24 V dc
	**Muting** Modules suspend safeguarding during non-hazardous time in the machine's cycle. page 740	Category 2, 3 or 4 PLe	2 PNP OSSD or 2 NO	1 PNP or 1 NC	24 V dc
	**Safe Speed** Modules monitor two sensors with PNP outputs for rotation and linear movements. page 744	Category 3 PLe	2 NO	1 NC	24 V ac/dc
	**Interface Relay** Dual input accepts the safety output of a safety device with solid-state or contact outputs and external device monitoring. page 746	Category 2, 3 or 4 (Depends on hookup)	3 NO or 2 NO	1 NC, depending on model	24 V dc
	**Extension Relay** Contact expansion for safety modules with contact outputs and external device monitoring. page 748	Category 2, 3 or 4 (Depends on hookup)	4 NO or 4 NO(w/delay)	—	24 V dc or 24 V ac/dc, depending on model

E-Stop & Interlocked Guard Safety Modules

Modules monitor positive-opening E-Stop and interlocking switches for proper operation, contact failure or wiring faults.

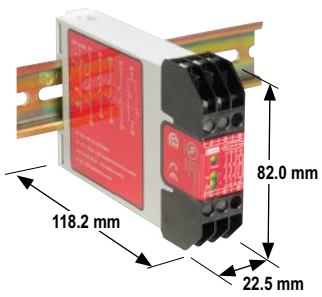
- AC and DC models available
- Module goes into lockout mode if fault is detected
- Housing are rugged polycarbonate and mount to standard 35 mm DIN rail
- Functional Stop Category 0 per NFPA79 and IEC 60204-1
- Relay outputs are capable of reliably switching low or high current applications (depending on model)

E-Stop & Guard Safety Modules

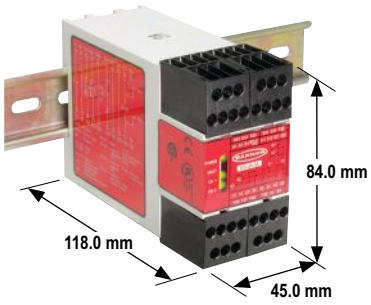
Supply Voltage	Inputs	Safety Outputs	Aux. Outputs	Output Rating	Output Response Time	Model
24 V ac/dc	1 NC & 1 NO (single or dual)	2 NO	—	6 amps	35 ms	**GM-FA-10J**
24 V ac/dc	1 NC (single) or 2 NC (dual)	3 NO	—	6 amps	25 ms	**ES-FA-9AA**
24 V ac/dc	1 NC (single) or 2 NC (dual)	2 NO	1 NC	7 amps	25 ms	**ES-FA-11AA**
24 V ac/dc	1 NC (single)	3 NO	1 NC	6 amps	35 ms	**ES-FA-6G**
115 V ac & 12-24 V dc	1 NC (single) or 2 NC (dual)	4 NO	1 NC & 2 PNP	6 amps	25 ms	**ES-UA-5A**
230 V ac & 12-24 V dc	1 NC (single) or 2 NC (dual)	4 NO	1 NC & 2 PNP	6 amps	25 ms	**ES-VA-5A**

NC = Normally Closed Relay, NO = Normally Open Relay

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



ES-FA-6G Models



ES-..A-5A Models

GM-FA-10J Guard Monitoring Module Specifications

Supply Voltage and Current	24 V dc ±15% @ 150 mA (SELV-rated supply according to EN IEC 60950, NEC Class 2) 24 V ac ±15% @ 150 mA, 50-60 Hz +/- 5% (NEC Class 2-rated transformer) **Power consumption:** approx. 3 VA / 3 W To comply with UL and CSA standards, the isolated secondary power supply circuit in the installation must incorporate a method to limit the overvoltage to 0.8 kV
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Overvoltage Category	**Output relay contact voltage of 1 V to 150 V ac/dc:** Category III **Output relay contact voltage of 151 V to 250 V ac/dc:** Category II (Category III, if appropriate overvoltage reduction is provided, as described in data sheet.)
Pollution Degree	2
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:** The 5 µm gold-plated contacts allow the 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, do not exceed the following max. values at any time:** **Min. voltage:** 1 V ac/dc — **Max. voltage:** 60 V **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: UL LISTED EMERGENCY STOP DEVICE 29YL — **Minimum:** **Voltage:** 15 V ac/dc, **Current:** 30 mA ac/dc, **Power:** 0.45 W (0.45 VA) — **Maximum:** 250 V ac/24 V dc, 6A resistive, B300, R300 per UL508 CE — **Minimum:** **Voltage:** 15 V ac/dc, **Current:** 30 mA ac/dc, **Power:** 0.45 W (0.45 VA) — **Maximum:** 250 V ac/24 V dc, 6A resistive, IEC 60947-5-1: AC15: 230 V ac. 3 A; DC-13: 24 V dc, 2A **Mechanical life:** ≥ 50,000,000 operations **Electrical life (switching cycles of the output contacts, resistive load):** 150,000 cycles @ 900 VA; 1,000,000 cycles @ 250 VA; 2,000,000 cycles @ 150 VA; 5,000,000 cycles @ 100 VA **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.
Input Requirements	Each switch or sensor must have a normally closed contact and a normally open contact capable of switching 20 to 50 mA @ 15 to 30 V dc **Reset switch:** 20 mA @ 12 V dc, hard contact only **Max. external resistance between terminals S11/S12, S11/S13, S21/S22 and S21/S23:** 270 ohms 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	IEC 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	CE: Cat. 4 PL e, per EN ISO 13849-1; SIL 3 per IEC 61508 and IEC 62061
Certifications	CE, UL LISTED EMERGENCY STOP DEVICE 29YL

ES-FA-..AA Safety Module Specifications

Supply Voltage and Current	24 V dc ±10% (SELV-rated supply according to EN IEC 60950, NEC Class 2) 24 V ac ±10%, 50/60Hz (NEC Class 2-rated transformer) **Power consumption:** approx. 2 W/2 VA
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Overvoltage Category	**Output relay contact voltage of 1 V to 150 V ac/dc:** Category III **Output relay contact voltage of 151 V to 250 V ac/dc:** Category III, if appropriate overvoltage reduction is provided, as described in data sheet
Pollution Degree	2
Output Configuration	**ES-FA-9AA:** 3 normally open (NO) output channels **ES-FA-11AA:** 2 normally open (NO) output channels and 1 normally closed (NC) auxiliary output Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2. The normally closed Aux. output channel of the **ES-FA-11AA** is a parallel connection of contacts from two forced-guided relays, K1-K2. **Contacts:** AgNi, 5 µm gold-plated **Low Current Rating:** The 5 µm gold-plated contacts allow the 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, do not exceed the following max. values at any time:** **Minimum:** **Voltage:** 1 V ac/dc **Current:** 5 mA ac/dc **Power:** 5 mW (5 mVA) **Maximum:** **Voltage:** 60 V **Current:** 300 mA **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) change to: **Minimum:** **Voltage:** 15 V ac/dc **Current:** 30 mA ac/dc **Power:** 0.45 W (0.45 VA) **Maximum:** **Voltage:** 250 V ac/dc **Current:** **ES-FA-9AA:** 6A **ES-FA-11AA:** 7 A **Power:** **ES-FA-9AA:** 200 W (1,500 VA) **ES-FA-11AA:** 200 W (1,750 VA) **Mechanical life:** > 20,000,000 operations **Electrical life (switching cycles of the output contacts, resistive load):** 150,000 cycles @ 1,500 VA; 1,000,000 cycles @ 450 VA; 2,000,000 cycles @ 250 VA; 5,000,000 cycles @ 125 VA **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:** **Dual-Channel (contacts) hookup –** 10 to 20 mA steady state @ 12 V dc NOTE: Inputs are designed with a brief contact-cleaning current of 100 mA when initially closed. **Single-Channel hookup –** 40 to 100 mA @ 24 V ac/dc +/- 10%; 50/60 Hz **Reset switch:** 20 mA @ 12 V dc, hard contact only
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 60068-2-6
Operating Conditions	**Temperature:** 0° to +50° C **Relative humidity:** 90% @ +50° C (non-condensing)
Design Standards	Cat. 4 PL e per EN ISO 13849-1; SIL 3 per IEC 61508 and IEC 62061
Certifications	CE UL LISTED EMERGENCY STOP DEVICE 29YL

ES-..A-5A Safety Module Specifications

Supply Voltage and Current	**AI-A2:** 115 V ac (model **ES-UA-5A**) or 230 V ac (model **ES-VA-5A**) ±15% , 50/60Hz **BI-B2:** 11 V dc – 27.6 V dc **Power consumption:** approx. 4 W/7 VA **The Safety Module 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.**
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Overvoltage Category	**Output relay contact voltage of 1 V to 150 V ac/dc:** Category III **Output relay contact voltage of 151 V to 250 V ac/dc:** Category III, if appropriate overvoltage reduction is provided, as described in data sheet
Pollution Degree	2
Output Configuration	4 normally open (NO) output channels; 1 normally closed (NC) and 2 solid-state auxiliary outputs Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2. The normally closed Aux. output channel is a parallel connection of contacts from two forced-guided relays, K1-K2. **Contacts:** AgNi, 5 µm gold-plated **Low Current Rating:** The 5 µm gold-plated contacts allow the 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, do not exceed the following max. values at any time:** **Minimum:** **Voltage:** 1 V ac/dc **Current:** 5 mA ac/dc **Power:** 5 mW (5 mVA) **Maximum:** **Voltage:** 60 V **Current:** 300 mA **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:

UL LISTED EMERGENCY STOP DEVICE 29YL c UL LISTED IND. CONT. EQ. 447Y	**Minimum:** **Voltage:** 15 V ac/dc **Current:** 250 mA ac/dc **Power:** 5 W (5 VA)	**Maximum:** **NO Safety Contacts (13-14, 23-24, 33-34, 43-44):** 250 V ac/ 24 V dc, 6A resistive B300, Q300 (UL508) **NC Auxiliary Contact (51-52):** 250 V ac/ 24 V dc, 5A resistive B300, Q300 (UL508)
CE	**Minimum:** **Voltage:** 15 V ac/dc **Current:** 250 mA ac/dc **Power:** 5 W (5 VA)	**Maximum—IEC60947-5-1** **NO Safety Contact: AC-1:** 250 V ac, 6A; **DC-1:** 24 V dc, 6A **AC-15:** 230 V ac, 3A; **DC-13:** 24 V dc, 4A **NC Auxiliary Contact: AC-1:** 250 V ac, 5A; **DC-1:** 24 V dc, 5A **AC-15:** 230 V ac, 2A; **DC-13:** 24 V dc, 4A

Mechanical life: > 20,000,000 operations
Electrical life (switching cycles of the output contacts, resistive load): 150,000 cycles @ 1,500 VA; 1,000,000 cycles @ 450 VA; 2,000,000 cycles @ 250 VA; 5,000,000 cycles @ 125 VA
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 in normal operation (no lockout)
- Output circuits require application of +12-24 V dc ±15% at terminal Y31; dc common at Y30
- Maximum switching current: 100 mA at 12-24 V dc
- Both outputs are protected against short circuits

Output Response Time	35 milliseconds max. (25 milliseconds typical)
Input Requirements	**E-stop switch** must have normally closed contacts each capable of switching 20 to 50 mA @ 12 to 30 V dc; and must be open ≥15 milliseconds for a valid stop command Maximum input resistance 250 ohms per channel @ 24 V dc supply voltage Maximum input resistance 25 ohms per channel @ 12 V dc supply voltage **Reset switch** must have one normally open contact capable of switching 20 to 50 mA @ 12 to 30 V ac/dc
OFF-State Recovery Time	350 milliseconds
Status Indicators	**3 green LEDs:** Power ON, Channel 1, Channel 2 **1 red LED:** Fault Condition
Construction	Polycarbonate housing

Continued on next page

ES-..A-5A Safety Module Specifications (cont'd)

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 (IP54), or better.
Vibration Resistance	10 to 60Hz @ 0.35 mm displacement per UL 991 60 to 150 Hz @ 5 g max.
Operating Conditions	**Temperature:** 0° to +50° C (surrounding air) **Relative humidity:** 90% @ +50° C (non-condensing)
Design Standards	Cat. 4 PL e per EN ISO 13849-1; SIL 3 per IEC 61508 and IEC 62061
Certifications	CE, UL LISTED EMERGENCY STOP DEVICE 29YL, c UL LISTED IND. CONT. EQ. 447Y

ES-FA-6G Safety Module Specifications

Supply Voltage and Current	24 V 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:** 250 V ac or 250 V dc **Max. current:** 6 A ac or dc **Min. current:** 30 mA @ 10 V 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 27 V ac/dc **Reset switch** must have one normally open contact capable of switching 20 to 30 mA @ 13 to 27 V 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 29YL CSA®	**Important Notice:** **European Community Machinery Directive 2006/42/EC** The ES-FA-6G Safety Module complies with Machinery Directive 98/37/EC, but not with Machinery Directive 2006/42/EC. Therefore, this Safety Module can only be installed as replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767.

Universal Input
Safety Modules

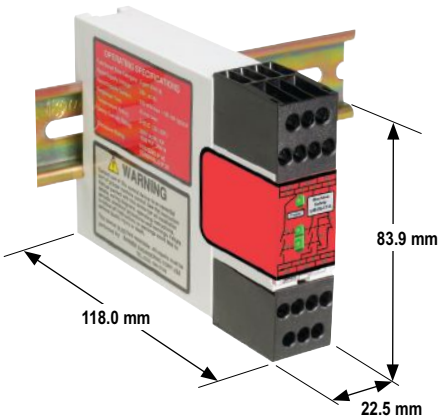
Modules monitor one or two solid-state PNP outputs or relay contact outputs from safety or non-safety devices such as sensors, safety light screens or one or two electromechanical contacts.

- Modules are an ideal choice for monitoring safety devices without external device monitoring(EDM) function
- Modules have single or dual channel inputs to monitor outputs from safety or non-safety devices
- Can be configured to monitor devices with solid-state PNP outputs or hard/relay contact outputs using DIP switches under removable terminals
- Housings are rugged polycarbonate and mount to standard 35 mm DIN rail
- Relay outputs are capable of reliably switching low or high current applications

Universal Safety Input Modules

Supply Voltage	Inputs	Safety Outputs	Aux. Output	Output Rating	Output Response Time	Model
24 V ac/dc	1 NC (single) or 2 NC (dual)	3 NO	–	6 amps	25 ms	**UM-FA-9A**
24 V ac/dc	1 NC (single) or 2 NC (dual)	2 NO	1 NC	7 amps	25 ms	**UM-FA-11A**

NC = Normally Closed Relay, NO = Normally Open Relay



UM-FA-..A Models

Universal Safety Input Module Specifications

Supply Voltage and Current	24 V dc ±10% (SELV-rated supply according to EN IEC 60950, NEC Class 2) 24 V ac ±10% 50-60 Hz (NEC Class 2-rated transformer) **Power consumption:** approx. 2 VA / 3 W
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Overvoltage Category	**Output relay contact voltage of 1 V to 150 V ac/dc:** Category III **Output relay contact voltage of 151 V to 250 V ac/dc:** Category II (Category III if appropriate overvoltage reduction is provided, as described in data sheet.)
Pollution Degree	2
Output Configuration	**UM-FA-9A:** 3 normally open (NO) output channels **UM-FA-11A:** 2 normally open (NO) output channels and 1 normally closed (NC) auxiliary output channel Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2. The normally closed Aux. output channel of the **UM-FA-11A** is a parallel connection of contacts from two forced-guided relays, K1-K2. **Contacts:** AgNi, 5 µm gold-plated **Low Current Rating:** The 5 µm gold-plated contacts allow the 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, do not exceed the following max. values at any time:** **Min. voltage:** 1 V ac/dc **Max. voltage:** 60 V **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:** 15 V ac/dc **Max. voltage:** 250 V ac/dc **Min. current:** 30 mA ac/dc **Max. current: UM-FA-9A:** 6 A **UM-FA-11A:** 7 A **Min. power:** 0.45 W (0.45 VA) **Max. power: UM-FA-9A:** 200 W (1,500 VA) **UM-FA-11A:** 200 W (1,750 VA) **Mechanical life:** > 20,000,000 operations **Electrical life (switching cycles of the output contacts, resistive load):** 150,000 cycles @ 1,500 VA; 1,000,000 cycles @ 450 VA; 2,000,000 cycles @ 250 VA; 5,000,000 cycles @ 125 VA **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:** **2-Channel (contacts) hookup:** 10 to 20 mA steady state @ 12 V dc NOTE: Inputs are designed with a brief contact-cleaning current of 100 mA when initially closed. **Solid-state Dual Channel hookup:** 5 to 20 mA steady state @ 18 to 28 V dc sourcing (PNP), < 2 mA leakage current **Single-Channel hookup:** 40 to 100 mA @ 24 V ac/dc ± 10%; 50/60 Hz **Reset Switch:** 20 mA @ 12 V dc, hard contact only
Minimum OFF-State Recovery Time	250 milliseconds (When used with the AG4 Safety Laser Scanner; the "Restart delay time after PF release" must be configured 280 milliseconds or greater.)
Indicators	**3 green LEDs:** Power ON K1 energized K2 energized
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 (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)
Design Standards	Cat. 4 PL e per EN ISO 13849-1; SIL 3 per IEC 61508 and IEC 62061
Certification	CE UL LISTED EMERGENCY STOP DEVICE 29YL

Safety Mat Monitoring
Safety Modules

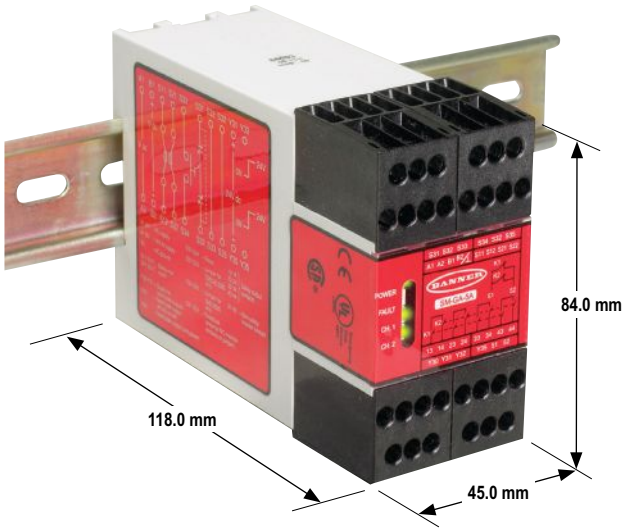
Module monitors a single or series connection of 4-wire safety mats or safety edge devices.

- Models work with AC or DC input voltages
- LED indicators show power on, output and fault
- Housings are rugged polycarbonate and mount to standard 35 mm DIN rail
- Relay outputs are capable of reliably switching low or high current applications

Safety Mat Monitoring Modules

Supply Voltage	Inputs	Safety Outputs	Aux. Outputs	Output Rating	Output Response Time	Model
115 V ac & 12-24 V dc	1 (or multiple in series) 4-wire Safety Mat	4 NO	1 NC & 2 PNP	6 amps	50 ms	**SM-GA-5A**
230 V ac & 12-24 V dc	1 (or multiple in series) 4-wire Safety Mat	4 NO	1 NC & 2 PNP	6 amps	50 ms	**SM-HA-5A**

NC = Normally Closed Relay, NO = Normally Open Relay



SM-..A-5A Models

Safety Mat Monitoring Module Specifications

Supply Voltage and Current	**AI-A2:** 115 V ac (model **SM-GA-SA**) or 230 V ac (model **SM-HA-5A**) ±15% , 50/60Hz **BI-B2:** 11 V dc – 27.6 V dc **Power consumption:** approx. 4 W/7 VA **The Safety Module 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, according to EN IEC 60950, NEC Class 2**
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Overvoltage Category	**Output relay contact voltage of 1 V to 150 V ac/dc:** Category III **Output relay contact voltage of 151 V to 250 V ac/dc:** Category III, if appropriate overvoltage reduction is provided, as described in data sheet
Pollution Degree	2
Output Configuration	4 normally open (NO) output channels; 1 normally closed (NC) and 2 solid-state auxiliary outputs Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2. The normally closed Aux. output channel is a parallel connection of contacts from two forced-guided relays, K1-K2. **Contacts:** AgNi, 5 µm gold-plated **Low Current Rating:** The 5 µm gold-plated contacts allow the 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:** **Minimum:** **Voltage:** 1 V ac/dc **Current:** 5 mA ac/dc **Power:** 5 mW (5 mVA) **Maximum:** **Voltage:** 60 V **Current:** 300 mA **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) change to:

EMERGENCY STOP DEVICE 29YL LISTED; IND. CONT. EQ. 447Y LISTED	**Minimum:** **Voltage:** 15 V ac/dc **Current:** 250 mA ac/dc **Power:** 5 W (5 VA)	**Maximum:** **NO Safety Contacts (13-14, 23-24, 33-34, 43-44):** 250 V ac/ 24 V dc, 6A resistive B300, Q300 (UL508) **NC Auxiliary Contact (51-52):** 250 V ac/ 24 V dc, 5A resistive B300, Q300 (UL508)
CE	**Minimum:** **Voltage:** 15 V ac/dc **Current:** 250 mA ac/dc **Power:** 5 W (5 VA)	**Maximum—IEC60947-5-1** **NO Safety Contact: AC-1:** 250 V ac, 6A; **DC-1:** 24 V dc, 6A **AC-15:** 230 V ac, 3A; **DC-13:** 24 V dc, 4A **NC Auxiliary Contact: AC-1:** 250 V ac, 5A; **DC-1:** 24 V dc, 5A **AC-15:** 230 V ac, 2A; **DC-13:** 24 V dc, 4A

	Mechanical life: >20,000,000 operations **Electrical life:** 150,000 cycles @ 1500 VA; 1,000,000 cycles @ 450 VA; 2,000,000 cycles @ 250 VA; 5,000,000 cycles @ 125 VA **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 in normal operation (no lockout) - Output circuits require application of +12-24 V dc ±15% at terminal Y31; dc common at Y30 - Maximum switching current: 100 mA at +12-24 V dc - Both outputs are protected against short circuits
Output Response Time	35 milliseconds max, 25 milliseconds typical
Input Requirements	**Safety mat normally open contact** must be capable of switching 20 to 100 mA @ 12 to 30 V dc; and must be closed ≥ 25 ms for a valid stop command **115/230 V ac or 24 V dc: Maximum input resistance** 250 ohms per lead; **maximum contact resistance:** 150 ohms **12 V dc Supply: Maximum input resistance** 25 ohms; **maximum contact resistance:** 10 ohms **Reset switch:** must have one normally open contact capable of switching 20 to 50 mA @ 12 to 30 V dc
OFF-State Recovery Time	350 ms max.
Status Indicators	**3 green LED indicators:** Power ON, Channel 1 (high side), Channel 2 (low side) **1 red LED indicator:** indicates a fault condition
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 (IP54) or better.
Vibration Resistance	**10 to 60 Hz @ 0.35 mm** displacement per UL 991 **60 to 150 Hz @ 5 g** max.
Operating Conditions	**Temperature:** 0° to +50° C **Relative humidity:** 90% @ +50° C (non-condensing)
Design Standards	Cat. 4, PL e per EN ISO 13849-1; SIL 3 per IEC 61508 and IEC 62061 (Cat 3 with Safety Mat)
Certifications	CE; EMERGENCY STOP DEVICE 29YL LISTED; IND. CONT. EQ. 447Y LISTED

Muting Module
Safety Modules

Muting Modules suspend safeguarding during non-hazardous times in the machine's cycle, allowing material to move into or from the process without tripping the muted safeguard.

- Monitors hard-relay contact or PNP output safety devices
- Suitable for Type 4 (Category 4) applications
- Connects to supplemental safeguarding devices or E-Stops
- Can be used as a Dual Controller for safety devices, such as two Safety Light Screens, regardless of whether or not the muting function is used
- Housings are rugged polycarbonate and mount to standard 35 mm DIN rail
- Relay outputs are capable of reliably switching low or high current applications

Muting Modules

Input Device	Supply Voltage	Inputs	Safety Outputs	Aux. Outputs	Output Rating	Output Response Time	Model
Electromechanical & Solid State	24 V dc	2 NC Muteable (dual) & 2 NC SSI (dual)	2 PNP OSSD	1 PNP	0.5 amps	10 ms	**MMD-TA-12B**
Electromechanical & Solid State	24 V dc	2 NC Muteable (dual) & 2 NC SSI (dual)	2 NO	1 NC	6 amps	20 ms	**MMD-TA-11B**

NC = Normally Closed Relay, NO = Normally Open Relay

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

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

System Power Requirements	**MMD-TA-11B:** +24 V dc ±15% @ 300 mA max (SELV/PELV) **MMD-TA-12B:** +24 V 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 +24 V dc or dc common
Response Time (MSSI and SSI)	**MMD-TA-12B:** (solid-state output) 20 milliseconds max. **MMD-TA-11B:** (relay output) 10 milliseconds max.
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. **Contacts:** AgNi, 5 µm gold-plated **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 be switched in series (e.g., "dry switching "). 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:** 1 V ac/dc — **Max. voltage:** 60 V **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:** 15 V ac/dc — **Max. voltage:** 120 V 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, resistive load) **NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts** **MMD-TA-12B:** **Two diverse-redundant solid-state safety outputs:** 24 V dc, 0.5 A sourcing OSSD (output signal switching device) **ON-State voltage:** ≥V in-1.5 V dc **OFF-State voltage:** 1.2 V dc max. (0-1 2 V 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

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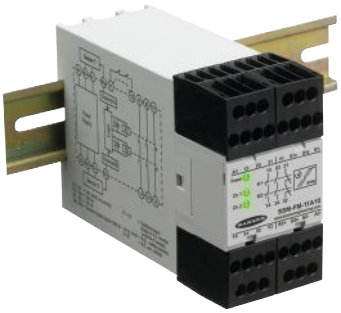
MMD-TA-12B & MMD-TA-11B Muting Modules Specifications (cont'd)

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:** 1 V ac/dc — **Max. Voltage:** 24 V 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) **High Current Rating:** For higher loads, the min. and max. values of the contact(s) changes to: **Min. Voltage:** 15 V ac/dc — **Max. Voltage:** 120 V 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:** >10 x 10^6 cycles **Model MMD-TA-12B:** Z4–Z3 = Aux. 24 V / 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:** 30 V dc **Max. switching current:** 360 mA **Min. switching current:** 10 mA **Saturation voltage:** ≤ 1.5 V dc @ 10 mA; ≤ 5 V 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:** -3 V to +5 V, 0 to 2 mA **ON State:** 15-30 V, 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 15-30 V 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 15-30 V dc at 10-50 mA.
Mute Enable Input	The mute enable input must have +24 V 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 15-30 V 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 15-30 V dc at 10-50 mA.

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

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 15-30 V dc at 10-50 mA.
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
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 us LISTED AOPD 10GH



Safe Speed Monitoring
Safety Modules

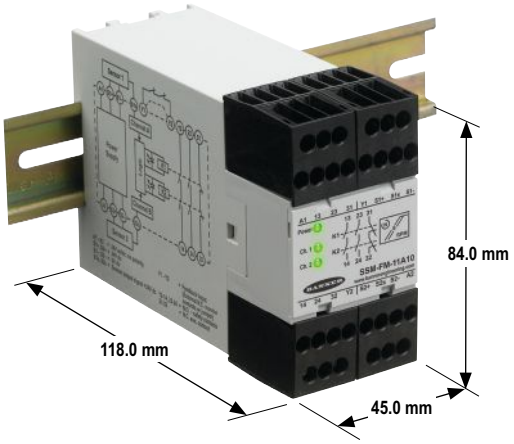
Safe Speed Safety Modules monitor redundant devices, such as two sensors with PNP outputs for rotation and linear movements allowing locked gates or guards to be opened when speed drops below or above the dangerous level.

- Each module has four adjustable RPM ranges
- Provides two normally open safety contacts and one normally closed auxiliary contact, each rated at 4 amps
- Housings are rugged polycarbonate and mount to standard 35 mm DIN rail

SSM Safe Speed Monitoring Modules

Supply Voltage	Inputs	Safety Outputs	Aux. Outputs	Ranges (lpm)	Output Rating	Model
24 V ac/dc	2 PNP	2 NO	1 NC	5 - 40, 35 - 340, 300 - 2700, 1200 - 10500	4 amps	**SSM-FM-11A10**
24 V ac/dc	2 PNP	2 NO	1 NC	10 - 80, 80 - 650, 600 - 5300, 2400 - 20000	4 amps	**SSM-FM-11A20**

NC = Normally Closed Relay, NO = Normally Open Relay



SSM-FM-11A... Models

SSM Safe Speed Monitoring Module Specifications

Supply Voltage and Current	24 V ac/dc, 50-60 Hz, no polarity **AC:** 24 V +10% / -15% **DC:** 24 V ±10% **Power consumption:** approx. 4 VA/2.5 W
Start-up Reset Time	1.5 second
Hysteresis	6% typical
Input Requirements	**PNP-Input sensors:** 24 V dc (terminals S1s and S2s) **Input current min.:** 3 mA **Input current max.:** 25 mA **Min. pulse time:** 1 millisecond ON; 1 millisecond OFF
Max. IPM at Inputs S1s and S2s	30,000
Adjustable Setting Ranges (Impulses per Minute)	**SSM-FM-11A10:** 5…40 ipm, 35…340 ipm, 300…2,700 ipm or 1,200…10,500 ipm **SSM-FM-11A20:** 10…80 ipm, 80…650 ipm, 600…5,300 ipm or 2,400…20,000 ipm
Output Response Time	**Standstill / Under-speed detection:** (60 seconds/adjusted IPM value) + 2.5 seconds = tDS tDS = output ON-delay after detection of standstill **Over-speed detection:** **SSM-FM-11A10:** Range 5…10,500: tR = 700 milliseconds typical **SSM-FM-11A20:** Range 10…20,000: tR = 350 milliseconds typical
Output Configuration	**Outputs K1 & K2:** two redundant (total of four) safety relay NO (forced-guided) contacts—AgNi, gold flashed; one auxiliary NC contact—AgNi, gold flashed **Contact ratings (all NO and NC output contacts):** 2 normally open (NO) output channels and 1 normally closed (NC) auxiliary output **Current Rating:** **Thermal Current Ith:** 4 A **Switching Capacity to AC 15:** 3 A / 230 V ac for NO contacts (per IEC/EN 60947-5-1) 2 A / 230 V ac for NC contact (per IEC/EN 60947-5-1) **Min. voltage:** 15 V ac/dc **Max. voltage:** 230 V ac/dc **Min. current:** 30 mA ac/dc **Max. current:** 4 A **Min. power:** 0.45 W (0.45 VA) **Max. power:** 100 W (920 VA) **Mechanical Life:** ≥50,000,000 operations **Electrical life (switching cycles of the output contacts, resistive load):** 350,000 cycles @ 920 VA; 1,000,000 cycles @ 440 VA; 2,000,000 cycles @ 250 VA; 5,000,000 cycles @ 125 VA **NOTE: Transient suppression is recommended when switching inductive loads. Install suppressor across load. Never install suppressor across output contacts.**
Indicators	**3 green LED indicators:** Power On, Channel 1 active, and Channel 2 active
Construction	Polycarbonate housing
Environmental Rating	Rated NEMA 1; IEC IP20 (IEC/EN 60529)
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 60068-2-6
Operating Conditions	**Temperature:** 0° to 50° C **Max. Rel. Humidity:** 90% @ +50° C (non-condensing)
Design Standards	Cat. 3 PL e per DIN EN ISO 13849-1; SIL CL 3 per IEC 62061
Certifications	Approvals are pending This module was evaluated by UL to UL508 Industrial Control Equipment, which is not a certification relating to the safety performance of the module

Interface Relay Modules
Safety Modules

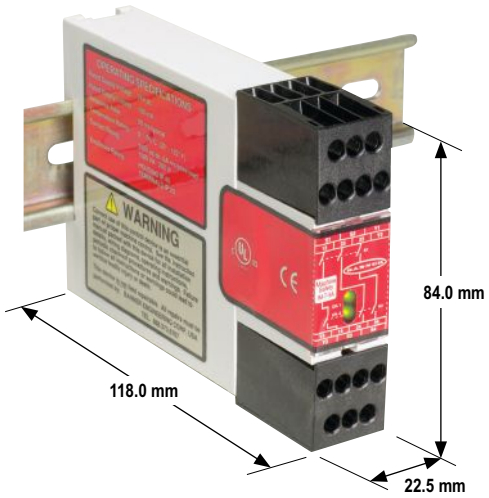
Interface relay modules serve as a relay for safety devices with OSSD solid-state or hard contact outputs and external device monitoring, such as the EZ-SCREEN®.

- Increases the switching current capacity of low-voltage safety devices up to 6 amps
- Requires no adjustment
- Housings are rugged polycarbonate and mount to standard 35 mm DIN rail
- Relay outputs are capable of reliably switching low or high current applications

Interface Modules

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

NC = Normally Closed Relay, NO = Normally Open Relay



Interface Models

Interface Modules Specifications

Input Voltage and Current	24 V 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
Overvoltage Category	**Output relay contact voltage of 1 V to 150 V ac/dc:** Category III **Output relay contact voltage of 151 V to 250 V ac/dc:** Category II (Category III, if appropriate overvoltage reduction is provided, as described in data sheet.)
Pollution Degree	2
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 (mechanically linked) 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:** The 5 µm gold-plated contacts allow the 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, do not exceed the following max. values at any time:** **Min. voltage:** 1 V ac/dc — **Max. voltage:** 60 V **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:** 15 V ac/dc — **Max. voltage:** 250 V ac/dc, 6A resistive **Min. current:** 30 mA ac/dc — **Max. power:** 150 W (1,500 VA) **Min. power:** 0.45 W (0.45 VA) — IEC 60947-5-1: AC-15: 230 V ac, 3A: DC-13: 24 V dc, 4 A **Mechanical life:** 20,000,000 operations **Electrical life:** 150,000 cycles @ 1500 VA; 1,000,000 cycles @ 450 VA; 2,000,000 cycles @ 250 VA; 5,000,000 VA @ 125 VA **Feedback contact rating (Y1-Y2, Y3-Y4):** **Min. voltage:** 1 V ac/dc — **Max. voltage:** 60 V **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; IEC 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)
Design Standards	EN 60204-1, IEC 61810-1, EN 60255-1, EN 50205
Application Notes	There are no adjustments or user-serviceable parts.
Certifications	CE c UL us

Extension Relay Modules
Safety Modules

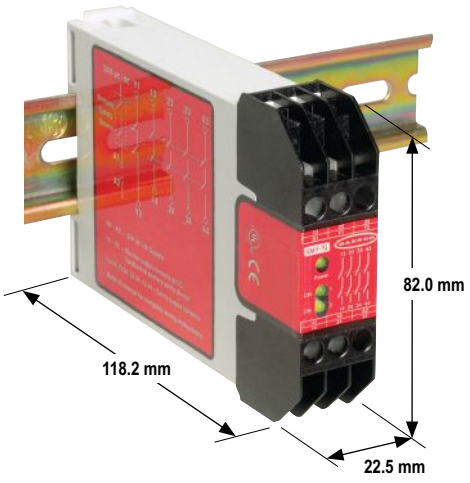
Extension Relay Modules provide additional safety outputs for a safety modules with relay contact outputs and external device monitoring.

- Provides delayed or immediate outputs, depending on model
- Requires no adjustment
- Housings are rugged polycarbonate and mount to standard 35 mm DIN rail

Extension Modules

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

NC = Normally Closed Relay, NO = Normally Open Relay



EM-F..-7G Models

EM-T-7A Models

Extension Module Specifications

Supply Voltage and Current	**EM-T-7A model:** A1-A2: 24 V dc, +/-15%, 10% max. ripple **EM-F/FD-7G.. models:** A1-A2: 24 V 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:** 250 V ac/dc **Max. current:** 6 A ac/dc **Min. current:** 30 mA @ 24 V 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:** 24 V dc @ 0.5A **EM-F/FD-7G..:** 250 V 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 Safety Device must each be capable of switching 30 to 250 mA @ 13 to 28 V dc **EM-F/FD-7G..:** Input from Safety Device must be capable of switching 40 to 100 mA @ 13 to 27 V 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 29YL