SAFETY PRODUCTS
2009-2010

www.bannerengineering.com

BANNER®

more sensors, more solutions

BANNER®

From simple to advanced, Banner solves more applications in your plant!

Sensors
- Presence
- Absence
- Inspection
- Gating
- Counting
- Measurement
- Position

Vision
- Pattern Recognition
- Complex Part Inspection
- Multi-Component Gauging
- Part ID/Orientation
- Assembly Verification
- Print Verification
- Traceability (Bar Code and Text)

Wireless
- Process Control & Monitoring
- Factory Automation
- Agriculture & Water Management
- Traffic Monitoring & Control
- Commercial & Consumer Monitoring

Indicator Lights
- Bin & Part Picking
- Error Proofing
- Pick-to-Light & Call for Parts
- Visual & Audible Indication
- Operator Guidance
- Visual Management
- Andon Indication
- Pilot & Stack Light Replacement

Machine Safety
- Safety Light Screens
- Fiber Optic Safety Systems
- Safety Modules & Controllers
- Emergency Stop Devices
- Safety Interlocks
- Ergonomic Two-Hand Control & Run Bars

Banner — The Most Preferred Sensor Supplier.

- More sensing innovations than any other manufacturer
- Choice of more than 20,000 photoelectric, ultrasonic and vision sensors, indicator lights, wireless networks and safety products available worldwide
- Experienced factory application engineers to solve your most advanced sensing challenges
- More than 3,000 factory and field representatives worldwide
- Complete factory training, field training and online training
- Commitment to 100% quality inspection and zero defect manufacturing

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Reference

Banner has the sensors you need– here's how to find them.

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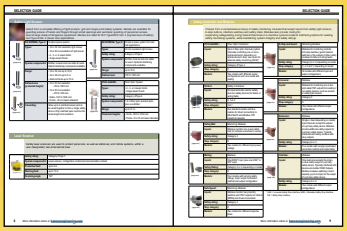

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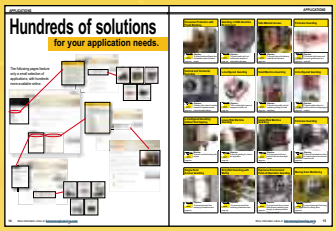

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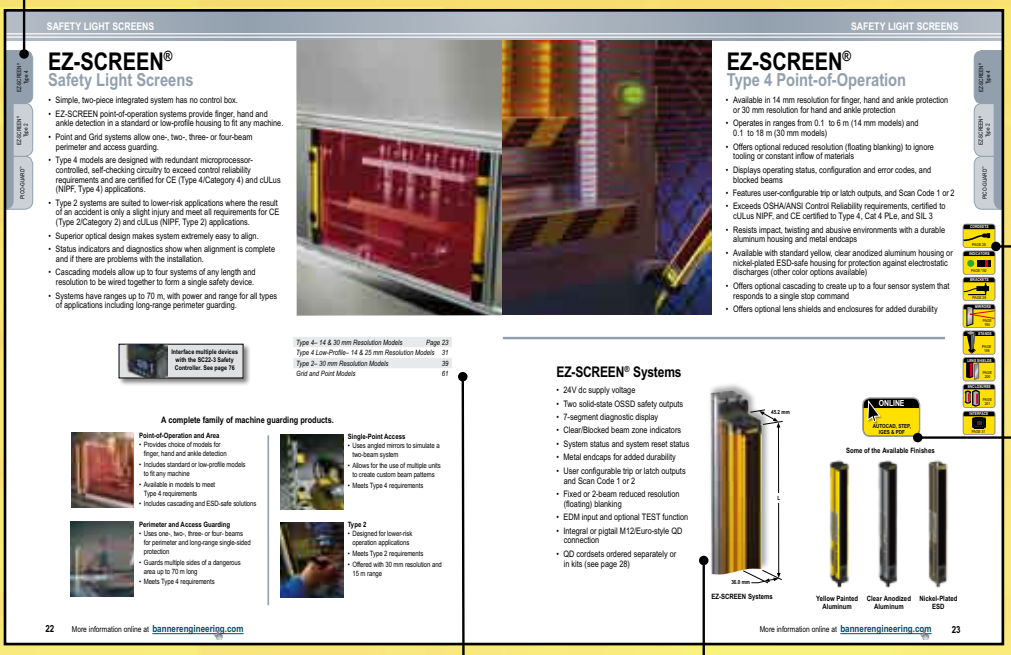

BRACKETS

Related Accessories

Detailed Dimensions available online

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Simple Dimensions

New features

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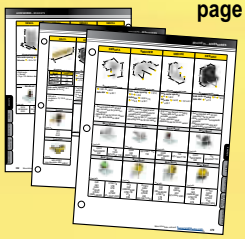

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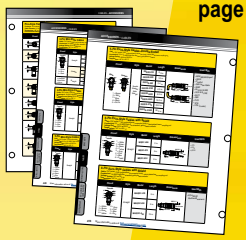


What's New!

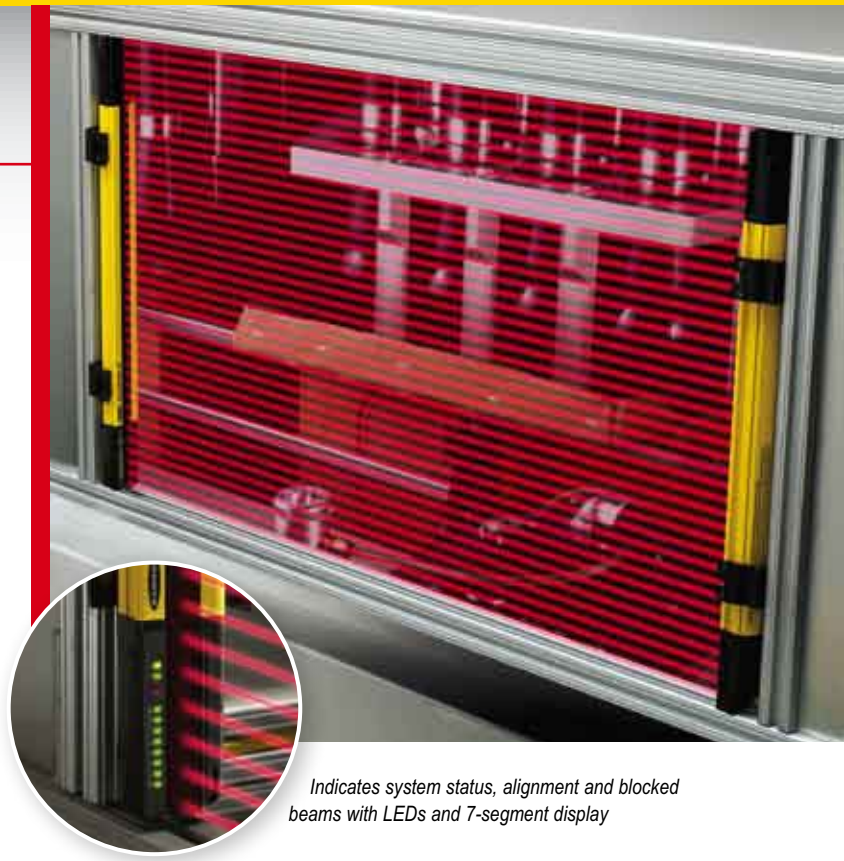
New Safety Light Screen for End-to-End Detection

Low-Profile Design with Proven EZ-SCREEN® Performance

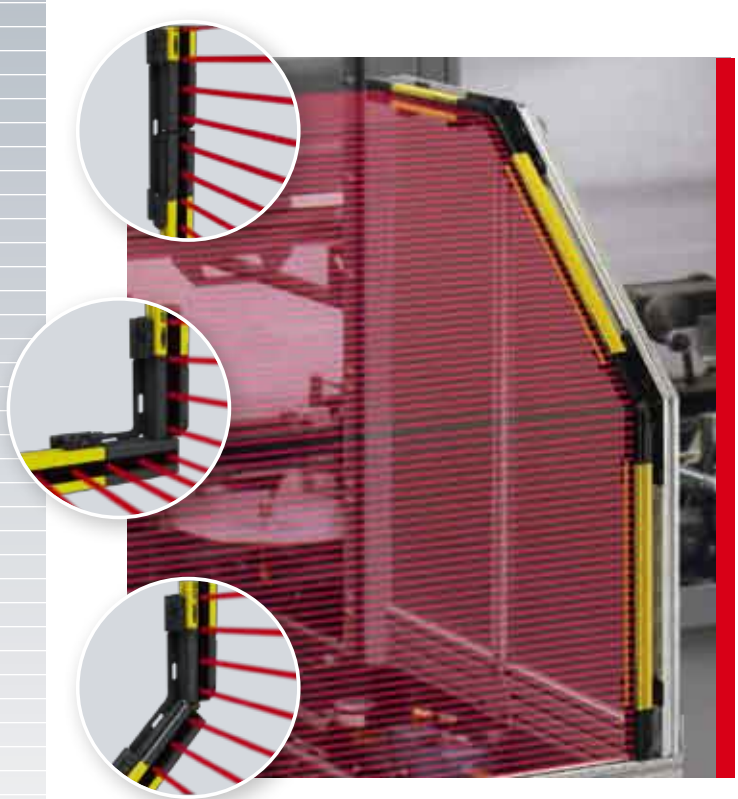
EZ-SCREEN® LP Safety Light Screens

PG 31

- Features a compact design, yet rugged housing and flexible mounting options for a precise fit with no dead zone
- Positions first and last beam at the ends for continuous sensing across entire light screen length
- Delivers a simple, two-piece integrated design with superior optical design for easy system alignment
- Includes two solid-state OSSD safety outputs and selectable trip/latch output (automatic and manual reset)
- Available in 14 or 25 mm resolution options and defined areas from 270 to 1810 mm
- Provides exceptional response times—as fast as 8 milliseconds
- Includes models with nickel-plated housing for ESD-safe applications, clear anodized aluminum housing or "safety" yellow powder-coat housing
- Exceeds OSHA/ANSI Control Reliability requirements; certified to cULus NIPF; CE certified to Type 4, Category 4 PLe and SIL 3



Indicates system status, alignment and blocked beams with LEDs and 7-segment display



Mounting Versatility and Flexible Cascading Options for a Perfect Fit

- Installs perfectly in machinery, eliminating protruding light screens
- Integrates easily into machinery with multi-directional routing of cables
- Includes brackets for end mounting or side mounting with no dead zone
- Allows four systems—of any length and resolution—to be connected in series, forming a single safety device
- Guards multiple sides of machine, such as L- or U-shaped configuration, while maintaining 25 mm resolution
- Provides continuous detection without overlapping light curtains or protruding cables

Low-profile housing

New Machine Safety Systems. New Solutions.

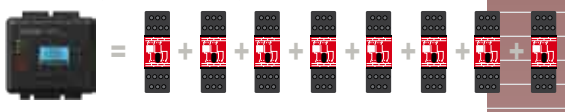
New Totally Configurable Safety Controller Easily Replaces Multiple Dedicated Safety Modules

Manages Multiple Safety and Non-Safety Devices with a Single Configurable Controller

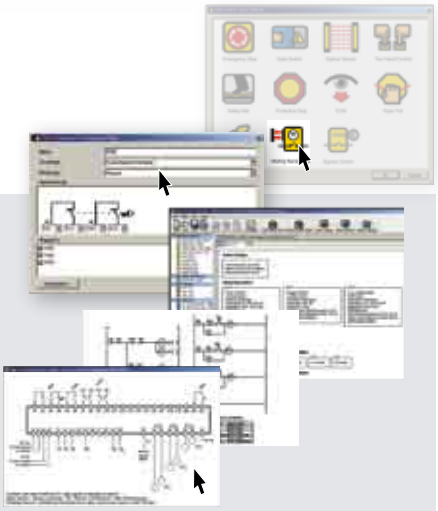
SC22-3 Safety Controller

PG 76

- Features 22 configurable inputs to monitor safety and non-safety input devices—eliminating the need for multiple dedicated safety modules

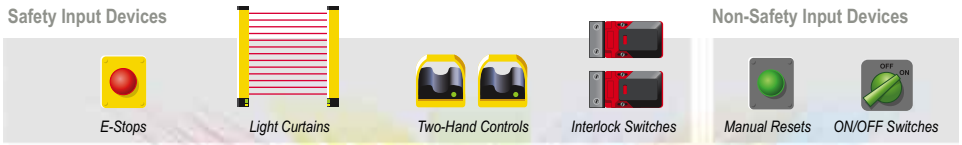


- Combines safety monitoring, bypass, muting and other functions
- Offers 3 pairs of independent solid-state safety outputs
- Provides 10 configurable auxiliary outputs for tracking inputs, outputs, lockout, I/O status and other functions
- Models available for direct connectivity to EtherNet/IP or Modbus TCP industrial protocols
- Features front panel control for configuration and real-time system status without a PC
- Facilitates offline configuration using a PC; allows users to replicate configuration to a memory card, email it or export it as a PDF or DXF file
- Meets Safety Integrity Level (SIL) 3 per IEC 62061 and IEC 61508, as well as Category 4 Performance Level (PL e) per ISO 13849-1



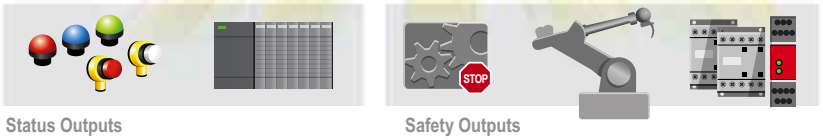
Vastly reduces installation and troubleshooting time

Using either the PC Interface or the Controller's Onboard Interface, setup is simple. All that is required is to define each device and what combination of the three independent safety outputs each device will control. User-friendly icons, circuit symbols and multilingual support make the process easy. Faulty devices or wiring configuration errors are automatically detected and displayed along with built-in diagnostic information to help users quickly locate and clear faults.



Accommodates a wide range of inputs from Banner devices or any other manufacturer, including:

- E-Stops
- Safety Light Screens
- Laser Scanners
- Two-Hand Controls
- Safety Mats and Edges
- Interlock Switches
- Rope Pulls



What's New!

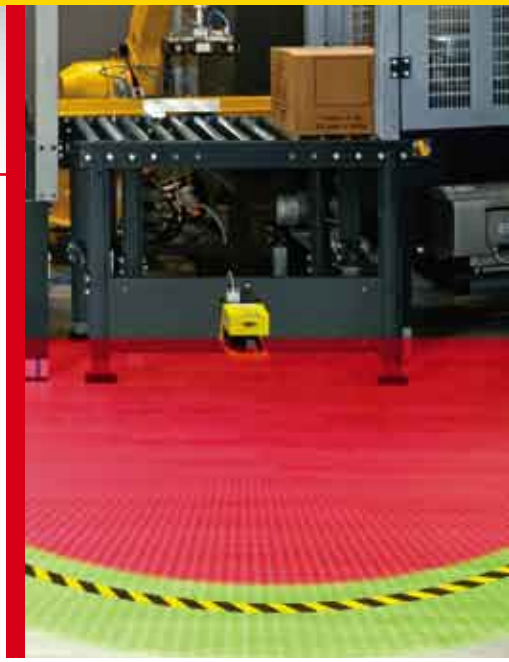
New Reliable Monitoring Devices to Assure Operator Safety

Dependable, Two-Dimensional Safeguarding of Danger Zones

AG4-4E Safety Laser Scanner

PG 53

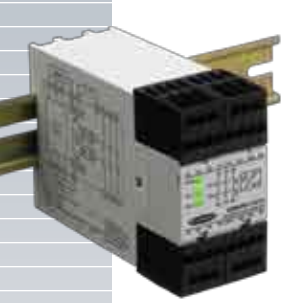
- Effectively protects personnel—as well as stationary and mobile systems—within a user-designated area
- Responds by sending an emergency stop signal to the machinery if a person or object enters the protection field
- Detects presence within a broad 190° working zone
- Provides eight individually defined zone pairs (eight protective and eight warning fields)
  - – Protective fields range up to 4 m
  - – Advance warning field range up to 15 m
- Meets all requirements for Type 3 applications per IEC 61496-1/-2 and Safety Integrity Level (SIL) 2 per IEC 61508
- Efficiently installs in work zones with a compact design and user-friendly configuration software



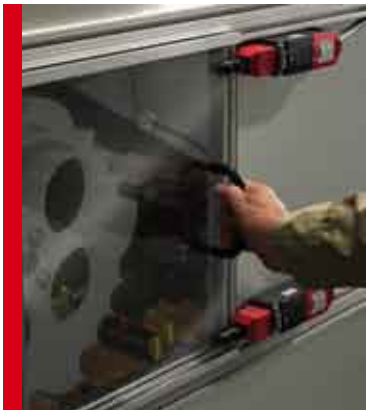
Dependable Speed Monitoring and Interfacing with Other Safety Devices

SSM Safe Speed Monitoring Module

PG 103



- Monitors two sensors with PNP outputs for rotation and linear movements
- Allows locked gates and guards to be opened when speed drops below the dangerous rate
- Provides 2 normally open safety contacts and 1 normally closed auxiliary contact, each rated at 5 amps
- Offers choice of two models with adjustable RPM ranges



Simple Device Monitoring for Identifying Contact Failure or Wiring Faults

Universal Safety Module

PG 89

- Monitors one or two solid-state PNP outputs or relay contact outputs from safety or non-safety devices
- Available in models with 3 normally open contacts, or 2 normally open and 1 normally closed auxiliary contact
- Allows Category 2, 3 or 4 hookup of input devices
- Offers output contacts rated for 6 amps

New Machine Safety Systems. New Solutions.

New Rugged Personnel Safety and Machine Actuation Devices

Load-Bearing Switch with Additional Safety Contacts and Adjustable Switching Point

SI-HG63 Hinge Switch

PG 130

- Features two normally closed safety contacts and one normally open auxiliary contact
- Offers right-angle and in-line QD models
- Operates to a full 270˚ range of motion, with safety switching point adjustable over full operating range
- Supports an axial and radial load of 1200 N
- Provides IP67 rating, with switch components protected from mechanical impact
- Constructed of corrosion-resistant stainless steel

Convenient, Economical Means for Two-Hand Control Machine Actuation

DUO-TOUCH® Run Bar with STB Buttons

PG 120

- Minimizes risk of defeat and accidental machine actuation
- Provides a convenient and economical means for safeguarding when interfaced with DUO-TOUCH® SG Two-Hand Control Modules or other control systems
- Constructed of robust, 13-gauge cold-rolled steel
- Offers ergonomic design for reduced hand, wrist and arm stress
- Provides two diverse-redundant microcontroller-based photoelectric STB Touch Buttons with continuous internal self-checking
- Offers models with an integrated emergency stop button

Effectively Stop Machine Motion in Hazardous, Potentially Explosive Areas

PICO-GUARD™ Optical E-Stop Button

PG 66

- Provides complementary protection when used with the PICO-GUARD™ Controller and other optical elements for personnel safety and equipment protection
- Features bright red push-to-stop, twist-to-release button with yellow background—complying with ANSI NFPA 79, IEC 60204-1 and ISO 13850 (EN 418)
- Meets Safety Category 4 applications (per ISO 13849-1) and is certified for use in potentially explosive environments
- Offers models with fiber connection on same or opposite side of housing
- Withstands harsh conditions with IP65 polycarbonate resin construction

Heavy-Duty Switch for Harsh Environmental and Outdoor Use

RP-RM83 Rope Pull Switch

PG 157

- Provides multiple location emergency shutdown
- Offers rope spans of 38 and 75 m
- Activates if the rope is pulled, becomes loose or breaks
- Offers minimum switch life of 1 million operations
- Manually resets with emergency stop button
- Delivers additional solid-state auxiliary output for remote tension monitoring

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Safety Laser Scanners

Fiber Optic Safety Systems

Safety Controllers and Modules

Two-Hand Control Modules

Safety Interlock Switches

ONLINE
AUTOCAD, STEP, IGES & PDF

Anytime this icon appears, dimension information is available online at bannerengineering.com

Safety Light Screens

Select from a complete offering of light screens, grid and single point safety systems. Models are available for guarding access of hands and fingers through small openings and perimeter guarding of personnel access around large areas of dangerous equipment. Models are rated for IEC Type4/ISO Cat. 4 (highest level of safety) and Type 2/Cat. 2 (lower risk) applications.

(page 23)

EZ-SCREEN® Type 4:	2-piece system
Types:	• 14 or 30 mm resolution light screen • 14 or 25 mm resolution LP light screen • 2-, 3- or 4- beam Grids • Single-beam Points
Safety rating:	Type 4 /Category 4
System components:	Emitter, receiver and one cordset for each. Optional interfacing components available.
Range:	• 14 or 30 mm up to 18 m • 14 or 25 mm up to 6 m • Grids & Points up to 70 m
Defined area (protected height):	• 14 mm resolution: 150 to 1800 mm • 30 mm resolution: 150 to 2400 mm • 14 or 25 mm resolution: 270 to 1810 mm • Grids: 500 to 1066 mm • Points: 25 mm beam diameter
Cascading:	Allow up to 4 emitter/receiver pairs (14, 25 or 30 mm systems) to be wired together to form a single safety device. Only matched pairs must be the same length and resolution.

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EZ-SCREEN® Type 2:	Simple 2-piece system for lower risk applications
Types:	30 mm resolution light screen
Safety rating:	Type 2 /Category 2
System components:	Emitter, receiver and one cordset for each. Optional interfacing components available.
Range:	up to 15 m
Defined area:	150 to 1500 mm

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PICO-GUARD™:	Fiber Optic System
Types:	• 2-, 3- or 4-beam Grids • Single-beam Points
Safety rating:	Type 4 /Category 4
System components:	1 to 4 fiber optic element pairs, plus a controller
Range:	up to 31 m
Protected heights:	• Grids– 500 to 1066 mm • Points– 9 to 25 mm beam diameter

Safety Laser Scanner

Safety laser scanners are used to protect personnel, as well as stationary and mobile systems, within a user-designated, two-dimensional area.

(page 53)

Safety rating:	Type 3/Category 3
System components:	Laser scanner, configuration cordset and communication cordset
Protective field	up to 4 m
Warning field	up to 15 m
Scanning angle	190°
Lateral Resolution	0.36°

Safety Controller and Modules

Choose from a comprehensive lineup of safety monitoring modules that accept inputs from safety light screens, E-stop buttons, interlock switches and safety mats. Modules also provide muting for suspending safeguarding during hazard-free times in a machine cycle and extend interfacing options for existing safety monitoring systems, while maintaining system integrity and safety ratings.

(page 76)

SC22-3:	Safety Controllers
Inputs:	22 input terminals monitor safety and non-safety devices.
Safety rating:	Category 2, 3 or 4
Stop category:	0 & 1
Models:	Four standard models and four models for direct connectivity to EtherNet/IP and Modbus TCP industrial networks

(page 60)

PICO-GUARD™:	Fiber Optic Controllers
Inputs:	Up to 4 fiber optic channels (optical channels) controlling one or more optical elements, depending on optical element. Also, two inputs for external safety devices (USSI)*.
Safety rating:	Type 4/Category 4
Stop category:	0
Models:	Two models with different output configurations and one model with muting

(page 81)

E-Stop and Guard:	Safety Modules
Inputs:	Modules for monitoring contacts of E-stop switches, guard interlock switches or the outputs of other safety modules.
Safety rating:	Category 2 or 4, depending on model
Stop category:	0, or 0 and 1, depending on model
Models:	20 models with different input and output configurations

(page 89)

Universal Input:	Safety Modules
Inputs:	Modules for monitoring one or two solid-state PNP or relay contact outputs from safety or non-safety devices, such as sensors or safety light screens.
Safety Rating:	Category 2, 3 or 4
Stop category:	0
Models:	Two models with different output configurations

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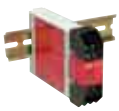
Safety Mat:	Safety Modules
Inputs:	Modules monitor one 4-wire safety mat (or multiple connected in series).
Safety rating:	Category 4
Stop category:	0
Models:	Two models for different input power voltages

(page 94)

Muting:	Safety Modules/Dual Controller
Inputs:	One MSSI* input, plus one USSI* or SSI* input
Safety rating:	Category 2, 3 or 4
Stop category:	0
Models:	Four models with varying safety ratings, input/output connection method and output configuration

(page 103)

Safe Speed:	Safety Modules
Inputs:	Modules monitor two sensors with PNP outputs for rotation and linear movements.
Safety rating:	Category 3
Stop category:	0
Models:	Two models with different response times



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Extension:	Relay Output Modules
Inputs:	Single or dual (depending on model) input channels accept the outputs of a primary safety device. Modules provide additional safety outputs for a primary safety device. Typically interfaced with safety modules with relay outputs.
Safety rating:	Category 2 or 4
Models:	Five models with varying input/output connection method and output delay

(page 107)

Interface:	Relay Output Modules
Inputs:	One dual input accepts the single or dual safety output of a primary safety device. Typically interfaced with devices solid-state OSSD Outputs. Module increases switching current capacity (up to 6 amps) for the output of a primary safety device.
Safety rating:	Category 2 or 4
Models:	Two models with different output configurations

* USSI = Universal Safety Stop Interface, MSSI = Muteable Safety Stop Interface, SSI = Safety Stop Interface

Two-Hand Control

STB Self-checking touch buttons are used with a safety controller or safety module, such as the DUO-TOUCH SG to provide two-hand control that initiates machine cycle.

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DUO-TOUCH® SG THC modules:	Two-Hand Control Modules; STB compatible
Inputs:	Two STB Self-Checking Touch Buttons or Form C Mechanical Button
Safety rating:	Category 4 (module); Type IIIC
Modules:	Five models with different supply voltage, outputs and control functions (example, muting)
STB touch buttons:	6 models with varying supply voltage, output type, cable and housing material

(page 120)

DUO-TOUCH® SG Run Bars:	STB Buttons with or without E-stop or EZ-LIGHT indicator
STB Buttons:	Two solid-state complimentary PNP
Models:	Six models with different connectors and accessory options
Modules: (purchased separately)	Five models with different supply voltage, outputs and control functions (example, muting)

Safety Interlock Switches

Banner offers a complete selection of safety switches for monitoring machine guard, cover, doors and gates. Types include several styles of positive-opening electromechanical switches, magnetic and non-contact fiber optic switches.

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PICO-GUARD	Fiber Optic Interlock Switches

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Compact Plastic Style	Interlock Switches

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Magnet Style	Interlock Switches

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Compact Metal Style	Interlock Switches

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Hinge Style	Interlock Switches

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Locking Style	Interlock Switches

Emergency Stop Devices

E-stop buttons and rope pull switches are manual control devices that trigger an emergency stop.

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PICO-GUARD™ Optical E-Stop Push Buttons	Emergency Stop Devices

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Rope Pull Switches	Emergency Stop Devices

(page 153)

Mechanical E-Stop Push Buttons and Components	Emergency Stop Devices

Established Safety Solutions From Banner

The following products are still available as standard products from Banner.
Please go online to bannerengineering.com for full description and technical reference.

ONLINE
LOOK FOR MORE INFO

Important Notice: European Community Machinery Directive 2006/42/EC
The safety solutions listed below comply with different Machine Directives. After December 29, 2009, when Machine Directive 2006/42/EC will be in force, safety devices that comply with earlier Machine Directives, such as 98/37/EC, can only be installed as a replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767.

MACHINE-GUARD™/ PERIMETER-GUARD™

- Offers trip output on MACHINE-GUARD™ and latch output for access guarding on PERIMETER-GUARD™
- Delivers exceptional durability and reliability, even in extremely demanding environments
- Offers 12 light screen heights, from 152 to 1829 mm

MULTI-SCREEN®

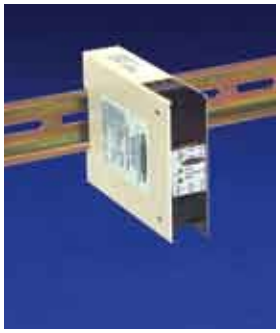
- Provide guarding for two areas, using two pairs of emitters/receivers
- Uses one control box to operate two pairs of MINI-SCREEN® or MACHINE-GUARD™ emitters/ receivers, or one pair of each
- Available with light screen heights from 114 mm to 1.8 m

ES-FA-9A Module

- Monitors one dual-channel normally closed emergency stop switch circuit
- Has three output switching channels for connecting to control-reliable power interrupt circuits
- Suited to functional stop category 0 applications, per NFPA 79 and ISO 13850

SI-MAG1C Magnet Controller

- Monitors magnetic interlock switches
- Uses one redundant switching channel
- Resets automatically
- Offers 8 amp safety output
- Must be used with magnetic switches



ES-FL-2A Module

- Monitors one dual-channal normally closed emergency stop switch circuits
- Includes two output switching channels to connect to control-reliable power interrupt circuits
- Suited to functional stop category 0 applications, per NFPA 79 and ISO 13850

10- & 6-Input Modules

- Depending on model, monitors up to 10 or 6 normally closed emergency stop switch circuits
- Uses DeviceNet™ to monitor status and diagnostic information
- Includes two output switching channels to connect to control-reliable power interrupt circuits

DUO-TOUCH® Modules

- Monitors a pair of mechanical push buttons or OTB optical touch buttons
- Permits machine operation only when the operator has both hands on the controls (within 500 ms)
- Meets Type IIIA/B requirements for Safety Category 1 and 3

OTB Optical Touch Button

- Responds to a finger blocking light rather than to pressure
- Features ergonomic design to prevent repetitive motion stress
- Includes field cover to prevent unintended switching

Established Safety Solutions From Banner

The following products are still available as standard products from Banner.
Please go online to bannerengineering.com for full description and technical reference.

MINI-SCREEN® Safety Light Screens

- Family is designed for heavy-duty production machinery.
- Full system includes emitter, receiver, controller and interconnecting cordsets.
- Standard and heavy-duty housing is available for emitters and receivers.
- Emitters and receivers feature compact housing with 19, 25 and 38 mm resolution.
- Explosion-proof enclosures are available.
- Controllers are available with dc or ac supply voltage.
- Systems include floating blanking (one- or two- beam), selectable auto power-up and optional fixed blanking.
- Controllers offered with muting or for two emitter/receiver pairs.

Standard and heavy-duty housings

- Standard yellow painted or black anodized aluminum housing with rugged endcaps
  - 19 mm resolution with maximum range of 9 m
  - 25 mm resolution with maximum range of 18 m
- Heavy-duty housing with 38 mm resolution and maximum range of 18 m
- 5-pin Mini QD connection standard
- Swivel brackets for easy alignment

ONLINE
LOOK FOR MORE INFO

Perimeter guarding with reduced resolution combines light screens and mirrors to guard a machine, while allowing material to pass through.

Tubular safety light screen enclosures are constructed of transparent FDA-approved polycarbonate tubing and guard entire sensor in washdown environment.

Important Notice: European Community Machinery Directive 2006/42/EC

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Established Safety Solutions From Banner

The following products are still available as standard products from Banner.
Please go online to bannerengineering.com for full description and technical reference.

MICRO-SCREEN® Safety Light Screens

- Family is designed for light- to medium-duty production machinery.
- Full system includes emitter, receiver, controller and interconnecting cordsets.
- Emitters and receivers feature ultra-compact housing with 19 or 32 mm resolution.
- Optional ESD-resistant housing is available.
- Indicators on emitters and receivers are visible from three sides.
- Controllers are available with ac, dc or ac/dc supply voltage.
- Metal box and DIN-module controllers are available.
- System includes floating blanking (one or two beam), selectable auto power up, E-stop input and optional fixed blanking with push-button TEACH mode programming.
- Controllers offered with DeviceNet™ or muting

Fifteen emitter/receiver lengths and two resolutions

- Ultra-compact housing to fit existing machinery—32 x 25 mm footprint
- Twelve heights for Standard Series; seven for V Series
  - Standard Series from 137 to 1255 mm with 19 mm resolution
  - V-Series from 645 to 1864 mm with 32 mm resolution
- Emitter/receiver separation from 150 mm to 9 m, depending on length
- 5-pin Euro QD connection standard
- Swivel bracket for easy alignment

ONLINE
LOOK FOR MORE INFO

Controllers with muting suspend safeguarding during hazard-free times in the machine's cycle.

DeviceNet™ controllers can be integrated directly into a new or existing DeviceNet network, for non-safety monitoring of system.

Nickel-plated ESD-safe housing protects against electrostatic discharge.

Important Notice: European Community Machinery Directive 2006/42/EC

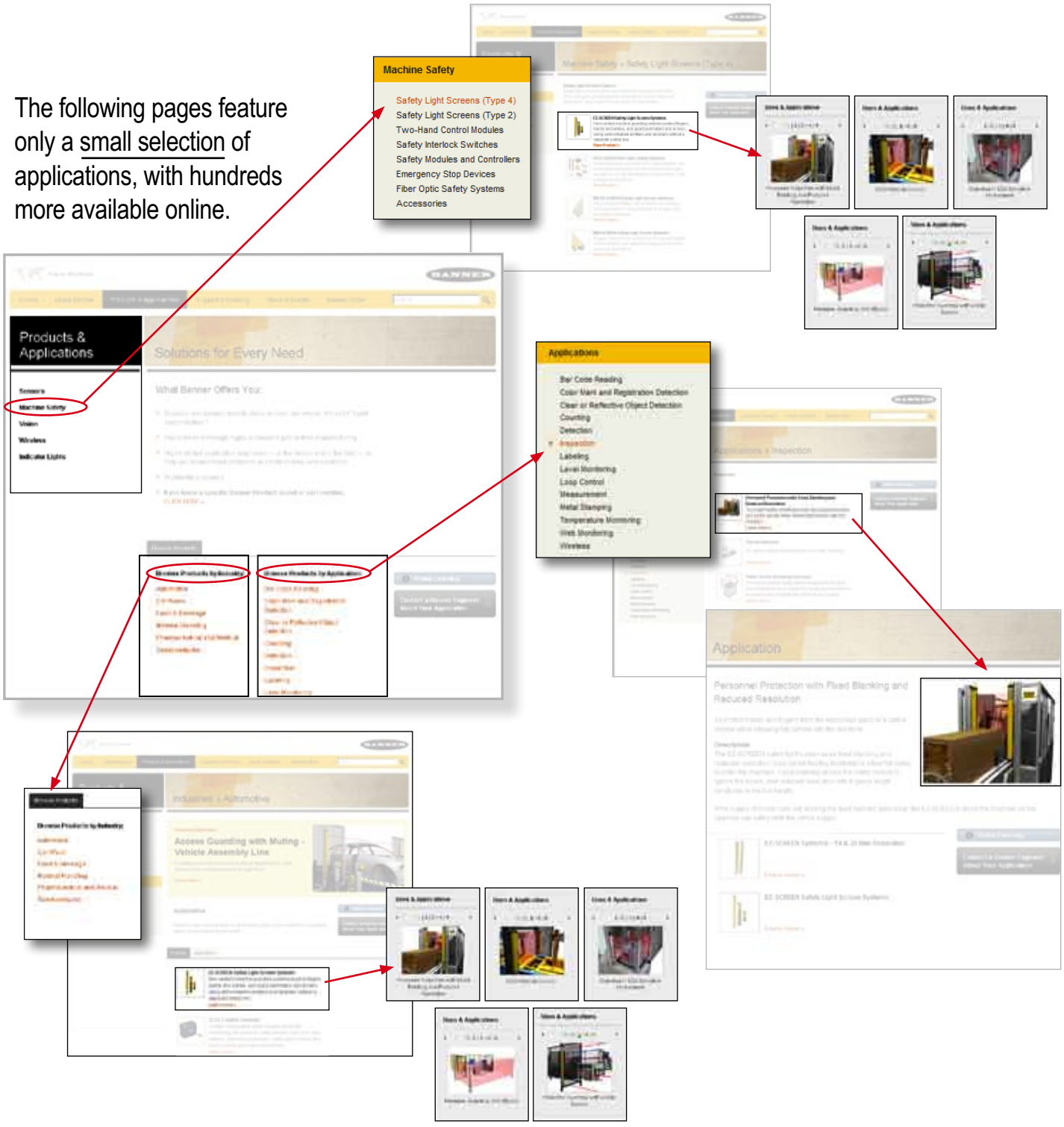
The safety solutions listed above comply with different Machine Directives. After December 29, 2009, when Machine Directive 2006/42/EC will be in force, safety devices that comply with earlier Machine Directives, such as 98/37/EC, can only be installed as a replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767.

DeviceNet ™ is a registered trademark of DeviceNet Vendor Association Inc.

Hundreds of solutions

for your application needs.

The following pages feature only a small selection of applications, with hundreds more available online.



Personnel Protection with Fixed Blanking

ONLINE LOOK FOR MORE INFO

Objective: To protect hands and fingers from the hazardous parts of a carton erector.

page 19

Guarding in ESD-Sensitive Environment

ONLINE LOOK FOR MORE INFO

Objective: To guard a wafer cell in an environment sensitive to electrostatic discharge.

page 19

Safe Material Access

ONLINE LOOK FOR MORE INFO

Objective: To prevent injury while allowing materials into a process.

page 19

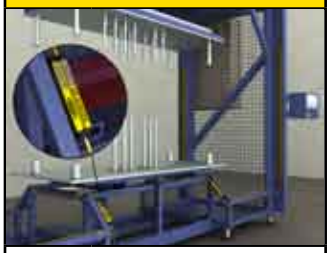
Perimeter Guarding

ONLINE LOOK FOR MORE INFO

Objective: To combine a light screen and mirrors to guard access to a work cell.

page 19

Vertical and Horizontal Guarding



ONLINE LOOK FOR MORE INFO

Objective: Guarding of two sides of machine because of separate operator load and unload stations.

page 19

L-Configured Guarding

ONLINE LOOK FOR MORE INFO

Objective: To link multiple light screens to safeguard a robotic cell.

page 19

Small Machine Guarding

ONLINE LOOK FOR MORE INFO

Objective: To provide low-profile, point-of-operation guarding for small machinery.

page 19

U-Configured Guarding

ONLINE LOOK FOR MORE INFO

Objective: To guard multiple sides of a machine without overlapping light curtains.

page 19

L-Configured Guarding without Overlapping

ONLINE LOOK FOR MORE INFO

Objective: To provide continual sensing with no gaps.

page 19

Lower-Risk Machine Guarding

ONLINE LOOK FOR MORE INFO

Objective: To provide guarding for a lower-risk application.

page 19

Lower-Risk Machine Guarding

ONLINE LOOK FOR MORE INFO

Objective: To protect personnel from a machine that can cause slight injuries.

page 19

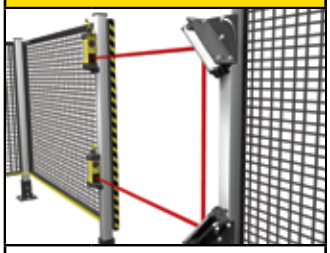
Perimeter Guarding

ONLINE LOOK FOR MORE INFO

Objective: To shut off the hazardous motion of a tube bender when someone enters the cell.

page 19

Single-Point Access Guarding



ONLINE LOOK FOR MORE INFO

Objective: To prevent personnel from accessing a hazardous area.

page 19

Entry/Exit Guarding with Muting

ONLINE LOOK FOR MORE INFO

Objective: To prevent personnel from accessing a hazardous area.

page 59

Explosive Environment Point-of-Operation Guarding

ONLINE LOOK FOR MORE INFO

Objective: To protect hands from a hazard while allowing material to pass through, by spacing individual Points as needed.

page 59

Moving Door Monitoring

ONLINE LOOK FOR MORE INFO

Objective: To prevent passenger from being struck by closing doors.

page 59

Explosive Environment Guarding with Muting

ONLINE LOOK FOR MORE INFO

Objective: To provide entry/exit guarding and muting, using Points in an explosive environment.

page 59

Monitoring Access to an Assembly Line

ONLINE LOOK FOR MORE INFO

Objective: To detect the presence/absence of objects or personnel as vehicles move along an assembly line.

page 53

Collision Avoidance

ONLINE LOOK FOR MORE INFO

Objective: To provide collision avoidance for automated guided vehicle (AGV).

page 53

Two-Zone Monitoring

ONLINE LOOK FOR MORE INFO

Objective: To detect the approach of personnel to each of two operator work stations of a robotic cell.

page 53

Monitoring of Multiple Safety Devices

ONLINE LOOK FOR MORE INFO

Objective: To provide monitoring of safety light grids, interlock switches, E-Stop button and a run bar with one safety controller

page 76

Monitoring of Multiple Safety Devices

ONLINE LOOK FOR MORE INFO

Objective: To monitor a safety light screen, self-checking touch buttons and an E-Stop button with one safety controller.

page 76

Emergency Stop Monitoring

ONLINE LOOK FOR MORE INFO

Objective: To stop a machine's operation in an emergency, using a module with three output switching channels.

page 81

Emergency Stop Monitoring

ONLINE LOOK FOR MORE INFO

Objective: To stop a machine's operation in an emergency, using a module with four output switching channels.

page 81

Gate Monitoring

ONLINE LOOK FOR MORE INFO

Objective: To monitor a door-guarding switch, whether the switch is mechanical or magnetic.

page 81

Mat Monitoring

ONLINE LOOK FOR MORE INFO

Objective: To monitor a safety mat that provides area guarding by responding to pressure.

page 91

Access Guarding with Muting

ONLINE LOOK FOR MORE INFO

Objective: To safeguard a hazardous area without triggering the safety devices when a vehicle passes through them.

page 94

Safe Material Access

ONLINE LOOK FOR MORE INFO

Objective: To prevent injury while allowing material into a process.

page 94

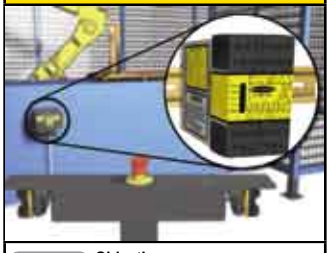
Two-Hand Control Monitoring

ONLINE LOOK FOR MORE INFO

Objective: To monitor any actuation device pair, using a module with two redundant output contacts.

page 109

Two-Hand Control Monitoring



ONLINE LOOK FOR MORE INFO

Objective: To monitor any actuation device pair, using a module with four redundant output contacts.

page 109

Two-Hand Control Monitoring with Muting

ONLINE LOOK FOR MORE INFO

Objective: To use a two-hand control to start a cycle and mute during the cycle's safe portion.

page 109

Door Monitoring

ONLINE LOOK FOR MORE INFO

Objective: To provide door guarding using a compact, barrel shaped interlocking switch.

page 59

Gate Monitoring

ONLINE LOOK FOR MORE INFO

Objective:
To monitor the position of a swing gate using a pair of interlocking switches.

page 59

Door Monitoring

ONLINE LOOK FOR MORE INFO

Objective:
To provide door guarding in an explosive environment, using fiber optic switches.

page 59

Door Monitoring

ONLINE LOOK FOR MORE INFO

Objective:
To provide door guarding in an environment cleaned with harsh chemicals, using a fiber optic interlocking switch.

page 59

Door Monitoring

ONLINE LOOK FOR MORE INFO

Objective:
To safeguard a door in an area with heavy machine traffic.

page 59

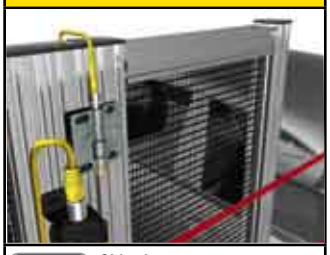
Swinging Gate Monitoring

ONLINE LOOK FOR MORE INFO

Objective:
To safeguard a hazard with a guard, gate or door that is mounted on a hinge.

page 129

Gate Monitoring



ONLINE LOOK FOR MORE INFO

Objective:
To prevent trapping or crushing by protecting an interlocked breakaway guard with an integral hinge.

page 129

Switch Door Locking

ONLINE LOOK FOR MORE INFO

Objective:
To lock out to an area until a machine's hazardous motion stops.

page 144

Sliding Door Monitoring

ONLINE LOOK FOR MORE INFO

Objective:
To instantly stop a hazardous machine when sliding door is opened.

page 144

Emergency Stopping Outdoors

ONLINE LOOK FOR MORE INFO

Objective:
To instantly stop the hazardous motion of a conveyor from multiple points, using a heavy-duty switch.

page 59

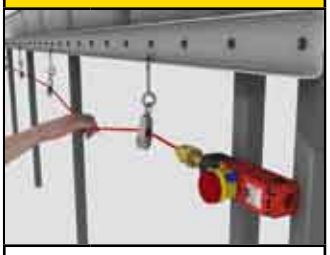
Emergency Stopping

ONLINE LOOK FOR MORE INFO

Objective:
To instantly stop the hazardous motion of a conveyor from multiple points, using a center-mounted switch.

page 157

Emergency Stopping



ONLINE LOOK FOR MORE INFO

Objective:
To instantly stop the hazardous motion of a conveyor from multiple points, using an end-mounted switch.

page 157

Emergency Stopping

ONLINE LOOK FOR MORE INFO

Objective:
To instantly stop the hazardous motion of a machine from a safe distance.

page 157

Emergency Stopping

ONLINE LOOK FOR MORE INFO

Objective:
To instantly stop the hazardous motion of a machine from a safe distance.

page 153

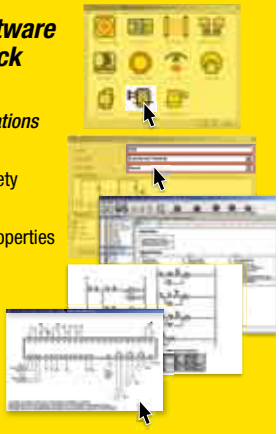
Safety is easier than you think.

Banner SC22-3 Safety Controller is Less Costly and Less Complex than Multiple Safety Modules or Safety PLCs.

The flexible, easy-to-configure safety module solution from Banner

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

Intuitive free software for point-and-click configuration



Create or edit configurations in minutes:

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

FREE DEMO and PCI Software Download at

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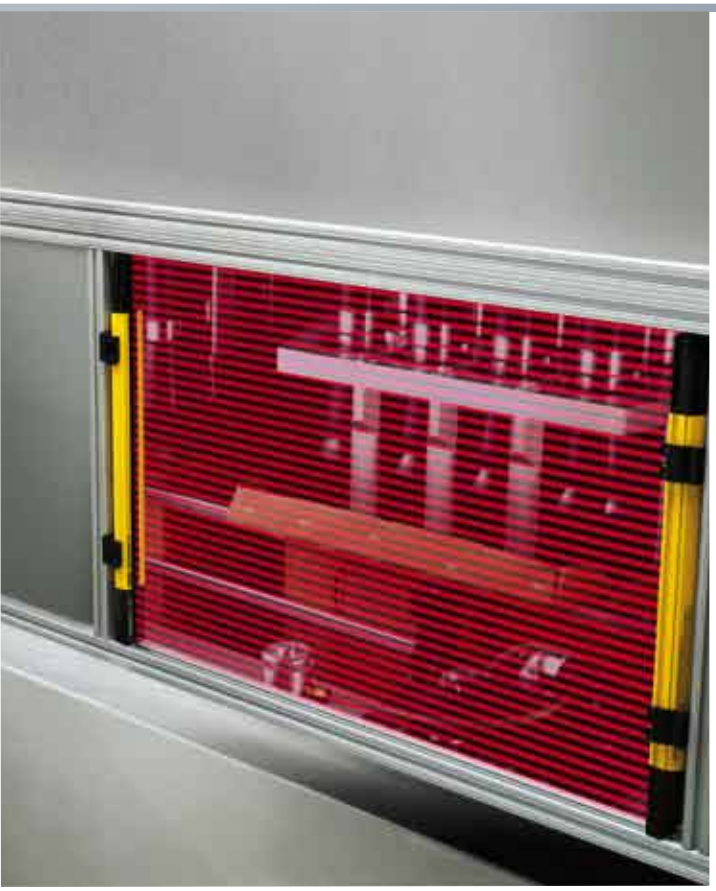


EZ-SCREEN®

Type 4 Light Screens page 23

- Provides point-of-operation, area, access and perimeter safeguarding
- Protects personnel from injury and equipment from damage
- Offered in a standard housing with 14 and 30 mm resolution, low-profile housing with 14 and 25 mm, single-beam points or multi-beam grids
- Reduced resolution and fixed blanking
- External Device Monitoring (EDM) ensures that a controller or "third box" is not required
- Easily understood advanced diagnostics allow for quick troubleshooting
- Safety PLC input compatible (per OSSD specifications)
- Rated Type 4 per IEC 61496
- Available with optional ESD-safe housing, pigtail connectors and cascading on some models

EZ-SCREEN® Type 2 page 39

- Designed for lower-risk applications
- Provides economical, compact optical safeguarding
- Rated Type 2 per IEC 61496
- Offered with 30 mm resolution and 15 m range

PICO-GUARD™ page 61

- Provides access and perimeter guarding
- Offers low-cost alternative to cumbersome machine guarding methods
- Combines fiber optic and photoelectric technologies for safeguarding in explosive or harsh environments
- Installs easily using inexpensive plastic fiber optics
- Rated Type 4 per IEC 61496

Model			Page	Safety Rating	Resolution	Supply Voltage	Maximum Range	
EZ-SCREEN® Type 4	Standard Systems		23	Type 4 Category 4 PLe SIL 3 Control Reliable	14 & 30 mm	24V dc	6 m/18 m	
	Cascade Systems				14 & 30 mm		6 m/18 m	
	Low-Profile Systems				14 & 25 mm		6 m	
	Low-Profile Cascade Systems				14 & 25 mm		6 m	
	Grid & Point Systems			Type 4 Category 4 Control Reliable	300 to 584 mm (beam spacing)		70 m	
EZ-SCREEN® Type 2	Type 2 Systems		39	Type 2 Category 2	30 mm	24V dc	15 m	
PICO-GUARD™	Grid Systems		61	Type 4 Category 4 (call for PL and SIL ratings) Control Reliable	300 to 584 mm (beam spacing)	24V dc	31 m	
	Point Systems				—			

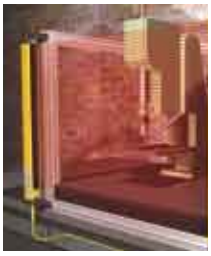
	Safety Output	Auxiliary Output	Blanking	Output Response Time	Housing Material	Environmental Rating
	2 PNP OSSD (Trip /Latch Selectable)	Yes PNP OSSD follow (when configured for 1-CH EDM)	2-beam Reduced Resolution & Fixed	9 to 56 ms	Aluminum housing with yellow polyester powder finish (other colors available) nickel-plated ESD, clear anodized aluminum or nickel-plated silver	IEC IP65
				11 to 56 ms		
				8 to 43.5 ms	Aluminum housing with yellow polyester powder finish, nickel-plated ESD, or clear anodized aluminum	
				9.5 to 43.5 ms		
		—	—	24 ms	Aluminum housing with yellow polyester powder finish	
	2 PNP OSSD (Trip or Latch)	—	—	11 to 25 ms	Aluminum housing with yellow polyester powder finish	IEC IP65
	2 PNP OSSD (Trip /Latch Selectable) See page 60 for controller	Yes (Dependent on controller model)	—	13 ms See page 60 for controller	Black aluminum housing, tempered glass window (MEK resistant)	IEC IP65
					12 mm threaded barrel: Black polycarbonate plastic housing **30 mm threaded barrel:** Stainless steel housing, glass window.	IEC IP67

EZ-SCREEN®
Safety Light Screens

- Simple, two-piece integrated system has no control box.
- EZ-SCREEN point-of-operation systems provide finger, hand and ankle detection in a standard or low-profile housing to fit any machine.
- Point and Grid systems allow one-, two-, three- or four-beam perimeter and access guarding.
- Type 4 models are designed with redundant microprocessor-controlled, self-checking circuitry to exceed control reliability requirements and are certified for CE (Type 4/Category 4) and cULus (NIPF, Type 4) applications.
- Type 2 systems are suited to lower-risk applications where the result of an accident is only a slight injury and meet all requirements for CE (Type 2/Category 2) and cULus (NIPF, Type 2) applications.
- Superior optical design makes system extremely easy to align.
- Status indicators and diagnostics show when alignment is complete and if there are problems with the installation.
- Cascading models allow up to four systems of any length and resolution to be wired together to form a single safety device.
- Systems have ranges up to 70 m, with power and range for all types of applications including long-range perimeter guarding.

Interface multiple devices with the SC22-3 Safety Controller. See page 76

A complete family of machine guarding products.

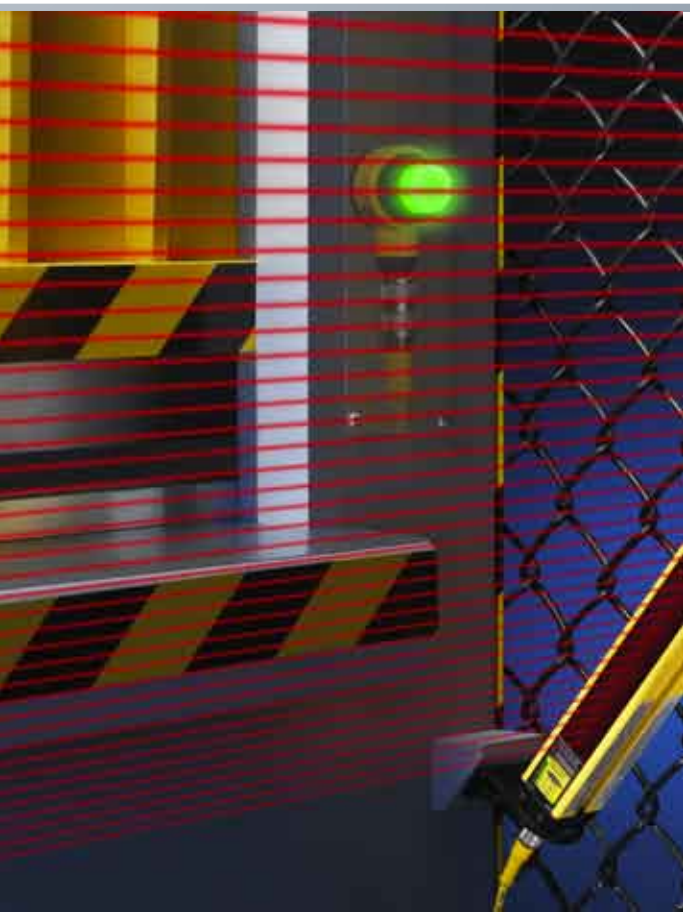


Point-of-Operation and Area
- Provides choice of models for finger, hand and ankle detection
- Includes standard or low-profile models to fit any machine
- Available in models to meet Type 4 requirements
- Includes cascading and ESD-safe solutions

Perimeter and Access Guarding
- Uses one-, two-, three- or four- beams for perimeter and long-range single-sided protection
- Guards multiple sides of a dangerous area up to 70 m long
- Meets Type 4 requirements

Single-Point Access
- Uses angled mirrors to simulate a two-beam system
- Allows for the use of multiple units to create custom beam patterns
- Meets Type 4 requirements

Type 2
- Designed for lower-risk operation applications
- Meets Type 2 requirements
- Offered with 30 mm resolution and 15 m range



EZ-SCREEN®

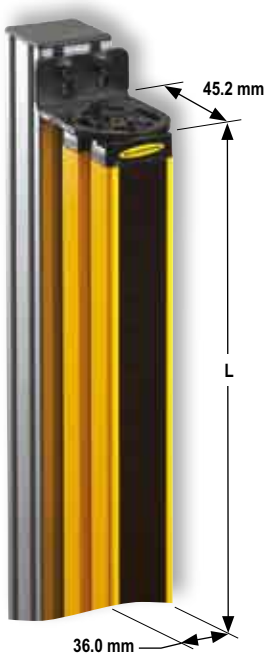
Type 4 Point-of-Operation

- Available in 14 mm resolution for finger, hand and ankle protection or 30 mm resolution for hand and ankle protection
- Operates in ranges from 0.1 to 6 m (14 mm models) and 0.1 to 18 m (30 mm models)
- Offers optional reduced resolution (floating blanking) to ignore tooling or constant inflow of materials
- Displays operating status, configuration and error codes, and blocked beams
- Features user-configurable trip or latch outputs, and Scan Code 1 or 2
- Exceeds OSHA/ANSI Control Reliability requirements, certified to cULus NIPF, and CE certified to Type 4, Cat 4 PLe, and SIL 3
- Resists impact, twisting and abusive environments with a durable aluminum housing and metal endcaps
- Available with standard yellow, clear anodized aluminum housing or nickel-plated ESD-safe housing for protection against electrostatic discharges (other color options available)
- Offers optional cascading to create up to a four sensor system that responds to a single stop command
- Offers optional lens shields and enclosures for added durability

EZ-SCREEN® Type 4
EZ-SCREEN® Type 2
PICO-GUARD™
CORDSETS PAGE 28
INDICATORS PAGE 192
BRACKETS PAGE 28
MIRRORS PAGE 194
STANDS PAGE 198
LENS SHIELDS PAGE 200
ENCLOSURES PAGE 201
INTERFACE PAGE 51

EZ-SCREEN® Systems

- 24V dc supply voltage
- Two solid-state OSSD safety outputs
- 7-segment diagnostic display
- Clear/Blocked beam zone indicators
- System status and system reset status
- Metal endcaps for added durability
- User configurable trip or latch outputs and Scan Code 1 or 2
- Fixed or 2-beam reduced resolution (floating) blanking
- EDM input and optional TEST function
- Integral or pigtail M12/Euro-style QD connection
- QD cordsets ordered separately or in kits (see page 28)



EZ-SCREEN Systems

ONLINE
AUTOCAD, STEP, IGES & PDF

Some of the Available Finishes

Yellow Painted Aluminum | Clear Anodized Aluminum | Nickel-Plated ESD

EZ-SCREEN® Systems, 14 mm Resolution–0.1 to 6 m Range

Defined Area	Models*			Connection**	Housing Length (L)	Response Time	# of Beams	Data Sheet
	Emitter	Receiver	Pair†					
150 mm	SLSE14-150Q8	SLSR14-150Q8	SLSP14-150Q88	8-pin QD	262 mm	11 ms	20	112852
	SLSE14-150P8	SLSR14-150P8	SLSP14-150P88	8-pin Pigtail QD				
300 mm	SLSE14-300Q8	SLSR14-300Q8	SLSP14-300Q88	8-pin QD	372 mm	15 ms	40	
	SLSE14-300P8	SLSR14-300P8	SLSP14-300P88	8-pin Pigtail QD				
450 mm	SLSE14-450Q8	SLSR14-450Q8	SLSP14-450Q88	8-pin QD	522 mm	19 ms	60	
	SLSE14-450P8	SLSR14-450P8	SLSP14-450P88	8-pin Pigtail QD				
600 mm	SLSE14-600Q8	SLSR14-600Q8	SLSP14-600Q88	8-pin QD	671 mm	23 ms	80	
	SLSE14-600P8	SLSR14-600P8	SLSP14-600P88	8-pin Pigtail QD				
750 mm	SLSE14-750Q8	SLSR14-750Q8	SLSP14-750Q88	8-pin QD	821 mm	27 ms	100	
	SLSE14-750P8	SLSR14-750P8	SLSP14-750P88	8-pin Pigtail QD				
900 mm	SLSE14-900Q8	SLSR14-900Q8	SLSP14-900Q88	8-pin QD	971 mm	32 ms	120	
	SLSE14-900P8	SLSR14-900P8	SLSP14-900P88	8-pin Pigtail QD				
1050 mm	SLSE14-1050Q8	SLSR14-1050Q8	SLSP14-1050Q88	8-pin QD	1120 mm	36 ms	140	
	SLSE14-1050P8	SLSR14-1050P8	SLSP14-1050P88	8-pin Pigtail QD				
1200 mm	SLSE14-1200Q8	SLSR14-1200Q8	SLSP14-1200Q88	8-pin QD	1270 mm	40 ms	160	
	SLSE14-1200P8	SLSR14-1200P8	SLSP14-1200P88	8-pin Pigtail QD				
1350 mm	SLSE14-1350Q8	SLSR14-1350Q8	SLSP14-1350Q88	8-pin QD	1420 mm	43 ms	180	
	SLSE14-1350P8	SLSR14-1350P8	SLSP14-1350P88	8-pin Pigtail QD				
1500 mm	SLSE14-1500Q8	SLSR14-1500Q8	SLSP14-1500Q88	8-pin QD	1569 mm	48 ms	200	
	SLSE14-1500P8	SLSR14-1500P8	SLSP14-1500P88	8-pin Pigtail QD				
1650 mm	SLSE14-1650Q8	SLSR14-1650Q8	SLSP14-1650Q88	8-pin QD	1719 mm	52 ms	220	
	SLSE14-1650P8	SLSR14-1650P8	SLSP14-1650P88	8-pin Pigtail QD				
1800 mm	SLSE14-1800Q8	SLSR14-1800Q8	SLSP14-1800Q88	8-pin QD	1869 mm	56 ms	240	
	SLSE14-1800P8	SLSR14-1800P8	SLSP14-1800P88	8-pin Pigtail QD				

EZ-SCREEN® Systems, 30 mm Resolution–0.1 to 18 m Range

Defined Area	Models*			Connection**	Housing Length (L)	Response Time	# of Beams	Data Sheet
	Emitter	Receiver	Pair†					
150 mm	SLSE30-150Q8	SLSR30-150Q8	SLSP30-150Q88	8-pin QD	262 mm	9 ms	10	112852
	SLSE30-150P8	SLSR30-150P8	SLSP30-150P88	8-pin Pigtail QD				
300 mm	SLSE30-300Q8	SLSR30-300Q8	SLSP30-300Q88	8-pin QD	372 mm	11 ms	20	
	SLSE30-300P8	SLSR30-300P8	SLSP30-300P88	8-pin Pigtail QD				
450 mm	SLSE30-450Q8	SLSR30-450Q8	SLSP30-450Q88	8-pin QD	522 mm	13 ms	30	
	SLSE30-450P8	SLSR30-450P8	SLSP30-450P88	8-pin Pigtail QD				
600 mm	SLSE30-600Q8	SLSR30-600Q8	SLSP30-600Q88	8-pin QD	671 mm	15 ms	40	
	SLSE30-600P8	SLSR30-600P8	SLSP30-600P88	8-pin Pigtail QD				
750 mm	SLSE30-750Q8	SLSR30-750Q8	SLSP30-750Q88	8-pin QD	821 mm	17 ms	50	
	SLSE30-750P8	SLSR30-750P8	SLSP30-750P88	8-pin Pigtail QD				
900 mm	SLSE30-1050Q8	SLSR30-900Q8	SLSP30-900Q88	8-pin QD	971 mm	19 ms	60	
	SLSE30-1050P8	SLSR30-900P8	SLSP30-900P88	8-pin Pigtail QD				

More on next page

* **ESD-safe models**: Add **N** to the model number, prior to the QD option designation (example, **SLSE14-150NQ8**). ESD-safe models are not available with the pigtail QD option.

Optional housing finishes:
Prior to the QD designation in the model number, add **A** for a clear (brushed) anodized aluminum finish, black endcaps (example, **SLSE14-150AQ8**); **S** for a nickel-plated (silver) finish, black endcaps (example, **SLSE14-150SQ8**), **B** for a black painted finish, black endcaps (example, **SLSE14-150BQ8**), **W** for a white painted finish, black endcaps (example, **SLSE14-150WQ8**) or **SO** for a safety orange painted finish, black endcaps (example, **SLSE14-150SOQ8**).

** For an emitter with TEST function, replace **Q8** with **Q5** on emitter model numbers (example, **SLSE14-150Q5**) and **Q88** with **Q85** on pair model numbers (example, **SLSP14-150Q85**). For a 300 mm Euro pigtail QD, replace **Q** with **P** in model numbers (example, **SLSP14-150P88**). For a 5-pin 300 mm Euro pigtail QD with No EDM or No TEST functions, replace **Q8** with **P5NT** on emitter or receiver (example, **SLSE14-150P5NT**) and **Q88** with **P55NT** on pair model numbers (example, **SLSP14-150P55NT**.) A model with a QD requires a mating cordset (see page 28).

† A pair includes an emitter and receiver (example, **SLSP14-150Q88**). Emitters (example, **SLSE14-150Q8**) and receivers (example, **SLSR14-150Q8**) are also sold separately.

EZ-SCREEN® Systems, 30 mm Resolution–0.1 to 18 m Range (cont'd)

Defined Area	Models*			Connection**	Housing Length (L)	Response Time	# of Beams	Data Sheet
	Emitter	Receiver	Pair†					
1050 mm	SLSE30-1050Q8	SLSR30-1050Q8	SLSP30-1050Q88	8-pin QD	1120 mm	21 ms	70	112852
	SLSE30-1050P8	SLSR30-1050P8	SLSP30-1050P88	8-pin Pigtail QD				
1200 mm	SLSE30-1200Q8	SLSR30-1200Q8	SLSP30-1200Q88	8-pin QD	1270 mm	23 ms	80	
	SLSE30-1200P8	SLSR30-1200P8	SLSP30-1200P88	8-pin Pigtail QD				
1350 mm	SLSE30-1350Q8	SLSR30-1350Q8	SLSP30-1350Q88	8-pin QD	1420 mm	25 ms	90	
	SLSE30-1350P8	SLSR30-1350P8	SLSP30-1350P88	8-pin Pigtail QD				
1500 mm	SLSE30-1500Q8	SLSR30-1500Q8	SLSP30-1500Q88	8-pin QD	1569 mm	27 ms	100	
	SLSE30-1500P8	SLSR30-1500P8	SLSP30-1500P88	8-pin Pigtail QD				
1650 mm	SLSE30-1650Q8	SLSR30-1650Q8	SLSP30-1650Q88	8-pin QD	1719 mm	30 ms	110	
	SLSE30-1650P8	SLSR30-1650P8	SLSP30-1650P88	8-pin Pigtail QD				
1800 mm	SLSE30-1800Q8	SLSR30-1800Q8	SLSP30-1800Q88	8-pin QD	1869 mm	32 ms	120	
	SLSE30-1800P8	SLSR30-1800P8	SLSP30-1800P88	8-pin Pigtail QD				
1950 mm	SLSE30-1950Q8	SLSR30-1950Q8	SLSP30-1950Q88	8-pin QD	2018 mm	34 ms	130	
	SLSE30-1950P8	SLSR30-1950P8	SLSP30-1950P88	8-pin Pigtail QD				
2100 mm	SLSE30-2100Q8	SLSR30-2100Q8	SLSP30-2100Q88	8-pin QD	2168 mm	36 ms	140	
	SLSE30-2100P8	SLSR30-2100P8	SLSP30-2100P88	8-pin Pigtail QD				
2250 mm	SLSE30-2250Q8	SLSR30-2250Q8	SLSP30-2250Q88	8-pin QD	2318 mm	38 ms	150	
	SLSE30-2250P8	SLSR30-2250P8	SLSP30-2250P88	8-pin Pigtail QD				
2400 mm	SLSE30-2400Q8	SLSR30-2400Q8	SLSP30-2400Q88	8-pin QD	2468 mm	40 ms	160	
	SLSE30-2400P8	SLSR30-2400P8	SLSP30-2400P88	8-pin Pigtail QD				

EZ-SCREEN® Cascade Systems, 14 mm Resolution–0.1 to 6 m Range

Defined Area	Models*			Connection**	Housing Length (L)	Response Time***	# of Beams	Data Sheet
	Emitter	Receiver	Pair†					
300 mm	SLSCE14-300Q8	SLSCR14-300Q8	SLSCP14-300Q88	8-pin QD	372 mm	15 ms	40	112852
	SLSCE14-300P8	SLSCR14-300P8	SLSCP14-300P88	8-pin Pigtail QD				
450 mm	SLSCE14-450Q8	SLSCR14-450Q8	SLSCP14-450Q88	8-pin QD	522 mm	19 ms	60	
	SLSCE14-450P8	SLSCR14-450P8	SLSCP14-450P88	8-pin Pigtail QD				
600 mm	SLSCE14-600Q8	SLSCR14-600Q8	SLSCP14-600Q88	8-pin QD	671 mm	23 ms	80	
	SLSCE14-600P8	SLSCR14-600P8	SLSCP14-600P88	8-pin Pigtail QD				
750 mm	SLSCE14-750Q8	SLSCR14-750Q8	SLSCP14-750Q88	8-pin QD	821 mm	27 ms	100	
	SLSCE14-750P8	SLSCR14-750P8	SLSCP14-750P88	8-pin Pigtail QD				
900 mm	SLSCE14-900Q8	SLSCR14-900Q8	SLSCP14-900Q88	8-pin QD	971 mm	32 ms	120	
	SLSCE14-900P8	SLSCR14-900P8	SLSCP14-900P88	8-pin Pigtail QD				
1050 mm	SLSCE14-1050Q8	SLSCR14-1050Q8	SLSCP14-1050Q88	8-pin QD	1120 mm	36 ms	140	
	SLSCE14-1050P8	SLSCR14-1050P8	SLSCP14-1050P88	8-pin Pigtail QD				
1200 mm	SLSCE14-1200Q8	SLSCR14-1200Q8	SLSCP14-1200Q88	8-pin QD	1270 mm	40 ms	160	
	SLSCE14-1200P8	SLSCR14-1200P8	SLSCP14-1200P88	8-pin Pigtail QD				
1350 mm	SLSCE14-1350Q8	SLSCR14-1350Q8	SLSCP14-1350Q88	8-pin QD	1420 mm	43 ms	180	
	SLSCE14-1350P8	SLSCR14-1350P8	SLSCP14-1350P88	8-pin Pigtail QD				

More on next page

* **ESD-safe models**: Add **N** to the model number, prior to the QD option designation (example, **SLSE30-1050NQ8**). ESD-safe models are not available with the pigtail QD option.
Optional housing finishes: Prior to the QD designation in the model number, add **A** for a clear (brushed) anodized aluminum finish, black endcaps (example, **SLSE30-1050AQ8**); **S** for a nickel-plated (silver) finish, black endcaps (example, **SLSE30-1050SQ8**), **B** for a black painted finish, black endcaps (example, **SLSE30-1050BQ8**), **W** for a white painted finish, black endcaps (example, **SLSE30-1050WQ8**) or **SO** for a safety orange painted finish, black endcaps (example, **SLSE30-1050SOQ8**).

** For an emitter with TEST function, replace **Q8** with **Q5** on emitter model numbers (example, **SLSE30-1050Q5**) and **Q88** with **Q85** on pair model numbers (example, **SLSP30-1050Q85**). For a 300 mm Euro pigtail QD, replace **Q** with **P** in model numbers (example, **SLSP30-1050P88**).
For a 5-pin 300 mm Euro pigtail QD with No EDM or No TEST, replace **Q8** with **P5NT** on emitter or receiver (example, **SLSE30-1050P5NT**) and **Q88** with **P55NT** on pair models (example, **SLSP30-1050P55NT**). A model with a QD requires a mating cordset (see page 28).

*** **Cascading system response time:** To the response time of the slowest pair, add 2 ms for each additional pair.
Example: slowest pair's response time is 15 ms, and the system has three additional pairs (four pairs total), so the system maximum response time is 15 ms + 6 ms (3 pairs x 2 ms) = 21 ms.

† A pair includes an emitter and receiver (example, **SLSP30-1050Q88**). Emitters (example, **SLSE30-1050Q8**) and receivers (example, **SLSR30-1050Q8**) are also sold separately.

EZ-SCREEN® Cascade Systems, 14 mm Resolution–0.1 to 6 m Range (cont'd)

Defined Area	Models*			Connection**	Housing Length (L)	Response Time***	# of Beams	Data Sheet
	Emitter	Receiver	Pair†					
1500 mm	SLSCE14-1500Q8	SLSCR14-1500Q8	SLSCP14-1500Q88	8-pin QD	1569 mm	48 ms	200	112852
	SLSCE14-1500P8	SLSCR14-1500P8	SLSCP14-1500P88	8-pin Pigtail QD				
1650 mm	SLSCE14-1650Q8	SLSCR14-1650Q8	SLSCP14-1650Q88	8-pin QD	1719 mm	52 ms	220	
	SLSCE14-1650P8	SLSCR14-1650Q8	SLSCP14-1650P88	8-pin Pigtail QD				
1800 mm	SLSCE14-1800Q8	SLSCR14-1800Q8	SLSCP14-1800Q88	8-pin QD	1869 mm	56 ms	240	
	SLSCE14-1800P8	SLSCR14-1800Q8	SLSCP14-1800P88	8-pin Pigtail QD				

EZ-SCREEN® Cascade Systems, 30 mm Resolution–0.1 to 18 m Range

Defined Area	Models*			Connection**	Housing Length (L)	Response Time***	# of Beams	Data Sheet
	Emitter	Receiver	Pair†					
300 mm	SLSCE30-300Q8	SLSCR30-300Q8	SLSCP30-300Q88	8-pin QD	372 mm	11 ms	20	112852
	SLSCE30-300P8	SLSCR30-300P8	SLSCP30-300P88	8-pin Pigtail QD				
450 mm	SLSCE30-450Q8	SLSCR30-450Q8	SLSCP30-450Q88	8-pin QD	522 mm	13 ms	30	
	SLSCE30-450P8	SLSCR30-450P8	SLSCP30-450P88	8-pin Pigtail QD				
600 mm	SLSCE30-600Q8	SLSCR30-600Q8	SLSCP30-600Q88	8-pin QD	671 mm	15 ms	40	
	SLSCE30-600P8	SLSCR30-600P8	SLSCP30-600P88	8-pin Pigtail QD				
750 mm	SLSCE30-750Q8	SLSCR30-750Q8	SLSCP30-750Q88	8-pin QD	821 mm	17 ms	50	
	SLSCE30-750P8	SLSCR30-750P8	SLSCP30-750P88	8-pin Pigtail QD				
900 mm	SLSCE30-900Q8	SLSCR30-900Q8	SLSCP30-900Q88	8-pin QD	971 mm	19 ms	60	
	SLSCE30-900P8	SLSCR30-900P8	SLSCP30-900P88	8-pin Pigtail QD				
1050 mm	SLSCE30-1050Q8	SLSCR30-1050Q8	SLSCP30-1050Q88	8-pin QD	1120 mm	21 ms	70	
	SLSCE30-1050P8	SLSCR30-1050P8	SLSCP30-1050P88	8-pin Pigtail QD				
1200 mm	SLSCE30-1200Q8	SLSCR30-1200Q8	SLSCP30-1200Q88	8-pin QD	1270 mm	23 ms	80	
	SLSCE30-1200P8	SLSCR30-1200P8	SLSCP30-1200P88	8-pin Pigtail QD				
1350 mm	SLSCE30-1350Q8	SLSCR30-1350Q8	SLSCP30-1350Q88	8-pin QD	1420 mm	25 ms	90	
	SLSCE30-1350P8	SLSCR30-1350P8	SLSCP30-1350P88	8-pin Pigtail QD				
1500 mm	SLSCE30-1500Q8	SLSCR30-1500Q8	SLSCP30-1500Q88	8-pin QD	1569 mm	27 ms	100	
	SLSCE30-1500P8	SLSCR30-1500P8	SLSCP30-1500P88	8-pin Pigtail QD				
1650 mm	SLSCE30-1650Q8	SLSCR30-1650Q8	SLSCP30-1650Q88	8-pin QD	1719 mm	30 ms	110	
	SLSCE30-1650P8	SLSCR30-1650P8	SLSCP30-1650P88	8-pin Pigtail QD				
1800 mm	SLSCE30-1800Q8	SLSCR30-1800Q8	SLSCP30-1800Q88	8-pin QD	1869 mm	32 ms	120	
	SLSCE30-1800P8	SLSCR30-1800P8	SLSCP30-1800P88	8-pin Pigtail QD				
1950 mm	SLSCE30-1950Q8	SLSCR30-1950Q8	SLSCP30-1950Q88	8-pin QD	2018 mm	34 ms	130	
	SLSCE30-1950P8	SLSCR30-1950P8	SLSCP30-1950P88	8-pin Pigtail QD				
2100 mm	SLSCE30-2100Q8	SLSCR30-2100Q8	SLSCP30-2100Q88	8-pin QD	2168 mm	36 ms	140	
	SLSCE30-2100P8	SLSCR30-2100P8	SLSCP30-2100P88	8-pin Pigtail QD				
2250 mm	SLSCE30-2250Q8	SLSCR30-2250Q8	SLSCP30-2250Q88	8-pin QD	2318 mm	38 ms	150	
	SLSCE30-2250P8	SLSCR30-2250P8	SLSCP30-2250P88	8-pin Pigtail QD				
2400 mm	SLSCE30-2400Q8	SLSCR30-2400Q8	SLSCP30-2400Q88	8-pin QD	2468 mm	40 ms	160	
	SLSCE30-2400P8	SLSCR30-2400P8	SLSCP30-2400P88	8-pin Pigtail QD				

* **ESD-safe models**: Add **N** to the model number, prior to the QD option designation (example, **SLSCE14-1500NQ8**). ESD-safe models are not available with the pigtail QD option.
Optional housing finishes: Prior to the QD designation in the model number, add **A** for a clear (brushed) anodized aluminum finish, black endcaps (example, **SLSCE14-1500AQ8**); **S** for a nickel-plated (silver) finish, black endcaps (example, **SLSCE14-1500SQ8**), **B** for a black painted finish, black endcaps (example, **SLSCE14-1500BQ8**), **W** for a white painted finish, black endcaps (example, **SLSCE14-1500WQ8**) or **SO** for a safety orange painted finish, black endcaps (example, **SLSCE14-1500SOQ8**).

** For an emitter with TEST function, replace **Q8** with **Q5** on emitter model numbers (example, **SLSE14-1500Q5**) and **Q88** with **Q85** on pair model numbers (example, **SLSP14-1500Q85**). For a 300 mm Euro pigtail QD, replace **Q** with **P** in model numbers (example, **SLSCP30-300P88**).
For a 5-pin 300 mm Euro pigtail QD with No EDM or No TEST, replace **Q8** with **P5NT** on emitter or receiver model numbers (example, **SLSCE14-1050P5NT**), and **Q88** with **P55NT** on pair model number (example, **SLSP14-1050P55NT**). A model with a QD requires a mating cordset (see page 28).

*** **Cascading system response time:** To the response time of the slowest pair, add 2 ms for each additional pair. Example: slowest pair's response time is 15 ms, and the system has three additional pairs (four pairs total), so the system maximum response time is 15 ms + 6 ms (3 pairs x 2 ms) = 21 ms.

† A pair includes an emitter and receiver (example, **SLSCP30-300Q88**). Emitters (example, **SLSE14-1500Q8**) and receivers (example, **SLSR14-1500Q8**) are also sold separately.

EZ-SCREEN® 14 & 30 mm Resolution Kits

You can purchase a kit that contains an emitter and receiver of equal length and resolution; brackets; and optional interfacing solution and quick-disconnect cordsets. Detailed information about individual kit components is as follows.

To Order:

1. Choose model, resolution and defined area.
2. Yellow housing is standard. To choose an optional housing, add designation listed below prior to the connection.
3. Choose the connection: Integral M12/Euro-Style QD with or without TEST, or 300 mm M12/Euro-Style pigtail with or without TEST.
4. Choose an optional interfacing solution, such as an **IM-T-9A** or **-11** interfacing model.
5. Choose one cordset for each sensor or two cordsets for a pair.

   M12/Euro QD models (example, **SLSK30-150Q88**) require mating M12/Euro QD cordsets, such as:
   - QDE cordset with flying leads
   - DEE2R double-ended cordset
   - CSB series splitter cordset

See EZ-SCREEN manual (p/n 112852) or www.bannerengineering.com for complete information and a current listing of accessories and options for kitting components. Call factory with questions regarding accessories.

Kit Model Key

Model Style	Kit	Resolution		Defined Area	Finish	Connection		Interfacing Options	QD Cordset Length Options
S L S	K	1 4	—	6 0 0		Q 8 8	—	1	R E 2 5

Model Style

SLS = Safety Light Screen
SLSC = Cascading Safety Light Screen

Kit

K = Kit

SLS Resolution

14 = 14 mm
30 = 30 mm

Sensor Finish

Blank = Yellow powder coat
N = Nickel plated ESD
A = Clear Anodized Aluminum
S = Nickel-plated (silver)
B = Black powder coat
W = White powder coat

QD Cordset Length Examples

RE15 = 4.5 m, 2 each
RE25 = 7.6 m, 2 each
R15E25 = 4.5 m (Receiver) & 7.6 m (Emitter)
R25E15 = 7.6 m (Receiver) & 4.5 m (Emitter)
DD1 = 0.3 DEE2R-81D, 2 each
C1D15 = CSB-M1281M1281 (Receiver) DEE2R-815D (8-pin Emitter)
C8D25 = CSB-M1288M1281 (SLS Receiver) DEE2R-825D (8-pin Emitter)
CU25D25 = CSB-UNT825M1281 (SLS Receiver) DEE2R-825D (8-pin Emitter)

Defined Area

150 mm*
300 mm
450 mm
600 mm
750 mm
900 mm
1050 mm
1200 mm
1350 mm
1500 mm
1650 mm
1800 mm

* 150 mm not available in cascade models

Receiver & Emitter QD Options

Q85 = Receiver with integral 8-pin Euro-style QD Emitter with integral 5-pin Euro-style QD with Test
Q88 = Receiver with integral 8-pin Euro-style QD Emitter with integral 8-pin Euro-style QD
P88 = Receiver with 8-pin Euro-style pigtail QD Emitter with 8-pin Euro-style pigtail QD
P55NT = Receiver with 5-pin Euro-style pigtail QD (No EDM) Emitter with 5-pin Euro-style pigtail QD (No Test)

Interfacing Options

1 = IM-T-9A Interface Module, 1 each (3 NO)
2 = IM-T-11A Interface Module, 1 each (2 NO/ 1 NC)
3 = 11-BG00-31-D-024 Contactors (10A), 2 each
4 = BF1801L-024 Contactors (18A), 2 each
5 = EZAC-R9-QE8 = AC Interface Box (3 NO), 1 each
6 = EZAC-R11-QE8 = AC Interface Box (2 NO/1 NC), 1 each

NOTE: See notes under model number tables. Not all combinations are listed.
Contact Banner Engineering Corp. for additional information and/or verification of valid kit model numbers.

Accessories EZ-SCREEN® (Type 4–14 & 30 mm Resolution)

Cordsets

Euro QD to Flying Leads

pg. 179

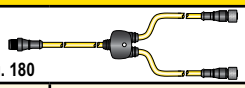
Length	8-Pin	5-Pin
4.5 m	QDE-815D	QDE-515D
7.6 m	QDE-825D	QDE-525D
15.2 m	QDE-850D	QDE-550D
22.8 m	QDE-875D	QDE-575D
30.4 m	QDE-8100D	QDE-5100D

Euro QD–Double-Ended

pg. 179

Length	8-Pin	5-Pin
0.3 m	DEE2R-81D	DEE2R-51D
0.9 m	DEE2R-83D	DEE2R-53D
2.5 m	DEE2R-88D	DEE2R-58D
4.6 m	DEE2R-815D	DEE2R-515D
7.6 m	DEE2R-825D	DEE2R-525D
15.2 m	DEE2R-850D	DEE2R-550D
22.9 m	DEE2R-875D	DEE2R-575D
30.5 m	DEE2R-8100D	DEE2R-5100D

Euro QD Splitter



pg. 180

Length	8-Pin
0 m	CSB-M1280M1280
0.3 m	CSB-M1281M1281
2.5 m	CSB-M1288M1281
4.6 m	CSB-M12815M1281
7.6 m	CSB-M12825M1281
7.6 m	CSB-UNT825M1281

NOTE: See page 51 for interface solutions. Additional accessories are listed on page 163.

Brackets

14 & 30 mm		14 & 30 mm	14 & 30 mm Cascade
 pg. 167	 pg. 166	 pg. 167	 pg. 167
EZA-MBK-12*	EZA-MBK-11*	EZA-MBK-20	EZA-MBK-21

*** Standard brackets included with emitter/receiver.**
Additional brackets are available, see page 164.

Replacement Parts

Model	Description
EZA-ADE-1	Copolyester access cover with label for 14 or 30 mm resolution emitters
EZA-ADE-2	Copolyester access cover with inverted label for 14 or 30 mm resolution emitters
EZA-ADR-1	Copolyester access cover with label for 14 or 30 mm resolution receiver
EZA-ADR-2	Copolyester access cover with inverted label for 14 or 30 mm resolution receiver
EZA-MBK-1	Center bracket kit (includes 1 bracket and hardware to mount to MSA Series stands) for 14 or 30 mm resolution EZ-SCREEN
EZA-MBK-11	Standard bracket kit with hardware (includes 2 end brackets and hardware to mount to MSA Series stands) for 14 or 30 mm resolution EZ-SCREEN
EZA-TP-1	Access cover security plate (includes 2 screws, wrench) for 14 or 30 mm resolution EZ-SCREEN
MGA-K-1	Replacement key for switch MGA-KS0-1
MGA-KS0-1	Keyed reset switch (same as that included in kits)
SMA-MBK-1	SSM Series Mirror Bracket Kit
STP-3	Specified test piece, 45 mm dia.
STP-13	14 mm test piece (for 14 mm resolution systems)
STP-14	30 mm test piece (for 14 mm resolution systems with 2-beam Reduced Resolution and for 30 mm resolution systems)
STP-15	60 mm test piece (for 30 mm resolution systems with 2-beam Reduced Resolution)

EZ-SCREEN® 14 & 30 mm Resolution Specifications

Supply Voltage at the Device	24V dc ±15% (use a SELV-rated supply according to EN IEC60950) (The external voltage supply must be capable of buffering brief mains interruptions of 20 ms, as specified in EN/IEC 60204-1.)
Residual Ripple	± 10% maximum
Supply Current	**Emitter:** 100 mA max. **Receiver:** 275 mA max., exclusive of OSSD1 and OSSD2 loads (up to an additional 0.5A each)
Response Time	9 to 56 milliseconds (see model number tables) **Cascade Safety Stop Interface (CSSI):** 40 milliseconds max.
Remote Test Input (Optional – available only on model SLSE..-..Q5 emitters)	Test Mode is activated either by applying a low signal (less than 3V dc) to emitter TEST #1 terminal for a minimum of 50 milliseconds, or by opening a switch connected between TEST #1 and TEST #2 for a minimum of 50 milliseconds. Beam scanning stops to simulate a blocked condition. A high signal at TEST #1 deactivates Test Mode. (See p/n 112852 for more information.) **High signal:** 10 to 30V dc **Low signal:** 0 to 3V dc **Input current:** 35 mA inrush, 10 mA max.
Wavelength of Emitter Elements	Infrared LEDs, 950 nm at peak emission
Recovery Time–Blocked to clear (OSSDs turn ON; varies with total number of sensing beams and whether Sync beam is blocked)	<table><tr><th></th><th>Beam 1 (Sync Beam)</th><th>All Other Beams</th></tr><tr><td>14 mm Models</td><td>109 to 800 ms</td><td>33 to 220 ms</td></tr><tr><td>30 mm Models</td><td>81 to 495 ms</td><td>25 to 152 ms</td></tr></table>
EDM Input	+24V dc signals from external device contacts can be monitored (one-channel, two-channel or no monitoring) via EDM1 and EDM2 terminals in the receiver. (See p/n 112852 for more information). **High signal:** 10 to 30V dc at 30 mA typical **Low signal:** 0 to 3V dc
Reset Input	The Reset input must be high for 0.25 to 2 seconds and then low to reset the receiver. **High signal:** 10 to 30V dc at 30 mA typical **Low signal:** 0 to 3V dc **Closed switch time:** 0.25 to 2 sec
Safety Outputs (OSSDs)	Two redundant solid-state 24V dc, 0.5 A 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". **ON-State voltage:** ≥ Vin-1.5V dc **OFF-State voltage:** 1.2V dc max. (0-1.2V dc) **Max. load capacitance:** 1.0 µF **Max. load inductance:** 10 H **Leakage current:** 0.50 mA maximum **Cable resistance:** 10 Ω maximum **OSSD test pulse width:** 100 to 300 microseconds **OSSD test pulse period:** 10 to 27 milliseconds (varies with number of beams) **Switching current:** 0-0.5 A
Auxiliary (Aux.) Output Switching Capacity	Current-sourcing (PNP) solid-state output, 24V dc at 75mA max that follow the safety outputs (lockout function optional)
Controls and Adjustments	**Emitter:** **Scan Code selection:** 2-position switch (code 1 or 2). Factory default position is code 1. **Receiver:** **Scan Code selection:** 2-position switch (code 1 or 2). Factory default position is code 1. **Trip/Latch Output selection:** Redundant switches. Factory default position is T (Trip). **EDM/MPCE monitor selection:** 2-position switch selects between 1- or 2-channel monitoring. Factory default position is 2. **Reduced Resolution (2-beam Floating Blanking):** Redundant switches. Factory default is OFF.
Short Circuit Protection	All inputs and outputs are protected from short circuits to +24V dc or dc common.
Electrical Safety Class (IEC 61140)	III
Operating Range	**14 mm models:** 0.1 m to 6 m **30 mm models:** 0.1 m to 18 m Range decreases with use of mirrors and/or lens shields: **Lens shields** – approximately 10% less range per shield. **Glass-surface mirrors** – approximately 8% less range per mirror. See Accessory section for more information on a specific mirror, page 194.
Ambient Light Immunity	> 10,000 lux at 5° angle of incidence
Strobe Light Immunity	Totally immune to one Federal Signal Corp. "Fireball" model FB2PST strobe
Effective Aperture Angle (EAA)	Meets Type 4 requirements per IEC 61496-2, ± 2.5° @ 3 m

More on next page

EZ-SCREEN® 14 & 30 mm Resolution Specifications (cont'd)

Enclosure	**Materials:** Extruded aluminum housing with yellow polyester powder (optional black or white or nickel-plated silver finish) and well-sealed, rugged die-cast zinc end caps, acrylic lens cover, copolyester access cover. Endcaps on silver models are also nickel-plated. **Rating:** IP65
Operating Conditions	**Temperature:** 0° to +55° C **Relative humidity:** 95% (non-condensing)
Status Indicators	**Emitter:** **One Bi-color (Red/Green) Status Indicator –** indicates operating mode, Lockout or power OFF condition **7-segment Diagnostic Indicator (1 digit) –** indicates proper operation, scan code or error code **Receiver:** **Yellow Reset Indicator –** indicates whether system is ready for operation or requires a reset **Bi-Color (Red/Green) Status Indicator –** indicates general system and output status **Bi-Color (Red/Green) Zone Status Indicators –** indicates condition (clear or blocked beam) of a defined group of beams **7-Segment Diagnostic Indicator (3-digit) –** indicates proper operation, scan code or error code, total number of blocked beams
Mounting Hardware	Emitter and receiver each are supplied with a pair of swivel end-mounting brackets. Models longer than 900 mm also include a swivel center-mount bracket. Mounting brackets are 8-gauge cold-rolled steel, black zinc finish.
Shock and Vibration	EZ-SCREEN components have passed vibration and shock tests according to IEC 61496-1. This includes vibration (10 cycles) of 10-55 Hz at 0.35 mm single amplitude (0.70 mm peak-to-peak) and shock of 10 g for 16 milliseconds (6,000 cycles).
Design Standards	Designed to comply with Type 4 per IEC 61496; Category 4 PLe per EN ISO 13849-1; SIL 3 per IEC 61508, SIL CL 3 per IEC 62061; Type 4 per UL 61496-1/-2
Certifications	CE c UL us LISTED
Wiring Diagrams	WD001, WD003, WD004, WD005, WD006, WD007, WD013, WD014, WD015, WD016, WD017, WD018, WD019 (pp. 220-230)

EZ-SCREEN®

Type 4 Low-Profile

- Available in 14 mm resolution for finger, hand and ankle protection or 25 mm resolution for hand and ankle protection
- Features space saving design to fit perfectly into machinery
- Operates in ranges up to 6 m
- Offers optional reduced resolution (floating blanking) to ignore tooling or constant inflow of materials
- Features a 7-segment display for diagnostic information and number of blocked beams
- Identifies clear and blocked beam using zone indicators
- Features user-configurable trip or latch outputs, and Scan Code 1 or 2
- Exceeds OSHA/ANSI Control Reliability requirements, certified to cULus NIPF, and CE certified to Type 4, Cat 4 PLe, and SIL 3
- Resists impact, twisting and abusive environments with a durable aluminum housing and metal endcaps
- Available with nickel-plated ESD-safe housing for protection against electrostatic discharges, clear anodized aluminum or with a “safety” yellow power-coat housing
- Offers optional cascading to create a system that responds to a single stop command

Coming Soon! ***Low-profile models with integral muting***

EZ-SCREEN® Type 4
EZ-SCREEN® Type 2
PICO-GUARD™
CORDSETS PAGE 36
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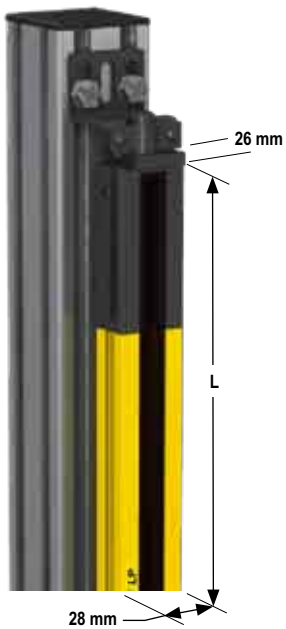
INTERFACE PAGE 51

EZ-SCREEN® Low-Profile Light Screen Systems

- Compact 28 x 26 mm housings
- 24V dc supply voltage
- Two solid-state OSSD safety outputs
- Blocked beam zone indicators
- Integral Removable Disconnect (RD) or pigtail Euro-style QD connection
- Multi-directional cable for easy integration into machinery
- QD cordsets ordered separately or in kits (see page 36)
- Metal endcaps for added durability
- User configurable trip or latch outputs and Scan Code 1 or 2
- EDM input and optional TEST function



EZ-SCREEN LP Systems

ONLINE
AUTOCAD, STEP, IGES & PDF

Available Finishes

Yellow Painted Aluminum | Clear Anodized Aluminum | Nickel-Plated ESD

EZ-SCREEN® Low-Profile Systems, 14 mm Resolution

Defined Area	Models*			Connection**	Housing Length (L)	Response Time	# of Beams	Data Sheet
	Emitter	Receiver	Pair†					
270 mm	SLPE14-270P8	SLPR14-270P8	SLPP14-270P88	Pigtail QD, 8-pin M12/Euro	270 mm	10.5 ms	27	140044
	SLPE14-270	SLPR14-270	SLPP14-270	Integral RD				
410 mm	SLPE14-410P8	SLPR14-410P8	SLPP14-410P88	Pigtail QD, 8-pin M12/Euro	410 mm	13.5 ms	41	
	SLPE14-410	SLPR14-410	SLPP14-410	Integral RD				
550 mm	SLPE14-550P8	SLPR14-550P8	SLPP14-550P88	Pigtail QD, 8-pin M12/Euro	549 mm	16.5 ms	55	
	SLPE14-550	SLPR14-550	SLPP14-550	Integral RD				
690 mm	SLPE14-690P8	SLPR14-690P8	SLPP14-690P88	Pigtail QD, 8-pin M12/Euro	689 mm	19.5 ms	69	
	SLPE14-690	SLPR14-690	SLPP14-690	Integral RD				
830 mm	SLPE14-830P8	SLPR14-830P8	SLPP14-830P88	Pigtail QD, 8-pin M12/Euro	829 mm	22.5 ms	83	
	SLPE14-830	SLPR14-830	SLPP14-830	Integral RD				
970 mm	SLPE14-970P8	SLPR14-970P8	SLPP14-970P88	Pigtail QD, 8-pin M12/Euro	969 mm	25.5 ms	97	
	SLPE14-970	SLPR14-970	SLPP14-970	Integral RD				
1110 mm	SLPE14-1110P8	SLPR14-1110P8	SLPP14-1110P88	Pigtail QD, 8-pin M12/Euro	1108 mm	28.5 ms	111	
	SLPE14-1110	SLPR14-1110	SLPP14-1110	Integral RD				
1250 mm	SLPE14-1250P8	SLPR14-1250P8	SLPP14-1250P88	Pigtail QD, 8-pin M12/Euro	1248 mm	31.5 ms	125	
	SLPE14-1250	SLPR14-1250	SLPP14-1250	Integral RD				
1390 mm	SLPE14-1390P8	SLPR14-1390P8	SLPP14-1390P88	Pigtail QD, 8-pin M12/Euro	1388 mm	34.5 ms	139	
	SLPE14-1390	SLPR14-1390	SLPP14-1390	Integral RD				
1530 mm	SLPE14-1530P8	SLPR14-1530P8	SLPP14-1530P88	Pigtail QD, 8-pin M12/Euro	1528 mm	37.5 ms	153	
	SLPE14-1530	SLPR14-1530	SLPP14-1530	Integral RD				
1670 mm	SLPE14-1670P8	SLPR14-1670P8	SLPP14-1670P88	Pigtail QD, 8-pin M12/Euro	1667 mm	40.5 ms	167	
	SLPE14-1670	SLPR14-1670	SLPP14-1670	Integral RD				
1810 mm	SLPE14-1810P8	SLPR14-1810P8	SLPP14-1810P88	Pigtail QD, 8-pin M12/Euro	1807 mm	43.5 ms	181	
	SLPE14-1810	SLPR14-1810	SLPP14-1810	Integral RD				

EZ-SCREEN® Low-Profile Systems, 25 mm Resolution

Defined Area	Models*			Connection**	Housing Length (L)	Response Time	# of Beams	Data Sheet
	Emitter	Receiver	Pair†					
270 mm	SLPE25-270P8	SLPR25-270P8	SLPP25-270P88	Pigtail QD, 8-pin M12/Euro	270 mm	8 ms	14	140044
	SLPE25-270	SLPR25-270	SLPP25-270	Integral RD				
410 mm	SLPE25-410P8	SLPR25-410P8	SLPP25-410P88	Pigtail QD, 8-pin M12/Euro	410 mm	9.5 ms	21	
	SLPE25-410	SLPR25-410	SLPP25-410	Integral RD				
550 mm	SLPE25-550P8	SLPR25-550P8	SLPP25-550P88	Pigtail QD, 8-pin M12/Euro	549 mm	11 ms	28	
	SLPE25-550	SLPR25-550	SLPP25-550	Integral RD				
690 mm	SLPE25-690P8	SLPR25-690P8	SLPP25-690P88	Pigtail QD, 8-pin M12/Euro	689 mm	12.5 ms	35	
	SLPE25-690	SLPR25-690	SLPP25-690	Integral RD				

More on next page

* Only standard yellow housing models are listed. 300 mm Pigtail QD models (example, **SLPE14-270P8**) have yellow PVC cable and black PVC QD overmold.
For other models:
Anodized aluminum housing: Prior to the connection designation (if any) in the model number, add **A** for a clear (brushed) anodized aluminum finish and black endcaps (example, **SLPE14-270AP8**). Pigtail QD models (example, **SLPE14-270AP8**) have black PVC cable and QD overmold.
ESD-safe models: Prior to the connection designation (if any) in the model number, add **N** for a nickel-plated housing and endcaps (example, **SLPE14-270NP8**). Pigtail QD models (example, **SLPE14-270NP8**) have black PVC cable and QD overmold.

** Pigtail QD models require mating cordsets with an 8-pin M12/Euro-style connector (such as **QDE-8..D**, **DEE2R-8..D** or **CSB-M128..M1281**; see page 36). Integral RD models require mating cordsets with a removable disconnect connector (such as **RDLP-8..D** or **DELPE-8..D**; see page 36).

† A pair includes an emitter and receiver.

EZ-SCREEN® Low-Profile Systems, 25 mm Resolution (cont'd)

Defined Area	Models*			Connection**	Housing Length (L)	Response Time	# of Beams	Data Sheet
	Emitter	Receiver	Pair†					
830 mm	SLPE25-830P8	SLPR25-830P8	SLPP25-830P88	Pigtail QD, 8-pin M12/Euro	829 mm	14 ms	42	140044
	SLPE25-830	SLPR25-830	SLPP25-830	Integral RD				
970 mm	SLPE25-970P8	SLPR25-970P8	SLPP25-970P88	Pigtail QD, 8-pin M12/Euro	969 mm	15.5 ms	49	
	SLPE25-970	SLPR25-970	SLPP25-970	Integral RD				
1110 mm	SLPE25-1110P8	SLPR25-1110P8	SLPP25-1110P88	Pigtail QD, 8-pin M12/Euro	1108 mm	17 ms	56	
	SLPE25-1110	SLPR25-1110	SLPP25-1110	Integral RD				
1250 mm	SLPE25-1250P8	SLPR25-1250P8	SLPP25-1250P88	Pigtail QD, 8-pin M12/Euro	1248 mm	18.5 ms	63	
	SLPE25-1250	SLPR25-1250	SLPP25-1250	Integral RD				
1390 mm	SLPE25-1390P8	SLPR25-1390P8	SLPP25-1390P88	Pigtail QD, 8-pin M12/Euro	1388 mm	20 ms	70	
	SLPE25-1390	SLPR25-1390	SLPP25-1390	Integral RD				
1530 mm	SLPE25-1530P8	SLPR25-1530P8	SLPP25-1530P88	Pigtail QD, 8-pin M12/Euro	1528 mm	21 ms	77	
	SLPE25-1530	SLPR25-1530	SLPP25-1530	Integral RD				
1670 mm	SLPE25-1670P8	SLPR25-1670P8	SLPP25-1670P88	Pigtail QD, 8-pin M12/Euro	1668 mm	22.5 ms	84	
	SLPE25-1670	SLPR25-1670	SLPP25-1670	Integral RD				
1810 mm	SLPE25-1810P8	SLPR25-1810P8	SLPP25-1810P88	Pigtail QD, 8-pin M12/Euro	1807 mm	24 ms	91	
	SLPE25-1810	SLPR25-1810	SLPP25-1810	Integral RD				

EZ-SCREEN® Low-Profile Cascade Systems, 14 mm Resolution

Defined Area	Models*			Connection**	Housing Length (L)	Response Time	# of Beams	Data Sheet
	Emitter	Receiver	Pair†					
410 mm	SLPCE14-410P8	SLPCR14-410P8	SLPCP14-410P88	Pigtail QD, 8-pin M12/Euro	410 mm	13.5 ms	41	140044
	SLPCE14-410	SLPCR14-410	SLPCP14-410	Integral RD				
550 mm	SLPCE14-550P8	SLPCR14-550P8	SLPCP14-550P88	Pigtail QD, 8-pin M12/Euro	549 mm	16.5 ms	55	
	SLPCE14-550	SLPCR14-550	SLPCP14-550	Integral RD				
690 mm	SLPCE14-690P8	SLPCR14-690P8	SLPCP14-690P88	Pigtail QD, 8-pin M12/Euro	689 mm	19.5 ms	69	
	SLPCE14-690	SLPCR14-690	SLPCP14-690	Integral RD				
830 mm	SLPCE14-830P8	SLPCR14-830P8	SLPCP14-830P88	Pigtail QD, 8-pin M12/Euro	829 mm	22.5 ms	83	
	SLPCE14-830	SLPCR14-830	SLPCP14-830	Integral RD				
970 mm	SLPCE14-970P8	SLPCR14-970P8	SLPCP14-970P88	Pigtail QD, 8-pin M12/Euro	969 mm	25.5 ms	97	
	SLPCE14-970	SLPCR14-970	SLPCP14-970	Integral RD				
1110 mm	SLPCE14-1110P8	SLPCR14-1110P8	SLPCP14-1110P88	Pigtail QD, 8-pin M12/Euro	1108 mm	28.5 ms	111	
	SLPCE14-1110	SLPCR14-1110	SLPCP14-1110	Integral RD				

* Only standard yellow housing models are listed. Pigtail QD models (example, **SLPE25-830P8**) have yellow PVC cable and black PVC QD overmold.
For other models:
Anodized aluminum housing: Prior to the connection designation (if any) in the model number, add **A** for a clear (brushed) anodized aluminum finish and black endcaps (example, **SLPE25-830AP8**). Pigtail QD models (example, **SLPE25-830AP8**) have black PVC cable and QD overmold.
ESD-safe models: Prior to the connection designation (if any) in the model number, add **N** for a nickel-plated housing and endcaps (example, **SLPE25-830NP8**). Pigtail QD models (example, **SLPE25-830NP8**) have black PVC cable and QD overmold.
** Pigtail QD models require mating cordsets with an 8-pin M12/Euro-style connector (such as **QDE-8..D**, **DEE2R-8..D** or **CSB-M128..M1281**; see page 36). Integral RD models require mating cordsets with a removable disconnect connector (such as **RDLP-8..D** or **DELPE-8..D**; see page 36).
† A pair includes an emitter and receiver.

More on next page

EZ-SCREEN® Low-Profile Cascade Systems, 14 mm Resolution (cont'd)

Defined Area	Models*			Connection**	Housing Length (L)	Response Time	# of Beams	Data Sheet
	Emitter	Receiver	Pair†					
1250 mm	SLPCE14-1250P8	SLPCR14-1250P8	SLPCP14-1250P88	Pigtail QD, 8-pin M12/Euro	1248 mm	31.5 ms	125	140044
	SLPCE14-1250	SLPCR14-1250	SLPCP14-1250	Integral RD				
1390 mm	SLPCE14-1390P8	SLPCR14-1390P8	SLPCP14-1390P88	Pigtail QD, 8-pin M12/Euro	1388 mm	34.5 ms	139	
	SLPCE14-1390	SLPCR14-1390	SLPCP14-1390	Integral RD				
1530 mm	SLPCE14-1530P8	SLPCR14-1530P8	SLPCP14-1530P88	Pigtail QD, 8-pin M12/Euro	1528 mm	37.5 ms	153	
	SLPCE14-1530	SLPCR14-1530	SLPCP14-1530	Integral RD				
1670 mm	SLPCE14-1670P8	SLPCR14-1670P8	SLPCP14-1670P88	Pigtail QD, 8-pin M12/Euro	1667 mm	40.5 ms	167	
	SLPCE14-1670	SLPCR14-1670	SLPCP14-1670	Integral RD				
1810 mm	SLPCE14-1810P8	SLPCR14-1810P8	SLPCP14-1810P88	Pigtail QD, 8-pin M12/Euro	1807 mm	43.5 ms	181	
	SLPCE14-1810	SLPCR14-1810	SLPCP14-1810	Integral RD				

EZ-SCREEN® Low-Profile Cascade Systems, 25 mm Resolution

Defined Area	Models*			Connection**	Housing Length (L)	Response Time	# of Beams	Data Sheet
	Emitter	Receiver	Pair†					
410 mm	SLPCE25-410P8	SLPCR25-410P8	SLPCP25-410P88	Pigtail QD, 8-pin M12/Euro	410 mm	9.5 ms	21	140044
	SLPCE25-410	SLPCR25-410	SLPCP25-410	Integral RD				
550 mm	SLPCE25-550P8	SLPCR25-550P8	SLPCP25-550P88	Pigtail QD, 8-pin M12/Euro	549 mm	11 ms	28	
	SLPCE25-550	SLPCR25-550	SLPCP25-550	Integral RD				
690 mm	SLPCE25-690P8	SLPCR25-690P8	SLPCP25-690P88	Pigtail QD, 8-pin M12/Euro	689 mm	12.5 ms	35	
	SLPCE25-690	SLPCR25-690	SLPCP25-690	Integral RD				
830 mm	SLPCE25-830P8	SLPCR25-830P8	SLPCP25-830P88	Pigtail QD, 8-pin M12/Euro	829 mm	14 ms	42	
	SLPCE25-830	SLPCR25-830	SLPCP25-830	Integral RD				
970 mm	SLPCE25-970P8	SLPCR25-970P8	SLPCP25-970P88	Pigtail QD, 8-pin M12/Euro	969 mm	15.5 ms	49	
	SLPCE25-970	SLPCR25-970	SLPCP25-970	Integral RD				
1110 mm	SLPCE25-1110P8	SLPCR25-1110P8	SLPCP25-1110P88	Pigtail QD, 8-pin M12/Euro	1108 mm	17 ms	56	
	SLPCE25-1110	SLPCR25-1110	SLPCP25-1110	Integral RD				
1250 mm	SLPCE25-1250P8	SLPCR25-1250P8	SLPCP25-1250P88	Pigtail QD, 8-pin M12/Euro	1248 mm	18.5 ms	63	
	SLPCE25-1250	SLPCR25-1250	SLPCP25-1250	Integral RD				
1390 mm	SLPCE25-1390P8	SLPCR25-1390P8	SLPCP25-1390P88	Pigtail QD, 8-pin M12/Euro	1388 mm	20 ms	70	
	SLPCE25-1390	SLPCR25-1390	SLPCP25-1390	Integral RD				
1530 mm	SLPCE25-1530P8	SLPCR25-1530P8	SLPCP25-1530P88	Pigtail QD, 8-pin M12/Euro	1528 mm	21 ms	77	
	SLPCE25-1530	SLPCR25-1530	SLPCP25-1530	Integral RD				
1670 mm	SLPCE25-1670P8	SLPCR25-1670P8	SLPCP25-1670P88	Pigtail QD, 8-pin M12/Euro	1668 mm	22.5 ms	84	
	SLPCE25-1670	SLPCR25-1670	SLPCP25-1670	Integral RD				
1810 mm	SLPCE25-1810P8	SLPCR25-1810P8	SLPCP25-1810P88	Pigtail QD, 8-pin M12/Euro	1807 mm	24 ms	91	
	SLPCE25-1810	SLPCR25-1810	SLPCP25-1810	Integral RD				

* Only standard yellow housing models are listed. Pigtail QD models (example, **SLPCE25-1670P8**) have yellow PVC cable and black PVC QD overmold.
For other models:
Anodized aluminum housing: Prior to the connection designation (if any) in the model number, add **A** for a clear (brushed) anodized aluminum finish and black endcaps (example, **SLPCE25-1670AP8**). Pigtail QD models (example, **SLPCE25-1670AP8**) have black PVC cable and QD overmold.
ESD-safe models: Prior to the connection designation (if any) in the model number, add **N** for a nickel-plated housing and endcaps (example, **SLPCE25-1670NP8**). Pigtail QD models (example, **SLPCE25-1670NP8**) have black PVC cable and QD overmold.
** Pigtail QD models require mating cordsets with an 8-pin M12/Euro-style connector (such as **QDE-8..D**, **DEE2R-8..D** or **CSB-M128..M1281**; see page 36).
Integral RD models require mating cordsets with a removable disconnect connector (such as **RDLP-8..D** or **DELPE-8..D**; see page 36).
† A pair includes an emitter and receiver.

EZ-SCREEN® Low-Profile 14 & 25 mm Resolution Kits

You can purchase a kit that contains an emitter and receiver of equal length and resolution; brackets; and optional interfacing solution and quick-disconnect cordsets. Detailed information about individual kit components is as follows.

To Order:

1. Choose model, resolution and defined area.
2. Yellow housing is standard. To choose an optional housing, add an **A** or **N** prior to the connection designation:

   A for anodized aluminum (clear) finish with black endcaps (example, **SLPK25-270A**). †

   N for ESD-safe models with a nickel-plated housing and endcaps (example, **SLPK25-270N**). †
3. Choose the connection: 300 mm M12/Euro-Style Pigtail QD or integral Removable Disconnect (RD).
4. Choose an optional interfacing solution, such as an **IM-T-9A** or **-11** interfacing model.

See EZ-SCREEN LP manual (p/n 140044) or www.bannerengineering.com for complete information and a current listing of accessories and options for kitting components. Call factory with questions regarding accessories.

† Optional housings with Pigtail QD models have a black 300 mm PVC cable and QD overmold.

5. Choose one cordset for each sensor or two cordsets for a pair.

   M12/Euro Pigtail QD models (example, **SLPK25-270P88**) require mating 8-pin M12/Euro QD cordsets, such as:
   - QDE cordset with flying leads
   - DEE2R double-ended cordset
   - CSB series splitter cordset

   Integral RD models (example, **SLPK25-270**) require mating cordsets, such as:
   - RDLP cordset with flying leads
   - DELPE double-ended cordset with M12/Euro QD (requires additional mating 8-pin M12/Euro QD cordsets)
   - DELP cordset in cascade application for connection of 2nd, 3rd and 4th sensors

Kit Model Key

Model Style	Kit	Resolution		Defined Area	Finish	Connection		Interfacing Options	QD Cordset Length Options
S L P	K	1 4	—	2 7 0		P 8 8	—	1	R 1 5 E 2 5

Model Style

SLP = Standard
SLPC = Cascade

Kit

K = Kit

SLS Resolution

14 = 14 mm
25 = 25 mm

Sensor Finish

Blank = Yellow powder coat
A = Clear anodized Aluminum
N = Nickel plated (ESD)

QD Cordset Length Examples

RE15 = 4.6 m, 2 each
RE25 = 8 m, 2 each
R15E25 = 4.6 m (Receiver) & 8 m (Emitter)
R25E15 = 8 m (Receiver) & 4.6 m (Emitter)
DD1 = 0.3 m, 2 each, DEE2R-8xxD, DELPE-8xxD or DELP-11xxxE, depending on QD option
C1D15 = CSB-M1281M1281 (Receiver) DEE2R-815D (Emitter)
C8D25 = CSB-M1288M1281 (Receiver) DEE2R-850D (Emitter)
CU25D25 = CSB-UNT825M1281 (Receiver DEE2R-825D (Emitter)

Defined Area

270 mm *
410 mm
550 mm
690 mm
830 mm
970 mm
1110 mm
1250 mm
1390 mm
1530 mm
1670 mm
1810 mm

* 270 mm not available in cascade models

Connection Options

P88 = Two 300 mm pigtail with 8-pin Euro-style QD connector. Used with QDE-8xxD, DEE2R-8xxD or CSB-M1281M128xx. Cordsets ordered separately.
R88 = Two RDLP-8xxD Removable Disconnect cordsets with flying lead wires
D88 = Two DELPE-8xxD with 8-pin Euro-style QD connector. Used with QDE-8xxD, DEE2R-8xxD or CSB-M1281M128xx. Cordsets ordered separately.
D1111 = Two DELP-11xxxE cordsets for 2nd, 3rd or 4th SLPC cascade sensors.

Interfacing Options

1 = IM-T-9A Interface Module, 1 each
2 = IM-T-11A Interface Module, 1 each
3 = 11-BG00-31-D-024 Contactors (10A), 2 each
4 = BF1801L-024 Contactors (18A), 2 each
5 = EZAC-R9-QE8 = AC Interface Box (3 NO), 1 each
6 = EZAC-R11-QE8 = AC Interface Box (2 NO/1 NC), 1 each

NOTE: See notes under model number tables. Not all combinations are listed. Contact Banner Engineering Corp. for additional information and/or verification of valid kit model numbers.

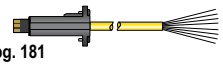
Accessories

EZ-SCREEN® (Type 4–Low-Profile)

Cordsets

For use with models with integral RD connections. All standard cordsets are yellow PVC with black overmold. For black PVC cable and overmold, add suffix B to model number (example, RDLP-815DB).

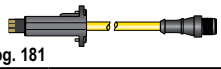
RD to Flying Leads



pg. 181

Length	8-Wire
4.6 m	RDLP-815D
8 m	RDLP-825D
15.3 m	RDLP-850D
23 m	RDLP-875D
30.5 m	RDLP-8100D

RD* to Euro QD

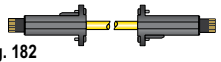


pg. 181

Length	8-Pin
0.3 m	DELPE-81D
1 m	DELPE-83D
2.5 m	DELPE-88D
4.6 m	DELPE-815D
8 m	DELPE-825D
15.3 m	DELPE-850D
23 m	DELPE-875D
30.5 m	DELPE-8100D

* Requires mating 8-pin M12/Euro cordset, such as those listed below.

RD to RD

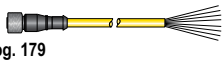


pg. 182

Length	Cascade
0.05 m	DELP-110E
0.3 m	DELP-111E
1 m	DELP-113E
2.5 m	DELP-118E
4.6 m	DELP-1115E
8 m	DELP-1125E
15.3 m	DELP-1150E
23 m	DELP-1175E
30.5 m	DELP-11100E

For use with models with Pigtail QD and DELPE-8xxD connections.

Euro QD to Flying Leads



pg. 179

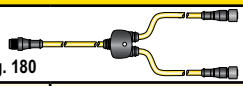
Length	8-Pin
4.5 m	QDE-815D
7.6 m	QDE-825D
15.2 m	QDE-850D
22.8 m	QDE-875D
30.4 m	QDE-8100D

Euro QD–Double-Ended

pg. 180

Length	8-Pin
0.3 m	DEE2R-81D
0.9 m	DEE2R-83D
2.5 m	DEE2R-88D
4.6 m	DEE2R-815D
7.6 m	DEE2R-825D
15.2 m	DEE2R-850D
22.9 m	DEE2R-875D
30.5 m	DEE2R-8100D

Euro QD Splitter



pg. 180

Length	8-Pin
0 m	CSB-M1280M1280
0.3 m	CSB-M1281M1281
2.5 m	CSB-M1288M1281
4.6 m	CSB-M12815M1281
7.6 m	CSB-M12825M1281
7.6 m	CSB-UNT825M1281

Brackets

Low-Profile 14 & 25 mm

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LPA-MBK-11*

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LPA-MBK-12*

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LPA-MBK-20

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LPA-MBK-22

Low-Profile 14 & 25 mm–Cascade

pg. 170

LPA-MBK-21

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LPA-MBK-90

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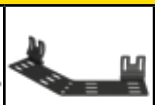
LPA-MBK-120



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LPA-MBK-135

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LPA-MBK-180

* Standard brackets included with emitter/receiver
Additional brackets are available, see page 164.

Replacement Parts

Model	Description
STP-13	14 mm test piece (for 14 mm resolution systems)
STP-17	34 mm test piece (for 14 mm resolution systems with 2-beam reduced resolution enabled)
STP-16	25 mm test piece (for 25 mm resolution systems)
STP-18	65 mm test piece (for 25 mm resolution systems with 2-beam reduced resolution enabled)
LPA-TP-1	Terminator plug, for emitter or receiver

Model	Description
DELPE-81D	Replacement for M12-terminated pigtail QD, as shipped with standard pigtail QD models; 8-conductor cable, 24 AWG; 0.3 m long
LPA-MBK-11	End-cap bracket kit (includes 2 end brackets and hardware to mount one sensor to MSA series stands; 360° sensor rotation; 14 ga (1.9 mm) steel, black zinc plated; die-cast zinc end-cap plate
LPA-MBK-12	Side-mount bracket kit (includes 1 bracket and hardware to mount to MSA Series stands; +10°/ −30° sensor rotation; 14 ga (1.9 mm) steel, black zinc plated; die-cast zinc clamp

NOTE: See page 51 for interfacing solutions.
Additional accessories are listed on page 163.

EZ-SCREEN® Low-Profile 14 & 25 mm Resolution Specifications

Supply Voltage at the Device	24V dc ±15% (use a SELV-rated supply according to EN IEC60950) (The external voltage supply must be capable of buffering brief mains interruptions of 20 milliseconds, as specified in EN/IEC 60204-1.)
Residual Ripple	± 10% maximum
Supply Current	**Emitter:** 100 mA max. **Receiver:** 275 mA max., exclusive of OSSD1 and OSSD2 loads (up to an additional 0.5A each) and Aux Output load (up to an additional 0.25A)
Response Time	8 to 43.5 milliseconds **Cascade safety stop interface (CSSI):** 40 miliseconds max.
Remote Test Input	Test mode is activated either by applying a low signal (less than 3V dc) to emitter Test/Reset terminal for a minimum of 50 milliseconds, or by opening a switch connected between Test/Reset and 24V dc for a minimum of 50 milliseconds. Beam scanning stops to simulate a blocked condition. A high signal at Test/Reset deactivates Test Mode. (See p/n 140044 for more information.) **High Signal:** 10 to 30V dc **Low Signal:** 0 to 3V dc **Input Current:** 35 mA inrush, 10 mA max.
Wavelength of Emitter Elements	Infrared LEDs, 850 nm at peak emission
Recovery Time–Blocked to clear (OSSDs turn ON; varies with total number of sensing beams and whether Sync beam is blocked)	<table><tr><th></th><th>Beam 1 (Sync Beam)</th><th>All Other Beams</th></tr><tr><td>**14 mm Models**</td><td>109 to 800 ms</td><td>33 to 220 ms</td></tr><tr><td>**25 mm Models**</td><td>81 to 495 ms</td><td>25 to 152 ms</td></tr></table>
EDM Input	+24V dc signals from external device contacts can be monitored (one-channel, two-channel or no monitoring) via EDM1 and EDM2 terminals in the receiver (see p/n 140044 for more information). **High Signal:** 10 to 30V dc at 30 mA typical **Low Signal:** 0 to 3V dc **Dropout Time:** 200 ms max.
Reset Input	The Reset input must be high for 0.25 to 2 seconds and then low to reset the receiver. **High Signal:** 10 to 30V dc at 30 mA typical **Low Signal:** 0 to 3V dc **Closed Switch Time:** 0.25 to 2 seconds
Safety Outputs (OSSDs)	Two redundant solid-state 24V dc, 0.5 A 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”. **ON-State voltage:** ≥ Vin-1.5V dc **OFF-State voltage:** 1.2V dc max. (0-1.2V dc) **Max. load capacitance:** 1.0 µF **Max. load inductance:** 10 H **Leakage Current:** 0.50 mA maximum **Cable Resistance:** 10 Ω maximum **OSSD test pulse width:** 100 to 300 microseconds **OSSD test pulse period:** 10 to 22 milliseconds (varies with number of beams) **Switching Current:** 0-0.5 A
Auxiliary (Aux.) /Fault Output Switching Capacity	Current-sourcing (PNP) Solid-state output, 24V dc at 250 mA max. that follow safety outputs or lock out status (configurable)

More on next page

EZ-SCREEN® Low-Profile 14 & 25 mm Resolution Specifications (cont'd)

Controls and Adjustments	**Emitter:** **Scan Code selection:** 2-position switch (code 1 or 2). Factory default position is code 1. **Test/Reset:** 2-position switch. Factory default position is Reset. **Invert Display:** 2-position switch default is OFF **Receiver:** **Scan Code selection:** 2-position switch (code 1 or 2). Factory default position is code 1. **Trip/Latch Output selection:** Redundant switches. Factory default position is T (trip). **EDM/MPCE monitor selection:** 2-position switch selects between 1- or 2-channel monitoring. Factory default position is 2. **Reduced Resolution:** Redundant switches. Factory default position is OFF. **Aux/Fault:** 2-position switch. Factory default position is Aux. **Invert Display:** 2-position switch. Factory default is OFF.
Short Circuit Protection	All inputs and outputs are protected from short circuits to +24V dc or dc common.
Electrical Safety Class (IEC 61140)	III
Operating Range	6 m Range decreases with use of mirrors and/or lens shields: **Lens shields** – approximately 10% less range per shield. **Glass-surface mirrors** – approximately 8% less range per mirror. See the Accessory section for more information on a specific mirror page 194, for further information.
Ambient Light Immunity	> 10,000 lux at 5° angle of incidence
Strobe Light immunity	Totally immune to one Federal Signal Corp. "Fireball" model FB2PST strobe
Effective Aperture Angle (EAA)	Meets Type 4 requirements per IEC 61496-2, ± 2.5° @ 3 m
Enclosure	**Materials:** Extruded aluminum housing with yellow polyester powder finish standard (optional clear anodized aluminum or nickel-plated silver finish) and well-sealed, rugged die-cast zinc end caps, acrylic lens cover, copolyester access cover. End caps on silver models are also nickel-plated. ESD-safe models have static-dissipative acrylic lens cover. **Rating:** IP65
Operating Conditions	**Temperature:** 0° to +55° C **Max. Relative Humidity:** 95% maximum relative humidity (non-condensing)
Status Indicators	**Emitter:** **One Bi-color (Red/Green) status indicator–** indicates operating mode, lockout or power OFF condition **7-segment Diagnostic Indicator (1 digit) –** indicates proper operation, scan code or error code **Receiver:** **Yellow Reset indicator** – indicates whether system is ready for operation or requires a reset **Bi-color (Red/Green) Status indicator** – indicates general system and output status **Bi-color (Red/Green) Zone Status indicators** – indicate condition (clear or blocked beam) of a defined group of beams **7-Segment Diagnostic indicator (1 digit)** – indicates proper operation, scan code, or error code, total number of blocked beams
Mounting Hardware	Emitter and receiver each are supplied with a pair of swivel end-mounting brackets and two swivel side-mounting brackets. Models longer than 690 mm also include one or more additional side-mount brackets for center support. See P/N 140044 for more information.
Shock and Vibration	EZ-SCREEN LP components have passed vibration and shock tests according to IEC 61496-1. This includes vibration (10 cycles) of 10-55 Hz at 0.35 mm single amplitude (0.70 mm peak-to-peak) and shock of 10 g for 16 milliseconds (6,000 cycles).
Design Standards	Designed to comply with Type 4 per IEC 61496; Type 4 per UL 61496-1/-2; Category 4 PLe per EN ISO 13849-1; SIL 3 per IEC 61508, SIL CL3 per IEC 62061
Certifications	CE c UL us LISTED
Wiring Diagrams	WD002, WD003, WD004, WD005, WD006, WD007, WD013, WD014, WD015, WD016, WD017, WD018, WD019 (pp. 220-230)

EZ-SCREEN®

Type 2 Point-of-Operation

- A low-cost solution is suited to lower-risk applications where the result of an accident is only a slight injury such as a bump, bruise, knockdown or trapping (but not crushing), minor cuts and abrasions.
- Simple two-piece system requires no control box.
- 30 mm resolution detects narrow objects, such as a hand or ankle across long spans up to 15 m.
- System meets all requirements for Type 2 devices per IEC 61496.
- System performs continual internal self-tests and provides Test function for external safety checks.
- Dedicated models eliminate selectable functions, DIP switches and programming.
- Trip output model automatically resets when the beam is cleared; Latch output model requires a manual reset.
- Fast response times of 11 to 25 milliseconds shutdown machinery quickly.

EZ-SCREEN® Type 4
EZ-SCREEN® Type 2
PICO-GUARD™
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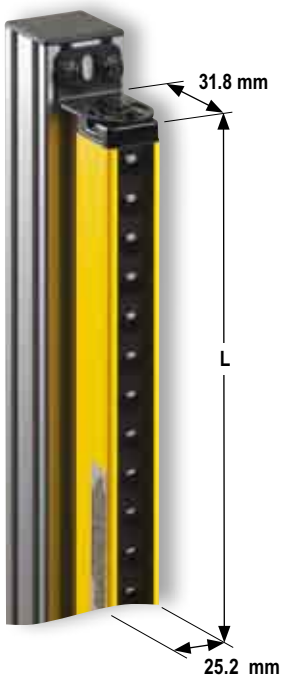
EZ-SCREEN® Type 2 Systems

- Economical, compact optical safeguarding
- Type 2 per IEC 61496
- 30 mm resolution and 15 m range
- 24V dc supply voltage
- Two solid-state OSSD safety outputs
- Latch or trip output, depending on model
- 8-pin Euro QD connection
- QD cordsets ordered separately or in kits (see page 42)
- IEC IP65 housing



EZ-SCREEN Type 2 Systems

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Full View

Yellow Painted Aluminum

EZ-SCREEN® Type 2 Systems, 30 mm Resolution–15 m Range

Defined Area	Output	Models			Connection**	Housing Length (L)	Response Time	# of Beams	Data Sheet
		Emitter	Receiver	Pair†					
150 mm	Trip	LS2E30-150Q8	LS2TR30-150Q8	LS2TP30-150Q88	8-pin Euro QD	215 mm	11 ms	8	122452
	Latch		LS2LR30-150Q8	LS2LP30-150Q88					
300 mm	Trip	LS2E30-300Q8	LS2TR30-300Q8	LS2TP30-300Q88		365 mm	13 ms	16	
	Latch		LS2LR30-300Q8	LS2LP30-300Q88					
450 mm	Trip	LS2E30-450Q8	LS2TR30-450Q8	LS2TP30-450Q88		515 mm	14 ms	24	
	Latch		LS2LR30-450Q8	LS2LP30-450Q88					
600 mm	Trip	LS2E30-600Q8	LS2TR30-600Q8	LS2TP30-600Q88		665 mm	16 ms	32	
	Latch		LS2LR30-600Q8	LS2LP30-600Q88					
750 mm	Trip	LS2E30-750Q8	LS2TR30-750Q8	LS2TP30-750Q88		815 mm	17 ms	40	
	Latch		LS2LR30-750Q8	LS2LP30-750Q88					
900 mm	Trip	LS2E30-900Q8	LS2TR30-900Q8	LS2TP30-900Q88		964 mm	19 ms	48	
	Latch		LS2LR30-900Q8	LS2LP30-900Q88					
1050 mm	Trip	LS2E30-1050Q8	LS2TR30-1050Q8	LS2TP30-1050Q88		1114 mm	21 ms	56	
	Latch		LS2LR30-1050Q8	LS2LP30-1050Q88					
1200 mm	Trip	LS2E30-1200Q8	LS2TR30-1200Q8	LS2TP30-1200Q88		1264 mm	22 ms	64	
	Latch		LS2LR30-1200Q8	LS2LP30-1200Q88					
1350 mm	Trip	LS2E30-1350Q8	LS2TR30-1350Q8	LS2TP30-1350Q88		1414 mm	24 ms	72	
	Latch		LS2LR30-1350Q8	LS2LP30-1350Q88					
1500 mm	Trip	LS2E30-1500Q8	LS2TR30-1500Q8	LS2TP30-1500Q88		1563 mm	25 ms	80	
	Latch		LS2LR30-1500Q8	LS2LP30-1500Q88					

† A pair includes an emitter and receiver.
** A model with a QD requires a mating cordset (see page 42).

EZ-SCREEN® Type 2 Kits

You can purchase a kit that contains an emitter and receiver of equal length; brackets; and optional interfacing solution and quick-disconnect cordsets. Detailed information about individual kit components is as follows.

To Order:

1. Choose model, output and defined area.
2. Choose an optional interfacing solution, such as an **IM-T-9A** or **-11** interfacing model.
3. Choose one cordset for each sensor or two cordsets for a pair. Require mating 8-pin M12/Euro QD cordsets, such as:
   - QDE cordset with flying leads
   - DEE2R double-ended cordset
   - CSB series splitter cordset

See EZ-SCREEN Type 2 manual (p/n 122452) or www.bannerengineering.com for complete information and a current listing of accessories and options for kitting components. Call factory with questions regarding accessories.

Kit Model Key

Model Style	Kit	Resolution	Defined Area	Connection	Interfacing Options	QD Cordset Length Options
L S 2 T	K	3 0	6 0 0	Q 8 8	1	R E 2 5

Model Style

LS2T = Type 2 Light Screen (Trip)
LS2L = Type 2 Light Screen (Latch)

Kit

K = Kit

Resolution

30 = 30 mm

Defined Area

150 mm
300 mm
450 mm
600 mm
750 mm
900 mm
1050 mm
1200 mm
1350 mm
1500 mm

Receiver & Emitter QD Options

Q88 = Receiver with integral 8-pin Euro-style QD Emitter with integral 8-pin Euro-style QD

QD Cordset Length Examples

RE15 = 4.5 m, 2 each
RE25 = 7.6 m, 2 each
R15E25 = 4.5 m (Receiver) & 7.6 m (Emitter)
R25E15 = 8 m (Receiver) & 5 m (Emitter)
RE50 = 15.2 m, 2 each
R15E50 = 4.6 m (Receiver) & 15.2 m (Emitter)
R50E15 = 15.2 m (Receiver) & 4.6 m (Emitter)
R25E50 = 7.6 m (Receiver) & 15.2 m (Emitter)
R50E25 = 15.2 m (Receiver) & 7.6 m (Emitter)
RE75 = 22.8 m, 2 each
RE100 = 30.4 m, 2 each

Interfacing Examples

1 = IM-T-9A Interface Module, 1 each
2 = IM-T-11A Interface Module, 1 each
3 = 11-BG00-31-D-024 Contactors (10A), 2 each
4 = BF1801L-024 Contactors (18A), 2 each
10 = UM-FA-9A
11 = UM-FA-11A

NOTE: See notes under model number tables. Not all combinations are listed below.
Contact Banner Engineering Corp. for additional information and/or verification of valid kit model number.

Accessories

EZ-SCREEN® (Type 2–30 mm Resolution)

Cordsets

Euro QD to Flying Leads

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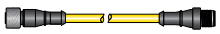
Length	8-Pin
4.5 m	QDE-815D
7.6 m	QDE-825D
15.2 m	QDE-850D
22.8 m	QDE-875D
30.4 m	QDE-8100D

Euro QD–Double-Ended



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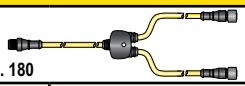
Length	8-Pin
0.3 m	DEE2R-81D
0.9 m	DEE2R-83D
2.5 m	DEE2R-88D
4.6 m	DEE2R-815D
7.6 m	DEE2R-825D
15.2 m	DEE2R-850D
22.9 m	DEE2R-875D
30.5 m	DEE2R-8100D

Euro QD Splitter



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Length	8-Pin
0 m	CSB-M1280M1280
0.3 m	CSB-M1281M1281
2.5 m	CSB-M1288M1281
4.6 m	CSB-M12815M1281
7.6 m	CSB-M12825M1281
7.6 m	CSB-UNT825M1281

Brackets

30 mm–Type 2

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USCMB-..	USMB-1	USMB-6	EZA-MBK-2	USMB-8

NOTE: See page 51 for interfacing solutions. Additional accessories are listed on page 163.

Replacement Parts

Model	Description
MGA-K-1	Replacement key for switch MGA-KS0-1
MGA-KS0-1	Keyed reset switch (same as that included in kits)
STP-14	30 mm test piece
USCMB-1	Center bracket kit and hardware to mount to MSA series stands (1 bracket, for 700 to 900 mm long sensors)
USCMB-2	Center bracket kit and hardware to mount to MSA series stands (2 brackets, for 1050 to 1500 mm long sensors)

EZ-SCREEN® Type 2 Specifications

Supply Voltage at the Device	24V dc ±20% (PELV) (The external voltage supply must be capable of buffering brief mains interruptions of 20 milliseconds as specified in EN/IEC 60204-1.)
Supply Current	**Emitter:** 50 mA max. **Receiver:** 90 mA max., exclusive of OSSD1 and OSSD2 loads (up to an additional 0.5A each)
Wavelength of Emitter Elements	Infrared LEDs, 950 nm at peak emission
Short Circuit Protection	All inputs and outputs are protected from short circuits to +24V dc or dc common*
Electrical Safety Class	III (per IEC 61140)
Operating Range	0.2 m to 15 m Range decreases with use of mirrors and/or lens shields: **Lens shields** – approximately 10% less range per shield. **Glass-surface mirrors** – approximately 8% less range per mirror. See Accessory section for more information on a specific mirror, page 194.
Effective Aperture Angle (EAA)	Meets Type 2 requirements per IEC 61496-2; ± 5° @ 3 m
Ambient Light Immunity	> 10,000 lux at 5° angle of incidence
Strobe Light Immunity	Immune as per IEC 61496-2
Response Time	Dependent on number of beams; see Models table on page 40.
EDM Input	"Power Monitoring" accomplished via Reset/Remote Test input
Reset Input / Remote Test Input	Connect to +24V dc via a normally closed (NC) reset switch **Auto Rest (Trip Output) Models:** Test/Reset **Manual Rest (Latch Output) Models:** Test/Restart/Reset
Safety Outputs	Two redundant solid-state 24V dc, 0.5 A max. sourcing OSSD (Output Signal Switching Device) safety outputs. (Use optional interface modules for ac or larger dc loads.) Not compatible with the Banner "Safety Handshake." **ON-State voltage:** > Vin-1.5V dc **OFF-State voltage:** 0.2V dc max. **Max. load capacitance:** 0.1 µF **Min. load resistance:** 48 Ω **Open ground leakage current:** 0.65 mA max. **OSSD test pulse width:** 0.2 - 0.25 milliseconds **OSSD test pulse period:** 260 milliseconds
Enclosure	**Materials:** Extruded aluminum housing with yellow polyester powder finish and well-sealed, rugged die-cast zinc end caps, acrylic lens cover **Rating:** IP65
Operating Conditions	**Temperature:** 0° to +55° C **Relative humidity:** 95% maximum (non-condensing)
Shock and Vibration	EZ-SCREEN Type 2 components have passed vibration and shock tests according to IEC 61496-1. This includes vibration (10 cycles) of 10-55 Hz at 0.35 mm single amplitude (0.70 mm peak-to-peak) and shock of 10 g for 16 milliseconds (6,000 cycles).
Design Standards	Designed to comply with Type 2 per IEC 61496-1, -2; Type 2 per UL 61496-1/-2; Category 2 per EN 954-1
Certifications	CE c UL us LISTED
Wiring Diagrams	**Emitter:** WD008 (p. 223) **Receiver with 2 Solid-State OSSDs, 2 FSDs and Power Monitoring:** WD009 (p. 224) **Power Monitoring of IM-T-9A Interface Module:** WD010 (p. 224)

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BRACKETS PAGE 48
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EZ-SCREEN®
Grids and Points

- Suited to a variety of access and long-range perimeter guarding applications
- Uses 1-, 2-, 3- or 4 beams to protect personnel and machinery
- Operates in ranges from 0.8 to 20 m or 15 to 70 m, depending on model
- Displays operating status, configuration and error codes
- Includes blocked beam zone indicators
- Features user-configurable trip or latch outputs, and Scan Code 1 or 2
- Can be combined with other devices, such as mirrors and Points, for a custom configuration
- Resists impact, twisting and abusive environments with a durable aluminum housing and metal endcaps
- Exceeds control reliability requirements and is certified per CE (Type 4/Category 4) and cULus (NIPF, Type 4) applications
- Offers optional lens shields and enclosures for added durability

EZ-SCREEN® Grid & Point Systems

- One to four beam models for access or perimeter guarding applications
- Two solid-state OSSD safety outputs
- 24V dc supply voltage
- Range from 0.8 to 20 m or 15 to 70 m, depending on model
- 7-segment diagnostic display
- Bi-color status indicator
- Type 4 per IEC 61496
- User configurable trip or latch outputs and Scan Code 1 or 2
- Configuration access port
- Models with integral Mini and Euro QD, or wiring terminal chamber
- QD cordsets ordered separately or kits (see page 48)

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EZ-SCREEN Grid Systems

EZ-SCREEN Point Systems

Full View

EZ-SCREEN Grid

EZ-SCREEN Point

EZ-SCREEN® Grid & Point Systems

Protected Height	Beam Spacing	Range	Models*			Connection**	Housing Length (L)	Data Sheet
			Emitter	Receiver	Pair†			
1066 mm	 533 mm	0.8 - 20 m	SGE3-533Q8E	SGR3-533Q8E	SGP3-533Q88E	8-pin Euro QD	1251 mm	68410
		15 - 70 m	SGXLE3-533Q8E		SGXLP3-533Q88E			
900 mm	 300 mm	0.8 - 20 m	SGE4-300Q8E	SGR4-300Q8E	SGP4-300Q88E		1084 mm	
		15 - 70 m	SGXLE4-300Q8E		SGXLP4-300Q88E			
800 mm	 400 mm	0.8 - 20 m	SGE3-400Q8E	SGR3-400Q8E	SGP3-400Q88E		984 mm	
		15 - 70 m	SGXLE3-400Q8E		SGXLP3-400Q88E			
584 mm	 584 mm	0.8 - 20 m	SGE2-584Q8E	SGR2-584Q8E	SGP2-584Q88E		768 mm	
		15 - 70 m	SGXLE2-584Q8E		SGXLP2-584Q88E			
500 mm	 500 mm	0.8 - 20 m	SGE2-500Q8E	SGR2-500Q8E	SGP2-500Q88E		684 mm	
		15 - 70 m	SGXLE2-500Q8E		SGXLP2-500Q88E			
N/A	 1-BEAM	0.8 - 20 m	SPE1Q8E	SPR1Q8E	SPP1Q88E		149 mm	68413
		15 - 70 m	SPXLE1Q8E		SPXLP1Q88E			

* For emitters and receivers with a wiring terminal chamber, remove the **Q8E** or **Q88E** from the model number (example, **SGE4-300**). For an emitter with a 5-pin Mini QD and TEST function, replace **Q8E** with **Q5** on emitter model numbers (example, **SGE4-300Q5**) and **Q88E** with **Q85** on pair model numbers (example, **SGP4-300Q85**). For emitters with a 3-pin Mini QD, replace **Q8E** with **Q3** (example, **SGE4-300Q3**); and for receivers with an 8-pin Mini QD, replace **Q8E** with **Q8** on model numbers (example, **SGE4-300Q8**); or for a pair replace **Q88E** with **Q83** (example, **SGP4-300Q83**). A model with a QD requires a mating cordset (see page 48).

† A pair includes an emitter and receiver (example, **SGP4-300Q88E**). Emitters (example, **SGE4-300Q8E**) and receivers (example, **SGR4-300Q8E**) are also sold separately.

EZ-SCREEN® Grid Kits

You can purchase a kit that contains an emitter and receiver of equal length and beam spacing; brackets; and optional interfacing solution and quick-disconnect cordsets. Detailed information about individual kit components is as follows.

To Order:

1. Choose model range, number of beams and beam spacing.
2. Choose the connection: Integral M12/Euro-Style QD or intergal Mini-Style QD
3. Choose an optional interfacing solution, such as an **IM-T-9A** or **-11** interfacing model.

See EZ-SCREEN Grids manual (p/n 68410) or www.bannerengineering.com for complete information and a current listing of accessories and options for kitting components. Call factory with questions regarding accessories.

4. Choose one cordset for each sensor or two cordsets for a pair.

M12/Euro QD models (example, **SGK4-300Q88E**) require mating 8-pin M12/Euro QD cordsets, such as:
- QDE cordset with flying leads
- DEE2R double-ended cordset
- CSB series splitter cordset

Mini QD models (example, **SGK4-300Q83**) require mating cordsets, such as:
- QDS cordset with flying leads

Kit Model Key

Model Style	Kit	No. of Beams		Beam Spacing	Connection		Interfacing Options		QD Cordset Length Options
S G	K	4	—	3 0 0	Q 8 8 E	—	1		R E 2 5

Model Style

SG = Safety Grid
SGXL = Safety Grid Long Range

Kit

K = Kit

No. of Beams

2 = two beams
3 = three beams
4 = four beams

Beam Spacing

300 mm
400 mm
500 mm
533 mm
584 mm

Receiver & Emitter QD Options

Blank =	Receiver and emitter with wiring terminal chamber
Q85 =	Receiver with integral 8-pin Mini-style QD Emitter with integral 5-pin Mini-style QD with Test
Q83 =	Receiver with integral 8-pin Mini-style QD Emitter with integral 3-pin Mini-style QD
Q88E =	Receiver and emitter with integral 8-pin Euro-style QD

Interfacing Examples

1 = IM-T-9A Interface Module, 1 each
2 = IM-T-11A Interface Module, 1 each
3 = 11-BG00-31-D-024 Contactors (10A), 2 each
4 = BF1801L-024 Contactors (18A), 2 each
5 = EZAC-R9-QE8 = AC Interface Box (3 NO), 1 each
6 = EZAC-R11-QE8 = AC Interface Box (2 NO/1 NC), 1 each

QD Cordset Length Examples

RE15 = 4.6 m, 2 each
RE25 = 7.6 m, 2 each
R15E25 = 4.6 m (Receiver) & 7.6 m (Emitter)
R25E15 = 7.6 m (Receiver) & 4.6 m (Emitter)
DD1 = 0.3 DEE2R-81D, 2 each
C1D15 = CSB-M1281M1281 (Receiver) DEE2R-815D (8-pin Emitter)
C8D25 = CSB-M1288M1281 (SLS Receiver) DEE2R-825D (8-pin Emitter)
CU25D25 = CSB-UNT825M1281 (SLS Receiver) DEE2R-825D (8-pin Emitter)

NOTE: See notes under model number table. Not all combinations are listed below. Contact Banner Engineering Corp. for additional information and/or verification of valid kit model numbers.

EZ-SCREEN® Point Kits

You can purchase a kit that contains an emitter and receiver of equal length; brackets; and optional interfacing solution and quick-disconnect cordsets. Detailed information about individual kit components is as follows.

To Order:

1. Choose model and range.
2. Choose the connection: Integral M12/Euro-Style QD or intergal Mini-Style QD
3. Choose an optional interfacing solution, such as an **IM-T-9A** or **-11** interfacing model.

See EZ-SCREEN Point manual (p/n 68413) or www.bannerengineering.com for complete information and a current listing of accessories and options for kitting components. Call factory with questions regarding accessories.

4. Choose one cordset for each sensor or two cordsets for a pair.

M12/Euro QD models (example, **SGK1-Q88E**) require mating 8-pin M12/Euro QD cordsets, such as:
- QDE cordset with flying leads
- DEE2R double-ended cordset
- CSB series splitter cordset

Mini QD models (example, **SGK1-Q83**) require mating cordsets, such as:
- QDS cordset with flying leads

Kit Model Key

Model Style	Kit	No. of Beams		Connector		Interfacing Options	QD Cordset Length Options
SP	K	1	—	Q 8 8 E	—	1	R E 2 5

Model Style

SP = Safety Point
SPXL = Safety Point Long Range

Kit

K = Kit

No. of Beams

1 = one beam

Receiver & Emitter QD Options

Blank =	Receiver and emitter with wiring terminal chamber
Q85 =	Receiver with integral 8-pin Mini-style QD Emitter with integral 5-pin Mini-style QD with Test
Q83 =	Receiver with integral 8-pin Mini-style QD Emitter with integral 3-pin Mini-style QD
Q88E =	Receiver and emitter with integral 8-pin Euro-style QD

NOTE: See notes under model table. Not all combinations are listed below. Contact Banner Engineering Corp. for additional information and/or verification of valid kit model numbers.

QD Cordset Length Examples

RE15 = 4.6 m, 2 each
RE25 = 7.6 m, 2 each
R15E25 = 4.6 m (Receiver) & 7.6 m (Emitter)
R25E15 = 7.6 m (Receiver) & 4.6 m (Emitter)
DD1 = 0.3 DEE2R-81D, 2 each
C1D15 = CSB-M1281M1281 (Receiver) DEE2R-815D (8-pin Emitter)
C8D25 = CSB-M1288M1281 (SLS Receiver) DEE2R-825D (8-pin Emitter)
CU25D25 = CSB-UNT825M1281 (SLS Receiver) DEE2R-825D (8-pin Emitter)

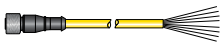
Interfacing Examples

1 = IM-T-9A Interface Module, 1 each
2 = IM-T-11A Interface Module, 1 each
3 = 11-BG00-31-D-024 Contactors (10A), 2 each
4 = BF1801L-024 Contactors (18A), 2 each
5 = EZAC-R9-QE8 = AC Interface Box (3 NO), 1 each
6 = EZAC-R11-QE8 = AC Interface Box (2 NO/1 NC), 1 each

Accessories EZ-SCREEN® (Grids & Points)

Cordsets

Euro QD to Flying Leads



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Length	8-Pin
4.5 m	QDE-815D
7.6 m	QDE-825D
15.2 m	QDE-850D
22.8 m	QDE-875D
30.4 m	QDE-8100D

Euro QD–Double-Ended

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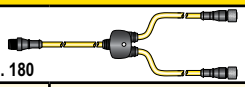
Length	8-Pin
0.3 m	DEE2R-81D
0.9 m	DEE2R-83D
2.5 m	DEE2R-88D
4.6 m	DEE2R-815D
7.6 m	DEE2R-825D
15.2 m	DEE2R-850D
22.9 m	DEE2R-875D
30.5 m	DEE2R-8100D

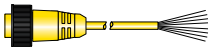
Euro QD Splitter



pg. 180

Length	8-Pin
0 m	CSB-M1280M1280
0.3 m	CSB-M1281M1281
2.5 m	CSB-M1288M1281
4.6 m	CSB-M12815M1281
7.6 m	CSB-M12825M1281
7.6 m	CSB-UNT825M1281

Mini QD with Flying Leads



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Length	3-Pin	5-Pin	8-Pin
4.5 m	QDS-315C	QDS-515C	QDS-815C
7.6 m	QDS-325C	QDS-525C	QDS-825C
15.2 m	QDS-350C	QDS-550C	QDS-850C
22.8 m	QDS-375C	–	QDS-875C
30.4 m	QDS-3100C	–	–

Brackets

Grid & Points–Type 4

pg. 166

EZA-MBK-1*

pg. 168

EZA-MBK-3

pg. 168

EZA-MBK-9

Points–Type 4

pg. 168

EZA-MBK-4

pg. 168

EZA-MBK-5

* Standard brackets included with emitter/receiver. Additional brackets are available, see page 164.
NOTE: See page 51 for interfacing solutions. Additional accessories are listed on page 163.

Replacement Parts

Model	Description
EZA-AP-1	Access port plug with o-ring
EZA-CP-13	Pg13.5 plug with o-ring
EZA-ECE-1	Emitter wiring chamber end cap (with gasket, captive screws, 3 plugs with o-rings, terminal block)
EZA-ECR-1	Receiver wiring chamber end cap (with gasket, captive screws, 3 plugs with o-rings, terminal block)
EZA-SW-1	Spanner wrench for Grid and Point
EZA-TBE-1	Emitter terminal block
EZA-TBR-1	Receiver terminal block
MGA-K-1	Replacement key for switch MGA-KS0-1
MGA-KS0-1	Keyed reset switch (same as that included in kits)
SMA-MBK-1	SSM Series Mirror Bracket Kit
STP-3	Specified test piece, 45 mm dia.

EZ-SCREEN® Grid & Point Specifications

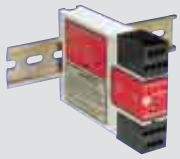
Supply Voltage (V in)	24V dc ±15%, 10% max. ripple
Supply Current	**Emitter:** 150 mA max. **Receiver:** 500 mA max., exclusive of OSSD1 and OSSD2 loads (up to an additional 0.5A each)
Short Circuit Protection	All inputs and outputs are protected from short circuits to +24V dc or dc common (except Emitter AUX power connections)
Response Time	24 milliseconds or less from interruption of light grid beam to safety outputs going to OFF-state
EDM Input	+24V dc signals from external device contacts can be monitored (single-channel, dual-channel or no monitoring) via EDM1 and EDM2 terminals in the receiver. Monitored devices must respond within 200 milliseconds of an output change.
Reset Input	The Reset input must be high (10 to 30V dc at 30 mA) for 0.25 to 2 seconds and then low (less than 3V dc) to reset the receiver.
Remote Test Input (optional- available only on certain models)	Test mode is activated either by applying a low signal (less than 3V dc) to emitter TEST1 terminal for a minimum of 50 milliseconds, or by opening a switch connected between TEST1 and TEST2 terminals for a minimum of 50 milliseconds. Beam scanning stops to simulate a blocked condition. A high signal (10 to 30V dc, 35 mA inrush, 10 mA max.) at TEST1 terminal deactivates Test mode and allows the emitter to operate normally. TEST1 and TEST2 are factory jumpered on models with wiring chamber.
Safety Outputs	Two diverse-redundant solid-state 24V dc, 0.5 A 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." **ON-State voltage:** ≥Vin-1.5V dc **OFF-State voltage:** 1.2V dc max. **Max. load resistance:** 1000 Ω **Max. load capacitance:** 0.1 µF **OSSD test pulse width:** 100 to 300 microseconds **OSSD test pulse period:** 10 to 27 milliseconds (varies with number of beams
Controls and Adjustments	**Emitter: Scan code selection:** 2-position switch (code 1 or 2). Factory default position is 1. **Receiver: Scan code selection:** 2-position switch (code 1 or 2). Factory default position is 1. **Trip/latch output selection:** redundant switches. Factory default position is L (latch) **EDM/MPCE monitor selection:** redundant switches select between 1- or 2-channel monitoring. Factory default position is 2.
Emitter/Receiver Operating Range	**Short-range models:** 0.8 m to 20 m **Long-range models:** 15 m to 70 m Range decreases with use of mirrors and/or lens shields.
Beam Spacing	**Model SG...4-300:** 300 mm **Model SG...3-400:** 400 mm **Model SG...2-500:** 500 mm **Model SG...3-533:** 533.4 mm **Model SG...2-584:** 584.2 mm
Beam Diameter	25 mm
Ambient Light Immunity	> 10,000 lux at 5° angle of incidence
Strobe Light Immunity	Totally immune to one Federal Signal Corp. "Fireball" model FB2PST strobe
Emitter Elements	Infrared LEDs, 880 nm at peak emission
Effective Aperture Angle (EAA)	Meets Type 4 requirements per IEC 61496-2 **Short-range models:** ± 2.5° @ 3 m **Long-range models:** ± 2.5° @ 15 m
Enclosure	**Materials:** Extruded aluminum housings with yellow polyester powder finish and well-sealed, rugged molded PBT end caps, acrylic lens cover **Rating:** NEMA 4, 13; IP65
Operating Conditions	**Temperature:** 0° to +50° C **Relative humidity:** 95% (non-condensing)
Shock and Vibration	EZ-SCREEN systems have passed vibration and shock tests according to IEC 61496-1/-2. This includes vibration (10 cycles) of 10-55 Hz at 0.35 mm single amplitude (0.70 mm peak-to-peak) and shock of 10 g for 16 milliseconds (6,000 cycles).

More on next page

EZ-SCREEN® Grid & Point Specifications (cont'd)

Status Indicators	**7-Segment Diagnostic Indicators, Both Emitter and Receiver** **Dash (–)** = System is OK **Error Codes** = See product manuals (p/n 68410 or 68413) for code definitions and recommended action **Scan code setting** (C1 or C2) = Appears during power-up or after scan code is changed. (Temporary indication; normal display resumes within a few seconds.) **Emitter:** One bi-color (red/green) Status indicator **Green steady** = RUN mode **Green single flashing** = TEST mode **Red single flashing** = Lockout **OFF** = No power to sensor **Receiver:** Two System Status indicators, plus one bi-color (red/green) Beam Status indicator for each beam **Yellow Reset Indicator** **ON steady** = RUN mode **Double flashing** = Waiting for manual reset after power-up **Single flashing** = Waiting for manual latch reset **OFF** = No power to sensor or system is not ready for operation **Bi-Color (Red/Green) Status Indicator** **Green steady** = Outputs ON **Red steady** = RUN mode, outputs OFF **Red single flashing** = Lockout **OFF** = No power to sensor or system is not ready for operation **Bi-Color (Red/Green) Beam Status Indicators** **Green steady** = Clear beam, strong signal **Green flickering** = Clear beam, weak signal **Red steady** = Beam blocked **OFF** = No power to sensor or no scanning
Mounting Hardware	Emitter and receiver each are supplied with a pair of swivel end mounting brackets. Mounting brackets are 8-gauge cold-rolled steel, black zinc finish.
Cables and Connections	Cables are user-supplied. Wiring terminals accommodate one 22 to 16 ga. wire or two wires up to 18 ga.; Pg 13.5 wiring chamber access port capacity varies, depending on cable gland or strain relief fitting used. Supplied cable gland is for a cable diameter of 6 to 12 mm.
Design Standards	Designed to comply with Type 4 per IEC 61496-1, -2; Type 4 per UL 61496-1/-2; Category 4 per ISO 13849-1 (EN 954-1)
Certifications	CE c UL us LISTED
Wiring Diagrams	WD011, WD012, WD013, WD014, WD015, WD016, WD017, WD018, WD019 (pp. 225-230)

EZ-SCREEN® Interfacing Products

Models			Description	Product Information	Data Sheet
Interface Modules and Controllers		**IM-T-9A** (3 NO)	• Interface modules provide two or three normally open force-guided relay outputs rated at 6 A. • EZ-SCREEN monitors these interface modules when they are connected to the EZ-SCREEN External Device Monitoring (EDM) inputs. • Convenient plug-in terminal blocks on a 22.5 mm DIN-rail mountable housing are included.	Page 107	62822
		IM-T-11A (2 NO/1 NC)			
		**SC22-3-S...**	• One controller provides configurable monitoring of multiple safety devices. • 22 input terminals can monitor both contact-based and PNP solid-state input devices. • 3 pairs of independent solid-state safety outputs can be used with selectable one- or two-channel external device monitoring. • Ten configurable non-safety status outputs track inputs, outputs, lockout, I/O status and other functions • SC22-3 modules use 24V dc. • 10/100 Base TX Ethernet communication option using EtherNet/IP and Modbus TCP protocols (SC22-3E models).	Page 76	133487
		SC22-3-C...			
		SC22-3E-S...			
		SC22-3E-C...			
Muting Modules		**MM-TA-12B**	• The Muting Module temporarily inhibits a safety light screen so materials can safely pass through the screen without stopping the machinery. • The module uses redundant microcontroller-based logic. • MMD Modules can be used as dual controllers when muting function is not used.	Page 94	63517
		MMD-TA-12B			116390
		MMD-TA-11B			
Receiver AC Interface Boxes		**EZAC-R9-QE8**	• Versatile power supplies allow EZ-SCREEN systems to connect to AC power sources. • Models are available to accommodate receivers only, emitters only, or both. • Receiver models include 8 amp safety relay output.	Page 189	120321
		EZAC-R11-QE8			
		EZAC-R15A-QE8-QS83			
		EZAC-R8N-QE8-QS53			
		EZAC-R10N-QE8-QS53			
Emitter AC Interface Boxes		**EZAC-E-QE8**			
		EZAC-E-QE5			
		EZAC-E-QE8-QS3			
		EZAC-E-QE5-QS5			
Contactors		**Mechanically Linked Contactors**	• Pairs of contactors create safety stop circuits with two normally open contacts in series. • EZ-SCREEN can monitor the circuit because of the contacts' force-guided mechanically linked design. • Contactors add 10 or 18 amp current carrying capability to any safety system. • Auxiliary contacts add 3 or 4 normally open contacts • Suppressors extend the life of an actuating device that uses a contactor. • Modular design simplifies assembly and installation.	Page 191	111881
		11-BG00-31-D-024			
		BF1801L-024			
		Aux. Contacts			
		11-BGX10-40			
		11-G484-30			
		Suppressors			
		11-BGX77-048			
		11-G318-48			

NC = Normally closed, NO = Normally open

LIGHT SCREENS

PICO-GUARD™ Grids & Points

page 61

- Fiber optic elements are for use with PICO-GUARD Controllers and fiber optic cables in personnel safety and equipment-protection applications.
- Choices include compact 12 or 30 mm non-contact fiber optic Point elements or Grid systems for perimeter and access guarding.
- Each fiber optic channel is one emitter/receiver (up to 4 pairs per controller).
- Grid system features rugged anodized aluminum construction, with 2, 3 or 4 beams and beam spacing from 300 to 584 mm.
- Each Point or Grid element can function as emitter or receiver, depending on installation.
- 12 mm Point has impact-resistant polycarbonate plastic construction.
- 30 mm Point has robust 304 stainless steel housing with tempered glass lens window.
- Environmental rating is IP65 for Grids and IP67 for Points.
- Grids and Points meet Type 4 per IEC 61496-2 and Safety Category 4 per EN 954-1 applications when used with a PICO-GUARD controller.
- Grid and Points are ATEX, CSA and FM approved for use in explosive environments when used with a PICO-GUARD controller.

GLANDS PAGE 69
BRACKETS PAGE 69
MIRRORS PAGE 194
STANDS PAGE 198

Grid Systems

- Two-, three- or four-beam systems
- Protected heights of 500 to 1066 mm
- Five lengths of fiber cable

Page 61

Point Systems

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

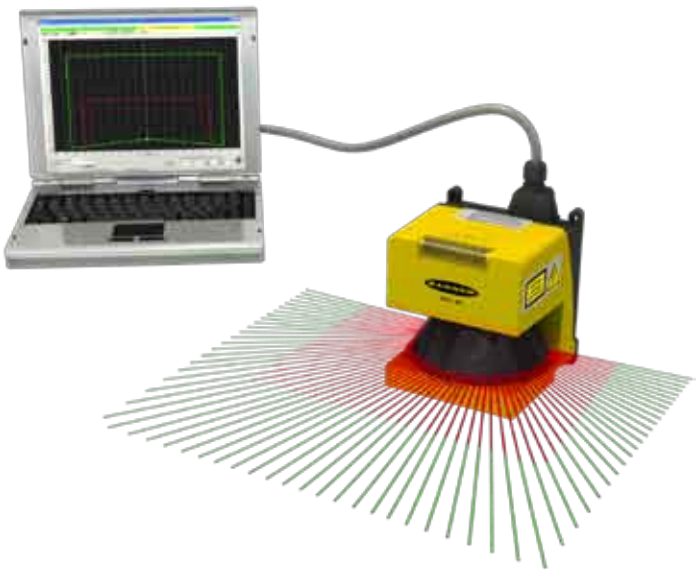
Page 63

AG4-4E
Safety Laser Scanner

- Two-dimensional laser scanner effectively protects personnel, as well as stationary and mobile systems within a user designated area.
- Persons or objects entering the protection field will be detected and a protective (safety) stop signal will be generated.
- Eight protective and warning field pairs are individually defined using a PC.
- Protection field resolution is from 30 to 150 mm with ranges up to 4 m.
- The warning field can be set for up to 15 m with a resolution of 150 mm.
- Scanner has a 0.36° lateral resolution and detects any object in a 190° working zone.
- The highly flexible protective and warning fields can be set to match the shape of the work area.
- System meets all requirements for Type 3 applications per IEC 61496-1/-2 and Safety Integrity Level (SIL) 2 per IEC 61508.
- Response time is 80 milliseconds (default), adjustable to 640 milliseconds.
- Compact design, simple installation and easy-to-use software provide efficient integration into work zones.
- 5-LED display presents system status and diagnostics of devices.

CORDSETS PAGE 56
BRACKETS PAGE 56
INTERFACE PAGE 56

Configuration and diagnostic software



Graphically adjust all device parameters and the protective field contours to both local conditions and required safety distances.

Configuration parameters are permanently stored in the configuration plug, providing easier storage and device replacement without a PC.

AG4-4E Safety Laser Scanner

- 24V dc supply voltage
- Two solid-state OSSD safety outputs and two solid-state auxiliary outputs
- RS-232 and RS-422 PC interface connection
- Five LED diagnostic display
- Aluminum die-cast housing
- Integral mounting holes for flat mounting
- Includes scanner, plugs and CD with diagnostic and configuration software (cordset not included)

ONLINE
AUTOCAD, STEP, IGES & PDF

AG4-4E Safety Laser Scanner

Model	Range		Safety Output	Aux. Outputs	Scanning Angle	Response Time	Data Sheet
	Protective Fields	Warning Fields					
AG4-4E	30 mm Resolution = 1.6 m 40 mm Resolution = 2.20 m 50 mm Resolution = 2.80 m 70 mm Resolution = 4.0 m 150 mm Resolution = 4.0 m	150 mm Resolution = 15 m	**2 PNP OSSD**	2 PNP	190°	80 ms (Default) adjustable to 340 ms	AG4 Soft Manual 144923 Product Manual 144924

AG4-TB1 Test Box

With the test box it's possible to test the following Scanner functions without hooking it up to the machine interface:

- Switch over between the different field pairs
- Correct reaction of the Safety OSSD outputs (When entering protective field)
- Correct reaction of the Alarm outputs (When entering warning field)
- Power supply is not included

AG4-TB1

AG4-4E Safety Laser Scanner Kits

You can purchase a kit that contains a laser scanner, optional interfacing solutions and cordsets.

To Order:

1. Choose an optional interfacing solution, such as an **UM-FA-9A** or -**11A** universal module.
2. Choose a DB15 configuration/machine interface cordset, such as AG4-CPD15...
3. Choose a PC communication cordset, such as AG4-PCD9...

See AG4-4E manuals (p/n 144923 & 144924) or www.bannerengineering.com for complete information and a current listing of accessories.

Kit Model Key

Scanner	Kit		Range		Interfacing Options	Configuration/ Machine Interface Cordset Options	PC Cordsets
AG4	K	—	4E	—	10	M10	P10

Kit
- **K** = Kit

Range
- **4E** = 4 m

Interfacing Options
- **Blank** = None
- **10** = UM-FA-9A
- **11** = UM-FA-11A
- **12** = MMD-TA-11A
- **13** = MMD-TA-12A

Configuration/ Machine Interface Cordset Length Options
- **M5** = 5 m
- **M10** = 10 m
- **M25** = 25 m
- **M50** = 50 m

PC Cordsets
- **P3** = 3 m
- **P5** = 5 m
- **P10** = 10 m

AG4-4E Interfacing Products

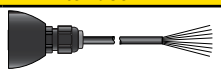
Models			Description	Product Information	Data Sheet
Interface Modules and Controllers		**UM-FA-9A** (3 NO)	• Universal modules monitors both contact based and PNP solid-state input devices. • Convenient plug-in terminal blocks on a 22.5 mm DIN-rail mountable housing.	Page 89	141249
		UM-FA-11A (2 NO)			
		**SC22-3-S...**	• One controller provides configurable monitoring of multiple safety devices. • 22 input terminals can monitor both contact-based and PNP solid-state input devices. • 3 pairs of independent solid-state safety outputs can be used with selectable one- or two-channel external device monitoring. • Ten configurable non-safety status outputs track inputs, outputs, lockout, I/O status and other functions • SC22-3 modules use 24V dc. • 10/100 Base TX Ethernet communication option using EtherNet/IP and Modbus TCP protocols (SC22-3E models).	Page 76	133487
		SC22-3-C...			
		SC22-3E-S...			
		SC22-3E-C...			
Muting Modules		**MM-TA-12B**	• The Muting Module temporarily inhibits a safety light screen so materials can safely pass through the screen without stopping the machinery. • The module uses redundant microcontroller-based logic.	Page 94	63517
		MMD-TA-12B			116390
		MMD-TA-11B			

NC = Normally closed, NO = Normally open

Accessories AG4-4E Laser Scanner

Cordsets

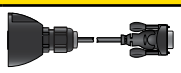
DB15 Configuration/Machine Interface



pg. 185

Length	Model Number
5 m	AG4-CPD15-5
10 m	AG4-CPD15-10
25 m	AG4-CPD15-25
50 m	AG4-CPD15-50

DB9 PC Communication



pg. 185

Length	Model Number
3 m	AG4-PCD9-3
5 m	AG4-PCD9-5
10 m	AG4-PCD9-10

Bracket

Swivel

pg. 166

AG4-MBK-1

Test Box

Configuration & Test Box

AG4-TB1

Misc. Replacement Parts

Model	Description
AG4A-SW-A	Software
AG4-WIN	Replacement window
AG4-CPD15	Replacement configuration plug, straight
AG4-CPD15-RA	Replacement configuration plug, right-angle

Model	Description
AG4-PD9	Replacement PC plug, straight
AG4-PD9-RA	Replacement PC plug, right-angle
AG4-CLN1	Cleaning set (small)
AG4-CLN2	Cleaning set (large)

AG4 Laser Scanner Specifications

Supply Voltage (UB)	24V dc +20%/-30% (IEC 60742)
Supply Current	420 mA approx. (use 2.5 A power supply)
Fuse (power supply)	1.6A normal blow, medium time lag fuse
Response Time	Min. 80 milliseconds (2 scans) Max. 640 milliseconds (16 scans)
Wavelength	905 nm
Protection Zone	**150 mm resolution:** 200 mm to 4.0 m (radius) **70 mm resolution:** 200 mm to 4.0 m (radius) **50 mm resolution:** 200 mm to 2.8 m (radius) **40 mm resolution:** 200 mm to 2.2 m (radius) **30 mm resolution:** 200 mm to 1.6 m (radius) **Sensing object reflectance:** Minimum 1.8%
Warning Zone	**Min. object size:** 150 mm x 150 mm **Sensing range (radius):** 200 mm to 15 m **Sensing object reflectance:** Minimum 20%
Measurement Zone	0-50 m
Scanning Angle	max. 190°
Control Outputs (OSSD1, OSSD 2)	**PNP open-collector transistor 2 outputs:** short circuit proofed **Rated operating voltage:** supply voltage (UB) -3.2 V **Max. source current**: 250 mA **Residual voltage:** 3.2 V or less **Operation mode:** **No object in detection zone:** ON **Object inside detection zone:** OFF **Response Time:** Min. 80 ms (2 scans) to max. 640 milliseconds (16 scans) switching method
Warning Output 1 (Alarm 1) & Warning Output 2 (Alarm 2)	PNP open-collector transistor **Rated operating voltage:** supply voltage (UB) -4 V **Max. source current:** 100 mA **Residual voltage:** 4 V or less **Operation mode:** Switching method of operation mode (set below) **Scanner at normal operation:** ON **Abnormal operation:** OFF **No object inside warning zone:** ON **Object inside warning zone:** OFF **Response Time:** Min. 80 ms (2 scans) to max. 640 milliseconds (16 scans) switching method
Laser Protection Class	Class 1 (IEC 60825-1)
Number of Field Pair (Zone) Settings	7 +1 (without detection zone). Zone pairs in combination of detection zone and warning zone can be switched over by external input.
Environmental Rating	IP65 (per IEC 60529)
Housing Material	Die-cast aluminum with a thermoplastic resin window
Weight	2.1 kg
Operating Conditions	**Temperature:** 0 to 50°C **Humidity:** Max. 95%
Indicators	Five LEDs on front show Safety Sensor Status

More on next page

AG4 Laser Scanner Specifications (cont'd)

Shock and Vibration	10 to 150 Hz frequency, 5 G max. (50 m/s^2 approx.) in X, Y and Z directions for twenty times each
Max Cordset Length	**15-pin plug:** 50 m **9-pin plug:** 10 m (RS-232C), 50 m (RS-422)
Design Standards	Designed to comply with IEC 61496-1/3 (Type 3), ISO 13849-1 (Category 3, PLd), IEC 61508-1 to 7 (SIL2) and IEC 62061 (SIL2)
Certifications	C US (all approvals are pending)
Wiring Diagrams	WD020, WD021, WD022 (pp. 230-231)

PICO-GUARD™
Fiber Optic Safety Systems

PICO-GUARD™ optical safety systems provide a control-reliable, non-contact and low-cost optical alternative to traditional machine safeguarding methods.

- Compact, economical and Category 4-rated safety system for personnel and equipment protection
- Easy installation: reduces need for expensive electrical wiring
- System includes Controller, flexible optical fiber, optional protective sheathing and interchangeable optical elements for a variety of safeguarding applications (see below)
- Optical elements never wear out and are easy to align
- Category 4 interlocking with one switch per guard, even with multiple switches per optical channel
- Rated for use in explosive environments: ATEX, FM and CSA certifications
- Rated for Class 1/Division 1 & 2, Groups A, B, C, D; Zone 0, Group IIC and Zone 22

Grid systems
- Two-, three- or four-beam systems
- Protected heights of 500 to 1066 mm
- Five lengths of fiber cable

Page 61

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

Page 63

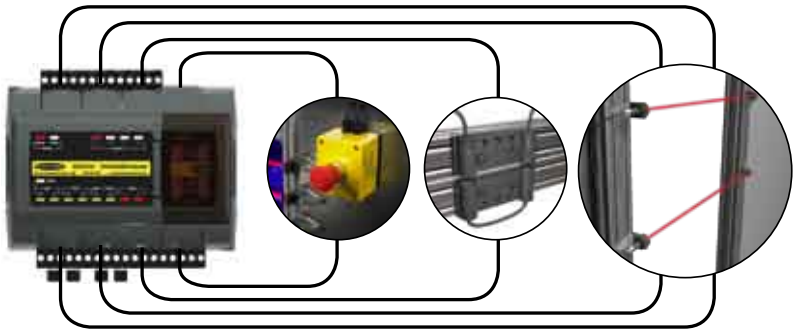
Interlock systems
- Non-contact optical safety switches
- Six housing styles
- Integral fibers or quick-release fiber connectors

Page 64

E-Stop buttons
- Push-to-stop, twist-to-release optical E-Stop button
- Models with fiber connection on same or opposite side of enclosure

Page 66

Controllers
- Four optical channels on all models
- DIN rail or panel/wall mounting
- Models with Universal Safety Stop Input (USSI), auxiliary outputs and muting function
- Quick-disconnect fiber optic interface and removable terminal blocks
- Selectable trip or latch output, external device monitoring and auto/manual power-up



Four optical channels for monitoring multiple points with one controller
- Interlock up to sixteen guards or gates
- Create one four-beam grid or two individual two-beam grids for perimeter and access guarding
- Combine grids, points, interlocks and E-Stop buttons for multiple application requirements

Compact fiber optic technology for explosive environments

- Paint booths
- Gaseous fill areas (example, cigarette lighters)
- Cosmetic and perfume manufacturing
- Pharmaceutical manufacturing
- Battery manufacturing
- Semiconductor processing
- Film and web processing
- Chemical processing
- Explosives manufacturing

CONTROLLERS

PICO-GUARD™ Fiber Optic

- Four optical channels to protect personnel from hazardous equipment and to protect critical tooling or processes.
- Controller signals the machine control circuit to stop when the system detects a loss in light signal or receives a safety stop request from its Universal Safety Stop Interface (USSI) input.
- Each channel can control several optical elements in the same fiber loop.
- Each channel can monitor a separate part of a machine, such as doors, points of entry and E-stops.
- USSI connects multiple PICO-GUARD™ Controllers and other safety devices in a single safety circuit, when required.
- Controllers are available with optical channel auxiliary outputs and muting.
- Controllers interface with PICO-GUARD Grids, Points, Interlock Switches and Optical E-Stop Buttons to solve numerous applications.
- Diverse-redundant and self-checking design exceeds control reliability requirements and meets Safety Category 4 per EN 954-1 and IEC 61496-1 Type 4 requirements.

BRACKETS PAGE 69
FIBERS PAGE 68

PICO-GUARD™ Controller

- Bi-color LED indicators for easy status monitoring
- Four optical channels
- Removable 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 or muting device inputs

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PICO-GUARD™ Controller Models, 24V dc

Model	Inputs	Safety Outputs	Output Rating	Aux. Outputs	Muting	Output Response Time	Data Sheet
SFCDT-4A1	4 Optical Channels & 2 NC USSI (dual) x2	**2 PNP OSSD**	0.5 amps	3 PNP (Aux., Fault, Weak)	-	13 ms (optical channels) 7 ms (USSIs)	69761, 69763
SFCDT-4A1C				7 PNP (Aux., Fault, Weak & Ch 1-4)	-		
SFCDT-4A1CM1	4 Optical Channels, Mute Inputs, Mute Enable			7 PNP (Aux./Mute lamp, Fault, Weak & Ch 1-4)	Yes	13 ms (optical channels)	122801, 69761, 69763

NOTE: A complete system requires a controller and optical elements, such as Interlocking Switches (see page 64), Grids and Points (see page 62), or E-Stop buttons (see page 66).

GRIDS & POINTS

PICO-GUARD™ Fiber Optic

- Grid and Point optical elements are for use with PICO-GUARD™ Controllers and fiber optic cables in personnel safety and equipment-protection applications.
- Choices include compact 12 or 30 mm non-contact fiber optic Point elements, or Grid systems for perimeter and access guarding.
- Each fiber optic channel uses one Emitter/Receiver pair (up to 4 pairs per controller).
- Each Point or Grid element can function as emitter or receiver, depending on installation.
- Grid system features rugged anodized aluminum construction, with two, three or four beams and beam spacing from 300 to 584 mm.
- 12 mm Point has impact-resistant polycarbonate plastic construction.
- 30 mm Point has robust stainless steel housing with tempered glass lens window.
- Environmental rating is IP65 for Grids and IP67 for Points.
- Grids and Points meet Type 4 per IEC 61496-2 and Safety Category 4 per EN 954-1 applications when used with a PICO-GUARD controller.
- Grid and Points are ATEX, FM and CSA approved for use in explosive environments when used with a PICO-GUARD controller.

CONTROLLERS
GRIDS & POINTS
INTERLOCKS
E-STOP BUTTONS

GLANDS PAGE 69
BRACKETS PAGE 69
MIRRORS PAGE 194
STANDS PAGE 198

PICO-GUARD™ Grid Systems

- Two-, three- or four-beam models
- PVC-coated integral cable with polished fibers
- IEC IP65 rated
- Robust black anodized housing with field replaceable window
- MEK-resistant housing for paint booth applications
- Optional MEK-resistant conduit and cable gland (see page 69)
- Interchangeable as emitter or receiver with PICO-GUARD™ controller

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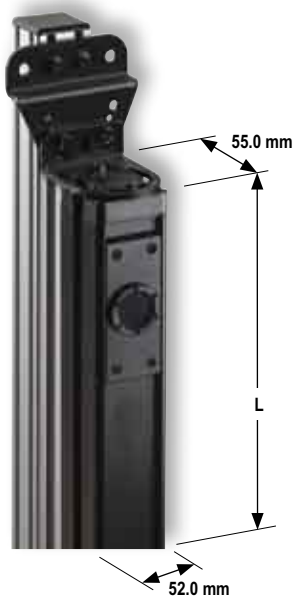

PICO-GUARD Grid

Full View

Black Anodized Aluminum

PICO-GUARD™ Grid Systems

Model*	Beam Spacing	Protected Height	Housing Length (L)	Fiber Description**	Fiber Length	Maximum Range***	Data Sheet
SFG4-300C8	 300 mm 4-Beam Grid	900 mm	1084 mm	Integral Polished-End, PVC Coated Fibers 7 mm diameter	2.4 m	31.1 m	69762 & 69763
SFG4-300C15					4.5 m	27.1 m	
SFG4-300C25					7.5 m	22.6 m	
SFG4-300C50					15 m	14.9 m	
SFG4-300C100					30 m	7.0 m	
SFG3-400C8	 400 mm 3-Beam Grid	800 mm	984 mm		2.4 m	31.1 m	
SFG3-400C15					4.5 m	27.1 m	
SFG3-400C25					7.5 m	22.6 m	
SFG3-400C50					15 m	14.9 m	
SFG3-400C100					30 m	7.0 m	
SFG3-533C8	 533 mm 3-Beam Grid	1066 mm	1251 mm		2.4 m	31.1 m	
SFG3-533C15					4.5 m	27.1 m	
SFG3-533C25					7.5 m	22.6 m	
SFG3-533C50					15 m	14.9 m	
SFG3-533C100					30 m	7.0 m	
SFG2-500C8	 500 mm 2-Beam Grid	500 mm	684 mm		2.4 m	31.1 m	
SFG2-500C15					4.5 m	27.1 m	
SFG2-500C25					7.5 m	22.6 m	
SFG2-500C50					15 m	14.9 m	
SFG2-500C100					30 m	7.0 m	
SFG2-584C8	 584 mm 2-Beam Grid	584 mm	768 mm		2.4 m	31.1 m	
SFG2-584C15					4.5 m	27.1 m	
SFG2-584C25					7.5 m	22.6 m	
SFG2-584C50					15 m	14.9 m	
SFG2-584C100					30 m	7.0 m	

* Order any two Grid optical elements with the same housing length.
** MEK-resistant conduit is available to protect fiber (see page 69).
*** Maximum range is based on using an emitter and receiver with the same length fiber. Using an emitter and receiver with different length fibers may decrease or increase range. Using corner mirrors reduces range. See specifications on page 71 for detailed range information.

PICO-GUARD™ Point Systems

- 12 or 30 mm threaded barrel fiber optic interchangeable as emitter or receiver with PICO-GUARD™ controller
- Multiple Points create customized grid system
- Polished-end integral fiber
- Moisture and dirt resistant
- 304 stainless steel (30 mm) or impact-resistant polycarbonate (12 mm) housing
- Type 4 effective aperture angle (EAA)
- IEC IP67 rated
- A complete system requires a controller (see page 60)

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PICO-GUARD Point (30 mm Barrel)

PICO-GUARD Point (12 mm Barrel)

PICO-GUARD™ Point Systems

Model*	Housing Material	Orientation/Type		Fiber Description	Fiber Length	Maximum Range**	Data Sheet
SFP30SXP8	304 Stainless Steel	Straight 30 mm Barrel Mounting (25 mm beam diameter)		Integral Polished-End, PVC Coated Fibers 5 mm Diameter	2.4 m	28.7 m	111390 & 69763
SFP30SXP15					4.5 m	24.4 m	
SFP30SXP25					7.5 m	21.9 m	
SFP30SXP50					15 m	14.0 m	
SFP30SXP100					30 m	8.5 m	
SFP30SXT8				Integral Polished-End, PTFE Coated Fibers 2.2 mm Diameter	2.4 m	28.7 m	
SFP30SXT15					4.5 m	24.4 m	
SFP30SXT25					7.5 m	21.9 m	
SFP30SXT50					15 m	14.0 m	
SFP30SXT100					30 m	8.5 m	
SFP30SS8				Integral Polished-End, Polyethylene Coated Fibers 2.2 mm Diameter	2.4 m	28.7 m	
SFP30SS15					4.5 m	24.4 m	
SFP30SS25					7.5 m	21.9 m	
SFP30SS50					15 m	14.0 m	
SFP30SS100					30 m	8.5 m	
SFP12PXP8	Plastic	Straight 12 mm Barrel Mounting (9 mm beam diameter)		Integral Polished-End, PVC Coated Fibers 5 mm Diameter	2.4 m	6.4 m	111389 & 69763
SFP12PXP15					4.5 m	4.8 m	
SFP12PXP25					7.5 m	3.4 m	
SFP12PXP50					15 m	1.5 m	
SFP12PXT8				Integral Polished-End, PTFE Coated Fibers 2.2 mm Diameter	2.4 m	6.4 m	
SFP12PXT15					4.5 m	4.8 m	
SFP12PXT25					7.5 m	3.4 m	
SFP12PXT50					15 m	1.5 m	
SFP12PS8				Integral Polished-End, Polyethylene Coated Fibers 2.2 mm Diameter	2.4 m	6.4 m	
SFP12PS15					4.5 m	4.8 m	
SFP12PS25					7.5 m	3.4 m	
SFP12PS50					15 m	1.5 m	

* Order any two Point optical elements with the same beam diameter.
** Maximum range is based on using an emitter and receiver with the same length fiber. Using an emitter and receiver with different length fibers may decrease or increase range. Using corner mirrors reduces range. See specifications on page 71 for detailed range information.

INTERLOCK SWITCHES

PICO-GUARD Fiber Optic

- Interlock switches interface with PICO-GUARD™ fiber optic controllers.
- Compact, non-contact and easy to install, the switches interlock doors, guards, gates and covers.
- Fiber optic interlock switches eliminate the need to run electrical wires to a hazardous area.
- Fibers connect and disconnect quickly.
- Switches meet Safety Category 4 requirements with one switch pair per guard (per ISO 13849-1).
- Impact-resistant polycarbonate plastic, extreme-duty chemically resistant stainless steel or heavy-duty impact-resistant zinc die-cast models are available.
- Switches have an environmental rating of IP67 and are ATEX, FM and CSA approved for use in explosive environments when used with a PICO-GUARD controller.
- Attenuator is available for reducing excess gain in short-run applications.
- Splices are available for easily connecting two fiber sections.

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FIBERS
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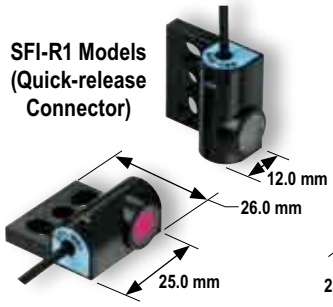
PICO-GUARD™ Fiber Optic Interlock Switches

- Six housing styles
- Easy-to-install housings
- Quick-release connectors or integral fibers, depending on model
- A complete system requires a controller (see page 60)

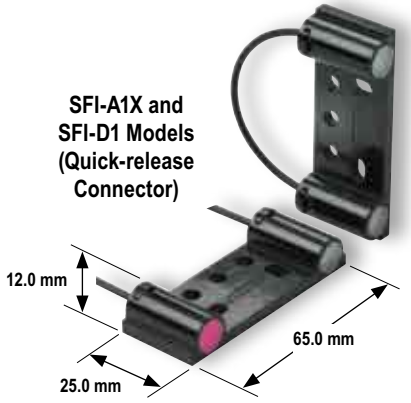
SFI-M12 Models (Integral Fibers)

SFI-R1 Models (Quick-release Connector)

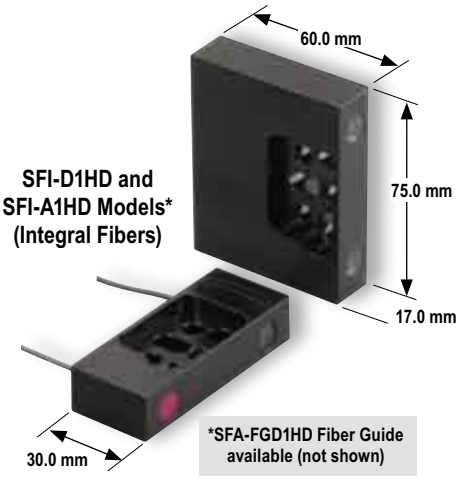


SFI-S1 Models (Quick-release Connector)

SFI-A1X and SFI-D1 Models (Quick-release Connector)

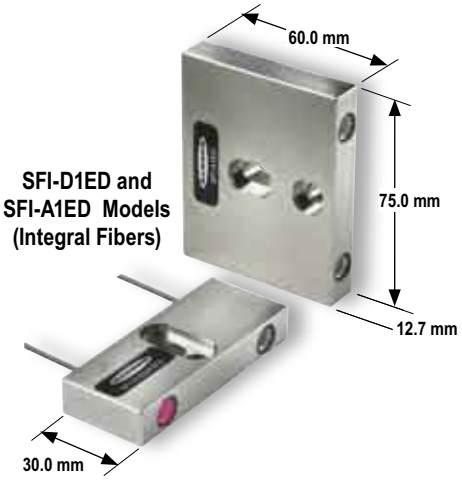


SFI-D1HD and SFI-A1HD Models* (Integral Fibers)



*SFA-FGD1HD Fiber Guide available (not shown)

SFI-D1ED and SFI-A1ED Models (Integral Fibers)



PICO-GUARD™ Fiber Optic Interlock Switches

Models	Housing Material	Orientation/Type		Fiber Length*	Separation and Max. Switching Distance	Data** Sheet
SFI-S1R	Plastic	Straight, Right Mounting		Bulk or Precut	1 mm = ± 10 mm 25 mm = ± 11 mm 50 mm = ± 12 mm	109909
SFI-S1L		Straight, Left Mounting				
SFI-R1R	Plastic	Right-angle, Right Mounting		Bulk or Precut	1 mm = ± 11 mm 25 mm = ± 21 mm 50 mm = ± 33 mm	109907
SFI-R1L		Right-angle, Left Mounting				
SFI-D1	Plastic	Dual, Center Mounting		Bulk or Precut	1 mm = ± 7 mm 25 mm = ± 8 mm 50 mm = ± 9 mm	109908
SFI-A1		Actuator, Polyethylene Jacket, Center Mounting				
SFI-A1XP		Actuator, Polyethylene Jacket, PVC Sheath, Center Mounting				
SFI-A1XT		Actuator, Polyethylene Jacket, Fluoropolymer Sheath, Center Mounting				
SFI-M12SS06UXT	316 Stainless Steel	Straight, Polyethylene Jacket, Fluoropolymer Sheath, 12 mm Barrel Mounting		1.8 m	1 mm = ± 10 mm 25 mm = ± 11 mm 50 mm = ± 12 mm	117201
SFI-M12SS15UXT				4.5 m		
SFI-M12SS30UXT				9.0 m		
SFI-D1EDPXT6	316 Stainless Steel	Straight, Polyethylene Jacket, Fluoropolymer Sheath, Center Mounting		1.8 m	1 mm = ± 7 mm 25 mm = ± 8 mm 50 mm = ± 9 mm	120125
SFI-D1EDPXT15				4.5 m		
SFI-D1EDPXT30				9.0 m		
SFI-D1EDPXT50				15.3 m		
SFI-A1ED		Actuator, Center Mounting		–		
SFI-D1HDPS6†	Zinc	Straight, Polyethylene Jacket, Center Mounting		1.8 m	1 mm = ± 7 mm 25 mm = ± 8 mm 50 mm = ± 9 mm	121307
SFI-D1HDPS15†				4.5 m		
SFI-D1HDPS30†				9.0 m		
SFI-D1HDPS50†				15.3 m		
SFI-D1HDPXT6†		Straight, Polyethylene Jacket, Fluoropolymer Sheath, Center Mounting		1.8 m		
SFI-D1HDPXT15†				4.5 m		
SFI-D1HDPXT30†				9.0 m		
SFI-D1HDPXT50†				15.3 m		
SFI-A1HD		Actuator, Center Mounting		—		

* Fibers available in bulk to be cut to length or precut lengths with polished ends. Order fibers separately (see page 68). Integral fiber lengths are listed.
† Optional fiber guide available (**SFA-FGD1HD**). See data sheet p/n 123560.
** Also see the Application and Design Guide p/n 69763.

Emergency Stop Push Buttons

PICO-GUARD™ Fiber Optic

- Features bright red push-to-stop, twist-to-release, direct opening button with yellow background (per ANSI NFPA 79 and IEC 60204-1)
- Provides choice of models with fiber connections on same side or opposite sides of enclosure
- Delivers easy connection for 2 mm OD (1 mm core) plastic fibers
- Accommodates up to 3 E-Stops in a series on a single channel (all PICO-GUARD™ controllers have four channels)
- Constructed of impact-resistant polycarbonate resin—rated IP65
- Can be used with SFI interlocking switches in same optical loop
- Offers easy mounting and installation
- Meets Safety Category 4 applications (per ISO 13849-1) applications when used with a PICO-GUARD controller
- Up to 125 m of fiber (polished) with one E-Stop button
- Certified to EN ISO 13850 and EN 60947-5-5 Emergency Stop button requirements
- Certified to ATEX, FM and CSA standards for use in potentially explosive environments

PICO-GUARD™ Optical E-Stop Buttons

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

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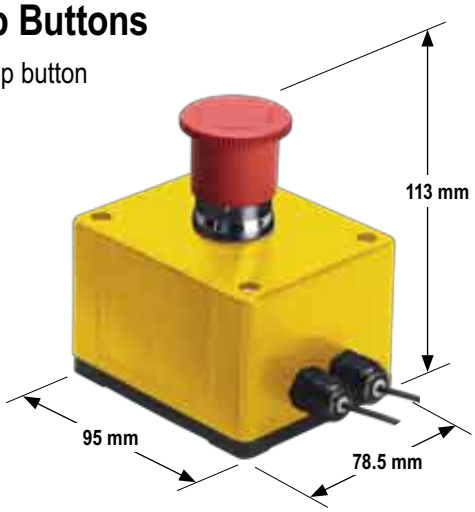
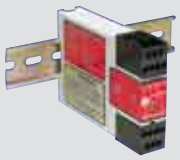


Emergency Stop Push Button with Enclosure

Models	Housing Description	Data Sheet
SFS-EMB-01E1	One-sided fiber connection	129342 & 69763
SFS-EMB-01E2	Two-sided fiber connection (opposite sides)	

Accessories PICO-GUARD™

PICO-GUARD™ Interfacing Products

Models			Description	Product Information	Data Sheet
Interface Modules		**IM-T-9A** (3 NO)	• Interface modules provide two or three normally open force-guided relay outputs rated at 6 A. • PICO-GUARD monitors these interface modules when they are connected to the PICO-GUARD External Device Monitoring (EDM) inputs. • Convenient plug-in terminal blocks on a 22.5 mm DIN-rail mountable housing are included.	Page 107	62822
		IM-T-11A (2 NO/1 NC)			
Muting Modules		**MM-TA-12B**	• 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. • The module uses redundant microcontroller-based logic.	Page 94	63517
		MMD-TA-12B			116390
		MMD-TA-11B			
Interface Modules and Controllers		**SC22-3-S...**	• One controller provides configurable monitoring of multiple safety devices. • 22 input terminals can monitor both contact-based and PNP solid-state input devices. • 3 pairs of independent solid-state safety outputs can be used with selectable one- or two-channel external device monitoring. • Ten configurable non-safety status outputs track inputs, outputs, lockout, I/O status and other functions • SC22-3 modules use 24V dc. • 10/100 Base TX Ethernet communication option using EtherNet/IP and Modbus TCP protocols (SC22-3E models).	Page 76	133487
		SC22-3-C...			
		SC22-3E-S...			
		SC22-3E-C...			
Contactors		**Mechanically Linked Contactors**	• Pairs of contactors create safety stop circuits with two normally open contacts in series. • PICO-GUARD can monitor the circuit because of the contacts' force-guided mechanically linked design. • Contactors add 10 or 18 amp current carrying capability to any safety system. • Auxiliary contacts add 3 or 4 normally open contacts. • Suppressors extend the life of an actuating device that uses a contactor. • Modular design simplifies assembly and installation.	Page 191	111881
		11-BG00-31-D-024			
		BF1801L-024			
		Aux. Contacts			
		11-BGX10-40			
		11-G484-30			
		Suppressors			
		11-BGX77-048			
		11-G318-48			

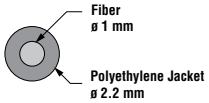
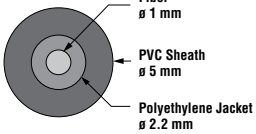
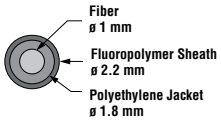
NC = Normally closed, NO = Normally open

PICO-GUARD™ Remote Display

Models		Description	Data Sheet
	**SFA-RD**	• The display provides the same ongoing operating status feedback as the PICO-GUARD controller. • Rated IP67; NEMA 6, it can be conveniently mounted outside enclosure. • Convenient DIN-rail mountable housing; flat-mount and right-angle brackets are included.	109374

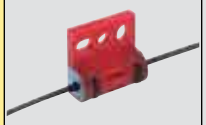
PICO-GUARD™ Plastic Fiber Optics

Plastic optical fiber for use with Banner PICO-GUARD optical elements is available in bulk form (to be cut to length in the field) or precut lengths with polished ends for maximum excess gain.

Length		Standard Polyethylene Jacket	PVC Sheath	Fluoropolymer Sheath
Dimensions				
Bulk	9 m	PIU430U	PIU430UXP	PIU430UXT
	18 m	PIU460U	PIU460UXP	PIU460UXT
	30.5 m	PIU4100U	PIU4100UXP	PIU4100UXT
	61 m	PIU4200U	PIU4200UXP	PIU4200UXT
	100.5 m	PIU4330U	PIU4330UXP	PIU4330UXT
	152.5 m	PIU4500U	PIU4500UXP	PIU4500UXT
	488 m	PIU41600U	PIU41600UXP	PIU41600UXT
Cut Lengths with Polished Ends	0.3 m	PWS43P	PWXP43P	PWXT43P
	0.5 m	PWS45P	PWXP45P	PWXT45P
	0.7 m	PWS47P	PWXP47P	PWXT47P
	1 m	PWS410P	PWXP410P	PWXT410P
	1.5 m	PWS415P	PWXP415P	PWXT415P
	2 m	PWS420P	PWXP420P	PWXT420P
	2.5 m	PWS425P	PWXP425P	PWXT425P
	3 m	PWS430P	PWXP430P	PWXT430P
	3.5 m	PWS435P	PWXP435P	PWXT435P
	4 m	PWS440P	PWXP440P	PWXT440P
	4.5 m	PWS445P	PWXP445P	PWXT445P
	5 m	PWS450P	PWXP450P	PWXT450P
	6 m	PWS460P	PWXP460P	PWXT460P
	7 m	PWS470P	PWXP470P	PWXT470P
	8 m	PWS480P	PWXP480P	PWXT480P
	9 m	PWS490P	PWXP490P	PWXT490P
	10 m	PWS4100P	PWXP4100P	PWXT4100P
	11 m	PWS4110P	PWXP4110P	PWXT4110P
	12 m	PWS4120P	PWXP4120P	PWXT4120P
	13 m	PWS4130P	PWXP4130P	PWXT4130P
	14 m	PWS4140P	PWXP4140P	PWXT4140P
	15 m	PWS4150P	PWXP4150P	PWXT4150P
	20 m	PWS4200P	PWXP4200P	PWXT4200P
	25 m	PWS4250P	PWXP4250P	PWXT4250P
	30 m	PWS4300P	PWXP4300P	PWXT4300P

PICO-GUARD™ Plastic Fiber Optic Accessories

Fiber optic devices used with PICO-GUARD™ optical elements improve performance and simplify installation.

Model			Description	Data Sheet
Attenuator		SFA-FA	• Reduces excess gain in short-run applications • Uses Banner 2.2 mm OD plastic fiber optic cable (1 mm core) • Made of impact-resistant polycarbonate plastic • Rated IP67	109910
Splice		SFA-FS	• Provides easy connection of two fiber sections • Simplifies connecting and disconnecting fibers • Uses Banner 2.2 mm OD plastic fiber optic cable (1 mm core) • Made of impact-resistant polycarbonate plastic • Rated IP67	109910
Fiber Cutter		PFC-2-25	• Used with Banner 2.2 mm OD diameter unterminated fiber optic cable (1 mm core) • Contains 25 fiber cutters	—

PICO-GUARD™ Cable Glands and Conduits

Conduit and gland used with PICO-GUARD™ Grids provide MEK-resistant protection.

Model	Description		
SFA-FCC-008	2.4 m	Conduit	• Made of flexible MEK-resistant polyamide • Protects fiber • Snaps into emitter/receiver • Easily cuts to length
SFA-FCC-015	4.5 m		
SFA-FCC-025	7.5 m		
SFA-FCC-050	15 m		
SFA-FCC-100	30 m		
SFA-FCC-CGM20	M20 Threads	Cable Gland	• Use with MEK-resistant conduit (above) • Made of MEK resistant polyamide • Attaches conduit to emitter/receiver and PICO-GUARD controller

PICO-GUARD™ Brackets

Controller	Grids				12 mm–Points	
						
pg. 166	pg. 166	pg. 167	pg. 168	pg. 168	pg. 172	pg. 172
DIN-35...	EZA-MBK-1	EZA-MBK-2	EZA-MBK-3	EZA-MBK-9	SMB12MM	SMB1812SF

30 mm–Points					Interlock Switches		
							
pg. 173	pg. 173	pg. 173	pg. 173	pg. 174	pg. 171	pg. 172	pg. 172
SMB30A	SMB30MM	SMB30SC	SMBAMS30P	SMBAMS30RA	SFA-IMB1	SFA-IMB2	SMB12MM

PICO-GUARD® Replacement Parts

Model	Description
EZA-LAT-1	Replacement adapter hardware for Grid.
MGA-KS0-1	SPST key reset switch, no wires (includes key)
SFA-CMH	PICO-GUARD controller mounting hardware
SFA-CTB1	PICO-GUARD controller 4-position terminal block
SFA-CTB2	PICO-GUARD controller 9-position terminal block
SFA-CTB3	PICO-GUARD controller 18-position terminal block

Model	Description
SFA-CTB4	PICO-GUARD controller 5-position terminal block
SFA-IAG	Interlock alignment guide
SFA-LAT-12	Replacement adapter hardware for SPF12
SFA-LAT-30	Replacement adapter hardware for SPF30
SFA-W-1	Replacement window for Grid
STP-3	Specified test piece, 45 mm dia. for Grid

PICO-GUARD™ Controller Specifications

System Power Requirements	24V dc ±15%, 10% max. ripple; 250 mA max., exclusive of output loads. External supply must be in accordance with IEC 61558.
Short Circuit Protection	All inputs and outputs are protected from short circuits to +24V dc or dc common.
Response Time	**Optical Channel:** 13 milliseconds max. (Time between the opening of an optical switch and the OSSD safety outputs turning off.) **USSI Inputs:** 7 milliseconds max. (Time between actuation of the safety stop input device and the OSSD safety outputs turning off.)
External Device Monitoring (EDM) Input	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.
System Reset Input	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.
USSI 1 Reset Input (Not available on SFCDT-4A1CM)	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 USSI 1 latch condition.
USSI 1 Input (Not available on SFCDT-4A1CM1)	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).
USSI 2 Input (Not available on SFCDT-4A1CM1)	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).
Muting Device Inputs (SFCDT-4A1CM1)	The muting devices work in pairs (MS1 and MS2, MS3 and MS4) and required to be "closed" within 3 seconds of each other (simultaneity requirement) to intiate a mute (assuming all other conditions are meet). Muting device outputs must be hard contacts (electrical), capable of switching 15 to 30V dc at 10 to 50 mA.
Mute Enable Input (SFCDT-4A1CM1)	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.
Safety Outputs	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". **ON-state voltage:** ≥ Vin-1.5V dc **OFF-state voltage:** 1.2V dc max. **Max. load resistance:** 1,000 Ω **Max. load capacitance:** 0.1 µF **OSSD test pulse width:** 100 to 300 microseconds **OSSD test pulse period:** 6 milliseconds
Non-Safety Outputs	Solid state 24V dc (≥ Vin – 1.5V dc), 0.25A max. sourcing (PNP) non-safety outputs
Non-muting models:	Aux., weak, fault, Ch 1-4
Muting models:	Aux./Mute temp, fault, Ch 1-4 (-4A1C models only)
Remote Status Interface	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 page 67.

More on next page

PICO-GUARD™ Controller Specifications (cont'd)

Controls and Adjustments	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.)
Ambient Light Immunity	> 10,000 lux at 5° angle of incidence
Strobe Light Immunity	Totally immune to one Federal Signal Corp. "Fireball" model FB2PST strobe
Emitter Element	Visible red LED, 660 nm at peak emission
Status Indicators	**All models:** **System Status (bi-color Red/Green):** overall status of the PICO-GUARD system **System Reset (bi-color Yellow/Red):** status of the input; indicates system reset needed **Channel (4 bi-color Red/Green):** each shows the status of one optical channel **EDM (bi-color Red/Green):** status of the EDM input channels **OSSD (bi-color Red/Green):** status of the OSSD outputs **Config (bi-color Red/Green):** status of the system configuration **Non-Muting models:** **USSI (2 bi-color Red/Green):** status of the USSI input channels (a-b and c-d) **USSI 1 Reset (bi-color Yellow/Red):** status of USSI 1 reset input; indicates USSI 1 reset needed **EDM (bi-color Red/Green):** status of the EDM input channels **OSSD (bi-color Red/Green):** status of the OSSD outputs **Config (bi-color Red/Green):** status of the system configuration **Muting Models:** **Muting (4 bi-color Red/Green):** status of the muting input **Mute Enable (bi-color) Yellow/Red):** status of the EDM enable
Enclosure Rating	P20
Operating Conditions	**Temperature:** 0° to +50° C **Relative humidity:** 95% maximum (non-condensing)
Design Standards	Designed to comply with Type 4 per IEC 61496-1; Type 4 per UL 61496-1; Category 4 per EN 954-1
Certifications	**Important Notice:** **European Community Machinery Directive 2006/42/EC** The PICO-GUARD Controllers comply with Machine Directive 98/37/EC. After December 29, 2009, when Machine Directive 2006/42/EC will be in force, the PICO-GUARD Controllers can only be installed as a replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767.
Wiring Diagrams	WD023, WD024, WD025, WD026, WD027, WD028 (pp. 232-263)

PICO-GUARD™ Grid & Point Systems Specifications

Operating Range

Range information is based on use of the integral polished fibers. The use of SFA-FS Fiber Splice reduces range by 20%. Do not cut polished fiber ends unless absolutely necessary (if the end is damaged or contaminated, or must be cut to length). Use only the Model PFC-2 Fiber Cutter to cut fibers, when necessary. If a polished end is cut, the excess gain is reduced, the advantage of polishing is lost, and the operating range is reduced.

12 mm Point Operating Range:
Minimum operating range: 150 mm
Maximum operating range: see table*

	SFP12..8	SFP12..15	SFP12..25	SFP12..50
SFP12..8	6.4 m	5.5 m	4.6 m	3 m
SFP12..15	5.5 m	4.8 m	4 m	2.7 m
SFP12..25	4.6 m	4 m	3.4 m	2.1 m
SFP12..50	3 m	2.7 m	2.1 m	1.5 m

30 mm Point Operating Range:
Minimum operating range: 800 mm
Maximum operating range: see table*

	SFP30..8	SFP30..15	SFP30..25	SFP30..50	SFP30..100
SFP30..8	28.7 m	25.9 m	23.2 m	20.1 m	13.7 m
SFP30..15	25.9 m	24.4 m	22.9 m	19.5 m	12.8 m
SFP30..25	23.2 m	22.9 m	21.9 m	17.1 m	12.2 m
SFP30..50	20.1 m	19.5 m	17.1 m	14.0 m	11.0 m
SFP30..100	13.7 m	12.8 m	12.2 m	11.0 m	8.5 m

Grids Operating Range:
Minimum operating range: 800 mm
Maximum operating range: see table*

	SFG..8	SFG..15	SFG..25	SFG..50	SFG..100
SFG..8	31.1 m	29.0 m	26.5 m	21.6 m	14.9 m
SFG..15	29.0 m	27.1 m	24.7 m	20.1 m	14.0 m
SFG..25	26.5 m	24.7 m	22.6 m	18.3 m	12.8 m
SFG..50	21.6 m	20.1 m	18.3 m	14.9 m	10.4 m
SFG..100	14.9 m	14.0 m	12.8 m	10.4 m	7.0 m

* In applications using SSM or MSM series corner mirrors, range is reduced by approximately 8 percent for each mirror used.

More on next page

PICO-GUARD™ Grid & Point Systems Specifications (cont'd)

Beam Diameter	**12 mm Point:** 9 mm **30 mm Point:** 25 mm **Grids:** 25 mm
Effective Aperture Angle (EAA)	Type 4 per IEC 61496-2; ±2.5° @ 3 m when used with SFCDT-..
Environmental Rating	**Points:** IP67 **Grids:** IP65
Operating Conditions	**Temperature:** 0° to +70° C **Relative humidity:** 95% (non-condensing)
Construction	**12 mm Point:** black polycarbonate plastic housing; polyethylene, PVC or PTFE coated fibers **30 mm Point:** 304 stainless steel housing, glass window; polyethylene, PVC or PTFE coated fibers **Grids:** black anodized aluminum housing and label; tempered glass window; zinc end caps; PVC coated fibers
Certifications	**Important Notice:** **European Community Machinery Directive 2006/42/EC** The PICO-GUARD Grid and Points comply with Machine Directive 98/37/EC. After December 29, 2009, when Machine Directive 2006/42/EC will be in force, the PICO-GUARD Grid and Points can only be installed as a replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767.

PICO-GUARD™ Fiber Optic Interlock Switches Specifications

Operating Distance	1-50 mm max.
Mounting	**SFI-S.., SFI-R..., SFI-D1, SFI-A1 and SFI-AIX.. models:** Holes for M4 (#10) screws (not included) **SFI-D1E..., SFI-AIED, SFI-D1H... and SFI-A1H... models:** Holes for M6 screws (not included) **SFI-M12... models:** Two M12 x 1.25 nuts (provided)
Construction	**SFI-S.., SFI-R..., SFI-D1, SFI-A1 and SFI-AIX.. models:** Polycarbonate plastic housing and window; acrylic lens **SFI-M12, SFI-D1E.. and SFI-AIED models:** 316 stainless steel housing, glass window, PTFE-sheathed plastic fiber **SFI-D1H... and SFI-A1H... models:** Cast zinc housing, glass window, PTFE-sheathed or PE plastic fiber
Operating Conditions	**Temperature:** 0° to +70° C **Relative humidity:** 95%
Environmental Rating	IP67
Certifications	**Important Notice:** **European Community Machinery Directive 2006/42/EC** The PICO-GUARD Safety Interlock Switches comply with Machine Directive 98/37/EC. After December 29, 2009, when Machine Directive 2006/42/EC will be in force, the PICO-GUARD Safety Interlock Switches can only be installed as a replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767.

PICO-GUARD™ E-Stop Button Specifications

Mounting	Holes (x4) for M5 screws (mounting hardware not included)
Construction	**Enclosure and Base:** Polycarbonate **Button:** Polymide **Button Base:** Aluminum/Zinc alloy
Operating Conditions	**Temperature:** 0° to +70° C **Relative humidity:** 95% (non-condensing)
Environmental Rating	IP65
Certifications	**Important Notice:** **European Community Machinery Directive 2006/42/EC** The PICO-GUARD Optical E-Stop Buttons comply with Machine Directive 98/37/EC. After December 29, 2009, when Machine Directive 2006/42/EC will be in force, the PICO-GUARD Optical E-Stop Buttons can only be installed as a replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767.

Safety Controllers & Modules

SC22-3 Safety Controller page 76

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

PICO-GUARD™ page 80

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

E-Stop & Guard page 81

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

Universal page 89

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

Safety Mat page 91

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

Muting page 94

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

Safe Speed page 103

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

Extension page 105

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

Interface page 107

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

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

NC = Normally Closed Relay, NO = Normally Open Relay

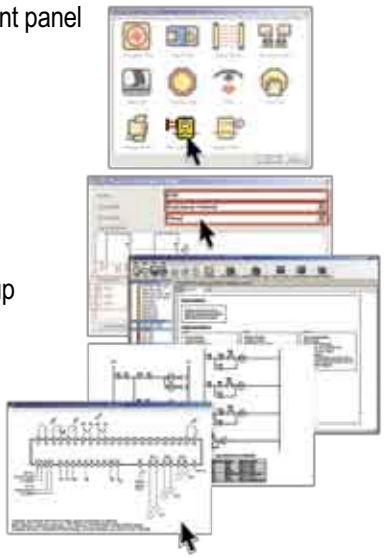
	Inputs	Safety Outputs	Output Rating	Auxiliary Outputs	Output Response Time	Delay	Housing Width
	22 Safety & Non-Safety	**6 PNP (3 pair)**	0.75 amps ea.	10 Discrete Status Outputs	10 ms	ON delay: 5 min max OFF delay: 5 min max	131 mm
			0.5 amps ea.	10 Discrete Status Outputs & EtherNet/Modbus TCP			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

SC22-3
Safety Controller

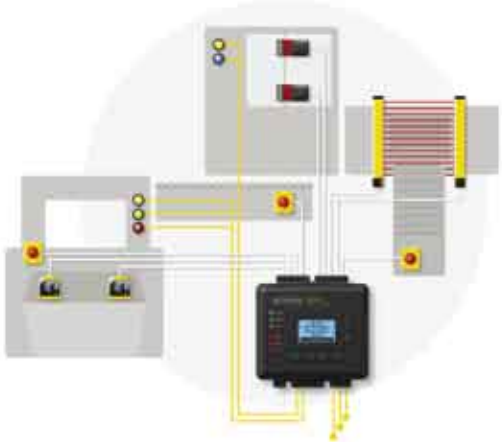
- Totally configurable and flexible safety controller that can easily replace multiple dedicated safety modules.
- Controller monitors up to 22 inputs for proper operations.
- Each input can be configured for Control Reliability for Category 2, 3 or 4 safety circuit performance per OSHA/ANSI or ISO 13849-1,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

Intuitive free software for point-and-click configuration

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



22 input terminals for monitoring safety and non-safety devices



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

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

BRACKETS PAGE 165
INTERFACE PAGE 77

SC22-3 Safety Controllers

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

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SC22-3 Safety Controller, 24V dc

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

SC22-3 Interface Modules

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

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

Additional Interfacing Products

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

NC = Normally closed, NO = Normally open

Accessories SC22-3 Safety Controllers

Cordsets

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

Miscellaneous

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

SC22-3 Safety Controller Specifications

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

More on next page

SC22-3 Safety Controller Specifications (con't)

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

PICO-GUARD™

Fiber Optic Controllers page 60

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

Advanced solid-state controller with four optical channels.

Use with optical elements including:

Point Systems

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

Grid Systems

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

Interlock Systems

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

PICO-GUARD™ Optical E-Stop Buttons

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

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E-Stop & Guard

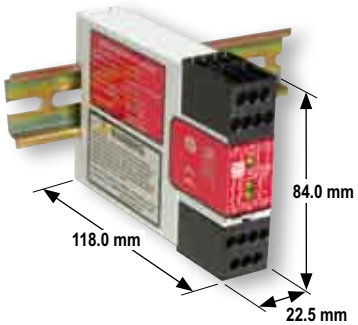
Safety Modules

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

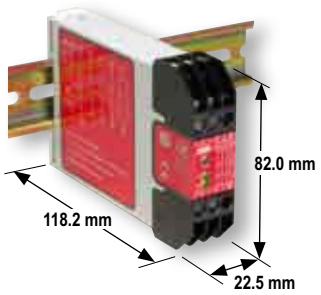
E-Stop & Guard Safety Modules

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

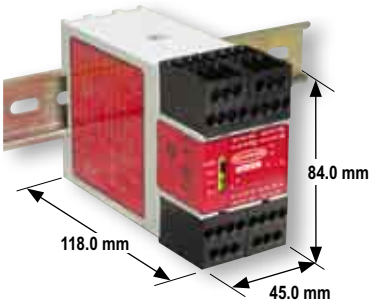
ONLINE
AUTOCAD, STEP, IGES & PDF



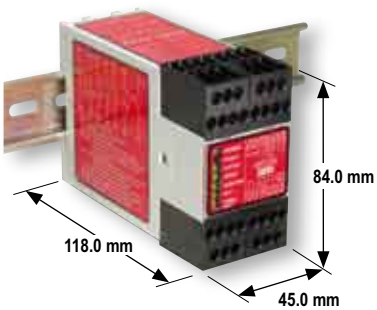
ES-FA-..AA & GM-FA-10J Models



ES-FA-6G Models



ES-..A-5A Models



ES-TN-1H.. Models

ES-TN-14H.. Models

BRACKETS
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E-Stop & Guard Safety Modules

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

NC = Normally Closed Relay, NO = Normally Open Relay

GM-FA-10J Guard Monitoring Module Specifications

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

ES-FA-..AA Safety Module Specifications

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

ES-..A-5A Safety Module Specifications

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

ES-TN-1H.. Safety Module Specifications

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

ES-TN-14H.. Safety Module Specifications

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

ES-FA-6G Safety Module Specifications

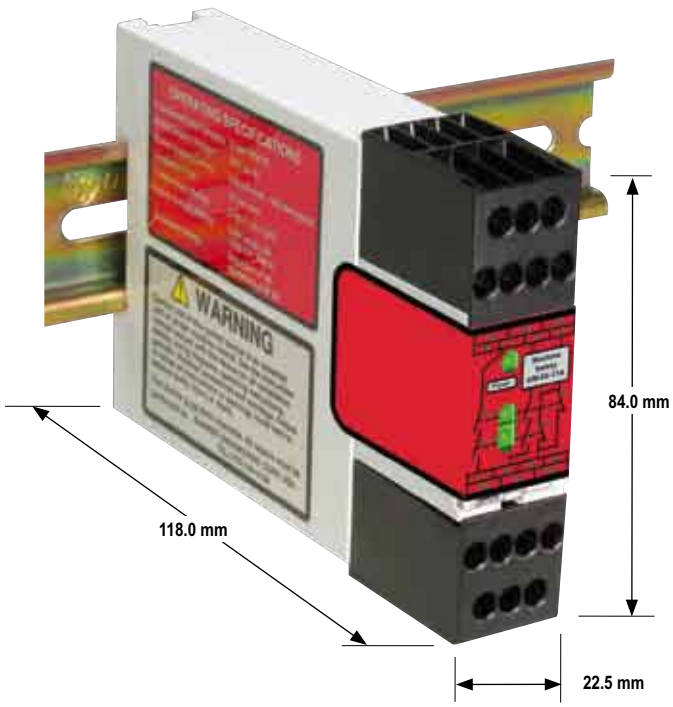
Supply Voltage and Current	24V ac/dc, +/- 10%; 50/60Hz **Power consumption:** approx. 2 W/0.75 VA
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Output Configuration	**Outputs (K1& K2):** three redundant (total of six) safety relay (forced-guided) contacts – $AgSnO_2$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

Universal Safety
Input Modules

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

Universal Safety Modules

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



UM-FA-..A Models

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Universal Safety Input Modules

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

NC = Normally Closed Relay, NO = Normally Open Relay

Universal Safety Input Module Specifications

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

Safety Mat
Modules

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

Safety Mat Monitoring Modules

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

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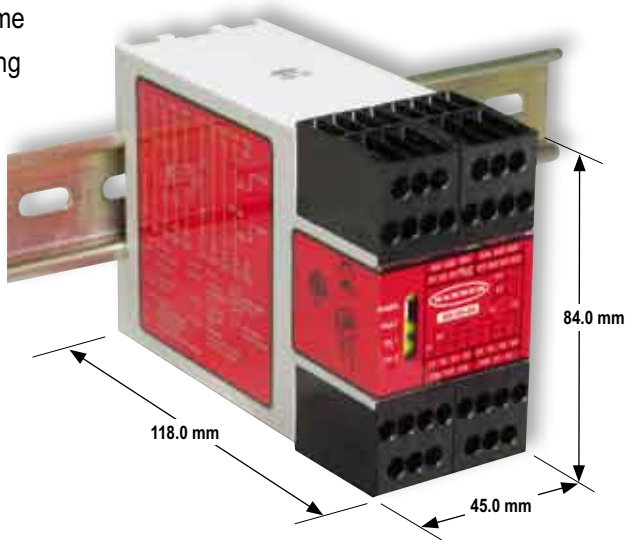

SM-..A-5A Models

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Safety Mat Monitoring Modules

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

NC = Normally Closed Relay, NO = Normally Open Relay

Safety Mat Monitoring Module Specifications

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

More on next page

Safety Mat Monitoring Module Specifications (cont'd)

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

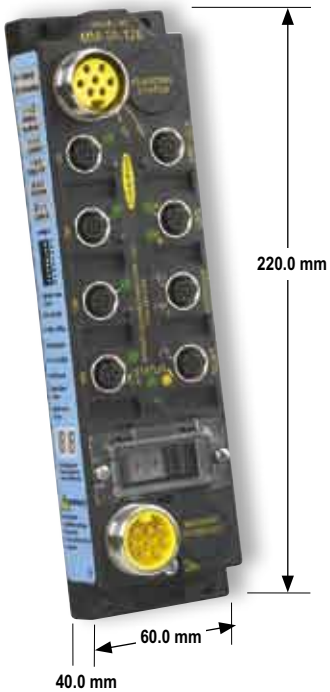
Muting

Modules and Dual Controllers

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

Muting Modules

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



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

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

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Muting Modules

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

NC = Normally Closed Relay, NO = Normally Open Relay

Accessories

Cordsets

See page 163 for a complete list of accessories

Light Screen with Euro-style QDs

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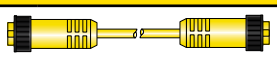
Length	8-pin Euro QD to 7-pin Mini QD
2.5 m	DESE4-508D
4.5 m	DESE4-515D
7.6 m	DESE4-525D

Grid and Point with Mini-style QDs



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

Grid and Point with Chamber

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

Mini QD to Flying Leads

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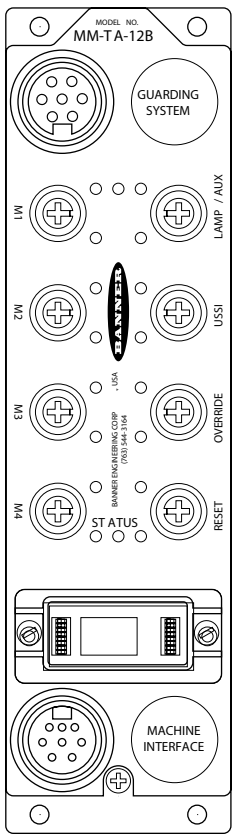
Length	8-Pin Mini to Flying Leads
4.5 m	QDS-815C
7.6 m	QDS-825C
15.2 m	QDS-850C



Euro (Female) QD to Flying Leads

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

Euro (Male) QD to Flying Leads

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

Euro QD–Double Ended

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

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

MM-TA-12B Muting Module Specifications

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

More on next page

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

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

MM2-TA-12B Muting Module Specifications

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

More on next page

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

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

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

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

More on next page

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

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

More on next page

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

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

Safe Speed

Safety Modules

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

SSM Safe Speed Monitoring Modules

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

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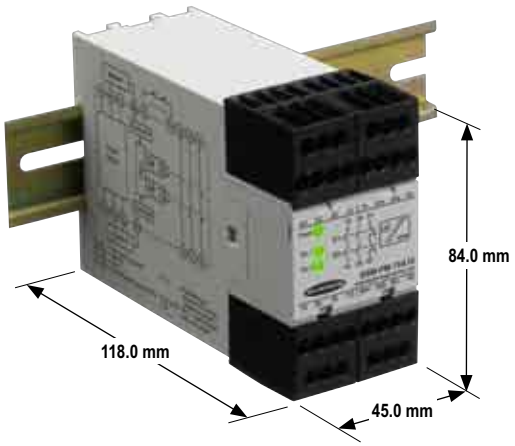

SSM-FM-11A... Models

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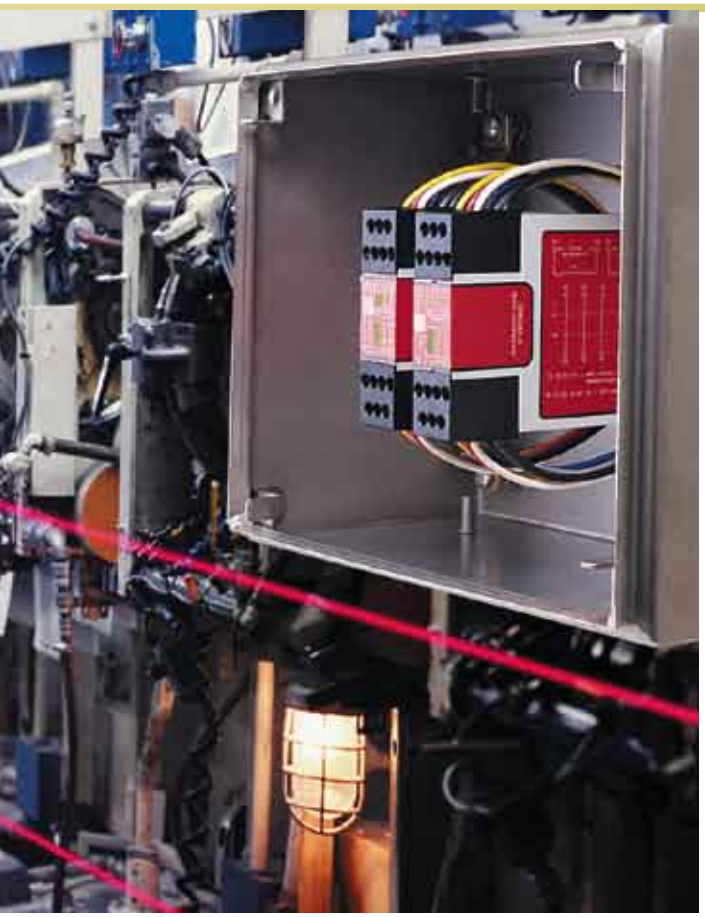
SSM Safe Speed Monitoring Modules

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

NC = Normally Closed Relay, NO = Normally Open Relay

SSM Safe Speed Monitoring Module Specifications

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



Extension
Relay Modules

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

Extension Modules

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

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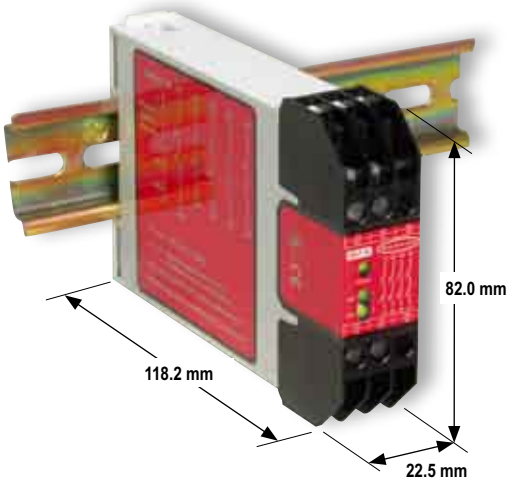

EM-F..-7G Models

EM-T-7A Models

SC22-3
PICO-GUARD™
E-STOP & GUARD
UNIVERSAL
SAFETY MAT
MUTING
SAFE SPEED
EXTENSION
INTERFACE
BRACKETS
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Extension Modules

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

NC = Normally Closed Relay, NO = Normally Open Relay

Extension Module Specifications

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

Interface
Relay Modules

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

Interface Modules

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

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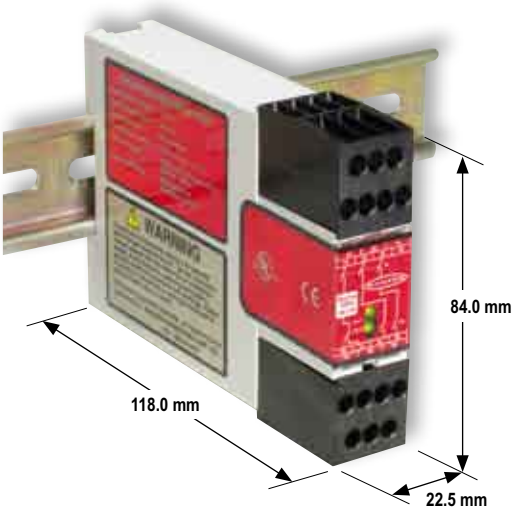

Interface Models

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Interface Modules

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

NC = Normally Closed Relay, NO = Normally Open Relay

Interface Modules Specifications

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

Two-Hand Control

DUO-TOUCH® SG page 111

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

STB Self-Checking Touch Buttons page 117

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

DUO-TOUCH® SG Run Bars page 120

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

DUO-TOUCH® SG Selection Chart

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

NC = Normally Closed, NO = Normally Open

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

DUO-TOUCH® SG

Two-Hand Control Modules, STB Compatible

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

DUO-TOUCH® SG MODULES
STB BUTTONS
DUO-TOUCH® Run Bars
CORDSETS PAGE 119
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AT-GM/HM-11KM Models
- 115V ac/24V dc (GM)
- 230V ac/24V dc (HM)
- 2 NO/NC inputs
- 2 muting inputs
- 1 safety stop interface
- 2 safety outputs
- Auxiliary outputs

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

Page 113

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

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DUO-TOUCH® SG Run Bar

Page 120

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

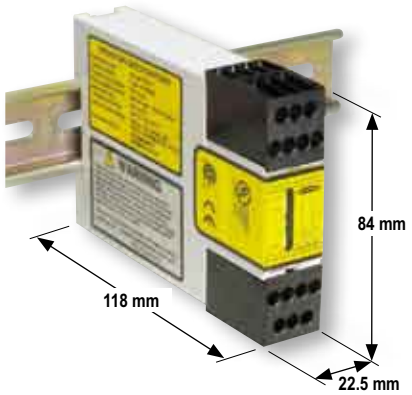
STB Self-Checking Touch Buttons

Page 117

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

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

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



AT-FM-10K Model

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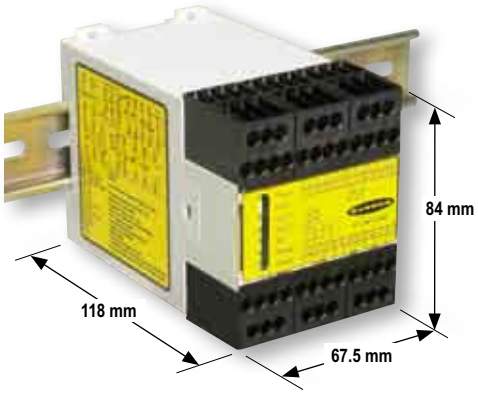
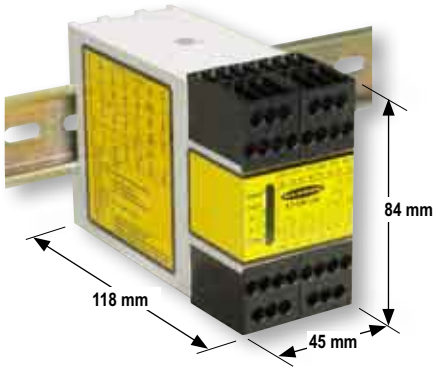


AT-GM-11KM & AT-HM-11KM Models
(AT-GM-11KM shown)



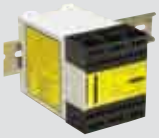
AT-GM-13A & AT-HM-13A Models
(AT-GM-13A shown)

DUO-TOUCH® SG Two-Hand Control Modules

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

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

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

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

NC = Normally Closed, NO = Normally Open

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

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

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

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

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

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

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

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

STB

Self-Checking Touch Buttons

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

DUO-TOUCH® SG MODULES
STB BUTTONS
DUO-TOUCH® Run Bars
CORDSETS PAGE 119
BRACKETS PAGE 119

STB Self-Checking Touch Buttons

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

STB models

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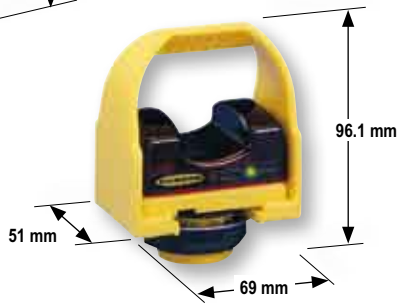
AUTOCAD, STEP, IGES & PDF



STB models with cover

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

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

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

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

NC = Normally Closed, NO = Normally Open

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

STB Self-Checking Buttons Specifications

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

More on next page

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

Accessories

STB Self-Checking Touch Buttons

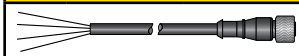
STB Self-Checking Button Field Covers

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

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

Cordsets

Euro-Style to Flying Leads



pg. 177

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

Euro-Style to Flying Leads

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

Mini-Style QD to Flying Leads

pg. 183

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

Brackets

STB

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

Run Bar

DUO-TOUCH® Run Bar with STBs

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

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BRACKETS PAGE 122
STANDS PAGE 198
INDICATORS PAGE 192

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

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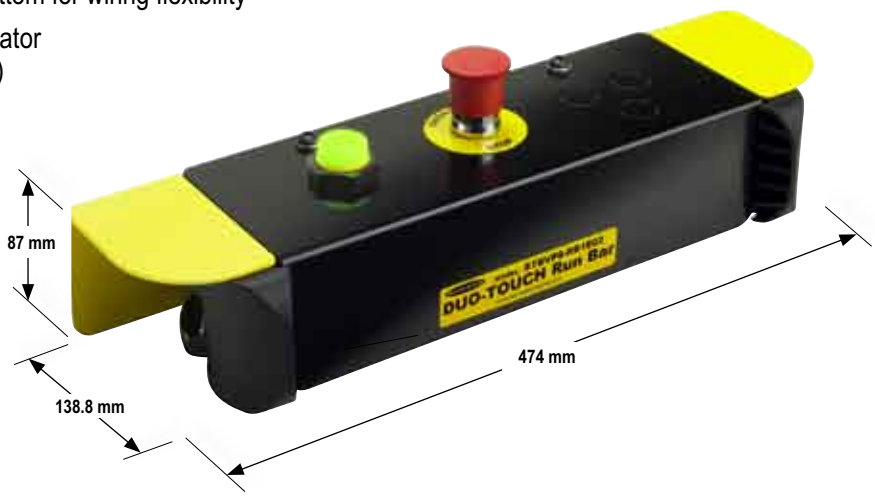
- ANSI B11.19 and ISO 13851 (EN 574) compliant
- Pre-installed STB optical touch buttons
- Robust, 13-gauge cold-rolled steel construction
- Emergency stop button on some models
- Knockouts on top, back and bottom for wiring flexibility
- Knockout for EZ-LIGHT™ indicator (sold separately, see page 192)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



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

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

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

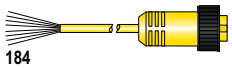
DUO-TOUCH® Run Bars with STB Self-Checking Touch Buttons

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

Accessories

DUO-TOUCH® Run Bar

Cordsets

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

Brackets

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

Stands

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

Indicators

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

INTERLOCK SWITCHES

PICO-GUARD™ page 125

- Fiber optic switches for non-contact applications
- Straight, right-angle, dual-lens, extreme-duty and heavy-duty models
- Low-cost alterative to cumbersome machine guarding methods
- Rugged construction for tough environments
- Easy to install

Magnet Style page 126

- Magnet switches for non-contact applications
- Compact, 3-piece non-contact system
- Sealed to resist water and dirt
- Designed to resist intentional defeat

Hinge Style page 129

- Load-bearing, lever and rotating hinge styles
- Adjustable range of operation
- One-piece switches

Compact Plastic page 135

- Designed to minimize tampering
- Five actuator types
- Actuator engagement from different locations

Compact Metal page 141

- Rigid and flexible in-line actuators
- Rotating actuator heads

Locking Style page 144

- Two options for locking mechanisms
- Two models for different voltages
- Rigid and flexible in-line actuators
- Rotating actuator heads

Model			Catalog Page	Type	Package Style	Housing Material	Actuator Contacts	Solenoid Contacts
PICO-GUARD™	SFI-S1../R1..		125	Fiber Optic	2-Piece	Plastic	—	—
	SFI-D1../A1..					Plastic		
	SFI-M12..					Metal		
	SFI-D1E../A1E..					Metal		
	SFI-D1H../A1H..					Metal		—
Magnet	SI-MAG1..		126	Magnetic	2-Piece	Plastic	1 NO & 1 NC	—
	SI-MAG2..					Plastic		
	SI-MAG3..					Plastic		
Hinge	SI-HG63		130	Mechanical Non-Locking	1-Piece	Metal	2 NC & 1 NO	—
	SI-HG80..		131			Metal	SPDT (Form C)	—
	SI-LS31R..		133			Plastic	1 NC & 1 NO, 2 NC	—
	SI-LS31H..		132			Plastic	1 NC & 1 NO, 2 NC	
Compact Plastic	SI-LS83../LS100..		135	Mechanical Non-Locking	2-Piece	Plastic	2 NC & 1 NO, 1 NC & 1 NO, 2 NC	—
	SI-QS75../QS90..		137			Plastic	1 NC, 1 NC & 1 NO, 2 NC, 2 NC & 1 NO	
Compact Metal	SI-LM40..		141	Mechanical Non-Locking	2-Piece	Metal	1 NO & 1 NC, 2 NC, 2 NC & 1 NO	—
Locking	SI-LS42..		144	Mechanical Locking	2-Piece	Plastic	1 NC & 1 NO, 2 NC, 2 NC & 1 NO, 3 NC	1 NC & 1 NO, 1 NC
	SI-QM100..		147			Metal	1 NC & 1 NO, 2 NC	1 NC & 1 NO

NC = Normally Closed, NO = Normally Open

INTERLOCK SWITCHES

PICO-GUARD Fiber Optic

- Interlock switches interface with PICO-GUARD SFCDT-.. fiber optic controllers.
- Compact, non-contact and easy to install, the switches interlock doors, guards, gates and covers.
- Fiber optic interlock switches eliminate the need to run electrical wires to a hazardous area.
- Fibers connect and disconnect quickly.
- Switches meet Safety Category 4 requirements with one switch pair per guard (per ISO 13849-1).
- Impact-resistant polycarbonate plastic, extreme-duty chemically resistant stainless steel or heavy-duty impact-resistant zinc die-cast models are available.
- Switches have an environmental rating of IP67 and are ATEX and FM approved for use in explosive environments when used with a PICO-GUARD controller.
- Attenuator is available for reducing excess gain in short-run applications.
- Splices are available for easily connecting two fiber sections.
- See page 59 for a complete PICO-GUARD controller.

FIBERS PAGE 68
BRACKETS PAGE 164

Models for a variety of applications & environments.

Straight **Page 64**
- In-line lens housing
- Right or left side mounting flange

Right Angle **Page 64**
- Right-angle lens housing
- Right or left side mounting flange

Dual Lens & Actuator **Page 64**
- Passive U-shaped actuator for lift-off doors and removable guards
- Center mounting configuration

Straight Barrel **Page 64**
- Impact- and chemically resistant stainless steel
- 12 mm threaded barrel mounting

Dual Lens & Actuator—Extreme- & Heavy-duty **Page 64**
- Actuator with U-shaped configuration allows fiber to “enter” and “exit” from one side of the guard only
- Extreme-duty chemically resistant stainless steel or heavy-duty impact resistant zinc die-cast models.
- Center mounting configuration

Magnet Style

Non-Contact Safety Interlock Switches

- Sealed components resist water, dirt and are more accommodating to misalignment than mechanical switches.
- Shifts in distance and alignment don't compromise sensing.
- Coded magnets minimize the risk of intentional defeat.
- Compact size makes it possible to conceal the switch.
- Magnets with different polarizations add security.
- For safety applications, switch must be used with Gate Monitoring Module GM-FA-10J, SC22-3 Safety Controller or comparable control systems.

INTERFACE
PAGE 127

Magnet Style Safety Switches

- 3-piece system: coded magnet, reed switch sensor and controller module
- Easy installation
- Three housing styles
- NEMA 4X and IP67 rating
- A complete system requires a guard monitoring module or controller (see page 127)

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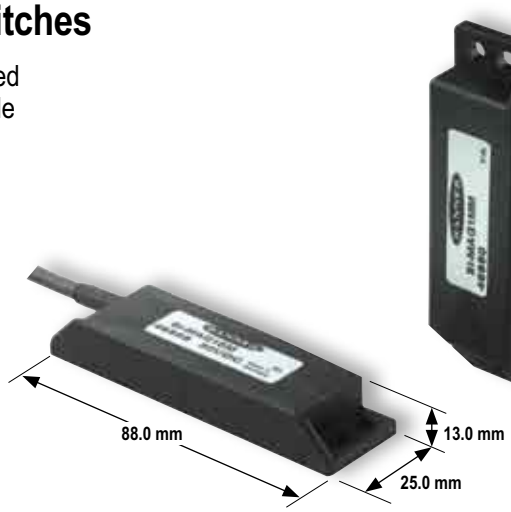
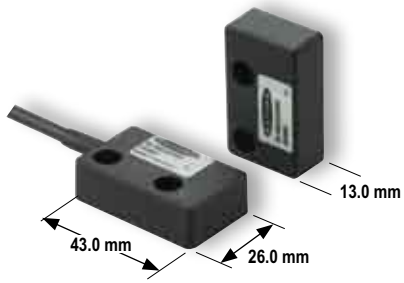


SI-MAG1SM.. and SI-MAG1MM.. Models

SI-MAG3SM and SI-MAG3MM Models



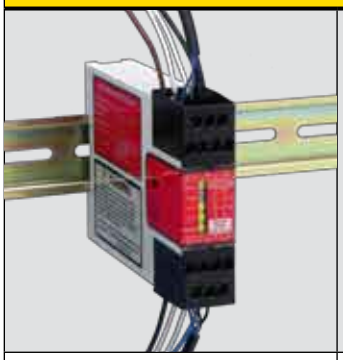
SI-MAG2SM and SI-MAG2MM Models

SI-MAG Magnet Style Safety Switches

Models			Contacts	Sensor Cable*	Switching Distance***		Data Sheet
					Min. ON	Max. OFF	
SI-MAG1SM	Sensor		**1 NO & 1 NC**	3 m	—	—	60998
SI-MAG1SMCO†							
SI-MAG1MM	Coded Magnet				0-3 mm	3-14 mm	
SI-MAG1MM90**							
SI-MAG1MMHF					0-8 mm	8-16 mm	
SI-MAG2SM	Sensor				—	—	
SI-MAG2MM	Coded Magnet				0-4 mm	4-8 mm	
SI-MAG3SM	Sensor				—	—	
SI-MAG3MM	Coded Magnet				0-3 mm	3-7 mm	

NC = Normally Closed Output, NO = Normally Open Output
* For 9 m cable, add **W/30** to the 3 m model number (example, **SI-MAG1SM W/30**).
** Difference is in Direction of Approach. See page 212 for more information.
*** For proper reset, switches must be positioned greater than 14 mm apart.
† Cable opposite
NOTE: The sensor and its magnet must be mounted at a minimum distance of 15 mm from any magnetized or ferrous material (example, steel) for proper operation. SFA-IMB1 or SFA-IMB2 can be used as spacers (see pages 171 and 172). Depending on the installation, multiple brackets may be required.

Monitoring Control Module (required for a complete system)

Models		Description	Product Information	Data Sheet
	**GM-FA-10J**	• The gate module monitors up to 20 Banner coded magnets for contact failure or wiring fault. • Two-channel operation monitors redundant switches on a single guard; one-channel operation monitors single switches on two guards. • Two redundant output switching channels connect to control-reliable power interrupt circuits and are rated for up to 250V ac at up to 6 A. • The reset input can be used for external device monitoring (EDM). • The gate monitoring module uses 24V ac/dc at less than 150 mA.	Page 81	60998
	**SC22-3-S...** **SC22-3-C...** **SC22-3E-S...** **SC22-3E-C...**	• One controller provides configurable monitoring of multiple safety devices. • 22 input terminals can monitor both contact-based and PNP solid-state input devices. • 3 pairs of independent solid-state safety outputs can be used with selectable one- or two-channel external device monitoring. • Ten configurable non-safety status outputs track inputs, outputs, lockout, I/O status and other functions • SC22-3 modules use 24V dc. • 10/100 Base TX Ethernet communication option using EtherNet/IP and Modbus TCP protocols (SC22-3E models).	Page 77	133487

SI-MAG Safety Switches Specifications

Switching Elements	Three pole-stable reed switches
Repeat Switching Accuracy	± 0.1 mm
Construction	Epoxy-encapsulated circuit in polyamide housing
Environmental Rating	NEMA 4X; IP67
Switching Capacity	30V dc max. @ 0.25 W
Operating Temperature	-5° to +70° C
Connections	Integral PVC-jacketed 3 m 4-wire cable. Cable O.D. is 5 mm. Wires are 24 AWG. (0.25 mm^2)
Wiring Diagrams	**1-Channel Coded Magnet Switches:** WD033 (p. 238) **2-Channel Positive Opening Switches:** WD034 (p. 238) **1-Channel (Multiple Guards):** WD035 (p. 239) **2-Channel (Multiple Guards):** WD036 (p. 239)

Hinge Style
Interlocking Switches

- Three types are available—load-bearing hinge, hinged lever and rotating hinge.
- One-piece switch eliminates need for alignment, engagement and risk of breakage of a separate actuator.
- Design meets positive opening requirements for safety interlocks ⊖.

CORDSETS PAGE 130
GLANDS PAGE 187

SI-HG63 Load Bearing **Page 130**

- Hinge operates to a full 270° range of motion.
- In-line and right-angle hinge models are available.
- Hinge supports an axial and radial load of 1200 N.
- Housing is constructed of corrosion-resistant stainless steel.

SI-HG80 Load Bearing **Page 131**

- Hinge operates to a full 180° range of motion.
- In-line and right-angle hinge models are available.
- Hinge supports an axial load of 750 N and more than 1,000 N in radial direction.
- Housing is constructed of corrosion-resistant zinc die-cast.

SI-LS31H
Hinge Lever Style **Page 132**

- Built-in hinge lever actuator attaches to doors or flaps which open 90° in one direction.
- Actuator head rotates in 90° increments.
- Housing is constructed of glass reinforced thermoplastic with plated steel actuator.

SI-LS31R
Rotary Hinge-Style **Page 133**

- Rotating actuator connects directly to door hinge.
- Actuator head rotates in 90° increments.
- Housing is constructed of glass reinforced thermoplastic with plated steel actuator.

SI-HG63 Hinge Style Switches

- In-line or right-angle models
- 270° range of motion
- ± 1.5° adjustment
- Corrosion-resistant stainless steel
- Repositional safety switching point
- 6-pin Micro-style quick-disconnect cordset fittings
- Positive opening safety contacts (IEC 60947-5-1)
- QD cordsets ordered separately

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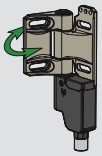
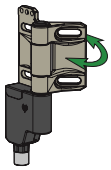
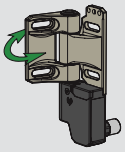
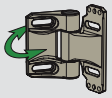
SI-HG63FQDRR

* Dimensions for SI-HG63FQDL are mirror image.

SI-HG63FQDR*

SI-HG63 Hinge Style Switches, 63 mm

Models	Actuator Type		Contact(s)	Contact Config. & Switch Diagram	Data Sheet
SI-HG63FQDR	In-line Integral load bearing		2 NC & 1 NO	SD001 (Page 213)	129465
SI-HG63FQDL	In-line Integral load bearing				
SI-HG63FQDRR	Right-angle Integral load bearing				
SI-HG63A	Blank hinge		–		

Hinge 270° NC = Normally closed contact, NO = Normally open contact

CORDSETS PAGE 177

Accessories

Cordsets

Micro-Style QD to Flying Leads

pg. 183

Length	Straight	Right-Angle
2 m	MQEAC-606	MQEAC-606RA
5 m	MQEAC-615	MQEAC-615RA
9.1 m	MQEAC-630	MQEAC-630RA

SI-HG80 Hinge Style Switches

- In-line and right-angle models
- Corrosion-resistant
- 180º range of motion
- 4-pin Micro-style quick-disconnect cordset fittings
- Positive opening safety contact (IEC 60947-5-1)
- QD cordsets ordered separately

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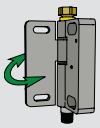
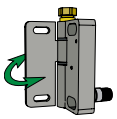
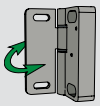
SI-HG80DQDR Right-Angle (top) Models and SI-HG80DQD In-Line (bottom)

SI-HG80 Hinge Style Switches, 80 mm

Models	Actuator Type		Contact(s)	Contact Config. & Switch Diagram	Data Sheet
SI-HG80DQD	In-line Integral load bearing		**SPDT (Form C)**	SD002 (Page 213)	46735
SI-HG80DQDR	Right-angle Integral load bearing				
SI-HG80A	Blank hinge		—		

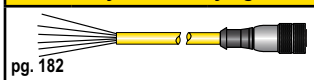
Hinge 180° SPDT = Single-Pole, Double-Throw Contacts

CORDSETS
PAGE 177

Accessories

Cordsets

Micro-Style QD to Flying Leads



pg. 182

Length	Straight	Right-Angle
2 m	MQEAC-406	MQEAC-406RA
5 m	MQEAC-415	MQEAC-415RA
9.1 m	MQEAC-430	MQEAC-430RA

SI-LS31H Hinge Lever Style Switches

- Glass reinforced thermoplastic switch housing
- Plated steel actuator
- Rotating head
- Insulated device on all models (IEC 60947-5-1)
- Positive opening safety contacts (IEC 60947-5-1)

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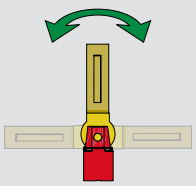
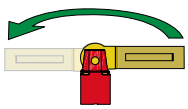
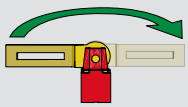
SI-LS31H Hinge Lever Style Switches, 31 mm

Models*	Actuator Type		Contact(s)	Contact Config. & Switch Diagram	Data Sheet
SI-LS31HGD	Vertical Hinged Lever ± 90°		1 NC & 1 NO	SD003 (Page 213)	50165
SI-LS31HGE			2 NC	SD004 (Page 213)	
SI-LS31HGRD	Right-Hand Hinged Lever 180°		1 NC & 1 NO	SD005 (Page 213)	
SI-LS31HGRE			2 NC	SD006 (Page 213)	
SI-LS31HGLD	Left-Hand Hinged Lever 180°		1 NC & 1 NO	SD007 (Page 214)	
SI-LS31HGLE			2 NC	SD008 (Page 214)	

Hinge 90° One-Directional 180° One-Directional 180° NC = Normally Closed Contact, NO = Normally Open Contact

* Contact factory for integral quick-disconnect (QD) and pigtail QD options.

SI-LS31R
Rotary Hinge Style Switches

- Glass reinforced thermoplastic switch housing
- Plated steel actuator
- Rotating actuator head
- Insulated device on all models (IEC 60947-5-1)
- Positive opening safety contacts (IEC 60947-5-1)

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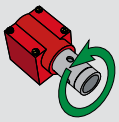
SI-LS31R Rotary Hinge Style Switches, 31 mm

Models*	Actuator Type		Contact(s)	Contact Config. & Switch Diagram	Data Sheet
SI-LS31RTD	Rotary Shaft		1 NC & 1 NO	SD009 (Page 214)	50163
SI-LS31RTE			2 NC	SD010 (Page 214)	

360° Rotary NC = Normally Closed Contact, NO = Normally Open Contact

* Contact factory for integral quick-disconnect (QD) and pigtail QD options.

SI-HG63 Hinge Style Switches Specifications

Contact Rating	3 A @ 230V ac max., 1.0 A @ 24V dc max. 2.5 kV max. transient tolerance NEMA A300 P300
European Rating	**Utilization categories**: AC15 and DC13 (IEC 90497-5-1) U_i = 250V ac, I_{th} = 5A
Minimum Switching Speed	5 operations per minute
Switching Angle	**NC contact**: ±3° **NO contact**: ±9° **Tolerance for all angles**: 1.5°
Mechanical Life	1 million operations
Short Circuit Protection	4 amp Slow Blow, 8 amp Fast Blow. Recommended external fusing or overload protection.
Force Exerted by Guard per Switch	**Axial and radial:** 1200 N (264 lbf) max.
Wire Connections	6-pin Micro-style quick-disconnect (QD) fitting. Cordsets are ordered separately. See page 183.
Operating Range	0° to 270°
Construction	**Hinge**: X22CrNi 17 **Switch**: PBT
Environmental Rating	NEMA 4; IP67
Operating Conditions	**Temperature**: –25° to +70° C
Weight	0.65 kg (1.43 lb)
Application Note	To avoid excessive radial stress in applications containing large doors, the hinge switch should be mounted either in pairs of two, or in conjunction with a blank hinge (see page 130).
Certifications	
Contact configuration and Switching Diagram	SD001 (p. 213)

SI-HG80 Hinge Style Switches Specifications

Contact Rating	3 A @ 250V ac max., 0.5 A @ 60V dc max. 2.5 kV max. transient tolerance NEMA A300 P300
European Rating	**Utilization categories**: AC15 and DC13 (IEC 90497-5-1) U_i = 250V ac, I_{th} = 3A
Minimum Switching Speed	20 operations per minute
Mechanical Life	1 million operations
Short Circuit Protection	6 amp Slow Blow, 10 amp Fast Blow. Recommended external fusing or overload protection.
Force Exerted by Guard per Switch	**Axial:** 750 N max. **Radial:** 1000 N max.
Operating Range	0° to 180°
Wire Connections	4-pin Micro-style quick-disconnect (QD) fitting. Cordsets are ordered separately. See page 182.
Construction	Zinc Die-cast (GD-Zn)
Environmental Rating	NEMA 4; IP67
Operating Conditions	**Temperature:** -25° to +70° C
Weight	0.40 kg
Application Notes	To avoid excessive radial stress in applications containing large doors, the hinge switch should be mounted either in pairs of two, or in conjunction with a blank hinge (see page 131).
Certifications	
Contact Configuration and Switching Diagrams	SD002 (p. 213)

SI-LS31 Hinge Style Switches Specifications

Contact Rating	10A @ 24V ac, 10A @ 110V ac, 6A @ 230V ac, 6A @ 24V dc 2.5 kV max. transient tolerance NEMA A300 P300
European Rating	**Utilization categories**: AC15 and DC13 U_i = 500V ac I_{th} = 10A
Contact Material	Silver-nickel alloy
Maximum Switching Speed	50 operations per minute
Mechanical Life	1 million operations
Required Actuation Force	**SI-LS31R models:** 10 N cm **SI-LS31H models:** 15 N cm
Short Circuit Protection	6 amp Slow Blow, 10 amp Fast Blow. Recommended external fusing or overload protection.
Wire Connections	Screw terminals with pressure plates accept the following wire sizes – **Stranded and solid:** 20 AWG (0.5 mm^2) to 16 AWG (1.5 mm^2) for one wire **Stranded:** 20 AWG (0.5 mm^2) to 18 AWG (1.0 mm^2) for two wires
Cable Entry	M20 x 1.5 threaded entrance Adapter supplied to convert from M20 x 1.5 to ½" - 14 NPT threaded entrance
Construction	Glass fiber-reinforced thermoplastic UL94-VO rating; plated steel actuator
Environmental Rating	IP65
Operating Conditions	**Temperature**: -30° to +80° C
Weight	0.09 Kg
Certifications	
Contact Configuration and Switching Diagrams	**SI-LS31R models:** SD009 and SD010 (p. 214) **SI-LS31H models:** SD003, SD004, SD005, SD006, SD007 and SD008 (p. 213-214)

40-60 Hz		
U_e V	I_e/AC-15 A	I_e/DC-13 A
24	10	6
110	10	1
230	6	.4

Compact Plastic

Flat Pack and Limit Switch Styles

- Mechanically coded actuators use two independent operating elements to minimize intentional tampering or defeat.
- Rotating head requires no tools.
- Four standard actuators are available, as well as an optional high-extraction-force adapter.
- IP65 switch housing rating increases to IP67 with addition of a screw to the wiring chamber door.

GLANDS PAGE 187
ACTUATORS PAGE 149

SI-LS83 and SI-LS100 Plastic Style Switches

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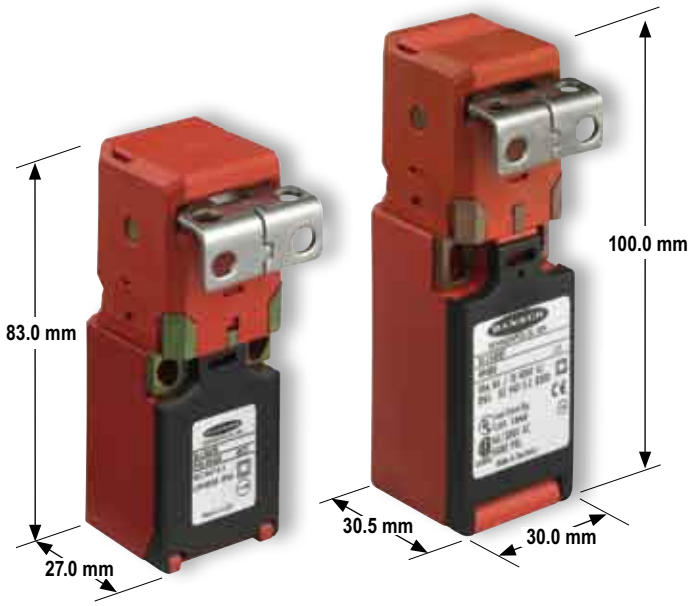
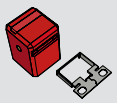
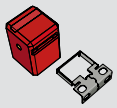
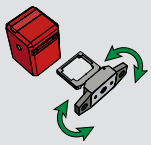
- Low profile for confined spaces
- Tough glass-reinforced thermoplastic housing
- Limit switch design (EN 50047)
- In-line or right-angle actuator
- Actuator engagement from four side or four top positions
- Insulated device on all models (IEC 60947-5-1)
- Positive opening safety contacts (IEC 60947-5-1)

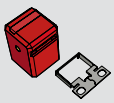
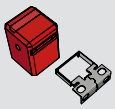
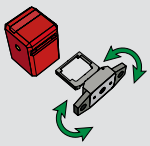
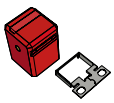
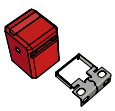
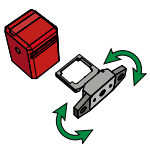


SI-LS83 Models **SI-LS100 Models**
(both models shown with right-angle rigid in-line actuator)

SI-LS100 Plastic Style Switches, 100 mm

Kits				Contact(s)	Contact Config. & Switch Diagram	Data Sheet
Kit Model*	Actuator Type		Interlock			
SI-LS100SF	**SI-QS-SSA-2** Straight Rigid In-Line		SI-LS100F	**2 NC & 1 NO**	SD011 (Page 214)	59622
SI-LS100SRAF	**SI-QS-SSA-3** Rigid In-Line		SI-LS100F			
SI-LS100MRFF	 **SI-QS-SSU** Flexible In-Line		SI-LS100F			

SI-LS83 Plastic Style Switches, 83 mm

Kits				Contact(s)	Contact Config. & Switch Diagram	Data Sheet
Kit Model*	Actuator Type		Interlock			
SI-LS83SD	**SI-QS-SSA-2** Straight Rigid In-Line		SI-LS83D	**1 NC & 1 NO**	SD012 (Page 214)	59622
SI-LS83SRAD	**SI-QS-SSA-3** Rigid In-Line		SI-LS83D			
SI-LS83MRFD	 **SI-QS-SSU** Flexible In-Line		SI-LS83D			
SI-LS83SE	**SI-QS-SSA-2** Straight Rigid In-Line		SI-LS83E	**2 NC**	SD013 (Page 215)	
SI-LS83SRAE	**SI-QS-SSA-3** **Rigid In-Line**		SI-LS83E			
SI-LS83MRFE	 **SI-QS-SSU** Flexible In-Line		SI-LS83E			

 Multi-Directional NC = Normally Closed Contact, NO = Normally Open Contact

* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only. Contact factory for integral quick-disconnect (QD) and pigtail QD options.

SI-QS75 and SI-QS90 Plastic Style Switches

- Actuator engagement from front, back, or either of two top positions
- Insulated device on all models (IEC 60947-5-1)
- Positive opening safety contacts (IEC 60947-5-1)

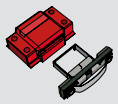
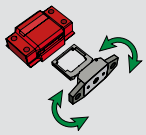
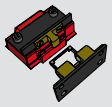
ONLINE
AUTOCAD, STEP, IGES & PDF

SI-QS75 Models

SI-QS90 Models

(both models shown with rigid in-line actuator)

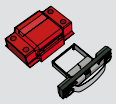
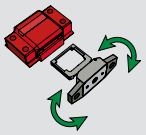
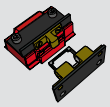
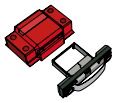
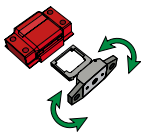
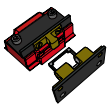
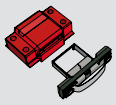
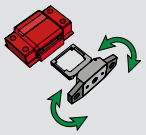
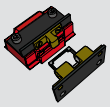
SI-QS75 Flat-Pack Style Switches, 75 mm

Kits				Contact	Contact Config. & Switch Diagram	Data Sheet
Kit Model*	Actuator Type		Interlock			
SI-QS75MC	**SI-QS-SSA-4** Rigid In-Line		SI-QS75C	**1 NC**	SD014 (Page 215)	49370
SI-QS75MFC	**SI-QS-SSU** Flexible In-Line		SI-QS75C			
SI-QS75MC-100 (High-Force)	**SI-QS-SSA** Rigid In-Line & **SI-QS-100** High-force Accessory		SI-QS75C			

Multi-Directional NC = Normally Closed Contact, NO = Normally Open Contact

* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only. Contact factory for integral quick-disconnect (QD) and pigtail QD options.

SI-QS90 Flat-Pack Style Switches, 90 mm

Kits				Contact(s)	Contact Config. & Switch Diagram	Data Sheet
Kit Model*	Actuator Type		Interlock			
SI-QS90MD	**SI-QS-SSA-4** Rigid In-Line		SI-QS90D	**1 NC & 1 NO**	SD015 (Page 215)	49370
SI-QS90MFD	**SI-QS-SSU** Flexible In-Line		SI-QS90D			
SI-QS90MD-100 (High-Force)	**SI-QS-SSA** Rigid In-Line & **SI-QS-100** High-force Accessory		SI-QS90D			
SI-QS90ME	**SI-QS-SSA-4** Rigid In-Line		SI-QS90E	**2 NC**	SD016 (Page 215)	49370
SI-QS90MFE	**SI-QS-SSU** Flexible In-Line		SI-QS90E			
SI-QS90ME-100 (High-Force)	**SI-QS-SSA** Rigid In-Line & **SI-QS-100** High-force Accessory		SI-QS90E			
SI-QS90MF	**SI-QS-SSA-4** Rigid In-Line		SI-QS90F	**2 NC & 1 NO**	SD017 (Page 215)	49370
SI-QS90MFF	**SI-QS-SSU** Flexible In-Line		SI-QS90F			
SI-QS90MF-100 (High-Force)	**SI-QS-SSA** Rigid In-Line & **SI-QS-100** High-force Accessory		SI-QS90F			

Multi-Directional NC = Normally Closed Contact, NO = Normally Open Contact

* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only. Contact factory for integral quick-disconnect (QD) and pigtail QD options.

SI-LS83 and SI-LS100 Plastic Style Switches Specifications

Contact Rating	10A @ 24V ac, 10A @ 110V ac, 6A @ 230V ac, 6A @ 24V dc 2.5 kV max. transient tolerance NEMA A300 P300
European Rating	**Utilization categories**: AC15 and DC13 (IEC 60947-5-1) **Switches with 1 & 2 contact pairs:** U_i= 500V ac, I_{th}= 10A **Switches with 3 contact pairs:** U_i= 400V ac, I_{th}= 5A
Contact Material	Silver-nickel alloy
Maximum Switching Speed	30 operations per minute
Maximum Actuator Speed	1 m/second
Mechanical Life	1 million operations
Minimum Actuator Engagement Radius	**In-line actuators:** 150 mm **Flexible actuators:** 50 mm in all directions
Actuation Extraction Force	12 N
Short Circuit Protection	6 amp Slow Blow, 10 amp Fast Blow. Recommended external fusing or overload protection.
Wire Connections	**Stranded and solid:** 20 AWG (0.5 mm^2) to 18 AWG (1.0 mm^2) for one wire **Stranded:** 20 AWG (0.5 mm^2) to 18 AWG (1.0 mm^2) for two wires
Cable Entry	M20 x 1.5 for **SI-LS100** and M16 x 1.5 for **SI-LS83** threaded entrance. Adaptor supplied to convert to ½"- 14 NPT threaded entrance.
Construction	Glass fiber-reinforced thermoplastic UL94-VO rating
Environmental Rating	IP65 Note: Addition of a No. 3 x ¼" screw (max) to the wiring access door increases sealing to IP67; NEMA 4X
Operating Conditions	**Temperature:** -30° to +80° C
Weight	**SI-LS83 models:** 0.12 kg **SI-LS100 models:** 0.13 kg
Certifications	CE, CSA C US, UL LISTED Auxiliary Device
Contact Configuration and Switching Diagrams	**SI-LS100 models:** SD011 (p. 214) **SI-LS83 models:** SD012 and SD013 (p. 214-215)

40-60 Hz		
U_e V	I_e/AC-15 A	I_e/DC-13 A
24	10	6
110	10	1
230	6	.4

SI-QS75 and SI-QS90 Flat-Pack Style Switches Specifications

Contact Rating	10A @ 24V ac, 10A @ 110V ac, 6A @ 230V ac, 6A @ 24V dc 2.5 kV max. transient tolerance NEMA A300 P300
European Rating	**Utilization categories**: AC15 and DC13 (IEC 60947-5-1) **Switches with 1 & 2 contact pairs**: U_i= 500V ac, I_{th}= 10A **Switches with 3 contact pairs**: U_i= 400V ac, I_{th}= 5A
Contact Material	Silver-nickel alloy
Maximum Switching Speed	30 operations per minute
Maximum Actuator Speed	1 m/second
Mechanical Life	1 million operations
Minimum Actuator Engagement Radius	**In-line actuators:** 150 mm **Flexible actuators:** 50 mm in all directions
Actuation Extraction Force	**High-Force models:** 100 N **All others:** 10 N
Short Circuit Protection	6 amp Slow Blow, 10 amp Fast Blow. Recommended external fusing or overload protection.
Wire Connections	Screw terminals with pressure plates accept the following wire sizes – **For switches with one or two contacts:** **Stranded and solid:** 20 AWG (0.5 mm^2) to 16 AWG (1.5 mm^2) for one wire **Stranded:** 20 AWG (0.5 mm^2) to 18 AWG (1.0 mm^2) for two wires **For switches with three contacts:** **Stranded and solid:** 20 AWG (0.5 mm^2) to 18 AWG (1.0 mm^2) for one w ire **Stranded:** 20 AWG (0.5 mm^2) to 18 AWG (1.0 mm^2) for two wires
Cable Entry	M20 x 1.5 for **SI-QS90** and M16 x 1.5 for **SI-QS75** threaded entrance. Adapter supplied to convert M20 x 1.5 to ½" - 14 NPT threaded entrance.
Construction	Glass fiber-reinforced thermoplastic UL94-VO rating
Environmental Rating	IP65 **Note:** Addition of a No. 3 x ¼" screw (max) to the wiring access door increases sealing to IEC IP67; NEMA 4X
Operating Conditions	**Temperature:** -30° to +80° C
Weight	**SI-QS75 models:** 0.11 kg **SI-QS90 models:** 0.13 kg
Application Notes	Models with one and two contacts have three cable entry locations (bottom and two sides); models with three contacts have two cable entry locations (two sides). All entry locations are sealed with knockouts. To remove knockouts, thread the supplied M16 x 1.5 or M20 x 1.5 to ½" - 14 NPT conduit adapter or optional M16 x 1.5 or M20 x 1.5 cable gland into one of the threaded entry locations. The knockout will break open just before the adapter or cable gland bottoms out.
Certifications	CE, CSA C US, UL LISTED Auxiliary Device
Contact Configuration and Switching Diagrams	**SI-QS75 models:** SD014 (p. 215) **SI-QS90 models:** SD015, SD016 and SD017 (p. 215)

40-60 Hz		
U_e V	I_e/AC-15 A	I_e/DC-13 A
24	10	6
110	10	1
230	6	.4

Compact Metal

Limit Switch Style with In-Line Actuator

- Rigid and flexible in-line actuators are available.
- Actuator head rotates to four possible positions, in 90° increments.
- Aluminum die cast construction

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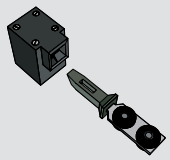
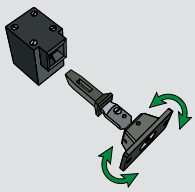
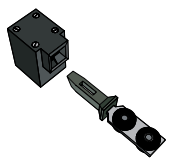
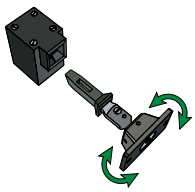
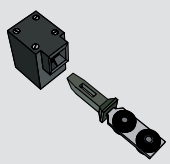
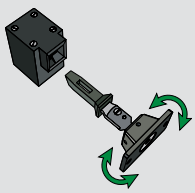
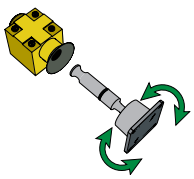
SI-LM40 Metal Style Switches

- Standard limit switch design
- Stainless steel actuators
- Trumpet-style switch option
- Protective earth terminal on all models (IEC 60947-1)
- Positive opening safety contacts (IEC 60947-5-1)

SI-LM40MKV Models
(with flexible in-line actuator)

SI-LM40MKH Models
(shown with rigid in-line actuator)

SI-LM40 Limit Switch Style, 40 mm

Kits				Contact(s)	Contact Config. & Switch Diagram	Data Sheet
Kit Model*	Actuator Type		Interlock			
SI-LM40MKHD	**SI-QM-SSA** Straight Rigid In-Line		SI-LM40KHD	**1 NO & 1 NC**	SD018 (Page 215)	49372
SI-LM40MKHFD	 **SI-QM-SMFA** Flexible In-Line		SI-LM40KHD			
SI-LM40MKHE	**SI-QM-SSA** Straight Rigid In-Line		SI-LM40KHE	**2 NC**	SD019 (Page 216)	
SI-LM40MKHFE	 **SI-QM-SMFA** Flexible In-Line		SI-LM40KHE			
SI-LM40MKHF	**SI-QM-SSA** Straight Rigid In-Line		SI-LM40KHF	**2 NC & 1 NO**	SD020 (Page 216)	
SI-LM40MKHFF	 **SI-QM-SMFA** Flexible In-Line		SI-LM40KHF			
SI-LM40MKVD	 **SI-QM-90A** Flexible In-Line		SI-LM40KVD	**1 NO & 1 NC**	SD021 (Page 216)	50159
SI-LM40MKVE			SI-LM40KVE	**2 NC**	SD022 (Page 216)	

 Multi-Directional NC = Normally Closed Contact, NO = Normally Open Contact

* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only. Contact factory for integral quick-disconnect (QD) and pigtail QD options.

SI-LM40 Limit Style Switches Specifications

Contact Rating	10A @ 24V ac, 10A @ 110V ac, 6A @ 230V ac, 6A @ 24V dc 2.5 kV max. transient tolerance NEMA A300 P300
European Rating	**Utilization categories**: AC15 and DC13 U_i= 500V ac, I_{th}= 10A

40-60 Hz		
U_e V	I_e/AC-15 A	I_e/DC-13 A
24	10	6
110	10	1
230	6	.4

Contact Material	Silver-nickel alloy
Maximum Switching Speed	**SI-LM40MKH models:** 50 operations per minute **SI-LM40MKV models:** 10 operations per minute
Maximum Actuator Speed	**SI-LM40MKH models:** 1.5 m/second **SI-LM40MKV models:** 0.5 m/second
Mechanical Life	**SI-LM40MKH models:** 1 million operations **SI-LM40MKV models:** 25,000 operations
Minimum Actuator Engagement Radius	**Rigid actuator:** 400 mm **Flexible actuator:** 150 mm
Actuation Extraction Force	**SI-LM40MKH models:** 10 N **SI-LM40MKV models:** 20 N
Short Circuit Protection	6 amp Slow Blow, 10 amp Fast Blow. Recommended external fusing or overload protection.
Wire Connections	Screw terminals with pressure plates accept the following wire sizes – **Stranded and solid:** 20 AWG (0.5 mm^2) to 16 AWG (1.5 mm^2) for one wire **Stranded:** 20 AWG (0.5 mm^2) to 18 AWG (1.0 mm^2) for two wires
Cable Entry	M20 x 1.5 threaded entrance Adapter supplied to convert M20 x 1.5 to ½" - 14 NPT threaded entrance
Construction	Aluminum alloy die cast
Environmental Rating	IP65
Operating Conditions	**Temperature:** -30° to +80° C
Weight	**SI-LM40MKH models:** 0.34 kg **SI-LM40MKV models:** 0.31 kg
Certifications	CE, CSA C US, UL LISTED Auxiliary Device
Contact Configuration and Switching Diagrams	**SI-LM40MKH..D models:** SD018 (p. 215) **SI-LM40MKH..F models:** SD020 (p. 216) **SI-LM40MKH..E models:** SD019 (p. 216) **SI-LM40MKV.. models:** SD021 and SD022 (p. 216)

Locking Style

Spring or Solenoid Locking

- Two locking mechanisms are available: spring lock with energized solenoid release and energized solenoid lock with spring release.
- Rigid and flexible in-line actuators are available.
- Actuator head can be rotated in 90º increments to eight possible actuator positions: four vertical and four horizontal.
- Two models are available, based on voltage.

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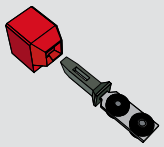
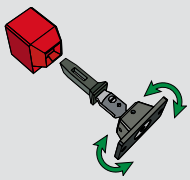
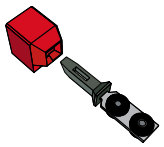
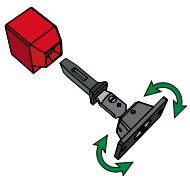
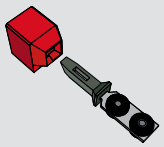
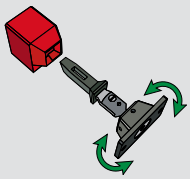
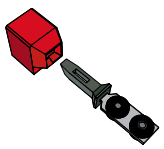
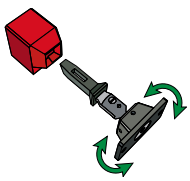
SI-LS42 Locking Style Switches

- Insulated device on all models (IEC 60947-5-1)
- Solenoid voltages: 24V ac/dc; and 24 to 48V dc or 24 to 230V ac
- Stainless steel actuator
- Positive opening safety contacts (IEC 60947-5-1)

SI-LS42 Models
(shown with rigid in-line actuator)

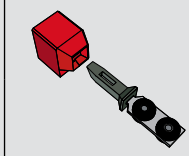
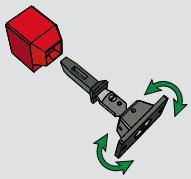
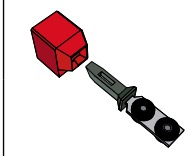
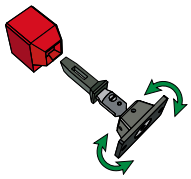
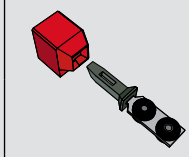
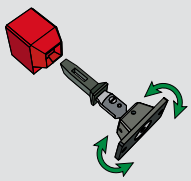
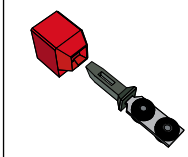
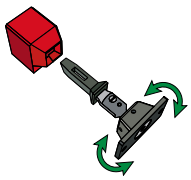
SI-LS42 Safety Switches, 42 mm - Spring Lock and Solenoid Unlock

Kits				Contact(s)	Solenoid Voltage	Contact Config. & Switch Diagram	Data Sheet
Kit Model *	Actuator Type		Interlock				
SI-LS42DMSG	**SI-QM-SSA** Straight Rigid In-Line		SI-LS42DSG	Actuator Contacts: **1 NC & 1 NO** Solenoid Monitor Contacts: **1 NC & 1 NO**	24V ac/dc	SD023 (Page 216)	60099
SI-LS42UMSG			SI-LS42USG		24-48V dc/ 24-230V ac		
SI-LS42DMSGF	**SI-QM-SMFA** Flexible In-Line		SI-LS42DSG		24V ac/dc		
SI-LS42UMSGF			SI-LS42USG		24-48V dc/ 24-230V ac		
SI-LS42DMSH	**SI-QM-SSA** Straight Rigid In-Line		SI-LS42DSH	Actuator Contacts: **2 NC** Solenoid Monitor Contacts: **1 NC & 1 NO**	24V ac/dc	SD024 (Page 216)	
SI-LS42UMSH			SI-LS42USH		24-48V dc/ 24-230V ac		
SI-LS42DMSHF	**SI-QM-SMFA** Flexible In-Line		SI-LS42DSH		24V ac/dc		
SI-LS42UMSHF			SI-LS42USH		24-48V dc/ 24-230V ac		
SI-LS42DMSI	**SI-QM-SSA** Straight Rigid In-Line		SI-LS42DSI	Actuator Contacts: **2 NC & 1 NO** Solenoid Monitor Contact: **1 NC**	24V ac/dc	SD025 (Page 217)	
SI-LS42UMSI			SI-LS42USI		24-48V dc/ 24-230V ac		
SI-LS42DMSIF	**SI-QM-SMFA** Flexible In-Line		SI-LS42DSI		24V ac/dc		
SI-LS42UMSIF			SI-LS42USI		24-48V dc/ 24-230V ac		
SI-LS42DMSJ	**SI-QM-SSA** Straight Rigid In-Line		SI-LS42DSJ	Actuator Contacts: **3 NC** Solenoid Monitor Contact: **1 NC**	24V ac/dc	SD026 (Page 217)	
SI-LS42DMSJF	**SI-QM-SMFA** Flexible In-Line		SI-LS42DSJ				

Multi-Directional NC = Normally Closed Contact, NO = Normally Open Contact

* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only. Contact factory for integral quick-disconnect (QD) and pigtail QD options.

SI-LS42 Safety Switches, 42 mm - Solenoid Lock and Spring Unlock

Kits				Contact(s)	Solenoid Voltage	Contact Config. & Switch Diagram	Data Sheet
Kit Model *	Actuator Type		Interlock				
SI-LS42DMMG	**SI-QM-SSA** Straight Rigid In-Line		SI-LS42DMG	Actuator Contacts: **1 NC & 1 NO** Solenoid Monitor Contacts: **1 NC & 1 NO**	24V ac/dc	SD023 (Page 216)	60099
SI-LS42UMMG			SI-LS42UMG		24-48V dc/ 24-230V ac		
SI-LS42DMMGF	**SI-QM-SMFA** Flexible In-Line		SI-LS42DMG		24V ac/dc		
SI-LS42UMMGF			SI-LS42UMG		24-48V dc/ 24-230V ac		
SI-LS42DMMH	**SI-QM-SSA** Straight Rigid In-Line		SI-LS42DMH	Actuator Contacts: **2 NC** Solenoid Monitor Contacts: **1 NC & 1 NO**	24V ac/dc	SD024 (Page 216)	
SI-LS42UMMH			SI-LS42UMH		24-48V dc/ 24-230V ac		
SI-LS42DMMHF	**SI-QM-SMFA** Flexible In-Line		SI-LS42DMH		24V ac/dc		
SI-LS42UMMHF			SI-LS42UMH		24-48V dc/ 24-230V ac		
SI-LS42DMMI	**SI-QM-SSA** Straight Rigid In-Line		SI-LS42DMI	Actuator Contacts: **2 NC & 1 NO** Solenoid Monitor Contact: **1 NC**	24V ac/dc	SD025 (Page 217)	
SI-LS42UMMI			SI-LS42UMI		24-48V dc/ 24-230V ac		
SI-LS42DMMIF	**SI-QM-SMFA** Flexible In-Line		SI-LS42DMI		24V ac/dc		
SI-LS42UMMIF			SI-LS42UMI		24-48V dc/ 24-230V ac		
SI-LS42DMMJ	**SI-QM-SSA** Straight Rigid In-Line		SI-LS42DMJ	Actuator Contacts: **3 NC** Solenoid Monitor Contact: **1 NC**	24V ac/dc	SD026 (Page 217)	
SI-LS42DMMJF	**SI-QM-SMFA** Flexible In-Line		SI-LS42DMJ				

Multi-Directional NC = Normally Closed Contact, NO = Normally Open Contact

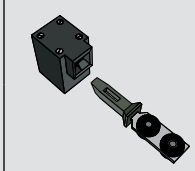
* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only. Contact factory for integral quick-disconnect (QD) and pigtail QD options.

SI-QM100 Locking Style Switches

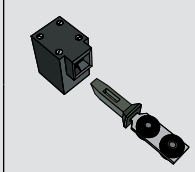
- Keyed actuators
- Solenoid voltages: 24V dc or 120V ac
- Protective earth terminal on all models (IEC 60947-1)
- Standard mounting hole pattern (EN 50041)
- Positive opening safety contacts (IEC 60947-5-1)

SI-QM100 Models
(shown with rigid in-line actuator)

SI-QM100 Safety Switches, 100 mm - Spring Lock and Solenoid Unlock

Kits				Contact(s)	Solenoid Voltage	Contact Config. & Switch Diagram	Data Sheet
Kit Model*	Actuator Type		Interlock				
SI-QM100DMSG	**SI-QM-SSA** Straight Rigid In-Line		SI-QM100DSG	Switching Contacts: **1 NC & 1 NO**	24V dc	SD027 (Page 217)	49374
SI-QM100AMSG			SI-QM100ASG	Solenoid Monitor Contacts: **1 NC & 1 NO**	120V ac		
SI-QM100DMSH			SI-QM100DSH	Switching Contacts: **2 NC** Solenoid Monitor Contacts: **1 NC & 1 NO**	24V dc	SD028 (Page 217)	

SI-QM100 Safety Switches, 100 mm - Solenoid Lock and Spring Unlock

Kits				Contact(s)	Solenoid Voltage	Contact Config. & Switch Diagram	Data Sheet
Kit Model*	Actuator Type		Interlock				
SI-QM100DMMG	**SI-QM-SSA** Straight Rigid In-Line		SI-QM100DMG	Switching Contacts: **1 NC & 1 NO**	24V dc	SD027 (Page 217)	49374
SI-QM100AMMG			SI-QM100AMG	Solenoid Monitor Contacts: **1 NC & 1 NO**	120V ac		

Multi-Directional NC = Normally Closed Contact, NO = Normally Open Contact

* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only. Contact factory for integral quick-disconnect (QD) and pigtail QD options.

Locking Style Switches Specifications

Contact Rating	4A @ 250V ac max. 2.5 kV max. transient tolerance NEMA A300 P300
European Rating	**Utilization categories**: AC15 and DC13 (IEC 60947-5-1) **Switches with 1 & 2 contact pairs:** U_i= 250V ac **SI-LS42 models:** I_{th}= 2.5 A **SI-QM100 models:** I_{th}= 10 A
Contact Material	Silver-nickel alloy
Solenoid Power Consumption	**SI-LS42 models:** 1.1 VA / Inrush 56 VA (0.2 sec) **SI-QM100 models:** 5.2 W
Maximum Actuator Speed	1.5 m/second
Mechanical Life	1 million operations
Minimum Actuator Engagement Radius	**Rigid actuator:** 400 mm **Flexible actuator:** 150 mm
Actuation Extraction Force	**SI-LS42 models:** 2000 N when locked **SI-QM100 models:** 1000 N when locked
Short Circuit Protection	6 amp Slow Blow, 10 amp Fast Blow. Recommended external fusing or overload protection.
Wire Connections	**SI-LS42 models:** 10 cage clamp elements 1.5 mm stranded max. / 16 AWG **SI-QM100 models:** Screw terminals with pressure plates accept the following wire sizes – 16 AWG (1.5 mm^2) max. solid; 14 AWG (2.5 mm^2) max. stranded, 18 AWG (1 mm^2) when using all 11 terminals
Cable Entry	M20 x 1.5 threaded entrance Adapter supplied to convert M20 x 1.5 to ½" - 14 NPT threaded entrance
Construction	**SI-LS42 models:** Glass fiber-reinforced polyamide thermoplastic housing; UL 94-V0 rating **SI-QM100 models:** Aluminum die cast
Environmental Rating	IP67
Operating Conditions	**Temperature:** **SI-LS42 models:** -30° to +70° C **SI-QM100 models:** -30° to +60° C
Weight	**SI-LS42 models:** 0.3 kg **SI-QM100 models:** 0.81 kg
Application Notes	When rotating the actuator head, the actuator MUST BE FULLY ENGAGED. When using a model with solenoid locking, the lock mechanism will disengage upon solenoid power failure.
Certifications	CE UL LISTED Auxiliary Device CSA®
Contact Configuration and Switching Diagrams	**SI-LS42 models:** SD023, SD024, SD025 & SD026 (pp. 216-217) **SI-QM100 models:** SD027 and SD028 (p. 217)

40-60 Hz		
U_e V	I_e/AC-15 A	I_e/DC-13 A
24	4	3
110	4	0.7
230	4	0.3

Replacement Actuators Parts for Safety Interlock Switches

Model		Description	Used With
	**SI-QM-90A**	Flexible in-line, trumpet-style, metal actuator used for doors or covers where alignment is difficult to maintain. Flexes in all directions. Minimum engagement radius for hinged closures is 150 mm.	• SI-LM40MKV
	**SI-QM-SB**	Rigid in-line metal actuator used for doors or covers. Slide-bolt design for use in heavy-duty applications where alignment is difficult to maintain.	• SI-LM40MKH • SI-LS42 • SI-QM100
	**SI-QM-SMFA**	Flexible in-line metal actuator used for doors or covers where alignment is difficult to maintain. Flexes in all directions. Minimum engagement radius for hinged closures is 150 mm.	• SI-LM40MKH • SI-LS42 • SI-QM100
	**SI-QM-SSA**	Rigid in-line metal actuator used for doors or covers with accurate alignment, such as sliding doors. Minimum engagement radius for hinged closures is 400 mm.	• SI-LM40MKH • SI-LS42 • SI-QM100
	**SI-QS-100**	High-extraction-force adaptor for particularly heavy or large doors. Adjustable from 50 to 100 Newtons (force). Used only for switches with in-line actuator SI-QS-SSA.	• SI-QS75 • SI-QS90
SI-LS42-COVER		Replacement terminal cover	• SI-LS42

Model		Description	Used With
	**SI-QS-SSA**	Rigid in-line metal (die-cast steel) actuator for doors or covers with a radius of 150 mm or greater.	• SI-QS75 (high-force) • SI-QS90 (high-force)
	**SI-QS-SSA-2**	Rigid in-line metal (stamped stainless steel) actuator used for doors or covers with accurate alignment, such as sliding doors. Minimum engagement radius for hinged closures is 150 mm.	• SI-LS83 • SI-LS100
	**SI-QS-SSA-3**	Rigid in-line metal (stamped stainless steel) actuator used for doors or covers with accurate alignment, such as sliding doors. Right-angle mounting flange. Minimum engagement radius for hinged closures is 150 mm.	• SI-LS83 • SI-LS100
	**SI-QS-SSA-4**	Rigid in-line metal (stamped stainless steel) actuator for doors or covers with a radius of 150 mm or greater.	• SI-QS75 • SI-QS90
	**SI-QS-SSU**	Flexible in-line metal (die-cast steel) actuator for hinged doors with a radius of 50 mm or greater. Flexes in all directions. Minimum engagement radius for hinged closures is 150 mm.	• SI-LS83 • SI-LS100 • SI-QS75 • SI-QS90

Safety Interlock Switches Replacement Parts

Model*	Description	Used In
SI-LM40KHD	Individual Interlock (without actuator)	SI-LM40MKH..D kits
SI-LM40KHE		SI-LM40MKH..E kits
SI-LM40KHF		SI-LM40MKH..F kits
SI-LM40KVD		SI-LM40MKVD kit
SI-LM40KVE		SI-LM40MKVE kit
SI-LS42DSG		SI-LS42DMSG.. kits
SI-LS42USG		SI-LS42UMSG.. kits
SI-LS42DSH		SI-LS42DMSH.. kits
SI-LS42USH		SI-LS42UMSH.. kits
SI-LS42DSI		SI-LS42DMSI.. kits
SI-LS42USI		SI-LS42UMSI.. kits
SI-LS42DSJ		SI-LS42DMSJ.. kits
SI-LS42DMG		SI-LS42DMMG.. kits
SI-LS42UMG		SI-LS42UMMG.. kits
SI-LS42DMH		SI-LS42DMMH.. kits
SI-LS42UMH		SI-LS42UMMH.. kits
SI-LS42DMI		SI-LS42DMMI.. kits
SI-LS42UMI		SI-LS42UMMI.. kits
SI-LS42DMJ		SI-LS42DMMJ.. kits
SI-LS100F		SI-LS100.. kits
SI-LS83D		SI-LS83.. kits
SI-LS83E		SI-LS83..E kits
SI-QM100DSG		SI-QM100DMSG kit
SI-QM100ASG		SI-QM100AMSG kit
SI-QM100DMG		SI-QM100DMMG kit
SI-QM100AMG		SI-QM100AMMG kit
SI-QS75C		SI-QS75..C kits
SI-QS90D		SI-QS90..D kits
SI-QS90E		SI-QS90..E kits
SI-QS90F		SI-QS90..F kits

* Kits with one safety interlock switch and an actuator are available (see pages 135-147).

E-Stop Buttons page 152

- Mechanical and optical palm buttons push to stop and twist to release.
- Modular design makes assembly and installation easy.
- Kits simplify selection and ordering.

Rope Pull Switches page 157

- Available spans range from 6 to 100 m.
- Trip and latch switch models are available.
- Minimum switch life is 1 million operations.
- Heavy-duty switch housings withstand harsh environments and outdoor use.

PICO-GUARD™

Fiber Optic Emergency Stop Push Buttons

PICO-GUARD™ Buttons work in conjunction with the PICO-GUARD Controller and other optical elements in personnel safety and equipment protection applications. The E-Stop Button is used with Banner's plastic fiber optic cable and offers a simple, quick means of connecting and disconnecting the fiber. When paired with the PICO-GUARD Controller, the E-Stop Button meets Safety Category 4 applications (per ISO 13849-1) and is certified for use in harsh and potentially explosive environments.

- Features bright red push-to-stop, twist-to-release button with yellow background that complies with ANSI NFPA 79, IEC 60204-1 and ISO 13850 (EN 418)
- Provides choice of models with fiber connections on same side or opposite sides of enclosure
- Certified to ISO 13849-1 Category 4 requirements
- Delivers easy connection for 2 mm OD (1 mm core) plastic fibers
- Accommodates up to 3 E-Stops in a series on a single channel (all PICO-GUARD controllers have four channels)
- Constructed of impact-resistant polycarbonate resin—rated IP65
- Can be used with SFI interlocking switches in same optical loop
- Offers easy mounting and installation

PICO-GUARD Optical E-Stop Buttons *Page 66*

ATEX, FM and CSA certified for use in Class 1 Division 1 and Zone 0 potentially explosive environment

- Paint booths
- Paint and stain manufacturing
- Gaseous fill areas (example, cigarette lighters)
- Cosmetic and perfume manufacturing
- Film and web processing
- Chemical processing
- Battery manufacturing
- Pharmaceutical manufacturing
- Semiconductor processing

Fiber connection ports

Same side
SFS-EBM-01E1

Opposite sides
SFS-EBM-01E2

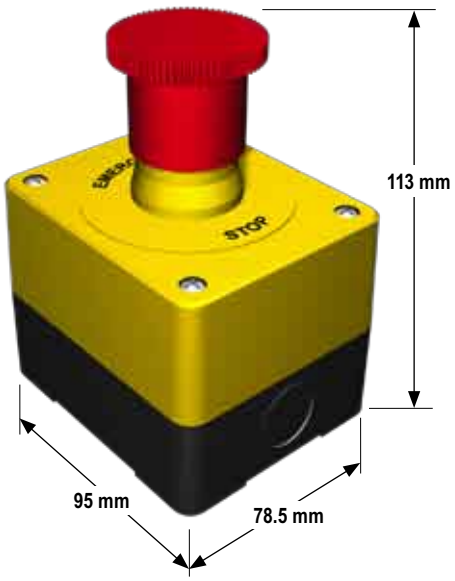
E-Stop Button

Emergency Stop Push Buttons

- Electromechanical palm buttons push to stop and twist to release.
- Modular design makes assembly and installation easy.
- Kits simplify selection and ordering.
- Latching design complies with ANSI NFPA 79, IEC 60204-1 and ISO 13850 (EN 418).
- Options include station enclosures, contact elements and disc labels.

E-Stop Buttons

- Choice of metal or plastic
- Rugged modular construction
- Choice of normally open auxiliary contacts and normally closed safety contacts
- Positive opening safety contacts (IEC 60947-5-1)



Emergency Stop Push Button with Enclosure
(Plastic button version shown)

ONLINE
AUTOCAD, STEP, IGES & PDF

Metal (top) and Plastic (bottom) buttons

E-Stop Push-Button Components

Models	Description	Product	Data Sheet
8-LP2T-B6644*	22.5 mm plastic button (mounting adapter included)		111880
8-LM2T-B6644*	22.5 mm metal button (8-LM2T-AU120 mounting adapter sold separately)		
8-LM2T-AU120	Metal mounting adapter		
8-LM2T-C01**	Normally closed (NC) positively driven contact element		
8-LM2T-C10	Normally open (NO) auxiliary contact element		
8-L2PP-1A5	One-button enclosure—control stations have wire entry through the top or bottom; IP65 rating		
8-LM2T-AU115†	60 mm diameter, non-adhesive plastic legend with “Emergency Stop” inscription		

* Twist to release, mechanical latching ISO 13850 (EN 418) compliant. Diameter 40 mm (without mounting adapter).
** Direct (positive) opening operation per IEC/EN 60947-5-1.
† Additional E-Stop background labels are available (see p/n 121976).

E-Stop Push-Button Kits

Models		E-Stop Button	Contacts	Enclosure	Legend
SSA-EBM-02L		Metal	**2 NC**	No	111880
SSA-EBM-11L			**1 NC & 1 NO**		
SSA-EBM-12L			**2 NC & 1 NO**		

NC = Normally Closed Contact, NO = Normally Open Contact

More on next page

E-Stop Push-Button Kits (cont'd)

Models		E-Stop Button	Contacts	Enclosure	Legend
SSA-EBP- 02L		Plastic	2 NC	No	Yes
SSA-EBP-11L			1 NC & 1 NO		
SSA-EBP-12L			2 NC & 1 NO		
SSA-EBM-02E		Metal	2 NC	Yes	Yes
SSA-EBM-11E			1 NC & 1 NO		
SSA-EBM-12E			2 NC & 1 NO		
SSA-EBP-02E		Plastic	2 NC	Yes	Yes
SSA-EBP-11E			1 NC & 1 NO		
SSA-EBP-12E			2 NC & 1 NO		

NC = Normally Closed Contact, NO = Normally Open Contact

E-Stop Push-Button Specifications

Mechanical Life	300,000 operations
Operating Force	0.8 kg
Mounting Adapter	**Plastic button:** The adapter is fixed to the mounting surface by means of incorporated screws (T_{max} = 0.6 Nm) **Metal button:** The adapter is fixed to the mounting surface by means of incorporated screws (T_{max} = 0.8 Nm)
Construction	**Plastic parts:** Polyamide and polycarbonate **Metal parts:** Aluminum and zinc alloy
Environmental Rating	IP65; NEMA 4, 13
Operating Temperature	-25° to +60° C
Certifications	c UL us LISTED

Contact Specifications

European Rating	**Utilization categories:** AC15 and DC13 U_i = 690V ac I_{th} = 10A UL designation = A 600 Q600
Mechanical Life	1,000,000 operations
Connections	(1 or 2) 12 AWG (2.5 mm^2) maximum wire size
Construction	Polyamide and polycarbonate
Environmental Rating	IP20
Operating Temperature	-25° to +60° C
Certifications	c UL us LISTED

Rope Pull Switches

Multiple Location Emergency Shutdown

- Available spans range from 6 to 100 m.
- Trip and latch switch models are available.
- Minimum switch life is 1-million operations.
- Heavy-duty switch housings withstand harsh environments and outdoor use.
- Switch activates if the rope is pulled, becomes loose or breaks.

GLANDS PAGE 187
COMPONENTS ROPE PULL PAGE 161

RP-RM83 Rope Pull Switches

- Latch design
- Rope span up to 75 meters
- Manual reset with E-Stop button
- Tension indicator
- Additional solid-state auxiliary output for remote tension monitoring
- Extra contacts for switch monitoring
- Positive opening safety contacts (IEC 60947-5-1)
- See page 161 for wire rope components

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AUTOCAD, STEP, IGES & PDF

RP-RM83F-75LT.. and RP-RM83F-38LT.. Models

RP-RM83F-75LR.. and RP-RM83F-38LR.. Models

RP-RM83 Series, 83 mm

Models		Actuation	Safety Contacts**	Auxiliary Contacts	Action/ Contact State**				Contact Config. & Switch Diagram	Data Sheet
Max. Rope Length 75 m	Max. Rope Length 38 m					Safety		Auxiliary			
RP-RM83F-75LTE	RP-RM83F-38LTE	Latch (Rope Pulled)	2 NC in →	2 NO in →	Cable Pulled	open	open	closed	closed	SD029 & SD030 (p. 217)	141245
RP-RM83F-75LRE	RP-RM83F-38LRE				Cable Break	open	open	closed	closed		
RP-RM83F-75LT	RP-RM83F-38LT										
RP-RM83F-75LR	RP-RM83F-38LR										

→ Run Position Cable Pulled Cable Break NC = Normally Closed Contact, NO = Normally Open Contact

** See data sheet or Contact Configuration and Switching Diagrams for more information/clarification.

RP-LS42 Rope Pull Switches

- Rope span up to 75 meters
- Manual reset
- Extra contacts for switch monitoring
- Latch design
- Tension indicator
- Model with E-stop button and quick rope fixing and tensioning
- 42 mm wide at base
- Insulated device (IEC 60947-5-1)
- Positive opening safety contacts (IEC 60947-5-1)
- See page 161 for wire rope components

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RP-LS42F-75L Model

RP-LS42F-75LF Model

RP-LS42F-75LE Model (with E-Stop Button)

RP-LS42 Series, 42 mm

Model	Actuation	Max. Rope Length	Safety Contacts**	Auxiliary Contact	Action/ Contact State**				Contact Config. & Switch Diagram	Data Sheet
					Safety		Auxiliary			
RP-LS42F-75L	Latch (Rope Pulled)	75 m	2 NC in →	2 NO in →	Cable Pulled	open	open	closed	closed	SD031 (p. 218)	67709
RP-LS42F-75LE					Cable Break	open	open	closed	closed		
RP-LS42F-75LF											

→ Run Position Cable Pulled Cable Break NC = Normally Closed Contact, NO = Normally Open Contact

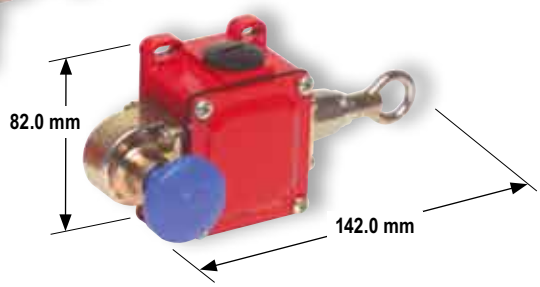
** See data sheet or Contact Configuration and Switching Diagrams for more information/clarification.

RP-QM72/QMT72 Rope Pull Switches

- Five latch-design models from which to choose
- Models with 6, 12 or 20 m rope spans
- Manual reset
- Models with extra contacts for monitoring or for dual-channel input to a safety device
- Protective earth terminal (IEC 60947-1)
- Tension indicator
- 82 mm wide at base
- Positive opening safety contacts (IEC 60947-5-1)
- See page 161 for wire rope components

ONLINE
AUTOCAD, STEP, IGES & PDF

RP-QMT72 Models



RP-QM72 Models

RP-QM72/QMT72 Series, 72 mm

Model	Actuation	Max. Rope Length	Safety Contacts*	Auxiliary Contact	Action/ Contact State*	Contact Config. & Switch Diagram	Data Sheet
RP-QM72D-6L	Latch (Rope Pulled)	6 m	2 NC in Run Position	—	**Safety** Cable Pulled: open / closed Cable Break: closed / open	SD032 (p. 218)	62084
RP-QM72D-12L		12 m				SD033 (p. 218)	
RP-QMT72D-20L		20 m				SD034 (p. 218)	
RP-QMT72F-12L		12 m	4 NC in Run Position	—	**Safety** Cable Pulled: open open closed closed Cable Break: closed closed open open	SD035 (p. 218)	
RP-QMT72E-12L		12 m	2 NC in Run Position	1 NO in Run Position	**Safety** **Auxiliary** Cable Pulled: open closed closed Cable Break: closed open open	SD036 (p. 218)	

Run Position Cable Pulled Cable Break NC = Normally Closed Contact

* Jumper Contacts together for use in a single-channel E-stop application. See data sheet or Contact Configuration and Switching Diagrams for more information/clarification.

RP-LM40 Rope Pull Switches

- Limit-switch style
- Rope span up to 6 meters
- Trip and latch models
- Protective earth terminal (IEC 60947-1)
- Standard limit switch housing (EN 50041)
- Rugged metal housing
- 40 mm wide at base
- Positive opening safety contacts (IEC 60947-5-1)
- See page 161 for wire rope components

ONLINE
AUTOCAD, STEP, IGES & PDF

RP-LM40D-6L Model

RP-LM40D-6 Model

RP-LM40 Series, 40 mm

Model	Actuation	Max. Rope Length	Safety Contact*	Auxiliary Contact	Action/ Contact State*	Contact Config. & Switch Diagram	Data Sheet
RP-LM40D-6	Trip	6 m	2 NC in →	—	open closed	SD037 (p. 219)	62082
RP-LM40D-6L	Latch				closed open	SD038 (p. 219)	

→ Run Position Cable Pulled Cable Break NC = Normally Closed Contact

* Jumper Contacts together for use in a single-channel E-stop application. See data sheet or Contact Configuration and Switching Diagrams for more information/clarification.

RP-QM90 Rope Pull Switch

- Latch design
- Rope span up to 100 m, with switch in center
- Manual reset
- Extra contacts for switch monitoring
- Protective earth terminal (IEC 60947-1)
- 90 mm wide at base
- Positive opening safety contact (IEC 60947-5-1)
- See page 161 for wire rope components

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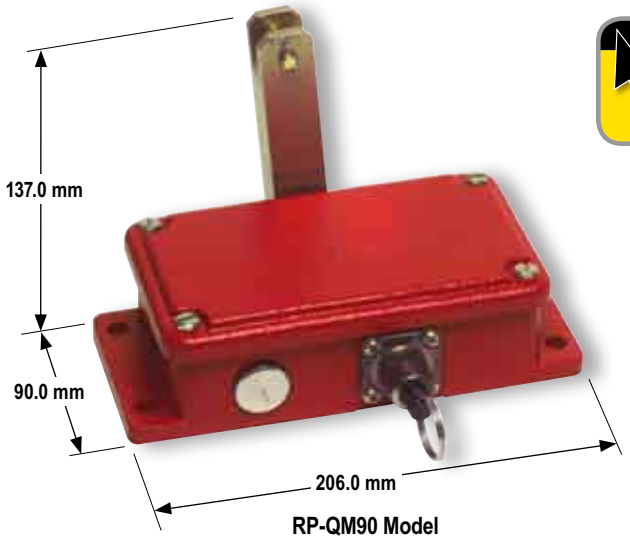
AUTOCAD, STEP, IGES & PDF



RP-QM90 Model

RP-QM90 Series, 90 mm

Model	Actuation	Max. Rope Length	Safety Contacts**	Auxiliary Contacts	Action/ Contact State**	Contact Config. & Switch Diagram	Data Sheet
RP-QM90F-100L	Latch (Rope Pulled)	100 m	2 NC in →	2 NO in →	Safety / Auxiliary open open closed closed open open closed closed	SD039 (p. 219)	62086

→ Run Position Cable Pulled Cable Break NC = Normally Closed Contact, NO = Normally Open Contact

** See data sheet or Contact Configuration and Switching Diagrams for more information/clarification.

Components for Wire Rope Assembly

Models		Package Quantity	Description	Used With
Wire Ropes	RPA-C1-10	10 m	2 mm steel wire rope with 0.5 mm red PVC jacket (unterminated)	• RP-LM40 models • RP-RM83 modules
	RPA-C1-20	20 m		
	RPA-C1-100	100 m		
	RPA-C2-10	10 m	3 mm steel wire rope with 0.5 mm red PVC jacket (unterminated)	• RP-LS42 models • RP-QM72/QMT72 models • RP-RM83 models
	RPA-C2-20	20 m		
	RPA-C2-50	50 m		
	RPA-C2-80	80 m		
	RPA-C3-20	20 m	4 mm steel wire rope with 0.5 mm red PVC jacket (unterminated)	• RP-QM90 models • RP-RM83 modules
	RPA-C3-100	100 m		
Thimbles	RPA-T1-4	4 pcs	Thimble for 2 mm wire rope	• RP-LM40 models
	RPA-T2-4	4 pcs	Thimble for 3 mm wire rope	• RP-LS42 models • RP-QM72/QMT72 models • RP-RM83 models
	RPA-T3-4	4 pcs	Thimble for 4 mm wire rope	• RP-QM90 models
Clamps	RPA-CC1-4	4 pcs	Clamp for 2 mm wire rope	• RP-LM40 models
	RPA-CC2-4	4 pcs	Clamp for 3 mm wire rope	• RP-LS42 models • RP-QM72/QMT72 models • RP-RM83 models
	RPA-CC3-4	4 pcs	Clamp for 4 mm wire rope	• RP-QM90 models
Turnbuckles	RPA-TA1-1	1 pc	#4 Turnbuckle	• RP-LM40 models • RP-LS42 models • RP-QM72/QMT72 models • RP-RM83 models
	RPA-TA2-1	1 pc	#5 Turnbuckle	• RP-QM90 models
Eye Bolts	RPA-EB1-1	1 pc	1/4" - 20 Eye bolt (3" bolt shaft)	• RP-LM40 models • RP-LS42 models • RP-QM72/QMT72 models • RP-RM83 models
	RPA-EB2-1	1 pc	5/16" - 18 Eye bolt (3" bolt shaft)	• RP-QM90 models
Pulleys	RPA-P1-1 / RPA-DP1-1	1 pc	RPA-P1-1 Pulley for in-line use RPA-DP1-1 Pulley for corner turns (90-180°)	• RP-LM40 models • RP-LS42 models • RP-QM72/QMT72 models • RP-RM83 models • RP-QM90 models
Tensioning Springs	RPA-S1-1	1 pc	Tensioning Spring #1	• RP-QM90 models
	RPA-S2-1	1 pc	Tensioning Spring #2	• RP-QM90 models
	RPA-S3-1	1 pc	Tensioning Spring #3	• RP-LS42 models • RP-RM83 models
	RPA-S5-1	1 pc	Tensioning Spring #5	• RP-LS42 models • RP-RM83 models
	RPA-S4-1	1 pc	Tensioning spring assembly with built-in eye bolt, cable thimble, clamp, tensioning and overload protection	• RP-RM83 models
	RPA-S6-1	1 pc		• RP-RM83 models
Terminal Cover	SI-LS42-COVER		Replacement terminal cover	• RP-LS42 models

Rope Pull Switches Specifications

Contact Rating	10A @ 24V ac, 10A @ 110V ac, 6A @ 230V ac, 6A @ 24V dc 2.5 kV max. transient tolerance NEMA A300 P300
Monitoring Solid-State Output Rating	**Rated operational voltage:** U_e = 10 to 30V dc **Rated operational current:** I_e = 50 mA **Utilization category:** DC13 Protected against reverse polarity and short circuit.
European Rating	**RP-RM83 models: Utilization categories:** AC15 and DC13 U_i = 250V ac, I_{th} = 10A **All others: Utilization categories:** AC15 and DC13 U_i = 500V ac, I_{th} = 10A

RP-RM83 models (40-60 Hz)

U_e V	I_e/AC-15 A	I_e/DC-13 A
120	6	0.55
240	3	0.27

All others (40-60 Hz)

U_e V	I_e/AC-15 A	I_e/DC-13 A
24	10	6
110	10	1
230	6	0.4

Contact Material	Silver-nickel alloy
Maximum Switching Speed	**RP-RM83 models:** 20 operations per minute **All others:** 50 operations per minute
Recommended Rope Size	**40 mm models:** 2 mm diameter steel rope **42 & 72 mm models:** 3 mm diameter steel rope **83 mm modles:** 2-5 mm diameter steel rope **90 mm models:** 4 mm diameter steel rope
Maximum Rope Pull Length	**RP-LM40D-6/6L and RP-QM72D-6L:** 6 m **RP-LS42F-75L/75LE/75LF:** 75 m **RP-QM72D-12L:** 12 m **RP-QMT72D-20L:** 20 m **RP-QMT72E-12L and RP-QMT72F-12L:** 12 m **RP-RM83F-75LTE/LT/LRE/LR:** 75 m **RP-RM83F-38LTE/LT/LR/LRE:** 38 m **RP-QM90F-100L:** 100 mm; equal lengths up to 50 m on either side of switch
Short Circuit Protection	**RP-RM83 models:** 6 amp Slow Blow, 10 amp Fast Blow **All others:** 10 amp Slow Blow, 15 amp Fast Blow. Recommended external fusing or overload protection.
Mechanical Life	1 million operations
Wire Connections	Screw terminals with pressure plates accept the following wire sizes – **Stranded and solid:** 20 AWG (0.5 mm²) to 16 AWG (1.5 mm²) for one wire **Stranded:** 20 AWG (0.5 mm²) to 18 AWG (1.0 mm²) for two wires
Cable Entry	M20 x 1.5 threaded entrance Adapter supplied to convert M20 x 1.5 to ½" - 14 NPT threaded entrance
Construction	**RP-LS42F-75L/75LE/75LF:** High-impact thermoplastic housing; zinc die-cast actuator **All others:** Aluminum alloy die cast
Environmental Rating	**RP-LS42F and RP-RM83F models:** NEMA 4; IEC IP67 **All other models:** NEMA 4; IP65
Operating Temperature	**RP-LS42F-75L/75LE/75LF:** -25° to +70° C **All other models:** -30° to +80° C
Weight	**RP-LM40D-6:** 0.22 Kg **RP-LM40D-6L:** 0.26 Kg **RP-LS42F-75L:** 0.48 Kg **RP-LS42F-75LE and RP-LS42F-75LF: 0**.65 Kg **RP-QM72D-6L:** 0.49 Kg **RP-QM72D-12L:** 0.52 Kg **RP-QMT72D-20L, RP-QMT72E-12L and RP-QMT72F-12L:** 0.64 Kg **RP-QM90F-100L:** 3.8 Kg **RP-RM83F-75LT and RP-RM83F-75LTE:** 1 Kg **RP-RM83F-75LR and RP-RM83F-75LRE:** 0.77 Kg **RP-RM83F-38LT and RP83FLT8**: 1Kg **RP-RM83F-38LR and RP-RM83F-38LRE:** 0.77 Kg
Certifications	
Contact Configurations and Switching Diagrams	**RP-LM40 models:** SD037 & SD038 (p. 219) **RP-LS42 models:** SD031 (p. 218) **RP-QM72/QMT72 models:** SD032, SD033, SD034, SD035 & SD036 (p. 218) **RP-RM83 models:** SD029 & SD030 (p. 217) **RP-QM90 models:** SD039 (p. 219)

Safety Accessories

Mounting Brackets page 164

- Broad offering of bracket styles makes it easy to install sensors vertically, horizontally or diagonally.
- Swivel brackets offer greater range of motion.
- Adapter brackets provide mounting flexibility.
- Retrofit brackets enable you to install a different emitter/receiver using existing mounting holes.
- Replacement brackets are available for brackets included with emitters/receivers.

Cordsets & Interfacing Products page 177

- Choice of cordset styles and lengths for each sensor or module makes installation easier.
- Cable glands and conduit adapters are available for use with bulk cable.
- Interface boxes supply 24V dc power to emitters and receivers.
- Indicator lights and lamps show remote indication of device status.
- Contactor accessories enhance the use of high current for a safety system.

Corner Mirrors page 194

- Mirrors expand guarding to multiple sides of an area using one emitter/receiver pair.
- Rotating endcaps allow mirrors to rotate to any angle.
- Glass and stainless steel models include brackets for quick installation.

Stands page 198

- Stands reliably support Banner light screens and corner mirrors.
- Standalone and mounting models have dual channels to allow easy and accurate height adjustment.

Explosive & Harsh Duty page 199

- Lens shields protect emitter and receiver lenses from impact and contamination.
- Tubular enclosures guard entire EZ-SCREEN® emitters/receivers in a washdown environment.
- Protective enclosures provide rugged protection for emitters/receivers and mirrors.
- Explosion-proof enclosures protect emitters/receivers in environments with flammable gases, liquids or dust.

Banner Bracket Selection Chart

Light Screens					
EZ-SCREEN Standard 14 & 30 mm Resolution page 23 	EZA-MBK-11 page 166	EZA-MBK-12 page 167	EZA-MBK-2 page 167	EZA-MBK-20 page 167	
EZ-SCREEN Cascade 14 & 30 mm Resolution page 25 	EZA-MBK-11 page 166	EZA-MBK-12 page 167	EZA-MBK-2 page 167	EZA-MBK-21 page 167	
EZ-SCREEN LP Standard 14 & 25 mm Resolution page 31 	LPA-MBK-11 page 169	LPA-MBK-12 page 169	LPA-MBK-20 page 170	LPA-MBK-22 page 170	
EZ-SCREEN LP Cascade 14 & 25 mm Resolution page 33	LPA-MBK-11 page 169	LPA-MBK-12 page 169	LPA-MBK-21 page 170	LPA-MBK-90 page 171	LPA-MBK-120 page 169
	LPA-MBK-135 page 169	LPA-MBK-180 page 170			
EZ-SCREEN Type 2 30 mm Resolution page 39 	USCMB-.. page 176	USMB-1 page 176	USMB-6 page 176	USMB-8 page 176	
EZ-SCREEN Grid page 44 	EZA-MBK-1 page 166	EZA-MBK-2 page 166	EZA-MBK-3 page 168	EZA-MBK-9 page 168	
EZ-SCREEN Point page 44 	EZA-MBK-1 page 166	EZA-MBK-2 page 166	EZA-MBK-3 page 168	EZA-MBK-4 page 168	EZA-MBK-5 page 168

Area Scanner					
AG4-4E page 53 	AG4-MBK1 page 166				

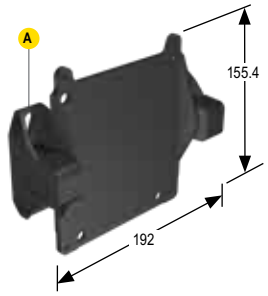
Fiber Optic					
PICO-GUARD Controller page 60 	DIN-35-.. page 166				
PICO-GUARD Grid page 61 	EZA-MBK-1 page 166	EZA-MBK-2 page 167	EZA-MBK-3 page 168	EZA-MBK-9 page 168	
PICO-GUARD 12 mm Point page 63 	SMB12MM page 172	SMB1812SF page 172			
PICO-GUARD 30 mm Point page 63 	SMB30A page 173	SMB30MM page 173	SMB30SC page 173	SMBAMS30P page 173	SMBAMS30RA page 174
PICO-GUARD Switches page 64 	SFA-IMB1 page 171	SFA-IMB2 page 172	SMB12MM page 172		
PICO-GUARD SFA-RD Remote Display page 67 	SMBR55F01 page 174	SMBR55F02 page 174	SMBR55FRA page 175		

Banner Bracket Selection Chart

Safety Controllers and Modules	
SC22-3 page 76 	DIN-35-.. page 166
E-Stop & Guard Safety Modules page 81 	DIN-35-.. page 166
Universal Input Modules page 89 	DIN-35-.. page 166
Safety Mat Modules page 91 	DIN-35-.. page 166
Muting Modules page 94 	DIN-35-.. page 166
SSM Safe Speed Modules page 103 	DIN-35-.. page 166
Extension Relay Modules page 105 	DIN-35-.. page 166
Interface Relay Modules page 107 	DIN-35-.. page 166

Two-Hand Control Modules					
DUO-TOUCH® SG Safety Modules page 111 	DIN-35-.. page 166				
STB Self-Checking Touch Buttons page 117 	SMB30A page 173	SMB30MM page 173	SMB30SC page 173	SMBAMS30P page 173	SMBAMS30RA page 174
DUO-TOUCH® SG Run Bars page 120 	STBA-RB1-MB1 page 175	STBA-RB1-MB2 page 175	STBA-RB1-MB3 page 175		

AG4-MBK1



Hole center spacing: A = 63
Hole size: 9 x 20.4

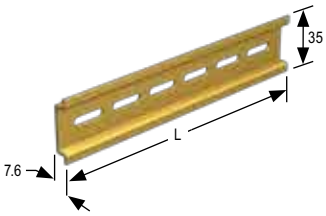
- Metal swivel bracket for mounting and aligning

Back Mount

Used with

AG4-4E Laser Scanner

DIN-35-..



All measurements in mm

Model	Length (L)
DIN-35-70	70
DIN-35-105	105
DIN-35-140	140

Hole center spacing: 35.1
Hole size: 25.4 x 5.3

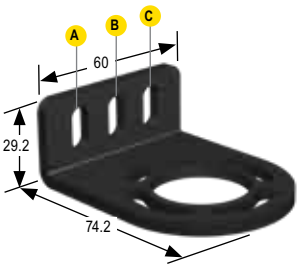
- Available in 70, 105 & 140 mm lengths

Controllers & Modules

Used with

PICO-GUARD Controllers
SC22-3 Controllers
GM Modules
ES Modules
SM Modules
MMD Modules
IM Modules
EM Modules
SSM Modules
UM Modules
Two-Hand Control Modules

EZA-MBK-1

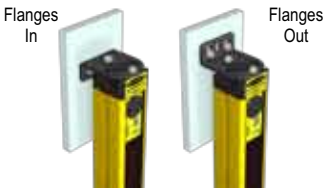


All measurements in mm

Hole center spacing:
A to B = 15.8, A to C = 31.5
Hole size: A, B, C = 15 x 7

- Two end-cap replacement brackets for one emitter/receiver
- 8-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish
- M5 and M6 mounting hardware

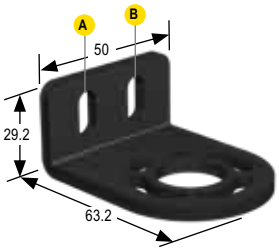
End Mount



Used with

EZ-SCREEN Point & Grid
PICO-GUARD Grid

EZA-MBK-11

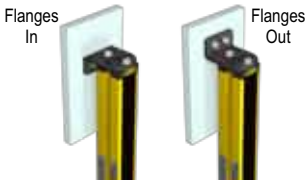


All measurements in mm

Hole center spacing: A to B = 20
Hole size: A, B = 15 x 7

- Two end-cap replacement brackets for one emitter/receiver
- 8-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish
- M5 and M6 mounting hardware

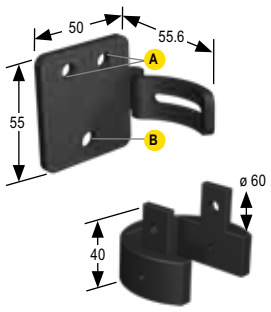
End Mount



Used with

EZ-SCREEN Standard 14 & 30

EZA-MBK-12



All measurements in mm

Hole center spacing: A = 20, A to B = 36
Hole size: A = ø 7, B = ø 8.3

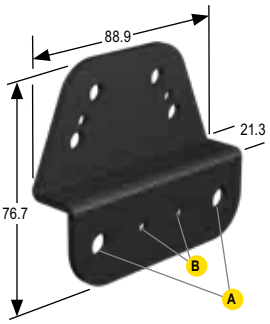
- Two-piece center bracket for one emitter/receiver
- 8-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish
- M5 and M6 mounting hardware

Center Mount

Used with

EZ-SCREEN Standard 14 & 30

EZA-MBK-2



All measurements in mm

Hole center spacing: A = 63.9, B = 19.9, A to B = 22
Hole size: A = ø 8.3, B = ø 4.8

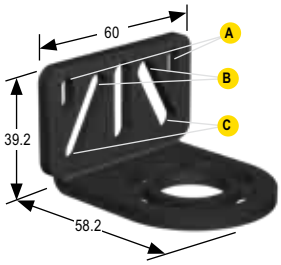
- Bracket adapter (Qty 2) for attaching EZA-MBK-1 to any MSA series stand

Bracket-to-Bracket

Used with

EZ-SCREEN Standard 14 & 30
EZ-SCREEN Point & Grid
PICO-GUARD Grid
MSA Stands

EZA-MBK-20

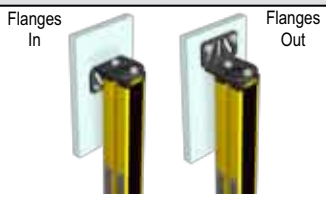


All measurements in mm

Hole center spacing: A = 44.5, B = 20, C = 40
Hole size: A =10.2 x 4.8, B, C = 25 x 7

- Retrofit for MINI-SCREEN, MICRO-SCREEN and MACHINE-GUARD
- Universal adapter bracket for mounting to engineered/slotted aluminum framing (example, 80/20™, Unistrut®)
- 8-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish

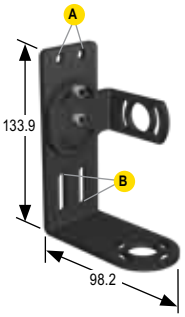
End Mount



Used with

EZ-SCREEN Standard 14 & 30

EZA-MBK-21



All measurements in mm

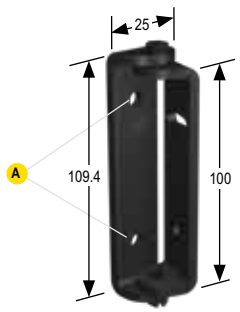
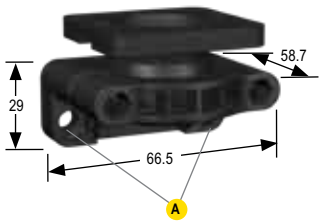
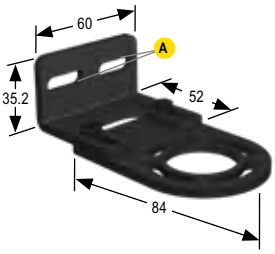
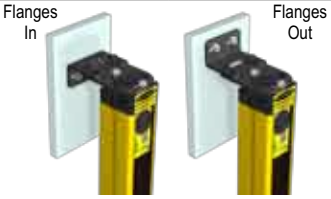
Hole center spacing: A = 20, B = 20, A to B = 101.4
Hole size: A = ø 7, B = 30 x 7.2

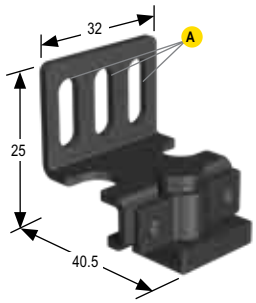
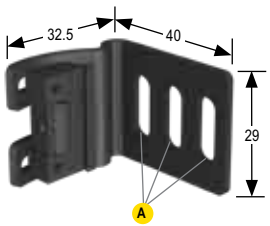
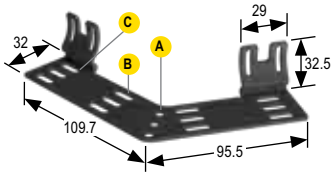
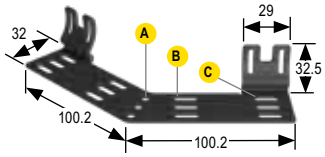
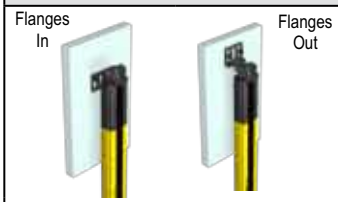
- Mounting bracket system for "L" configuration of two cascaded light screens
- 8-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish
- M5 and M6 mounting hardware

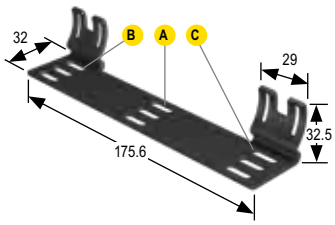
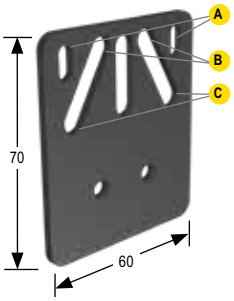
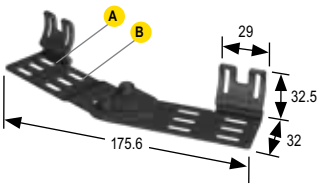
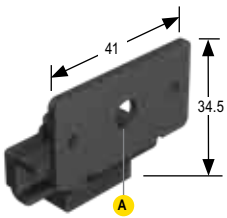
Cascading Mount

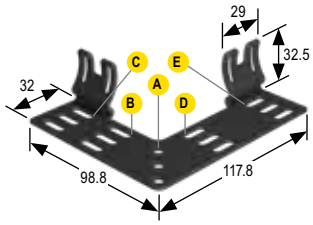
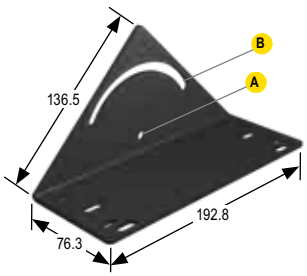
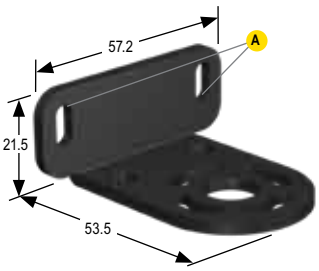
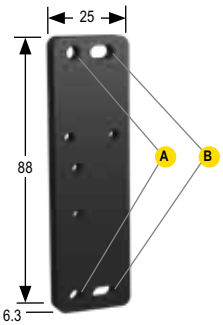
Used with

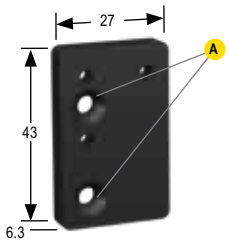
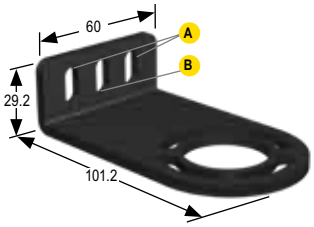
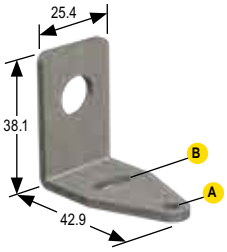
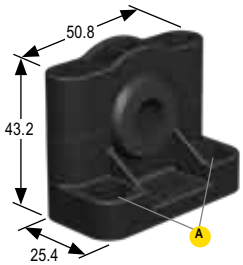
EZ-SCREEN Standard 14 & 30

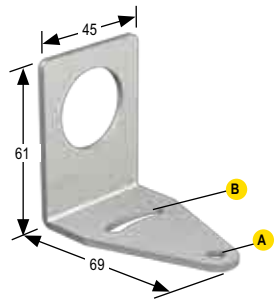
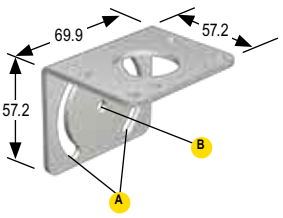
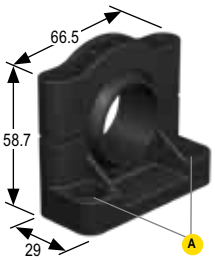
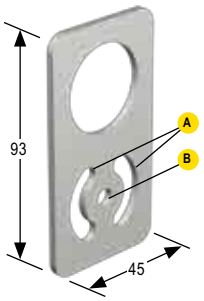
EZA-MBK-3	EZA-MBK-4	EZA-MBK-5	EZA-MBK-9
			
All measurements in mm	All measurements in mm	All measurements in mm	All measurements in mm
Hole center spacing: A = 65 **Hole size:** A = ø 7	**Hole center spacing:** A = 50.8 **Hole size:** ø 7	**Hole center spacing:** A = 50.8 **Hole size:** ø 7	**Hole center spacing:** A = 30.8 **Hole size:** 21 x 7
• Two-piece side-swivel bracket kit • 180º range of motion • 8-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish	• Top-mounting kit with SMB30SC swivel bracket and threaded adapter • 45° rotation in any direction • Black reinforced thermoplastic polyester	• Bottom-mounting kit with SMB30SC swivel bracket and threaded adapter plate • 45° rotation in any direction • Black reinforced thermoplastic polyester	• Two-bracket kit with 30 mm range of motion for mounting sensor • 8-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish • M5 and M6 mounting hardware
Side Mount	**End Mount**	**End Mount**	**End Mount**
			
Used with	Used with	Used with	Used with
EZ-SCREEN Point & Grid PICO-GUARD Grid	EZ-SCREEN Point	EZ-SCREEN Point	EZ-SCREEN Grid PICO-GUARD Grid

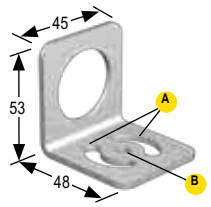
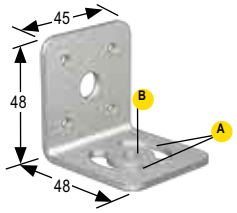
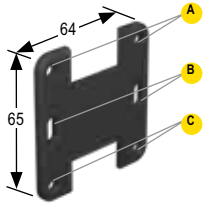
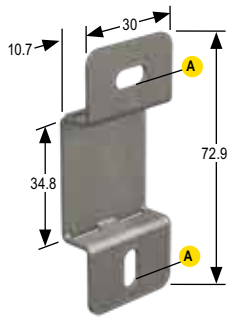
LPA-MBK-11	LPA-MBK-12	LPA-MBK-120	LPA-MBK-135
 All measurements in mm	 All measurements in mm		
Hole center spacing: A = 10 **Hole size:** A = 5.5 x 15.5	**Hole center spacing:** A = 10 **Hole size:** A = 15.5 x 5.5	**Hole center spacing:** A, B, C = 10, B to C = 50 **Hole size:** A = ø 5.8, B, C = 15.5 x 5.5	**Hole center spacing:** A, B, C = 10, B to C = 50 **Hole size:** A = ø 5.8, B, C = 15.5 x 5.5
• End-cap bracket kit • 360° sensor rotation • 14-ga. (1.9 mm) steel, black zinc plated; die-cast metal clamp • Includes 2 brackets and hardware	• Side-mount bracket kit +10°/-30° sensor rotation • 14-ga. (1.9 mm) steel, black zinc plated; die-cast zinc clamp • Includes 1 bracket and hardware	• Pair of angled "L" brackets for two cascaded emitter/receiver pairs • Fixed 120° orientation • +10°/-30° sensor rotation • 14-ga. (1.9 mm) steel, black zinc plated	• Pair of angled "L" brackets for two cascaded emitter/receiver pairs • Fixed 135° orientation • +10°/-30° sensor rotation • 14-ga. (1.9 mm) steel, black zinc plated
End Mount	**Center Mount**	**Cascading Mount**	**Cascading Mount**
			
Used with	Used with	Used with	Used with
EZ-SCREEN LP 14 & 25 mm	EZ-SCREEN LP 14 & 25 mm	EZ-SCREEN LP 14 & 25 mm	EZ-SCREEN LP 14 & 25 mm

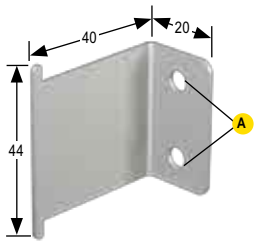
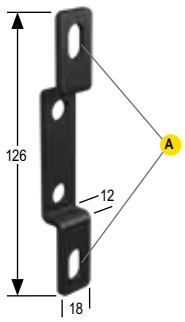
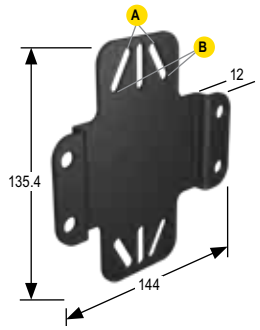
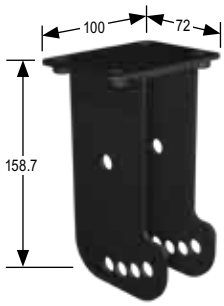
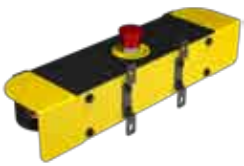
LPA-MBK-180	LPA-MBK-20	LPA-MBK-21	LPA-MBK-22
			
All measurements in mm	All measurements in mm	All measurements in mm	All measurements in mm
Hole center spacing: A to B = 73.3, A to C = 73.3 **Hole size:** A, B, C = 15.5 x 5.5	**Hole center spacing:** A = 44.5, B = 20, C = 40 **Hole size:** A = 4.8 x 10.2, B, C = 7 x 25	**Hole center spacing:** A = 10, B = 10, A to B = 30 **Hole size:** A, B = 15.5 x 5.5	**Hole size:** A = ø 6.6,
• Pair of inline (straight) brackets for two cascaded emitter/receiver pairs • Fixed 180° orientation • +10°/-30° sensor rotation • 14-ga. (1.9 mm) steel, black zinc plated	• Universal adapter bracket for mounting to engineered/slotted aluminum framing (example, 80/20™, Bosch) • Use with LPA-MBK-11, -12 or -13 • 12-ga (2.66 mm) steel; black zinc plated • Includes 1 bracket and hardware	• Pivoting "L" bracket system for two cascaded emitters/receivers; uses clamps from side-mount bracket LPA-MBK-12 • Adjustable 90° to 180° orientation • +10°/-30° sensor rotation • 14-ga. (1.9 mm) steel, black zinc plated	• End-cap bracket for mounting inside Unistrut® metal framing • Fits Unistrut® P1000 size (1 5/8"), with M6 or 1/4" channel nuts • 14-ga. (1.9 mm) steel, black zinc, plated; die–cast zinc clamp • Includes 2 brackets and hardware
Cascading Mount	**Bracket-to-Bracket**	**Cascading Mount**	**Bracket-to-Bracket**
			
Used with	Used with	Used with	Used with
EZ-SCREEN LP 14 & 25 mm	EZ-SCREEN LP 14 & 25 mm	EZ-SCREEN LP 14 & 25 mm	EZ-SCREEN LP 14 & 25 mm

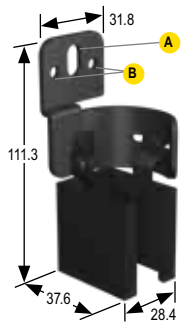
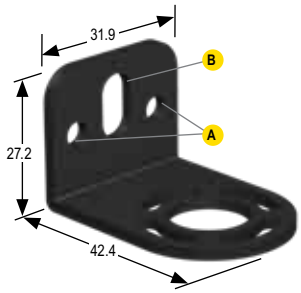
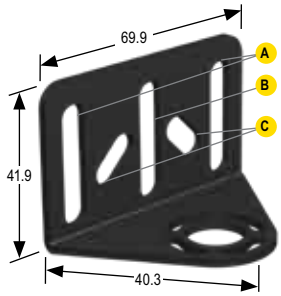
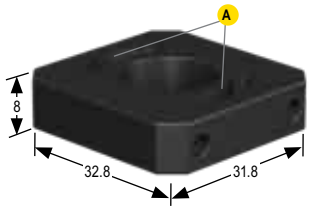
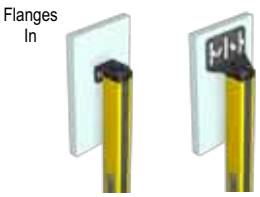
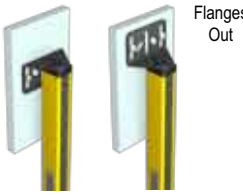
LPA-MBK-90	MSMB-MSM-45	MSMMB	SFA-IMB1
			
All measurements in mm	All measurements in mm	All measurements in mm	All measurements in mm
Hole center spacing: A, B, C, D, E = 10, B to C = 30, D to E = 50 **Hole size:** A = ø 5.8, B, C, D, E = 15.5 x 5.5	**Hole center spacing:** A to B = 50.8 **Hole size:** A = ø 7, B = 87.7 x 7	**Hole center spacing:** A = 45 **Hole size:** A = 10 x 4.7	**Hole center spacing:** A, B = 78, A to B = 10 **Hole size:** A = ø 4.5, B = 8 x 4.5
• Pair of angled "L" brackets for two cascaded emitter/receiver pairs • Fixed 90° orientation • +10°/-30° sensor rotation • 14-ga. (1.9 mm) steel, black zinc plated	• Bracket for 45° mounting of mirror • 11-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish • Bracket hardware included	• Two-bracket replacement kit for brackets that come with MSM mirrors • 11-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish • Bracket hardware included	• Retrofit bracket for replacing SI-MAG1 Magnetic Interlock switches with PICO-GUARD switches • Black reinforced thermoplastic polyester
Cascading Mount	**Bracket-to-Bracket**	**End Mount**	**Flat Mount**
			
Used with	Used with	Used with	Used with
EZ-SCREEN LP 14 & 25 mm	MSM4A Mirror	MSM Mirror	PICO-GUARD Switches
	Note: For a kit containing a bracket and MSM4A mirror, order model number **MSA-MBM-K45**		

SFA-IMB2	SMA-MBK-1	SMB12MM	SMB1812SF
			
All measurements in mm	All measurements in mm	All measurements in mm	All measurements in mm
Hole center spacing: A = 22 **Hole size:** ø 4.5	**Hole center spacing:** A = 31.5, A to B = 15.7 **Hole size:** A, B = 15 X 7	**Hole center spacing:** A to B = 26 **Hole size:** A = ø 4.6, B = 12.8 x 4.6	**Hole center spacing:** A = 36.1 **Hole size:** A = ø 5
• Retrofit bracket for replacing SI-MAG2 Magnetic Interlock switches with PICO-GUARD switches • Black reinforced thermoplastic polyester	• Two-bracket replacement kit for brackets that come with SSM Mirrors • 8-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish • Bracket hardware included	• ±10° of lateral movement • 12-ga. stainless-steel • Mounting holes for M4 (#6) hardware	• Swivel bracket with 12 mm mounting hole • Black reinforced thermoplastic polyester • Stainless steel mounting and swivel locking hardware included
Flat Mount	**End Mount**	**Barrel Mount**	**Barrel Mount**
			
Used with	Used with	Used with	Used with
PICO-GUARD Switches	SSM Mirror	PICO-GUARD Switches PICO-GUARD Points	PICO-GUARD Points

SMB30A	SMB30MM	SMB30SC	SMBAMS30P
			
All measurements in mm	All measurements in mm	All measurements in mm	All measurements in mm
Hole center spacing: A to B = 40 **Hole size:** A = ø 6.3, B = 27.1 x 6.3	**Hole center spacing:** A = 51, A to B = 25.4 **Hole size:** A = 42.6 x 7, B = ø 6.4	**Hole center spacing:** A = 50.8 **Hole size:** ø 7	**Hole center spacing:** A = 26, A to B = 13 **Hole size:** A = 26.8 x 7, B = ø 6.5
• ± 15° of lateral movement • Right-angle bracket curved mounting slot for versatility and orientation • Clearance for M6 (1/4¨) hardware • Mounting hole for 30 mm sensor • 12-ga. stainless-steel	• Mounting hole for 30 mm sensor • 90° of lateral movement • 12-ga. stainless steel bracket with curved mounting slot for versatility and orientation • Clearance for M6 (1/4") hardware	• Swivel bracket with 30 mm mounting hole for sensor • Black reinforced thermoplastic polyester • Stainless steel mounting and swivel locking hardware included	• Flat SMBAMS series bracket • 30 mm hole for mounting sensors • Articulation slots for 90+° rotation • 12-ga. (2.6 mm) cold-rolled steel
Base Mount	**Base Mount**	**Base Mount**	**Base Mount**
			
Used with	Used with	Used with	Used with
STB EZ-LIGHT K50L EZ-LIGHT TL50	STB EZ-LIGHT K50L EZ-LIGHT TL50	STB EZ-LIGHT K50L EZ-LIGHT TL50	STB EZ-LIGHT K50L EZ-LIGHT TL50
Barrel Mount	**Barrel Mount**	**Barrel Mount**	**Barrel Mount**
			
Used with	Used with	Used with	Used with
PICO-GUARD Point EZ-LIGHT T30	PICO-GUARD Point EZ-LIGHT T30	PICO-GUARD Point EZ-LIGHT T30	PICO-GUARD Point EZ-LIGHT T30

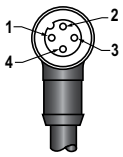
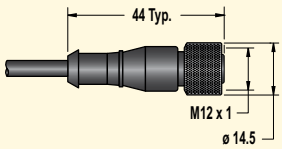
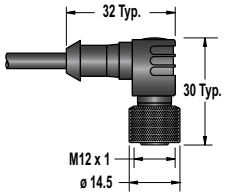
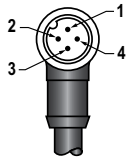
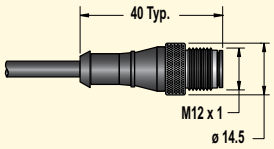
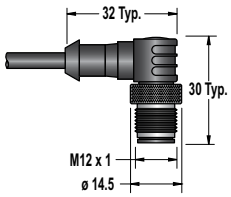
SMBAMS30RA	SMBAMSBRA	SMBR55F01	SMBR55F02
			
All measurements in mm	All measurements in mm	All measurements in mm	All measurements in mm
Hole center spacing: A = 26, A to B = 13 **Hole size:** A = 26.8 x 7, B = ø 6.5	**Hole center spacing:** A = 26, A to B = 13 **Hole size:** A = 26.8 x 7, B = ø 6.5	**Hole center spacing:** A, B, C = 50.8, A to B, B to C = 25.3 **Hole size:** A, C = ø 5, B = 11 x 5	**Hole center spacing:** A = 50.3 **Hole size:** A = 11.2 x 5.6
• Right-angle SMBAMS series bracket • 30 mm hole for mounting sensors • Articulation slots for 90+° rotation • 12-ga. (2.6 mm) cold-rolled steel	• Right-angle base piece for SMBAMS series of versatile mounting hardware • Four point hole pattern to intergrate with articulation slots in SMBAMS series brackets • 12-ga. (2.6 mm) cold-rolled steel	• Flat-mounting bracket • Eliminates need for DIN rail • Black reinforced thermoplastic polyester	• Mounts to T-slotted or narrow flat surfaces • 19-ga. stainless-steel
Base Mount	**Bracket-to-Bracket**	**Flat Mount**	**Flat Mount**
			
Used with	Used with	Used with	Used with
STB EZ-LIGHT K50L EZ-LIGHT TL50	SMBAMS30P SMBAMS30RA	PICO-GUARD SFA-RD	PICO-GUARD SFA-RD
Barrel Mount			
			
Used with			
PICO-GUARD Point EZ-LIGHT T30			

SMBR55FRA	STBA-RB1-MB1	STBA-RB1-MB2	STBA-RB1-MB3
			
All measurements in mm	All measurements in mm	All measurements in mm	All measurements in mm
Hole center spacing: A = 20 **Hole size:** A = ø 5.4	**Hole center spacing:** A = 106 **Hole size:** A = 9 x 15	**Hole center spacing:** A = 20, B = 40 **Hole size:** A = 20, A to B = 10, A, B = 27 x 7	**NA**
• Side-mounted bracket • Eliminates need for DIN rail • 19-ga. stainless-steel	• Pair of wall-mount brackets; run bar "hangs" on vertical surface • Slotted holes for vertical adjustment • 12-ga. cold-rolled steel with black powdercoat paint	• Universal-mount bracket; allows run bar to mount to vertical stand or surface • Slotted holes for adjustment • 12-ga. cold-rolled steel with black powdercoat paint	• Swivel-mount bracket; mounts to telescoping stand • Holes for radial adjustment, 0° to 30° in 10° increments • 12-ga. cold-rolled steel with black powdercoat paint
Side Mount	**Wall Mount**	**Wall/Stand Mount**	**Stand Mount**
			
Used with	Used with	Used with	Used with
PICO-GUARD SFA-RD	DUO-TOUCH Run Bar	DUO-TOUCH Run Bar	DUO-TOUCH Run Bar
			Note: Included with telescoping stands STBA-RB1-S1 and STBA-RB1-S2

USCMB-..	USMB-1	USMB-6	USMB-8
			
All measurements in mm	All measurements in mm	All measurements in mm	All measurements in mm
Hole center spacing: B = 19.9, A to B = 10 **Hole size:** A = 12.2 x 7.1, B = ø 4.8	**Hole center spacing:** A = 20, A to B = 10 **Hole size:** A = ø 4.8, B = 12.7 x 7	**Hole center spacing:** A = 52.1, A to B = 26, C = 30.6 **Hole size:** A, B = 25.4 x 7.1, C = 15.5 x 7	**Hole center spacing:** A = 22.7 **Hole size:** A = 15 x 3.5
• Two-piece center mounting replacement kit for bracket that comes with emitter/receiver • 13-ga. cold-rolled steel with black power coat paint • Bracket hardware included	• Two-bracket replacement kit for brackets that come with emitter/receiver • 13-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish • Bracket hardware included	• Two-bracket universal-mounting surface kit • 13-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish • Bracket hardware included	• Two-bracket kit for one emitter/receiver • Mounting plate for 90° sensor direction • Black anodized aluminum
Center Bracket	**End Mount**	**End Mount**	**End Mount**
			
Used with	Used with	Used with	Used with
EZ-SCREEN Type 2	EZ-SCREEN Type 2	EZ-SCREEN Type 2	EZ-SCREEN Type 2
Note: USCMB-1 fits emitters/receivers up to 900 mm long USCMB-2 fits emitters/receivers more than 900 mm long			

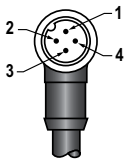
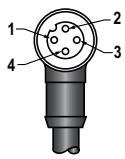
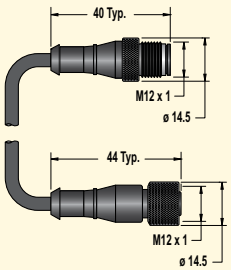
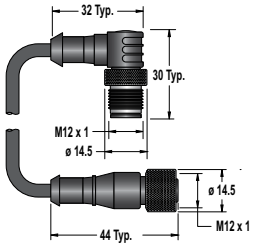
4-Pin Euro-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
Conductors: 22 AWG high-flex stranded, gold-plated contacts
Temperature: -40° to +90° C
Voltage Rating: 250V ac/300V dc

Pinout	Style	Model	Length	Dimensions (mm)	Used With
Female  1 = Brown 2 = White 3 = Blue 4 = Black	Straight	MQDC-406	2 m		• STB w/solid-state relay • Muting Module
		MQDC-415	5 m		
		MQDC-430	9 m		
		MQDC-450	15 m		
	Right-Angle	MQDC-406RA	2 m		
		MQDC-415RA	5 m		
		MQDC-430RA	9 m		
		MQDC-450RA	15 m		
Male  1 = Brown 2 = White 3 = Blue 4 = Black	Straight	MQDMC-406	2 m		• Muting Module
		MQDMC-415	5 m		
		MQDMC-430	10 m		
		MQDMC-450	15.5 m		
	Right-Angle	MQDMC-406RA	2 m		
		MQDMC-415RA	5 m		
		MQDMC-430RA	10 m		
		MQDMC-450RA	15.5 m		

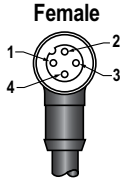
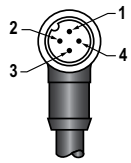
4-Pin Euro-Style Cordsets - Double Ended

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
Conductors: 22 AWG high-flex stranded, gold-plated contacts
Temperature: -40° to +90° C
Voltage Rating: 250V ac/300V dc

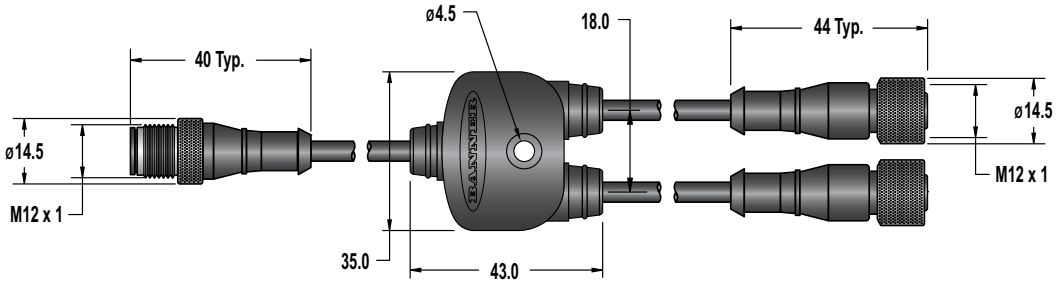
Pinout	Style	Model	Length	Dimensions (mm)	Used With
Male  Female  1 = Brown 2 = White 3 = Blue 4 = Black	Male Straight/ Female Straight	MQDEC-403SS	0.9 m		• Muting Module
		MQDEC-406SS	1.8 m		
		MQDEC-412SS	3.6 m		
		MQDEC-420SS	6.1 m		
		MQDEC-430SS	9.2 m		
		MQDEC-450SS	15.2 m		
	Male Right-Angle/ Female Straight	MQDEC-403RS	0.9 m		
		MQDEC-406RS	1.8 m		
		MQDEC-412RS	3.6 m		
		MQDEC-420RS	6.1 m		
		MQDEC-430RS	9.1 m		
		MQDEC-450RS	15.2 m		

4-Pin Euro-Style Splitter Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
Conductors: 22 AWG high-flex stranded, gold-plated contacts
Temperature: -40° to +90° C
Voltage Rating: 250V ac/300V dc

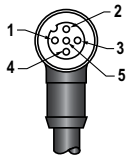
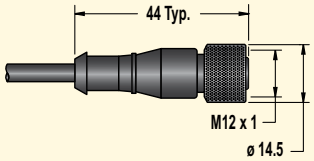
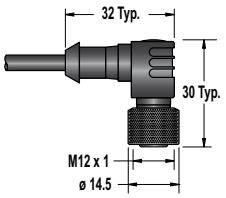
Pinout	Model	Branches	Trunk	Used With
Female 	**CSB-M1240M1240**	4-Pin Euro QD No Branch Female	No Trunk Male	• Muting Module
	CSB-M1241M1241	4-Pin Euro QD 2 x 0.3 m Female	0.3 m Male	
	CSB-M1248M1241		2.5 m Male	
	CSB-M12415M1241		4.6 m Male	
	CSB-M12425M1241		7.6 m Male	
Male  1 = Brown 2 = White 3 = Blue 4 = Black	**CSB-UNT425M1241**		7.6 m Unterminated	

Dimensions



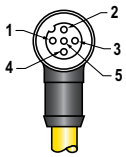
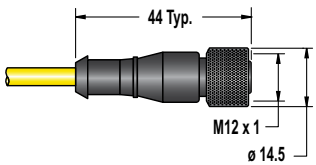
5-Pin Euro-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
Conductors: 22 AWG high-flex stranded, gold-plated contacts
Temperature: -40° to +90° C
Voltage Rating: 250V ac/300V dc

Pinout	Style	Model	Length	Dimensions (mm)	Used With
Female  1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray	Straight	**MQDC1-501.5**	0.5 m		• STB w/em relay
		MQDC1-506	2 m		
		MQDC1-515	5 m		
		MQDC1-530	9 m		
	Right-Angle	**MQDC1-506RA**	2 m		
		MQDC1-515RA	5 m		
		MQDC1-530RA	9 m		

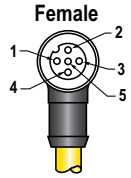
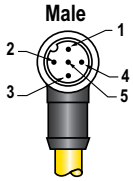
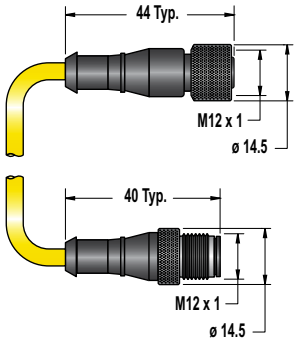
5-Pin Euro-Style Cordsets with Green/Yellow Grounding Wire

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
Conductors: 22 AWG high-flex stranded, gold-plated contacts
Temperature: -40° to +90° C
Voltage Rating: 250V ac/300V dc

Pinout	Style	Model	Length	Dimensions (mm)	Used With
Female  1 = Brown 2 = White 3 = Blue 4 = Black 5 = Green/Yellow	Straight	QDE-515D	4.5 m	 	• EZ-SCREEN Emitters w/5-pin QD & Test (14 & 30 mm Resolution)
		QDE-525D	7.6 m		
		QDE-550D	15.2 m		
		QDE-575D	22.8 m		
		QDE-5100D	30.4 m		

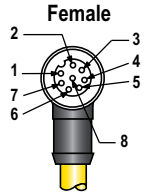
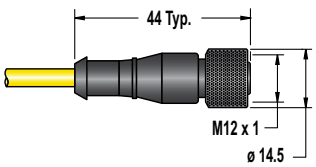
5-Pin Euro-Style Cordsets - Double Ended

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
Conductors: 22 AWG high-flex stranded, gold-plated contacts
Temperature: -40° to +90° C
Voltage Rating: 250V ac/300V dc

Pinout	Style	Model	Length	Dimensions	Used With
Female  Male  1 = Brown 2 = White 3 = Blue 4 = Black 5 = Green/Yellow	Female Straight/ Male Straight	DEE2R-51D	0.3 m	 	• EZ-SCREEN Emitters w/5-pin QD & Test (14 & 30 mm Resolution) • AC Interface Boxes
		DEE2R-53D	0.9 m		
		DEE2R-58D	2.5 m		
		DEE2R-515D	4.6 m		
		DEE2R-525D	7.6 m		
		DEE2R-550D	15.2 m		
		DEE2R-575D	22.9 m		
		DEE2R-5100D	30.5 m		

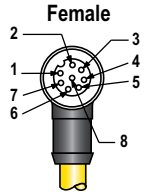
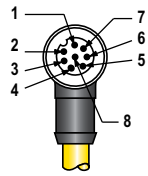
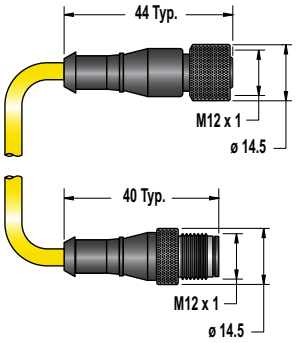
8-Pin Euro-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
Conductors: 22 AWG high-flex stranded, gold-plated contacts
Temperature: -40° to +90° C
Voltage Rating: 250V ac/300V dc

Pinout	Style	Model	Length	Dimensions	Used With
Female  1 = Brown 5 = Black 2 = Or/Bk 6 = Blue 3 = Orange 7 = Gn/Ye 4 = White 8 = Violet	Straight	QDE-815D	4.5 m	 	• EZ-SCREEN Emitters & Receivers w/8-pin QD (14 & 30 mm Resolution) • EZ-SCREEN LP Emitters & Receivers w/8-pin QD (14 & 25 mm Resolution) • EZ-SCREEN Emitters & Receivers w/8-pin QD (Point & Grid) • EZ-SCREEN Type 2
		QDE-825D	7.6 m		
		QDE-850D	15.2 m		
		QDE-875D	22.8 m		
		QDE-8100D	30.4 m		

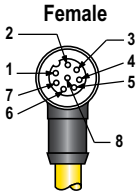
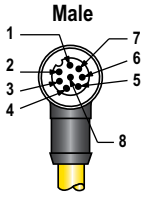
8-Pin Euro-Style Cordsets - Double Ended

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
Conductors: 22 AWG high-flex stranded, gold-plated contacts
Temperature: -40° to +90° C
Voltage Rating: 250V ac/300V dc

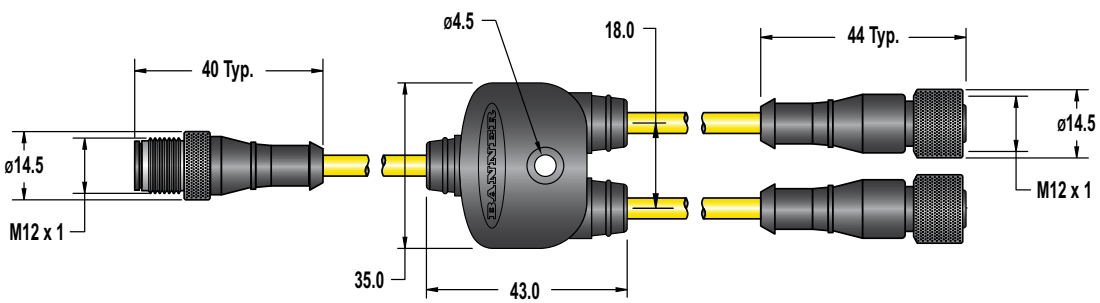
Pinout	Style	Model	Length	Dimensions	Used With
Female  Male  1 = Brown 5 = Black 2 = Or/Bk 6 = Blue 3 = Orange 7 = Gn/Ye 4 = White 8 = Violet	Female Straight/ Male Straight	**DEE2R-81D**	0.3 m		• EZ-SCREEN Emitters & Receivers w/8-pin QD (14 & 30 mm Resolution) • EZ-SCREEN LP Emitters & Receivers w/8-pin QD (14 & 25 mm Resolution) • EZ-SCREEN Emitters & Receivers w/8-pin QD (Point & Grid) • EZ-SCREEN Type 2 • AC Interface Boxes
		DEE2R-83D	0.9 m		
		DEE2R-88D	2.5 m		
		DEE2R-815D	4.6 m		
		DEE2R-825D	7.6 m		
		DEE2R-850D	15.2 m		
		DEE2R-875D	22.9 m		
		DEE2R-8100D	30.5 m		

8-Pin Euro-Style Splitter Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
Conductors: 22 AWG high-flex stranded, gold-plated contacts
Temperature: -40° to +90° C
Voltage Rating: 250V ac/300V dc

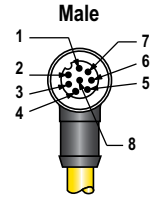
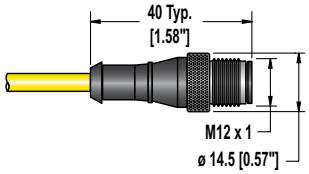
Pinout	Model	Branches	Trunk	Used With
Female  Male  1 = Brown 2 = Or/Bk 3 = Orange 4 = White 5 = Black 6 = Blue 7 = Gn/Ye 8 = Violet	**CSB-M1280M1280**	8-Pin Euro QD No Branch Female	No Trunk Male	• EZ-SCREEN Emitters & Receivers w/8-pin QD (14 & 30 mm Resolution) • EZ-SCREEN LP Emitters & Receivers w/8-pin QD (14 & 25 mm Resolution) • EZ-SCREEN Emitters & Receivers w/8-pin QD (Point & Grid) • EZ-SCREEN Type 2 • AC Interface Boxes • EZ-LIGHT Indicator Light • Muting Module
	CSB-M1281M1281	8-Pin Euro QD 2 x 0.3 m Female	0.3 m Male	
	CSB-M1288M1281		2.5 m Male	
	CSB-M12815M1281		4.6 m Male	
	CSB-M12825M1281		7.6 m Male	
	CSB-UNT825M1281		7.6 m Unterminated	

Dimensions



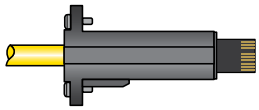
8-Pin Euro-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
Conductors: 22 AWG high-flex stranded, gold-plated contacts
Temperature: -40° to +90° C
Voltage Rating: 250V ac/300V dc

Pinout	Style	Model	Length	Dimensions	Used With
Male  1 = Brown 5 = Not used 2 = Black 6 = Not used 3 = Blue 7 = Not used 4 = Not used 8 = White	Straight	**QDE2R4-815D**	4.6 m	 	• EZ-SCREEN Receiver (Cascade) w/8-pin QD (14 & 30 mm) • EZ-SCREEN LP Receiver (Cascade) w/8-pin QD (14 & 25 mm)
		QDE2R4-825D	7.6 m		

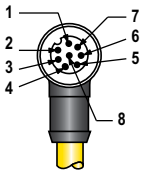
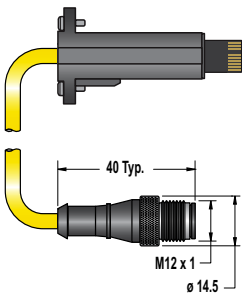
RD to Flying Lead Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
Conductors: 22 AWG high-flex stranded, gold-plated contacts
Temperature: -40° to +90° C
Voltage Rating: 250V ac/300V dc

Pinout	Style	Model*	Length	Dimensions	Used With
RD  1 = Brown 2 = Or/Bk 3 = Orange 4 = White 5 = Black 6 = Blue 7 = Gn/Ye 8 = Violet	RD	**RDLP-815D**	4.6 m		• EZ-SCREEN LP Emitters and Receivers w/RD (14 & 25 mm Resolution)
		RDLP-825D	8 m		
		RDLP-850D	15.3 m		
		RDLP-875D	23 m		
		RDLP-8100D	30.5 m		

8-Pin Euro-Style QD to RD Cordsets

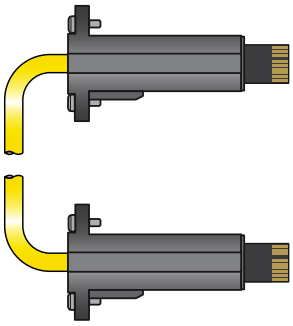
Cable: EURO: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
RD: Nylon (polyamide)/PUR (polyurethane)
Conductors: 22 AWG high-flex stranded, gold-plated contacts
Temperature: -40° to +90° C
Voltage Rating: 250V ac/300V dc

Pinout	Style	Model*	Length	Dimensions	Used With
RD  Male  1 = Brown 5 = Black 2 = Or/Bk 6 = Blue 3 = Orange 7 = Gn/Ye 4 = White 8 = Violet	RD/ Male Straight	**DELPE-81D**	0.3 m	 	• EZ-SCREEN LP Emitters and Receivers w/RD (14 & 25 mm Resolution)
		DELPE-83D	1 m		
		DELPE-88D	2.5 m		
		DELPE-815D	4.6 m		
		DELPE-825D	8 m		
		DELPE-850D	15.3 m		
		DELPE-875D	23 m		
		DELPE-8100D	30.5 m		

* Standard cordsets are yellow PVC with black overmold. For black PVC cable and overmold, add suffix **B** to model number (example, **RDLP-815DB**).

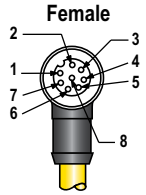
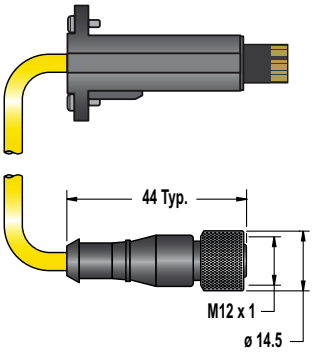
RD to RD Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
Conductors: 24 AWG high-flex stranded, gold-plated contacts
Temperature: -40° to +90° C
Voltage Rating: 250V ac/300V dc

End View	Style	Model*	Length	Dimensions	Used With
	RD/ RD	**DELP-110E**	0.05 m		• EZ-SCREEN LP Cascading Emitters and Receivers (14 & 25 mm resolution)
		DELP-111E	0.3 m		
		DELP-113E	1 m		
		DELP-118E	2.5 m		
		DELP-1115E	4.6 m		
		DELP-1125E	8 m		
		DELP-1150E	15.3 m		
		DELP-1175E	23 m		
		DELP-11100E	30.5 m		

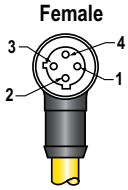
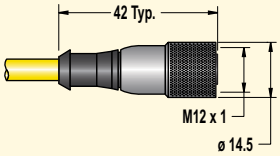
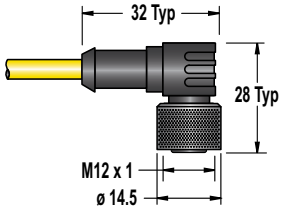
8-Pin Euro-Style QD to RD Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
Conductors: 22 AWG high-flex stranded, gold-plated contacts
Temperature: -40° to +90° C
Voltage Rating: 250V ac/300V dc

End View	Style	Model*	Length	Dimensions	Used With
Female  1 = Brown 5 = Black 2 = Or/Bk 6 = Blue 3 = Orange 7 = Gn/Ye 4 = White 8 = Violet	RD/ Female Straight	**DELPEF-81D**	0.3 m		• EZ-SCREEN LP Receiver (Cascade) w/8-pin pigtail QD (14 & 25 mm); requires QDE2R4-8…D cordset

4-Pin Micro-Style Cordsets

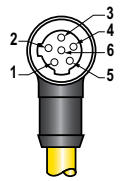
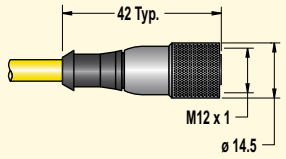
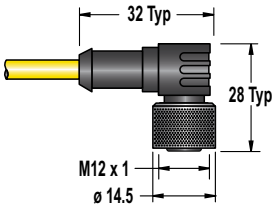
Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
Conductors: 22 AWG high-flex stranded, gold-plated contacts
Temperature: -40° to +90° C
Voltage Rating: 125V ac/150V dc

Pinout	Style	Model	Length	Dimensions	Used With
Female  1 = Red/Bk 2 = Red/Wh 3 = Red 4 = Green	Straight	**MQEAC-406**	2 m		• SI-HG80 Hinge-Style Switches
		MQEAC-415	5 m		
		MQEAC-430	9.1 m		
	Right-Angle	**MQEAC-406RA**	2 m		
		MQEAC-415RA	5 m		
		MQEAC-430RA	9.1 m		

* Standard cordsets are yellow PVC with black overmold. For black PVC cable and overmold, add suffix **B** to model number (example, **DELP-110EB**).

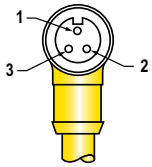
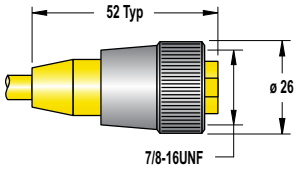
6-Pin Micro-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
Conductors: 22 AWG high-flex stranded, gold-plated contacts
Temperature: -40° to +90° C
Voltage Rating: 125V ac/150V dc

Pinout	Style	Model	Length	Dimensions	Used With
Female  1 = Red/White 2 = Red 3 = Green 4 = Red/Yellow 5 = Red/Black 6 = Red/Blue	Straight	MQEAC-606	2 m		• SI-HG63 Hinge-Style Switches
		MQEAC-615	5 m		
		MQEAC-630	9.1 m		
	Right-Angle	MQEAC-606RA	2 m		
		MQEAC-615RA	5 m		
		MQEAC-630RA	9.1 m		

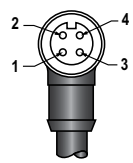
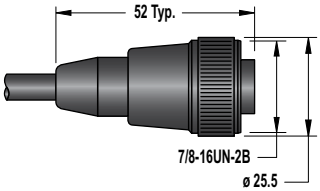
3-Pin Mini-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, chrome-plated brass coupling nut
Conductors: 18 AWG high-flex stranded, PVC insulation, gold-plated contacts
Temperature: -40° to +80° C
Voltage Rating: 250V ac/300V dc

Pinout	Style	Model	Length	Dimensions	Used With
Female  1 = Green/Ye 2 = Brown 3 = Blue	Straight	QDS-315C	4.5 m		• EZ-SCREEN Emitters w/3-pin QD (Point & Grid)
		QDS-325C	7.6 m		
		QDS-350C	15.2 m		
		QDS-375C	22.8 m		
		QDS-3100C	30.4 m		

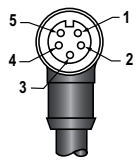
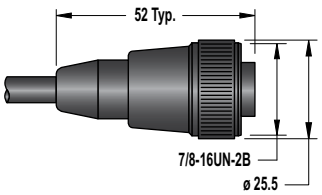
4-Pin Mini-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nylon coupling nut
Conductors: 18 AWG high-flex stranded, PVC insulation, gold-plated contacts
Temperature: -40° to +90° C
Voltage Rating: 250V ac/300V dc

Pinout	Style	Model	Length	Dimensions	Used With
Female  1 = Brown 2 = White 3 = Blue 4 = Black	Straight	MBCC-406	2 m		• STB w/solid-state relay
		MBCC-412	4 m		
		MBCC-430	10 m		

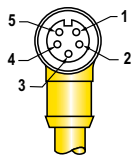
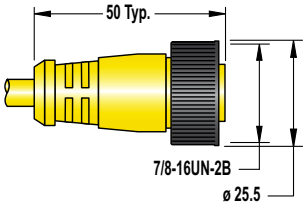
5-Pin Mini-Style Cordsets with Yellow Wire

Cable: PVC jacket, PUR (polyurethane) connector body, nylon coupling nut
Conductors: 18 AWG high-flex stranded, PVC insulation, gold-plated contacts
Temperature: -40° to +90° C
Voltage Rating: 250V ac/300V dc

Pinout	Style	Model	Length	Dimensions	Used With
Female  1 = Black 2 = Blue 3 = Yellow 4 = Brown 5 = White	Straight	**MBCC-506**	2 m	 	• STB w/em relay
		MBCC-512	4 m		
		MBCC-530	10 m		

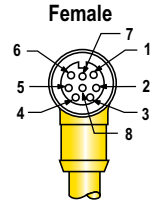
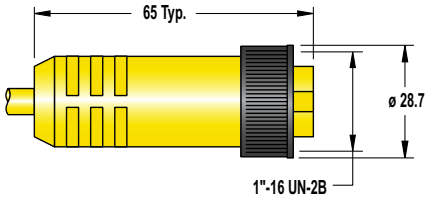
5-Pin Mini-Style Cordsets with Green/Yellow Grounding Wire

Cable: PVC jacket, PUR (polyurethane) connector body, nylon coupling nut
Conductors: 20 AWG high-flex stranded, PVC insulation, gold-plated contacts
Temperature: -40° to +80° C
Voltage Rating: 250V ac/300V dc

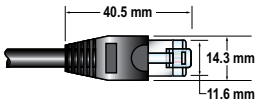
Pinout	Style	Model	Length	Dimensions	Used With
Female  1 = Black 2 = Blue 3 = Gn/Ye 4 = Brown 5 = White	Straight	**QDS-515C**	4.5 m	 	• EZ-SCREEN Emitters w/5-pin QD & TEST (Point & Grid)
		QDS-525C	7.6 m		
		QDS-550C	15.2 m		

8-Pin Mini-Style Cordsets

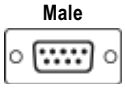
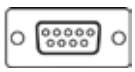
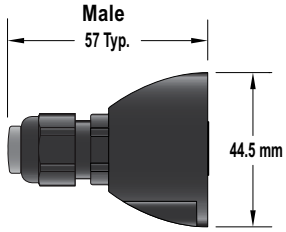
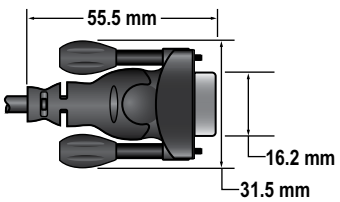
Cable: PVC jacket, PUR (polyurethane) connector body, nylon coupling nut
Conductors: 20 AWG high-flex stranded, PVC insulation, gold-plated contacts
Temperature: -40° to +80° C
Voltage Rating: 250V ac/300V dc

Pinout	Style	Model	Length	Dimensions	Used With
Female  1 = Brown 5 = Black 2 = Or/Bk 6 = Blue 3 = Orange 7 = Gn/Ye 4 = White 8 = Violet	Straight	**QDS-815C**	4.5 m	 	• EZ-SCREEN Receivers w/8-pin QD (Point & Grid) • DUO-TOUCH SG Run Bar • Muting Module
		QDS-825C	7.6 m		
		QDS-850C	15.2 m		
		QDS-875C	22.8 m		

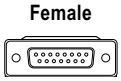
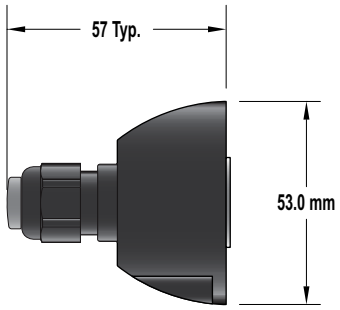
RJ45 Ethernet Cordsets

End View	Style	Model	Length	Dimensions	Used With
Male 	Cat5e Shielded	**STP07**	2.1 m		• SC22-3E
	Cat5e Crossover Shielded	**STPX07**			
	Cat5e Shielded	**STP25**	7.6 m		
	Cat5e Crossover Shielded	**STPX25**			
	Cat5e Shielded	**STP50**	15.5 m		
	Cat5e Crossover Shielded	**STPX50**			
	Cat5e Shielded	**STP75**	23 m		
	Cat5e Crossover Shielded	**STPX75**			

DB9 PC Communication Cordsets

Pinout	Style	Model	Length	Dimensions	Used With
Male  Female 	Male DB9/ Female DB9	**AG4-PCD9-3**	3 m	Male  Female 	• AG4-4E
		AG4-PCD9-5	5 m		
		AG4-PCD9-10	10 m		

DB15 Configuration/Machine Interface Cordsets

Pinout	Style	Model	Length	Dimensions	Used With
Female 	DB15	**AG4-CPD15-5**	5 m		• AG4-4E
		AG4-CPD15-10*	10 m		
		AG4-CPD15-25	25 m		
		AG4-CPD15-50	50 m		

* For a right-angle cordset, add **RA** to model number (example, **AG4-CPD15-10RA**).

QD End-Caps

Replace or convert EZ-SCREEN Grid and Point hard-wire terminal chamber end cap to QD model.

Model	Style	Dimensions	Used With
EZA-QDE-3	3-pin Mini QD	Converts terminal chamber end cap to QD model	• EZ-SCREEN Emitters w/Terminal Chamber (Point & Grid)
EZA-QDE-5	5-pin Mini QD		• EZ-SCREEN Emitters w/Terminal Chamber & TEST (Point & Grid)
EZA-QDR-8	8-pin Mini QD		• EZ-SCREEN Receivers w/Terminal Chamber (Point & Grid)

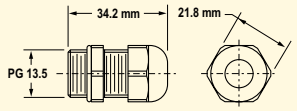
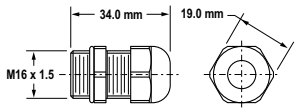
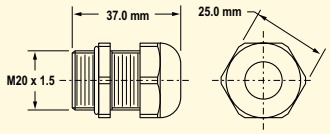
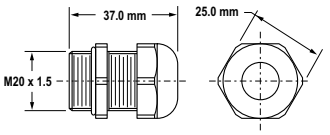
Unterminated Bulk Cable

Cable: PVC jacket
Conductors: 20 AWG high-flex stranded, PVC insulation
Temperature: -40° to +80° C
Voltage Rating: 250V ac/300V dc

Model	Length	Dimensions	Used With
UTB-325C	7.6 m	3-conductor (Brown, Blue, Green/Yellow)	• EZ-SCREEN Emitters w/Terminal Chamber (Point & Grid) • AC Interface Boxes
UTB-350C	15.2 m		
UTB-3100C	30.4 m		
UTB-3250C	76.2 m		
UTB-525C	7.6 m	5-conductor (Black, Blue, Brown, White, Green/Yellow)	• EZ-SCREEN Emitters w/Terminal Chamber & TEST (Point & Grid) • AC Interface Boxes
UTB-550C	15.2 m		
UTB-5100C	30.4 m		
UTB-5250C	76.2 m		
UTB-825C	7.6 m	8-conductor (Brown, Orange/Black, Orange, White, Black, Blue, Violet, Green/Yellow)	• EZ-SCREEN Receivers w/Terminal Chamber (Point & Grid) • AC Interface Boxes • DUO-TOUCH SG Run Bars
UTB-850C	15.2 m		
UTB-8100C	30.4 m		
UTB-8250C	76.2 m		

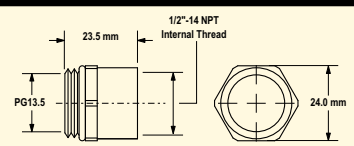
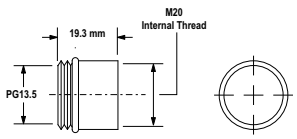
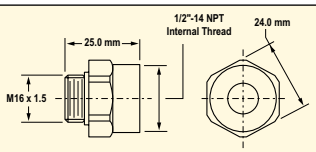
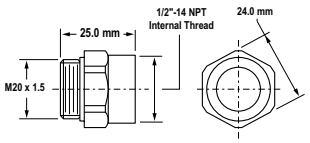
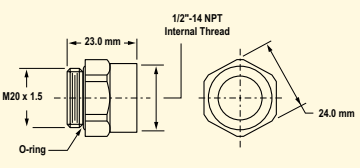
Cable Glands

- Secures the cable end in the housing and seals the point of connection.
- Available for EZ-SCREEN Point and Grid, rope pulls and safety interlock switches.

Model	Size	For Cable Diameter	Dimensions	Used With
SI-QS-CG13	PG13.5 Plastic	3.0 to 8.0 mm		• EZ-SCREEN w/Terminal Chamber (Point & Grid)
SI-QS-CGM16	M16 x 1.5 Plastic	3.0 to 8.0 mm		• SI-QS75 Safety Interlock Switches • SI-LS83 Safety Interlock Switches
SI-QS-CGM20	M20 x 1.5 Plastic	5.0 to 12.0 mm		• SI-QS90 Safety Interlock Switches • SI-LS100 Safety Interlock Switches • SI-LS31 Safety Interlock Switches • SI-LS42 Safety Interlock Switches • RP-LS42 Rope Pull Switches
SI-QM-CGM20	M20 x 1.5 Metal	5.0 to 12.0 mm		• SI-LM40 Safety Interlock Switches • SI-QM100 Safety Interlock Switches • SI-LM40 Safety Interlock Switches • RP-RM83 Rope Pull Switches • RP-LM40 Rope Pull Switches • RP-QM72/QMT72 Rope Pull Switches • RP-QM90 Rope Pull Switch

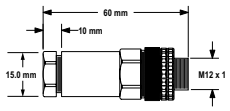
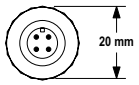
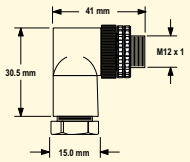
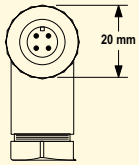
Conduit Adapters

- Connects conduit of different diameters.
- Available for EZ-SCREEN Point and Grid, rope pulls and safety interlock switches.

Model	Size	Thread Conversion	Dimensions	Used With
SI-QM-13	1/2" NPT to PG13.5 Metal	PG 13.5 to 1/2" NPT		• EZ-SCREEN w/Terminal Chamber (Point & Grid)
SI-QM-13-M20	M20 to PG13.5 Metal	PG 13.5 to M20		• EZ-SCREEN w/Terminal Chamber (Point & Grid)
SI-QS-M16	1/2" – 14 NPT Plastic	M16 x 1.5 to 1/2" – 14 NPT		• SI-QS75 Safety Interlock Switches • SI-LS83 Safety Interlock Switches
SI-QS-M20	1/2" – 14 NPT Plastic	M20 x 1.5 to 1/2" – 14 NPT		• SI-QS90 Safety Interlock Switches • SI-LS100 Safety Interlock Switches • SI-LS31 Safety Interlock Switches • SI-LS42 Safety Interlock Switches • RP-LS42 Rope Pull Switches
SI-QM-M20	1/2" – 14 NPT Metal	M20 x 1.5 to 1/2" – 14 NPT		• SI-LM40 Safety Interlock Switches • SI-QM100 Safety Interlock Switches • SI-LM40 Safety Interlock Switches • RP-RM83 Rope Pull Switches • RP-LM40 Rope Pull Switches • RP-QM72/QMT72 Rope Pull Switches • RP-QM90 Rope Pull Switch

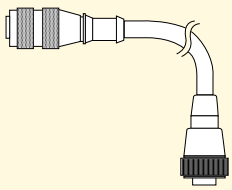
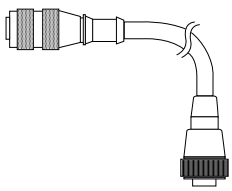
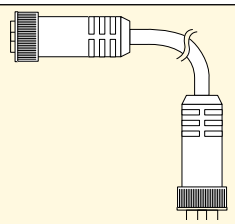
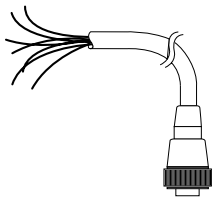
4-Pin Euro-Style Field-Wireable Connectors

Cable: Gold-plated, 4-pin models rated 250V ac/dc max., 4 A max.
Cable Diameter: 4.0 to 5.0 mm
Temperature: -25° to +90° C
Environmental Rating: NEMA 6P, IP67

Model	Style	Dimensions	Pinout	Used With
FIC-M12M4	Male Straight			• Muting Module
FIC-M12M4A	Male Right Angle			

MSSI Cordsets for use with Muting Modules

Cable: PVC jacket, polyurethane connector body, chrome-plated brass coupling nut
Cable Diameter: 22 or 20 AWG high-flex stranded, PVC insulation, gold-plated contacts
Temperature: -40° to +80° C
Voltage Rating: 250V ac/300V dc

Model	Length	Description		Used With
DESE4-508D	2.5 m	8-Pin Female Euro QD to 7-Pin Male Mini QD		• EZ-SCREEN Receivers w/Euro QDs (14 & 30 mm Resolution) • EZ-SCREEN LP Receivers w/Euro QDs (14 & 25 mm Resolution) • Muting Modules
DESE4-515D	4.6 m			
DESE4-525D	7.6 m			
DESE5-508D	2.5 m	8-Pin Female Euro QD to 7-Pin Male Mini QD		• EZ-SCREEN Type 2 • Muting Modules
DESE5-515D	4.6 m			
DESE5-525D	7.6 m			
DES4-508C	2.5 m	8-Pin Female Mini QD to 7-Pin Male Mini QD		• EZ-SCREEN Receivers w/Mini QDs (Grid & Point) • Muting Modules
DES4-515C	4.6 m			
DES4-525C	7.6 m			
QDS-715C	4.6 m	Unterminated end to 7-Pin Male Mini QD		• EZ-SCREEN Receivers w/Terminal Chamber (Grid & Point) • Safeguarding w/Hard-Wired Contacts • Muting Modules
QDS-725C	7.6 m			
QDS-750C	15.2 m			

AC Emitter/Receiver Interface Boxes

- Provides AC power for up to three receivers or two cascaded emitter/receiver pairs, with external device monitoring (EDM) available.
- Supplies +24V dc power at 0.7 amps (16.8 W max. power) and accepts input voltages from 100-250V ac (50-60 Hz).

	Model	Safety Outputs	EDM	Emitter/ Receiver Connection	AC Power Connection	Output and EDM Connections	Used with	Data Sheet
 CORDSETS PAGE 179	**EZAC-R9-QE8**	**3 NO**	Selectable 1- or 2-Channel or no EDM	8-Pin M12/Euro QD	Hard-wired	Hard-wired	• EZ-SCREEN	120321
	EZAC-R11-QE8	**2 NO & 1 NC**			Hard-wired	Hard-wired		
	EZAC-R15A-QE8-QS83	**1 NO & 1 SPDT**	1-Channel		3-Pin Mini QD	8-Pin Mini QD		
	EZAC-R8N-QE8-QS53	**1 NO & 1 NC**	Power Monitoring		3-Pin Mini QD	5-Pin Mini QD		
	EZAC-R10N-QE8-QS53	**2 NO**			3-Pin Mini QD	5-Pin Mini QD		

AC Emitter Interface Boxes

- Provides AC power for up to four emitters, with external device monitoring (EDM) available.
- Supplies +24V dc power at 0.7 amps (16.8 W max. power) and accepts input voltages from 100-250V ac (50-60 Hz).

	Model	Emitter Connection	AC Power Connection	Used with	Data Sheet
 CORDSETS PAGE 179	**EZAC-E-QE8**	8-Pin M12/Euro QD	Hard-wired	• EZ-SCREEN SLSE..-..Q8 (without Test input) • EZ-SCREEN SLPE..	120321
	EZAC-E-QE5	5-Pin M12/Euro QD	Hard-wired	• EZ-SCREEN SLSE..-..Q5 (with Test input)	
	EZAC-E-QE8-QS3	8-Pin M12/Euro QD	3-Pin Mini QD	• EZ-SCREEN SLSE..-..Q8 (without Test input) • EZ-SCREEN SLPE..	
	EZAC-E-QE5-QS5	5-Pin M12/Euro QD	5-Pin Mini QD	• EZ-SCREEN SLSE..-..Q5 (with Test input)	

NC = Normally Closed, NO = Normally Open

AC Interface Box Specifications

Input Voltage and Current	100-230V ac ±15%; 16.8W max., output 24V dc 0.7A **Input current:** typ. 0.37A @ 100V ac in typ. 0.23A @ 200V ac in **Inrush current:** typ. 15A @ 100V ac in (5 milliseconds max.) typ. 30A @ 200V ac in (5 milliseconds max.)
Output Voltage and Current	24V dc @ 0.7 A (16.8 W) SELV; capable of buffering 20 milliseconds power interruptions
Supply Protection Circuitry	Protected against transient voltages
Input Channels	24V dc ± 15%; 40 mA per channal
Output Configuration	**Models EZAC-R.. only;** see models listing on previous page. Each normally open output channel is a series connection of contacts from two forced-guided (positive-guided) relays, K1-K2. The normally closed contact is a parallel connection of contacts from K1-K2. **Contacts:** AgNi, 5 µm gold-plated **Low Current Rating:** **Caution: The 5 µm gold-plated contacts allow the switching of low current/low voltage.** To preserve the gold plating on the contacts, the following max. values should not be exceeded at any time: **Min. voltage:** 1V ac/dc **Max. voltage:** 60V ac/dc **Min. current:** 5 mA ac/dc **Max. current:** 300 mA **Min. power:** 5 mW (5 mVA) **Max. power:** 7 W (7 VA) **High Current Rating:** If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to: **Min. voltage:** 15V ac/dc **Max. voltage:** 250V ac/dc **Min. current:** 30 mA ac/dc **Max. current:** 8 A **Min. power:** 5 W (5 VA) **Max. power:** 200 W (2000 VA) **Mechanical life:** 50,000,000 operations **Electrical life:** 100,000 operations (typical @ 200 W [2000 VA] switched power, resistive load) **Feedback Contact Rating (Y1-Y2, Y3-Y4):** **Min. voltage:** 1V ac/dc **Max. voltage:** 60V ac/dc **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	10 milliseconds max.
Status Indicators	**Models EZAC-R.. :** One bicolor (Red/Green) LED indicator on box cover indicates the power and output status of internal relays K1 and K2. **Models EZAC-E.. :** One Green LED indicator on box cover indicates the power status (ON when power is ON).
Construction	Welded steel box with yellow polyester powder paint finish
Environmental Rating	IP65
Vibration Resistance	10 to 50 Hz @ 0.35 mm displacement per IEC 68-2-6
Mounting	Box provides flanges for screw mounting; can be mounted directly to EZ-SCREEN receiver or emitter housing.
Operating Conditions	**Temperature:** 0° to +55° C **Relative humidity:** 90% @ +55° C (non-condensing)
Application Notes	The box offers a field-replaceable relay module; see Repairs section of data sheet for more information.
Certifications	Listed as an accessory to EZ-SCREEN products.
Wiring Diagrams	**EZAC-R9QE8:** WD013 (p. 226) **EZAC-R11-QE8:** WD014 (p. 227) **EZAC-R15A-QE8-QS83:** WD015 (p. 228) **EZAC-R8N-QE8-QS53:** WD016 (p. 228) **EZAC-R10N-QE8-QS53:** WD017 (p. 229) **EZAC-E-QE8/QE5:** WD018 & WD019 (pp. 229-230)

Mechanically Linked Contactors*

Provides an additional 10 or 18 amp carrying capability to any safety system.

Models		Coil Voltage	Contacts	Contact Rating	Dimensions (h x w x l)	Used With	Data Sheet
	**11-BG00-31-A12060**	120V ac	3 NO & 1 NC	10 amps	57 x 44 x 58 mm	• EZ-SCREEN • PICO-GUARD • SC22-3	111881
	11-BG00-31-D-024	24V dc		10 amps (thermal)	57 x 44 x 58 mm		
	**BF1801A-12060**	120V ac		18 amps**	80 x 44 x 80 mm		
	BF1801L-024	24V dc		18 amps** (inductive)	80 x 44 x 80 mm		

NC = Normally Closed, NO = Normally Open, minimum switching current (power): 5 mA @ 17V dc (85 mw)
* One Arc Suppressor is needed for each relay across the coil (see below).
** NC contact is rated at 10 amps

Auxiliary Contacts for Mechanically Linked Contactors

Adds contacts to mechanically linked contactors.

Models		Contacts	Positively Guided	Used With	Data Sheet
	**11-BGX10-40**	4 NO	No (Aux. only)	• 11-BG Series	111881
	11-G484-30	3 NO	Yes	• BF Series	

NC = Normally Closed, NO = Normally Open

Suppressors for Mechanically Linked Contactors

Extends the life of the actuating device—such as a light screen or control module—that uses a mechanically linked contactor.

Models		Voltage	Used With	Data Sheet
	**11-BGX77-048**	48V dc	• 11-BG00-31-D024	111881
	11-BGX77-240	125-240V ac	• 11-BG00-31-A12060	
	**11-G318-48**	48V dc	• BF1801L-024	
	**BFX77-240**	125-240V ac	• BF1801A-12060	

NC = Normally Closed, NO = Normally Open

EZ-LIGHT™ Smart Indicator Lights

- Indicates the status of a machine or process, using a solid or flashing color light in a sealed housing
- Replaces panel indicators and post and stack lights with a single, compact unit

Model		Construction	Connector	LED Function	Inputs	Used With	Data Sheet
	**M18RGX8PQ8***	18 mm mount Nickel-plated brass	M12/ 8-pin Euro QD	**2 Color:** Red/Green indication follows OSSD output of the EZ-SCREEN receiver	PNP	• EZ-SCREEN	121901
	**T18RGX8PQ8***	18 mm mount Thermoplastic polyester					
	**T30RGX8PQ8***	30 mm mount Thermoplastic polyester					
	**K30LRGX8PQ8***	30 mm dome/ 22 mm mount Thermoplastic polyester					
	**K50LRGX8PQ8***	50 mm dome/ 30 mm mount Thermoplastic polyester					
	**K80LRGX8PQ8***	50 mm dome/ Flat or DIN-mount Thermoplastic polyester					
	**T30GRYB11P**	30 mm mount Thermoplastic polyester	2 m	**4 Color:** Green, Red, Yellow, Blue	PNP	• DUO-TOUCH SG Run Bars	131634
	**K50LGRYB11P**	50 mm dome/ 30 mm mount Thermoplastic polyester					

* A mating cordset is required (see page 180). Typically a CSB splitter and DEE2R-8..D cordsets are used.

Indicator Lamps

- Indicates whether a switch is open or closed
- Available in red or green, 120V ac or 24V ac/dc

Model		Supply Voltage	Lamp Color	Thread	Used With	Data Sheet
	**SI-PL3T-R**	24V ac/dc	Red	M20 x 1.5	• SI-QS90 Safety Interlock Switches • SI-LS42 Safety Interlock Switches • SI-QM100 Safety Interlock Switches • RP-LS42 Rope Pull Switches • RP-QM72/QMT72 Rope Pull Switches • RP-RM83 Rope Pull Switches • RP-QM90 Rope Pull Switch	—
	SI-PL3A-R	120V ac				
	SI-PL3T-G	24V ac/dc	Green			
	SI-PL3A-G	120V ac				

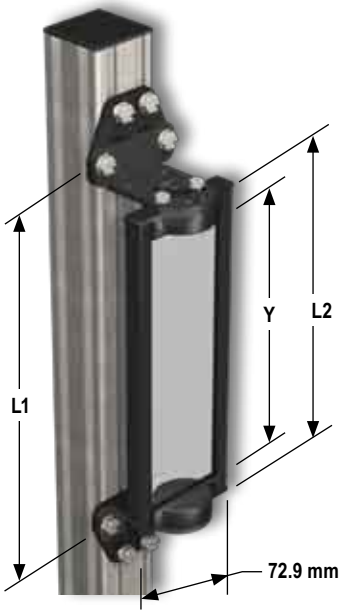
Muting Lamps

- Indicates when muting is active for optical safety systems with a muting module.
- Uses a solid-state LEDs light, eliminating the need to replace bulbs.

Model		Supply Voltage	Lamp Color	Overall Height	Used with	Data Sheet
	**TL50GYRQ**	18-30V dc or 24V ac	Red, Yellow, Green	142.6 mm	• PICO-GUARD • EZ-SCREEN • Muting Modules	142406
	TL50YQ		Yellow	61.2 mm		
	TL50WQ		White			
	**M18RGR5PNQ**	+24V dc	Red Green Yellow (Amber)	Ø 18 mm		121899
	**SSA-ML-A**	24V ac/dc	Amber	383 mm		62097
	SSA-ML-W		White (clear)			

MSM Corner Mirrors

- Compact for light-duty applications
- Available in 12 lengths
- Decreases range by 8%
- Rated 85% efficiency



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MSM Corner Mirrors
(shown with standard brackets and MSAMB adapter bracket mounted on MSA stand)**

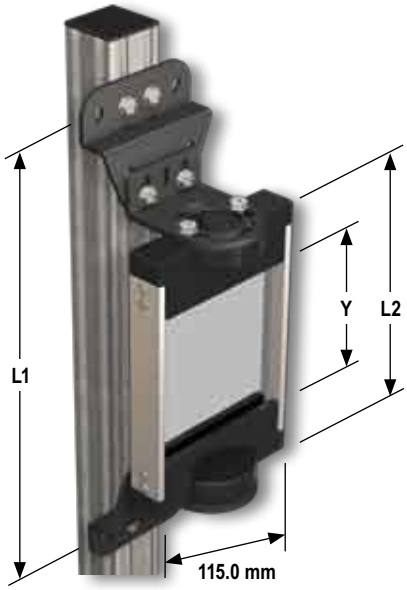
MSM Corner Mirrors

Models	Reflective Area (Y)	Mounting Height (L1)*	Mirror Height (L2)	Data Sheet
MSM4A	165 mm	221 mm	191 mm	43685
MSM8A	267 mm	323 mm	292 mm	
MSM12A	356 mm	411 mm	381 mm	
MSM16A	457 mm	513 mm	483 mm	
MSM20A	559 mm	615 mm	584 mm	
MSM24A	660 mm	716 mm	686 mm	
MSM28A	762 mm	818 mm	787 mm	
MSM32A	864 mm	919 mm	889 mm	
MSM36A	965 mm	1021 mm	991 mm	
MSM40A	1067 mm	1123 mm	1092 mm	
MSM44A	1168 mm	1224 mm	1194 mm	
MSM48A	1270 mm	1326 mm	1295 mm	

* The mounting brackets may be inverted from the positions shown (flanges pointing "inward" instead of "outward," as shown). When this is done, dimension L1 decreases by 57 mm.
** MSAMB adapter bracket kit included with each MSA stand.

SSM Corner Mirrors

- Robust for heavy-duty applications
- Extra wide for use with long-range optical safety systems
- Available in stainless steel for harsh applications
- Available in 20 lengths
- Rated 85% efficiency for SSM models and 50% on SSM-S models
- Decreases range by 8% for SSM models and 30% for SSM-S models



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SSM and SSM-S Corner Mirrors (shown with standard brackets and EZA-MBK-2 adapter bracket mounted on MSA stand)**

SSM Glass Corner Mirrors

Models	Reflective Area (Y)	Mounting Height (L1)*	Mirror Height (L2)	Data Sheet
SSM-100	100 mm	211 mm	178 mm	61934
SSM-150	150 mm	261 mm	228 mm	
SSM-200	200 mm	311 mm	278 mm	
SSM-250	250 mm	361 mm	328 mm	
SSM-375	375 mm	486 mm	453 mm	
SSM-475	475 mm	586 mm	553 mm	
SSM-550	550 mm	661 mm	628 mm	
SSM-675	675 mm	786 mm	753 mm	
SSM-825	825 mm	936 mm	903 mm	
SSM-875	875 mm	986 mm	953 mm	
SSM-975	975 mm	1086 mm	1053 mm	
SSM-1100	1100 mm	1211 mm	1178 mm	
SSM-1175	1175 mm	1286 mm	1253 mm	
SSM-1275	1275 mm	1386 mm	1353 mm	
SSM-1400	1400 mm	1511 mm	1478 mm	
SSM-1475	1475 mm	1586 mm	1553 mm	
SSM-1550	1550 mm	1661 mm	1628 mm	
SSM-1675	1675 mm	1786 mm	1753 mm	
SSM-1750	1750 mm	1861 mm	1828 mm	
SSM-1900	1900 mm	2011 mm	1978 mm	

* The mounting brackets may be inverted from the positions shown (flanges pointing "inward" instead of "outward," as shown). When this is done, dimension L1 decreases by 58 mm.
** One EZA-MBK-2 adapter bracket kit required if used with a MSA stand.
NOTE: The total range decreases by approximately 8% per mirror.

SSM-S Stainless Steel Corner Mirrors

Mirror Model	Reflective Area (Y)	Mounting Height (L1)*	Mirror Height (L2)	Data Sheet
SSM-100-S	100 mm	211 mm	178 mm	67200
SSM-150-S	150 mm	261 mm	228 mm	
SSM-200-S	200 mm	311 mm	278 mm	
SSM-250-S	250 mm	361 mm	328 mm	
SSM-375-S	375 mm	486 mm	453 mm	
SSM-475-S	475 mm	586 mm	553 mm	
SSM-550-S	550 mm	661 mm	628 mm	
SSM-675-S	675 mm	786 mm	753 mm	
SSM-825-S	825 mm	936 mm	903 mm	
SSM-875-S	875 mm	986 mm	953 mm	
SSM-975-S	975 mm	1086 mm	1053 mm	
SSM-1100-S	1100 mm	1211 mm	1178 mm	
SSM-1175-S	1175 mm	1286 mm	1253 mm	
SSM-1275-S	1275 mm	1386 mm	1353 mm	
SSM-1400-S	1400 mm	1511 mm	1478 mm	
SSM-1475-S	1475 mm	1586 mm	1553 mm	
SSM-1550-S	1550 mm	1661 mm	1628 mm	
SSM-1675-S	1675 mm	1786 mm	1753 mm	
SSM-1750-S	1750 mm	1861 mm	1828 mm	
SSM-1900-S	1900 mm	2011 mm	1978 mm	

* The mounting brackets may be inverted from the positions shown (flanges pointing “inward” instead of “outward,” as shown). When this is done, dimension L1 decreases by 58 mm.
** One EZA-MBK-2 adapter bracket kit required if used with a MSA stand.
NOTE: The total range decreases by approximately 30% per mirror.

Laser Alignment Tools

- Simplifies the alignment of any emitter/ receiver pair
- Available for EZ-SCREEN® and PICO-GUARD™
- Includes a built-in bubble level
- Uses one 9-volt battery, which is included

LAT-1 Laser Alignment Tool (shown without clip)

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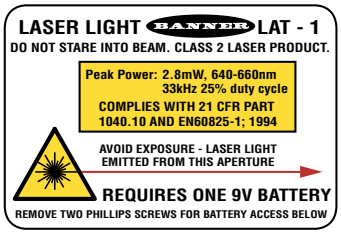


LAT-1 Laser Alignment Tools

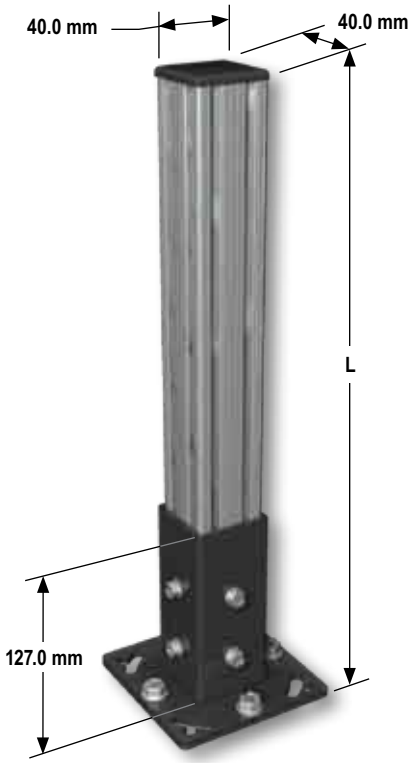
Safety Light Screen Housing	LAT-1 with Clip Kit	Clip w/Target	Data Sheet
EZ-SCREEN Grid or Points and PICO-GUARD Grids	**LAT-1-HD**	**EZA-LAT-1**	
EZ-SCREEN 14 & 30 mm Resolution	**LAT-1-SS**	**EZA-LAT-2**	
EZ-SCREEN LP 14 & 25 mm Resolution	**LAT-1-LP**	**LPA-LAT-1**	
EZ-SCREEN Type 2	**LAT-1-LS**	**LSA-LAT-1**	54599
All of the Above	**LAT-1**	**–**	
PICO-GUARD SFP12 Safety Points	**LAT-1-SFP12**	**SFA-LAT-12**	
PICO-GUARD SFP30 Safety Points	**LAT-1-SFP30**	**SFA-LAT-30**	

LAT-1 Laser Alignment Tool Specifications

Supply Voltage and Current	One standard 9V battery, included (replaceable); approximately 20 hours of continuous operation
Sensing Beam	Class 2 laser, 640-660 nm visible red IEC **Pulse Width:** 7 microseconds **Rep rate:** 30 microseconds **Peak output power:** 2.8 mW, 33kHz, 25% duty cycle
Beam Size at Aperture	Approximately 2 mm diameter
Beam Divergence	± 1.0 milliradian within specified temperature range ± 0.5 milliradians at room temperature
Beam Placement	Within ± 4 milliradians (approximately ±0.25 degrees) of parallel to front, back, top and bottom of housing
Construction	Aluminum housing; black anodized finish Black polypropylene cover with flexible hinge for battery access
Environmental Rating	NEMA 1; IP50
Operating Conditions	**Temperature:** 0° to +40° C **Relative humidity:** 90% @ +50° C (non-condensing)
Laser Classification	U.S. Safety Standards 21 CFR 1040.10 European Standards EN 60825-1:1994
Application Note	The useable range (red dot viewed at the target) depends on the color/reflectance of the target, the level of ambient light, air-borne contaminates, and the use of mirrors. Under average lighting with no airborne contaminates or mirrors, the red dot is viewable at approximately 30+ m on a 90% white-card. When using a 100 x 100 mm retroreflector target (included with the LAT), useable range can exceed 91+ m.

MSA Stands

- Supports emitter, receiver or corner mirror
- Available without stand base, for attaching to a surface
- Assembles easily
- Includes mounting hardware
- Accepts attachment of USA Series protective mounting stands



MSA Stand

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MSA Series Stands

Model*	Used With**	Stand Height (L)	Useable Stand Length	Data Sheet
MSA-S24-1	EZ-SCREEN®, PICO-GUARD Grids/Points and Mirrors	616 mm	483 mm	43687
MSA-S42-1		1037 mm	940 mm	
MSA-S66-1		1682 mm	1550 mm	
MSA-S84-1		2140 mm	2007 mm	
MSA-S105-1		2673 mm	2667 mm	
SPKA-AG12-1	SFP12 Safety Points	1067 mm	940 mm	
SPKA-AG30-1	SFP30 Safety Points	1067 mm	940 mm	

* Available without a base by adding suffix **NB** to model number (example, **MSA-S24-1NB**).
** Adapter brackets EZA-MBK-2 (2 each) are required for mounting EZ-SCREEN Grid and Point emitters/receivers or SSM Series mirrors (ordered separately).

Run Bar Telescoping Stands

- Locates touch buttons 800 to 1232 mm above the floor surface
- Includes swivel-mount bracket to mount Run Bar
- Made of cold-rolled steel

STBA...S1

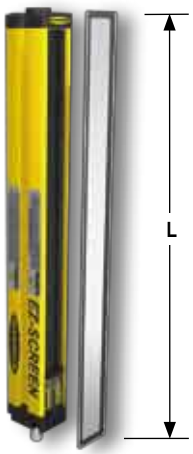
STBA...S2

Telescoping Stands

Model	Used with	Description	Data Sheet
STBA-RB1-S1	STB-VP6-RB1	• Floor-mounted telescoping stand • Stationary base with 4 mounting holes in corners	131634
STBA-RB2-S1	STB-VP6-RB2		
STBA-RB1-S2	STB-VP6-RB1	• Free-standing, telescoping stand • Movable H-shaped floor base with mounting holes 560 mm apart	
STBA-RB2-S2	STB-VP6-RB2		

Lens Shields

- Made of thin, strong polycarbonate
- Snaps on sensor or attaches easily with an adhesive-backed neoprene foam gasket
- Reduces range by approximately 10% per shield (20% per pair)



Lens Shield

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EZ-SCREEN® Grids and Points Lens Shields–Adhesive Backed

Model		Lens Shield Length (L)	Emitter/Receiver Model	Emitter/Receiver Protected Height	Data Sheet
Point	**EZS-149**	149 mm	SP..1	—	61960
Grid	**EZS-684**	684 mm	SG..2-500	500 mm	
	EZS-768	768 mm	SG..2-584	584 mm	
	EZS-984	984 mm	SG..3-400	800 mm	
	EZS-1251	1251 mm	SG..3-533	900 mm	
	EZS-1084	1084 mm	SG..4-300	1066 mm	

Polycarbonate construction with neoprene gasket

EZ-SCREEN® 14 & 30 mm Resolution Lens Shields

Adhesive Backed*		Snap-On**		Used With		Data Sheet
Model	Length	Model	Length	Emitter/Receiver Model	Emitter/Receiver Defined Area	
EZS-150	258 mm	**EZSS-150**	236 mm	SLS..-150..	150 mm	Adhesive: 61960 Snap-on: 127944
EZS-300	368 mm	**EZSS-300**	346 mm	SLS..-300..	300 mm	
EZS-450	518 mm	**EZSS-450**	496 mm	SLS..-450..	450 mm	
EZS-600	667 mm	**EZSS-600**	645 mm	SLS..-600..	600 mm	
EZS-750	817 mm	**EZSS-750**	795 mm	SLS..-750..	750 mm	
EZS-900	967 mm	**EZSS-900**	945 mm	SLS..-900..	900 mm	
EZS-1050	1116 mm	**EZSS-1050**	1094 mm	SLS..-1050..	1050 mm	
EZS-1200	1266 mm	**EZSS-1200**	1244 mm	SLS..-1200..	1200 mm	
EZS-1350	1416 mm	**EZSS-1350**	1394 mm	SLS..-1350..	1350 mm	
EZS-1500	1565 mm	**EZSS-1500**	1543 mm	SLS..-1500..	1500 mm	
EZS-1650	1715 mm	**EZSS-1650**	1693 mm	SLS..-1650..	1650 mm	
EZS-1800	1865 mm	**EZSS-1800**	1843 mm	SLS..-1800..	1800 mm	

* Polycarbonate construction with neoprene gasket.

** Copolyester construction

EZ-SCREEN® Type 2 Lens Shields–Adhesive Backed

Model	Used With		Lens Shield Length (L)	Data Sheet
	Emitter/Receiver Model	Emitter/Receiver Defined Area		
LSS-150	LS2..30-150	150 mm	210 mm	121366
LSS-300	LS2..30-300	300 mm	360 mm	
LSS-450	LS2..30-450	450 mm	510 mm	
LSS-600	LS2..30-600	600 mm	660 mm	
LSS-750	LS2..30-750	750 mm	810 mm	
LSS-900	LS2..30-900	900 mm	959 mm	
LSS-1050	LS2..30-1050	1050 mm	1109 mm	
LSS-1200	LS2..30-1200	1200 mm	1558 mm	
LSS-1350	LS2..30-1350	1350 mm	1708 mm	
LSS-1500	LS2..30-1500	1500 mm	1858 mm	

Polycarbonate construction with neoprene gasket.

Tubular Enclosures

- Available for EZ-SCREEN
- Ideal for high-power washdown environments
- Made of clear FDA-grade polycarbonate tubing, with acetal end caps
- Includes stainless mounting brackets and hardware
- Rated NEMA 4X; IP67

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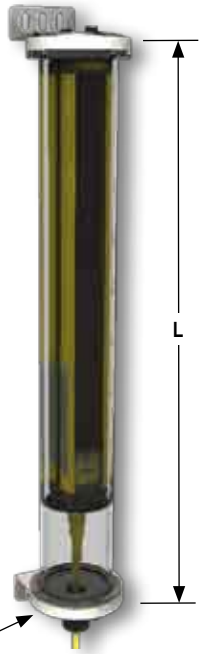


Tubular Enclosure
(EZA-TE model shown)

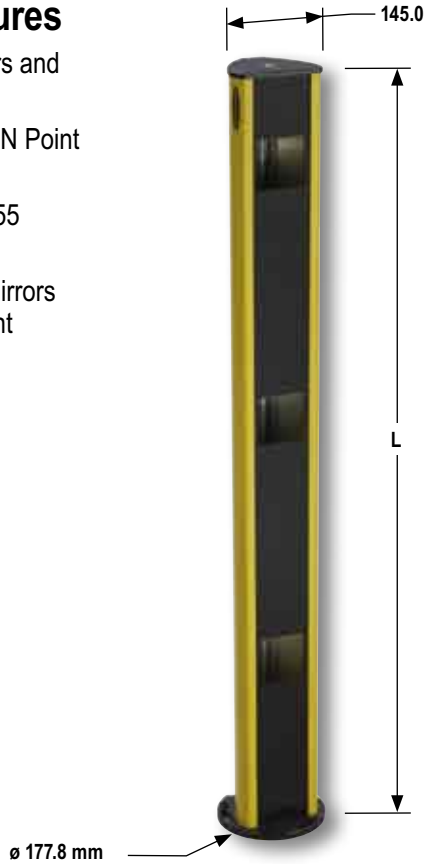
EZA-TE EZ-SCREEN® Series Tubular Enclosures

Model	Used With		Enclosure Height (L)	Data Sheet
	Emitter/Receiver Model	Emitter/Receiver Defined Area		
EZA-TE-150	SLS..-150	150 mm	439 mm	117107
EZA-TE-300	SLS..-300	300 mm	541 mm	
EZA-TE-450	SLS..-450	450 mm	744 mm	
EZA-TE-600	SLS..-600	600 mm	846 mm	
EZA-TE-750	SLS..-750	750 mm	1024 mm	
EZA-TE-900	SLS..-900	900 mm	1151 mm	
EZA-TE-1050	SLS..-1050	1050 mm	1354 mm	
EZA-TE-1200	SLS..-1200	1200 mm	1455 mm	
EZA-TE-1350	SLS..-1350	1350 mm	1608 mm	
EZA-TE-1500	SLS..-1500	1500 mm	1760 mm	
EZA-TE-1650	SLS..-1650	1650 mm	1913 mm	
EZA-TE-1800	SLS..-1800	1800 mm	2065 mm	

NOTE: Use of the enclosure affects the sensing range of the emitter/receiver used: when used in pairs, range can be reduced by 50%.

EZA-S Protective Enclosures

- Provide rugged protection for sensors and mirrors in high-traffic areas
- Available for mirrors and EZ-SCREEN Point and Grid
- Meets ANSI/RIA 15.06 and ISO 13855 standards for beam spacing
- Includes independently adjustable mirrors and bubble level to simplify alignment
- Rotates up to 20°



EZA-S Protective Enclosure

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EZA-S EZ-SCREEN® Protective Enclosures

Model*	Used With		Enclosure Height (L)	No. of Openings	Application Standard	Data Sheet
	Emitter/Receiver Model	Emitter/ Receiver Protected Area				
EZA-S300	SG..4-300	900 mm	1543 mm	4	ANSI/RIA R15.06 ISO 13855	109308
EZA-S300-M						
EZA-S400	SG..3-400	800 mm	1238 mm	3	ANSI/RIA R15.06 ISO 13855	
EZA-S400-M						
EZA-S500	SG..2-500	500 mm	1035 mm	2	ISO 13855	
EZA-S500-M						
EZA-S500-M45	SP..1	—				
EZA-S533	SG..3-533	1066 mm	1543 mm	3	ANSI/RIA R15.06	
EZA-S533-M						
EZA-S584	SG..2-584	584 mm	1238.2 mm	2	ANSI/RIA R15.06	
EZA-S584-M						
EZA-S584-M45	SP..1	—				

* Model numbers with suffix **M** include vertical mirrors for perimeter-guarding applications.
Model numbers with suffix **M45** include two 45°-mounted mirrors for access-guarding applications.

NOTE: The rear-surfaced glass mirrors are rated at 85% efficiency per mirror and reduce maximum range by 8% per mirror.

Explosion-Proof Enclosures

- Protects light screen in environments with flammable gases, liquids or dust
- Available for EZ-SCREEN Point and Grid
- Complies with UL and CSA for use in specific hazardous atmospheres
- Includes mounting brackets and hardware
- Reduces range by approximately 25% per emitter/receiver pair

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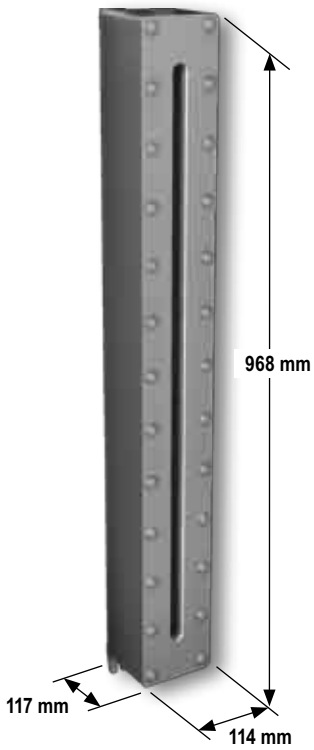
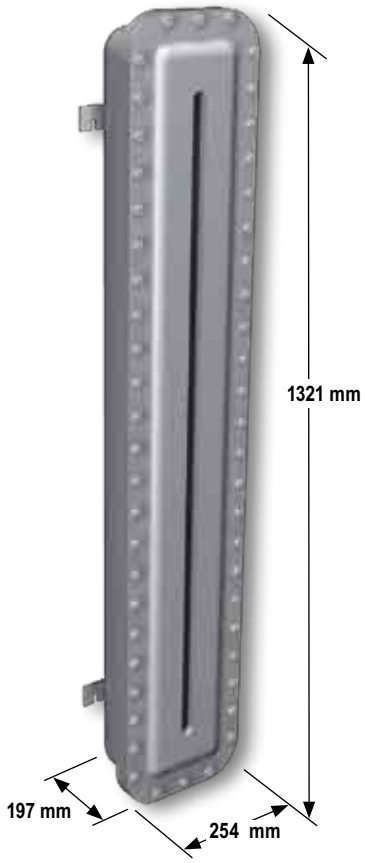


Model ..-XPE-32
Explosion-Proof Enclosure



Model ..-XPE-43
Explosion-Proof Enclosure

Explosion-Proof Enclosures

Model	Used With		Data Sheet
	Model Family	Emitter/Receiver Defined Area	
SS-XPE-32	EZ-SCREEN	450 to 600 mm	63443
SS-XPE-43	EZ-SCREEN	750 to 1050 mm	64216

NOTE: Use of enclosure affects the sensing range of emitter/receiver used: when used in pairs, range can be reduced by 25%.

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A Brilliant Safety Solution For Explosive Atmospheres

Compact, Non-Contact Fiber Optic Safety Technology for Explosive Atmospheres

- Paint booths
- Paint and stain manufacturing
- Gaseous fill areas (example, cigarette lighters)
- Cosmetic and perfume manufacturing
- Film and web processing
- Chemical processing
- Battery manufacturing
- Pharmaceutical manufacturing
- Semiconductor processing

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Safety Solutions for Explosive Environments

FM APPROVED

- Offers FM, ATEX and CSA certification ratings
- Rated for Class 1/Division 1 & 2, Groups A, B, C, D; Zone 0, Group IIC, and Zone 22
- Eliminates the need for costly isolation barriers (IS) or explosion-proof housings

Non-Contact Optical Elements

- Offers choice of 2-, 3- or 4-beam Grids and single-beam Points for perimeter and access guarding
- Features a variety of interlock switches for doors, guards, gates and covers
- Eliminates alignment issues and wear
- Eliminates electrical wires and expensive electrical wiring for easy installation
- Meets Category 4 interlocking requirements with one switch per guard, even with multiple switches per optical channel

Sleek, Advanced Controller

- Mounts directly to DIN rails or panels
- Features four optical channels
- Includes two Universal Safety Stop Interface (USSI) inputs for direct connection of multiple safety devices
- Offers selectable trip or latch output, external device monitoring and auto/manual power-up
- Provides removable terminal blocks for convenience
- Models available with auxiliary outputs and muting function

Type 4, Category 4 Design & Control Reliable

CE cULus LISTED

- Certified to ISO 13849-1 Category 4 and IEC 61496 Type 4 requirements
- FMEA (Failure Mode and Effects Analysis) tested for control reliability

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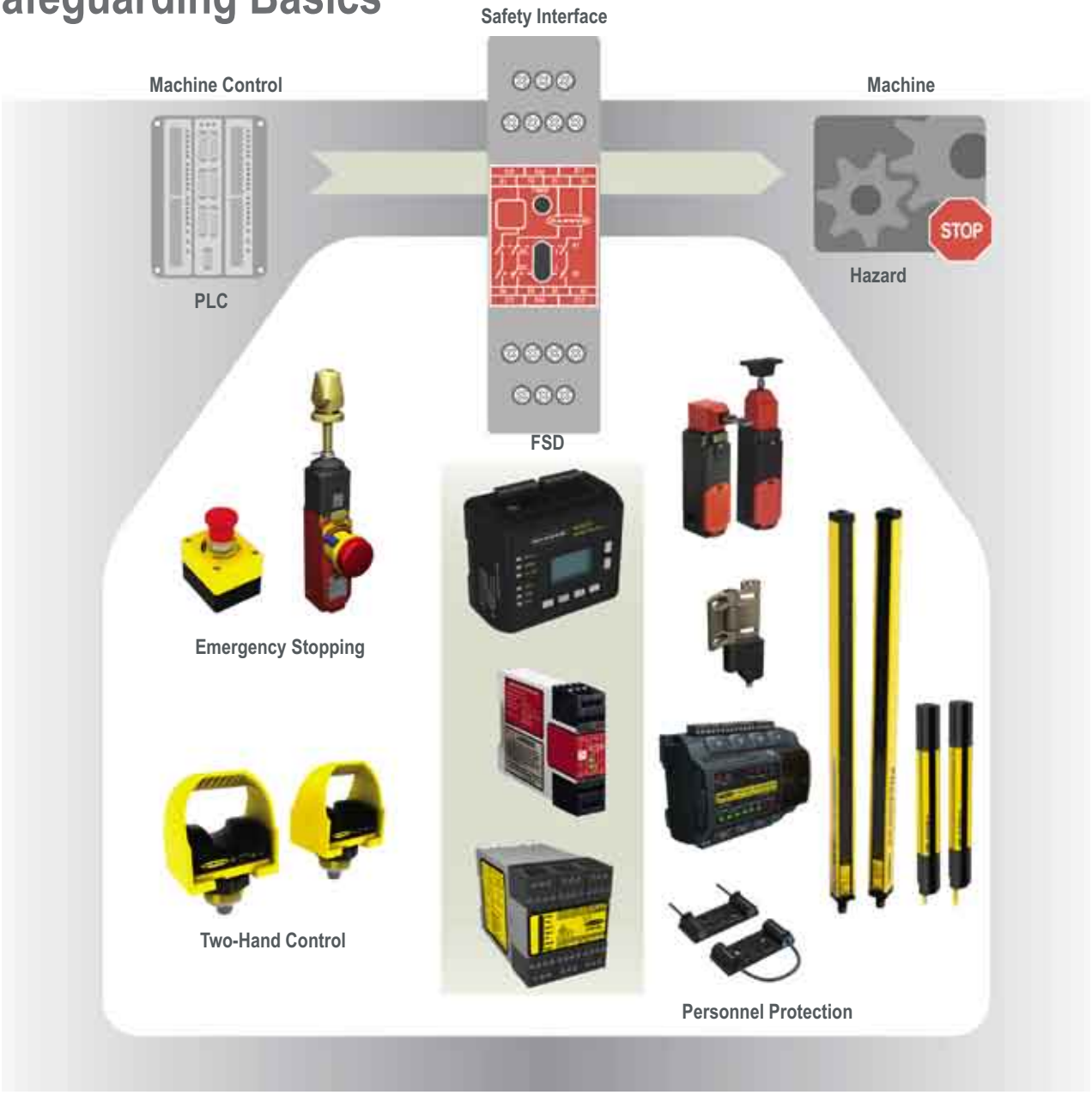
Reference Table of contents

Safeguarding Basics



Basics of Safeguarding

Machine and Personnel safeguarding refers to the combination of requirements, methods and solutions used to protect people who come in contact with dangerous machines in the industrial environment.

Requirements

National and regional governmental bodies have regulations, mandates, standards and recommendations for implementing a safety method or a solution.

Key regulations regarding general machine guarding include the following:

- Machinery Directive - EU
- OSHA General Duty Clause – USA

(see page 210 for an abridged version list of industry safety standards)

Device Requirements

Safety devices must be able to consistently and reliably bring a machine hazard to an orderly stop.

To be considered a safety device, the following methods must be used to ensure reliable operation: fault exclusion, redundancy, and self-checking.

Safety Circuit Requirements

A safety stop circuit typically comprises of 2 normally open contact from mechanically-linked relays. The circuit is monitored to detect certain failures that could lead to the loss of the safety function.

Methods: Risk Assessment

The Risk Assessment Process in machine safeguarding is a process used to identify hazards through each phase of the machine's life cycle and to minimize dangers to personnel and equipment.

The basic steps in a Risk Assessment Process:

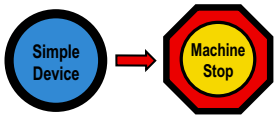
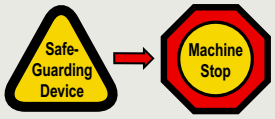
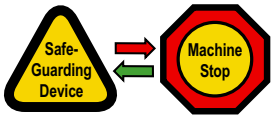
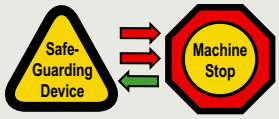
1. Identify hazards and where they occur.
2. Assess risk by severity of harm and probability of occurrence.
3. Reduce the risk through the use of protective measures.
4. Validate and document results.

Risk Assessment Standards

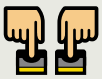
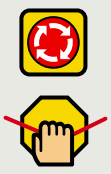
- OSHA 3071, Job Hazard Analysis
- MIL-STD-8820, US DOD System Safety Program
- ANSI/RIA R15.06-1999, Safety Requirements for Industrial Robots and Robot Systems
- ANSI B11.TR3, Risk Assessment and Risk Reduction
- ISO 14121 (EN 1050), Principles of Risk Assessment
- SEMI S10, Risk Assessment, Semiconductor Manufacturing Equipment

Methods: Safety Circuits

Depending on the level of risk associated with the machine or operations, an appropriate level of control circuitry performance must be incorporated into safety device design.

	Basic	Single	Single with Monitoring	Dual with Monitoring
Generic	Stop Command	Safety Stop Command	Safety Stop Command Monitoring Signal	Redundant Safety Stop Commands Monitoring Signal
				
	• Non safety-rated components • Integrated in accordance with relevant standards • Reliability depends on robust components • Redundancy not required	• Safety-rated components • Integrated in accordance with safety principles and design • Redundancy not required	• Safety-rated components • Conducts periodic test of system • Normal operation allowed if no faults are found • If unsafe fault is found, system will default to safe state or indicate that unsafe system exists	• Safety-rated components • Greatest degree of fault tolerance • Redundancy and self-checking • Single failure cannot cause loss of safety function • Faults detected immediately or at next demand on system
Fault	Possible loss of safety function	Greater reliability, but possible loss of safety function	Fault detected at each test	Safety function is ensured with a single fault. An accumulation of faults is not possible or detected.
Risk	**Very Low** Minor bump or bruise with no lost time	**Low** Minor first aid, infrequent exposure, or high likelihood of avoiding the hazard	**Mid Range** Injuries that are slight or normally reversible, requiring normal healing or only first aid.	**High or Very High** Normally reserved for hand-fed applications where injuries could be severe to irreversible
ANSI / B11	—	—	—	Control Reliable ANSI B11.19 (Clause 6.1 and Annex C) Not directly comparable to the requirements of ISO 13849-1 and exceeds a Category 2
ANSI / RIA	Simple	Single Channel	Single Channel with Monitoring	Control Reliable ANSI/RIA R15.06 (Clause 4.5) Control reliability for robots typically exceeds a Cat 3 but is not necessarily intended to be a Cat 4
ISO / EN	Category B ISO 13849-1/EN 954-1	Category 1 ISO 13849-1/EN 954-1	Category 2 ISO 13849-1/EN 954-1	Category 3 & 4 ISO 13849-1/EN 954-1

Solutions: Comparing Guards and Devices

Type	Safety Function	Advantages	Limitations	Requirements	Standards
Guards: protective physical barrier used to prevent access.					
Fixed Guard 	Provides a fixed barrier to the hazard	• Low maintenance • Long life • Low cost for small areas • Protects all individuals • Can contain ejected materials	• Poor ergonomics • Limited visibility • Limited access • Costly for large areas • Maintenance may require removal of guard	• Protect from identified hazard • Prevent user from reaching over, under, around or through the barrier • Provide safe openings	• ANSI B11.19 • ISO 14120 • ISO 13852 • ISO 13853 • ASME B15.1
Interlocked Guard 	Interrupts power to machine when guard is opened	• Low initial investment • Can be placed close to hazard • Protects all individuals • Can contain ejected materials	• Costly for large areas • Increased maintenance	• Must be difficult to defeat • Guard may open only after machine has stopped– or must be installed at a safe distance	• ANSI B11.19 • NFPA 79 • ISO 14119 • IEC 60204-1
Safeguarding Devices: components, attachments or mechanisms designed to perform a specific safeguarding function.					
Safety Light Screen 	Arrests power to machine when sensing field is interrupted	• Excellent ergonomics • Allows frequent access • Protects all individuals • Cost effective for large areas • Allows for good visibility	• Limited to machines that can be stopped quickly • No protection from ejected parts • May require the use of additional guards • May create a pass-through hazard	• Initiate immediate stop when sensing field is interrupted • Appropriate resolution required to detect objects the size of a torso, ankle, hand or finger	• ANSI B11.19 • IEC 61496 • ISO 13855
Multiple-Beam System: • Grids • Points 	Arrests power to machine when sensing field is interrupted	• Low initial investment • Allows frequent access • Allows for good visibility • Protects all individuals	• Limited to machines that can be stopped quickly • No protection from ejected parts • Large safety distance • May create a pass-through hazard	• Initiate immediate stop when sensing field is interrupted • Appropriate resolution required to detect objects the size of a torso	• ANSI B11.19 • IEC 61496 • ISO 13855
Two-Hand Control 	Operator must use both hands to actuate machine motion hereby preventing operator access to hazardous area	• Operator's hands are away from hazardous area • Low initial investment • Low maintenance	• Potential ergonomic impact • Provides protection only for operator • No protection from ejected parts	• Concurrent actuation • Release and reactivation required before machine motion may be reinitiated	• ANSI B11.19 • NFPA 79 • ISO 13855 • ISO 13856 • IEC 60204-1
Safety Mat Monitor 	Interrupts power to machine when a minimum pressure is applied	• Excellent ergonomics • Protects all individuals • Allows for good visibility	• Costly for large areas • Maintenance intensive • Large safety distance	Minimum object sensitivity of 66 lbs on and 3-1/8" surface to detect a foot	• ANSI B11.19 • ISO 13855 • ISO 13856
Complementary Safety Devices: used to supplement a primary safeguard.					
E-Stop • Button • Rope-Pull 	Operator activates button in emergency situation to shut off power to machine	• Immediate response • Safe shutdown of machine process	• Not considered a safeguard • Requires conscious act of operator • Limits injury or machine damage but typically does not prevent it	• Overrides all other functions and operations • Reset of E-stop doesn't initiate machine motion • Button must be red with yellow background • Should be located at each operation station • Final removal of power done by electromechanical components	• ANSI B11.19 • NFPA 79 • ISO 12100 • IEC 60204-1 • ISO 13850

*This represents a partial list of available safeguards & devices.

Solutions: Choosing and Locating a Safeguard

When choosing a safeguard, ask yourself the following questions:

1) is it safe, 2) is it legal, and 3) does it make sense for the application.

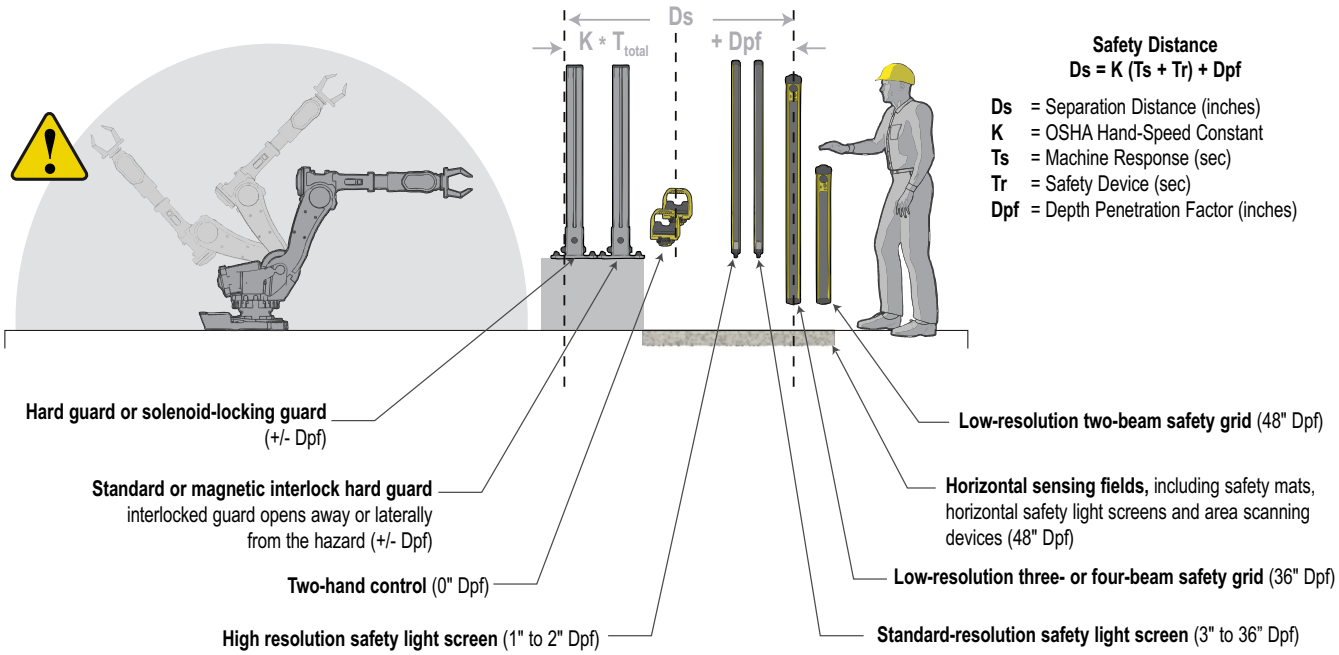
Choosing a Safety Product

- ☐ Who will use it?
- ☐ How will they use it?
- ☐ What hazards are associated with which task?
- ☐ What are the types of hazards?
- ☐ Where will the safeguard be located?

E = Excellent
A = Acceptable
P = Poor
X = Not Acceptable

Guarding Solutions	Maintenance $	Frequent Access	Infrequent Access	Locate Close to Hazard	Long Machine Stop Time	Ergonomic	Visibility	Multiple Operators	Guards Against Ejected Material	Comments
Fixed Hard Guard	P	P	E	E	E	P	P	E	E	• Limited access • Limited visibility to the machine • Limited visibility to the machine • Costly for large areas • Costly to maintain and fix
Locking Guard	P	P	E	E	E	P	P	E	E	
Interlock Guard	P	P	A	E	A	P	P	E	E	
2-Hand Control	A	A	A	A	A	A	A	P	P	• Only protects operator(s)
High-Resolution SLS	E	E	P	E	P	E	E	E	X	• Locate closer to hazard
Low-Resolution SLS	E	E	P	E	P	E	E	E	X	• Costs less than high resolution SLS
3- or 4-Beam Perimeter	E	A	A	P	A	E	E	E	X	• Takes less space than 2-beam
2-Beam Perimeter	E	A	A	P	A	E	E	E	X	• Costs less than 3- or 4-beam
Safety Mats	P	A	A	P	A	E	E	E	X	• Maintenance-intensive

Locating a Safety Product



NOTE: Illustration examples are based upon the described safeguards being used as the primary safeguarding device, all examples having identical stopping time, and following generally accepted industrial engineering practices that are found within ANSI B11 and ANSI/RIA R15.06 safety standards.

Requirements: Standards

Safeguarding standards are minimum requirements for product and machine design, manufacture, use and evaluation that guide the methods used to improve safety.

Go online for a more comprehensive and up-to-date list of standards.

General Requirements

U.S.
OSHA 29CFR1910.212
General Requirements for (Guarding of) All Machines

International/European
ISO 12100-1&2 (EN 292)
Safety of Machinery: Basic Concepts, General Principles for Design

ISO 14121 (EN 1050)
Safety of Machinery: Risk Assessment

Standards: Safeguarding Design

U.S.
ANSI/NFPA 79
Electrical Standard for Industrial Machinery

ANSI Z535
Safety Signs, Symbols and Color Codes

ANSI Z136.1
Safe Use of Lasers

ANSI Z244.1 Lockout/Tagout of Energy Sources

ANSI B11.21
Machine Tools Using Lasers – Safety

OSHA 29CFR1910.147
Control of Hazardous Energy

OSHA 29CFR1910.219
Mechanical Power Transmission Apparatus

ANSI/ASME B15.1
Mechanical Power Transmission Apparatus

ANSI B11.19
Safeguarding (Machine Tools)

ANSI B11.TR1
Ergonomic Guidelines

ANSI B11.TR3
Risk Assessment / Risk Reduction

ANSI B11.TR4
Programmable Electronic Systems (PES/PLC)

OSHA 3071
Job Hazard Analysis

International/European
IEC 60204-1
Electrical Equipment of Machines

ISO 14118 (EN 1037)
Prevention of Unexpected Start Up

ISO 13849-1 (EN 954-1)
Safety Related Parts of Control Systems

ISO 14120 (EN 953)
Guards – General Requirements for the Design and Construction

Standards: Specific Machine Applications, Grouped by Type

Machine Tools
OSHA 29CFR1910.217
(Guarding of) Mechanical Power Press

ANSI B11.1
Mechanical Power Presses

EN 692
Mechanical Power Presses
More online....

Conveyors
ANSI/ASME B20.1
Conveyors and Related Equipment

ISO 4123
Belt Conveyors

ISO 9851
Overhead Electrical Monorail Conveyors

Industrial Robots
ANSI/RIA R15.06
Industrial Robots and Robot Systems

ISO 10218
Manipulating Industrial Robots – Safety

Injection Molding
ANSI B151.1
Horizontal Injection Molding Machines

ANSI B151.21
Injection Blow Molding Machines – Safety

ANSI B151.26
Dynamic Reaction – Injection Molding Machines

ANSI B151.27
Plastics Machinery – Robots Used With HIM Machines – Safety

Mills and Calenders
OSHA 29CFR1910.261
Pulp, Paper, and Paperboard Mills

OSHA 29CFR1910.216
Mills and Calenders in the Rubber and Plastics Industry

ANSI B28.1
Safety Code for Rubber Mills and Calenders

EN 1417
Rubber and Plastics Machines – Two-Roll Mills

Packaging
ANSI/PMMI B155.1
Packaging and Packaging-Related Converting Machinery – Safety

EN 415
Safety of Packaging Machines

Semiconductor
SEMI S1
Safety Guideline for Equipment Safety Labels

SEMI S2
Environmental, Health, and Safety Guideline for Semiconductor Manufacturing Equipment

SEMI S3
Safety Guidelines for Heated Chemical Baths

SEMI S7
Safety Guidelines for Environmental, Safety, and Health (ESH) Evaluation of Semiconductor Manufacturing Equipment

SEMI S8
Safety Guidelines for Ergonomics Engineering of Semiconductor Manufacturing Equipment

SEMI S9
Safety Guideline for Electrical Design Verification Tests for Semiconductor Manufacturing Equipment

SEMI S10
Safety Guideline for Risk Assessment

And More...
Cranes, Printing, Woodworking, Lumber and Logging

Safety Standards Acronyms

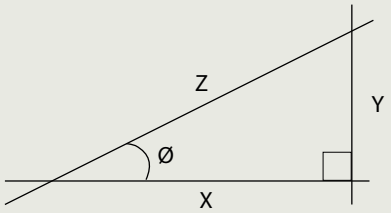
ANSI: American National Standards Institute
CE: Mark of European Conformity
CEN: European Committee for Standardization
CENELEC: European Committee for Electrotechnical Standardization
CSA: Canadian Standards Association
EN: European Norm
IEC: International Electrotechnical Commission
ISO: International Organization for Standardization
MIL-STD: USA Military Standard
OSHA: Occupation Safety and Health Administration
UL: Underwriters Laboratory

Copper Wire Information

AWG	Solid Wire Diameter American Wire or Brown and Sharpe Gage		Approximate Stranded Wire Diameter[1]		Approximate Resistance per 100 feet (30 meters)[2]
	Inches	Millimeters	Inches	Millimeters	Ohms
0000	0.4601	11,687	0.522	13.26	0.0050
000	0.4097	10.406	0.464	11.79	0.0060
00	0.3648	9.266	0.414	10.52	0.0080
0	0.3249	8.252	0.368	9.35	0.010
1	0.2893	7.348	0.328	8.33	0.012
2	0.2576	6.543	0.292	7.42	0.016
3	0.2294	5.827	—	—	0.020
4	0.2043	5.189	0.232	5.89	0.025
5	0.1819	4.620	—	—	0.030
6	0.1620	4.115	0.184	4.67	0.040
7	0.1443	3.665	—	—	0.050
8	0.1285	3.264	0.147	3.73	0.060
9	0.1144	2.906	—	—	0.080
10	0.1019	2.588	0.116	2.95	0.10
11	0.0907	2.304	—	—	0.13
12	0.0808	2.052	0.095	2.41	0.16
13	0.0720	1.829	—	—	0.20
14	0.0641	1.628	0.073	1.85	0.25
15	0.0571	1.450	—	—	0.32
16	0.0508	1.290	0.059	1.50	0.40
17	0.0453	1.151	—	—	0.50
18	0.0403	1.024	0.048	1.22	0.64
19	0.0359	0.912	—	—	0.80
20	0.0320	0.813	0.036	0.91	1.0
21	0.0285	0.724	—	—	1.3
22	0.0253	0.643	0.030	0.76	1.6
23	0.0226	0.574	—	—	2.0
24	0.0201	0.511	0.024	0.61	2.6
25	0.0179	0.455	—	—	3.2
26	0.0159	0.404	0.020	0.51	4.1
27	0.0142	0.361	0.018	0.46	5.2
28	0.0126	0.320	0.015	0.38	6.5
29	0.0113	0.287	—	—	8.2
30	0.0100	0.254	0.012	0.30	10

[1] Exact diameter is dependent upon the wire gage used for the strands. Diameter listed represents the most common wire type for AWG.
[2] Resistance values assume the resistivity of solid copper wire. Stranding and/or copper alloy increase the resistance values.

Trigonometric Formulas for Distance or Angle Calculation

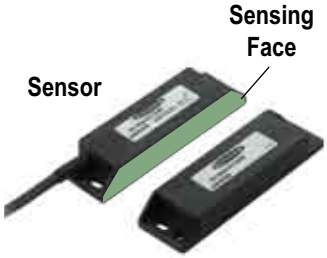
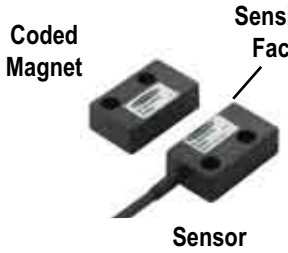
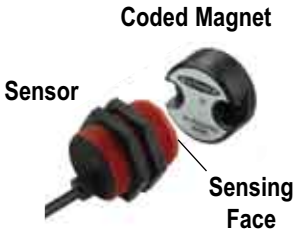
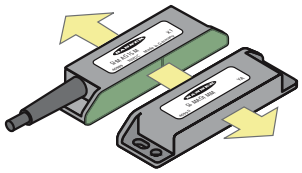
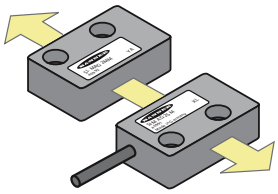
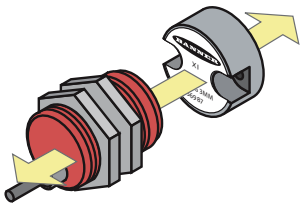
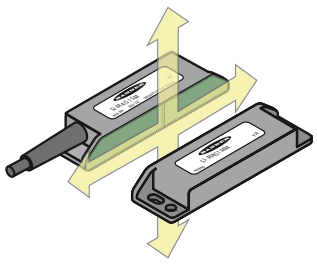
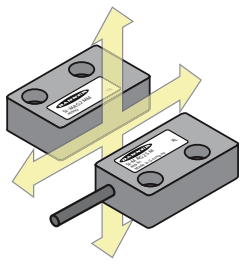
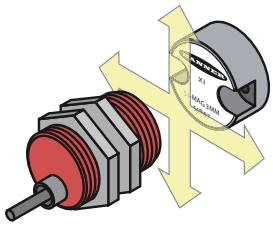
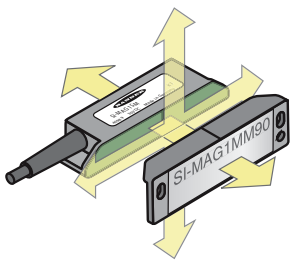
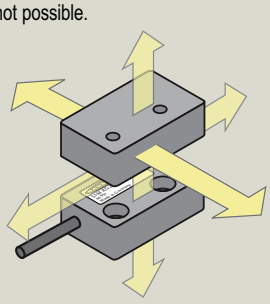
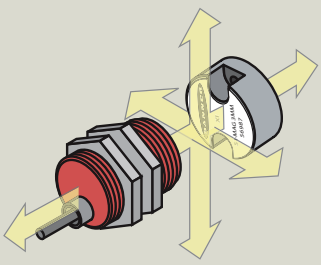
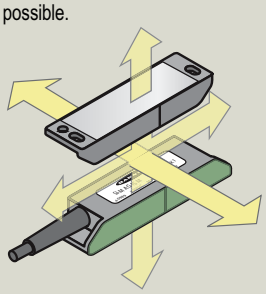
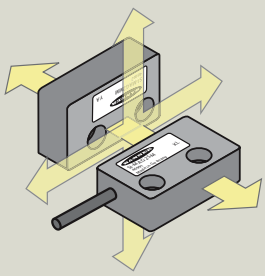
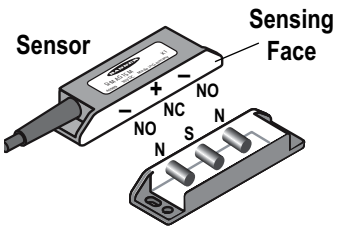


Relationships:
sin ø = Y/Z
cos ø = X/Z
tan ø = X/Y
csc ø = Z/Y = 1/sin ø
sec ø = Z/X = 1/cos ø
cot ø = X/Y = 1/tan ø

Given ø and X: Y = X tan ø Z = X sec ø
Given ø and Y: X = Y cot ø Z = Y csc ø

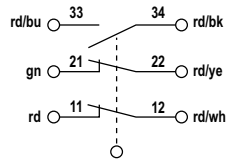
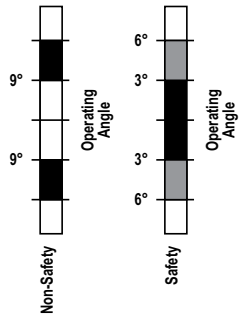
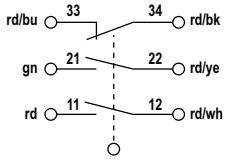
Given ø and Z: X = Z cos ø Y = Z sin ø
Given X and Y: $Z = \sqrt{X^2 + Y^2}$ ø = arctan (Y/X)

Magnet-Style Interlocks: Direction of Approach for Sensor/Magnet Pairs

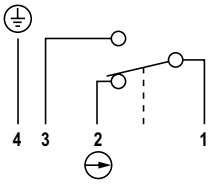
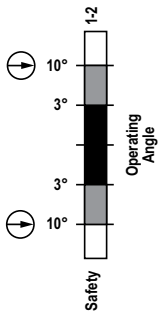
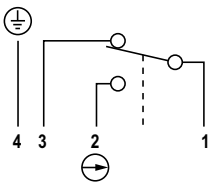
Model SI-MAG1	Model SI-MAG1	Model SI-MAG1
		
Correct Movement is **perpendicular** to the sensing face. 	**Correct** Movement is **perpendicular** to the sensing face. 	**Correct** Movement is **perpendicular** to the sensing face. 
Correct Movement is **parallel** to the sensing face. 	**Correct** Movement is **parallel** to the sensing face. 	**Correct** Movement is **parallel** to the sensing face. 
Correct 90° approach of sensor and magnet is approved only for model **SI-MAG1MM90**. 	**Incorrect** Label to label approach of sensor and magnet is not possible. 	**Incorrect** Magnet orientation relative to magnet sensor cable is incorrect. 
Incorrect Label to label approach of sensor and magnet is not possible. 	**Incorrect** 90° approach of sensor and magnet is not possible. 	**Detail of Interiors** 

NOTE: With SI-MAG1C Controller, approach speed for all magnet-style switches must be greater than 0.2 ms.
With GM-FA-10J Controller, approach speed must be greater than 0.1 ms.

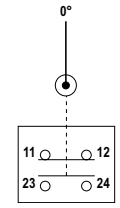
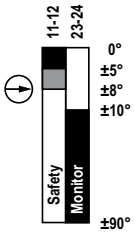
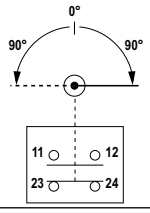
SD001 - SI-HG63 Series

Contact Configuration	Switching Diagram
ON State	
	
OFF State	
	
☐ Open ■ Closed ■ Transition	Page 130

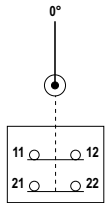
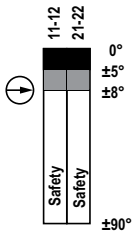
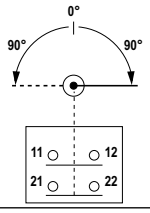
SD002 - SI-HG80 Series

Contact Configuration	Switching Diagram
ON State	
	
OFF State	
	
☐ Open ■ Closed ■ Transition	Page 131

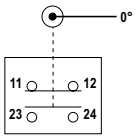
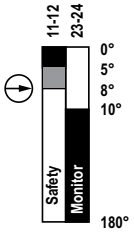
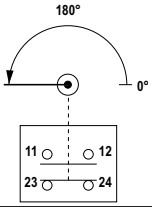
SD003 - SI-LS31HGD Series

Contact Configuration	Switching Diagram
Lever in Normal Position	
	
Lever Rotated	
	
☐ Open ■ Closed ■ Transition	Page 132

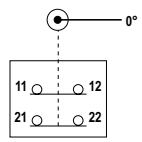
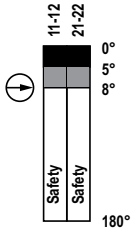
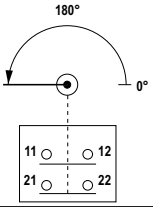
SD004 - SI-LS31HGE Series

Contact Configuration	Switching Diagram
Lever in Normal Position	
	
Lever Rotated	
	
☐ Open ■ Closed ■ Transition	Page 132

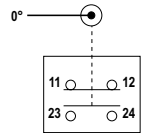
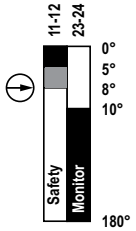
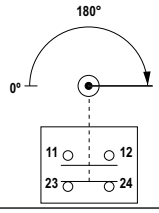
SD005 - SI-LS31HGRD Series

Contact Configuration	Switching Diagram
Lever in Normal Position	
	
Lever Rotated	
	
☐ Open ■ Closed ■ Transition	Page 132

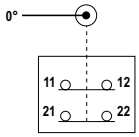
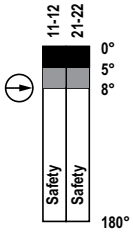
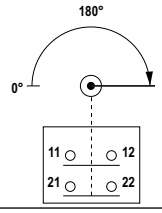
SD006 - SI-LS31HGRE Series

Contact Configuration	Switching Diagram
Lever in Normal Position	
	
Lever Rotated	
	
☐ Open ■ Closed ■ Transition	Page 132

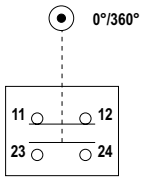
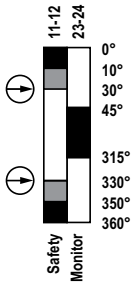
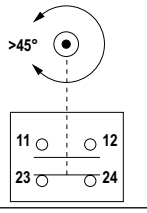
SD007 - SI-LS31HGLD Series

Contact Configuration	Switching Diagram
Lever in Normal Position	
	
Lever Rotated	
	☐ Open ■ Closed ■ Transition Page 132

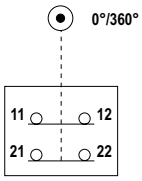
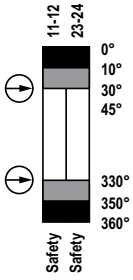
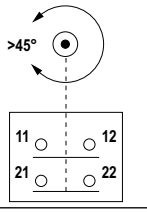
SD008 - SI-LS31HGLE Series

Contact Configuration	Switching Diagram
Lever in Normal Position	
	
Lever Rotated	
	☐ Open ■ Closed ■ Transition Page 132

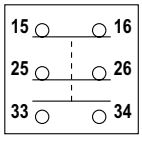
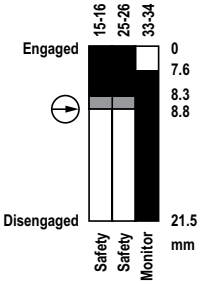
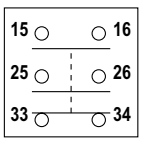
SD009 - SI-LS31RTD Series

Contact Configuration	Switching Diagram
Axle in Home Position 0°	
	
Axle Rotated 45°	
	☐ Open ■ Closed ■ Transition Page 133

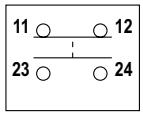
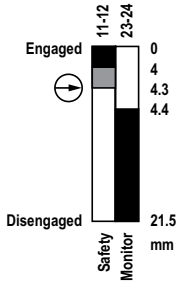
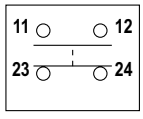
SD010 - SI-LS31RTE Series

Contact Configuration	Switching Diagram
Axle in Home Position 0°	
	
Axle Rotated 45°	
	☐ Open ■ Closed ■ Transition Page 133

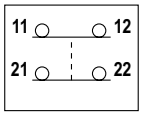
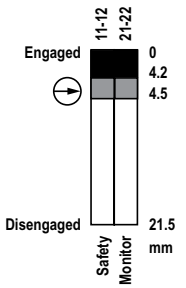
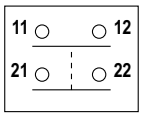
SD011 - SI-LS100 Series

Contact Configuration	Switching Diagram
Actuator Engaged	
	
Actuator Removed	
	☐ Open ■ Closed ■ Transition Page 136

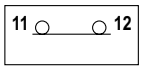
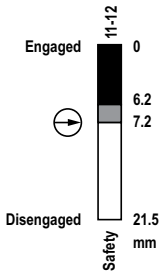
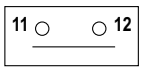
SD012 - SI-LS83..D Series

Contact Configuration	Switching Diagram
Actuator Engaged	
	
Actuator Removed	
	☐ Open ■ Closed ■ Transition Page 136

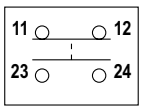
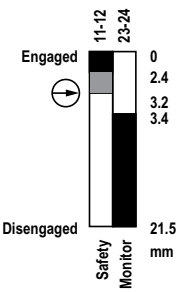
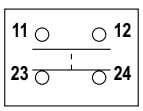
SD013 - SI-LS83..E Series

Contact Configuration	Switching Diagram
Actuator Engaged	
	
Actuator Removed	
	☐ Open ■ Closed ■ Transition
	Page 136

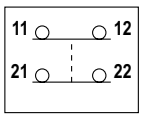
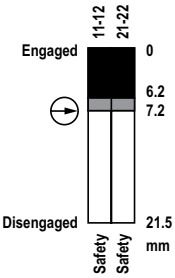
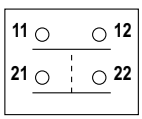
SD014 - SI-QS75 Series

Contact Configuration	Switching Diagram
Actuator Engaged	
	
Actuator Removed	
	☐ Open ■ Closed ■ Transition
	Page 137

SD015 - SI-QS90MD Series

Contact Configuration	Switching Diagram
Actuator Engaged	
	
Actuator Removed	
	☐ Open ■ Closed ■ Transition
	Page 138

SD016 - SI-QS90ME Series

Contact Configuration	Switching Diagram
Actuator Engaged	
	
Actuator Removed	
	☐ Open ■ Closed ■ Transition
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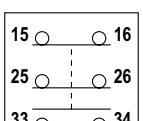
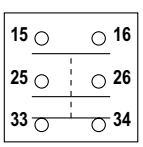
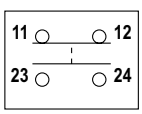
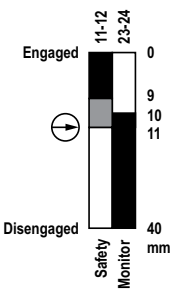
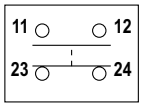
SD017 - SI-QS90MF Series

Contact Configuration	Switching Diagram
Actuator Engaged	
	
Actuator Removed	
	☐ Open ■ Closed ■ Transition
	Page 138

SD018 - SI-LM40MKHD Series

Contact Configuration	Switching Diagram
Actuator Engaged	
	
Actuator Removed	
	☐ Open ■ Closed ■ Transition
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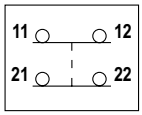
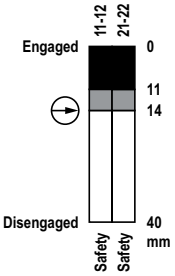
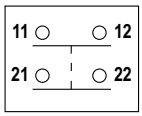
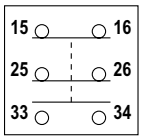
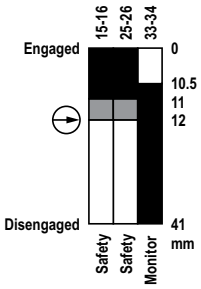
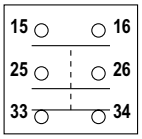
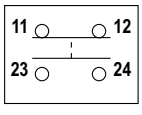
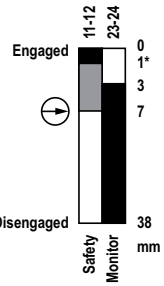
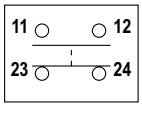
SD019 - SI-LM40MKHE Series

Contact Configuration	Switching Diagram
Actuator Engaged 	
Actuator Removed 	☐ Open ■ Closed ■ Transition Page 142

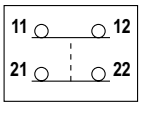
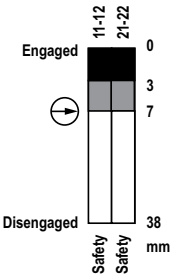
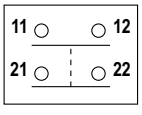
SD020 - SI-LM40MKF Series

Contact Configuration	Switching Diagram
Actuator Engaged 	
Actuator Removed 	* 1 mm of movement will open contact ☐ Open ■ Closed ■ Transition Page 142

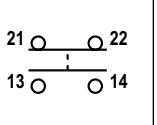
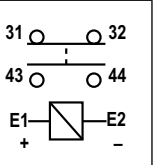
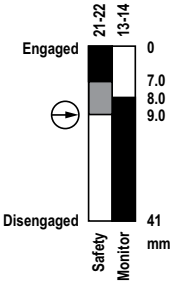
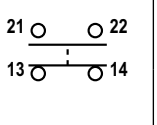
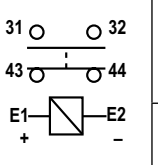
SD021 - SI-LM40MKVD Series

Contact Configuration	Switching Diagram
Actuator Engaged 	
Actuator Removed 	☐ Open ■ Closed ■ Transition Page 142

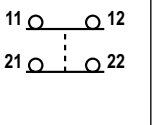
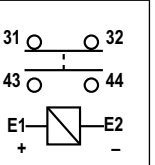
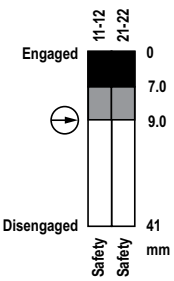
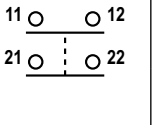
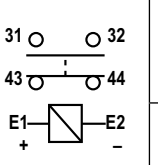
SD022 - SI-LM40MKVE Series

Contact Configuration	Switching Diagram
Actuator Engaged 	
Actuator Removed 	☐ Open ■ Closed ■ Transition Page 142

SD023 - SI-LS42..MSG/MMG Series

Contact Configuration	Switching Diagram
Actuator Engaged & Locked Actuator Contacts  Solenoid Monitor Contacts 	
Actuator Removed & Unlocked Actuator Contacts  Solenoid Monitor Contacts 	☐ Open ■ Closed ■ Transition Pages 145-146

SD024 - SI-LS42..MSH/MMH Series

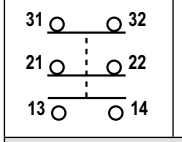
Contact Configuration	Switching Diagram
Actuator Engaged & Locked Actuator Contacts  Solenoid Monitor Contacts 	
Actuator Removed & Unlocked Actuator Contacts  Solenoid Monitor Contacts 	☐ Open ■ Closed ■ Transition Pages 145-146

SD025 - SI-LS42..MSI/MMI Series

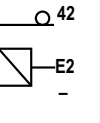
Contact Configuration

Actuator Engaged & Locked

Actuator Contacts

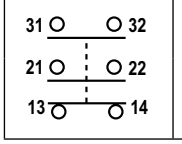


Solenoid Monitor Contacts

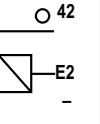


Actuator Removed & Unlocked

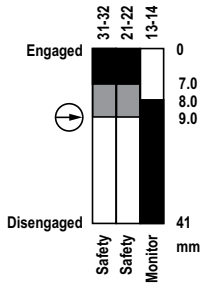
Actuator Contacts



Solenoid Monitor Contacts



Switching Diagram



☐ Open
■ Closed
■ Transition

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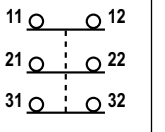
SD026 - SI-LS42..MSJ/MMJ Series

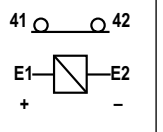
Contact Configuration

Actuator Engaged & Locked

Actuator Contacts

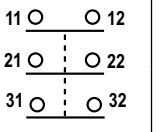


Solenoid Monitor Contacts

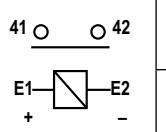


Actuator Removed & Unlocked

Actuator Contacts



Solenoid Monitor Contacts



Switching Diagram

☐ Open
■ Closed
■ Transition

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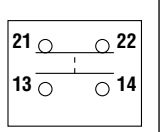
SD027 - SI-QM100..MSG/MMG Series

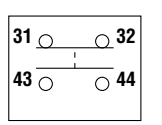
Contact Configuration

Actuator Engaged & Locked

Actuator Contacts

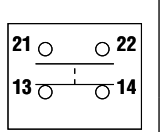


Solenoid Monitor Contacts

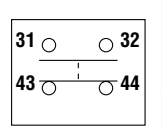


Actuator Removed & Unlocked

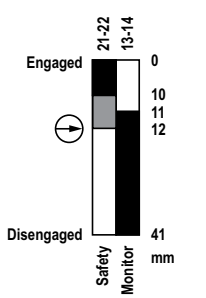
Actuator Contacts



Solenoid Monitor Contacts



Switching Diagram



☐ Open
■ Closed
■ Transition

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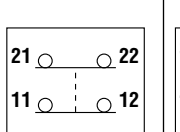
SD028 - SI-QM100..DMSH Series

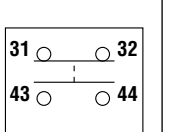
Contact Configuration

Actuator Engaged & Locked

Actuator Contacts

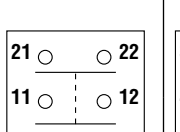


Solenoid Monitor Contacts

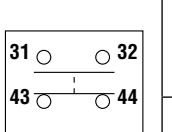


Actuator Removed & Unlocked

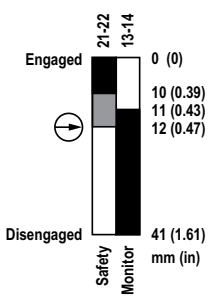
Actuator Contacts



Solenoid Monitor Contacts



Switching Diagram



☐ Open
■ Closed
■ Transition

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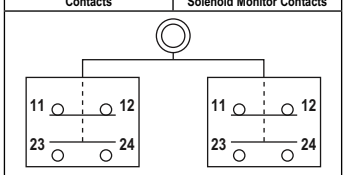
SD029 - RP-RM83..LTE/LTR Series

Contact Configuration

Run Position

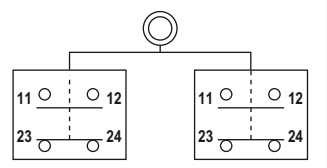
Actuator Contacts



Solenoid Monitor Contacts

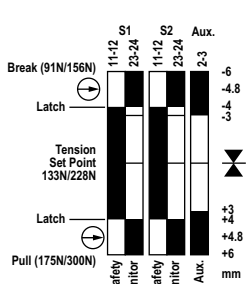
Cable Pull or Break

Actuator Contacts



Solenoid Monitor Contacts

Switching Diagram



☐ Open
■ Closed

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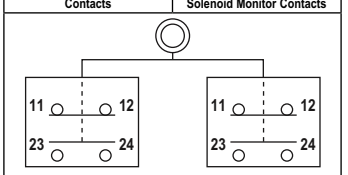
SD030 - RP-RM83..LT/LR Series

Contact Configuration

Run Position

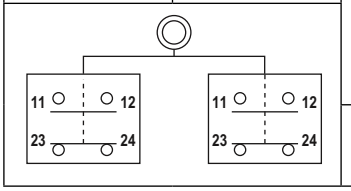
Actuator Contacts



Solenoid Monitor Contacts

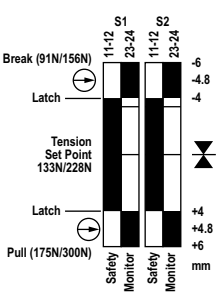
Cable Pull or Break

Actuator Contacts



Solenoid Monitor Contacts

Switching Diagram



☐ Open
■ Closed

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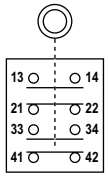
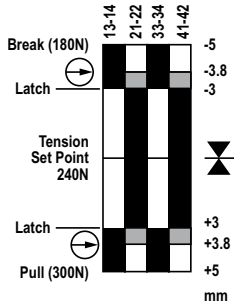
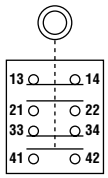
SD031 - RP-LS42F-75L Series

Contact Configuration	Switching Diagram
Run Position	
	
Cable Pulled or Cable Break	
	
	☐ Open ■ Closed ■ Transition
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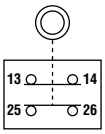
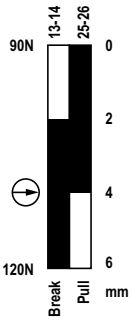
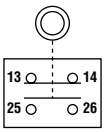
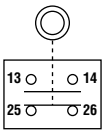
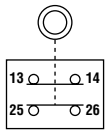
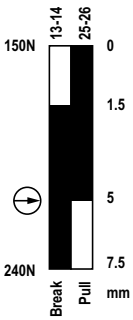
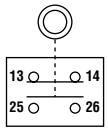
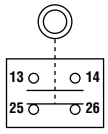
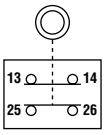
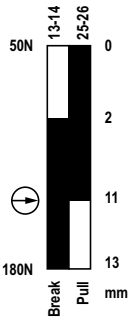
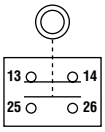
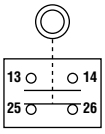
SD032 - RP-QM72D-6L Series

Cable Position	Switching Diagram
Run Position	
	
Cable Pulled	
	
Cable Break	
	
	☐ Open ■ Closed
	Page 159

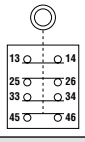
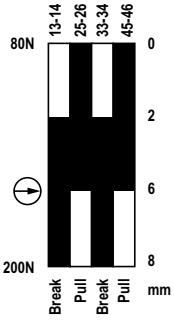
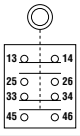
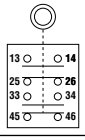
SD033 - RP-QM72D-12L Series

Cable Position	Switching Diagram
Run Position	
	
Cable Pulled	
	
Cable Break	
	
	☐ Open ■ Closed
	Page 159

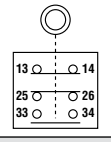
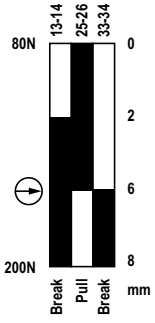
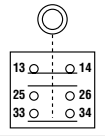
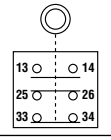
SD034 - RP-QMT72D-20L Series

Cable Position	Switching Diagram
Run Position	
	
Cable Pulled	
	
Cable Break	
	
	☐ Open ■ Closed
	Page 159

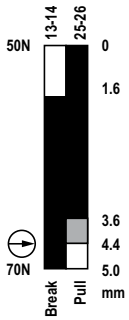
SD035 - RP-QMT72F-12L Series

Cable Position	Switching Diagram
Run Position	
	
Cable Pulled	
	
Cable Break	
	
	☐ Open ■ Closed
	Page 159

SD036 - RP-QMT72E-12L Series

Cable Position	Switching Diagram
Run Position	
	
Cable Pulled	
	
Cable Break	
	
	☐ Open ■ Closed
	Page 159

SD037 - RP-LM40D-6 Series

Cable Position	Switching Diagram
Run Position	
Cable Pulled	
Cable Break	

Open
Closed
Transition

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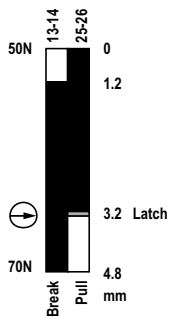
SD038 - RP-LM40D-6L Series

Cable Position	Switching Diagram
Run Position	
Cable Pulled	
Cable Break	

Open
Closed
Transition

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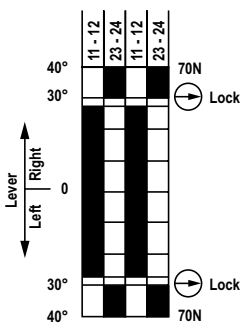
SD039 - RP-QM90F-100L Series

Cable Position	Switching Diagram
Run Position	
Cable Pulled or Break	

Open
Closed

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WD001

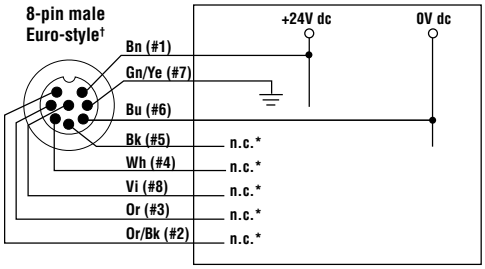
EZ-SCREEN® System (Type 4)

Page 23

8-Pin Euro-Style (Standard Emitter)

Models

- EZ-SCREEN 14 & 30 mm emitter models with 8-pin Euro QD



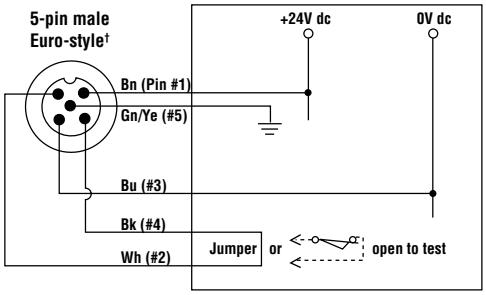
***NOTE: Pins 2, 3, 4, 5, and 8 are not connected, *or* are paralleled to same color wire from the 8-pin receiver cable**

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

5-Pin Euro-Style (Emitter with Test)

Models

- EZ-SCREEN 14 & 30 mm emitter models with 5-pin Euro QD



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

† See Euro-style connectors on page 179 for female mating cordset.

WD002

EZ-SCREEN® LP System (Type 4)

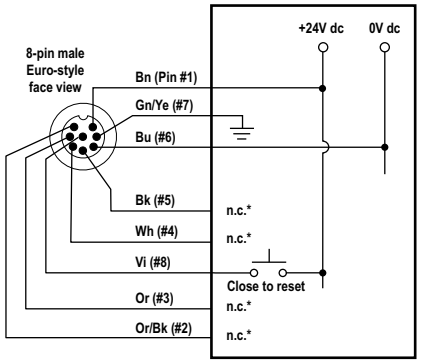
Page 31

8-Pin Euro-Style (Reset Hookup)

Models

- EZ-SCREEN LP 14 & 25 mm emitter models with 8-pin Euro QD

***NOTE: Pins 2, 3, 4 and 5 either are not connected, or are paralleled to same color wire from the 8-pin receiver cable.**



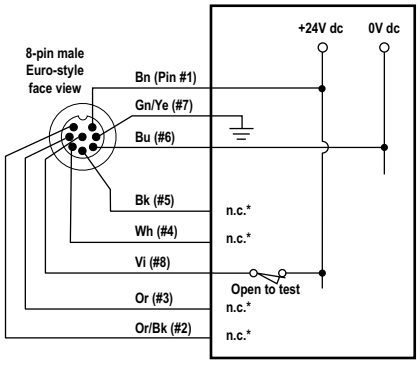
Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

8-Pin Euro-Style (Test Hookup)

Models

- EZ-SCREEN 14 & 25 mm emitter models with 8-pin Euro QD

***NOTE: Pins 2, 3, 4 and 5 either are not connected, or are paralleled to same color wire from the 8-pin receiver cable.**



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

† See Euro-style connectors on page 179 for female mating cordset.

WD003

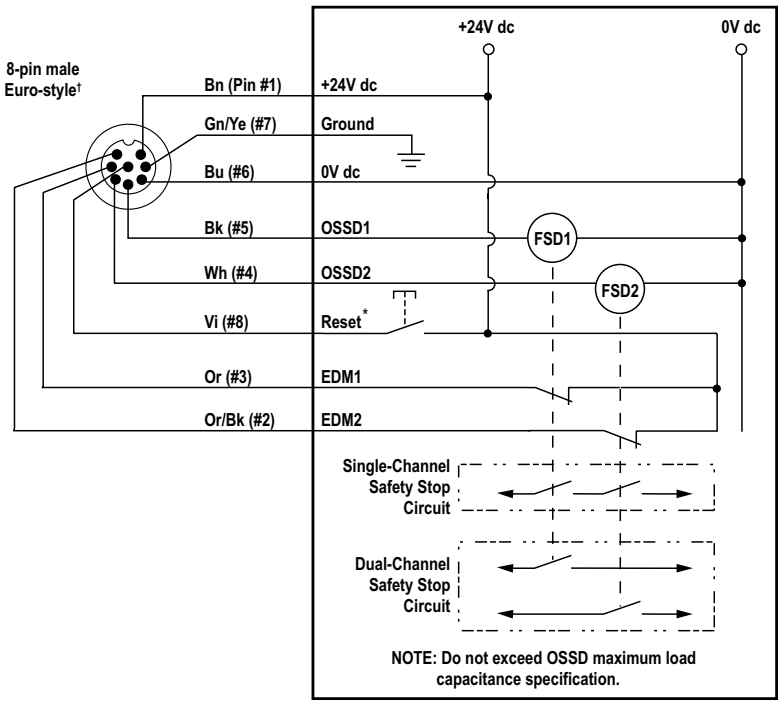
EZ-SCREEN® System (Type 4)

Receiver with 2 Solid-State OSSDs, 2 FSDs and 2-Channel EDM

Page 22

Models

- EZ-SCREEN 14 & 30 mm receiver models with 8-pin Euro QD
- EZ-SCREEN LP 14 & 25 mm emitter models with 8-pin Euro QD



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

* Trip (auto reset) not connected.
† See Euro-style connectors on page 179 for female mating cordset.

WD004

EZ-SCREEN® System (Type 4)

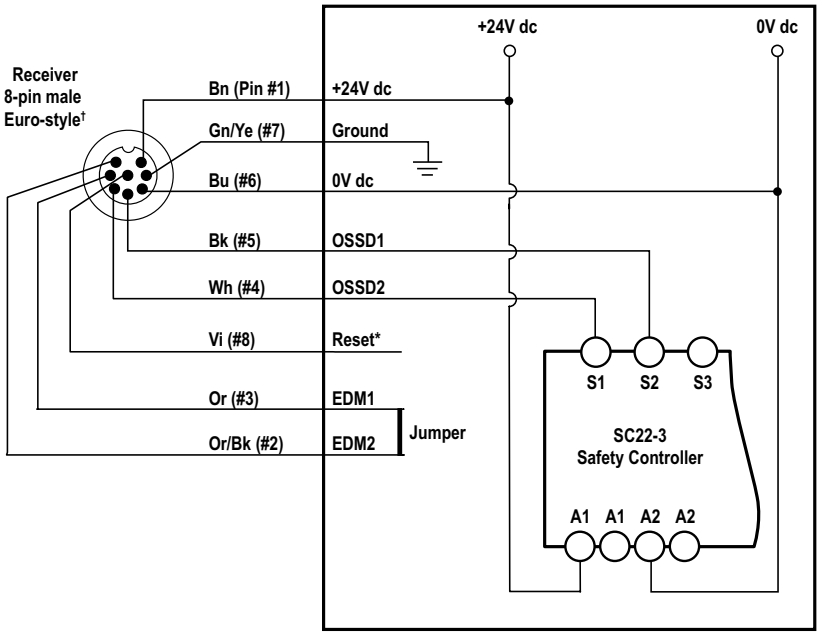
2 Solid-State OSSDs and 2-Channel EDM of SC22-3

Page 22

Models

- EZ-SCREEN 14 & 30 mm emitter models with 8-pin Euro QD
- EZ-SCREEN LP 14 & 25 mm models with 8-pin Euro QD

NOTE: EZ-SCREEN receiver DIP switches are configured for "Trip" (T) output and 2-channel EDM (E2). If the Auxiliary output is to be used, configure the EZ-SCREEN receiver for 1-channel EDM (E1) and connect pin #3 (Or) to +24V dc.



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

* Trip (auto reset)- Not connected
† See Euro-style connectors on page 179 for female mating cordset.

WD005

EZ-SCREEN® System (Type 4)

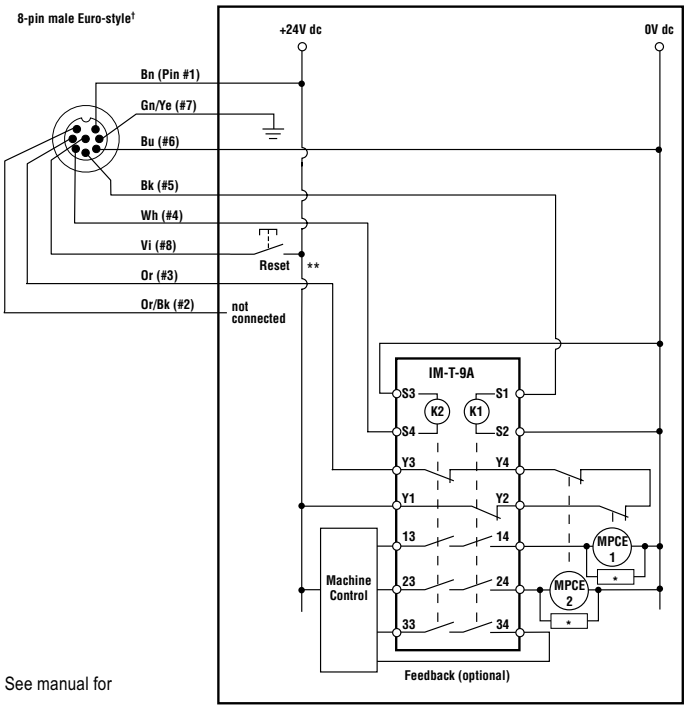
1-Channel EDM of IM-T-9A Interface Module

Page 22

Models

- EZ-SCREEN 14 & 30 mm models with 8-pin Euro QD
- EZ-SCREEN LP 14 & 25 mm models with 8-pin Euro QD

IM-T-9A Terminal Locations



* Arc Suppressors. See manual for specific warnings.
** Trip (auto reset) not recommended.
† See Euro-style connectors on page 179 for female mating cordset.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD006

EZ-SCREEN® System (Type 4)

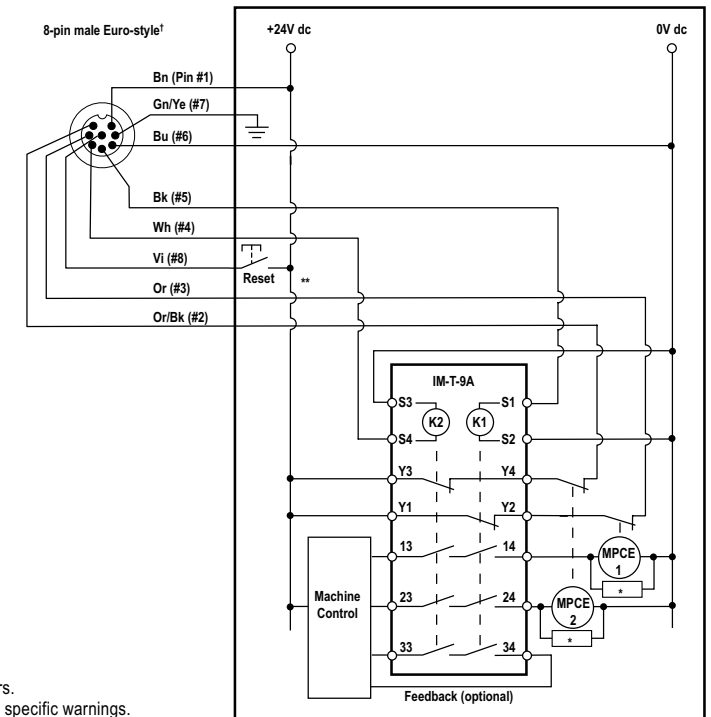
2-Channel EDM of IM-T-9A Interface Module

Page 23

Models

- EZ-SCREEN 14 & 30 mm models with 8-pin Euro-style QD
- EZ-SCREEN LP 14 & 25 mm models with 8-pin Euro QD

IM-T-9A Terminal Locations



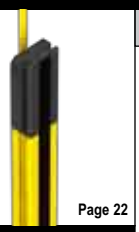
* Arc Suppressors. See manual for specific warnings.
** Trip (auto reset) not recommended.
† See Euro-style connectors on page 179 for female mating cordset.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD007

EZ-SCREEN® System (Type 4)

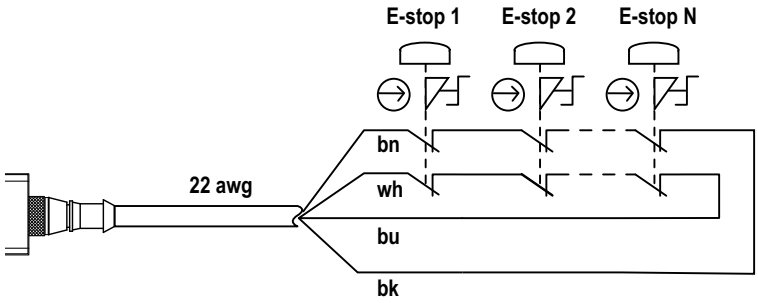
Hookup of E-Stop Button to the Last Receiver in a Cascade



Page 22

Models

- EZ-SCREEN 14 & 30 mm models
- EZ-SCREEN LP 14 & 25 mm models



QDE2R4-8..D Cable Pinout*

Pin #1 – Brown (Ch 1a)	**Pin** #5 – n.c
Pin #2 – Black (Ch 1b)	**Pin** #6 – n.c.
Pin #3 – Blue (Ch 2b)	**Pin** #7 – n.c.
Pin #4 – n.c.	**Pin** #8 – White (Ch 2a)

* Standard M12/Euro-style cables (8-pin male QD) can also be used, although pin number/wire color must be verified.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD008

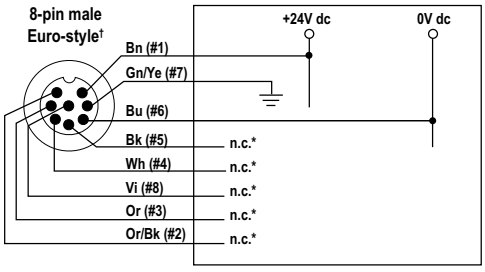
EZ-SCREEN® System (Type 2)

Emitter

Page 39

Models

- EZ-SCREEN Type 2 30 mm models



*** NOTE: Pins 2, 3, 4, 5 and 8 are not connected, or are paralleled to same color wire from the receiver cable.**

† See Euro-style connectors on page 179 for female mating cordset.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD009

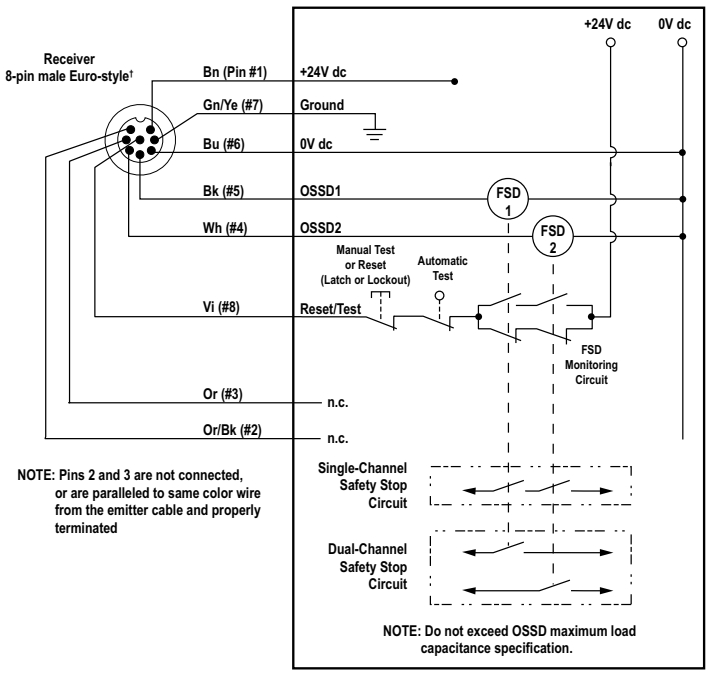
EZ-SCREEN® System (Type 2)

Receiver with 2 Solid-State OSSDs, 2 FSDs and Power Monitoring

Page 39

Models

- EZ-SCREEN Type 2 30 mm models



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

† See Euro-style connectors on page 179 for female mating cordset.

WD010

EZ-SCREEN® System (Type 2)

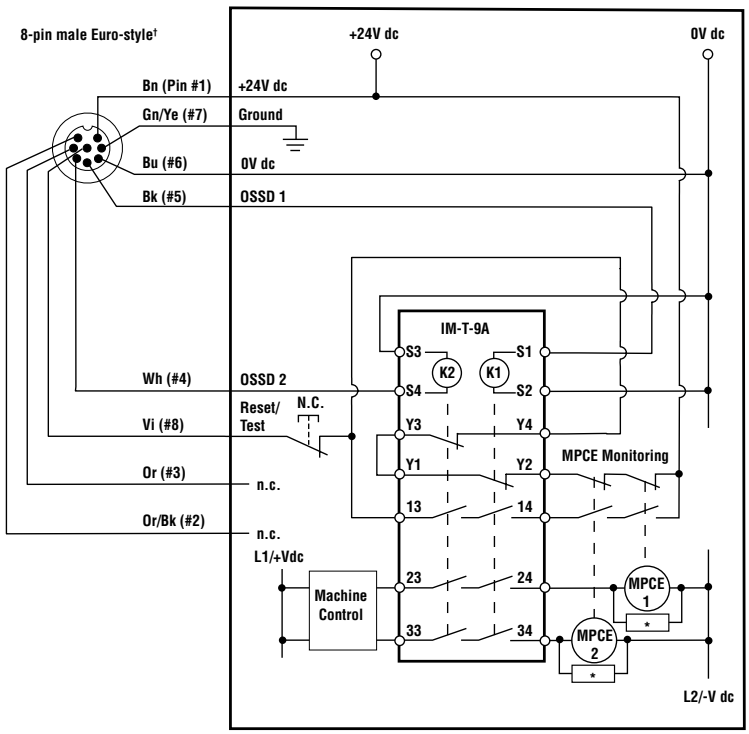
Power Monitoring of IM-T-9A Interface Module

Page 39

Models

- EZ-SCREEN Type 2 30 mm models

IM-T-9A Terminal Locations



NOTE: Pins 2 and 3 are not connected, or are paralleled to same color wire from the emitter cable and properly terminated.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

* Arc Suppressors. See manual for specific warnings.

† See Euro-style connectors on page 179 for female mating cordset.

WD011

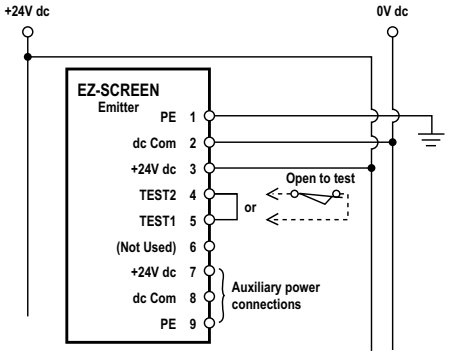
EZ-SCREEN® System (Type 4)

Page 44

Models

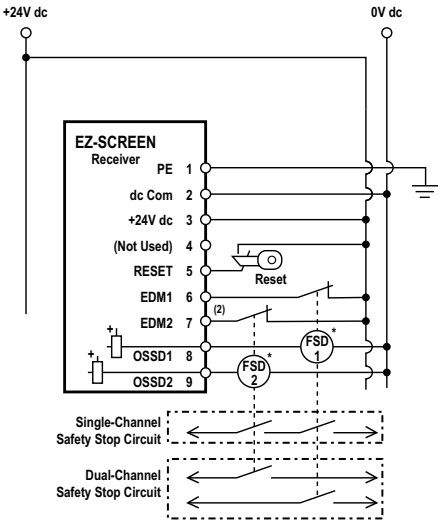
• EZ-SCREEN Grid & Point

Emitter



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

Receiver with 2 Solid-State OSSDs, 2 FSDs and 2-Channel EDM



NOTE: Do not exceed OSSD maximum load capacitance specification.

* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD012

EZ-SCREEN® System (Type 4)

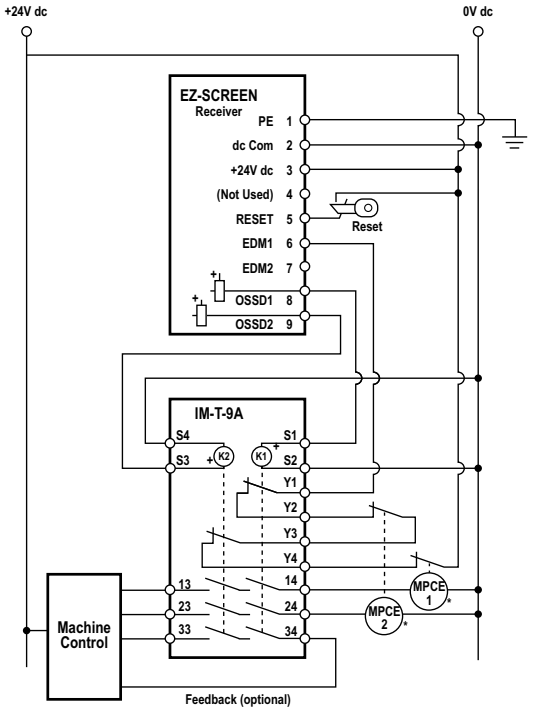
Page 44

Models

• EZ-SCREEN Grid & Point

IM-T-9A Terminal Locations

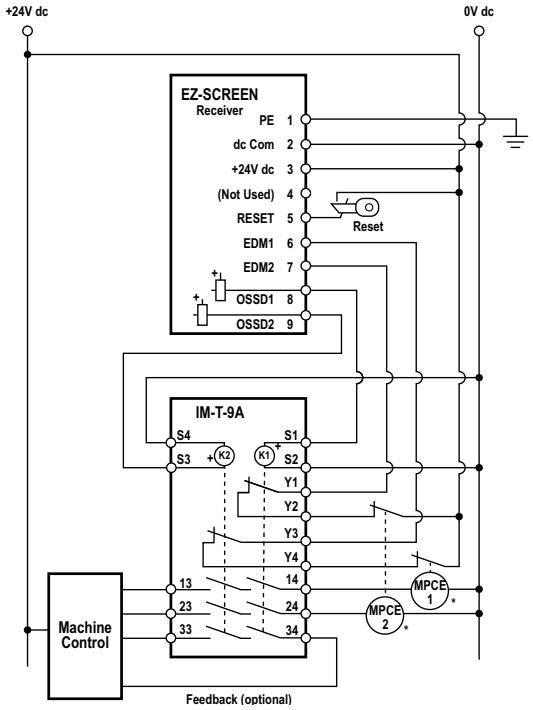
1-Channel EDM of IM-T-9A Interface Module



* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

2-Channel EDM of IM-T-9A Interface Module



* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD013

EZ-SCREEN® AC Interface Box

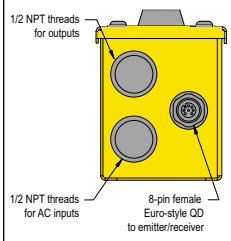
EZAC-R9-QE8 – Hard-Wired with 3 NO and EDM

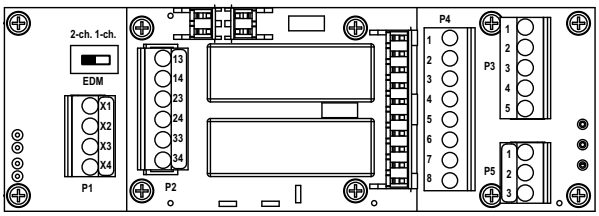
Page 189

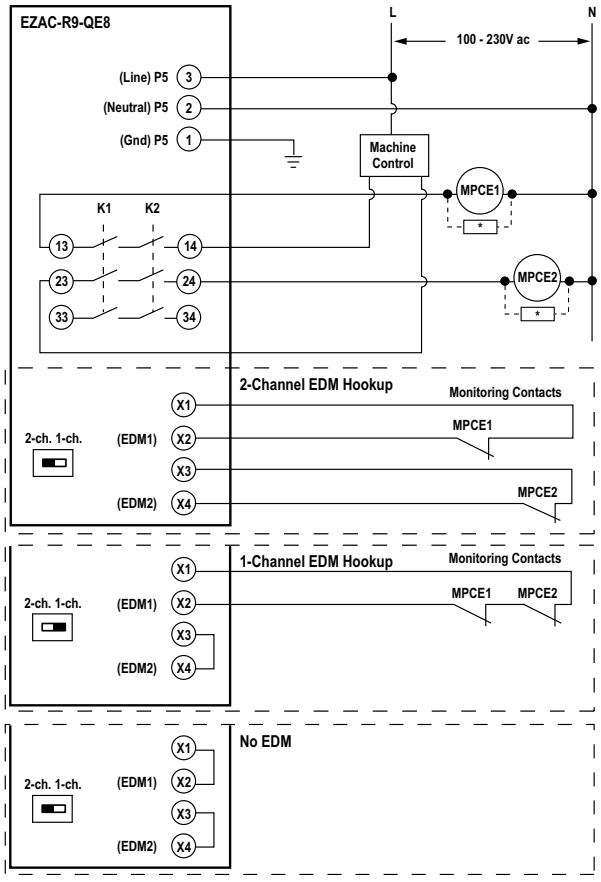
Models

• EZAC-R9-QE8

Connections (Hard Wired)







* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD014

EZ-SCREEN® AC Interface Box

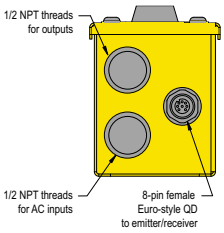
EZAC-R11-QE8 – Hard-Wired with 2 NO, 1 NC and EDM

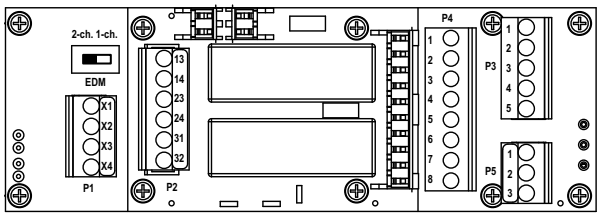
Page 189

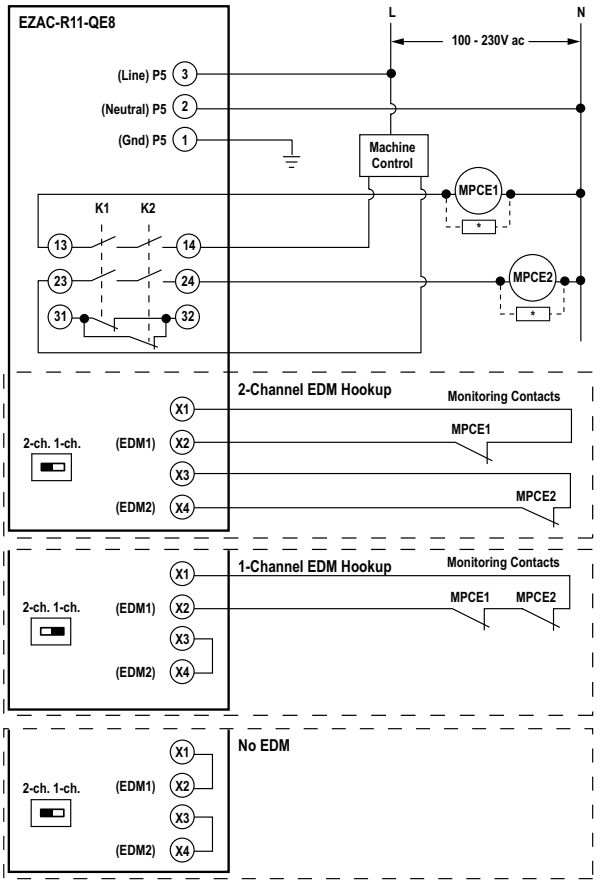
Models

• EZAC-R11-QE8

Connections (Hard Wired)







* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD015

EZ-SCREEN® AC Interface Box

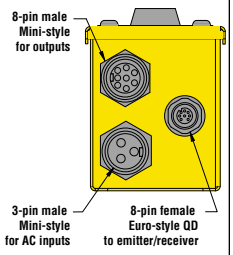
EZAC-R15A-QE8-QS83 – Mini-Style QD with 1 NO, 1 SPDT and 1-Channel EDM

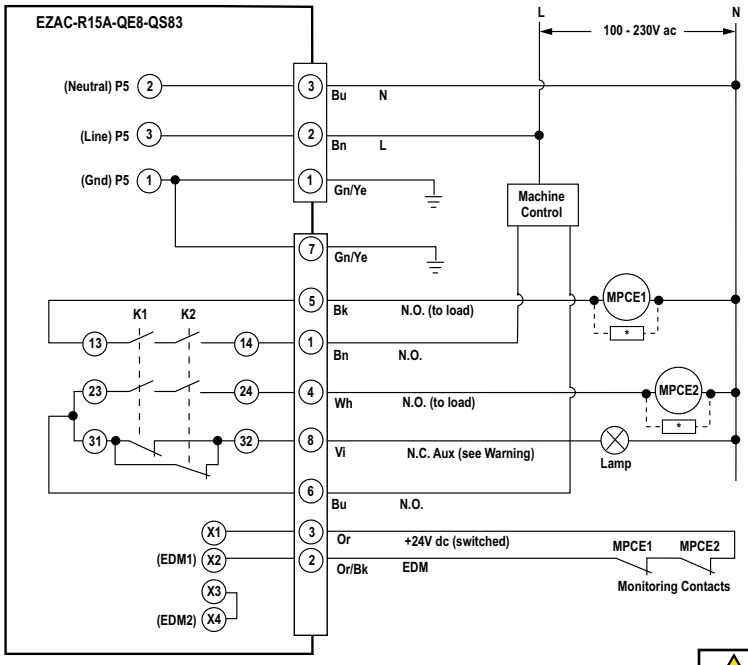
Page 189

Models

• EZAC-R15A-QE8-QS83

Connections (8-Pin Mini)





3-Pin Mini-Style Power Connector Male Face View

Mating Cordset: QDS-3..C		
Pin	Color	Function
1	Green/Yellow	Gnd/PE
2	Brown	Line
3	Blue	Neutral

8-Pin Mini-Style Output Connector Male Face View

Mating Cordset: QDS-8..C		
Pin	Color	Function
1	Brown	N.O.
2	Orange/Black	+24V dc (EDM)
3	Orange	EDM
4	White	N.O. (to load)
5	Black	N.O. (to load)
6	Blue	Common
7	Green/Yellow	Gnd/PE
8	Violet	N.C. Aux.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

* Arc Suppressors. See manual for specific warnings.

WD016

EZ-SCREEN® AC Interface Box

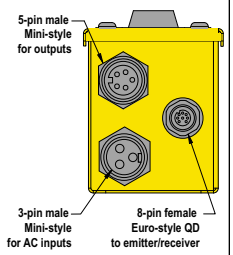
EZAC-R8N-QE8-QS53 – Mini-Style QD with 1 NO, 1 NC and Power Monitoring

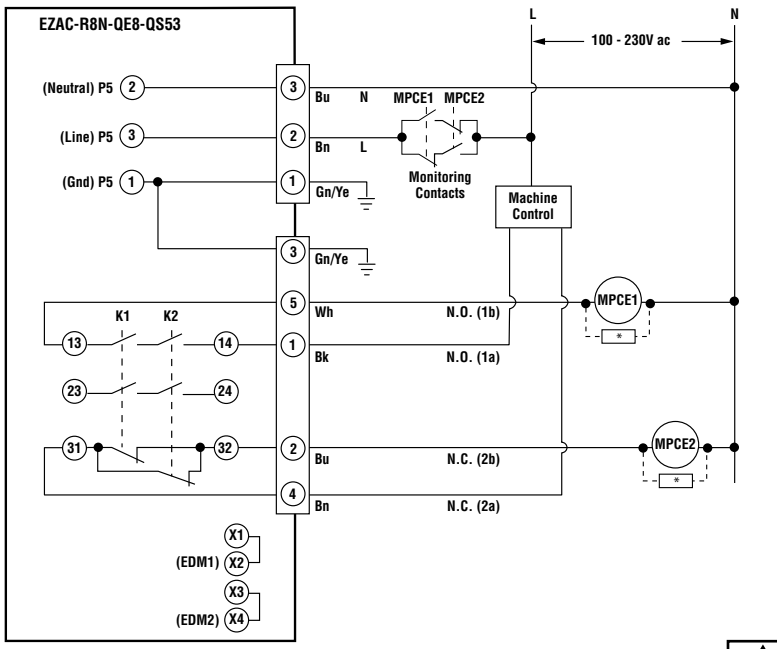
Page 189

Models

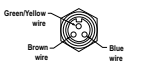
• EZAC-R8N-QE8-QS53

Connections (5-Pin Mini)



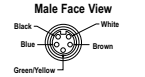


3-Pin Mini-Style Power Connector Male Face View



Mating Cordset: QDS-3..C		
Pin	Color	Function
1	Green/Yellow	Gnd/PE
2	Brown	Line
3	Blue	Neutral

5-Pin Mini-Style Output Connector Male Face View



Mating Cordset: QDS-5..C		
Pin	Color	Function
1	Black	N.O. (1a)
2	Blue	N.C. (2a)
3	Green/Yellow	Gnd/PE
4	Brown	N.C. (2b)
5	White	N.O. (1b)

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

* Arc Suppressors. See manual for specific warnings.

WD017

EZ-SCREEN® AC Interface Box

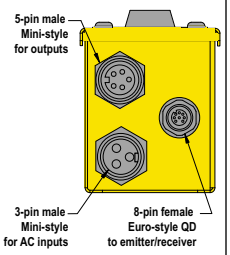
EZAC-R10N-QE8-QS53 – Mini-Style QD with 2 NO and Power Monitoring

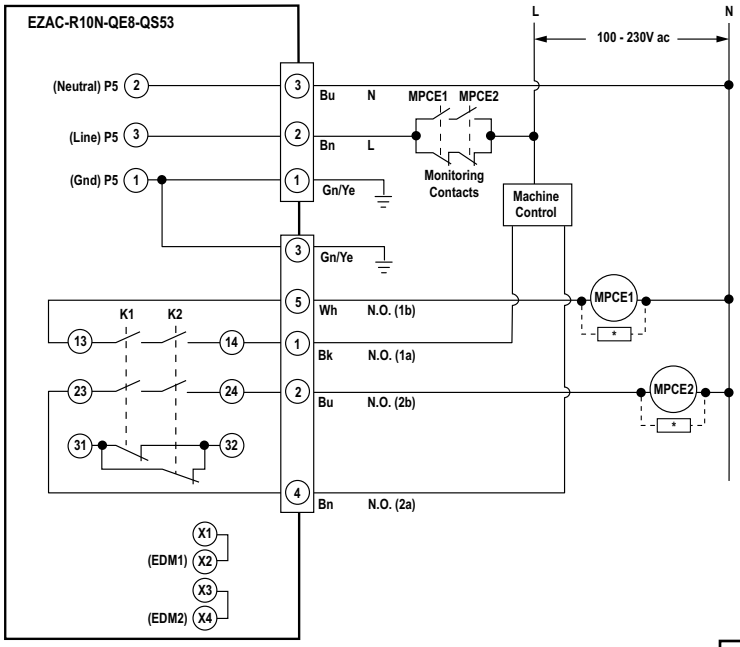
Page 189

Models

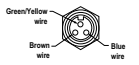
• EZAC-R10N-QE8-QS53

Connections (5-Pin Mini)





3-Pin Mini-Style Power Connector Male Face View



Mating Cordset: QDS-3..C		
Pin	Color	Function
1	Green/Yellow	Gnd/PE
2	Brown	Line
3	Blue	Neutral

5-Pin Mini-Style Output Connector Male Face View

Mating Cordset: QDS-5..C		
Pin	Color	Function
1	Black	N.O. (1a)
2	Blue	N.C. (2a)
3	Green/Yellow	Gnd/PE
4	Brown	N.C. (2b)
5	White	N.O. (1b)

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

* Arc Suppressors. See manual for specific warnings.

WD018

EZ-SCREEN® AC Interface Box

EZAC-E-QE.. – Hard-Wired Emitters with or without Test

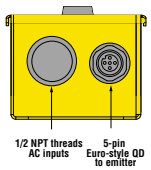
Page 189

Models

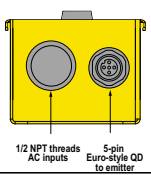
• EZAC-E-QE8
• EZAC-E-QE5

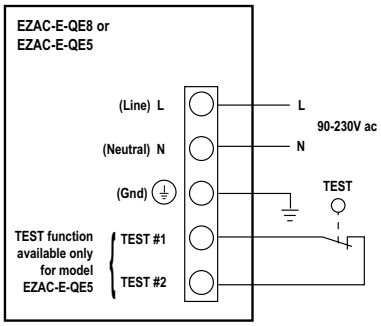
Connections

5-Pin Euro



8-Pin Euro





Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD019

EZ-SCREEN® AC Interface Box

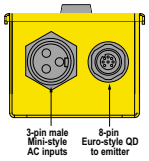
Page 189

Models

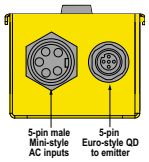
- EZAC-E-QE8-QS3
- EZAC-E-QE5-QS5

Connections

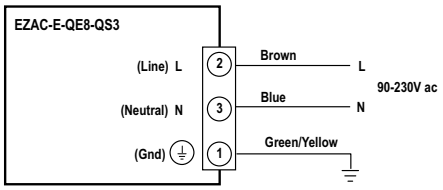
(3-Pin Mini)

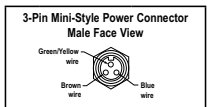


(5-Pin Mini)



EZAC-E-QE8-QS3 – Mini-Style QD Emitter



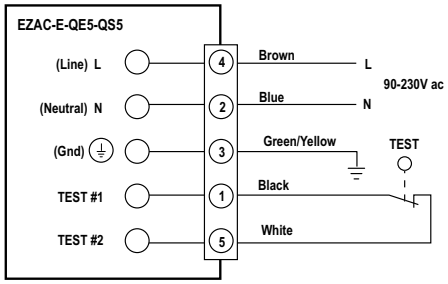


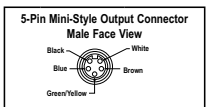
Mating Cordset: QDS-3..C

Pin	Color	Function
1	Green/Yellow	Gnd/PE
2	Brown	Line
3	Blue	Neutral

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

EZAC-E-QE5-QS5 – Mini-Style QD Emitter with Test





Mating Cordset: QDS-5..C

Pin	Color	Function
1	Black	N.O. (1a)
2	Blue	N.C. (2a)
3	Green/Yellow	Gnd/PE
4	Brown	N.C. (2b)
5	White	N.O. (1b)

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD020

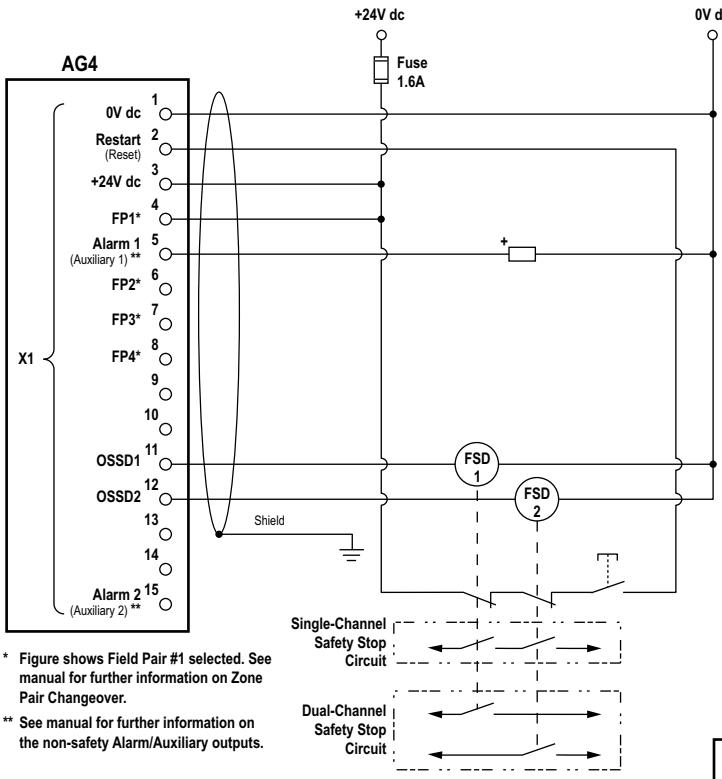
AG4-4E Laser Scanner

Page 53

Models

- AG4-4E

AG4-4E to FSD1 & FSD2



* Figure shows Field Pair #1 selected. See manual for further information on Zone Pair Changeover.

** See manual for further information on the non-safety Alarm/Auxiliary outputs.

Warning: Monitoring FSDs
FSDs must be monitored for proper

NOTE: Do not exceed OSSD maximum load capacitance specification.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD021

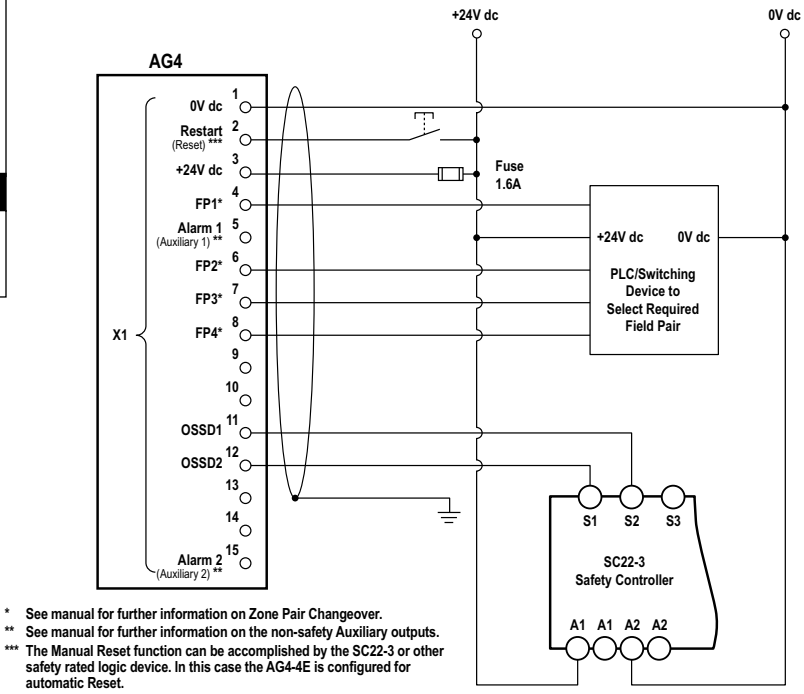
AG4-4E Laser Scanner

AG4-4E to SC22-3

Page 53

Models

• AG4-4E



* See manual for further information on Zone Pair Changeover.
** See manual for further information on the non-safety Auxiliary outputs.
*** The Manual Reset function can be accomplished by the SC22-3 or other safety rated logic device. In this case the AG4-4E is configured for automatic Reset.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD022

AG4-4E Laser Scanner

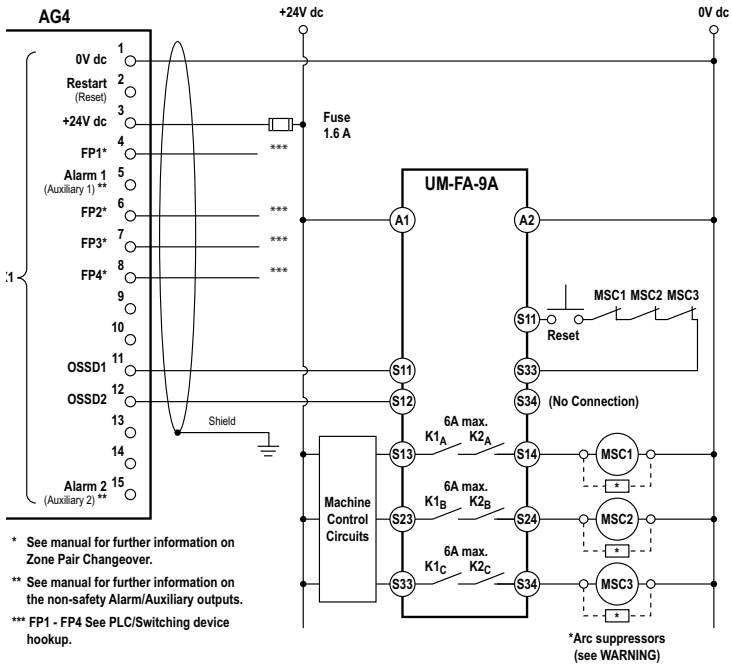
AG4-4E to UM Modules

Page 53

Models

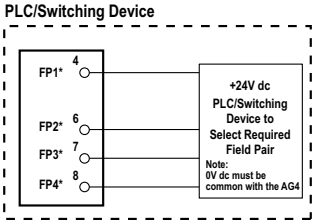
• AG4-4E

UM-FA-..A Terminal Locations

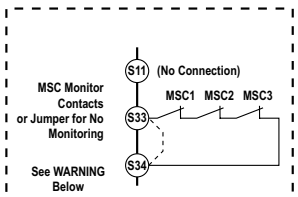


* See manual for further information on Zone Pair Changeover.
** See manual for further information on the non-safety Alarm/Auxiliary outputs.
*** FP1 - FP4 See PLC/Switching device hookup.

PLC/Switching Device



UM Module Auto Reset



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD023

PICO-GUARD™ Controller

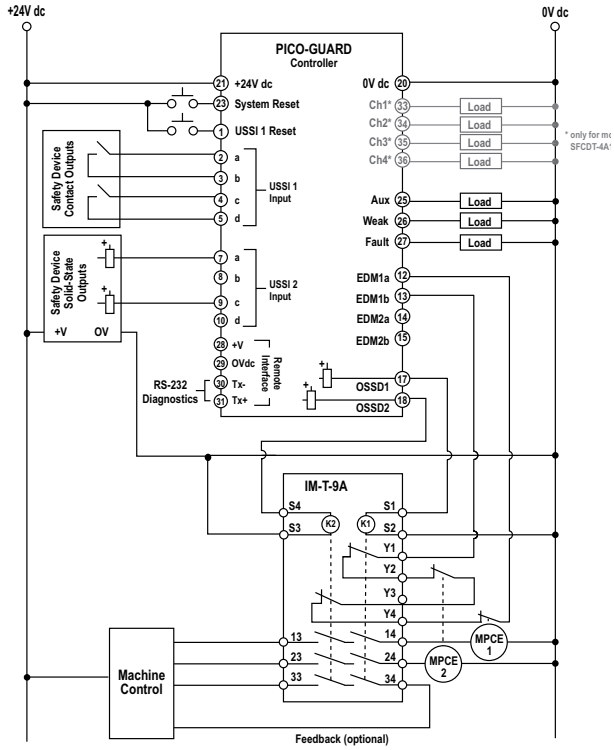
One PICO-GUARD System with 1-Channel EDM of IM-T-9A Interface Module

Page 59

Models

- SFCDT-4A1
- SFCDT-4A1C

IM-T-9A Terminal Locations



> **Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.**

WD024

PICO-GUARD™ Controller

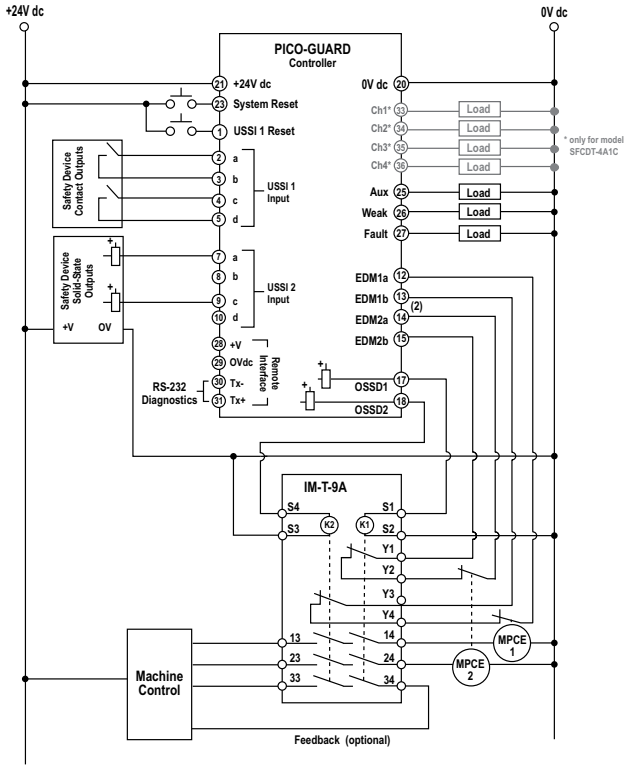
One PICO-GUARD System with 2-Channel EDM of IM-T-9A Interface Module

Page 59

Models

- SFCDT-4A1
- SFCDT-4A1C

IM-T-9A Terminal Locations



> **Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.**

WD025

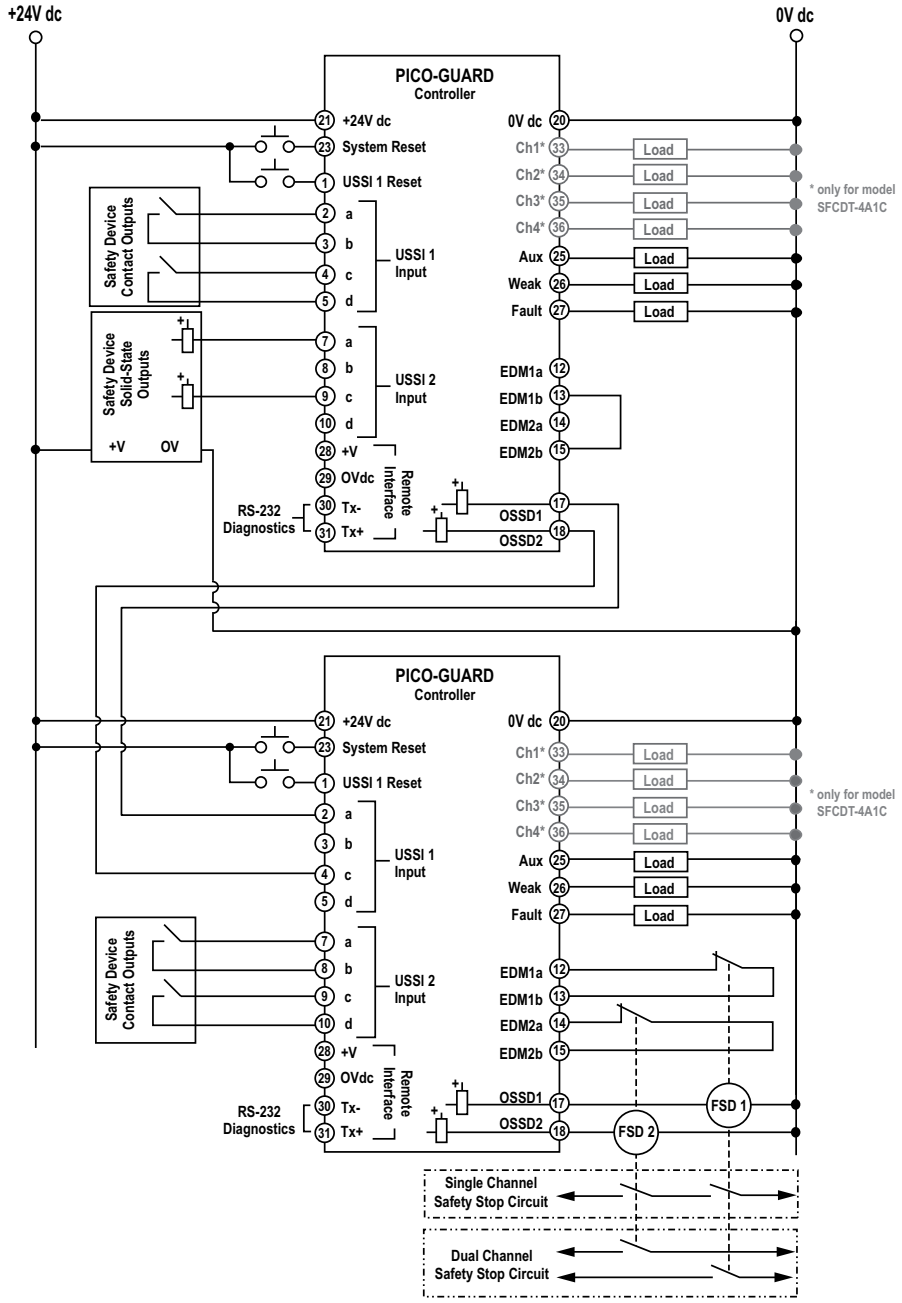
PICO-GUARD™ Controller

Two PICO-GUARD Systems with 2-Channel EDM

Page 59

Models

- SFCDT-4A1
- SFCDT-4A1C



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD026

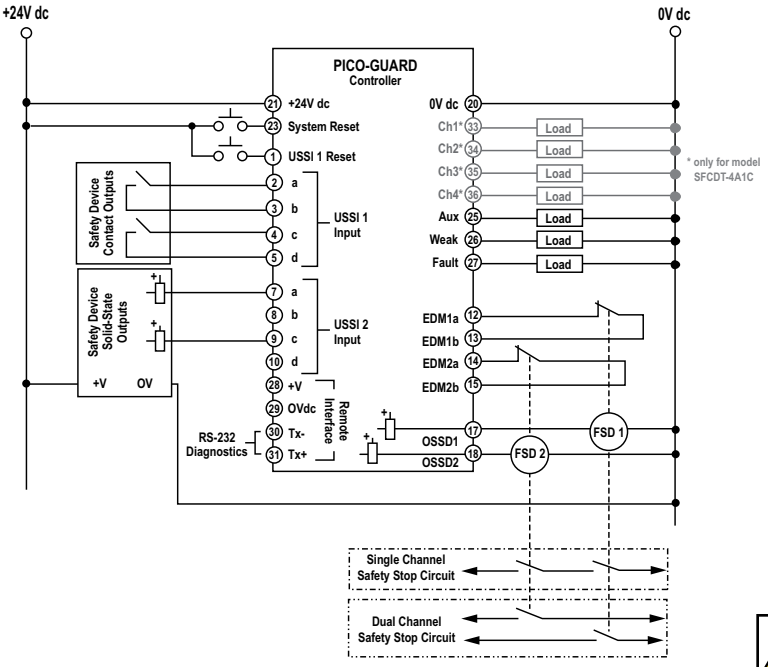
PICO-GUARD™ Controller

One PICO-GUARD System with 2-Channel EDM and 2 Generic FSDs

Page 59

Models

- SFCDT-4A1
- SFCDT-4A1C



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD027

PICO-GUARD™ EXI/ATEX Controller

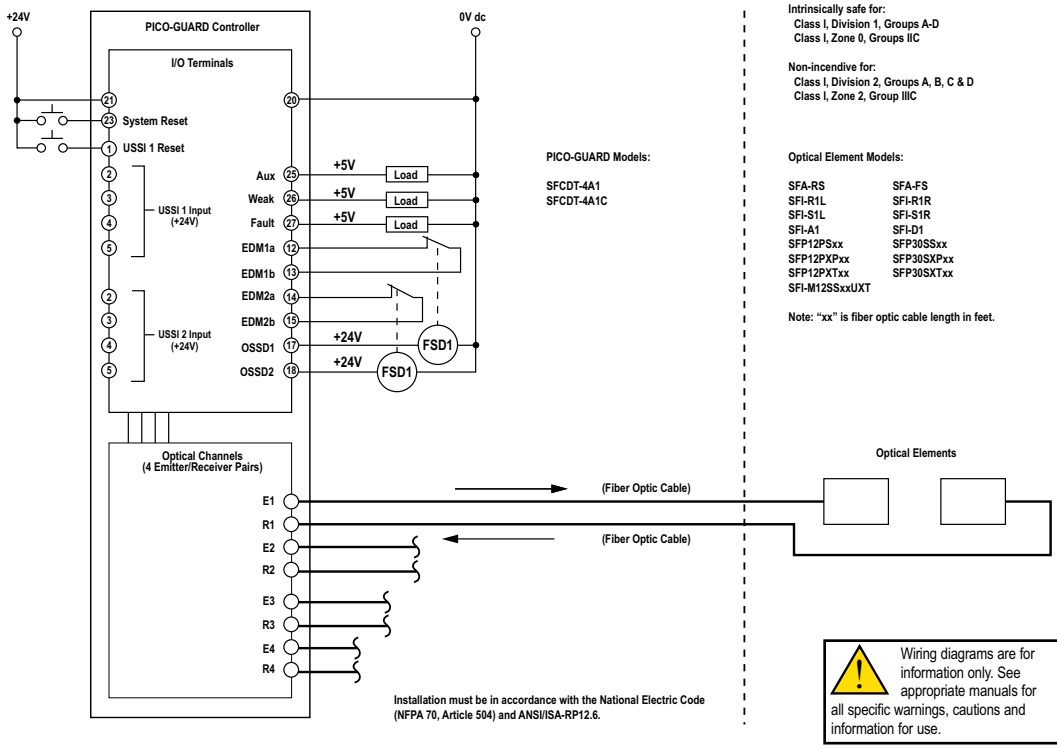
Hazardous Environment Appication to Optical Elements

Page 59

Models

- SFCDT-4A1
- SFCDT-4A1C

Unclassified or Class I, Division 2, Groups A, B, C an D Hazardous (Classified) Locations Class I, Zone 2, Group IIC. For information on compliance and classification according to Directive 94/9/EC (ATEX).



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD028

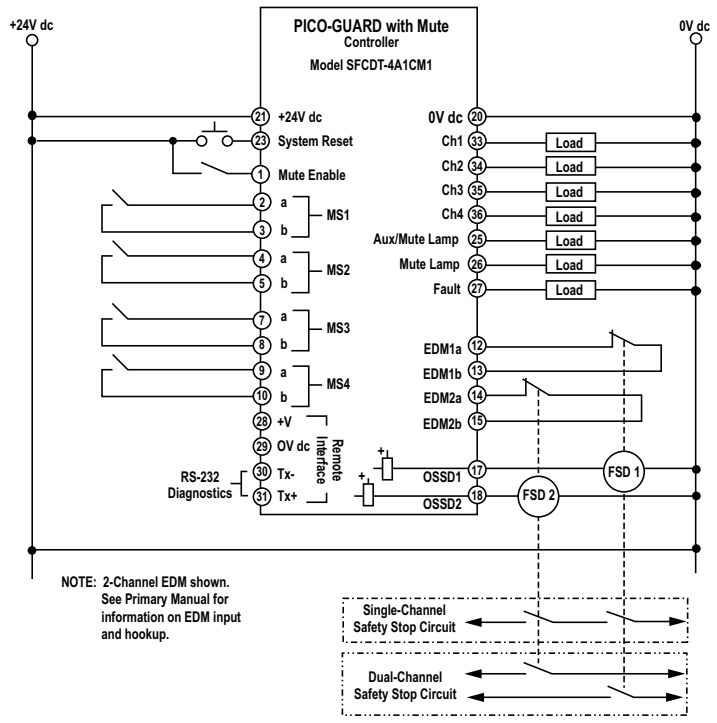
PICO-GUARD™ Controller with Muting

One PICO-GUARD with Muting and 2-Channel EDM and 2 Generic FSDs

Page 59

Models

• SFCDT-4A1CM1



See Primary Manual for information on interfacing of safety stop circuits

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD029

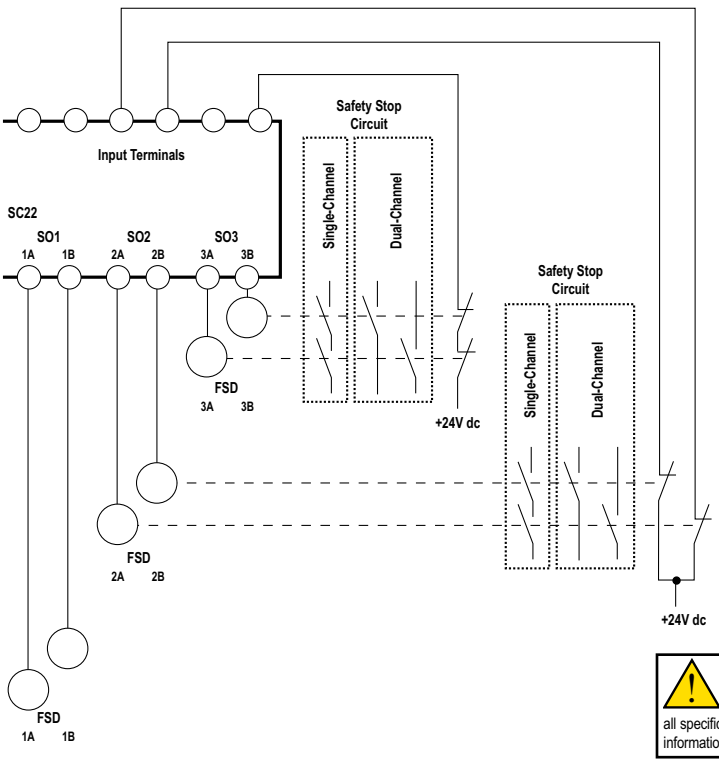
SC22-3 Safety Controller

1-Channel, 2-Channel and No EDM

Page 76

Models

• SC22-3



The figure shown is generic in nature and represents all three EDM options:

- **Safety Output SO1 is shown with NO EDM configured (typically used with self-monitored devices)**
- **Safety Output SO2 is shown with Two-Channel EDM configured.**
- **Safety Output SO3 is shown with One-Channel EDM configured.**
- **Any particular Safety Controller configuration may use any combination of external device monitoring options, depending on the application.**

See product manual for information on external device monitoring and interfacing safety circuits.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD030

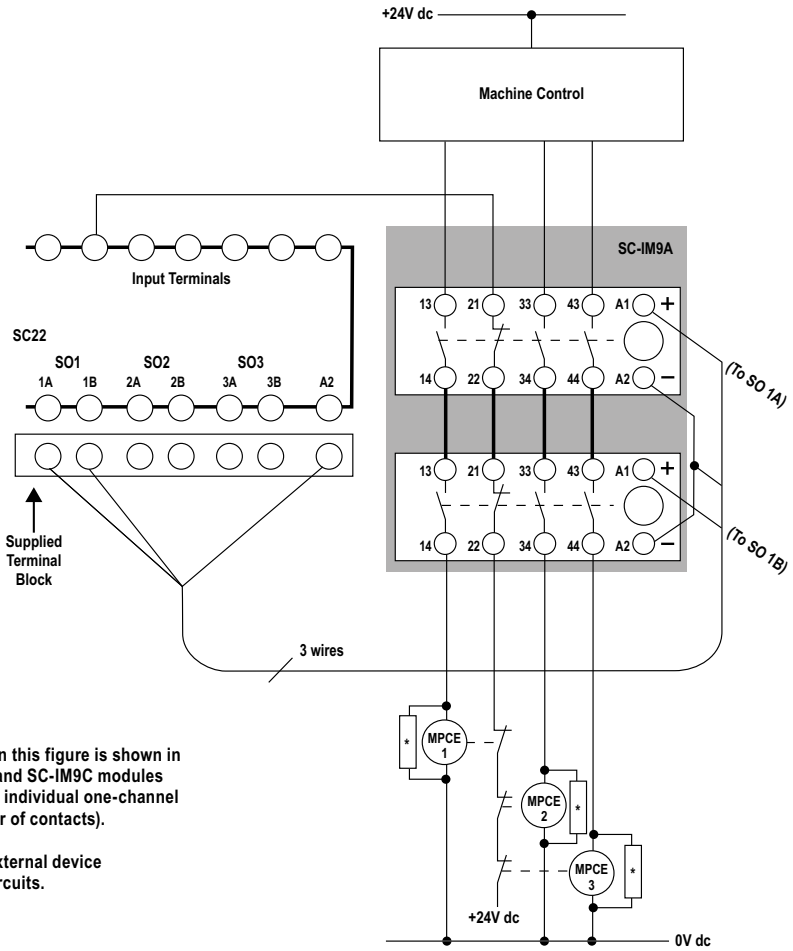
SC22-3 Safety Controller

1-Channel EDM to SC-IM9A

Page 76

Models

• SC22-3



The SC-IM9A interface module depicted in this figure is shown in one-channel EDM hookup. The SC-IM9B and SC-IM9C modules are connected in the same manner, using individual one-channel EDM circuits (terminals 21/22 on each pair of contacts).

See product manual for information on external device monitoring and interfacing safety stop circuits.

* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD031

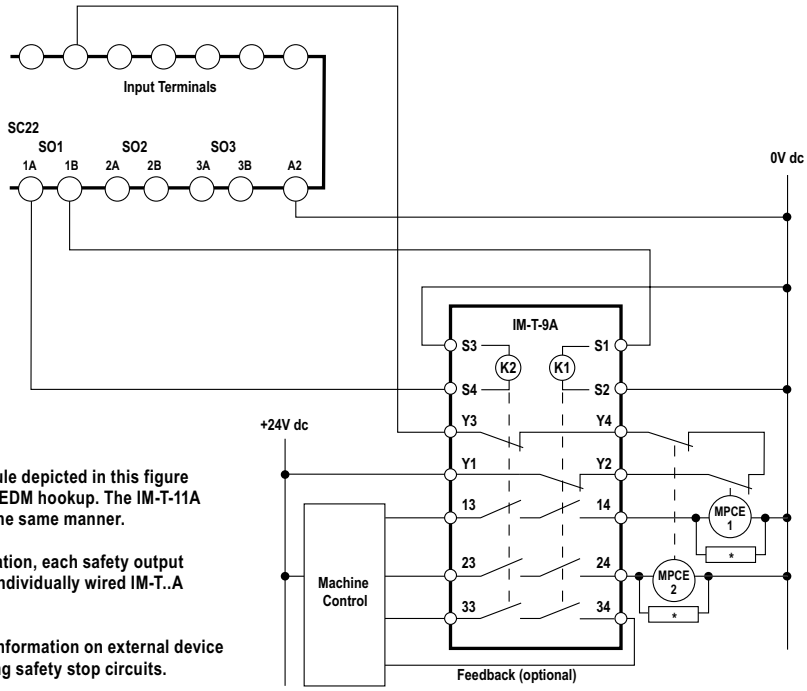
SC22-3 Safety Controller

1-Channel EDM to IM-TA-9A

Page 76

Models

• SC22-3



The IM-TA interface module depicted in this figure is shown in one-channel EDM hookup. The IM-T-11A module is connected in the same manner.

Depending on the application, each safety output requires a separate and individually wired IM-T..A module.

See product manual for information on external device monitoring and interfacing safety stop circuits.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

* Arc Suppressors. See manual for specific warnings.

WD032

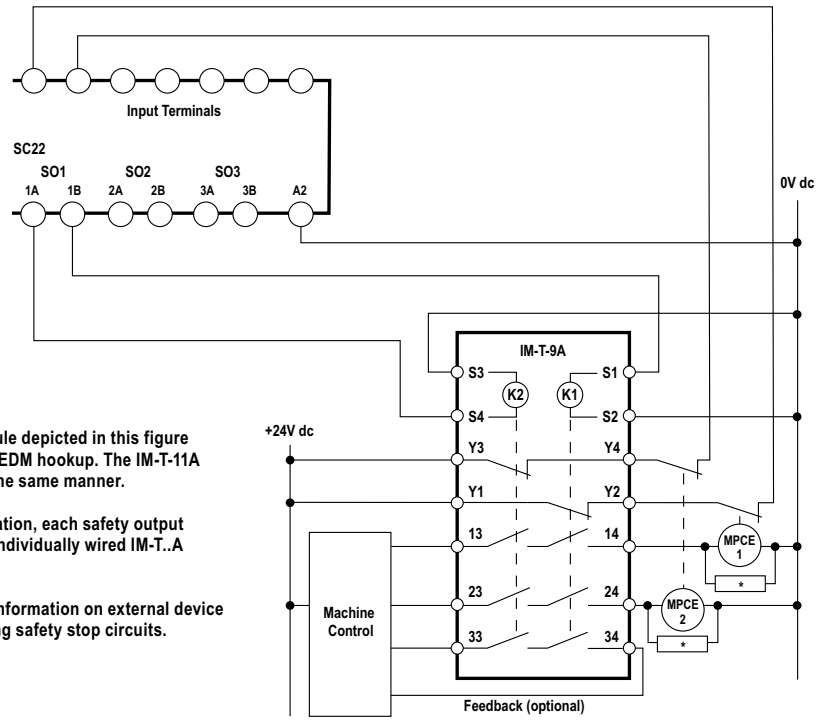
SC22-3 Safety Controller

2-Channel EDM to IM-TA-9A

Page 76

Models

• SC22-3



The IM-TA interface module depicted in this figure is shown in two-channel EDM hookup. The IM-T-11A module is connected in the same manner.

Depending on the application, each safety output requires a separate and individually wired IM-T..A module.

See product manual for information on external device monitoring and interfacing safety stop circuits.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

* Arc Suppressors. See manual for specific warnings.

WD033

GM-FA-10J Guard Monitoring Safety Module

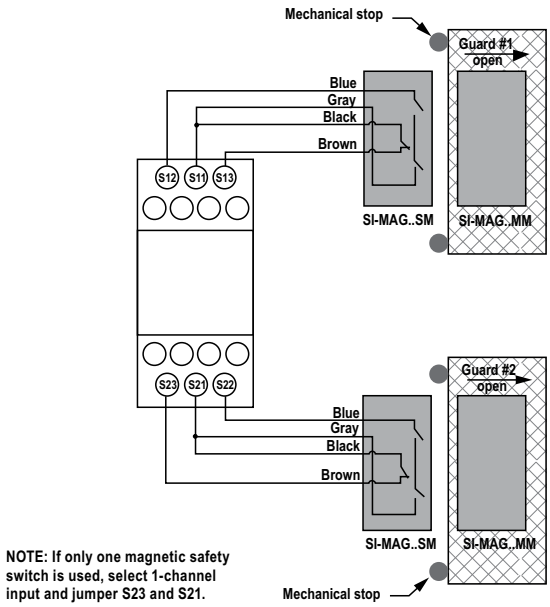
GM-FA-10J 1-Channel Monitoring to Two 4-Wire Coded Magnetic Safety Switches

Page 81

Models

• GM-FA-10J

GM-FA-10J Terminal Locations



NOTE: If only one magnetic safety switch is used, select 1-channel input and jumper S23 and S21.

Configured for one-channel monitoring of either one or two guards. This application is considered to meet or exceed requirements for OSHA control reliability and Safety Category 3 and 4 per ISO 13849-1 (EN 954-1).

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD034

GM-FA-10J Guard Monitoring Safety Module

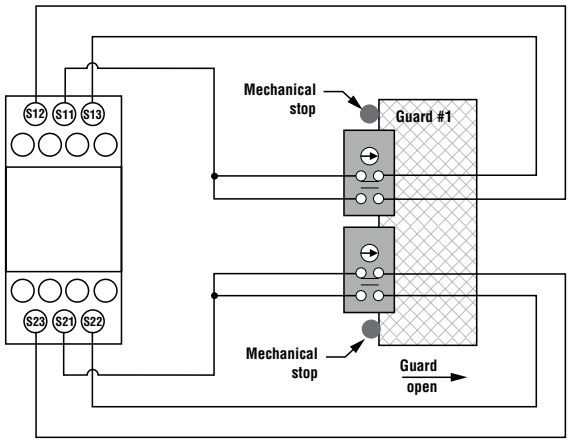
GM-FA-10J 2-Channel Monitoring to Two Positive-Opening Safety Interlock Switches

Page 81

Models

• GM-FA-10J

GM-FA-10J Terminal Locations



NOTE: Guard shown in closed position.

Configured for two-channel monitoring of one guard. This application is considered to meet or exceed requirements for OSHA control reliability and Safety Category 3 and 4 per ISO 13849-1 (EN 954-1).

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD035

GM-FA-10J Guard Monitoring Safety Module

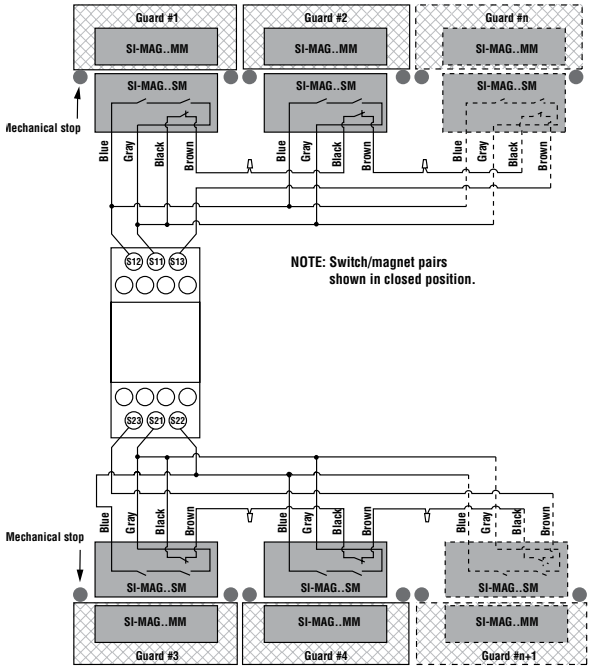
Page 81

Models

• GM-FA-10J

GM-FA-10J Terminal Locations

GM-FA-10J Alternate Wiring for 1-Channel Monitoring of Multiple Guards



Configured for one-channel monitoring of multiple guards with single switches at each guard. Up to 10 Banner magnetic switches may be connected to each channel in this series/parallel method. If other than Banner magnetic switches are used, a total resistance of 270 ohms between S11/S13, S11/S12, S21/S22 and S21/S23 must not be exceeded. **Note: Not a Category 4 application per ISO 13849-1 (EN 954-1).**

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD036

GM-FA-10J Guard Monitoring Safety Module

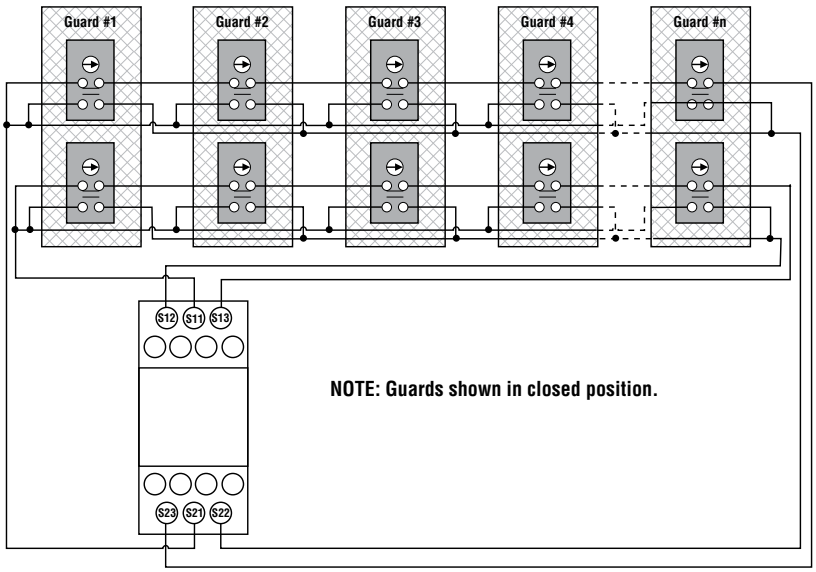
Page 81

Models

• GM-FA-10J

GM-FA-10J Terminal Locations

GM-FA-10J Alternate Wiring for 2-Channel Monitoring of Multiple Guards



Configured for two-channel monitoring of multiple guards with two safety switches mounted individually on each guard. The number of mechanical switches is limited by the max. resistance of 270 ohm between S11-S13, S11-S12, S21-S22 and S21-S23. The total resistance is calculated by adding the resistance of all guard switch contacts and the resistance of the cables that connect the switches and the switches to the module.
Note: Not a Category 4 application per ISO 13849-1 (EN 954-1).

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD037

GM-FA-10J Guard Monitoring Safety Module

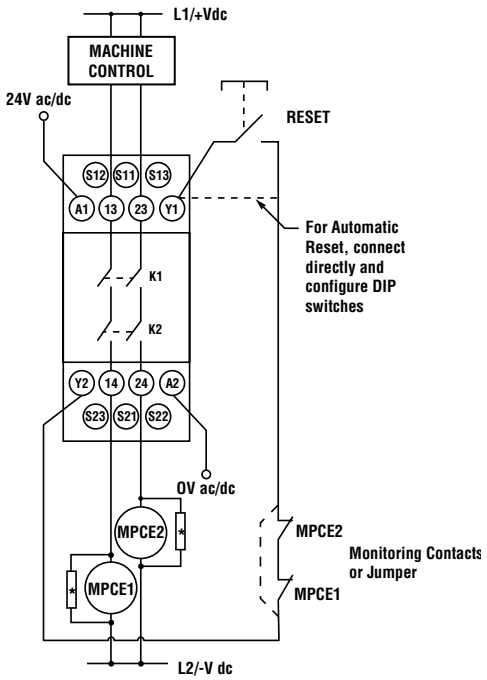
Page 81

Models

- GM-FA-10J

GM-FA-10J Terminal Locations

GM-FA-10J to Guarded Machine



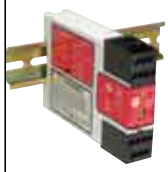
* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD038

ES-FA-..AA E-Stop Safety Module

ES-FA-..AA 1-Channel

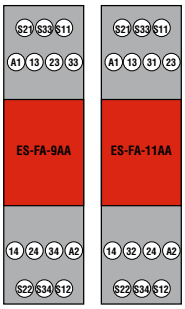


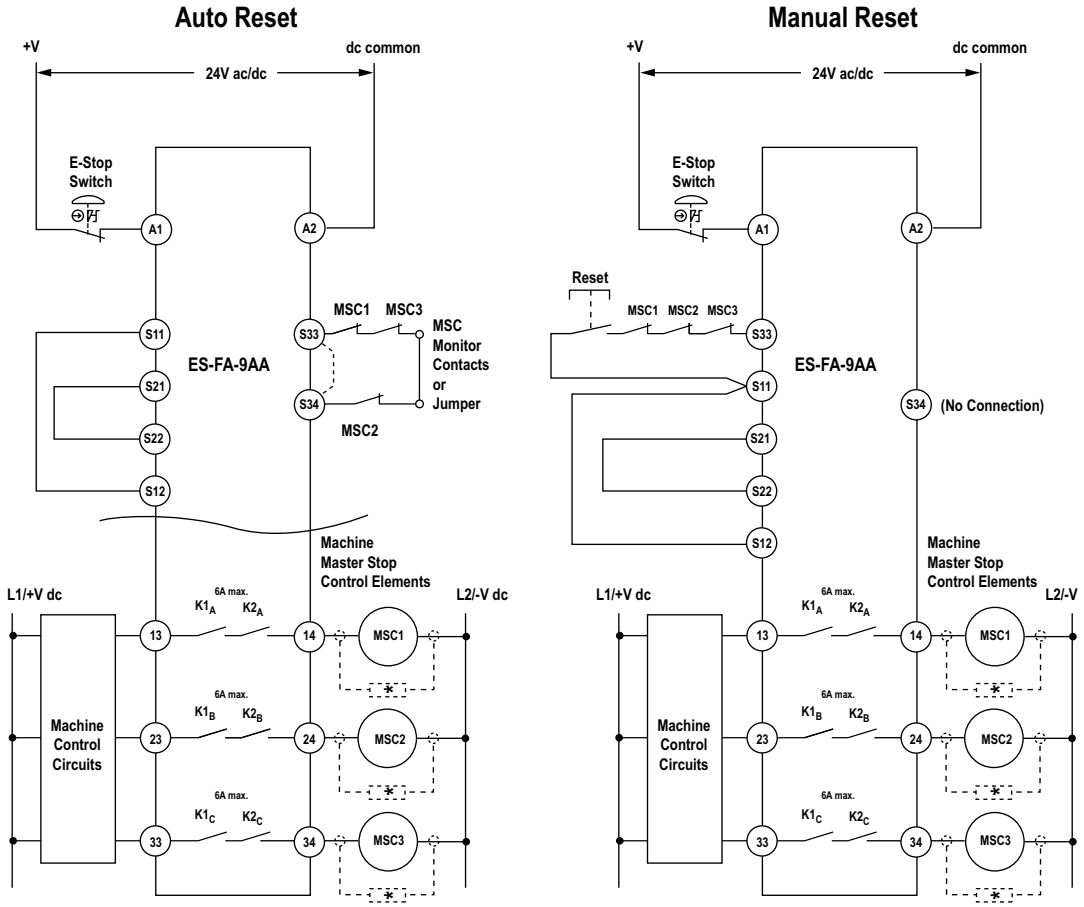
Page 81

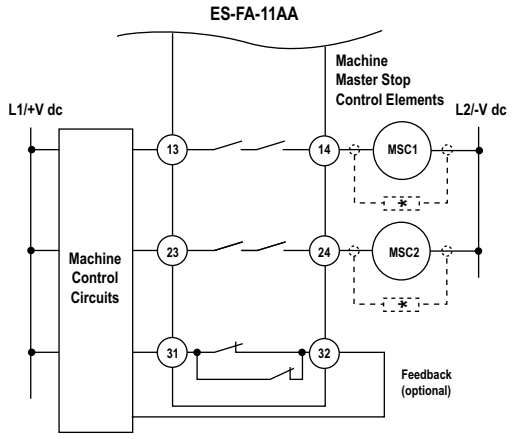
Models

- ES-FA-9AA
- ES-FA-11AA

ES-FA-..AA Terminal Locations







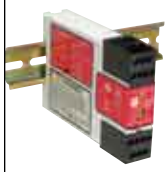
* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD039

ES-FA-...AA E-Stop Safety Module

ES-FA-...AA 2-Channel

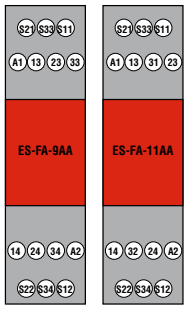


Page 81

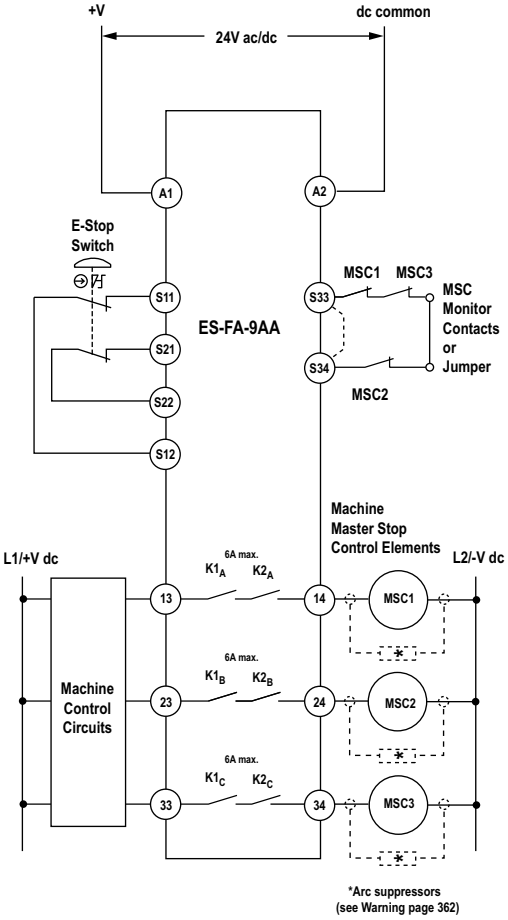
Models

- ES-FA-9AA
- ES-FA-11AA

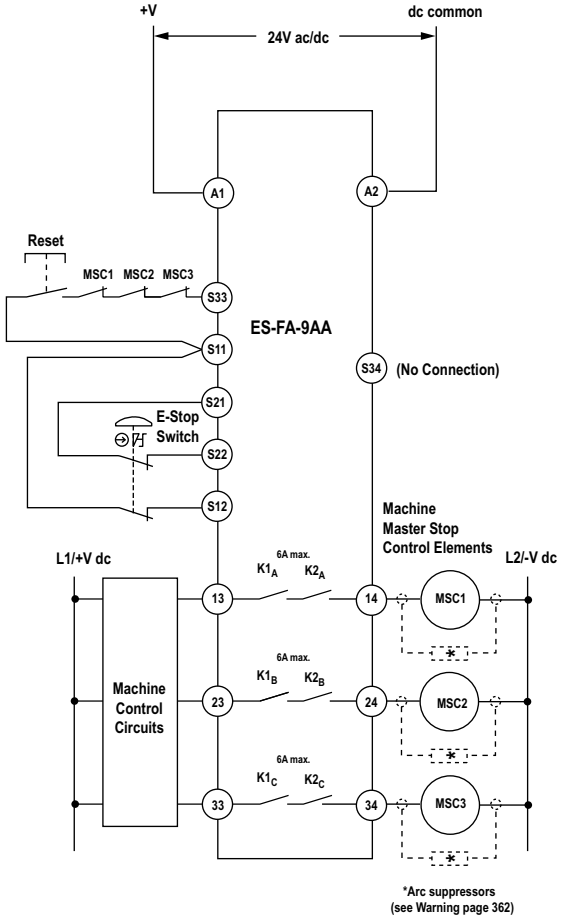
ES-FA-...AA Terminal Locations



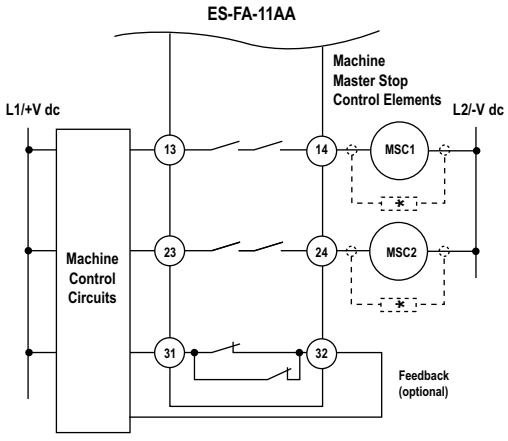
Auto Reset



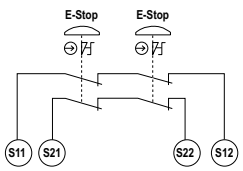
Manual Reset



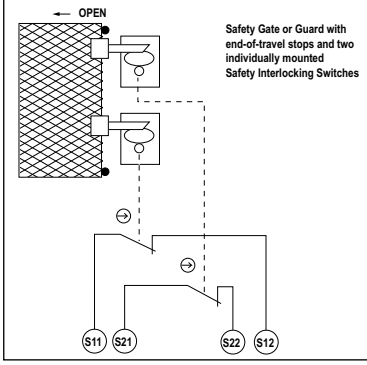
ES-FA-11AA



Series Connection of Multiple E-Stop Switches



Hookup Using Contacts from Two Safety Switches



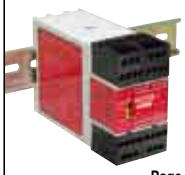
* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD040

ES-..A-.5 E-Stop Safety Module

ES-..A-5A 1-Channel

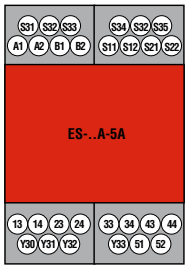


Page 81

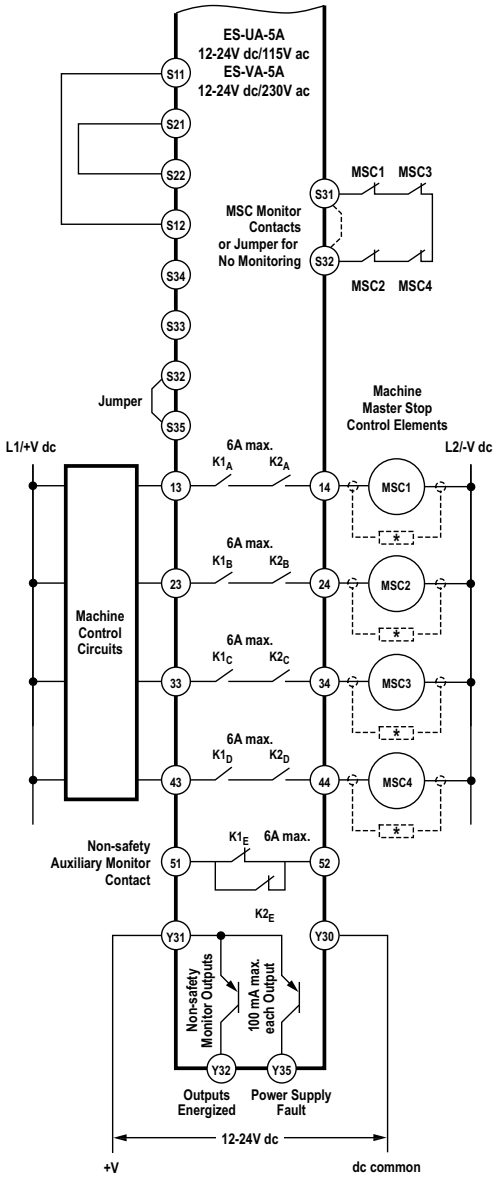
Models

- ES-UA-5A
- ES-VA-5A

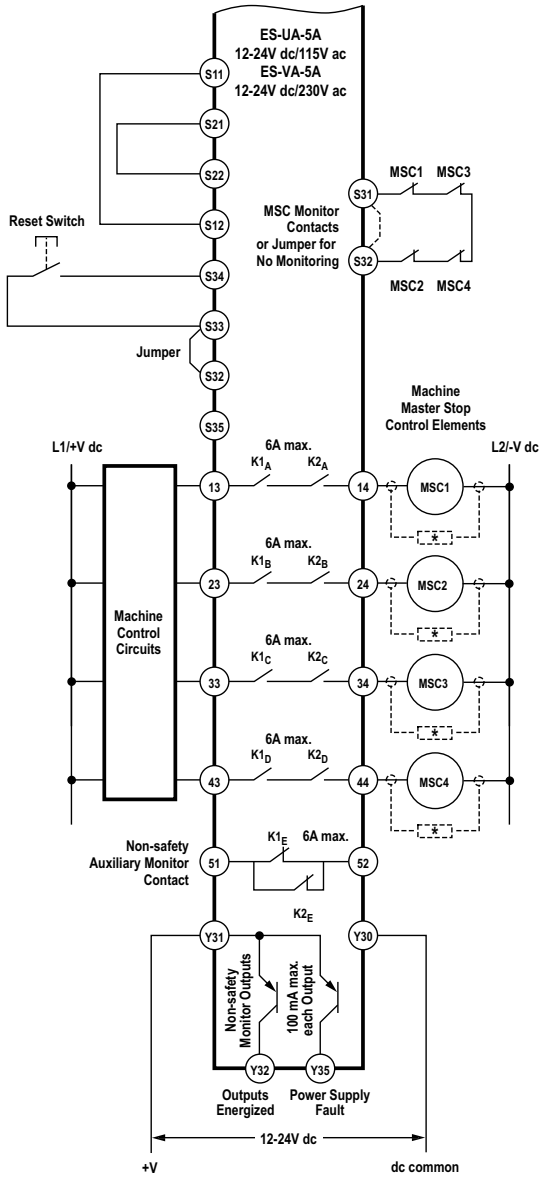
ES-..A-5A Terminal Locations



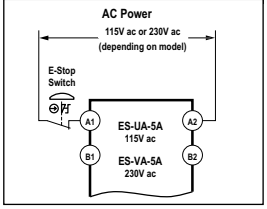
Auto Reset



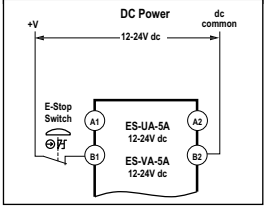
Manual Reset



AC Power Connection



DC Power Connection



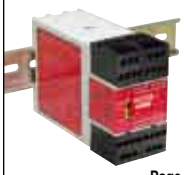
Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

* Arc Suppressors. See manual for specific warnings.

WD041

ES-..A-.5 E-Stop Safety Module

ES-..A-5A 2-Channel



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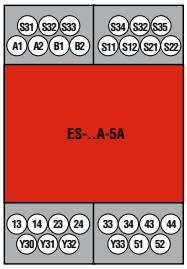
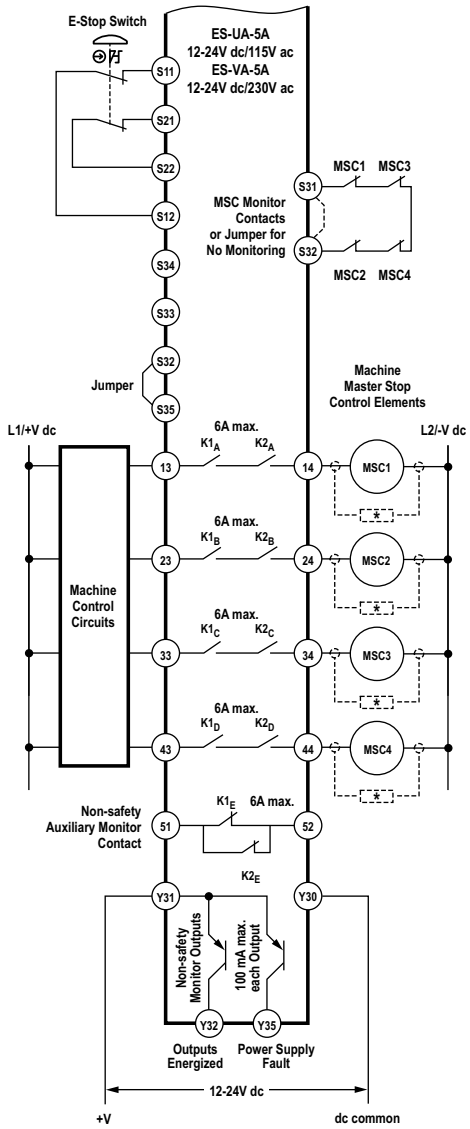
Models

- ES-UA-5A
- ES-VA-5A

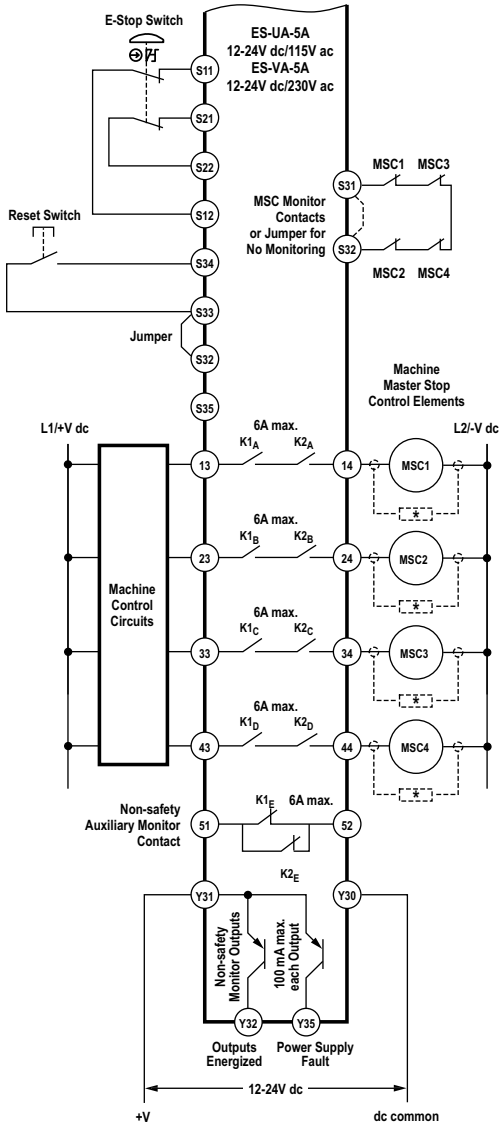
ES-..A-5A Terminal Locations



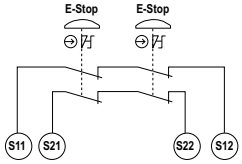
Auto Reset



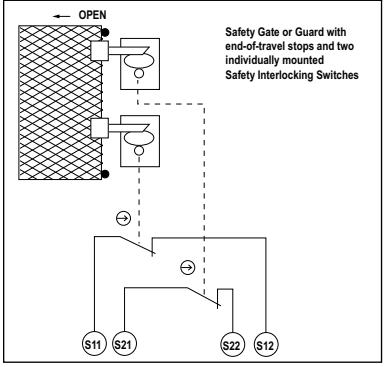
Manual Reset



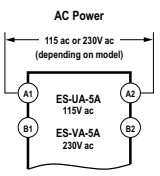
Series Connection of Multiple E-Stop Switches



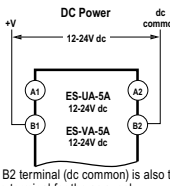
Hookup Using Contacts from Two Safety Switches



AC Power Connection



DC Power Connection



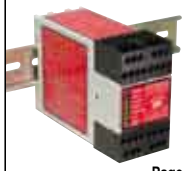
NOTE: B2 terminal (dc common) is also the earthing terminal for the ac supply.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

* Arc Suppressors. See manual for specific warnings.

WD042

ES-TN-1H.. E-Stop Safety Module



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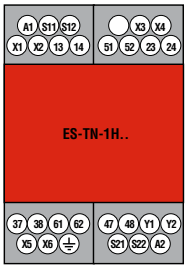
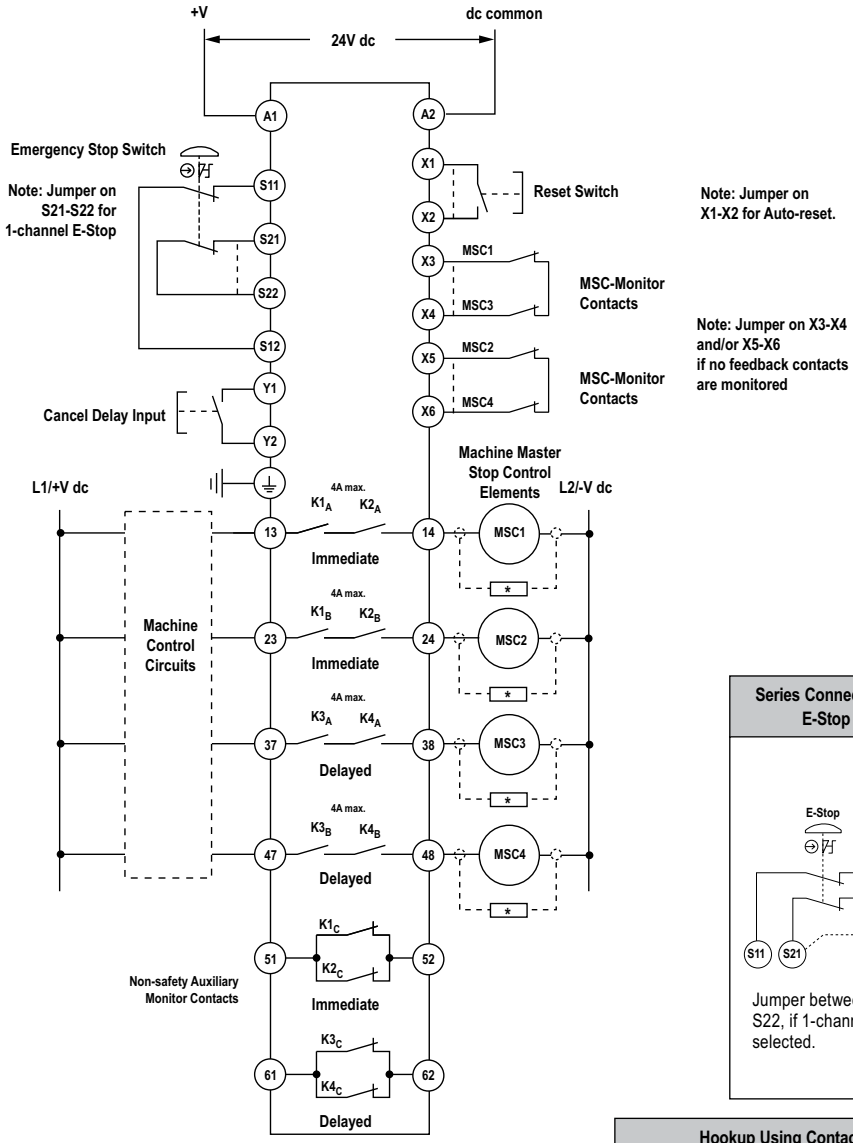
Models

- ES-TN-1H1
- ES-TN-1H2
- ES-TN-1H3
- ES-TN-1H4
- ES-TN-1H5
- ES-TN-1H6
- ES-TN-1H7
- ES-TN-1H8
- ES-TN-1H9
- ES-TN-1H10
- ES-TN-1H11
- ES-TN-1H12

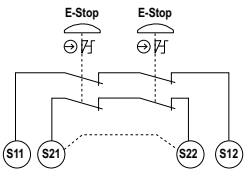
ES-TN-1H.. Terminal Locations



ES-TN-1H.. 2-Channel

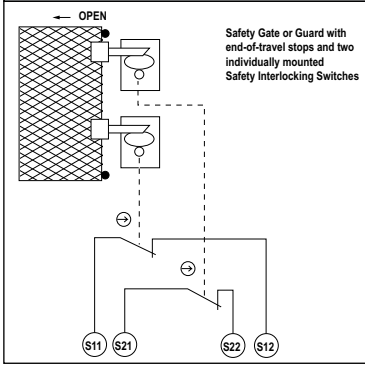


Series Connection of Multiple E-Stop Switches



Jumper between S21 and S22, if 1-channel E-Stop is selected.

Hookup Using Contacts from Two Safety Switches



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

* Arc Suppressors. See manual for specific warnings.

WD043

ES-TN-14.. E-Stop Safety Module

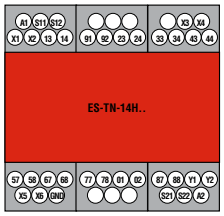
ES-TN-14H.. 2-Channel

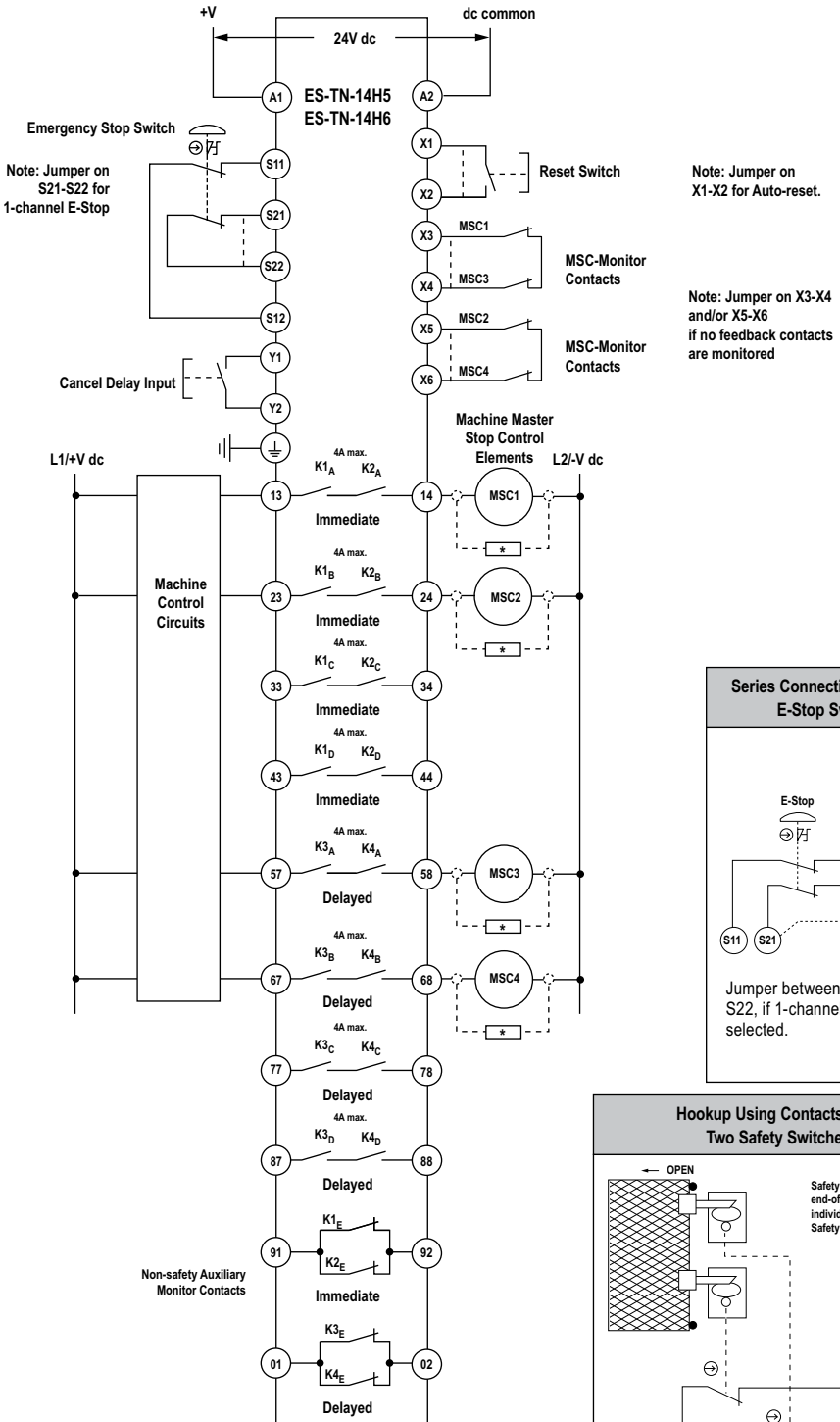
Page 81

Models

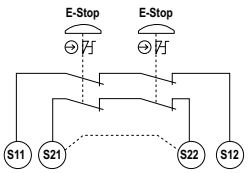
- ES-TN-14H5
- ES-TN-14H6

ES-TN-14H. Terminal Locations



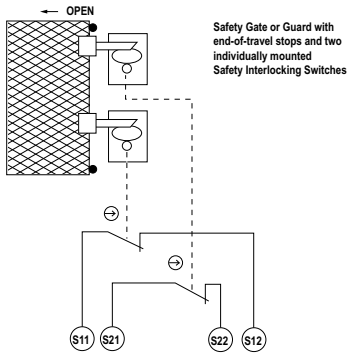


Series Connection of Multiple E-Stop Switches



Jumper between S21 and S22, if 1-channel E-Stop is selected.

Hookup Using Contacts from Two Safety Switches



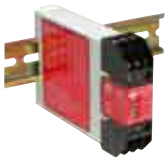
* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD044

ES-FA-6G E-Stop Safety Module

ES-FA-6G 1-Channel



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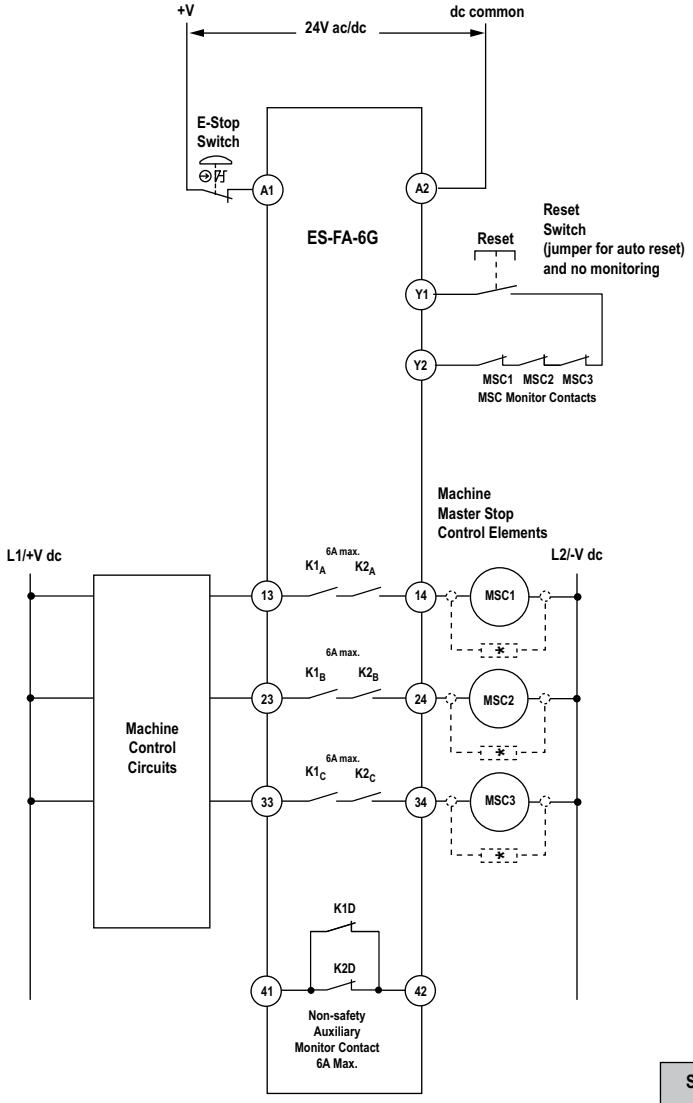
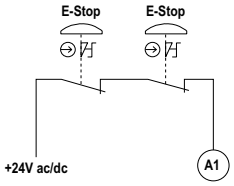
Models

• ES-FA-6G

ES-FA-6G Terminal Locations



Series Connection of Multiple E-Stop Switches



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

* Arc Suppressors. See manual for specific warnings.

WD045

UM-A... Universal Safety Module

UM-FA-..A Hard Contact, 2-Channel

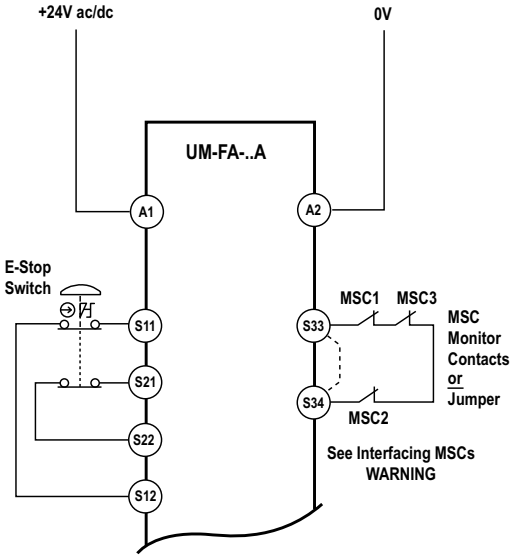
Page 89

Models

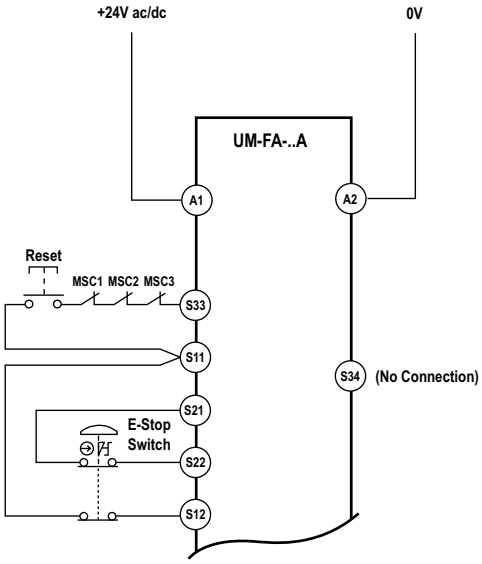
- UM-FA-9A
- UM-FA-11A

UM-FA-..A Terminal Locations

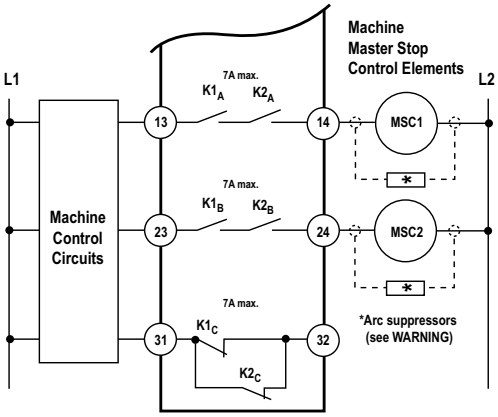
Auto Reset



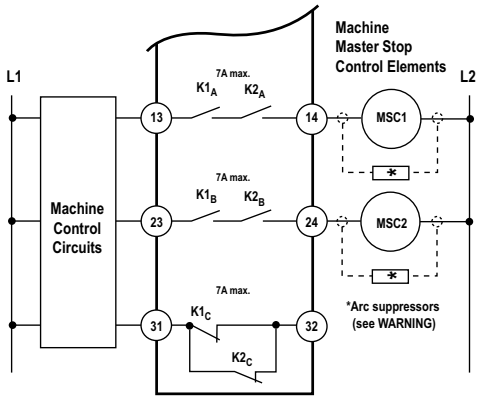
Manual Reset



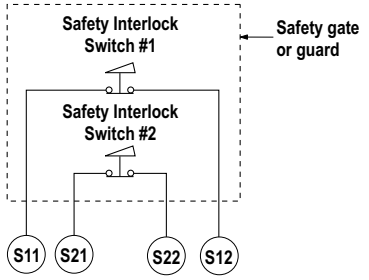
UM-FA-9A Machine Connection



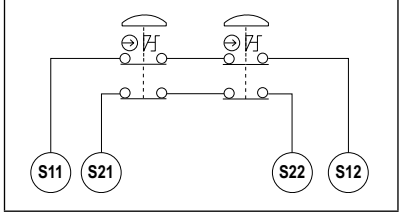
UM-FA-11A Machine Connection



Two Safety Switches



Multiple E-stops



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

* Arc Suppressors. See manual for specific warnings.

WD046

UM-FA-..A Universal Safety Module

UM-FA-..A Hard Contact, 1-Channel

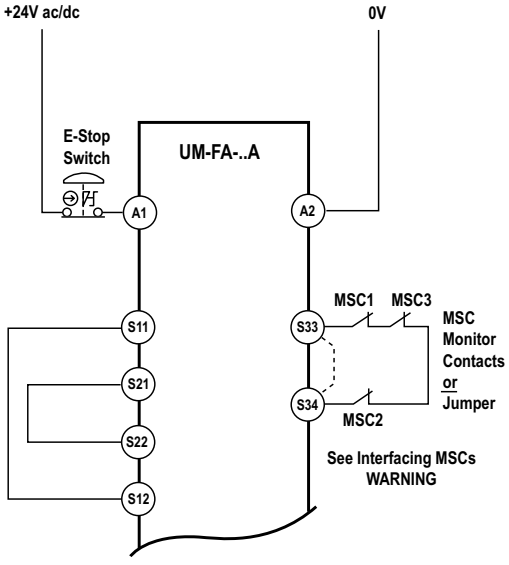
Page 89

Models

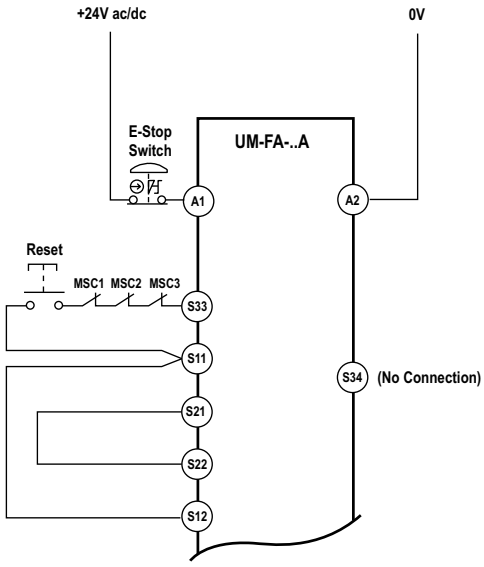
- UM-FA-9A
- UM-FA-11A

UM-FA-..A Terminal Locations

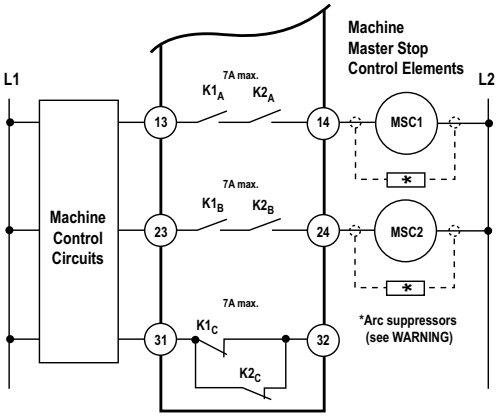
Auto Reset



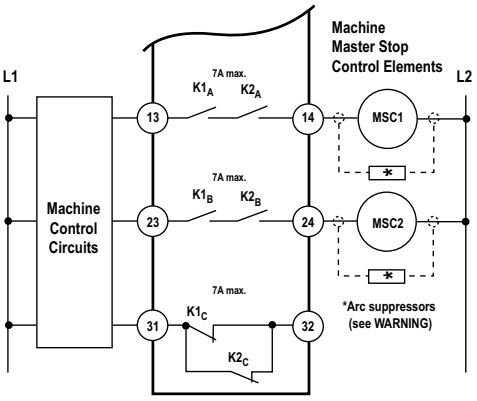
Manual Reset



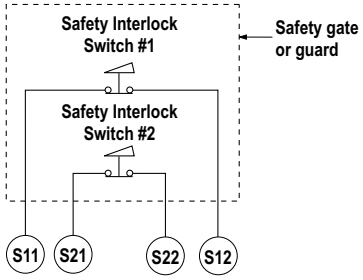
UM-FA-9A Machine Connection



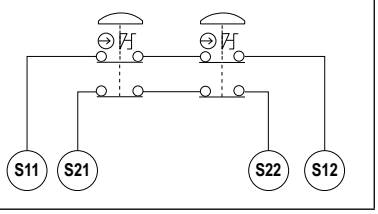
UM-FA-11A Machine Connection



Two Safety Switches



Multiple E-stops



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

* Arc Suppressors. See manual for specific warnings.

WD047

UM-FA-..A Universal Safety Module

UM-FA-..A Solid-State, 2 channel

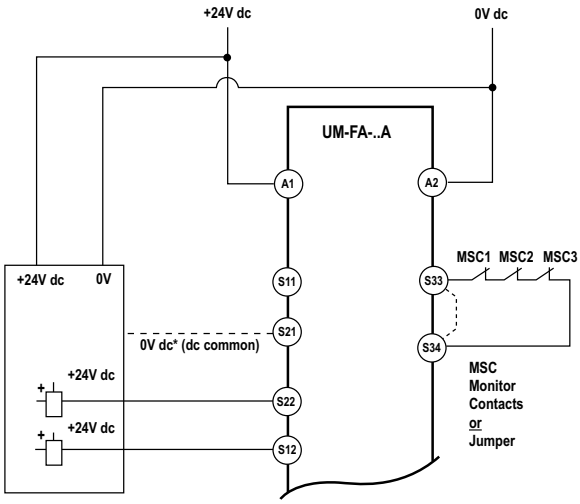
Page 89

Models

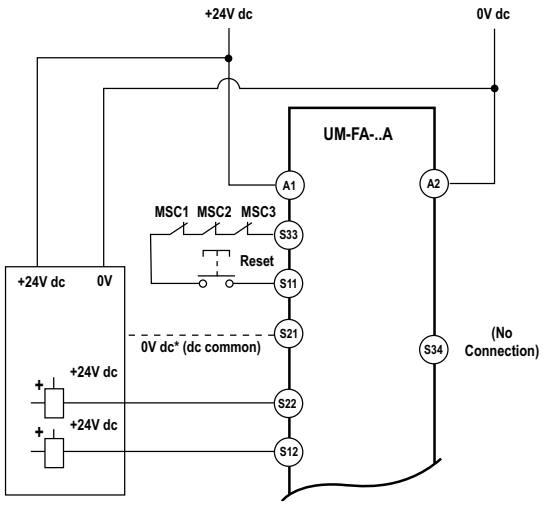
- UM-FA-9A
- UM-FA-11A

UM-FA-..A Terminal Locations

Auto Reset

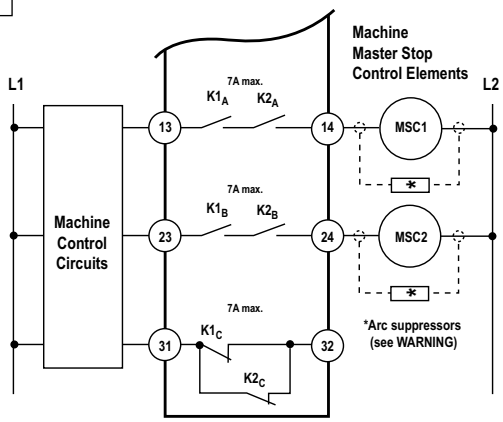


Manual Reset

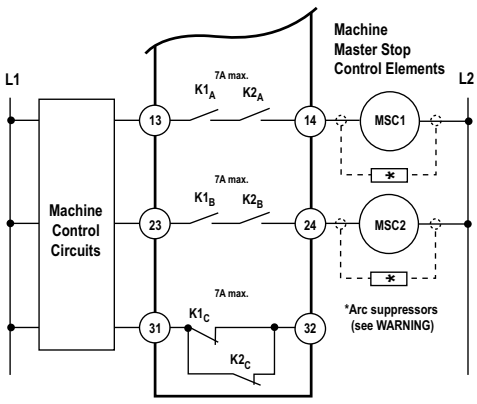


* S21 must be connected to 24V dc output common only in 24V ac supply applications.

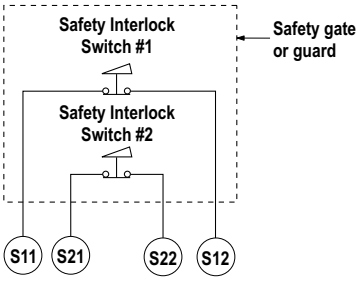
UM-FA-9A Machine Connection



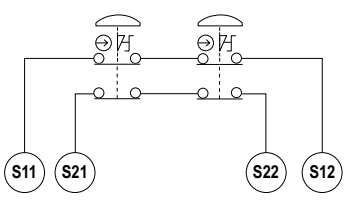
UM-FA-11A Machine Connection



Two Safety Switches



Multiple E-stops



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD048

SM-..A-5A Safety Mat Monitoring Module

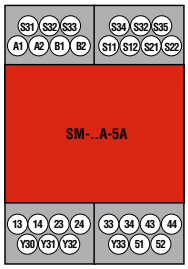
SM-..A-5A to 4-Wire Safety Mat

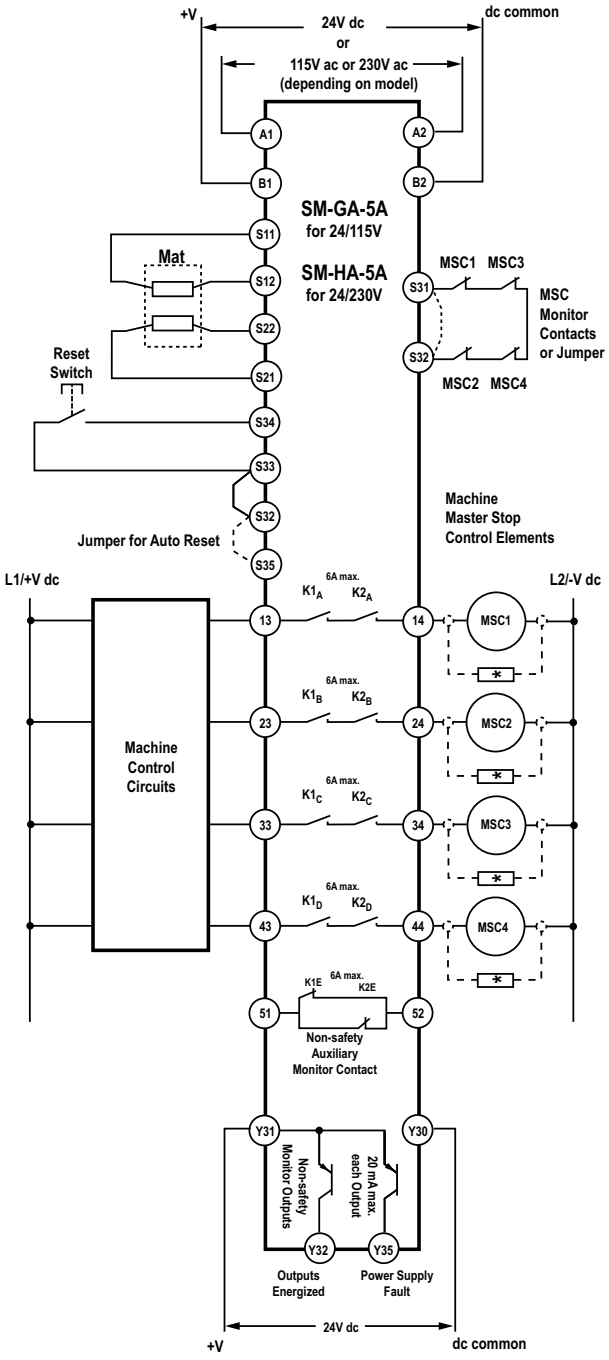
Page 91

Models

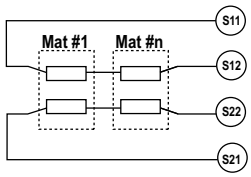
- SM-GA-5A
- SM-HA-5A

SM-..A-5A Terminal Locations





Series Connection of Multiple E-Stop Switches



NOTE: The number of mats is limited by the total series resistance per input channel.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

* Arc Suppressors. See manual for specific warnings.

WD049

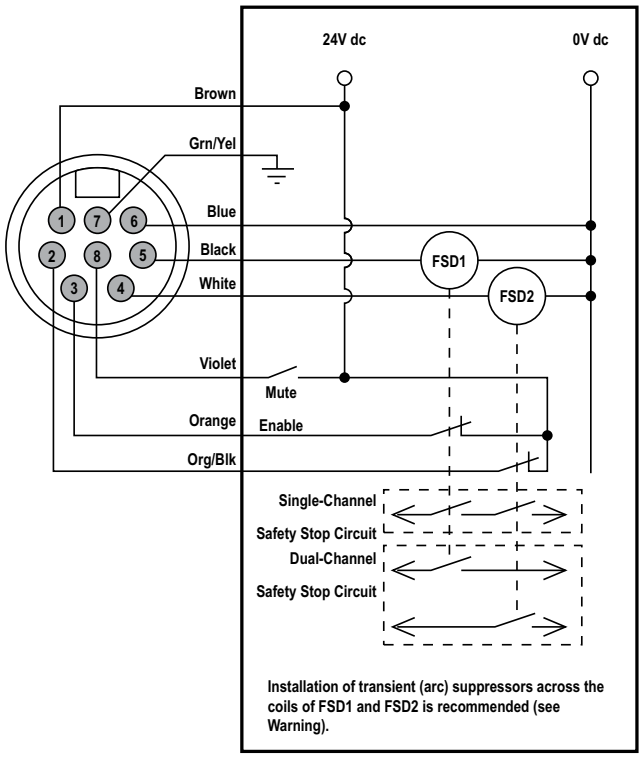
MM-TA-12B and MM2-TA-12B Muting Modules

2 FSDs, 2-Channel EDM, Mute Enable

Page 94

Models

- MM-TA-12B
- MM2-TA-12B



Installation of transient (arc) suppressors across the coils of FSD1 and FSD2 is recommended (see Warning).

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD050

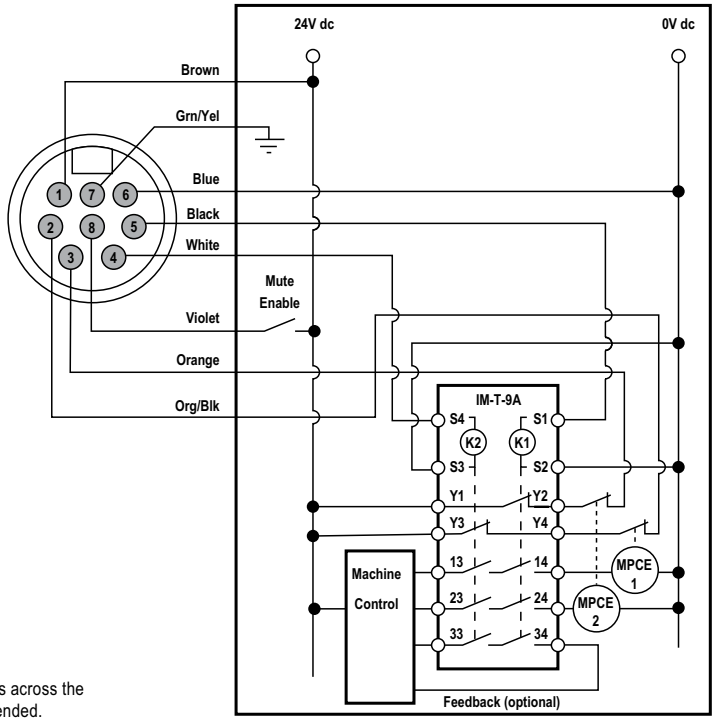
MM-TA-12B and MM2-TA-12B Muting Modules

Generic Hookup, 2-Channel EDM, Mute enabled to IM-TA-..A

Page 94

Models

- MM-TA-12B
- MM2-TA-12B



Installation of transient (arc) suppressors across the coils of MPCE1 and MPCE2 is recommended.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD051

MMD-TA-12B DIN-Rail Muting Module

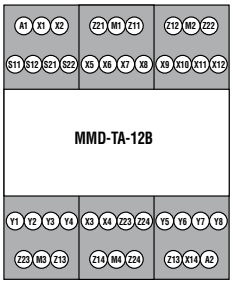
Solid-State Output, 2 FSDs and 2-Channel EDM

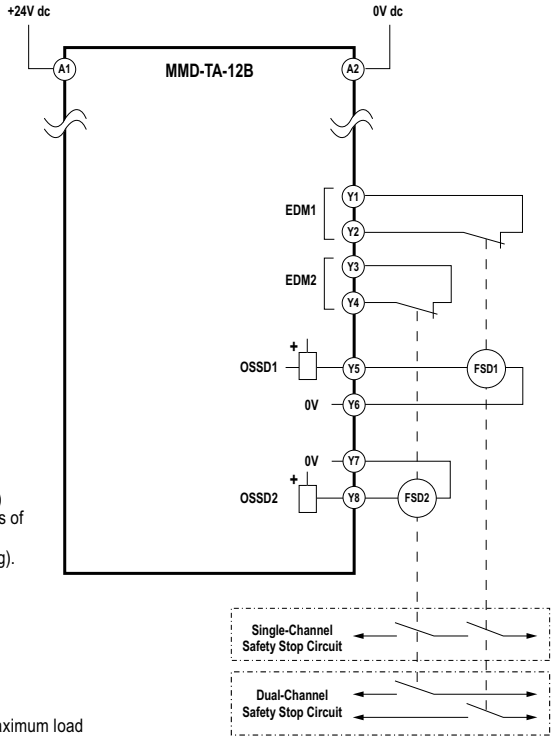
Page 94

Models

• MMD-TA-12B

MMD-TA-12B Terminal Locations





Installation of transient (arc) suppressors across the coils of FSD1 and FSD2 is recommended (see Warning).

NOTE: Do not exceed OSSD maximum load capacitance specifications.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD052

MMD-TA-11B DIN-Rail Muting Module

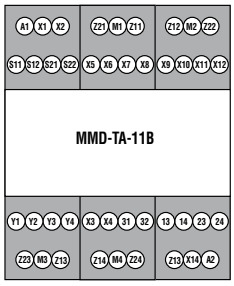
Relay Outputs

Page 94

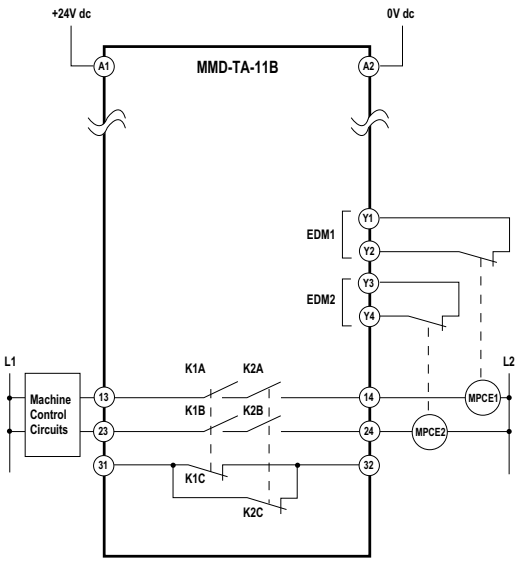
Models

• MMD-TA-11B

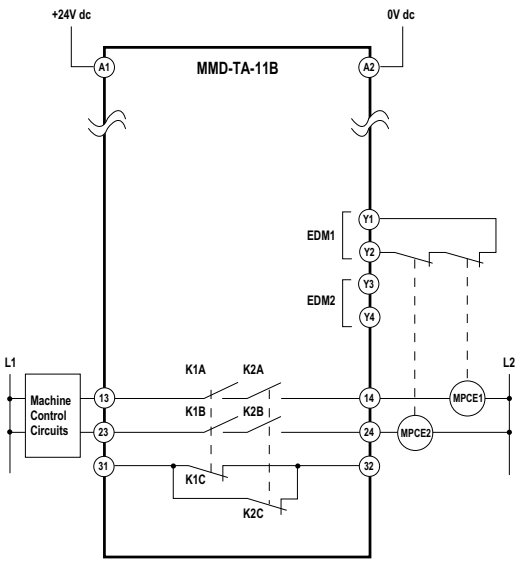
MMD-TA-11B Terminal Locations



2-Channel EDM



1-Channel EDM



Installation of transient (arc) suppressors recommended across MPCE1 and MPCE2.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD053

MMD-TA-12B DIN-Rail Muting Module

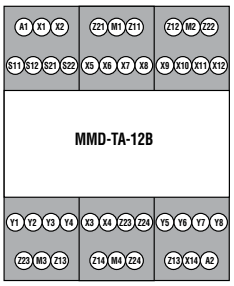
2-Channel EDM with Interface Model

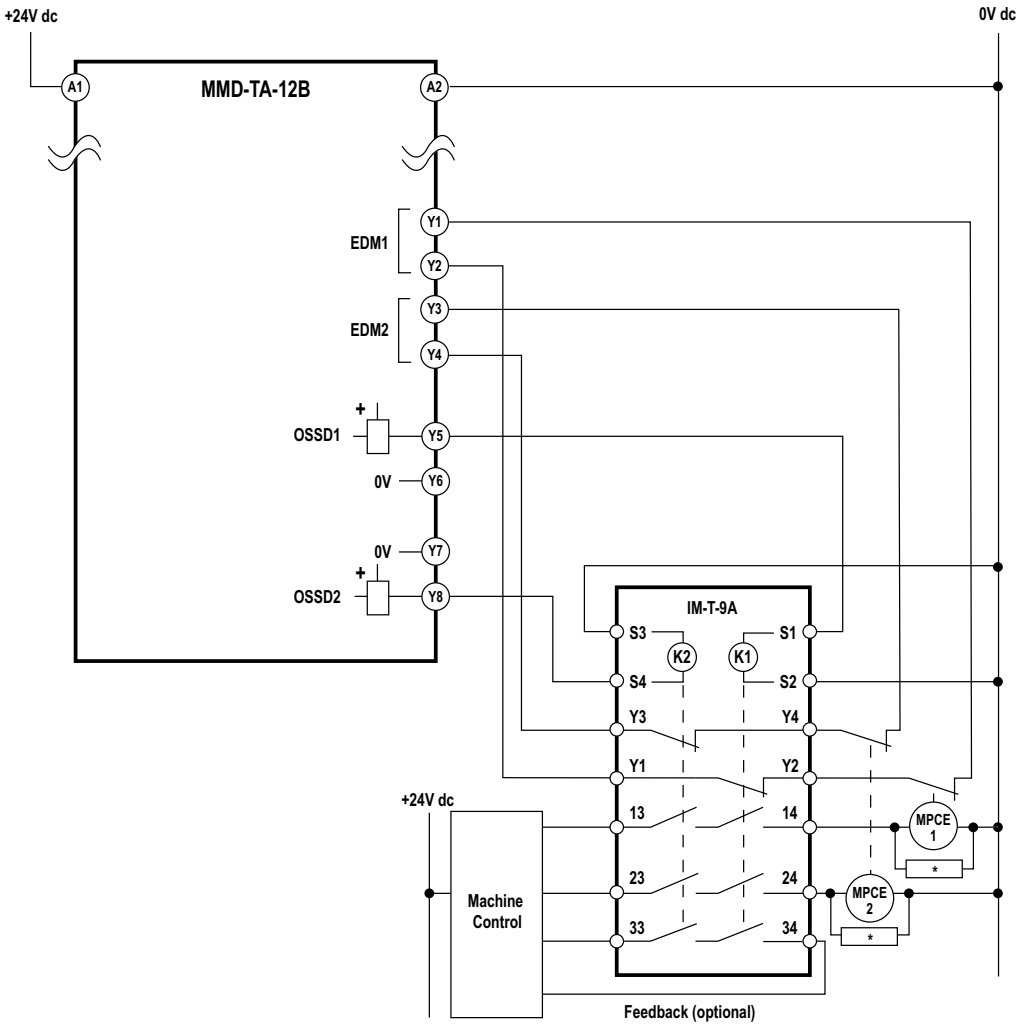
Page 94

Models

• MMD-TA-12B

MMD-TA-12B Terminal Locations





* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD054

MMD-TA-12B DIN-Rail Muting Module

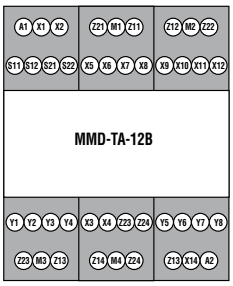
1-Channel EDM with Interface Model

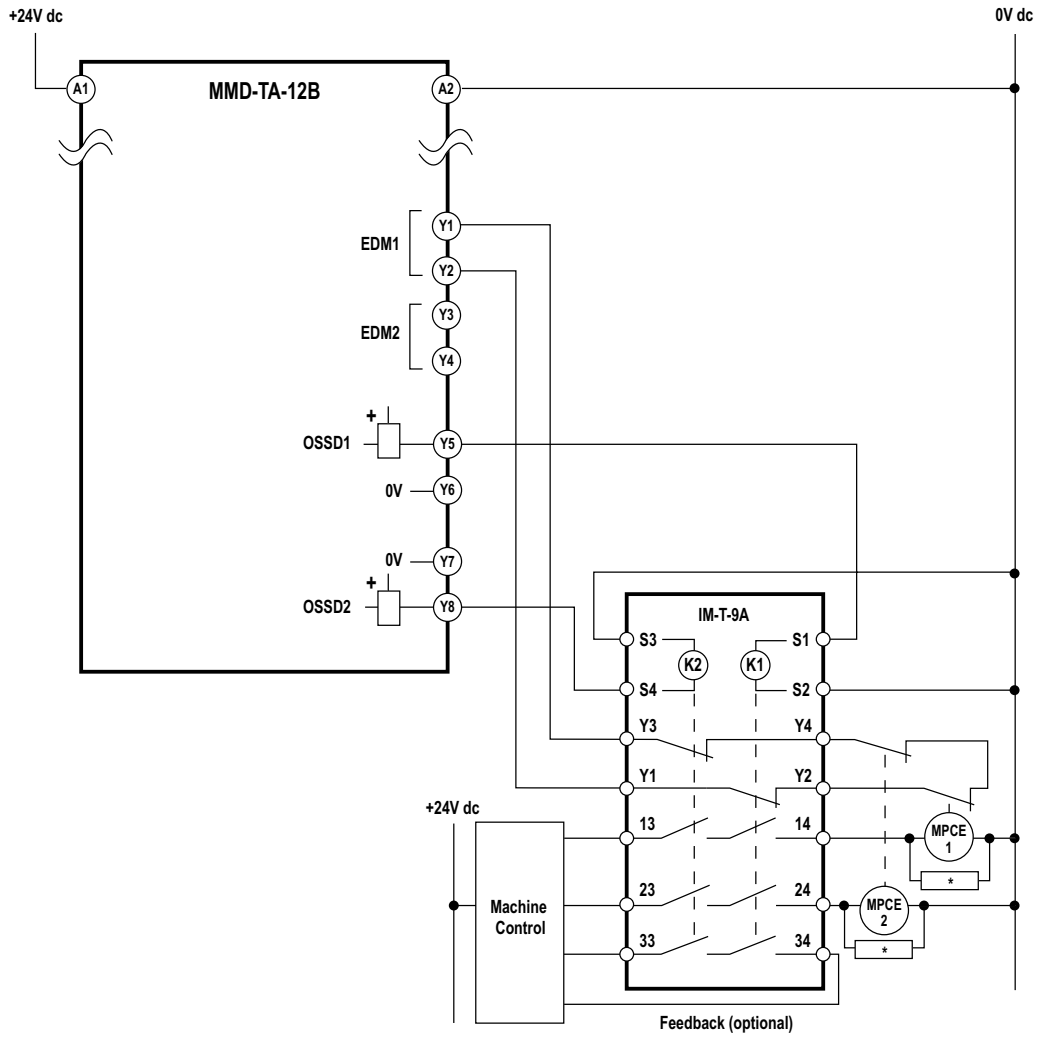
Page 94

Models

- MMD-TA-12B

MMD-TA-12B Terminal Locations





Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

* Arc Suppressors. See manual for specific warnings.

WD055

SSM Safe Speed Monitor Module

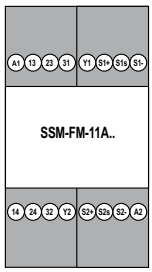
SSM-FM-11.. to Two PNP Sensors

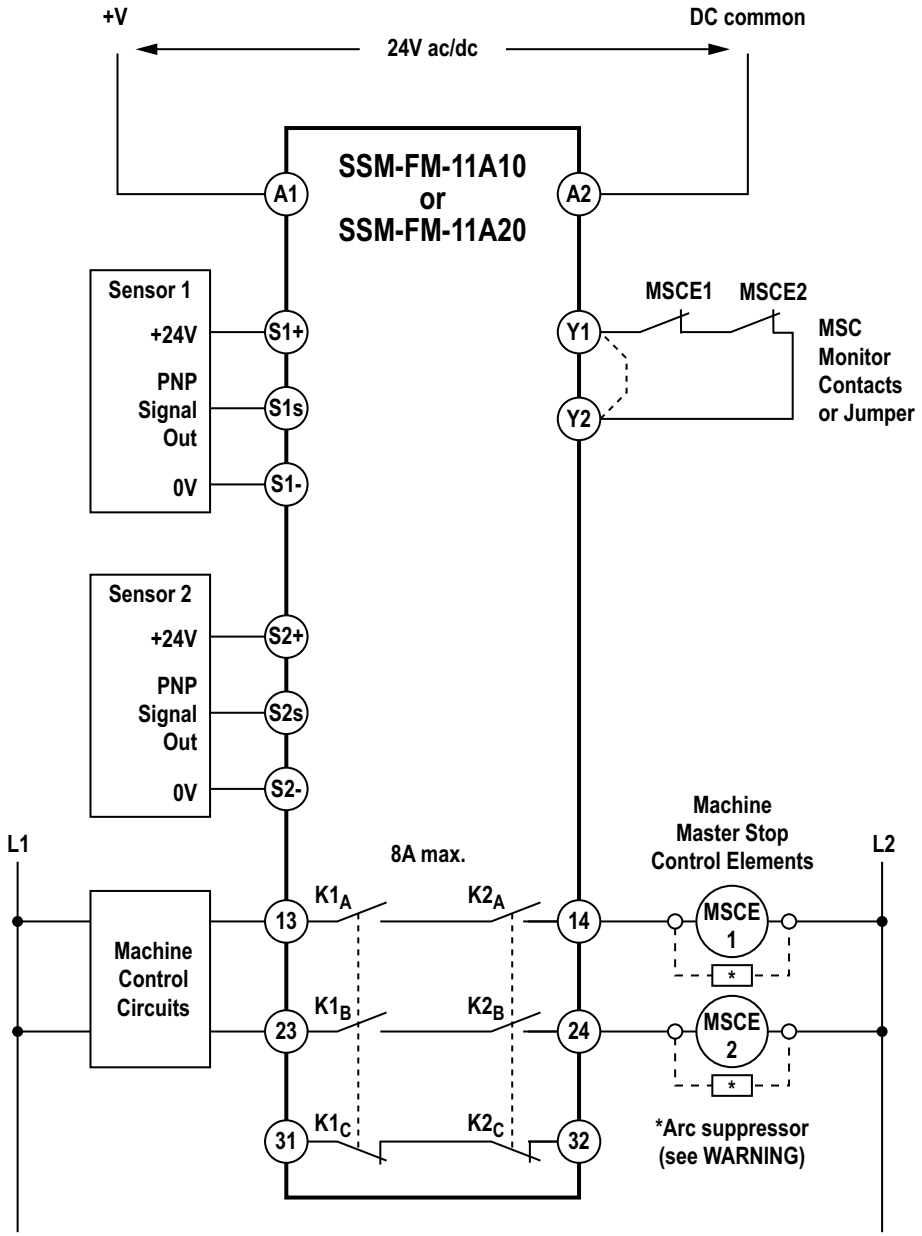
Page 103

Models

- SSM-FM-11A10
- SSM-FM-11A20

**SSM-FA-11A..
Terminal Locations**





Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

* Arc Suppressors. See manual for specific warnings.

WD056

EM-T-7A Extension Module

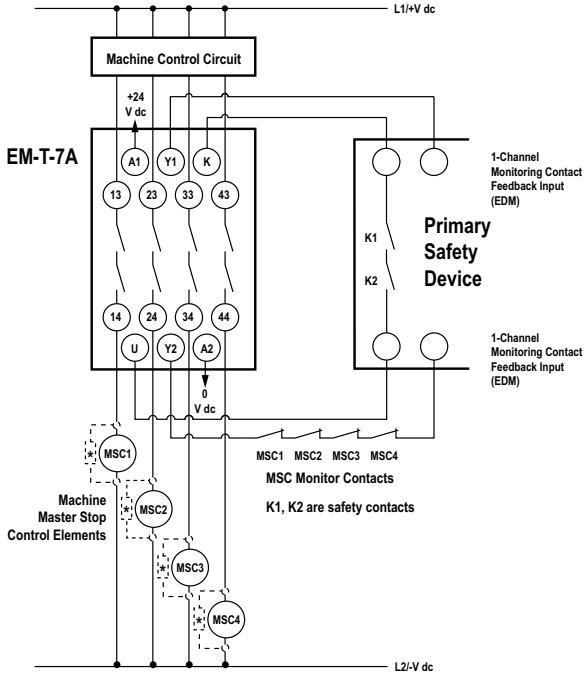
EM-T-7A 1-Channel EDM

Page 105

Models

• EM-T-7A

EM-T-7A Terminal Locations



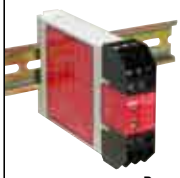
Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

* Arc Suppressors. See manual for specific warnings.

WD057

EM-T-7A Extension Module

EM-T-7A 2-Channel EDM

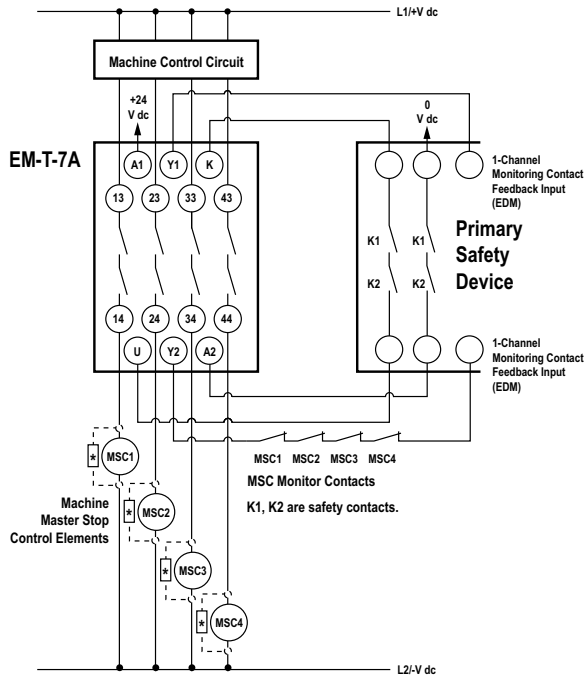


Page 105

Models

• EM-T-7A

EM-T-7A Terminal Locations

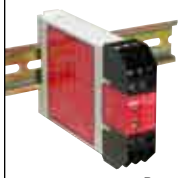


Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

* Arc Suppressors. See manual for specific warnings.

WD058

EM-F-7G Extension Module



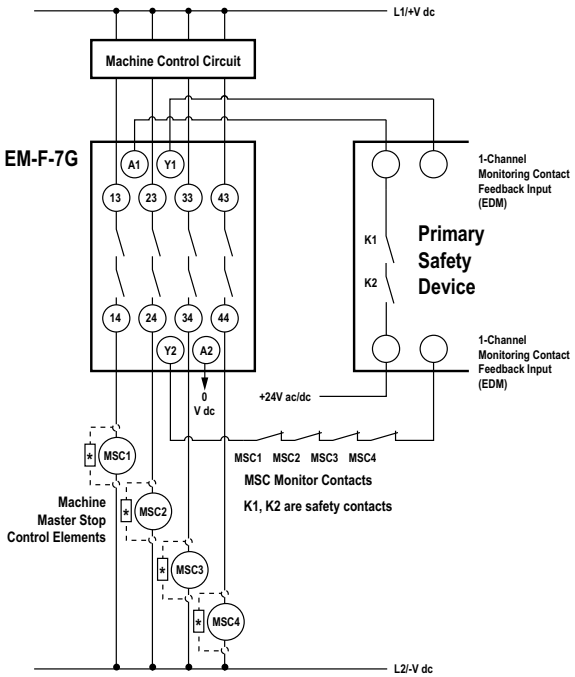
Page 105

Models

- EM-F-7G

EM-F-7G Terminal Locations

EM-F-7G 1-Channel EDM

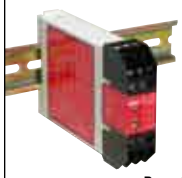


* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD059

EM-FD-7G.. Extension Module



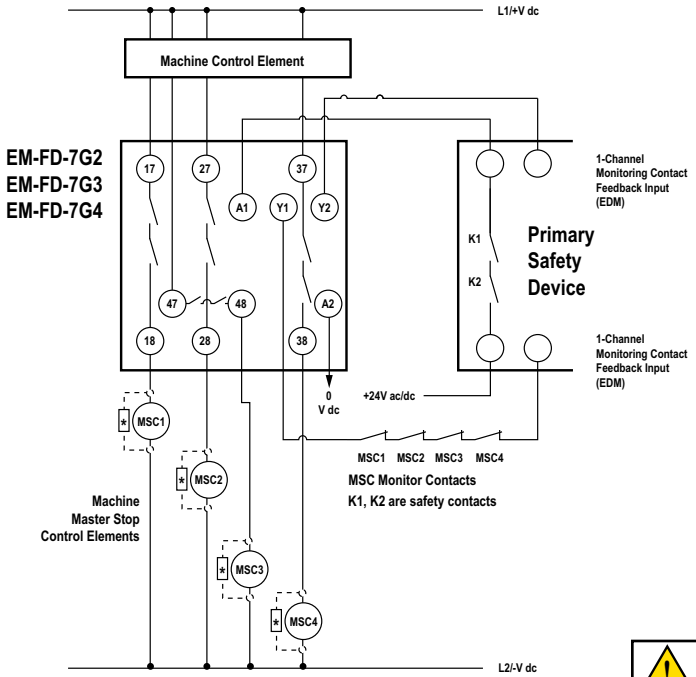
Page 105

Models

- EM-FD-7G2
- EM-FD-7G3
- EM-FD-7G4

EM-FD-7G Terminal Locations

EM-FD-7G.. 1-Channel EDM



* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD060

IM-T-..A Interface Module

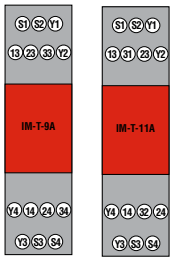
IM-T-..A 2-Channel Primary Safety Device with 2 FSDs and 2 EDM

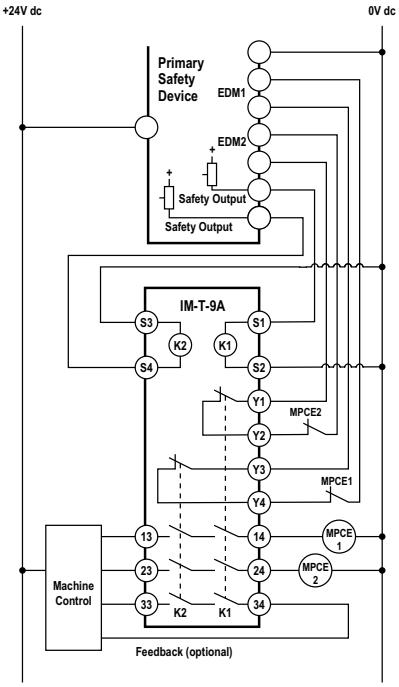
Page 107

Models

- IM-T-9A
- IM-T-11A

IM-T-..A Terminal Locations





Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

* Arc Suppressors. See manual for specific warnings.

WD061

IM-T-..A Interface Module

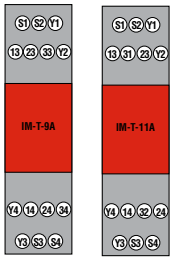
IM-T-..A 2-Channel Primary Safety Device with 2 PNP and 1 EDM

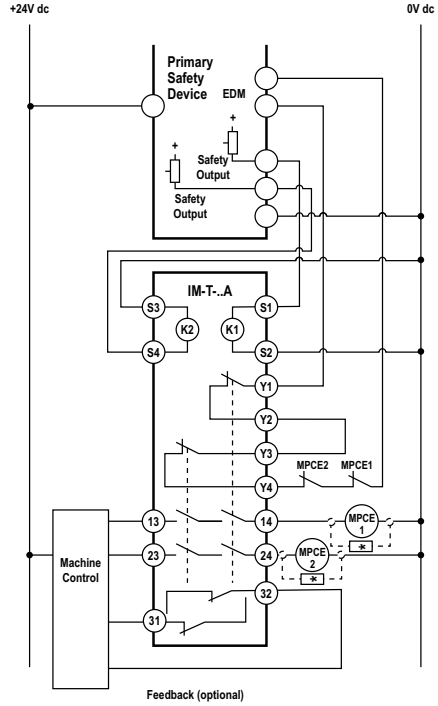
Page 107

Models

- IM-T-9A
- IM-T-11A

IM-T-..A Terminal Locations





Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

* Arc Suppressors. See manual for specific warnings.

WD062

IM-T-..A Interface Module

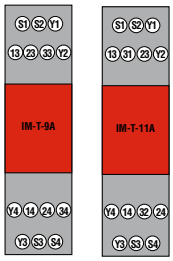
IM-T-..A 2-Channel Primary Safety Device with 2 FSDs and 1 EDM

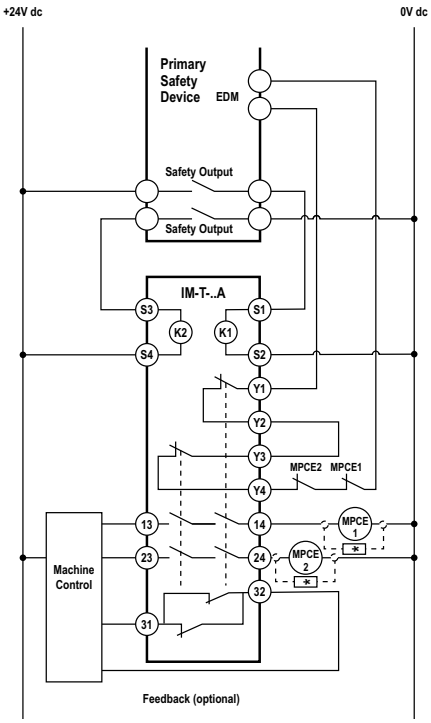
Page 107

Models

- IM-T-9A
- IM-T-11A

IM-T-..A Terminal Locations





* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD063

IM-T-..A Interface Module

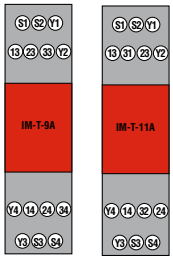
IM-T-..A 1-Channel Primary Safety Device with 1 Redundant-Relay and 1 EDM

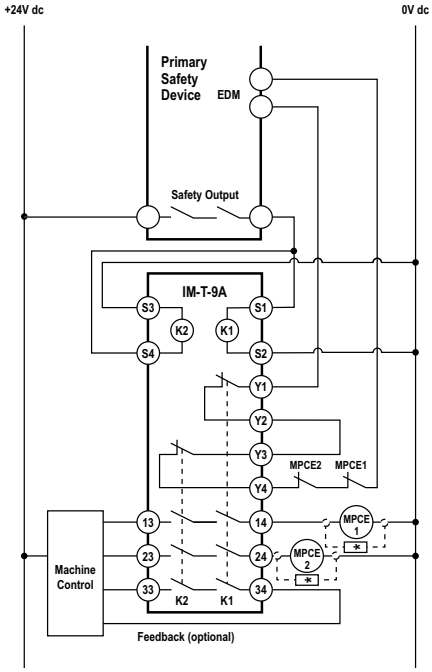
Page 107

Models

- IM-T-9A
- IM-T-11A

IM-T-..A Terminal Locations





* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD064

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

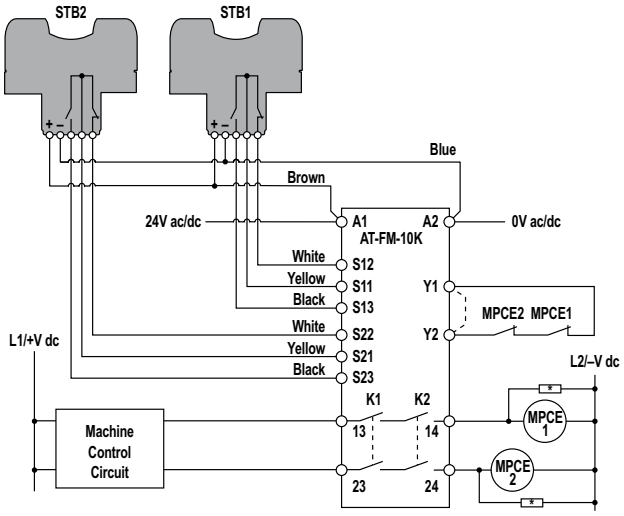
Page 111

Models

• AT-FM-10K

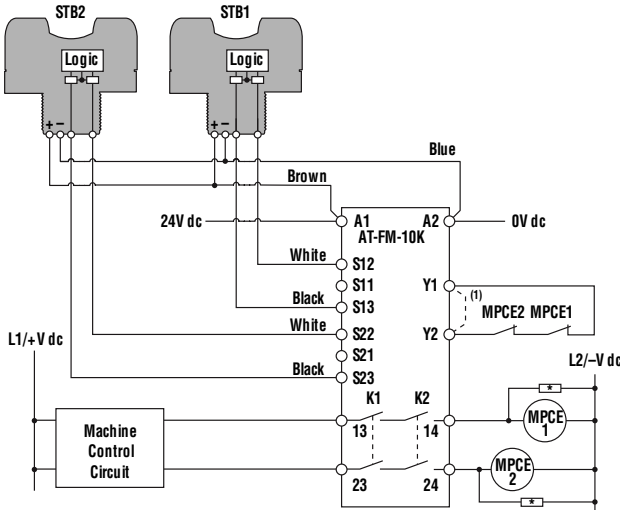
AT-FM-10K Terminal Locations

AT-FM-10K to Two STB Touch Buttons with Contact Outputs



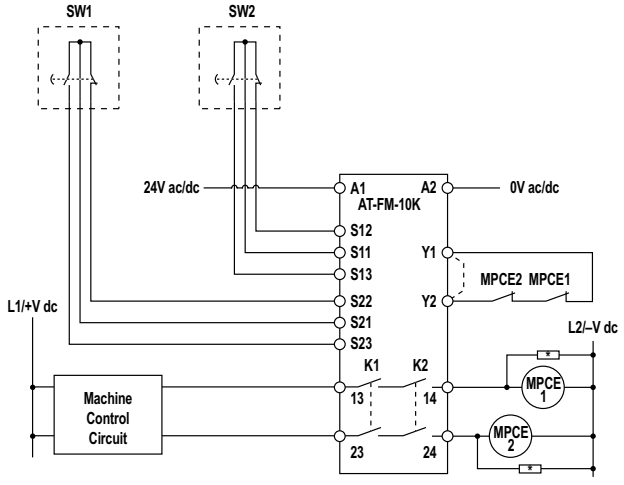
Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

AT-FM-10K to Two STB Touch Buttons with PNP (Sourcing) Outputs



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

AT-FM-10K to Two Mechanical Push Buttons with Contact Outputs



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

* Arc Suppressors. See manual for specific warnings.

WD065

STB Self-Checking Touch Buttons

Solid-State Sourcing (PNP) Outputs

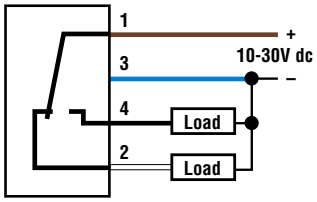
Page 117

Models

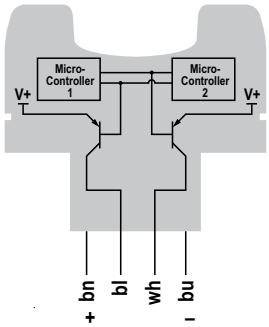
• STBVP6.. models

Key

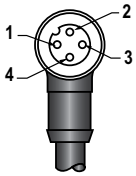
1 = Brown
2 = White
3 = Blue
4 = Black



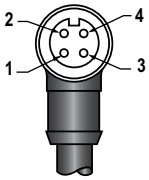
Solid-State
10-30V dc



4-Pin Euro



4-Pin Mini



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD066

STB Self-Checking Touch Buttons

Electromechanical Relay Output

Page 117

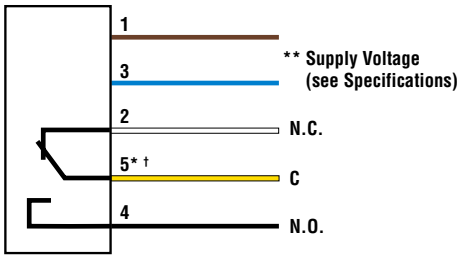
Models

• STBVR81.. models

Key

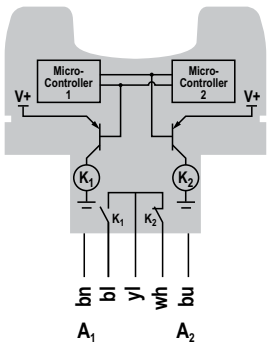
5-Pin Euro
1 = Brown
2 = White
3 = Blue
4 = Black
5 = Gray†

5-Pin Mini
1 = Brown
2 = White
3 = Blue
4 = Black
5 = Yellow*

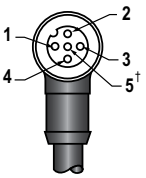


** NOTE: Connection of dc power is without regard to polarity.

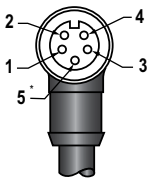
Relay
20-30V ac/dc



5-Pin Euro



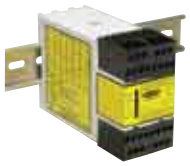
5-Pin Mini



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD067

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

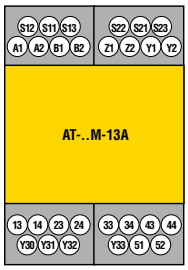


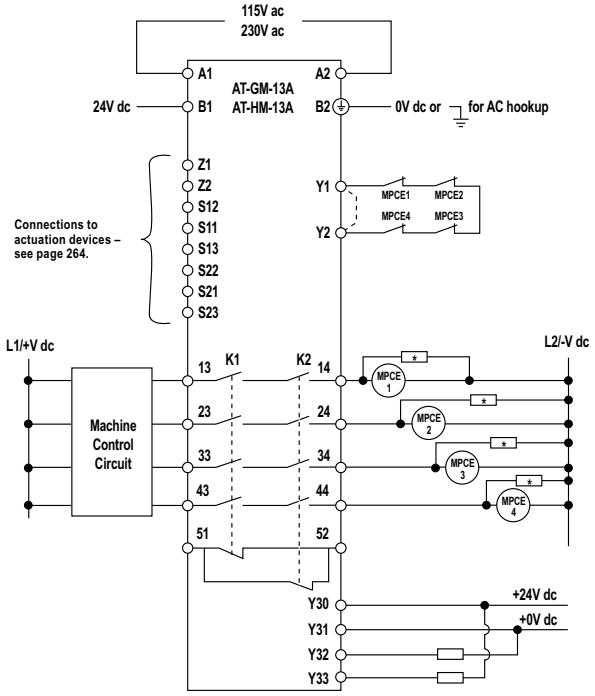
Page 111

Models

- AT-GM-13A
- AT-HM-13A

AT-..M-13A Terminal Locations





* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD068

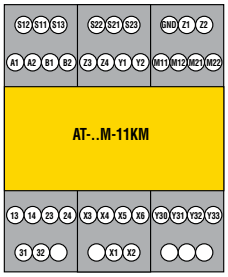
DUO-TOUCH® SG Two-Hand Control Modules, STB Compatible

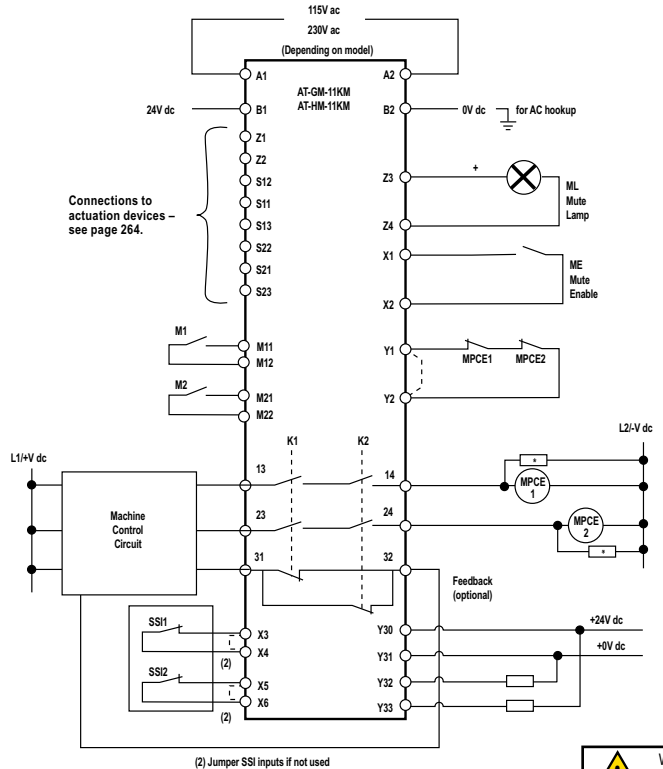
Page 111

Models

- AT-GM-11KM
- AT-HM-11KM

AT-..M-10K Terminal Locations





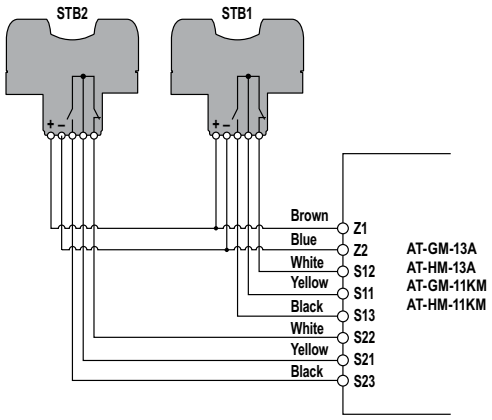
* Arc Suppressors. See manual for specific warnings.

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD069

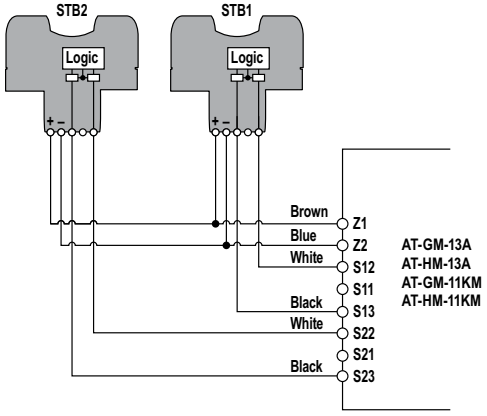
DUO-TOUCH® SG Two-Hand Control Modules, Actuation Device Hookups

AT-..M-13A and AT-..M-11KM to Two STB Touch Buttons with Contact Outputs



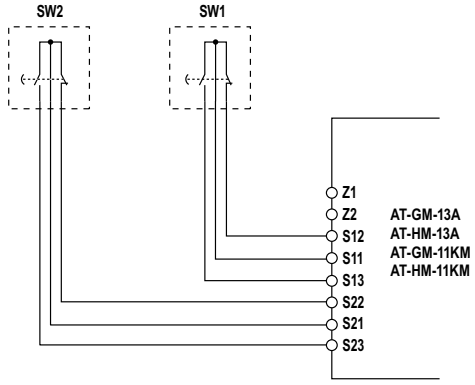
Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

AT-..M-13A and AT-..M-11KM to Two STB Touch Buttons with PNP (Sourcing) Outputs



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

AT-..M-13A and AT-..M-11KM to Two Mechanical Push Buttons with Contact Outputs



Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

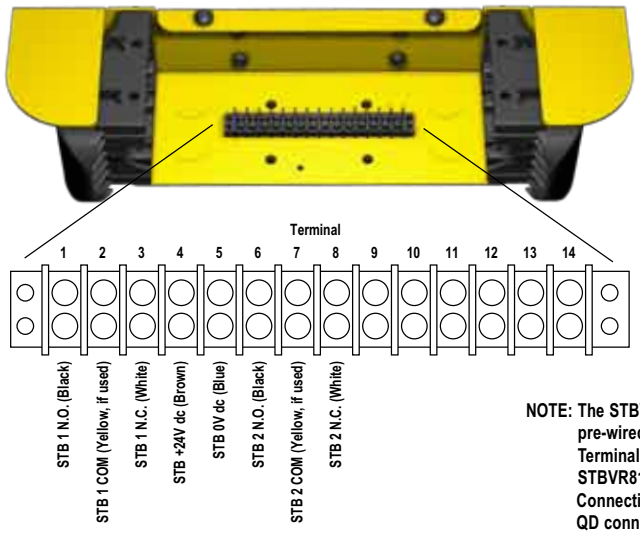
WD070

DUO-TOUCH® Run Bar with STBs

Page 120

Models

• STBVP6-RB1..



NOTE: The STBVP6 hand control buttons are pre-wired to terminals 1, 3, 4, 5, 6, and 8. Terminals 2 and 7 are reserved for use of STBVR81 buttons. Connection of EZ-LIGHT indicator(s) and QD connectores not shown. (See data sheet P/N 131634 for details)

Wiring diagrams are for information only. See appropriate manuals for all specific warnings, cautions and information for use.

WD071

EZ-LIGHT™ for Two-Hand Control

Page 192

LED Function	Brown Wire	Gray Wire	Black Wire	White Wire	Typical Function
Red ON	+V dc	—	—	—	Stop and/or Not Ready
Blue ON	+V dc	+V dc	—	—	Stopped, but Ready/Enabled
Green ON	+V dc	+V dc	+V dc	—	Go
Yellow ON	+V dc	+V dc	+V dc	+V dc	Mute Condition
Red Flashing	Any other hookup combination				Abnormal State

NOTES:
- Blue wire connected to 0V dc
- Supply Voltage and Current = 10 to 30V dc, 60 mA max.

A

Access guard
A type of perimeter guarding, typically used to guard doorways, cell entries or exits, walkways, and machine access points.

Adjustable guard
A guard that can be adjusted to accommodate various jobs or set-ups.

Angle of Divergence/Acceptance
See Effective Aperture Angle (EAA)

Anti-tie down
A feature of a two-hand control where both hand controls must be released before the machine can restart.

Antirepeat
The function of the control system designed to limit the machine to a single stroke or cycle even if the tripping or actuating means is held operated.

Area guard
A safeguarding technique that provides a means of continually sensing or detecting an individual within an area adjacent to or associated with a hazard.

Area-scanning device
A safeguarding device that creates a sensing plane to detect the presence of an individual or object.

Auto power-up
A safety light screen system feature that enables the system to be powered up into the RUN mode (or recover from a power interruption) without requiring a manual reset.

Awareness device
A barrier, signal, light or signage that warns individuals of an approaching, present, or the proximity of a hazard.

B

Beam Diameter
The portion of a beam that must be blocked to cause an individual photo receiver to change state. One of the factors in determining resolution of a safety light screen. Also known as effective beam diameter.

Beam Spacing
The distance from the center of one beam to the center of an adjacent beam, and one factor in determining resolution of a safety light screen. Also known as beam pitch.

Blanking
An optional function that allows a light screen system to ignore objects located within the sensing field so as not to create an OFF-state of the safety outputs and cause a Trip or Latch condition.

Blocked condition
A condition that occurs when an opaque object of sufficient size interrupts one or more light screen beams. When a blocked condition occurs, OSSD1 and OSSD2 outputs simultaneously turn off within the system response time.

C

Cascade
Series connection (or "daisy-chaining") of multiple sensors.

Category 0 Stop (Functional)
An uncontrolled stop produced by immediately removing power to the machine actuators.

Category 1 Stop (Functional)
A controlled stop achieved with power remaining to the machine actuators. Power is removed after the stop is achieved.

Category 2 Stop (Functional)
A controlled stop with power left available to the machine actuators.

Common mode failure
The failure of multiple components or equipment resulting from the same root cause.

Complementary Protective Equipment
Devices used to assure or supplement the operation of a primary safeguard.

Contact
One of the current-carrying parts of a relay, switch, or connector that open and close to complete associated electrical circuits.

Contact configuration
Refers to the construction of a relay or a switch, in many configurations, for example, SPDT (Form C), with one normally open, one normally closed, and one common between the two.

Control reliability
A method of ensuring the performance integrity of a control system or device. Control circuits are designed and constructed so that a single failure or fault within the system does not prevent the normal stopping action from being applied to the machine when required, or does not create unintended machine action, but does prevent initiation of successive machine action until the failure is corrected.

Control Relay (CR)
A relay that is used to perform logic functions in a machine control circuit.

Controlled stop
The stopping of machine motion while retaining power to machine actuators during the stopping process.

Crosstalk (Optical)
Optical crosstalk occurs when a photoelectric receiver responds to light from an adjacent emitter.

D

Defined area
The "screen of light" generated by a safety light screen system, defined by the height and the separation of the emitter and receiver. When the defined area is interrupted by an opaque object of a specified cross section, a Trip or Latch condition results.

Depth of field
The distance, length or the size of the sensing surface or field from the outer edge toward the hazard. Also known as "depth of detection."

Depth penetration factor
Compensation factor for distance an object can penetrate the sensing field of a Presence Sensing Safeguarding Device (PSSD) before the device reliably detects the intrusion and signals a stop. Often abbreviated as Dpf.

Diverse-redundancy
The practice of using components, circuitry or operation of different designs, architectures or functions to achieve redundancy and to reduce the possibility of common mode failures.

Dpf
See Depth Penetration Factor.

Dual channel
Duplication or redundant system that minimizes the possibility of a failure to danger in the event of a single fault. This is because the second independent channel maintains the ability to arrest dangerous motion.

E

Effective Aperture Angle (EAA)
The maximum angle of deviation from the optical alignment of the emitter and the receiver within which the safety light screen continues in normal operation. Also known as Angle of Divergence/Acceptance, or Field-of-View.

Effective beam
The "working" part of a photoelectric beam. Not to be confused with the actual radiation pattern of the emitter, or with the field of view of the receiver.

Electromechanical relay
Conventional switching relays consisting of "hard" contacts (metal-to-metal), switched to opened or closed position by applying voltage to an electromagnetic coil.

Electro-Sensitive Protective Equipment (ESPE)
An assembly of devices and/or components working together for protective tripping or presence sensing purposes and comprising as a minimum: a sensing device, controlling/monitoring devices, and output signal switching devices. See IEC61496-1

Emergency Stop
A control function that is initiated by a single human action to arrest dangerous machine motion, or otherwise avert arising or reduce existing hazards to persons, damage to machinery or to work in progress. See ANSI/NPFA79, IEC60204-1, or ISO13850.

EMI
Abbreviation for Electromagnetic Interference. Electrical "noise" which may interfere with proper operation of sensors, programmable logic controllers, counters, data recorders, and other sensitive electronic equipment.

Emitter
The light-emitting component of a safety light screen system, consisting of a row of synchronized modulated LEDs. The emitter, together with the receiver (placed opposite), creates a "screen of light" called the defined area.

Exact blanking
A configuration allowing a light screen system to ignore stationary objects (such as brackets or fixtures) that interrupt a specific number of light beams.

External device monitoring
A means by which a safeguarding device monitors the state of external devices that may be controlled by the safety device.

F

Fail-safe
A description of a circuit or system that is guaranteed not to fail in the event of a malfunction so that the catastrophic loss of function is not possible.

Fail to Safe
A design or event in which a failure or fault within a system causes the hazardous machine motion or process to achieve a safe state (Commonly confused with "fail-safe").

Failure
An event in which an item (e.g. component, circuit, or device) ceases to perform its required function.

Failure to danger
A failure which delays or prevents a safety system from arresting dangerous machine motion, thereby increasing risk to personnel.

Fault
The state of an item (e.g. component, circuit, device or machine) characterized by its inability to perform a required function. A fault is often the result of a failure of the item itself, but may exist without prior failure. See Failure.

Fault exclusion
The ability to minimize or eliminate known possible failures or faults through design, selection of components, or implementation of additional measures.

Fault tolerance
The ability of a system to function as it was designed even in the presence of faults or failures.

Final Switching Device (FSD)
Component of a safety-related control system that interrupts the circuit to the machine primary control element (MPCE) when the output signal switching device (OSSD) goes to the OFF-state.

Fixed blanking
A way to configure a light screen system to ignore stationary objects (such as brackets or fixtures) that are always present at a specific location within the defined area.

FMEA
Abbreviation for Failure Mode and Effects Analysis, a testing procedure by which potential failure modes in a system are analyzed to determine their results or effects on the system.

Forced-guided contacts
Relay contacts that are mechanically-linked, so that when the relay coil is energized or de-energized, all of the linked contacts move together. If one set of contacts in the relay becomes immobilized, no other contact of the same relay will be able to move. The function of forced-guided contacts is to enable the safety circuit to check the status of the relay. Forced-guided contacts are also known as "mechanically-linked contacts," "positive-guided contacts," "captive contacts," "locked contacts," or "safety relays."

G

General Duty Clause
Section 5(a)(1) of the Occupational Safety and Health Act of 1970 (Public Law 91-596, 91st Congress, S.2193, 29Dec1970) places primary accountability on the employer for work place safety. "5(a)(1) Each employer shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees." OSHA inspectors often use section 5(a)(1) of the "General Duty Clause" as the bases of citations resulting from on-site inspections.

General Requirements for All Machines
(29CFR1910.212) requires that one or more methods of machine guarding shall be provided to protect the operator and other employees from hazards, and the guarding device shall be in conformity with any appropriate standards.

Good Engineering Practice
Minimum guidelines that specify commonly-used and recognized design principles, well-tried and robust components, and safety practices to make the workplace free of industry recognized hazards and compliant to relevant standards.

Guard
A protective physical barrier that prevents an individual from accessing a hazardous area.

Guarded machine
The machine whose point of operation or other hazardous area is guarded by the safety system.

H

Hand control
A hand-operated mechanism or device used as an actuating control. Two normally open "input switches" are used as hand controls in a two-hand control system

Hard guard
Screens, bars, or other mechanical barriers affixed to the frame of the machine intended to prevent entry by personnel into the hazardous area(s) of a machine.

Hazard
A potential source of harm.

Hazard point
The closest reachable point of the hazardous area.

Hazardous area
An area that poses an immediate or impending physical hazard.

Hazardous situation
A circumstance in which a person is exposed to a hazard, or any specific activity done on or around the machine during its lifecycle that results in a potential source of harm. See B11.TR3 for further information.

I

I/O
(Input-Output) Provides communication channels to system and to manufacturing process.

Integrity
The degree to which a circuit, system or device can be expected to perform unimpaired an anticipated function in the event of a fault. Integrity depends on several characteristics including fault tolerance, fault exclusion, risk reduction, reliable and well-tried components, well-tried safety principles, and other design considerations.

Interlocked guard
A guard or barrier interfaced with a machine control system so as to restrict access to or prevent inadvertent access to the hazard.

Internal lockout
A Lockout condition due to an internal safety system problem.

Intrinsic safety
A design technique applied to electrical equipment, such as sensors, switches, and wiring for hazardous locations. The technique involves limiting energy to a level below that required to ignite a specific hazardous atmosphere. Intrinsic safety design often eliminates the requirement for explosion-proof enclosures. Also see "NAMUR".

IP rating
A rating system established by the IEC which defines the suitability of sensor and sensor system enclosures for various environments. Similar to NEMA ratings for enclosures.

K

Key reset
A key-operated switch used to reset a safety system to the RUN mode following a Lockout condition or to reset a safety system from a Latch condition.

L

L Configuration
In a safety light screen application, the installation of two emitter/receiver pairs to create a vertical and a horizontal sensing field. Gains advantages of both area guarding and point-of-operation guarding techniques to reduce the possibility of pass-through hazards.

Latch condition
The response of a safety or safeguarding device in which an OFF-state is maintained after the device has been actuated until the safeguard is cleared, re-closed, or re-armed and a manual reset is performed.

Legend
Any type of marking, sign, or inscription which identifies the device type, function or purpose.

Lockout Condition
A safety system condition that is automatically attained in response to certain failure modes (an internal lockout). When a Lockout condition occurs, the safety system's safety outputs turn OFF, the failure must be corrected, and a manual reset is required to return the system to RUN mode.

M

Machine response time
The time between the activation of a stopping device and the instant when the dangerous parts of the machine reach a safe state.

Machine secondary control element (MSCE)
An electrically-powered element, independent of the machine primary control element(s), capable of removing power from the machine's actuator (prime mover) of the relevant hazardous parts and is typically controlled by the secondary switching device (SSD).

Master Control Relay (MCR)
A relay that is used to provide electrical power to the machine control circuitry. Typically interfaced with the Master Start/Stop (ON/OFF) and Emergency Stop functions.

Master Stop Control (MSC)
An electrically-powered device, external to the E-stop Safety Module, that provides a safety stop by immediately removing electrical power to the hazard and, if necessary, by applying braking to dangerous motion.

Mechanically-linked contact
See Forced-Guided Contact.

Monitoring
The verification of system components to detect failures or faults of any part of the monitored system that could affect the performance of safety-related functions.

Minimum Object Sensitivity (MOS)
The minimum-diameter object that a safety light screen system can reliably detect. Objects of this diameter or greater will be detected anywhere in the defined area. A smaller object can pass undetected through the light if it passes exactly midway between two adjacent light beams.

Machine Primary Control Element (MPCE)
An electrically-powered element, external to the safety system, which directly controls the machine's normal operating motion in such a way that the element is last (in time) to operate when machine motion is either initiated or arrested. (Examples include motor/motor contactors, magnetic clutch brake, or electrically operated valve.)

Master Stop Control (MSC)
An electrically-powered device, external to the E-stop Safety Module, that provides a safety stop by immediately removing electrical power to the hazard and, if necessary, by applying braking to dangerous motion. This stopping action is accomplished by removing power to the actuator coil of either Master Stop Control Element.

Muting
The automatic suspension of the safeguarding function of a safety device during a non-hazardous portion of the machine cycle.

N

NAMUR
Devices and sensors designed for use with certified switching amplifiers with intrinsically-safe circuits. NAMUR sensors are most commonly used in explosive environments.

Normally Closed (NC)
Designation that states the contacts of a switch or relay are closed or connected when at rest. When activated, the contacts open or separate.

Normally Open (NO)
Designation that states the contacts of a switch or relay are normally open or not connected. When activated, the contacts close or become connected.

NPN output (Current sinking)
A transistor available as an output switch in DC sensors and logic modules. Usually configured with its collector open and its emitter connected to ground (DC common). In this configuration, a load is connected between the output (collector) and the positive of the DC supply. This output configuration is also called a "sinking" output.

O

OFF State
The state in which the output circuit is interrupted and does not permit the flow of current.

ON State
The state in which the output circuit is complete and permits the flow of current.

Optical short circuit
Deflection of one or more beams around an object in the defined area which may result in reduced detection capability of a light screen or in the worst case, of an object being allowed to pass through undetected. The result of locating a sensing field next to a highly reflective surface e.g. stainless steel, glossy paint.

Output Signal Switching Device (OSSD)
Abbreviation for Output Signal Switching Device. The safety outputs of a safeguarding device that are used to initiate a stop signal by achieving an OFF-state. (Note: Includes, but is not limited to, solid-state outputs, relay contacts, or other electrical contacts.)

P

Pass-through hazard
A situation that may exist when personnel pass through a safeguard (at which point the hazard stops or is removed), and then continue into the guarded area. At this point the safeguard may not be able to prevent an unexpected start or restart of the machine with personnel within the guarded area.

Perimeter guard
A safeguarding technique that provides a barrier or means of detection at the boundary of a hazard or hazardous area.

PNP output (Current sourcing)
A transistor available as an output switch in DC sensors. Usually configured with its collector open and its emitter connected to the positive of the sensor supply voltage. In this configuration, a load is connected between the output (collector) and ground (DC common). This output configuration is also called a "sourcing" output.

Point of operation
The location of a machine where material or a workpiece is positioned and a machine function is performed upon it.

Point-of-operation guarding
Safeguards, such as hard guards or safety light screens, which are designed to protect personnel from hazardous machine motion associated with the machine's point of operation.

Positive-guided contact
See Forced-guided contact.

Positive Opening (Safety Switch)
Safety switch that employs a rigid mechanical link from the actuator to open Normally Closed contacts. The normal operation of the switch will force apart contacts, even those that are welded shut.

Power monitoring
Monitoring function accomplished through a series-parallel connection of contacts that provide feedback about the machine's status. Power is supplied to the module as long as both contactors work as they should.

Power-Up/Power-Interrupt Lockout
A Lockout condition of a safety light screen system that, if Auto Power-Up is OFF, occurs when the system is powered up (including power-ups after a loss of power).

Presence-sensing device
A device that creates a sensing area to detect the presence of an individual or object.

Presence-Sensing Device Initiation (PSDI)
An application in which a presence-sensing device is used to start the cycle of a machine.

Presence-Sensing Safeguarding Device (PSSD)
Abbreviation for Presence-Sensing Safeguarding Device. A presence-sensing device used as a safeguard.

Pull-back
A safeguarding device attached to an operator's hands and wrists that withdraws the operator's hands from the hazard area during hazardous operation.

Q

Qualified Person
An individual who, by possession of a recognized degree or certificate of professional training, or by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve problems relating to the subject matter and work.

R

Receiver
The light-receiving component of a safety light screen system, consisting of a row of synchronized phototransistors. The receiver, together with the emitter (placed opposite), creates a "screen of light" called the defined area.

Reduced resolution
A configuration that allows a light screen system to intentionally ignore the interruption of consecutive light beams within the defined area. The effect is to ignore multiple objects with cross-sections less than a certain size, while increasing the size of an object that will be reliably detected anywhere within the defined area. Sometimes called "Floating Blanking."

Redundancy
The duplication of components or circuitry providing the same function should a component or circuit fail.

Reliability
The ability of a machine's circuits and components to consistently perform its stated function within its specifications without failing.

Relay
An electromechanical device that opens or closes contacts in response to a small current or voltage change of an electric circuit. This device effects the operation of other devices in the same or another electric circuit.

Reset
The use of a manually-operated switch to restore the safety outputs to the ON state from a Latch condition, or return to the RUN mode from a Lockout condition.

Resolution
The minimum size (diameter or cross section) of an object that a safety light screen will reliably detect. Calculated by adding the beam spacing dimension to effective beam diameter. Objects of this size or larger will be detected anywhere in the sensing field.

Risk
The probability of the occurrence of harm and its severity.

Risk assessment
A procedure used in machine safety to identify, document and eliminate or reduce hazards in a particular machine or process.

S

Safeguard
A guard (barrier) or safeguarding device used to protect personnel from hazards by preventing or restricting access, or by detecting the presence of an individual.

Safeguarding
Measures (including guards, safeguarding devices, awareness devices, safeguarding methods, or safe work procedures) used to protect personnel from hazards which cannot reasonably be eliminated, or from the risks which cannot be sufficiently reduced by inherently safe design measures.

Safeguarding device
A device that detects or prevents inadvertent access to a hazard (i.e. not a guard or a barrier). Also known as a Protective Device.

Safety device
A technique or means to reduce the risk of harm to personnel from a machine hazard which includes but is not limited to Safety Light Screens, Emergency Stop Buttons, Guards (barriers), Interlocking, Enabling Pendants, Two-hand Control, Restraints, or Lockout/Tagout equipment.

Safety distance
The calculated distance between a hazard and its associated safeguard.

Safety edge
A safeguarding device consisting of a sensing edge and a control, used to detect individuals who comes into contact with the sensing edge.

Safety interlock switch
A switch on a guard barrier used to detect if the guard is opened. Designed to prevent intentional defeat. Electromechanical safety interlock switches use positive opening contacts. Other forms of safety interlock switch include magnetic, RF tag, optical, or inductive.

Safety light curtain
See safety light screen.

Safety light screen
A safeguarding device comprising an LED array emitter and receiver element which creates a sensing field or plane. When an individual or object interrupts this sensing field, the light screen detects the interruption and initiates a stop command. Also known as Active Opto-electronic Protective Device -AOPD, Presence Sensing Safeguarding Device, safety light curtain, light devices and optical guards.

Safety mat
A safeguarding device consisting of a sensing surface and a control. The sensing surface is capable of detecting the presence of individual(s) on its surface.

Safety module
A device that performs a specific safety function(s) and consists of monitored, multiple, mechanically-linked relays, or monitored solid-state safety outputs. Commonly confused with a single, discrete mechanically-linked "safety" relay. Also know as Safety Interface Module or Safety Relay Modules.

Safety relay
An electromechanical relay with force-guided contacts which allow the monitoring of a safety device's circuit to check relay status. See also force-guided contacts.

Safety stop
Removal of power to the Machine Primary Control Elements that allow for an orderly cessation of motion for safeguarding purposes. Also known as a Protective Stop.

Safety Stop Interface (SSI)
An interface which provides the means to integrate external devices to effect a stop command. It consists of two input channels (A&B), which are compatible with devices that have two Normally Open hard contacts or relay outputs.

Secondary Switching Device (SSD)
An output which, in a lock-out condition, performs a back-up safety function by going to the OFF-state and initiating an appropriate machine control action.

Self-checking circuitry
A circuit with the capability to verify that all of its own critical safety circuit components, along with their redundant backups, are operating properly.

Separation distance
The calculated distance between a hazard and its associated safeguard. See Safety distance.

Simultaneity
Concurrent events, actions, or actuations occurring within a specific time frame. This time frame is 0.5 second in a Two-Hand Control or Two-Hand Trip applications per ANSI B11.19, ANSI/RIA R15.06 and ISO 13851 (Note: ISO 13851 defines this as synchronous actuation).

Solenoid
A coil equipped with a movable iron core that will produce linear motion as a result of current passing through the coil (the iron core is pulled into the center of the coil). When current is removed, a spring returns the iron core to the original position.

Secondary Switching Device (SSD)
Abbreviation for Secondary Switching Device. An output which, in a lock-out condition, performs a back-up safety function by going to the OFF-state and initiating an appropriate machine control action.

Safety Stop Interface (SSI)
Abbreviation for Safety Stop Interface. An interface which provides the means to integrate external devices to effect a stop command. It consists of two input channels (A&B), which are compatible with devices that have two normally open hard contacts or relay outputs.

Standards
A specification, criterion or benchmark that is widely used, accepted or is sanctioned and codified by a standards agency. Safety standards are minimum requirements for product and machine design, manufacture, use and evaluation.

Supplemental guarding/safeguarding
Additional means used to prevent or hinder personnel from accessing the guarded hazard by augmenting the primary means of safeguarding.

T

Trip condition
The response of a safety or safeguarding device in which an ON-state is achieved when the safeguard is cleared, re-closed, or re-armed, without operator intervention.

Trip initiate
The resetting, reclosing, or clearing of a safeguard causing the initiation of machine motion or operation. Trip Initiate is not allowed as a means to initiate a machine cycle per NFPA 79 and ISO 60204-1, and is commonly confused with PSDI.

Two-hand control device
An actuating control that requires concurrent actuation of both of the operator's hands to initiate and control machine motion during the hazardous portion of the machine cycle.

Two-hand trip
An actuating control that requires concurrent actuation of both of the operator's hands to initiate the machine cycle. Typically used on full revolution clutch or single-stroke machines.

Type 2 light screen
A set of design, construction and testing requirements for light screens described by IEC 61496. The "types" perform differently in the presence of faults and under influences from environmental conditions. Type 2 requirements are less stringent than those for Type 3 or Type 4

Type 4 safety light screen
A set of design, construction and testing requirements for light screens described by IEC 61496. The "types" perform differently in the presence of faults and under influences from environmental conditions. Type 4 requirements are the most stringent.

U

Uncontrolled stop
The stopping of machine motion by removing power to the machine actuators, all brakes and/or other mechanical stopping devices being activated.

Universal Safety Stop Interface (USSI)
Abbreviation for Universal Safety Stop Interface. An interface that provides a means to integrate external devices to effect a stop command. It consists of two input channels (A&B), which are compatible with Banner solid-state OSSD outputs with "handshake" verification (two-wire hookup), or with devices that have two normally open hard contacts or relay outputs (four-wire hookup).

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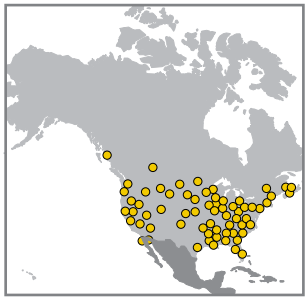

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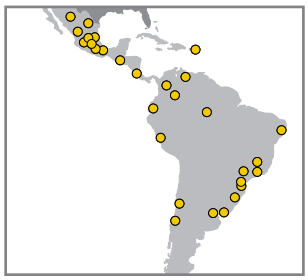

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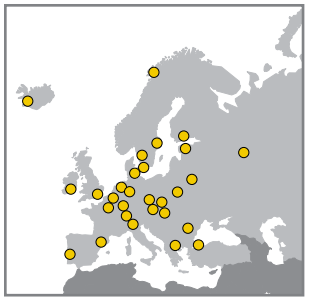

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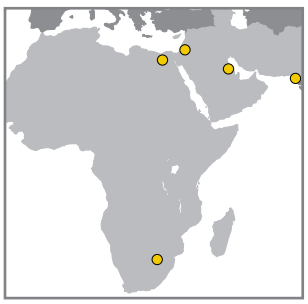

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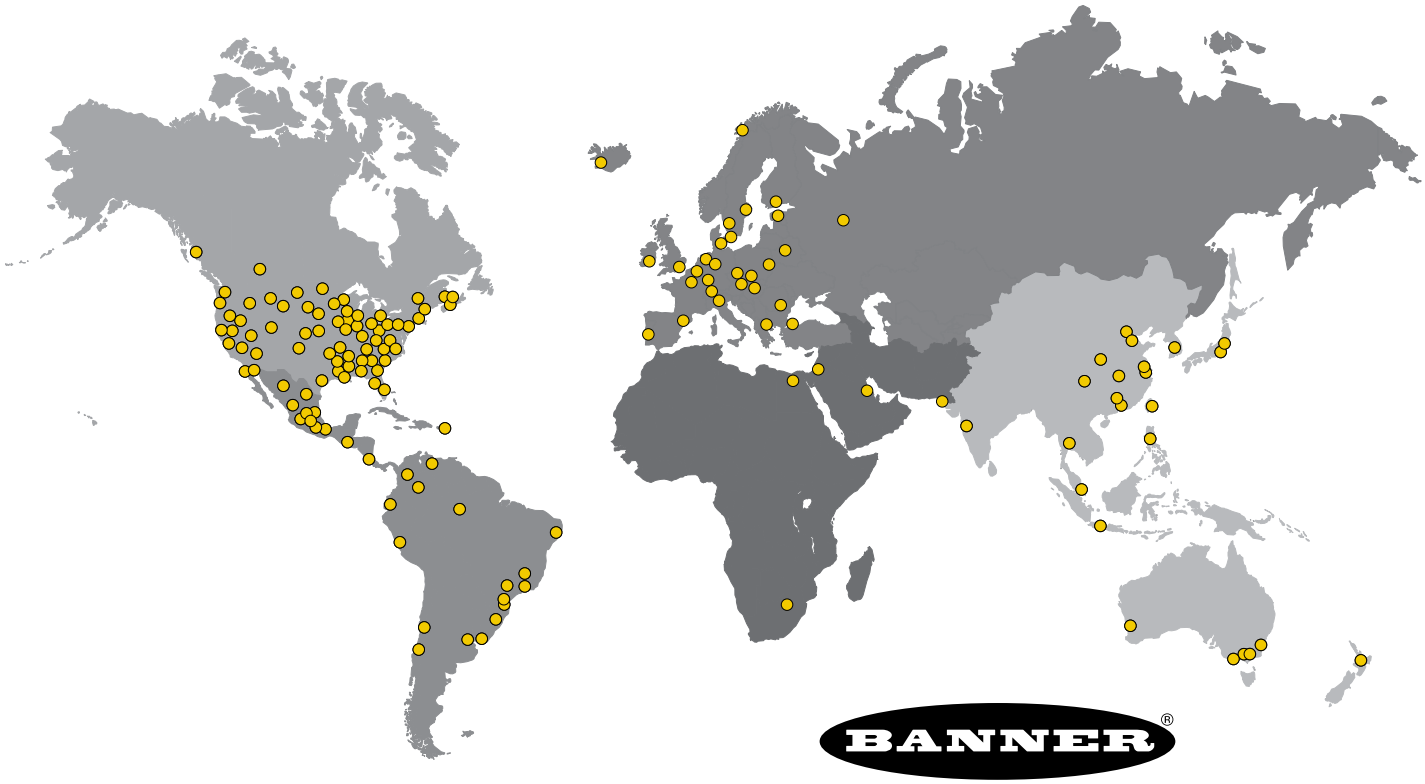

BANNER®

Model	Part #	Pg Ref.
EZSS-450	76069	200
EZSS-600	76070	200
EZSS-750	76071	200
EZSS-900	76072	200
FIC-M12F4	58912	w.o.
FIC-M12F4A	58913	w.o.
FIC-M12M4	58910	188
FIC-M12M4A	58911	188
GM-FA-10J	60987	82
GMMSE2424YP	79284	w.o.
GMMSE424Y	77520	w.o.
GMMSR2424YP	79285	w.o.
GMMSR424Y	77061	w.o.
GMSLSCE30-1200Q8	79639	w.o.
GMSLSCE30-1350Q8	79641	w.o.
GMSLSCE30-1800Q8	79643	w.o.
GMSLSCE30-600Q8	79635	w.o.
GMSLSCP14-1200Q88	77134	w.o.
GMSLSCP14-300Q88	77396	w.o.
GMSLSCP30-1800Q88	77961	w.o.
GMSLSCR30-1200Q8	79640	w.o.
GMSLSCR30-1350Q8	79642	w.o.
GMSLSCR30-1800Q8	79644	w.o.
GMSLSCR30-600Q8	79636	w.o.
GMSLSE30-1200Q8	79705	w.o.
GMSLSE30-600Q8	79633	w.o.
GMSLSE30-900Q8	79637	w.o.
GMSLSP30-1200Q88	79704	w.o.
GMSLSR30-1200Q8	79706	w.o.
GMSLSR30-600Q8	79634	w.o.
GMSLSR30-900Q8	79638	w.o.
IM-T-11A	61424	108
IM-T-9A	61425	108
K30LRGX8PQ8	78790	192
K50LGRYB11P	77389	192
K50LRGX8PQ8	76000	192
K80LRGX8PQ8	78085	192
LAT-1	52150	197
LAT-1-HD	71444	197
LAT-1-LP	83816	197
LAT-1-LS	73745	197
LAT-1-MS	71442	w.o.
LAT-1-SFP12	71847	197
LAT-1-SFP30	72999	197
LAT-1-SS	71445	197
LAT-1-US	71443	w.o.
LPA-LAT-1	83817	197
LPA-MBK-11	82841	169
LPA-MBK-12	82842	169
LPA-MBK-120	82847	169
LPA-MBK-13	82843	w.o.
LPA-MBK-135	82848	169
LPA-MBK-180	82849	170
LPA-MBK-20	82853	170
LPA-MBK-21	82845	170
LPA-MBK-22	82844	170
LPA-MBK-90	82846	171
LPA-TP-1	82840	36
LS2E30-1050Q8	73530	40
LS2E30-1200Q8	73531	40
LS2E30-1350Q8	73532	40
LS2E30-1500Q8	73533	40
LS2E30-150Q8	73524	40
LS2E30-1650Q8	77248	w.o.
LS2E30-1800Q8	77249	w.o.
LS2E30-300Q8	73525	40
LS2E30-450Q8	73526	40
LS2E30-600Q8	73527	40
LS2E30-750Q8	73528	40
LS2E30-900Q8	73529	40
LS2LK30-450Q88-1RE50	79774	41
LS2LK30-450Q88-2RE15	77288	41
LS2LK30-750Q88-1RE15	81052	41
LS2LK30-750Q88-2RE15	77944	41
LS2LK30-900Q88-1RE15	80785	41
LS2LK30-900Q88-2RE15	81586	41
LS2LP30-1050Q88	73570	40
LS2LP30-1200Q88	73571	40
LS2LP30-1350Q88	73572	40
LS2LP30-1500Q88	73573	40
LS2LP30-150Q88	73564	40
LS2LP30-1650Q88	77256	w.o.
LS2LP30-1800Q88	77257	w.o.
LS2LP30-300Q88	73565	40
LS2LP30-450Q88	73566	40
LS2LP30-600Q88	73567	40
LS2LP30-750Q88	73568	40
LS2LP30-900Q88	73569	40
LS2LR30-1050Q8	73560	40
LS2LR30-1200Q8	73561	40
LS2LR30-1350Q8	73562	40
LS2LR30-1500Q8	73563	40
LS2LR30-150Q8	73554	40
LS2LR30-1650Q8	77252	w.o.
LS2LR30-1800Q8	77253	w.o.
LS2LR30-300Q8	73555	40
LS2LR30-450Q8	73556	40
LS2LR30-600Q8	73557	40
LS2LR30-750Q8	73558	40
LS2LR30-900Q8	73559	40
LS2TK30-1200Q88-2RE25	77296	41
LS2TK30-1500Q88-2RE25	77305	41
LS2TK30-150Q88-1RE15	79142	41
LS2TK30-150Q88-2RE25	77295	41
LS2TK30-300Q88-1RE25	78527	41
LS2TK30-300Q88-1RE50	79604	41
LS2TK30-300Q88-2RE15	80063	41
LS2TK30-300Q88-2RE25	77297	41
LS2TK30-450Q88-1RE25	80711	41
LS2TK30-450Q88-2RE25	77294	41
LS2TK30-600Q88-1RE15	77526	41
LS2TK30-600Q88-2RE25	78529	41
LS2TK30-750Q88-1RE15	81701	41
LS2TK30-750Q88-1RE50	79605	41
LS2TK30-900Q88-1RE100	79768	41
LS2TK30-900Q88-1RE15	81702	41
LS2TK30-900Q88-1RE25	80744	41
LS2TK30-900Q88-1RE50	79606	41
LS2TK30-900Q88-2RE25	77293	41
LS2TK30-900Q88-2RE75	77279	41
LS2TP30-1050Q88	73550	40
LS2TP30-1200Q88	73551	40
LS2TP30-1350Q88	73552	40
LS2TP30-1500Q88	73553	40
LS2TP30-150Q88	73544	40
LS2TP30-1650Q88	77254	w.o.
LS2TP30-1800Q88	77255	w.o.
LS2TP30-300Q88	73545	40
LS2TP30-450Q88	73546	40
LS2TP30-600Q88	73547	40
LS2TP30-750Q88	73548	40
LS2TP30-900Q88	73549	40
LS2TR30-1050Q8	73540	40
LS2TR30-1200Q8	73541	40
LS2TR30-1350Q8	73542	40
LS2TR30-1500Q8	73543	40
LS2TR30-150Q8	73534	40
LS2TR30-1650Q8	77250	w.o.
LS2TR30-1800Q8	77251	w.o.
LS2TR30-300Q8	73535	40
LS2TR30-450Q8	73536	40
LS2TR30-600Q8	73537	40
LS2TR30-750Q8	73538	40
LS2TR30-900Q8	73539	40
LSA-LAT-1	73746	197
LSA-LAT-2	73747	w.o.
LSS-1050	73754	200
LSS-1200	73755	200
LSS-1350	73756	200
LSS-150	73748	200
LSS-1500	73757	200
LSS-300	73749	200
LSS-450	73750	200
LSS-600	73751	200
LSS-750	73752	200
LSS-900	73753	200
M18RGX8PQ8	74027	192
M18RGR5PNQ	74368	193
MBCC-406	45134	183
MBCC-415	25226	183
MBCC-430	29951	183
MBCC-506	32297	184
MBCC-515	25496	184
MBCC-530	29950	184
MDSA-PTB-1	61083	w.o.
MDSA-PTB-2	61084	w.o.
MDSDAB-1	48226	w.o.
MDSDAL-1	65785	w.o.
MDSDA-RM-1	48225	w.o.
MDSDINT-1L2	45327	w.o.
MDSDINT-1T2	45325	w.o.
MGA-12-CA	29380	w.o.
MGA-54-CA	34399	w.o.
MGA-60-CA	31574	w.o.
MGA-66-CA	34400	w.o.
MGA-6-CA	29379	w.o.
MGA-72-CA	31575	w.o.
MGAB-4	30701	w.o.
MGAB-5	30700	w.o.
MGA-GS-1	27850	w.o.
MGA-GST-1	28511	w.o.
MGA-K-1	28513	28
MGA-KS-1	28509	w.o.
MGA-KSO-1	30140	28
MGA-LP-1	28508	w.o.
MGA-LR-1	29769	w.o.
MGA-LRKS-1	29770	w.o.
MGA-RC-1	28510	w.o.
MGA-RMFSD	33629	w.o.
MGA-RMSSD	33630	w.o.
MGA-S72-1	30125	w.o.
MGA-SBFS-2	29957	w.o.
MGA-SPB-1	35623	w.o.
MGA-STP-1	28518	w.o.
MGA-TBA4-1	34067	w.o.
MGA-TBA5-1	34068	w.o.
MGA-VM-1	28514	w.o.
MGCA-4A	34048	w.o.
MGCA-5A	34049	w.o.
MGCB-4A	34050	w.o.
MGCB-5A	34051	w.o.
MGE1216A	27749	w.o.
MGE1816A	27824	w.o.
MGE2416A	27750	w.o.
MGE3016A	27825	w.o.
MGE3616A	27751	w.o.
MGE4216A	27826	w.o.
MGE4816A	27752	w.o.
MGE5416A	33012	w.o.
MGE6016A	30264	w.o.
MGE616A	27823	w.o.
MGE6616A	33014	w.o.
MGE7216A	29746	w.o.
MGR1216A	32174	w.o.
MGR1816A	32175	w.o.
MGR2416A	32176	w.o.
MGR3016A	32177	w.o.
MGR3616A	32178	w.o.
MGR4216A	32179	w.o.
MGR4816A	32180	w.o.
MGR5416A	33013	w.o.
MGR6016A	32181	w.o.
MGR616A	32182	w.o.
MGR6616A	33015	w.o.
MGR7216A	32300	w.o.
MGS12A	29377	w.o.
MGS18A	29401	w.o.
MGS24A	29402	w.o.
MGS30A	29403	w.o.
MGS36A	29404	w.o.
MGS42A	29405	w.o.
MGS48A	29406	w.o.
MGS54A	33555	w.o.
MGS60A	29982	w.o.
MGS66A	33556	w.o.
MGS6A	29376	w.o.
MGS72A	29917	w.o.
MM2-TA-12B	74934	95
MMD-TA-11B	75090	95
MMD-TA-12B	75091	95
MM-TA-12B	63516	95
MQDC1-501.5	71038	178
MQDC1-506	51127	178
MQDC1-506RA	51128	178
MQDC1-515	47812	178
MQDC1-515RA	47813	178
MQDC1-530	47814	178
MQDC1-530RA	47815	178
MQDC-406	45136	177
MQDC-406RA	47104	177
MQDC-415	26850	177
MQDC-415RA	26848	177
MQDC-430	27142	177
MQDC-430RA	27080	177
MQDC-450	33649	177
MQDC-450RA	49213	177
MQDEC-403RS	47456	177
MQDEC-403SS	47631	177
MQDEC-406RS	47457	177
MQDEC-406SS	47632	177
MQDEC-412RS	47458	177
MQDEC-412SS	47633	177
MQDEC-420RS	47459	177
MQDEC-420SS	47634	177
MQDEC-430RS	78626	177
MQDEC-430SS	72154	177
MQDEC-450RS	78628	177
MQDEC-450SS	76602	177
MQDMC-406	02780	177
MQDMC-406RA	70899	177
MQDMC-415	02781	177
MQDMC-415RA	70900	177
MQDMC-430	02954	177
MQDMC-430RA	70967	177
MQDMC-450	call	177
MQDMC-450RA	70971	177
MQEAC-406	75291	182
MQEAC-406RA	75294	182
MQEAC-415	75292	182
MQEAC-415RA	75295	182
MQEAC-430	75293	182
MQEAC-430RA	75296	182
MQEAC-606	77319	182
MQEAC-606RA	77322	183
MQEAC-615	77320	183
MQEAC-615RA	77323	183
MQEAC-630	77321	183
MQEAC-630RA	77324	183
MSAB-1	39029	w.o.
MSAB-2	47381	w.o.
MSA-KS-1	39023	w.o.
MSAL-1	55695	w.o.
MSA-LAT-2	54302	w.o.
MSAMB	43152	w.o.

Model	Part #	Pg Ref.
MSK2D4024C2Y	45921	w.o.
MSK2D4024C3	46005	w.o.
MSK2D4024C3Y	45933	w.o.
MSK2D424C1	45972	w.o.
MSK2D424C1Y	45900	w.o.
MSK2D424C2	45984	w.o.
MSK2D424C2Y	45912	w.o.
MSK2D424C3	45996	w.o.
MSK2D424C3Y	45924	w.o.
MSK2D4424C1	45982	w.o.
MSK2D4424C1Y	45910	w.o.
MSK2D4424C2	45994	w.o.
MSK2D4424C2Y	45922	w.o.
MSK2D4424C3	46006	w.o.
MSK2D4424C3Y	45934	w.o.
MSK2D4824C1	45983	w.o.
MSK2D4824C1Y	45911	w.o.
MSK2D4824C2	45995	w.o.
MSK2D4824C2Y	45923	w.o.
MSK2D4824C3	46007	w.o.
MSK2D4824C3Y	45935	w.o.
MSK2D8243C1Y	78573	w.o.
MSK2D824C1	45973	w.o.
MSK2D824C1Y	45901	w.o.
MSK2D824C2	45985	w.o.
MSK2D824C2Y	45913	w.o.
MSK2D824C3	45997	w.o.
MSK2D824C3Y	45925	w.o.
MSK2T1224C1	46010	w.o.
MSK2T1224C1Y	45938	w.o.
MSK2T1224C2	46022	w.o.
MSK2T1224C2Y	45950	w.o.
MSK2T1224C3	46034	w.o.
MSK2T1224C3Y	45962	w.o.
MSK2T1624C1	46011	w.o.
MSK2T1624C1Y	45939	w.o.
MSK2T1624C2	46023	w.o.
MSK2T1624C2Y	45951	w.o.
MSK2T1624C3	46035	w.o.
MSK2T1624C3Y	45963	w.o.
MSK2T2024C1	46012	w.o.
MSK2T2024C1Y	45940	w.o.
MSK2T2024C2	46024	w.o.
MSK2T2024C2Y	45952	w.o.
MSK2T2024C3	46036	w.o.
MSK2T2024C3Y	45964	w.o.
MSK2T2424C1	46013	w.o.
MSK2T2424C1Y	45941	w.o.
MSK2T2424C2	46025	w.o.
MSK2T2424C2Y	45953	w.o.
MSK2T2424C3	46037	w.o.
MSK2T2424C3Y	45965	w.o.
MSK2T2824C1	46014	w.o.
MSK2T2824C1Y	45942	w.o.
MSK2T2824C2	46026	w.o.
MSK2T2824C2Y	45954	w.o.
MSK2T2824C3	46038	w.o.
MSK2T2824C3Y	45966	w.o.
MSK2T3224C1	46015	w.o.
MSK2T3224C1Y	45943	w.o.
MSK2T3224C2	46027	w.o.
MSK2T3224C2Y	45955	w.o.
MSK2T3224C3	46039	w.o.
MSK2T3224C3Y	45967	w.o.
MSK2T3624C1	46016	w.o.
MSK2T3624C1Y	45944	w.o.
MSK2T3624C2	46028	w.o.
MSK2T3624C2Y	45956	w.o.
MSK2T3624C3	46040	w.o.
MSK2T3624C3Y	45968	w.o.
MSK2T4024C1	46017	w.o.
MSK2T4024C1Y	45945	w.o.
MSK2T4024C2	46029	w.o.
MSK2T4024C2Y	45957	w.o.
MSK2T4024C3	46041	w.o.
MSK2T4024C3Y	45969	w.o.
MSK2T424C1	46008	w.o.
MSK2T424C1Y	45936	w.o.
MSK2T424C2	46020	w.o.
MSK2T424C2Y	45948	w.o.
MSK2T424C3	46032	w.o.
MSK2T424C3Y	45960	w.o.
MSK2T4424C1	46018	w.o.
MSK2T4424C1Y	45946	w.o.
MSK2T4424C2	46030	w.o.
MSK2T4424C2Y	45958	w.o.
MSK2T4424C3	46042	w.o.
MSK2T4424C3Y	45970	w.o.
MSK2T4824C1	46019	w.o.
MSK2T4824C1Y	45947	w.o.
MSK2T4824C2	46031	w.o.
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SGXLE2-500Q8E	79544	45
SGXLE2-584	62751	45
SGXLE2-584Q3	71095	45
SGXLE2-584Q5	75125	45
SGXLE2-584Q8E	76439	45
SGXLE3-400	62753	45
SGXLE3-400Q3	02939	45
SGXLE3-400Q5	75141	45
SGXLE3-400Q8E	77849	45
SGXLE3-533	62755	45
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SGXLE3-533Q5	75125	45
SGXLE3-533Q8E	76439	45
SGXLE4-300	62757	45
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SLSCR30-2400Q8	83836	26
SLSCR30-300P8	73937	26
SLSCR30-300Q8	72424	26
SLSCR30-450P8	73938	26
SLSCR30-450Q8	72425	26
SLSCR30-600P8	73939	26
SLSCR30-600Q8	72426	26
SLSCR30-750P8	73940	26
SLSCR30-750Q8	72427	26
SLSCR30-900P8	73941	26
SLSCR30-900Q8	72428	26
SLSE14-1050P8	73862	24
SLSE14-1050Q5	71218	24
SLSE14-1050Q8	72365	24
SLSE14-1200P8	73863	24
SLSE14-1200Q5	71219	24
SLSE14-1200Q8	72366	24
SLSE14-1350P8	73864	24
SLSE14-1350Q5	73355	24
SLSE14-1350Q8	73359	24
SLSE14-1500P8	73865	24
SLSE14-1500Q5	73356	24
SLSE14-1500Q8	73360	24
SLSE14-150P8	73856	24
SLSE14-150Q5	71212	24
SLSE14-150Q8	72359	24
SLSE14-1650P8	73866	24
SLSE14-1650Q5	73357	24
SLSE14-1650Q8	73361	24
SLSE14-1800Q5	73358	24
SLSE14-1800Q8	73362	24
SLSE14-300P8	73857	24
SLSE14-300Q5	71213	24
SLSE14-300Q8	72360	24
SLSE14-450P8	73858	24
SLSE14-450Q5	71214	24
SLSE14-450Q8	72361	24
SLSE14-600P8	73859	24
SLSE14-600Q5	71215	24
SLSE14-600Q8	72362	24
SLSE14-750P8	73860	24
SLSE14-750Q5	71216	24
SLSE14-750Q8	72363	24
SLSE14-900P8	73861	24
SLSE14-900Q5	71217	24
SLSE14-900Q8	72364	24
SLSE30-1050P8	73874	25
SLSE30-1050Q5	71242	25
SLSE30-1050Q8	72373	25
SLSE30-1200P8	73875	25
SLSE30-1200Q5	71243	25
SLSE30-1200Q8	72374	25
SLSE30-1350P8	73876	25
SLSE30-1350Q5	71244	25
SLSE30-1350Q8	72375	25
SLSE30-1500P8	73877	25
SLSE30-1500Q5	71245	25
SLSE30-1500Q8	72376	25
SLSE30-150P8	73868	24
SLSE30-150Q5	71236	24
SLSE30-150Q8	72367	24
SLSE30-1650P8	73878	25
SLSE30-1650Q5	71246	25
SLSE30-1650Q8	72377	25

Model	Part #	Pg Ref.
SLSE30-1800P5	71247	25
SLSE30-1800P8	73879	25
SLSE30-1800Q8	72378	25
SLSE30-1950P8	83837	25
SLSE30-1950Q5	83838	25
SLSE30-1950Q8	82067	25
SLSE30-2100P8	83839	25
SLSE30-2100Q5	83840	25
SLSE30-2100Q8	82068	25
SLSE30-2250P8	83841	25
SLSE30-2250Q5	83842	25
SLSE30-2250Q8	79018	25
SLSE30-2400P8	83843	25
SLSE30-2400Q5	83844	25
SLSE30-2400Q8	82069	25
SLSE30-300P8	73869	24
SLSE30-300Q5	71237	24
SLSE30-300Q8	72368	24
SLSE30-450P8	73870	24
SLSE30-450Q5	71238	24
SLSE30-450Q8	72369	24
SLSE30-600P8	73871	24
SLSE30-600Q5	71239	24
SLSE30-600Q8	72370	24
SLSE30-750P8	73872	24
SLSE30-750Q5	71240	24
SLSE30-750Q8	72371	24
SLSE30-900P8	73873	24
SLSE30-900Q5	71241	24
SLSE30-900Q8	72372	24
SLSK14-1200Q88-2RE25	78475	27
SLSK14-1200Q88-RE25	81507	27
SLSK14-1350Q88-2RE15	78046	27
SLSK14-1350Q88-2RE25	78019	27
SLSK14-1500Q88-1RE15	78853	27
SLSK14-150P88-2RE15	78339	27
SLSK14-1800Q85-2R15E25	81440	27
SLSK14-300NQ88-2RE15	78122	27
SLSK14-300Q85-1R15E25	78452	27
SLSK14-300Q88-2RE15	78458	27
SLSK14-300Q88-3RE15	79884	27
SLSK14-300Q88-3RE25	79885	27
SLSK14-300Q88-RE25	81531	27
SLSK14-450NQ88-1RE25	77409	27
SLSK14-450Q88-1RE15	73477	27
SLSK14-450Q88-2RE25	78412	27
SLSK14-450Q88-5RE25	79185	27
SLSK14-600Q85-2R15E25	81431	27
SLSK14-600Q88-2RE25	79510	27
SLSK14-600Q88-5RE25	79654	27
SLSK14-600Q88-6RE25	78850	27
SLSK14-600Q88-RE15	78089	27
SLSK14-750Q88-1RE15	73478	27
SLSK14-750Q88-1RE25	77329	27
SLSK14-750Q88-RE15	78737	27
SLSK14-900Q88-2RE15	78869	27
SLSK14-900Q88-RE25	77399	27
SLSK30-1050P88-2RE25	77582	27
SLSK30-1050Q85-1RE25	81258	27
SLSK30-1050Q88-2RE25	77677	27
SLSK30-1050Q88-RE15	78837	27
SLSK30-1200P88-2RE25	78575	27
SLSK30-1200Q85-RE25	72252	27
SLSK30-1200Q88-1R25E15	79427	27
SLSK30-1200Q88-2R25E15	81097	27
SLSK30-1200Q88-2RE25	78438	27
SLSK30-1350Q85-RE25	72253	27
SLSK30-1350Q88-1RE15	81229	27
SLSK30-1350Q88-2RE25	77332	27
SLSK30-1350Q88-5RE15	78571	27
SLSK30-1350Q88-RE25	77911	27
SLSK30-1500Q85-RE25	72254	27
SLSK30-1500Q88-1RE15	78550	27
SLSK30-1500Q88-2RE25	78439	27
SLSK30-150Q88-1RE15	77304	27
SLSK30-150Q88-1RE25	75691	27
SLSK30-150Q88-2RE15	79157	27
SLSK30-1650Q85-2RE25	81526	27
SLSK30-1650Q85-RE25	72255	27
SLSK30-1650Q88-1RE15	78556	27
SLSK30-1650Q88-RE15	81280	27
SLSK30-1800Q88-1RE15	78031	27
SLSK30-1800Q88-2RE15	78127	27
SLSK30-300Q88-1R15E25	78699	27
SLSK30-300Q88-1RE25	77282	27
SLSK30-300Q88-6RE15	79754	27
SLSK30-300Q88-RE15	77707	27
SLSK30-450NQ88-1RE25	77691	27
SLSK30-450Q88-1RE25	80665	27
SLSK30-600AQ88-1RE15	79377	27
SLSK30-600Q85-RE25	72250	27
SLSK30-600Q88-1R15E50	79899	27
SLSK30-600Q88-1R25E15	78987	27
SLSK30-600Q88-1RE75	78528	27
SLSK30-600Q88-4R25E15	77371	27
SLSK30-600Q88-4RE25	77225	27
SLSK30-750P88-2RE15	79007	27
SLSK30-750Q88-1RE15	73505	27

Model	Part #	Pg Ref.
SLSK30-750Q88-1RE50	77333	27
SLSK30-750Q88-RE15	78922	27
SLSK30-900P88-2RE15	78539	27
SLSK30-900Q85-RE25	72251	27
SLSK30-900Q88-1RE15	78549	27
SLSK30-900Q88-5RE15	79658	27
SLSK30-900Q88-RE15	81147	27
SLSP14-1050P88	73954	24
SLSP14-1050Q85	71234	24
SLSP14-1050Q88	72385	24
SLSP14-1200P88	73955	24
SLSP14-1200Q85	71235	24
SLSP14-1200Q88	72386	24
SLSP14-1350P88	73956	24
SLSP14-1350Q85	73367	24
SLSP14-1350Q88	73371	24
SLSP14-1500P88	73957	24
SLSP14-1500Q85	73368	24
SLSP14-1500Q88	73372	24
SLSP14-150P88	73948	24
SLSP14-150Q85	71228	24
SLSP14-150Q88	72379	24
SLSP14-1650P88	73958	24
SLSP14-1650Q85	73369	24
SLSP14-1650Q88	73373	24
SLSP14-1800P88	73959	24
SLSP14-1800Q85	73370	24
SLSP14-1800Q88	73374	24
SLSP14-300P88	73949	24
SLSP14-300Q85	71229	24
SLSP14-300Q88	72380	24
SLSP14-450P88	73950	24
SLSP14-450Q85	71230	24
SLSP14-450Q88	72381	24
SLSP14-600P88	73951	24
SLSP14-600Q85	71231	24
SLSP14-600Q88	72382	24
SLSP14-750P88	73952	24
SLSP14-750Q85	71232	24
SLSP14-750Q88	72383	24
SLSP14-900P88	73953	24
SLSP14-900Q85	71233	24
SLSP14-900Q88	72384	24
SLSP30-1050P88	73966	25
SLSP30-1050Q85	71266	25
SLSP30-1050Q88	72393	25
SLSP30-1200P88	73967	25
SLSP30-1200Q85	71267	25
SLSP30-1200Q88	72394	25
SLSP30-1350P88	73968	25
SLSP30-1350Q85	71268	25
SLSP30-1350Q88	72395	25
SLSP30-1500P88	73969	25
SLSP30-1500Q85	71269	25
SLSP30-1500Q88	72396	25
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SLSP30-150Q85	71260	24
SLSP30-150Q88	72387	24
SLSP30-1650P88	73970	25
SLSP30-1650Q85	71270	25
SLSP30-1650Q88	72397	25
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SLSP30-1800Q85	71271	25
SLSP30-1800Q88	72398	25
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SLSP30-1950Q85	83846	25
SLSP30-1950Q88	82074	25
SLSP30-2100P88	83847	25
SLSP30-2100Q85	83848	25
SLSP30-2100Q88	82075	25
SLSP30-2250P88	83849	25
SLSP30-2250Q85	83850	25
SLSP30-2250Q88	82076	25
SLSP30-2400P88	83851	25
SLSP30-2400Q85	83852	25
SLSP30-2400Q88	82077	25
SLSP30-300P88	73961	24
SLSP30-300Q85	71261	24
SLSP30-300Q88	72388	24
SLSP30-450P88	73962	24
SLSP30-450Q85	71262	24
SLSP30-450Q88	72389	24
SLSP30-600P88	73963	24
SLSP30-600Q85	71263	24
SLSP30-600Q88	72390	24
SLSP30-750P88	73964	24
SLSP30-750Q85	71264	24
SLSP30-750Q88	72391	24
SLSP30-900P88	73965	24
SLSP30-900Q85	71265	24
SLSP30-900Q88	72392	24
SLSR14-1050P8	73886	24
SLSR14-1050Q8	71226	24
SLSR14-1200P8	73887	24
SLSR14-1200Q8	71227	24
SLSR14-1350P8	73888	24
SLSR14-1350Q8	73363	24
SLSR14-1500P8	73889	24

Model	Part #	Pg Ref.
USDK2T3624C5YP2	49681	w.o.
USDK2T3624YI	42544	w.o.
USDK2T4012C5Y	57033	w.o.
USDK2T4012YI	54474	w.o.
USDK2T4024C4YP2	49670	w.o.
USDK2T4024C5Y	57028	w.o.
USDK2T4024C5YP2	49682	w.o.
USDK2T4024YI	42545	w.o.
USDK2T424C4YP2	49661	w.o.
USDK2T424C5Y	57019	w.o.
USDK2T424C5YP2	49673	w.o.
USDK2T424YI	42536	w.o.
USDK2T4424C4YP2	49671	w.o.
USDK2T4424C5Y	57029	w.o.
USDK2T4424C5YP2	49683	w.o.
USDK2T4424YI	42546	w.o.
USDK2T4812C4YP2	54507	w.o.
USDK2T4812C5Y	57034	w.o.
USDK2T4812C5YP2	54511	w.o.
USDK2T4812YI	54475	w.o.
USDK2T4824C4YP2	49672	w.o.
USDK2T4824C5Y	57030	w.o.
USDK2T4824C5YP2	49684	w.o.
USDK2T4824YI	42547	w.o.
USDK2T5612C4YP2	51709	w.o.
USDK2T5612C5Y	57035	w.o.
USDK2T5612C5YP2	51712	w.o.
USDK2T5612YI	51721	w.o.
USDK2T6412C4YP2	51710	w.o.
USDK2T6412C5Y	57036	w.o.
USDK2T6412C5YP2	51713	w.o.
USDK2T6412YI	51722	w.o.
USDK2T7212C4YP2	51711	w.o.
USDK2T7212C5Y	57037	w.o.
USDK2T7212C5YP2	51714	w.o.
USDK2T7212C8YP2	54974	w.o.
USDK2T7212YI	51723	w.o.
USDK2T824C4YP2	49662	w.o.
USDK2T824C5Y	57020	w.o.
USDK2T824C5YP2	49674	w.o.
USDK2T824YI	42537	w.o.
USDK2TD1224C4YP2	49735	w.o.
USDK2TD1224C5Y	57059	w.o.
USDK2TD1224C5YP2	49747	w.o.
USDK2TD1224YI	42562	w.o.
USDK2TD1624C4YP2	49736	w.o.
USDK2TD1624C5Y	57060	w.o.
USDK2TD1624C5YP2	49748	w.o.
USDK2TD1624YI	42563	w.o.
USDK2TD2024C4YP2	49737	w.o.
USDK2TD2024C5Y	57061	w.o.
USDK2TD2024C5YP2	49749	w.o.
USDK2TD2024YI	42564	w.o.
USDK2TD2412C5Y	57069	w.o.
USDK2TD2424C4YP2	49738	w.o.
USDK2TD2424C5Y	57062	w.o.
USDK2TD2424C5YP2	49750	w.o.
USDK2TD2424YI	42565	w.o.
USDK2TD2824C4YP2	49739	w.o.
USDK2TD2824C5Y	57063	w.o.
USDK2TD2824C5YP2	49751	w.o.
USDK2TD2824YI	42566	w.o.
USDK2TD3212C5Y	57070	w.o.
USDK2TD3224C4YP2	49740	w.o.
USDK2TD3224C5Y	57064	w.o.
USDK2TD3224C5YP2	49752	w.o.
USDK2TD3224YI	42567	w.o.
USDK2TD3624C4YP2	49741	w.o.
USDK2TD3624C5Y	57065	w.o.
USDK2TD3624C5YP2	49753	w.o.
USDK2TD3624YI	42568	w.o.
USDK2TD4012C5Y	57071	w.o.
USDK2TD4024C4YP2	49742	w.o.
USDK2TD4024C5Y	57066	w.o.
USDK2TD4024C5YP2	49754	w.o.
USDK2TD4024YI	42569	w.o.
USDK2TD424C4YP2	49733	w.o.
USDK2TD424C5Y	57057	w.o.
USDK2TD424C5YP2	49745	w.o.
USDK2TD424YI	42560	w.o.
USDK2TD4424C4YP2	49743	w.o.
USDK2TD4424C5Y	57067	w.o.
USDK2TD4424C5YP2	49755	w.o.
USDK2TD4424YI	42570	w.o.
USDK2TD4812C5Y	57072	w.o.
USDK2TD4824C4YP2	49744	w.o.
USDK2TD4824C5Y	57068	w.o.
USDK2TD4824C5YP2	49756	w.o.
USDK2TD4824YI	42571	w.o.
USDK2TD5612C5Y	57073	w.o.
USDK2TD6412C5Y	57074	w.o.
USDK2TD6412C5YP2	51737	w.o.
USDK2TD7212C5Y	57075	w.o.
USDK2TD824C4YP2	49734	w.o.
USDK2TD824C5Y	57058	w.o.
USDK2TD824C5YP2	49746	w.o.
USDK2TD824YI	42561	w.o.
USDKT1224C4YP2	49627	w.o.
USDKT1224C5Y	57002	w.o.
USDKT1224C5YP2	49639	w.o.
USDKT1224YI	42526	w.o.
USDKT1624C4YP2	49628	w.o.
USDKT1624C5Y	57003	w.o.
USDKT1624C5YP2	49640	w.o.
USDKT1624YI	42527	w.o.
USDKT2024C4YP2	49629	w.o.
USDKT2024C5Y	57004	w.o.
USDKT2024C5YP2	49641	w.o.
USDKT2024YI	42528	w.o.
USDKT2412C4YP2	54492	w.o.
USDKT2412C5Y	57012	w.o.
USDKT2412C5YP2	54496	w.o.
USDKT2412YI	54468	w.o.
USDKT2424C4YP2	49630	w.o.
USDKT2424C5Y	57005	w.o.
USDKT2424C5YP2	49642	w.o.
USDKT2424YI	42529	w.o.
USDKT2824C4YP2	49631	w.o.
USDKT2824C5Y	57006	w.o.
USDKT2824C5YP2	49643	w.o.
USDKT2824YI	42530	w.o.
USDKT3212C4YP2	54493	w.o.
USDKT3212C5Y	57013	w.o.
USDKT3212YI	54469	w.o.
USDKT32244C5Y	77157	w.o.
USDKT3224C4YP2	49632	w.o.
USDKT3224C5Y	57007	w.o.
USDKT3224C5YP2	49644	w.o.
USDKT3224YI	42531	w.o.
USDKT3624C4YP2	49633	w.o.
USDKT3624C5Y	57008	w.o.
USDKT3624C5YP2	49645	w.o.
USDKT3624YI	42532	w.o.
USDKT4012C4YP2	54494	w.o.
USDKT4012C5Y	57014	w.o.
USDKT4012C5YP2	54498	w.o.
USDKT4024C4YP2	49634	w.o.
USDKT4024C5Y	57009	w.o.
USDKT4024C5YP2	49646	w.o.
USDKT4024YI	42533	w.o.
USDKT424C4YP2	49625	w.o.
USDKT424C5Y	57000	w.o.
USDKT424C5YP2	49637	w.o.
USDKT424YI	42524	w.o.
USDKT4424C4YP2	49635	w.o.
USDKT4424C5Y	57010	w.o.
USDKT4424C5YP2	49647	w.o.
USDKT4424YI	42534	w.o.
USDKT4812C4YP2	54495	w.o.
USDKT4812C5Y	57015	w.o.
USDKT4812C5YP2	54499	w.o.
USDKT4812YI	54471	w.o.
USDKT4824C4Y	80431	w.o.
USDKT4824C4YP2	49636	w.o.
USDKT4824C5Y	57011	w.o.
USDKT4824C5YP2	49648	w.o.
USDKT4824YI	42535	w.o.
USDKT5612C4YP2	51700	w.o.
USDKT5612C5Y	57016	w.o.
USDKT5612C5YP2	51703	w.o.
USDKT5612YI	51718	w.o.
USDKT6412C4YP2	51701	w.o.
USDKT6412C5Y	57017	w.o.
USDKT6412C5YP2	51704	w.o.
USDKT6412YI	51719	w.o.
USDKT7212C4YP2	51702	w.o.
USDKT7212C5Y	57018	w.o.
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USDKT824C4YP2	49626	w.o.
USDKT824C5Y	57001	w.o.
USDKT824C5YP2	49638	w.o.
USDKT824YI	42525	w.o.
USDKTD1224C4YP2	49699	w.o.
USDKTD1224C5Y	57040	w.o.
USDKTD1224C5YP2	49711	w.o.
USDKTD1224YI	42550	w.o.
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USDKTD1624C5Y	57041	w.o.
USDKTD1624C5YP2	49712	w.o.
USDKTD1624YI	42551	w.o.
USDKTD2024C4YP2	49701	w.o.
USDKTD2024C5Y	57042	w.o.
USDKTD2024C5YP2	49713	w.o.
USDKTD2024YI	42552	w.o.
USDKTD2412C5Y	57050	w.o.
USDKTD2412C5YP2	54520	w.o.
USDKTD2424C4YP2	49702	w.o.
USDKTD2424C5Y	57043	w.o.
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USDKTD2424YI	42553	w.o.
USDKTD2824C4YP2	49703	w.o.
USDKTD2824C5Y	57044	w.o.
USDKTD2824C5YP2	49715	w.o.
USDKTD2824YI	42554	w.o.
USDKTD3212C5Y	57051	w.o.
USDKTD3224C4YP2	49704	w.o.
USDKTD3224C5Y	57045	w.o.
USDKTD3224C5YP2	49716	w.o.
USDKTD3224YI	42555	w.o.
USDKTD3624C4YP2	49705	w.o.
USDKTD3624C5Y	57046	w.o.
USDKTD3624C5YP2	49717	w.o.
USDKTD3624YI	42556	w.o.
USDKTD4012C5Y	57052	w.o.
USDKTD4024C4YP2	49706	w.o.
USDKTD4024C5Y	57047	w.o.
USDKTD4024C5YP2	49718	w.o.
USDKTD4024YI	42557	w.o.
USDKTD424C4YP2	49697	w.o.
USDKTD424C5Y	57038	w.o.
USDKTD424C5YP2	49709	w.o.
USDKTD424YI	42548	w.o.
USDKTD4424C4YP2	49707	w.o.
USDKTD4424C5Y	57048	w.o.
USDKTD4424C5YP2	49719	w.o.
USDKTD4424YI	42558	w.o.
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USE2024Y	55143	w.o.
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USE4424YP2	49621	w.o.
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Model	Part #	Pg Ref.
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USK2D2412C5YP2	54556	w.o.
USK2D2412YI	54488	w.o.
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USK2D2424C5YP2	51566	w.o.
USK2D2424YI	51873	w.o.
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USK2D2824C5Y	57101	w.o.
USK2D2824C5YP2	51567	w.o.
USK2D2824YI	51874	w.o.
USK2D3212C5Y	57108	w.o.
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USMB-5	55669	w.o.
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USR6412YP2	51311	w.o.
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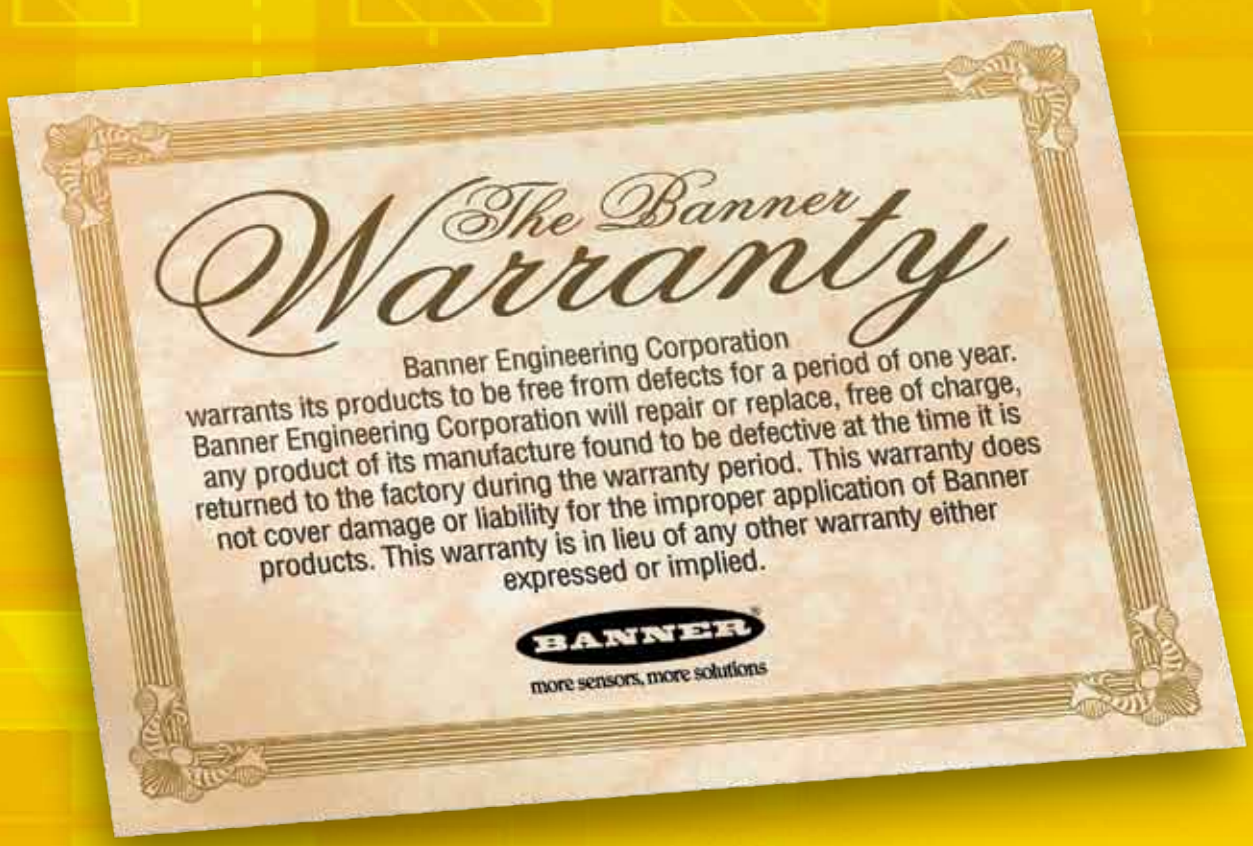

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