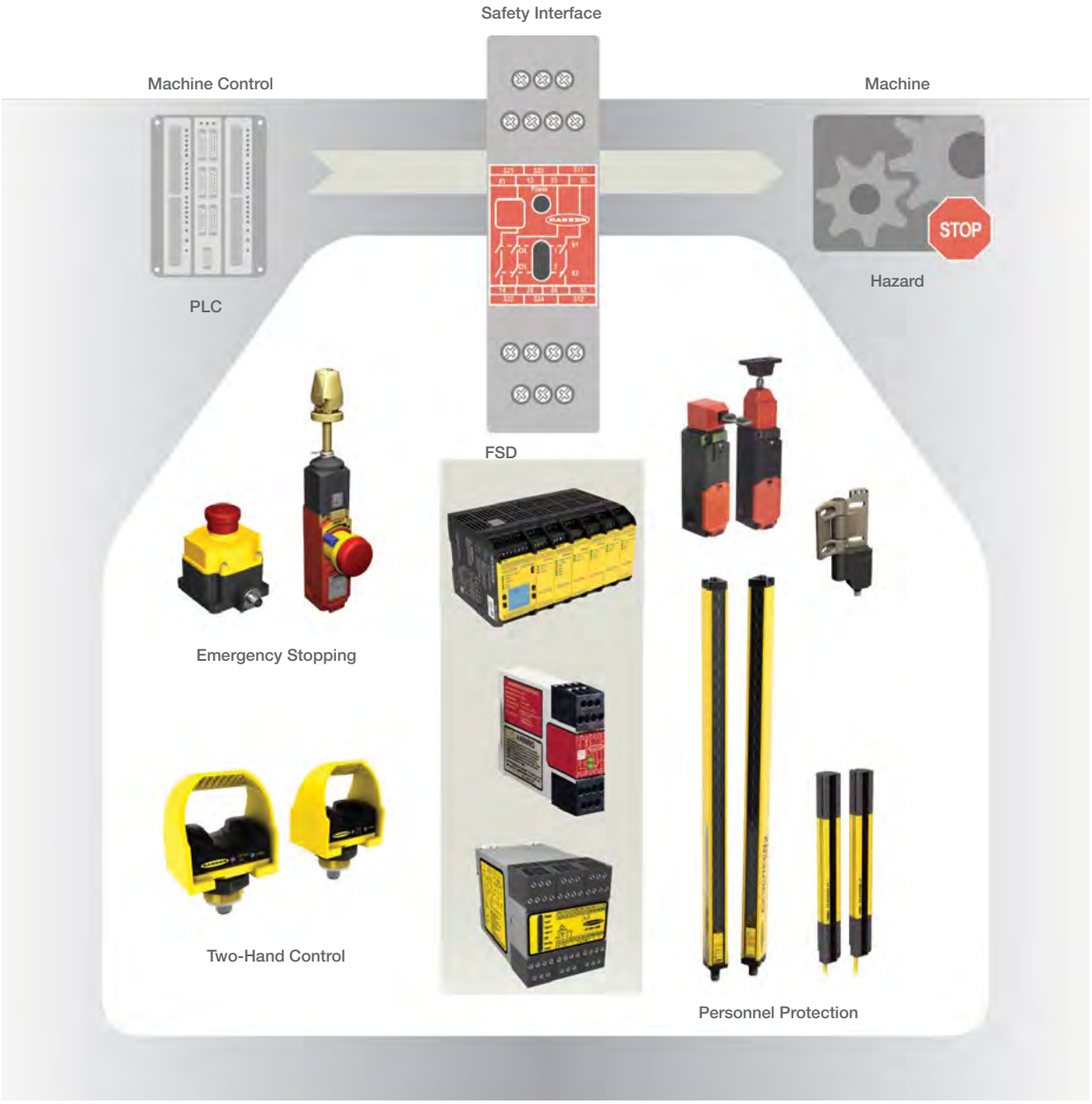
Safety

Banner produces a wide range of safety-related products, including safety light screens, safety interlock switches, e-stop modules and two-hand control safety modules that protect personnel and equipment.

SAFETY

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

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 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:

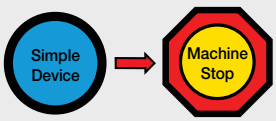
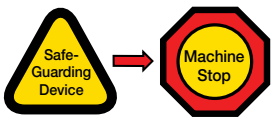
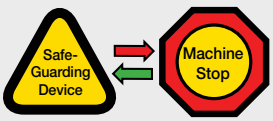
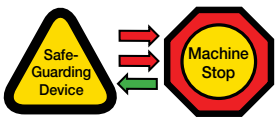
1. Identify hazards and where they occur.
2. Assess risk by severity of harm and probability of occurrence.
3. Reduce the risk through the use of protective measures.
4. Validate and document results.

Risk Assessment Standards

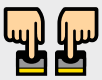
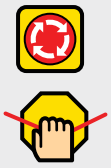
- OSHA 3071, Job Hazard Analysis
- MIL-STD-8820, US DOD System Safety Program
- ANSI B11.0 General (Safety) Requirements and Risk Assessment
- ISO 12100, General Principles for Design, Risk Assessment and Risk Reduction
- SEMI S10, Risk Assessment, Semiconductor Manufacturing Equipment

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  • Non safety-rated components • Integrated in accordance with relevant standards • Reliability depends on robust components • Redundancy not required	Protective Command  • Safety-rated components • Integrated in accordance with safety principles and design • Redundancy not required	Protective Command Monitoring Signal  • 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	Redundant (Safety) Stop Commands Monitoring Signal  • 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 detected or not possible.
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) Category 3 or 4 and/or PL d or PL e per ISO 13849-1 satisfy Control Reliability requirements
ANSI / RIA	Simple	Single Channel	Single Channel with Monitoring	Typically, a minimum of PL=d with Category 3 per ISO 13849-1:2006 or control reliable (see ANSI B11.TR6 or ANSI B11.19)
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 13857
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 • ISO 14120 • IEC 60204-1 • ISO 13857 • ISO 13855
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 within 1/2 second • Release and reactivation required before machine motion may be reinitiated	• ANSI B11.19 • NFPA 79 • ISO 13851 • IEC 60204-1 • ISO 13855
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) Equipment: used to supplement/augment safeguarding.					
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?

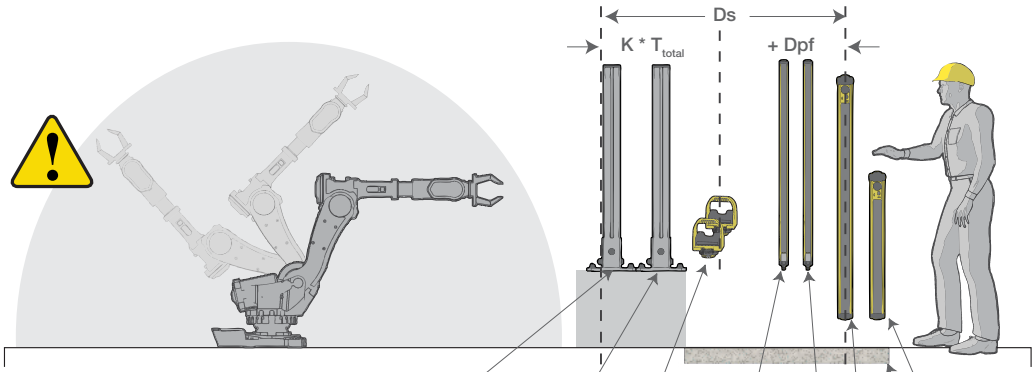
Choosing a Safety Product

- ☐ 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 • 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	
Two-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



Safety Distance
Ds = K (Ts + Tr) + Dpf

Ds = Safety Distance (inches)
K = OSHA Hand-Speed Constant
Ts = Machine Response (sec)
Dpf = Depth Penetration Factor (inches)

Hard guard or solenoid-locking guard

Standard or magnetic interlock hard guard interlocked guard opens away or laterally from the hazard (+/- Dpf)

Two-hand control (0" Dpf)

High-resolution safety light screen (1" to 2" Dpf)

Low-resolution two-beam safety grid (48" Dpf)

Horizontal sensing fields, including safety mats, horizontal safety light screens and area scanning devices (48" Dpf)

Low-resolution three- or four-beam safety grid (36" Dpf)

Standard-resolution safety light screen (3" to 8" Dpf)

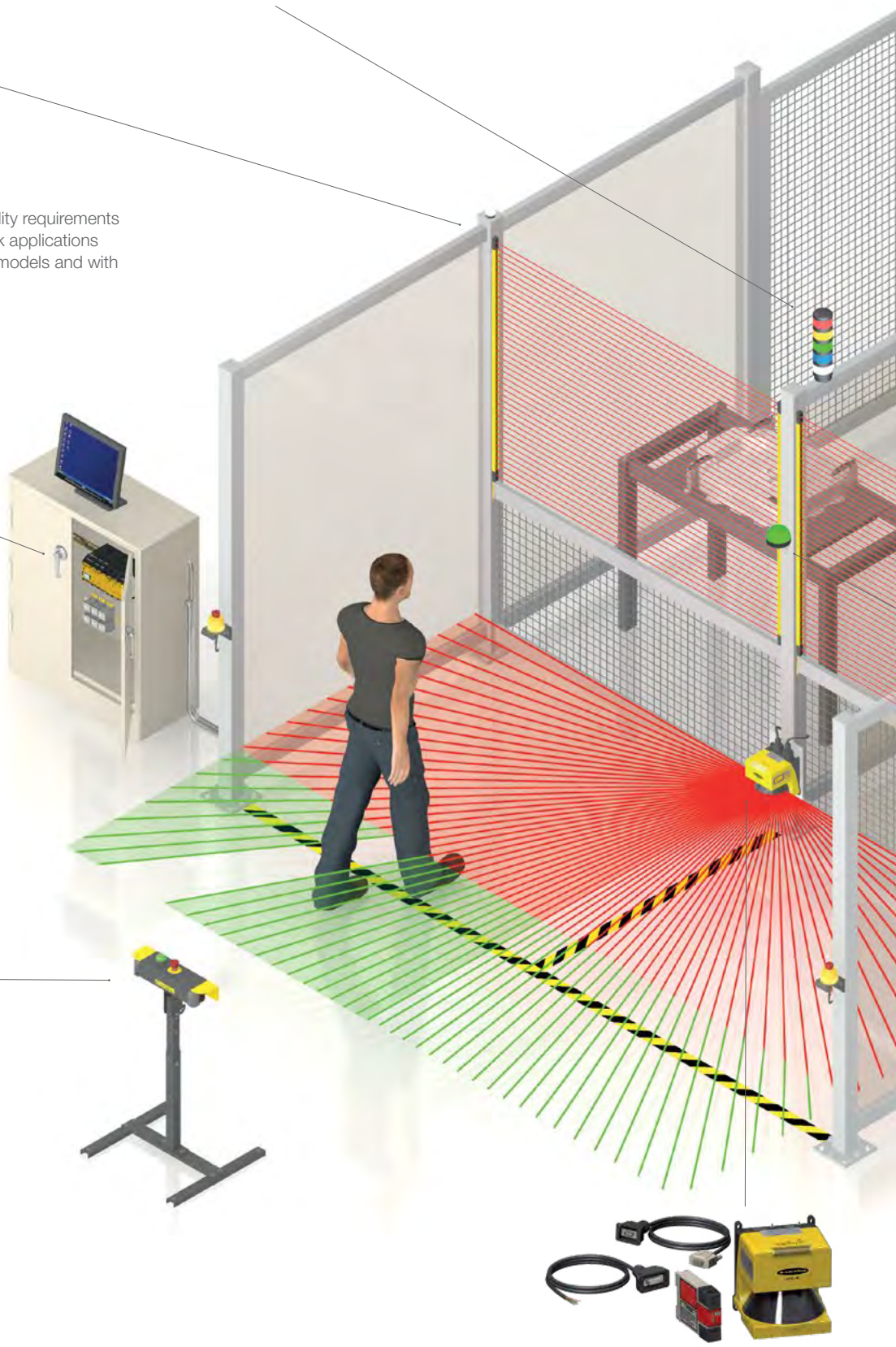
NOTE: Illustration examples are based upon the described safeguards being used as the primary safeguarding device, all examples having identical stopping time, and following generally accepted industrial engineering practices that are found within ANSI B11.19 safety standard.

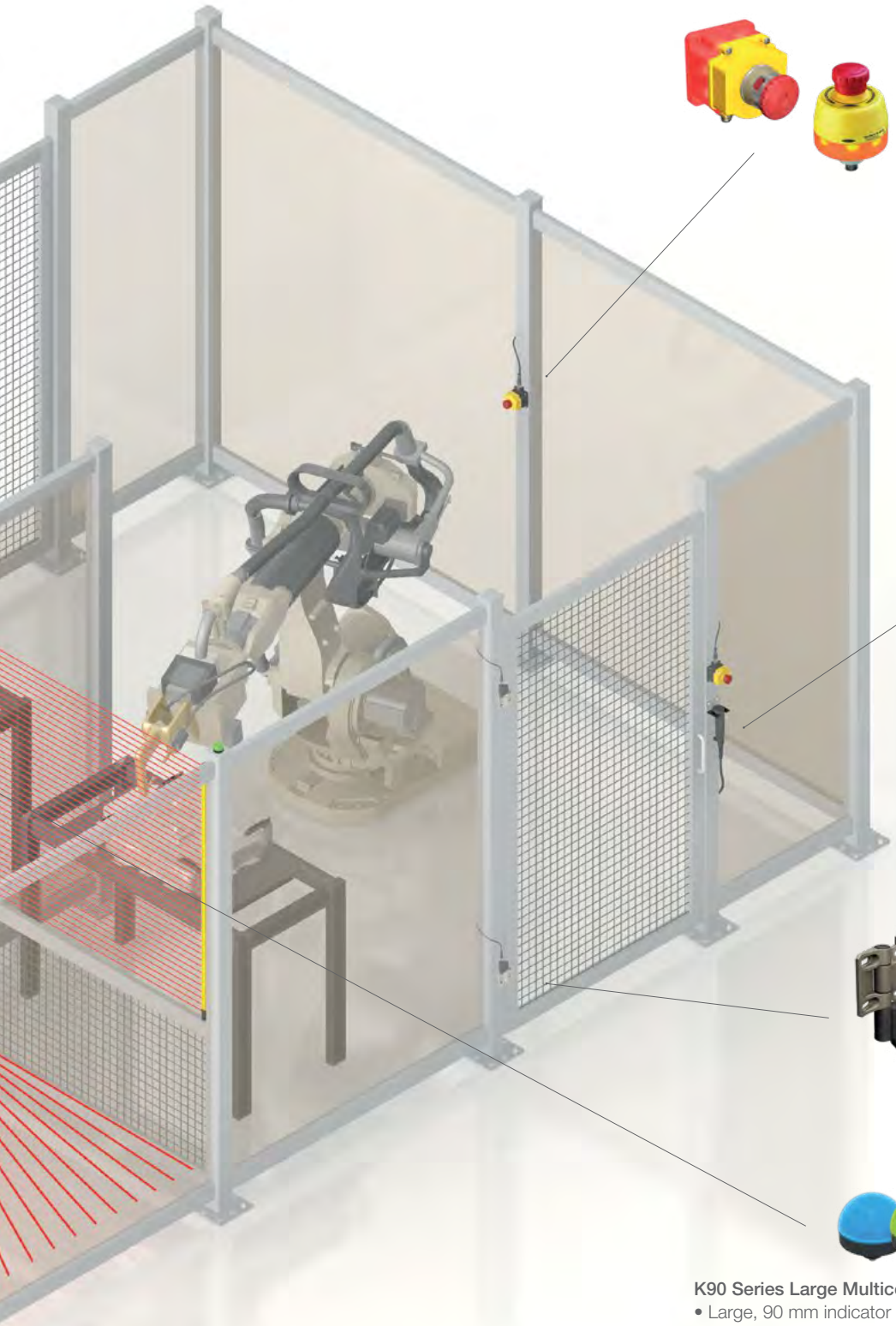
EZ-SCREEN Safety Light Screens
- Type 4 models exceed control reliability requirements
- Type 2 models available for lower-risk applications
- Available in standard or cascadable models and with integrated muting

TL70 Modular LED Tower Light
- Up to five colors plus an audible module in one device
- Bright, easy-to-see indicator segments for clear status indication
- Segments appear gray when OFF to eliminate false indication from ambient light

XS26-2 Expandable Safety Controller
- Up to eight expansion I/O modules can be added as your safety application grows or changes
- Begin programming right away using our intuitive, easy-to-use configuration software
- Simulator functionality allows users to test their configurations without being connected to a controller

Two-Hand Control
- Ergonomic design reduces risk of repetitive strain injury
- Optional run bar stand
- Add EZ-LIGHTs for status indication in lean manufacturing
- Provides highest level of safety for two-hand control input devices





Emergency Stop and Stop Control
- Available as panel mount or as pre-assembled enclosures
- Illuminated models help operators quickly identify actuated buttons
- Easy-to-mount enclosures install using M12 cables for quick wiring

Enabling Devices
- Provides safety function when user either squeezes or releases the handle grip switch
- Ergonomic design with a detented enable position

Safety Interlock Switches
- Load bearing hinge switch with 270° range
- Safety switching point is adjustable and repositionable
- Stainless or zinc die-cast

K90 Series Large Multicolor EZ-LIGHT
- Large, 90 mm indicator lights provide extremely bright and uniform illumination from all directions and over longer distances
- Up to five colors in a single device
- Rugged IP67 design

Safety Scanner
- Two-dimensional laser scanner with easy-to-use software
- Programming of irregular shaped warning and detection zones
- 190° scanning angle with selectable resolutions (30 mm, 40 mm, 50 mm, 70 mm and 150 mm) and a 4 m or 6.25 m range

Light Screens

Safety light screens protect personnel from injury and machines from damage by guarding points of operation, access, areas and perimeters. Type 4 safety light screens provide control reliability and high levels of fault tolerance and Type 2 safety light screens are cost effective for guarding lower-risk applications.

Series	Description	Max. Sensing Range	Defined Area	Safety Rating	Dimensions H x W x D	Power Supply
	**EZ-SCREEN®** Two-piece system with 14 or 30 mm resolution provides finger, hand and ankle detection. page 556	**14 mm:** 6 m **30 mm:** 18 m	150 to 1800 mm 150 to 2400 mm	Type 4 /Category 4/PLe	H (varies by model) 35 x 45.2 mm	24 V dc
	**EZ-SCREEN® LS** Intuitive, easy-to-use safety light screens with 14, 23, and 40 mm resolution to provide finger, hand and ankle detection. page 560	12 m	280 to 1820 mm	Type 4 /Category 4/PLe	H (varies by model) 45 x 42.5 mm	24 V dc
	**EZ-SCREEN® LP** Two-piece system with 14 or 25 mm resolution provides finger, hand and ankle detection. page 564	**14 or 25 mm:** 7 m	270 to 1810 mm	Type 4 /Category 4/PLe	H (varies by model) 28 x 26 mm	24 V dc
	**EZ-SCREEN® Grids** Two-piece perimeter guarding system with up to four beams of torso detection. page 572	70 m	500 to 1066 mm	Type 4 /Category 4/PLe	H (varies by model) 52 x 55 mm	24 V dc
	**EZ-SCREEN® Points** Two-piece perimeter guarding system with 1 beam of torso detection. page 573	70 m	25 mm beam diameter	Type 4 /Category 4/PLe	149 x 52 x 55 mm	24 V dc
	**EZ-SCREEN® Type 2** Suited for lower risk applications where the result is only a slight injury. page 578	15 m	150 to 1800 mm	Type 2 /Category 2/PLe	H (varies by model) 25.2 x 31.8 mm	24 V dc

Choosing a Safety Light Screen Model

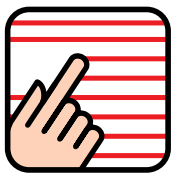
1 Select Hazard Level

Type 4

Protect personnel from injury and machines from damage by guarding points of operation, access, areas and perimeters. With self-checking circuitry, Type 4 light curtains provide control reliability and high levels of fault tolerance.

2 Select Resolution

Finger



14 mm resolution for finger, hand and ankle detection

Hand

lower resolution for hand and ankle detection

Body

2, 3, or 4 beams to protect personnel and machinery

3 Select Housing

Standard

Non-contact machine guarding systems protect fingers, hands and ankles, and guard perimeters and access, using self-contained emitters and receivers without a separate control box.
See page 556

LS

The Lean & Simple design combines Machine Safety and the notion of Lean Manufacturing by focusing on features that provide high-value for most applications while eliminating those that unnecessarily add cost and complicate the installation, use, and maintenance of the device.
See page 560

Low-Profile

The space-saving, compact profile is ideal for smaller machines, yet robust enough to meet the demands of large power presses.
See page 564

Grids & Points

Point and Grid systems allow one-, two-, three- or four-beam perimeter and access guarding.
See page 572

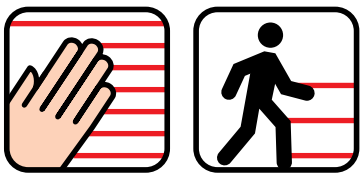
Select Hazard Level 1

Type 2

Used for lower-risk applications, where the result of an accident is only a slight injury. Type 2 Light curtains feature a large field of view and use fault exclusion to ensure the integrity of safeguarding.

Select Resolution 2

Hand/Body



30 mm resolution for bump, bruise or knock-down detection

Select Housing 3

Standard

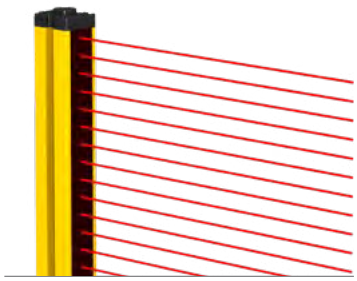
Inexpensive, compact optical safeguarding solution designed for lower-risk applications where risk of injury is limited but some guarding is necessary.

See page 578

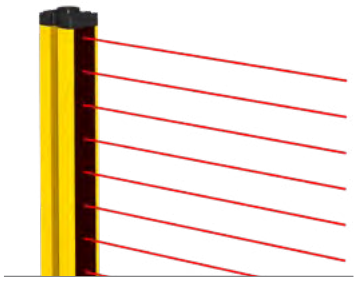
EZ-SCREEN®

Safety Light Screens

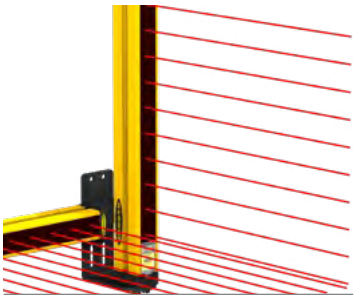
- EZ-SCREEN® point-of-operation systems provide finger, hand and ankle detection in a robust housing and metal endcaps.
- Operating range up to 18 m
- Displays operating status, configuration error codes, and blocked beams
- Exceeds OSHA/ANSI Control Reliability requirements, certified to cULus NIPF, and CE certified to Type 4, Cat 4 PLe, and SIL3
- Resists impact, twisting, and abusive environments with durable aluminum housing or nickel-plated ESD-safe housing for protection against electrostatic discharges
- Available in 14 or 30 mm resolution
- Cordsets and brackets see page 578



14 mm Resolution
14 mm resolution safety light screens can be used for finger, hand and ankle protection.



30 mm Resolution
30 mm resolution safety light screens can be used for hand and ankle protection.



Cascade
Cascading models allow four systems of any length and resolution to be connected in a series, forming a single safety device.

Some of the Available Finishes

Yellow Painted Aluminum

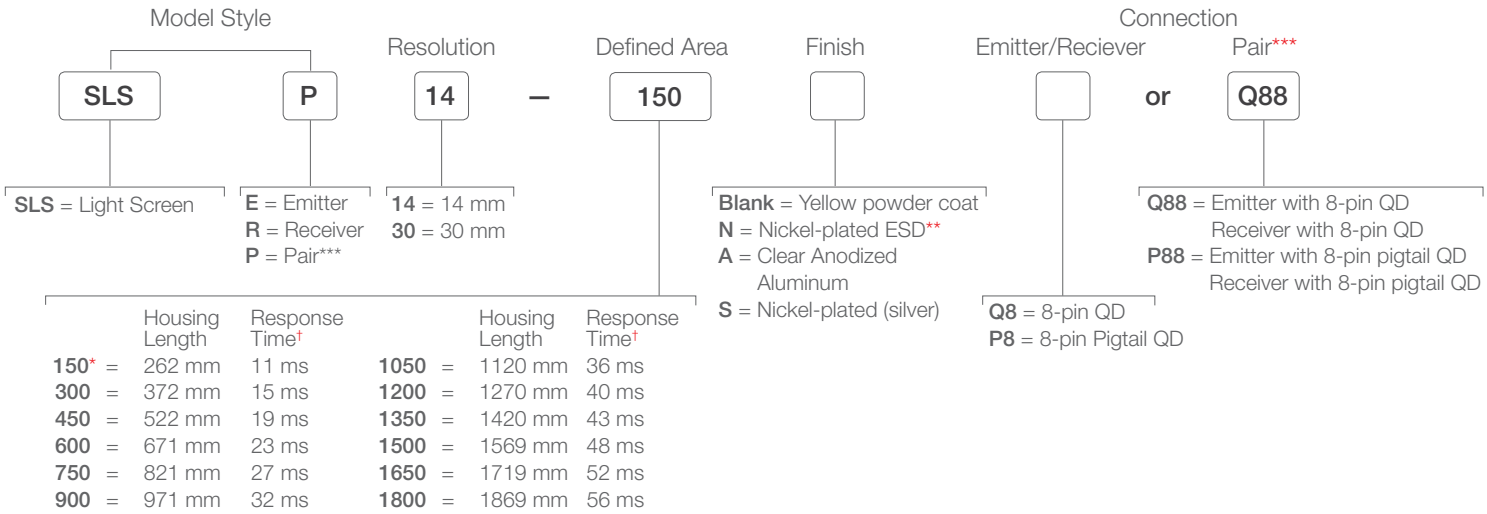
Clear Anodized Aluminum

Nickel-Plated ESD

EZ-SCREEN Systems

EZ-SCREEN® Systems, Non-Casade

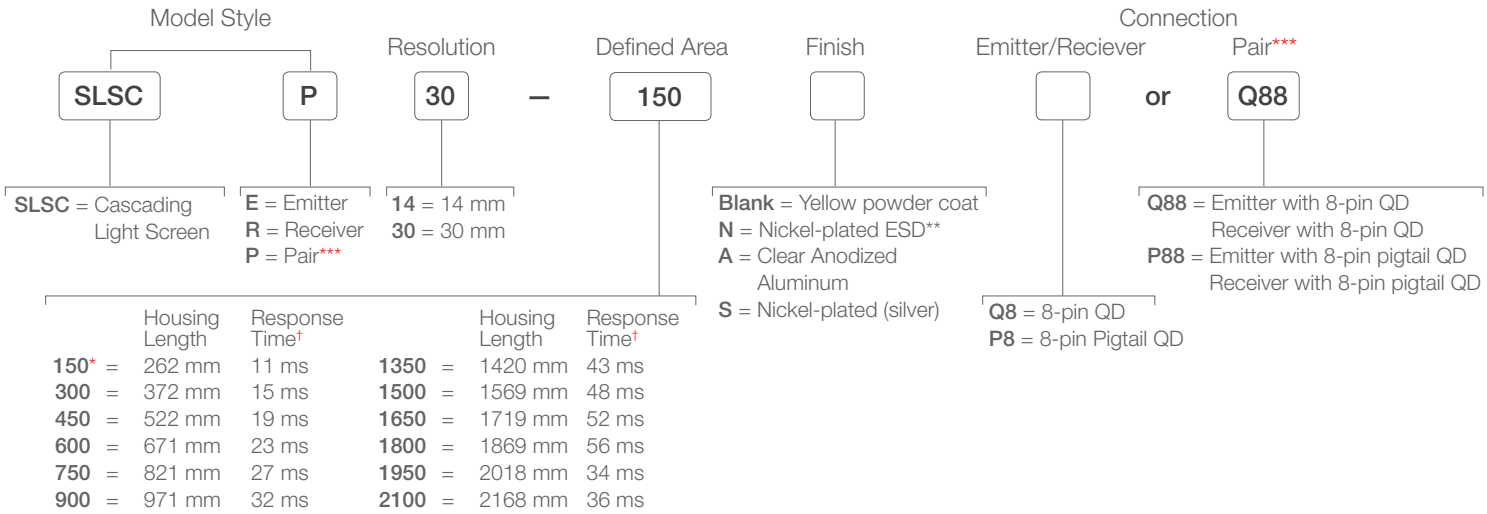
Example Model Number SLSP14-150Q88



	Housing Length	Response Time†		Housing Length	Response Time†
150* =	262 mm	11 ms	1050 =	1120 mm	36 ms
300 =	372 mm	15 ms	1200 =	1270 mm	40 ms
450 =	522 mm	19 ms	1350 =	1420 mm	43 ms
600 =	671 mm	23 ms	1500 =	1569 mm	48 ms
750 =	821 mm	27 ms	1650 =	1719 mm	52 ms
900 =	971 mm	32 ms	1800 =	1869 mm	56 ms

EZ-SCREEN® Systems, Cascade

Example Model Number SLSCP30-150Q88



	Housing Length	Response Time†		Housing Length	Response Time†
150* =	262 mm	11 ms	1350 =	1420 mm	43 ms
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600 =	671 mm	23 ms	1800 =	1869 mm	56 ms
750 =	821 mm	27 ms	1950 =	2018 mm	34 ms
900 =	971 mm	32 ms	2100 =	2168 mm	36 ms
1050 =	1120 mm	36 ms	2250 =	2318 mm	38 ms
1200 =	1270 mm	40 ms	2400 =	2468 mm	40 ms

For more specifications see page 559.

QD models: A model with a QD requires a mating cordset (see page 578).

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 5-pin 300 mm M12/Euro pigtail QD with No EDM or TEST functions, replace **Q8** with **P5NT** on emitter or receiver (example, **SLSE14-150P5NT**) and **Q88** with **P55NT** on pair model numbers (example, **SLSP14-150P55NT**).
For a 4-pin 300 mm M12/Euro pigtail QD with no EDM or TEST functions (GND/PE via mounting), replace **Q8** with **P4NT** or **Q88** with **P44NT** (example, **SLSP14-150P4NT** or **SLSP14-150P44NT**).

* 150 mm not available in cascade models

** ESD-safe models are not available with the pigtail QD option

*** A pair includes an emitter and receiver (example, **SLSP30-150Q88**)

† 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.
Contact Banner Engineering Corp. for additional information and/or verification of valid kit model numbers.

M12/Euro-Style
Straight connector models listed

8-Pin
QDE-815D
4.5 m (15')
QDE-825D
7.6 m (25')
QDE-850D
15.3 m (50')
QDE-875D
22.9 m (75')
QDE-8100D
30.5 m (100')

Euro-Style
Double-ended male/female

8-Pin

DEE2R-81D 0.3 m (1')	**DEE2R-825D** 7.6 m (25')
DEE2R-83D 0.9 m (3')	**DEE2R-850D** 15.3 m (50')
DEE2R-88D 2.4 m (8')	**DEE2R-875D** 22.9 m (75')
DEE2R-815D 4.5 m (15')	**DEE2R-8100D** 30.5 m (100')

Euro-Style Adaptor
male/female

8-Pin/4-Pin*	8-Pin/5-Pin*
DEE8-41D 0.3 m (1')	**DEE8-51D** 0.3 m (1')
DEE8-48D 2.4 m (8')	**DEE8-58D** 2.4 m (8')
DEE8-415D 4.5 m (15')	**DEE8-515D** 4.5 m (15')
DEE8-425DD 7.6 m (25')	**DEE8-525DD** 7.6 m (25')

NOTE: See page 577 for interfacing solutions.
Additional accessories are listed on page 686.

* For SLS/SLP sensors with Q8 or P8 connection to safety BUS gateway/ node, "smart" self-monitored safety module, safety controller or safety PLC see page 771.

Euro-Style
Straight splitter

8-Pin
CSB-M1280M1280
CSB-M1281M1281
CSB-M1288M1281
CSB-M12815M1281
CSB-M12825M1281
CSB-UNT825M1281

Additional cordset information is available. See page 758

EZA-MBK-12**

EZA-MBK-11**

EZA-MBK-20

Used with: 14 and 30 mm

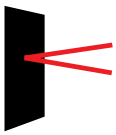
EZA-MBK-21
Cascade

Additional bracket information is available. See page 729

Stands

see page 802

Mirrors



see page 806

Interface

see page 820

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-12	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
EZA-RR-1	External normally open reset switch with 8-pin/M12 Euro-style QD
MGA-K-1	Replacement key for switch MGA-KS0-1
MGA-KS0-1	Panel-mount keyed normally open reset switch
EZA-HK-1	Wrench, Security
EZA-RTP-1	Terminator plug for cascade receiver
STP-13	14 mm test piece (14 mm resolution systems)
STP-14	30 mm test piece (14 mm resolution systems with 2-beam Reduced Resolution and for 30 mm resolution systems)
STP-15	60 mm test piece (30 mm resolution systems with 2-beam Reduced Resolution)

NOTE: See Installation manual p/n **112852** for complete list of replacement parts and accessories.

EZ-SCREEN® 14 & 30 mm Resolution Specifications

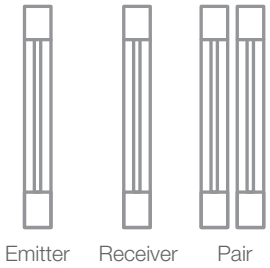
Supply Voltage at the Device	24 V dc ±15% (use a SELV-rated supply according to EN IEC 60950) (The external voltage supply must be capable of buffering brief mains interruptions of 20 ms, as specified in EN/IEC 60204-1.)
Residual Ripple	± 10% maximum
Supply Current	**Emitter:** 100 mA max., 40 mA at 24 V dc typical **Receiver:** 275 mA max., 160 mA at 24 V dc typical, exclusive of OSSD1 and OSSD2 loads (up to an additional 0.5A each) and AUX output load (up to 75 mA)
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 3 V 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. **High signal:** 10 to 30 V dc **Low signal:** 0 to 3 V dcInput 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)	**Beam 1 (Sync Beam) / All Other Beams** **14 mm Models:** 109 to 800 ms / 33 to 220 ms **30 mm Models:** 81 to 495 ms / 25 to 152 ms
EDM Input	+24 V dc signals from external device contacts can be monitored (one-channel, two-channel or no monitoring) via EDM1 and EDM2 terminals in the receiver **High signal:** 10 to 30 V dc at 30 mA typical **Low signal:** 0 to 3 V 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 30 V dc at 30 mA typical **Low signal:** 0 to 3 V dcClosed switch time: 0.25 to 2 sec
Safety Outputs (OSSDs)	Two redundant solid-state 24 V 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-1.5 V dc **OFF-State voltage:** 1.2 V dc max. (0-1.2 V 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, 24 V 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 +24 V 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 559.
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 (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

EZ-SCREEN® LS

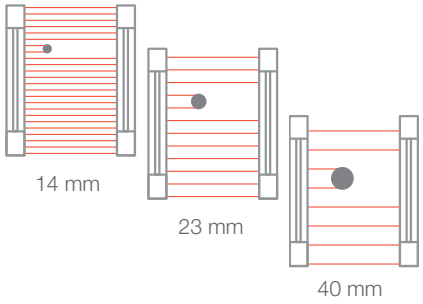
Rugged Safety Light Screen with Enhanced Features

- Alignment indicators are highly visible and intuitive diagnostics simplify setup, facilitate troubleshooting and streamline installation
- No blind zone design provides end-to-end sensing to eliminate gaps in detection
- Metal end caps, thick aluminum housing and a recessed window to avoid damage from impact
- Standard pairs, cascade systems and extensive accessories to suit a wide variety of safeguarding configurations
- Cordsets and brackets see page 562

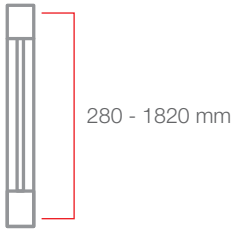
1. Choose one



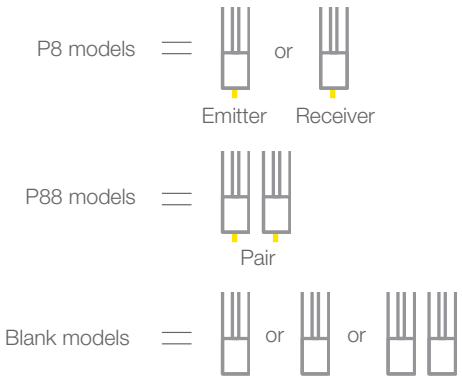
2. Choose your resolution



3. Choose your defined area



4. Choose your machine interface connection



Use DELS-.. cordset for connection between cascade pairs

Build a Standard (Non-Cascade) Pair

- Use standard models for a lower cost safety solution
- Cascade models allow for future flexibility and use of optional indicators (see "Build a Cascade System")

Family	System Type	Resolution		Defined Area	Connector*
SLL	**P**	**14**	–	**770**	**P88**

Family: **SLL**

System Type:
- **E** = Emitter only
- **R** = Receiver only
- **P** = Pair (Emitter and Receiver)

Resolution:
- **14** = 14 mm
- **23** = 23 mm
- **40** = 40 mm

Defined Area:

280 = 280 mm	**1120** = 1120 mm
350 = 350 mm	**1190** = 1190 mm
420 = 420 mm	**1260** = 1260 mm
490 = 490 mm	**1330** = 1330 mm
560 = 560 mm	**1400** = 1400 mm
630 = 630 mm	**1470** = 1470 mm
700 = 700 mm	**1540** = 1540 mm
770 = 770 mm	**1610** = 1610 mm
840 = 840 mm	**1680** = 1680 mm
910 = 910 mm	**1750** = 1750 mm
980 = 980 mm	**1820** = 1820 mm
1050 = 1050 mm	

Connector*:
- **P8** = 300 mm pigtail, 8-Pin M12 QD (individual Emitter or Receiver models)
- **P88** = 300 mm pigtail, 8-Pin M12 QD (on BOTH Emitter and Receiver models)
- **Blank** = no pigtail, RD connection (for RDLS-8..D cordset)

* *5-pin M12 QD options available* (**P5** or **P55**)

Build a Cascade System

- Determine the configuration of the first EZ-SCREEN® LS pair ("master" connected to the machine control)
- Determine the remaining (second, third or fourth) pairs ("slaves" connected to the master using a DELS-.. cordset)

Family	Cascadable	System Type	Resolution		Defined Area	Connector*
SLL	**C**	**P**	**14**	–	**770**	**P88**

Family: **SLL**

Cascadable:
- **C** = Cascadable

System Type:
- **E** = Emitter only
- **R** = Receiver only
- **P** = Pair (Emitter and Receiver)

Resolution:
- **14** = 14 mm
- **23** = 23 mm
- **40** = 40 mm

Defined Area:

350 = 350 mm	**1120** = 1120 mm
420 = 420 mm	**1190** = 1190 mm
490 = 490 mm	**1260** = 1260 mm
560 = 560 mm	**1330** = 1330 mm
630 = 630 mm	**1400** = 1400 mm
700 = 700 mm	**1470** = 1470 mm
770 = 770 mm	**1540** = 1540 mm
840 = 840 mm	**1610** = 1610 mm
910 = 910 mm	**1680** = 1680 mm
980 = 980 mm	**1750** = 1750 mm
1050 = 1050 mm	**1820** = 1820 mm

Connector*:
- **P8** = 300 mm pigtail, 8-Pin M12 QD (individual Emitter or Receiver models)
- **P88** = 300 mm pigtail, 8-Pin M12 QD (on BOTH Emitter and Receiver models)
- **Blank** = no pigtail, RD connection (for RDLS-8..D cordset)

* *5-pin M12 QD options available* (**P5** or **P55**)

For more specifications see page 563.

QD models: A model with a QD requires a mating cordset (see page 578).

Machine Interface Connections

8-Pin

RD Cordsets

RDLS-815
4.6 m (15')
RDLS-825
8 m (26')
RDLS-860
15 m (60')

NOTE: 5-pin options available

8-Pin

M12/Euro-Style
Straight connector models listed

QDE-815D
4.5 m (15')
QDE-825D
7.6 m (25')
QDE-850D
15.3 m (50')
QDE-875D
22.9 m (75')
QDE-8100D
30.5 m (100')

8-Pin

Euro-Style
Straight splitter

CSB-M1280M1280
CSB-M1281M1281
CSB-M1288M1281
CSB-M12815M1281
CSB-M12825M1281

8-Pin*

Euro-Style
Double-ended male/female

DEE2R-81D
0.3 m (1')
DEE2R-83D
0.9 m (3')
DEE2R-88D
2.4 m (8')
DEE2R-815D
4.5 m (15')
DEE2R-825D
7.6 m (25')
DEE2R-850D
15.3 m (50')
DEE2R-875D
22.9 m (75')
DEE2R-8100D
30.5 m (100')

Cascading Connections

Double-ended RD to RD

DELS-110E
0.05 m (0.2')
DELS-111E
0.3 m (1')
DELS-113E
1 m (3.3')
DELS-118E
2.5 m (8.2')
DELS-1115E
4.6 m (15')
DELS-1125E
8 m (26')
DELS-1150E
15.3 m (50')

Additional cordset information is available. See page 758

EZLSA-MBK-11

EZLSA-MBK-12

EZLSA-MBK-16

EZLSA-MBK-20

Additional bracket information is available. See page 729

EZLSA-K30LGR
Connects directly to **SLLCR...** cascade receiver

K30LGRXPQ
requires 4-pin QD

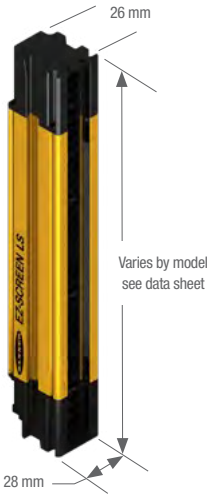
K50LGRXPQ
requires 4-pin QD

TL50GRQ
requires 4-pin QD

RD to Euro-Style*
Connects indicators to a cascade receiver

DELSEF-40D
0.5 m (0.02')
DELSEF-41D
0.3 m (1')
DELSEF-43D
1 m (3.3')
DELSEF-48D
2.5 m (8.2')
DELSEF-415D
4.6 m (15.1')

NOTE: For Remote Fixed Blanking use **DELSEF-81D**



EZ-SCREEN LS Systems

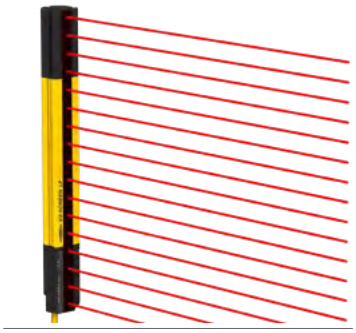
EZ-SCREEN LS Specifications

Supply Voltage at the Device	24 V dc ±15% (use a SELV-rated power supply according to EN IEC 60950).The external voltage supply must be capable of buffering brief mains interruptions of 20 ms, as specified in IEC/EN 60204-1.
Short Circuit Protection	All inputs and outputs are protected from short circuits to +24 V dc or dc common
Supply Protection Circuitry	
Output Configuration	**Off-state leakage current:** less than 10 µA **PNP On-state saturation voltage:** less than 200 mV at 10 mA load and less than 1.0 V at 100 mA **NPN On-state saturation voltage:** less than 1.0 V at 10 mA load and less than 2.0 V at 100 mA
Effective Aperture Angle (EAA)	Meets Type 4 requirements per IEC 61496-2
Residual Ripple	±10% maximum
Electrical Safety Class	III (per IEC 61140: 1997)
Operating Range	0.1 m to 12 m (4 in to 39 ft) — Range decreases with use of mirrors and/or lens shields: • Lens shields — approx 10% less range per shield • Glass-surface mirrors — approx 8% less range per mirror See the specific mirror datasheet for more information
Mounting Hardware	Emitter and receiver each are supplied with a pair of swivel end-mounting brackets (**EZLSA-MBK-11**). Models 980 mm and longer are supplied with an additional center-mount bracket (**EZLSA-MBK-12**) for center support in applications with significant vibration. Mounting brackets are 8-gauge cold-rolled steel, black zinc finish.
Resolution	14 mm, 23 mm, or 40 mm, depending on model
Enclosure	Extruded aluminum housing with yellow polyester powder finish standard and well-sealed, rugged die-cast zinc end caps, acrylic lens cover
Safety Rating	Type 4 per IEC 61496-1, -2 Category 4 PL e per EN ISO13849-1 SIL3 per IEC 61508; SIL CL3 per IEC 62061
Environmental Rating	IEC IP65/IEC IP67
Shock and Vibration	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 (0.014 in) single amplitude (0.70 mm peak-to-peak) and shock of 10 g for 16 milliseconds (6,000 cycles).
Operating Conditions	–20 to +55 °C (–4 to +131 °F) 95% maximum relative humidity (non-condensing)
Certifications	CE c UL us LISTED

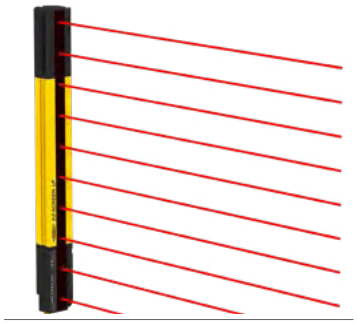
EZ-SCREEN® Low Profile (LP)

Type 4 Safety Light Screens

- Small, compact design with end-to-end sensing.
- Operating range up to 7 m
- Features seven-segment display for diagnostic information and number of blocked beams
- Offers reduced resolution and fixed blanking to ignore tooling or constant inflow of materials
- Identifies clear and blocked beams using zone indicators
- Exceeds OSHA/ANSI Control Reliability requirements, certified to cTUVus, and CE certified to Type 4, Cat 4 PLe, and SIL 3
- Cordsets and brackets see page 568



14 mm Resolution
14 mm resolution safety light screens can be used for finger, hand and ankle protection.



25 mm Resolution
25 mm resolution safety light screens can be used for hand and ankle protection.

Cascade
Low-profile models allow four systems of any length and resolution to be connected in a series, forming a single safety device.

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

EZ-SCREEN® Low-Profile Systems, Non-Cascade

Example Model Number SLPP14-270Q88

Model Style	Resolution		Defined Area	Finish	Connection: Emitter/Reciever		Connection: Pair
SLP	**P**	**14**	–	**270**			or	**P88**
SLP = Light Screen	**E** = Emitter only **R** = Receiver only **P** = Pair†	**14** = 14 mm **25** = 25 mm		**Blank** = Yellow powder coat **N** = Nickel-plated ESD** **A** = Clear Anodized Aluminum	**Blank** = Integral RD **P8** = 8-pin Pigtail QD			**Blank** = Emitter with Integral RD Receiver with Integral RD **P88** = Emitter with 8-pin pigtail QD Receiver with 8-pin pigtail QD **RD** = Removable disconnect

	Housing Length	Response Time††		Housing Length	Response Time††
270* =	270 mm	10.5 ms	**1110** =	1108 mm	28.5 ms
410 =	410 mm	13.5 ms	**1250** =	1248 mm	31.5 ms
550 =	549 mm	16.5 ms	**1390** =	1388 mm	34.5 ms
690 =	689 mm	19.5 ms	**1530** =	1528 mm	37.5 ms
830 =	829 mm	22.5 ms	**1670** =	1667 mm	40.5 ms
970 =	969 mm	25.5 ms	**1810** =	1807 mm	43.5 ms

EZ-SCREEN® Low-Profile Systems, Cascadable

Example Model Number SLPCP25-270Q88

Model Style	Resolution		Defined Area	Finish	Connection: Emitter/Reciever		Connection: Pair†
SLPC	**P**	**25**	–	**270**			or	**P88**
SLPC = Cascading	**E** = Emitter only **R** = Receiver only **P** = Pair†	**14** = 14 mm **25** = 25 mm		**Blank** = Yellow powder coat **N** = Nickel-plated ESD** **A** = Clear Anodized Aluminum	**Blank** = Integral RD **P8** = 8-pin Pigtail QD			**Blank** = Emitter with Integral RD Receiver with Integral RD **P88** = Emitter with 8-pin pigtail QD Receiver with 8-pin pigtail QD **RD** = Removable disconnect

	Housing Length	Response Time††		Housing Length	Response Time††
270* =	270 mm	10.5 ms	**1110** =	1108 mm	28.5 ms
410 =	410 mm	13.5 ms	**1250** =	1248 mm	31.5 ms
550 =	549 mm	16.5 ms	**1390** =	1388 mm	34.5 ms
690 =	689 mm	19.5 ms	**1530** =	1528 mm	37.5 ms
830 =	829 mm	22.5 ms	**1670** =	1667 mm	40.5 ms
970 =	969 mm	25.5 ms	**1810** =	1807 mm	43.5 ms

For more specifications see page 570.

QD models: A model with a QD requires a mating cordset (see page 570).

QD models: 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 568).
Integral RD models require mating cordsets with a removable disconnect connector (such as **RDLP-8..D** or **DELPE-8..D**; see page 568).

* 270 mm not available in cascade models

** ESD-safe models are not available with the pigtail QD option

† A pair includes an emitter and receiver (example, **SLSP30-150Q88**)

†† **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.

Contact Banner Engineering Corp. for additional information and/or verification of valid kit model numbers.

EZ-SCREEN® Low Profile (LP)

With Muting—Type 4 Safety Light Screens

- Has a built-in muting function with no third box required.
- Eight pre-defined muting configuration options including Bypass, Mute-Dependent Override, Mute Enable, and Mute-cycle time extensions (four seconds) for "L"-style cell exit applications
- Mute Lamp and Status Outputs to EZ-LIGHT (or other indicating devices)
- Lower power consumption allows for energy savings and fewer/smaller power supplies
- Exceeds OSHA/ANSI Control Reliability requirements, certified to cTUVus, and CE certiffed to Type 4, Cat 4 PLe, and SIL 3
- Cordsets and brackets see page 568

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

Example Model Number SLPMP14-410Q128

Model Style	Resolution		Defined Area	Finish	Emitter/Reciever		Connection Pair*
SLPMP	14	–	410			or	P128

Model Style
- **SLPE** = Emitter
- **SLPR** = Receiver
- **SLPMP** = Muting LP Pair*

Resolution
- **14** = 14 mm
- 25 = 25 mm

Defined Area

	Housing Length	Response Time††
410 =	410 mm	13.5 ms
550 =	549 mm	16.5 ms
690 =	689 mm	19.5 ms
830 =	829 mm	22.5 ms
970 =	969 mm	25.5 ms
1110 =	1108 mm	28.5 ms
1250 =	1248 mm	31.5 ms
1390 =	1388 mm	34.5 ms
1530 =	1528 mm	37.5 ms
1670 =	1667 mm	40.5 ms
1810 =	1807 mm	43.5 ms

Finish
- **Blank** = Yellow powder coat
- **N** = Nickel-plated ESD
- **A** = Clear Anodized Aluminum

Emitter/Reciever
- **Blank** = Integral RD
- **P8** = 8-pin Pigtail QD (SLP Emitter)
- **P12** = 12-pin Pigtail QD (SLPM Receiver)

Connection Pair*
- **Blank** = Receiver with Integral RD Emitter with Integral RD
- **P128** = Emitter with 8-pin pigtail QD Receiver with 12-pin pigtail QD (SLPM Receiver)

RD = Removable disconnect

For more specifications see page 570.

QD models: A model with a QD requires a mating cordset (see page 568).

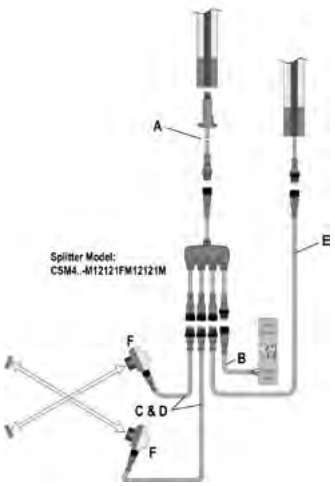
QD models: Pigtail QD models require mating cordsets with an 8 or 12-pin M12/Euro-style connector (such as **QDE-8..D**, **QDE-12..E**, **DEE2R-8..D**).
Integral RD models require mating cordsets with a removable disconnect connector (such as **RDLP-8..D** or **RDLP-11..E**).

* A pair includes an emitter and receiver (example, **SLPMP14-410P128**)

Contact Banner Engineering Corp. for additional information and/or verification of valid model numbers.

EZ-SCREEN® LPM Cordset Overview*

Muting Splitter Cordsets	
3-Branch models	**Banner sensors (PNP)**
CSM3DO-M12121FM12121M	Dark Operate (pin 2)
CSM3LO-M12121FM12121M	Light Operate (pin 4)
4-Branch models (With Emitter hookup)	
CSM4DO-M12121FM12121M	Dark Operate (pin 2)
CSM4LO-M12121FM12121M	Light Operate (pin 4)
Muting Sensor Cordsets (C & D)	**Length**
DEE2R-51D	0.3 m (1')
DEE2R-53D	1 m (3')
DEE2R-58D	2.5 m (8')
DEE2R-815D	4.5 m (15')



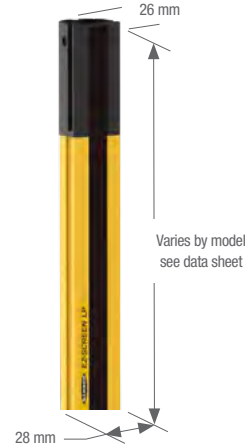
"**A**" (Receiver cordset): On RD models = **DELPE-12xxE**; On P12 models cordset "**A**" is a preinstalled **DELPE-121E**.
"**B**": Machine interface cordset = QDE-12xxE.
"**C**" and "**D**": Muting Sensor cordsets = **DEE2R-515D**. Ensure sensors connected to Cordsets C & D are PNP output with Dark Operate on pin 2 or Light Operate on pin 4.
"**E**" (Emitter cordset): On RD models = **DELPE-12xxE**; On P8 models (shown), use a **DEE2R-8xxD** double-ended cordset. If using a 3-Branch Muting Splitter cordset, use appropriate Emitter cordset.
"**F**": **QS18VP6LPQ8** (4-pin M12/Euro QD) sensor shown as example. Other sensors or switches may be used.

* NOTE: See EZ-SCREEN® Low Profile with Muting manual (p/n 150216) for complete information.

EZ-SCREEN® Muting Indicators

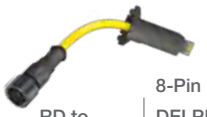
TL50WQ	Single Color (White)
DELPEF-40D	Single Color Cordset 0.05 m
DELPEF-41D	Single Color Cordset 0.3 m
DELPEF-43D	Single Color Cordset 1 m
K50LGRW2PQ-18886	Three Color (Green/Red/White)
TL50GYRWQ	Four Color (Green/Yellow/Red/White)
DELPEF-50D	Multi-Color Cordset 0.05 m
DELPEF-51D	Multi-Color Cordset 0.3 m
DELPEF-53D	Multi-Color Cordset 1 m
LPA-MBK-15	Optional mounting bracket (Used with DELPEF-..0D cordset)

Additional Indicators available, see EZS LPM manual



EZ-SCREEN LP Systems

RD Cordsets	8-Wire*	11-Wire
	RDLP-815D 4.5 m (15')	**RDLP-1115E** 4.5 m (15')
	RDLP-825D 7.6 m (25')	**RDLP-1125E** 7.6 m (25')
	RDLP-850D 15.3 m (50')	**RDLP-1150E** 15.3 m (50')
	RDLP-875D 22.9 m (75')	**RDLP-1175E** 22.9 m (75')
	RDLP-8100D 30.5 m (100')	**RDLP-11100E** 30.5 m (100')



RD to Euro QD**	8-Pin Male	12-Pin Male	8-Pin Female
	DELPE-81D 0.3 m (1')	**DELPE-81E** 0.3 m (1')	**DELPEF-81E** 0.3 m (1')
	DELPE-83D 0.9 m (3')	**DELPE-83E** 0.9 m (3')	**DELPEF-83E** 0.9 m (3')
	DELPE-88D 2.4 m (8')	**DELPE-88E** 2.4 m (8')	**DELPEF-88E** 2.4 m (8')
	DELPE-815D 4.5 m (15')	**DELPE-815E** 4.5 m (15')	**DELPEF-815E** 4.5 m (15')
	DELPE-825D 7.6 m (25')	**DELPE-825E** 7.6 m (25')	
	DELPE-850D 15.3 m (50')	**DELPE-850E** 15.3 m (50')	
	DELPE-875D 22.9 m (75')	**DELPE-875E** 22.9 m (75')	
	DELPE-8100D 30.5 m (100')	**DELPE-8100E** 30.5 m (100')	

RD to RD	
	DELP-110E 0.05 m (0.2')
	DELP-110E 0.3 m (1')
	DELP-110E 1 m (3.3')
	DELP-118E 2.5 m (8.2')
	DELS-1115E 4.6 m (15')
	DELS-1125E 8 m (26')
	DELS-1150E 15.3 m (50')
	DELS-1175E 23 m (75')
	DELS-11100E 30 m (100')

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**).

* For connection of E-Stop or other hard/relay contacts see page 774.

** Requires mating 8-pin M12/Euro cordset. 8-pin Male used for Machine Interface connection (indicator end of sensor). 8-pin Female used for cascade connection when using M12/Euro QDs.

See page 567 for EZ-SCREEN® LPM cordset overview.

Euro-Style Double-ended male/female	8-Pin*	
	DEE2R-81D 0.3 m (1')	**DEE2R-825D** 7.6 m (25')
	DEE2R-83D 0.9 m (3')	**DEE2R-850D** 15.3 m (50')
	DEE2R-88D 2.4 m (8')	**DEE2R-875D** 22.9 m (75')
	DEE2R-815D 4.5 m (15')	**DEE2R-8100D** 30.5 m (100')

M12/Euro-Style Straight connector models listed	8-Pin
	QDE-815D 4.5 m (15')
	QDE-825D 7.6 m (25')
	QDE-850D 15.3 m (50')
	QDE-875D 22.9 m (75')
	QDE-8100D 30.5 m (100')

Euro-Style Straight splitter	8-Pin
	CSB-M1280M1280
	CSB-M1281M1281
	CSB-M1288M1281
	CSB-M12815M1281
	CSB-M12825M1281

Use with: models with Pigtail QD and DELPE-8xxD connections.

* For connection to safety BUS gateway/node, a "smart" self-monitored safety module, safety controller or safety PLC see page 771.

Additional cordset information is available. See page 758

LPA-MBK-11*

LPA-MBK-12*

LPA-MBK-20

LPA-MBK-22

* Standard brackets included with emitter/receiver.

Use with: Low-Profile 14 & 25 mm

LPA-MBK-21

LPA-MBK-90

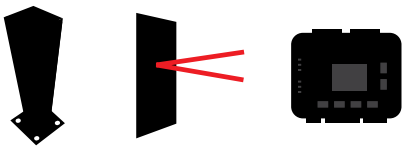
LPA-MBK-120

LPA-MBK-135

Use with: Low-Profile 14 & 25 mm–Cascade

Additional bracket information is available. See page 729

Stands Mirrors Interface



Additional interfacing and accessory information is available. See page 802

Remote Fixed Blanking Switch

Allows frequent configuration of a fixed blanked area, without using the receiver DIP switches.

EZA-RBK-1

Replacement Parts

Model	Description
STP-13	14 mm test piece (for 14 mm resolution systems)
STP-16	25 mm test piece (for 25 mm resolution systems)
STP-17	34 mm test piece (for 14 mm resolution systems with 2-beam reduced resolution enabled)
STP-18	65 mm test piece (for 25 mm resolution systems with 2-beam reduced resolution enabled)
LPA-TP-1	Terminator plug, for SLPC... emitter/receiver (included with sensor)
EZA-RR-1	External normally open reset switch with 8-pin M12/Euro-style QD
MGA-KSO-1	Panel-mount keyed normally open reset switch

Model	Description
MGA-K-1	Replacement key for switch MGA-KSO-1
DELPE-81D	Replacement for M12-terminated pigtail QD, as shipped with standard pigtail QD models; 8-conductor cable, 22 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 installation manual p/n 112852 for complete list of replacement parts and accessories.

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

Supply Voltage at the Device	24 V dc ±15% (use a SELV-rated supply according to EN IEC 60950) (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:** 60 mA max., exclusive of fault load **Receiver:** 150 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 (see model number tables) **Cascade safety stop interface (CSSI):** 40 milliseconds max. (contacts must be open for 60 milliseconds min.)
Remote Test Input	Test mode is activated either by applying a low signal (less than 3 V dc) to emitter Test/Reset terminal for a minimum of 50 milliseconds, or by opening a switch connected between Test/Reset and 24 V dc for a minimum of 50 milliseconds. Beam scanning stops to simulate a blocked condition. A high signal at Test/Reset deactivates Test Mode. **High Signal:** 10 to 30 V dc **Low Signal:** 0 to 3 V 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)	

	Beam 1 (Sync Beam)	All Other Beams
14 mm Models	109 to 800 ms	33 to 220 ms
30 mm Models	81 to 495 ms	25 to 152 ms

EDM Input	+24 V dc signals from external device contacts can be monitored (one-channel, two-channel or no monitoring) via EDM1 and EDM2 terminals in the receiver **High Signal:** 10 to 30 V dc at 30 mA typical **Low Signal:** 0 to 3 V 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 30 V dc at 30 mA typical **Low Signal:** 0 to 3 V dc **Closed Switch Time:** 0.25 to 2 seconds
Safety Outputs (OSSDs)	Two redundant solid-state 24 V 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-1.5 V dc **OFF-State voltage:** 1.2 V dc max. (0-1.2 V 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, 24 V dc at 250 mA max. that follow safety outputs or lock out status (configurable)
External Remote Indicator Outputs (SLPMR models only)	Current sourcing (PNP), solid-state, 24 V dc outputs for the connection of remote indicator lamps such as EZ-LIGHTs. See EZ-LIGHT™ for EZ-SCREEN® Low Profile with Muting in manual **150216** for compatible EZ-LIGHTs and associated cordsets. **Rated Current:** 100 mA maximum at 24 V dc
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. Factory default position is OFF (Standard display). **Fault:** 2-position switch. Factory default position 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-channel monitoring. (SLPMR models: 1-channel monitoring only) **Mute Lamp Monitoring:** ON/OFF switch. Factory default position is ON (SLPMR models only) **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 position is OFF.
Short Circuit Protection	All inputs and outputs are protected from short circuits to +24 V dc or dc common
Electrical Safety Class (IEC 61140)	III

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

Operating Range	0.1 to 7 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 806, 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 Bicolor (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 Bicolor (Red/Green) Status indicator – indicates general system and output status Bicolor (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 Yellow Mute Device Input Indicators – indicates status of mute device inputs (SLPMR models only)
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.
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 61496-1/-2; Category 4 PLe per EN ISO 13849-1; SIL 3 per IEC 61508, SIL CL3 per IEC 62061
Certifications	CE TÜVRheinland C US — TUV Rheinland of North America, a Nationally Recognized Test Laboratory (NRTL) in the United States according to OSHA 29 CFR 1910.7, and accredited by the Standards Council of Canada to test and certify products to Canadian National Standards, has certified the EZ-SCREEN® Low Profile to all applicable U.S. and Canadian National Standards. The cTUVus mark is recognized throughout the United States and Canada by OSHA and the SCC. C US — Actual certification mark on EZ-SCREEN® Low Profile product labels. This simplified certification mark is used on the product labels due to limited space.

EZ-SCREEN® Grids

Type 4 Multi-Beam Systems

- The EZ-SCREEN® Grids have strong, durable housings and are an optically synchronized, opposed-mode optoelectronic light grid, requiring no external controller.
- Operates in range up to 70 m
- Resists impact, twisting and abusive environments with a durable aluminum housing
- Exceeds OSHA/ANSI Control Reliability requirements and is certified to cULus NIPF, and complies with Type 4 (IEC 61496) and Category 4 (EN 954)
- Includes blocked beam zone indicators
- Can be combined with other devices, such as mirrors and Points, for a custom configuration
- Cordsets and brackets see page 574

EZ-SCREEN® Grid Systems

Example Model Number SGP3-533Q88E

Model Style		Beam Number		Beam Spacing	Connection Emitter/Reciever		Connection Pair*
SG	P	3	–	533		or	Q88E

SG = Safety Grid (Receiver & Short Range Emitters)
SGXL = Safety Grid (Long Range Emitters & Pairs)

E = Emitter
R = Receiver
P = Pair*

2-500 = 2 beams, 500 mm spacing (500 mm protected height)
2-584 = 2 beams, 584 mm spacing (584 mm protected height)
3-400 = 3 beams, 400 mm spacing (800 mm protected height)
3-533 = 3 beams, 533 mm spacing (1066 mm protected height)
4-300 = 4 beams, 300 mm spacing (900 mm protected height)

Q8E = 8-pin QD

Q88E = Emitter with 8-pin QD
Receiver with 8-pin QD

For more specifications see page 575.

A model with a QD requires a mating cordset (see page 574).

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, **SGR4-300Q8**); or for a pair replace **Q88E** with **Q83** (example, **SGP4-300Q83**).
* A pair includes an emitter and receiver (example, **SGP3-533Q88E**)
Contact Banner Engineering Corp. for additional information and/or verification of valid kit model numbers.

EZ-SCREEN® Points

Type 4 Single-Beam Systems

- EZ-SCREEN® Point systems have strong, durable housings and are a synchronized, opposed-mode single optoelectronic light beam, requiring no external controller.
- Operates in range up to 70 m
- Resists impact, twisting and abusive environments with a durable aluminum housing
- Exceeds OSHA/ANSI Control Reliability requirements and is certified to cULus NIPF, and complies with Type 4 (IEC 61496) and Category 4 (EN 954)
- Includes blocked beam zone indicators
- Can be combined with other devices, such as mirrors and Points, for a custom configuration
- Cordsets and brackets see page 574

EZ-SCREEN® Point Systems

Example Model Number SP3-533Q88E

Model Style		Beam Number	Connection: Emitter/Reciever		Connection: Pair*
SP	**P**	**1**		or	**Q88E**
SP = Safety Point (Receiver & Short Range Emitters) **SPXL** = Safety Point (Long Range Emitters & Pairs)	**E** = Emitter **R** = Receiver **P** = Pair*	**1** = 1-point models	**Q8E** = 8-pin QD		**Q88E** = Emitter with 8-pin QD Receiver with 8-pin QD

For more specifications see page 575.

A model with a QD requires a mating cordset (see page 574).

For emitters and receivers with a wiring terminal chamber, remove the **Q8E** or Q88E from the model number (example, **SPE1**).
For an emitter with a 5-pin Mini QD and TEST function, replace **Q8E** with **Q5** on emitter model numbers (example, **SPE1Q5**) and **Q88E** with **Q85** on pair model numbers (example, **SP1Q85**).
For emitters with a 3-pin Mini QD, replace **Q8E** with **Q3** (example, **SPE1Q3**); and for receivers with an 8-pin Mini QD, replace **Q8E** with **Q8** on model numbers (example, **SPR1Q8**); or for a pair replace **Q88E** with **Q83** (example, **SPP1Q83**).
* A pair includes an emitter and receiver (example, **SPP1Q88E**)
Contact Banner Engineering Corp. for additional information and/or verification of valid kit model numbers.

8-Pin*

Euro-Style
Double-ended male/female

DEE2R-81D 0.3 m (1')	**DEE2R-825D** 7.6 m (25')
DEE2R-83D 0.9 m (3')	**DEE2R-850D** 15.3 m (50')
DEE2R-88D 2.4 m (8')	**DEE2R-875D** 22.9 m (75')
DEE2R-815D 4.5 m (15')	**DEE2R-8100D** 30.5 m (100')

* For connection to safety BUS gateway/node, a "smart" self-monitored safety module, safety controller or safety PLC see page 771.

8-Pin

M12/Euro-Style
Straight connector models listed

QDE-815D 4.5 m (15')
QDE-825D 7.6 m (25')
QDE-850D 15.3 m (50')
QDE-875D 22.9 m (75')
QDE-8100D 30.5 m (100')

8-Pin

Euro-Style
Straight splitter

CSB-M1280M1280
CSB-M1281M1281
CSB-M1288M1281
CSB-M12815M1281
CSB-M12825M1281

Additional cordset information is available.
See page 758

EZA-MBK-1*

EZA-MBK-3

EZA-MBK-9

* Standard brackets included with emitter/receiver.

Use with: Grids & Points—Type 4

EZA-MBK-2**

EZA-MBK-4

EZA-MBK-5

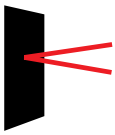
** One **EZA-MBK-2** adapter bracket kit required per sensor when mounting to MSA series stands.

Use with: Points—Type 4

Additional bracket information is available.
See page 729

Stands

Mirrors



Interface

Additional interfacing and accessory information is available.
See page 802

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	Panel-mount keyed normally open reset switch
STP-3	Specified test piece, 45 mm dia.

NOTE: See installation manual p/n 112852 for complete list of replacement parts and accessories.

EZ-SCREEN® Grid Systems

EZ-SCREEN® Point Systems

EZ-SCREEN® Grid & Point Specifications

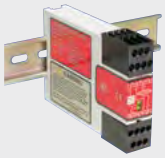
Supply Voltage	24 V dc ±15%, 10% max. ripple
Supply Current	**Emitter:** 150 mA max. **Receiver:** 500 mA max., exclusive of OSSD1 and OSSD2 loads (up to an additional 0.5A each)
Short Circuit Protection	All inputs and outputs are protected from short circuits to +24 V dc or dc common (except Emitter AUX power connections)
Response Time	24 milliseconds or less from interruption of light grid beam to safety outputs going to OFF-state
EDM Input	+24 V 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 30 V dc at 30 mA) for 0.25 to 2 seconds and then low (less than 3 V 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 3 V 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 30 V 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 24 V 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-1.5 V dc **OFF-State voltage:** 1.2 V dc max. **Max. load resistance:** 1000 Ω **Max. load capacitance:** 0.1 µF **OSSD test pulse width:** 250 microseconds **OSSD test pulse period:** 6 milliseconds
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.

Continued on next page

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

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).
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 = Appears during power-up or after scan code is changed. (C1 or C2) (Temporary indication; normal display resumes within a few seconds.) **Emitter:** One bicolor (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 Bicolor (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 Bicolor (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 **Important Notice:** European Community Machinery Directive 2006/42/EC EZ-SCREEN® grids and points comply with Machinery Directive 98/37/EC, but not with Machinery Directive 2006/42/EC. Therefore, the EZ-SCREEN® grids 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.

EZ-SCREEN® Interfacing Products

		Description	Models	Product Information
Interface Modules and Controllers		• Interface modules provide two or three normally open force-guided relay outputs rated at 6 A (-9 A) or 7 A (-11 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	IM-T-9A (3 NO) IM-T-11A (2 NO/1 NC)	Page 698
		• Control system monitors a variety of input devices such as e-stop buttons, rope pulls, enabling devices, protective safety stops, interlocked guards or gates, optical sensors, two-hand controls and safety mats • Intuitive programming environment for easy implementation • Configure inputs, outputs and functionality of the controller for more usability • Base controller allows eight of the 26 inputs to be configured as outputs for efficient terminal utilization • Ethernet models available providing up to 64 virtual status outputs, fault diagnostic codes and messages	SC26-2, XS26-2 SC26-2D, XS26-2D SC26-2E, XS26-2E SC26-2DE, XS26-2DE	Page 582
		• 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 • All SC22-3 modules use 24 V dc • 10/100 Base TX Ethernet communication option using EtherNet/IP and Modbus TCP protocols (SC22-3E models)	SC22-3-S... SC22-3-C... SC22-3E-S... SC22-3E-C...	Page 592
Muting Modules		• 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	MMD-TA-12B MMD-TA-11B	Page 710
Receiver AC Interface Boxes		• 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	EZAC-R9-QE8 EZAC-R11-QE8 EZAC-R15A-QE8-QS83 EZAC-R8N-QE8-QS53 EZAC-R10N-QE8-QS53	Page 821
Emitter AC Interface Boxes		• Versatile power supplies allow EZ-SCREEN systems to connect to AC power sources • Models are available to accommodate emitters only • Receiver models include 8 amp safety relay output	EZAC-E-QE8 EZAC-E-QE5 EZAC-E-QE8-QS3 EZAC-E-QE5-QS5	Page 821
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	**Mechanically Linked Contactors** 11-BG00-31-D-024 BF1801L-024 **Aux. Contacts** 11-BGX10-40 11-G484-30 **Suppressors** 11-BGX77-048 11-G318-48	Page 822

EZ-SCREEN® Type 2

Type 2 Safety Light Screens

- A low-cost solution suited to lower risk applications where the result is only a slight injury.
- Operating range up to 15 m
- Simple, two-piece system requires no control box
- System meets all requirements for Type 2 devices per IEC 61496 and Cat 2 PL d per EN ISO 13849-1 (CE certified) and cULus NIPF
- Fast response times of 11 to 29 milliseconds shutdown machinery quickly
- Dedicated models eliminate selectable functions, DIP switches and programming

EZ-SCREEN® Type 2 Systems, 30 mm Resolution

Example Model Number LS2TP30-150Q88

Model Style

LS2 **TP**

E = Emitter
TR = Trip Receiver
TP = Trip Pair†
LR = Latch Receiver
LP = Latch Pair†

Resolution

30

30 = 30 mm

–

Defined Area

150

	Housing Length	Response Time
150 =	215 mm	11 ms
300 =	365 mm	13 ms
450 =	515 mm	14 ms
600 =	665 mm	16 ms
750 =	815 mm	17 ms
900 =	964 mm	19 ms
1050 =	1114 mm	21 ms
1200 =	1264 mm	22 ms
1350 =	1414 mm	24 ms
1500 =	1563 mm	25 ms
1650 =	1713 mm	27 ms
1800 =	1863 mm	29 ms

Connection

Emitter/Reciever

Q8 = 8-pin QD

or

Pair†

Q88

Q88 = Emitter with 8-pin QD
Receiver with 8-pin QD

For more specifications see page 581.

A model with a QD requires a mating cordset.

† A pair includes an emitter and receiver (example, **LS2TP30-150Q88**)
Contact Banner Engineering Corp. for additional information and/or verification of valid kit model numbers.

8-Pin*

Euro-Style
Double-ended male/female

DEE2R-81D 0.3 m (1')	**DEE2R-825D** 7.6 m (25')
DEE2R-83D 0.9 m (3')	**DEE2R-850D** 15.3 m (50')
DEE2R-88D 2.4 m (8')	**DEE2R-875D** 22.9 m (75')
DEE2R-815D 4.5 m (15')	**DEE2R-8100D** 30.5 m (100')

* For connection to safety BUS gateway/node, a "smart" self-monitored safety module, safety controller or safety PLC see page 771.

Additional cordset information is available.
See page 758

8-Pin

M12/Euro-Style
Straight connector models listed

QDE-815D 4.5 m (15')
QDE-825D 7.6 m (25')
QDE-850D 15.3 m (50')
QDE-875D 22.9 m (75')
QDE-8100D 30.5 m (100')

8-Pin

Euro-Style
Straight splitter

CSB-M1280M1280
CSB-M1281M1281
CSB-M1288M1281
CSB-M12815M1281
CSB-M12825M1281

USCMB-..**

USMB-1*

USMB-6

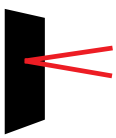
USMB-8

* USMB-1 brackets are supplied
** USCMB-1/-2 are dependent on length

Additional bracket information is available.
See page 729

Stands

Mirrors



Interface

Additional interfacing and accessory information is available.
See page 802

Replacement Parts

Description	Model
Replacement key for switch MGA-KS0-1	MGA-K-1
Panel-mount keyed normally open reset switch	MGA-KS0-1
30 mm test piece	STP-14
Standard end brackets with hardware to mount to MSA series stands	USMB-1
Center bracket kit and standard end brackets with hardware to mount to MSA series stands (1 bracket, for 600 to 900 mm long sensors)	USCMB-1
Center bracket kit and standard end brackets with hardware to mount to MSA series stands (2 brackets, for 1050 to 1500 mm long sensors)	USCMB-2

NOTE: See installation manual p/n **112852** for complete list of replacement parts and accessories.

EZ-SCREEN®
Type 2 Systems

EZ-SCREEN® Type 2 Specifications

Supply Voltage at the Device	24 V 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 +24 V dc or dc common
Electrical Safety Class (IEC 61140)	III
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 806
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 key on page 578
EDM Input	"Power Monitoring" accomplished via Reset/Remote Test input
Reset Input / Remote Test Input	Connect to +24 V 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 24 V 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-1.5 V dc **OFF-State voltage:** 0.2 V 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 typical
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; Category 2 PI d per EN ISO 13849-1; SIL 2 per IEC 61 508; Type 2 per UL 61496-1/-2
Certifications	CE c UL us LISTED

Safety Controllers

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

Series	Description	Inputs	Outputs	Dimensions H x W x D	Features	Power Supply
	**SC26-2** Easy to program, install and allows for more flexibility of how the controller is used and configured. page 584	26	2 pair (4 PNP)	110 x 45 x 128.4 mm	Programmable Logic Optional Ethernet Optional LCD screen	24 V dc
	**XS26-2** Easy to program, install and allows for up to eight expansion I/O modules page 588	Dependent on modules used	Dependent on modules used	110 x (varies) x 129 mm (base module is 45 mm each addition module adds 22.5 mm)	Explanable Programmable Logic Optional Ethernet Optional LCD screen	24 V dc
	**SC22-3** Completely configurable and flexible safety controller that can easily replace multiple dedicated safety modules. page 592	22	3 pair (6 PNP)	112 x 131 x 64 mm	Optional Ethernet Dedicated status outputs LCD screen	24 V dc

SC26-2

Safety Controller

- Easy to program, install and allows for more flexibility of how the safety controller is used and configured
- Lower cost option for smaller jobs and applications
- Monitors a variety of input devices such as E-stop buttons, rope pulls, enabling devices, protective safety stops, interlocked guards or gates, optical sensors, two-hand controls and safety mats
- Intuitive programming environment for easy implementation
- Configure inputs, outputs and functionality of the controller for more usability
- Base controller allows eight of the 26 inputs to be configured as status outputs for efficient terminal utilization
- Ethernet models available providing up to 256 status outputs and non-safety virtual outputs
- Accessories see page 586

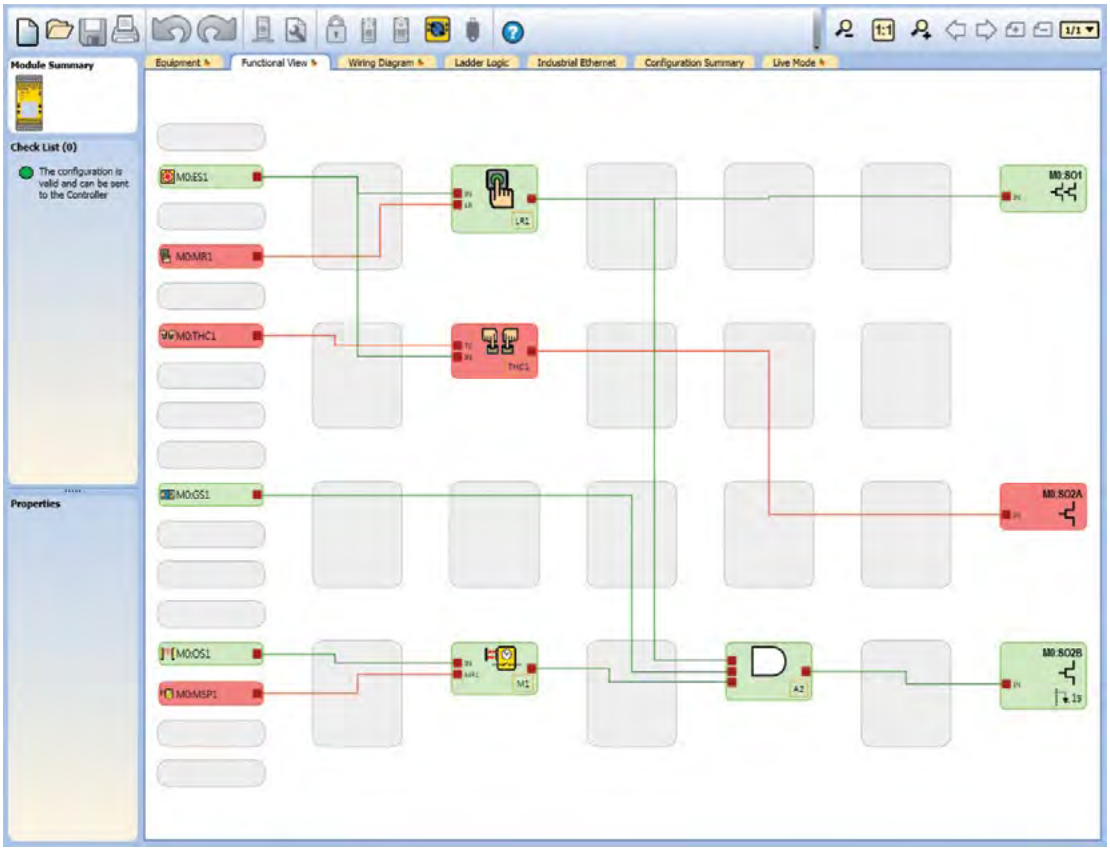
SC26-2 Safety Controller

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

Start using the software today

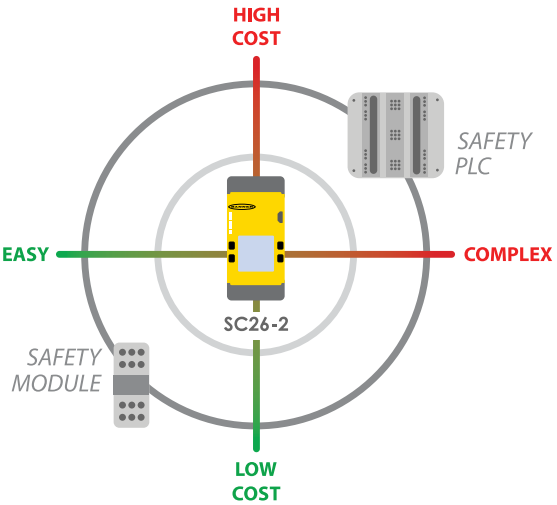
bannerengineering.com/SC26-2

The next level in machine safety control...

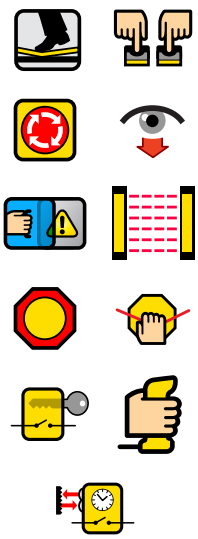


Target Equipment

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



Safety Input Devices



SC-XM2
Memory Card

SC-XMP2
Programming Tool

SC-USB2
USB Cable

SC-TC2
Spring Terminal Block Set

Additional Interfacing Products
see page 595

SC26-2 Safety Controller Specifications

Power	24 V dc, ± 20% **Ethernet models:** add 40 mA **Display models:** add 20 mA
Safety Inputs (and Convertible I/O when used as inputs)	**Input On threshold:** > 15 V dc (guaranteed on), 30 V dc max. **Input Off threshold:** < 5 V dc and < 2 mA, –3 V dc min. **Input On current:** 5 mA typical at 24 V dc, 50 mA peak contact cleaning current at 24 V dc **Input lead resistance:** 300 Ω max. (150 Ω per lead) **Input requirements for a 4-wire Safety Mat:** • Max. capacity between plates: 0.22µF • Max. capacity between bottom plate and ground: 0.22µF • Max. resistance between the 2 input terminals of one plate: 20 Ω
Solid State Safety Outputs	0.5 A max. at 24 V dc (1.0 V dc max. drop) **Output OFF threshold:** 1.7 V dc typical (2.0 V dc max.) **Output leakage current:** 50 µ A max. with open 0V **Load:** 0.1 µ F max., 1 H max., 10 Ω max. per lead
Response and Recovery Times	See Configuration Summary in the data sheet
Environmental Rating	NEMA 1 (IEC IP20), for use inside NEMA 3 (IEC IP54) or better enclosure
Operating Conditions	**Temperature range:** 0 to +55 °C
Mechanical Stress	**Shock:** 15g for 11 milliseconds, half sine, 18 shocks total (per IEC 61131-2) **Vibration:** 3.5 mm occasional /1.75 mm continuous @ 5Hz to 9Hz, 1.0g occasional and 0.5g continuous @ 9Hz to 150Hz: all at 10 sweep cycles per axis (per IEC 61131-2)
Removable Terminals	**Important:** Clamp terminals are designed for 1 wire only. If more than 1 wire is connected to a terminal, a wire could loosen or become completely disconnected from the terminal, causing a short. **Wire size:** 24 to 16 AWG (0.20 to 1.31 mm²) **Wire strip length:** 8.00 mm (0.315 in)
Design Standards	• SIL CL 3 per IEC 62061 Safety of Machinery – Functional Safety of Safety-Related Electrical, Electronic and Programmable Electronic Control Systems • SIL 3 per IEC 61508 Functional Safety of Electrical/Electronic/Programmable Electronic Safety-Related Systems • Category 4 per ISO 13849-1 • Category 4 Performance Level (PL) e per ISO 13849-1 • Complies with Machinery Directive 2006/42/EC • IEC 61131-2 Programmable Controllers, Part 2: Equipment Requirements and Tests • UL 508 Industrial Control Equipment • ANSI NFPA 79 Electrical Standards for Industrial Machinery • IEC 60204-1 Electrical Equipment of Machines: General Requirements • ISO 13851 (EN574) Safety of Machinery – Two-Hand Control Devices – Functional Aspects and Design Principles • ISO 13850 (EN418) Emergency Stop Devices
Certifications	CE c UL us LISTED IND. CONT. EQ. 3NVF UL LISTED PROGRAMMABLE SAFETY CONTROLLER 3NBN PROFINET INDUSTRIAL ETHERNET

XS26-2

Safety Controller

- Easy to both program and install while providing scalable flexibility to meet your growing automation needs.
- Allows up to eight expansion modules
- Configuration software free of charge
- Real-time live display feedback
- Intuitive functional diagram configuration; logic function blocks including AND, OR, XOR, NAND, NOR, SR Flip-flop, RS Flip-flop
- Ethernet models available providing up to 256 status outputs and non-safety virtual outputs
- Accessories see page 590

XS26-2 Safety Controller, 24 V DC

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

Expansion Modules

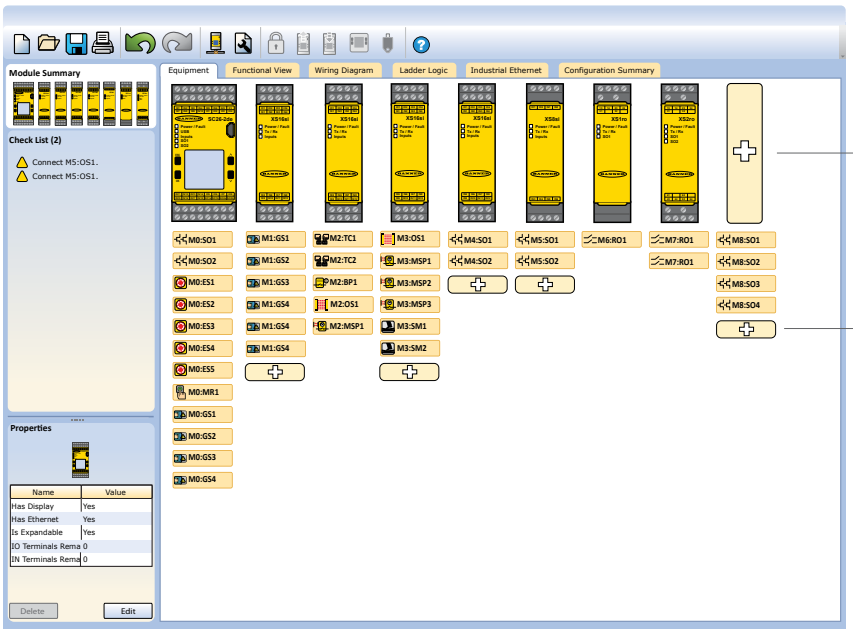
Description	Output Configuration	Model*
8 Pin Safety input module	NA	XS8si
16 Pin Safety input module	NA	XS16si
Safety output module	2 dual channel PNP	XS2so
Solid-state safety output module	4 dual channel PNP	XS4so
Safety relay output module	2 NO/1NC	XS1ro
Safety relay output module	4 NO/2 NC	XS2ro

* All models come with screw terminals

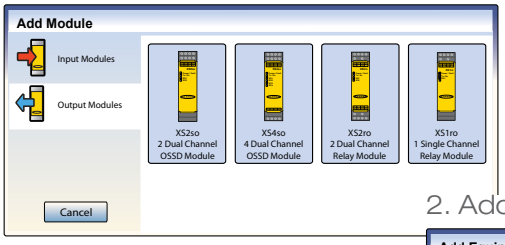
Build System and Select Equipment

Start using the software today. Go to bannerengineering.com/xs26-2

Equipment View

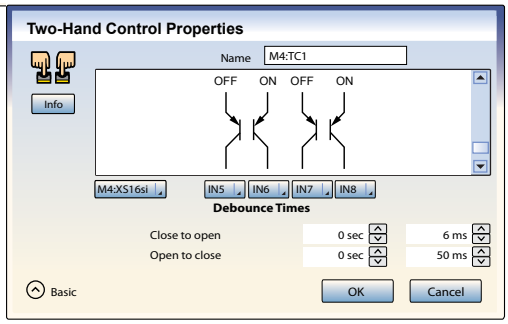


1. Add up to 8 modules



2. Add safety devices

3. Select safety device properties



SC-XM2
Memory Card

SC-XMP2
Programming Tool

SC-USB2
USB Cable

SC-TC2
Spring Terminal Block Set

Additional Interfacing Products
see page 595

XS26-2 Safety Controller Specifications

Power	24 V dc, ± 20% **Ethernet models:** add 40 mA **Display models:** add 20 mA **Expandable models:** add 3.6 A max. bus load
Safety Inputs (and Convertible I/O when used as inputs)	**Input On threshold:** > 15 V dc (guaranteed on), 30 V dc max. **Input Off threshold:** < 5 V dc and < 2 mA, –3 V dc min. **Input On current:** 5 mA typical at 24 V dc, 50 mA peak contact cleaning current at 24 V dc **Input lead resistance:** 300 Ω max. (150 Ω per lead) **Input requirements for a 4-wire Safety Mat:** • Max. capacity between plates: 0.22µF • Max. capacity between bottom plate and ground: 0.22µF • Max. resistance between the 2 input terminals of one plate: 20 Ω
Solid State Safety Outputs	**Input On threshold:** > 15 V dc (guaranteed on), 30 V dc max. **Input Off threshold:** < 5 V dc and < 2 mA, –3 V dc min. **Input On current:** 5 mA typical at 24 V dc, 50 mA peak contact cleaning current at 24 V dc **Input lead resistance:** 300 Ω max. (150 Ω per lead) **Input requirements for a 4-wire Safety Mat:** • Max. capacity between plates: 0.22 µF • Max. capacity between bottom plate and ground: 0.22 µF • Max. resistance between the 2 input terminals of one plate: 20 Ω
Response and Recovery Times	See Configuration Summary in the data sheet
Environmental Rating	NEMA 1 (IEC IP20), for use inside NEMA 3 (IEC IP54) or better enclosure
Operating Conditions	**Temperature range:** 0 to +55 °C
Mechanical Stress	**Shock:** 15g for 11 milliseconds, half sine, 18 shocks total (per IEC 61131-2) **Vibration:** 3.5 mm occasional / 1.75 mm continuous @ 5Hz to 9Hz, 1.0g occasional and 0.5g continuous @ 9Hz to 150Hz: all at 10 sweep cycles per axis (per IEC 61131-2)
Removable Terminals	**Important:** Clamp terminals are designed for 1 wire only. If more than 1 wire is connected to a terminal, a wire could loosen or become completely disconnected from the terminal, causing a short. **Wire size:** 24 to 12 AWG (0.20 to 3.13 mm²) **Wire strip length:** 7 to 8 mm (0.275 in to 0.315 in)
Design Standards	Category 4, PL e (EN ISO 13849) SIL CL 3 (IEC 62061, IEC 61508)
Certifications	CE, c UL us LISTED IND. CONT. EQ. 3NVF, UL LISTED PROGRAMMABLE SAFETY CONTROLLER 3NBN, PROFINET INDUSTRIAL ETHERNET

SC22-3/-3E

Safety Controller

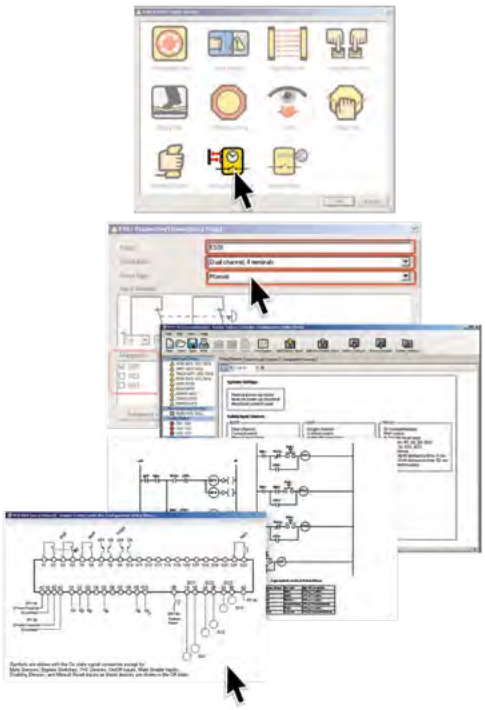
- The SC22-3 Safety Controller is a completely configurable and flexible safety controller that can easily replace multiple dedicated safety modules
- Input terminals can monitor both contact-based or PNP solid-state outputs
- Ten configurable auxiliary status outputs track inputs, outputs, lockout, I/O status and other functions
- Three pairs of solid-state safety outputs with ON-Delay, OFF-Delay and cancel OFF-Delay
- SC22-3E models provide diagnostic information using EtherNet/IP, Modbus TCP and PCCC
- Safety Controller is designed to meet stringent standards including Safety Integrity Level (SIL) 3 per IEC 61508, SIL CL 3 per IEC 62061 and Category 4 Performance Level (PL e) per EN ISO 13849-1
- Accessories see page 594

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

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

Intuitive free software for point-and-click configuration

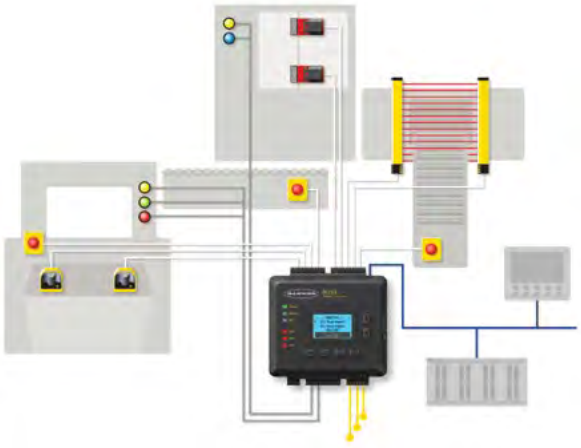
1. Select the type of safety input device
2. Map functions and properties from a pull down list
3. Wiring and ladder logic diagrams autopopulate along with configuration summary
   - View and track status using front panel display or PC "Live Display"
   - Includes fault history with time/date stamp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



22 input terminals for monitoring safety and non-safety devices

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

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



	Shielded	Shielded Crossover
Ethernet Communication	**STP07** 2 m (7')	**STPX07** 2 m (7')
	STP25 7 m (25')	**STPX25** 7 m (25')
	STP50 15 m (50')	**STPX50** 15 m (50')
	STP75 23 m (75')	**STPX75** 23 m (75')

Additional cordset information is available
See page 758

DIN-35..

Additional bracket information is available
See page 729

Miscellaneous

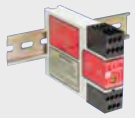
Description	Model
SC22-3 replacement controller (without terminals)	**SC-SC22-3**
SC22-3E replacement controller (without terminals), Ethernet compatible	**SC-SC22-3E**
External memory card (XM card)	**SC-XM1**
Bulk pack of 5 XM Cards	**SC-XM1-5**
Screw terminal replacement set	**SC-TS1**
Clamp terminal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

SC22-3/-3E Interface Modules

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

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

Additional Interfacing Products

	Description		Models	Product Information
Interface Modules		• Interface modules provide two or three normally open force-guided relay outputs rated at 6 A • Convenient plug-in terminal blocks on a 22.5 mm DIN-rail mountable housing are included	**IM-T-9A (3 NO)** **IM-T-11A (2 NO/1 NC)**	Page 698
Mechanically Linked Contactors		• Contactors add 10 or 18 amp current carrying capability to any safety system • Suppressors extend the life of an actuating device that uses a contactor • Modular design simplifies assembly and installation	**11-BG00-31-D-024** **BF1801L-024**	Page 822

NC = Normally closed, NO = Normally open

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

SC22-3/-3E Safety Controller Specifications

Power	24 V dc, ± 20% **SC22-3 models:** 0.4 A (controller only), 5.9 A (all outputs ON @ full rated load) **SC22-3E models:** 0.4 A (controller only), 4.9 A (all outputs ON @ full rated load) The Controller should be connected only to a SELV (safety extra-low voltage, for circuits without earth ground) or a PELV (protected extra-low voltage, for circuits with earth ground) power supply	
Safety and Non-Safety Inputs (22 terminals)	**Input ON threshold:** > 15 V dc (guaranteed on), 30 V dc max. **Input OFF threshold:** < 5 V dc (guaranteed off with any 1 fault), –3 V dc min. **Input ON current:** 8 mA typical @ 24 V dc, > 2 mA (guaranteed with 1 fault) 50 mA peak contact cleaning current @ 24 V dc **Sourcing current:** 30 mA minimum continuous (3 V dc max. drop) **Input lead resistance:** 300 Ω max. (150 Ω per lead) **Input requirements for a 4-wire safety mat:** Max. capacity between plates: 0.5 µF Max. capacity between bottom plate and ground: 0.5 µF Max. resistance between the 2 input terminals of one plate: 20 Ω	
Safety Outputs (6 terminals, 3 redundant outputs)	**Rated output current: SC22-3 models:** 0.75 A max. each output (1.0 V dc max drop) **SC22-3E models:** 0.5 A max. each output (1.0 V dc max drop) **Output OFF threshold:** 0.6 V dc typical (1.2 V dc max. guaranteed with 1 fault) **Output leakage current:** 50 µA max. with open 0 V **Load:** 0.1 µF max., 1 H max., 10 Ω max. per lead	
Status Outputs (10 terminals)	**Rated output current:** 0.5A @ 24 V dc (individual), 1.0 A @ 24 V dc (total of all outputs) **O1 to O8 (General Purpose) — Output OFF voltage:** < 0.5 V dc (no load), 22 KΩ pull down to 0 V **O9 and O10 (General Purpose or Monitored Mute Lamp) — Output OFF voltage:** Internal 94 KΩ pull up to 24 V dc supply **Output ON/OFF threshold:** 15 V dc +/–4 V dc @ 24 V dc supply NOTE: For O9 and O10 (if configured as monitored mute lamp output only), if a short circuit or other fault condition causes the output to drop below this threshold while the output is ON, a lockout will occur. If an open circuit or other fault condition causes the output to rise above this threshold while the output is OFF, a lockout will occur.	
Network Interface (SC22-3E only)	Ethernet 10/100 Base-T/TX, RJ45 modular connector Selectable auto negotiate or manual rate and duplex Auto MDI/MDIX (Auto cross) **Protocols:** EtherNet/IP (with PCCC), Modbus TCP **Data:** 32 configurable virtual status outputs; fault diagnostic codes and messages; access to fault log	
Response and Recovery Times	**Response time (ON to OFF):** 10 milliseconds max. (with standard 6 milliseconds debounce; this can increase if debounce time increases. Refer to the configuration summary for actual response time.) **Recovery time (OFF to ON):** 400 milliseconds max. (with manual reset option) **Recovery time (OFF to ON):** 400 milliseconds max. plus input debounce time (auto reset)	
Onboard LCD Information Display— Password Requirements	**Password is not required:** Run mode (I/O status) Fault (I/O fault detection and remedial steps) Review configuration parameters (I/O properties and erminals)	**Password is required:** Configuration mode (create/modify/confirm/download configurations)
Environmental Rating	NEMA 1 (IEC IP20), for use inside NEMA 3 (IEC IP54) or better enclosure	
Operating Conditions	**Temperature range:** 0 to +55 °C	
Mechanical Stress	**Shock:** 15g for 11 milliseconds, half sine, 18 shocks total (per IEC 61131-2) **Bump:** 10g for 16 milliseconds, 6000 cycles total (per IEC 61496-1) **Vibration:** 3.5 mm occasional / 1.75 mm continuous @ 5Hz to 9Hz, 1.0g occasional and 0.5g continuous @ 9Hz to 150Hz: (per IEC 61131-2) and 0.35 mm single amplitude / 0.70 mm peak-to-peak @ 10 to 55Hz (per IEC 61496-1), all @ 10 sweep cycles per axis	
EMC	Meets or exceeds all EMC requirements in IEC 61131-2, IEC 61496-1 (Type 4), and IEC 62061 Annex E, Table E.1 (increased immunity levels)	

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

Removable Terminals	Screw terminals **Wire sizes:** 16, 18, 20, 22 or 24 AWG (0.20 – 1.31 mm2) Wire strip length: 5.00 mm **Tightening torque:** 0.23 Nm (2 in. lbs) nominal Tightening torque: 0.34 Nm (3.0 in. lbs) maximum Clamp terminals **Wire size:** 16, 18, 20, 22, or 24 AWG (0.20 – 1.31 mm2) 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 Safety of Machinery – Functional Safety of Safety-Related Electrical, Electronic and Programmable Electronic Control Systems • SIL 3 per IEC 61508 Functional Safety of Electrical/Electronic/Programmable Electronic Safety-Related Systems • Category 4 per ISO 13849-1 • Category 4 Performance Level (PL) e per ISO 13849-1 • Complies with Machinery Directive 2006/42/EC • IEC 61131-2 Programmable Controllers, Part 2: Equipment Requirements and Tests • UL 508 Industrial Control Equipment • UL 1998 Software in Programmable Components • ANSI NFPA 79 Electrical Standards for Industrial Machinery • IEC 60204-1 Electrical Equipment of Machines: General Requirements • ISO 13851 (EN574) Safety of Machinery – Two-Hand Control Devices – Functional Aspects and Design Principles • ISO 13850 (EN418) Emergency Stop Devices
Certifications	CE, UL LISTED, c UL LISTED Auxiliary Device US

Emergency Stop Buttons

Push-to-stop/twist-to-release Emergency Stop palm buttons are available in panel-mount or remotely located IP65 enclosures. Illuminated models help operators quickly identify actuated buttons, allowing for a quick return to normal operations.

Series	Description	Options	Mounting	Dimensions H x W x D	Protection Rating
	Easy to install 30 mm mount. page 600	Non-Illuminated Illuminated	30 mm	119.8 x ø 80 mm	IP65
	Flat mount with wide variety of options. page 601	Non-Illuminated Illuminated Non-Illuminated Locking Illuminated Locking	Flat mount	102.1 x 80.8 x 80.3 mm	IP65
	Panel mount E-Stop buttons. page 612	Non-Illuminated Illuminated Locking Illuminated Locking	Panel	Varies by model	IP65
	Mechanical E-Stop button kits. page 616	High current Metal shaft	Panel or flat	106 x 70 x 70 mm	IP65

E-Stop Buttons

Illuminated 30 mm Mount

- Illumination allows for easy identification of which E-stop has been activated.
- Easy installation and no assembly or individual wiring required
- Push-to-stop, twist-to-release or pull-to-release operation per IEC 60947-5-5
- Compliant with ANSI B11.19, ANSI NFPA79 and IEC/EN 60204-1 Emergency Stop requirements
- Incorporate with OTB/STB optical touch button for a simplified operator station that does not require an additional enclosure.
- "Safe Break Action" ensures NC contacts will open if the contact block is damaged or separated from the actuator
- Models designed to interface with Safety BUS nodes/gateways

Illuminated Base-mount E-Stop Push-Buttons

Description	Illumination***	Models
2NC / 1NO (PNP)	YEL/RED-Flash/Solid	**SSA-EB1PLYR-12ECQ8**
2NC / 1NO (PNP)	GREEN/RED-Flash/Solid	**SSA-EB1PLGR-12ECQ8**
2NC / 1NO (PNP)	OFF/RED-Flash/Solid	**SSA-EB1PLXR-12ECQ8**
2NC / 1NO (PNP)	OFF/RED-Flash/Solid, with 60 mm button	**SSA-EB2PLXR-12ECQ8**
2NC / 1NO (PNP)	OFF/RED-Solid/Solid	**SSA-EB1PL-12ECQ8**
2NC – Safety BUS node compatible*	YEL/RED-Flash	**SSA-EB1PLYR-02ECQ5A**
2NC – Safety BUS node compatible*	OFF/RED-Flash	**SSA-EB1PLXR-02ECQ5A**
2NC – Safety BUS node compatible*	OFF/RED-Soild	**SSA-EB1PL-02ECQ5A**
2NC – Safety BUS node compatible*	Illuminated button, OFF (armed), RED (solid, PUSH ON)	**SSA-EB1PL2-02ECQ5A**
2NC – Safety BUS node compatible**	YEL/RED-Flash	**SSA-EB1PLYR-02ECQ5B**
2NC – Safety BUS node compatible**	OFF/RED-Flash	**SSA-EB1PLXR-02ECQ5B**
2NC – Safety BUS node compatible**	OFF/RED-Solid	**SSA-EB1PL-02ECQ5B**
2NC – Safety BUS node compatible**	Illuminated button, OFF (armed) RED (solid, PUSH ON)	**SSA-EB1PL2-02ECQ5B**

For more specifications see page 609.

Connection options: A model with a QD requires a mating cordset (see page 606).

* CH1 = pins 1 & 2, CH2 = pins 4 & 5, 5-pin M12 QD
** CH1 = pins 1 & 4, CH2 = pins 2 & 5, 5-pin M12 QD
*** For EZ-LIGHT Illumination logic see page 607.

E-Stop Buttons

Illuminated Flush Mount

- Illumination allows for easy identification of which E-stop has been activated.
- Easy installation with no assembly or individual wiring required
- Remotely located E-Stop buttons can be positioned to be clearly identified, clearly visible and readily accessible
- Push-to-stop, twist-to-release or pull-to-release operation per IEC 60947-5-5
- Compliant with ANSI B11.19, ANSI NFPA79 and IEC/EN 60204-1 Emergency Stop requirements
- "Safe Break Action" ensures NC contacts will open if the contact block is damaged or separated from the actuator
- Models designed to interface with Safety BUS nodes/gateways

Illuminated Flush-mount E-Stop Push-Buttons

Description	Illumination***	Models
2NC / 1NO (PNP)	YEL/RED-Flash/Solid	**SSA-EB1PLYR-12ED1Q8**
2NC / 1NO (PNP)	YEL/RED-Flash/Solid, 1/2" NPT conduit connection with terminal strip	**SSA-EB1PLYR-12ED1**
2NC / 1NO (PNP)	GREEN/RED-Flash/Solid	**SSA-EB1PLGR-12ED1Q8**
2NC / 1NO (PNP)	GREEN/RED-Flash/Solid, 1/2" NPT conduit connection with terminal strip	**SSA-EB1PLGR-12ED1**
2NC / 1NO (PNP)	OFF/RED-Flash/Solid	**SSA-EB1PLXR-12ED1Q8**
2NC / 1NO (PNP)	OFF/RED-Flash/Solid, with 60 mm button	**SSA-EB2PLXR-12ED1Q8**
2NC / 1NO (PNP)	OFF/RED-Flash/Solid, 1/2" NPT conduit connection with terminal strip	**SSA-EB1PLXR-12ED1**
2NC / 1NO (PNP)	OFF/RED-Solid/Solid	**SSA-EB1PL-12ED1Q8**
2NC – Safety BUS node compatible*	YEL/RED-Flash	**SSA-EB1PLYR-02ED1Q5A**
2NC – Safety BUS node compatible*	OFF/RED-Flash	**SSA-EB1PLXR-02ED1Q5A**
2NC – Safety BUS node compatible*	OFF/RED-Solid	**SSA-EB1PL-02ED1Q5A**
2NC – Safety BUS node compatible**	YEL/RED-Flash	**SSA-EB1PLYR-02ED1Q5B**
2NC – Safety BUS node compatible**	OFF/RED-Flash	**SSA-EB1PLXR-02ED1Q5B**
2NC – Safety BUS node compatible**	OFF/RED-Solid	**SSA-EB1PL-02ED1Q5B**

For more specifications see page 609.

Connection options: A model with a QD requires a mating cordset (see page 606).

* CH1 = pins 1 & 2, CH2 = pins 4 & 5, 5-pin M12 QD
** CH1 = pins 1 & 4, CH2 = pins 2 & 5, 5-pin M12 QD
*** For EZ-LIGHT Illumination logic see page 607.

E-Stop Buttons

30 mm Mount

- Allows for easy installation with no assembly or individual wiring required
- Rugged design
- Push-to-stop, twist-to-release or pull-to-release operation per IEC 60947-5-5
- Compliant with ANSI B11.19, ANSI NFPA79 and IEC/EN 60204-1 Emergency Stop requirements
- "Safe Break Action" ensures NC contacts will open if the contact block is damaged or separated from the actuator
- Models designed to interface with Safety BUS nodes/gateways

Base-mount E-Stop Push-Buttons

Description	Models
2NC	SSA-EB1P-02ECQ4
1NC / 1NO	SSA-EB1P-11ECQ4
2NC – Safety BUS node compatible*	SSA-EB1P-02ECQ5A
2NC – Safety BUS node compatible with 60 mm button*	SSA-EB2P-02ECQ5A
2NC – Safety BUS node compatible**	SSA-EB1P-02ECQ5B
2NC – Safety BUS node compatible with 60 mm button**	SSA-EB2P-02ECQ5B
2NC / 2NO	SSA-EB1P-22ECQ8
4NC with 60 mm button	SSA-EB2P-04ECQ8

For more specifications see page 609.

Connection options: A model with a QD requires a mating cordset (see page 606).

* CH1 = pins 1 & 2, CH2 = pins 4 & 5, 5-pin M12 QD
** CH1 = pins 1 & 4, CH2 = pins 2 & 5, 5-pin M12 QD

E-Stop Buttons

Flush Mount

- Easy to install with no assembly or individual wiring required
- Models designed to interface with Safety BUS nodes/gateways
- Rugged design
- Push-to-stop, twist-to-release or pull-to-release operation per IEC 60947-5-5
- Compliant with ANSI B11.19, ANSI NFPA79 and IEC/EN 60204-1 Emergency Stop requirements
- "Safe Break Action" ensures NC contacts will open if the contact block is damaged or separated from the actuator

Flush-Mount E-Stop Push-Button

Description	Standard Models
2NC	SSA-EB1P-02ED1Q4
2NC - Alternate pinout	SSA-EB1P 02ED1Q4A
1NC/1NO	SSA-EB1P-11ED1Q4
2NC, Safety BUS node compatible*	SSA-EB1P-02ED1Q5A
2NC, Safety BUS node compatible with 60 mm button*	SSA-EB2P-02ED1Q4A
2NC, Safety BUS node compatible**	SSA-EB1P-02ED1Q5B
2NC, Safety BUS node compatible with 60 mm button**	SSA-EB2P-02ED1Q4B
2NC/2NO	SSA-EB1P-22ED1Q8
4NC with 60 mm button	SSA-EB2P-04ED1Q8
2NC/1NO, Illuminated button—Push ON RED	SSA-EB1PL2-12ED1Q8

For more specifications see page 609.

Connection options: A model with a QD requires a mating cordset (see page 606).

* CH1 = pins 1 & 2, CH2 = pins 4 & 5, 5-pin M12 QD
** CH1 = pins 1 & 4, CH2 = pins 2 & 5, 5-pin M12 QD

Lockable E-Stop Buttons

Illuminated Flush Mount

- Easy to install and have a locking capability
- Push-to-stop, twist-to-release operation per IEC 60947-5-5
- Compliant with ANSI B11.19, ANSI NFPA79 and IEC/EN 60204-1 Emergency Stop requirements
- "Safe Break Action" ensures NC contacts will open if the contact block is damaged or separated from the actuator
- Models designed to interface with Safety BUS nodes/gateways
- Rugged design is easy to install with no assembly or individual wiring required

Lockable Illuminated Flush-mount E-Stop Push-Buttons

Description	Illumination*	Models
2NC / 1NO (PNP)	YEL/RED-Flash/Solid	**SSA-EB1MLYRP-12ED1Q8**
2NC / 1NO (PNP)	YEL/RED-Flash/Solid, 1/2" NPT conduit connection with terminal strip	**SSA-EB1MLYRP-12ED1Q8**
2NC / 1NO (PNP)	GREEN/RED-Flash/Solid	**SSA-EB1MLGRP-12ED1Q8**
2NC / 1NO (PNP)	GREEN/RED-Flash/Solid, 1/2" NPT conduit connection with terminal strip	**SSA-EB1MLGRP-12ED1**
2NC / 1NO (PNP)	OFF/RED-Flash/Solid	**SSA-EB1MLXRP-12ED1Q8**
2NC / 1NO (PNP)	OFF/RED-Flash/Solid, 1/2" NPT conduit connection with terminal strip	**SSA-EB1MLXRP-12ED1**
2NC / 1NO (PNP)	OFF/RED-Solid/Solid	**SSA-EB1MLP-12ED1Q8**

For more specifications see page 610.

Connection options: A model with a QD requires a mating cordset (see page 606).

* For EZ-LIGHT Illumination logic see page 607.

Lockable E-Stop Buttons

Flush Mount

- Easy to install and have a locking capability.
- Push-to-stop, twist-to-release operation per IEC 60947-5-5
- Compliant with ANSI B11.19, ANSI NFPA79 and IEC/EN 60204-1 Emergency Stop requirements
- "Safe Break Action" ensures NC contacts will open if the contact block is damaged or separated from the actuator
- Models designed to interface with Safety BUS nodes/gateways
- Rugged design is easy to install with no assembly or individual wiring required

Lockable Flush-mount E-Stop Push-Button

Description	Models
2NC	SSA-EB1MP-02ED1Q4
2NC - Alternate pinout	SSA-EB1MP-02ED1Q4A
1NC/1NO	SSA-EB1MP-11ED1Q4
2NC, Safety BUS node compatible*	SSA-EB1MP-02ED1Q5A
2NC, Safety BUS node compatible**	SSA-EB1MP-02ED1Q5B
2NC/2NO	SSA-EB1MP-22ED1Q8
2NC/1NO, Illuminated button—Push ON RED	SSA-EB1ML2P-12ED1Q8

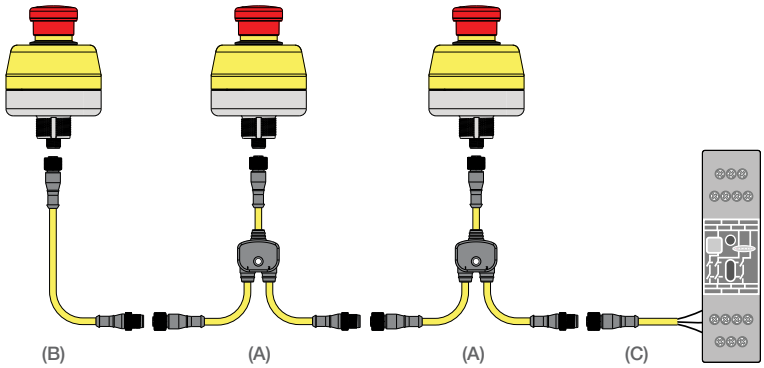
For more specifications see page 609.

Connection options: A model with a QD requires a mating cordset (see page 606).

* CH1 = pins 1 & 2, CH2 = pins 4 & 5, 5-pin M12 QD
** CH1 = pins 1 & 4, CH2 = pins 2 & 5, 5-pin M12 QD

Series Hookup Cordset Solution

This interconnection solution allows for quick hookup of a series string of emergency stop buttons. For the CSS models (A) Branch #1 and Branch #2 are 300 mm (12") in length and the length of the trunk is listed below. See "Cordsets" below and specific model E-Stop datasheet for compete information, including installation instructions, hookup, and accessories.



(A)

Euro-Style
Straight splitter

4-Pin

CSS-M12F41M12M41M12F41
0.3 m (1')
CSS-M12F43M12M41M12F41
0.9 m (3')
CSS-M12F48M12M41M12F41
2.4 m (8')

8-Pin

CSS-M12F81M12M81M12F81
0.3 m (1')
CSS-M12F83M12M81M12F81
0.9 m (3')
CSS-M12F88M12M81M12F81
2.4 m (8')

(B)

Euro-Style
Double-ended male/female

5-Pin	8-Pin
DEE2R-51D 0.3 m (1')	**DEE2R-81D** 0.3 m (1')
DEE2R-53D 0.9 m (3')	**DEE2R-83D** 0.9 m (3')
DEE2R-58D 2.4 m (8')	**DEE2R-88D** 2.4 m (8')
DEE2R-515D 4.5 m (15')	**DEE2R-815D** 4.5 m (15')
DEE2R-525D 7.6 m (25')	**DEE2R-825D** 7.6 m (25')
DEE2R-550D 15.3 m (50')	**DEE2R-850D** 15.3 m (50')
DEE2R-575D 22.9 m (75')	**DEE2R-875D** 22.9 m (75')
DEE2R-5100D 30.5 m (100')	**DEE2R-8100D** 30.5 m (100')

(C)

M12/Euro-Style
Straight connector models listed

4-Pin	8-Pin
MQDC-406 2 m (6')	**MQDC2S-806** 2 m (6')
MQDC-415 5 m (25')	**MQDC2S-815** 5 m (25')
MQDC-430 9 m (50')	**MQDC2S-830** 9 m (50')
MQDC-450 15 m (50')	**MQDC2S-850** 15 m (50')

Additional cordset information is available.
See page 758

SSA-MBK-EEC1

SSA-MBK-EEC2

SSA-MBK-EEC3

SSA-EB1P-ECWC

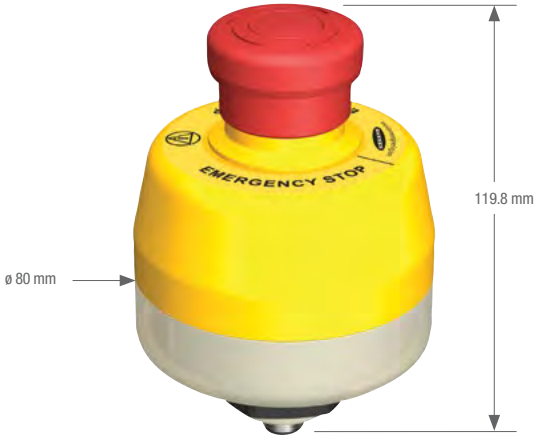
Additional bracket information is available.
See page 752

E-Stop Legend Labels (adhesive backed label)

Product	Description	Language	Inscription	Models
	60 mm diameter (OD) Emergency Stop Legend with inscription and ISO 13850 Emergency Stop symbol (adhesive backed label). 41 mm hole for application around the base of **SSA-EB1(2)P**… (Pack of 10 each)	English	EMERGENCY STOP	**ESL-41/60-10**
		English & Spanish	PARADA DE EMERGENCIA	**ESL-41/60-ENES-10**
		Spanish	PARADA DE EMERGENCIA	**ESL-41/60-ES-10**
		German	NOT-AUS	**ESL-41/60-DE-10**
		French	ARRÊT D'URGENCE	**ESL-41/60-FR-10**
		Italian	EMERGENZA ARRESTO	**ESL-41/60-IT-10**
		Russian	БГБСЙКОЬ К ПТУБОПГ	**ESL-41/60-RU-10**
		Japanese	非常停止	**ESL-41/60-JA-10**
		Simplified Chinese (Mainland China)	紧急停止	**ESL-41/60-CN-10**
		Traditional Chinese (Taiwan)	緊急停止	**ESL-41/60-TW-10**
		Portuguese	PARADA DE EMERGÊNCIA	**ESL-41/60-PT-10**
	70 mm diameter (OD) Emergency Stop Legend with inscription and ISO 13850 Emergency Stop symbol (adhesive backed label). 44 mm hole for application around **SSA-EB1M…** (Pack of 10 each).	English	EMERGENCY STOP	**ESL-44/70-10**
		English & Spanish	PARADA DE EMERGENCIA	**ESL-44/70-ENES-10**
		Spanish	PARADA DE EMERGENCIA	**ESL-44/70-ES-10**
		German	NOT-AUS	**ESL-44/70-DE-10**
		French	ARRÊT D'URGENCE	**ESL-44/70-FR-10**
		Italian	EMERGENZA ARRESTO	**ESL-44/70-IT-10**
		Russian	АВАРИЙНЫЙ ОСТАНОВ	**ESL-44/70-RU-10**
		Japanese	非常停止	**ESL-44/70-JA-10**
		Simplified Chinese (Mainland China)	紧急停止	**ESL-44/70-CN-10**
		Traditional Chinese (Taiwan)	緊急停止	**ESL-44/70-TW-10**
		Portuguese	PARADA DE EMERGÊNCIA	**ESL-44/70-PT-10**

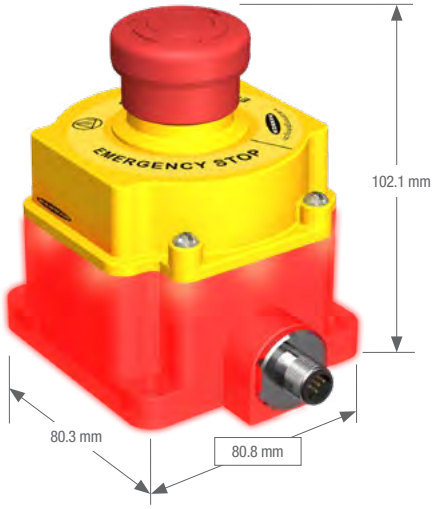
EZ-LIGHT™ Illumination Logic for Emergency Stop buttons

Situation	Indication	Illumination Logic
SSA-EB1xxLYR-xxxxQx or SSA-EB1xxLGR-xxxxQx		
Button Armed Pin 3 open	YELLOW / SOLID or GREEN / SOLID	• Indicates button is armed • If used, ES-FA-11AA Module is in a RESET/RUN condition (31/32 open)
Button Pushed Pin 3 open or +V dc	RED / FLASH	• Indicates the button that is pushed (actuated) • Signal on Pin 3 has no effect on a button that has been pushed (actuated)
Button Armed Pin 3 = +V dc	RED / SOLID	• Indicates the machine is in an Emergency Stop or other stop condition, but that specific button has not been pushed (actuated) • This optional signal (12 to 30 V dc) allows the user to indicate a stop condition by turning the armed indication to a RED (steady) Indication
SSA-EB1xxLXR-xxxxQx		
Button Armed Pin 3 open	OFF	• Indicates button is armed • If used, ES-FA-11AA Module is in a RESET/RUN condition (31/32 open)
Button Pushed Pin 3 open or +V dc	RED / FLASH	• Indicates the button that is pushed (actuated) • Signal on Pin 3 has no effect on a button that has been pushed (actuated)
Button Armed Pin 3 = +V dc	RED / SOLID	• Indicates the machine is in an Emergency Stop or other stop condition, but that specific button has not been pushed (actuated) • This optional signal (12 to 30 V dc) allows the user to indicate a stop condition by turning the armed indication to a RED (steady) Indication
SSA-EB1xxL-xxxxQx		
Button Armed Pin 3 open	OFF	• Indicates button is armed • If used, ES-FA-11AA Module is in a RESET/RUN condition (31/32 open)
Button Pushed Pin 3 open or +V dc	RED / SOLID	• Indicates the button that is pushed (actuated) • Signal on Pin 3 has no effect on a button that has been pushed (actuated)
Button Armed Pin 3 = +V dc	RED / SOLID	• Indicates the machine is in an Emergency Stop or other stop condition, but that specific button has not been pushed (actuated) • This optional signal (12 to 30 V dc) allows the user to indicate a stop condition by turning the armed indication to a RED (steady) Indication



Illuminated models

Non-Illuminated models



Illuminated models

Non-Illuminated models

Illuminated models

Non-Illuminated models

30 mm E-Stop Push Button Specifications

Housing / Button Mounting	Polycarbonate / Polyamide Threaded base has M30 x 1.5 external threads.(M30 hardware included) **Max. Tightening Torque:** 0.56 N·m (5 in·lbf)
Operating Temperature	–25 to +55 °C
Environmental rating	IP65 (IEC60529)
Operating Humidity	45% to 85% RH (no condensation)
Insulation Resistance	100M minimum (500 V dc megger)
Impulse Withstand Voltage	2.5 kV
Pollution Degree	3
Overvoltage Category	II
Contact material / bounce*	Gold plated silver / 20 ms
Electrical Life	100,000 operations minimum, 250,000 operations minimum at 24 V ac/dc, 100 mA
Mechanical Life	250,000 operations
B10d	100,000 (based on ISO13849-1(2006))
Shock & Vibration Resistance	**Operating extremes:** 150m/s2 (15G) **Operating extremes:** 10 to 500 Hz, amplitude 0.35 mm acceleration 50 m/s2
LED Illumination	**Color:** Yellow - 590 nm, Red - 618 nm, Green - 525 nm; **Flash Rate:** 1.6 Hz at 50% duty cycle; **Voltage/Current:** 12 – 30 V dc; 120 mA at 12 V dc, 65 mA at 24 Vdc, 60 mA at 30 V dc, SSA-EB1..LGR-.. **(GREEN) only:** 12 – 30 V dc; 135 mA @ 12 V dc, 75 mA @ 24 V dc, 70 mA @ 30 V dc
Electrical Rating	**Minimum load:** 1 mA @ 5 V ac/dc **SSA-EB1xx-..Q5A/Q5B:** 3A @ 250 V maximum **SSA-EB1xx-xxED1Q8:** 2A at 60 V ac/75 V dc maximum **UL Applications (UL/cUL):** 1.5A @ 250 V ac, 1A @ 30 V dc (pilot duty) **CE Applications: AC-15:** 1.5A @ 250 V ac, DC-13: 1A @ 30 V dc
Rated Insulation Voltage (Ui)	250 V
Rated Current (Ith)	3A
Rated Operating Voltage (Ue)	See Electrical Rating

Rated Operating Current

			30 V	60 V ac/75 V dc	125 V	250 V
SSA-EB1xxLxx-02ED1Q5A/Q5B						
Safety Contact (NC)	AC 50/60 Hz	Resistive Load (AC-12)	—	—	—	3A
		Inductive Load (AC-15)	—	—	3A	1.5A
	DC	Resistive Load (DC-12)	2A	—	0.4A	0.2A
		Inductive Load (DC-13)	1A	—	0.22A	0.1A
Monitor Contacts (NO)	AC 50/60 Hz	Resistive Load (AC-12)	—	—	1.2A	0.6A
		Inductive Load (AC-15)	—	—	0.6A	0.3A
	DC	Resistive Load (DC-12)	2A	—	0.4A	0.2A
		Inductive Load (DC-13)	1A	—	0.22A	0.1A
SSA-EB1PLxx-02ECQ5A/Q5B (illuminated)						
Safety Contact (NC)	AC 50/60 Hz	Resistive Load (AC-12)	—	—	—	3A
		Inductive Load (AC-15)	—	—	3A	1.5A
	DC	Resistive Load (DC-12)	2A	—	0.4A	0.2A
		Inductive Load (DC-13)	1A	—	0.22A	0.1A
SSA-EB1Pxx-xxECQ8 See above for **SSA-EB1P-22ECQ8** Monitor Contacts						
Safety Contact (NC)	AC 50/60 Hz	Resistive Load (AC-12)	—	2A	—	—
		Inductive Load (AC-15)	—	2A	—	—
	DC	Resistive Load (DC-12)	2A	0.4A	—	—
		Inductive Load (DC-13)	1A	0.22A	—	—
Auxiliary Output (NO)	12 to 30 V dc (from pin 2)	Resistive Load (DC-12)	0.25A	—	—	—
		Inductive Load (DC-13)	0.25A	—	—	—

- The rated operating currents are measured at resistive/inductive load types specified in IEC 60947-5-1.
- See "Electrical Rating" above for maximum voltage/current rating per model.

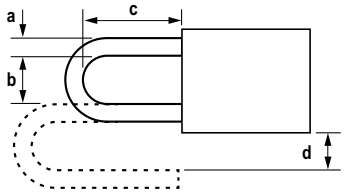
Design Standards	Compliant with EN/IEC 60497-1 / -5-1, ISO 13850, ANSI B11.19 , ANSI NFPA79, IEC 60204-1
Certifications	E-stop button: CE cULus LISTED (pending)

Lockable and Illuminated E-Stop Push-Button Specifications

Housing / Button Mounting	Polycarbonate / Polyamide #10 or M5 (M5 hardware included), Max. Tightening Torque: 0.56 N•m (5 in•lbf)
Operating Temperature	–25 to +55 °C
Environmental rating	IP65 (IEC60529)
Operating Humidity	45% to 85% RH (no condensation)
Insulation Resistance	100MΩ minimum (500 V dc megger)
Impulse Withstand Voltage	2.5kV
Pollution Degree	3
Overvoltage Category	II
Contact material / bounce	Gold plated silver / 20ms
Electrical Life	100,000 operations minimum, 250,000 operations minimum at 24 V ac/dc, 100 mA
Mechanical Life	250,000 operations,
B10d	100,000 (based on ISO13849-1(2006))
Total Weight of Padlock and Hasp (SSA-EB1M..P-.. only)	1500g (3.3 lb) maximum Since various form and sizes are available, ensure applicability of padlock and hasp before use. If total weight exceeds 1500g, the switch may malfunction or fail.

Padlock size

a	b	c	d
7 mm max	19 mm min	39 mm min	15 mm min



Dimension “d” is 6 mm or more when attaching a padllock from the side of a switch.

Shock Resistance	**Operating extremes:** 150m/s2 (15G)
Vibration Resistance	**Operating extremes:** 10 to 500 Hz, amplitude 0.35 mm acceleration 50 m/s2
LED Illumination	**Color:** Yellow - 590 nm, Red - 618 nm, Green - 525 nm **Flash Rate:** 1.6 Hz @ 50% duty cycle **Voltage/Current:** 12 – 30 V dc; 120 mA @ 12 V dc, 65 mA @ 24 V dc, 60 mA @ 30 V dc, SSA-EB1..LGR-..(GREEN) only: 12 - 30 V dc; 135 mA @ 12 V dc, 75 mA @ 24 V dc, 70 mA @ 30 V dc
Electrical Rating	**Minimum load:** 1 mA @ 5 V ac/dc **SSA-EB1xx-..Q5A/Q5B:** 3A @ 250 V maximum **SSA-EB1xx-xxED1Q8:** 2A @ 60 V ac/75 V dc maximum **UL Applications (UL/cUL):** 1.5A @ 250 V ac, 1A @ 30 V dc (pilot duty) **CE Applications: AC-15:** 1.5A @ 250 V ac, DC-13: 1A @ 30 V dc
Rated Insulation Voltage (Ui)	250 V
Rated Current (Ith)	3A

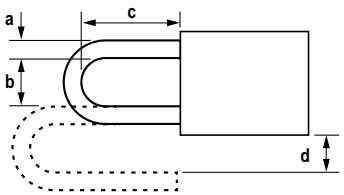
Rated Operating Current

Rated Operating Voltage (Ue)				30 V	60 V ac/75 V dc	125 V	250 V
See Electrical Rating							
SSA-EB1xxLxx-02ED1Q5A/Q5B							
Safety Contact (NC)	AC 50/60 Hz	Resistive Load (AC-12)		—	—	—	3A
		Inductive Load (AC-15)		—	—	3A	1.5A
	DC	Resistive Load (DC-12)		2A	—	0.4A	0.2A
		Inductive Load (DC-13)		1A	—	0.22A	0.1A
SSA-EB1xx-xxED1Q8							
Safety Contact (NC)	AC 50/60 Hz	Resistive Load (AC-12)		—	2A	—	—
		Inductive Load (AC-15)		—	2A	—	—
	DC	Resistive Load (DC-12)		2A	0.4A	—	—
		Inductive Load (DC-13)		1A	0.22A	—	—
Auxiliary Output (NO)	12 to 30 V dc (from pin 2)	Resistive Load (DC-12)		0.25A	—	—	—
		Inductive Load (DC-13)		0.25A	—	—	—

- The rated operating currents are measured at resistive/inductive load types specified in IEC 60947-5-1.
- See “Electrical Rating” above for maximum voltage/current rating per model.

Design Standards	Compliant with EN/IEC 60497-1 / -5-1, ISO 13850, ANSI B11.19 , ANSI NFPA79, IEC 60204-1
Certifications	**E-stop button:** CE (pending) cULus LISTED (pending)

Lockable E-Stop Push-Button Specifications

Housing / Button Mounting	Polycarbonate / Polyamide #10 or M5 (M5 hardware included), Max. Tightening Torque: 0.56 N•m (5 in•lbf)
Operating Temperature	–25 to +55 °C
Environmental rating	IP65 (IEC60529)
Operating Humidity	45% to 85% RH (no condensation)
Insulation Resistance	100MΩ minimum (500 V dc megger)
Impulse Withstand Voltage	2.5kV
Pollution Degree	3
Overvoltage Category	II
Contact material / bounce	Gold plated silver / 20 ms
Electrical Life	100,000 operations minimum, 250,000 operations minimum at 24 V ac/dc, 100 mA
Mechanical Life	250,000 operations,
B10d	100,000 (based on ISO13849-1(2006))
Total Weight of Padlock and Hasp (SSA-EB1M..P-.. only)	1500g (3.3 lb) maximum Since various form and sizes are available, ensure applicability of padlock and hasp before use. If total weight exceeds 1500g, the switch may malfunction or fail. **Padlock size** a: 7 mm max; b: 19 mm min; c: 39 mm min; d: 15 mm min  Dimension “d” is 6 mm or more when attaching a padllock from the side of a switch.
Shock Resistance	Operating extremes: 150m/s2 (15G)
Vibration Resistance	Operating extremes: 10 to 500 Hz, amplitude 0.35mm acceleration 50m/s2
LED Voltage/Current	24 V ac/dc ±10%, 15mA @ 24 V ac/dc (SSA-EB1PL2-12ED1Q8 only)
Electrical Rating	Minimum load: 1 mA @ 5 V ac/dc SSA-EB1xx-..Q4 and -..Q5: 3A @ 250 V maximum SSA-EB1xx-..Q8: 2A @ 60 V AC/75 V DC maximum UL Applications (UL/cUL): 1.5A @ 250 V ac, 1A @ 30 V dc (pilot duty) CE Applications: AC-15: 1.5A @ 250 V ac, DC-13: 1A @ 30 V dc
Rated Insulation Voltage (Ui)	250 V
Rated Current (Ith)	3A

Rated Operating Voltage (Ue): See Electrical Rating

Rated Operating Current

			30 V	125 V	250 V
Safety Contact (NC)	AC 50/60 Hz	Resistive Load (AC-12)	-	-	3A
		Inductive Load (AC-15)	-	3A	1.5A
	DC	Resistive Load (DC-12)	2A	0.4A	0.2A
		Inductive Load (DC-13)	1A	0.22A	0.1A
Monitor Contacts (NO)	AC 50/60 Hz	Resistive Load (AC-12)	-	1.2A	0.6A
		Inductive Load (AC-14)	-	0.6A	0.3A
	DC	Resistive Load (DC-12)	2A	0.4A	0.2A
		Inductive Load (DC-13)	1A	0.22A	0.1A

- The rated operating currents are measured at resistive/inductive load types specified in IEC 60947-5-1.
- See “Electrical Rating” above for maximum voltage/current rating per model.

Design Standards	Compliant with EN/IEC 60497-1 / -5-1, ISO 13850, ANSI B11.19 , ANSI NFPA79, IEC 60204-1
Certifications	**E-stop button:** CE (pending) c UL us LISTED (pending)

E-Stop Buttons

30 mm Panel Mount

- Easy to install with locking and illuminated models available
- Up to four contacts; various configurations available
- Push-to-stop, twist-to-release (standard and lockable), or pull-to-release (standard) operation per IEC60947-5-5
- Latching design complies with ISO 13850; direct (positive) opening operation per IEC 60947-5-1
- Compliant with ANSI B11.19, ANSI NFPA79, and IEC/EN 60204-1 Emergency Stop requirements
- "Safe Break Action" ensures N.C. contacts will open if the contact block is separated from the actuator

Panel Mount E-Stop Push-Buttons

Description	Models 40 mm Button	Models 60 mm Button
2NC	SSA-EB1P-02	SSA-EB2P-02
4NC	SSA-EB1P-04	SSA-EB2P-04
1NC / 1NO	SSA-EB1P-11	SSA-EB2P-11
3NC / 1NO	SSA-EB1P-13	SSA-EB2P-13
2NC / 2NO	SSA-EB1P-22	SSA-EB2P-22

Lockable Panel Mount E-Stop Push-Buttons

Description	Models 44 mm Button
2NC	SSA-EB1MP-02
4NC	SSA-EB1MP-04
1NC / 1NO	SSA-EB1MP-11
3NC / 1NO	SSA-EB1MP-13
2NC / 2NO	SSA-EB1MP-22

Illuminated E-Stop Buttons

30 mm Panel Mount

- Easy to install with locking and illuminated models available
- Up to four contacts; various configurations available
- Push-to-stop, twist-to-release (standard and lockable), or pull-to-release (standard) operation per IEC60947-5-5
- Latching design complies with ISO 13850; direct (positive) opening operation per IEC 60947-5-1
- Compliant with ANSI B11.19, ANSI NFPA79, and IEC/EN 60204-1 Emergency Stop requirements
- "Safe Break Action" ensures N.C. contacts will open if the contact block is separated from the actuator

Illuminated Panel Mount E-Stop Push-Buttons

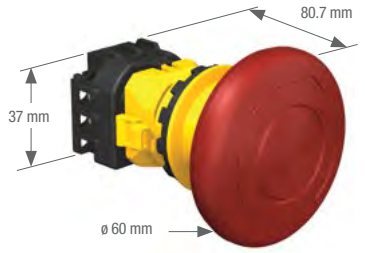
Description	Models 40 mm Button
2NC, LED function per hookup	SSA-EB1PL1-02
4NC, LED function per hookup	SSA-EB1PL1-04
1NC / 1NO, LED function per hookup	SSA-EB1PL1-11
3NC / 1NO, LED function per hookup	SSA-EB1PL1-13
2NC / 2NO, LED function per hookup	SSA-EB1PL1-22
2NC / 1NO, LED function PRESS ON	SSA-EB1PL2-12

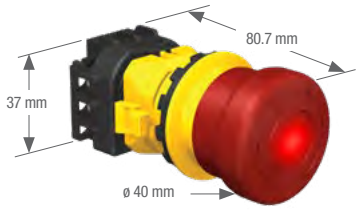
Illuminated Lockable Panel Mount E-Stop Push-Buttons

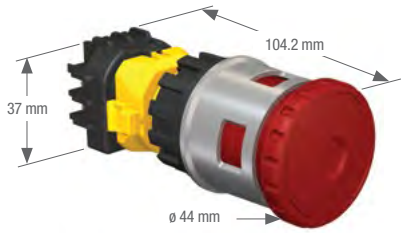
Description	Models 44 mm Button
2NC, LED function per hookup	SSA-EB1ML1P-02
4NC, LED function per hookup	SSA-EB1ML1P-04
1NC / 1NO, LED function per hookup	SSA-EB1ML1P-11
3NC / 1NO, LED function per hookup	SSA-EB1ML1P-13
2NC / 2NO, LED function per hookup	SSA-EB1ML1P-22
2NC / 1NO, LED function PRESS ON	SSA-EB1ML2P-12

E-Stop Legend Labels (adhesive backed label)

Product	Description	Language	Inscription	Models
	60 mm diameter (OD) Emergency Stop Legend with inscription and ISO 13850 Emergency Stop symbol (adhesive backed label). 41 mm hole for application around the base of SSA-EB1(2)P… (Pack of 10 each)	English	EMERGENCY STOP	**ESL-41/60-10**
		English & Spanish	PARADA DE EMERGENCIA	**ESL-41/60-ENES-10**
		Spanish	PARADA DE EMERGENCIA	**ESL-41/60-ES-10**
		German	NOT-AUS	**ESL-41/60-DE-10**
		French	ARRÊT D'URGENCE	**ESL-41/60-FR-10**
		Italian	EMERGENZA ARRESTO	**ESL-41/60-IT-10**
		Russian	АВАРИЙНЫЙ ОСТАНОВ	**ESL-41/60-RU-10**
		Japanese	非常停止	**ESL-41/60-JA-10**
		Simplified Chinese (Mainland China)	紧急停止	**ESL-41/60-CN-10**
		Traditional Chinese (Taiwan)	緊急停止	**ESL-41/60-TW-10**
		Portuguese	PARADA DE EMERGÊNCIA	**ESL-41/60-PT-10**
	70 mm diameter (OD) Emergency Stop Legend with inscription and ISO 13850 Emergency Stop symbol (adhesive backed label). 44 mm hole for application around SSA-EB1M… (Pack of 10 each).	English	EMERGENCY STOP	**ESL-44/70-10**
		English & Spanish	PARADA DE EMERGENCIA	**ESL-44/70-ENES-10**
		Spanish	PARADA DE EMERGENCIA	**ESL-44/70-ES-10**
		German	NOT-AUS	**ESL-44/70-DE-10**
		French	ARRÊT D'URGENCE	**ESL-44/70-FR-10**
		Italian	EMERGENZA ARRESTO	**ESL-44/70-IT-10**
		Russian	АВАРИЙНЫЙ ОСТАНОВ	**ESL-44/70-RU-10**
		Japanese	非常停止	**ESL-44/70-JA-10**
		Simplified Chinese (Mainland China)	紧急停止	**ESL-44/70-CN-10**
		Traditional Chinese (Taiwan)	緊急停止	**ESL-44/70-TW-10**
		Portuguese	PARADA DE EMERGÊNCIA	**ESL-44/70-PT-10**
	60 mm diameter (OD) Emergency Stop Legend with or without inscription (plastic with seal). 30 mm hole for application with SSA-EB1(2)P… or SSA-EB1M… (1 each)	English	EMERGENCY STOP	**ESLP1-30/60**
		N.A.	(Blank)	**ESLP1-30/60-NW**
	IP20 Finger-safe terminal cove			**SSA-EB1-FSTC**
	Standard terminal cover (supplied)			**SSA-EB1-TC**
	Jam nut wrench			**SSA-EB1-LRW**
	Jam nut twist wrench			**SSA-EB1-LRTW**







E-Stop Push Button Specifications

Button/Locking Collar	Polyamide/Aluminum
Operating Temperature	**Non-illuminated:** –25 to +60 °C **Illuminated:** –25 to +55 °C
Environmental rating	IP65 (IEC60529)
Operating Humidity	45% to 85% RH (no condensation)
Insulation Resistance	100M minimum (500 V dc megger)
Impulse Withstand Voltage	2.5kV
Pollution Degree	3
Overvoltage Category	II
Contact material / bounce*	Gold plated silver / 20 ms
Electrical Life	100,000 operations minimum, 250,000 operations minimum at 24 V ac/dc, 100 mA
Mechanical Life	250,000 operations
B10d	100,000 (based on ISO13849-1(2006))
Shock & Vibration Resistance	**Shock Operating extremes:** 150m/s2 (15G) **Vibration Operating extremes:** 10 to 500 Hz, amplitude 0.35 mm acceleration 50 m/s2
Electrical Rating	**Minimum load:** 1 mA @ 5 V ac/dc **UL Applications:** 1.5A @ 250 V ac, 1A @ 30 V dc (pilot duty) **CE Applications:** AC-15: 1.5A @ 250 V ac, DC-13: 1A @ 30 V dc
Rated Insulation Voltage (Ui)	250 V
Rated Current (Ith)	3A
Rated Operating Current	See tables below
Design Standards	Compliant with EN/IEC 60497-1 / -5-1, ISO 13850, ANSI B11.19 , ANSI NFPA79, IEC 60204-1
Certifications	CE cULus LISTED

Safety Contact (NC)		30 V	125 V	250 V
AC 50/60 Hz	Resistive Load (AC-12)	—	—	—
	Inductive Load (AC-15)	—	—	3A
DC	Resistive Load (DC-12)	2A	—	0.4A
	Inductive Load (DC-13)	1A	—	0.22A

Monitor Contact (NO)		30 V	125 V	250 V
AC 50/60 Hz	Resistive Load (AC-12)	—	1.2A	0.6A
	Inductive Load (AC-15)	—	0.6A	0.3A
DC	Resistive Load (DC-12)	2A	0.4A	0.2A
	Inductive Load (DC-13)	1A	0.22A	0.1A

The operating current is classified according to JIS C 8201-5-1-1999 making and breaking capacities and are measured at resistive/inductive load types specified in IEC 60947-5-1. See “Electrical Rating” above for specific model and UL/CE maximum ratings.

E-Stop Buttons

Emergency Stop Push Buttons

- E-Stop button solution available as individual components or as kits for easy ordering.
- Higher current rating
- Modular design makes assembly and installation easy for either panel-mount or enclosure mounting
- Push-to-stop, twist-to-release operation per IEC 60497-5-5
- Compliant with ANSI B11.19, ANSI NFPA79, and IEC/EN 60204-1 Emergency Stop requirements
- Panel mount through 22 mm mounting hole

E-Stop Push-Button Panel Mount Kits

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

E-Stop Push-Button Enclosure Kits

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

NC = Normally closed contact, NO = Normally open contact

* The **LPZP1A5** enclosure has replaced **8-L2PP-1A5** (discontinued). Please note changes in size (**8-L2PP-1A5:** 72mm x 85mm) and mounting hole location (**8-L2PP-1A5:** 49mm x 54mm).

E-Stop Push-Button Components

Product	Description	Models
	22.5 mm metal button (8-LM2T-AU120 mounting adapter sold separately)	**8-LM2T-B6644***
	Metal mounting adapter (for metal button)	**8-LM2T-AU120**
	Normally closed (NC) positively driven contact element	**8-LM2T-C01****
	Normally open (NO) auxiliary contact element	**8-LM2T-C10**
	One 22 mm button enclosure, maximum of three contact blocks, wire entry through three sides (M16, M20 or M25) or the bottom (M16)	**LPZP1A5*****

* 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.
*** The **LPZP1A5** enclosure has replaced **8-L2PP-1A5** (discontinued). Please note changes in size (**8-L2PP-1A5:** 72mm x 85mm) and mounting hole location (**8-L2PP-1A5:** 49mm x 54mm).

E-Stop Legend Labels (adhesive backed label)

Product	Description	Language	Inscription	Models†
	60 mm diameter, non-adhesive plastic legend with "Emergency Stop" inscription	English	EMERGENCY STOP	**8-LM2T-AU115†**
	60 mm diameter (OD) Emergency Stop Legend with inscription and ISO 13850 Emergency Stop symbol (adhesive backed label). 41 mm hole for application around the base of **SSA-EB1(2)P**… (Pack of 10 each)	English	EMERGENCY STOP	**ESL-41/60-10**
		English & Spanish	PARADA DE EMERGENCIA	**ESL-41/60-ENES-10**
		Spanish	PARADA DE EMERGENCIA	**ESL-41/60-ES-10**
		German	NOT-AUS	**ESL-41/60-DE-10**
		French	ARRÊT D'URGENCE	**ESL-41/60-FR-10**
		Italian	EMERGENZA ARRESTO	**ESL-41/60-IT-10**
		Russian	АВАРИЙНЫЙ ОСТАНОВ	**ESL-41/60-RU-10**
		Japanese	非常停止	**ESL-41/60-JA-10**
		Simplified Chinese (Mainland China)	紧急停止	**ESL-41/60-CN-10**
		Traditional Chinese (Taiwan)	緊急停止	**ESL-41/60-TW-10**
		Portuguese	PARADA DE EMERGÊNCIA	**ESL-41/60-PT-10**

† Additional E-Stop background labels are available (see p/n 121976).

E-Stop Push-Button Specifications

Mechanical Life	300,000 operations
Operating Force	0.8 kg
Mounting Adapter	**Metal button:** The adapter is fixed to the mounting surface by means of incorporated screws (Tmax = 0.8 Nm)
Construction	**Plastic parts:** Polyamide and polycarbonate **Metal parts:** Aluminum and zinc alloy
Environmental Rating	IP65
Operating Temperature	-25 to +60 °C
Certifications	Compliant with EN/IEC 60947-1; -5-1

Contact Specifications

Mechanical Life	300,000 operations
European Rating	**Utilization categories:** AC15 and DC13 Ui = 690 V ac Ith = 10A UL designation = A 600 Q600
Rated Operating Voltage (Ue) and Current	**IEC operational power in AC15**

V	12	24	48	120	240	400	480	500	600
A	6	6	6	6	3	1.9	1.5	1.4	1.2

IEC operational power in DC13

V	12	14	48	125	250	440	500	600	
A	3	3	1.5	0.55	0.27	0.15	0.13	0.1	

Mechanical Life	1,000,000 operations
B10d	8-LM2T-Cxx 1,000,000
Connections	(1 or 2) 12 AWG (2.5 mm^2) maximum wire size, tightening torque: Tmax = 1 Nm
Construction	Polyamide and polycarbonate
Environmental Rating	IP20
Operating Temperature	-25 to +60 °C
Application Notes	Normally Closed safety contacts (8-LM2T-C01) should only be attached to the left and right snap-on positions of the mounting adaptor. A maximum of two contact elements can be used in a single snap-on position.
Certifications	Compliant with EN/IEC 60947-1; -5-1

Emergency Stop & Stop Control

Rope pull emergency stop switches, when used with steel wire rope, provide emergency stop actuation for conveyors and large machinery.

Series	Description	Application	Dimensions H x W x D	Actuation	Housing Material
	**RP-RM83** Rated for use in harsh environments and outdoors, and activates if the rope is pulled, becomes loose or breaks. page 622	Emergency Stop	H (varies by model) 90 x 53 mm	Latch	Metal
	**RP-LS42** Rugged plastic housing to withstand harsh environments and is available with an E-stop button with manual reset. page 623	Emergency Stop	H (varies by model) 42 x 45 mm	Latch	Plastic
	**RP-QM72** Heavy-duty switch housing withstands harsh environments. page 624	Stop-Control	**RP-QM72:** 142 x 69 x 82 mm **RP-QMT72:** 181 x 69 x 82 mm	Latch	Metal
	**RP-LM40** Heavy-duty switch housing withstands harsh environments. page 625	Stop-Control	**RP-LM40D-6:** 124.5 x 40 x 37.5 mm **RP-LM40D-6L:** 147.5 x 40 x 37.5 mm	Trip & Latch	Metal
	**RP-QM90** Heavy-duty switch housing withstands harsh environments. page 626	Stop-Control	137 x 206 x 90 mm	Latch	Metal
	**ED1G** Handheld grip-style switch is typically used for manual control of machine functions, including visual observations, minor adjustments, troubleshooting, calibration and more. page 636	Stop-Control	260 x 46 x 58 mm		Plastic

RP-RM83

Rope Pull E-Stop Device

- Heavy-duty housing rated to IP67 for use in harsh environments and outdoors, and activates if the rope is pulled, becomes loose or breaks
- Additional solid-state auxiliary output for remote tension monitoring
- Tension indicators
- Operates in a range up to 75 m
- Design meets positive opening requirements for rope pull switches (IEC 60947-5-1)
- Complies with ANSI NFPA 79, ANSI B11.19, IEC 60204-1, EN 13850 and EN ISO 60947-5-5 for Emergency Stop applications

Components for wire rope assembly kits (page 629)

RP-RM83 Series E-Stop and Stop Control Device

Max. Rope Length	Safety Contacts	Auxiliary Contacts	Action	Contact State	Model*
38 m	2 NC in	2 NO in		Safety 1 2 / Auxiliary 1 2 open open closed closed open open closed closed	RP-RM83F-38LTE RP-RM83F-38LRE RP-RM83F-38LT RP-RM83F-38LR
75 m	2 NC in	2 NO in		Safety 1 2 / Auxiliary 1 2 open open closed closed open open closed closed	RP-RM83F-75LTE RP-RM83F-75LRE RP-RM83F-75LT RP-RM83F-75LR

* Models with T suffix have a Built-in Turnbuckle for rope
Models with R suffix have a Ring connection to rope
Models with E suffix have an auxiliary status output

For more specifications see page 632.

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

RP-RM83 rope pulls comply with IEC 60947-5-1 Positive Opening requirements.
See data sheet or Contact Configuration and Switching Diagrams for more information/clarification.(page 633)
For dimensions see page 627.

RP-LS42

Rope Pull E-Stop Device

- Rugged plastic housing to withstand harsh environments and has an E-stop button model with manual reset.
- Tension indicators
- Operates in ranges up to 75 m
- Switch activates if the rope is pulled, becomes loose or breaks
- Design meets positive opening requirements for rope pull switches (IEC 60947-5-1)
- Complies with ANSI NFPA 79, ANSI B11.19, IEC 60204-1, EN 13850 and EN ISO 60947-5-5 for Emergency Stop applications

RP-LS42 Series E-Stop and Stop Control Device

Max. Rope Length	Safety Contacts	Auxiliary Contacts	Action	Contact State				Model*
				Safety		Auxiliary		
				1	2	1	2	
25 m	2 NC in →	2 NO in →		open	open	closed	closed	RP-LS42F-25L
				open	open	closed	closed	RP-LS42F-25LE RP-LS42F-25LF
37.5 m	2 NC in →	2 NO in →		Safety		Auxiliary		RP-LS42F-38L
				1	2	1	2	
				open	open	closed	closed	RP-LS42F-38LE
				open	open	closed	closed	RP-LS42F-38LF
75 m	2 NC in →	2 NO in →		Safety		Auxiliary		RP-LS42F-75L
				1	2	1	2	
				open	open	closed	closed	RP-LS42F-75LE
				open	open	closed	closed	RP-LS42F-75LF

• Models with LF suffix have a Built-in Turnbuckle for rope
Models with L suffix have a Ring connection to rope
Models with LE suffix have a Built-in Turnbuckle for rope and an E-stop button

Components for wire rope assembly kits (page 629)

For more specifications see page 632

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

RP-RM83 rope pulls comply with IEC 60947-5-1 Positive Opening requirements.
See data sheet or Contact Configuration and Switching Diagrams for more information/clarification.(page 633)
For dimensions see page 627.

RP-QM72/QMT72

Rope Pull Switches

- Heavy-duty switch housing withstands harsh environments and have a max. rope pull length of 6, 12 or 20 m depending on model.
- Switches activate if the rope is pulled, becomes loose or breaks
- Manual reset (Latch) design if the rope is pulled
- Rugged metal housing with protective earth terminal (IEC 60947-1)
- Comply with ANSI NFPA 79 and IEC 60204-1 for Stop Control applications

Components for wire rope assembly kits (page 629)

RP-QM72/QMT72 Series Stop Control Device

Max. Rope Length	Safety Contacts	Auxiliary Contacts	Action	Contact State	Model
6 m 12 m 20 m	2 NC in →	—		Safety 1: open, open Auxiliary 1: closed, closed	RP-QM72D-6L RP-QM72D-12L RP-QMT72D-20L
12 m	4 NC in →	—		Safety 1: open, closed; 2: open, closed Auxiliary 1: closed, open; 2: closed, open	RP-QMT72F-12L
12 m	2 NC in →	1 NO in →		Safety 1: open, closed; 2: open, closed Auxiliary 1: closed, open; 2: closed, open	RP-QMT72E-12L

For more specifications see page 632.

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

RP-RM83 rope pulls comply with IEC 60947-5-1 Positive Opening requirements.
See data sheet or Contact Configuration and Switching Diagrams for more information/clarification.(page 633)
For dimensions see page 627.

RP-LM40

Rope Pull Switches

- Heavy-duty switch housing withstands harsh environments
- Manual reset (Latch) design after the rope is pulled and Auto Reset (Trip) models
- Rugged metal housing with protective earth terminal (IEC 60947-1)
- Switches activate if the rope is pulled, becomes loose or breaks
- Design meets positive opening requirements for rope pull switches (IEC 60947-5-1)
- Comply with ANSI NFPA 79 and IEC 60204-1 for Stop Control applications

RP-LM40 Series Stop Control Device

Max. Rope Length	Safety Contacts	Auxiliary Contacts	Action	Contact State				Model*
				Safety		Auxiliary		
				1	2	1	2	
6 m	2 NC in →	—	Run Position Cable Pulled	open closed	open closed	closed open	closed open	RP-LM40D-6 RP-LM40D-6L

* Models with 6 suffix use Trip actuation
Models with 6L suffix use Latch actuation (typical)

Components for wire rope assembly kits (page 629)

For more specifications see page 632

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

RP-RM83 rope pulls comply with IEC 60947-5-1 Positive Opening requirements.
See data sheet or Contact Configuration and Switching Diagrams for more information/clarification.(page 633)
For dimensions see page 627.

RP-QM90

Rope Pull Switches

- Heavy-duty switch housing withstands harsh environments
- Manual reset (Latch) design after the rope is pulled
- Rugged metal housing with protective earth terminal (IEC 60947-1)
- Switch activates if the rope is pulled, becomes loose or breaks
- Operates in a range up to 100 m
- Design meets positive opening requirements for rope pull switches (IEC 60947-5-1)

Components for wire rope assembly kits (page 629)

RP-QM90 Series Stop Control Device

Max. Rope Length	Safety Contacts	Auxiliary Contacts	Action	Contact State				Model
				Safety		Auxiliary		
				1	2	1	2	
100 m (50 m each side)	2 NC in →	2 NO in →		open open	open open	closed closed	closed closed	RP-QM90F-100L

For more specifications see page 632.

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

RP-RM83 rope pulls comply with IEC 60947-5-1 Positive Opening requirements.
See data sheet or Contact Configuration and Switching Diagrams for more information/clarification.(page 633)
For dimensions see page 627.

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

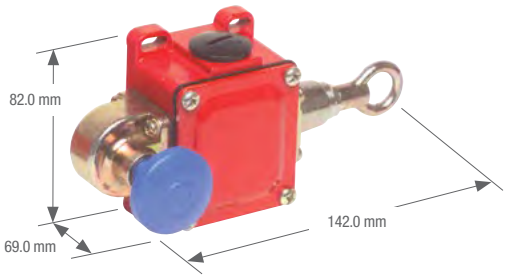
RP-RM83F-75LR.. and RP-RM83F-38LR.. Models

RP-LS42F-..L Model

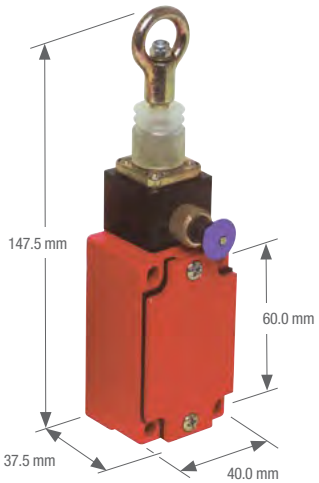
RP-LS42F-..LF Model

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

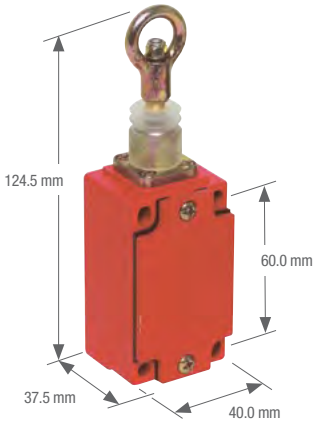
RP-QMT72 Models



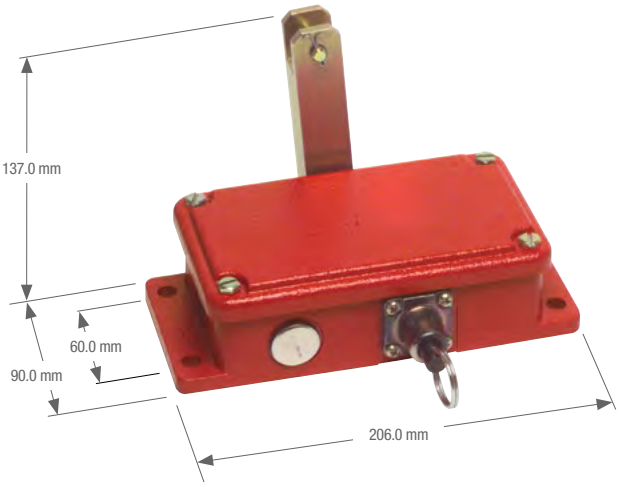
RP-QM72 Models



RP-LM40D-6L Model



RP-LM40D-6 Model



RP-QM90 Model

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
	RPA-C1-20	20 m		
	RPA-C1-100	100 m		
	RPA-C2-10	10 m	3 mm steel wire rope with 0.25 mm red PVC jacket (unterminated)	• RP-LS42 models • RP-QM72/QMT72 models • RP-RM83 models
	RPA-C2-20	20 m		
	RPA-C2-40	40 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
	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 (< 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 (75 m) • RP-RM83 models (75 m)
	RPA-S5-1	1 pc	Tensioning Spring #5	• RP-RM83 models (38 m)
	 RPA-S4-1	1 pc	Tensioning spring assembly with built-in eye bolt, cable thimble, clamp, tensioning and overload protection	• RP-LS42 models (75 m) • RP-RM83 models (75 m)
	RPA-S6-1	1 pc		• RP-RM83 models (38 m) • RP-LS42 models (25 & 38 m)
Terminal Cover	SI-LS42-COVER	Replacement terminal cover		• RP-LS42 models

Continued on next page

Components for Wire Rope Assembly (cont'd)

	Models		Package Quantity	Description	Used With
EZ-LIGHT®		SI-K30LGRX7P	1 pc	Green/Red indication	• RP-LM40 • RP-LS42F • RP-QM90F • RP-QM(T)72 • RP-RM83F • SI-LS31 • SI-LS100 • SI-QS90 • SI-LM40 • SI-LS42SI-QM100
		SI-K30LYRX7P	1 pc	Yellow/Red indication (used with RP-RM83F-xxLTE/-xxLRE with tension alarm)	
		SI-K30LRXX7P	1 pc	Red indication	
Indicator Lamps		SI-PL3T-R	1 pc	Red with M20 x 1.5 (24 V ac/dc)	• RP-LS42 • RP-QM72/QMT72 • RP-RM83 • RP-QM90
		SI-PL3A-R	1 pc	Red with M20 x 1.5 (120 V ac)	
		SI-PL3T-G	1 pc	Green with M20 x 1.5 (24 V ac/dc)	
		SI-PL3A-G	1 pc	Green with M20 x 1.5 (120 V ac)	
Cable Gland		SI-QS-CGM20	1 pc	For 5 to 12 mm diameter cable	• 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
Conduit Adaptor		SI-QS-M20	1 pc	M20 x 1.5 to ½ in-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

Wire Rope Assembly Kits (Tensioning Springs ordered separately)

3 mm Rope (Length)	Thimbles (Each)	Clamps (Each)	Eye Bolts (Each)	In-Line Pulleys (Each)	Turnbuckle (Each)	Kit Model
0.5 m	2	2	—	—	—	RPAK-C2SBP-1
10 m	4	4	3	—	—	RPAK-CH2-10
	4	4	3	3	—	RPAK-CHP2-10
	4	4	3	—	1	RPAK-CH2-10-TA
	4	4	3	3	1	RPAK-CHP2-10-TA
20 m	4	4	6	—	—	RPAK-CH2-20
	4	4	6	6	—	RPAK-CHP2-20
	4	4	6	—	1	RPAK-CH2-20-TA
	4	4	6	6	1	RPAK-CHP2-20-TA
40 m	4	4	11		—	RPAK-CH2-40
	4	4	11	11	—	RPAK-CHP2-40
	4	4	11	—	1	RPAK-CH2-40-TA
	4	4	11	11	1	RPAK-CHP2-40-TA
50 m	4	4	14	—	—	RPAK-CH2-50
	4	4	14	14	—	RPAK-CHP2-50
	4	4	14	—	1	RPAK-CH2-50-TA
	4	4	14	14	1	RPAK-CHP2-50-TA
80 m	4	4	21	—	—	RPAK-CH2-80
	4	4	21	21	—	RPAK-CHP2-80
	4	4	21	—	1	RPAK-CH2-80-TA
	4	4	21	21	1	RPAK-CHP2-80-TA

Rope Pull Switches Specifications

Contact Rating

10A @ 24 V ac, 10A @ 110 V ac, 6A @ 230 V ac, 6A @ 24 V dc
2.5 kV max. transient tolerance
NEMA A300 P300

Monitoring Solid-State Output Rating

Rated operational voltage: Ue= 10 to 30 V dc
Rated operational current: Ie= 50 mA
Utilization category: DC13
Protected against reverse polarity and short circuit.

European Rating

Utilization categories: AC15 and DC13
Ui= 500V ac, I_{th} = 10A

Rated Surge Capacity: 2.5 kV (RP-RM83 only)

RP-RM83 models (40-60 Hz)		
Ue V	Ie/AC-15 A	Ie/DC-13 A
120	6	0.55
240	3	0.27

All others (40-60 Hz)		
Ue V	Ie/AC-15 A	Ie/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 models: 2-5 mm diameter steel rope (3 mm recommended)
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-LS42F-38L/38LE/38LF:** 37.5 m **RP-LS42F-25L/25LE/25LF:** 25 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

10 amp Slow Blow, 15 amp Fast Blow.
Recommended external fusing or overload protection.

Mechanical Life

RP-RM83: 100,000 operations
All others: 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-..L/..LE/..LF: 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-..L/..LE/..LF: –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-..L: 0.48 Kg **RP-LS42F-..LE** and **RP-LS42F-..LF**: 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: 1 Kg **RP-RM83F-38LR** and **RP-RM83F-38LRE:** 0.77 Kg

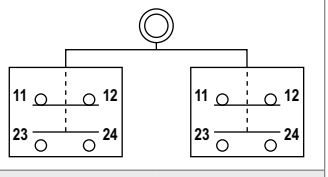
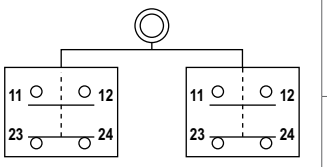
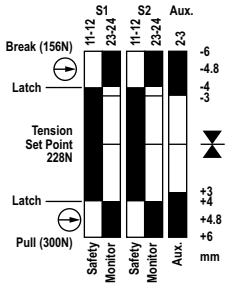
Certifications

(RP-RM83 and RP-LS42 only)

Contact Configurations and Switching Diagrams

RP-LM40 models: SD11, SD12 (page 634)
RP-LS42 models: SD05 (page 633)
RP-QM72/QMT72 models: SD06, SD07, SD08, SD09 & SD10 (page 634)
RP-RM83 models: SD01, SD02, SD03 & SD04 (page 633)
RP-QM90 models: SD13 (page 635)

SD01 - RP-RM83F-75LTE/LRE Series

Contact Configuration	Switching Diagram
Run Position S1 S2  Cable Pull or Break S1 S2 	
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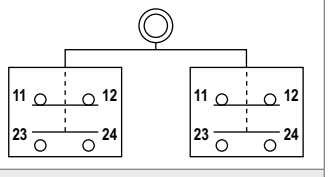
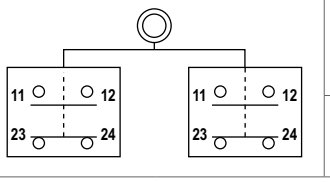
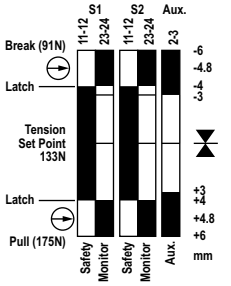
SD02 - RP-RM83F-38LTE/LRE Series

Contact Configuration	Switching Diagram
Run Position S1 S2  Cable Pull or Break S1 S2 	
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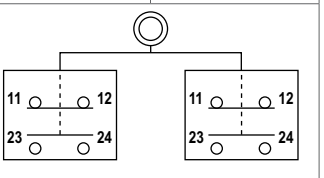
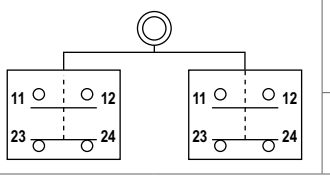
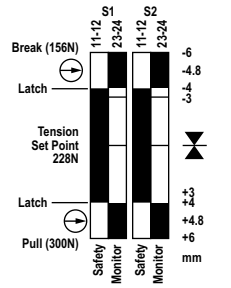
SD03 - RP-RM83-75LT/LR Series

Contact Configuration	Switching Diagram
Run Position S1 S2  Cable Pull or Break S1 S2 	
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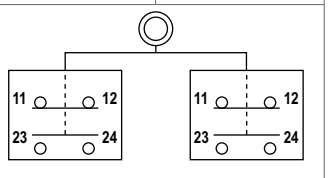
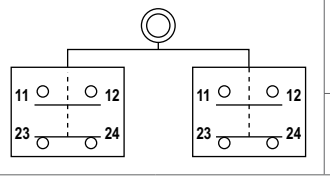
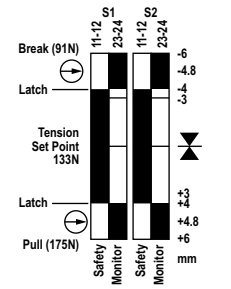
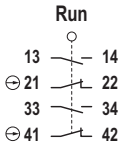
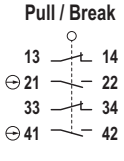
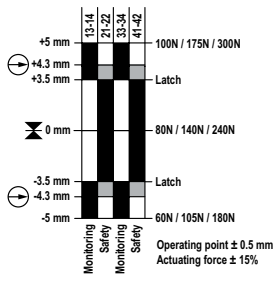
SD04 - RP-RM83-38LT/LR Series

Contact Configuration	Switching Diagram
Run Position S1 S2  Cable Pull or Break S1 S2 	
☐ Open ■ Closed	Page 622

SD05 - RP-LS42F-25/38/75xx Series

Contact Configuration	Switching Diagram
Run Position  Cable Pulled or Cable Break 	
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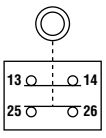
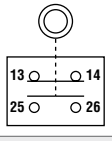
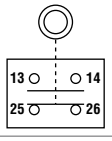
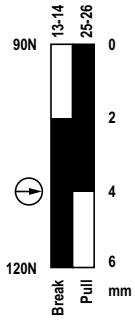
SD06 - RP-QM72D-6L Series

Cable Position	Switching Diagram
Run Position  Cable Pulled  Cable Break 	
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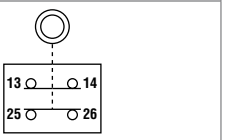
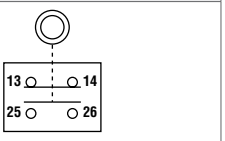
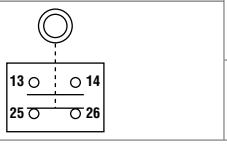
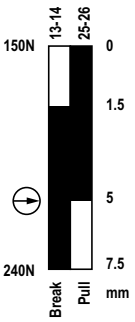
SD07 - RP-QM72D-12L Series

Cable Position	Switching Diagram
Run Position	
Cable Pulled	
Cable Break	
	
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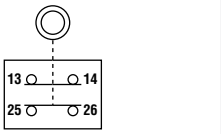
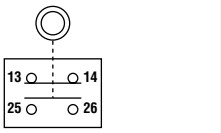
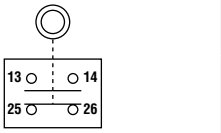
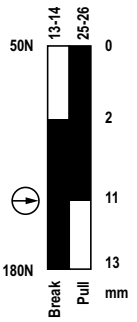
	Page 624

SD08 - RP-QMT72D-20L Series

Cable Position	Switching Diagram
Run Position	
Cable Pulled	
Cable Break	
	
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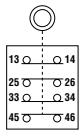
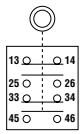
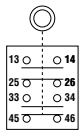
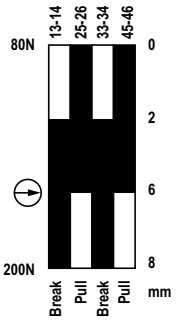
	Page 624

SD09 - RP-QMT72F-12L Series

Cable Position	Switching Diagram
Run Position	
Cable Pulled	
Cable Break	
	
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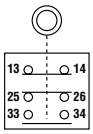
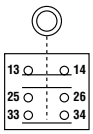
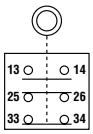
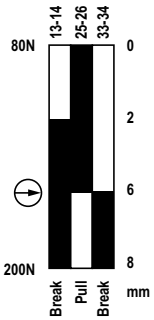
	Page 624

SD10 - RP-QMT72E-12L Series

Cable Position	Switching Diagram
Run Position	
Cable Pulled	
Cable Break	
	
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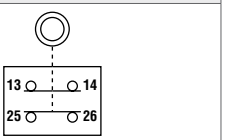
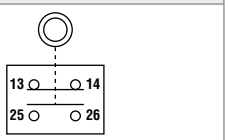
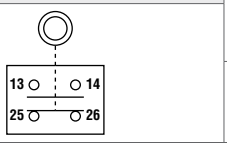
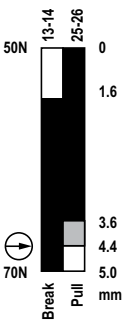
	Page 624

SD11 - RP-LM40D-6 Series

Cable Position	Switching Diagram
Run Position	
Cable Pulled	
Cable Break	
	
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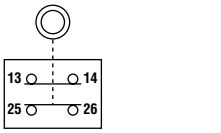
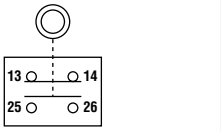
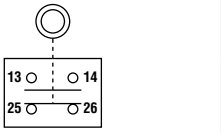
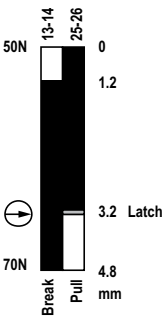
	Page 625

SD12 - RP-LM40D-6L Series

Cable Position	Switching Diagram
Run Position	
Cable Pulled	
Cable Break	
	
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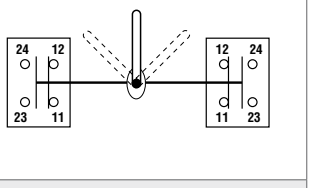
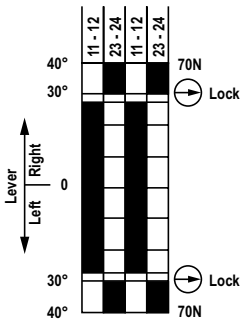
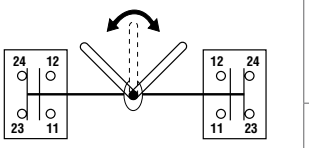
	Page 625

SD13 - RP-QM90F-100L Series

Cable Position	Switching Diagram
Run Position 	
Cable Pulled or Break 	
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	Page 626

ED1G

Enabling Devices

- Handheld grip-style switch is typically used for manual control of machine functions, including visual observations, minor adjustments, troubleshooting, calibration and more
- Provides the three-position functionality (OFF-ON-OFF) required for manual control of a machine, including enabling and hold-to-run applications
- Ergonomic design has a detented enable position (position 2)
- Design meets or exceeds: ANSI RIA R15.06 and ISO 10218 Robot safety standard, ANSI B11.19 Performance Criteria for Safeguards, and ANSI NFPA 79 (2007) and IEC 60204-1 (2000) Electrical Requirements for Industrial Machines

ED1G Series Enabling Devices, Stop Control Devices

Contact Configuration	Additional Push-Button Switch	Environmental Rating	Model
2 NO & 1 NC Aux	—	IP66	**ED1G-L21SM-1N**
1 NO & 1 NC Aux & 1 NO Momentary Push Button	Momentary Push Button	IP65	**ED1G-L21SMB-1N**
2 NO & 2 NO Momentary Push Button	Momentary Push Button	IP65	**ED1G-L20MB-1N**

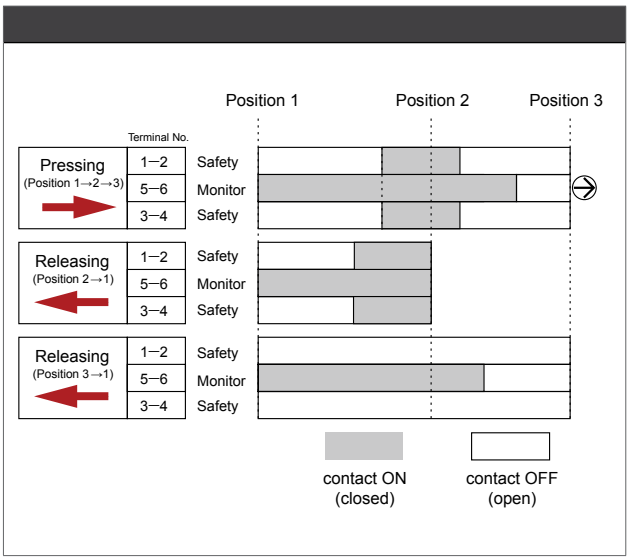
ED9Z-GH1

Additional bracket information is available. See page 729

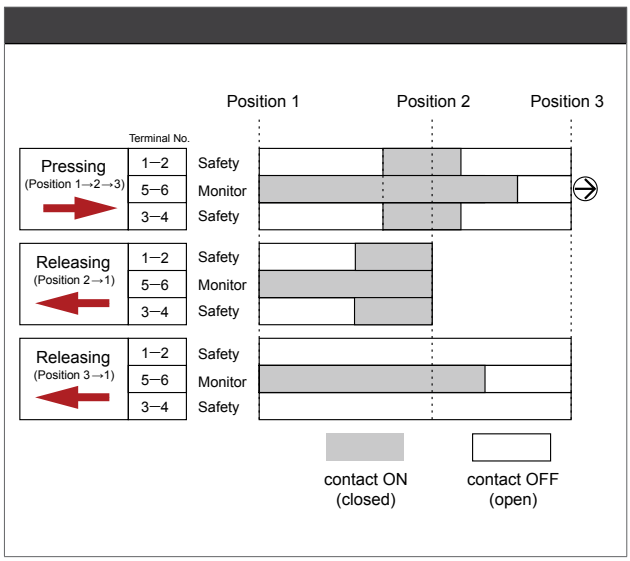
ED1G-L21SM-1N Model

ED1G-L21SMB-1N Model

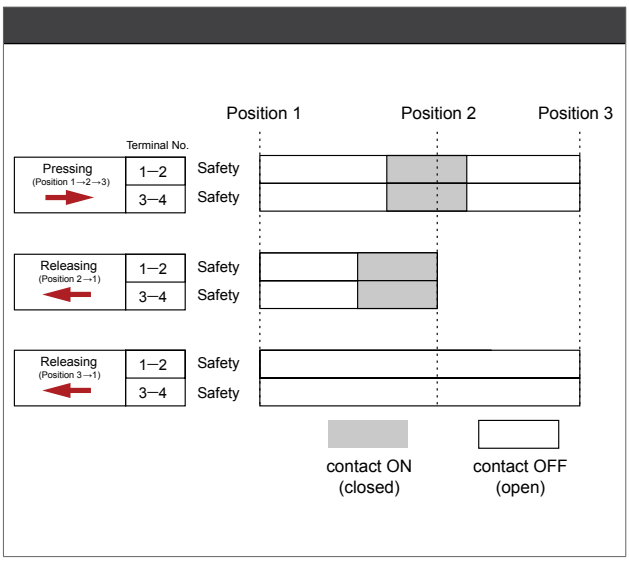
SD01 - ED1G-L21SM-1N Series



SD02 - ED1G-L21SMB-1N Series



SD03 - ED1G-L20MB-1N Series



ED1G Enabling Device Specifications

Supply Voltage and Current	250 V ac/dc
Impulse Withstand Voltage	**Three Position Switch:** 2.5 kV **Momentary pushbutton:** 1.5 kV
Output Contact Ratings	**Rated Insulation Voltage (UI):** 3-position switch 250 V; momentary push button 125 V **Rated Thermal Current (Ith):** 2.5 A* ***40 °C ≤ operating temperature < 50 °C:** 2 A (4 contacts under load) ***50 °C ≤ operating temperature ≤ 60 °C:** 1.5 A (3 contacts under load

Rated Current (Ie) 3-Position Switch Terminals 1-2 and 3-4 (all models)

Rated Voltage Ue		30 V	125 V	250 V
AC	Resistive load (AC-12)	—	1 A	0.5 A
	Inductive load (AC-15)	—	0.7 A	0.5 A
DC	Resistive load (DC-12)	1 A	0.2 A	—
	Inductive load (DC-13)	0.7 A	0.1 A	—

Rated Current (Ie) Monitor Switch Terminals 5-6 (models..-L21SM.. and..-L21SMB..)

Rated Voltage Ue		30 V	125 V	250 V
AC	Resistive load (AC-12)	—	2 A	1 A
	Inductive load (AC-15)	—	1 A	0.5 A
DC	Resistive load (DC-12)	2 A	0.4 A	0.2 A
	Inductive load (DC-13)	1 A	0.22 A	0.1 A

Rated Current (Ie) Momentary Push Button Switch Terminals 7-8 (model ..-ED1G-L21SMB-1N..); 5-6 and 7-8 (model ED1G-L20MB-1N)

Rated Voltage Ue		30 V	125 V	250 V
AC	Resistive load (AC-12)	—	0.5 A	—
	Inductive load (DC-15)	—	0.3 A	—
DC	Resistive load (AC-12)	1 A	0.2 A	—
	Inductive load (DC-13)	0.7 A	0.1 A	—

Contact Resistance	100 mohm max.
Insulation Resistance	Live to dead metal parts: 100 Mohm min. **Positive to negative live parts:** 100 Mohm min.
Recommended Wire/Cable Size	**Wire:** 0.14 to 1.5 mm² (25 AWG to 16 AWG) **Cable:** ø 7 to 13 mm M20 conduit
Short Circuit Protection	250 V / 10A fast blow fuse (IEC 60127-1) **Conditional short circuit current:** 50 A (250 V)
Vibration Resistance	**Operating extremes:** 5 to 55 Hz, half amplitude 0.5 mm minimum **Damage limits:** 16.7 Hz, half amplitude 1.5 mm minimum
Shock Resistance	**Operating extremes:**150 m/s² (15 G) **Damage limits:** 1,000 m/s² (100 G)
Mechanical Life	**Positions 1 & 2 only:** 1,000,000 operations minimum **Positions 1, 2 & 3:** 100,000 operations minimum **Operating frequency:** 1,200 operations per hour maximum
Electrical Life	100,000 minimum at rated load
Pollution Degree	3
Terminal Pulling Strength	20 N minimum
Terminal Screw Torque	0.5 to 0.6 N
Operating Conditions (indoor use only)	**Temperature:** –10 to +60 °C (no freezing) **Humidity:** 45 to 85% RH max. (no condensation) **Storage Temperature:** –40 to +80 °C (no freezing)
Construction	Polyamide housing and cable gland, NBR/PVC polyblend rubber grip switch boot; model ED1G-L21SM-1N meets IP66; other models meet IP65
Design Standards	IEC 60947-5-1, EN 60947-5-1, JIS C8201-5-1, UL 508, CSA C22.2 No. 14, GS-ET-22
Certifications	CE cULus LISTED

Interlock Switches

Safety interlock switches respond when a guard opens. Interlock switches feature “positive opening” contacts for high reliability and withstand attempts to override the switch and defeat the system.

Series	Description	Style	Protection Rating	Housing Material
	**Magnetic style** page 642	Non-contact	IP67	Plastic
	**Hinge style** page 646	Load bearing and rotating	IP67	Plastic & Metal
	**Two piece key actuator style** page 654	Flat pack and limit switch	IP65	Plastic & Metal
	**Locking style** page 666	Spring or solenoid locking	IP67	Plastic & Metal

Magnet Style

Non-Contact Safety Interlock Switches

- Accommodating to misalignment
- Sealed components resist water and dirt
- Coded magnets minimize the risk of intentional defeat
- Three housing styles available for flat or 30 mm barrel mounting
- For safety applications, switch must be used with Gate Monitoring Module, Safety Controller or comparable control system

SI-MAG Magnet Style Safety Switches

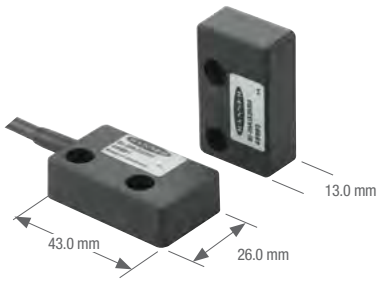
Description		Contacts	Sensor Cable	Switching Distance Min. ON	Switching Distance Max. OFF	Models
	Sensor	1 NO & 1 NC	3 m	—	—	SI-MAG1SM
	Sensor	1 NO & 1 NC	3 m	—	—	SI-MAG1SMCO†
	Coded Magnet	—	—	0-3 mm	3-14 mm	SI-MAG1MM
	Coded Magnet	—	—	0-3 mm	3-14 mm	SI-MAG1MM90*
	Coded Magnet	—	—	2-8 mm	8-16 mm	SI-MAG1MMHF
	Sensor	1 NO & 1 NC	3 m	—	—	SI-MAG2SM
	Coded Magnet	1 NO & 1 NC	—	0-4 mm	4-8 mm	SI-MAG2MM
	Sensor	1 NO & 1 NC	3 m	—	—	SI-MAG3SM
	Coded Magnet	—	—	0-3 mm	3-7 mm	SI-MAG3MM

NC = Normally Closed Output, NO = Normally Open Output

Connection options:

For 9 m cable, add suffix **W/30** to the 3 m model number (example, **SI-MAG1SM W/30**).
* Difference is in Direction of Approach. See page 646 for more information.
† 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 page 646). Depending on the installation, multiple brackets may be required.

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



SI-MAG2SM and SI-MAG2MM Models

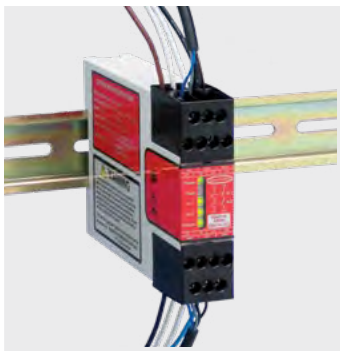
SI-MAG3SM and SI-MAG3MM Models

SI-MAG Safety Switches Specifications

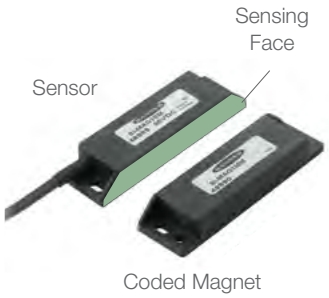
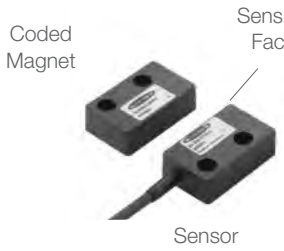
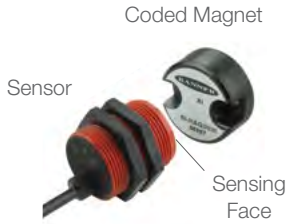
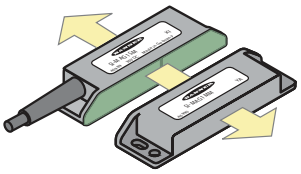
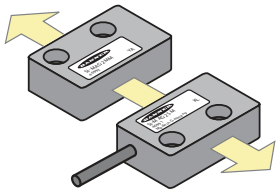
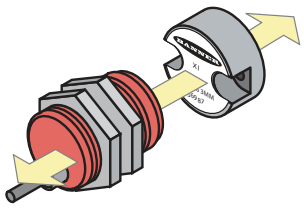
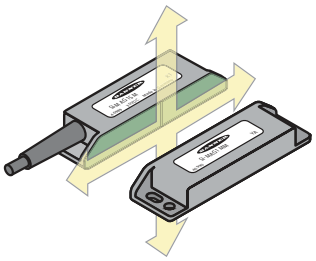
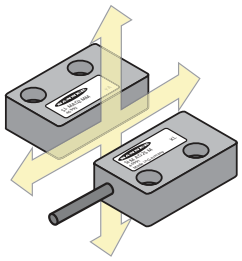
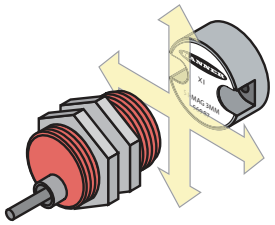
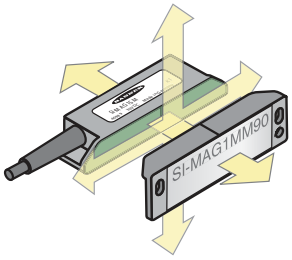
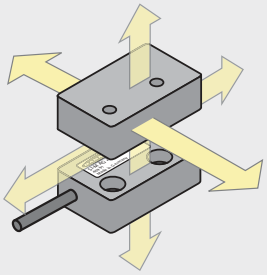
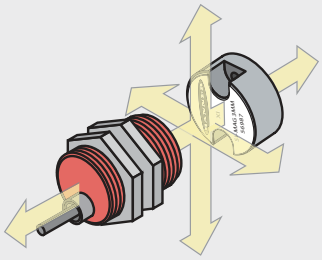
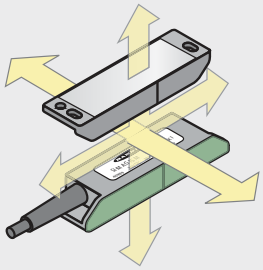
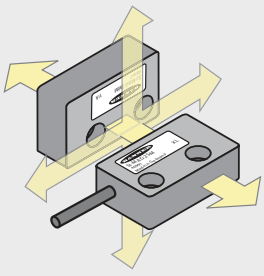
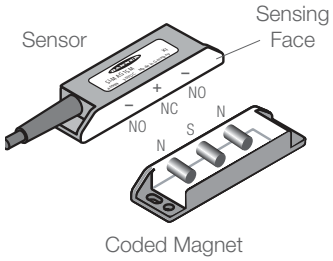
Switching Elements	Three pole-stable reed switches
Repeat Switching Accuracy	± 0.1 mm
Construction	Epoxy-encapsulated circuit in polyamide housing
Environmental Rating	NEMA 4X; IP67
Switching Capacity	30 V dc max. @ 0.25 W
Operating Temperature	-5 to +70 °C
Connections	Integral PVC-jacketed 3 m 4-wire cable. Cable O.D. is 5 mm. Wires are 24 AWG. (0.25 mm)

NOTE: See page 646 for direction of approach information.

Monitoring Control Module (required for a complete system)

	Description	Models	Product Information
	• 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 250 V ac at up to 6 A • The reset input can be used for external device monitoring (EDM) • The gate monitoring module uses 24 V ac/dc at less than 150 mA	**GM-FA-10J**	Page 698
	• Control system monitors a variety of input devices such as e-stop buttons, rope pulls, enabling devices, protective safety stops, interlocked guards or gates, optical sensors, two-hand controls and safety mats • Intuitive programming environment for easy implementation • Configure inputs, outputs and functionality of the controller for more usability • Base controller allows eight of the 26 inputs to be configured as outputs for efficient terminal utilization • Ethernet models available providing up to 64 virtual status outputs, fault diagnostic codes and messages	**SC26-2, XS26-2** **SC26-2D, XS26-2D** **SC26-2E, XS26-2E** **SC26-2DE, XS26-2DE**	Page 584
	• One controller provides configurable monitoring of multiple safety devices • 22 input terminals can monitor both contact-based and PNP solid-state input devices • Three 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 • All SC22-3 modules use 24 V dc • 10/100 Base TX Ethernet communication option using EtherNet/IP and Modbus TCP protocols (SC22-3E models)	**SC22-3-S...** **SC22-3-C...** **SC22-3E-S...** **SC22-3E-C...**	Page 592

Magnet-Style Interlocks: Direction of Approach for Sensor/Magnet Pairs

Model SI-MAG1	Model SI-MAG2	Model SI-MAG3
		
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** 

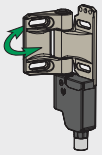
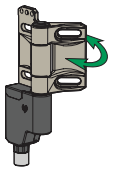
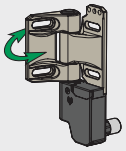
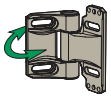
NOTE: With **SI-MAG1C** Controller, approach speed for all magnet-style switches must be greater than 0.2 ms.
With **GM-FA-10J** Controller, approach speed must be greater than 0.1 ms.

SI-HG63

Hinge Style Switches

- Load bearing and operate to a full 270° range of motion with safety switching point
- Safety switching point is adjustable and repositionable
- Housing is constructed of corrosion-resistant stainless steel or zinc die-cast
- Design meets positive opening requirements for safety interlocks (IEC 60947-5-1)
- Right-hinge QD, left-hinge QD, and right-angle QD hinge models available
- High degree of tamper-resistances

SI-HG63 Hinge Style Switches, 63 mm

Actuator Type		Contact(s)	Construction	Models
In-line QD Integral load bearing		2 NC & 1 NO	Stainless Steel Zinc Die-Cast	**SI-HG63FQDR** **SI-HGZ63FQDR**
In-line QD Integral load bearing		2 NC & 1 NO	Stainless Steel Zinc Die-Cast	**SI-HG63FQDL** **SI-HGZ63FQDL**
Right-angle QD Integral load bearing		2 NC & 1 NO	Stainless Steel Zinc Die-Cast	**SI-HG63FQDRR** **SI-HGZ63FQDRR**
Blank hinge		—	Stainless Steel Zinc Die-Cast	**SI-HG63A** **SI-HGZ63A**

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

Connection options: A model with a QD requires a mating cordset.

For contact/switching diagrams see page 672.

6-Pin

Micro-Style to Flying Leads
Straight connector models listed; for right-angle, add **RA** to the end of the model number (example, **MQEAC-806RA**)

MQEAC-606
2 m (6')
MQEAC-615
5 m (25')
MQEAC-630
9 m (50')

Additional cordset information is available. See page 758

SI-HG63FQDR*
SI-HGZ63FQDR*

SI-HG63FQDRR
SI-HGZ63FQDRR

SI-HG63 Hinge Style Switches Specifications

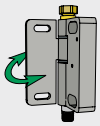
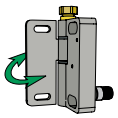
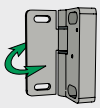
Contact Rating	3 A @ 230V ac max., 1.0 A @ 24V dc max. 2.5 kV max. transient tolerance
European Rating	Ui = 250 V, Ue = 230 V ac, 24 V dc, Ithe = 4A **Utilization categories: AC-15:** Ue/Ie 230 V / 3A; **DC-13:** Ue/Ie 24 V / 1A (IEC/EN 90497-5-1)
Switching Frequency	Max. 300 operations/h (5 operations per minute)
Switching Angle	**NC contact:** ±3° **NO contact:** ±9° **Tolerance for all angles:** 1.5°
Mechanical Life	1 million operations (Excessive loading (force) and/or vibration, as well as improper installation, can reduce the service life)
Short Circuit Protection	4 amp Slow Blow. Recommended external fusing or overload protection.
Operating Range	0° to 270°
Wire Connections	6-pin Micro-style quick-disconnect fitting (M12 Dual-Key-Way).
Construction	**SI-HG63.. Hinge:** Cast Stainless (X22CrNi 17), Switch: PBT **SI-HGZ63.. Hinge:** Zinc Die Cast (Nickel Finish), Switch: PBT
Environmental Rating	IEC IP67 acc. IEC/EN60529
Operating Conditions	**Temperature:** –25 to +70 °C (connecting cable permanently mounted; no freezing over/no condensation)
Weight	SI-HG63..≈ 0.45 kg, SI-HG63A ≈ 0.27 kg SI-HGZ63.. ≈ 0.5 kg, SI-GHZ63A ≈ 0.22 kg
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 646).
Certifications	CE cSAus
Contact configuration and Switching Diagram	SD001 (p. 672)

SI-HG80

Hinge Style Switches

- Load bearing and operate to a full 180° range of motion
- Housing is constructed of corrosion-resistant zinc die-cast
- One-piece switch eliminates need for alignment, engagement and risk of breakage of a separate actuator
- Design meets positive opening requirements for safety interlocks (IEC 60947-5-1)
- High degree of tamper-resistance

SI-HG80 Hinge Style Switches, 80 mm

Actuator Type		Contact(s)	Connection	Models
In-line QD Integral load bearing		SPDT (Form C)	4-pin Micro QD	**SI-HG80DQD**
Right-angle QD Integral load bearing		SPDT (Form C)	4-pin Micro QD	**SI-HG80DQDR**
Blank hinge		–	–	**SI-HG80A**

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

Connection options: A model with a QD requires a mating cordset.

For contact/switching diagrams see page 672.

6-Pin

Micro-Style to Flying Leads
Straight connector models listed; for right-angle, add **RA** to the end of the model number (example, **MQEAC-806RA**)

MQEAC-606
2 m (6')
MQEAC-615
5 m (25')
MQEAC-630
9 m (50')

Additional cordset information is available. See page 758

SI-HG80DQDR

SI-HG80DQD

SI-HG80 Hinge Style Switches Specifications

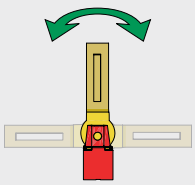
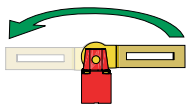
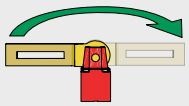
Contact Rating	3 A @ 250 V ac max., 0.5 A @ 60 V dc max. 2.5 kV max. transient tolerance NEMA A300 P300
European Rating	**Utilization categories:** AC15 and DC13 (IEC 90497-5-1) Ui = 250 V ac, Ith= 3A
Minimum Switching Speed	20 operations per minute
Mechanical Life	1 million operations
Short Circuit 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.
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.
Certifications	
Contact Configuration and Switching Diagrams	SD002 (p. 672)

SI-LS32H

Hinge Style Switches

- Actuator head rotates in 90° increments
- Built-in hinge lever attaches to doors or flaps, which open 90° in one direction
- Housing is constructed of glass reinforced thermoplastic with plated steel actuator
- One-piece switch eliminates need for alignment, engagement and risk of breakage of a separate actuator
- Design meets positive opening requirements for safety interlocks (IEC 60947-5-1)

SI-LS31H Hinge Lever Style Switches, 31 mm

Actuator Type		Contact(s)	Models*
Vertical Hinged Lever ± 90°		1 NC & 1 NO	SI-LS31HGD
		2 NC	SI-LS31HGE
Right-Hand Hinged Lever 180°		1 NC & 1 NO	SI-LS31HGRD
		2 NC	SI-LS31HGRE
Left-Hand Hinged Lever 180°		1 NC & 1 NO	SI-LS31HGLD
		2 NC	SI-LS31HGLE

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

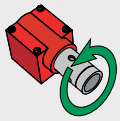
* Contact factory for integral quick-disconnect (QD) and pigtail QD options.

SI-LS31R

Hinge Style Switches

- Actuator head rotates in 90° increments
- Rotating actuator connects directly to door hinge
- Housing is constructed of glass reinforced thermoplastic with plated steel actuator
- One-piece switch eliminates need for alignment, engagement and risk of breakage of a separate actuator
- Design meets positive opening requirements for safety interlocks (IEC 60947-5-1)

SI-LS31R Rotary Hinge Style Switches, 31 mm

Actuator Type	Contact(s)	Models*
  Rotary Shaft	1 NC & 1 NO	**SI-LS31RTD**
	2 NC	**SI-LS31RTE**

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

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

SI-LS32H

SI-LS31R

SI-LS31 Hinge Style Switches Specifications

Contact Rating	10A @ 24 V ac, 10A @ 110 V ac, 6A @ 230 V ac, 6A @ 24 V 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

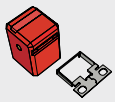
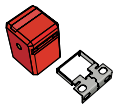
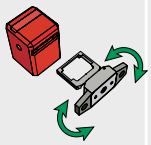
Contact Material	Silver-nickel alloy
Maximum Switching Speed	50 operations per minute
Mechanical Life	1 million operations
Required Actuation Force	**SI-LS31R models:** 10 N cm **SI-LS31H models:** 15 N cm
Short Circuit Protection	6 amp Slow Blow, 10 amp Fast Blow. Recommended external fusing or overload 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	CE C SA US UL AUXILIARY DEVICE LISTED
Contact Configuration and Switching Diagrams	**SI-LS31R models:** SD009 and SD010 (p. 673) **SI-LS31H models:** SD003, SD004, SD005, SD006, SD007 and SD008 (p. 672)

SI-LS100

Non-Locking Plastic Safety Interlock Switches

- Mechanically coded actuators minimize intentional tampering or defeat
- 100 mm plastic style switch
- Rotating head requires no tools
- Limit switch style
- Actuator engagement from four side or four top positions

SI-LS100 Plastic Style Switches (kits), 100 mm

Actuator Type		Interlock	Contact(s)	Kit Model*
SI-QS-SSA-2 Straight Rigid In-Line		**SI-LS100F**	2 NC & 1 NO	**SI-LS100SF**
SI-QS-SSA-3 Rigid In-Line		**SI-LS100F**	2 NC & 1 NO	**SI-LS100SRAF**
 **SI-QS-SSU** Flexible In-Line		**SI-LS100F**	2 NC & 1 NO	**SI-LS100MRFF**

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

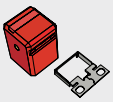
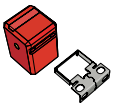
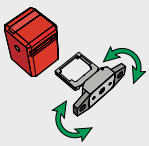
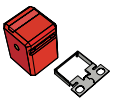
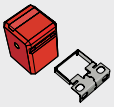
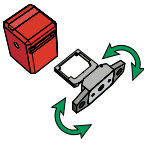
* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only. Contact factory for integral quick-disconnect (QD) and pigtail QD options.

SI-LS83

Non-Locking Plastic Safety Interlock Switches

- Mechanically coded actuators minimize intentional tampering or defeat
- 83 mm plastic style switch
- Rotating head requires no tools
- Limit switch style
- Actuator engagement from four side or four top positions

SI-LS83 Plastic Style Switches (kits), 83 mm

Actuator Type		Interlock		Kit Model*
SI-QS-SSA-2 Straight Rigid In-Line		**SI-LS83D**	1 NC & 1 NO	**SI-LS83SD**
SI-QS-SSA-3 Rigid In-Line		**SI-LS83D**	1 NC & 1 NO	**SI-LS83SRAD**
SI-QS-SSU Flexible In-Line		**SI-LS83D**	1 NC & 1 NO	**SI-LS83MRFD**
SI-QS-SSA-2 Straight Rigid In-Line		**SI-LS83E**	2 NC	**SI-LS83SE**
SI-QS-SSA-3 Rigid In-Line		**SI-LS83E**	2 NC	**SI-LS83SRAE**
SI-QS-SSU Flexible In-Line		**SI-LS83E**	2 NC	**SI-LS83MRFE**

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.

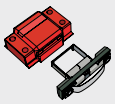
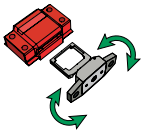
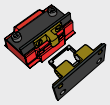
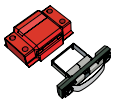
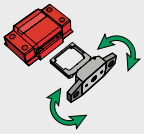
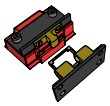
SI-QS90

Non-Locking Plastic Safety Interlock Switches

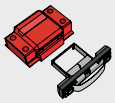
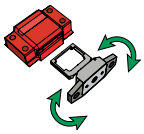
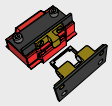
- Mechanically coded actuators minimize intentional tampering or defeat
- 90 mm flat-pack style switch
- Rotating head requires no tools
- Rotating head allows actuator engagement from front or back or either of two top positions

Replacement actuators for safety interlock switches (page 830)

SI-QS90 Flat-Pack Style Switches(kits), 90 mm

Actuator Type		Interlock	Contact(s)	Kit Model*
SI-QS-SSA-4 Rigid In-Line		**SI-QS90D**	1 NC & 1 NO	**SI-QS90MD**
SI-QS-SSU Flexible In-Line		**SI-QS90D**	1 NC & 1 NO	**SI-QS90MFD**
SI-QS-SSA Rigid In-Line & **SI-QS-100** High-force Accessory		**SI-QS90D**	1 NC & 1 NO	**SI-QS90MD-100** (High-Force)
SI-QS-SSA-4 Rigid In-Line		**SI-QS90E**	2 NC	**SI-QS90ME**
SI-QS-SSU Flexible In-Line		**SI-QS90E**	2 NC	**SI-QS90MFE**
SI-QS-SSA Rigid In-Line & **SI-QS-100** High-force Accessory		**SI-QS90E**	2 NC	**SI-QS90ME-100** (High-Force)

SI-QS90 Flat-Pack Style Switches(kits), 90 mm

Actuator Type		Interlock	Contact(s)	Kit Model*
SI-QS-SSA-4 Rigid In-Line		**SI-QS90F**	2 NC & 1 NO	**SI-QS90MF**
 **SI-QS-SSU** Flexible In-Line		**SI-QS90F**	2 NC & 1 NO	**SI-QS90MFF**
SI-QS-SSA Rigid In-Line & **SI-QS-100** High-force Accessory		**SI-QS90F**	2 NC & 1 NO	**SI-QS90MF-100** (High-Force)

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

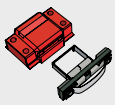
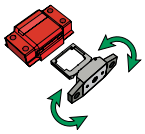
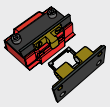
* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only. Contact factory for integral quick-disconnect (QD) and pigtail QD options.

SI-QS75

Non-Locking Plastic Safety Interlock Switches

- Mechanically coded actuators minimize intentional tampering or defeat
- 75 mm flat-pack style switch
- Rotating head requires no tools
- Flat pack and limit switch styles
- Rotating head allows actuator engagement from front or back or either of two top positions

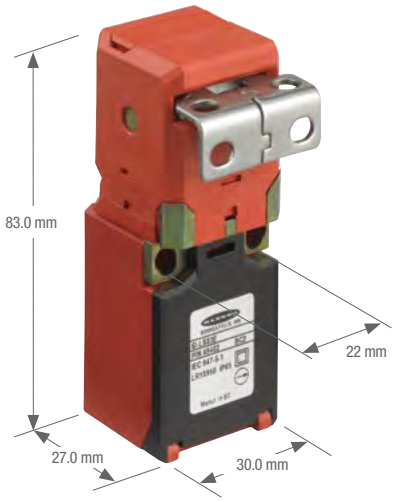
SI-QS75 Flat-Pack Style Switches (kits), 75 mm

Actuator Type		Interlock	Contact(s)	Kit Model*
SI-QS-SSA-4 Rigid In-Line		**SI-QS75C**	1 NC	**SI-QS75MC**
 **SI-QS-SSU** Flexible In-Line		**SI-QS75C**	1 NC	**SI-QS75MFC**
SI-QS-SSA Rigid In-Line & **SI-QS-100** High-force Accessory		**SI-QS75C**	1 NC	**SI-QS75MC-100** (High-Force)

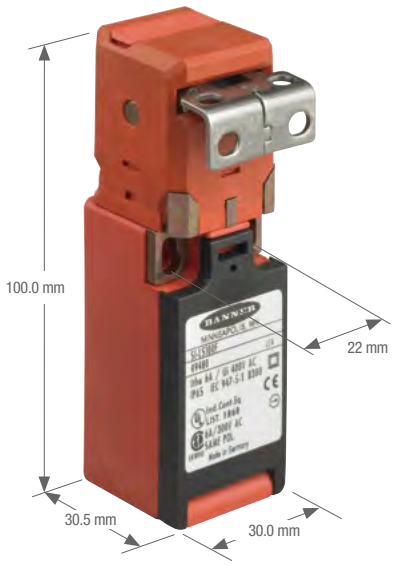
 Multi-Directional NC = Normally Closed Contact, NO = Normally Open Contact

* 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.

Flat-Pack Style Switches



SI-LS83 Models



SI-LS100 Models

(both models shown with right-angle rigid in-line actuator)

Flat-Pack Style Switches

SI-QS75 Models

SI-QS90 Models

(both models shown with rigid in-line actuator)

SI-LS83 and SI-LS100 Plastic Style Switches Specifications

Contact Rating	10A @ 24 V ac, 10A @ 110 V ac, 6A @ 230 V ac, 6A @ 24 V 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: Ui= 500V ac, Ith= 10A Switches with 3 contact pairs: Ui= 400V ac, Ith= 5A

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	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. Adapter 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, C SA US, UL AUXILIARY DEVICE LISTED
Contact Configuration and Switching Diagrams	**SI-LS100 models:** SD011 (p. 673) **SI-LS83 models:** SD012 and SD013 (p. 673)

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: Ui= 500V ac, Ith= 10A Switches with 3 contact pairs: Ui= 400V ac, Ith= 5A

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

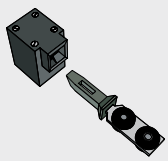
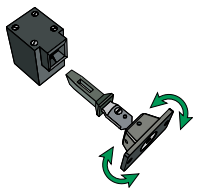
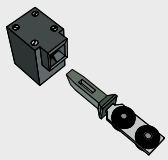
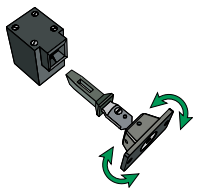
Contact Material	Silver-nickel alloy
Maximum Switching Speed	30 operations per minute
Maximum Actuator Speed	1 m/second
Mechanical Life	1 million operations
Minimum Actuator Engagement Radius	**In-line actuators:** 150 mm **Flexible actuators:** 50 mm in all directions
Actuation Extraction Force	**High-Force models:** adjustable from 50-100 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 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-QS90 and M16 x 1.5 for SI-QS75 threaded entrance. Adapter 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 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 AUXILIARY DEVICE LISTED
Contact Configuration and Switching Diagrams	**SI-QS75 models:** SD014 (p. 674) **SI-QS90 models:** SD015, SD016 and SD017 (p. 674)

SI-LM40MKH

Non-Locking Metal Safety Interlock Switches

- Mechanically coded actuators minimize intentional tampering or defeat
- Rigid or flexible in-line actuators
- Actuator head rotates to four possible positions in 90° increments
- Rugged metal housing
- Design meets positive opening requirements for safety interlocks (IEC 60947-5-1)

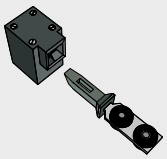
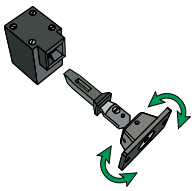
SI-LM40MKH Limit Switch Style (kits), 40 mm

Actuator Type		Interlock	Contact(s)	Kit Model*
SI-QM-SSA Straight Rigid In-Line		**SI-LM40KHD**	1 NO & 1 NC	**SI-LM40MKHD**
SI-QM-SMFA Flexible In-Line		**SI-LM40KHD**	1 NO & 1 NC	**SI-LM40MKHFD**
SI-QM-SSA Straight Rigid In-Line		**SI-LM40KHE**	2 NC	**SI-LM40MKHE**
SI-QM-SMFA Flexible In-Line		**SI-LM40KHE**	2 NC	**SI-LM40MKHFE**

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-LM40MKH Limit Switch Style (kits), 40 mm (cont'd)

Actuator Type		Interlock	Contact(s)	Kit Model*
SI-QM-SSA Straight Rigid In-Line		**SI-LM40KHF**	2 NC & 1 NO	**SI-LM40MKHF**
 **SI-QM-SMFA** Flexible In-Line		**SI-LM40KHF**	2 NC & 1 NO	**SI-LM40MKHFF**

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

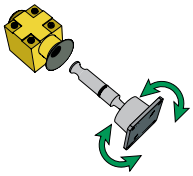
* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only. Contact factory for integral quick-disconnect (QD) and pigtail QD options.

SI-LM40MKV

Non-Locking Metal Safety Interlock Switches

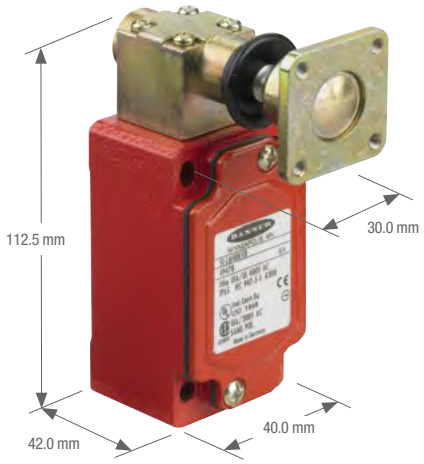
- Mechanically coded actuators minimize intentional tampering or defeat
- In-line Spring-loaded actuator; flexes in all directions
- Actuator head rotates to four possible positions in 90° increments
- Rugged metal housing
- Design meets positive opening requirements for safety interlocks (IEC 60947-5-1)

SI-LM40MKV Limit Switch Style (kits), 40 mm

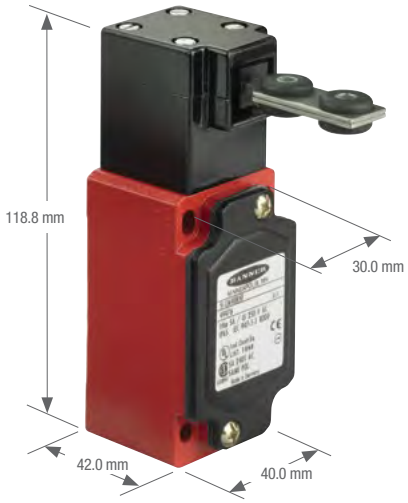
Actuator Type		Interlock	Contact(s)	Kit Model*
 **SI-QM-90A** Flexible In-Line		**SI-LM40KVD**	1 NO & 1 NC	**SI-LM40MKVD**
		SI-LM40KVE	2 NC	**SI-LM40MKVE**

 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-LM40MKV Models
(with flexible in-line actuator)



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

SI-LM40 Limit Style Switches Specifications

Contact Rating	10A @ 24 V ac, 10A @ 110 V ac, 6A @ 230 V ac, 6A @ 24 V 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

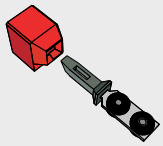
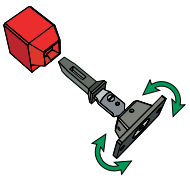
Contact Material	Silver-nickel alloy
Maximum Switching Speed	**SI-LM40MKH models:** 50 operations per minute **SI-LM40MKV models:** 10 operations per minute
Maximum Actuator Speed	**SI-LM40MKH models:** 1.5 m/second **SI-LM40MKV models:** 0.5 m/second
Mechanical Life	**SI-LM40MKH models:** 1 million 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 AUXILIARY DEVICE LISTED
Contact Configuration and Switching Diagrams	**SI-LM40MKH..D models:** SD018 (p. 674) **SI-LM40MKH..E models:** SD019 (p. 675) **SI-LM40MKH..F models:** SD020 (p. 675) **SI-LM40MKV.. models:** SD021 and SD022 (p. 675)

SI-LS42

Plastic Locking Style Safety Interlock Switches

- Two locking mechanisms available including spring lock with energized solenoid release and energized solenoid lock with spring release
- Actuator head can be rotated in 90° increments to eight possible actuator positions: four vertical and four horizontal
- Design meets positive opening requirements for safety interlocks (IEC 60947-5-1)
- AC and DC voltage available

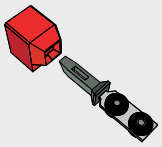
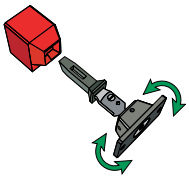
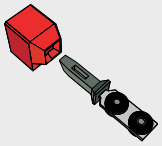
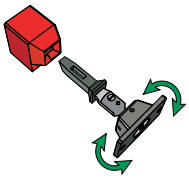
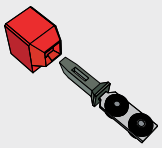
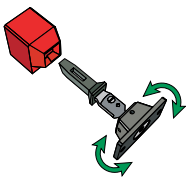
SI-LS42 Safety Switches, 42 mm - Spring Lock and Solenoid Unlock

Actuator Type		Interlock	Contact(s)	Solenoid Voltage	Kit Model *
SI-QM-SSA Straight Rigid In-Line		**SI-LS42DSG**	Actuator Contacts: 1 NC & 1 NO	24 V ac/dc	**SI-LS42DMSG**
		SI-LS42WSG	Solenoid Monitor Contacts: 1 NC & 1 NO	110 V ac/ 230 V ac	**SI-LS42WMSG**
SI-QM-SMFA Flexible In-Line		**SI-LS42DSG**	Actuator Contacts: 1 NC & 1 NO	24 V ac/dc	**SI-LS42DMSGF**
		SI-LS42WSG	Solenoid Monitor Contacts: 1 NC & 1 NO	110 V ac/ 230 V ac	**SI-LS42WMSGF**

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.

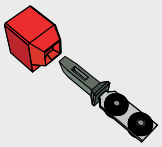
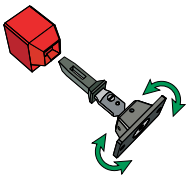
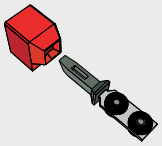
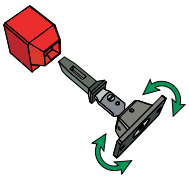
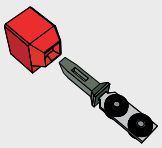
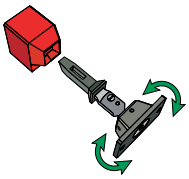
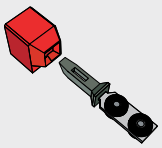
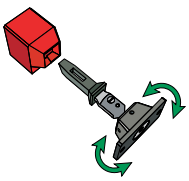
SI-LS42 Safety Switches, 42 mm - Spring Lock and Solenoid Unlock (cont'd)

Actuator Type		Interlock	Contact(s)	Solenoid Voltage	Kit Model *
SI-QM-SSA Straight Rigid In-Line		**SI-LS42DSH** **SI-LS42WSH**	Actuator Contacts: 2 NC Solenoid Monitor Contacts: 1 NC & 1 NO	24 V ac/dc 110 V ac/ 230 V ac	**SI-LS42DMSH** **SI-LS42WMSH**
SI-QM-SMFA Flexible In-Line		**SI-LS42DSH** **SI-LS42WSH**	Actuator Contacts: 2 NC Solenoid Monitor Contacts: 1 NC & 1 NO	24 V ac/dc 110 V ac/ 230 V ac	**SI-LS42DMSHF** **SI-LS42WMSHF**
SI-QM-SSA Straight Rigid In-Line		**SI-LS42DSI** **SI-LS42WSI**	Actuator Contacts: 2 NC & 1 NO Solenoid Monitor Contact: 1 NC	24 V ac/dc 110 V ac/ 230 V ac	**SI-LS42DMSI** **SI-LS42WMSI**
SI-QM-SMFA Flexible In-Line		**SI-LS42DSI** **SI-LS42WSI**	Actuator Contacts: 2 NC & 1 NO Solenoid Monitor Contacts: 1 NC	24 V ac/dc 110 V ac/ 230 V ac	**SI-LS42DMSIF** **SI-LS42WMSIF**
SI-QM-SSA Straight Rigid In-Line		**SI-LS42DSJ**	Actuator Contacts: 3 NC Solenoid Monitor Contact: 1 NC	24 V ac/dc	**SI-LS42DMSJ**
SI-QM-SMFA Flexible In-Line		**SI-LS42DSJ**	Actuator Contacts: 3 NC Solenoid Monitor Contact: 1 NC	24 V ac/dc	**SI-LS42DMSJF**

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 (cont'd)

Actuator Type		Interlock	Contact(s)	Solenoid Voltage	Kit Model *
SI-QM-SSA Straight Rigid In-Line		**SI-LS42DMG** **SI-LS42WMG**	Actuator Contacts: 1 NC & 1 NO Solenoid Monitor Contacts: 1 NC & 1 NO	24 V ac/dc 110 V ac/ 230 V ac	**SI-LS42DMMG** **SI-LS42WMMG**
SI-QM-SMFA Flexible In-Line		**SI-LS42DMG** **SI-LS42WMG**	Actuator Contacts: 1 NC & 1 NO Solenoid Monitor Contacts: 1 NC & 1 NO	24 V ac/dc 110 V ac/ 230 V ac	**SI-LS42DMMGF** **SI-LS42WMMGF**
SI-QM-SSA Straight Rigid In-Line		**SI-LS42DMH** **SI-LS42WMH**	Actuator Contacts: 2 NC Solenoid Monitor Contacts: 1 NC & 1 NO	24 V ac/dc 110 V ac/ 230 V ac	**SI-LS42DMMH** **SI-LS42WMMH**
SI-QM-SMFA Flexible In-Line		**SI-LS42DMH** **SI-LS42WMH**	Actuator Contacts: 2 NC Solenoid Monitor Contacts: 1 NC & 1 NO	24 V ac/dc 110 V ac/ 230 V ac	**SI-LS42DMMHF** **SI-LS42WMMHF**
SI-QM-SSA Straight Rigid In-Line		**SI-LS42DMI** **SI-LS42WMI**	Actuator Contacts: 2 NC & 1 NO Solenoid Monitor Contact: 1 NC	24 V ac/dc 110 V ac/ 230 V ac	**SI-LS42DMMI** **SI-LS42WMMI**
SI-QM-SMFA Flexible In-Line		**SI-LS42DMI** **SI-LS42WMI**	Actuator Contacts: 2 NC & 1 NO Solenoid Monitor Contact: 1 NC	24 V ac/dc 110 V ac/ 230 V ac	**SI-LS42DMMIF** **SI-LS42WMMIF**
SI-QM-SSA Straight Rigid In-Line		**SI-LS42DMJ**	Actuator Contacts: 3 NC Solenoid Monitor Contact: 1 NC	24 V ac/dc	**SI-LS42DMMJ**
SI-QM-SMFA Flexible In-Line		**SI-LS42DMJ**	Actuator Contacts: 3 NC Solenoid Monitor Contact: 1 NC	24 V ac/dc	**SI-LS42DMMJF**

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

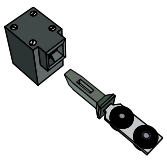
* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only. Contact factory for integral quick-disconnect (QD) and pigtail QD options.

SI-QM100

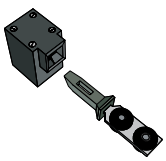
Metal Locking Style Safety Interlock Switches

- Two locking mechanisms available including spring lock with energized solenoid release and energized solenoid lock with spring release
- Actuator head can be rotated in 90° increments to four possible actuator positions
- Design meets positive opening requirements for safety interlocks (IEC 60947-5-1)
- AC and DC voltage available

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

Actuator Type		Interlock	Contact(s)	Solenoid Voltage	Kit Model*
SI-QM-SSA Straight Rigid In-Line		**SI-QM100DSG**	Switching Contacts: 1 NC & 1 NO	24 V dc	**SI-QM100DMSG**
		SI-QM100ASG	Solenoid Monitor Contacts: 1 NC & 1 NO	120 V ac	**SI-QM100AMSG**
		SI-QM100DSH	Switching Contacts: 2 NC Solenoid Monitor Contacts: 1 NC & 1 NO	24 V dc	**SI-QM100DMSH**

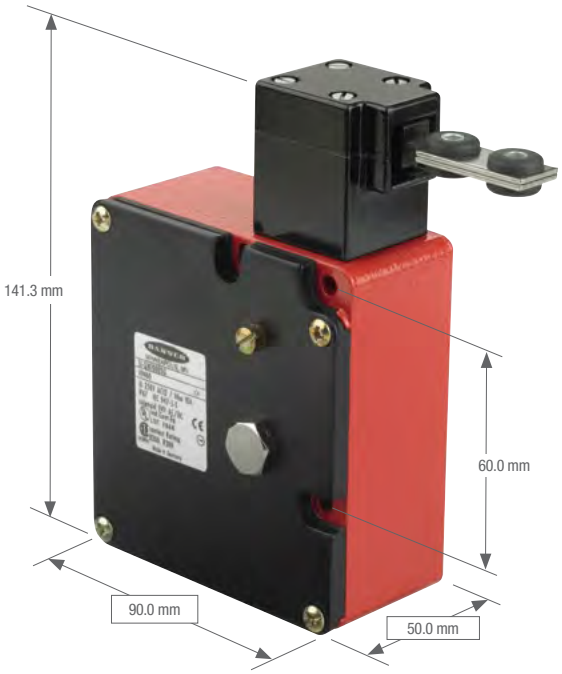
SI-QM100 Safety Switches, 100 mm - Solenoid Lock and Spring Unlock

Actuator Type		Interlock	Contact(s)	Solenoid Voltage	Kit Model*
SI-QM-SSA Straight Rigid In-Line		**SI-QM100DMG**	Switching Contacts: 1 NC & 1 NO	24 V dc	**SI-QM100DMMG**
		SI-QM100AMG	Solenoid Monitor Contacts: 1 NC & 1 NO	120 V ac	**SI-QM100AMMG**

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 Models
(shown with rigid in-line actuator)



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

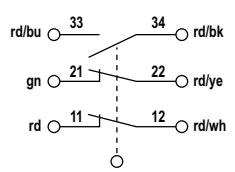
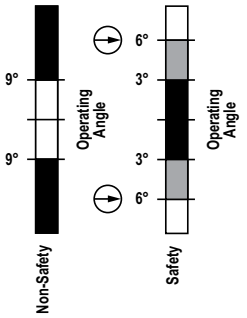
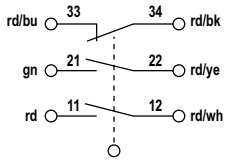
Locking Style Switches Specifications

Contact Rating	4A @ 250 V 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

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
Solenoid Power Consumption	**SI-LS42 models:** 1.1 VA / Inrush 12 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:** 1500 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 c SP® US
Contact Configuration and Switching Diagrams	**SI-LS42 models:** SD023, SD024, SD025 & SD026 (p. 675) **SI-QM100 models:** SD027 and SD028 (p. 676)

SD001 - SI-HG63 Series

Contact Configuration	Switching Diagram
Guard Closed	
	
Guard Open	
	
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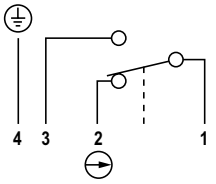
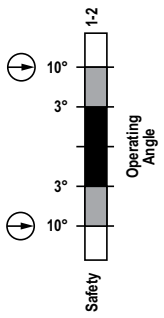
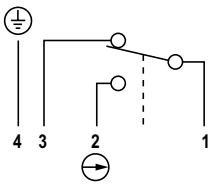
SD002 - SI-HG80 Series

Contact Configuration	Switching Diagram
Guard Closed	
	
Guard Open	
	
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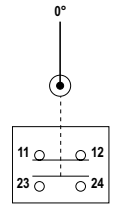
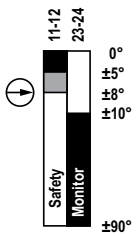
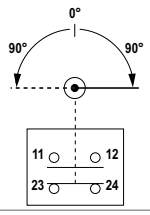
SD003 - SI-LS31HGD Series

Contact Configuration	Switching Diagram
Lever in Normal Position	
	
Lever Rotated	
	
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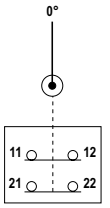
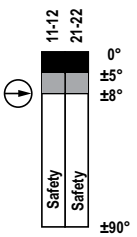
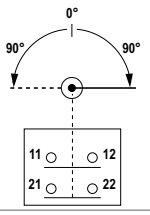
SD004 - SI-LS31HGE Series

Contact Configuration	Switching Diagram
Lever in Normal Position	
	
Lever Rotated	
	
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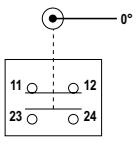
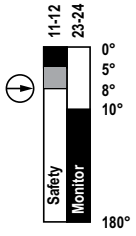
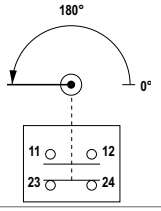
SD005 - SI-LS31HGRD Series

Contact Configuration	Switching Diagram
Lever in Normal Position	
	
Lever Rotated	
	
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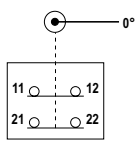
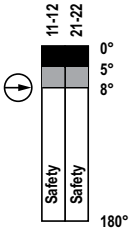
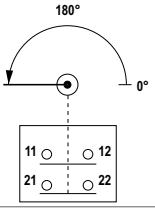
SD006 - SI-LS31HGRE Series

Contact Configuration	Switching Diagram
Lever in Normal Position	
	
Lever Rotated	
	
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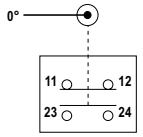
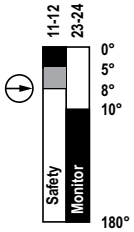
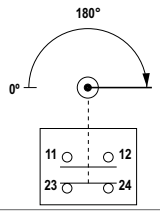
SD007 - SI-LS31HGLD Series

Contact Configuration	Switching Diagram
Lever in Normal Position	
	
Lever Rotated	
	
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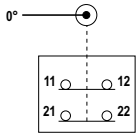
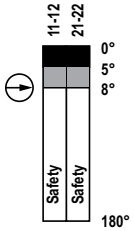
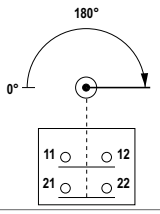
SD008 - SI-LS31HGLE Series

Contact Configuration	Switching Diagram
Lever in Normal Position	
	
Lever Rotated	
	
	☐ Open ■ Closed ▒ Transition
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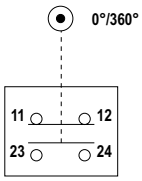
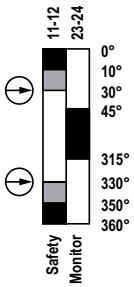
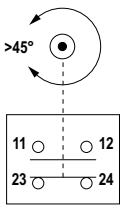
SD009 - SI-LS31RTD Series

Contact Configuration	Switching Diagram
Axle in Home Position 0°	
	
Axle Rotated 45°	
	
	☐ Open ■ Closed ▒ Transition
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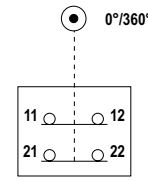
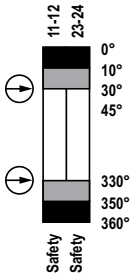
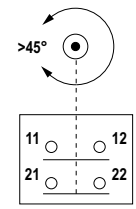
SD010 - SI-LS31RTE Series

Contact Configuration	Switching Diagram
Axle in Home Position 0°	
	
Axle Rotated 45°	
	
	☐ Open ■ Closed ▒ Transition
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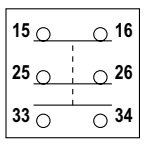
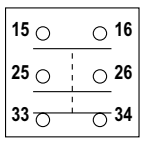
SD011 - SI-LS100 Series

Contact Configuration	Switching Diagram
Actuator Engaged	
	
Actuator Removed	
	
	☐ Open ■ Closed ▒ Transition
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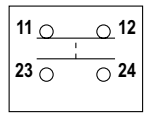
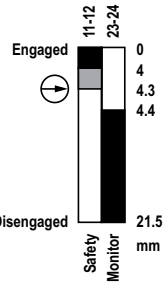
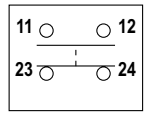
SD012 - SI-LS83..D Series

Contact Configuration	Switching Diagram
Actuator Engaged	
	
Actuator Removed	
	
	☐ Open ■ Closed ▒ Transition
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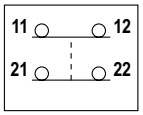
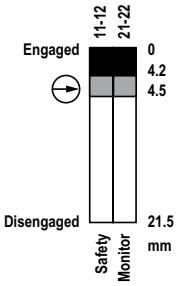
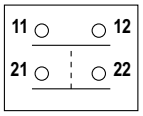
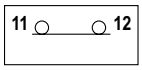
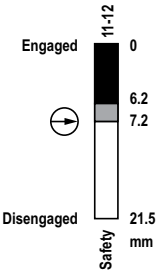
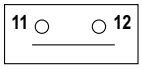
Continued on next page

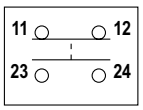
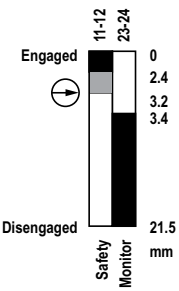
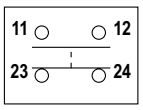
SD013 - SI-LS83..E Series

Contact Configuration	Switching Diagram
Actuator Engaged	
	
Actuator Removed	
	☐ Open ■ Closed ■ Transition Page 796

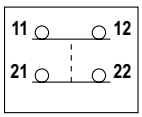
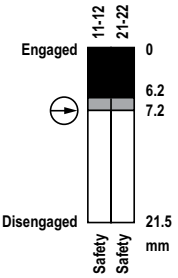
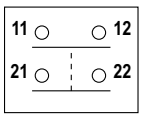
SD014 - SI-QS75 Series

Contact Configuration	Switching Diagram
Actuator Engaged	
	
Actuator Removed	
	☐ Open ■ Closed ■ Transition Page 796

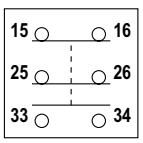
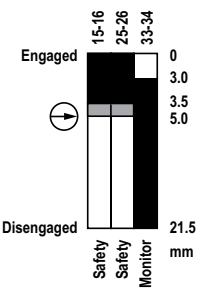
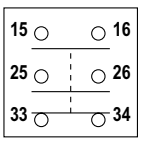
SD015 - SI-QS90MD Series

Contact Configuration	Switching Diagram
Actuator Engaged	
	
Actuator Removed	
	☐ Open ■ Closed ■ Transition Page 796

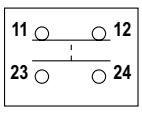
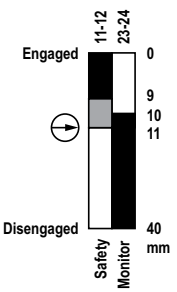
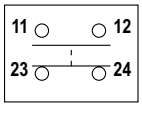
SD016 - SI-QS90ME Series

Contact Configuration	Switching Diagram
Actuator Engaged	
	
Actuator Removed	
	☐ Open ■ Closed ■ Transition Page 796

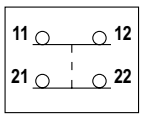
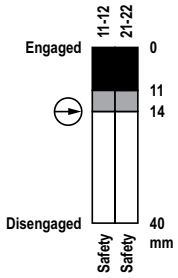
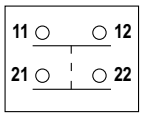
SD017 - SI-QS90MF Series

Contact Configuration	Switching Diagram
Actuator Engaged	
	
Actuator Removed	
	☐ Open ■ Closed ■ Transition Page 796

SD018 - SI-LM40MKHD Series

Contact Configuration	Switching Diagram
Actuator Engaged	
	
Actuator Removed	
	☐ Open ■ Closed ■ Transition Page 796

SD019 - SI-LM40MKHE Series

Contact Configuration	Switching Diagram
Actuator Engaged 	
Actuator Removed 	☐ Open ■ Closed ■ Transition
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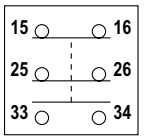
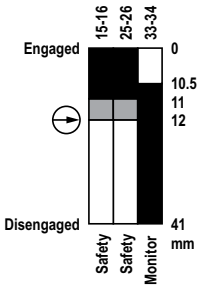
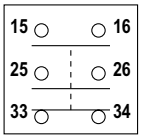
SD020 - SI-LM40MKHF Series

Contact Configuration	Switching Diagram
Actuator Engaged 	
Actuator Removed 	* 1 mm of movement will open contact
	☐ Open ■ Closed ■ Transition
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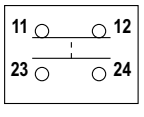
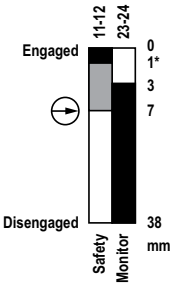
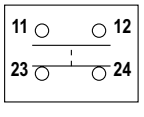
SD021 - SI-LM40MKVD Series

Contact Configuration	Switching Diagram
Actuator Engaged 	
Actuator Removed 	☐ Open ■ Closed ■ Transition
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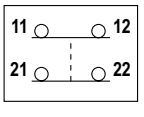
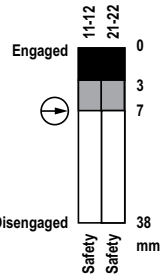
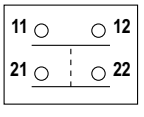
SD022 - SI-LM40MKVE Series

Contact Configuration	Switching Diagram
Actuator Engaged 	
Actuator Removed 	☐ Open ■ Closed ■ Transition
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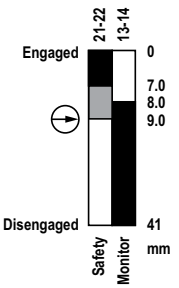
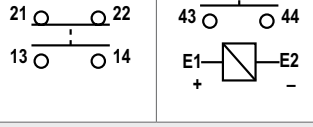
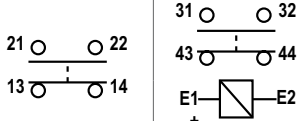
SD023 - SI-LS42..MSG/MMG Series

Contact Configuration	Switching Diagram
Actuator Engaged & Locked	
Actuator Contacts / Solenoid Monitor Contacts 	
Actuator Removed & Unlocked	
Actuator Contacts / Solenoid Monitor Contacts 	☐ Open ■ Closed ■ Transition
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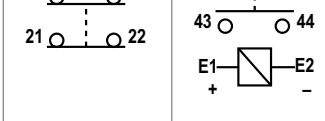
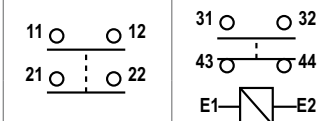
SD024 - SI-LS42..MSH/MMH Series

Contact Configuration	Switching Diagram
Actuator Engaged & Locked	
Actuator Contacts / Solenoid Monitor Contacts 	
Actuator Removed & Unlocked	
Actuator Contacts / Solenoid Monitor Contacts 	☐ Open ■ Closed ■ Transition
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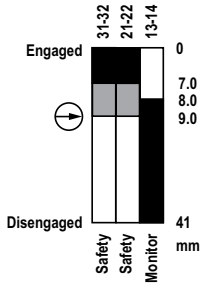
Continued on next page

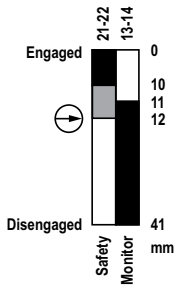
SD025 - SI-LS42..MSI/MMI Series

Contact Configuration	Switching Diagram
Actuator Engaged & Locked Actuator Contacts: 31–32, 21–22, 13–14 Solenoid Monitor Contacts: 41–42, E1(+)–E2(–) Actuator Removed & Unlocked Actuator Contacts: 31–32, 21–22, 13–14 Solenoid Monitor Contacts: 41–42, E1(+)–E2(–)	
☐ Open ■ Closed ■ Transition	Page 798

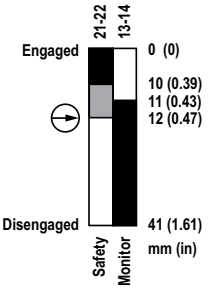
SD026 - SI-LS42..MSJ/MMJ Series

Contact Configuration	Switching Diagram
Actuator Engaged & Locked Actuator Contacts: 11–12, 21–22, 31–32 Solenoid Monitor Contacts: 41–42, E1(+)–E2(–) Actuator Removed & Unlocked Actuator Contacts: 11–12, 21–22, 31–32 Solenoid Monitor Contacts: 41–42, E1(+)–E2(–)	
☐ Open ■ Closed ■ Transition	Page 798

SD027 - SI-QM100..MSG/MMG Series

Contact Configuration	Switching Diagram
Actuator Engaged & Locked Actuator Contacts: 21–22, 13–14 Solenoid Monitor Contacts: 31–32, 43–44 Actuator Removed & Unlocked Actuator Contacts: 21–22, 13–14 Solenoid Monitor Contacts: 31–32, 43–44	
☐ Open ■ Closed ■ Transition	Page 798

SD028 - SI-QM100..DMSH Series

Contact Configuration	Switching Diagram
Actuator Engaged & Locked Actuator Contacts: 21–22, 11–12 Solenoid Monitor Contacts: 31–32, 43–44 Actuator Removed & Unlocked Actuator Contacts: 21–22, 11–12 Solenoid Monitor Contacts: 31–32, 43–44	
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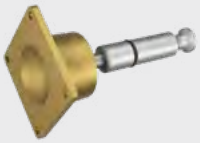
Safety Interlock Switches Replacement Parts

Used In	Description	Model*
SI-LM40MKH..D kits	Individual Interlock (without actuator)	SI-LM40KHD
SI-LM40MKH..E kits		SI-LM40KHE
SI-LM40MKH..F kits		SI-LM40KHF
SI-LM40MKVD kit		SI-LM40KVD
SI-LM40MKVE kit		SI-LM40KVE
SI-LS42DMSG.. kits		SI-LS42DSG
SI-LS42WMSG.. kits		SI-LS42WSG
SI-LS42DMSH.. kits		SI-LS42DSH
SI-LS42WMSH.. kits		SI-LS42WSH
SI-LS42DMSI.. kits		SI-LS42DSI
SI-LS42WMSI.. kits		SI-LS42WSI
SI-LS42DMSJ.. kits		SI-LS42DSJ
SI-LS42DMMG.. kits		SI-LS42DMG
SI-LS42WMMG.. kits		SI-LS42WMG
SI-LS42DMMH.. kits		SI-LS42DMH
SI-LS42WMMH.. kits		SI-LS42WMH
SI-LS42DMMI.. kits		SI-LS42DMI
SI-LS42WMMI.. kits		SI-LS42WMI
SI-LS42DMMJ.. kits		SI-LS42DMJ
SI-LS100..F kits		SI-LS100F
SI-LS83..D kits		SI-LS83D
SI-LS83..E kits		SI-LS83E
SI-QM100DMSG kit		SI-QM100DSG
SI-QM100AMSG kit		SI-QM100ASG
SI-QM100DMMG kit		SI-QM100DMG
SI-QM100AMMG kit		SI-QM100AMG
SI-QS75..C kits		SI-QS75C
SI-QS90..D kits		SI-QS90D
SI-QS90..E kits		SI-QS90E
SI-QS90..F kits		SI-QS90F

* Kits with one safety interlock switch and an actuator are available (see pp. 806-821).

Replacement Actuator Parts for Safety Interlock Switches

Description		Used With	Model
	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-90A**
	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-SB**
	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-SMFA**
	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-QM-SSA**
	High-extraction-force adapter 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-QS-100**

Replacement Actuator Parts for Safety Interlock Switches (cont'd)

Description		Used With	Model
	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**
	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-2**
	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-3**
	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-SSA-4**
	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	**SI-QS-SSU**
Replacement terminal cover		• SI-LS42	**SI-LS42-COVER**
Tamper Proof Screw (One way)		• SI-LS42	**SI-LS42-SCREW OW**

Two-Hand Control

Modules monitor the output of each Banner STB self-checking touch button or electromechanical button and deenergizes when the machine operator removes one or both hands from the buttons, providing protection for the worker actuating the hand controls.

Series	Description	Protection Rating	Power Supply
	**Two Hand-Control Module** page 682	Category 4 (module); Type IIIC	24 V ac/dc, 115 V ac/24 V dc or 230 V ac/24 V dc, depending on model
	**STB Buttons** page 686	Dependent on controller/module	10 - 30 V dc or 20-30 V ac/dc depending on model
	**Run Bar** page 690	Dependent on controller/module	10 to 30 V dc

DUO-TOUCH® SG

Two-Hand Control Modules

- Modules work with existing electromechanical palm buttons or with Banner's STB Self-Checking Touch Buttons to create a complete, ergonomic two-hand control system
- Anti-tiedown logic requires both touch buttons to be activated within one-half second or less of each other
- Modules easily interface with DUO-TOUCH® Run Bars with STBs for an economical, convenient means for actuation
- Designed to meet OSHA/ANSI Control Reliability requirements and Category 4 per ISO 13849-1 (EN 954-1) and functional Type IIIC Two-Hand Control per ISO 13851 (EN 574)
- AC modules have a complementary DC power supply to power the STB button
- Relay outputs are capable of reliably switching low or high current applications (depending on model)

DUO-TOUCH® SG Two-Hand Control Modules

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

NC = Normally Closed, NO = Normally Open

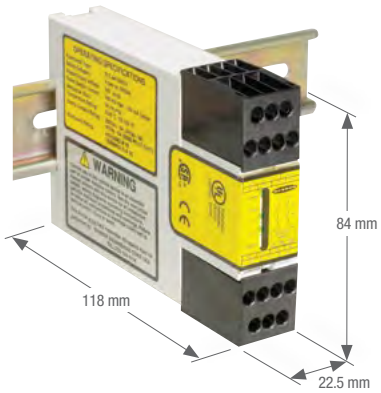
* May also use two electromechanical push buttons, each with one normally open (NO) and one normally closed (NC) contact (Form C). See data sheets for details.

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 686.

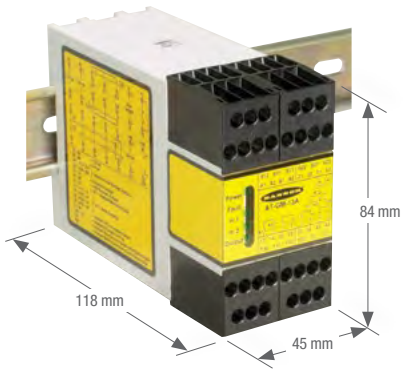
DUO-TOUCH® SG Kits — Solid-State STB Touch Buttons (Meets Category IIIC)

Kit Components						Kit
DUO-TOUCH® SG Safety Module	STB Touch Buttons (see page 686)	Supply Voltage	Safety Outputs	Auxiliary Outputs	Connection	Includes 2 STB Touch Buttons & a DUO-TOUCH® SG Safety Module
 AT-FM-10K	STBVP6	24 V ac/dc	2 NO	–	2 m	ATK-VP6
	STBVP6Q				4-Pin Mini QD	ATK-VP6Q
	STBVP6Q5				4-Pin Euro QD	ATK-VP6Q5
 AT-GM-13A	STBVP6	115 V ac/ 24 V dc	4 NO	1 NPN, 1 PNP & 1 NC	2 m	ATGMK-VP6
	STBVP6Q				4-Pin Mini QD	ATGMK-VP6Q
	STBVP6Q5				4-Pin Euro QD	ATGMK-VP6Q5
 AT-HM-13A	STBVP6	230 V ac/ 24 V dc	4 NO	1 NPN, 1 PNP & 1 NC	2 m	ATHMK-VP6
	STBVP6Q				4-Pin Mini QD	ATHMK-VP6Q
	STBVP6Q5				4-Pin Euro QD	ATHMK-VP6Q5

NC = Normally Closed, NO = Normally Open



AT-FM-10K Model



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

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

Supply Voltage and Current	24 V dc ±15% @ 150 mA (use a SELV-rated supply according to EN IEC 60950, NEC Class 2) 24 V ac ±15% @ 150 mA, 50-60 Hz +/- 5% (use an NEC Class 2-rated transformer) To comply with UL and CSA standards, the installation's isolated secondary power supply circuit must incorporate a method to limit the overvoltage to 0.8 kV.
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Overvoltage Category	**Output relay contact voltage of 1 V to 150 V ac/dc:** Category III **Output relay contact voltage of 151 V to 250 V ac/dc:** Category II (Category III, if appropriate overvoltage reduction is provided, as described in data sheet.)
Pollution Degree	2
Safety Outputs	Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2. **Contacts:** AgNi, 5 µm gold-plated **Low Current Rating:** The 5 µm gold-plated contacts allow the switching of low current/low voltage. In these low-power applications, multiple contacts can also be switched in series (e.g., "dry switching"). To preserve the gold plating on the contacts, do not exceed the following max. values at any time **Min. voltage:** 1V ac/dc — **Max. voltage:** 60 V **Min. current:** 5 mA ac/dc — **Max. current:** 300 mA **Min. power:** 5 mW (5 mVA) — **Max. power:** 7 W (7 VA) **High Current Rating:** If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to: c UL us LISTED PRESS CONTROL 8N35 **Minimum** — **Maximum** **Voltage:** 15 V ac/dc — 250 V ac/dc / 24 V dc, 6 A resistive **Current:** 30 mA ac/dc — B300, R300 per UL508 **Power:** 0.45 W (0.45 VA) CE **Minimum** — **Maximum** **Voltage:** 15 V ac/dc — 250 V ac/dc / 24 V dc, 6 A resistive **Current:** 30 mA ac/dc — IEC 60947-5-1 **Power:** 0.45 W (0.45 VA) — AC15 230 V ac, 3A; DC-13: 24 V dc, 2A **Mechanical life:** 20,000,000 operations **Electrical life (switching cycles of the output contacts, resistive load):** 150,000 cycles @ 900 VA; 1,000,000 cycles @ 250 VA; 2,000,000 cycles @ 150 VA; 5,000,000 cycles @ 100 VA NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.
Output Response Time	35 milliseconds maximum
Input Requirements	Outputs from actuating devices must each be capable of switching 25 mA @ 24 V dc (nominal).
Simultaneity Monitoring Period	≤ 500 milliseconds
Status Indicators	**4 green LEDs:** Power ON, Input 1 energized, Input 2 energized, Output **1 red LED:** Fault
Construction	Polycarbonate housing
Environmental Rating	IEC IP20
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 55 Hz @ 0.35 mm displacement per IEC 60068-2-6
Operating Conditions	**Temperature:** 0° to +50 °C — **Relative humidity:** 90% @ +50 °C (non-condensing)
Design Standards	CE : Cat. 4 PL e, per EN ISO 13849-1; SIL 3 per IEC 61508 and IEC 62061; Type IIIC per ISO 13851 (EN574) (when used with STBs or hard contacts)
Certifications	CE c UL us LISTED PRESS CONTROL 8N35

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

Supply Voltage and Current	**AT-GM-13A:** 115 V ac, ±15%; 50/60 Hz & 24 V dc, ±15%, 10% max. ripple **AT-HM-13A:** 230 V ac, ±15%; 50/60 Hz & 24 V 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 51/52)	Outputs (K1 and K2): four redundant (total of eight) forced-guided safety relay contacts **Contact ratings:** **Min. voltage:** 15V ac/dc — **Max. voltage:** 250 V ac or 250 V dc **Min. current:** 30 mA — **Max. current:** 6A ac or dc (resistive load) **Min. power:** 0.45 VA (0.45 W) — **Max. power:** 1500 VA (200 W) **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)	24 V dc @ 1A (between Y30 & Y33)
Auxiliary Solid-State Output Current	500 mA max., short circuit protected (Y32 or Y33)
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 @ 12 V dc.
Simultaneity Monitoring Period	≤ 500 milliseconds
Z1/Z2 Courtesy Voltage	24 V 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 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 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 Machinery Directive 98/37/EC, but not with Machinery Directive 2006/42/EC. Therefore, these 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.

Self-Checking Touch Buttons (STB)

Two-Hand Control

- Provide the highest level of safety for two-hand control input devices via redundant microprocessor and optical path
- Features ergonomic design to prevent repetitive motion stress by responding to a finger blocking light rather than to pressure
- Includes yellow field cover to prevent unintended switching
- For safety applications, STB buttons must be used with DUO-TOUCH® SG Two-Hand control modules, Safety Controller or comparable control Type IIIC Two-Hand system

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

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

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

Connection	Upper Housing	Relay Outputs	Models
2 m 5-Pin Mini QD 5-Pin Euro QD	Polyetherimide	2 Complementary SPST (1 NC, 1 NO)	STBVR81 STBVR81Q STBVR81Q6

For more specifications see page 689.

Connection options: A model with a QD requires a mating cordset.

For 9 m cable, add suffix **W/30** to the 2 m model number (example, **STBVP6 W/30**).

Euro-Style to Flying Leads
Straight connector models listed; for right-angle, add **RA** to the end of the model number (example, **MQDC-406RA**)

4-Pin	5-Pin
MQDC-406 2 m (6.5')	**MQDC1-406** 2 m (6.5')
MQDC-415 5 m (15')	**MQDC1-415** 5 m (15')
MQDC-430 9 m (30')	**MQDC1-430** 9 m (30')

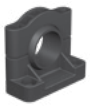
Mini-Style
Straight connector models only

4-Pin	5-Pin
MBCC-406 2 m (6.5')	**MBCC-506** 2 m (6.5')
MBCC-412 4 m (12')	**MBCC-512** 4 m (12')
MBCC-415 9 m (30')	**MBCC-515** 9 m (30')

Additional cordset information is available.
See page 758

SMB30A

SMB30MM



SMB30SC

SMBAMS30P

SMBAMS30RA

Additional bracket information is available.
See page 737

Field Covers

OTC-1-BK Black	**OTCL-1-BK** Black
OTC-1-GN Green	**OTCL-1-GN** Green
OTC-1-RD Red	**OTCL-1-RD** Red
OTC-1-YW Yellow	**OTCL-1-YW** Yellow

STB models

STB models with cover

STB Self-Checking Buttons Specifications

Supply Voltage and Current	**STBVP6 Models:** 10 to 30 V dc @ 75 mA, typical **STBVR81 Models:** 20 to 30 V ac/dc or 20 V to 30 V ac (peak-to-peak value), (50/60 Hz ± 5%) @ 75 mA
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:** +V(supply) -1.5V **OFF-state leakage current:** less than 1 µA **STBVR81 Models (electromechanical relay):** **Max. switching voltage:** 125 V dc/150 V ac **Max. switching current:** 1A @ 24 V dc; 0.4A @ 125V ac (resistive loads) **Max. resistive load power:** 24 W dc; 50 VA ac **Mechanical life of relay:** 109 cycles **Electrical life of relay:** 1.5 x 105 cycles at 1 amp 24 V 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) upper housing; 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. **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.
Ambient Light Immunity	Up to 100,000 lux
Applicable Agency Standards	(Used with an AT-FM-10K module or an SC22-3 Safety Controller) Analysis of measures for fault avoidance and fault control according to SIL3 (IEC 61508 and IEC 62061) and Category 4 (EN ISO 13849-1) passes EMI/RFI test levels as specified in IEC61496 and IEC62061.
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.
Two-Hand Control System Note	When the STBVP6 is used with Banner's SC22-3 Safety Controller in a two-hand control system, the power supply to the STBVP6 must be of the same voltage that is used to power the Safety Controller and they must have a common supply ground.
Certifications	CE c UL us LISTED

DUO-TOUCH® Run Bar with STBs

Two-Hand Control

- Provide a convenient and economical means for safeguarding when interfaced with DUO-TOUCH® Two-Hand Control Modules or comparable control systems
- Minimizes risk of defeat and accidental machine actuation
- Offers ergonomic design for reduced hand, wrist and arm stress
- Constructed of robust, 13-gauge cold-rolled steel
- Provides knockouts for wiring flexibility and installation of accessories such as EZ-LIGHT™ indicators
- Meets ANSI B11.19 and ISO 13851 (EN 574) standards when monitored by Type IIIC Two-Hand Control logic device (e.g., AT series Two-Hand Control modules, see page 680)

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

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

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

8-Pin

Mini-Style
Straight connector models only

QSD-815C
4m (15')
QSD-825C
8 m (25')
QSD-850C
15 m (50')
QSD-875C
23 m (75')

Additional cordset information is available. See page 758

STBA-RB1-MB1*

STBA-RB1-MB2*

STBA-RB1-MB3*

* When used with **STBVP6-RB2** models change **..-RB1-..** to **..-RB2-..**

Additional bracket information is available. See page 753

Telescoping Stands

STBA-RB1-S1

STBA-RB1-S2

* When used with **STBVP6-RB2** models change **..-RB1-..** to **..-RB2-..**
NOTE: DUO-TOUCH SG Run Bars are sold separately.

Run Bar Indicators

T30GRYB11P

K50LGRYB11P

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

Supply Voltage and Current	10 to 30 V dc @ 75 mA (each button) Power consumption: approx. 1.8W @ 24 V 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:** +V(supply)-1.5V **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.
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 c UL us LISTED

Laser Scanners

Safety laser scanners provide a safety solution for mobile vehicles and stationary applications, such as the interior of robotic work cells, that cannot be solved by other safeguarding solutions.

AG4 Series

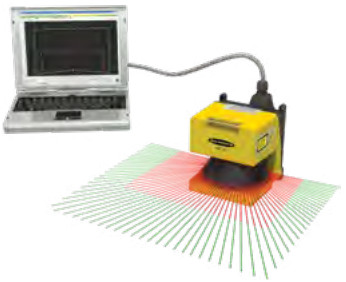
Safety Laser Scanner

- Two-dimensional laser scanners effectively protect personnel, as well as stationary and mobile systems within a user designated area.
- Eight protective warning field pairs are individually defined using a PC
- Scanner has 0.36° lateral resolution and detects objects in 190° working zone
- The highly flexible protective and warning fields can be set to match the shape of the work area
- Exceeds OSHA/ANSI Control Reliability requirements, certified to cTUVus, and CE certified to Type 3, Cat 3 PLd, and SIL 2
- Compact design with a rugged, die-cast aluminum housing for simple installation into work areas
- Cordsets and brackets see page 695

AG4 Safety Laser Scanners

Range		Safety Output	Aux. Outputs	Scanning Angle	Response Time	Model*
Protective Fields	Warning Fields					
30 mm Resolution = 1.6 m 40 mm Resolution = 2.2 m 50 mm Resolution = 2.8 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 640 ms	**AG4-4E**
30 mm Resolution = 1.6 m 40 mm Resolution = 2.2 m 50 mm Resolution = 2.8 m 70 mm Resolution = 6.25 m 150 mm Resolution = 6.25 m	150 mm Resolution = 15 m	2 PNP OSSD	2 PNP	190°	80 ms (Default) adjustable to 640 ms	**AG4-6E**

* Model includes scanner, plugs and CD with diagnostic and configuration software. Cordset ordered separately.



Configuration and Diagnostic Software

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

Test Box

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

- Can be used as a "cloning" device to load the same configuration into multiple scanners
- Switch over between the different field pairs
- Indication of the Safety OSSD outputs (when entering protective field)
- Indication of the Alarm outputs (when entering warning field)
- Machine Interface-to-Test Box cordset included
- Power supply not included

Test Box for AG4 Safety Laser Scanners

Description	Model
AG4 Test Box	**AG4-TB1**

AG4 Safety Laser Scanner Kits

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

- Scanner page 693
- Interfacing Options page 697
- Cordsets page 695

To Order:

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

See www.bannerengineering.com for complete documentation and a current listing of accessories.

Family	Kit		Range		Interface Options	Machine Interface Cordset Options	PC Cordsets
AG4	K	—	4E	—	10	M10	P10
	K = Kit		**4E** = 4 m **6E** = 6 m		**Blank** = None **10** = UM-FA-9A **11** = UM-FA-11A **12** = MMD-TA-11A **13** = MMD-TA-12A	**M5** = 5 m **M10** = 10 m **M25** = 25 m **M50** = 50 m	**P3** = 3 m **P5** = 5 m **P10** = 10 m **Blank** = none

DB15 Machine Interface

AG4-CPD15-5
5 m
AG4-CPD15-10
10 m
AG4-CPD15-25
25 m
AG4-CPD15-50
50 m

DB9 PC Communication
RS-232 Serial Protocol

AG4-PCD9-3
3 m
AG4-PCD9-5
5 m
AG4-PCD9-10
10 m

DB9 to USB†

AG4-PCD9USB-1
1 m

† Not recommended for use with **AG4-PCD9-10**

Additional cordset information is available. See page 758

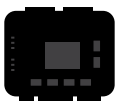
AG4-MBK1

Additional bracket information is available. See page 729

Misc. Replacement Parts

Description	Model
Replacement window	AG4-WIN1
Replacement configuration plug, straight	AG4-CP
Replacement PC plug, straight	AG4-PCD9
Cleaning set (150 ml fluid)	AG4-CLN1
Cleaning set (1000 ml fluid)	AG4-CLN2

Interface



Additional accessory information is available. See page 697

AG4 Laser Scanner Specifications

Supply Voltage (UB)	24 V dc (+20% / -30%) Power supply in acc. with IEC 742 with safe supply isolation and compensation with voltage dips of up to 20 milliseconds in acc. with EN 61496-1. **Over current protection:** Via 1.6 A fuse, melting fuse in the cabinet **Over-voltage protection:** Over-voltage protection with safe limit stop **Protective earth conductor:** Connection not permitted
Supply Current	420 mA approx. (use 2.5 A power supply)
Fuse (power supply)	1.6A normal blow, medium time lag fuse (user supplied)
Response Time	Min. 80 milliseconds (2 scans) Max. 640 milliseconds (16 scans)
Wavelength	905 nm
Protection Field (Sensing Range)	**AG4-4E:** **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% **AG4-6E:** **150 mm resolution:** 200 mm to 6.25 m (radius) **70 mm resolution:** 200 mm to 6.25 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 Field	**Resolution:** 150 mm (at 15 m) **Sensing range (radius):** 200 mm to 15 m **Sensing object reflectance:** Minimum 20%
Monitored Area	0-50 m
Scanning Angle	max. 190°
Output Signal Switching Devices (OSSD1, OSSD2)	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 protection field:** ON Object inside protection field: OFF **Response Time:** Min. 80 milliseconds (2 scans) to max. 640 milliseconds (16 scans) switching method
Alarm (Auxiliary) Outputs 1 & 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 Field:** ON **Object inside Warning Field:** OFF **Response Time:** Min. 80 milliseconds (2 scans) to max. 640 milliseconds (16 scans) switching method
Start-Restart	+24 V opto-uncoupled, dynamically monitored
Field Pair Switchover	Selection of 4 or 8 field pairs via 4 control lines, +24 V opto-uncoupled, dynamically monitored, logically 1 = field pair activated
Input Signal Definition	**High/logical 1:** 16-30 V **Low/logical 0:** less than 3 V
Laser Protection Class	Class 1 (IEC 60825-1)
Number of Field Pair Configurations	8 Field Pairs in combination of Protective Field and Warning Field can be switched over by external input. Field Pair number 8 is not user configurable.
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
Shock and Vibration	10 to 150 Hz frequency, 5 G max. (50 m/s2 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	IEC 61496-1/-3 (Type 3), ISO 13849-1 (Category 3, PLd), IEC 61508-1 to -7 (SIL2) and IEC 62061 SIL CL2
Certifications	CE TUV Rheinland of North America, a Nationally Recognized Test Laboratory (NRTL) in the United States according to OSHA 29 CFR 1910.7, and accredited by the Standards Council of Canada to test and certify products to Canadian National Standards, has certified the AG4 Laser Scanner to all applicable U.S. and Canadian National Standards. The cTUVus mark is recognized throughout the United States and Canada by OSHA and the SCC.

AG4 Interfacing Products

	Description		Models	Product Information
Interface Modules and Controllers		• Universal input safety 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	**UM-FA-9A (3 NO)** **UM-FA-11A (2 NO/1NC)**	Page 698
		• Control system monitors a variety of input devices such as e-stop buttons, rope pulls, enabling devices, protective safety stops, interlocked guards or gates, optical sensors, two-hand controls and safety mats • Intuitive programming environment for easy implementation • Configure inputs, outputs and functionality of the controller for more usability • Base controller allows eight of the 26 inputs to be configured as outputs for efficient terminal utilization • Ethernet models available providing up to 64 virtual status outputs, fault diagnostic codes and messages	**SC26-2** **SC26-2D** **SC26-2E** **SC26-2DE**	Page 588
		• 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 • All SC22-3 modules use 24 V dc • 10/100 Base TX Ethernet communication option using EtherNet/IP and Modbus TCP protocols (SC22-3E models)	**SC22-3-S...** **SC22-3-C...** **SC22-3E-S...** **SC22-3E-C...**	Page 584
Muting Modules		• 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	**MMD-TA-12B** **MMD-TA-11B**	Page 710

NC = Normally closed, NO = Normally open

Safety Modules

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

Series	Description	Safety Rating	Safety Outputs	Aux Outputs	Power Supply
	**E-Stop & Guard** Modules monitor contacts of E-stop switches, guard interlock switches or the outputs of other safety modules. page 699	Category 2 or 4, depending on model	2 NO, 3 NO, 4 NO	1 NC, 1 NC & 2 PNP	24 V ac/dc, 115 V ac & 12-24 V dc, 230 V ac & 12-24 V dc or 24 V dc
	**Universal Input** Modules monitor one or two solid-state PNP or relay contact outputs from safety or non-safety devices, such as sensors or safety light screens. page 706	Category 2, 3 or 4 PLe	3 NO or 2 NO	1 NC, depending on model	24 V ac/dc
	**Safety Mat Monitoring** Modules monitor one 4-wire safety mat (or multiple connected in series). page 708	Category 3 (with mat)	4 NO	1 NC & 2 PNP	115 V ac & 12-24 V dc or 230 V ac & 12-24 V dc
	**Muting** Modules suspend safeguarding during non-hazardous time in the machine's cycle. page 710	Category 2, 3 or 4 PLe	2 PNP OSSD or 2 NO	1 PNP or 1 NC	24 V dc
	**Safe Speed** Modules monitor two sensors with PNP outputs for rotation and linear movements. page 714	Category 3 PLe	2 NO	1 NC	24 V ac/dc
	**Interface Relay** Dual input accepts the safety output of a safety device with solid-state or contact outputs and external device monitoring. page 716	Category 2, 3 or 4 (Depends on hookup)	3 NO or 2 NO	1 NC, depending on model	24 V dc
	**Extension Relay** Contact expansion for safety modules with contact outputs and external device monitoring. page 718	Category 2, 3 or 4 (Depends on hookup)	4 NO or 4 NO (w/delay)	—	24 V dc or 24 V ac/dc, depending on model

E-Stop & Interlocked Guard

Safety Modules

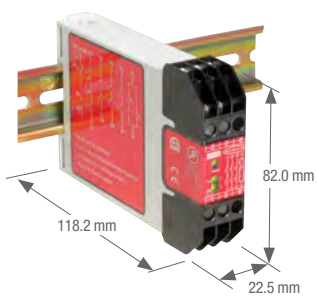
- Modules monitor positive-opening E-Stop and interlocking switches for proper operation, contact failure or wiring faults
- AC and DC models available
- Module goes into lockout mode if fault is detected
- Housing are rugged polycarbonate and mount to standard 35 mm DIN rail
- Functional Stop Category 0 per NFPA79 and IEC 60204-1
- Relay outputs are capable of reliably switching low or high current applications (depending on model)

E-Stop & Guard Safety Modules

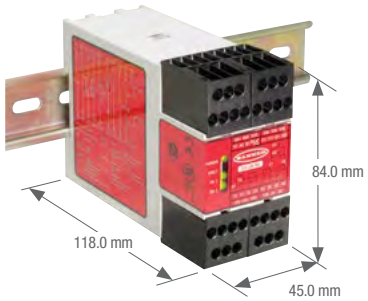
Supply Voltage	Inputs	Safety Outputs	Aux. Outputs	Output Rating	Output Response Time	Model
24 V ac/dc	1 NC & 1 NO (single or dual)	2 NO	—	6 amps	35 ms	**GM-FA-10J**
24 V ac/dc	1 NC (single) or 2 NC (dual)	3 NO	—	6 amps	25 ms	**ES-FA-9AA**
24 V ac/dc	1 NC (single) or 2 NC (dual)	2 NO	1 NC	7 amps	25 ms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

NC = Normally Closed Relay, NO = Normally Open Relay

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



ES-FA-6G Models



ES-..A-5A Models

GM-FA-10J Guard Monitoring Module Specifications

Supply Voltage and Current	24 V dc ±15% @ 150 mA (SELV-rated supply according to EN IEC 60950, NEC Class 2) 24 V ac ±15% @ 150 mA, 50-60 Hz +/- 5% (NEC Class 2-rated transformer) **Power consumption:** approx. 3 VA / 3 W To comply with UL and CSA standards, the isolated secondary power supply circuit in the installation must incorporate a method to limit the overvoltage to 0.8 kV
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Overvoltage Category	**Output relay contact voltage of 1 V to 150 V ac/dc:** Category III **Output relay contact voltage of 151 V to 250 V ac/dc:** Category II (Category III, if appropriate overvoltage reduction is provided, as described in data sheet.)
Pollution Degree	2
Output Configuration	Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2 **Contacts:** AgNi, 5 µm gold-plated **Low Current Rating:** The 5 µm gold-plated contacts allow the switching of low current/low voltage. In these low-power applications, multiple contacts can also be switched in series (e.g., "dry switching") To preserve the gold plating on the contacts, do not exceed the following max. values at any time: **Min. voltage:** 1 V ac/dc — **Max. voltage:** 60 V **Min. current:** 5 mA ac/dc — **Max. current:** 300 mA **Min power:** 5 mW (5 mVA) — **Max. power:** 7 W (7 VA) **High Current Rating:** If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to: EMERGENCY STOP DEVICE 29YL LISTED **Minimum:** **Voltage:** 15 V ac/dc **Current:** 30 mA ac/dc **Power:** 0.45 W (0.45 VA) **Maximum:** 250 V ac/24 V dc, 6A resistive B300, R300 per UL508 CE **Minimum:** **Voltage:** 15 V ac/dc **Current:** 30 mA ac/dc **Power:** 0.45 W (0.45 VA) **Maximum:** 250 V ac/24 V dc, 6A resistive **IEC 60947-5-1:** **AC15:** 230 V ac. 3 A; **DC-13:** 24 V dc, 2A **Mechanical life:** ≥ 50,000,000 operations **Electrical life (switching cycles of the output contacts, resistive load):** 150,000 cycles @ 900 VA; 1,000,000 cycles @ 250 VA; 2,000,000 cycles @ 150 VA; 5,000,000 cycles @ 100 VA NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.
Output Response Time	35 milliseconds max.
Input Requirements	Each switch or sensor must have a normally closed contact and a normally open contact capable of switching 20 to 50 mA @ 15 to 30 V dc **Reset switch:** 20 mA @ 12 V dc, hard contact only Max. external resistance between terminals S11/S12, S11/S13, S21/S22 and S21/S23: 270 ohms each.
Simultaneity Monitoring	**2-Channel operation:** 3 seconds **1-Channel operation:** infinite
Status Indicators	**4 green LEDs:** **Power:** power is supplied to Safety Module **Channel 1:** inputs satisfied (guard closed) **Channel 2:** inputs satisfied (guard closed) **Output:** K1 and K2 energized, safety outputs closed **1 red LED:** Fault
Construction	Polycarbonate housing
Environmental Rating	IEC IP20
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 55 Hz @ 0.35 mm displacement per IEC 60068-2-6
Operating Conditions	**Temperature:** 0° to +50 °C **Relative humidity:** 90% @ +50 °C (non-condensing)
Design Standards	CE: Cat. 4 PL e, per EN ISO 13849-1; SIL 3 per IEC 61508 and IEC 62061
Certifications	CE UL LISTED EMERGENCY STOP DEVICE 29YL

ES-FA-..AA Safety Module Specifications

Supply Voltage and Current	24 V dc ±10% (SELV-rated supply according to EN IEC 60950, NEC Class 2) 24 V ac ±10%, 50/60Hz (NEC Class 2-rated transformer) **Power consumption:** approx. 2 W/2 VA
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Overvoltage Category	**Output relay contact voltage of 1 V to 150 V ac/dc:** Category III **Output relay contact voltage of 151 V to 250 V ac/dc:** Category III, if appropriate overvoltage reduction is provided, as described in data sheet
Pollution Degree	2
Output Configuration	**ES-FA-9AA:** 3 normally open (NO) output channels **ES-FA-11AA:** 2 normally open (NO) output channels and 1 normally closed (NC) auxiliary output Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2. The normally closed Aux. output channel of the ES-FA-11AA is a parallel connection of contacts from two forced-guided relays, K1-K2. **Contacts:** AgNi, 5 µm gold-plated **Low Current Rating:** The 5 µm gold-plated contacts allow the switching of low current/low voltage. In these low-power applications, multiple contacts can also be switched in series (e.g., "dry switching") To preserve the gold plating on the contacts, do not exceed the following max. values at any time: **Minimum:** **Voltage:** 1 V ac/dc **Current:** 5 mA ac/dc **Power:** 5 mW (5 mVA) **Maximum:** **Voltage:** 60 V **Current:** 300 mA **Power:** 7 W (7 VA) **High Current Rating:** **If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) change to:** **Minimum:** **Voltage:** 15 V ac/dc **Current:** 30 mA ac/dc **Power:** 0.45 W (0.45 VA) **Maximum:** **Voltage:** 250 V ac/dc **Current: ES-FA-9AA:** 6A **ES-FA-11AA:** 7 A **Power: ES-FA-9AA:** 200 W (1,500 VA) **ES-FA-11AA:** 200 W (1,750 VA) **Mechanical life:** > 20,000,000 operations **Electrical life (switching cycles of the output contacts, resistive load):** 150,000 cycles @ 1,500 VA; 1,000,000 cycles @ 450 VA; 2,000,000 cycles @ 250 VA; 5,000,000 cycles @ 125 VA NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.
Output Response Time	25 milliseconds typical
Input Requirements	**Safety input switch:** Dual-Channel (contacts) hookup – 10 to 20 mA steady state @ 12 V dc NOTE: Inputs are designed with a brief contact-cleaning current of 100 mA when initially closed. Single-Channel hookup – 40 to 100 mA @ 24 V ac/dc +/- 10%; 50/60 Hz **Reset switch:** 20 mA @ 12 V dc, hard contact only
Minimum OFF-State Recovery Time	250 milliseconds
Status Indicators	**3 green LEDs**: Power ON K1 energized K2 energized
Construction	Polycarbonate housing
Environmental Rating	Rated NEMA 1; IP40, Terminals IP20
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 55Hz @ 0.35 mm displacement per IEC 60068-2-6
Operating Conditions	**Temperature:** 0° to +50 °C **Relative humidity:** 90% @ +50 °C (non-condensing)
Design Standards	Cat. 4 PL e per EN ISO 13849-1; SIL 3 per IEC 61508 and IEC 62061
Certifications	CE UL LISTED EMERGENCY STOP DEVICE 29YL

ES-..A-5A Safety Module Specifications

Supply Voltage and Current	**AI-A2:** 115 V ac (model ES-UA-5A) or 230 V ac (model ES-VA-5A) ±15%, 50/60Hz **BI-B2:** 11 V dc – 27.6 V dc **Power consumption:** approx. 4 W/7 VA The Safety Module should be connected only to a SELV (safety extra-low voltage, for circuits without earth ground) or a PELV (protected extra-low voltage, for circuits with earth ground) power supply.
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Overvoltage Category	Output relay contact voltage of 1 V to 150 V ac/dc: Category III Output relay contact voltage of 151 V to 250 V ac/dc: Category III, if appropriate overvoltage reduction is provided, as described in data sheet
Pollution Degree	2
Output Configuration	4 normally open (NO) output channels; 1 normally closed (NC) and 2 solid-state auxiliary outputs Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2. The normally closed Aux. output channel is a parallel connection of contacts from two forced-guided relays, K1-K2. **Contacts:** AgNi, 5 µm gold-plated **Low Current Rating:** The 5 µm gold-plated contacts allow the switching of low current/low voltage. In these low-power applications, multiple contacts can also be switched in series (e.g., "dry switching") To preserve the gold plating on the contacts, do not exceed the following max. values at any time: **Minimum:** **Voltage:** 1 V ac/dc **Current:** 5 mA ac/dc **Power:** 5 mW (5 mVA) **Maximum:** **Voltage:** 60 V **Current:** 300 mA **Power:** 7 W (7 VA) **High Current Rating: If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to:** EMERGENCY STOP DEVICE 29YL LISTED IND. CONT. EQ. 447Y LISTED **Minimum:** **Voltage:** 15 V ac/dc **Current:** 250 mA ac/dc **Power:** 5 W (5 VA) **Maximum:** NO Safety Contacts (13-14, 23-24, 33-34, 43-44): 250 V ac/ 24 V dc, 6A resistive B300, Q300 (UL508) NC Auxiliary Contact (51-52): 250 V ac/ 24 V dc, 5A resistive B300, Q300 (UL508) CE **Minimum:** **Voltage:** 15 V ac/dc **Current:** 250 mA ac/dc **Power:** 5 W (5 VA) **Maximum—IEC60947-5-1** **NO Safety Contact: AC-1:** 250 V ac, 6A; **DC-1:** 24 V dc, 6A **AC-15:** 230 V ac, 3A; **DC-13:** 24 V dc, 4A **NC Auxiliary Contact: AC-1:** 250 V ac, 5A; **DC-1:** 24 V dc, 5A **AC-15:** 230 V ac, 2A; **DC-13:** 24 V dc, 4A **Mechanical life:** > 20,000,000 operations **Electrical life (switching cycles of the output contacts, resistive load):** 150,000 cycles @ 1,500 VA; 1,000,000 cycles @ 450 VA; 2,000,000 cycles @ 250 VA; 5,000,000 cycles @ 125 VA NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts. **Solid-State Monitor Outputs:** - Two non-safety solid-state dc outputs - Output at Y32 monitors state of outputs – conducts (output high) when both K1 and K2 are energized - Output at Y35 conducts (output high) when in normal operation (no lockout) - Output circuits require application of +12-24 V dc ±15% at terminal Y31; dc common at Y30 - Maximum switching current: 100 mA at 12-24 V dc - Both outputs are protected against short circuits
Output Response Time	35 milliseconds max. (25 milliseconds typical)
Input Requirements	E-stop switch must have normally closed contacts each capable of switching 20 to 50 mA @ 12 to 30 V dc; and must be open ≥15 milliseconds for a valid stop command Maximum input resistance 250 ohms per channel @ 24 V dc supply voltage Maximum input resistance 25 ohms per channel @ 12 V dc supply voltage Reset switch must have one normally open contact capable of switching 20 to 50 mA @ 12 to 30 V ac/dc
OFF-State Recovery Time	350 milliseconds
Status Indicators	**3 green LEDs:** Power ON, Channel 1, Channel 2 **1 red LED:** Fault Condition

Continued on next page

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

Construction	Polycarbonate housing
Environmental Rating	Rated NEMA 1; IEC IP20
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 60Hz @ 0.35 mm displacement per UL 991 60 to 150 Hz @ 5 g max.
Operating Conditions	**Temperature:** 0° to +50 °C (surrounding air) **Relative humidity:** 90% @ +50 °C (non-condensing)
Design Standards	Cat. 4 PL e per EN ISO 13849-1; SIL 3 per IEC 61508 and IEC 62061
Certifications	CE, UL LISTED EMERGENCY STOP DEVICE 29YL, c UL LISTED IND. CONT. EQ. 447Y

ES-FA-6G Safety Module Specifications

Supply Voltage and Current	24 V ac/dc, +/- 10%; 50/60Hz **Power consumption:** approx. 2 W/0.75 VA
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Output Configuration	Outputs (K1 & K2): three redundant (total of six) safety relay (forced-guided) contacts – AgSnO2 one auxiliary non-safety monitor output (open when both K1 and K2 are energized; closed when either K1 or K2 are de-energized) **Contact ratings:** **Max. voltage:** 250 V ac or 250 V dc **Max. current:** 6 A ac or dc **Min. current:** 30 mA @ 10 V dc **Max. power:** 1500 VA, 150 W **Mechanical life:** 10,000,000 operations Electrical life: 100,000 at full resistive load NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.
Output Response Time	35 milliseconds typical
Input Requirements	Input switch must have a normally closed contact capable of switching 40 to 100 mA @ 13 to 27 V ac/dc Reset switch must have one normally open contact capable of switching 20 to 30 mA @ 13 to 27 V ac/dc
Status Indicators	**3 green LEDs:** Power ON K1 energized K2 energized
Construction	Polycarbonate
Environmental Rating	Rated NEMA 1; IP40, Terminals IP20
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 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	UL LISTED EMERGENCY STOP DEVICE 29YL CSA® **Important Notice:** European Community Machinery Directive 2006/42/EC The ES-FA-6G Safety Module complies with Machinery Directive 98/37/EC, but not with Machinery Directive 2006/42/EC. Therefore, this Safety Module can only be installed as replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767.

Universal Input

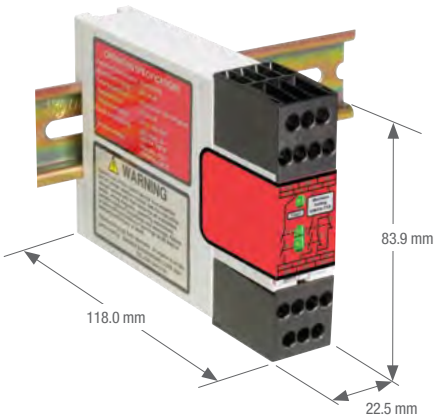
Safety Modules

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

Universal Safety Input Modules

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

NC = Normally Closed Relay, NO = Normally Open Relay



UM-FA-..A Models

Universal Safety Input Module Specifications

Supply Voltage and Current	24 V dc ±10% (SELV-rated supply according to EN IEC 60950, NEC Class 2) 24 V ac ±10% 50-60 Hz (NEC Class 2-rated transformer) **Power consumption:** approx. 2 VA / 3 W
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Overvoltage Category	**Output relay contact voltage of 1 V to 150 V ac/dc:** Category III **Output relay contact voltage of 151 V to 250 V ac/dc:** Category II (Category III if appropriate overvoltage reduction is provided, as described in data sheet.)
Pollution Degree	2
Output Configuration	**UM-FA-9A:** 3 normally open (NO) output channels **UM-FA-11A:** 2 normally open (NO) output channels and 1 normally closed (NC) auxiliary output channel Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2. The normally closed Aux. output channel of the UM-FA-11A is a parallel connection of contacts from two forced-guided relays, K1-K2. **Contacts:** AgNi, 5 µm gold-plated **Low Current Rating:** The 5 µm gold-plated contacts allow the switching of low current/low voltage. In these low-power applications, multiple contacts can also be switched in series (e.g., "dry switching"). **To preserve the gold plating on the contacts, do not exceed the following max. values at any time:** **Min. voltage:** 1 V ac/dc — **Max. voltage:** 60 V **Min. current:** 5 mA ac/dc — **Max. current:** 300 mA **Min. power:** 5 mW (5 mVA) — **Max. power:** 7 W (7 VA) **High Current Rating: If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to:** **Min. voltage:** 15 V ac/dc — **Max. voltage:** 250 V ac/dc **Min. current:** 30 mA ac/dc — **Max. current: UM-FA-9A:** 6 A — **UM-FA-11A:** 7 A **Min. power:** 0.45 W (0.45 VA) — Max. power: **UM-FA-9A:** 200 W (1,500 VA) — **UM-FA-11A:** 200 W (1,750 VA) **Mechanical life:** > 20,000,000 operations **Electrical life (switching cycles of the output contacts, resistive load):** 150,000 cycles @ 1,500 VA; 1,000,000 cycles @ 450 VA; 2,000,000 cycles @ 250 VA; 5,000,000 cycles @ 125 VA NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.
Output Response Time	25 milliseconds typical
Input Requirements	**Safety input switch:** 2-Channel (contacts) hookup: 10 to 20 mA steady state @ 12 V dc NOTE: Inputs are designed with a brief contact-cleaning current of 100 mA when initially closed. Solid-state Dual Channel hookup: 5 to 20 mA steady state @ 18 to 28 V dc sourcing (PNP), < 2 mA leakage current Single-Channel hookup: 40 to 100 mA @ 24 V ac/dc ± 10%; 50/60 Hz **Reset Switch:** 20 mA @ 12 V dc, hard contact only
Minimum OFF-State Recovery Time	250 milliseconds (When used with the AG4 Safety Laser Scanner; the "Restart delay time after PF release" must be configured 280 milliseconds or greater.)
Indicators	**3 green LEDs:** Power ON K1 energized K2 energized
Construction	Polycarbonate housing
Environmental Rating	Rated NEMA 1; IEC IP40, Terminals IP20
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 55 Hz @ 0.35 mm displacement per IEC 60068-2-6
Operating Conditions	**Temperature:** 0° to +50 °C — **Max. Relative Humidity:** 90% @ +50 °C (non-condensing)
Design Standards	Cat. 4 PL e per EN ISO 13849-1; SIL 3 per IEC 61508 and IEC 62061
Certification	CE, UL LISTED, EMERGENCY STOP DEVICE 29YL

Safety Mat Monitoring

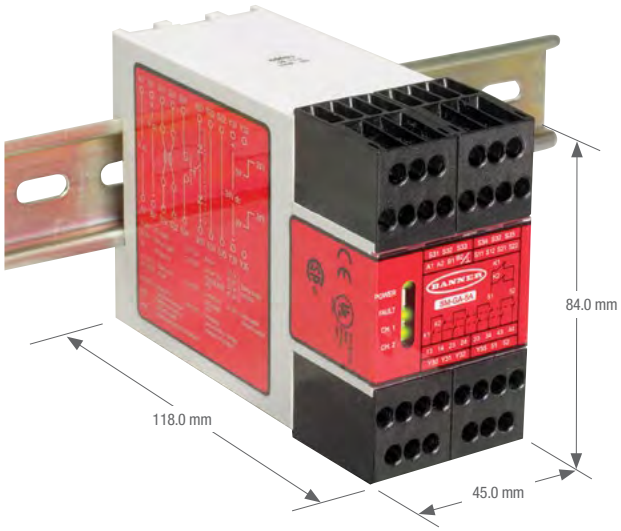
Safety Modules

- Module monitors a single or series connection of 4-wire safety mats or safety edge devices
- Models work with AC or DC input voltages
- LED indicators show power on, output and fault
- Housings are rugged polycarbonate and mount to standard 35 mm DIN rail
- Relay outputs are capable of reliably switching low or high current applications

Safety Mat Monitoring Modules

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

NC = Normally Closed Relay, NO = Normally Open Relay



SM-..A-5A Models

Safety Mat Monitoring Module Specifications

Supply Voltage and Current	**AI-A2:** 115 V ac (model SM-GA-SA) or 230 V ac (model SM-HA-5A) ±15%, 50/60Hz **BI-B2:** 11 V dc – 27.6 V dc **Power consumption:** approx. 4 W/7 VA The Safety Module should be connected only to a SELV (safety extra-low voltage, for circuits without earth ground) or a PELV (protected extra-low voltage, for circuits with earth ground) power supply, according to EN IEC 60950, NEC Class 2
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Overvoltage Category	**Output relay contact voltage of 1 V to 150 V ac/dc:** Category III **Output relay contact voltage of 151 V to 250 V ac/dc:** Category III, if appropriate overvoltage reduction is provided, as described in data sheet
Pollution Degree	2
Output Configuration	4 normally open (NO) output channels; 1 normally closed (NC) and 2 solid-state auxiliary outputs Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2. The normally closed Aux. output channel is a parallel connection of contacts from two forced-guided relays, K1-K2. **Contacts:** AgNi, 5 µm gold-plated **Low Current Rating:** The 5 µm gold-plated contacts allow the switching of low current/low voltage. In these low-power applications, multiple contacts can also be switched in series (e.g., "dry switching"). **To preserve the gold plating on the contacts, the following max. values should not be exceeded at any time:** **Minimum:** **Voltage:** 1 V ac/dc **Current:** 5 mA ac/dc **Power:** 5 mW (5 mVA) **Maximum:** **Voltage:** 60 V **Current:** 300 mA **Power:** 7 W (7 VA) **High Current Rating: If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) change to:** EMERGENCY STOP DEVICE 29YL LISTED c UL IND. CONT. EQ. 447Y LISTED **Minimum:** **Voltage:** 15 V ac/dc **Current:** 250 mA ac/dc Power: 5 W (5 VA) **Maximum:** NO Safety Contacts (13-14, 23-24, 33-34, 43-44): 250 V ac/ 24 V dc, 6A resistive B300, Q300 (UL508) NC Auxiliary Contact (51-52): 250 V ac/ 24 V dc, 5A resistive B300, Q300 (UL508) CE **Minimum:** **Voltage:** 15 V ac/dc **Current:** 250 mA ac/dc **Power:** 5 W (5 VA) **Maximum—IEC60947-5-1** **NO Safety Contact: AC-1:** 250 V ac, 6A; **DC-1:** 24 V dc, 6A **AC-15:** 230 V ac, 3A; **DC-13:** 24 V dc, 4A **NC Auxiliary Contact: AC-1:** 250 V ac, 5A; **DC-1:** 24 V dc, 5A **AC-15:** 230 V ac, 2A; **DC-13:** 24 V dc, 4A **Mechanical life:** >20,000,000 operations **Electrical life:** 150,000 cycles @ 1500 VA; 1,000,000 cycles @ 450 VA; 2,000,000 cycles @ 250 VA; 5,000,000 cycles @ 125 VA NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts. **Solid-State Monitor Outputs:** - Two non-safety solid-state dc outputs - Output at Y32 monitors state of outputs – conducts (output high) when both K1 and K2 are energized - Output at Y35 conducts (output high) when in normal operation (no lockout) - Output circuits require application of +12-24 V dc ±15% at terminal Y31; dc common at Y30 - Maximum switching current: 100 mA at +12-24 V dc - Both outputs are protected against short circuits
Output Response Time	35 milliseconds max, 25 milliseconds typical
Input Requirements	Safety mat normally open contact must be capable of switching 20 to 100 mA @ 12 to 30 V dc; and must be closed > 25 ms for a valid stop command **115/230 V ac or 24 V dc:** Maximum input resistance 250 ohms per lead; maximum contact resistance: 150 ohms **12 V dc Supply:** Maximum input resistance 25 ohms; maximum contact resistance: 10 ohms **Reset switch:** must have one normally open contact capable of switching 20 to 50 mA @ 12 to 30 V dc
OFF-State Recovery Time	350 ms max.
Status Indicators	**3 green LED indicators:** Power ON, Channel 1 (high side), Channel 2 (low side) **1 red LED indicator:** indicates a fault condition
Construction	Polycarbonate housing
Environmental Rating	Rated NEMA 1; IEC IP20
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54) or better.
Vibration Resistance	10 to 60 Hz @ 0.35 mm displacement per UL 991 60 to 150 Hz @ 5 g max.
Operating Conditions	**Temperature:** 0° to +50 °C **Relative humidity:** 90% @ +50 °C (non-condensing)
Design Standards	Cat. 4, PL e per EN ISO 13849-1; SIL 3 per IEC 61508 and IEC 62061 (Cat 3 with Safety Mat)
Certifications	CE, EMERGENCY STOP DEVICE 29YL LISTED, c UL IND. CONT. EQ. 447Y LISTED

Muting Module

Safety Modules

- Muting Modules suspend safeguarding during non-hazardous times in the machine's cycle, allowing material to move into or from the process without tripping the muted safeguard
- Monitors hard-relay contact or PNP output safety devices
- Suitable for Type 4 (Category 4) applications
- Connects to supplemental safeguarding devices or E-Stops
- Can be used as a Dual Controller for safety devices, such as two Safety Light Screens, regardless of whether or not the muting function is used
- Housings are rugged polycarbonate and mount to standard 35 mm DIN rail
- Relay outputs are capable of reliably switching low or high current applications

Muting Modules

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

NC = Normally Closed Relay, NO = Normally Open Relay

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

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

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

Continued on next page

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

Non-Safety Outputs	**Model MMD-TA-11B:** Aux. output 31–32 is a parallel connection of two N.C. contacts from internal relays K1 and K2 **Contact:** AgNi, 5 µm gold-plated **Low Current Rating:** **Caution: The 5 µm gold-plated contacts allow the switching of low current/low voltage.** To preserve the gold plating on the contacts and also guarantee reliable switching, the following values should be kept within the min. and max. ranges shown below: **Min. Voltage:** 1 V ac/dc **Max. Voltage:** 24 V ac/dc **Min. Current:** 5 mA ac/dc **Max. Current:** 250 mA ac/dc **Min. Power:** 5 mW (5 mVA) **Max. Power:** 6 W (6 VA) **High Current Rating:** **For higher loads, the min. and max. values of the contact(s) changes to:** **Min. Voltage:** 15 V ac/dc **Max. Voltage:** 120 V ac/dc **Min. Current:** 30 mA ac/dc **Max. Current:** 6 A **Min. Power:** 0.45 W (0.45 VA) **Max. Power:** 160 W/720 VA **Mechanical Life:** 50,000,000 operations Electrical Life: >10 x 106 cycles **Model MMD-TA-12B:** Z4–Z3 = Aux. 24 V / 250 mA PNP output follows the two OSSD safety outputs
Status Indicators	**3 Status LEDs (Red, Green and Yellow):** indicate waiting for Reset, Lockout, Override, and OSSD status Yellow and Green LEDs adjacent to individual inputs/interfaces indicate status (ON = active/closed)
Diagnostic Code Display	Diagnostic Display is a two-digit numeric display that indicates the cause of lockout conditions and the amount of time remaining for the backdoor timer
Muting Lamp Output	A monitored or non-monitored (selectable) sinking output. If monitoring has been selected, the current draw must be 10 to 360 mA. Interconnect wire resistance < 30 Ω. **Max. switching voltage:** 30 V dc **Max. switching current:** 360 mA **Min. switching current:** 10 mA **Saturation voltage:** ≤ 1.5 V dc @ 10 mA; ≤ 5 V dc @ 360 mA
Controls and Adjustments	**All configured on two redundant banks of DIP switches:** Manual/auto reset One-way/two-way muting Monitored/non-monitored mute lamp output One-channel/two-channel/no EDM Backdoor timer Mute on power-up enable
Inputs	The MSSI and the SSI can be interfaced with external safety devices that have either hard contact outputs or solid-state sourcing outputs When connecting the MSSI (S11-S12, S21-S22) or SSI (X5-X6, X7-X8) inputs to safety relay outputs or hard contacts, these contacts must be capable of switching 15 to 30 V dc at 10-50 mA **Operating Range for MSSI and SSI Inputs** **OFF State:** –3 V to +5 V, 0 to 2 mA **ON State:** 15-30 V, 10-50 mA **Muteable Safety Stop Interface (MSSI)** This input consists of two channels (MSSI-A and MSSI-B), and can be muted when the requirements for a mute cycle have been met. When muted, the OSSDs remain ON, independent of the MSSI status. If not muted, when either or both channels open, the OSSD outputs will go OFF. Maximum external resistance per channel must not exceed 400 Ω. **Safety Stop Interface (SSI)** This input consists of two channels (SSI-A and SSI-B), and is always active. When one or both channels open, the OSSD Outputs will go OFF. Maximum external resistance per channel must not exceed 400 Ω.
External Device Monitoring (EDM)	Two pairs of terminals are provided to monitor the state of external devices controlled by the OSSD outputs. Each device must be capable of switching 15-30 V dc at 10-50 mA.
Muting Device Inputs	The muting devices work in pairs (M1 and M2, M3 and M4) and are required to be "closed" within 3 seconds of each other (simultaneity requirement/synchronous actuation) to initiate a mute (assuming all other conditions are met). Each muting device must be capable of switching 15-30 V dc at 10-50 mA.
Mute Enable Input	The mute enable input must have +24 V dc applied in order to start a mute; opening this input after mute has begun has no effect. The switching device must be capable of switching 15-30 V dc at 10-50 mA.

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

Override Inputs	The two-channel inputs must be closed within 3 seconds of each other (simultaneity/synchronous action requirement) and held closed during the 30-second Override. To initiate a subsequent Override, open both channels, wait 3 seconds, and then re-close both channels (within 3 seconds). The switching devices must be capable of switching 15-30 V dc at 10-50 mA.
Reset Input	Terminals must be closed for a minimum of 0.25 seconds and not more than 2.0 seconds in order to guarantee a reset. The switching device must be capable of switching 15-30 V dc at 10-50 mA.
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 55 Hz @ 0.35 mm displacement per IEC 60068-2-6
Construction	Polycarbonate housing
Connections	Removable terminal blocks
Environmental Rating	NEMA 1; IP20
Operating Conditions	**Temperature range:** 0° to +50 °C **Relative humidity:** 95% (non-condensing)
Design Standards	Designed to comply with Safety Category 4 per SIL 3 (IEC 61508); SIL CL3 (IEC 62061); Category 4, Performance Level (PL) e (ISO 13849-1)
Certifications	CE c UL us LISTED AOPD 10GH

Safe Speed Monitoring

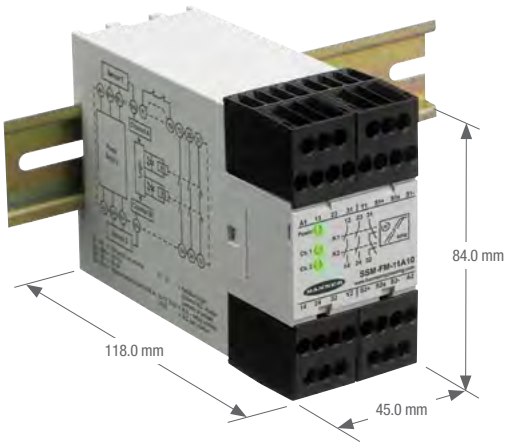
Safety Modules

- Safe Speed Safety Modules monitor redundant devices, such as two sensors with PNP outputs for rotation and linear movements allowing locked gates or guards to be opened when speed drops below or above the dangerous level
- Each module has four adjustable RPM ranges
- Provides two normally open safety contacts and one normally closed auxiliary contact, each rated at 4 amps
- Housings are rugged polycarbonate and mount to standard 35 mm DIN rail

SSM Safe Speed Monitoring Modules

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

NC = Normally Closed Relay, NO = Normally Open Relay



SSM-FM-11A... Models

SSM Safe Speed Monitoring Module Specifications

Supply Voltage and Current	24 V ac/dc, 50-60 Hz, no polarity **AC:** 24 V +10% / -15% DC: 24 V ±10% Power consumption: approx. 4 VA/2.5 W
Start-up Reset Time	1.5 second
Hysteresis	6% typical
Input Requirements	**PNP-Input sensors:** 24 V dc (terminals S1s and S2s) **Input current min.:** 3 mA **Input current max.:** 25 mA **Min. pulse time:** 1 millisecond ON; 1 millisecond OFF
Max. IPM at Inputs S1s and S2s	30,000
Adjustable Setting Ranges (Impulses per Minute)	**SSM-FM-11A10:** 5…40 ipm, 35…340 ipm, 300…2,700 ipm or 1,200…10,500 ipm **SSM-FM-11A20:** 10…80 ipm, 80…650 ipm, 600…5,300 ipm or 2,400…20,000 ipm
Output Response Time	**Standstill / Under-speed detection:** (60 seconds/adjusted IPM value) + 2.5 seconds = tDS tDS = output ON-delay after detection of standstill **Over-speed detection:** **SSM-FM-11A10:** Range 5…10,500: tR = 700 milliseconds typical **SSM-FM-11A20:** Range 10…20,000: tR = 350 milliseconds typical
Output Configuration	**Outputs K1 & K2:** two redundant (total of four) safety relay NO (forced-guided) contacts—AgNi, gold flashed; one auxiliary NC contact—AgNi, gold flashed **Contact ratings (all NO and NC output contacts):** 2 normally open (NO) output channels and 1 normally closed (NC) auxiliary output **Current Rating:** **Thermal Current Ith:** 4 A **Switching Capacity to AC 15:** 3 A / 230 V ac for NO contacts (per IEC/EN 60947-5-1) 2 A / 230 V ac for NC contact (per IEC/EN 60947-5-1) **Min. voltage:** 15 V ac/dc — **Max. voltage:** 230 V ac/dc **Min. current:** 30 mA ac/dc — **Max. current:** 4 A **Min. power:** 0.45 W (0.45 VA) — **Max. power:** 100 W (920 VA) **Mechanical Life:** ≥50,000,000 operations **Electrical life (switching cycles of the output contacts, resistive load):** 350,000 cycles @ 920 VA; 1,000,000 cycles @ 440 VA; 2,000,000 cycles @ 250 VA; 5,000,000 cycles @ 125 VA NOTE: Transient suppression is recommended when switching inductive loads. Install suppressor across load. Never install suppressor across output contacts.
Indicators	**3 green LED indicators:** Power On, Channel 1 active, and Channel 2 active
Construction	Polycarbonate housing
Environmental Rating	Rated NEMA 1; IEC IP20 (IEC/EN 60529)
Mounting	Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IEC IP54) or better.
Vibration Resistance	10 to 55 Hz @ 0.35 mm displacement per IEC 60068-2-6
Operating Conditions	**Temperature:** 0° to 50 °C **Max. Rel. Humidity:** 90% @ +50 °C (non-condensing)
Design Standards	Cat. 3 PL e per DIN EN ISO 13849-1; SIL CL 3 per IEC 62061
Certifications	Approvals are pending This module was evaluated by UL to UL508 Industrial Control Equipment, which is not a certification relating to the safety performance of the module

Interface Relay Modules

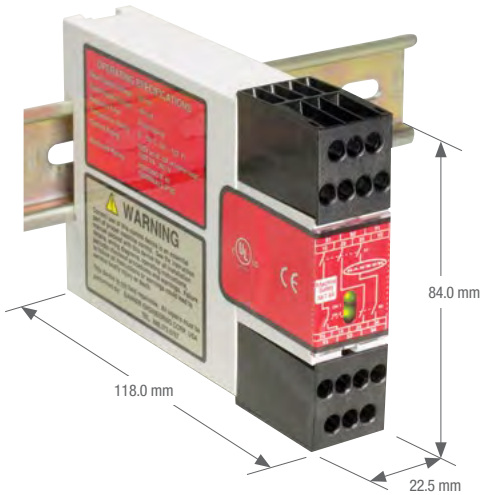
Safety Modules

- Interface relay modules serve as a relay for safety devices with OSSD solid-state or hard contact outputs and external device monitoring, such as the EZ-SCREEN®
- Increases the switching current capacity of low-voltage safety devices up to 6 amps
- Requires no adjustment
- Housings are rugged polycarbonate and mount to standard 35 mm DIN rail
- Relay outputs are capable of reliably switching low or high current applications

Interface Modules

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

NC = Normally Closed Relay, NO = Normally Open Relay



Interface Models

Interface Modules Specifications

Input Voltage and Current	24 V dc, +/-15% no polarity, 10% max. ripple; 50 mA per input channel Power consumption: approx. 2.4 W
Supply Protection Circuitry	Protected against transient voltages
Overvoltage Category	Output relay contact voltage of 1 V to 150 V ac/dc: Category III Output relay contact voltage of 151 V to 250 V ac/dc: Category II (Category III, if appropriate overvoltage reduction is provided, as described in data sheet.)
Pollution Degree	2
Output Configuration	**IM-T-9A:** 3 normally open output channels **IM-T-11A:** 2 normally open output channels and 1 normally closed auxiliary output channel Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2. The normally closed contact 31-32 is a parallel connection of contacts from K1-K2. **Contacts:** AgNi, 5 µm gold-plated **Low Current Rating:** The 5 µm gold-plated contacts allow the switching of low current/low voltage. In these low-power applications, multiple contacts can also be switched in series (e.g., "dry switching"). To preserve the gold plating on the contacts, do not exceed the following max. values at any time: **Min. voltage:** 1 V ac/dc — **Max. voltage:** 60 V **Min. current:** 5 mA ac/dc — **Max. current:** 300 mA **Min. power:** 5 mW (5 mVA) — **Max. power:** 7 W (7 VA) **High Current Rating: If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to:** **Min. voltage:** 15 V ac/dc — **Max. voltage:** 250 V ac/dc, 6A resistive **Min. current:** 30 mA ac/dc — **Max. power:** 150 W (1,500 VA) **Min. power:** 0.45 W (0.45 VA) — IEC 60947-5-1: **AC-15:** 230 V ac, **3A: DC-13:** 24 V dc, 4 A **Mechanical life:** 20,000,000 operations **Electrical life:** 150,000 cycles @ 1500 VA; 1,000,000 cycles @ 450 VA; 2,000,000 cycles @ 250 VA; 5,000,000 VA @ 125 VA **Feedback contact rating (Y1-Y2, Y3-Y4):** **Min. voltage:** 1 V ac/dc — **Max. voltage:** 60 V **Min. current:** 5 mA ac/dc — **Max. current:** 300 mA **Min. power:** 5 mW (5 mVA) — **Max. power:** 7 W (7 VA) NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.
Output Response Time	20 milliseconds max.
Status Indicators	**2 green LED indicators:** K1 energized K2 energized
Construction	Polycarbonate housing
Environmental Rating	Rated NEMA 1; IEC IP20
Mounting	Mounts to standard 35 mm DIN rail track. Interface Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 55Hz @ 0.35 mm displacement per IEC 60068-2-6
Operating Conditions	**Temperature:** 0° to +50 °C **Relative humidity:** 90% @ 50 °C (non-condensing)
Design Standards	EN 60204-1, IEC 61810-1, EN 60255-1, EN 50205
Application Notes	There are no adjustments or user-serviceable parts.
Certifications	CE c UL us

Extension Relay Modules

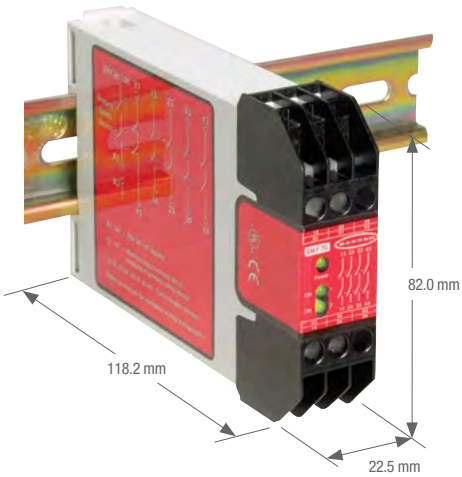
Safety Modules

- Extension Relay Modules provide additional safety outputs for a safety modules with relay contact outputs and external device monitoring
- Provides delayed or immediate outputs, depending on model
- Requires no adjustment
- Housings are rugged polycarbonate and mount to standard 35 mm DIN rail

Extension Modules

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

NC = Normally Closed Relay, NO = Normally Open Relay



EM-F..-7G Models

EM-T-7A Models

Extension Module Specifications

Supply Voltage and Current	**EM-T-7A model:** A1-A2: 24 V dc, +/-15%, 10% max. ripple **EM-F/FD-7G.. models:** A1-A2: 24 V ac/dc, +/-10%, 10% max. ripple on dc
Supply Protection Circuitry	Protected against transient voltages and reverse polarity
Output Configuration	**Four output channels:** **EM-T-7A:** Each channel is a series connection of two forced-guided (positive-guided) relay contacts – AgNi, gold flashed **EM-F/FD-7G.. :** Each channel is a series connection of two forced-guided (positive-guided) relay contacts – AgSnO2 **Contact ratings:** **Max. voltage:** 250 V ac/dc **Max. current:** 6 A ac/dc **Min. current:** 30 mA @ 24 V dc **Max. power:** 1500 VA, 200 W **Mechanical life: EM-T-7A model:** 50,000,000 operations **EM-F/FD-7G.. models:** 10,000,000 operations **Electrical life:** 100,000 at full resistive load **Feedback contact rating (Y1-Y2): EM-T-7A:** 24 V dc @ 0.5A **EM-F/FD-7G..:** 250 V ac/dc @ 3A NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.
Output Response Time	**EM-T-7A:** 20 milliseconds max. (if channel u-k fails, maximum response time is 200 milliseconds) **EM-F-7G:** 35 milliseconds typical **EM-FD-7G..:** **Delay OFF:** 0.5 seconds ±30% for **EM-FD-7G2**, 1 seconds ±30% for **EM-FD-7G3**, 2 seconds ±30% for **EM-FD-7G4**, as measured from the time when the supply voltage to A1 is interrupted **Delay ON:** 30 milliseconds for all models
Input Requirements	**EM-T-7A:** Inputs from Safety Device must each be capable of switching 30 to 250 mA @ 13 to 28 V dc **EM-F/FD-7G..:** Input from Safety Device must be capable of switching 40 to 100 mA @ 13 to 27 V ac/dc
Status Indicators	**3 green LEDs:** Power ON K1 energized K2 energized
Construction	Polycarbonate housing
Environmental Rating	Rated NEMA 1; IP20
Mounting	Mounts to standard 35 mm DIN rail track. Extension Module must be installed inside an enclosure rated NEMA 3 (IP54), or better.
Vibration Resistance	10 to 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 EN 292-1, ISO 12100-1, EN 292-2, ISO 12100-2, EN 954-1, EN 20604-1, EN 60335-1
Certifications	UL LISTED EMERGENCY STOP DEVICE 29YL