

English

SYA14, SYA30 and SYA60 Series Safety Light Curtains



⚠ WARNING

IMPROPER INSTALLATION

- Consult with US and/or European safety agencies and their requirements when designing a machine control link, interface and all control elements that affect safety.
- Strictly adhere to all installation instructions.
Failure to comply with these instructions could result in death or serious injury.

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1. Important Information

1.1 Overview

Thank you for purchasing this Honeywell safety product. This manual contains description, operation, installation, electrical connections, maintenance and troubleshooting information related to the FF-SYA Series safety light curtains.

1.2 Organization of Installation Manual

This installation manual has the following sections:

- **Important Information** contains important highlighted information, the manual's organization, control reliability information, approvals, standards, regulations and directives.
- **Description and Operation** provides operation and specification information.
- **Installation** explains how to properly install safety light curtains.
- **Connections and Setup** covers electrical installation, interfacing and setup procedures.
- **Inspection and Maintenance** contains inspection, maintenance, and indicator status information.
- **Order Guides** provide catalog listings of light curtains, accessories, and spare parts.
- **Warranty Information** provides important contact information related to sales and service.
- **Index** contains keywords and their associated pages related to topics found throughout this manual.

1.3 Important Highlighted Information

Important danger, warning, caution and notices are highlighted throughout the manual as follows:

DANGER

A DANGER symbol indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

A WARNING symbol indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

A CAUTION symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

NOTICE

A NOTICE symbol indicates important information that must be remembered and aids in job performance.

1.4 Control Reliability

“Control Reliability” means that, “the device, system or interface shall be designed, constructed and installed such that a single component failure within the device, interface or system shall not prevent normal stopping action from taking place but shall prevent a successive machine cycle.” (ANSI B11.19-1990, 5.5)

OSHA 29 CFR 1910.217 states that, “the control system shall be constructed so that a failure within the system does not prevent the normal stopping action from being applied to the press when required, but does prevent initiation of a successive stroke until the failure is corrected. The failure shall be detectable by a simple test, or indicated by the control system.”

Honeywell has developed a self-checking technique that combines reliability with safety. The FF-SYA Series safety light curtain functions with dual channel redundancy and positive self-check monitoring. This means that a faulty component in our product will make the safety light curtain fail in a safe mode.

This design meets the highest safety requirements (type 4) described in the IEC/EN 61496-1 and IEC/pr EN 61496-2 norms. Type 4 devices are designed and manufactured in such a way that a single breakdown or an accumulation of failures does not lead to the loss of the safety function when a dangerous situation arises. **The safety function is maintained on a permanent basis.**

1.5 Approvals

Approvals	Description
CE Compliance with the EN 61496 - parts 1 & 2 Standards for type 4 Electrosensitive Protective Equipment	Only the packaging and the documentation of FF-SYA Series products carry the CE mark; the CE declaration of conformity is at the back of this manual
CSAcus	Canadian Standards Association

1.6 Safety Light curtain Installation and Use

Installation and use of this product must be performed by a qualified person thoroughly familiar with all instructions contained within this manual and all applicable safety regulations including those described below.

1.7 European Directives Compliance

Directives	Number
Machine Directive	98/37/EEC
Low Voltage Directive	73/23 EEC
Electromagnetic Compatibility Directive	89/336 EEC

The EC type examination certificate granted by the French Institut National de la Recherche et de la Sécurité (INRS) guarantees the conformity of the product with respect to the essential requirements of the Machinery Directive 98/37/EEC. To complete the EC type examination, further tests have been carried out by external laboratories to guarantee the conformity of the product with respect to the Low Voltage 73/23 EEC and the Electromagnetic Compatibility 89/336 EEC.

An EC declaration of conformity will be found at the back of this manual.

1.8 European Standards Compliance

- The FF-SYA Series safety light curtain complies with the following European standards:

Regulation	Title
EN 292	Safety of Machinery - Basic concepts, general principles for design
EN 60204 - 1	Safety of Machinery - Electrical equipment of machines
EN 954 - 1	Safety of Machinery - Safety related parts of control systems
IEC/EN 61496 - 1	Safety of Machinery - Electrosensitive protective equipment - part 1: General requirements and tests
IEC/pr EN 61496-2	Safety of Machinery - Electrosensitive protective equipment - part 2: Active optoelectronic Protective Devices

- Installation and use of the FF-SYA light curtain must comply with the following applicable European standards (non exhaustive list):

Regulation	Title
EN 292	Safety of Machinery - Basic concepts, general principles for design
EN 60204 - 1	Safety of Machinery - Electrical equipment of machines
EN 954 - 1	Safety of Machinery - Safety related parts of control systems
IEC/EN 61496-1	Safety of Machinery - Electrosensitive protective equipment - part 1: General requirements and tests
IEC/pr EN 61496-2	Safety of Machinery - Electrosensitive protective equipment - part 2: Active optoelectronic Protective Devices
Pr EN 999	Safety of Machinery - The positioning of protective equipment in respect of approach speeds of parts of the human body
EN 294	Safety of Machinery - Safety distances to prevent danger zones from being reached by the upper limbs
Pr EN 811	Safety of Machinery - Safety distances to prevent danger zones from being reached by the lower limbs
pr EN 692	« Machine-tool - Safety - Mechanical Presses »
pr EN 693	« Machine-tool - Safety - Hydraulic Presses »
pr EN 12622	« Hydraulic press brakes - Safety »
pr EN 201	« Injection plastic moulding machines »
pr EN 289	« Compression moulding and transfer machines »
pr EN 11553	« Laser for material processing »
EN 775	« Manipulating Industrial Robots »
EN 415-1	« Safety of packaging machines - Part 1: Common requirements »
EN 415-2	« Safety of packaging machines - Part 2: Preformed rigid container packaging machinery »
EN 415-3	« Safety of packaging machines - Part 3: Form, fill and seal machines »
EN 415-4	« Safety of packaging machines - Part 4: palletisers and depalletisers »

1.9 United States Regulations Compliance

US Regulation	Title
OSHA 29 CFR 1910.212	General Requirements for (guarding of) All Machines
OSHA 29 CFR 1910.217	(Guarding of) Mechanical Power Presses

- Safety light curtains may be used as primary protection for machines where the movement of the functional parts can be interrupted at any moment in a dangerous phase.
- Safety light curtains may be used as primary protection for machines on which the control circuit has been designed in such a manner that a fault in one component does not result in any risk.
- Cancellation of the safety light curtain stop signal must not cause the restart of the moving parts. The function to restart can only be initiated by means of a control designed for this purpose.

1.10 United States Standards Compliance

- Installation and use of the FF-SYA light curtain must comply with the following applicable American standards (non exhaustive list) :

Standards	Title
ANSI B11.1	Mechanical Power Presses
ANSI B11.2	Hydraulic Power Presses
ANSI B11.19	Safeguarding when Referenced by the Other B11 Machine Tool Safety Standards
ANSI/RIA R15.06	Safety Requirements for Industrial Robots and Robot Systems

1.11 Additional Protection

In some applications, it may be necessary to provide additional protection to maintain the protection level provided by the safety light curtain. Hard guards or additional presence sensing devices such as safety mats or laser scanner, may be used to ensure the operator is either forced to move through the sensing field to enter the danger zone, or forced to stand on the sensing area inside the danger zone.

Hard guards should be installed permanently with the aid of a tool or welded (if possible). If hard guards need to be automatically positioned, their positioning must be checked. It must not be possible for operators to neutralize the detectors associated with these hard guards. Hard guards shall comply with the following applicable European Standards:

Standards	Title
Pr EN 953	Safety of Machinery - General requirements for the design and construction of guards
EN 294	Safety of Machinery - Safety distances to prevent danger zones from being reached by the upper limbs
pr EN 811	Safety of Machinery - Safety distances to prevent danger zones from being reached by the lower limbs
EN 1088	Safety of Machinery - Interlocking devices with and without guard locking
EN 954-1	Safety of Machinery - Safety related parts of control system

Honeywell FF-SR Series safety control modules may be used as an interface between protective safety equipment and machine control circuitry. The following safety control modules are particularly recommended:

- FF-SRS: safety control module designed for emergency stop
- FF-SRD Series: safety control module designed for door monitoring
- FF-SR2: safety relay control module designed for two-hand controls
- FF-SR0 Series: safety control module designed for standstill detection on inductive motors
- FF-SRT Series: time delay module
- FF-SRE Series: expansion relay module

They offer redundancy, monitoring, and control reliability features that ensure the highest level of industrial safety.

Honeywell safety switches and sensors that may be used to check the position of guards include:

- 50FY and 40FY Hall effect safety sensors
- GSS safety limit switches
- GK and GKM key operated safety switches
- GKR/L solenoid key operated safety interlock switches
- 24/924CE miniature safety limit switch

Honeywell safety optoelectronic products that may be used with the FF-SYA Series safety light curtain include:

- FF-SM safety mat
- FF-SE laser scanner
- FF-SPS4 single beam safety device
- FF-SCAN modular safety light curtain

2. Description and Operation

2.1 Overview

This chapter contains terms and concepts related to safety and the application of the FF-SYA Series light curtain. The importance of the installer's role in the set-up and installation of the machine guarding systems is discussed. The section also contains specification and order guide information.

2.2 Machine Guarding and Perimeter Protection

FF-SYA14 and FF-SYA30 Series thru-scan light curtains are non-contact machine guarding devices designed to increase the protection of operators of power driven machinery (see Figure 2-1). The FF-SYA60 Series light curtain is designed for access control of dangerous areas.

WARNING

IMPROPER INSTALLATION OF FF-SYA SERIES LIGHT CURTAIN

- Install FF-SYA light curtains in accordance with this installation manual and applicable local safety regulations (OSHA, ANSI, European standards).
- Allow entry into protected area by interruption of sensing field of the safety light curtain or activation of other safeguarding device only.

Failure to comply with these instructions could result in death or serious injury.

FF-SYA Series light curtains generate a stop signal if the sensing field is interrupted. Further operation is prevented until the sensing field is cleared. The FF-SYA Series light curtain monitors itself continuously for component failures, misalignments, and dirt accumulations. Small misalignments or dirt accumulation are indicated by a flashing LED. If misalignment or dirt accumulations become too great or a component fails, a stop signal is generated. Operation is prevented until the condition is corrected.

WARNING

IMPROPER SYSTEM PERFORMANCE

- Comply with local safety requirements when designing machine control link, interface and all control elements that affect safety.
- Install two independent safety relay contacts into machine control stop circuit controlled by FF-SYA Series light curtain.
- Ensure two independent stop circuit relays have mechanically linked contacts to reliably detect a welded contact.
- Using the FF-SRS59392 safety control module will provide fail-safe contacts to the machine control stop circuit.

Failure to comply with these instructions could result in death or serious injury.

FF-SYA14, FF-SYA30 and FF-SYA60 Series light curtains are designed so a malfunction or an interruption of the sensing field will immediately cause the light curtain to generate a stop signal. This stop signal will be generated automatically if a malfunction occurs in the light curtain. All other machine control components that affect safety should also be designed to the same high level of operation.

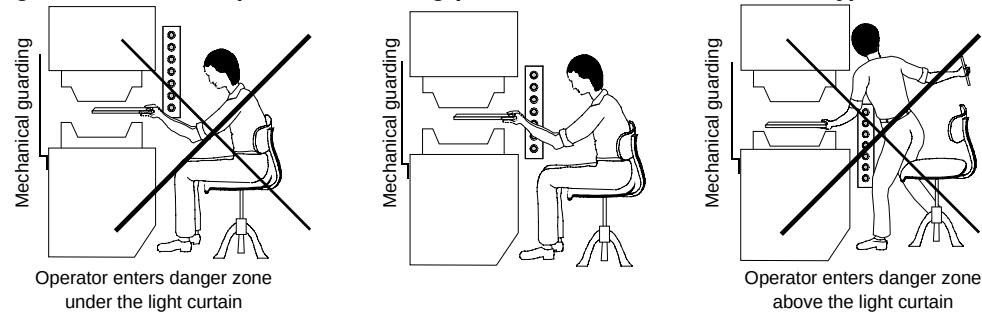
⚠ WARNING

IMPROPER MACHINE REACTION

- Ensure the machine control is capable of stopping the machine at any point in the cycle.
- Ensure that a loss of power does NOT impair stopping action of machine.

Failure to comply with these instructions could result in death or serious injury.

Figure 2-1 Point-of-operation Guarding (use FF-SYA14 and FF-SYA30 only)



FISYA1

Point-of-operation is defined as that area where a machine performs work (such as cutting, shaping, boring, or forming) on a material.

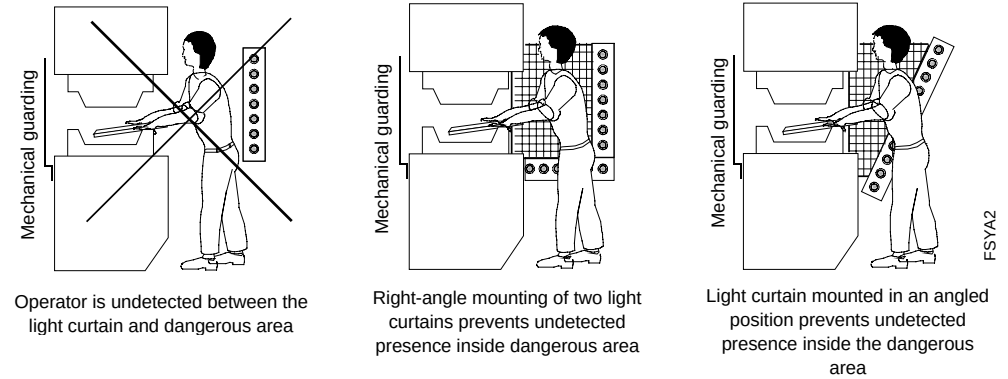
⚠ DANGER

FULL REVOLUTION MECHANICAL POWER PRESSES CANNOT BE STOPPED IN MID-STROKE (OSHA 29CFR 1910.217). Do NOT use FF-SYA Series light curtains on full revolution mechanical power presses.

Failure to comply with these instructions will result in death or serious injury.

For point-of-operation guarding, the light curtain(s) and any mechanical guards should be installed so no one can stand between the light curtain and the danger zone. This may require additional hard guarding, horizontal or angled positioning of the light curtain, or additional light curtains.

Figure 2-2 Point-of-operation Guarding (use FF-SYA14 and FF-SYA30 only)



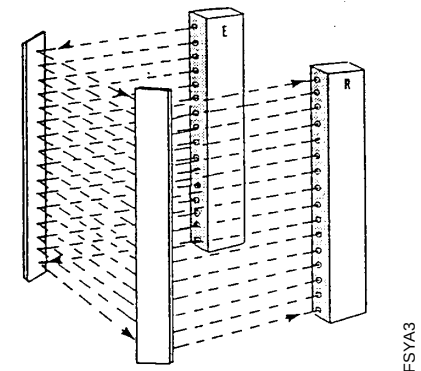
⚠ DANGER

IMPROPER POINT-OF-OPERATION PROTECTION

Do NOT use FF-SYA60 Series light curtains in point-of-operation applications.

Failure to comply with these instructions will result in death or serious injury.

Figure 2-3 Perimeter Guarding (use the FF-SYA light curtain and the FF-SB or FF-SLC mirrors)



⚠ WARNING

IMPROPER PERIMETER PROTECTION ACTIVATION

- Design control circuit that requires a manual restart before further machine operation can occur.
- Locate manual restart to allow operator a clear view of danger zone.
- Operator must NOT be able to reach manual restart from within danger zone.
- Design control circuit to prevent Programmable Logic Controller from overriding manual restart.

Failure to comply with these instructions could result in death or serious injury.

2.3 Approval and rating plates

Figure 2-4 Rating plate

NSR	0.6...20 m / 2...65 ft	V	24 Vdc, +/- 15% (6W)	FF-SYA60048C2R		L	5 kΩ max. impedance 5 V (resistive) / 7 V (inductive) min. turn-on voltage	Honeywell (F) 38240 MEYLAN
Nominal scanning range		Supply voltage		Type		Loads		
PH	510 mm / 20.08 in	T	12 ms	00056	11/98	GB : 0161/251/4038 F : 01 60 19 80 41 D : 069/8064-444 USA : 1/8005376945 C : 1-800-737-3360 AS : (02) 9370 4303		
Protection height		Response time		N°	Date			
R	30 mm / 1.2 in	I	500 mA / 24 Vdc	IP 65 / NEMA 4 & 13		Service		
Resolution		Output switching capacity		Sealing				

NSR	Nominal Scanning Range	I	Output Switching Capacity
PH	Protection Height	Type	Product Part Number
R	Resolution	N°	Serial number and date code (month/year)
V	Supply Voltage (power consumption)	S	Sealing
T	Response time	L	Loads specifications (max. impedance and min turn-on voltage)

Figure 2-5 Approvals plate

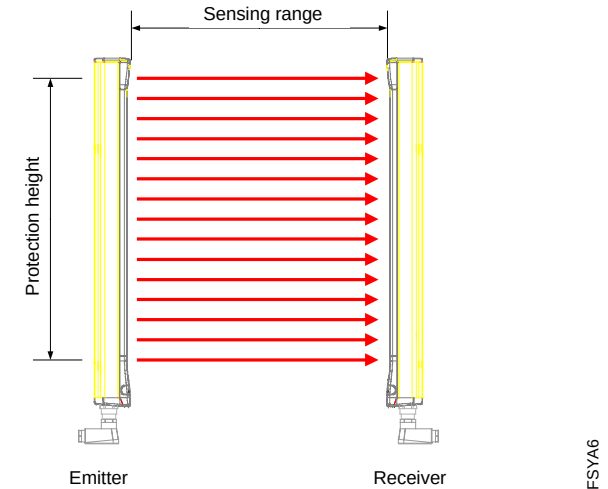
EC type examination certificate delivered by Attestation d'examen CE de type délivrée par EG Baumusterprüfbescheinigung von	 Type 4 ESPE EN 61496-1 & pr EN 61496-2
 NRTL / C	
Caution : Tests must be performed to be sure that the FF-SYA series light curtain and the machine's control system work properly. These tests should be performed : daily or after any modification or maintenance operation (see the users manual). Attention : Des tests doivent être appliqués afin de s'assurer du fonctionnement correct de la barrière immatérielle FF-SYA et du système de contrôle de la machine : quotidiennement et après chaque modification ou opération de maintenance (se reporter au manuel de l'utilisateur)	

CE	Only the packaging and the documentation of FF-SYA Series products carry the CE mark; the CE declaration of conformity is at the back of this manual
INRS	Institut National de Recherche et de Sécurité (French body notified for the CE certification of Electrosensitive protective Equipment)
CSA _{NRTL/C} (pending)	The Canadian Standard Association has been accredited as a Nationally Recognized Testing Laboratory (NRTL) by the US Occupational Safety and Health Administration (OSHA). The CSA is able to carry out tests according to the Canadian and UL standards and delivers a single certificate which is valid for both Canada and the United States.

2.4 Operation

The FF-SYA14, FF-SYA30 and FF-SYA60 Series are thru-scan light curtains. Emitters transmit modulated, infrared light that is detected by photoreceivers in the receiver. The number of light beams depends on the protected height and resolution of the light curtain.

Figure 2-6 FF-SYA Series Operational Diagram



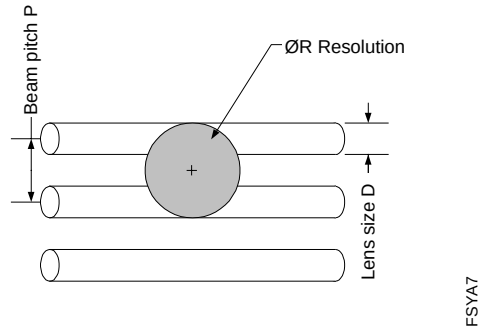
2.4.1 Synchronization

The emitter and the receiver are optically synchronized. The synchronization is an effective beam transmitted by the emitter towards the receiver. **No connection is necessary between the emitter and the receiver which simplifies installation and maintenance.**

2.4.2 Resolution

FF-SYA Series light curtain resolution (sometimes called minimum object sensitivity) is the minimum object size that will interrupt at least one light beam when it enters the sensing field. Anything entering the sensing field equal to or greater than this minimum size will be detected. Resolution is not affected by scanning distance or dust accumulation. For safety reason, the FF-SYA Series does not have a sensitivity adjustment. Two factors determine the resolution of the light curtain: beam pitch and light lens diameter (see Figure 2-7). Lens diameter is the smallest width that will block a single light beam. The combination of the beam diameter and center distance gives the FF-SYA14 (see Figure 2-6) a resolution of 14 mm (0.6 in.), the FF-SYA30 a resolution of 30 mm (1.2 in.) and the FF-SYA60 a resolution of 60 mm (2.4 in.).

Figure 2-7 Light Curtain Resolution



Models	Resolution R	Beam pitch P	Lens size D
FF-SYA14	Ø 14 / 0.6	10 / 0.4	4 / 0.16
FF-SYA30	Ø 30 / 1.2	20 / 0.8	10 / 0.4
FF-SYA60	Ø 60 / 2.4	40 / 1.6	10 / 0.4

Dimensions in mm / in.

2.4.3 Protection Height

Protection height is the height from the top of the uppermost light beam to the bottom of the lowest beam (see Figure 2-6).

2.4.4 Response Times

The response time of FF-SYA Series light curtains is the maximum time it takes the light curtain to generate a stop signal after the sensing field has been interrupted. See the table below for response times for individual light curtains.

Model number	Response Times		
	FF-SYA14	FF-SYA30	FF-SYA60
032	14.0 ms	13.5 ms	13.5 ms
048	15.0 ms	14.0 ms	14.0 ms
064	15.5 ms	14.0 ms	14.0 ms
080	17.5 ms	14.5 ms	14.5 ms
096	19.5 ms	15.0 ms	15.0 ms
112	20.5 ms	15.0 ms	15.0 ms
128	22.5 ms	15.5 ms	15.5 ms
144	NA	16.0 ms	16.0 ms
160	NA	17.5 ms	17.5 ms
176	NA	17.5 ms	17.5 ms

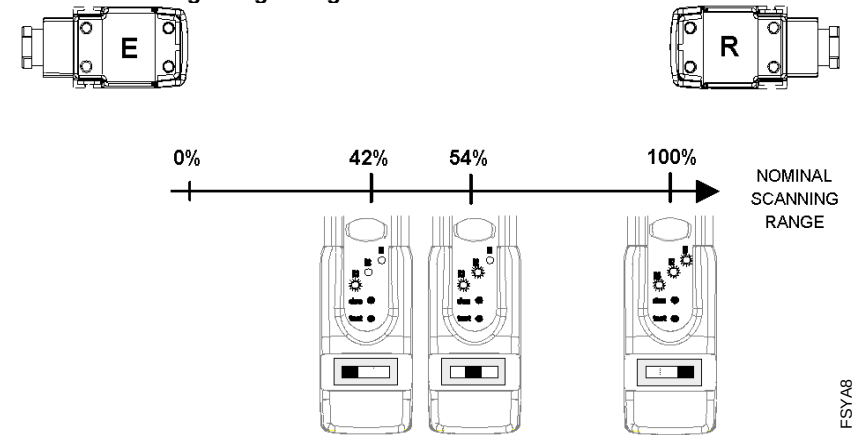
NA : Not Available

2.4.5 Scanning Ranges

Nominal scanning range is the maximum distance allowed between the emitter and the receiver. A selector switch is available on the emitter unit for the selection of the adequate emission power. Refer to the chapter 3.5 Mutual Interference or Cross-talk for correct adjustment.

The FF-SYA Series light curtains have the following scanning ranges:

Figure 2-8 Scanning Range Diagram



SCANNING RANGE SETTINGS			
Product	100% (factory setting)	54 %	42 %
FF-SYA14	0 to 6 m (0 to 20 ft)	0 to 3.25 m (0 to 10.7 ft)	0 to 2.5 m (0 to 8.3 ft)
FF-SYA30	0.6 to 20 m (2 to 65 ft)	0.2 to 10.8 m (0.6 to 35 ft)	0 to 8.4 m (0 to 27 ft)
FF-SYA60	0.6 to 20 m (2 to 65 ft)	0.2 to 10.8 m (0.6 to 35 ft)	0 to 8.4 m (0 to 27 ft)

NOTICE

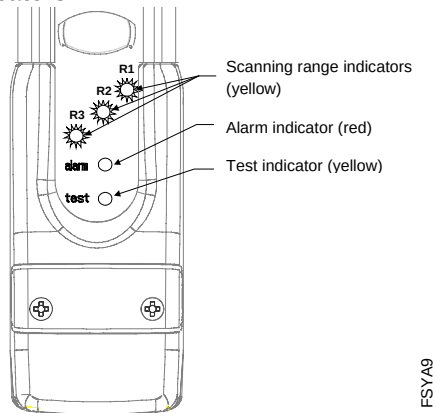
MINIMUM SCANNING RANGE

Using the light curtain below the specified minimum scanning range will maintain the light curtain in a lock out condition. To go back to normal conditions of operations, switch the power off, move away the receiver from the emitter then restaure the power.

2.5 Indicators

The FF-SYA Series emitters have five LED indicators. The receivers have four LED indicators. These LED indicators provide important information related to light curtain status.

Figure 2-9 Emitter Indicators



2.5.1 Scanning range indicators (emitter)

R3 yellow	R2 yellow	R1 yellow
Nominal Scanning Range (factory setting)		
R3 yellow	R2 yellow	R1 yellow
54% of the Nominal Scanning Range		
R3 yellow	R2 yellow	R1 yellow
42% of the Nominal Scanning Range		

The emitter is equipped with a scanning range selector for the control of the infrared emission power. The scanning range indicators are 3 yellow indicators which give an information on the selected scanning range. The maximum emission power corresponding to the light curtain Nominal Scanning Range is preset on delivery, and these 3 LEDs light on permanently. If the Nominal Scanning Range NSR is decreased to 54 % or 42 %, then only 2 or 1 LEDs remain permanently on (see chapter 2.4.5 Scanning Ranges).

2.5.2 Alarm indicator (emitter)

Alarm Normal operation red	Alarm Emitter failure red

The alarm indicator is a red LED which flashes if the emitter is detecting an emission problem. The receiver is in an alarm state and the emitter needs to be changed for correct operation. If this LED is off while the receiver is in an alarm state despite the sensing field is clear, then the receiver may be suspected.

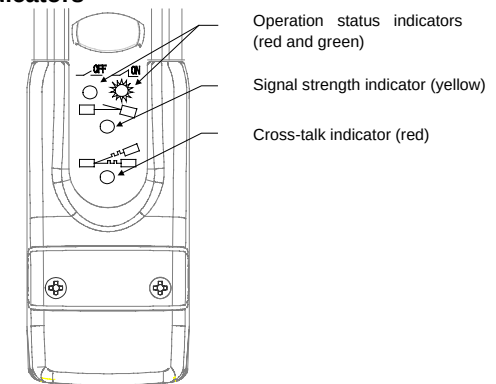
2.5.3 Test Indicator (emitter)

Test  Normal operation red	Test  Test mode red

FF-SYA Series light curtains provide a connection for testing the state of external contacts in case of long machine working cycle. The test contact allows verification of external safety-related electromechanical components before each machine cycle. When the contact in the external test circuit opens, the FF-SYA Series light curtains switches to the alarm state. The red test indicator turns on and the fail safe static outputs remain open while the test circuit is open.

The customer is responsible for providing the external test circuitry. See Electrical Connections chapter.

Figure 2-10 Receiver Indicators



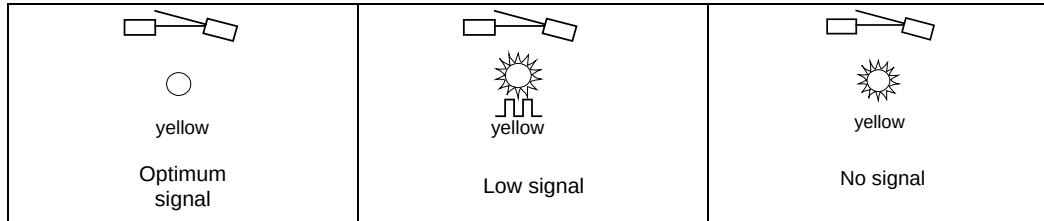
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2.5.4 Operation Indicators (receiver)

OFF ON  red  green Outputs are closed	OFF ON  red  green Outputs are open

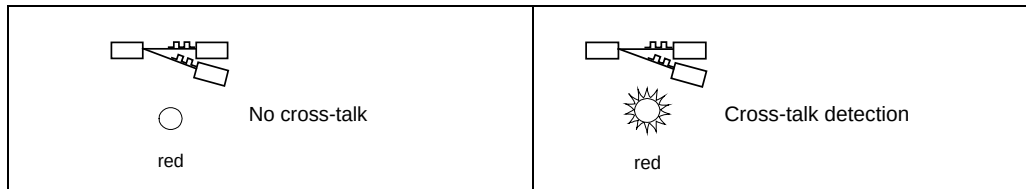
The operation indicators are two green and red LED indicators that provide operation status. The green LED indicates the receiver is operating normally and the sensing field is clear. This indicator must be on to ensure the equipment is working properly (the red LED will be off). The red LED indicates that the light curtain is in an alarm state. If the sensing field is interrupted, the FF-SYA Series light curtain will immediately generate a stop signal. In this condition, the green LED will be off.

2.5.5 Signal Strength Indicator (receiver)



The signal strength indicator is a yellow indicator which flashes repeatedly if the received light level is lower than the normal operating level, but is still sufficient for operation. If the received light level drops too low, an alarm state results and the light curtain generates a stop signal. To prevent unnecessary shutdowns, this indicator will signal the need for cleaning and/or alignment. This indicator also provides useful indication for beam alignment during the installation step.

2.5.6 Cross-talk indicator (receiver)



The cross-talk indicator is a red LED which lit on if the receiver receives two different signals from two different emitters. In this case, the light curtain is maintained in a lock-out condition. This LED helps identify cross-talk between light curtains. For correct operation this LED shall be off. To go back to normal operation, switch the power off and eliminate the interferences by reversing systems emitting orientation, or by using opaque screens, or by adjusting the adequate emission power regarding the application (see chapter 3.5. Mutual Interference or Cross-talk).

2.6 Mirrors

Mirrors provide a means to guard more than one side of a danger zone with one light curtain. One or two mirrors can be used with a emitter and receiver pair. Each mirror reduces the scanning range by 10 % (FF-SBSMIR ... series) or 30 % (FF-SLC ... MIR series). See the Scanning Range with Mirrors table below.

2.6.1 Scanning Range with Mirrors FF-SBSMIR ... Series

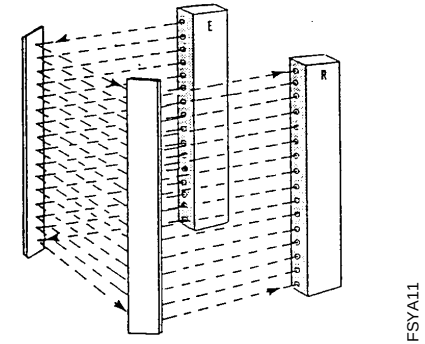
FF-SYA Series	Nominal Scanning Range	Scanning Range with Mirrors FF-SBSMIR ... Series	
		1 Mirror	2 Mirrors
FF-SYA14	0 to 6 m / 0 to 20 ft	0 to 5.4 m / 0 to 17.8 ft	0 to 4.8 m / 0 to 16.0 ft
FF-SYA30	0.6 to 20 m / 2 to 65.6 ft	0 to 18 m / 0 to 59 ft	0 to 16.2 m / 0 to 53.1 ft
FF-SYA60	0.6 to 20 m / 2 to 65.6 ft	0 to 18 m / 0 to 59 ft	0 to 16.2 m / 0 to 53.1 ft

2.6.2 Scanning Range with Mirrors FF-SLC ... MIR Series

FF-SYA Series	Nominal Scanning Range	Scanning Range with Mirrors FF-SLC...MIR Series	
		1 Mirror	2 Mirrors
FF-SYA14	0 to 6 m / 0 to 20 ft	0 to 4.2 m / 0 to 13.8 ft	0 to 2.9 m / 0 to 9.5 ft
FF-SYA30	0.6 to 20 m / 2 to 65.6 ft	0 to 14 m / 0 to 45.9 ft	0 to 9.8 m / 0 to 32.1 ft
FF-SYA60	0.6 to 20 m / 2 to 65.6 ft	0 to 14 m / 0 to 45.9 ft	0 to 9.8 m / 0 to 32.1 ft

The figure below illustrates the combination of an emitter, receiver, and two mirrors guarding three sides of a danger zone.

Figure 2-11 Two Mirrors Used with One FF-SYA Light Curtain



The protected height of the light curtain determines which mirrors should be used. Refer to the Mirror Heights table below for the height of individual mirrors and the model number they are meant to operate with.

Mirror Heights FF-SBSMIR ... Series

Part Listings	Use with following model number *	Overall Mirror Frame Height without brackets
FF-SBSMIR04	032 and 048	501 (19.72)
FF-SBSMIR06	064	704 (27.72)
FF-SBSMIR08	080	909 (35.79)
FF-SBSMIR10	096	1112 (43.78)
FF-SBSMIR12	112 and 128	1315 (51.77)
FF-SBSMIR14	144	1520 (59.84)
FF-SBSMIR16	160	1723 (67.83)

(*) : see Sensing Field Heights in the Installation chapter

Mirrors are shipped with all the necessary mounting hardware and rotatable brackets (see page 42).

Mirror Heights FF-SLC ... MIR Series

Part Listings	Use with following model number *	Overall Mirror Frame Height without brackets
FF-SLC02MIR	032	370 (14.56)
FF-SLC04MIR	048	540 (21.26)
FF-SLC06MIR	064	715 (28.15)
FF-SLC07MIR	080	885 (34.84)
FF-SLC09MIR	096	1060 (41.73)
FF-SLC11MIR	112	1230 (48.42)
FF-SLC13MIR	128	1400 (55.12)
FF-SLC16MIR	144 and 160	1750 (68.89)
FF-SLC18MIR	176	1920 (75.58)

(*) : see Sensing Field Heights in the Installation chapter

Mirrors are shipped with all the necessary mounting hardware and rotatable brackets (see page 42).

2.7 Specifications

OPERATING CHARACTERISTICS		
Nominal Scanning Range	FF-SYA14	0 to 6 m / 0 to 20 ft
	FF-SYA30	0.6 to 20 m / 2 to 65 ft
	FF-SYA60	0.6 to 20 m / 2 to 65 ft
Object Detection Size	FF-SYA14	14 mm (0.6 in.) minimum (fingers detection)
	FF-SYA30	30 mm (1.2 in.) minimum (hands detection)
	FF-SYA60	60 mm (2.4 in.) minimum (body detection)
Angle of Divergence		± 2° ±25%
Emitting Light Source		Infrared, pulsed, 880 nm
Immunity to Ambient Light	sunlight	20 000 lux
	lamplight	15 000 lux
ELECTRICAL CHARACTERISTICS		
Supply Voltage (emitter or receiver)		24 Vdc ±15%, with DC to DC converter *
Power Consumption (emitter or receiver)		Emitter: 7 W maximum
		Receiver: 5.5 W maximum
Output Type		fail-safe solid state, 2 NO
Output Switching Capability		0.5 A at 24 Vdc Max.
Allowed loads impedance		55.2 Ω min. / 5kΩ max.
Allowed loads turn-on voltage		5 V min. on 100 % resistive loads / 7 V min. on inductive loads
Test Input		External dry contact required
Response Times	FF-SYA14	≤ 22.5 msec
	FF-SYA30	≤ 17.5 msec
	FF-SYA60	≤ 17.5 msec
Immunity to Electrical Noise		IEC 61000-4-4 (Replaces IEC 801-4 Norm)
ENVIRONMENTAL/PHYSICAL CHARACTERISTICS		
Operating Temperature Range		0 to 55°C (32 to 131°F)
Relative humidity		95 %
Storage Temperature Range		-20 to 75°C (-4 to 167°F)
Sealing		NEMA 4, 13, and IP 65
Housing Dimension	FF-SYA14/30/60	Width, 42 mm (1.65 in); Depth, 55 mm (2.16 in); Height**
Material	Housing	Aluminum Alloy and polycarbonate
	Front Plate	Polymethylmethacrylate (PMMA)
	Weight per device	1.0 to 4.8 kg (2.20 to 10.56 lbs)***

*The DC to DC converter provides immunity to external disturbances as required by the IEC/EN 61496-1 standard. This is essential to guarantee the safety integrity of the light curtain.

**Refer to the Unit Height Table for individual unit heights.

***Refer to Emitter and Receiver dimensions / weights

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3. Installation

3.1 Overview

This chapter contains information about calculating the safety distance and properly mounting a safety light curtain. Mirror information is also provided.

DANGER

- **FULL REVOLUTION MECHANICAL POWER PRESSES CANNOT BE STOPPED IN MID-STROKE (OSHA 29CFR 1910.217).**
 - Do NOT use FF-SYA Series light curtains on full revolution mechanical power presses.
- Failure to comply with these instructions will result in death or serious injury.**

WARNING

IMPROPER INSTALLATION OF FF-SYA SERIES LIGHT CURTAIN

- Install FF-SYA Light Curtains in accordance with this installation manual and applicable local safety regulations (OSHA, ANSI, European standards).
- Allow entry into protected area by interruption of sensing field or other safeguarding device only.

Failure to comply with these instructions could result in death or serious injury.

WARNING

IMPROPER SYSTEM PERFORMANCE

- Comply with local safety requirements when designing machine control link, interface and all control elements that affect safety.
- Install two independent safety relay contacts into machine control stop circuit. These safety relays shall be cross-monitored to ensure fail-safe operation
- Ensure two independent stop circuit safety relays have mechanically linked contacts to reliably detect a welded contact.
- Using the FF-SRS59392 safety relay module will provide fail-safe contacts to the machine control stop circuit.

Failure to comply with these instructions could result in death or serious injury.

WARNING

IMPROPER MACHINE REACTION

- Ensure the machine control is capable of stopping the machine at any point in the cycle.
- Ensure that a loss of power does NOT impair stopping action of machine.

Failure to comply with these instructions could result in death or serious injury.

3.2 Point-of-operation Guarding

⚠ DANGER

IMPROPER POINT-OF-OPERATION INSTALLATION.

- DO NOT allow an operator to stand undetected between the light curtain and the machine when using FF-SYA Series safety light curtains for point-of-operation guarding.

Failure to comply with these instructions will result in death or serious injury.

Point-of-operation is defined as that area where a machine performs work (such as cutting, shaping, boring, or forming) on a material. For point-of-operation guarding the safety light curtain(s) and any mechanical guards must be installed so no one can stand undetected between the light curtain and the dangerous machine zone. Additional hard guarding, or light curtains may be required.

3.3 How to Calculate Safety Distance

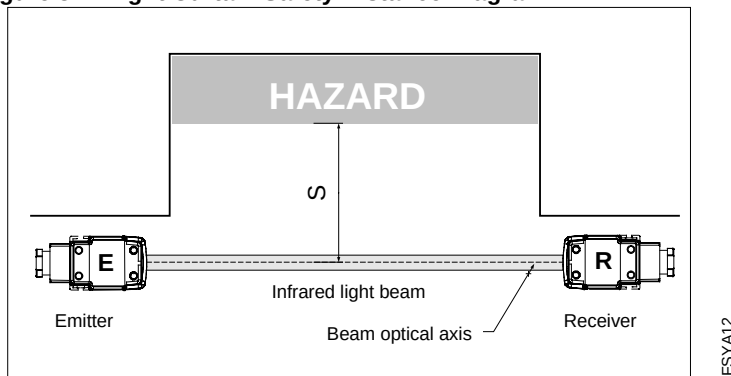
The safety distance is the minimum distance between the sensing field and the danger zone. This distance ensures that the danger zone cannot be reached until the machine motion has been stopped.

Calculate the safety distance (see Figure 3-1) using the following formula:

$S \geq V(t_1 + t_2) + C$ where,

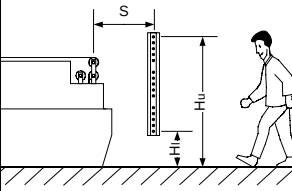
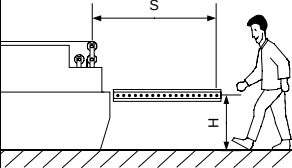
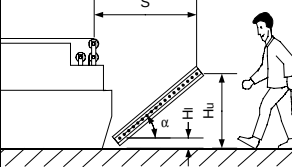
- S is the safety distance from the light curtain sensing field to the danger zone
- V is the velocity of movement into the danger zone
- t_1 is the response time of the FF-SYA light curtain.
- t_2 is the stopping time of the equipment guarded by the light curtain including interconnecting components such as all mechanical, electromechanical, and electronic parts such as relays, solenoids, and brakes.
- C is additional safety distance.

Figure 3-1 Light Curtain Safety Distance Diagram



FSYA12

3.3.1 European pr EN 999 standard

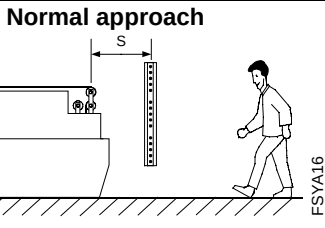
	SYA14	SYA30	SYA60
Normal approach  FSYA13	$S \geq 2000 (t1+t2)$, with $S \geq 100$ if $S \geq 500$, then use: $S \geq 1600 (t1+t2)$, with $S \geq 500$	$S \geq 2000 (t1+t2) + 128$, with $S \geq 100$ if $S \geq 500$, then use: $S \geq 1600 (t1+t2) + 128$, with $S \geq 500$	$S \geq 1600 (t1+t2) + 850$ with $Hu \geq 900 \text{ mm}$ $Hl \leq 300 \text{ mm}$
Parallel approach  FSYA14	$S \geq 1600 (t1+t2) + (1200 - 0.4H)$, with $H \leq 875$ or $S \geq 1600 (t1+t2) + 850$, with $875 \leq H \leq 1000$ with $H \geq 15$ (R-50) where R is the light curtain resolution (with $H \geq 150 \text{ mm}$ for the FF-SYA60 light curtain)		
Angled approach  FSYA15	if $\alpha \geq 30^\circ$, then use the normal approach formula, with $Hu \geq 900 \text{ mm}$ and $Hl \leq 300 \text{ mm}$ for the FF-SYA60 light curtain. if $\alpha \leq 30^\circ$, then use the parallel approach formula, with $Hu \leq 1000 \text{ mm}$ and $Hl \geq 15$ (R-50) where R is the light curtain resolution (with $Hl \geq 150 \text{ mm}$ for the FF-SYA60 light curtain)		

With :

- S minimum safety distance (in mm, 100 mm = 3.9 in.)
- t1 light curtain response time (in sec.)
- t2 machine stopping time (in sec.)
- H height of the detection plane above the reference floor (in mm, 100 mm = 3.9 in.)
- Hu height of the uppermost beam above the reference floor (in mm, 100 mm = 3.9 in.)
- Hl height of the lowest beam above the reference floor (in mm, 100 mm = 3.9 in.)

For more information, refer to the pr EN 999 European standard or comply with the requirements on safety distances given by the type C European standard if existing for the considered machine.

3.3.2 US ANSI standard

	SYA14	SYA30	SYA60
Normal approach 	$S \geq 63 (t_1 + t_2) + 0.94$	$S \geq 63 (t_1 + t_2) + 3.08$	$S \geq 63 (t_1 + t_2) + 33.46$

With:

- S minimum safety distance (in inch, 1 in. = 25,4 mm)
- t₁ light curtain response time (in sec.)
- t₂ machine stopping time (in sec.)

⚠ WARNING

IMPROPER SAFETY DISTANCE

- Calculate safety distance using formula $S > V (t_1 + t_2) + C$ where,
 - S is the safety distance from the light curtain sensing field to the danger zone (OSHA 29 CFR 1910.217 (c) (3) (iii) (e))
 - V is the velocity of movement into the danger zone; the OSHA hand speed constant is 63 in. per second; see local health and safety regulations for current value
 - t₁ is the response time of the FF-SYA light curtain
 - t₂ is the stopping time of the equipment guarded by the light curtain including interconnecting components such as all mechanical, electromechanical, and electronic parts such as relays, solenoids, and brakes
 - C is additional safety distance
- Obtain C, the additional safety distance from local safety agency.

Failure to comply with these instructions could result in death or serious injury.

3.3.2.1 Sample Calculation (Point-of-operation guarding)

Country: USA
 Application: Mechanical/hydraulic power press
 Protection: Point-of-operation guarding
 Formula: $S \geq V(t_1 + t_2) + C$
 – $V = 63 \text{ in./sec.}$
 – $t_1 = 14.5 \text{ ms (FF-SYA30080C2)}$
 – $t_2 = 200 \text{ ms (machine stop time; including response time of all interconnecting components, such as relays, solenoids, brakes, etc.)}$
 – $C = 3.08 \text{ in. (ANSI B11.1 and ANSI B11.2) [FF-SYA30]}$
 $S = 63 (0.014 + 0.200) + 3.08 \text{ in.} = 16.56 \text{ in.}$

3.3.2.2 Sample Calculation (Perimeter guarding)

Country: USA
 Application: Robotics
 Protection: Perimeter guarding
 Formula: $S \geq V(t_1 + t_2) + C$
 – $V = 63 \text{ in./sec.}$
 – $t_1 = 15 \text{ ms (FF-SYA60096C2)}$
 – $t_2 = 200 \text{ ms (robotics stop time; including response time of all interconnecting components, such as relays, solenoids, brakes, etc.)}$
 $C = 33.46 \text{ in. (USA)}$
 $S = 63 (0.015 + 0.200) + 33.46 = 47.00 \text{ in.}$

3.4 How to Calculate Minimum Distance Considering Reflective Surfaces

WARNING

REFLECTIVE SURFACES

- To prevent two optical paths to the receiver, install FF-SYA light curtains so there are no reflective surfaces within the beam angles of the emitter and receiver.
- Calculate reflective minimum distance using formula $D = L(\tan 2.5^\circ)$, where
 - D is the minimum distance to reflective surface (always greater than 131 mm or 5.16 in)
 - L is the installed scanning range

Failure to comply with these instructions could result in death or serious injury.

Reflective surfaces near the sensing field can cause reflection of the sensing beams and result in two optical paths to the receiver. The light curtain must be installed so there are no reflective surfaces within the beam angles of the emitter and receiver. Figure 3-2 illustrates the beam angles.

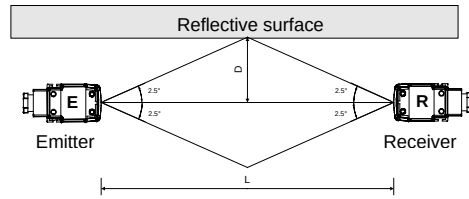
Calculate the reflective minimum distance using the following formula:

$D = 131 \text{ mm, for scanning distances between 0 and 3 m}$
 $D = L \times \tan 2.5^\circ, \text{ for scanning distances greater than 3 m}$

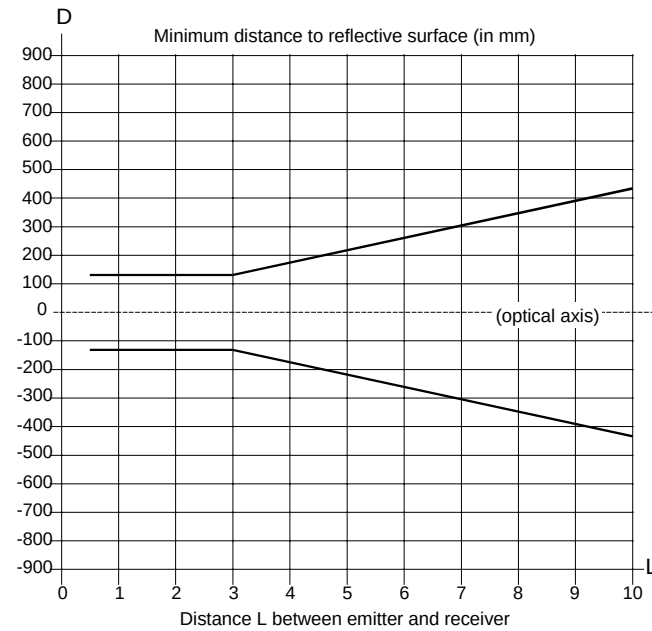
$D = \text{Minimum distance to reflective surface (always greater than 131 mm or 5.16 in.)}$
 $L = \text{Installed scanning range}$

The emitter and receiver must have the same protected height and resolution. The emitter and receiver must be mounted at the same height and aligned with each other.

Figure 3-2 Distance from Reflective Surfaces



FSYA17



FSYA18

3.5 Mutual Interference or Cross-talk

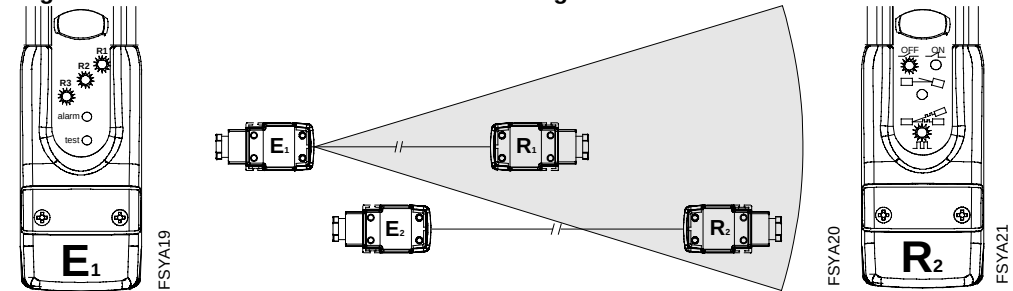
The FF-SYA Series light curtain is based upon an infrared transmission between an emitter unit and a receiver unit. It is a safety requirement of the IEC/pr EN 61496-2 standard that if a receiver R2 receives two signals transmitted by two different emitters E1 and E2, the receiver R2 must turn to the alarm state. This happens if the receiver R2 is within the 2.5° beam aperture angle and within the nominal scanning range of the second emitter E1, and the cross-talk detection indicator flickers to warn the installer.

NOTICE

MUTUAL INTERFERENCE OR CROSSTALK

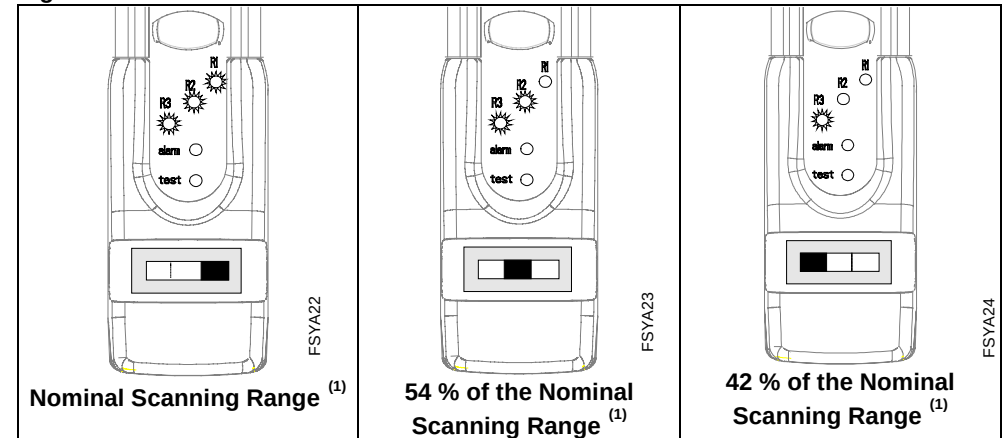
Reception of two infrared emissions will maintain the light curtain in a lock-out condition. To go back to normal operation, switch the power off and eliminate the interferences by reversing systems emitting orientation or by using opaque screen, or by adjusting the adequate emission power regarding the application. Then restaure the power.

Figure 3-3 Mutual Interferences between two light curtain sets



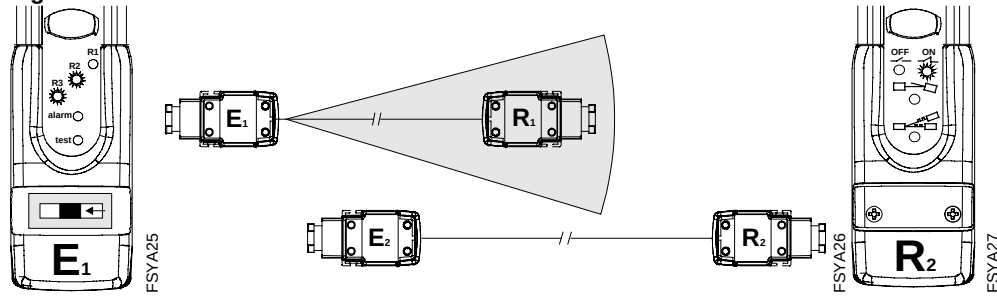
A selector switch is available on the emitter unit for the selection of the adequate emission power. It can be used to prevent this cross-talk phenomenon by decreasing the nominal scanning range.

Figure 3-4 Emission Power selector switch



(1): the Nominal Scanning Range is 6 m for the FF-SYA14 light curtain and 18 m for the FF-SYA30 and FF-SYA60 light curtains (factory settings). To guarantee this nominal scanning range and the decreased scanning ranges, the devices have a greater effective scanning range with up to 20 % variations from the nominal values.

Figure 3-5 Cross-talk reduction



3.6 Emitter and Receiver Dimensions / Weights

Different protection heights are available in the FF-SYA Series light curtain product line. Refer to the figure below and the emitter/receiver heights table below.

Figure 3-6 Emitter and Receiver Height Diagram

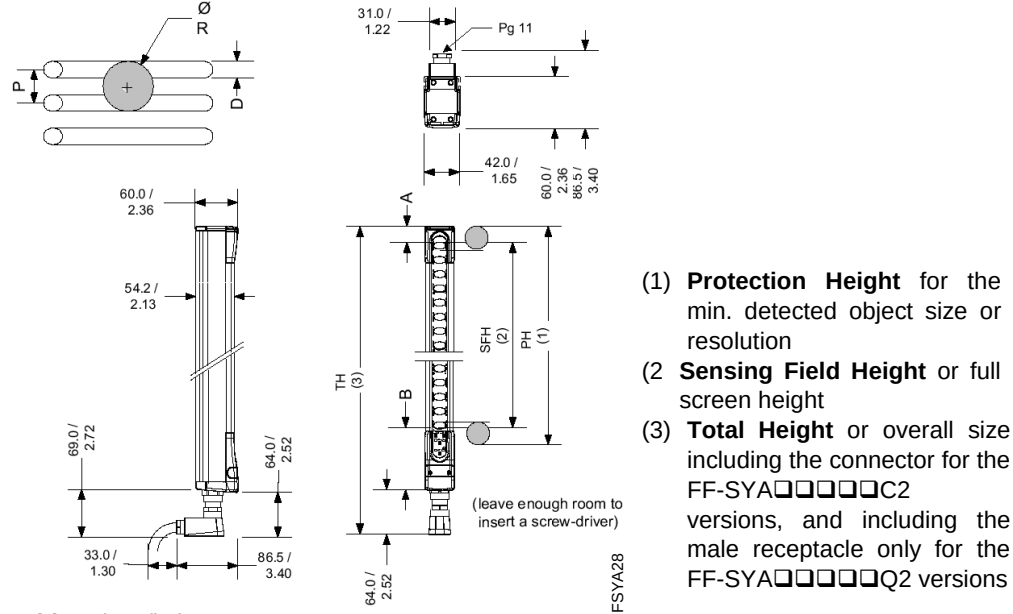


Table 1 (mm/in.)

	ØR (resolution)	P (lens pitch)	D (lens diameter)	A (inactive zone)	B (inactive zone)
FF-SYA14	Ø 14/0.6	10/0.4	4/0.16	15.2/0.60	90.6/3.56
FF-SYA30	Ø 30/1.2	20/0.8	10/0.4	22.2/0.87	87.6/3.45
FF-SYA60	Ø 60/2.4	40/1.6	10/0.4	42.2/1.66	87.6/3.45

Emitter and Receiver Heights (values in mm/kg) - for reference only

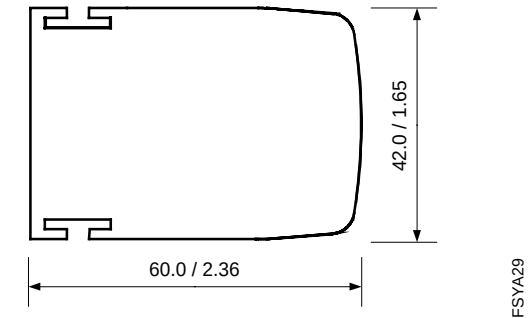
Model	032	048	064	080	096	112	128	144	160	176
Protection Height (mm) (1)										
SYA14	334	494	654	814	974	1134	1294			
SYA30	350	510	670	830	990	1150	1310	1470	1630	1790
SYA60	390	550	710	870	1030	1190	1350	1510	1670	1830
Sensing Field Height (mm) (2)										
SYA14	314	474	634	794	954	1114	1274			
SYA30	310	470	630	790	950	1110	1270	1430	1590	1750
SYA60	290	450	610	770	930	1090	1250	1410	1570	1730
Total Height (mm) (3)										
FF-SYA□□□□□C2	483	643	803	963	1123	1283	1443	1603	1763	1923
FF-SYA□□□□□Q2	443	603	763	923	1083	1243	1403	1563	1723	1883
Weight per device (kg)	1.00	1.38	1.76	2.14	2.52	2.90	3.28	4.04	4.42	4.80

Emitter and Receiver Heights (values in inches/lbs) - for reference only

Model	032	048	064	080	096	112	128	144	160	176
Protection Height (in.) (1)										
SYA14	13.1	19.4	25.7	32.07	38.3	44.6	50.9			
SYA30	13.7	20.09	26.3	32.7	39	45.3	51.6	57.9	64.2	70.47
SYA60	15.3	21.6	27.9	34.2	40.5	46.8	53.1	59.4	65.7	72.05
Sensing Field Height (in.) (2)										
SYA14	12.3	18.6	24.9	31.2	37.5	43.8	50.1			
SYA30	12.2	18.5	24.8	31.1	37.4	43.7	50.03	56.3	62.6	68.90
SYA60	11.4	17.7	24.0	30.3	36.6	42.9	49.2	55.1	61.8	68.11
Total Height (in.) (3)										
FF-SYA□□□□□C2	19.0	25.3	31.6	37.9	44.2	50.5	56.8	63.1	69.4	75.72
FF-SYA□□□□□Q2	17.4	23.7	30.0	36.3	42.6	48.9	55.2	61.5	67.8	74.1
Weight per device (lbs)	2.20	3.04	3.88	4.71	5.55	6.39	7.23	8.90	9.74	10.56

All emitter and receiver units have the same cross-sectional size. The figure below illustrates the cross-sectional dimensions of the light curtain series.

Figure 3-7 Emitter and Receiver overall sizes



(for overall size including brackets and connector, see T-slot mounting system section)

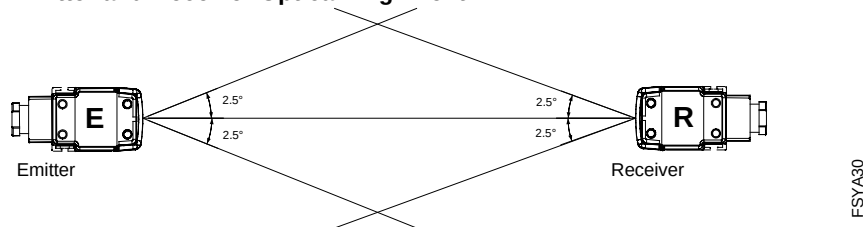
3.7 Mounting Considerations

This section discusses optical alignment and mounting considerations. There are several different ways to mount the FF-SYA Series light curtains (singularly, in groups, and in several different orientations).

3.7.1 Optical Alignment

Proper optical alignment of the FF-SYA Series light curtains ensures optimum operation. The emitter and receiver units must be mounted in parallel, at the same height, and with an angular displacement of no more than $\pm 2.5^\circ$. See figure below for proper alignment.

Figure 3-8 Emitter and Receiver Optical Alignment



3.7.2 Vertical Mounting

⚠ WARNING

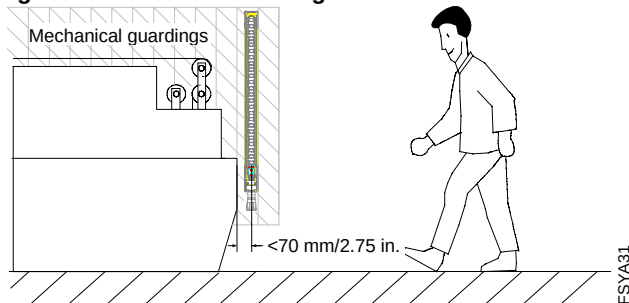
IMPROPER INSTALLATION OF FF-SYA SERIES LIGHT CURTAIN

- Mount FF-SYA Series light curtains so that any entry into protected area must interrupt sensing field of the safety light curtain or activate other safeguarding devices.
- Install mechanical guards or additional FF-SYA light curtains to prevent operating personnel from reaching around, under, or over sensing field.

Failure to comply with these instructions could result in death or serious injury.

Vertical mounting may require the installation of mechanical guards or additional light curtains to prevent operating personnel from reaching around, under, or over the sensing field.

Figure 3-9 Vertical Mounting



For point-of-operation guarding, the light curtain(s) and any mechanical guards must be installed to detect or prevent operating personnel from standing between the light curtain and the danger zone (see figures belows).

Figure 3-10 Point-of-operation Guarding (use FF-SYA14 and FF-SYA30 only)

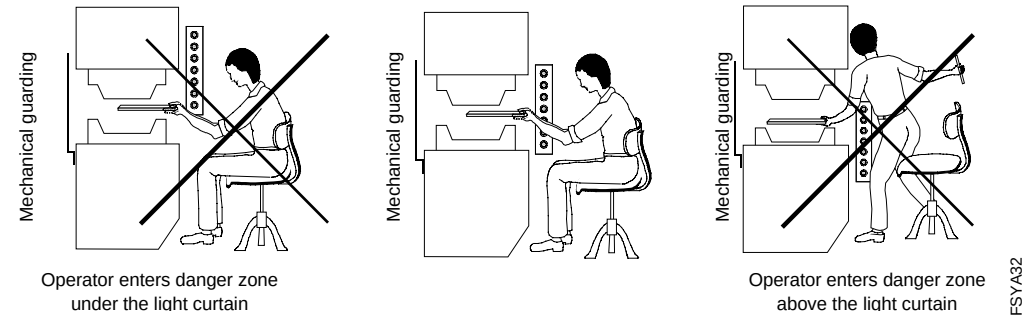
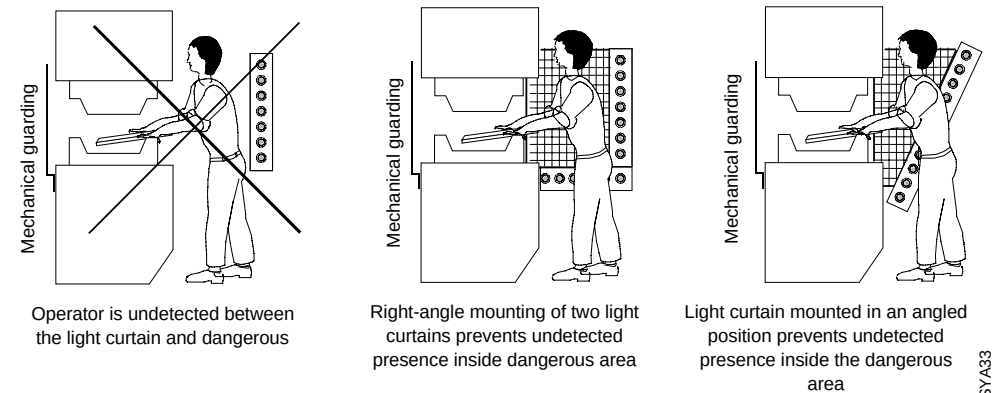


Figure 3-11 Point-of-operation Guarding (use FF-SYA14 or FF-SYA30 only)



⚠ DANGER

IMPROPER POINT-OF-OPERATION PROTECTION

- Install FF-SYA Light Curtains and mechanical guards so NO person can stand between light curtain and danger zone without being detected.
- Do NOT use FF-SYA60 Series light curtains for point-of-operation applications.

Failure to comply with these instructions will result in death or serious injury.

3.7.3 Vertical Mounting / Linear Assembly

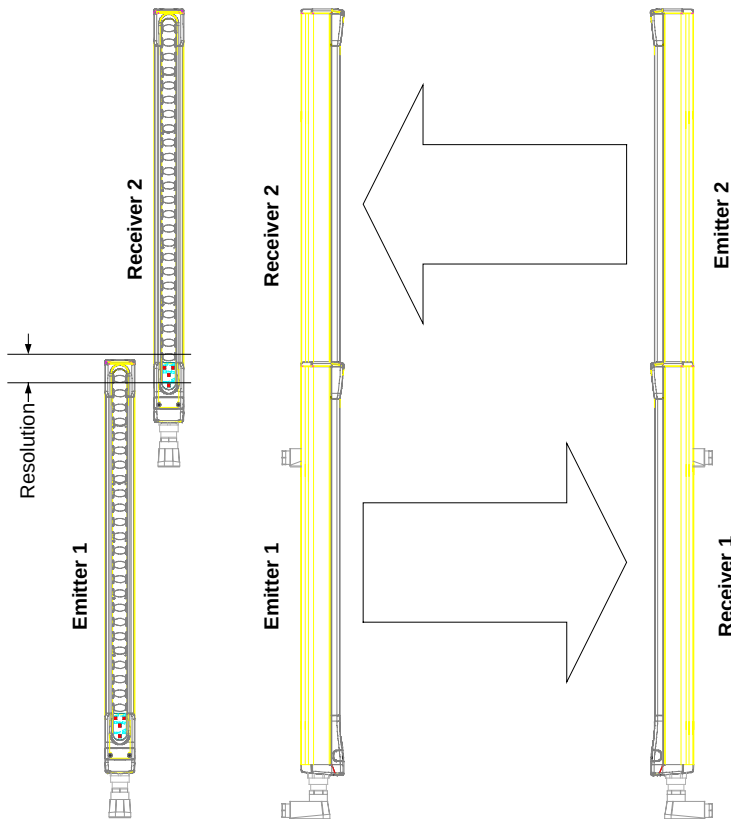
NOTICE

MUTUAL INTERFERENCE OR CROSSTALK

When two emitter/receiver units are mounted together to obtain a greater protected height, the emitter and receiver units **must** be mounted in a reverse transmitting position to prevent mutual interference or cross-talk. Reception of two infrared emissions will maintain the light curtain in a lock-out condition. To go back to normal operation, switch off and on the light curtain power.

Two emitter/receiver units may be mounted together to obtain a greater protected height (see figure below). The units may be mounted with the overlapping housings to maintain the resolution throughout the protected height.

Figure 3-12 Linear Assembly



FSYA34

3.7.4 Vertical Mounting / Side by Side Installation

NOTICE

MUTUAL INTERFERENCE OR CROSSTALK

When two or more light curtain systems are installed on adjacent machines, optical interference may occur if two units are within the field of view. Mutual interference between light curtains can be eliminated by reversing systems emitting orientation, or by using opaque screens, or by adjusting the adequate emission power regarding the application. A selector switch is available on the emitter unit for this purpose. Reception of 2 infrared emissions will maintain the light curtain in a lock-out condition. To go back to normal operation, switch off and on the light curtain power.

The FF-SYA light curtain is based upon an infrared transmission between an emitter unit and a receiver unit. It is a requirement of the IEC/pr EN 61496-2 standard that if a receiver receives two signals transmitted by two different emitters, this receiver must turn to the alarm state for safety reasons. This happens if the considered receiver is within the 2.5° beam aperture angle and within the nominal scanning range of a second emitter, and when the cross-talk detection indicator flickers to warn the installer.

Figure 3-13 Side by side installation of two light curtains

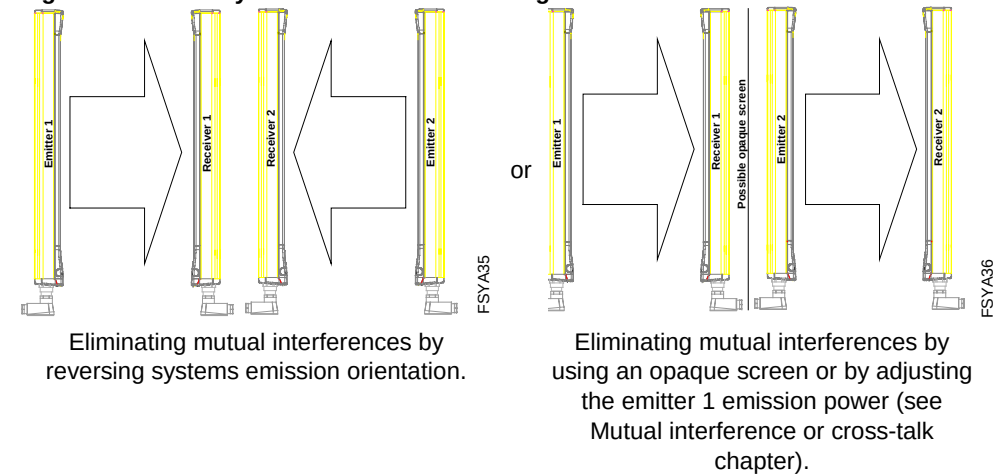
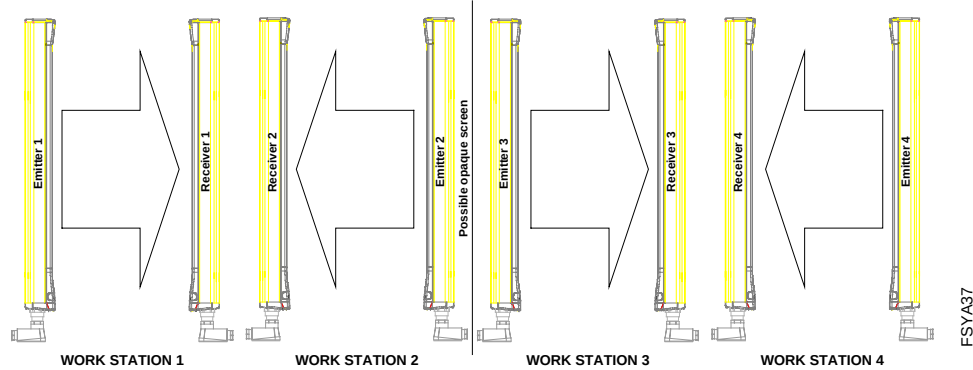


Figure 3-14 Side by side installation of more than two light curtains



If the beams of two adjacent light curtains are reversed, no interference will occur between these two light curtains. If more than two light curtains are installed side by side, then some of them may interfere together. In the above example, Receivers 2 and 3 may respectively receive a signal from the Emitters 4 and 1. An opaque screen can be used between emitter 2 and emitter 3 to solve this mutual interference problem. However, switches available on emitters 4 and 1 may be used to reduce the effective scanning range and solve this problem in a smart manner (see Mutual interference or cross-talk chapter).

3.7.5 Horizontal mounting

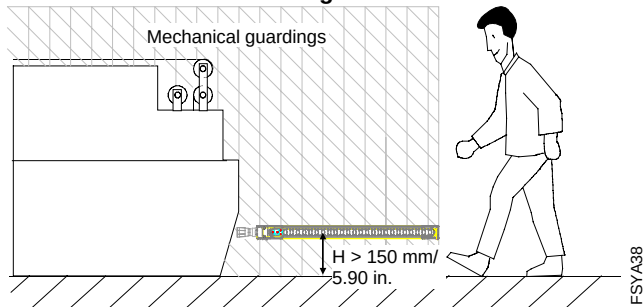
⚠ DANGER

IMPROPER PRESENCE SENSING PROTECTION

- Install FF-SYA Light Curtains and mechanical guards so NO person can stand between light curtain and danger zone without being detected.
- Do NOT install the FF-SYA60 Series light curtains at an height lower than 150 mm above the floor.

Failure to comply with these instructions will result in death or serious injury.

Figure 3-15 Horizontal mounting



3.7.6 Diagonal and Right-Angle Mounting

⚠ WARNING

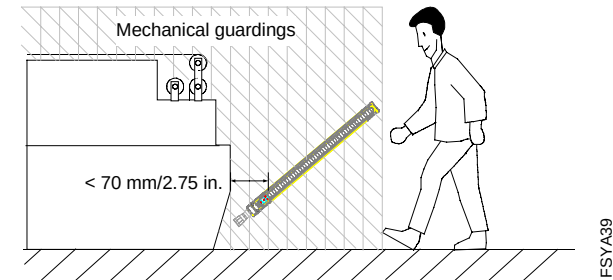
IMPROPER INSTALLATION FOR POINT-OF-OPERATION

To prevent operating personnel from access to danger zone, install hard guard or right-angle mounting if distance between danger zone and closest light beam is greater than 70 millimeters (2.8 in.).

Failure to comply with these instructions could result in death or serious injury.

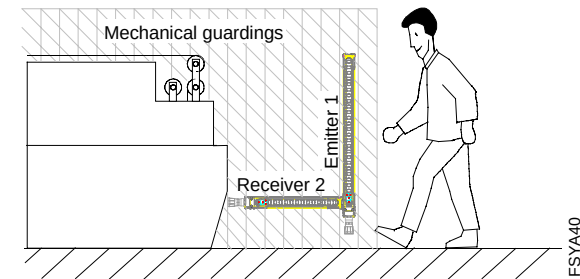
For point-of-operation guarding, the safety light curtain(s) and any hard guarding must be installed so that no person can stand between the light curtain and the danger zone without being detected. Installation may require additional hard guarding, horizontal or diagonal mounting of the light curtain, or additional light curtains mounted at right angles to each other.

Figure 3-16 Diagonal Mounting



A right-angle mounting arrangement may be used if the altered resolution at the joint is acceptable to the local regulatory agency. The emitters and receivers units should be mounted with opposite orientations to prevent mutual interference or cross-talk(see figure below).

Figure 3-17 Right-Angle Mounting



3.8 Mounting Hardware

FF-SYA Series light curtains are designed with an easy to use T-slot mounting system. Two standard mounting brackets are delivered together with the light curtain including the necessary mounting accessories (bolts, nuts, and washers) to mount one emitter or one receiver unit.

⚠ WARNING

ELECTRICAL SHOCK

Properly ground FF-SYA Series light curtain housing by connecting earth ground through the connector. **Failure to comply with these instructions could result in death or serious injury.**

To mount one complete light curtain system, use two pairs of brackets, one for the emitter and one for the receiver. The emitter and receiver may required different types of mounting brackets based on application requirements.

NOTICE

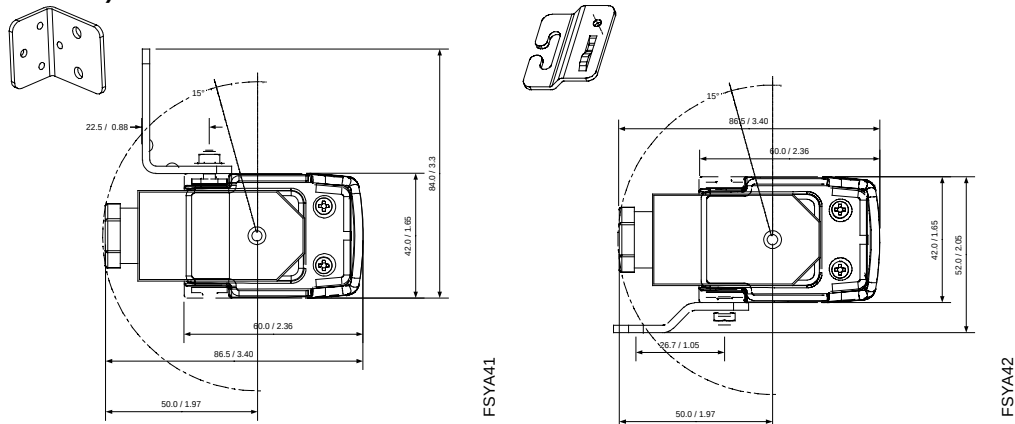
OPERATION UNDER HIGH VIBRATIONS

In case of high vibrations, an additional pair of brackets (total 3 pairs) must be used for light curtain systems with protection heights greater or equal to 1000 mm to maintain correct alignment (see Order guide section) .

3.8.1 T-slot Mounting System

The FF-SYA Series T-slot mounting design allows bracket placement anywhere along the sides of the light curtain housing (see figure below). The two T-slots are designed to fit the head of the delivered M4 T-shape bolts.

Figure 3-18 T-slots with Standard Mounting Bracket (Right-angle and straight brackets)



Note: On the SYA□□□□C2 version, the position of the hirschmann connector can be adjusted with a 15° angular pitch.

3.8.2 Mounting Accessory Set

The mounting accessory set contains the following hardware:

Mounting Hardware	Quantity
M4 T-shape bolts	3
HM4 nuts	3
M4 Rip-lock washers	3
M6 Rip-lock washers	6

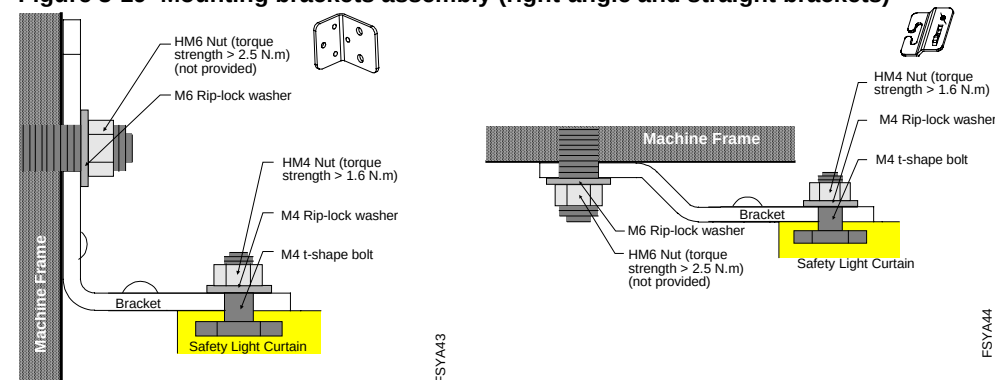
CAUTION

LIGHT CURTAIN/MOUNTING HARDWARE DAMAGE

- Carefully install mounting hardware (especially washers) to ensure correct orientation and installation.
- Use the provided M4 Rip-lock washers to install brackets on the light curtain only. Never use fan type lockwashers. The torque strength of the provided HM4 nuts must be lower than 1.6 N.m .
- Use the provided M6 Rip-lock washers to install brackets on the machine only. Never use fan type lockwashers. The torque strength of the HM6 nuts (not provided) must be greater than 2.5 N.m .

Failure to comply with these instructions may result in product damage.

Figure 3-19 Mounting brackets assembly (right-angle and straight brackets)



3.8.3 Mounting Brackets

A standard kit of mounting brackets is delivered together with the light curtain and includes 2 pairs of straight brackets, 2 pairs of right-angle brackets and mounting hardware.

Two pairs are required for one light curtain system (one for the emitter and one for the receiver). See T-slot Mounting System section for assembly.

NOTICE

PROTECTION AGAINST HIGH VIBRATIONS

In case of high vibrations, 3 pairs of brackets must be used for light curtain systems with protection heights greater or equal to 1000 mm / 39,4 in. (An additional bracket kit must be ordered separately).

Figure 3-20 Straight Bracket Dimensions (in mm / in.)

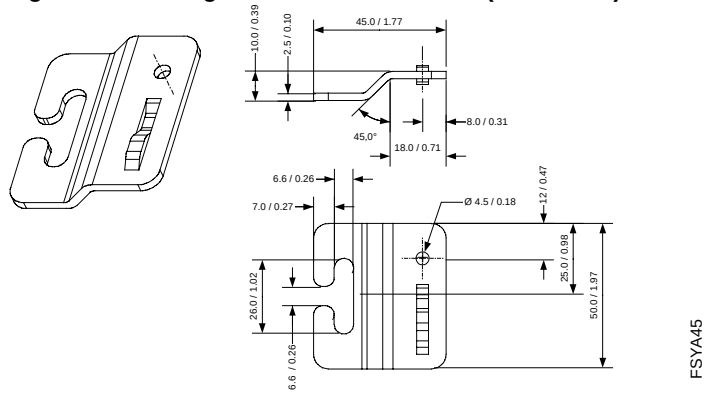
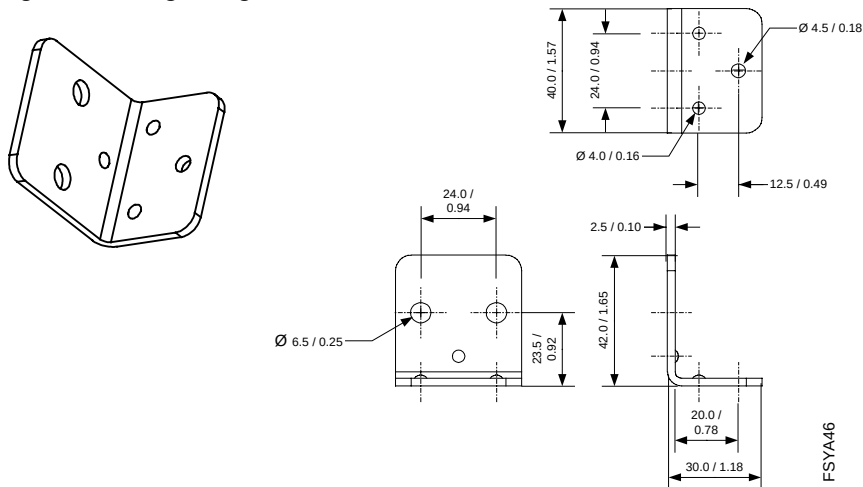


Figure 3-21 Right-angle Bracket Dimensions

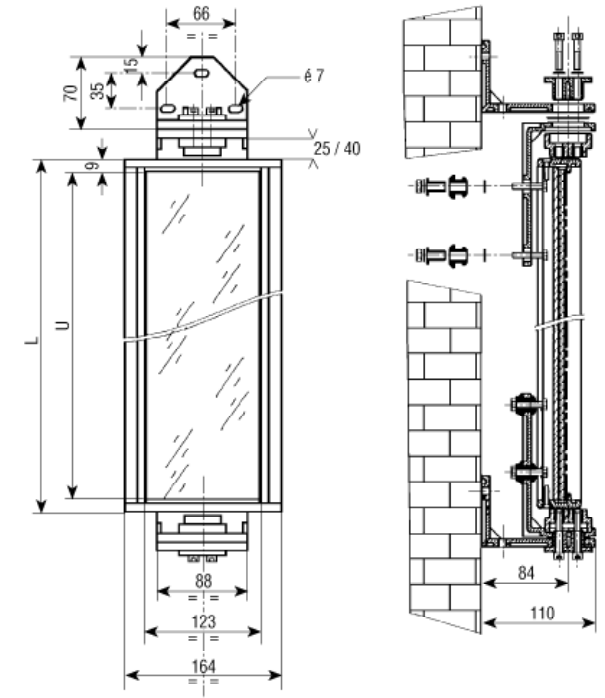


3.8.4 Mounting the Mirrors

- FF-SBSMIR ... Series mirrors

The mirrors include all mounting hardware necessary for installation. The mounting brackets allow rotation of the mirrors to the desired angle. See figure below for mounting dimensions.

Figure 3-22 FF-SBSMIR ... Mirror Mounting Dimensions



Mirror Heights FF-SBSMIR ... Series

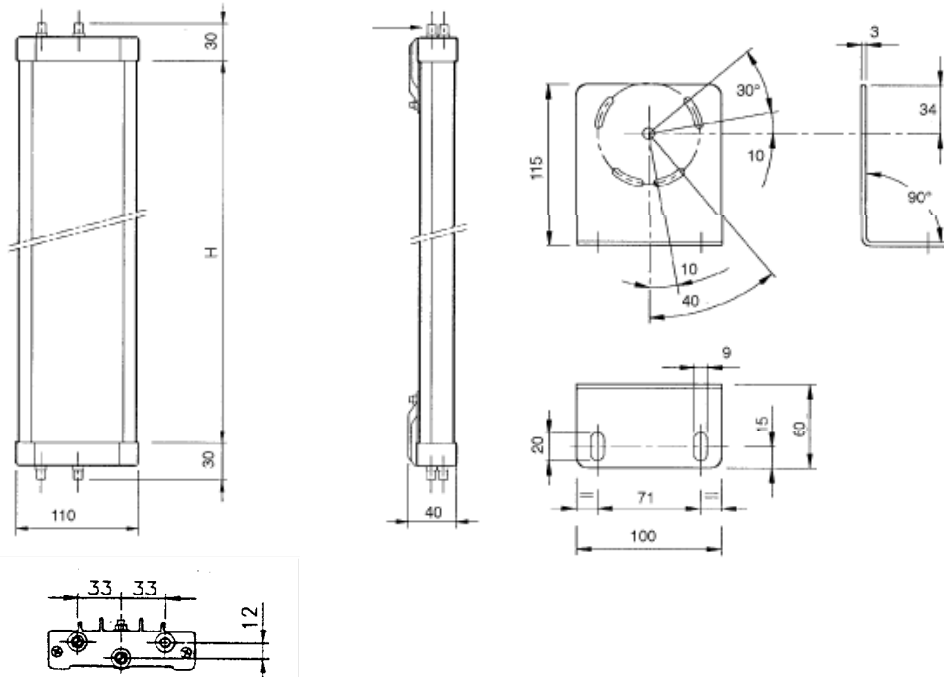
Part Listings	Use with following model number *	Overall Mirror Frame Height without brackets (U)	Weight per unit (kg)
FF-SBSMIR04	032 and 048	501 (19.72)	3.35
FF-SBSMIR06	064	704 (27.72)	4.65
FF-SBSMIR08	080	909 (35.79)	6.00
FF-SBSMIR10	096	1112 (43.78)	7.30
FF-SBSMIR12	112 and 128	1315 (51.77)	8.60
FF-SBSMIR14	144	1520 (59.84)	10.00
FF-SBSMIR16	160	1723 (67.83)	11.30

(*) : see Sensing Field Heights in the Installation chapter
Mirrors are shipped with all the necessary mounting hardware and rotatable brackets.

FF-SLC ... MIR Series mirrors

The mirrors include all mounting hardware necessary for installation. The mounting brackets allow rotation of the mirrors to the desired angle. See figure below for mounting dimensions.

Figure 3-23 FF-SLC ... MIR Mirror Mounting Dimensions



Mirror Heights FF-SLC ... MIR Series

Part Listings	Use with following model number *	Overall Mirror Frame Height without brackets (H)	Weight per unit (kg)
FF-SLC02MIR	032	370 (14.56)	3.0
FF-SLC04MIR	048	540 (21.26)	3.5
FF-SLC06MIR	064	715 (28.15)	4.4
FF-SLC07MIR	080	885 (34.84)	4.9
FF-SLC09MIR	096	1060 (41.73)	5.8
FF-SLC11MIR	112	1230 (48.42)	6.3
FF-SLC13MIR	128	1400 (55.12)	7.3
FF-SLC16MIR	144 and 160	1750 (68.89)	
FF-SLC18MIR	176	1920 (75.58)	

(*) : see Sensing Field Heights in the Installation chapter

Mirrors are shipped with all the necessary mounting hardware and rotatable brackets.

4. Electrical Connections

4.1 Overview

This chapter contains information about electrical installation and wiring.

⚠ WARNING

IMPROPER INSTALLATION

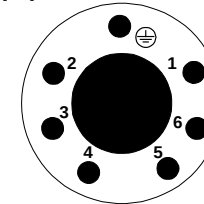
Strictly adhere to all electrical connection instructions.

Failure to comply with these instructions could result in death or serious injury.

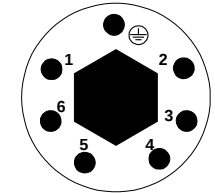
4.2 Connector Wiring for the FF-SYA□□□□C2 light curtains

All FF-SYA□□□□C2 light curtains have two plastic quick-disconnect connectors. Emitter units and receiver units use the same connector. The figure below illustrates a rear view of the connector (crimped contacts inserted this side). Both emitter and receiver use the same connector type and both connectors use the same type of crimped contacts.

Figure 4-1 View of customer quick-disconnect Connector (Hirschmann N6RFF connector type)



Rear View of customer Connector
(crimped contacts inserted this side)



Front View of customer Connector
(Do NOT insert crimped contact from this side)

Ensure the following tools are available when wiring the quick-disconnect connector:

- A set of wire strippers.
- A flat-head screwdriver.
- A regular crimping tool.

Cross sectional area of the cables: minimum 0.5 mm² / AWG 21, maximum 1.5 mm² / AWG 16 stranded wire.

Packing Gland and recommended cable diameters to guarantee the IP 65/NEMA 4, 13 sealing: PG11 allows use of cable diameters from 6.5 mm to 10.5 mm (0.25 in. to 0.41 in.)

Install socket contacts into connector as follows:

1. Strip about 8 mm (0.3 in.) of insulation from the wire end.
2. Using a crimping tool, crimp the socket contact onto the wire.

3. Push the socket contact into the correct slot in the connector. Tabs on the sides of the socket contact will expand into slots and hold the socket contact in place when properly seated.

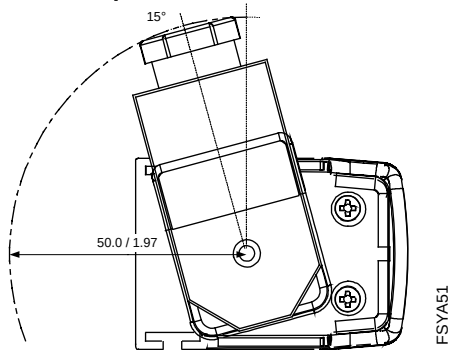
Remove a socket contact from the connector as follows:

1. Remove the cover from the plug.
2. Unscrew the contact receptacle.
3. Using the removal tool, slide over socket contact and push until the spring releases the socket contact; remove socket contact.

Change the position of the plug as follows:

1. Unscrew the socket contact receptacle.
2. Pull out and rotate the receptacle to change the position of the polarizing slot
3. Install the socket contact receptacle.

Figure 4-2 The position of the connector can be adjusted with a 15° angular pitch



CAUTION

WRONG CONNECTOR HANDLING

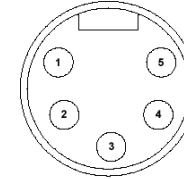
Do NOT change the connector position when it is installed on the light curtain. The position of the connector polarizing slot is defined when assembling the connector.

Failure to comply with these instructions may result in product damage.

4.3 Connector wiring for the FF-SYA□□□□□Q2 light curtains

All the FF-SYA□□□□□Q2 light curtains have straight male receptacles compatible with Brad Harrison Mini-Change plugs. The plugs can be ordered separately (see Accessories order guide section to choose the right plugs). The emitter uses a 5-pole male receptacle and the receiver uses a 7-pole male receptacle. The figures below illustrate a front view of each male receptacle.

**Figure 4-3 View of the light curtain receptacles
(compatible with Brad Harrison Mini-Change plugs)**



Face view of the emitter receptacle
(7/8" – 16UNS – 2A thread)



Face view of the receiver receptacle
(1" – 16UN – 2A thread)

4.4 Power Wiring (emitter and receiver terminals 1 and 2)

FF-SYA Series light curtains operate on 24 volts DC +/- 15% and are protected against reversed polarity. They are equipped with DC/DC converters to provide the galvanic insulation made mandatory by the IEC/EN 61496-1 standard for type 4 electrosensitive protective equipment. As a result, an additional galvanic insulated means (like a dedicated power supply with DC/DC converter) is not required.

The power consumption for the emitter and for the receiver are given in the following table :

Model	032	048	064	080	096	112	128	144	160	176
Power consumption (W)										
FF-SYA14										
Emitter	5	5	6	6	6	7	7	-	-	-
Receiver	3.5	4	4	4.5	5	5	5.5	-	-	-
FF-SYA30										
Emitter	4	4	5	5	5	6	6	6	6	6
Receiver	3.5	3.5	4	4	4	4	4.5	4.5	4.5	4.5
FF-SYA60										
Emitter	4	4	5	5	5	6	6	6	6	6
Receiver	3.5	3.5	3.5	4	4	4	4	4.5	4.5	4.5

The light curtain supply inputs are protected by internal fuses which cannot be replaced by the user. Use of external protection fuses (1A) is highly recommended.

NOTICE

- It takes 200 ms for the light curtain to start at power up.

CAUTION

CONNECTION OF THE GROUND TERMINALS

The ground terminal of the receiver and the emitter must be connected to the main ground of the machine.

Failure to comply with these instructions may result in product damage.

All of the FF-SYA Series light curtains have the same connections for power. The two next figures show the Emitter and the receiver connections.

NOTICE

- The wire gauge of the ground connection should be equal to the power supply wire gauge.
- The length of the ground connection wire should be as short as possible (refer to EN 60204).

Figure 4-4 Emitter receptacle pinout (Minichange plug color code)

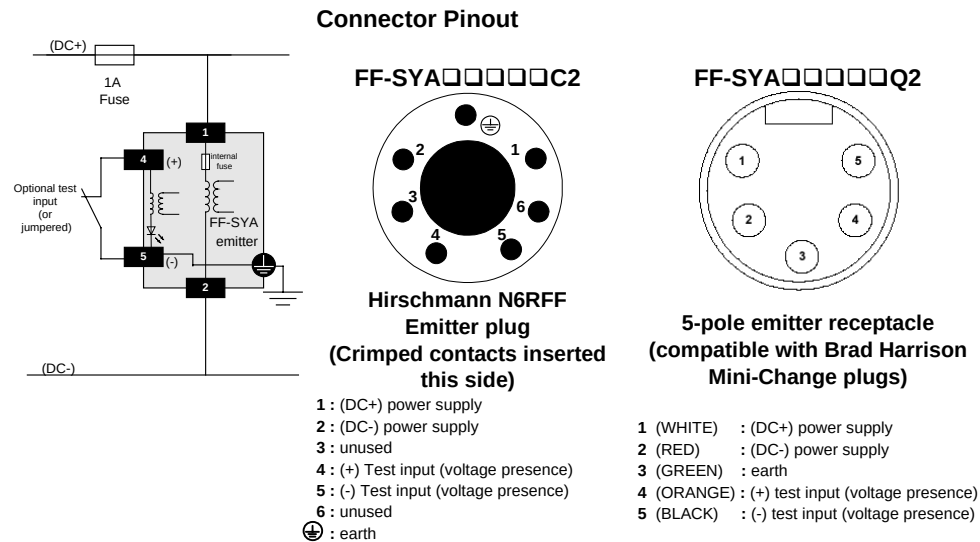
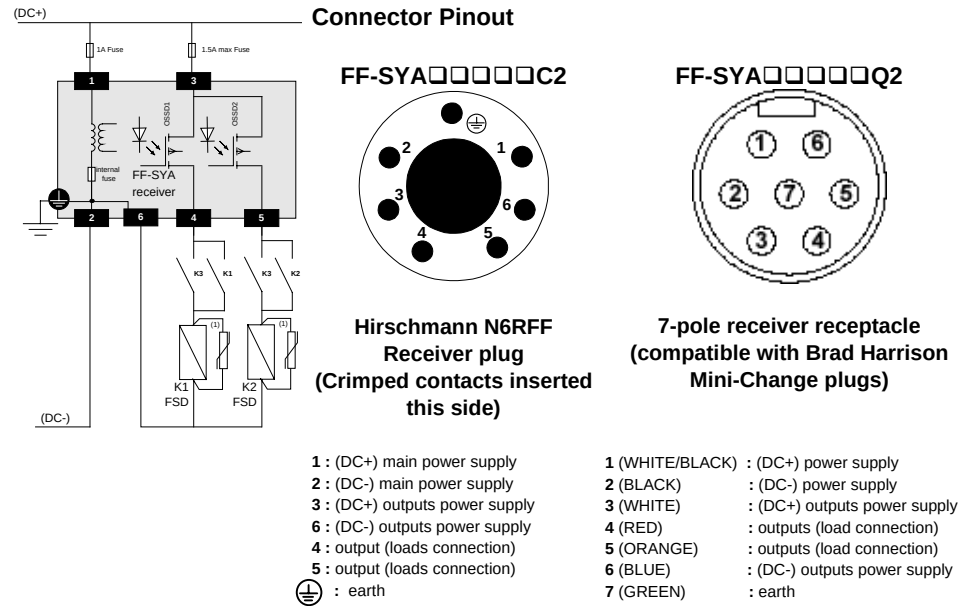


Figure 4-5 Receiver receptacle pinout (Minichange plugs color code)



4.5 Machine Stop contacts (Receiver terminals 4 and 5)

Features	Machine Stop Contacts
Type	static DC (Normally Open contacts)
Switching capacity	0.5 A/24 Vdc
Voltage drop	< 2 Vdc
Protections	short-circuits, overloads, reversed polarity, micro-cutoff (4.5 ms)

NOTICE

POWER CUTOFF PROTECTION

The FF-SYA failsafe static outputs withstand 4.5 ms power cutoff. The use of the optional AC to DC power supply improves the power cut of resistance up to 20 ms.

4.5.1 Permanent Self-checking (Monitoring)

Fail-safe static outputs OSSD1 and OSSD2 (Output Signal Switching Devices) are switched simultaneously. An internal permanent self-check (monitoring) verifies that both static outputs always have the same status. If one of the two outputs remains accidentally closed, the remaining output would no longer be able to close. Similarly, a possible internal or external short-circuit of one of the two outputs will immediately bring about the opening of the other output. A internal or external short-circuit between the two outputs will also lead to the opening of the light curtain outputs. **It is therefore important to use the two outputs to prevent operation of the machine.**

WARNING

IMPROPER USE OF THE MACHINE STOP CONTACTS

- Always use the two fail-safe outputs to control the machine movement.

Failure to comply with these instructions could result in death or serious injury

NOTICE

IMPROPER USE OF THE FF-SYA LIGHT CURTAIN

The cross-monitoring of the FF-SYA static outputs is based upon a self-checking principle which guarantees the detection of an output short-circuit and the detection of a short-circuit between the outputs (cross-fault detection). The FF-SRS5939 interface control module is primarily designed to be interfaced with Honeywell fail-safe static outputs. Compatibility with any other emergency stop relay module is not guaranteed.

4.5.2 Protection of Machine Stop Contacts

The OSSD1 and OSSD2 outputs must be protected by an external 1.5 A max. fuse. It is also recommended to connect 31 Vdc varistors in parallel with the FSDs relay coils.

NOTICE

- Use of RC circuits across the loads will prevent the light curtain from operating.

⚠ WARNING

IMPROPER PROTECTION INSTALLATION

- Never install varistor across the fail safe static output of the light curtain.
- Always install varistors across the coils of the external safety relays.
- Use fuses with the correct rating to protect the safety outputs.

Failure to comply with these instructions could result in death or serious injury

4.5.3 Connection to the machine control circuitry

It is necessary to connect the terminal 3 to the +24V to energize the relays K1 and K2 through the OSSD1 and OSSD2 outputs. The switching capacity of the static output (0.5A/24Vdc) combined with the number of available outputs displayed by the equipment (2 Normally Open outputs) means that the equipment may be connected to two external relays with guided contacts K1 and K2 (usually called « Final Switching Devices » - FSDs). These FSDs must be regularly controlled.

NOTICE

- It takes 160 ms for the light curtain to restart after each beam release.

⚠ WARNING

IMPROPER EXTERNAL SAFETY RELAYS PERFORMANCE

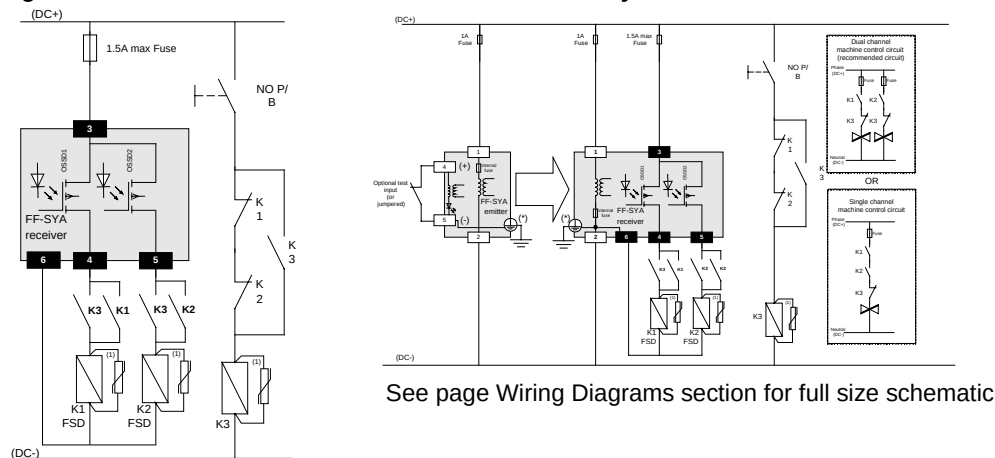
- Use three independent stop circuit safety relays K1, K2 and K3 with mechanically linked contacts (such as GE CR120 BP Machine Tool Relay or Telemecanique CA3-KN31BD3 or CA3-DN31BD relay) to reliably detect a welded contact.

Failure to comply with these instructions could result in death or serious injury

NOTICE

- The loads impedance allowed by the FF-SYA failsafe static outputs must be 55.2Ω minimum and $5k\Omega$ maximum. The turn-on voltage must be greater than 5 V on resistive loads or greater than 7 V on inductive loads.
- The maximum cable length between the FF-SYA static outputs and the loads mainly depends upon the loads resistance : the cable length must be $L_{\text{cable}} \leq 50000 / R_{\text{load}}$
- If the FF-SYA light curtain outputs are connected on safety relays with mechanically linked contacts, the maximum cable length between the FF-SYA outputs and the relays is greater than 100 m.
- If the FF-SYA light curtain outputs are connected to the FF-SRM muting module, the maximum cable length between the FF-SYA outputs and the muting module is 50 m.
- If the FF-SYA light curtain outputs are connected to the FF-SRS5939 safety control module, the maximum cable length between the FF-SYA outputs and the control module is 50 m (for cable length greater than 10 m, use a cable with a 20pF / m capacitance per unit length).

Figure 4-6 Connection to the Machine Control Circuitry



⚠ WARNING

IMPROPER CONNECTION OF LOAD

For safety reasons, the loads must be connected between terminals 4-6 and between terminals 5-6 .

Failure to comply with these instructions could result in death or serious injury.

4.6 Test Contact (emitter terminals 4 and 5)

Features	Test input
Type	Voltage presence, Normally Closed contact
External contact resistance	20 Ω max.
Protections	Galvanic insulation : 2000 Vdc, short-circuits, overloads

Test contact may be used for additional external relay checking. When the link between the two contacts is open, the light curtain is in the alarm condition and the red test indicator on the emitter is illuminated as well as the red operation indicator on the receiver. To return to the green condition, the link between the contacts must be reestablished.

NOTICE

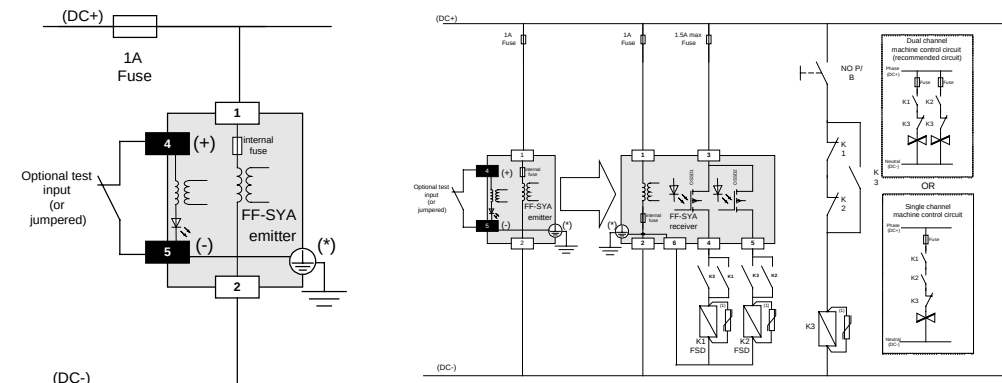
- The Normally Closed contact must remain open for at least 40 ms to generate a test sequence, and it takes 200 ms for the light curtain to restart after closing the test contact.

CAUTION

WRONG TEST INPUT CONNECTION

The test input is NOT voltage free. Do not power the test input with any voltage supply. Failure to comply with these instructions will result in product damage.

Figure 4-7 Test Contact



See page Wiring Diagrams section for full size schematic

(*) : use pin 3 for the FF-SYA□□□□Q2E emitter

4.7 Wiring Diagrams

The following wiring diagrams illustrate the electrical connections for the FF-SYA Series light curtains. The customer must supply the three safety relays, K1, K2 and K3, the cycle start push-button and the test circuit.

Note : Mechanically linked contact relays are sometimes called captive contact, anti-weld, or guided contact relays.

WARNING

IMPROPER INSTALLATION OF FF-SYA SERIES LIGHT CURTAIN

- Use the recommended wiring diagrams to ensure external relay monitoring by the interface.

Failure to comply with these instructions could result in death or serious injury.

WARNING

IMPROPER SYSTEM PERFORMANCE

- Ensure independent stop circuit safety relays have mechanically linked contacts (such as GE CR120 BP Machine Tool Relay or Telemecanique CA3-KN31BD3 or CA3-DN31BD relay) that prevent contact overlapping in the event of a welded contact.

Failure to comply with these instructions could result in death or serious injury.

WARNING

IMPROPER CONNECTION OF LOADS

For safety reasons, the loads must be connected between terminals 4-6 and between 5-6.

Failure to comply with these instructions could result in death or serious injury.

WARNING

IMPROPER PERIMETER PROTECTION

- Design control circuit to allow a manual restart before further machine operation can occur.
- Locate manual restart to allow operator a clear view of danger zone.
- Operator shall NOT be able to reach manual restart from within danger zone.
- Design control circuit to prevent Programmable Logic Controller from overriding manual restart.

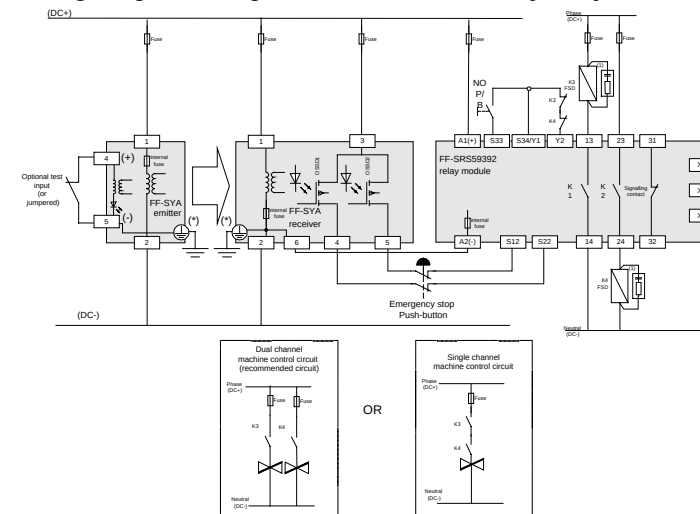
Failure to comply with these instructions could result in death or serious injury.

NOTICE

IMPROPER USE OF THE FF-SYA LIGHT CURTAIN

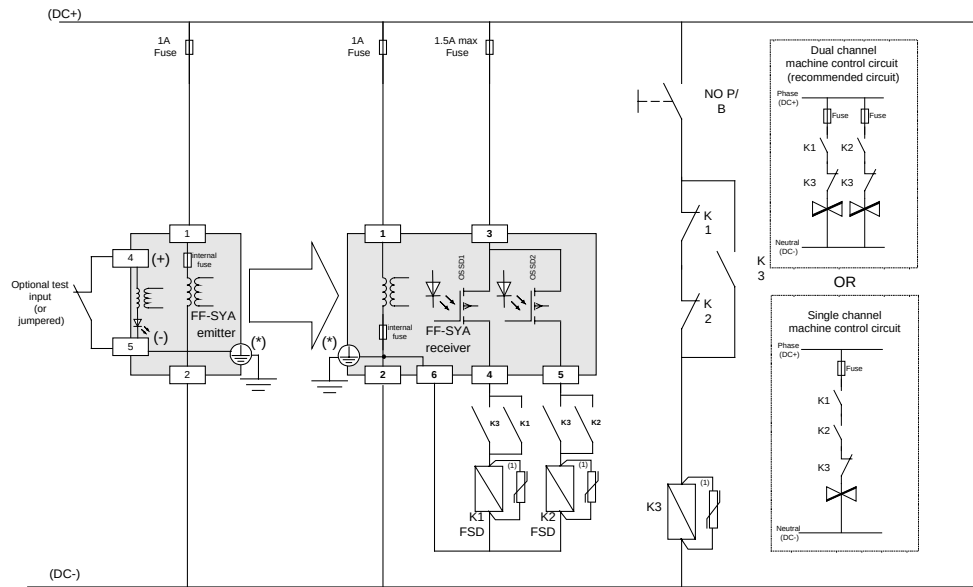
- The loads impedance allowed by the FF-SYA failsafe static outputs must be 55.2Ω minimum and $5k\Omega$ maximum. The turn-on voltage must be greater than 5 V on resistive loads or greater than 5 V on resistive loads or greater than 7 V on inductive loads.
- The maximum cable length between the FF-SYA static outputs and the loads mainly depends upon the loads resistance : the cable length must be $L_{cable} \leq 50000 / R_{load}$.
- If the FF-SYA light curtain outputs are connected on safety relays with mechanically linked contacts, the maximum cable length between the FF-SYA outputs and the relays is greater than 100 m.
- If the SYA light curtain outputs are connected to the FF-SRM muting module, the maximum cable length between the FF-SYA outputs and the muting module is 50 m.
- If the FF-SYA light curtain outputs are connected to the FF-SRS5939 safety control module, the maximum cable length between the FF-SYA outputs and the control module is 50 m (for cable length greater than 10 m, use a cable with a 20pF / m capacitance per unit length).
- The cycle-start push-button is the normal push-button used to start the machine cycle and not an additional button for the operator.
- The cross-monitoring of the FF-SYA static outputs is based upon a self-checking principle which guarantees the detection of an output short-circuit and the detection of a short-circuit between the outputs (cross-fault detection). The FF-SRS5939 interface control module is primarily designed to be interfaced with Honeywell fail-safe static outputs. Compatibility with any other emergency stop relay module is not guaranteed.

Figure 4-8 Wiring Diagram using the FF-SRS59392 safety relay module



- (1) : arc suppressors ($220 \Omega + 0.22 \mu F$), NO P/B: cycle-start push button (Normally open contact)
- (*) : use pin 3 for the FF-SYA□□□□Q2E emitter and pin 7 for the FF-SYA□□□□Q2R receiver

Figure 4-9 Wiring Diagram using three independent stop circuit safety relays



(1) : 31 Vdc varistors, NO P/B: cycle-start push button (Normally open contact)

(*) : use pin 3 for the FF-SYA□□□□□Q2E emitter and pin 7 for the FF-SYA□□□□□Q2R receiver

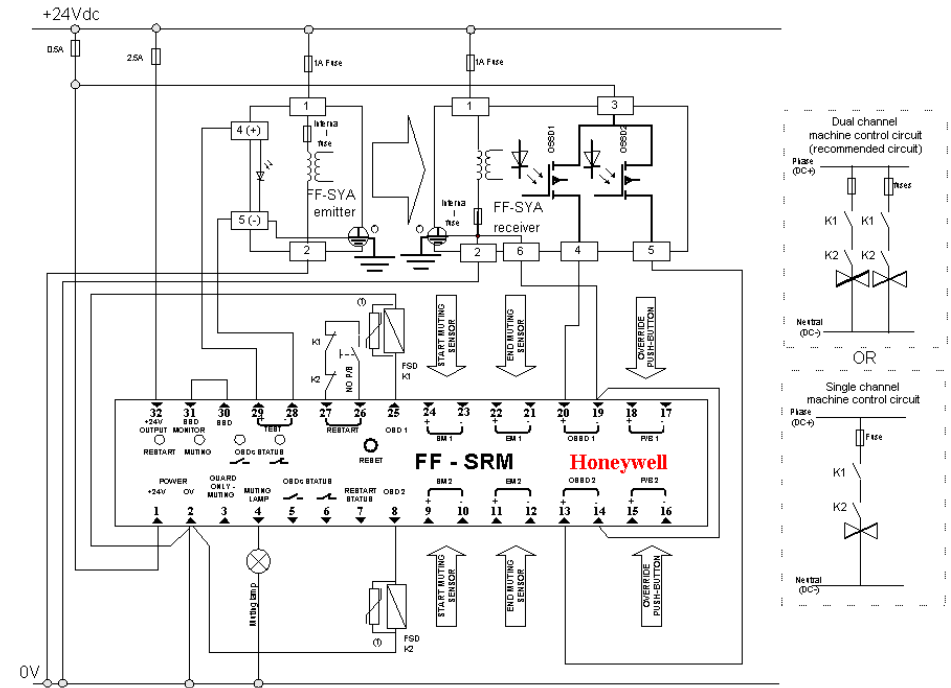
⚠ WARNING

IMPROPER CONNECTION OF LOAD

For safety reasons, the loads must be connected connected between terminals 4-6 and between terminals 5-6 .

Failure to comply with these instructions could result in death or serious injury.

Figure 4-10 Wiring diagram using the FF-SRM muting module



(1) : 31 Vdc varistors NO P/B : cycle-start push button (Normally Open contact)

(*) : use pin 3 for the FF-SYA□□□□□Q2E emitter and pin 7 for the FF-SYA □□□□□Q2R receiver.

⚠ WARNING

Refer to the FF-SRM muting module installation manual for detailed information on wiring.
Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING

IMPROPER CONNECTION OF LOAD

For safety reasons, the loads must be connected connected between terminals 4-6 and between terminals 5-6 .

Failure to comply with these instructions could result in death or serious injury.

NOTICE

The cross monitoring of the FF-SYA static outputs does not allow to connect two receivers in series on a single FF-SRS5939 safety control module. Indeed this will be detected by the units as a short-circuit between the outputs. Use in this case two FF-SRS5939 as shown below.

Figure 4-11 Connection of two safety light curtains (using two FF-SRS5939 safety control modules)

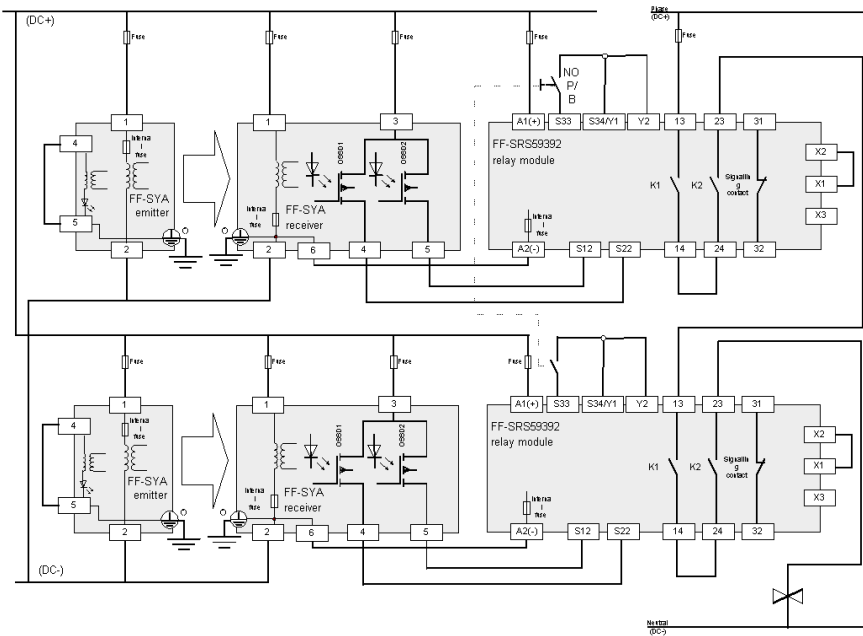
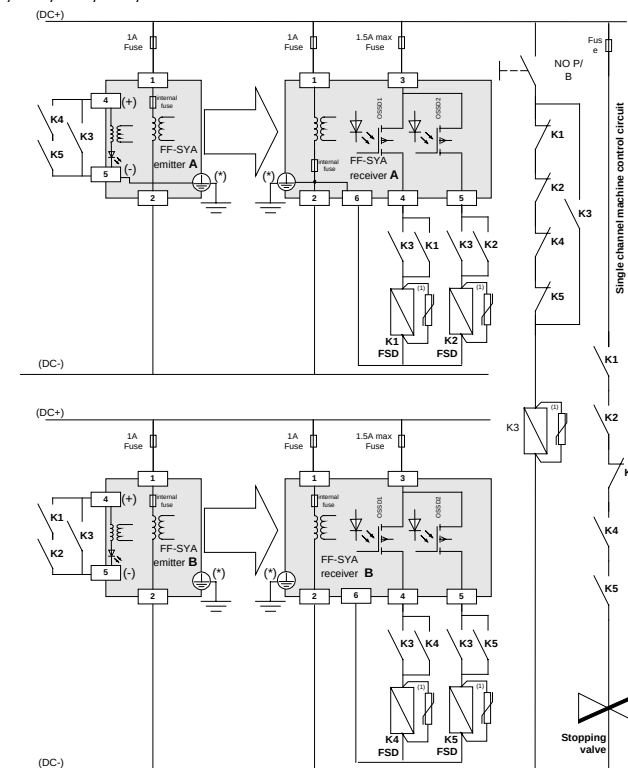


**Figure 4-12 Connection of Two Safety Light Curtains
(using independent stop circuit safety relays)**

Five safety relays, K1, K2, K3, K4 and K5 are used as follows:



(1) : 31Vdc varistors

(*) : use pin 3 for the FF-SYA□□□□Q2E emitter and pin 7 for the FF-SYA□□□□Q2R receiver

WARNING

IMPROPER CONNECTION OF LOAD

For safety reasons, the loads must be connected connected between terminals 4-6 and between terminals 5-6 .

Failure to comply with these instructions could result in death or serious injury.

NOTICE

If the sensing field of one safety light curtain is interrupted, the other goes immediately into the RED condition.

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5. Maintenance and Troubleshooting

5.1 Overview

This chapter contains operational test procedures, troubleshooting, cleaning, and maintenance, instructions.

⚠ WARNING

IMPROPER MAINTENANCE

Strictly adhere to all maintenance and troubleshooting instructions.

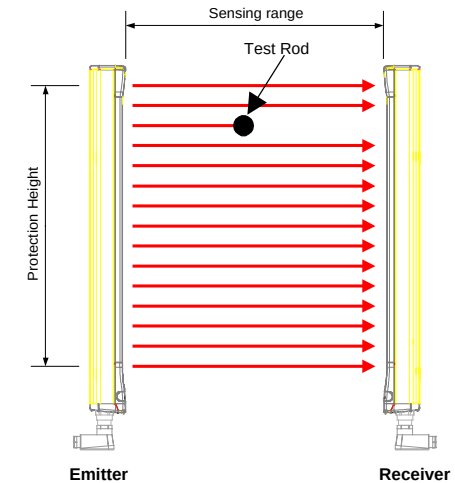
Failure to comply with these instructions could result in death or serious injury.

5.2 Operational Test

To ensure operational readiness, perform the operational test at least once a day and every time the light curtain is repaired or powered up. The operational test consists of passing a test rod (included with the FF-SYA14 or FF-SYA30 units) or the hand (for the FF-SYA60 units) through the sensing field to ensure the light curtain will detect it (see figure below). The sensing function of the light curtain shall be actuated by moving the relevant test rod at a maximum speed of 2.5 m/s for the FF-SYA14 and the FF-SYA30 (or by moving the hand at a maximum speed of 1.6 m/s for the FF-SYA60). The included test rod will have a diameter equal to the resolution of the light curtain. The resolutions of the FF-SYA Series light curtains are as follows:

Light Curtain	Resolution
FF-SYA14	14 mm (0.6 inch)
FF-SYA30	30 mm (1.2 inch)
FF-SYA60	60 mm (2.4 inches)

Figure 5-1 Operational Test with the Test Rod



5.3 Troubleshooting Procedures

When the FF-SYA Series safety light curtains are working properly and the sensing field is not interrupted, at least one of the emitter yellow LEDs R1, R2 and R3 is illuminated, the receiver green LED «ON» is illuminated, and all other LEDs are NOT illuminated. If this condition is not met, refer to the following troubleshooting chart, flow diagram and corresponding repair procedures.

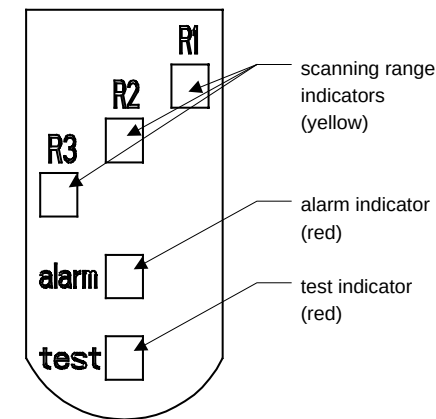
Troubleshooting Chart (see next figure for indicator information)

Symptom	Probable Cause	Corrective Action
All light emitting diode (LED) indicators are NOT illuminated	No power.	Ensure external fuse is not blown. Ensure supply voltage and polarity are correct (see Specifications). Ensure electrical power connections are secure and correct. (see Electrical Connections chapter).
The emitter red « test » indicator and the receiver red « OFF » operation indicator are both illuminated	Test input is open.	Ensure the external circuit wiring connection between pins 4 and 5 on the emitter connector is secure (see Electrical Connections chapter, Mutual Interference or Cross-talk).
The emitter red « alarm » indicator is flickering and the receiver red « OFF » operation indicator is illuminated	Emitter is having a failure	Replace the emitter unit by a new one of the same resolution and protection height
The receiver red cross-talk indicator is « ON » and the receiver red « OFF » operation indicator is illuminated	Receiver is receiving a signal from a second emitter	Adjust the emission power of the second emitter (see chapter Installation)
The receiver yellow signal strength indicator is flickering and the green « ON » operation indicator is illuminated	Emitter and/or receiver units need to be cleaned Emitter and/or receiver units need to be aligned Emission power is too low	Clean emitter lens, receiver lens and mirrors (see Emitter and Receiver Cleaning). Align emitter, receiver and mirrors Adjust the emission power of the emitter (see Installation chapter, Mutual Interference or Cross-talk)
The receiver yellow signal strength indicator is flickering and the red « OFF » operation indicator is illuminated	Emitter and/or receiver units need to be cleaned Emitter and/or receiver units need to be aligned Emission power is too low	Clean emitter lens, receiver lens and mirrors (see Emitter and Receiver Cleaning). Align emitter, receiver and mirrors Adjust the emission power of the emitter (see Installation chapter, Mutual Interference or Cross-talk)

The receiver yellow signal strength indicator and the red « OFF » operation indicator are both illuminated	Sensing field may be obstructed Emitter and/or receiver units need to be cleaned Emitter and/or receiver units need to be aligned Emission power is too low Receiver unit internal error	Remove obstacles interrupting sensing field. Clean emitter lens, receiver lens and mirrors (see Emitter and Receiver Cleaning). Align emitter, receiver and mirrors Adjust the emission power of the emitter (see Installation chapter, Mutual Interference or Cross-talk) Replace receiver unit by a new one of the same resolution and protection height
Random alarms without apparent cause (i.e., erratic outputs, flickering LEDs)	Line voltage transients greater than IEC 801-4 Norm standard Unacceptable ambient light interference	Ensure the correct supply voltage is provided (see Electrical Connections chapter). Ensure varistors on the inductive loads are present (see Electrical Connections chapter). Ensure external circuit connection to pins 4 and 5 on the emitter connector are secure (see Electrical Connections chapter). Ensure ground connection on emitter and receiver are secure (see Electrical Connections chapter).

Figure 5-2 Emitter and Receiver LEDs

Emitter LEDs



Receiver LEDs

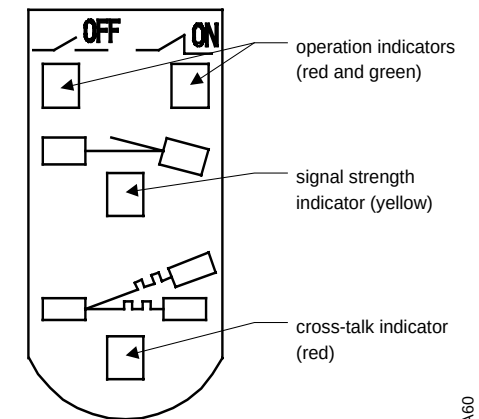
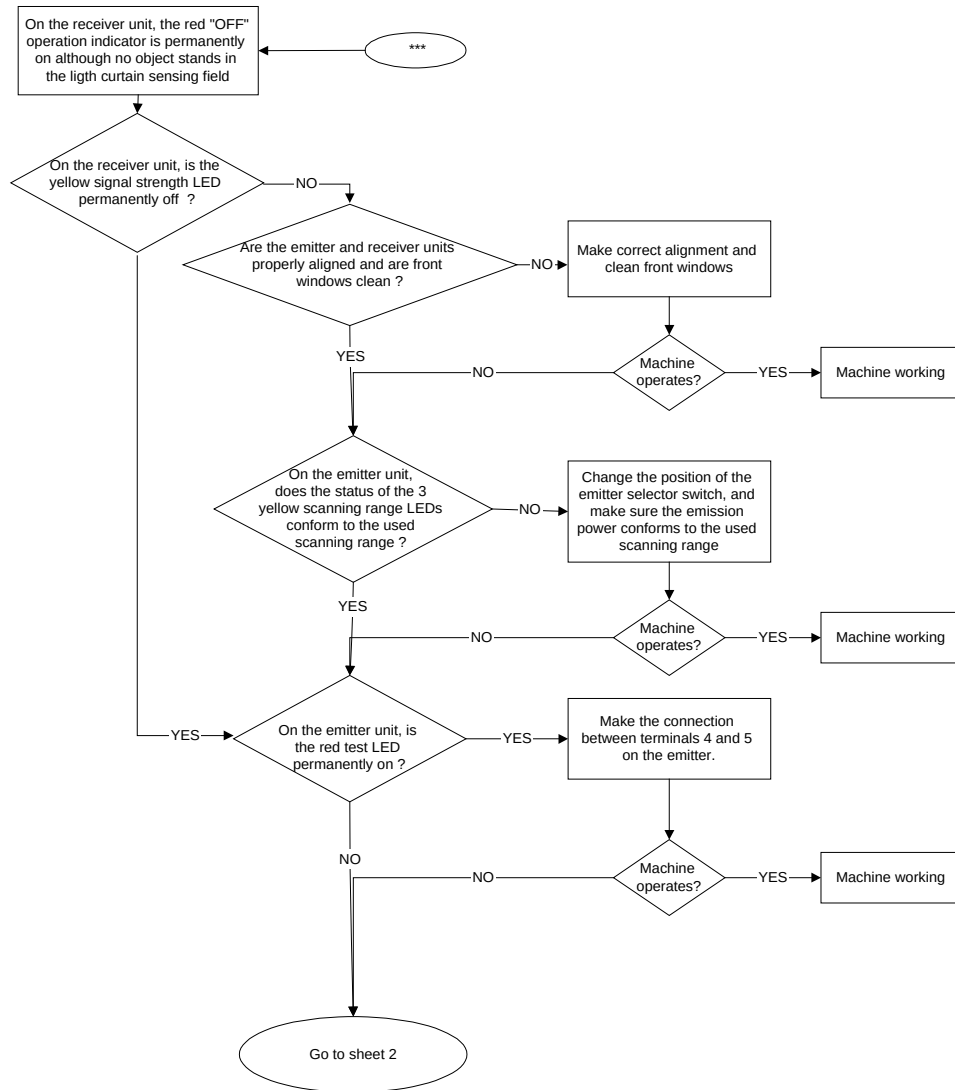
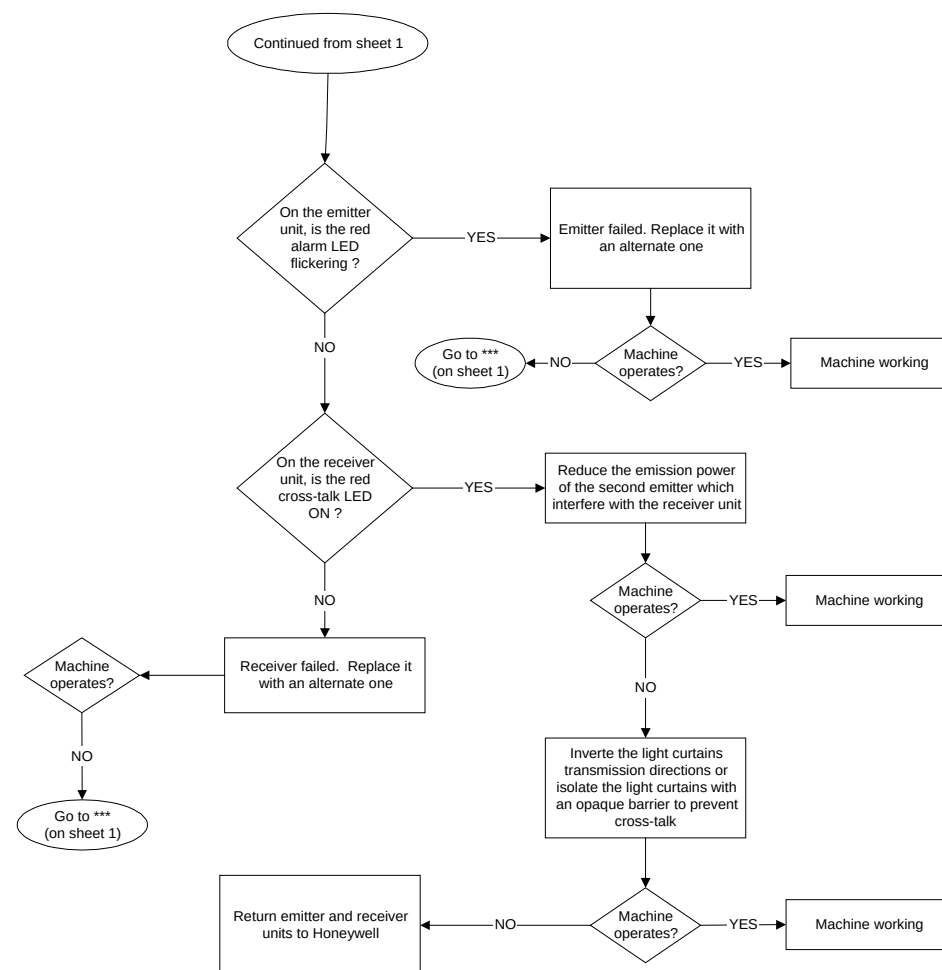


Figure 1. Troubleshooting Flow Diagram (sheet 1)



Troubleshooting Flow diagram (sheet 2)



5.4 Cleaning

The FF-SYA Series light curtains and mirrors are designed to operate in harsh industrial environments. Exposure to dirt, dust, grease, and oil are unavoidable in these harsh environments. Periodically clean the emitter/receiver units and mirrors. This section provides specific, step by step, instructions on the proper cleaning techniques for the FF-SYA Series emitters, receivers, and mirrors.

5.4.1 Using a Dry Cloth

Clean dust or loose, dry dirt from the emitter and receiver units using a soft, clean, non-abrasive cloth.

WARNING

POWER APPLIED TO MACHINE CONTROL SYSTEM

Turn off and disconnect power from FF-SYA Series light curtain and machine.

Failure to comply with these instructions could result in death or serious injury.

1. Turn off and disconnect power to both the light curtain and the machine.
2. Gently wipe the soiled areas with a soft, clean, non-abrasive cloth. Do not rub hard to prevent scratching the clear plastic front plate or finish. If the dirt will not wipe off with a dry cloth, clean units with a soap and water solution. See Using Soap and Water below.
3. Connect power to the machine and light curtain.
4. Perform the operational test to ensure proper functional readiness.

CAUTION

FF-SYA SERIES LIGHT CURTAIN FRONT PLATE AND FINISH DAMAGE

Gently wipe soiled areas with soft, clean, non-abrasive cloth. To prevent scratching clear plastic front plate or finish, do NOT rub hard.

Failure to comply with these instructions may result in product damage.

5.4.2 Using Soap and Water

1. Turn off and disconnect power to the light curtain and machine.
2. Dampen a soft, clean, non-abrasive cloth in the solution of mild soap and water. Squeeze excess solution from the cloth.
3. Wipe the soiled areas gently with the damp cloth. Do not rub hard to prevent scratching the clear plastic front plate or paint finish.
4. Rinse the cloth in clean water and gently wipe off any excess soap.
5. Dry the emitter and receiver with a soft, dry, non-abrasive cloth. Ensure there is no moisture left on the emitter and receiver units before power is applied.
6. Connect power to the machine and light curtain.
7. Perform the operational test to ensure proper functional readiness.

5.4.3 Cleaning the Mirrors

CAUTION

MIRROR DAMAGE

Use soft, clean, non-abrasive cloth to clean dust or dirt from mirror to prevent scratching surface.

Failure to comply with these instructions may result in product damage.

1. Dampen a soft, clean, non-abrasive cloth with 90% alcohol or white spirit.
2. Wipe the face of the mirror gently with the damp cloth. Do not rub hard to prevent scratching the finish.
3. Dry the mirror with a soft, dry, non-abrasive cloth. Ensure there is no moisture or lint left on the mirrors.
4. Perform the operational test to ensure proper functional readiness.

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6. Order Guide

6.1 Light Curtain Order Guide

- Catalog listings for the FF-SYA□□□□C2 light curtains include : one emitter, one receiver, two mating right-angle hirschmann connectors, two pairs of right-angle brackets, two pairs of straight brackets, one test rod, and this installation manual.
- Catalog listings for the FF-SYA□□□□Q2 light curtains includes : one emitter, one receiver, two pairs of right-angle brackets, two pairs of straight brackets, one test rod and this installation manual. The Brad Harrison plugs must be ordered separately.

The safety control module FF-SRS59392 or safety relays K1 to K5, the cycle start push-button, the test contacts (shown in the wiring diagram in Electrical Connections chapter) Mirrors and optional accessories (such as mating straight plugs) must be supplied or ordered separately by the customer.

Example:

FF-SYA 30 080 C 2□

Blank : Emitter and Receiver
E : Emitter
R : Receiver

Connection
C : DIN43651 plastic 7-pin right angle plugs (Hirschmann N6RFF type, included)
Q : 5 and 7 pole straight male receptacles (compatible with Brad Harrison Mini-Change plugs, not included)

Model	032	048	064	080	096	112	128	144	160	176
PH FF-SYA14	334	494	654	814	974	1134	1294	NA	NA	NA
FF-SYA30	350	510	670	830	990	1150	1310	1470	1630	1790
FF-SYA60	390	550	710	870	1030	1190	1350	1510	1670	1830

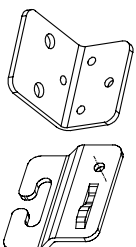
PH : Protection Height in mm (100 = 3.9 in.)
NA : Not Available

Resolution

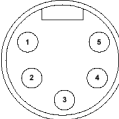
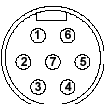
14 :	14 mm / 0.6 in. (fingers detection)
30 :	30 mm / 1.2 in. (hands detection)
60 :	60 mm / 2.4 in. (body detection)

6.2 Accessories Order Guide

6.2.1 Mounting Bracket Kit

Part Listings	Description
FF-SYZ001001 	Kit of 2 right-angle brackets and 2 straight brackets with mounting hardware (mounting hardware includes 3 T-shape bolts, 3HM4 nuts, 3M4 Rip-lock washers, and 6 M6 Rip-lock washers). NOTICE PROTECTION AGAINST HIGH VIBRATIONS In case of high vibrations, 3 pairs of brackets must be used for ligh curtain systems with protection heights, greater or equal to 1000 mm / 39.4 in. (An additional bracket kit must be ordered separately).

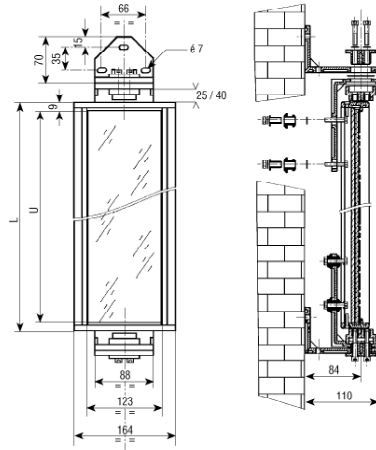
6.2.2 Plugs Kits

Part Listings	Description
FF-SYZ172113 	For the FF-SYA□□□□C2 light curtains kit of 2 DIN 43651 plastic 7-pin right-angle connectors with crimping contacts (Hirschmann, N6RFF type). Order 1 kit for a complete set emitter and receiver. (already included in the FF-SYA package, to be ordered as spares only)
FF-SYZ172159 	For the FF-SYA□□□□C2 light curtains kit of 2 DIN 43651 plastic 7-pin straight connectors with crimping contacts (Hirschmann, N6REF type). Order 1 kit for a complete set emitter and receiver. (to be ordered separately as an option)
  Male face view Colour code	41308 (for FF-SYA□□□□Q2E emitters) 5-pole female straight Brad Harrison Mini-Change plug, 12ft/3.66m cable length. Order one plug for the emitter. To be ordered separately when using the FF-SYA□□□□Q2 light curtains. 41322 (for FF-SYA□□□□Q2E emitters) 5-pole female straight Brad Harrison Mini-Change plug, 20ft/6.10m cable length. Order one plug for the emitter. To be ordered separately when using the FF-SYA□□□□Q2 light curtains.
  Male face View Colour code	42803 (for FF-SYA□□□□Q2R receivers) 7-pole female straight Brad Harrison Mini-Change plug, 12ft/3.66m cable length. Order one plug for the receiver. To be ordered separately when using the FF-SYA□□□□Q2 light curtains. 42821 (for FF-SYA□□□□Q2R receivers) 7-pole female straight Brad Harrison Mini-Change plug, 20ft/6.10m cable length. Order one plug for the receiver. To be ordered separately when using the FF-SYA□□□□Q2 light curtains.

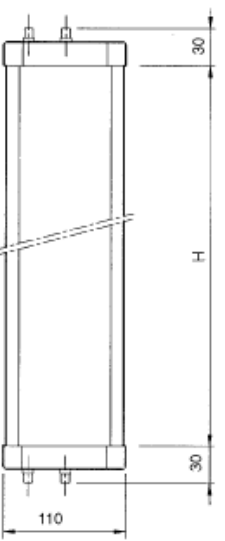
6.2.3 Test rods

Part Listings	Description
FF-SYZROD14 	test rod for Ø 14 mm resolution safety light curtains (already included in the FF-SYA package, to be ordered as spares only)
FF-SBZROD30 	test rod for Ø 30 mm resolution safety light curtains (already included in the FF-SYA package, to be ordered as spares only)

6.2.4 Mirrors FF-SBSMIR ... Series (10 % reduction on scanning range)

	Part Listings	Description
	FF-SBSMIR04	One deflection mirror for use with the 032 and 048 model light curtains
	FF-SBSMIR06	One deflection mirror for use with the 064 model light curtain
	FF-SBSMIR08	One deflection mirror for use with the 080 model light curtains
	FF-SBSMIR10	One deflection mirror for use with the 096 model light curtain
	FF-SBSMIR12	One deflection mirror for use with the 112 and 128 model light curtains
	FF-SBSMIR14	One deflection mirror for use with the 144 model light curtain
	FF-SBSMIR16	One deflection mirror for use with the 160 model light curtain

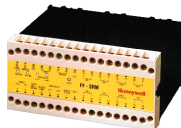
6.2.5 Mirrors FF-SLC ... MIR Series (30 % reduction on scanning range)

	Part Listings	Description
	FF-SLC02MIR	One deflection mirror for use with the 032 model light curtain
	FF-SLC04MIR	One deflection mirror for use with the 048 model light curtain
	FF-SLC06MIR	One deflection mirror for use with the 064 model light curtains
	FF-SLC07MIR	One deflection mirror for use with the 080 model light curtain
	FF-SLC09MIR	One deflection mirror for use with the 096 model light curtain
	FF-SLC11MIR	One deflection mirror for use with the 112 model light curtain
	FF-SLC13MIR	One deflection mirror for use with the 128 model light curtain
	FF-SLC16MIR	One deflection mirror for use with the 144 and 160 model light curtains
	FF-SLC18MIR	One deflection mirror for use with the 176 model light curtain

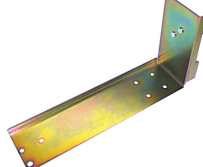
6.2.6 Safety control module

Part Listings	Description
FF-SRS59392 	Emergency stop control module designed for safety light curtains (24 Vdc) (to be ordered separately as an option)

6.2.7 Safety muting interface

Part Listings	Description
FF-SRM100P2 	Interface between the safety light curtain and the control circuitry of a dangerous machine (to be ordered separately as an option)

6.2.8 AC to DC power supply

Part Listings	Description
FF-SYZ880246 	Lambda Coutant JWS 50-24A type AC/DC power supply Input voltage : 85 to 265 Vac Output voltage : 24 Vdc / 2.2A (50W) Dimensions : 159 x 85 x 37 mm / 6.26 x 3.34 x 1.45 in. Mounting : three M3 screws or Din rail adapter (see below) Approvals : UL 1950, CSA 950 and EN 60950 (to be ordered separately as an option)
FF-SYZ736048 	Din rail adapter for Lambda Coutant JWS 50 power supply (to be ordered separately as an option)

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7. Warranty Information

7.1 *Warranty and Remedy*

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during that period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is the Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

While we provide application assistance, personally and through our literature, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

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(34) 91 313 61 00	Spain
1-815-235-6847	International
+ 44 (0) 161 251 4079	UK
1-800-537-6945	USA

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1-800-565-4130	Canada
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<http://www.honeywell.com/sensing/>
info@micro.honeywell.com

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8. CE Declaration of Conformity

Centre Européen de la Photoélectricité
Honeywell-Cometa
B.P. 81
38243 Meylan Cedex - France
Tel : (33) 04 76 41 72 00
Fax : (33) 04 76 41 72 56



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CE declaration of conformity

We : Honeywell-Cometa
ZIRST B.P. 81
21, chemin du Vieux Chêne
38240 Meylan Cedex - France

Declare : under our sole responsibility that the protective equipment catalogued:

Safety light curtain FF-SYA series

to which this declaration relates is in conformity with the technical requirements of the standards and the provisions of the essential requirements of the Directives detailed below.

Directives : • **Machine Directive 98/37/EEC**, to which the EC-type examination certificate ⁽¹⁾ delivered by the Institut National de Recherche et de Sécurité relates. Our Quality Assurance System guarantees that the presently delivered product is identical to the sample which passed the EC-type examination.
• **Low Voltage Directive 73/23 EEC**
• **Electromagnetic Compatibility Directive 89/336 EEC**

Standards : **EN 61496-1** : Safety of Machinery - Electrosensitive Protective Equipment - part 1 : General requirements and tests.
EN 61496-2 : Safety of Machinery - Electrosensitive Protective Equipment - part 2 : Active Optoelectronic Protective Devices

Safety category : type 4 as per EN 61496-1 and pr EN 61496-2

Legal Representative
in Europe :

Place of issue : Meylan
Quality Manager :
Patrick Goud
Signature :

Date:15/12/98
General Manager:
Lionel Heitz
Signature :

(1) : Available upon request.

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South Africa (Republic of)

Honeywell Southern
Honeywell S.A. Pty. Ltd
Tel: (27) 11 805-1201
Fax: (27) 11 805-1554

Spain

Honeywell S.A.
Tel: (34) 91 313 61 00
Fax: (34) 91 313 61 29

Sweden

Honeywell AB
Tel: (46) 8 775 55 00
Fax: (46) 8 775 56 00

Switzerland

Honeywell AG
Tel: (41) 1 839 25 25
Fax: (41) 1 831 03 14

United Kingdom

Honeywell Control Systems Ltd
Tel: (44) 1344 656000
Fax: (44) 1344 656015

Mediterran & Africa Distributors & Turkey

Honeywell SpA
Tel: (39) 2 6773 532
Fax: (39) 2 6773 555

Middle East Headquarters

Honeywell Middle East Ltd.
Tel: (9712) 322530



Characteristics and dimensions of equipment listed in this manual are for reference only and are subject to change without prior notice.

Safety Light Curtain Installation Manual

FF-SB12, SB14, SB15 and SB30 Series
Safety Light Curtains

PK 86830 Issue 4

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Introduction

Overview

This manual contains description, operation, installation, electrical connections, maintenance and troubleshooting information related to the FF-SB Series safety light curtains.

Important Highlighted Information

Important danger, warning, caution and notices are highlighted throughout the manual as follows:

DANGER

A DANGER symbol indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

A WARNING symbol indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

A CAUTION symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

NOTICE

A NOTICE symbol indicates important information that must be remembered and aids in job performance.

Organization of Installation Manual

This installation manual consists of the following:

Introduction contains a table of contents and explains the manual's organization.

Description and Operation discusses the terms and concepts related to operation as well as specifications and order guide information. This section also discusses the importance of the installer's role in set-up and installation of the machine guarding system.

Organization of Installation Manual (cont'd)

Installation contains mounting and positioning information. This section explains safety distance and how it is calculated. How to mount light curtains and mirrors is also discussed.

Electrical Connections covers electrical installation and wiring diagram information.

Maintenance and Troubleshooting contains inspection, cleaning, maintenance, troubleshooting, and repair information.

Index contains keywords and their associated pages related to topics found throughout this manual.

Warranty And Remedy

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Commencing with date of shipment, Honeywell's warranty runs for 18 months. If warranted goods are returned to Honeywell during that period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is the Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

While we provide application assistance, personally and through our literature, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

Sales And Service

Honeywell's MICRO SWITCH Division serves its customers through a worldwide network of sales offices and distributors. For application assistance, current specifications, pricing or the name of the nearest distributor, contact a nearby sales office or call:

1-800-537-6945 USA
1-800-737-3360 Canada
1-815-235-6847 International

FAX
1-815-235-6847

INTERNET
<http://www.sensing.honeywell.com>
info@micro.honeywell.com

Light Curtain Identification

Each emitter and receiver has two plates, an identification plate and an approval plate.

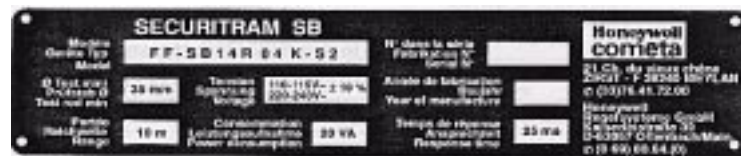
The identification plate contains the following:

- Catalog listing (type)
- Serial number
- Date code
- Power consumption (P)
- Supply voltage

The approval plate certifies that the product conforms to the technical examination endorsement issued by the approval institutes of different countries.

FF-SB Original Version

Identification Plate



Approval Plate



Catalog Listing	Serial Number
FF-SB12E/R...	1 TO 999
FF-SB14E/RxxK-S2	10000 TO 19999
FF-SB14E/Rxx4-S2	20000 TO 20999
FF-SB15...	1 TO 999

Power Consumption

- 20 VA for AC version
- 20W for DC version

FF-SB CE Version

Identification Plate



Approval Plate



Switches for Selection Mode on Receiver Power Board	
Catalog Listing	Serial Number
FF-SB12E/R...	5001 TO 5067
FF-SB14E/RxxK-S2	50001 TO 51729
FF-SB14E/Rxx4-S2	21001 TO 21438
FF-SB15...	1001 TO 1024
FF-SB30...	70001 TO 70015
Jumper Links for Selection Mode on Receiver Power Board	
Catalog Listing	Serial Number
FF-SB12E/R...	5068 TO ...
FF-SB14E/RxxK-S2	51730 TO ...
FF-SB14E/Rxx4-S2	21439 TO ...
FF-SB15...	1025 TO ...
FF-SB30...	70016 TO ...

Power Consumption

- 8 VA for AC version
- 8 W for DC version

Description and Operation

Overview

This chapter contains terms and concepts related to safety and the application of the FF-SB Series light curtain. The importance of the installer's role in the set-up and installation of the machine guarding systems is discussed. The section also contains specification and order guide information.

Machine Guarding and Perimeter Protection

FF-SB12, FF-SB14 and FF-SB30 Series thru-scan light curtains are non-contact machine guarding devices designed to increase the protection of operators of power driven machinery (see figure 1-1). The FF-SB15 Series light curtain is designed for perimeter guarding of dangerous areas.

WARNING

IMPROPER INSTALLATION OF FF-SB SERIES LIGHT CURTAIN

- Install FF-SB light curtains in accordance with this installation manual and applicable local safety regulations (OSHA, ANSI, European standards).
- Allow entry into protected area by interruption of sensing field or other safeguarding device only.
- Consult local safety agency before installing FF-SB Safety light curtains.

Failure to comply with these instructions could result in death or serious injury.

FF-SB Series light curtains generate a stop signal if the sensing field is interrupted. Further operation is prevented until the sensing field is cleared. The FF-SB Series light curtain monitors itself continuously for component failures, misalignments, and dirt accumulations. Small misalignments or dirt accumulation are indicated by a flashing LED. If misalignment or dirt accumulations become too great or a component fails, a stop signal is generated. Operation is prevented until the condition is corrected.

⚠ WARNING

IMPROPER SYSTEM PERFORMANCE

- Consult local safety agency before designing a machine control system.
- Comply with local safety requirements when designing machine control link, interface and all control elements that affect safety.
- Install two independent safety relay contacts into machine control stop circuit controlled by FF-SB Series light curtain.
- Ensure two independent stop circuit relays have mechanically linked contacts that prevent contact overlapping in the event of a welded contact.

Failure to comply with these instructions could result in death or serious injury.

FF-SB12, FF-SB14, FF-SB15 and FF-SB30 Series light curtains are designed so a malfunction or an interruption of the sensing field will cause the light curtain to generate a stop signal within a maximum of 30 milliseconds. This stop signal will be generated automatically if a malfunction occurs in the light curtain. All other machine control components that affect safety should also be designed to the same high level of operation.

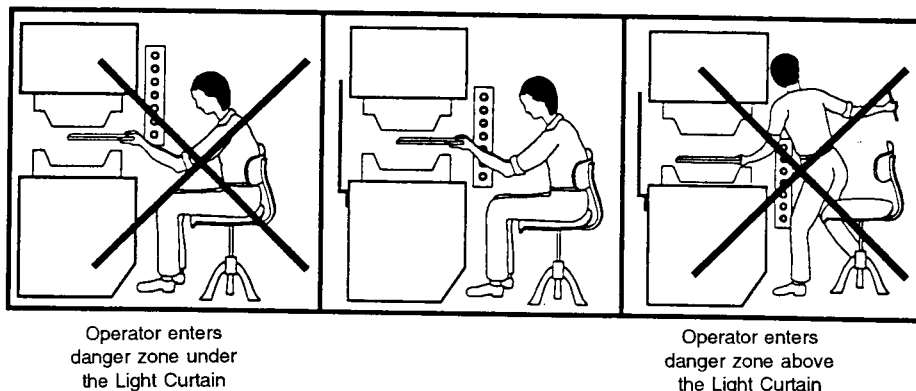
⚠ WARNING

IMPROPER MACHINE REACTION

- Ensure the machine control is capable of stopping the machine at any point in the cycle.
- Ensure that a loss of power does NOT impair stopping action of machine.

Failure to comply with these instructions could result in death or serious injury.

Figure 1-1 Point-of-operation Guarding (use FF-SB12, 14 or 30 only)



Point-of-operation is defined as that area where a machine performs work (such as cutting, shaping, boring, or forming) on a material.

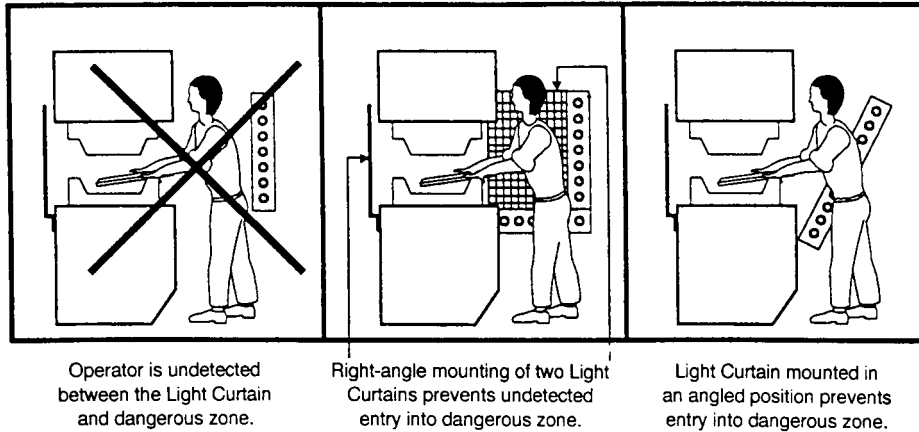
⚠ DANGER

FULL REVOLUTION MECHANICAL POWER PRESSES CANNOT BE STOPPED IN MID-STROKE (OSHA 29CFR 1910.217). Do NOT use FF-SB Series light curtains on full revolution mechanical power presses.

Failure to comply with these instructions will result in death or serious injury.

For point-of-operation guarding the light curtain(s) and any mechanical guards should be installed so no one can stand between the light curtain and the danger zone. This may require additional hard guarding, horizontal or angled positioning of the light curtain, or additional light curtains (see figure 1-2).

Figure 1-2 Point-of-operation Guarding (use FF-SB12, 14 or 30 only)



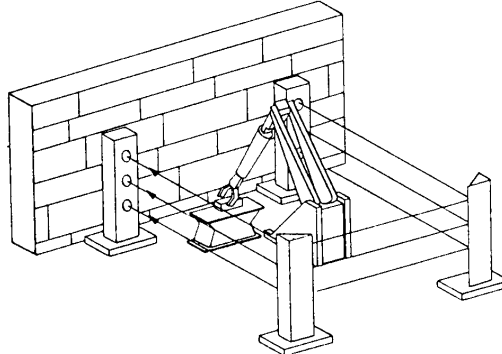
⚠ DANGER

IMPROPER POINT-OF-OPERATION PROTECTION

Do NOT use FF-SB15 Series light curtains in point-of-operation applications.

Failure to comply with these instructions will result in death or serious injury.

Figure 1-3 Perimeter Guarding (use FF-SB12, 14, 15, or 30)



⚠ WARNING

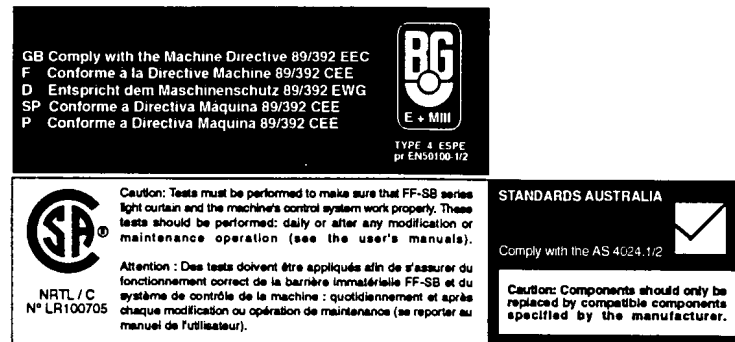
IMPROPER PERIMETER PROTECTION ACTIVATION

- Design control circuit that requires a manual restart before further machine operation can occur.
- Locate manual restart to allow operator a clear view of danger zone.
- Operator must NOT be able to reach manual restart from within danger zone.
- Design control circuit to prevent Programmable Logic Controller from overriding manual restart.

Failure to comply with these instructions could result in death or serious injury.

Approvals

Figure 1-4 Approvals Plate



CE	Only the packaging and the documentation of FF-SB Series products carry the CE mark; the CE declaration of conformity is at the back of this manual
CSA NRTL/C	Canadian Standards Association - Nationally Recognized Testing Laboratory (NRTL)
Standard Australia	Australia Standard
BG	German Berufsgenossenschaft E+MIII

Standards Compliance

Standard	Title
ANSI B11.1	Mechanical Power Presses
ANSI B11.2	Hydraulic Power Presses
ANSI B11.19	Safeguarding when Referenced by the Other B11 Machine Tool Safety Standards
ANSI/RIA R15.06	Safety Requirements for Industrial Robots and Robot Systems
UL508	Underwriters Laboratory
IEC1496 PART 1 and 2	International Electrotechnical Commission
EN 61496	European Normalisation
EN 292	Safety of Machinery - Basic Concepts, General Principles for Design
EN 60204	Safety of Machinery - Electrical Equipment of Machines
IEC 61496 (replaces IEC1496 1/2)	Safety of Machinery - Electrosensitive Protective Equipment
pr EN 999	Safety of Machinery - Positioning of Protective Equipment Related to Approach Speeds of Parts of the Human Body
EN 294	Safety of Machinery - Safety Distances to Prevent Upper Limbs from Reaching Danger Zones
pr EN 811	Safety of Machinery - Safety Distances to Prevent Lower Limbs from Reaching Danger Zones

Regulations Compliance

	Title
OSHA 29 CFR 1910.212	General Requirements for (guarding of) All Machines
OSHA 29 CFR 1910.217	(Guarding of) Mechanical Power Presses

Directives Compliance

Machine Directive 89/392 EEC
Low Voltage Directive 73/23 EEC
Electromagnetic Compatibility Directive 89/336

Control Reliability

“Control Reliability” means that “the device, system or interface shall be designed, constructed and installed such that a single component failure within the device, interface or system shall not prevent normal stopping action from taking place but shall prevent a successive machine cycle.” (ANSI B11.19-1990, 5.5)

OSHA 29 CFR 1910.217 states that “the control system shall be constructed so that a failure within the system does not prevent the normal stopping action from being applied to the press when required, but does prevent initiation of a successive stroke until the failure is corrected. The failure shall be detectable by a simple test, or indicated by the control system.”

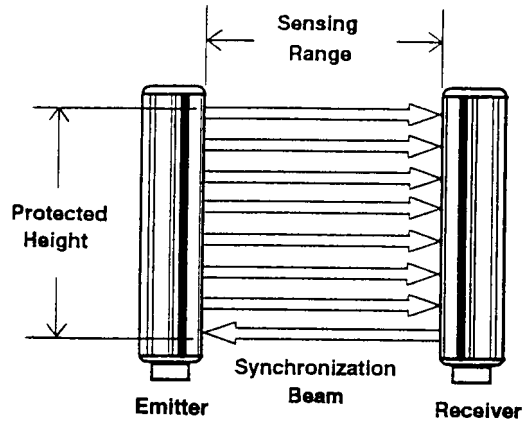
Honeywell has developed new patented self-checking techniques which combine reliability with safety. The FF-SB Series light curtains function with dual channel redundancy and positive self-checking monitoring. This means that a faulty component in our system will make the safety barrier fail in a safe mode.

This design meets the highest requirements (Category 4 Electrosensitive Protective equipment) as described in the IEC61496 European project norm. Category 4 safety light curtains are designed and manufactured in such a way that a single breakdown or an accumulation of failures does not lead to the loss of the safety function when a dangerous situation arises. **The safety function is maintained on a permanent basis.**

Operation

The FF-SB12, FF-SB14 and FF-SB30 Series are thru-scan light curtains. Emitters transmit modulated, infrared light that is detected by photoreceivers in the receiver (see figure 1-5). The number of light beams depends on the protected height and resolution of the light curtain.

Figure 1-5 FF-SB Series Operational Diagram



The FF-SB15 Series is also a thru-scan type light curtain. The emitter transmits two or three groups of eight beams each, plus the synchronization beam.

Resolution

FF-SB Series light curtain resolution (sometimes called object sensitivity) is the minimum object size that will interrupt at least one light beam when it enters the sensing field. Anything entering the sensing field equal to or greater than this minimum size will be detected. Resolution is not affected by scanning distance or dust accumulation. The FF-SB Series does not have a sensitivity adjustment.

Two factors determine the resolution of the light curtain: beam center distance and light beam diameter (see figure 1-6). FF-SB12 has a center distance of 12,7 mm (0.5 inches) and the FF-SB14 and the FF-SB30 have a center distance of 25,4 mm (1 inch).

Beam diameter is the smallest width that will block a single light beam. The FF-SB12 and FF-SB14 have a beam diameter of 9,5 mm (0.37 inch). The FF-SB30 has a beam diameter of 4,5 mm (0.177 inch). The combination of the beam diameter and center distance gives the FF-SB12 (see figure 1-6) a resolution of 22 mm (0.87 inch), the FF-SB14 a resolution of 35 mm (1.38 inches) and the FF-SB30 a resolution of 30 mm (1.18 inches).

The FF-SB15 has a 235 mm (8.5 inches) gap between the sets of its beams and is considered suitable for perimeter guarding only.

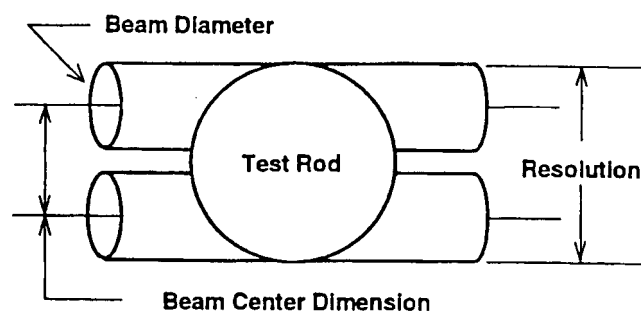
⚠ DANGER

IMPROPER POINT-OF-OPERATION PROTECTION

Do NOT use FF-SB15 Series light curtains in point-of-operation applications.

Failure to comply with these instructions will result in death or serious injury.

Figure 1-6 Light Curtain Resolution



⚠ WARNING

IMPROPER INSTALLATION OF FF-SB SERIES LIGHT CURTAIN

- Because the emitter and receiver units must have the same resolution and protected height to operate, DO NOT use FF-SB30 emitter with FF-SB14 receiver or vice versa.
- DO NOT use FF-SB12 or SB14 with FF-SB15 emitters or receivers.

Failure to comply with these instructions could result in death or serious injury.

Protected Height

Protected height is the height from the top of the uppermost light beam to the bottom of the synchronization beam (see figure 1-5). The synchronization beam is part of the protected height.

Synchronization

The FF-SB Series emitter is optically synchronized by an infrared light beam sent from the receiver to the emitter. The beam keeps the emitter and receiver in synchronization. External wiring between the emitter and receiver or through a third control unit is not needed. To simplify maintenance and inventory, the emitter and receiver are not matched.

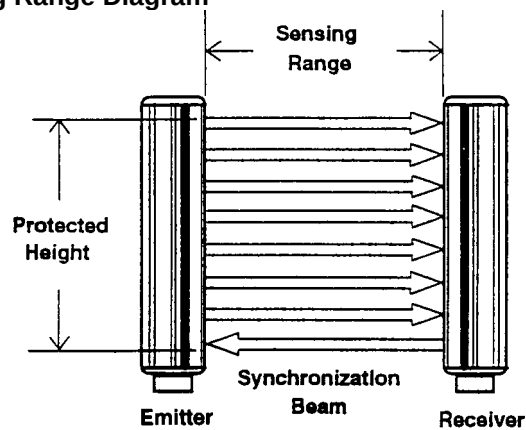
Response Times

The response time of FF-SB Series light curtains is the maximum time it takes the light curtain to generate a stop signal after the sensing field has been interrupted. See the table below for response times for individual light curtains.

Protected Heights (mm/in)	Response Times (milliseconds)		
	FF-SB12	FF-SB14/FF-SB30	FF-SB15
200 (7.87)	25	—	—
400 (15.75)	27	25	—
600 (23.6)	29	26	25
800 (31.5)	—	27	—
1000 (39.37)	—	28	26
1200 (47.24)	—	29	—
1400 (55.12)	—	30	27

Scanning Range

Figure 1-7 Scanning Range Diagram



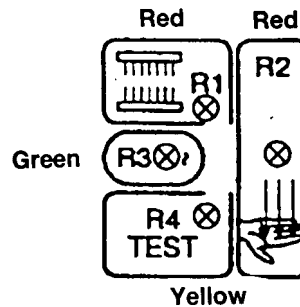
Scanning range is the maximum distance allowed between the emitter and the receiver (see figure 1-7). The FF-SB Series light curtains have the following scan ranges:

Product	Scan Range
FF-SB12	0 to 10 meters (0 to 32.8 feet)
FF-SB14 (standard version)	0 to 10 meters (0 to 32.8 feet)
FF-SB14 (filter version for crowded areas or welding applications)	0 to 6 meters (0 to 19.7 feet)
FF-SB30	0 to 6 meters (0 to 19.7 feet)
FF-SB15	3 to 24 meters (9.84 to 78.8 feet)
FF-SB12E/R02E-52	0 to 6 meters (0 to 19.7 feet)

Indicators

FF-SB12, FF-SB14, FF-SB15 and FF-SB30 Series receivers have four LED indicators (see figure 1-8). The emitters have one LED. These LED indicators provide important information related to light curtain status.

Figure 1-8 Receiver Indicators



Signal Strength Indicator (receiver)

The R1 indicator will flash repeatedly if the received light level is lower than the normal operating level, but is still sufficient for operation. If the received light level drops too low, an alarm state results and the light curtain generates a stop signal. To prevent unnecessary shutdowns, this indicator will signal the need for cleaning and/or alignment.

Operation Indicators (receiver)

There are two LED indicators that provide operation status (see figure 1-8): R2 (red) and R3 (green). R3 indicates the receiver is operating normally and the sensing field is clear. This indicator must be on to ensure the equipment is working properly (red R2 will be off).

R2 indicates that the light curtain is in an alarm state. If the sensing field is interrupted, the FF-SB Series light curtain will immediately generate a stop signal. In this condition, R2 will be on and R3 will be off.

Test Indicator (receiver)

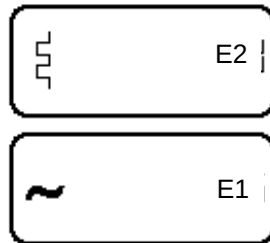
FF-SB Series light curtains provide a connection for testing the state of external contacts. The test contacts allow verification of external safety-related electromechanical components. When any contact in the external test circuit opens, the FF-SB Series light curtains will switch to the alarm state. R4, the test indicator, will turn on and the relay outputs will be de-energized while the test circuit is open.

The customer is responsible for providing the external test circuitry. See figures 3-3, 3-4 and 3-5 for the wiring diagrams of the external test circuitry.

Power Indicator (emitter)

FF-SB Series emitters have a yellow E1 LED that, if illuminated, indicates power is applied to the light curtain (see figure 1-9).

Figure 1-9 Emitter Indicators



Synchronization Beam Reception Indicator (emitter)

FF-SB Series emitters have a yellow E2 LED that, if illuminated, indicates the synchronization beam is established. (see figure 1-9). E2 also illuminates if one beam is interrupted near the emitter.

Mirrors

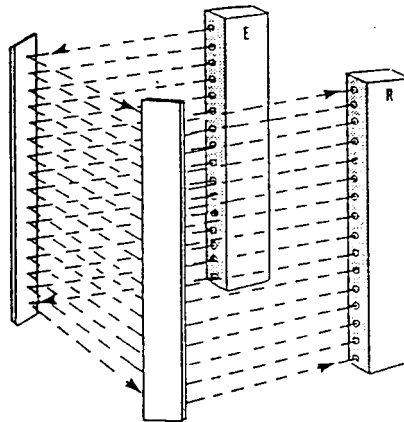
FF-SB Series mirrors provide a means to guard more than one side of a danger zone with one light curtain. One or two mirrors can be used with a emitter and receiver pair. For FF-SB12, 14 and 30 light curtains, each mirror reduces the scanning range by 10 %. For FF-SB15 light curtains, each mirror reduces the scanning range by 15%. See the Scanning Range with Mirrors table below.

Scanning Range with Mirrors

FF-SB Series	Scanning Range m (ft.)	Scanning Range with Mirrors	
		1 Mirror	2 Mirrors
FF-SB12	10 (32.8)	9,0 (26.52)	8,1 (23.87)
FF-SB14	10 (32.8)	9,0 (26.52)	8,1 (23.87)
FF-SB15	24 (78.8)	20,4 (75)	17,3 (63.7)
FF-SB30	6 (19.7)	5,4 (17.7)	4,9 (15.9)

Figure 1-10 illustrates the combination of an emitter, receiver, and two mirrors guarding three sides of a danger zone.

Figure 1-10 Two Mirrors Used with One FF-SB Light Curtain



The protected height of the light curtain determines which mirrors should be used. Refer to the Mirror Heights table below for the height of individual mirrors and the protected height they are meant to operate with.

Mirror Heights

Part Listing	Use with Protected Height mm (in.)	Overall Mirror Frame Height w/o brackets
FF-SBSMIR02	200 (7.87)	298 (11.73)
FF-SBSMIR04	400 (15.75)	501 (19.72)
FF-SBSMIR06	600 (23.6)	704 (27.72)
FF-SBSMIR08	800 (31.5)	909 (35.79)
FF-SBSMIR10	1000 (39.37)	1112 (43.78)
FF-SBSMIR12	1200 (47.24)	1315 (51.77)
FF-SBSMIR14	1400 (55.12)	1520 (59.84)

Mirrors are shipped with all the necessary mounting hardware and rotatable brackets (see page 35).

Specifications

OPERATING CHARACTERISTICS		
Scanning Range	FF-SB12	0 to 10 m (0 to 32.8 ft.) for -S2 version 0 to 6 m (0 to 19.7 ft.) for -S2F version and FF-SB12E1R02E-S2
	FF-SB14	0 to 10 m (0 to 32.8 ft.)
	FF-SB30	0 to 6 m (0 to 19.7 ft.)
	FF-SB15	3 to 24 m (9.84 to 78.8 ft.)
	FF-SB30	30 mm (1.18 in.) minimum
Object Detection Size	FF-SB12	22 mm (0.87 in.) minimum
	FF-SB14	35 mm (1.38 in.) minimum
	FF-SB15	235 mm (9.25 in.) minimum (body detection)
	FF-SB30	30 mm (1.18 in.) minimum
Angle of Divergence		$\pm 2^\circ$
Emitting Light Source		Infrared, pulsed, 880 nm
Immunity to Ambient Light	sunlight	20,000 lux
	lamplight	15,000 lux
ELECTRICAL CHARACTERISTICS		
Supply Voltage (emitter or receiver)		120/240 VAC (+10%,-20%), 48 to 62 Hz 24 to 48 VDC*, $\pm 15\%$,
Power Consumption (emitter or receiver)		8 VAC/8W DC
Output Type		Mechanically-linked relay contacts
Output Switching Capability		50 mA min., 2 Amps at 250 VAC 1 Amp at 48 VDC Max.
Test Input		External dry contact required
Response Times	FF-SB12	≤ 29 msec
	FF-SB14/FF-SB30	≤ 30 msec
	FF-SB15	≤ 27 msec
Immunity to Electrical Noise		IEC 1000-4-4 (Replaces IEC 801-4, Norm)
ENVIRONMENTAL/PHYSICAL CHARACTERISTICS		
Operating Temperature Range		0 to 55°C (32 to 131°F)
Sealing		NEMA 4, 13, and IP 65
Housing Dimension	FF-SB12/14/30	Width, 56 mm (2.2 in); Depth, 116 mm (4.6 in); Height**
	FF-SB15	Width, 56 mm (2.2 in); Depth, 116 mm (4.6 in) Height 4 beam group, 1569 mm (61.77 in) Height 3 beam group, 1169 mm (46.02 in) Height 2 beam group, 769 mm (30.28 in)
Material	Housing	Aluminum Alloy
	Front Plate	Polycarbonate (FF-SB12, 14, 30) Polymethylmethacrylate (PMMA) (FF-SB15)

*The DC version is featured with a galvanic insulation (DC to DC converter) that provides the same level of immunity to external disturbances as AC versions; this is essential to guarantee the safety integrity of the light curtain.

**Refer to the Unit Height Table for individual unit heights.

Light Curtain Order Guide

Catalog listings for the FF-SB Series light curtains include: one emitter, one receiver, two mating plugs for the metal quick-disconnect connectors, two arc suppressors, one test rod, and this installation manual.

The three safety relays R1, R2, and R3, the cycle start push-button, and the test contacts (shown in the wiring diagram in Chapter 3) must be supplied by the customer. Mounting brackets, accessories, and mirrors must be ordered separately.

Each set of mounting brackets includes the following hardware: bolts, nuts, washers, and vibration dampeners. For a typical light curtain installation, two sets of mounting brackets are necessary; one for the emitter and one for the receiver. An emitter or receiver may require different types of mounting brackets in certain applications.

If the light curtains are mounted directly to a machine, order the mounting accessories set (FF-SBZS8000). Mirrors are supplied with mounting brackets and accessories.

FF-SB12 Series

Resolution: 22 mm (0.86 in)

FF- SB12E/R ☐ ☐ ☐ - S2

K = 120/240 VAC¹ (unit size > 200 mm)
E = 120 VAC only (unit size = 200 mm)

Nominal protected height
02 = 200 mm (7.87 in)
04 = 400 mm (15.75 in)
06 = 600 mm (23.62 in)

Example: FF-SB12E/R04K-S2

¹The unit automatically switches to the applied AC voltage level.

FF-SB14 Series

Resolution: 35 mm (1.38 in)

FF- SB14E/R □□ □ - S □

Nominal ranges:
2=10 meters (standard)
2F=6 meters (filtered)

K = 120/240 VAC¹
4 = 24 to 48 VDC

Nominal protected height
04 = 400 mm (15.75 in)
06 = 600 mm (23.62 in)
08 = 800 mm (31.50 in)
10 = 1000 mm (39.37 in)
12 = 1200 mm (47.24 in)
14 = 1400 mm (55.12 in)

Example: FF-SB14E/R08K-S2

FF-SB15 Series

Resolution: Perimeter Guarding (Body Detection) ONLY

FF- SB15E/R □□ □-S2

K = 120/240 VAC¹
4 = 24 to 48 VDC

Nominal protected height
06 = 600 mm (23.62 in), 2 sets of beams
10 = 1000 mm (39.37 in), 3 sets of beams
14 = 1400 mm (55.12 in), 4 sets of beams

Example: FF-SB15E/R10K-S2

¹The unit automatically switches to the applied AC voltage level.

FF-SB30 Series

Resolution: 30 mm (1.18 in)

FF- SB30E/R □□ □ - S2

K = 120/240 VAC¹

4 = 24 to 48 VDC

Nominal protected height

04 = 400 mm (15.75 in)

06 = 600 mm (23.62 in)

08 = 800 mm (31.50 in)

10 = 1000 mm (39.37 in)

12 = 1200 mm (47.24 in)

14 = 1400 mm (55.12 in)

Example: FF-SB30E/R084-S2

¹The unit automatically switches to the applied AC voltage level.

Mirror and Mounting Bracket Order Guide

Mounting Bracket Kit (one kit is required for emitter, one kit is required for receiver)

Part Listings	Description
FF-SBZS5000	Two omega shaped brackets with vibration dampeners and mounting accessories
FF-SBZS6000	Two "L" shaped brackets with vibration dampeners and mounting accessories
FF-SBZS7000A	Two rotatable brackets with vibration dampeners and mounting accessories
FF-SBZS8000	Set of vibration dampeners and mounting accessories
FF-MPZS9018	Floor mounting post for mirror
FF-SBZS9010	Floor mounting column for FF-SB Series with protected height at 1000 mm or less

Mirrors

Part Listings	Description
FF-SBSMIR02	One deflection mirror for use with the 200 mm protection height light curtain
FF-SBSMIR04	One deflection mirror for use with the 400 mm protection height light curtain
FF-SBSMIR06	One deflection mirror for use with the 600 mm protection height light curtain
FF-SBSMIR08	One deflection mirror for use with the 800 mm protection height light curtain
FF-SBSMIR10	One deflection mirror for use with the 1000 mm protection height light curtain
FF-SBSMIR12	One deflection mirror for use with the 1200 mm protection height light curtain
FF-SBSMIR14	One deflection mirror for use with the 1400 mm protection height light curtain

Replacement Part Order Guide

There are two versions of the FF-SB Series light curtains: the Original version and the CE version. Refer to the appropriate replacement part table when ordering.

FF-SB Original Version Light Curtains

Catalog Listings	Serial Numbers
FF-SB12E/R . . .	1 → 999
FF-SB14E/RxxK-S2	10000 → 19999
FF-SB14E/Rxx4-S2	20000 → 20999
FF-SB15 . . .	1 → 999

FF-SB Original Version Replacement Parts

Catalog Listings	Description
Relays	
FF-SBZ0110030	Removable relay board for FF-SB14 (on 94 and 95 products)
FF-SBZ0110020	Two safety relays for FF-SB12E/R02E-S
Fuses	
FF-SBZ0120020	10 fuses Quick 0.25A for FF-SB12 200 mm
FF-SBZ0120030	10 fuses 5 mm dia. -20 mm length Delay 0.4A for FF-SB120/240 VAC
FF-SBZ17504	10 fuses 5 mm dia. 20 mm length Delay 1A for FF-SB low voltage
Plugs	
FF-SBZ0150020	Plug-Cover + sup. metal connector emitter FF-SB/K-S (installed on light curtain)
FF-SBZ0160020	Plug-Cover + sup. metal connector receiver FF-SB/K-S (installed on light curtain)
FF-SBZ1721137	Plug-female supply metal plug emitter FF-SB/K-S
FF-SBZ1721202	Plug-female supply metal plug receiver FF-SB/K-S
Other Spare Parts	
FF-SBZ0000220	Set of 2 RC filters (arc suppresser, 220 Ω . 0.22 μ F)
FF-SBZ0130010	Set of 8 Torx screws for FF-SB12/14
FF-SBZ0170010	Flat cable, 8 leads, for FF-SB12/14
FF-SBZ0180010	Flat cable, 16 leads, for FF-SB12/14
FF-SB-KIT1	Adapters for FF-SB plug (PG21 > 13.5 + PG21 > 1/2")
FF-SB-KIT2	100 female + 100 male pins for FF-SB plugs
FA0100-164	Crimping tool
FG0300-146	Pin removal tool
Extension Modules	
FF-SBZ0230010	Extension Module for Emitter FF-SB14/15
FF-SBZ0270010	Extension Module for Receiver FF-SB14/15
FF-SBZ0500010	Extension Module for Emitter FF-SB12
FF-SBZ0510010	Extension Module for Receiver FF-SB12
Master Modules	
FF-SBZ0480010	Master Module for Emitter FF-SB12
FF-SBZ0480030	Master Module for Emitter FF-SB14/FF-SB15
FF-SBZ0490010	Master Module for Receiver FF-SB12
FF-SBZ0490030	Master Module for Receiver FF-SB14
Supply Modules	
FF-SBZ0410010	Supply Module 120/240 VAC for FF-SB12/14/15 Emitter
FF-SBZ0460010	Supply Module 120 VAC for FF-SB12 200 mm Emitter
FF-SBZ0470010	Supply Module 120 VAC for FF-SB12 200 mm Receiver
FF-SBZ5521K	Supply Module 120/240 VAC for FF-SB12/14/15 Receiver
FF-SBZ70004	Supply Module 24 to 48 VDC for FF-SB14 Emitter
FF-SBZ71004	Supply Module 24 to 48 VDC for FF-SB14 Receiver

FF-SB CE Version Light Curtains

Catalog Listing	Serial Number
FF-SB12E/R . . .	5001→....
FF-SB14E/RxxK-S2	50001→....
FF-SB14E/Rxx4-S2	21001→....
FF-SB15 . . .	1001→....
FF-SB30 . . .	70001 →....

FF-SB CE Version Replacement Parts

Part Listings	Description
Relays	
FF-SBZ132001	Removable 3 relay board for FF-SB Series except FF-SB12 200 mm
FF-SBZ0110020	Two safety relays for FF-SB12E/R02E-S2
Fuses	
FF-SBZ0120020	10 fuses Quick 0.25A for FF-SB12 200 mm
FF-SBZ109002	Box of 10 fuses 0.5A time delay for FF-SB
Plugs	
FF-SBZ1721137	Plug-female supply metal plug emitter FF-SB/K-S
FF-SBZ1721202	Plug-female supply metal plug receiver FF-SB/K-S
Other Spare Parts	
FF-SBZ0000220	Set of 2 RC filters (arc suppresser, 220 Ω. 0.22 μF)
FF-SBZ0130010	Set of 8 Torx screws for FF-SB12/14
FF-SB-KIT1	Adapters for FF-SB plug (PG21 > 13.5 + PG21> 1/2")
FF-SB-KIT2	100 female + 100 male pins for FF-SB plugs
FA0100-164	Crimping tool
FG0300-146	Pin removal tool
Extension Modules	
FF-SBZE131X	Extension Module for Emitter FF-SB14/15/30
FF-SBZR131X	Extension Module for Receiver FF-SB14/15/30
FF-SBZE104X	Extension Module for Emitter FF-SB12
FF-SBZR104X	Extension Module for Receiver FF-SB12
Master Modules	
FF-SBZE104M	Master Module for Emitter FF-SB12
FF-SBZE131M	Master Module for Emitter FF-SB14/FF-SB15
FF-SBZR104M	Master Module for Receiver FF-SB12
FF-SBZR131M	Master Module for Receiver FF-SB14
FF-SBZR105M	Master Module for Receiver FF-SB15
FF-SBZE130K	Supply Module 120/240 VAC for FF-SB12/14/15/30 Emitter with metal plugs
FF-SBZE090E	Supply Module 120 VAC for FF-SB12 200 mm Emitter with metal plugs
FF-SBZR090E	Supply Module 120 VAC for FF-SB12 200 mm Receiver with metal plugs
FF-SBZR130K	Supply Module 120/240 VAC for FF-SB12/14/15/30 Receiver with metal plugs
FF-SBZE1384	Supply Module 24 to 48 VDC for FF-SB14/30 Emitter with metal plugs
FF-SBZR1384	Supply Module 24 to 48 VDC for FF-SB1/304 Receiver with metal plugs

Installation

Overview

This chapter contains information about calculating the safety distance and properly mounting a safety light curtain. Mirror information is also provided.

WARNING

IMPROPER INSTALLATION OF FF-SB SERIES LIGHT CURTAIN

- Install FF-SB Light Curtains in accordance with this installation manual and applicable local safety regulations (OSHA, ANSI, European standards).
- Allow entry into protected area by interruption of sensing field or other safeguarding device only.

Failure to comply with these instructions could result in death or serious injury.

WARNING

IMPROPER SYSTEM PERFORMANCE

- Comply with local safety requirements when designing machine control link, interface and all control elements that affect safety.
- Install two independent relay contacts into machine control stop circuit controlled by FF-SB Series Light Curtain.
- Ensure two independent stop circuit safety relays have mechanically linked contacts that prevent contact overlapping in the event of a welded contact.

Failure to comply with these instructions could result in death or serious injury.

WARNING

IMPROPER MACHINE REACTION

- Ensure the machine control is capable of stopping the machine at any point in the cycle.
- Ensure that a loss of power does NOT impair stopping action of machine.

Failure to comply with these instructions could result in death or serious injury.

How to Calculate Safety Distance

⚠ WARNING

IMPROPER SAFETY DISTANCE

- Calculate safety distance using formula $D_s > V(t_1 + t_2) + C$ where,
 - D_s is the safety distance OSHA 29 CFR 1910.217 (c) (3) (iii) (e)
 - V is the hand speed constant of 63 inches per second
 - t_1 is the response time of the FF-SB light curtain
 - t_2 is the stopping time of the machine including interconnecting components such as relays, solenoids, and brakes, and C is additional safety distance.
- Obtain C , the additional safety distance from local safety agency.

Failure to comply with these instructions could result in death or serious injury.

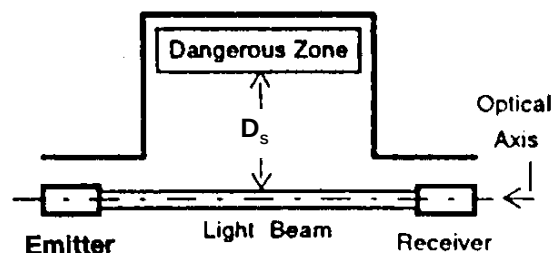
The safety distance is the minimum distance between the sensing field and the danger zone. This distance ensures that the danger zone cannot be reached until the machine motion has been stopped.

Calculate the safety distance (see figure 2-1) using the following formula:

$$D_s \geq V(t_1 + t_2) + C \text{ where,}$$

- D_s is the safety distance from the light curtain sensing field to the danger zone.
- V is the velocity of movement into the danger zone; the OSHA hand speed constant is 63 inches per second; see local health and safety regulations for current value.
- t_1 is the response time of the FF-SB light curtain.
- t_2 is the stopping time of the equipment guarded by the light curtain including interconnecting components such as all mechanical, electromechanical, and electronic parts such as relays, solenoids, and brakes.
- C is additional safety distance. See local health and safety regulations for this value.

Figure 2-1 Light Curtain Safety Distance Diagram



⚠ DANGER**IMPROPER POINT-OF-OPERATION PROTECTION**

Install the FF-SB Light Curtains and mechanical guards so that NO person can stand between the light curtain and the danger zone without being detected.

Failure to comply with these instructions will result in death or serious injury.

Point-of-operation is defined as that area where a machine performs work (such as cutting, shaping, boring, or forming) on a material.

Sample Calculation (Point-of-operation guarding)

Country: USA

Application: Mechanical or hydraulic power press

Protection: Point-of-operation guarding

Formula: $D_s \geq V(t_1 + t_2) + C$

- $V = 63 \text{ in./sec.}$
- $t_1 = 30 \text{ ms}$ (FF-SB14E/R14K-S2)
- $t_2 = 200 \text{ ms}$ (machine stop time; including response time of all interconnecting components, such as relays, solenoids, brakes, etc.)
- $C = 3.8 \text{ in.}$ (ANSI B11.1 and ANSI B11.2) [FF-SB14]
- $D_s = 63 (0.030 + 0.200) + 3.8 \text{ in.} = 18.29 \text{ in.}$

⚠ WARNING**IMPROPER PERIMETER PROTECTION**

- Design control circuit to require a manual restart before further machine operation can occur.
- Locate manual restart to allow operator a clear view of danger zone.
- Operator should NOT be able to reach manual restart from within danger zone.
- Design control circuit to prevent Programmable Logic Controller from overriding manual restart.

Failure to comply with these instructions could result in death or serious injury.

Sample Calculation (Perimeter guarding)

Country: USA

Application: Robotics

Protection: Perimeter guarding

Formula: $D_s \geq V(t_1 + t_2) + C$

- $V = 63 \text{ in./sec.}$
- $t_1 = 26 \text{ ms}$ (FF-SB15E/R10K-S2)
- $t_2 = 200 \text{ ms}$ (robotics stop time, including response time of all interconnecting components, such as relays, solenoids, brakes, etc.)
- $C = 33.5 \text{ in.}$ (USA)
- $D_s = 63 (0.026 + 0.200) + 33.5 = 47.74 \text{ in.}$

How to Calculate Safety Distance (Reflective Surfaces Considered)

⚠ WARNING

REFLECTIVE SURFACES

- To prevent two optical paths to the receiver, install FF-SB light curtains so there are no reflective surfaces within the beam angles of the emitter and receiver.
- Calculate reflective safety distance using formula $D = \frac{L}{2}(\tan 2^\circ) + C$, where
 - D is the minimum distance to reflective surface (always greater than 100mm or 3.94 in)
 - L is the installed scanning range and C is the additional safety distance.
- Obtain C, the additional safety distance, from local safety agency.

Failure to comply with these instructions could result in death or serious injury.

Reflective surfaces near the sensing field can cause reflection of the sensing beams and result in two optical paths to the receiver. The light curtain must be installed so there are no reflective surfaces within the beam angles of the emitter and receiver. Figure 2-2 illustrates the beam angles.

Calculate the safety distance using the following formula:

$$D = \frac{L}{2} \tan 2^\circ + C$$

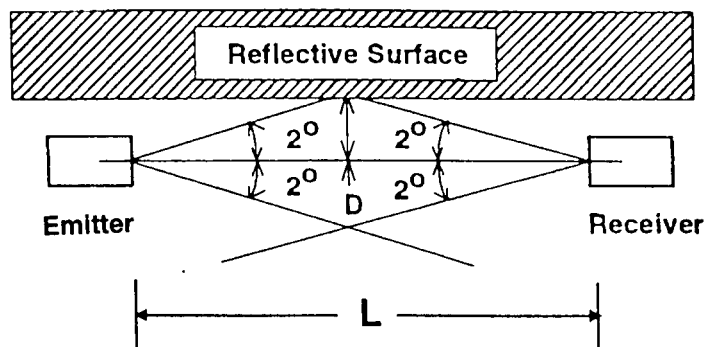
D = Minimum distance to reflective surface (always greater than 100mm or 3.94 in)

L = Installed scanning range

C = Additional distance may be required by a local regulatory agency.

The emitter and receiver must have the same protected height and resolution. The emitter and receiver must be mounted at the same height and aligned with each other (see figure 2-2).

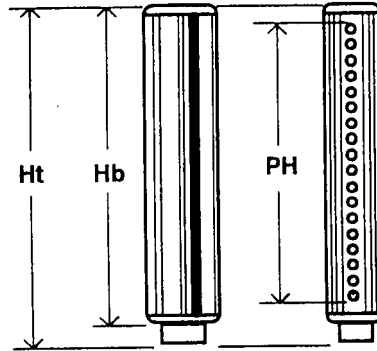
Figure 2-2 Distance from Reflective Surfaces



Emitter and Receiver Dimensions

Different protection heights are available in the FF-SB Series light curtain product line. Refer to figure 2-3 and the emitter and receiver heights table below.

Figure 2-3 Emitter and Receiver Height Diagram



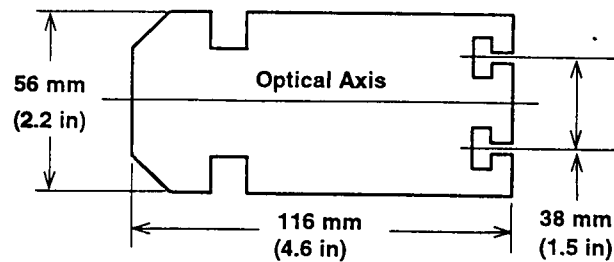
Emitter and Receiver Heights mm (in) - for reference only

Model	Nominal Protected Height	PH	Hb	Ht
FF-SB12	200 (7.87)	212,7 (8.4)	274,6 (10.8)	366,6 (14.4)
FF-SB12	400 (15.75)	415,9 (16.4)	477,8 (18.8)	569,8 (22.4)
FF-SB14		415,9 (16.4)	477,8 (18.8)	569,8 (22.4)
FF-SB30		410,4 (16.2)	477,8 (18.8)	569,8 (22.4)
FF-SB12	600 (23.6)	619,1 (24.4)	681 (26.8)	773 (30.4)
FF-SB14		619,1 (24.4)	681 (26.8)	773 (30.4)
FF-SB15		619 (24.4)	689 (27.1)	769 (30.3)
FF-SB30		613,6 (24.2)	681 (26.8)	773 (30.4)
FF-SB14	800 (31.5)	822,3 (32.4)	884,2 (34.8)	976,2 (38.4)
FF-SB30		816,8 (32.2)	884,2 (34.8)	976,2 (38.4)
FF-SB14	1000 (39.37)	1025,5 (40.4)	1087,4 (42.8)	1179,4 (46.4)
FF-SB15		1025 (40.4)	1089 (42.9)	1169 (46.0)
FF-SB30		1020,0 (40.2)	1087,4 (42.8)	1179,4 (46.4)
FF-SB14	1200 (47.24)	1228,7 (48.4)	1291 (50.8)	1382,6 (54.4)
FF-SB30		1233,2 (48.6)	1290,6 (50.8)	1382,6 (54.4)
FF-SB14	1400 (55.12)	1431,9 (56.4)	1493,8 (58.8)	1585,8 (62.4)
FF-SB15		1432 (56.4)	1489 (58.6)	1569 (61.8)
FF-SB30		1426,4 (56.2)	1493,8 (58.8)	1585,8 (62.4)

PH = Protection Height; Hb = Unit Height; Ht = Unit Height with Female Plug Connector

All emitter and receiver units have the same cross-sectional size. Figure 2-4 illustrates the cross-sectional dimensions of the light curtain series.

Figure 2-4 Emitter and Receiver cross-sectional Dimensions



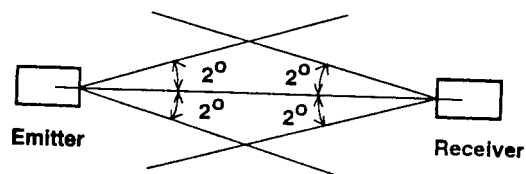
Mounting Considerations

This section discusses optical alignment and mounting considerations. There are several different ways to mount the FF-SB Series light curtains (singularly, in groups, and in several different orientations).

Optical Alignment

Proper optical alignment of the FF-SB Series light curtains ensures optimum operation. The emitter and receiver units must be mounted in parallel, at the same height, and with an angular displacement of no more than $\pm 2^\circ$. See figure 2-5 for proper alignment.

Figure 2-5 Emitter and Receiver Optical Alignment



Vertical Mounting

⚠ WARNING

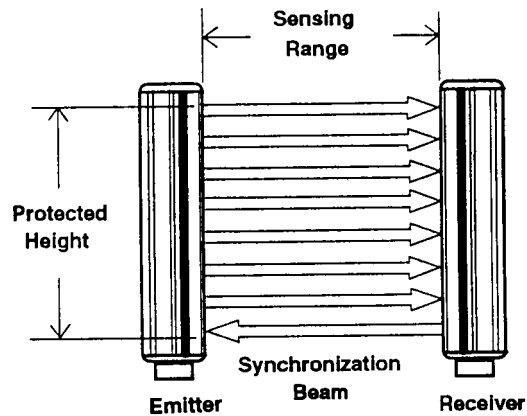
IMPROPER INSTALLATION OF FF-SB SERIES LIGHT CURTAIN

- Mount FF-SB Series light curtains so that any entry into protected area must interrupt sensing field or other safeguarding devices.
- Install mechanical guards or additional FF-SB light curtains to prevent operating personnel from reaching around, under, or over sensing field.

Failure to comply with these instructions could result in death or serious injury.

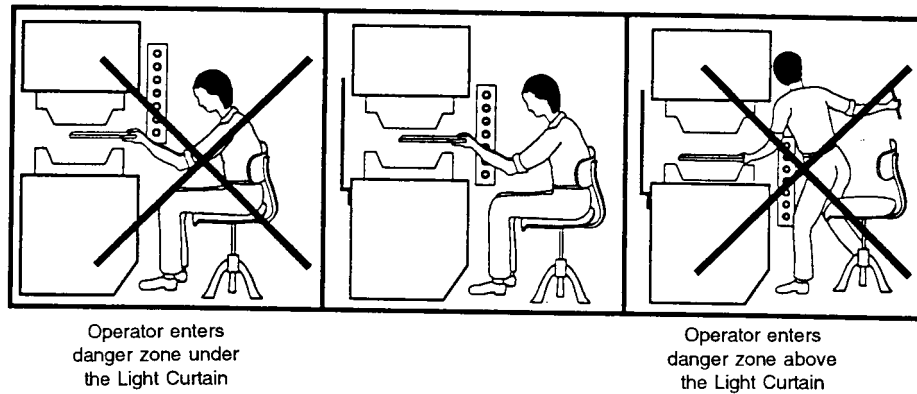
Vertical mounting may require the installation of mechanical guards or additional light curtains to prevent operating personnel from reaching around, under, or over the sensing field (see figure 2-6).

Figure 2-6 Vertical Mounting



For point-of-operation guarding, the light curtain(s) and any mechanical guards must be installed to detect or prevent operating personnel from standing between the light curtain and the danger zone (see figures 2-7 and 2-8).

Figure 2-7 Point-of-operation Guarding (use FF-SB12, 14 or 30 only)

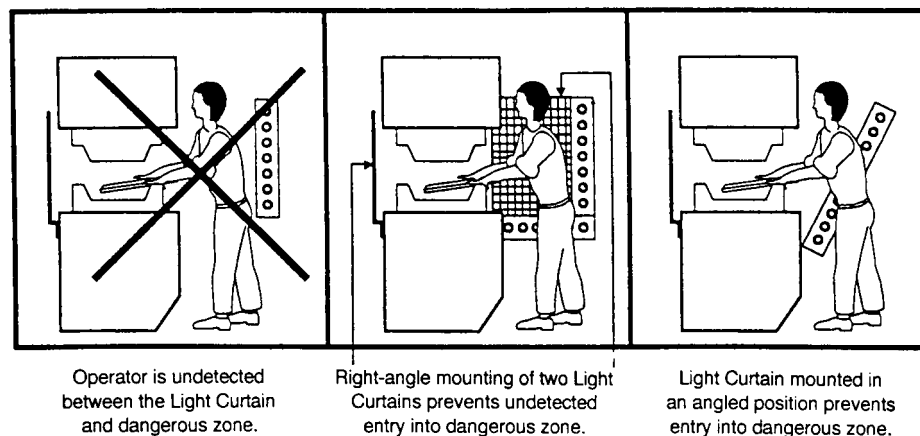


⚠ DANGER

IMPROPER POINT-OF-OPERATION PROTECTION

Install FF-SB Light Curtains and mechanical guards so NO person can stand between light curtain and danger zone without being detected. **Failure to comply with these instructions will result in death or serious injury.**

Figure 2-8 Point-of-operation Guarding (use FF-SB12, 14 or 30 only)



FF-SB15 Mounting

⚠ DANGER

IMPROPER POINT-OF-OPERATION PROTECTION

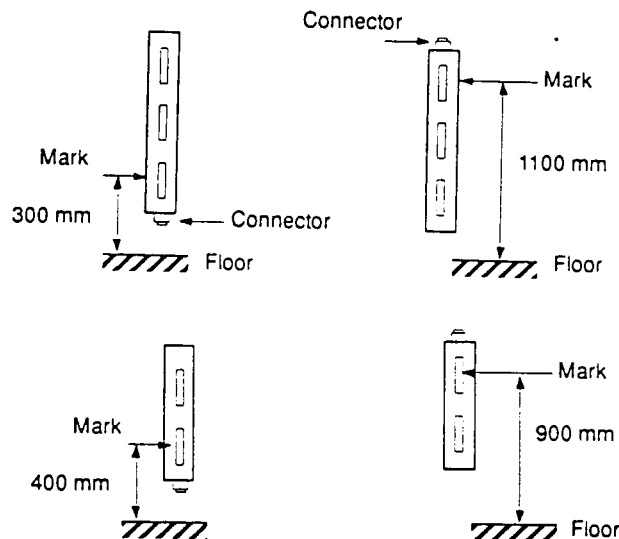
Do NOT use FF-SB15 Series light curtains for point-of-operation applications.

Failure to comply with these instructions will result in death or serious injury.

Using the alignment mark located near the connector of each FF-SB15 emitter and receiver unit, (see figure 2-9) mount the three beam units so that the mark is 300 mm (11.8 in.) above the ground with connector down or 1100 mm (43.3 in.) above the ground with the connector up.

Mount the two-beam-group FF-SB15 light curtain units so the alignment mark is 400 mm (15.75 in.) or 900 mm (35.4 in.) above the floor. Note the orientation of the connector (see figure 2-9).

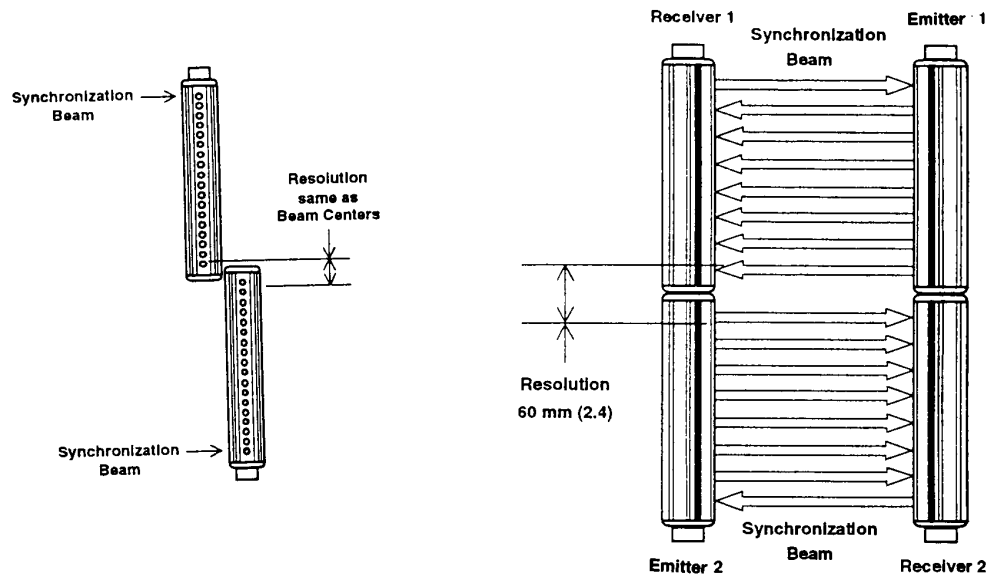
Figure 2-9 FF-SB15 Emitter and Receiver Vertical Mounting



FF-SB12, 14 and 30 Mounting

Two emitter/receiver units may be mounted together to obtain a greater protected height (see figure 2-10). Mount the units head-to-head so the synchronization beams are as far apart as possible. Mount the emitter/receiver units in a reverse transmitting position to prevent mutual interference or cross-talk. The units may be mounted with the over-lapping heads to maintain the resolution throughout the protected height.

Figure 2-10 Two Emitter/Receiver Units Mounted Vertically



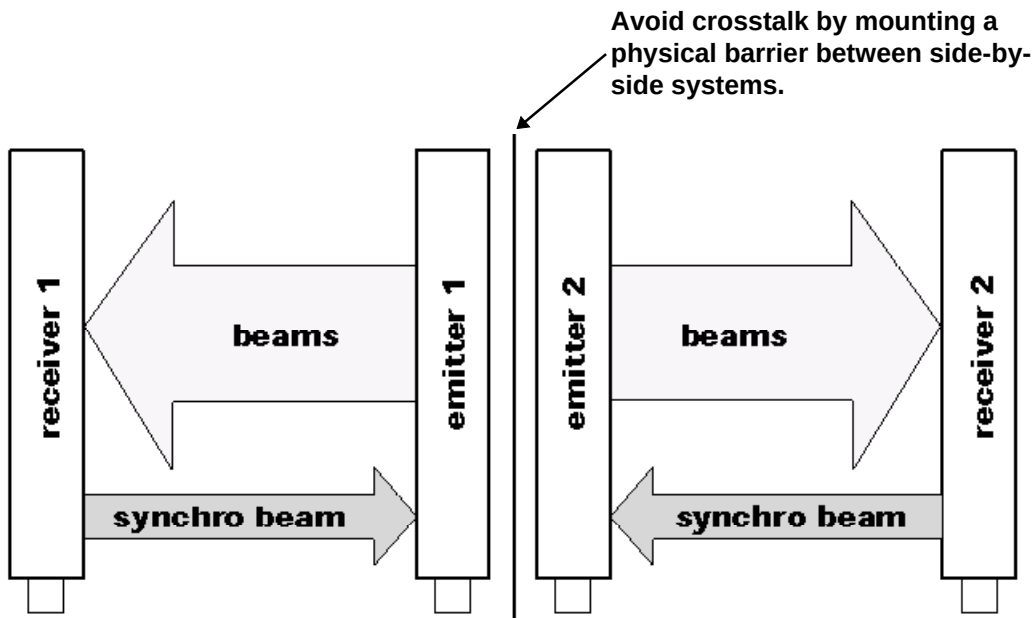
Side by Side Installation**NOTICE****MUTUAL INTERFERENCE OR CROSSTALK**

A physical barrier or filter may be necessary in side-by-side system installations for proper operation.

When two or more light curtain systems are installed on adjacent machines, optical interference may occur if two units are within the field of view. A physical barrier may be required to eliminate the interfering light path (see figure 2-11).

Interference or crosstalk may also be prevented by installing an additional front plate filter or using a filter version of the FF-SB14 Series. The scanning range of these units is up to 6 meters (19.68 feet).

Figure 2-11 Physical Barrier



Diagonal and Right-Angle Mounting

⚠ WARNING

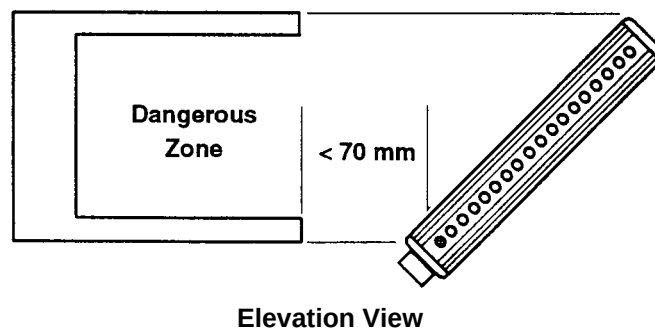
IMPROPER INSTALLATION OF FF-SB SERIES LIGHT CURTAIN

To prevent operating personnel from access to danger zone, install hard guard or right-angle mounting if distance between danger zone and closest light beam is greater than 70 millimeters (2.8 in.).

Failure to comply with these instructions could result in death or serious injury.

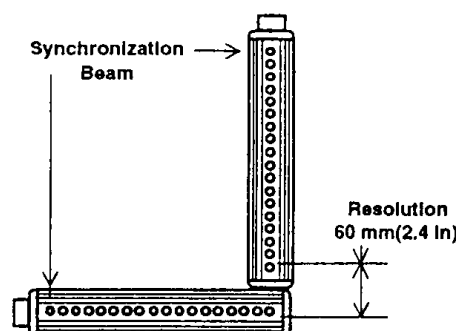
For point-of-operation guarding, the safety light curtain(s) and any hard guarding must be installed so that no person can stand between the light curtain and the danger zone without being detected. Installation may require additional hard guarding, horizontal or diagonal mounting of the light curtain (see figure 2-12), or additional light curtains mounted at right angles to each other (see figure 2-13).

Figure 2-12 Diagonal Mounting



A right-angle mounting arrangement may be used if the altered resolution at the joint is acceptable to the local regulatory agency. If right-angle mounting is used, the units must be mounted so the synchronization beams are as far apart as possible (see figure 2-13). The emitters and receivers units should be mounted with opposite orientations to prevent mutual interference or cross-talk.

Figure 2-13 Right-Angle Mounting



Mounting Hardware

FF-SB Series light curtains are designed with an easy to use T-slot mounting system. Three styles of mounting brackets are available. Each style bracket includes the necessary mounting accessories (bolts, nuts, washers, and vibration dampeners) to mount one emitter or one receiver unit.

⚠ WARNING**ELECTRICAL SHOCK**

Properly ground FF-SB Series light curtain housing by connecting earth ground through the connector. Vibration dampeners electrically isolate FF-SB light curtain housing from mounting surface.

Failure to comply with these instructions could result in death or serious injury.

CAUTION**LIGHT CURTAIN DAMAGE**

Mount FF-SB Series light curtains with vibration dampening to prevent damage to emitter and receiver units.

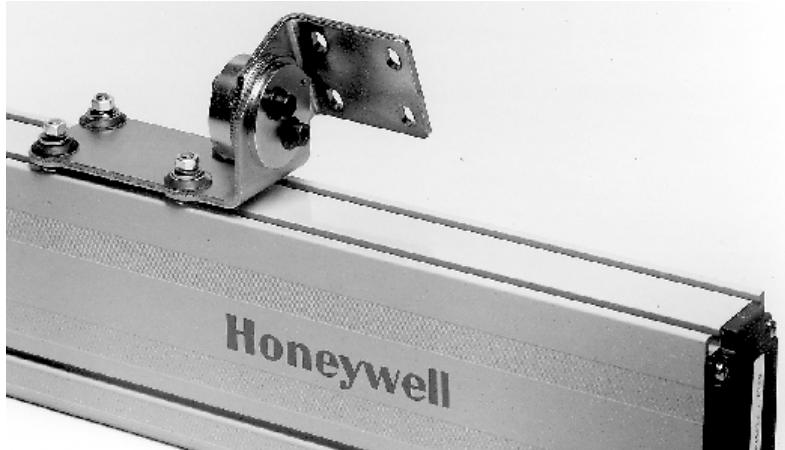
Failure to comply with these instructions may result in product damage.

To mount one complete light curtain system, use two mounting bracket sets, one for the emitter and another for the receiver. The emitter and receiver units may require different types of mounting brackets based on application requirements. Order mounting accessories (FF-SBZS8000) if the light curtain system is mounted directly to the machine, custom brackets are used, or replacement mounting accessories are needed.

T-slot Mounting System

The FF-SB Series T-slot mounting design allows bracket placement anywhere along the back of the light curtain housing (see figure 2-14). The two parallel T-slots are designed to fit the head of an M6-25 bolt.

Figure 2-14 T-slots with Rotatable Mounting Bracket

**Mounting Accessory Set**

The mounting accessory set (FF-SBZS8000) may be used with custom brackets. The accessory set contains the following hardware:

Mounting Accessory Set FF-SBZS8000

Mounting Hardware	Quantity
M6.U Washer	8
H.M6 Nut	8
H.M6-25 Bolt	8
Onduflex Ø6 Washer	8
Rubber Vibration Damper (603 155.002)	8
Metal Hub (604 649.001)	8

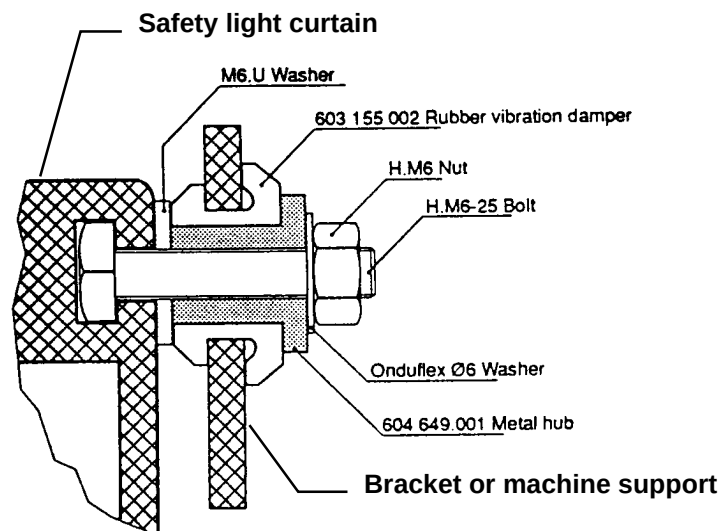
Figure 2-15 illustrates how the mounting accessories are assembled for direct mounting or mounting with brackets.

CAUTION

LIGHT CURTAIN/MOUNTING HARDWARE DAMAGE

Carefully install mounting hardware (especially washers, rubber vibration damper and metal hub) to ensure correct orientation and installation. **Failure to comply with these instructions may result in product damage.**

Figure 2-15 Mounting Accessory Set Assembly



Mounting Brackets

Three types of mounting brackets are available:

- Omega bracket (see figure 2-16)
- "L" bracket (see figure 2-17)
- Rotatable bracket (see figure 2-18)

Each mounting accessories set includes two brackets and mounting hardware. Two sets are required for one light curtain system (one for the emitter and one for the receiver). See figure 2-15 for assembly.

Figure 2-16 Omega Bracket Dimensions

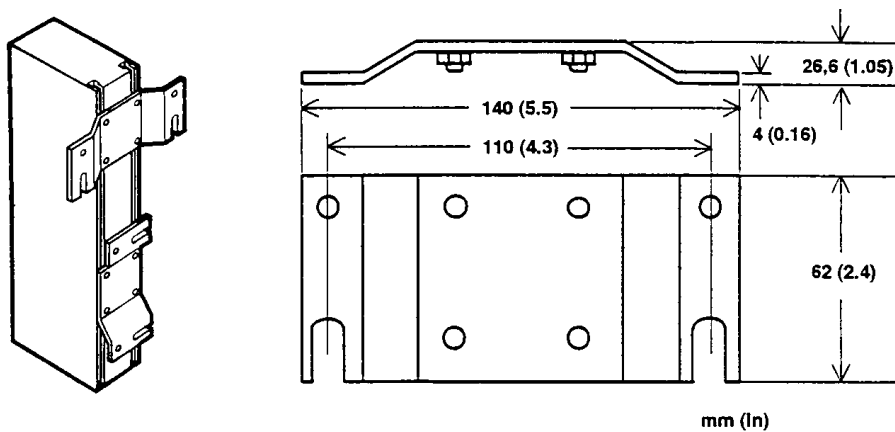


Figure 2-17 "L" Bracket Dimensions

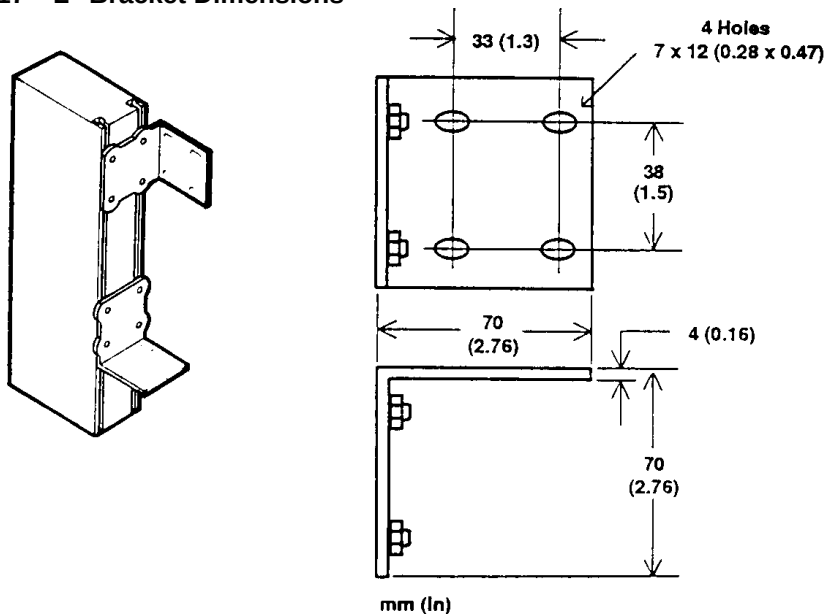
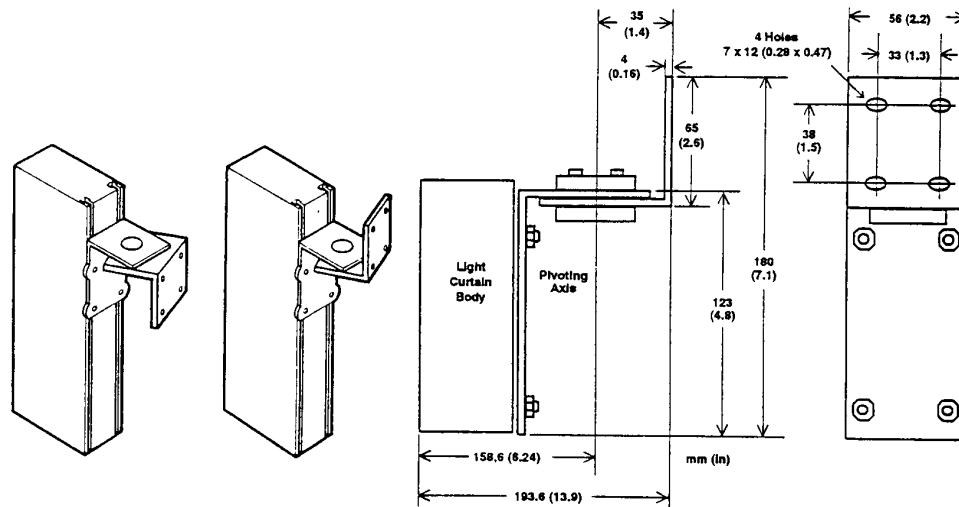
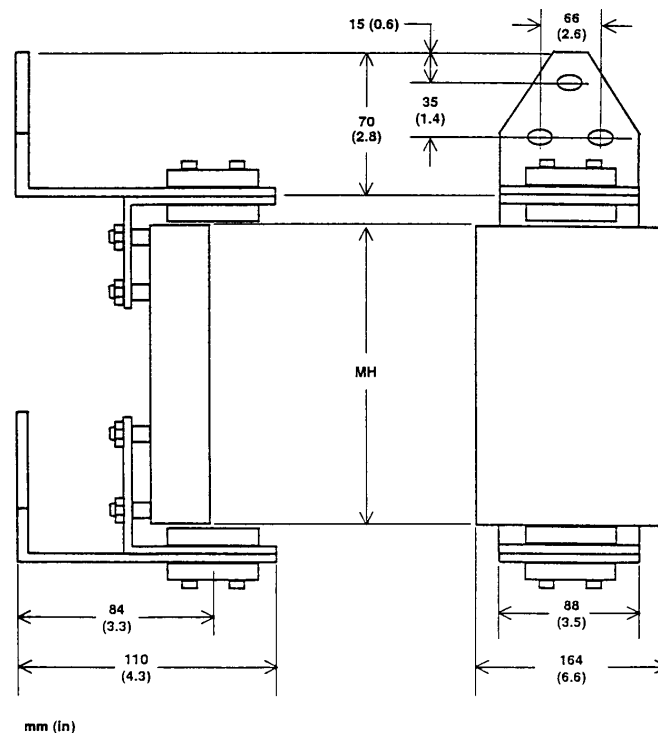


Figure 2-18 Rotatable Bracket Dimensions**Mounting the Mirrors**

FF-SB Series mirrors include all mounting brackets and hardware necessary for installation. The mounting brackets allow rotation of the mirrors to the desired angle. See figure 2-19 for mounting dimensions. Rotatable brackets are recommended if the emitter and receiver devices are mounted more than 1/2 the maximum scanning distance of the product (and/or using mirrors). Figures 2-20 and 2-21 illustrate floor mounting posts that are available.

Figure 2-19 Mirror Mounting Dimensions

Mirror Heights

Catalog Listing*	Protected Height	MH Mirror Heights
FF-SBSMIR02	200 (7.87)	298 (11.73)
FF-SBSMIR04	400 (15.75)	501 (19.72)
FF-SBSMIR06	600 (23.6)	704 (27.72)
FF-SBSMIR08	800 (31.5)	909 (35.79)
FF-SBSMIR10	1000 (39.37)	1112 (43.78)
FF-SBSMIR12	1200 (47.24)	1315 (51.77)
FF-SBSMIR14	1400 (55.12)	1520 (59.84)

*Rotatable brackets are included with mirrors.

Figure 2-20 Floor Mounting Post FF-MPZS9018 (mm)

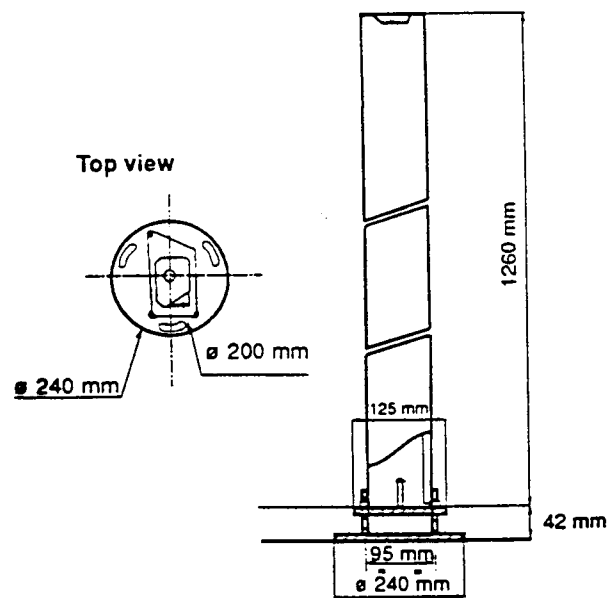
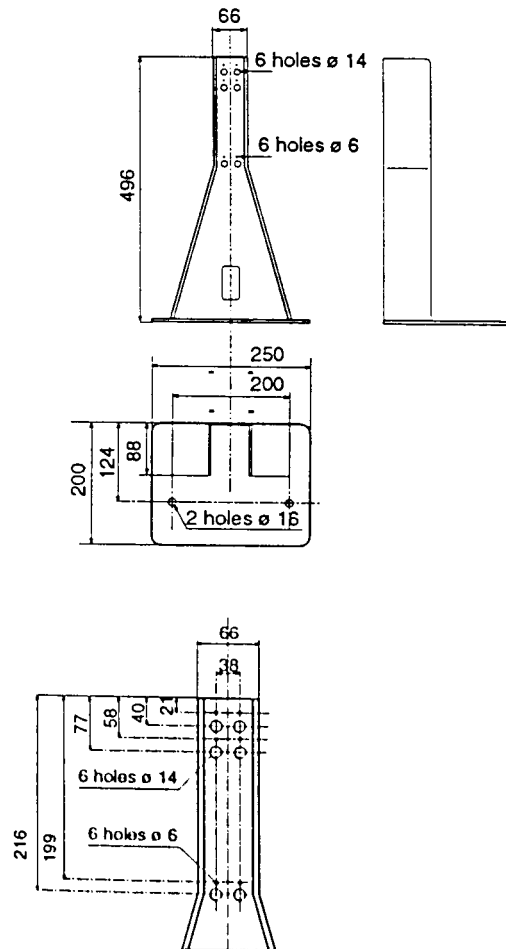


Figure 2-21 Floor Mounting Post FF-SBZS9010 (mm) - light curtain used for 1000 mm (39.37 in) height or less)



Electrical Connections

Overview

This chapter contains information about electrical installation and wiring.

⚠ WARNING

IMPROPER INSTALLATION

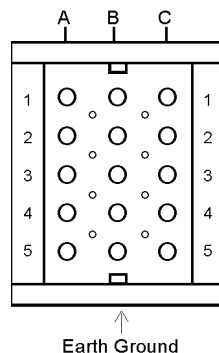
Strictly adhere to all electrical connection instructions.

Failure to comply with these instructions could result in death or serious injury.

Connector Wiring

All FF-SB Series light curtains have a metal quick-disconnect connector (supplied). Emitter units use connector FF-SBZ1721137 and the receiver units use connector FF-SBZ1721202. Figure 3-1 illustrates a rear view of the connector (pins inserted this side). Both connectors use the same type of crimped pins.

Figure 3-1 Rear View of Quick-Disconnect Connector



- connections are made through quick disconnect metal DIN 43652 plugs delivered with the light curtain.
- cross sectional area of stranded wires to be crimped (metal DIN 43652 plugs only) : 0.5 mm² (AWG20) as a minimum, 1.5 mm² (AWG16) as a maximum.
- packing glands and allowed cable diameters to guarantee the IP65 / NEMA 4, 13 sealing (metal DIN 43652 plugs only) : PG9 for the emitter plug (allowed cable diameters : 5.5 to 8.7 mm / 0.22 to 0.34 in.), PG21 for the receiver plug (allowed cable diameters : 11 to 19 mm / 0.44 to 0.74 in.).

Ensure the following tools are available when wiring the quick-disconnect connector:

- A set of wire strippers.
- A medium sized flat-head screwdriver.
- An FA 0100-164 (Honeywell part number FA0100-164) crimping tool or equivalent.

FF-SB Installation Manual

Install pin into connector as follows:

1. Strip about 8 mm (0.3 inch) of insulation from the wire end.
2. Using a crimping tool, crimp the pin onto the wire.
3. Push the pin into the correct slot in the connector. Tabs on the sides of the pin will expand into slots and hold the pin in place when properly seated.

Remove a pin from the connector as follows:

1. Remove the gray plastic receptacle from the plug.
2. Remove the ground screw.
3. Using a screwdriver, pry up the edges of the plastic retainer piece on each side of the receptacle.
4. Slide the plastic retainer up and remove it.
5. Slide the metal part on each side down, and remove it.
6. Using a screw driver in the side slots, push the top part off.
7. Using the removal tool equivalent to FG 0300-146 (Honeywell part number FG-0300-146), slide over pin and push until the spring releases the pin; remove pin.

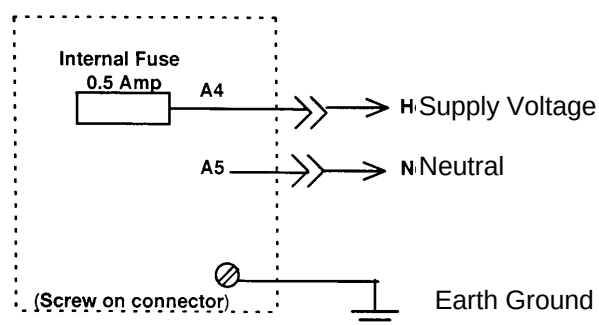
Power Wiring

FF-SB Series light curtains operate on either 120 or 240 volts AC. The emitter and receiver units automatically switch to the AC voltage applied with the exception of FF-SB12E/R02E-S2 which operates on 120 VAC only.

A low voltage version (24-48 VDC) is available for the FF-SB14, FF-SB15 and FF-SB30 Series.

All of the FF-SB Series light curtains have the same connections for power. Figure 3-2 shows the power connections. Figure 3-3 illustrates the receiver connections.

Figure 3-2 Emitter and Receiver Power Connections



Note : For VDC versions, the supply connection is the following :

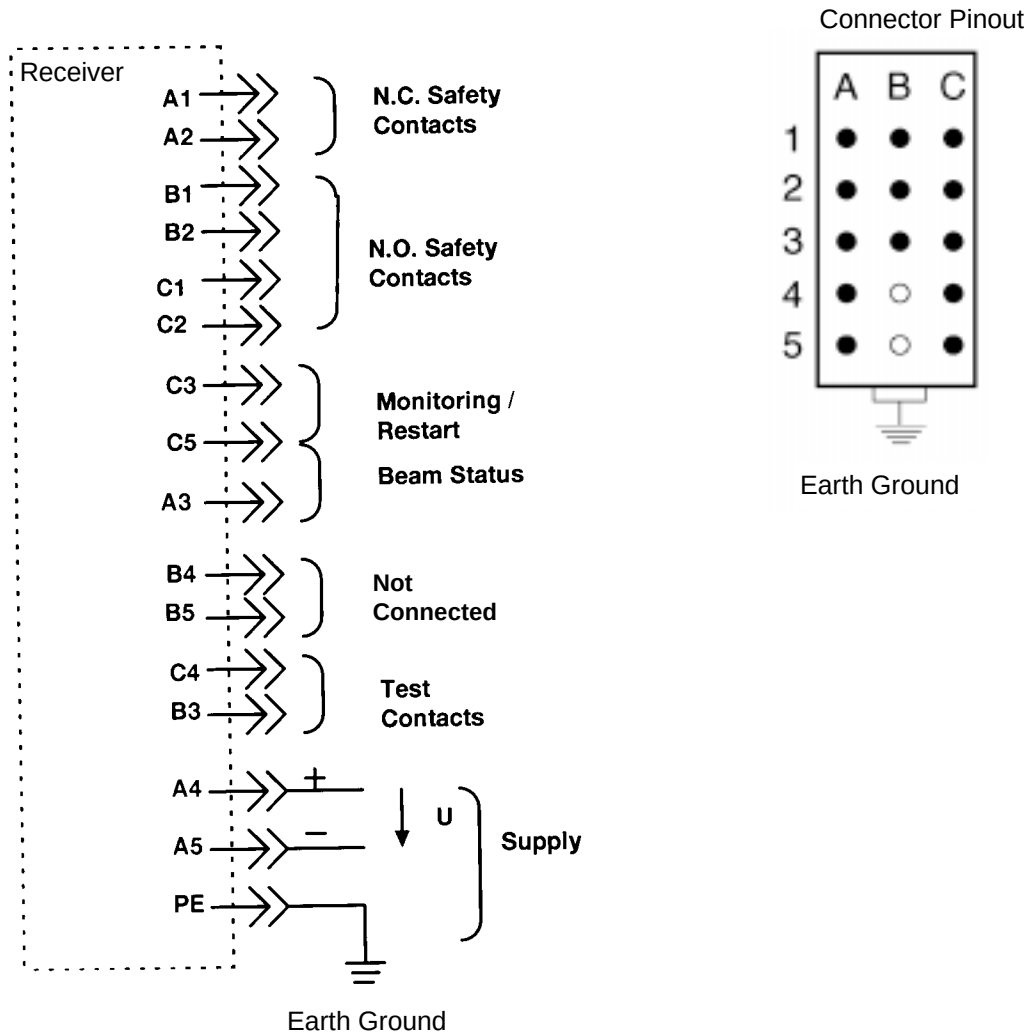
Terminal A4 : +

Terminal A5 : -

However, the FF-SB14, FF-SB15 and FF-SB30 low voltage light curtains are polarity independent.

The wire gauge of the ground connection should be equal to the power supply wire gauge. The length of the ground connection wire should be as short as possible. To minimize noise interference, the ground terminal of the light curtain **must** be connected to the main ground of the machine.

Figure 3-3 Connections for Receivers



A1, A2: 1 Normally Closed (NC) safety contact

B1, B2 and C1, C2: 2 Normally Open (NO) safety contacts

A3, C5: Beam status, A3 is internally connected to the 0 V when the beams are unobstructed (NPN output), $I = 5$ to 20 mA, 30 VDC max.

C3, C5: Restarts the safety light curtain and monitors the external relays.

Test Contacts

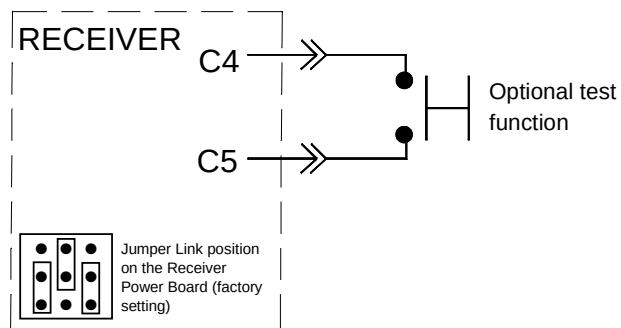
Test contacts may be used for additional external relay checking. When the link between the two contacts is open, the light curtain is in the red condition and R2 and R4 (LEDs on receiver) are illuminated. To return to the green condition, the link between the contacts must be reestablished.

C4, C5: For FF-SB Original Series or FF-SB CE in factory setting (see figure 3-4).

C4, B3: For FF-SB CE Series in cycle start mode (see figure 3-5).

Factory Settings (receivers only)

Figure 3-4 Replacing FF-SB Original Series with CE Version (factory setting)

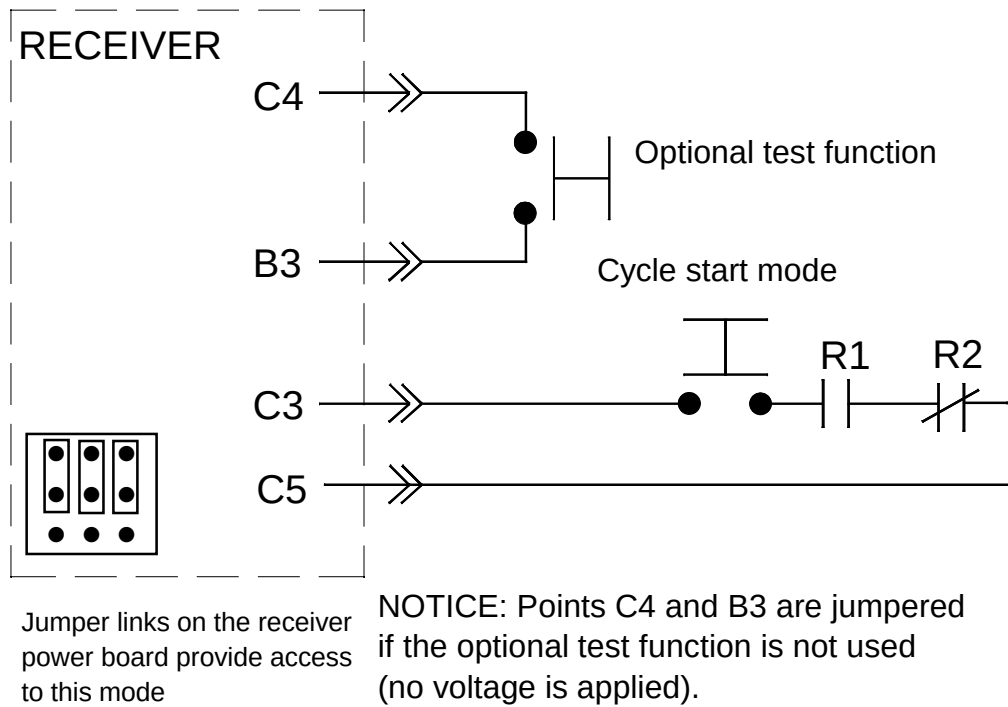


NOTICE: Points C4 and C5 are jumpered if the optional test function is not used (no voltage is applied).

Cycle Start Mode

During the cycle start mode, the R4 LED on the receiver flickers and the cycle start mode push-button on the external relay monitoring loop (C3-C5) requires actuation. Once actuated, the light curtain changes to a green condition (R3 LED is illuminated, R2 LED is not illuminated) and allows the machinery to operate.

Figure 3-5 FF-SB Series CE Version (cycle start mode) with external relay monitoring by the FF-SB



Wiring Diagrams

⚠ WARNING

IMPROPER SYSTEM PERFORMANCE

Ensure independent stop circuit safety relays have mechanically linked contacts that prevent contact overlapping in the event of a welded contact.

Failure to comply with these instructions could result in death or serious injury.

The following wiring diagrams illustrate the electrical connections for the FF-SB Series light curtains. The customer must supply the three safety relays, R1, R2 and R3, the cycle start push-button and the test circuit.

Mechanically linked contact relays are sometimes called captive contact, anti-weld, or guided contact relays.

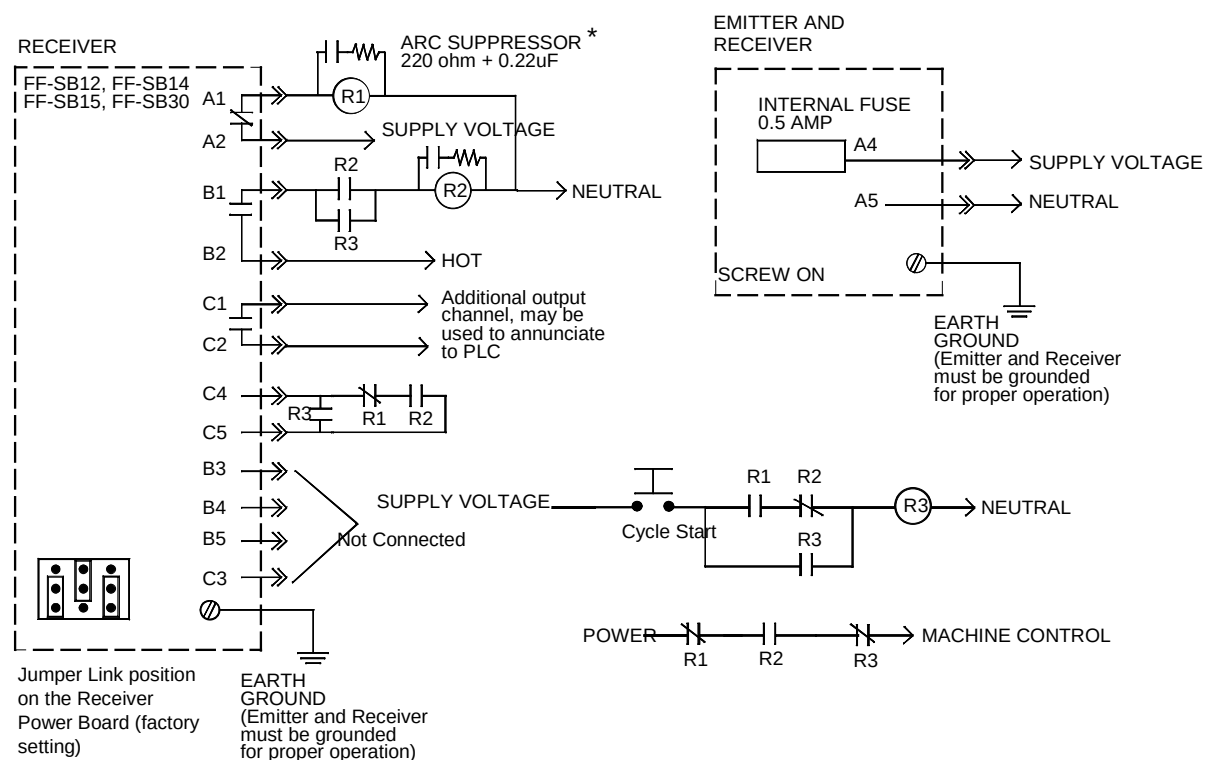
⚠ WARNING**IMPROPER INSTALLATION OF FF-SB SERIES LIGHT CURTAIN**

Use figure 3-6 wiring diagram to ensure external relay monitoring by the interface.
Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING**IMPROPER SYSTEM PERFORMANCE**

Ensure independent stop circuit safety relays have mechanically linked contacts that prevent contact overlapping in the event of a welded contact.
Failure to comply with these instructions could result in death or serious injury.

Figure 3-6 Wiring Diagram to replace Original Version FF-SB Series configuration with CE Version of FF-SB Series configuration (except FF-SB12R02)



*Two arc suppressors are provided with the light curtain.

NOTICE

The cycle-start push-button is the normal push-button used to start the machine cycle and not an additional button for the operator.

⚠ WARNING**IMPROPER SYSTEM PERFORMANCE**

Ensure independent stop circuit safety relays have mechanically linked contacts that prevent contact overlapping in the event of a welded contact.

Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING**IMPROPER INSTALLATION OF CE VERSION FF-SB SERIES LIGHT CURTAIN**

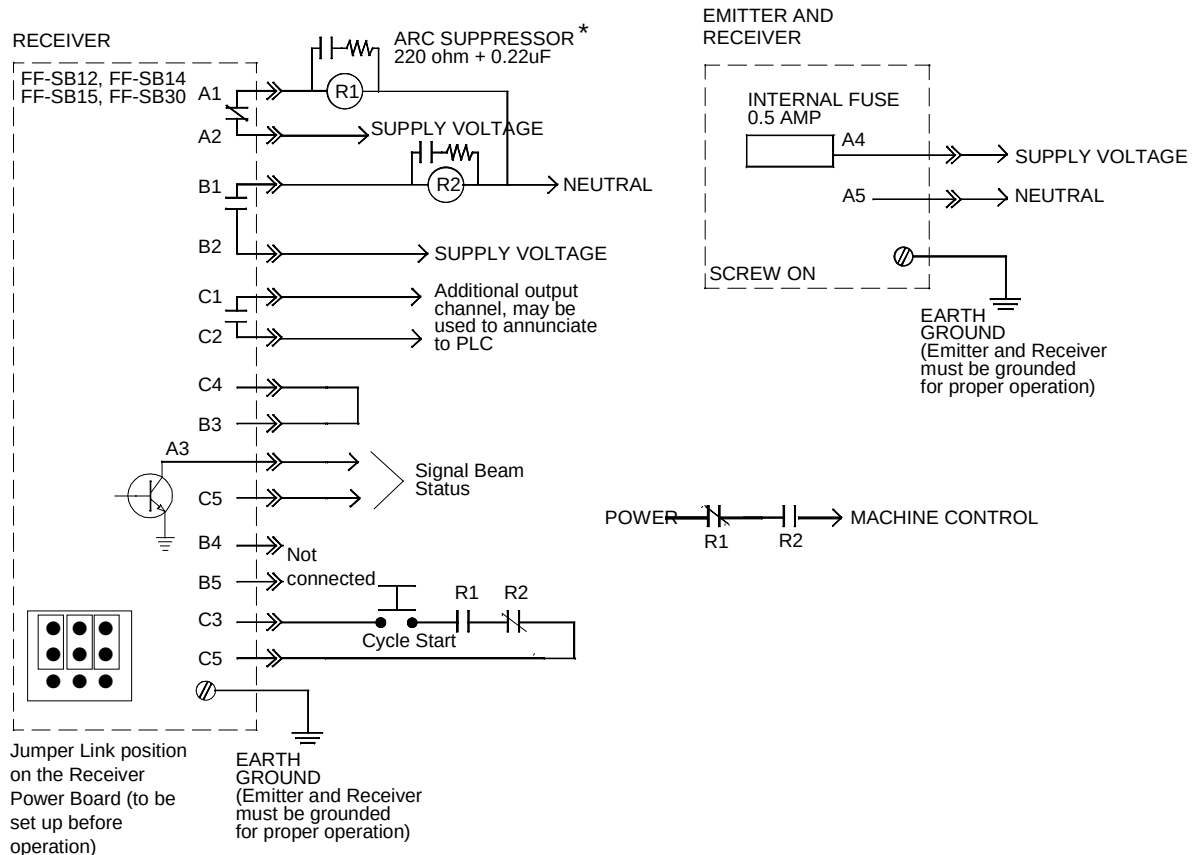
Use Figure 3-7 wiring diagram to ensure external relay monitoring by the CE version of the FF-SB Series Light Curtain.

Failure to comply with these instructions could result in death or serious injury.

NOTICE

Two versions of FF-SB Series light curtains exist: an Original version and a CE version. The CE version may be used instead of an Original. However, an Original version will not work (red condition) with the circuit illustrated in Figure 3-7.

Figure 3-7 Wiring Diagram for CE Version FF-SB Series configuration (except FF-SB12R02)



*Two arc suppressors are provided with the light curtain.

⚠ WARNING

IMPROPER SYSTEM PERFORMANCE

Ensure independent stop circuit safety relays have mechanically linked contacts that prevent contact overlapping in the event of a welded contact.

Failure to comply with these instructions could result in death or serious injury.

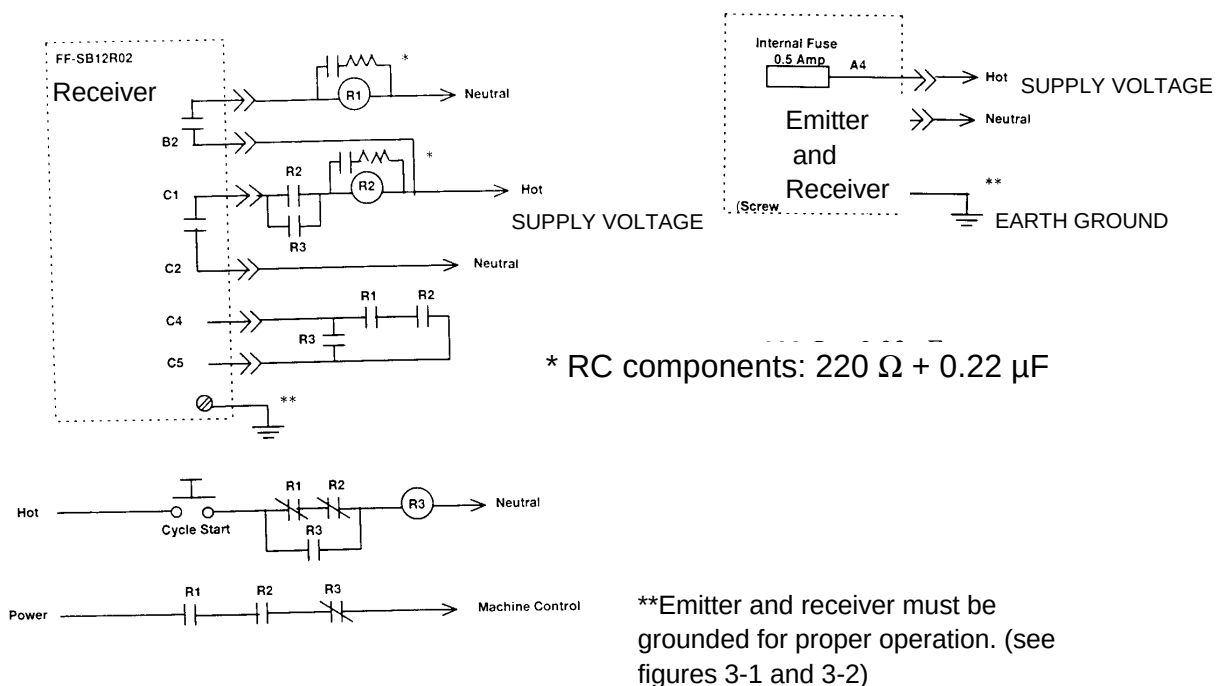
⚠ WARNING

IMPROPER INSTALLATION OF FF-SB12E/R02 SERIES LIGHT CURTAIN

For FF-SB12R02 Series light curtains, use figure 3-8 wiring diagram ONLY.

Failure to comply with these instructions could result in death or serious injury.

Figure 3-8 Wiring Diagram of FF-SB12R02



NOTICE

The cycle-start push-button is the normal push-button used to start the machine cycle and not an additional button for the operator.

⚠ WARNING**IMPROPER PERIMETER PROTECTION**

- Design control circuit to allow a manual restart before further machine operation can occur.
- Locate manual restart to allow operator a clear view of danger zone.
- Operator should NOT be able to reach manual restart from within danger zone.
- Design control circuit to prevent Programmable Logic Controller from overriding manual restart.

Failure to comply with these instructions could result in death or serious injury.

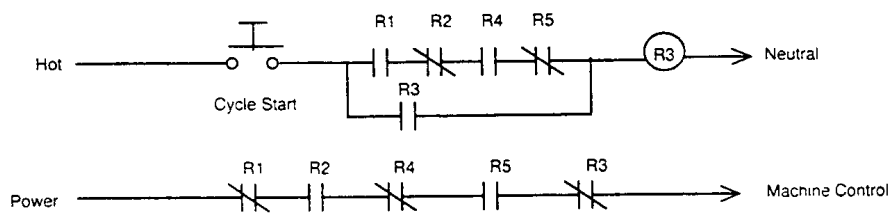
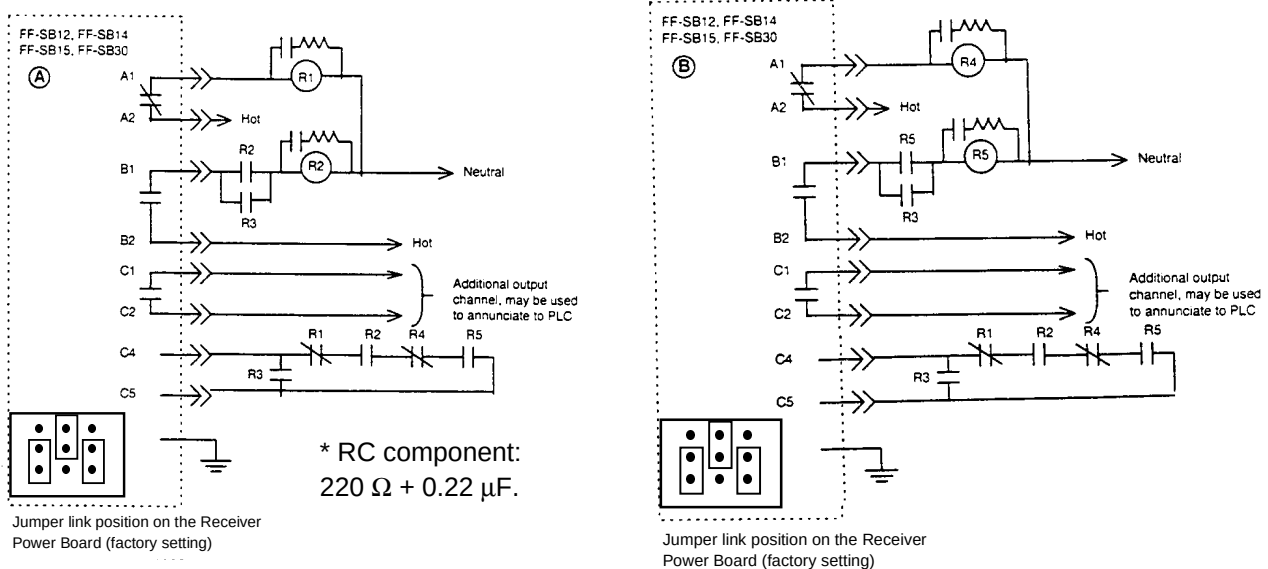
⚠ WARNING**IMPROPER SYSTEM PERFORMANCE**

Ensure independent stop circuit safety relays have mechanically linked contacts that prevent contact overlapping in the event of a welded contact.

Failure to comply with these instructions could result in death or serious injury.

Figure 3-9 Connection of Two Safety Light Curtains (new installation)

Five relays, R1, R2, R3, R4 and R5 are used as follows:

**NOTICE**

If the sensing field of one safety light curtain is interrupted, the other goes immediately into the RED condition.

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Maintenance and Troubleshooting

Overview

This chapter contains operational test procedures, troubleshooting, cleaning, maintenance, and repair instructions.

⚠ WARNING

IMPROPER MAINTENANCE

Strictly adhere to all maintenance and troubleshooting instructions.

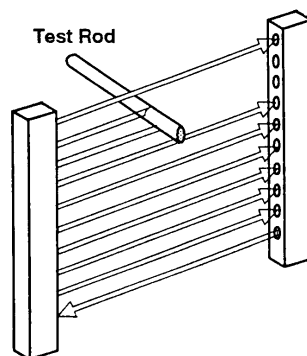
Failure to comply with these instructions could result in death or serious injury.

Operational Test

To ensure operational readiness, perform the operational test at least once a day and every time the light curtain is repaired or powered up. The operational test consists of passing a test rod (included with unit) through the sensing field to ensure the light curtain will detect it (see figure 4-1). The included test rod will have a diameter equal to the resolution of the light curtain. The resolutions of the FF-SB Series light curtains are as follows:

Light Curtain	Resolution
FB-SB12	22 mm (0.87 inch)
FB-SB14	35 mm (1.38 inch)
FB-SB30	30 mm (1.18 inches)

Figure 4-1 Operational Test with the Test Rod

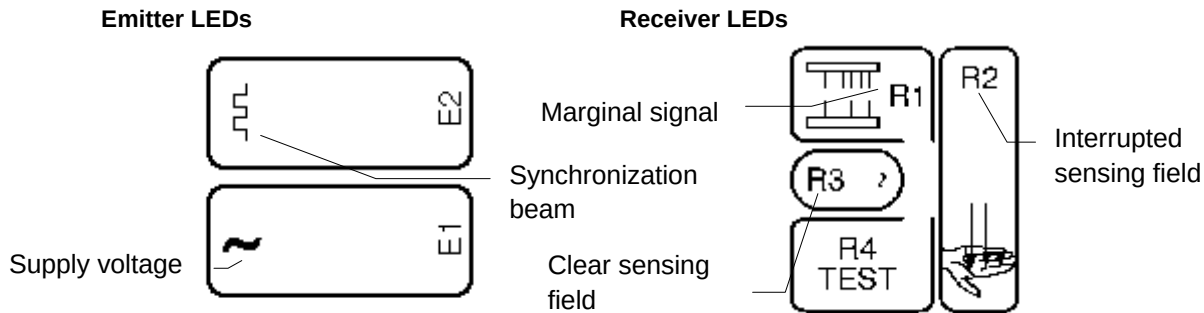


Troubleshooting Procedures

When the FF-SB Series safety light curtains are working properly and the sensing field is not interrupted, the emitter LEDs E1 and E2 (yellow) are both illuminated, the receiver LED R3 (green) is illuminated, and all other LEDs are NOT illuminated. If this condition is not met, refer to the following troubleshooting chart, flow diagram (see figure 4-3) and corresponding repair procedures.

Troubleshooting Chart (see figure 4-2 for indicator information)

Symptom	Probable Cause	Corrective Action
All light emitting diode (LED) indicators are NOT illuminated	No power.	Ensure fuse is not blown (see Fuse Replacement procedure). Ensure supply voltage is correct; as specified (see Specifications). Ensure electrical power connections are secure and correct. (see Electrical Connections chapter).
LED E1, E2, R1, R2 and R4 are illuminated	Test input is open.	Ensure the external circuit wiring connection between pins C4 and B3 on the receiver connector is secure (see Electrical Connections chapter). On pre-1996 wiring, ensure the external circuit wiring between pins C4 and C5 on the receiver connection is secure (see Electrical Connections chapter).
LED E1 and R2 are illuminated, R4 and E2 are NOT illuminated	Sensing field may be obstructed Emitter and/or receiver units need to be cleaned Emitter and/or receiver units need to be aligned Emitter and/or receiver unit internal error	Remove obstacles interrupting sensing field. Clean emitter lens, receiver lens and mirrors (see Emitter and Receiver Cleaning). Align emitters, receiver and mirrors. Replace emitter and/or receiver unit.
LED E1, E2 and R2 are illuminated, R4 is flickering	Light curtain is in cycle start mode	Ensure monitoring loop connections between pins C3 and C5 are secure. (see Electrical Connections chapter). Press cycle-start push button.
LED E1, E2 and R3 are illuminated, R1 is flickering	Emitter and/or receiver units is contaminated Emitter and/or receiver units is misaligned	Clean emitter lens, receiver lens and mirrors (see Emitter and Receiver Unit Cleaning section). Align emitters, receiver and mirrors.
Random alarms without apparent cause (i.e., erratic outputs, flickering LEDs)	Line voltage transients greater than IEC 801-4 Norm standard Unacceptable ambient light interference	Ensure the correct supply voltage is provided (see Electrical Connections chapter). Ensure RC elements on the inductive loads are present (see Electrical Connections chapter). Ensure external circuit connection to pins C4 and C5 on the receiver connector are secure (see Electrical Connections chapter). Ensure ground connection on emitter and receiver are secure (see Electrical Connections chapter). Use a special optical filter (see Order Guide).
LEDs E1, E2 and R3 are NOT illuminated, or other LEDs are illuminated.	External relays may not be working.	Refer to system wiring diagram and ensure the external relays connected to or linked with the safety light curtain are operating properly (see Electrical Connections chapter).

Figure 4-2 Emitter and Receiver LEDs

LED	Location	Color	Function
E1	Emitter	Yellow	Supply voltage on
E2	Emitter	Yellow	Synchronization beam detection
R1	Receiver	Red	Marginal signal detection
R2	Receiver	Red	Interrupted sensing field
R3	Receiver	Green	Clear sensing field
R4	Receiver	Yellow	Illuminated=test, Flickering=restart required

Test Plug Construction (see troubleshooting flow diagram, sheet 1 of 2)

Emitter Female Plug Connector FF-SBZ1721137	Receiver Female Plug Connector FF-SBZ1721202
Using Female Plug Connector FF-SBZ1721137, connect pins A4 and A5 to supply voltage and the ground pin to earth ground.	Using a Female Plug Connector FF-SBZ1721202, connect pins A4 and A5 to supply voltage and the ground pin to earth ground. Also jumper the following pins: C4, C5, B3 and C3.

Emitter Board Visual Test (see troubleshooting flow diagram, sheet 2 of 2)

1. Clean the front lens window of the emitter.
2. Place your eye against the emitter front lens window and observe the presence of a low energy red light (a spot) in the middle of each beam (except synchronization).
3. If you can observe the presence of this red light, the emitter is working correctly. If you cannot, replace the faulty emitter board.

Figure 4-3 Troubleshooting Flow Diagram (Sheet 1 of 2)

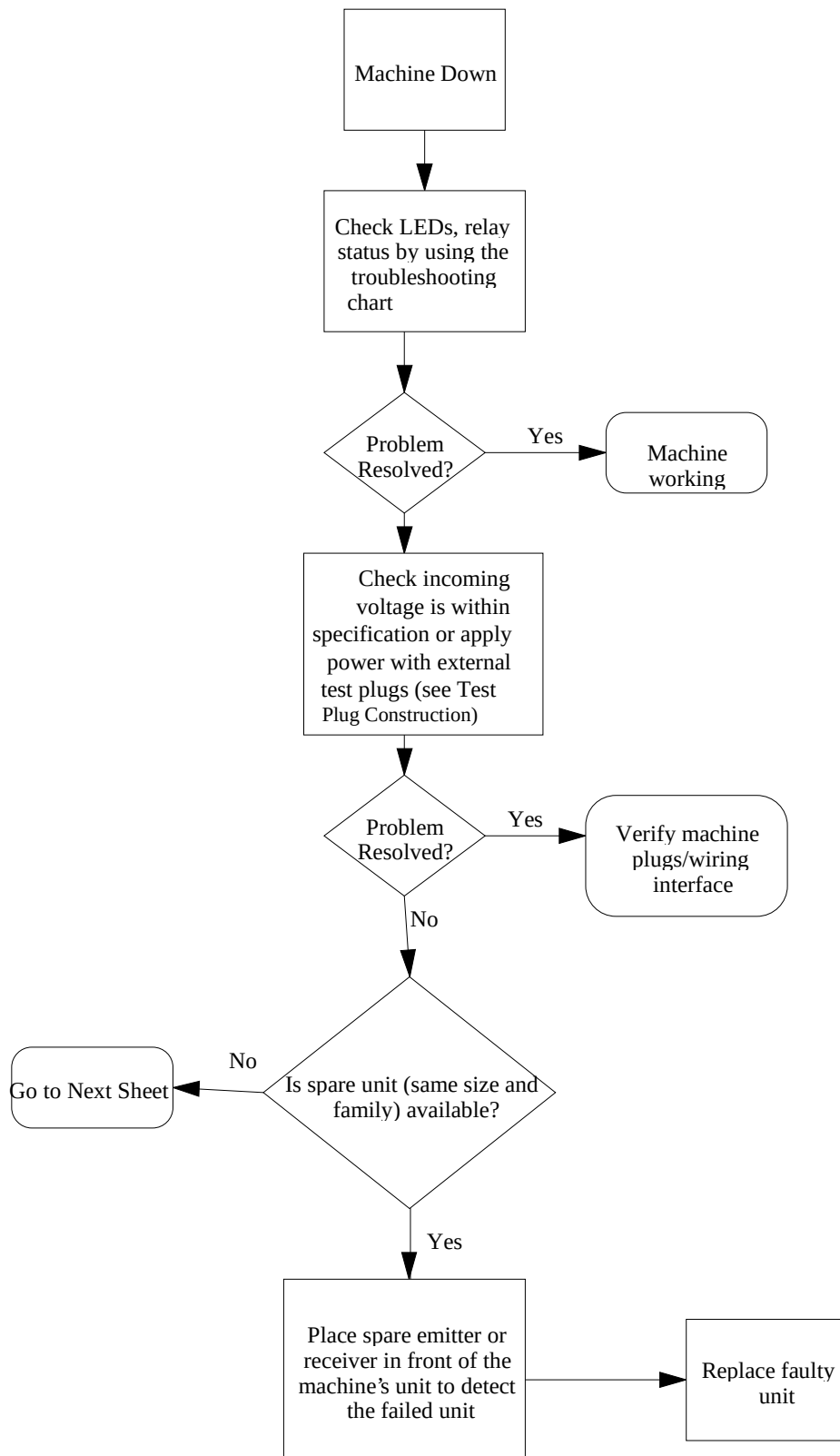
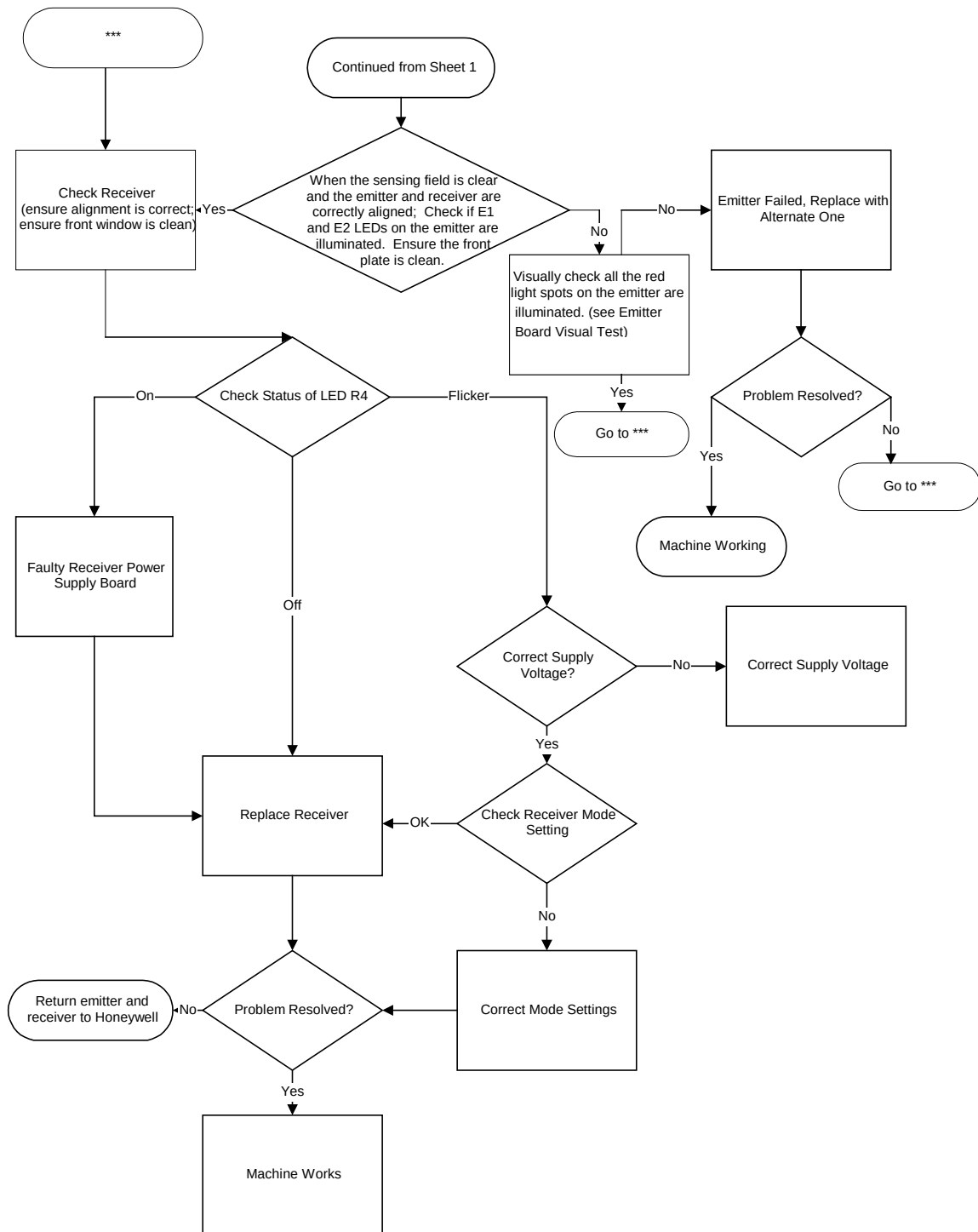


Figure 4-3 Troubleshooting Flow Diagram (Sheet 2 of 2)



Cleaning

The FB-SB Series light curtains and mirrors are designed to operate in harsh industrial environments. Exposure to dirt, dust, grease, and oil are unavoidable in these harsh environments. Periodically clean the emitter/receiver units and mirrors. This section provides specific, step by step, instructions on the proper cleaning techniques for the FB-SB Series emitters, receivers, and mirrors.

Using a Dry Cloth

Clean dust or loose, dry dirt from the emitter and receiver units using a soft, clean, non-abrasive cloth.

WARNING

POWER APPLIED TO MACHINE CONTROL SYSTEM

Turn off and disconnect power from FF-SB Series light curtain and machine.

Failure to comply with these instructions could result in death or serious injury.

1. Turn off and disconnect power to both the light curtain and the machine.

CAUTION

FF-SB SERIES LIGHT CURTAIN FRONT PLATE AND FINISH DAMAGE

Gently wipe soiled areas with soft, clean, non-abrasive cloth. To prevent scratching clear plastic front plate or finish, do NOT rub hard.

Failure to comply with these instructions may result in product damage.

2. Gently wipe the soiled areas with a soft, clean, non-abrasive cloth. Do not rub hard to prevent scratching the clear plastic front plate or finish. If the dirt will not wipe off with a dry cloth, clean units with a soap and water solution. See Cleaning with Soap and Water below.
3. Connect power to the machine and light curtain.
4. Perform the operational test to ensure proper functional readiness.

Using Soap and Water

WARNING

POWER APPLIED TO MACHINE CONTROL SYSTEM

Turn off and disconnect power from FF-SB Series light curtain and machine.

Failure to comply with these instructions could result in death or serious injury.

CAUTION

FF-SB SERIES LIGHT CURTAIN FRONT PLATE AND FINISH DAMAGE

Do NOT use solvents to clean emitter or receiver to prevent damage to clear plastic front plate and paint finish.

Failure to comply with these instructions may result in product damage.

1. Turn off and disconnect power to the light curtain and machine.
2. Dampen a soft, clean, non-abrasive cloth in the solution of mild soap and water. Squeeze excess solution from the cloth.
3. Wipe the soiled areas gently with the damp cloth. Do not rub hard to prevent scratching the clear plastic front plate or paint finish.
4. Rinse the cloth in clean water and gently wipe off any excess soap.
5. Dry the emitter and receiver with a soft, dry, non-abrasive cloth. Ensure there is no moisture left on the emitter and receiver units before power is applied.
6. Connect power to the machine and light curtain.
7. Perform the operational test to ensure proper functional readiness.

Cleaning the Mirrors

CAUTION

FF-SBMIR SERIES MIRROR DAMAGE

Use soft, clean, non-abrasive cloth to clean dust or dirt from mirror to prevent scratching surface.

Failure to comply with these instructions may result in product damage.

1. Dampen a soft, clean, non-abrasive cloth with 90% alcohol or white spirit.
2. Wipe the face of the mirror gently with the damp cloth. Do not rub hard to prevent scratching the finish.
3. Dry the mirror with a soft, dry, non-abrasive cloth. Ensure there is no moisture or lint left on the mirrors.
4. Perform the operational test to ensure proper functional readiness.

Repair and Maintenance

This section provides step-by-step instructions related to repair and maintenance..

The tools required include a Philips head screw driver and a #20 Torx driver.

⚠ WARNING

WARRANTY CONDITIONS

Repair and maintenance are limited only to : power supply module replacement, optical controller module replacement, and fuse replacement.

Please send back the board to Honeywell for repair.

Failure to comply with these instructions could result in death or serious injury.

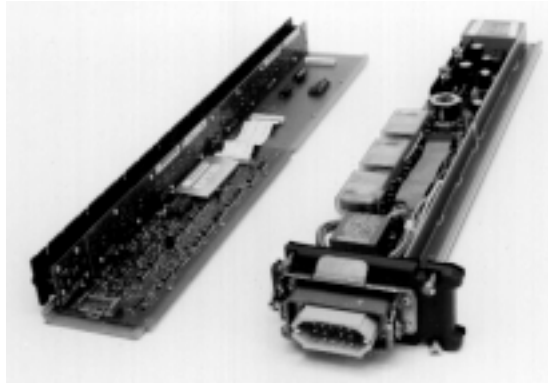
Interchangeability

Emitter and receiver units are not matched. An emitter unit from one FF-SB system may be used with the receiver unit from another if the catalog listings of the units are the same. If a replacement for one part of a FF-SB system is required, maintenance time is greatly reduced.

Emitter and Receiver Module Assemblies

Two module assemblies are located inside each emitter and receiver unit; the power supply module and the optical controller module (see figure 4-4)

Figure 4-4 Emitter and Receiver Module Assemblies



The power supply module in the receiver unit has three mechanically linked relays. The power supply module in the emitter unit has no relays. A fuse is located on the power supply module of the emitter and receiver.

The optical controller module has a master module that controls the LEDs in the emitter unit and the photoreceivers in the receiver unit. Some units may have one or more optical extension modules connected to the master module (and any other extension modules) via a flat ribbon cable.

Power Supply Module Removal

⚠ WARNING

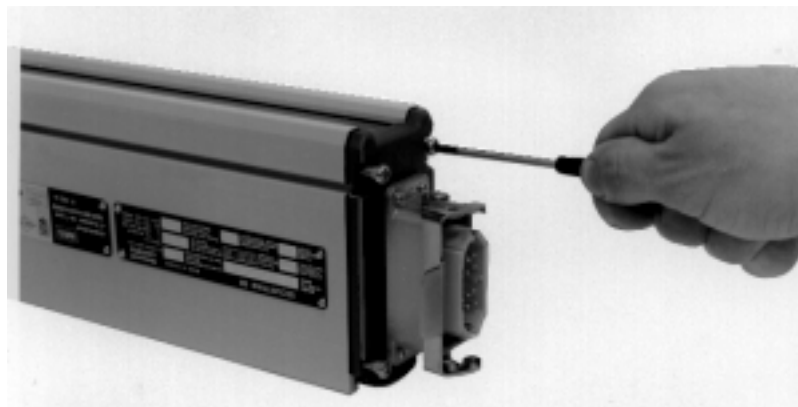
POWER APPLIED TO MACHINE CONTROL SYSTEM

Turn off and disconnect power from FF-SB Series light curtain and machine.

Failure to comply with these instructions could result in death or serious injury.

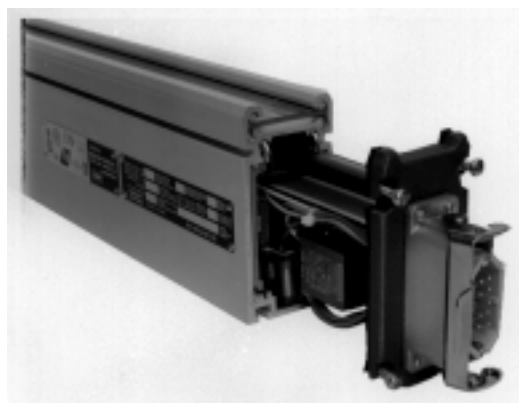
1. Turn off and disconnect power to the light curtain and machine.
2. Remove the light curtain from the machine and place it on a clean, level work surface.
3. Using a #20 Torx driver, loosen the four captive screws in the end-plate with the terminal block connector (see figure 4-5). The screws do not need to be removed from the end-plate. Pull the end-plate away from the housing.

Figure 4-5 End-plate



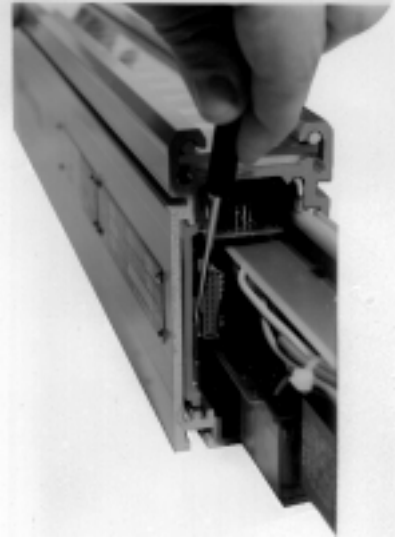
4. Remove the terminal block connector and circuit board by sliding the module out (see figure 4-6) of the housing.

Figure 4-6 Terminal Block Connector



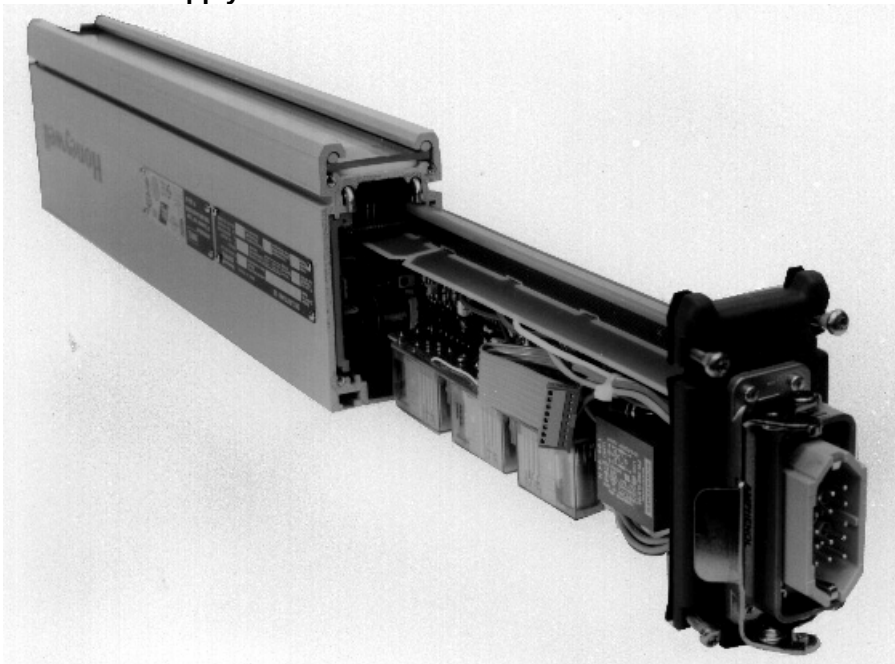
5. Disconnect the flat cable connector by pushing the tab that holds the connector to the left (see figure 4-7). Pull the connector straight out.

Figure 4-7 Flat Cable Connector



6. Remove the power supply module from the housing (see figure 4-8).

Figure 4-8 Power Supply Module

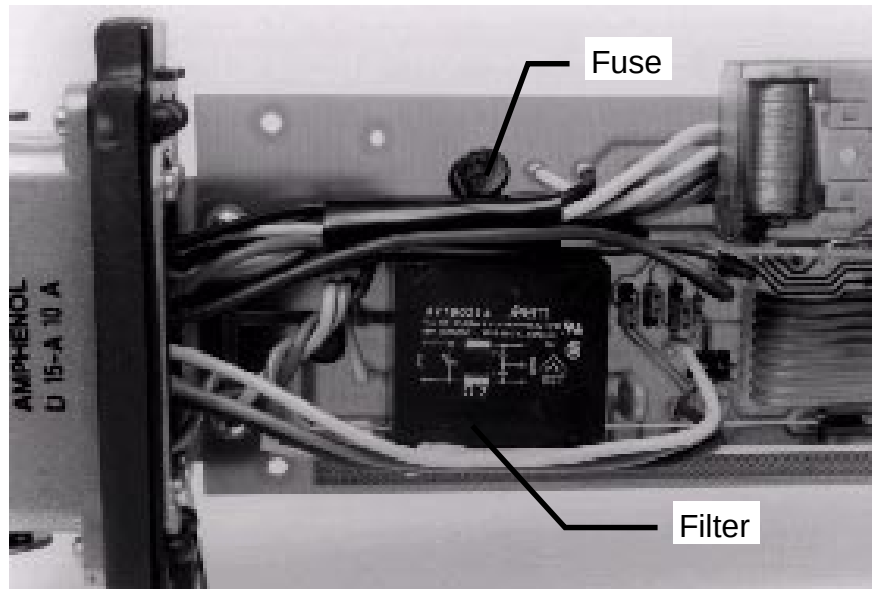


Fuse Replacement

The fuse is located near the relays above the electrical noise filter on the receiver unit (see figure 4-9). The fuse is in the same location on the emitter power board.

1. Remove the power supply module as directed in the previous section.

Figure 4-9 Fuse



2. Replace the fuse with a 0.5 amp, (120/240 VAC versions) or a 1 amp slow blow fuse (low voltage version).
3. Replace the power supply module.
4. Perform the operational test to ensure proper functional readiness.

Output Relay Replacement (on receiver)

1. Remove the receiver power supply module as directed in the Power Supply Module Removal section.
2. Remove the screws holding the output relay board to the power supply module. Two holes in the orange rail ease access to the screws. (see figure 4-10).
3. Carefully disconnect and remove the output relay board.

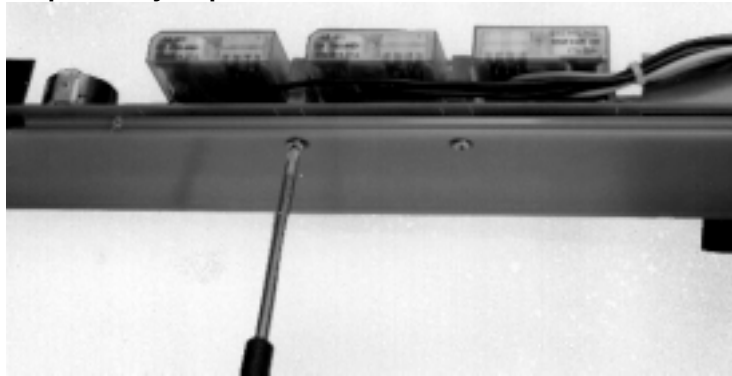
CAUTION**CONNECTOR PIN DAMAGE**

Replace 3-output relay board with care to avoid damaging pins.

Failure to comply with these instructions may result in product damage.

4. Positioning the connectors like the first output relay board, install a new output relay board (same part number).

Figure 4-10 Output Relay Replacement



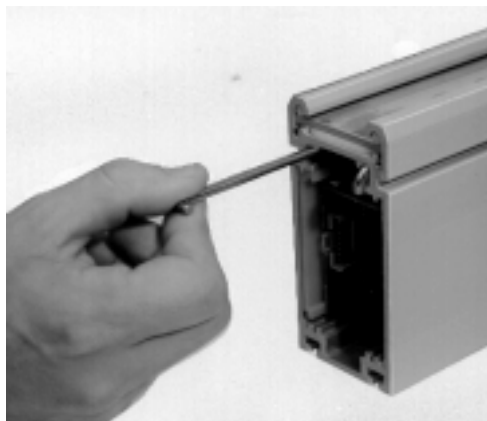
5. Perform the operational test to ensure proper functional readiness.

Optical Controller Module Replacement

The removal and replacement of the optical controller module for the emitter and receiver units are identical. The only difference between the various protected height units is the number of optical extension modules on the optical controller module. See Replacement Part Order Guide.

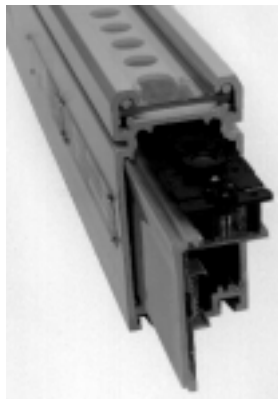
1. Remove the power supply module (see Power Supply Module Removal).
2. Turn the retaining rods and slide them out of the housing before removing the optical controller module (see figure 4-11).

Figure 4-11 Retaining Rod Removal



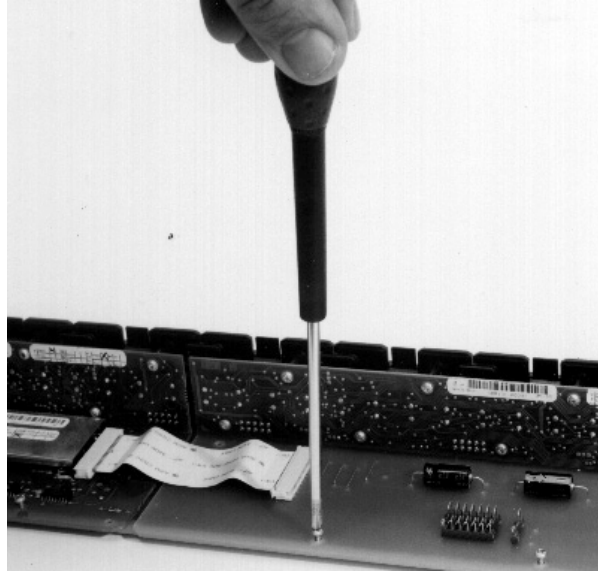
3. Gently pull the optical controller module straight out of the housing (see figure 4-12). With the plastic support pointed downward and the LEDs or photoreceivers pointed away, lay the optical controller module down on clean, level work surface.

Figure 4-12 Optical Controller Module Removal



4. Using a Philip's head screw driver, remove all of the screws holding the optical controller module to the plastic support rail (see figure 4-13).

Figure 4-13 Optical Controller Module Removal from Plastic Support



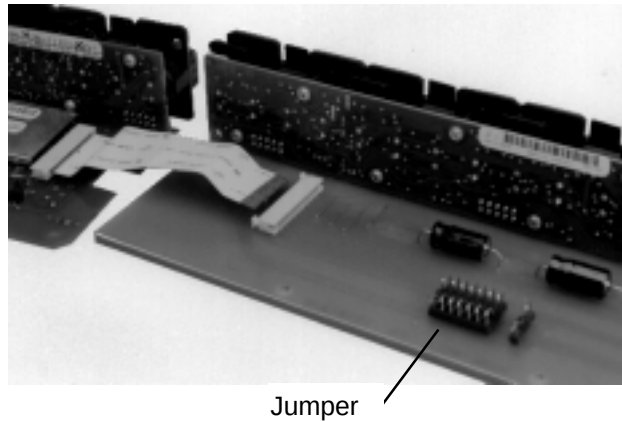
5. Before removing an extension module, observe and make a note of which jumper is unhooked. Each extension module has a set of jumpers that configures a unique address for each extension module position. Unhook the same jumper on the replacement extension module.
6. Slide the small moving parts on each side of the connector to release the flat cable, then remove the cable.
7. One retaining tab on the plastic lens holder keeps the master module and the extension module together (see figure 4-14). Lift them apart and remove the master module. Remove any additional boards to facilitate the replacement operation.

Figure 4-14 Extension Module Removal



8. Set the jumpers on the jumper switches before replacing the module (see figure 4-15).

Figure 4-15 Tab Removal/Jumper Setting



9. Place replacement module in position and plug the flat cable connector into the socket. Retain it with two moving parts.
10. Position all the optical modules on the plastic support and ensure they are correctly aligned. Using a Philip's screwdriver, install and tighten all screws.
11. Aligning the slots in the plastic support with those on the housing, gently push the optical controller module into the housing.
12. Aligning the straight ends of the retaining rods with the slot next to the lens holders, slide the rods in (see figure 4-11) and turn them to secure into position. The retaining rod ends must be vertical to close the unit.
13. Perform the Power Supply Module Replacement procedure.

Power Supply Module Replacement

1. Ensure the optical controller module and the retaining rods are correctly in place.
2. Aligning the power supply module with the slots in the housing, slide the module into the housing until the flat cable connector can be connected to the optical controller module.
3. Push the flat cable connector straight into its receptacle, making sure the tab closes over the edge of the connector (see figure 4-7).
4. Install the power supply module and tighten the four Torx screws using the #20 Torx driver.
5. Install the light curtain on the machine.
6. Connect and apply power to the machine and light curtain.
7. Perform the operational test to ensure proper functional readiness.

Changing Internal Jumper Link Positions (receiver only)

1. Remove the receiver power supply module from the light curtain housing.
2. Observe and note the position of the jumper links (see Electrical Connections chapter).
3. To replace an original FF-SB Series version light curtain with a FF-SB CE version, no jumper link change is necessary (see figures 4-16 and 4-17).
4. To reconfigure the factory settings of a new FF-SB Series light curtain to the cycle start mode, carefully remove the jumper links and plug them in the positions illustrated in figure 4-18.
5. Perform an operational test to ensure proper functional readiness.

Figure 4-16 Factory Setting Jumper Link Positions on Receiver Power Supply Board

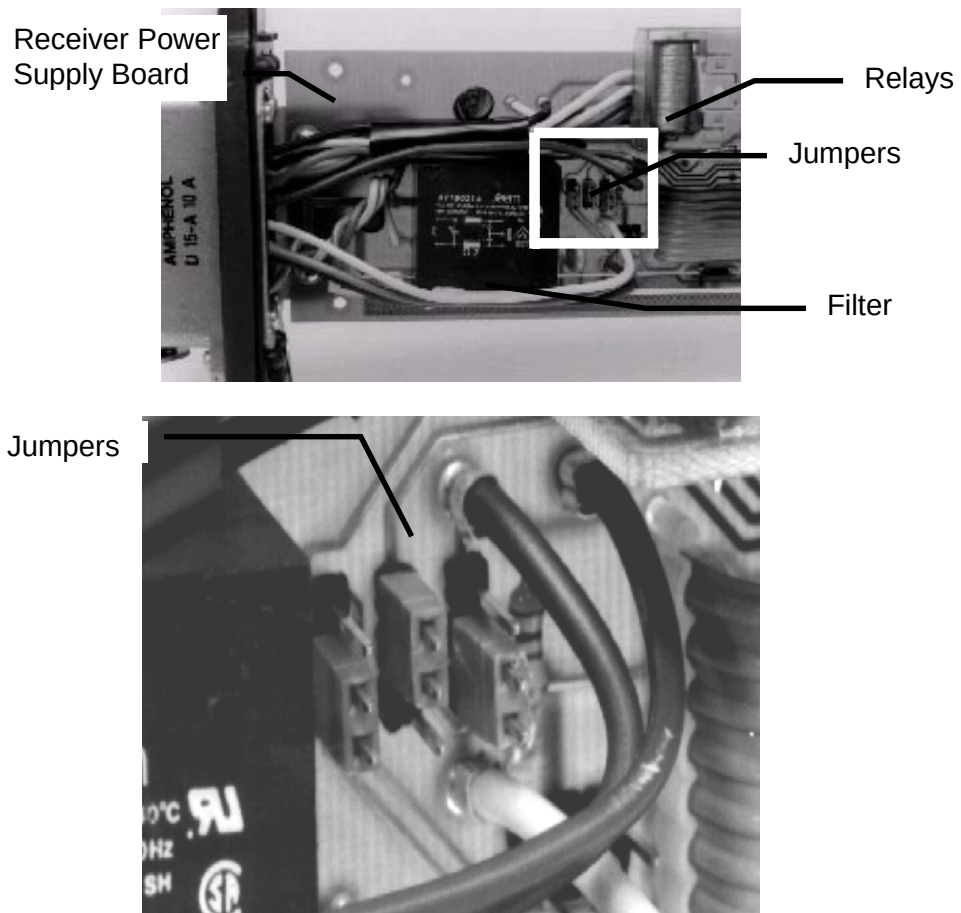


Figure 4-17 Factory Setting Jumper Positions

Factory setting
jumper positions

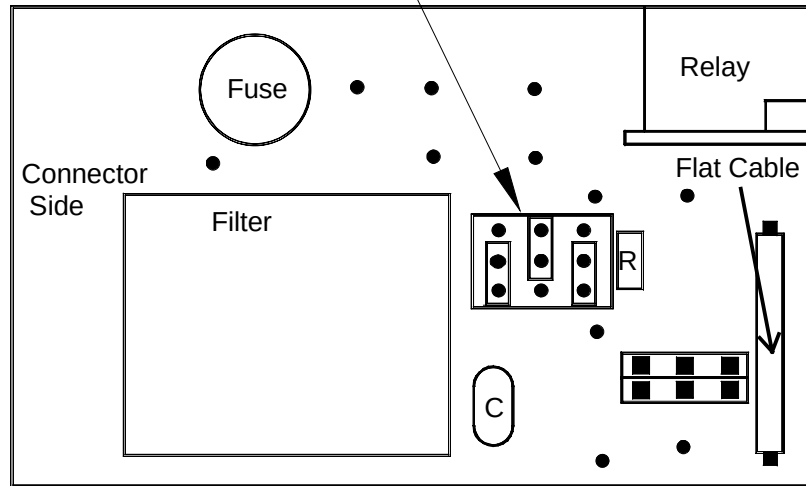
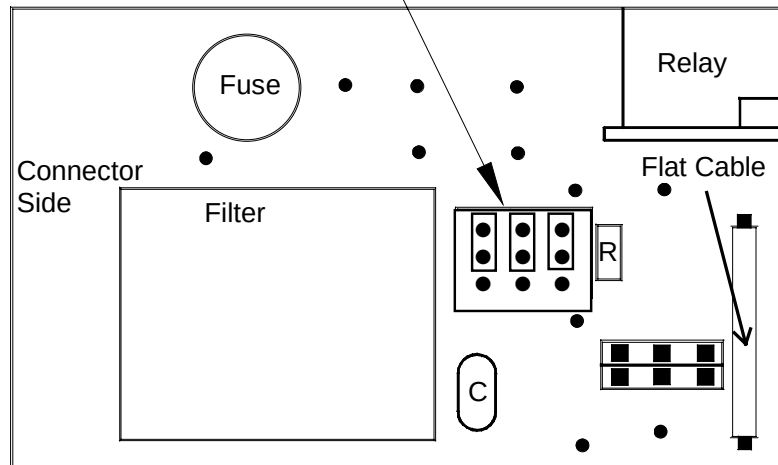


Figure 4-18 Cycle Start Mode Jumper Positions

Cycle start
jumper positions



Front Window Plate Replacement

NOTICE

1200 and 1400 mm protected height FF-SB Series Light Curtain emitters and receivers have a black part located in the middle of the transparent front plate that must be removed during front plate removal.

1. Ensure you have the following tools and spare parts: 1 #20 Torx driver, 2 to 4 joiner clamps (2 for FB-SB14 400 mm, 4 for FB-SB14 1400 mm), 2 wooden battens (30 x 30 mm for example), spare front plates with gaskets.
2. Remove the power supply and optical controller modules as described in the previous sections.
3. Remove the end cover and pull off the two plastic caps on each end of this piece.
4. Depress both sides of the plate and remove the black piece by pushing it to one side.
5. Depress the transparent front window plate with the clamp, inserting wooden battens between clamps and the safety light curtain.
6. Remove the two pressing rods by pushing them (for 1200 and 1400 mm, pull the rods with a screw).
7. Remove front window plate and gasket.
8. Install the new gasket. Glue point of the gasket in the middle of the height of the light curtains (ease tension on gasket).
9. Hold gasket and allow the new front window plate to slide in the housing (sticker inside).
10. Press the front window plate with the clamps and replace the pressing rods.
11. Replace end cover and the electronic boards.
12. Perform an operational test to ensure proper functional readiness.

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CE Declaration of conformity

European Photoelectric Center
Honeywell-Cométa
B.P. 81
38243 Meylan Cedex - France
Phone : (33) 04 76 41 72 00
Fax : (33) 04 76 41 72 56

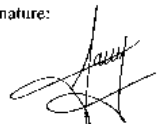


HONEYWELL EUROPEAN PHOTOELECTRIC CENTER QUALITY ASSURANCE DEPARTMENT

CE declaration of conformity

- **We:** Honeywell-Cométa
ZIRST BP 81
21, chemin du Vieux Chêne
38240 Meylan Cedex - France
- **Declare:** under our sole responsibility that the Electrosensitive Protective Equipment catalogued:

Safety Light Curtains, FF-SB Series

to which this declaration relates is in conformity with the technical requirements of the standards and the provisions of the essential requirements of the directives detailed below.
- **Directives:**
- Machine Directive 89/392 EEC and its amendments 91/368 EEC, 94/44 EEC and 93/68 EEC, to which the EC-type examination certificate (1) delivered by the *Berufsgenossenschaft E+M/H* relates.
 - Low Voltage Directive 73/23 EEC
 - Electromagnetic Compatibility Directive 89/336 EEC
- **Standards:**
- pr EN 50 100 - part 1(2) : Safety of machinery - Electrosensitive protective equipment - General requirements for tests.
 - pr EN 50 100 - part 2(2) : Safety of machinery - Electrosensitive protective equipment - Particular requirements for systems using active optoelectronic protective devices
- **Safety level:** Type 4 per pr EN 954
- **Legal Representative in Europe**
- | | |
|--|--|
| Place of issue: Meylan | Date of issue : 25/10/96 |
| Quality Manager: Patrick Goud | General Manager: Jean-Pierre Sany |
| Signature:  | Signature:  |
- Issue nb: 03

(1): available upon request

(2): The IEC is adopting the European project norm. Finally, it will be codified EN 61 496 - parts 1 & 2

Honeywell S.A. - Capital 97 000 000 FRF
European Photoelectric Center - 21 Chemin du Vieux Chêne - Z.I.R.S.T. 38240 MEYLAN - France
SIREN 562 004 796 - APE 332B
Siège social : Honeywell SA - Sensing and Control Division - Immeuble «de Mercure»
Parc Technologique de Saint Aubin - Route de l'Orme - 91190 Saint Aubin
R.C.S. Corbeil-Essomes B 562 004 796 - Phone (33) 01 60 19 80 40 - Fax: (33) 01 60 19 81 73

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MICRO SWITCH
Honeywell Inc.
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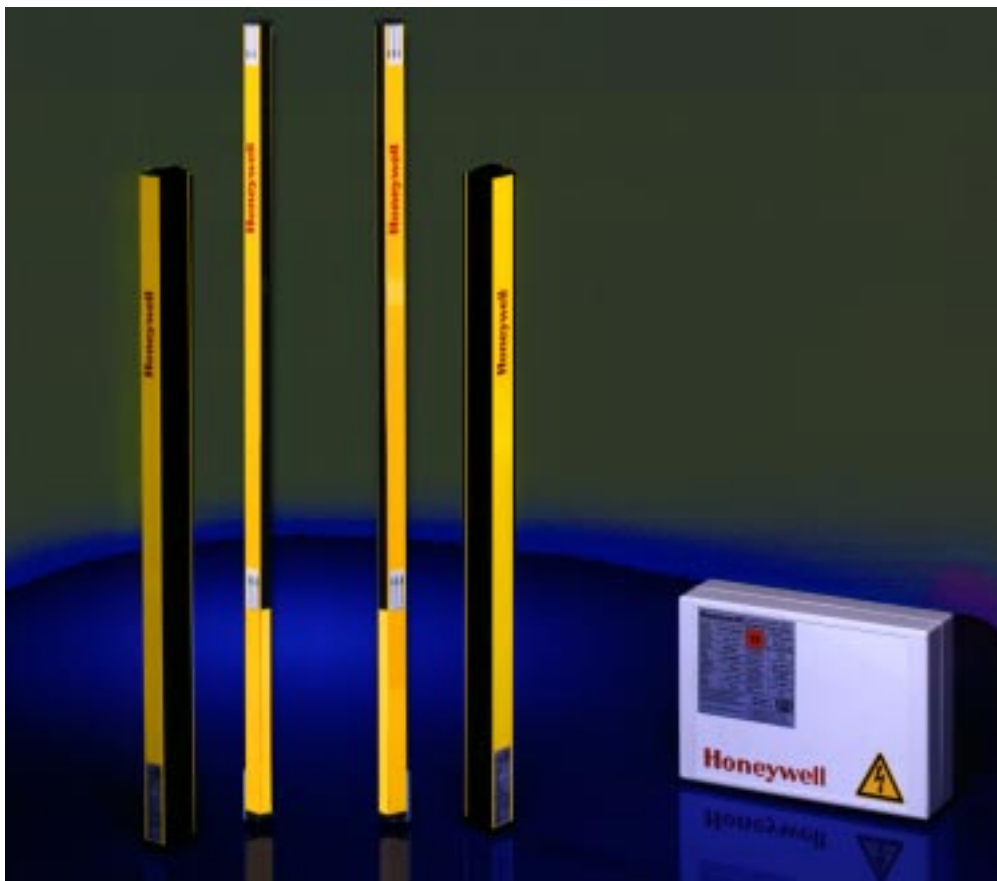


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21, Chemin du Vieux Chêne
38243 MEYLAN Cedex – France
Tel : (33) 4 76 41 72 00

Helping You Control Your World

Miniature Safety Light Curtain Installation Manual

FF-LS14 and FF-LS30 Series



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1. Important Information

1.1 Overview

Thank you for purchasing this Honeywell safety product. The FF-LS Series miniature safety light curtain is an ultra-compact infrared multi-beam device designed to increase the protection of operators working with dangerous machines. The FF-LS Series product is ideal for the protection of work stations where space is critical.

1.2 Read And Understand This Instruction Manual

- FF-LS Series safety light curtain devices described in this manual are designed to protect humans from danger zones normally associated with the moving parts of machinery.
- To ensure the full benefits of this protection, the safety light curtains described in this manual must be properly selected, installed, maintained and operated.

1.3 Organization of Installation Manual

This installation manual consists of the following:

- **Important Information** contains important highlighted information, the manual's organization, control reliability information, approvals, standards, regulations and directives.
- **Description and Operation** describes the miniature safety light curtain and the terms and concepts related to operation.
- **Installation** explains how to properly install the miniature safety light curtains.
- **Electrical Connections** covers electrical installation and wiring diagram information. This section also contains a sensing unit and control unit compatibility table.
- **Inspection and Maintenance** contains inspection, cleaning, maintenance, troubleshooting, and repair information.
- **Order Guides** provide catalog listings of safety light curtain sets, mounting brackets, cables, power supplies, fuses, control units, sensing units, test rods and control unit hardware kit. This section also contains a sensing unit and control unit compatibility table.
- **Warranty Information** contains important contact information related to sales and service.
- **Index** contains keywords and their associated pages related to topics found throughout this manual.
- **EC-type Examination Certificate (from approval agency)** is available upon request from the Honeywell European Photoelectric Center Quality Assurance Department (**CE Declaration of Conformity** is provided at the back of this manual).

1.4 Important Highlighted Information

Important danger, warning, caution and notices are highlighted throughout the manual as follows:

DANGER

A DANGER symbol indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

A WARNING symbol indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

A CAUTION symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

NOTICE

A NOTICE symbol indicates important information that must be remembered and aids in job performance.

1.5 Control Reliability

"Control Reliability" means that, "the device, system or interface shall be designed, constructed and installed such that a single component failure within the device, interface or system shall not prevent normal stopping action from taking place but shall prevent a successive machine cycle." (ANSI B11.19-1990, 5.5)

OSHA 29 CFR 1910.217 states that, "the control system shall be constructed so that a failure within the system does not prevent the normal stopping action from being applied to the press when required, but does prevent initiation of a successive stroke until the failure is corrected. The failure shall be detectable by a simple test, or indicated by the control system."

Honeywell has developed a self-checking technique that combines reliability with safety. The FF-LS Series safety light curtain functions with dual channel redundancy and positive self-check monitoring. This means that a faulty component in the miniature safety light curtain will cause it to fail in a safe mode.

This design meets the highest safety requirements (Type 4 Electrosensitive Protective equipment) described in the EN61496 European standard. Type 4 safety light curtains are designed and manufactured in such a way that a single breakdown or an accumulation of failures does not lead to the loss of the safety function when a dangerous situation arises. **The safety function is maintained on a permanent basis.**

1.6 Product Approval

Approvals	Description
TÜV CE Type 4 cCSAus	Only the packaging and the documentation of FF-LS Series products carry the CE mark; the CE declaration of conformity is located at the back of this installation manual

1.7 Compliance

1.7.1 European Directives Compliance

The EC type examination certificate granted by the TÜV Hannover/Sachsen-Anhalt ensures conformity of the product with respect to the essential requirements of the following EEC Directives:

Directives	Number
Machine Directive	89/392 EEC and its amendments: 91/368/EEC, 93/44/EEC and 93/68/
Low Voltage Directive	73/93 EEC
Electromagnetic Compatibility Directive	89/336 CEE

1.7.2 European Regulations Compliance

The installation of a FF-LS Series safety light curtain is subject to strict rules that may vary from country to country. Correct installation is essential to ensure safe operation and must be carried out according to the appropriate regulations.

Regulation	Title
EN 292	Safety of Machinery - Basic concepts, general principles for design
EN 294	Safety of Machinery - Safety distances to prevent danger zones being reached by the upper limbs
EN 61496-1/2 (replaces EN 50100-1/2)	Safety of Machinery - Electrosensitive Protective Equipment
EN 60204	Safety of Machinery - Electrical equipment of machines
EN 954	Safety of Machinery - Safety related parts of control systems
pr EN 999	Safety of Machinery - The positioning of protective equipment in respect of approach speeds of parts of the human body
pr EN 811	Safety of Machinery - Safety distances to prevent danger zones from being reached by the lower limbs

1.7.3 United States Regulations Compliance

Regulation	Title
OSHA 29 CFR 1910.212	General Requirements for (guarding of) All Machines
OSHA 29 CFR 1910.217	(Guarding of) Mechanical Power Presses

1.7.4 United States Standards Compliance

Standards	Title
ANSI B11.1	Mechanical Power Presses
ANSI B11.2	Hydraulic Power Presses
ANSI B11.19 - 1990	Safeguarding when Referenced by the Other B11 Machine Tool Safety Standards
ANSI/RIA R15.06 - 1992	Safety Requirements for Industrial Robots and Robot Systems

1.8 Selection, Installation and Use Considerations

DANGER

FULL REVOLUTION MECHANICAL POWER PRESSES CANNOT BE STOPPED IN MID-STROKE (OSHA 29CFR 1910.217). Do NOT use FF-LS Series safety light curtains on full revolution mechanical power presses. **Failure to comply with these instructions will result in death or serious injury.**

WARNING

IMPROPER SELECTION AND INSTALLATION OF SAFETY DEVICES

- The safety light curtains in this manual are used as safety devices. When properly installed and maintained, their function is to establish a sensing field between a person and a defined zone of potential danger. Intrusion into the sensing field is detected and communicated to the machine's operating controls to neutralize the danger before an injury can occur.
- The full protection offered by the use of the safety light curtain device is only assured by: (1) the proper selection of the device and components for the specific application, (2) and the correct installation, proper maintenance and use of the light curtain device.
- You must read and understand the information in this manual to ensure the safety device selected is the most appropriate for the application.

Failure to comply with these instructions could result in death or serious injury. If you need assistance, see Customer Service Information.

FF-LS Series safety light curtains are designed for the principal protection for small presses, punches or machines where the movement of the functional parts can be interrupted at any moment in a dangerous phase. Safety light curtains set up an invisible barrier between the safe region and a danger zone and produce an emergency stop signal when the invisible barrier is interrupted.

WARNING

IMPROPER INSTALLATION OF SAFETY LIGHT CURTAINS

- The machine control circuitry must be designed in such a manner that a single component fault does not lead to an unsafe condition.
- Cancellation of the FF-LS Series safety light curtain emergency stop signal must not cause the restart of moving parts. A restart may only be initiated by means of a control designed for this purpose.
- Installation and use of this product must be performed by a qualified person thoroughly familiar with all instructions contained within this manual and all applicable safety regulations including those described below.

Failure to comply with these instructions could result in death or serious injury. If you need assistance, refer to Customer Service Information section in this manual.

1.9 Additional Protection

In some applications, it may be necessary to provide additional protection to augment the protection provided by the safety light curtain. Fixed barriers or additional safety light curtains shall be used to ensure an operator is forced to move through the sensing field to enter the danger zone. The operator shall not be able to stand between the danger zone and the safety light curtain without being detected. Additional protection shall be properly positioned and have the necessary mounting dimensions to prevent an operator from reaching the danger zone from the top, bottom, rear or laterally. Fixed barriers shall be installed permanently with the aid of a tool or welded (if possible). If barriers need to be automatically positioned, their positioning must be checked. It must not be possible for operators to neutralize the positioning sensors associated with these barriers.

Honeywell FF-SR Series safety control modules may be used as an interface between the protective safety equipment and the machine control circuitry. These products offer redundancy, monitoring, and control reliability features that ensure the highest level of industrial safety.

Honeywell safety switches and sensors that may be used to check the position of barriers include:

- 50FY multi-sensor door interrupt safety system
- 40FY door interrupt sensors
- GSS safety limit switches
- GK safety switches
- GKR/GKL safety switches
- 24/924CE miniature safety limit switch
-

Honeywell safety products that may be used with the FF-LS safety light curtain and comply with European standards include:

- FF-SM safety mat
- FF-SB safety light curtains
- FF-SPS4 single beam safety device
- FF-SCAN multi-beam modular safety light curtain
- FF-SE safety laser scanner

2. Description and Operation

2.1 Overview

This chapter contains terms and concepts related to safety and the application of the FF-LS Series miniature safety light curtain. The importance of the installer's role in the set-up and installation of the machine guarding systems is discussed. This section also contains device identification and specification information.

2.2 Description

2.2.1 Control and Sensing Unit

The FF-LS Series safety light curtain is an infrared multi-beam device designed to protect operators working on dangerous machines. Entering the invisible sensing field causes the light curtain output contacts to open. An emergency stop condition is then sent to the machine control circuitry. Detection of the operator body parts will lead to the immediate stoppage of the moving parts of the machine.

The FF-LS Series device consists of a control unit connected to a pair of sensing units. Each sensing unit is made up of a row of emitting circuits alternating with receiving circuits. These circuits are contained in an extremely small aluminum housing. The 1.18 in (30 mm) resolution device has a housing cross section of 0.47 x 0.78 in (12 x 19.7 mm); the 0.55 in (14 mm) resolution has a cross section of 1.38 x 0.91 in (35 x 23 mm).

The control unit supplies power to the sensing units, monitors correct system operation and transmits the stop signal to the machine control circuitry via its two output relays.

The light curtain may be operated in one of two different modes. In the automatic mode, the device restarts automatically after powering up or after any intrusion into the sensing field. In the start/restart interlock mode (manual), the operator must press an external push button connected to the terminal strip of the control unit to restart the light curtain. The mode of operation is selected via an internal selector switch located in the control unit.

The control unit has a test input that is used to trigger the output relay switching and check the correct operation of the final switching devices. For troubleshooting, the control unit provides optical and acoustic signals to help perform diagnostics.

Permanent self-checking is based on microprocessor technology and meets the requirements of EN 61496 (replaces EN 50 100) - part 1 & 2 European standards for type 4 electrosensitive protective equipment. This technique has been examined by TÜV of Hannover who granted the EC-type examination certificate.

The FF-LS Series safety light curtains are ideal for the protection of workstations on small machines such as paper-cutting machines or pick-and-place robots.

2.2.2 Unit Compatibility

WARNING

INCOMPATIBILITY OF FF-LS SERIES SAFETY LIGHT CURTAIN UNITS

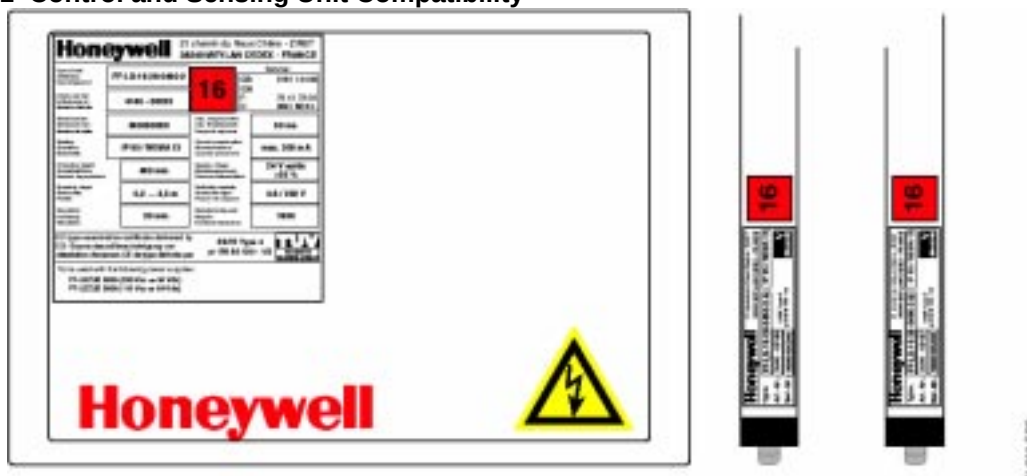
- The control unit and the sensing units (A and B) are delivered as a set and are preset (same number of beams). Each of the units in a set has a red label on its housing with the same number that specifies the number of beams in the sensing field.
- Ensure the number on the red label is the same for each of the three units in a set.
- Ensure the serial numbers on the sensing units A and B are the same.

Failure to comply with these instructions could result in death or serious injury.

NOTICE

The two sensing units A/B are matched to each other by individual coding. Therefore, only connect a matched pair of sensing units A/B (each has the same serial number) to a control unit. Failure to comply with these instructions will result in improper product performance.

Figure 2-1 Control and Sensing Unit Compatibility



Each sensing unit must be connected to a specific control unit per table 2-1.

WARNING

INCOMPATIBILITY OF FF-LS SERIES SAFETY CONTROL UNITS

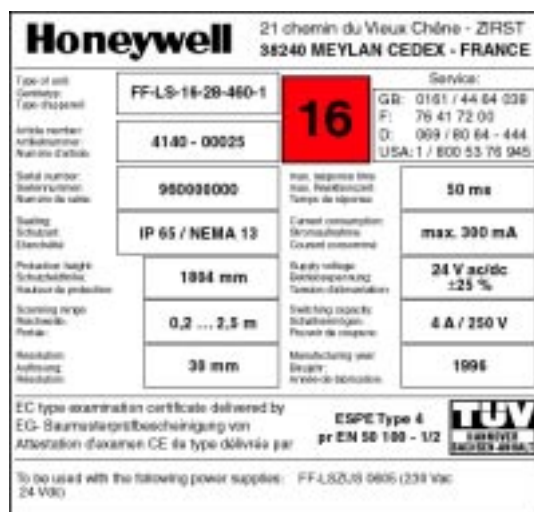
DO NOT connect a different control unit other than the one specified (see table below) to the sensing units.
Failure to comply with these instructions could result in death or serious injury.

Table 2-1 Control Unit and Sensing Units Compatibility

Control unit	30 mm Resolution Sensing Unit	14 mm Resolution Sensing Unit	Number of Beams
FF-LS08C	FF-LS082802362A/B	--	08
FF-LS16C	FF-LS162804602A/B	FF-LS16141962A/B	16
FF-LS24C	FF-LS242806842A/B	--	24
FF-LS32C	FF-LS322809082A/B	FF-LS32143782A/B	32
FF-LS40C	FF-LS402811322A/B	--	40
FF-LS48C	FF-LS482813562A/B	FF-LS48145612A/B	48
FF-LS56C	FF-LS562815802A/B	--	56
FF-LS64C	FF-LS642818042A/B	FF-LS64147442A/B	64

2.2.3 Unit Identification Plates

Figure 2-2 Control Unit Rating and Approvals Plate



Red label indicates the number of beams. This number must be the same number that is on the sensing units red label.

Figure 2-3 Sensing Units (A and B) Rating and Approval Plate



Figure 2-4 Control Unit Warning Plate



2.2.4 Specifications

OPERATING CHARACTERISTICS	
Resolution (minimum object detection)	14 mm (0.55 in) or 30 mm (1.18 in) diameter
Response Time	≤ 50 ms
Scanning Range	0.2 to 3.5 m (0.65 to 11.48 ft)
Emission	Modulated infrared light (880 nm)
Alignment tolerance	According to IEC/EN 61496 - 2 standard
ELECTRICAL CHARACTERISTICS	
Supply voltage	22 to 30 Vdc or 18 to 25 Vac
Current consumption	< 300 mA
Output switching capacity	2 NO safety outputs (MAIN OUT 1 and MAIN OUT 2): 4 A/250 Vac positive-guided (fuse protected) Lamp indicator: 1 NO, 1 NC outputs, 4 A/42 Vac (fuse protected)
Electrical connection	Control unit: screw terminal Sensing units: RS-485 cable; pre-wired connectors; 10 m (32.8 ft)
ENVIRONMENTAL/PHYSICAL CHARACTERISTICS	
Sealing	Control and Sensing Units: IP 65, NEMA 13
Electromagnetic immunity	According to IEC 801-4: level IV According to IEC 801-3: level III
Light immunity	50 000 lux
Status indicators	Customer supplied lamps must be connected to the indicator outputs of the control unit.
Operating temperature	0° to 55°C (32° to 131°F)
Material	Sensor Units: Aluminum Control Unit: Polycarbonate
Size	30 mm Resolution Sensor Units: 12 x 19.7 x Nominal Protected Height (mm) 0.47 x 0.77 x Nominal Protected Height (in) 14 mm Resolution Sensor Units: 23 x 35 x Nominal Protected Height (mm) 0.90 x 1.38 x Nominal Protected Height (in) Control Unit: 60 x 160 x 240 (mm) 2.36 x 6.30 x 9.45 (in)

2.3 Operation

The FF-LS Series are thru scan safety light curtains. Emitter circuitry (sensing unit A and B) transmits modulated, infrared light that is detected by photoreceiver circuitry (sensing unit A and B). The number of light beams depends on the protected height and resolution of the safety light curtain.

2.3.1 Protection Height

Protection height is the height from the top of the uppermost light beam to the bottom of the lowermost light beam.

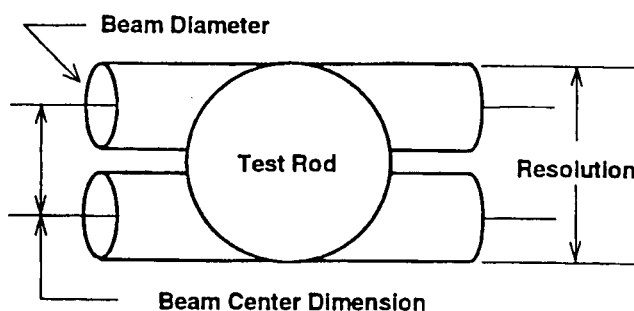
Catalog Listing	Description	Protection Heights mm (in)	Response Time	Weight of Control and Sensing Units
FF-LS16141962	14 mm resolution, 16 beam	196 (7.72)	≤ 50 ms	1.85 kg (4.07 lb.)
FF-LS32143782	14 mm resolution, 32 beam	378 (14.89)	≤ 50 ms	2.06 kg (4.53 lb.)
FF-LS48145612	14 mm resolution, 48 beam	561 (22.10)	≤ 50 ms	2.26 kg (4.97 lb.)
FF-LS64147442	14 mm resolution, 64 beam	744 (29.31)	≤ 50 ms	2.38 kg (5.45 lb.)
FF-LS082802362	30 mm resolution, 8 beam	236 (9.29)	≤ 50 ms	1.75 kg (3.85 lb.)
FF-LS162804602	30 mm resolution, 16 beam	460 (18.12)	≤ 50 ms	1.86 kg (4.09 lb.)
FF-LS242806842	30 mm resolution, 24 beam	684 (26.94)	≤ 50 ms	1.97 kg (4.33 lb.)
FF-LS322809082	30 mm resolution, 32 beam	908 (35.77)	≤ 50 ms	2.08 kg (4.57 lb.)
FF-LS402811322	30 mm resolution, 40 beam	1132 (44.60)	≤ 50 ms	2.19 kg (4.81 lb.)
FF-LS482813562	30 mm resolution, 48 beam	1356 (53.42)	≤ 50 ms	2.30 kg (5.06 lb.)
FF-LS562815802	30 mm resolution, 56 beam	1580 (62.25)	≤ 50 ms	2.41 kg (5.30 lb.)
FF-LS642818042	30 mm resolution, 64 beam	1804 (71.07)	≤ 50 ms	2.52 kg (5.54 lb.)

2.3.2 Resolution

FF-LS Series safety light curtain resolution (sometimes called minimum object sensitivity) is the minimum object size that will always interrupt at least one light beam when it enters the sensing field. Anything entering the sensing field equal to or greater than this minimum size will be detected. Resolution is not affected by scanning distance or dust accumulation. The FF-LS Series does not have a sensitivity adjustment.

Two factors determine the resolution of the safety light curtain: beam center distance and light beam diameter (see figure 2-5). FF-LS has a 30 mm and 14 mm resolution.

Figure 2-5 FF-LS Safety Light Curtain Resolution



3. Installation

3.1 Overview

This chapter contains information about properly installing a FF-LS safety light curtain including how to calculate the safety distance and mounting considerations.

DANGER

FULL REVOLUTION MECHANICAL POWER PRESSES CANNOT BE STOPPED IN MID-STROKE (OSHA 29CFR 1910.217). Do NOT use FF-LS Series safety light curtains on full revolution mechanical power presses.
Failure to comply with these instructions will result in death or serious injury.

DANGER

IMPROPER POINT-OF-OPERATION PROTECTION

Install FF-LS safety light curtains and fixed barriers so that NO person can stand between light curtain and danger zone without being detected.
Failure to comply with these instructions will result in death or serious injury.

WARNING

IMPROPER INSTALLATION OF FF-LS SERIES LIGHT CURTAIN

- Install FF-LS safety light curtains in accordance with this installation manual and applicable local safety regulations (OSHA, ANSI, European standards).
- Mount FF-LS Series safety light curtains so that any entry into protected area must interrupt sensing field or activate other safeguarding devices.
- Install fixed barrier or additional safety light curtains to prevent operating personnel from reaching around, under, or over the sensing field.

Failure to comply with these instructions could result in death or serious injury.

WARNING

IMPROPER SYSTEM PERFORMANCE

- Comply with local safety requirements when designing the machine control interface and all the control elements that affect safety.
- Ensure the BEAM NUMBER on the red label located on the sensing units (A and B) and the control unit are ALL THE SAME.
- Install two independent safety relay contacts into machine control stop circuit controlled by FF-LS Series safety light curtain.
- Ensure two independent stop circuit relays have mechanically linked contacts to reliably detect a welded contact.

Failure to comply with these instructions could result in death or serious injury.

WARNING

IMPROPER MACHINE REACTION

- Ensure the machine control is capable of stopping the machine at any point in the cycle.
- Ensure that a loss of power does NOT impair stopping action of machine.

Failure to comply with these instructions could result in death or serious injury.

3.2 Machine Guarding Protection

FF-LS Series thru scan safety light curtains are non-contact machine guarding devices designed to increase the protection of operators of power driven machinery.

FF-LS Series safety light curtains generate a stop signal if the sensing field is interrupted. Continued operation is prevented until the sensing field is cleared. The FF-LS Series safety light curtain monitors itself continuously for component failures, misalignments, and dirt accumulations. If misalignment or dirt accumulations become too great or a component fails, a stop signal is generated. Operation is prevented until the condition is corrected.

FF-LS Series light curtains are designed so a malfunction or an interruption of the sensing field will cause the light curtain to generate a stop signal within a maximum of 50 milliseconds. This stop signal will be generated automatically if a malfunction occurs in the safety light curtain. All other machine control components that affect safety should also be designed to the same high level of operation.

Vertical mounting may require the installation of fixed barriers or additional light curtains to prevent operating personnel from reaching around, under, or over the sensing field.

For point-of-operation guarding, the safety light curtain(s) and any fixed barriers must be installed so that NO PERSON can stand or reach between the light curtain and the danger zone (see figure 3-1).

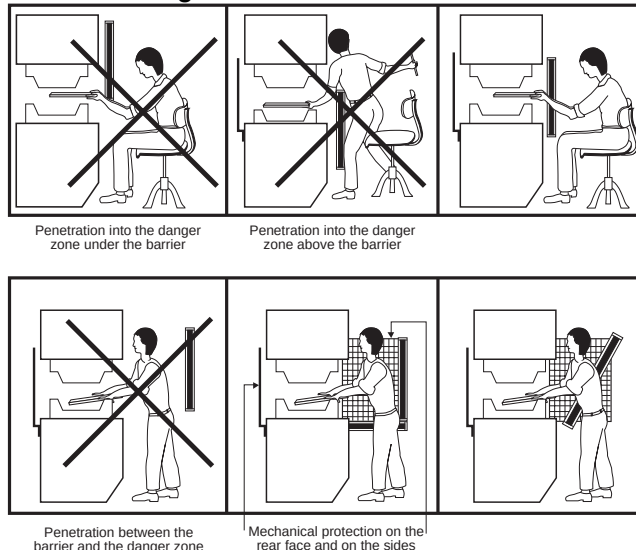
⚠ WARNING

IMPROPER POINT OF OPERATION INSTALLATION

- For point-of-operation guarding the light curtain(s) and any fixed barrier must be installed so that NO PERSON can stand or reach between the light curtain and the danger zone.
- Allow entry into the protected area by interruption of sensing field or other safeguarding device only. This may require using additional fixed barrier guarding, horizontal or angled positioning of the light curtain, or additional light curtains.

Failure to comply with these instructions could result in death or serious injury.

Figure 3-1 Point-of-operation Guarding



3.3 How to Calculate Safety Distance

WARNING

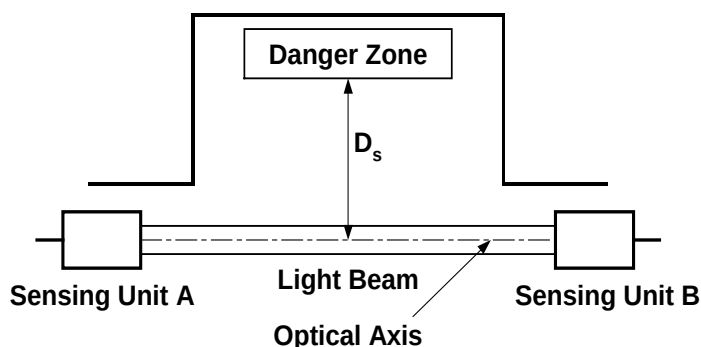
IMPROPER SAFETY DISTANCE

- To ensure the proper safety distance (D_s) use the formulas described in this section.
- The safety distance between the sensing field and the danger zone must be large enough to ensure that if the sensing field is entered, the danger zone cannot be reached before the hazardous movement is stopped.
- The approach speed or velocity of movement into the danger zone (V) depends on the position of the safety light curtain.
- The additional safety distance (C) depends on the minimum object detection (resolution) of the safety light curtain.

Failure to comply with these instructions could result in death or serious injury.

The safety distance (see figure 3-2) is the minimum distance between the sensing field and the danger zone. This distance ensures that the danger zone cannot be reached until the machine motion has been stopped.

Figure 3-2 Light Curtain Safety Distance Diagram



NOTICE

If mechanical or process constraints require closer proximity to the dangerous machine motion, the FF-LS14 safety light curtain is better suited than the FF-LS30 safety light curtain for such applications (FF-LS14 Series has better minimum object detection). The FF-LS30 safety light curtain requires greater safety distance (2.15 inches more than FF-LS14 in the US and 128 mm more in Europe) than the FF-LS14 safety light curtain if installed on the same machine.

3.3.1 Normal Approach Point-of-operation Guarding

Point-of-operation is defined as that area where a machine performs work (such as cutting, shaping, boring, or forming) on a material.

3.3.1.1 European Safety Distance Calculation

The safety distance D_s (see figure 3-3) between the danger zone and the optical axis shall be no less than the value calculated using the following formula:

$D_s \geq 2000\text{mm}(t_1 + t_2) + C$ (mm) where, D_s is the safety distance
 V is the velocity of movement (approach speed) into the danger zone; (2000mm/sec)
 t_1 is the response time of the FF-LS light curtain (sec)
 t_2 is the stopping time of the equipment (sec)
 C is additional safety distance $C = 8(\text{minimum object detection} - 14)$ mm

This formula applies for all safety distances of D_s greater than 100 mm up to and including 500 mm. If D_s is greater than 500 mm using the formula above, reduce the distance above using the formula below. A minimum distance of 500 mm is required.

$D_s \geq 1600\text{mm}(t_1 + t_2) + C$ (mm) where, D_s is the safety distance AND $D_s \geq 500$ mm
 V is the velocity of movement (approach speed) into the danger zone; (1600mm/sec)
 t_1 is the response time of the FF-LS light curtain (sec)
 t_2 is the stopping time of the equipment (sec)
 C is additional safety distance $C = 8(\text{minimum object detection} - 14)$ (mm)

D_s shall be greater or equal to 500 mm. When access to the danger zone can be gained from over the top, around the sides, or underneath the safety light curtain, provide additional safeguarding devices (or hardguarding) to prevent access.

Country: European (pr EN 999)

Protection: Normal Approach Point-of-operation guarding using a FF-LS14 safety light curtain (14 mm minimum object detection)

Application: Small mechanical or hydraulic power press

Formula: $D_s > 2000(t_1 + t_2) + C$

- D_s is the safety distance from the light curtain sensing field to the danger zone.
- V is the velocity of movement (approach speed) into the danger zone (2000 mm/sec).
- t_1 is the response time of the FF-LS light curtain (50 ms).
- t_2 is the stopping time of the equipment guarded by the light curtain including interconnecting components such as all mechanical, electromechanical, and electronic parts such as relays, solenoids, and brakes (150 ms).
- C is additional safety distance, $C = 8$ (minimum object detection - 14).

For example, if:

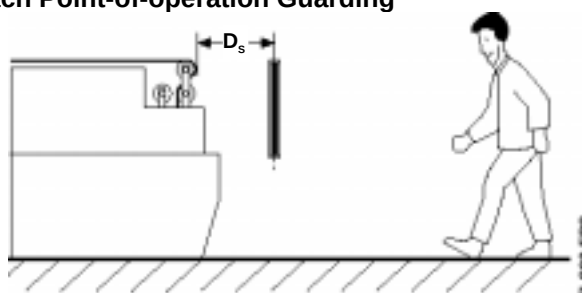
- $V = 2000$ mm/sec (pr EN 999).
- $t_1 = 50$ ms = 0.050 sec
- $t_2 = 200$ ms = 0.200 sec
- $C = 0$ mm, 8(minimum object detection - 14), then:
- $D_s = 2000(0.050 + 0.200) + 0 = 500$ mm

3.3.1.2 United States Safety Distance Calculation

The safety distance D_s (see figure 3-3) allowed between the danger zone and the vertical sensing plane shall be no less than the value calculated using the following formula:

$D_s \geq 63in(t_1 + t_2) + C$ (in) where, D_s is the safety distance
 V is the velocity of movement (approach speed) into the danger zone; (63in/sec)
 t_1 is the response time of the FF-LS light curtain (sec)
 t_2 is the stopping time of the equipment (sec)
 C is additional safety distance $C = 3.4$ (minimum object detection - 0.276) (in)

Figure 3-3 Normal Approach Point-of-operation Guarding



Country: USA (OSHA 29 CFR 1910.217, ANSI B11.19 1990)

Protection: Normal Approach Point-of-operation guarding using a FF-LS14 safety light curtain (14 mm minimum object detection)

Application: Small mechanical or hydraulic power press

Formula: $D_s > V(t_1 + t_2) + C$, where,

- D_s is the safety distance from the light curtain sensing field to the danger zone.
- V is the velocity of movement (approach speed) into the danger zone; (63in/sec).
- t_1 is the response time of the FF-LS light curtain (50 ms).
- t_2 is the stopping time of the equipment guarded by the light curtain including interconnecting components such as all mechanical, electromechanical, and electronic parts such as relays, solenoids, and brakes (150 ms).
- C is additional safety distance (0.93 inch). $C = 3.4$ (minimum object detection - 0.276).

For example, if:

- $V = 63$ in./sec (ANSI B11.1 and ANSI B11.2).
- $t_1 = 50$ ms = 0.050 sec
- $t_2 = 150$ ms = 0.150 sec
- $C = 0.93$ in., then:
- $D_s = 63(0.050 + 0.150) + 0.93 = 13.53$ in.

3.3.2 Parallel Approach Point-of-operation Guarding

⚠ DANGER

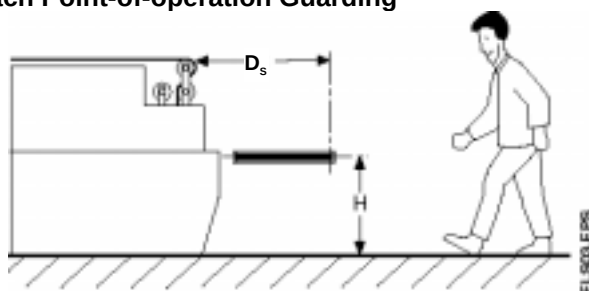
IMPROPER POINT-OF-OPERATION PROTECTION

Install the FF-LS safety light curtains and mechanical guards so that NO person can stand or reach between the light curtain and the danger zone without being detected.

Failure to comply with these instructions will result in death or serious injury.

If the direction of approach is parallel to the plane of detection (e.g. if the safety light curtain is horizontally mounted, see figure 3-4), the minimum safety distance D_s from the danger zone to the outer beam depends on the height (H) of the light curtain above the ground.

Figure 3-4 Parallel Approach Point-of-operation Guarding



3.3.2.1 European Safety Distance Calculation

Calculate the safety distance D_s using the formula below:

If $875 < H \leq 1000$, then $D_s \geq 1600\text{mm}(t_1 + t_2) + 850$, t in sec

or

If $0 < H \leq 875$, then $D_s \geq 1600\text{mm}(t_1 + t_2) + (1200 - 0.4 H)$, t in sec, H in mm

The height H should be a maximum of 1000 mm from the ground. However, if the installation height H is greater than 300 mm, there is a risk of inadvertent undetected access beneath the safety light curtain. Install additional protective safety devices as required. Example: if $H = 300$ mm, then $D_s = 1.6(t_1 + t_2) + 1080$.

Country: European (pr EN 999)

Protection: Parallel Approach Point-of-operation guarding using a FF-LS14 safety light curtain (14 mm minimum object detection)

Application: Small mechanical or hydraulic power press

Formula: $D_s > 1600(t_1 + t_2) + (1200 - 0.4H)$ (mm) where $(1200 - 0.4H) > 850$ mm

If H is greater than 300 mm (11.82 in), there is a risk of access from under the safety light curtain. For this safety light curtain, the minimum height allowed is $H_{\min} = 0$ mm. The maximum height allowed is $H_{\max} = 1000$ mm (39.37 in).

- D_s is the safety distance from the light curtain sensing field to the danger zone.
- V is the velocity of movement into the danger zone (1600 mm/sec).
- t_1 is the response time of the FF-LS light curtain (50 ms).
- t_2 is the stopping time of the equipment guarded by the light curtain including interconnecting components such as all mechanical, electromechanical, and electronic parts such as relays, solenoids, and brakes.
- H is the height of the detection plane (250 mm)

For example, if:

- $V = 1600$ mm/sec.
- $t_1 = 50$ ms = 0.050 sec
- $t_2 = 150$ ms = 0.150 sec
- $H = 250$ mm, then:
- $D_s = 1600(0.050 + 0.150) + (1200 - 0.4[250]) = 1420$ mm

3.3.3 Angular Approach Point-of-operation Guarding

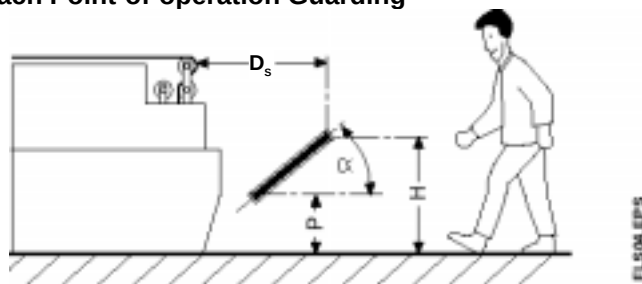
Country: European (pr EN 999)

Protection: Angular Approach Point-of-operation guarding (the direction of approach and the sensing plane forms an angle, see figure 3-5)

Application: Small mechanical or hydraulic power press

Formula: If angle α is greater than 30° , but less than 90° ($30^\circ < \alpha < 90^\circ$), use the **NORMAL APPROACH** calculation. If the angle α is less than or equal to 30° ($0^\circ < \alpha \leq 30^\circ$), use the **PARALLEL APPROACH** calculation. In this case, the minimum height allowed (P) is 0 mm and the maximum height allowed (H) is 1000 mm. However, if $P > 300$ mm, the risk of inadvertent access from below must be taken into account.

Figure 3-5 Angular Approach Point-of-operation Guarding



3.4 Reflective Surfaces

WARNING

REFLECTIVE SURFACES

To prevent two optical paths to a receiver (located within each sensing unit), install FF-LS safety light curtains so there are no reflective surfaces within the beam angles of the sensing units.

Failure to comply with these instructions could result in death or serious injury.

Reflective surfaces near the sensing field can cause reflection of the sensing beams and result in two optical paths to a receiver (located within each sensing unit). This can lead to deflection and prevent detection of an object in sensing field. The light curtain must be installed so there are no reflective surfaces within the beam angles of the sensing units. The beam angle of the optics and the alignment tolerance for the sensing units are approximately 2° (see figure 3-6). A minimum distance D to the optical axis shall be observed. For a distance L between sensing units A and B, see figure 3-6. Figure 3-7 illustrates the minimum safety distance.

Figure 3-6 Distance from Reflective Surfaces

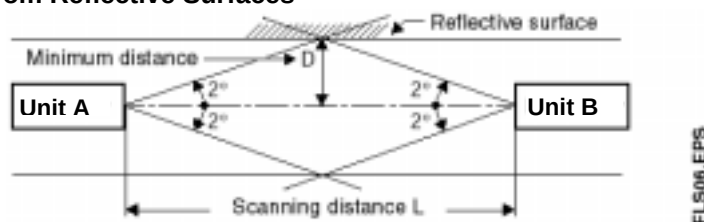
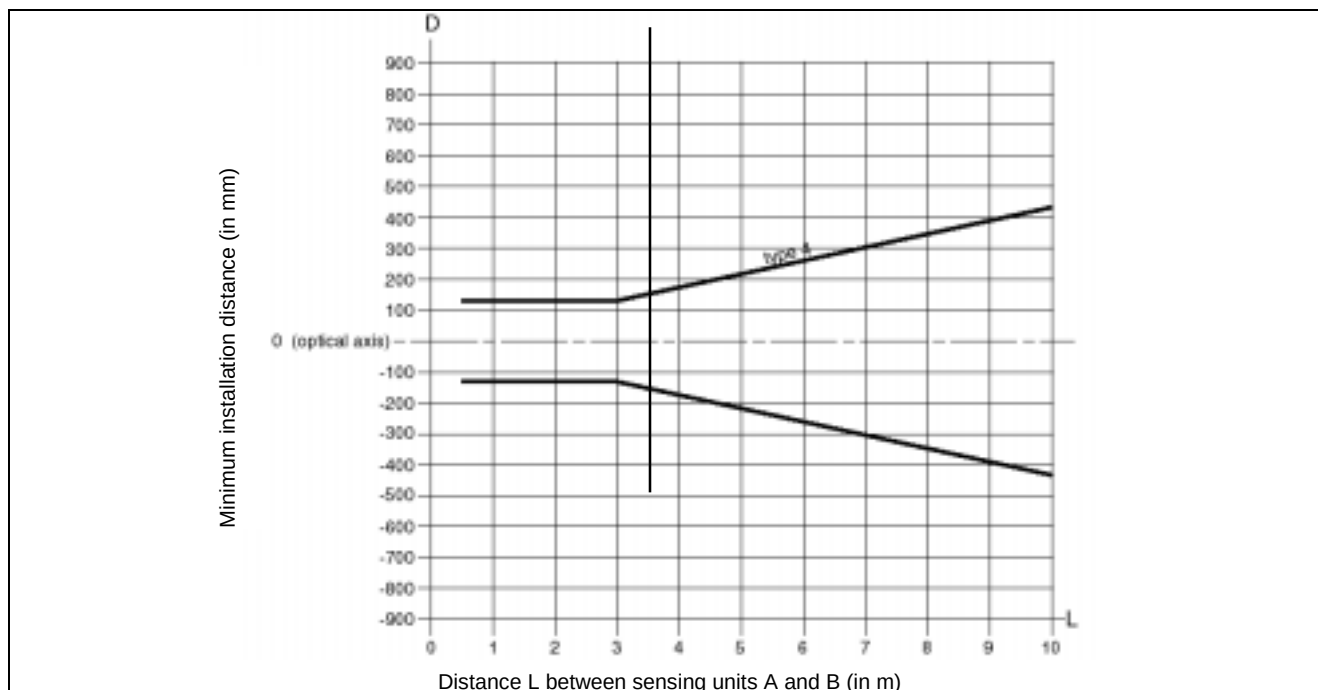


Figure 3-7 Minimum Safety Distance (D)

Scanning Distance (L)	Minimum Distance (D)
0.2 m - 3.0 m (8 inches to 10 ft)	105 mm (4.1 in)
3.5 m (11.5 ft)	123 mm (4.8 in) $D = \tan 2^\circ \times L$
If $L \geq 3$ m, the distance can be deduced from the graph below.	



3.5 Mounting Considerations

This section discusses optical alignment and mounting considerations. There are several different ways to mount the FF-LS Series safety light curtains (singularly, in groups, and in several different orientations).

⚠ WARNING

IMPROPER MACHINE PROTECTION (FF-LS30 ONLY)

- The arrow labels located on the sides of the sensing units define the active sensing zone of the FF-LS30 Series light curtain. The yellow tape located on the front plate of the sensing units defines an inactive non-sensing area. When providing protection, ensure the danger zone is completely protected and within the sensing zone of the FF-LS30.
- Ensure the arrows on sensing units A and B are properly aligned.

Failure to comply with these instructions could result in death or serious injury.

3.5.1 Optical Alignment Procedure

Proper optical alignment of the FF-LS Series safety light curtains ensures optimum operation. Sensing units A and B must be parallel, at the same height and plane of the beams, and with an angular displacement of no more than $\pm 2^\circ$. See figure 3-8 for proper optical alignment. Perform alignment as follows:

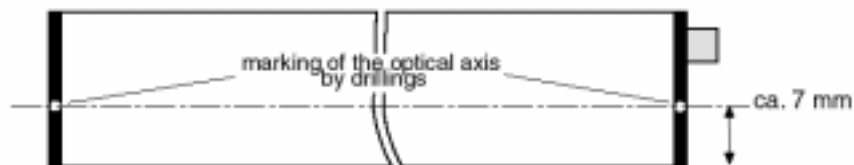
1. Turn one of the sensing units around its longitudinal axis in both directions to locate the point where the sensing field is interrupted.
2. Center the sensing unit between the two points of interruption for optimal adjustment.
3. Repeat steps 1 and 2 for the other sensing unit.

Figure 3-8 Optical Alignment

FF-LS-XX-28

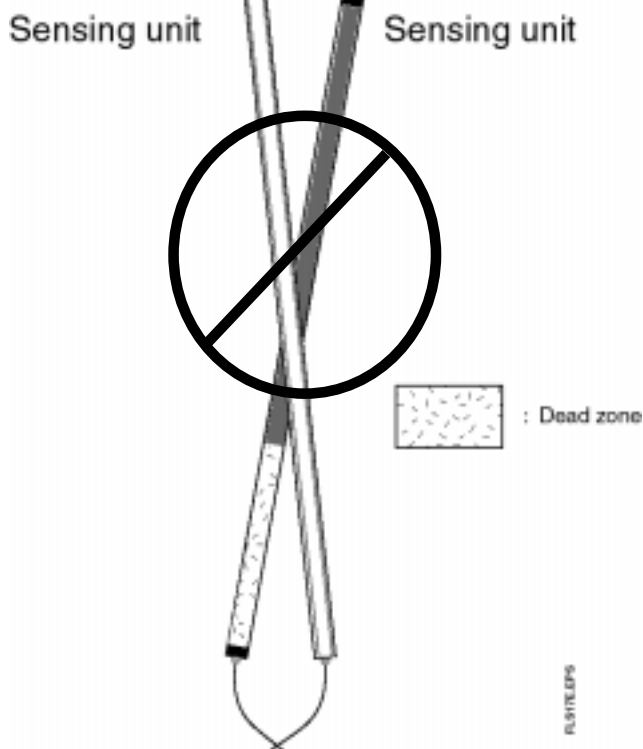


FF-LS-XX-14



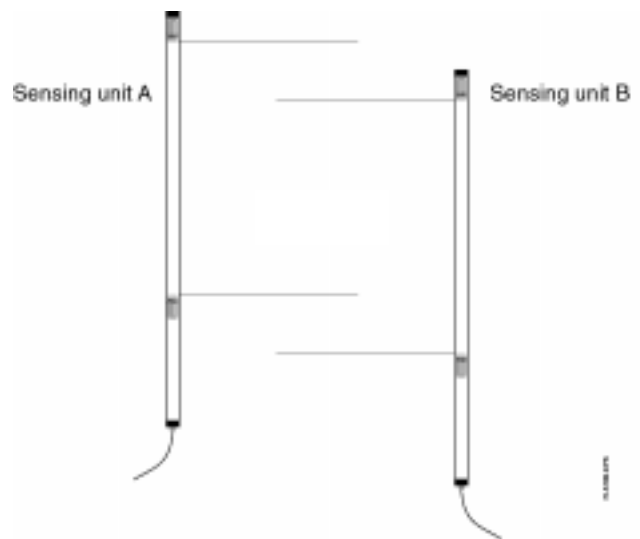
FLS16 EPS

Ensure the sensing units are parallel and in the plane perpendicular to the beams.



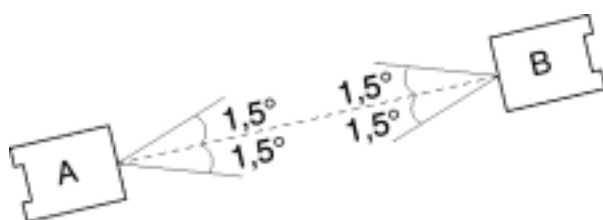
FLS16 EPS

Ensure the relative height of the sensing units is the same.



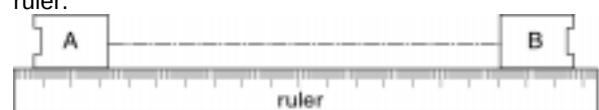
FLS16 EPS

Ensure the correct angular alignment of the sensing units.



FLS16 EPS

For small scanning distances, the optical alignment of the sensing units can be carried out easily and quickly using a ruler.



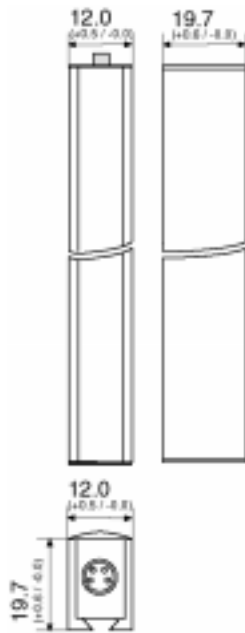
FLS16 EPS

3.5.2 Mounting Dimensions

Figure 3-9 Sensing Units

FF-LS□□-28-□□□□-2-A/B Sensing Units

(in mm) 1 inch = 25.4 mm



b) FF-LS□□-14-□□□□-2-A/B Sensing Units

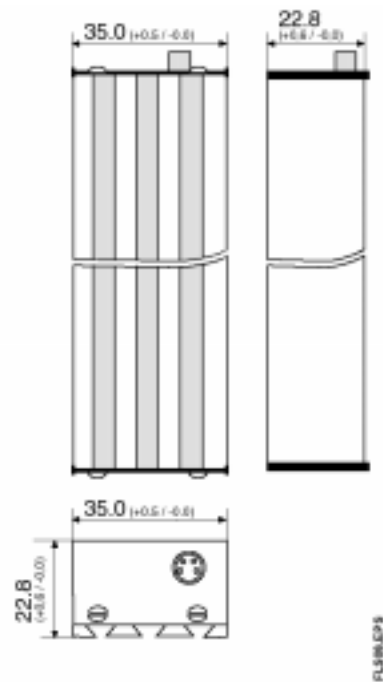


Figure 3-10 Control Unit

c) FF-LS-□□-C Control Unit (in mm) 1 inch = 25.4 mm

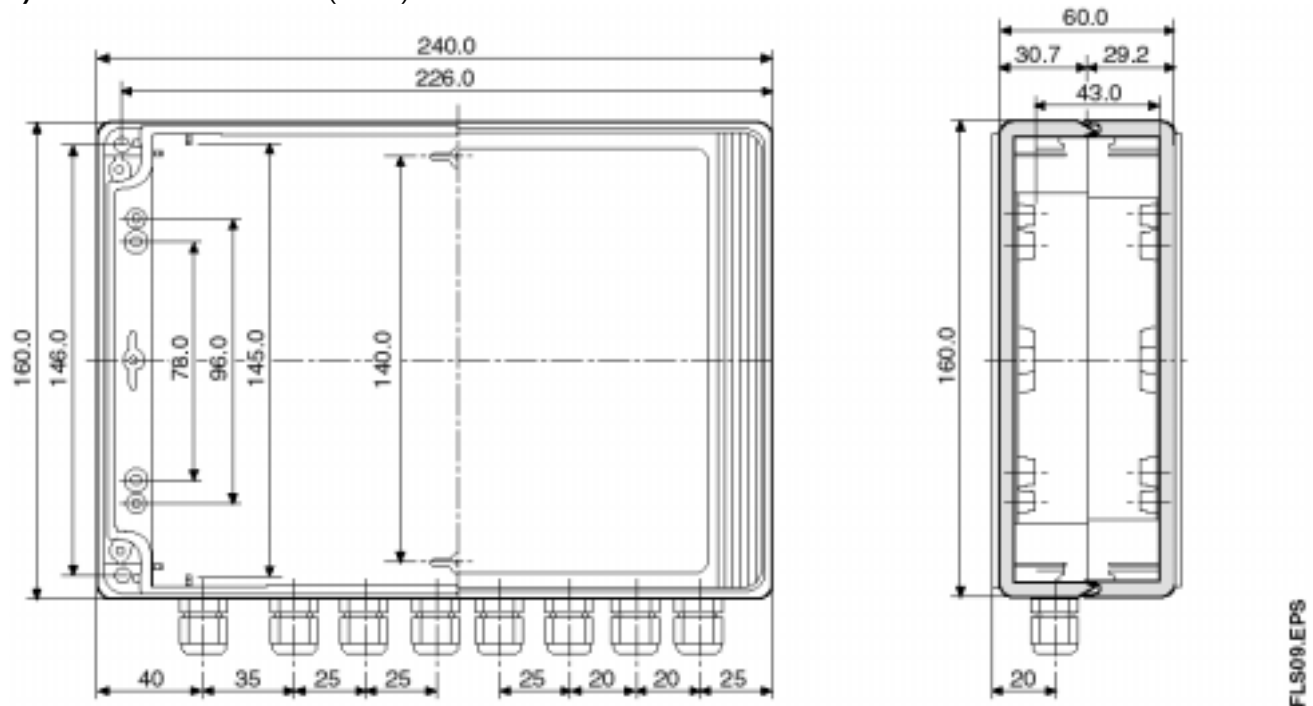
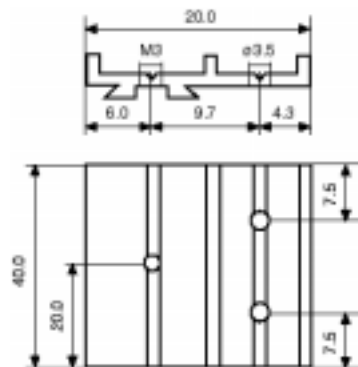


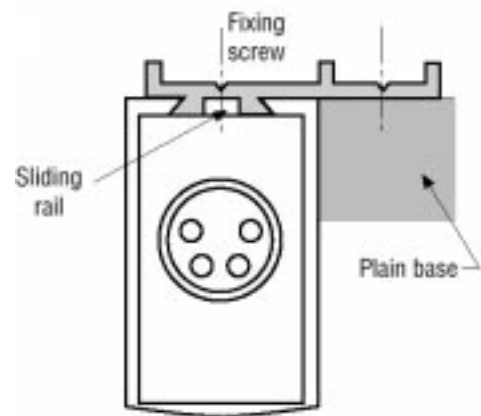
Figure 3-11 FF-LSZMS660 and FF-LSZMS690 Brackets (30 mm resolution sensing units)

FF-LSZMS660: Straight bracket (in mm) 1 inch = 25.4 mm

Kit of 2 straight brackets for an installation parallel to the sliding rail.

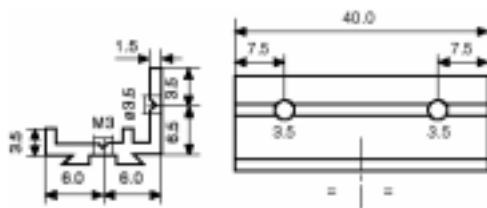


FLS10.EPS

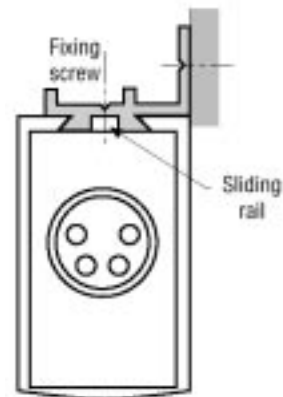


FF-LSZMS690: Right-angle bracket (in mm) 1 inch = 25.4 mm

Kit of 2 right-angled brackets for an installation perpendicular to the sliding rail.



FLS11.EPS

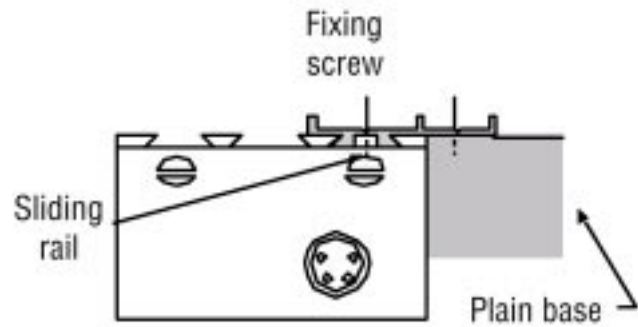
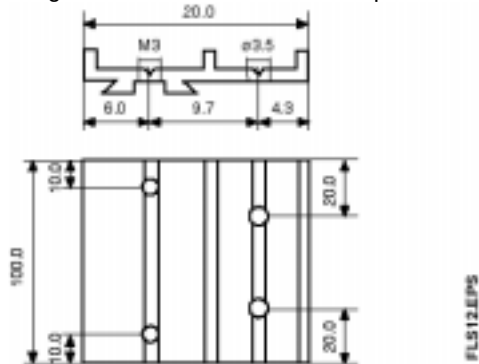


All FF-LS Series safety light curtains are delivered with both types of brackets. The brackets provided allow one bracket to be installed every 19.7 inches (500 mm) along the housing profile.

Figure 3-12 FF-LSZMS720 and FF-LSZMS730 Brackets (14 mm resolution sensing units)

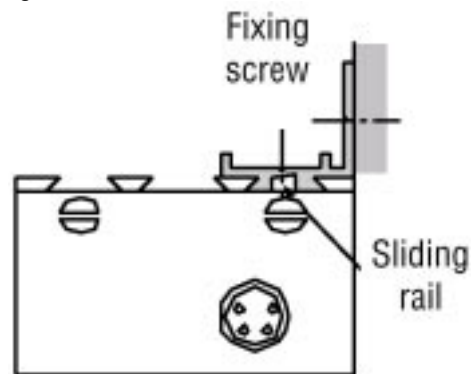
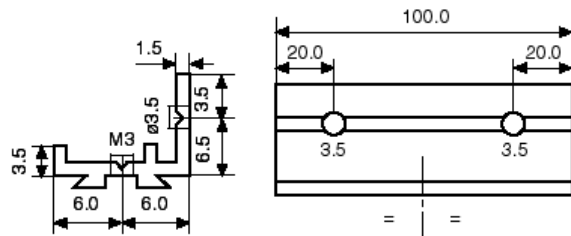
FF-LSZMS720: Straight bracket (in mm) 1 inch = 25.4 mm

Kit of 2 straight brackets for an installation parallel to the sliding rail.



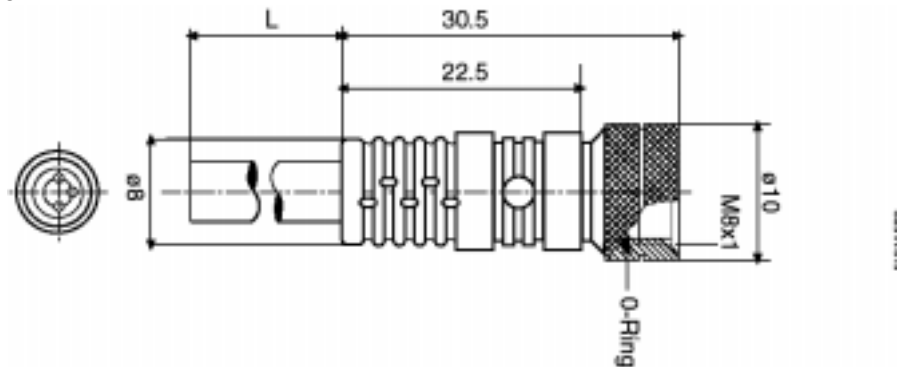
FF-LSZMS730: Right-angle bracket

Kit of 2 right-angled brackets for an installation perpendicular to the sliding rail.

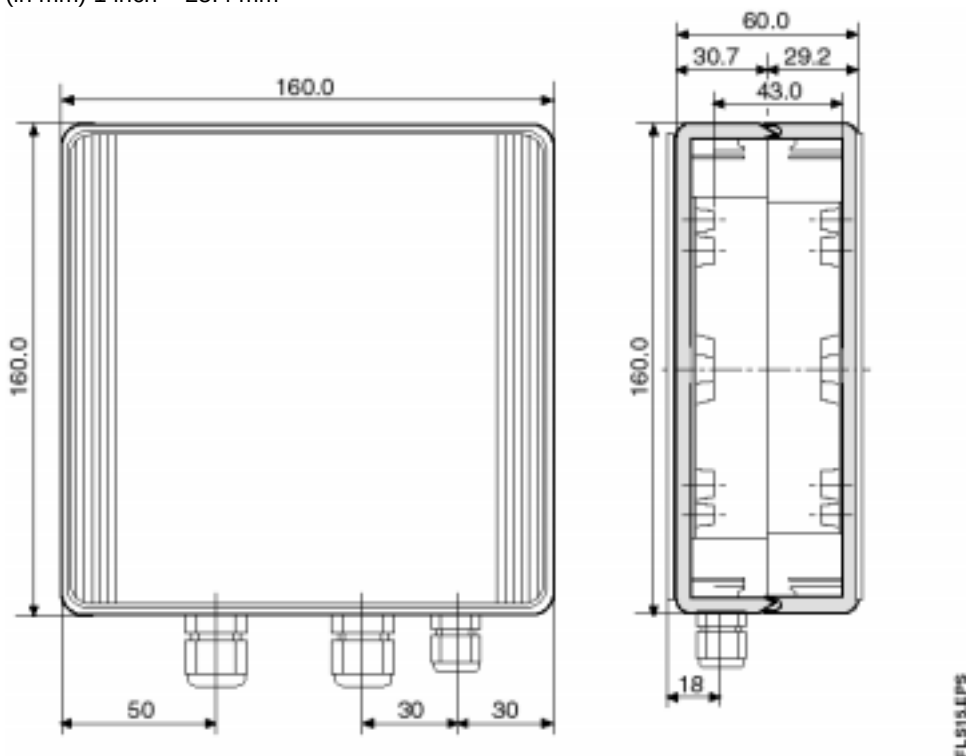


Note: All FF-LS equipment is delivered with both types of brackets. The brackets provided allow one bracket to be installed every 19.7 inches (500 mm) along the housing profile.

Figure 3- 13 FF-LSZKA0611 interface cables and FF-LSZUS0605, FF-LSZUS0606 power supplies
FF-LSZKA0611 32 ft. (10 m) Cables
 (in mm) 1 inch = 25.4 mm



FF-LSZUS0605 (230 Vac/24 Vdc) and FF-LSZUS0606 (115 Vac/24 Vdc) Power Supplies
 (in mm) 1 inch = 25.4 mm



4. Electrical Connection

4.1 Overview

This section contains information about electrical installation and wiring. See figure 4-1 for overall wiring diagram.

⚠ WARNING

IMPROPER INSTALLATION

- Connect the safety light curtain to the machine control circuitry so the outputs (external safety relays with positive-guided contacts) are systematically self-checked at each cycle.
- Each interruption of one or more beams of the safety light curtain must immediately stop dangerous machine motion within the response time of the components.
- Clearing the sensing zone must NOT start the operation of the machine. When restarting, a normal control sequence must be used to set the machine in motion.
- Applying (or switching on) electrical power must NOT set the machine parts in motion, especially after an interruption during a cycle. A normal control sequence must be used to set the machine in motion.
- Strictly adhere to all electrical connection instructions.

Failure to comply with these instructions could result in death or serious injury.

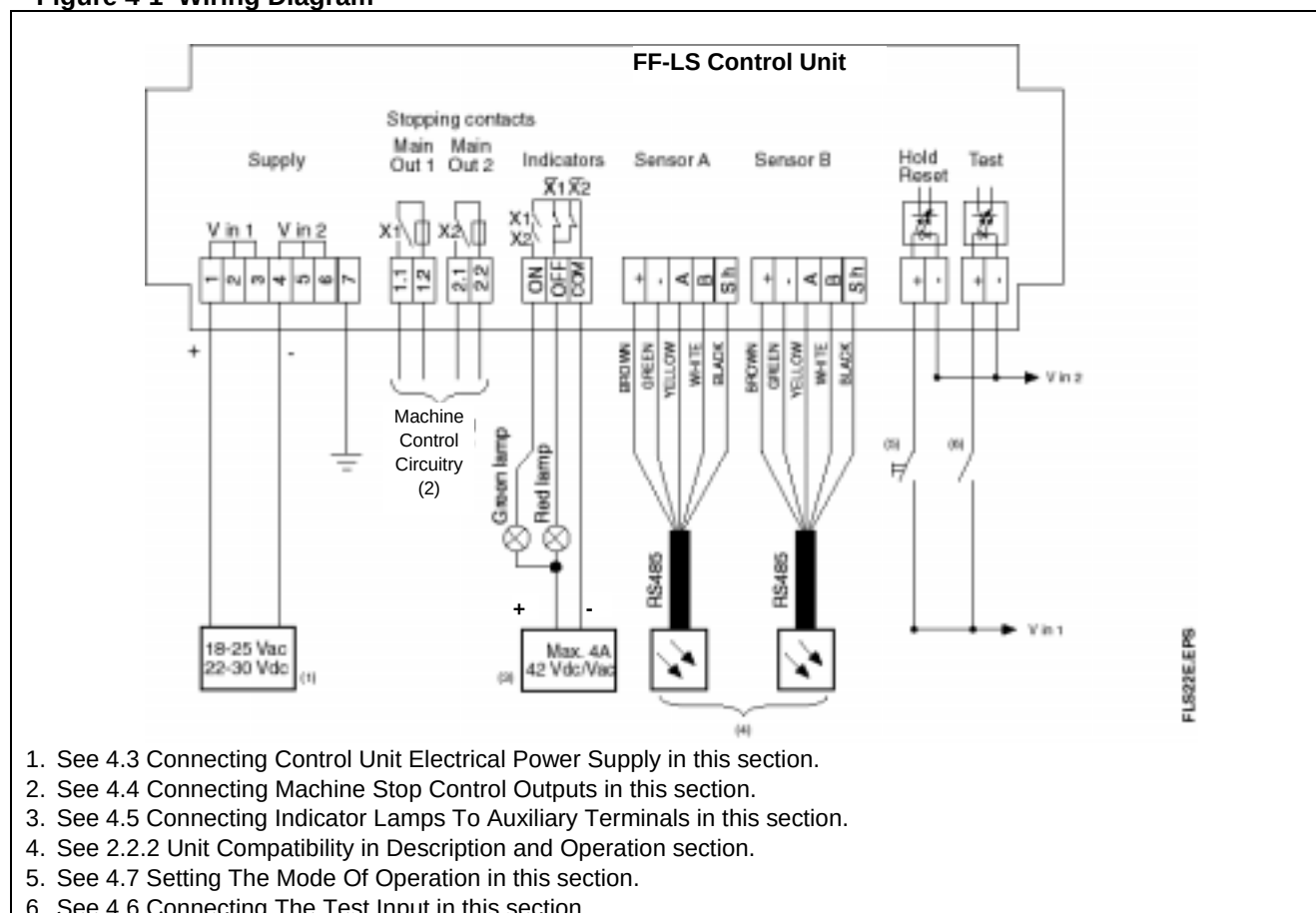
⚠ WARNING

IMPROPER SYSTEM PERFORMANCE

Ensure two independent stop circuit relays have mechanically linked contacts to reliably detect a welded contact.

Failure to comply with these instructions could result in death or serious injury.

Figure 4-1 Wiring Diagram



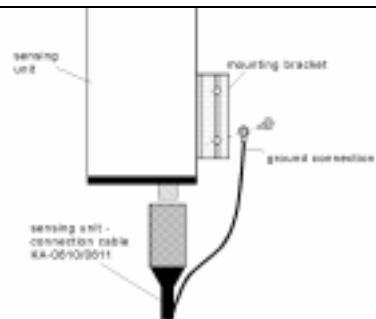
4.2 Connecting Sensing Units to Control Units

1. Install the wire end of the FF-LSKA0611 (RS485) cable into the control unit housing through its terminal gland.
2. Connect the wires of the RS485 cable to the control unit circuit board terminals as shown in figure 4-1.
3. Install the cable connector end of the RS485 cable to the sensing unit.

⚠ WARNING

IMPROPER GROUNDING OF THE SENSORS

Ensure the shield termination at the sensor end of the RS485 interface cable is connected to the mounting bracket through the bracket fixing screw.



Failure to comply with these instructions could result in death or serious injury.

NOTICE

The RS485 cable may be cut to meet specific customer application needs.

⚠ WARNING

IMPROPER GROUNDING OF THE CONTROL UNIT

Ensure terminal number 7 in the control unit is connected to ground.

Failure to comply with these instructions could result in death or serious injury.

NOTICE

IMPROPER WIREWAY

Ensure the RS485 signal cable is kept away from power lines. Use different wire routes to bring power and signal to the control unit.

⚠ WARNING

IMPROPER CONNECTION BETWEEN SENSING UNIT AND CONTROL UNIT

- Always use FF-LSKA0611 (RS485) cable to ensure a proper connection between a sensing unit and a control unit.
- If damaged, replace the FF-LSKA0611 cable immediately. Do not try to repair the cable or extend its length.

Failure to comply with these instructions could result in death or serious injury.

NOTICE

The two sensing units A/B are matched to each other by individual coding. Therefore, only connect a matched pair of sensing units A/B (each has the same serial number) to a control unit. Failure to comply with these instructions will result in improper product performance.

NOTICE

To ensure the proper operation of the FF-LS safety light curtain, 10 meters (132 feet) is the maximum cable length that may be used for any application. However, a cable may be shortened, if necessary. Sensing units A and B are not matched to the RS485 cable.

4.3 Electrical Power and the Control Unit**⚠ WARNING****POWER APPLIED TO MACHINE CONTROL SYSTEM**

Before intervention, turn off and disconnect power from FF-LS Series safety light curtain and machine.

Failure to comply with these instructions could result in death or serious injury.

The control unit FF-LS __ C provides electrical power to the sensing units A and B and uses 22 to 30 Vdc or 18 to 25 Vac supply voltages. For DC voltages, any polarity is allowed. The EN 61496 (previously pr EN 50 100 - part 1) standard mandates the use of a galvanic insulated power supply for type 4 protective equipment.

NOTICE

Use the electrical power supply units in Table 4-1 to ensure the necessary galvanic insulation of the FF-LS Series safety light curtain. To ensure specified immunity to electrical noise, connect the earth terminal to the machine's main earth ground. Failure to comply with these instructions will result in improper product performance.

Table 4- 1 Power Supply Units (optional) Order Guide

Catalog Listing	Description
FF-LSZUS0606	Power supply, 115 Vac / 24 Vdc
FF-LSZUS0605	Power supply, 230 Vac / 24 Vdc

4.4 Connecting Machine Stop Control Outputs (MAIN OUT 1 and MAIN OUT 2)**⚠ WARNING****POWER APPLIED TO MACHINE CONTROL SYSTEM**

Before intervention, turn off and disconnect power from FF-LS Series safety light curtain and machine.

Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING**IMPROPER SYSTEM PERFORMANCE**

Ensure two independent stop circuit relays have mechanically linked contacts to reliably detect a welded contact.

Failure to comply with these instructions could result in death or serious injury.

CAUTION**SAFETY RELAY CONTACT DAMAGE**

Inductive loads generate high voltage transients that will degrade the life expectancy of the safety relay contacts. Use arc suppression (resistor/capacitor) RC components to avoid contact damage. For Vdc interfaces, use varistors in place of RC components.

Failure to comply with these instructions could result in product damage.

⚠ WARNING**IMPROPER ARC SUPPRESSORS INSTALLATION**

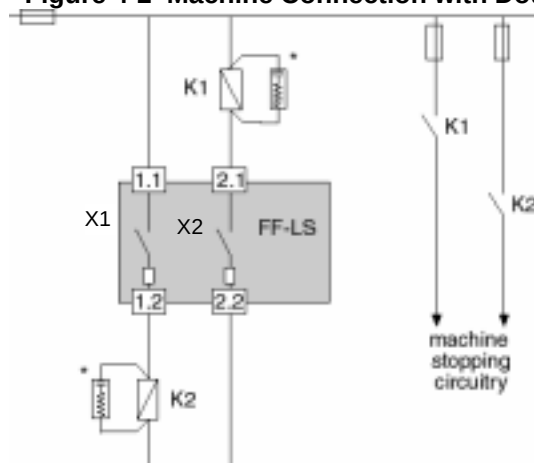
- Never install an arc suppressor across the safety output contact of the control unit.
- Always install arc suppressors across the coils of external safety relays.

Failure to comply with these instructions could result in death or serious injury.

Internal safety relay contacts X1 and X2 are switched simultaneously. An internal permanent check ensures that both safety relays have the same status. If one of the two contacts X1 or X2 becomes accidentally welded, the remaining contact would no longer be able to close. It is therefore important to use the two signals to prevent operation of the machine.

In this case, use the contacts 1.1 / 1.2 and 2.1 / 2.2 separately:

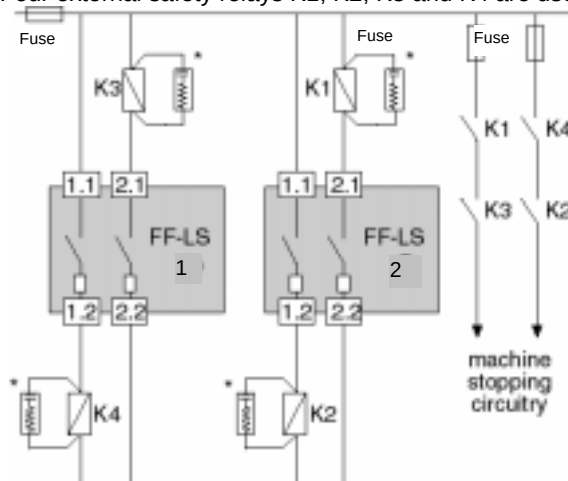
Figure 4-2 Machine Connection with Double Stopping Circuitry



* RC component (See figure 4-6, page 33 for correct interfacing of K1 and K2. The partial example shown here is more appropriate for AC power.)

Figure 4-3 Multiple Safety Light Curtain Connection

Four external safety relays K1, K2, K3 and K4 are used in the following manner:



* RC component (See figure 4-6, page 33 for correct interfacing of K1, K2, K3 and K4. The partial example shown here is more appropriate for AC power.)

Standard values for RC components:

Supply voltage	Resistor	Capacitor
115/230 Vac	220 Ω	0.22 μF
24/48 Vac	100 Ω	2.2 μF
Safety output contacts are protected by 4 A / 250 V fuses.		

4.5 Connecting Indicator Lamps To Auxiliary Terminals

⚠ WARNING**POWER APPLIED TO MACHINE CONTROL SYSTEM**

Before intervention, turn off and disconnect power from FF-LS Series safety light curtain and machine.

Failure to comply with these instructions could result in death or serious injury.

Per the EN 61496 (previously pr EN 50 100 - part 1) standard, the control unit allows installation of lamp indicators as follows:

- A **green** lamp indicator must be connected between the ON terminal and ground. The COM terminal should be connected to the +24 volt power supply. The ON and COM terminals are located on the control unit circuit board. When the lamp illuminates (ON), no beams are interrupted, no failures are detected and the output NO contacts are closed.
- A **red** lamp must be connected between the OFF terminal and ground. The COM terminal should be connected to the +24 volt power supply. The OFF and COM terminals are located on the control unit circuit board. When the lamp illuminates (ON), at least one beam is interrupted, or a failure is detected and the output NO contacts are opened.

Both lamps operate complementarily.

4.6 Connecting The Test Input

WARNING

POWER APPLIED TO MACHINE CONTROL SYSTEM

Before intervention, turn off and disconnect power from FF-LS Series safety light curtain and machine.

Failure to comply with these instructions could result in death or serious injury.

The test input provides a way to test the functionality of the entire machine safety system. The connection of the test input to an external 24 Vac/dc supply turns off (opens the NO contacts of the FF-LS safety light curtain) the equipment even if the beams have not been broken. Once connection between the test input and the external 24 Vac/dc supply is established, ensure that every component of the machine safety control circuitry is operating correctly. **Notes:**1) External 24 Vac/dc supply: 24 Vac/dc, $\pm 25\%$ (48 to 62 Hz) 2) Photocouplers provide an electrical isolation from the rest of the system 3) Minimum closing time is 100 ms.

4.7 Setting The Mode Of Operation

WARNING

POWER APPLIED TO MACHINE CONTROL SYSTEM

Before intervention, turn off and disconnect power from FF-LS Series safety light curtain and machine.

Failure to comply with these instructions could result in death or serious injury.

WARNING

IMPROPER MACHINE RESTART

- Clearing the sensing zone must not start dangerous machine operation. When restarting the machine operation, a normal machine control sequence must be used.
- If electrical power is removed from a machine, its restoration must not initiate dangerous machine operation; a normal machine control sequence must be used.
- If a safety light curtain is activated, the machine must NOT be able to restart.
- A Programmable Logic Controller must NOT be able to override a manual restart function.

Failure to comply with these instructions could result in death or serious injury.

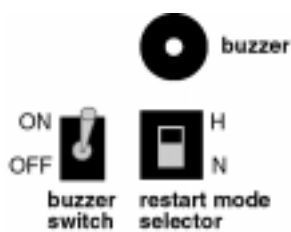
The FF-LS Series safety light curtain may operate in one of two following modes:

- In the **Automatic** mode, the FF-LS starts automatically at power up and restarts automatically after any intrusion in the sensing field.
- In the **Start and Restart Interlock** (manual) mode, pushing an external push button (customer supplied) is necessary to restart the equipment at power up and after any intrusion into the sensing field.

To select the proper mode of operation do the following:

1. Remove the protective plastic covers located on each side of the control unit face plate lid using a small screwdriver (small recess in covers).
2. Loosen four captive screws securing the face plate lid on the control unit housing and remove the lid.
3. Locate the internal restart mode selector near the buzzer switch (see figure 4-4).
4. Select start and restart interlock (manual) mode (H for Hold) or automatic restart mode (N for Normal) as required.
5. Select buzzer option as required.
6. Reinstall lid, tighten screws and snap the protective plastic covers back in place.

Figure 4 - 4 Mode Selector and Buzzer Switch



H = Hold (Start and Restart Interlock (manual) mode)
N = Normal (Automatic Restart mode)

In the start and restart interlock (manual) mode, the connection between the restart input and an external 24 Vac/dc supply must be set using a push button to restart the equipment (minimum closing time is 200 ms). It takes 500 ms for the system to restart after activation of the push button.

NOTICE

In this mode, the FF-LS safety light curtain will detect a restart push button failure (broken in a closed position) and will prevent the next cycle of operation until the failure has been corrected.

4.8 Example Electrical Wiring Connections

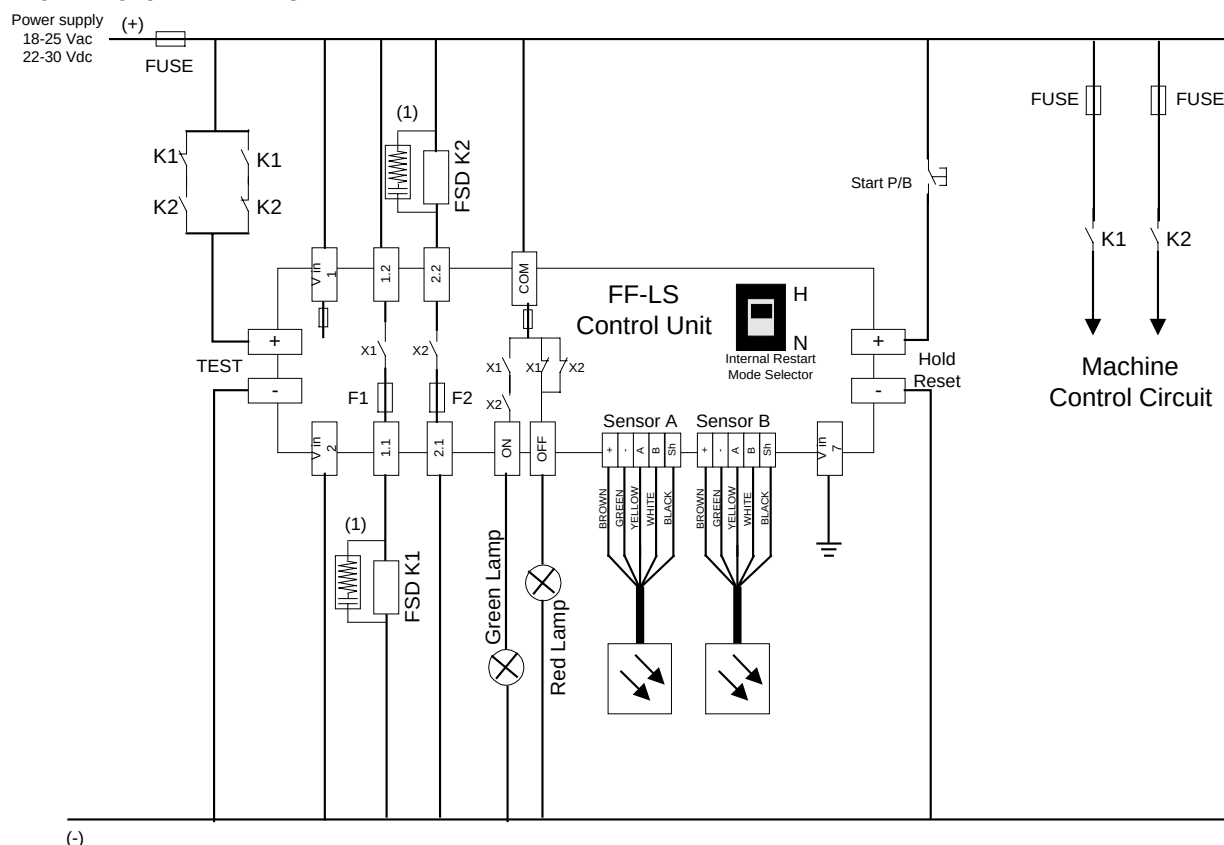
WARNING

IMPROPER SYSTEM PERFORMANCE

Ensure independent stop circuit safety relays (K1 and K2) have mechanically linked contacts that prevent contact overlapping in the event of a welded contact.

Failure to comply with these instructions could result in death or serious injury.

Figure 4 - 5 Start And Restart Interlock (Manual) Mode With Final Switching Device (FSD, External Safety Relays) Monitoring



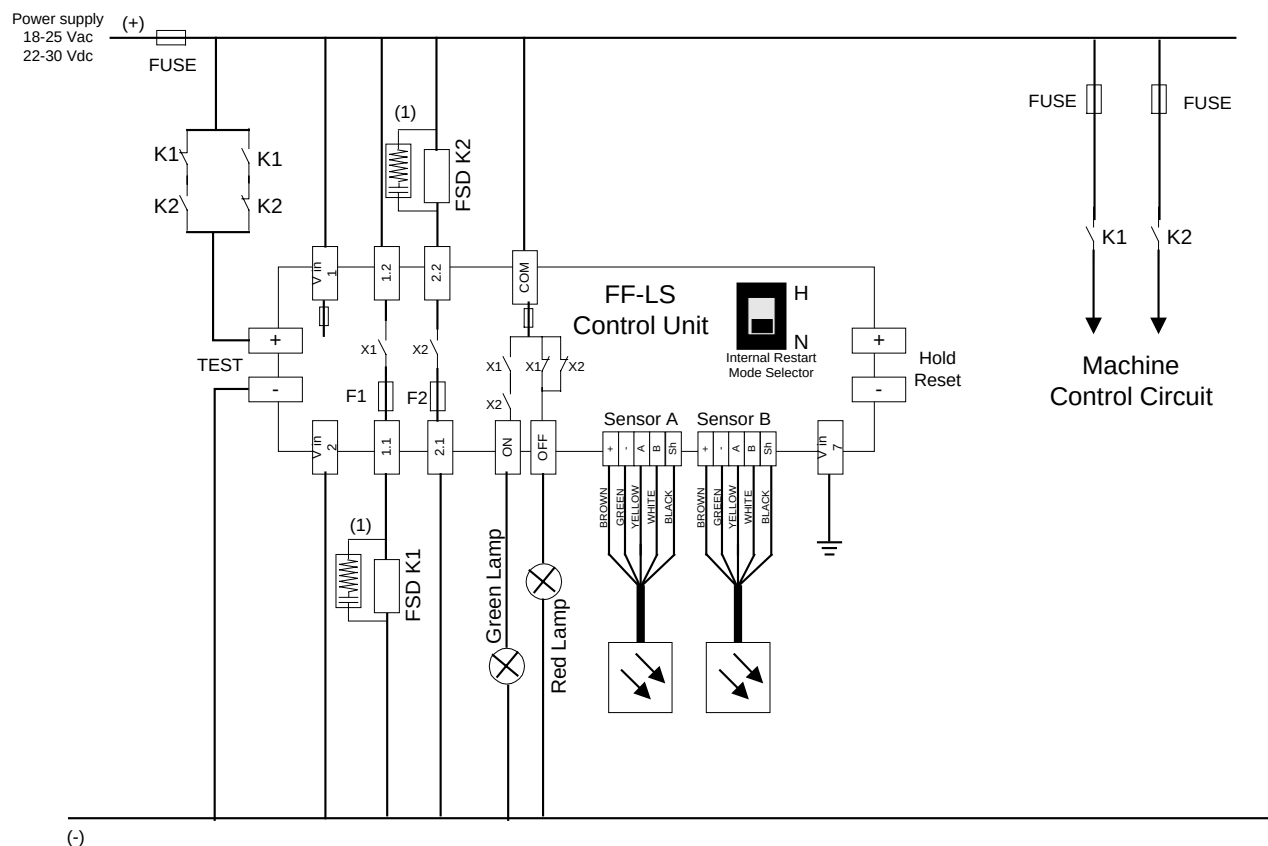
(1) RC components for AC interfaces or varistors for DC interfaces.

⚠ WARNING**IMPROPER SYSTEM PERFORMANCE**

Ensure independent stop circuit safety relays (K1 and K2) have mechanically linked contacts that prevent contact overlapping in the event of a welded contact.

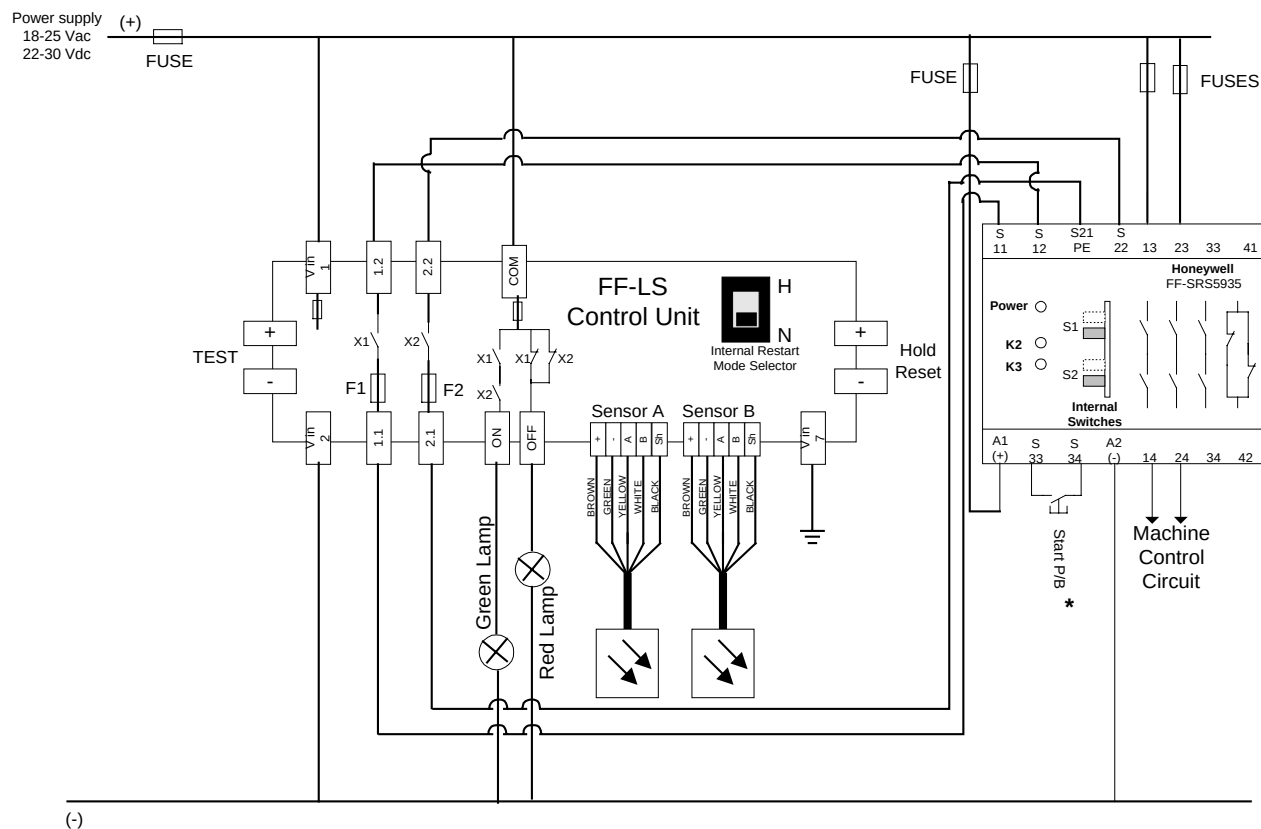
Failure to comply with these instructions could result in death or serious injury.

Figure 4 - 6 Automatic Restart Mode With FSD (External Safety Relays) Monitoring



(-) (1) RC components for AC interfaces or varistors for DC interfaces.

Figure 4 - 7 Automatic or Start Restart Interlock Mode With FF-SRS 5935 Series Safety Modules



- *1. Install a jumper between S33 and S34 for automatic restart mode.
2. Position the FF-SRS5935 internal switches per its instruction manual.

5. Inspection and Maintenance

WARNING

IMPROPER MAINTENANCE

- Strictly adhere to all test, inspection, troubleshooting and maintenance instructions.
- Access to the control unit is restricted to the buzzer switch, restart mode selector switch, fuse replacement, and wire connections.
- Do not touch any other components inside the control unit.

Failure to comply with these instructions could result in death or serious injury.

WARNING

IMPROPER MACHINE GUARDING PROTECTION

- Refer to and comply with prEN 999 and ANSI standards when calculating safety distances.
- Select a safety light curtain with the proper protective (sensing zone) height to ensure an operator cannot reach a dangerous machine operation.
- The arrow labels located on the sides of the sensing units define the active sensing zone of the FF-LS30 Series light curtain. The yellow tape located on the front plate of the sensing units defines an inactive non-sensing area. When providing protection, ensure the danger zone is completely protected and within the sensing zone of the FF-LS30.
- When using FF-LS Series for point-of-operation guarding, DO NOT allow an operator to stand or reach undetected between the safety light curtain and dangerous machine operation.
- If the FF-LS location allows possible access to dangerous machine operation, install additional protective safety equipment.
- Ensure the location of the manual restart function is outside of the danger zone and provides the operator with a clear view of the zone.
- Ensure each safety light curtain activation immediately stops machine operation within the response time of the components.
- Ensure FF-LS status indicators (customer supplied) operate properly and are visible from the dangerous area.

Failure to comply with these instructions could result in death or serious injury.

WARNING

IMPROPER ELECTRICAL INSTALLATION

- Each safety light curtain activation must stop dangerous machine operation within the response time of the components.
- Clearing the sensing zone must not start dangerous machine operation. When restarting machine operation, a normal machine control start sequence must be used.
- If electrical power is removed from a machine, its restoration must not initiate dangerous machine operation; a normal machine control start sequence must be used.
- If the safety light curtain is activated, the machine must NOT be able to restart.
- The external safety relays located between the safety outputs of the FF-LS and the machine control circuitry must be monitored.
- If a component failure occurs, the machine control circuitry must still be able to stop dangerous machine operation and must prevent the next machine cycle activation.
- A Programmable Logic Controller (PLC) must NOT be able to override a manual restart function.
- If the control unit operates in an automatic restart mode, another part of the safety control circuitry must keep the latched function engaged.
- To keep the latched function engaged and maintain control reliability, use safety components only. Do not use a PLC.
- Strictly adhere to all electrical connection instructions and local wiring standards.

Failure to comply with these instructions could result in death or serious injury.

5.1 Inspection

5.1.1 Scheduled Machine Inspection

A knowledgeable person (understands this manual and local safety requirements) must inspect the machinery on a regular basis (at least every 6 months) to ensure the installation of the machine control circuitry and protective safety equipment has NOT been modified.

5.1.2 Scheduled Safety Light Curtain Inspection

The following inspection must be carried out at power up, after any maintenance and daily by a knowledgeable person designated by the machine user (for some machines, it may be necessary to keep a copy of the results near the machine).

1. Insert the test rod into the sensing field. In normal condition, a green output status indicator (customer supplied) goes to the OFF state while a red output status indicator (customer supplied) goes to the ON state. Both green and red output status indicators should remain respectively OFF and ON while the test rod is slowly moved up and down in the sensing field. Inserting the test rod into the sensing field plane must be done at three different locations: near each sensing unit and in the middle of the sensing field,
2. Inserting the test rod into the sensing field during the machine operation must immediately stop the dangerous movement.

Figure 5-1 Safety Equipment Test Rod Detection

∅ 14 mm or ∅ 30 mm test rod

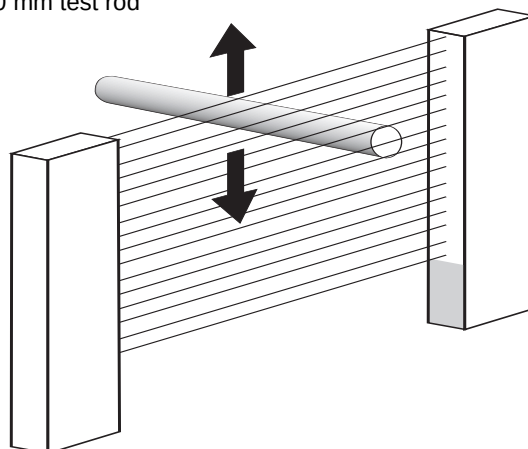


Table 5-1 Summary of Inspection and Test Methods

Inspect and Test	Method	Frequency
Object detection and machine reaction	Insert a 30 mm or 14 mm diameter test rod into the light curtain sensing field and ensure the machine stops.	Daily, at each power up, and after each intervention (or maintenance) performed on the protective safety equipment
Operation of the machine control circuitry	Test function generated by the machine (closing an external normally open contact located in the "test loop" of the FF-LS control unit)	Each time the machine is used or as part of each cycle
Output relay	Count the machines cycles and evaluate the number of operations.	1,000,000 operations (1.5 A/220 Vac, 1.5 A / 24 Vdc) or every 3 years if protective RC elements are mounted
Enclosure	Visually inspect enclosure to ensure the control unit is closed and locked. The key should be kept by an appointed person.	Based on environment and needs
Electrical wiring	Visually inspect the safety light curtain and the electrical wiring to ensure that they are in serviceable condition.	Based on environment and needs
Cleaning	- Use a clean, soft, dry cloth for dust removal. - Use a clean, soft cloth with soapy water for grease removal. - Wipe without rubbing (rubbing causes streaks and static electricity that attracts dust). - Products used to clean windows may be used. - Never use solvents like petrol, white spirit, trichloroethane, trichloroethylene, or acetone.	Based on environment and needs

5.2 Control Unit Status Indicators

⚠ WARNING

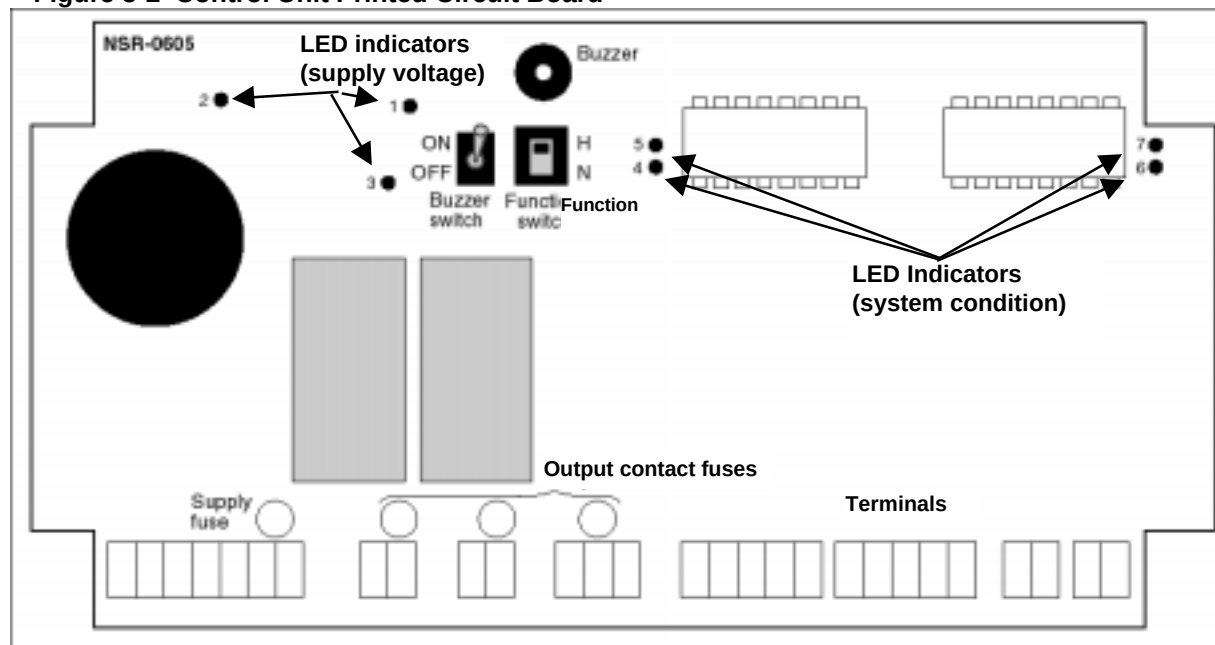
POWER APPLIED TO MACHINE CONTROL SYSTEM

Before intervention, turn off and disconnect power from FF-LS Series safety light curtain and machine.

Failure to comply with these instructions could result in death or serious injury.

The control unit has seven status indicator LEDs (see below). The green status LEDs 1, 2 and 3 are always illuminated if the supply voltage is present. The yellow status LEDs 4 and 6, the red status LEDs 5 and 7 and a buzzer (acoustic signal) are used to determine the operational status of the safety equipment. This buzzer (acoustic signal) can be switched on or off using the buzzer switch located on the control unit printed circuit board (see figure 5-2).

Figure 5-2 Control Unit Printed Circuit Board



Use the tables below to determine the operating status of the protective safety equipment. To use the acoustic signal to determine the protective safety equipment status, the buzzer switch must be set to the ON position (see figure above).

Table 5-2 FF-LS Status in Automatic Restart Mode (with power ON)

Beam Condition	LED And Buzzer Status	FF-LS Status and Remedy
CLEAR	- Red LEDs 5 and 7 flicker. - Yellow LEDs 4 and 6 are always illuminated. - Acoustic signal NOT present. (1)	- The FF-LS is operating correctly. - Safety output contacts X1 and X2 are closed.
INTERRUPTED	- Red LEDs 5 and 7 flicker. - Yellow LEDs 4 and 6 are NOT illuminated. - Acoustic signal present (short interval). (1)	- The FF-LS is operating correctly, but needs a clear beam status. - Safety output contacts X1 and X2 are open.

(1) Buzzer switch ON.

Table 5-3 FF-LS Status in Start and Restart Interlock (Manual) Mode

Beam Condition	LED And Buzzer Status	FF-LS Status and Remedy
AT POWER UP		
CLEAR	- Red LEDs 5 and 7 are always illuminated. - Yellow LEDs 4 and 6 are NOT illuminated. - Acoustic signal is always present. (1)	- The FF-LS is operating correctly but needs to be restarted. - Safety output contacts X1 and X2 are open.
INTERRUPTED	- Red LEDs 5 and 7 are always illuminated. - Yellow LEDs 4 and 6 are NOT illuminated. - Acoustic signal is always present. (1)	- An object within the sensing field forbids the effective restart of the FF-LS. - Safety output contacts X1 and X2 are open.
DURING NORMAL OPERATION		
CLEAR	- Red LEDs 5 and 7 are illuminated. - Yellow LEDs 4 and 6 are always illuminated. - Acoustic signal NOT present. (1)	- The FF-LS is operating correctly. - Safety output contacts X1 and X2 are closed.
INTERRUPTED THEN RELEASED	- Red LEDs 5 and 7 are always illuminated. - Yellow LEDs 4 and 6 are NOT illuminated. - Acoustic signal always present. (1)	- The FF-LS is operating correctly but needs to be restarted. - Safety output contacts X1 and X2 are open.

(1) Buzzer switch ON.

5.3 Troubleshooting

⚠ WARNING

POWER APPLIED TO MACHINE CONTROL SYSTEM

Before intervention, turn off and disconnect power from FF-LS Series safety light curtain and machine.

Failure to comply with these instructions could result in death or serious injury.

If a protective safety equipment (FF-LS safety light curtains or machine safety control equipment monitored by the FF-LS) failure occurs during self-check or test input, the protective safety equipment is locked in an OFF condition. This OFF condition cannot be defeated by turning the power supply voltage OFF and ON.

Table 5-4 Troubleshooting Chart

Failure	Possible cause	Inspect and repair
- Sensing field is clear, but the protective safety equipment will not release after actuation of an external reset push button switch. - Green LED indicator is illuminated.	Open circuit between output relays and machine control circuitry.	Inspect terminal wiring and, if necessary, repair wiring.
	Blown fuse at output relay terminals.	Replace fuse.
- Sensing field is clear, but the protective safety equipment will not release after actuation of an external reset push button switch. - Red LED indicator is illuminated.	Open circuit between both or one of the sensing units and the control unit.	Ensure correct terminal polarity and proper cable connection between the sensing and control units.
	Translucent surface of sensing units are contaminated.	Clean surface.
	Sensing unit is defective.	Replace sensing unit (matched pair).
	Faulty reset pushbutton or open circuit.	Replace reset pushbutton or repair wiring.
- Sensing field is clear, but the protective safety equipment will not release after actuation of an external reset push button switch. - No LED indicator is illuminated.	No supply voltage to the control unit.	Inspect terminal wiring and, if necessary, repair wiring.
	Blown fuse at supply voltage terminal.	Replace fuse. See fuse replacement. (5.4.1)
- During normal operation the red LED 5, located near microprocessor on circuit board in control unit (see figure 5-2), pulses (illuminates) every 3 seconds. - If there is no release when the sensing field is clear, the red LED 5 may:		
Illuminate continuously	Faulty synchronization	Replace control unit.
Flicker one time	Faulty self test	Replace control unit.
Flicker two times	Faulty communication	- Replace matched sensor units. - Visually inspect cable pair and replace if required.
Flicker three times	Faulty communication sensor A	Visually inspect sensor cable A and replace if required.
Flicker four times	Faulty communication sensor B	Visually inspect sensor cable B and replace if required.
Flicker five times	Faulty installation parameters	Visually inspect compatibility of sensor and control unit components. Ensure the beam number labels on all of the components are the same.

5.4 Repair

WARNING

POWER APPLIED TO MACHINE CONTROL SYSTEM

Before intervention, turn off and disconnect power from FF-LS Series safety light curtain and machine.

Failure to comply with these instructions could result in death or serious injury.

5.4.1 Sensing Unit Replacement

NOTICE

The two sensing units A/B are matched to each other by individual coding. Therefore, only connect a matched pair of sensing units A/B (each has the same serial number) to a control unit. Failure to comply with these instructions will result in improper product performance.

Replace the sensing units A/B as follows:

1. Disconnect the cable from the sensing units A/B connectors.
2. Loosen the mounting bracket screws and remove the sensing units A/B from the brackets.
3. Install the new sensing units A/B into the mounting brackets and tighten the screws.
4. Connect the cable to the new sensing units A/B connectors.

5.4.2 Fuse Replacement

The control unit has a power supply fuse (time delay 1.6 / 250 V) and three output contact fuses (time delay 4 A / 250 V). Replace these fuses as follows:

1. Remove the protective plastic covers located on each side of the control unit face plate lid using a small screwdriver (small recess in covers).
2. Loosen four captive screws securing the face plate lid on the control unit housing and remove the lid.
3. Locate the appropriate fuse near the terminal strips on the control unit printed circuit board (see figure 5-2).
4. Replace fuse with proper rating (power supply uses time delay; 1.6 / 250 V; output contact fuses use time delay 4 A / 250 V).
5. Reinstall lid, tighten screws and snap the protective plastic covers back in place.

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6. Order Guides

6.1 Complete Product Set Order Guides*

*All complete FF-LS safety light curtain sets include straight and right angle brackets. The brackets allow for the installation of one bracket (positioned) every 500 millimeters (~20 in).

Table 6-1 FF-LS14 Series Order Guide

Catalog Listing	Description	Protection Heights mm (in)
FF-LS16141962	14 mm resolution, 16 beam, sensing units, control unit, RS485 cables, brackets and test rod	196 (7.72)
FF-LS32143782	14 mm resolution, 32 beam, sensing units, control unit, RS485 cables, brackets and test rod	378 (14.89)
FF-LS48145612	14 mm resolution, 48 beam, sensing units, control unit, RS485 cables, brackets and test rod	561 (22.10)
FF-LS64147442	14 mm resolution, 64 beam, sensing units, control unit, RS485 cables, brackets and test rod	744 (29.31)

Table 6-2 FF-LS30 Series Order Guide

Catalog Listing	Description	Protection Heights mm (in)
FF-LS082802362	30 mm resolution, 8 beam, sensing units, control unit, RS485 cables, brackets and test rod	236 (9.29)
FF-LS162804602	30 mm resolution, 16 beam, sensing units, control unit, RS485 cables, brackets and test rod	460 (18.12)
FF-LS242806842	30 mm resolution, 24 beam, sensing units, control unit, RS485 cables, brackets and test rod	684 (26.94)
FF-LS322809082	30 mm resolution, 32 beam, sensing units, control unit, RS485 cables, brackets and test rod	908 (35.77)
FF-LS402811322	30 mm resolution, 40 beam, sensing units, control unit, RS485 cables, brackets and test rod	1132 (44.60)
FF-LS482813562	30 mm resolution, 48 beam, sensing units, control unit, RS485 cables, brackets and test rod	1356 (53.42)
FF-LS562815802	30 mm resolution, 56 beam, sensing units, control unit, RS485 cables, brackets and test rod	1580 (62.25)
FF-LS642818042	30 mm resolution, 64 beam, sensing units, control unit, RS485 cables, brackets and test rod	1804 (71.07)

6.2 Replacement Part and Accessories Order Guides

Table 6-3 Sensing Units Order Guide (matched pair)

Catalog Listing	Description	Protection Heights mm (in)
FF-LS16141962A/B	Sensing units (only), 14 mm resolution, 16 beam	196 (7.72)
FF-LS32143782A/B	Sensing units (only), 14 mm resolution, 32 beam	378 (14.89)
FF-LS48145612A/B	Sensing units (only), 14 mm resolution, 48 beam	561 (22.10)
FF-LS64147442A/B	Sensing units (only), 14 mm resolution, 64 beam	744 (29.31)
FF-LS082802362A/B	Sensing units (only), 30 mm resolution, 8 beam	236 (9.29)
FF-LS162804602A/B	Sensing units (only), 30 mm resolution, 16 beam	460 (18.12)
FF-LS242806842A/B	Sensing units (only), 30 mm resolution, 24 beam	684 (26.94)
FF-LS322809082A/B	Sensing units (only), 30 mm resolution, 32 beam	908 (35.77)
FF-LS402811322A/B	Sensing units (only), 30 mm resolution, 40 beam	1132 (44.60)
FF-LS482813562A/B	Sensing units (only), 30 mm resolution, 48 beam	1356 (53.42)
FF-LS562815802A/B	Sensing units (only), 30 mm resolution, 56 beam	1580 (62.25)
FF-LS642818042A/B	Sensing units (only), 30 mm resolution, 64 beam	1804 (71.07)

Table 6-4 Control Units Order Guide

Catalog Listing	Description
FF-LS08C	Control unit for 8 beam sensing unit FF-LS082802362 only
FF-LS16C	Control unit for 16 beam sensing unit FF-LS162804602 or FF-LS16141962 only
FF-LS24C	Control unit for 24 beam sensing unit FF-LS242806842 only
FF-LS32C	Control unit for 32 beam sensing unit FF-LS322809082 or FF-LS32143782 only
FF-LS40C	Control unit for 40 beam sensing unit FF-LS402811322 only
FF-LS48C	Control unit for 48 beam sensing unit FF-LS482813562 or FF-LS48145612 only
FF-LS56C	Control unit for 56 beam sensing unit FF-LS562815802 only
FF-LS64C	Control unit for 64 beam sensing unit FF-LS642818042 or FF-LS64147442 only

Table 6-5 Mounting Brackets Order Guide

Catalog Listing	Description
FF-LSZMS660	Mounting bracket kit, 2 straight brackets, used for 30 mm resolution
FF-LSZMS690	Mounting bracket kit, 2 right-angle brackets, used for 30 mm resolution
FF-LSZMS720	Mounting bracket kit, 2 straight brackets, used for 14 mm resolution
FF-LSZMS730	Mounting bracket kit, 2 right-angle brackets, used for 14 mm resolution

Table 6-6 Cables and Accessories Order Guide

Catalog Listing	Description
FF-LSZKA0611	RS-485 cable, 10 m length (32.8 ft)
FF-LSZMS650	Kit, eight PG7 cable glands and 4 caps, used with control unit

Table 6-7 Power Supplies Order Guide

Catalog Listing	Description
FF-LSZUS0605	Power supply, 230 Vac / 24 Vdc supply with galvanic insulation (300 mA)
FF-LSZUS0606	Power supply, 115 Vac / 24 Vdc supply with galvanic insulation (300 mA)

Table 6-8 Table Fuses Order Guide

Catalog Listing	Description
FF-LSZS16T	Fuse kit, 10 power supply fuses, 1.6 A, 250 Vac, time delay fuses
FF-LSZS40T	Fuse kit, 10 output contact fuses, 4 A, 250 Vac, time delay fuses

Table 6-9 Test Rods Order Guide

Catalog Listing	Description
FF-LSZPZS01	Test rod, 30 mm diameter
FF-LSZPLS02	Test rod, 14 mm diameter

7. Customer Service Information

7.1 Warranty and Remedy

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during that period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is the Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

7.2 Sales and Service

Honeywell's Sensing and Control Division serves its customers through a worldwide network of sales offices and distributors. For application assistance, current specifications, pricing or the name of the nearest distributor, contact a nearby sales office or call :

TELEPHONE

1-800-737-3360	Canada
+ 33 (0) 1 60 19 80 41	France
+ 49 (0) 69 8064 444	Germany
34 91 313 61 00	Spain
1-815-235-6847	International
+ 44 (0) 161 251 4079	UK
1-800-537-6945	USA

FAX

1-815-235-6847 USA
+ 61 (0) 2 9353 7406 Australia
1-800-565-4130 Canada
+ 33 (0) 1 60 19 81 73 Francia
+ 49 (0) 69 8064 442 Germany
34 91 313 61 29 Spain
+44 (0) 161 251 4141 UK

INTERNET

<http://www.honeywell.com/sensing/>
info@micro.honeywell.com

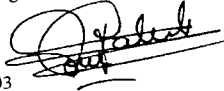
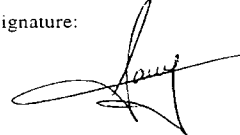
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9. Declaration of Conformity

HONEYWELL EUROPEAN PHOTOELECTRIC CENTER QUALITY ASSURANCE DEPARTMENT	
CE declaration of conformity	
■ We:	Honeywell-Cométa ZIRST BP 81 21, chemin du Vieux Chêne 38240 Meylan Cedex - France
■ Declare:	under our sole responsibility that the Electrosensitive Protective Equipment catalogued: <i>Safety Light Curtain, FF-LS Series</i> to which this declaration relates is in conformity with the technical requirements of the standards and the provisions of the essential requirements of the directives detailed below.
■ Directives:	• Machine Directive 89/392 EEC and its amendments 91/368 EEC, 94/44 EEC and 93/68 EEC, to which the EC-type examination certificate ⁽¹⁾ delivered by the <i>TÜV Hannover/Sachsen-Anhalt</i> relates. • Low Voltage Directive 73/23 EEC • Electromagnetic Compatibility Directive 89/336 EEC
■ Standards:	• pr EN 50 100 - part 1⁽²⁾ : Safety of machinery - Electrosensitive protective equipment - General requirements for tests. • pr EN 50 100 - part 2⁽²⁾ : Safety of machinery - Electrosensitive protective equipment - Particular requirements for systems using active optoelectronic protective devices
■ Safety level:	Type 4 per pr EN 954
■ Legal Representative in Europe	Place of issue: Meylan Quality Manager: Patrick Goud Signature:  Date of issue : 25/10/96 General Manager: Jean-Pierre Sany Signature: 
Issue nb:	03

(1): available upon request

(2): The IEC is adopting the European project norm. Finally, it will be codified EN 61 496 - parts 1 & 2

Installation manual
Einbauanleitung
Manuel d'installation
Manuale di installazione
Manual de instalación

FF-SE



⚠ WARNING

IMPROPER INSTALLATION

- Consult with US and/or European safety agencies and their requirements when designing a machine control link, interface and all control elements that affect safety.
- Strictly adhere to all installation instructions.

Failure to comply with these instructions could result in death or serious injury.

English

FF-SE Series

Installation manual



This instruction manual must be kept with the product at all phases of the product life. Especially, it must be forwarded to the end user who will keep it as long as he uses it. This manual must be read completely before installation, commissioning or maintenance operation.

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1. Important information

Thank you for purchasing this Honeywell safety product. The FF-SE laser scanner is an electrosensitive protective equipment (ESPE) designed to detect an intruder inside a dangerous zone. This permanent self-checking device meets the highest standards of control reliability.

General

- The FF-SE has been tested by the BIA (Berufsgenossenschaftliches Institut für Arbeitssicherheit, or "Trade Association Institute for Workplace Safety") according to the Machinery Directive 98/37/EEC.
- The FF-SE satisfies requirement for a category 3 product as according to the EN 954-1.

The correct operation of the FF-SE depends on the correct definition of the alarm and safety zones.

The installation of the FF-SE, the definition and programming of the protection areas as well as the integration into the machine control must be carried out by an authorised person, who knows and applies the safety regulations.

After finishing the programming and downloading the data to the FF-SE, the protection areas must be checked while the machine is switched off.

- Honeywell observes the QA System ISO 9001 (certified by AFAQ) during design, development and production.

- **Recycling :**

The product must be recycled according to the regulations in force in your country. Honeywell is ready to do this. A fee will be charged according to our general conditions

1.1 Overview

This manual contains description, operation, installation, electrical connections, maintenance and troubleshooting information related to the FF-SE Series safety laser scanner.

1.2 Organisation of Installation Manual

This installation manual has the following sections:

- **Important Information**
- **Statutory Provisions**
- **Description and Operation**
- **Installation and Mounting**
- **Electrical Connections**
- **Maintenance and Trouble Shooting**
- **Order Guide**
- **Warranty Information**
- **Appendix**

1.3 Important Highlighted Information

Important danger, warning, caution and notices are highlighted throughout the manual as follows:

DANGER

A DANGER symbol indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

A WARNING symbol indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

A CAUTION symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

NOTICE

A NOTICE symbol indicates important information that must be remembered and aids in job performance.

1.4 Control Reliability

“Control Reliability” means that, “the device, system or interface shall be designed, constructed and installed such that a single component failure within the device, interface or system shall not prevent normal stopping action from taking place but shall prevent a successive machine cycle.” (ANSI B11.19-1990, 5.5)

OSHA 29 CFR 1910.217 states that, “the control system shall be constructed so that a failure within the system does not prevent the normal stopping action from being applied to the press when required, but does prevent initiation of a successive stroke until the failure is corrected. The failure shall be detectable by a simple test, or indicated by the control system.”

Honeywell has developed a self-checking technique that combines reliability with safety. The FF-SE Series safety laser scanner functions with dual channel redundancy and positive self-check monitoring. This means that a faulty component in our product will make the safety laser scanner fail in a safe mode.

This design meets the highest safety requirements described in the IEC/EN 61496-1 and pr EN 61496-3 norms for laser scanners. The FF-SE is designed and manufactured in such a way that a single breakdown does not lead to the loss of the safety function when a dangerous situation arises. **The safety function is maintained on a permanent basis.**

1.5 Approvals

Approvals	Description
CE Compliance with the EN 61496 - part 1 Standard for Electrosensitive Protective Equipment Compliance with EN 954-1, Category 3	Only the packaging and the documentation of FF-SE Series products carry the CE mark .
CSA NRTL/C (pending)	Canadian Standards Association - Nationally Recognised Testing Laboratory (NRTL)

1.6 Safety Laser Scanner Installation and Use

Installation and use of this product must be performed by a qualified person thoroughly familiar with all instructions contained within this manual and all applicable safety regulations including those described below.

1.7 European Directives Compliance

Directives	Number
Machine Directive	98/37 EC
Low Voltage Directive	73/23 EC
Electromagnetic Compatibility Directive	89/336 EC

The EC type examination certificate granted by the German BIA (Berufsgenossenschaftliches Institut für Arbeitssicherheit) guarantees the conformity of the product with respect to the essential requirements of the Machinery Directive 98/37 EC. To complete the EC type examination, further tests have been carried out by external laboratories to guarantee the conformity of the product with respect to the Low Voltage 73/23 EC and the Electromagnetic Compatibility 89/336 EC.

A CE declaration of conformity will be found at the back of this manual.

1.8 European Standards Compliance

- The FF-SE Series safety laser scanner complies with the following European standards :

Regulation	Title
EN 292	Safety of Machinery - Basic concepts, general principles for design
EN 60204 - 1	Safety of Machinery - Electrical equipment of machines
EN 954 - 1	Safety of Machinery - Safety related parts of control systems
IEC / EN 61496 - 1	Safety of Machinery - Electrosensitive protective equipment - part 1 : General requirements and tests

- Installation and use of the FF-SE laser scanner must comply with the following European standards (non exhaustive list)

Regulation	Title
EN 292	Safety of Machinery - Basic concepts, general principles for design
EN 60204 - 1	Safety of Machinery - Electrical equipment of machines
EN 954 - 1	Safety of Machinery - Safety related parts of control systems
IEC/EN 61496-1	Safety of Machinery - Electrosensitive protective equipment - part 1 : General requirements and tests
pr EN 999	Safety of Machinery - The positioning of protective equipment in respect of approach speeds of parts of the human body
EN 294	Safety of Machinery - Safety distances to prevent danger zones from being reached by the upper limbs
pr EN 811	Safety of Machinery - Safety distances to prevent danger zones from being reached by the lower limbs
pr EN 692	« Machine-tool - Safety - Mechanical Presses »
pr EN 693	« Machine-tool - Safety - Hydraulic Presses »
pr EN 12622	« Hydraulic press brakes - Safety »
pr EN 201	« Injection plastic moulding machines »
pr EN 289	« Compression moulding and transfer machines »
pr EN 11553	« Laser for material processing »
EN 775	« Manipulating Industrial Robots »
EN 415-1	« Safety of packaging machines - Part 1 : Common requirements »
EN 415-2	« Safety of packaging machines - Part 2 : Performed rigid container packaging machinery »
EN 415-3	« Safety of packaging machines - Part 3 : Form, fill and seal machines »
EN 415-4	« Safety of packaging machines - Part 4 : palletisers and depalletisers »

1.9 United States Regulations Compliance

US Regulation	Title
OSHA 29 CFR 1910.212	General Requirements for (guarding of) All Machines
OSHA 29 CFR 1910.217	(Guarding of) Mechanical Power Presses

1.10 United States Standards Compliance

- Installation and use of the FF-SE laser scanner must comply with the following American standards (non exhaustive list)

Standards	Title
ANSI B11.1	Mechanical Power Presses
ANSI B11.2	Hydraulic Power Presses
ANSI B11.19	Safeguarding when Referenced by the Other B11 Machine Tool Safety Standards
ANSI/RIA R15.06	Safety Requirements for Industrial Robots and Robot Systems

1.11 Additional protection

Hard guards should be installed permanently with the aid of a tool or welded (if possible). If hard guards need to be automatically positioned, their positioning must be checked. It must not be possible for personnel to neutralise the detectors associated with these hard guards. Hard guards shall comply with the following European Standards:

Standards	Title
pr EN 953	Safety of Machinery - General requirements for the design and construction of guards
EN 294	Safety of Machinery - Safety distances to prevent danger zones from being reached by the upper limbs
pr EN 811	Safety of Machinery - Safety distances to prevent danger zones from being reached by the lower limbs
EN 1088	Safety of Machinery - Interlocking devices with and without guard locking
EN 954 - 1	Safety of Machinery - Safety related parts of control system

Honeywell FF-SR Series safety control modules may be used as an interface between protective safety equipment and machine control circuitry. The following safety control modules are particularly recommended :

- FF-SRS : safety control module designed for emergency stop
- FF-SRD Series : safety control module designed for door monitoring
- FF-SR2 : safety relay control module designed for two-hand controls
- FF-SR0 Series : safety control module designed for standstill detection on inductive motors
- FF-SRT Series : time delay module
- FF-SRE Series : expansion relay module

They offer redundancy, monitoring, and control reliability features that ensure the highest level of industrial safety.

Honeywell safety switches and sensors that may be used to check the position of guards include:

- 50FY and 40FY Hall effect sensors
- GSS safety limit switches
- GK and GKM key operated safety switches
- GKR/L solenoid key operated safety interlock switches
- 24/924CE miniature safety limit switch

Honeywell safety optoelectronic products that may be used with the FF-SE safety laser scanner include:

- FF-SM safety mat
- FF-SYA safety light curtains
- FF-SB safety light curtains
- FF-SPS4 single beam safety device
- FF-SCAN modular safety light curtain
- FF-LS Miniature safety light curtain

In some applications, it may be necessary to provide additional protection to augment the protection provided by the safety laser scanner. Hard guards may be used to ensure that any part of the person is forced to move through the sensing area to enter the danger zone.

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2. Introduction

2.1 Overview

This part explains the terms used throughout this manual.

2.2 Important notes on safety

Read and understand this installation manual and the associated software manual (PK107029-EN) before installing the

FF-SE. Become familiar with the **sensor** and its programming software before installation, by using the simulation mode. See section 8.2 Sales and Service for additional information.

2.3 Glossary

Definition of technical terms used in this document:

2.3.1 Setting the zones :

- The FF-SE monitors pre-defined areas, called **protection zones**.
- A **protection zone** of the FF-SE is made up of 600 beams. Each beam sends infrared light and receives a signal back that corresponds to a distance from the closest object detected in this direction. If this equivalent value falls below a certain distance during the monitoring, it means that an object is present in this protection area. The corresponding relay is then opened.
The **protection zone limit** is customer selected and corresponds to the switching point of the relays for all 600 beams.

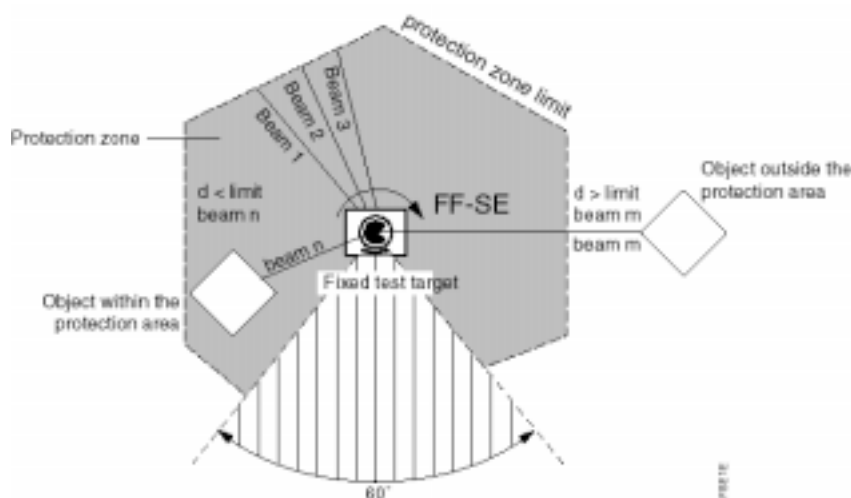


Figure 2-1 : Protection zone

- The dangerous zone is the zone where dangerous motion occurs. This is the zone to be protected with the laser scanner.

- The **viewing zone** describes a 300° arc around the **sensor**, with a maximum radius of 10 m (32.8 ft).
- The **detection zone** is the zone within which the FF-SE guarantees the detection of any object, even a dark one (with a poor reflectivity). This zone has a radius of 6 m (19.68 ft).

Inside these circular zones, the user defines the **protection zones** which can have an irregular shape, adapted to the environment. These zones are:

- the **alarm zone** (within the viewing zone).
- the **safety zone** (within the detection zone).

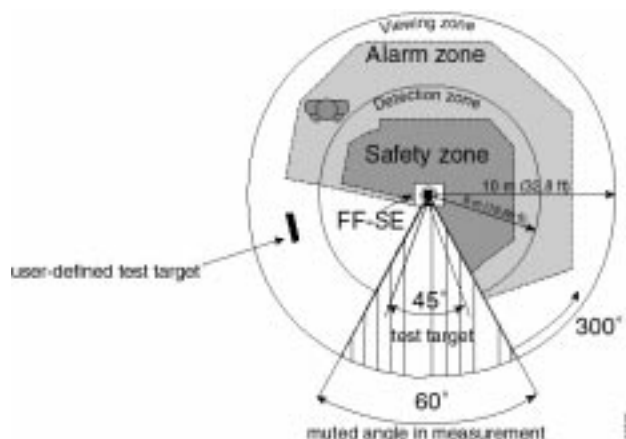


Figure 2-2 : Protection zones

2.3.2 Targets :

- The **fixed test target** is the part of the **sensor**, the beam is hitting on every turn to check the correct operation of the beam.
- The FF-SE can use one or more **user defined test targets** to ensure its correct positioning. A user defined test target is a part of the environment and acts as a reference for the positioning of the FF-SE towards the zones to be protected.
- If there is a change in distance or angle on the external test target, this will trigger an error and the outputs will open. There is a timing filter of 4 seconds before the laser scanner goes to error, which means that if an object crosses the test target beam for less than 4 seconds, no error will be triggered.

2.3.3 Outputs :

- As soon as an object enters the **alarm zone**, the FF-SE opens the **alarm output** : this can be used to turn a light or a buzzer on.
- As soon as an object enters the **safety zone**, the FF-SE opens the **safety relays** outputs which results in switching off the **machine**.
- If an **error** occurs in the FF-SE, the **safety and alarm** relays contacts will immediately open.

2.3.4 Others :

- **ESPE** is the abbreviation for "Electrosensitive Protective Equipment".
- **BIA** is the abbreviation for "Berufsgenossenschaftliches Institut für Arbeitssicherheit," or "Trade Association Institute for Workplace Safety."
- The **sensor** stands for the FF-SE and is generally drawn in the centre of all drawings.
- **Machine** is the term used for the system to be monitored. When it is operating, the machine creates a dangerous situation, which forbids the presence of persons or objects in the protection zones.
- Use the **installation program**, to define the protection areas and to check the conformity of the installation (see software installation manual ref. PK107029-EN).

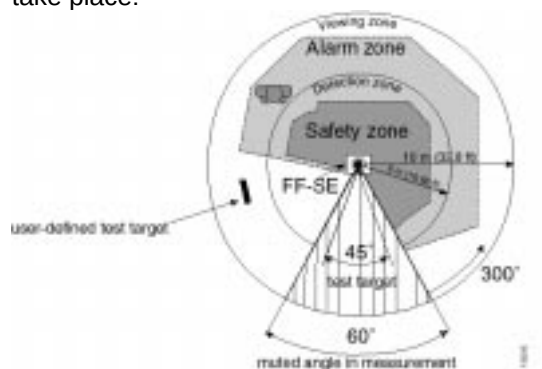
3. Description and Operation

3.1 Overview

This chapter contains terms and concepts related to safety and the application of the FF-SE. The importance of the installer's role in the set-up and installation of the machine guarding systems is discussed. This section also contains specification and order guide information.

3.2 General

The FF-SE is an ElectroSensitive Protective Equipment compliant with category 3 of EN 954-1. It monitors user defined dangerous zones. As soon as an object or a person penetrates the monitored area, the following events take place:



- When an object is present in the alarm zone, the FF-SE causes the switching of a signalling (alarm) contact. This contact can be connected to an acoustic or optical warning device. It indicates to clear the zone in order to prevent a shut-down.
- When an object is present in the safety zone, the FF-SE causes the switching of two safety contacts. These contacts trigger an immediate shut-down of the monitored machine.

The programming software allowing the definition of the protection areas is sold separately.

Figure 3-1 : Protection zones

3.3 Principle of operation

The type of laser beam used in this **sensor** is invisible and corresponds to IEC 825 class 1, representing no hazard to the eyes. The measuring range begins directly in front of the lens.

The **fixed test target** is to ensure that the beam status is correct, through reflectivity and position check. This also checks the lens contamination.

■ Measuring principle

The FF-SE emits a pulsed laser beam (Class 1 infrared laser) rotating in a 360° circle. This circle is obtained thanks to the reflection of this beam on a revolving mirror. This pulsed laser beam is diffusely reflected by the surrounding objects, and the returning signal is received by the photo diode. The distance of the object is determined by measuring the time the laser pulse takes to return to the FF-SE. This measuring principle is similar to that used in RADAR systems.

At each rotation, the FF-SE carries out 600 measurements on 300° (60° are required for the measurement of the **fixed test target**). The position of each beam is determined by an angle encoder.

The position of an object and measuring data can be determined by connecting a computer to the output interface.

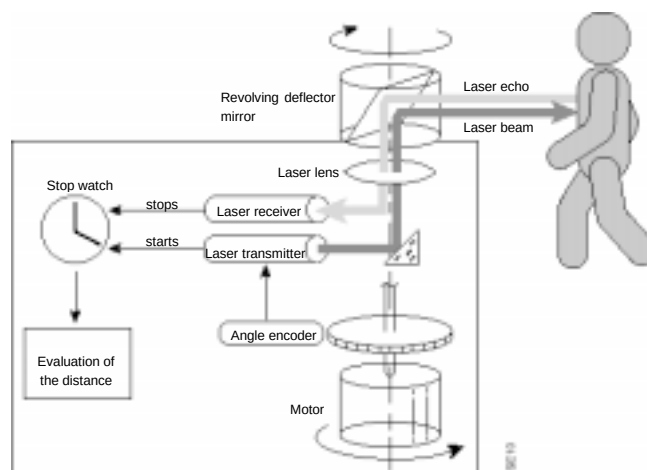


Figure 3-2 : Measuring principle

■ Monitoring the protection area

With the installation program, one can specify two limit values from the **sensor** head for each of the 600 beams, which define the distances of the alarm and safety zones. When monitoring, the **sensor** compares the measured distance of the object with the limit values specified. The tables of the limit values are determined by the computer and stored in the **sensor**. In case of power removal, the **sensor** will still keep these values and will be fully operational when power is restored. The alarm and safety zones can have any shape and can be perfectly adapted to any working environment.

The **sensor** will always be located within the protection areas as illustrated in Figure 3-3 :

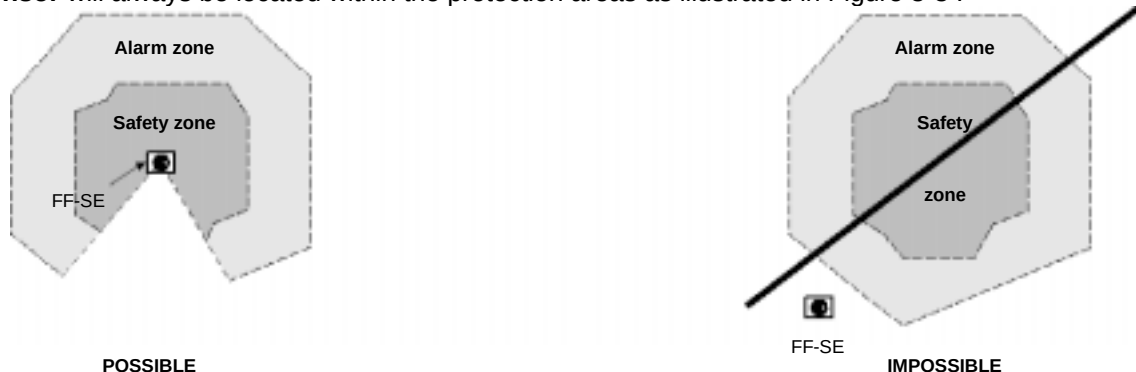


Figure 3-3 : Respective positions for sensor and protection zones

⚠ WARNING

IMPROPER ZONE GUARDING

Position the FF-SE to avoid any non detection zone in the safety zone or use additional safety sensors :

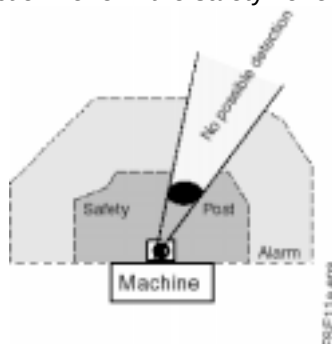


Figure 3-4 : Non detection zones

Failure to comply with these instructions could result in death or serious injury.

■ Self-checking

Test targets :

Internal self-tests are continually carried out in the FF-SE. Due to these self-tests, the safety of the system can be assured. All essential components are either redundant, or they are monitored by independent test logic circuits.

a. Fixed test target:

By measuring the light reflected from the **fixed test target**, the sensitivity of the sensor is monitored. Contamination of the optics or the test target can lead to the error message « Error on test target » (LED displays. See chapter 6.7). In such a case the **sensor** optics and test target must be cleaned in accordance with the instructions in « Maintenance procedures. See chapter 6.4».

b. User defined external test target:

To ensure correct positioning, after installation, it is important to use one or more test target placed near the **sensor**. A fixed reliable target must be chosen, since it is measured at every revolution. Any change in the measured value (angle, distance) greater than tolerance of this target (such as unexpected movement of the **sensor** in the zones) means a system error and will cause a shut-down of the machine.

NOTICE

IMPROPER USER-DEFINED TEST TARGET POSITIONING

Do not allow access between the **sensor** head and the **user defined fixed target**, since this will be detected as a **sensor** incorrect positioning and will stop the machine and lock the **sensor** in error.

3.4 Sensor construction

The **sensor** is mounted in a rugged aluminum housing. The housing is designed to resist to splashes of water according to IP 65 / NEMA 4,13 (only if the female connectors or the cap are on the male connectors).

The rotating head containing the angular deflection mirror of the laser beam is located on top of the FF-SE. Both the emitted and the received laser signals pass through the same lens.

NOTICE

WARRANTY VALIDITY

Do not attempt to open any part of the FF-SE. If any part is opened, the warranty becomes void.

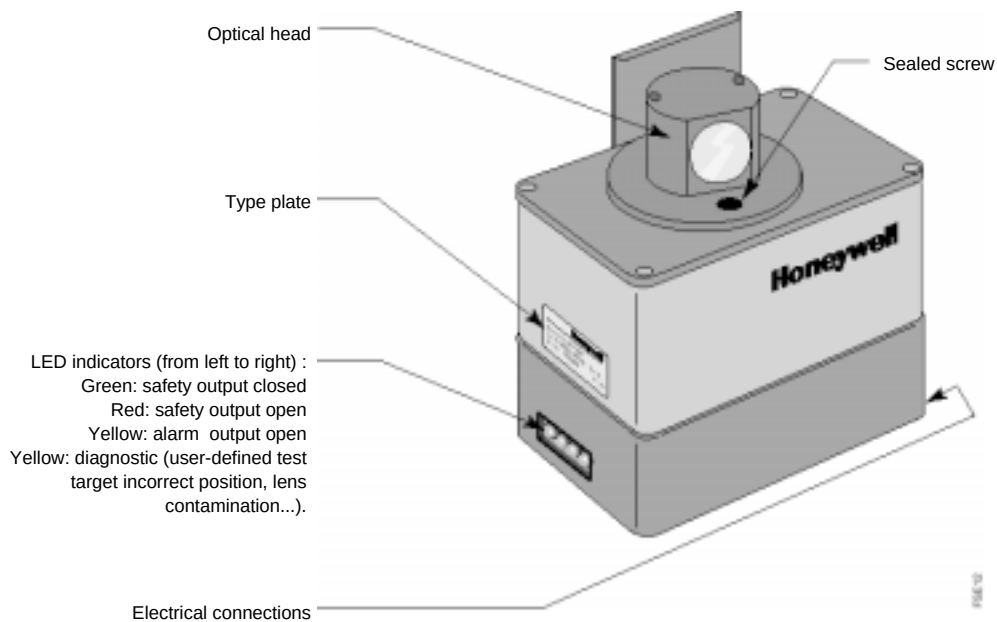


Figure 3-5 : Sensor construction - indicators side

Four LED indicators are displaying the status of the FF-SE.

Green Safety output	Red Safety output	Yellow Alarm output	Yellow Diagnostic	
				No power
				LED test during 1 sec after power-up*
				Machine operating - Alarm zone cleared - Safety zone cleared
				Machine operating - Alarm zone occupied - Safety zone cleared
				Machine stopped : Safety zone occupied Alarm zone cleared
				Machine stopped : Safety zone occupied Alarm zone occupied
				Error detected : see section 6.7 Troubleshooting

Figure 3-6 : LED indicators

	: LED off
	: LED on
	: Flickering

* Upon power-up, the system condition LED illuminates while initialisation tests are performed. During 5 seconds before the sensor is ready for operation, the LED flickers at 2 Hz.

FF-SE technical description

On the front side of the housing are two female connectors, one 14 pin called « interface » and one 8 pin « 24 Vdc/Signal ». The male connectors are included with the cables.

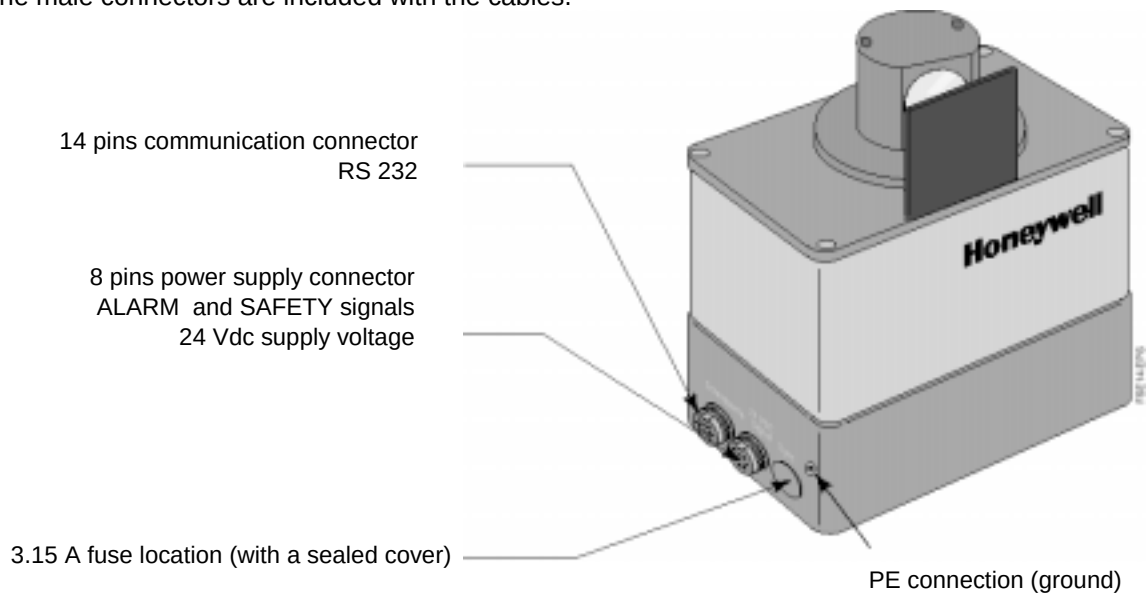


Figure 3-7 : Sensor construction – Connector side

Interface

Communication between the **sensor** and a computer is performed via a RS 232 (serial port of the PC) interface.

24 Vdc / Signal

This socket is used for the power supply and relay outputs (ALARM, SAFETY1 and SAFETY2).

3.5 Technical specifications

Safety class	Category 3 according to EN 954-1
Protective device	Tested according to EN 61496-1
Laser	IEC 825, infrared laser class 1 (eye-safe)
FF-SE characteristics	
Measuring and alarm zone	0 to 10 m (0 to 32.80 ft)
Detection and safety zone*	0 to 6 m (including safety margin) (0 to 19.68 ft)
Response time in detection zone	280 ms
Max. viewing angle	300°
Laser and angle measurements	
Infrared laser diode	
Wavelength	905 nm
Laser protection class	1 (IEC 825)
laser diode, pulse frequency	5.76 kHz, $\pm 5\%$
Head rotation frequency	8 Hz, $+ 5\%$
Scan angle	300°
Resolution	0.5°
Lens	
Coaxial emitter and receiver lens	
Laser beam divergence	15 mrad. (0.9°)
Focal distance	30 mm (1.18 in)
Lens diameter	30 mm (1.18 in)
Power supply voltage	
Power supply	24 Vdc $\pm 15\%$ (galvanic insulation with transformer according to IEC 742); for applications powered by battery, a DC/DC converter with an input voltage of 24 V $\pm 30\%$ must be used (see 5.4)
Current consumption	approx. 1 A at 24 Vdc
In rush at start-up	2A during 100 ms
Total Power consumption	24 W
Housing	
Material	Aluminium
Sealing	IP 65
Length	172 mm (6.62 in)
Width	112 mm (4.25 in)
Height	176 mm (6.93 in)
Weight	approx. 3 kg (6.61 lbs.)
Operating temperature	0 to 50°C (32 to 122°F)
Storage temperature	-20 to +70°C (-4 to 158°F)
Interface	
Interface type	RS 232
	9600 baud
	8 data bits, 1 stop bit
	no parity
Relay outputs for ALARM SAFETY	
	insulated relay output
	1 Normally Open output contact (max. 2 A / 48 V) DC
	2 Normally Open output contacts (max. 2 A / 48 V) DC
	resistive load, electrical life: 2 millions operations, specification for the output contacts of the safety relay
	: 10V / 10 mA
Cable plug connections	
"Serial interface" connection	14-pin BINDER plug
"24 Vdc/Signal" connection	8-pin BINDER plug

*Target to be detected: Dark cylinder, 70 mm diameter and 1.8% reflectivity.

3.5.1 Minimum distance to obstacles

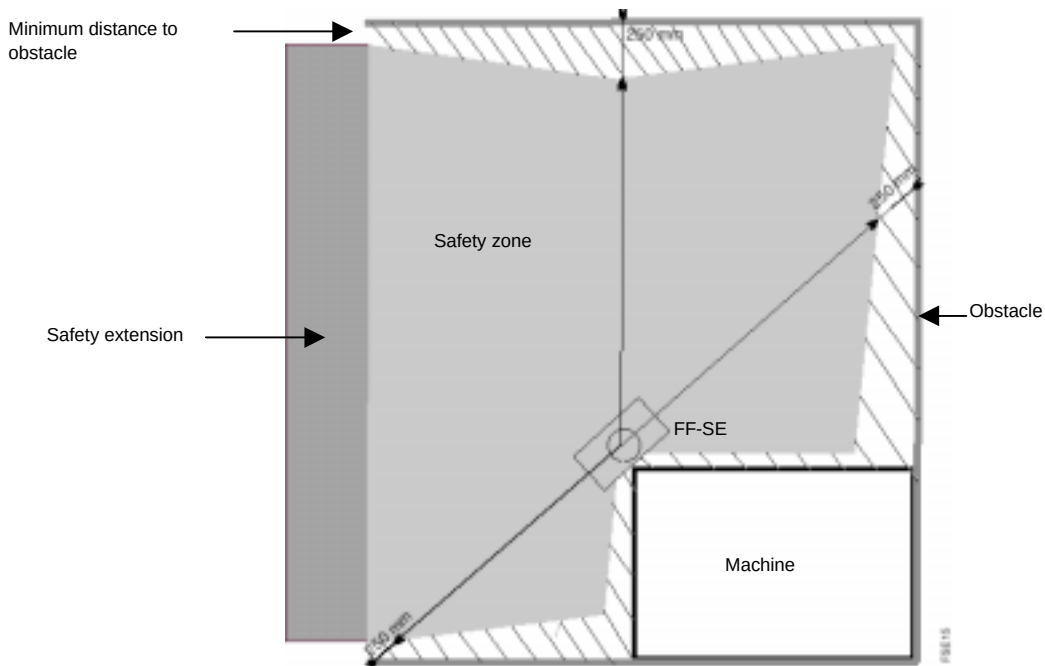


Figure 3-8 : Distance to obstacle (not to scale)

When the zones limit follow physical obstacle (for example along a wall), the distance between the obstacle and the zone limit, measured on the segment from the scanning head, must not be closer than 250 mm (9.85 in.). The 250 mm distance to obstacles is a maximum value taking into account the influence of all environment parameters. For a given sensor, at constant temperature, a distance to obstacle of 120 mm can reliably be used

⚠ WARNING

IMPROPER PROTECTION DUE TO MINIMUM DISTANCE TO OBJECT

If the minimum distance to the object allows undetected access to machine, use additional safety **sensors** or hard guarding to force personnel to go through the detection area.

Failure to comply with these instructions could result in death or serious injury.

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4. Installation and mounting

4.1 Overview

This chapter contains information about calculating the safety distance and properly mounting a **sensor**.

4.2 Material required for installing the FF-SE

■ Equipment :

- 4 screws M4 x 10 for mounting on a horizontal surface (hardware) included
- Washers for tightening (hardware) included
- A mounting bracket FF-SEZ6BRAC3 (not included)
- A floor mounting post FF-SEZ6POST (not included)
- Varistors for protection of the FF-SE relays (3 Relays) included

■ Tools :

- A bubble level for alignment
- Screw drivers (hardware)

4.3 Operating precautions

DANGER

IMPROPER INSTALLATION ON THE MACHINE

When mounting the FF-SE, the manufacturer's safety requirements for any work on the machine must be strictly adhered to. Only qualified personnel may undertake mounting the FF-SE.

Failure to comply with these instructions will result in death or serious injury.

Please observe the following indications:

- The FF-SE is only suited for installation in closed spaces.
- The FF-SE may detect rain, snow, dust and smoke as objects. They may activate the **sensor** and cause an alarm, safety or error condition.
- The FF-SE is protected against water splash per IP 65 and operates in a temperature range of 0 to 50° C (32 to 122°F).
- Do not expose the **sensor** to rain or temperatures outside these specifications.
- Do not subject the FF-SE to rapid changes in temperature which could lead to condensation on the lens. If the sensor was stored below 0°C, run it 15 minutes before doing any programming.
- The detection of a glass pane located within the protection areas cannot be ensured. Glass panes must be avoided in the detection zones or at their limits.
- The FF-SE can be mounted head up or down. This could allow additional head protection against shock or dust contamination.

4.4 Mounting

NOTICE

IMPROPER DISTANCE FROM GROUND

When installing the sensor, the emitted laser beam divergence of 0.9° must be taken into account. Consequently, a minimum distance of 150 mm must be kept between the optical axis and the floor. This distance is ensured by the **sensor's** own height on an even floor when the sensor is mounted head up and the beam is parallel to the ground. However, a height of 300 mm is recommended / per the European norm (see section 4.5).

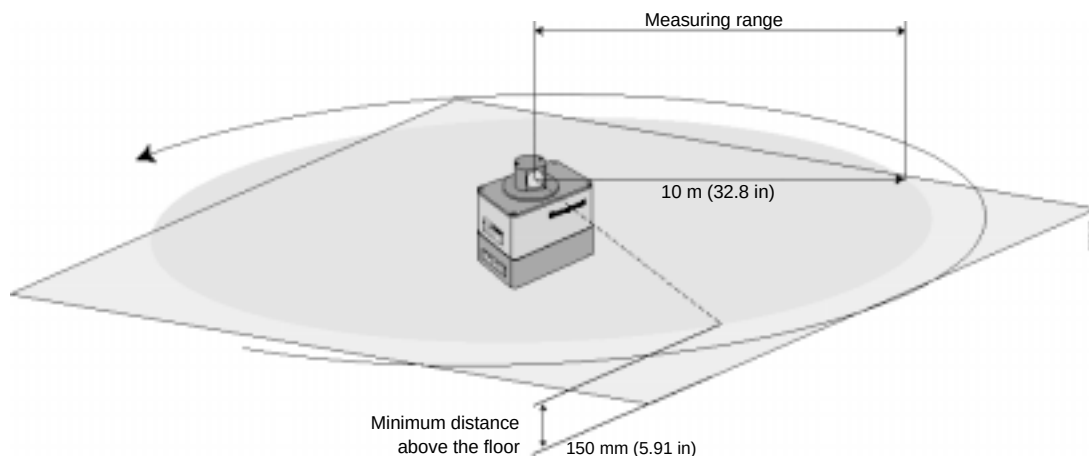


Figure 4-1 Minimum distance to floor

NOTICE

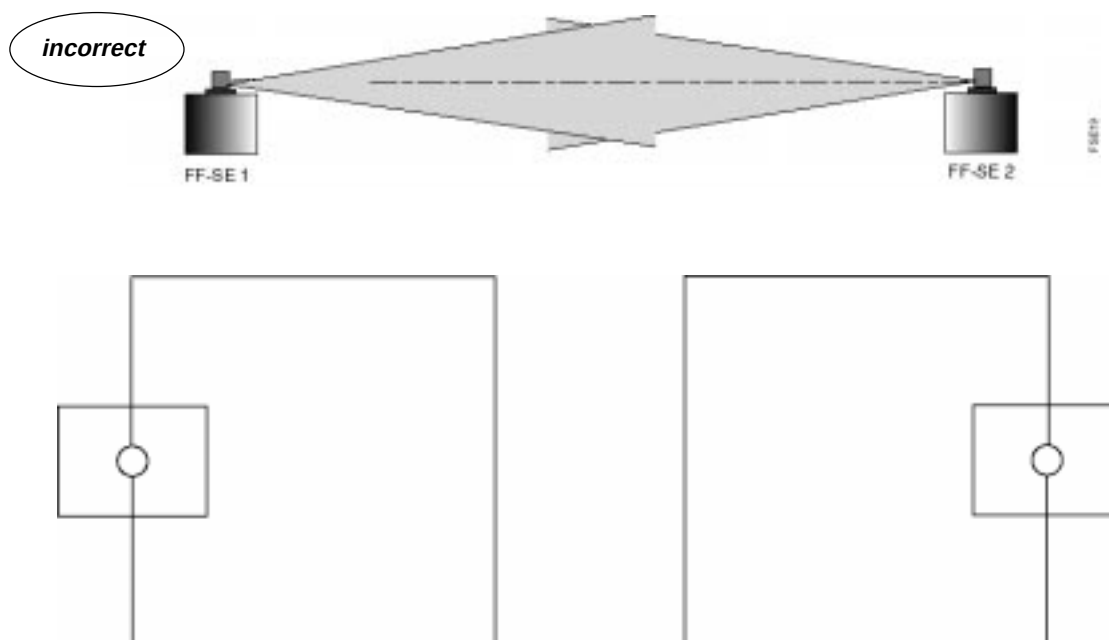
IMPROPER MULTIPLE SENSOR INSTALLATION

If several **sensors** are installed in close proximity, ensure their beams do not interfere (by direct or indirect reflection) with each other, i.e. the beam of one laser scanner can hit the optical head of another laser scanner in the direction where a zone has been programmed.

Possible solutions :

The **sensors** can, for example, have protection zones which do not “look” at each other (example 2) or be mounted at different heights (example 3) or with different angles of inclination with regard to the floor (example 4). It is also possible to place a solid barrier between two **sensors** to eliminate the risk of interference (example 5).

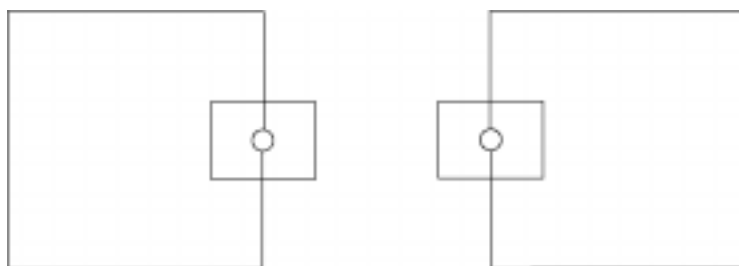
• Example 1



FSE19a_EPS

• Example 2

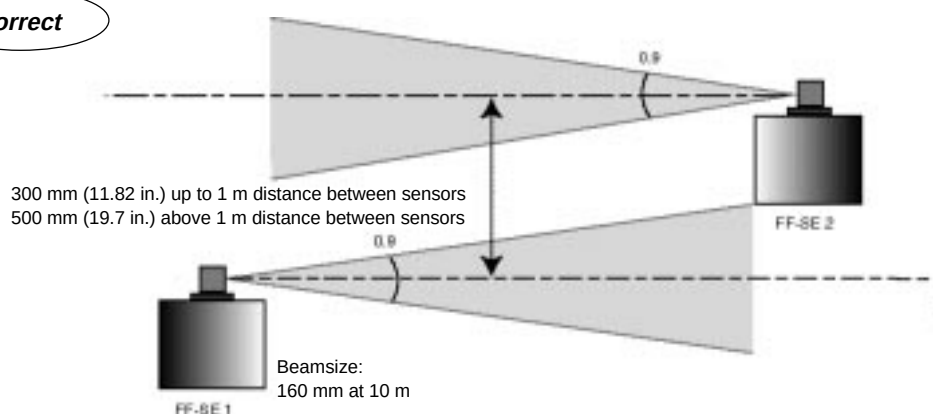
Correct



FSE19bEPS

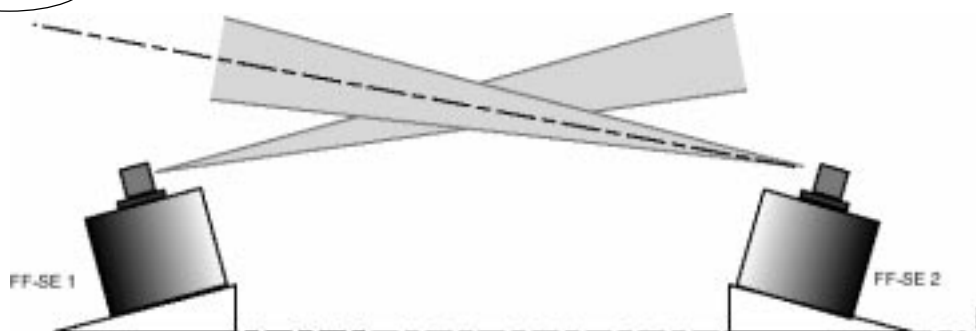
• Example 3

Correct



• Example 4

correct



• Example 5

correct

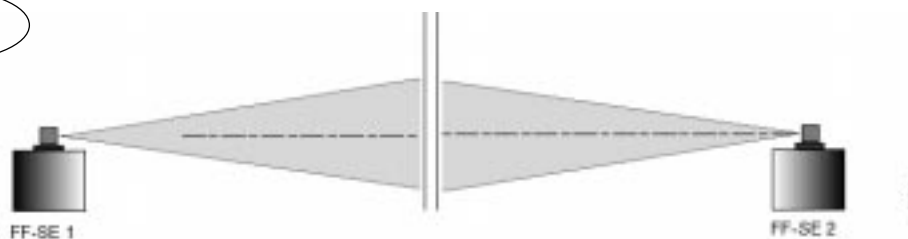


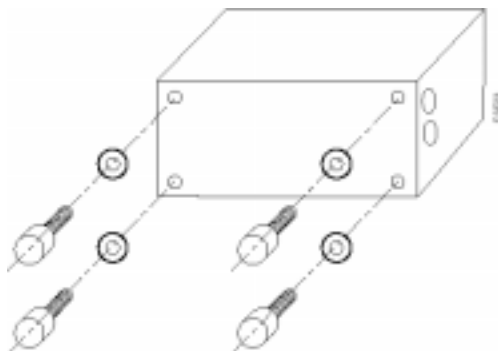
Figure 4-2 : Mutual interferences

NOTICE**IMPROPER MULTIPLE SENSOR INSTALLATION**

Even if the steps above have been followed to avoid direct interference between multiple sensors, make sure that there cannot be indirect interferences from reflecting surfaces (mirrors, metal parts,...)

The FF-SE can be installed in any position (head up, upside down, mounted on a wall, inclined etc.). There are two possibilities for mounting the sensor on the machine:

- 4 tapped M4 x 10 holes are available on the lower side of the **sensor** for horizontal mounting.



4 screws M4 x 10 (included)

Figure 4-3 : Mounting

■ For mounting, the following material is required:

- 4 M4 x 10 screws for mounting on a horizontal surface (included).
- Washers and lock washers (included).
- A bubble level for alignment.
- The bracket sold separately is delivered with its own mounting kit. It is recommended to use it to protect the FF-SE.

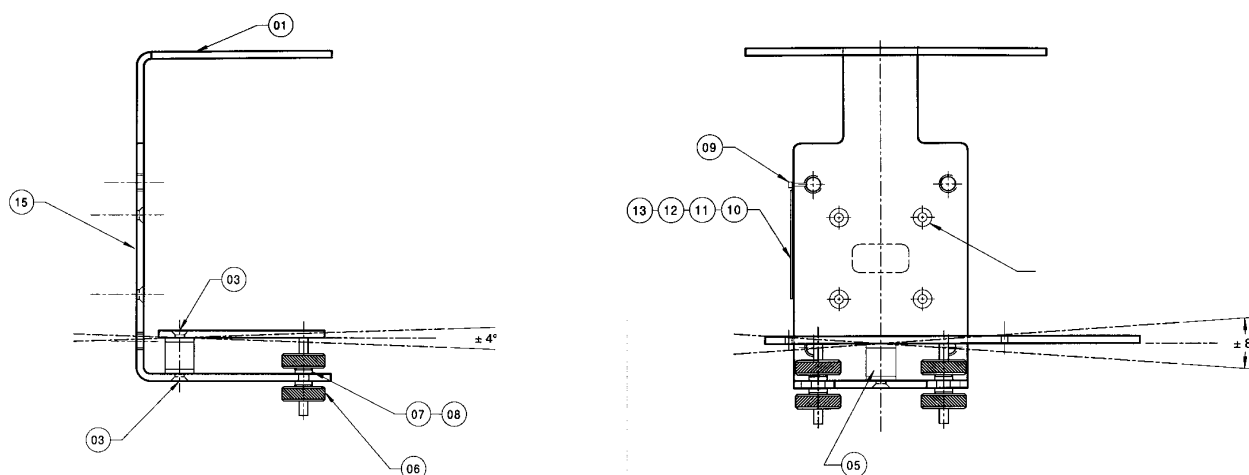


Figure 4-4 : FF-SE6BRAC3 : bracket for FF-SE safety laser

■ Mounting the FF-SE :

⚠ WARNING

IMPROPER INSTALLATION ENVIRONMENT

Before mounting the sensor, ensure the machine is switched off and all danger is eliminated.

Failure to comply with these instructions could result in death or serious injury.

1. Secure the FF-SE to the mounting surface with its screws, washers and lock washers.
2. Align the **sensor**, then tighten the mounting hardware.
3. Use a bubble level if necessary.
4. Follow Electrical connections section 5
You will find the dimensions in the Appendix 9

4.5 Statutory mounting and operating provisions

4.5.1 Safety distances

⚠ DANGER

IMPROPER APPLICATION OF FF-SE LASER SCANNER

- A safety laser scanner may be used as primary protection for machines where the movement of the functional parts can be interrupted at any time during the dangerous cycle.
- A safety laser scanner may be used as primary protection for machines where the control circuit has been designed so that a fault in one component does not result in any risk.
- Cancellation of the safety laser scanner stop signal must not cause the restart of the moving parts. The function to restart may only be initiated by means of a control designed for this purpose.

Failure to comply with these instructions will result in death or serious injury.

⚠ WARNING

IMPROPER APPLICATION OF FF-SE LASER SCANNER

- If the FF-SE is OFF, the machine must be switched off.
- The maximum value of the machine stop time, including the FF-SE's response time must be short enough so that no object can penetrate the danger area before the dangerous movement is stopped.
- The safety distance S between the protection area and the dangerous zone must be less than the maximum sensing distance. The calculation of the distance of the protection area must take into account the response time of the FF-SE, the stopping time of the machine with regard to the penetration velocity of an object or a person and an error margin.

In Europe, it must be calculated according to paragraph 6.2 of EN 999.

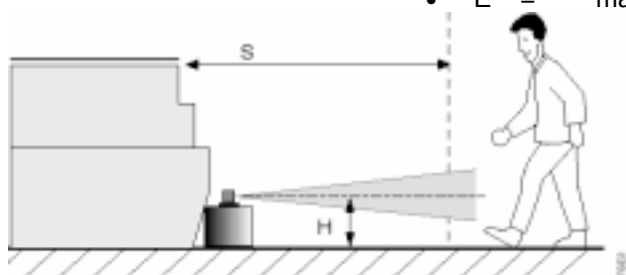
Failure to comply with these instructions could result in death or serious injury.

European Standards :

Where :

- S = distance (in mm)
- 1,6 = penetration velocity (in mm/ms)
- t1 = response time of the FF-SE (see section Technical specifications)
- t2 = stopping time of the machine (in ms) ; i.e. the time interval necessary to stop the machine, after the protection device has emitted the stop signal
- H = height of the beam from the ground, $300 \leq H \leq 1000$ mm
- E = maximum error in measurement (see chapter 4.5.2)

$$S \geq 1.6 (t_1 + t_2) + (1200 - 0.4 H) + E$$



- Install hard guarding on the sides and back of the machine.
- Install hard guarding fences on all sides, or set up the zone to ensure a « S » safety distance in all directions.

⚠ DANGER

IMPROPER INSTALLATION HEIGHT OF FF-SE LASER SCANNER

When choosing an installation height, ensure that personnel cannot penetrate the safety area above or below the laser beam. In Europe, the installation height H must be greater or equal to 300 mm (11.82 in) and smaller than or equal to 1000 mm (39.4 in).

Failure to comply with these instructions will result in death or serious injury.

⚠ WARNING

IMPROPER INSTALLATION OF FF-SE LASER SCANNER

Ensure that personnel can not reach the dangerous zone without passing through the protection area.

Ensure that personnel can not reach the dangerous zone from above or below the protection area

Use additional protection or hardware to prevent such access.

Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING

IMPROPER INTEGRATION OF FF-SE LASER SCANNER

FF-SE integration into the machine control must be performed by an authorised person who knows the safety regulations and the necessary information concerning the dangerous machine.

Failure to comply with these instructions could result in death or serious injury.

4.5.2 Sensor accuracy / safety margin

The **sensor** accuracy depends on the distance. A safety margin needs to be taken into account when calculating the safety distances :

Range	Safety margin = E
$R \leq 2 \text{ m}$ (6.56 ft) *	250 mm (9.85 in)
$2 < R \leq 3 \text{ m}$ (9.84 ft) *	350 mm (13.79 in)
$3 < R \leq 4 \text{ m}$ (13.12 ft) *	450 mm (17.73 in)
$4 < R \leq 5 \text{ m}$ (16.4 ft) *	550 mm (21.67 in)
$5 < R \leq 6 \text{ m}$ (19.68 ft) *	700 mm (27.58 in)

* Distance measurements always include safety extensions.

These tolerances consider all conceivable influences, in particular the reflective properties of all possible materials, as well as possible background influences, and all temperature range change. The tolerance to be added depends on the safety distance which is calculated with the formula in section 4.5.

⚠ WARNING

IMPROPER SAFETY DISTANCES

When programming the **sensor**, consider the safety margins. These safety margins need to be added only on the "open" side of the protection zones. Where the protection zones follow obstacles like walls, the distance to obstacles explained in section 3.5.1 must be taken into account.

Failure to comply with these instructions could result in death or serious injury.

4.5.3 Example of stationary application

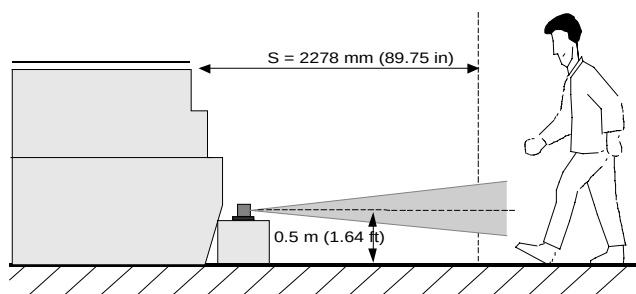
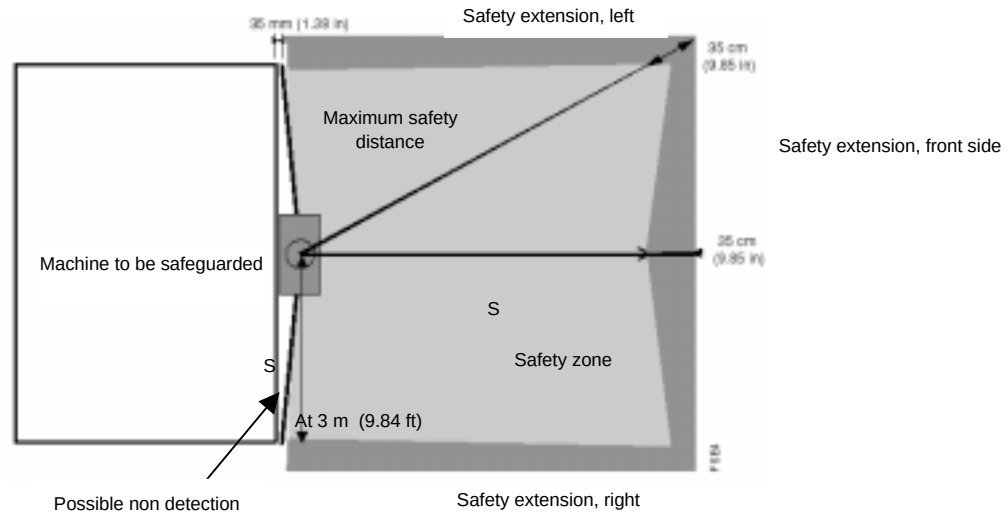


Figure 4-5 : Example of stationary application



M Width of safety area = 2200 mm (7.21 in)
t1 response time of the FF-SE = 280 ms
t2 stop time of machine = 300 ms
h height of laser beam above floor = 500 mm (1.64 in)
safety margin = 350 mm (13.79 in)
safety zone width = M + safety margins left and right

$$S = 1.6 (280 \text{ ms} + 300 \text{ ms}) + (1200 - (0.4 * 500\text{mm})) + 350 \text{ mm} \quad S = 2278 \text{ mm} \quad (89.75 \text{ in})$$

$$\text{Safety zone width} = 2.2 \text{ m} + 0.35 \text{ m} + 0.35 \text{ m} \quad S = 2900 \text{ mm} \quad (114.26 \text{ in})$$

$$\text{Maximum measuring distance } (S^2 + 1/2 \text{ safety zone width}^2)^{1/2} = 2700 \text{ mm} \quad (106.38 \text{ in})$$

⚠ WARNING

IMPROPER PROTECTION OF THE MACHINE

Ensure that the sides and the back of the machinery are protected. Use hard guarding if necessary.
Failure to comply with these instructions could result in death or serious injury.

⚠ DANGER

IMPROPER SAFETY DISTANCE

The safety margin is determined by the maximum measuring distance. If the undetected presence in front of the machine cannot be prevented by the design of the safety zone, the width of the no-detection accessible zone which is directly in front of the machine must be smaller than 35 mm (1.38 in) (for a safety distance up to 3 m (9.84 in)). For greater safety distances, the gap must be zero.

Failure to comply with these instructions will result in death or serious injury.

4.5.4 Application on a Automatic Guide Vehicle (AGV)

⚠ WARNING

IMPROPER BEAM LOCATION FROM THE FLOOR IN AGV APPLICATION

Ensure that the beam is located between 100 and 200 mm to ensure personnel detection even when beam on the floor.

Failure to comply with these instructions will result in death or serious injury.

NOTICE

IMPROPER LEVEL OF THE BEAM

Ensure good level of the beam to avoid floor detection.

In accordance with the Regulations for AGVs (EN 1525), the minimum distance between the edge of the safety zone and the danger area of the vehicle (AGV) is calculated as follows:

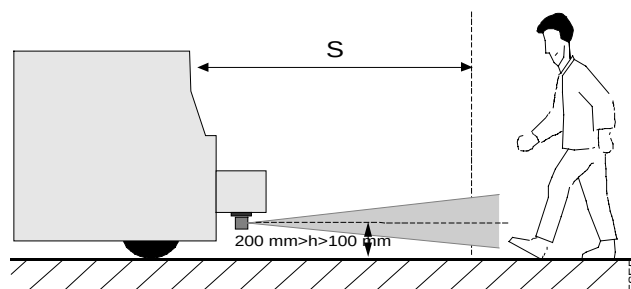


Figure 4-6 : Application on a AGV

$$S = V_{AGVmax} \cdot (t1 + t2) + 1.1 \cdot S_{braking\ distance} + S_{safety\ extension} + Z_{play\ in\ the\ base} *$$

* Applies only if there is no gap in the base, in accordance with pr EN 1493.

with :

S	minimum distance in mm = stopping distance AGV
t1	response time of FF-SE ((in ms) ; see "Technical specifications")
t2	reaction time the AGV control (in ms)
V _{AGVmax}	maximum speed of AGV (in m/s)
S _{braking distance}	braking distance of AGV (in mm)
S _{safety extension}	maximum measured error of the FF-SE ((in mm) ; see chapter 4.5.2)
Z _{play in the base}	150 mm (if base play of AGV is less than 50 mm)

⚠ DANGER

IMPROPER INSTALLATION OF FF-SE LASER SCANNER

Use spell-check safety equipment with the FF-SE if one of the following situations applies:

- a danger area can be reached without passing through the safety zone;
- the area monitored by the FF-SE can be reached by passing under, over, or around the safety zone.

Failure to comply with these instructions will result in death or serious injury.

⚠ WARNING

IMPROPER SAFETY ZONE DEFINITION

- The safety zone must cover the entire width of the AGV. The safety zone must be widened at each side by safety extensions (see chapter 4.5.2).
- In the case of inaccessible lateral movements, the safety zone to the sides must be configured the same as in the direction of travel.
- The safety zone must be configured so that nothing can penetrate between it and the AGV in the direction of travel (no undercut). The FF-SE has a maximum safety zone range of 300°. The following example shows how this feature can be used to prevent any type of undercut.

Failure to comply with these instructions could result in death or serious injury.

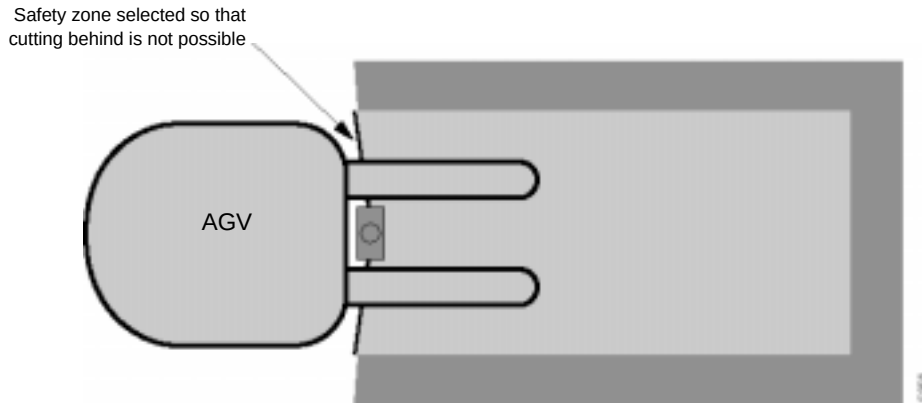


Figure 4-7 : Application on an AGV

If the undetected presence in front of the AGV cannot be prevented by the design of the safety zone, the following applies:

- The AGV must be in restart interlock mode (manual restart)
- The width of the no-detection accessible zone which is directly in front of the AGV must be smaller than 35 mm (1.38 in) (for a safety distance up to 3 m (9.84 ft)). For higher safety distances, the gap must be zero.

⚠ WARNING

IMPROPER RESTART MODE CONFIGURATION

To avoid a dangerous restart of the AGV after exiting of the safety zone, the system control must be configured in the restart interlock mode setting (manual restart) using a restart hold time of at least 2s (see start menu in software manual).

Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING

IMPROPER PERSONNEL PROTECTION

Install the safety equipment to prevent personnel to travel with the AGV. Use additional safety equipment if necessary.

Failure to comply with these instructions could result in death or serious injury.

4.5.5 Example of application for AGV

AGV _{width}	1600 mm (5.3 ft)	
t1	response time of FF-SE = 280 ms	
t2	reaction time of AGV control = 300 ms	
V _{AGVmax}	maximum speed of AGV = 1 m/s	
S _{braking distance}	braking distance of AGV = 300 mm	(0.98 ft)
S _{safety extension}	maximum measured error of FF-SE = 250 mm	(0.82 ft)
Z _{play in the base}	N/A, AGV has play in the base	
Safety zone width	AGV _{width} + safety extensions left and right	
$S = 1.1((1 \text{ m/s} * 280 \text{ ms} + 300 \text{ ms})) + 1.1 * 300 \text{ mm} + 250 \text{ mm}$		$S = 1160 \text{ mm} \quad (45.70 \text{ in})$
Safety zone width = 1600 mm + 250 mm + 250 mm		$S = 2100 \text{ mm} \quad (82.74 \text{ in})$
Maximum measuring distance $(S^2 + (1/2 \text{ safety zone width})^2)^{1/2}$		$= 1409 \text{ mm} \quad (55.51 \text{ in})$

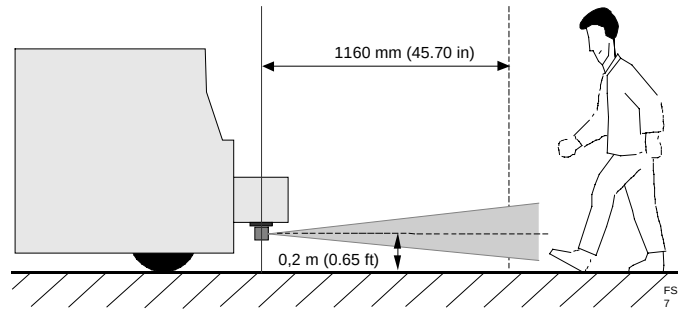
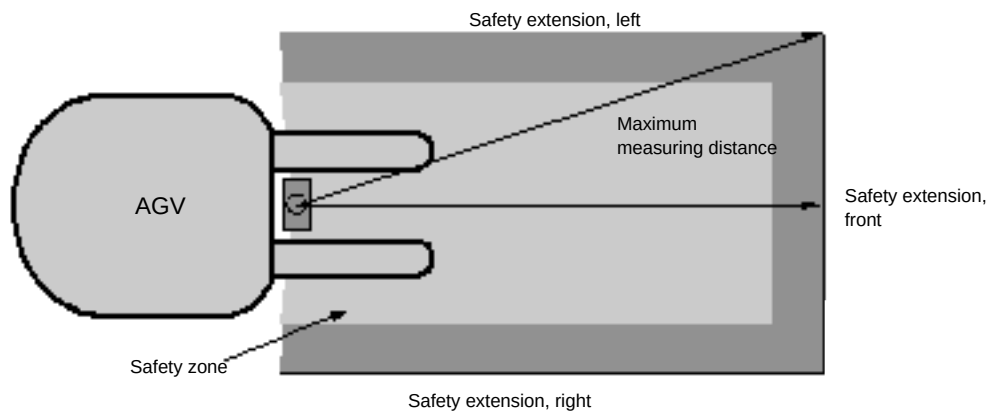


Figure 4-8 : Example of application for AGV



5. Electrical connections

5.1 Overview

This chapter contains information about electrical installation and wiring.

⚠ WARNING

IMPROPER INSTALLATION

Strictly adhere to all electrical connection instructions.

Failure to comply with these instructions could result in death or serious injury.

5.2 Integrating FF-SE signals into machine control

⚠ DANGER

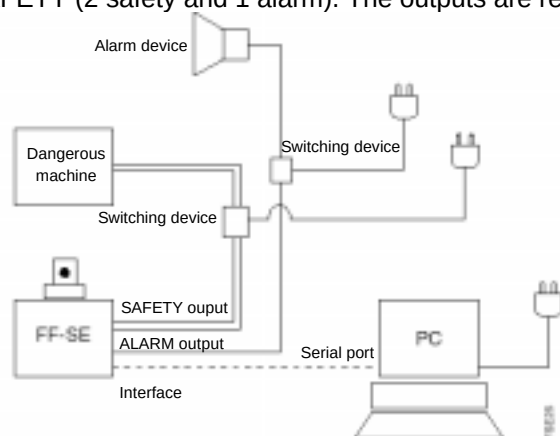
IMPROPER ELECTRICAL CONNECTION OF FF-SE LASER SCANNER

Only qualified personnel may undertake connecting the FF-SE to the machine.

These persons must possess all information provided by the machine's supplier and be completely familiar with installation instructions and all applicable safety regulations.

Failure to comply with these instructions will result in death or serious injury.

For connecting to the machine, three potential-free circuit outputs are available for the conditions ALARM and SAFETY (2 safety and 1 alarm). The outputs are realised as N.O. contacts.



Example of connecting the ALARM and SAFETY outputs
(PC is connected only for programming)

Figure 5-1 : FF-SE connections

ALARM output

The relay contact ALARM can be used for issuing an alarm signal. The ALARM output will be opened when the alarm zone has been penetrated or the **sensor** is malfunctioning. If the object leaves the alarm zone, the relay contact closes after a programmed time of 200 ms to 5 s (delayed restart). The electric rating of this output is 2 A / 48 VDC max.

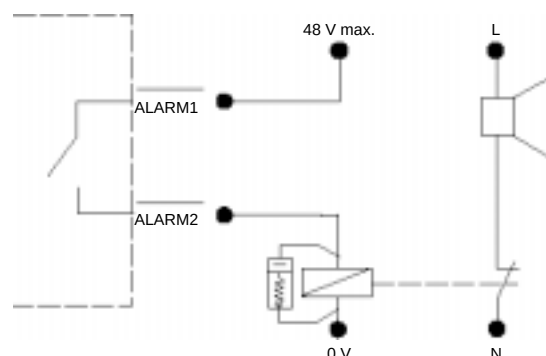


Figure 5-2 : Example of Alarm zone connection

⚠ DANGER

IMPROPER ELECTRICAL CONNECTION OF FF-SE LASER SCANNER

Always use the safety outputs to stop the machinery, never the alarm output

Failure to comply with these instructions will result in death or serious injury.

SAFETY outputs

⚠ DANGER**IMPROPER ELECTRICAL CONNECTION OF FF-SE LASER SCANNER**

Always connect the SAFETY outputs directly to the machine control circuitry of the dangerous machine, never connect the safety outputs to a programmable logic controller.

Failure to comply with these instructions will result in death or serious injury.

The SAFETY outputs are used as an emergency stop function. If the safety zone has been penetrated or the **sensor** is malfunctioning, the outputs are opened. The contact will close after having cleared the zone (programmable delay between 200 ms and 5 s). The electrical rating of this output is 2 A/48 V max.

See below two examples for connecting the FF-SE to a machine control.

Figure 5-3 :

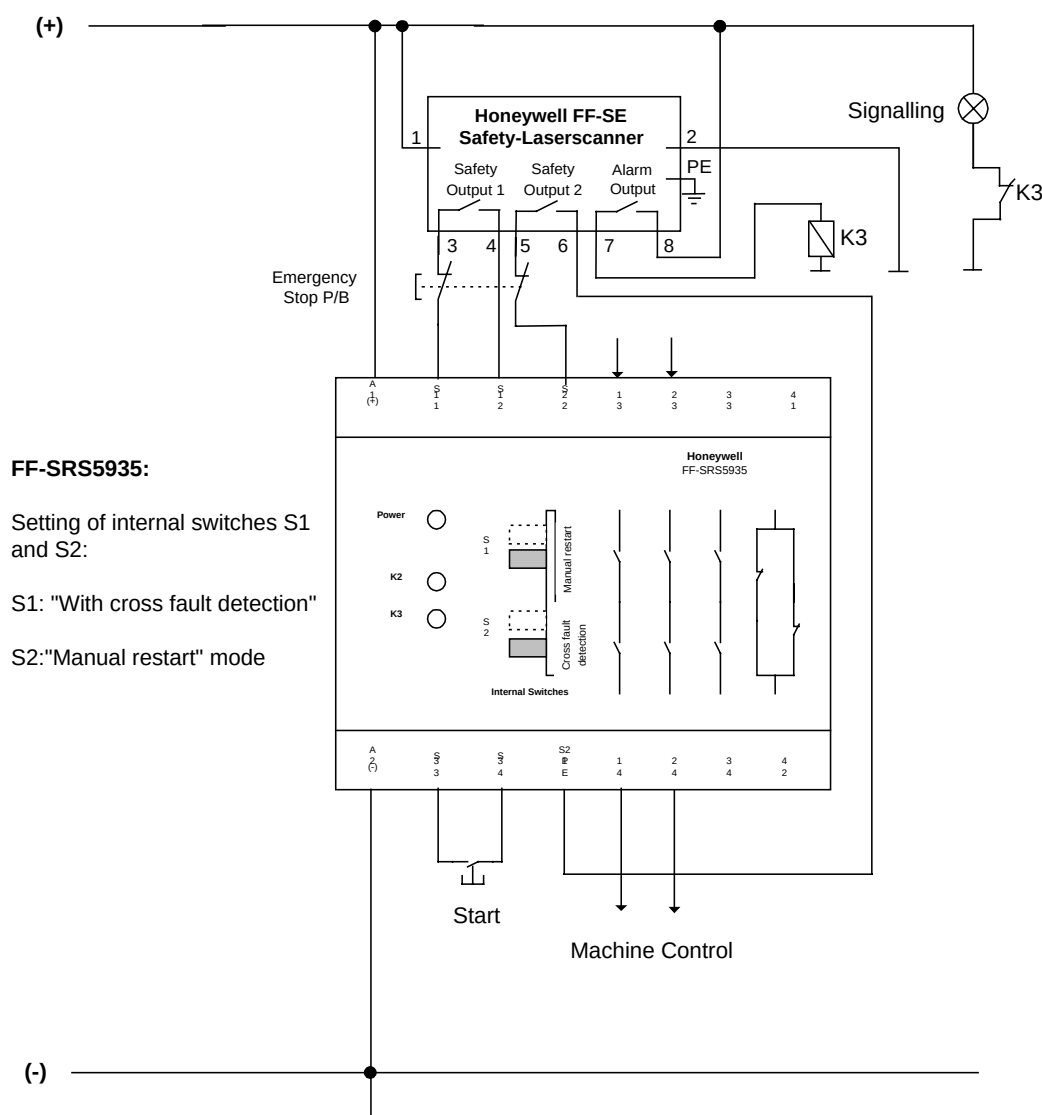
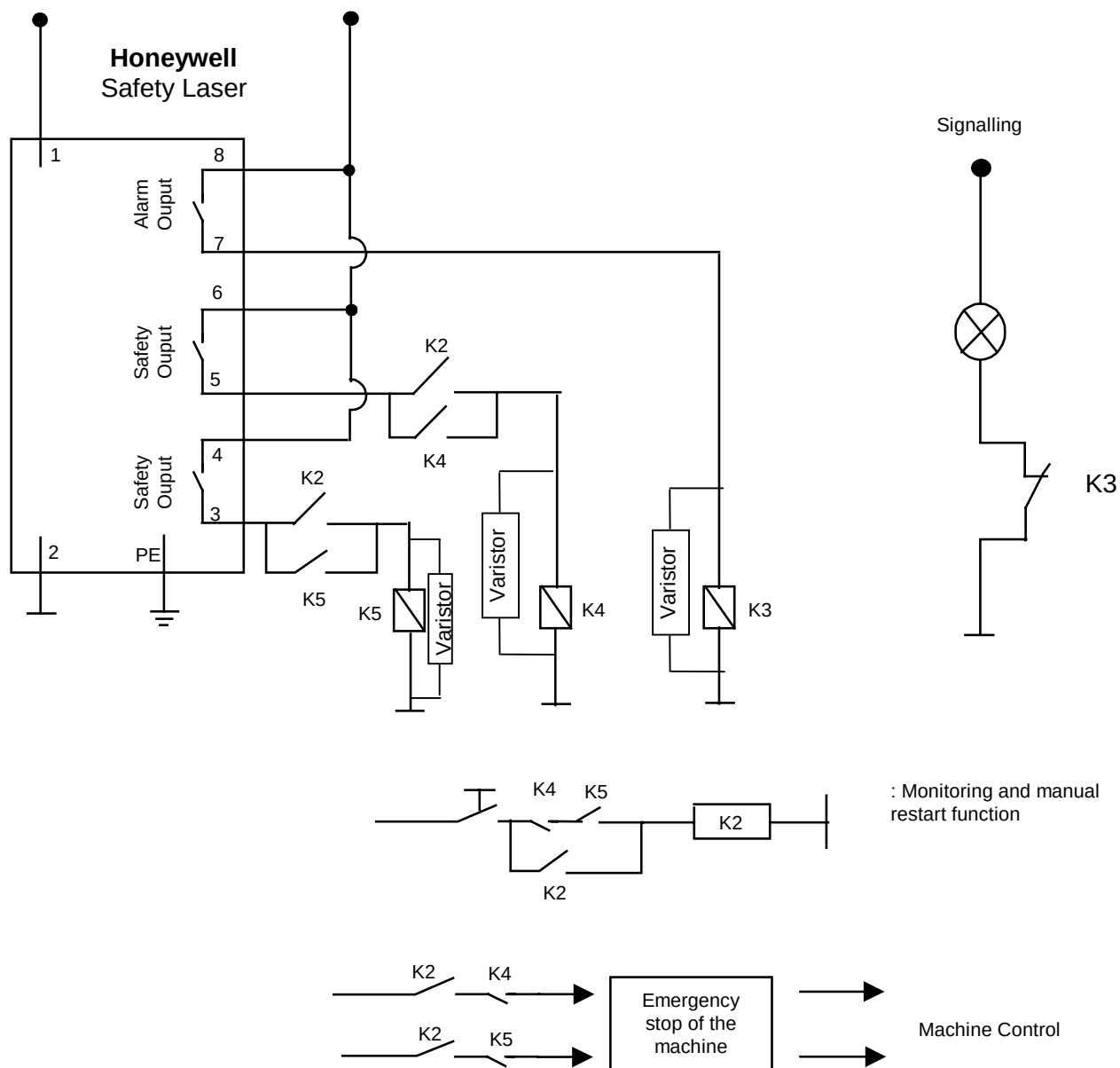


Figure 5-4 :

Laser connected to Safety Relays
Example - Not Contractual -



CAUTION

IMPROPER OUTPUT PROTECTION

Install a varistor MURR ELEKTRONIK reference VG – A/24 (DC interfaces) in parallel with the load to protect the safety relays.

Failure to comply with these instructions will result in product damage.

Refer to section 5.4 Connecting the interface cable for detailed instructions about connecting PC to FF-SE.

5.3 Connecting the power supply and the signal cable

⚠ WARNING

IMPROPER ELECTRICAL CONNECTION OF FF-SE LASER SCANNER

Electrical work may only be carried out by qualified personnel.

Failure to comply with these instructions could result in death or serious injury.

The power supply and signal outputs are all grouped together in a connector located on the bottom of the housing. The power / signal cable is included with the sensor (Spare part : order FF-SEZ6POWC).

• **Cable specifications**

Length	5m, shielded	(7.7*10 ⁻⁴ in ²), (9.84 ft)
Material	PUR	
Number of conductors	9	
Outer diameter	5 to 8 mm	(0.197 to 0.315 in)
Cross section of conductors	0.50 to 0.75 mm ²	(26 to 22AWG)

NOTICE

Maximum allowed length of cable with 0.5 mm ² conductors	20 m, shielded	(65.61 ft)

• **Required power supply**

Supply voltage for the sensor	24 Vdc ± 15 %
Current consumption	750 mA at 24 Vdc, Rush at start-up: 2 A during 100 ms
Lead cross-section for function ground	Frame Ground 1 mm ² - 2 mm ² (1.55*10 ⁻³ in ² - 3.1*10 ⁻³ in ²)

⚠ DANGER

IMPROPER ELECTRICAL CONNECTION

Before connecting the power supply to the sensor, ensure the following :

- Before making any wiring connections, ensure the machine is switched off and that any danger is eliminated.
- To avoid short-circuits, ensure that the **sensor** is switched OFF.
- Alarm output must not be used to stop machinery : Always use safety outputs.
- If the shielded power cable (5m (16.4 ft)) delivered with the **sensor** is not long enough, extend the cable using the same type of cable and shielding. If the cable extension is not shielded, take precautions to ensure immunity against electrical noise : use metal cable or flexible conduits, separate from power cables and/or use, filters at the terminal blocks.
- If the installation contains two different power supplies (one for the PLC, and another for the main contactors), we recommend to connect the laser scanner to the PLC power supply, in order to ensure a better EMC immunity.

Failure to comply with these instructions will result in death or serious injury.

CAUTION

IMPROPER EARTH GROUND CONNECTION

Always connect the laser scanner to earth ground.

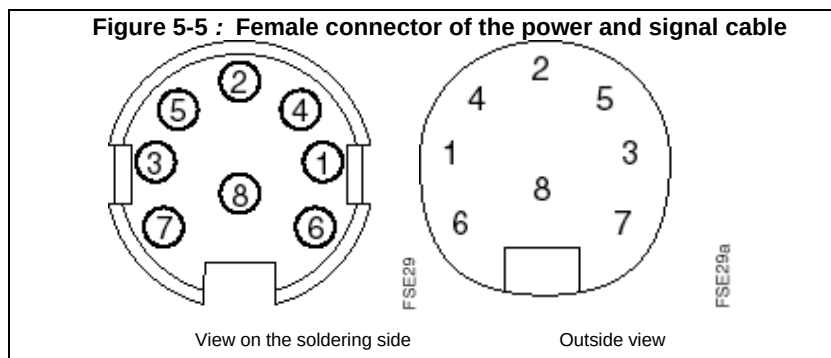
Failure to comply with these instructions may result in product damage.

CAUTION

IMPROPER OVERVOLTAGE PROTECTION

Protect the sensor power supply with an external 1.25 A delay (slow-blow) fuse.

Failure to comply with this instruction may result in product damage.



Connecting the power supply and the signal cables

Pin no.	Signal	Identification	Colour	Description
1	24 V	+	White	24 V DC supply
2	GND24	-	Brown	0 V DC supply
3	SAFETY2.1	S2	Blue	relay output SAFETY 2.1
4	SAFETY2.2	S2	Violet	relay output SAFETY 2.2
5	SAFETY1.1	S1	Grey	relay output SAFETY 1.1
6	SAFETY1.2	S1	Pink	relay output SAFETY 1.2
7	ALARM1	A	Black (thin)	relay output ALARM 1.1
8	ALARM2	A	Red	relay output ALARM 1.2
Screen / Connector	PE	PE	Black (thick)	protection earth / case

1. Gently Connect the cable to the "24 Vdc/Signal" socket of the FF-SE and screw tight.
2. Connect the other end of the cable to the power supply observing the polarity.
3. Turn on power supply.
4. The optical head will begin to rotate. After a few seconds and the self-check is complete, the diagnostic LED will go off, and the FF-SE is ready to have the protection areas set. The red and yellow LEDs may remain on, depending on the position of the FF-SE (the two protection zones are factory-set and may be penetrated during the set-up). However, this will not hinder the set-up at all.

NOTICE

If the PC is connected, but the FFSE.EXE program does not run, the laser scanner may not start. In this case, the RS232 interface cable has to be disconnected from the laser or the FFSE.EXE program has to be started.

Important grounding information

The correct grounding connection must be observed when installing the sensor.

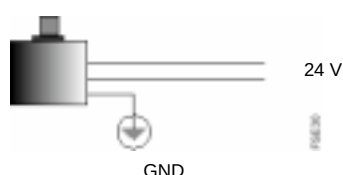
1. In stationary applications, ground the FF-SE.
2. In AGVs installation, the function ground must be combined with earth potential. For applications using battery-powered vehicles, a DC voltage converter must be added before connection to the FF-SE. To ensure functionality, use one of the following converters.

Melcher positive regulator – DQ-2660-7R for onboard mains of 48V to 80Vdc

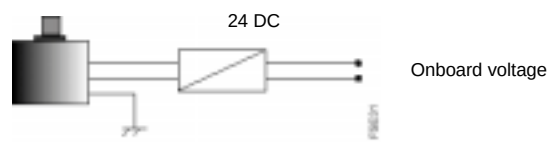
Melcher DC/DC converter–BQ2660-7R for onboard mains of 24Vdc

24V Type GWN24/24/2 converter (shock resistant, according to the requirement of the norm DIN 40839, level III)

The **sensor** must be powered by a transformer insulated according to the requirements of IEC 742.



Example of voltage supply and grounding for stationary applications



Example of voltage supply via a DC/DC converter and grounding on a transport vehicle

Figure 5-6 : Grounding for FF-SE

5.4 Connecting the interface cable

The connection between the computer and the FF-SE is accomplished via a RS232 cable with a 9-pin DSub plug. This cable is available from Honeywell and is included with the software kit.

To connect the computer interfaces to the FF-SE do the following :

1. To avoid any short-circuits, ensure power is not applied to the **sensor** and the computer. Ensure the **sensor** is properly grounded.

Cable delivered with FF-SEZ6SOFT2

Cable specifications :

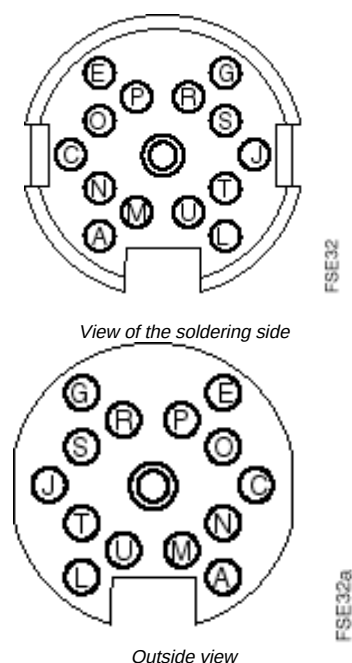
Cable length	5 m
Number of conductors for RS 232	14
Outer diameter	5-8 mm (0.197 in)
Cross section of conductors	0.14-0.75 mm ² (2.17*10 ⁻⁴ in ² - 1.16*10 ⁻³ in ²)
Maximum cable length allowed	15 m (49.21 ft)

- The conductors of the RS 232 cable are connected according to the following wiring diagram:

see also Appendix 9.2

Pin no.	Signal	Description	Direction	Level
A	GND	Earth RS 232		
C	RTS	RS 232: Ready to send	Output	V24
E	CTS	RS 232: Clear to send	Input	V24
G	TxD	RS 232: Transmit data	Output	V24
J	RxD	RS 232: Receive data	Input	V24
L	...	Do not connect !		
M	RESET	RESET (low active)	Input	V24 / TTL
N	...	Do not connect !		
O	...	Do not connect !		
P	...	Do not connect !		
R	...	Do not connect !		
S	GND	Ground	...	...
T	WA	Restart	Input	12...48 V
U	...	Do not connect !		

Figure 5-7 :
Female connector of the interface cable

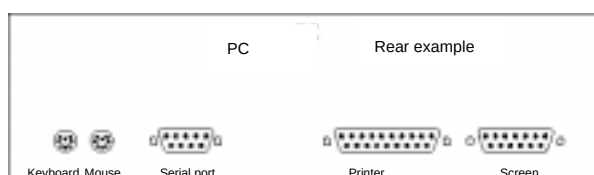


2. Connect the RS232 cable to the «Interface» connector of the FF-SE and hand tighten.

NOTICE

The sensor conforms to sealing class IP 65 / NEMA 4, 13 only if the interface connector is covered with the female connector or with a cap.

3. Ensure the PC is connected to electrical ground (except for portable PC).
4. Connect the other end of the RS232 cable to the serial port of the PC. Notice the number of the port to which the cable is connected. The port number will be required when setting the parameters of the software.



NOTICE**UNEXPECTED FF-SE STOPPAGE**

- If the FF-SE is operating when you connect your PC, through the RS232 cable it may stop when connected. A residual signal in the serial port buffer of the PC may cause this condition. Start the FFSE.EXE program, to reset the FF-SE to normal operation.
- Once the sensor has been programmed, disconnect the interface cable from the sensor, in order to ensure optimum EMC immunity.

5.5 Defining the protection zones**⚠ DANGER****IMPROPER PROTECTION ZONE DEFINITION**

Ensure the definition of the protection zones is performed by a qualified person, who understands the safety regulations.

Failure to comply with these instructions will result in death or serious injury.

Use Honeywell installation program FFSE.EXE to define the protection areas and the other control parameters of the FF-SE. This software runs on a standard personal computer.

Use the software reference manual (PK107029-EN) to program the **sensor**. The software and the software reference manual (PK107029-EN) are included in a separate kit (FF-SEZ6SOFT2) that may be ordered from Honeywell (see Order guide p.48).

5.6 checking the monitoring functions**⚠ WARNING****IMPROPER INSTALLATION CHECK**

After the protection zones are defined, you must check the installation. In two steps:

- 1) check the definition of the protection zones only with the computer connected, and document this test.
- 2) connect the machine outputs and repeat the procedure.

Failure to comply with these instructions could result in death or serious injury.

- **Check and document the protection zones with the computer connected as follows :** (see software reference installation manual (PK107029-EN) for additional information)

1. Start the program FFSE.EXE . Enter the main menu.
2. Select *Monitor* from the main menu.
3. Check the limits of the safety zone with a dark test object of approx. 70 mm (2.76 in) in diameter.
Observe red LED illuminates, the green LED turns off, indicating that the safety zone is occupied.
Observe the field «Safety» on the computer screen illuminates red and an acoustic signal may be heard (depends on sound mode selection).
4. Check the limit of the Alarm Zone in the same manner.
5. Observe the yellow alarm LED illuminates, indicating that the alarm zone is occupied.
6. Observe the field "ALARM" illuminates yellow and an acoustic signal be heard (depends on sound mode selection).
7. Check the external test target for correct positioning (if used).

Obstruct the light beam between the head and the external test target for few seconds.

Observe the alarm and safety outputs open.

Reset the sensor by turning power off and restoring it after few seconds.

- **Check the installation of the safety function as follows :**

1. After checking the protection zones, connect the signal outputs of the FF-SE to the machine control circuit. Check the zones with the machine switched on but not running. Check the functionality of the safety system.
2. Check the reactions of the machine with the FF-SE switched off.

3. Switch the machine on. Throw an object into the protection areas, for example a cardboard box, and watch the reaction of the machine.
 4. Create a report that documents the results.
 - **To evaluate correct operation, do the following :**
1. Document this evaluation by printing out screen displays of the defined protection zones.
 2. Ensure that no dangerous machine part can be set in motion while an object is in the danger zone.
 3. Ensure all parts of the dangerous machine come to a standstill, before a person can reach them.

DANGER

IMPROPER ZONE DEFINITION

When defining the protection zones, take both the stopping time of the machine AND the response time of the FF-SE into consideration to ensure proper zone definition.

Failure to comply with these instructions will result in death or serious injury.

4. Ensure the FF-SE and other safety systems monitor complete access to the dangerous zone.
5. Ensure there are no dead zones between the FF-SE and the dangerous zone.
6. Ensure the FF-SE is correctly mounted and firmly in position during normal operating conditions. Ensure the sensor cannot be moved or changed in its position.
7. Ensure the sensor's two safety outputs are used to stop the machinery.

DANGER

IMPROPER SIGNAL OUTPUT USE

Do not use the Alarm output as a safety output, it is not self-checked. Use the 2 safety outputs of the FF-SE.

Failure to comply with these instructions will result in death or serious injury.

8. Save the parameter file on a floppy disk for future use.
9. Train the machine-operating staff to use the safety system properly. Explain the installation and operation of the **sensor** (LEDs, diagnostics, ...).

5.7 Access authorisation

Access to the FF-SE is protected by a password.

- Upon delivery, the password is set to **HWLL**.

WARNING

IMPROPER PASSWORD PROTECTION

- Those responsible for workplace safety must ensure that the password is made known to authorised personnel only. Select another password to replace the default **HWLL** password.

Failure to comply with these instructions could result in death or serious injury.

- If you do not enter the correct password, an error message will appear and the main menu will not be accessible.

NOTICE

The password input is case sensitive.

- The FF-SE programming software reference manual (PK107029-EN) explains how to enter or change a password.

6. Maintenance and Trouble shooting

6.1 Overview

This chapter contains operational test procedures, troubleshooting, cleaning, and maintenance instructions. Besides the maintenance operations described below, the sensor does not require any additional maintenance including adjustment or calibration.

WARNING

IMPROPER MAINTENANCE

Strictly adhere to all maintenance and troubleshooting instructions.

Failure to comply with these instructions could result in death or serious injury.

6.2 Daily maintenance

CAUTION

IMPROPER PRODUCT MAINTENANCE

The checks described below must be carried out on a regular basis.

The daily maintenance operations can be carried out by the machine-operating staff.

Failure to comply with this instruction may result in product damage.

Check the condition and installation of the FF-SE to verify correct operation as follows :

- Always keep the optical head lens clean. Remove power from the **sensor** and use a soft brush or lens cloth included with the **sensor**.
- Check the monitoring function every day by intentionally activating the safety output or removing power. In case of doubt, switch the sensor off and inform the responsible safety specialist.

6.3 Six-month maintenance

WARNING

IMPROPER MAINTENANCE AND CONTROL

The checking of the protection areas must be performed by the persons responsible for safety every 6 months or less.

Failure to comply with these instructions could result in death or serious injury.

Using the software, check the definitions of the **protection zones** every six months

- Perform the procedures described in the section 5.6 "checking the monitoring functions"

6.4 Maintenance procedures

CAUTION

IMPROPER SENSOR CARE

To ensure proper **sensor** care :

- Never touch the optical head lens. Use a lens cloth or a soft brush to clean the lens.
- Clean the housing of the **sensor** with a soft, damp cloth.
- Protect the FF-SE from constant direct sunlight.
- Do not expose the FF-SE to rapid temperature changes to prevent the formation of condensation.
- Do not expose the FF-SE to harsh chemical detergents (especially certain cleaning products).
- Do not open the **sensor**. The FF-SE does not contain any onsite replaceable parts. Opening of the **sensor** will void the warranty.

Failure to comply with this instruction may result in product damage.

6.5 Transport and storage

Please observe the following transport instructions:

- Remove all plugs to prevent damage to the cables.
- Fix rotating parts with an adhesive band to protect the lens from being scratched.
- Avoid any mechanical stress on the rotating parts.
- Whenever possible use the original shipping package .
- Clearly, indicate on the packaging that the product is «fragile».

Please observe the following storage instructions:

CAUTION

- Ensure the **sensor** is dry before putting it into storage. Condensation will damage the optical parts.
- Do not store the **sensor** in an air-tight container to prevent trapping any moisture.

Failure to comply with this instruction may result in product damage.

- Storage humidity : 5 to 85% (without condensation).
- Storage temperature : -20 to +70° C (-4 to 158 °F).

6.6 FF-SE replacement procedure

During initial **sensor** programming (alarm zone, safety zone, password, restart delay) and when exiting the main menu, save the program on a disk using a file name relating to the installation (do not use the serial number).
For example : POST23.PRM or AGV2B.PRM.

If a replacement sensor is required (damaged sensor, maintenance, break down...) do the following :

- 1) Obtain a new **sensor**, a PC and a disk with the saved installation information.
- 2) Ensure the machinery is in a safe state (stopped, power removed...)
- 3) Shut down the power supply, disconnect the **sensor** power cable, remove the mounting hardware and sensor.
- 4) Store the **sensor** in the special shipping container.
- 5) Install the replacement **sensor** using mounting hardware :
Ensure the **sensor** is in the same location as the previous **sensor** in relation to the reference target. Also, ensure the optical head is clean and moves freely.
- 6) Connect the replacement **sensor** to the « 24 Vdc/signal » cable plug. Ensure the cable plug is hand tight.
- 7) Power up the **sensor**.
- 8) Observe the replacement **sensor** starts up after an initial self-checking period about 10 seconds. The safety (red) and warning (yellow) LED's should light up (unless the **sensor** is positioned in an open area of more than 10 m (32.8 in)), because the maximum safety and alarm zone parameters are factory pre-programmed (radius of 6 m (19.68 in) and 10 m (32.8 in)).
- 9) Connect RS232 cable to the sensor's "Interface connector".

NOTICE**UNEXPECTED FF-SE STOPPAGE**

If the FF-SE is operating when you connect your PC, through the RS232 cable it may stop when connected. A residual signal in the serial port buffer of the PC may cause this condition. Start the FFSE.EXE program to reset the FF-SE to normal operation.

- **Using the FFSE.EXE program.**

- 1) Start the FFSE.EXE program.
- 2) Insert the disk into drive A and from the start menu, chose «Load settings file ».
- 3) Select the saved file information on the disk, (file used by the previous **sensor** for example POST23.PRM or AGV2B.PRM).
- 4) Leave the start menu with [Continue] and entering the password (use the indicated original password for the replacement **sensor**).
- 5) The main menu will appear.
- 6) Select [settings] and the loaded **protection zones** (PRM file) will appear on the screen.
- 7) Adjust the North alignment option accordingly, to compensate for the alignment differences between the different sensors (Menu : [Define], [Options])
- 8) Ensure that the loaded zones will not include existing obstacles.
- 9) Select [Done] and confirm the Transfer setting into the FF-SE memory, selecting [Yes].
- 10) PRM file is transferred to the replacement **sensor** memory.
- 11) The programmed zones and the restart delays are listed on screen.
- 12) Confirm one more time, if FF-SE settings are correct by clicking on [Yes].
- 13) Release new settings by selecting [Ok].
- 14) The **sensor** is now programmed with the same configuration as the previous **sensor**.

- **Physically check the protection zones with the machine switched off as follows :**

- 1) Select the function [Monitor] from the main menu.
- 2) With a dark test object, with a radius of approximately 70 mm (2.758 in), check the safety and alarm zone limits. The red and yellow lights must illuminate. On screen the fields [Safety] and [Alarm] light up and you hear an acoustic signal.
- 3) Once you have checked the **protection zones**, connect the signal outputs of the FF-SE to the machine stopping circuitry. Now that the machine is powered up, but not yet operating, check the functions of the safety system.
- 4) Ensure the proper functioning of the safety system with the FF-SE switched off.
- 5) Now operate the machine. Introduce an object, for example a box, into the **protection zones**.

6.7 Troubleshooting

Obtain the following information before contacting the After Sales Service for assistance:

1. Serial Number and Manufacturing Date Code of the device (information available on the rating plate).
2. Version of the software you are using (displayed in the welcome window)
3. What is the Operating System from which you are running the PC Software?
4. Type of power cable in use (with an external filter or not, provide listing if possible).
5. Type of RS 232 cable in use (with a shielding or not, provide listing if possible).
6. Short description of the application.
7. Drawing of the Alarm and Safety Zones, as well as the environment with measured distances. This can be obtained by using the FFSE.EXE program and the "Monitor" menu for a few seconds, then save the parameter file when exiting. This will create a PRM file with your protection zones and an OWS file containing the profiles measured with monitor.
8. Did you define an external test target?
9. Status of the LED indicators and flashing sequence of the diagnostic LED.
10. Status of the diagnostic window in the FF-SE program , " Monitor " menu
11. Refer to troubleshooting table below.

Indication	Possible Cause	Corrective Action
All the LED indicators are not illuminated and the rotating head is not turning. 	Power supply is off	Turn on power supply
	Fuse(s) may be blown.	Replace fuse(s) as required.
	Power supply voltage may not be within the specified range.	Ensure the power supply is 24Vdc +/-15%. Adjust or replace the power supply as required.
	Power supply may not be able to absorb the current inrush during startup (especially when several laser scanners are powered from the same source).	Install a power supply with a current capability that can absorb the current inrush (2A for 100 ms)
	Cable connection between power supply and sensor is open.	Properly seat and tighten the sensor cable connection.
	Incorrect power source connection	Ensure the power cable is properly connected to + and - of the power source.
	Connector is damaged/broken	Repair or replace cable connector pins/receptacles as required.
	The PC is connected and sends a permanent reset to the sensor	Disconnect the RS232 interface cable or start the FFSE.EXE program

Indication	Possible Cause	Corrective Action
Some LED indicators are illuminated but the rotating head is not turning.	Power supply may be unable to absorb the current inrush during startup.	Install a power supply with a current capability that can absorb the current inrush oneword.
	Drive belt broken or motor has malfunction or is in operable.	Send the sensor to Honeywell for repair (see section 8.2 Sales and Service).

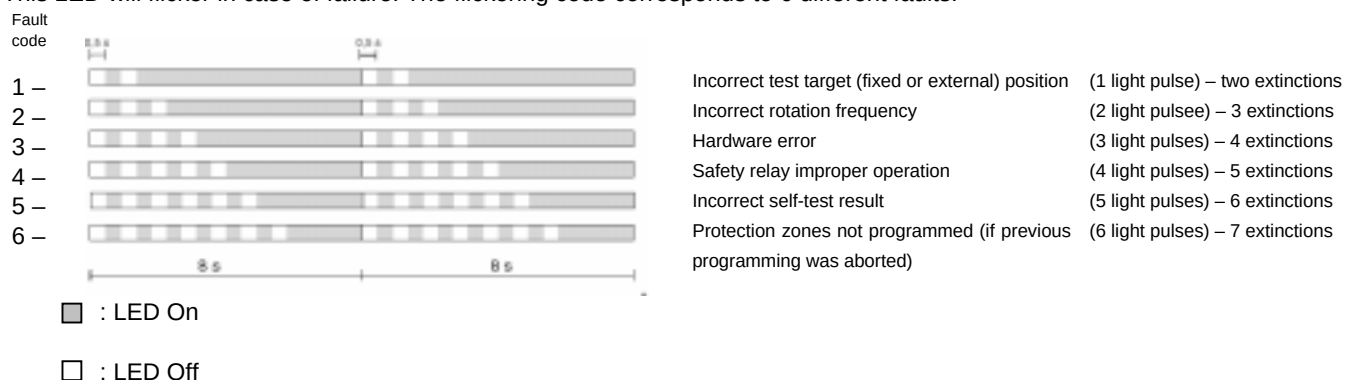
Indication	Possible Cause	Corrective Action
The rotating head stops turning when RS232 cable is connected	The PC is connected and sends a permanent reset to the sensor	Disconnect the RS232 interface cable or start the FFSE.EXE program.

Indication	Possible Cause	Corrective Action
The green LED is not illuminated, the "Alarm" or "Safety" LEDs are permanently illuminated and the diagnostic LED is not illuminated. Head is rotating.  or  or  LED indicators  Green  Red « safety »  Yellow « alarm »  Yellow « diagnostic »	Optical head may be heavily contaminated (fingerprints or dust). User zones have not been programmed and the laser scanner is still operating with the default "maximum zones" settings from the factory. An object is permanently detected. The installation environment may have changed (the detected object could be the floor).	Remove power from the sensor and clean the optical head (see section 6.4 "Advice on maintenance"). Use the FFSE.EXE program to set safety and alarm zones into the laser scanner Ensure no object is detected by the FF-SE. Connect the computer. Select the function "Monitor" in the main menu. Modify the environment to its original installation characteristics or modify the safety and alarm zones.

Indication	Possible Cause	Corrective Action
The green LED is not illuminated, the "Alarm" and "Safety" LEDs are permanently illuminated. The diagnostic LED is flickering. Head is rotating.  LED indicators  Green  Red « safety »  Yellow « alarm »  Yellow « diagnostic »	Power on self-check sequence, not completed. Optical head may be heavily contaminated (fingerprints or dust). External test target error (test beam has been broken, sensor has moved, target has moved). The diagnostic LED will flicker with 3 extinction sequence. Unsuccessful programming (if the last attempt to program the sensor failed or if it was not confirmed by the user, the FFSE.EXE will lock itself with maximum zones (alarm and safety). The diagnostic LED will flicker with 7 extinction sequence Sensor fault.	Ensure the Power ON Self-Check sequence is completed. This is an internal sequence of tests which takes 10 seconds Remove power from the sensor and clean the optical head (see section 6.4 "Advice on maintenance"). Reset the sensor by turning power off and on again. If fault continues, reprogram the external test target with a personal computer and the FFSE.EXE software Use a personal computer and the FFSE.EXE software program to the redefine safety and alarm zones. Reset the sensor by turning power off and then on again. If the diagnostic LED is still flickering, connect the computer. If communication with the PC is still possible, select the function "Monitor" in the main menu. If there is an error, an error number will appear in the "Status" window. If the fault cannot be rectified, return the sensor to Honeywell (see section 8.1.2 Sales and service). Remove the RS232 cable from the sensor.
	If the RS232 cable is still connected to the sensor, electrical noise interference may be present.	

Diagnostic LED

This LED will flicker in case of failure. The flickering code corresponds to 6 different faults.



Indication	Possible Cause	Corrective Action
Objects are not detected where they should be. (LED status does not change when object enters into protection zones)	Incorrect alarm and safety zones are in use	Use a personal computer and the FFSE.EXE software program to redefine the alarm and safety zones.
	Objects are too small/too dark	The resolution of the FFSE is 70mm. Smaller objects may not be detected.

Indication	Possible Cause	Corrective Action
The "Alarm" and "Safety" LEDs illuminate from time to time without apparent reason	Optical head may be slightly contaminated (fingerprints or dust).	Remove power from the sensor and clean the optical head (see section 6.4 "Advice on maintenance").
	The EMI in the environment exceeds standard specifications.	Install an electrical noise filter between the power supply and sensor.
	Power supply voltage may fluctuate be from a source that provides power to actuators.	Ensure the power supply is not the same source used for actuators. Replace the power source as required.
	If the scanner is not mounted directly onto the machine's body, the earth ground connection may be poor or non-existent. A good ground connection is crucial to ensure EMI immunity.	Ensure a quality earth ground connection exists via a dedicated wire on the power cable or ground screw.
	Electrical actuator switching, especially when the coil of an actuator is NOT protected against the generation of electrical noise, may cause false triggering (on the SAFETY or ALARM output)	Install varistor protection to minimize electrical noise interference.
	Light sources or reflective surfaces (like glass, metal foil transparent plastic,...) located around the scanner may cause false triggering.	Remove or block out the light source or the reflective surfaces. If not possible, change the angle of the laser scanner to prevent sensing these sources.
	Rain, snow, fog, smoke and dust may be detected as objects.	Protect the scanner from air pollution. Do not use the scanner outdoors
	If a second scanner is located close to a scanner, the installed sensor, mutual interference may occur.	Remove the mutual interference caused by the other FF-SE scanner (see section 4.4 Mounting);
	If a light source like a stroboscope is located close to the installed sensor, light interference may exist.	Remove the light source causing the interference.
	If the RS232 cable is still connected to the sensor, electrical noise interference may be induced into the sensor.	Remove the RS232 cable from the scanner.
	An object is detected intermittently. The installation environment may have changed (the detected object could be the floor).	Ensure that no object is detected by the FF-SE. (consider the required 250 mm (9.8 in) stand off distance from obstacles). Connect the computer. Select the function "Monitor" in the main menu. Modify the environment to its original installation characteristics or modify the protection zones.
	Moving objects located close to the limits of safety and alarm zones may cause detection.	Check to see that no moving object is detected by the FF-SE. Connect the computer. Select the function "Monitor" in the main menu. Remove the objects or redefine the safety and alarm zones.

Indication	Possible Cause	Corrective Action
The machine does not switch off when an object is detected in the safety zone	If the red safety output LED is illuminated, the object is detected but the safety outputs signal are not getting to the machine control circuitry.	Properly seat the cable connectors between the sensor "outputs" and the machine.
	If the red safety output LED is NOT illuminated, the object is not detected. No safety outputs signals are being sent to the machine control circuitry.	Repair or replace cable connector pins/receptacles as required.
		Use a personal computer and the FFSE.EXE software program to the redefine alarm and safety zones. If the fault cannot be rectified, return the sensor to Honeywell (see section 8.1.2 Sales and service).

7. Order guide

Catalog Listings	Description
FF-SEGE6G2-1	• FF-SE sensor • Power and relay output signal cable • 4 screws, washers to mount the sensor • Lens cleaning cloth • FF-SE installation manual in three languages (English, German, French).
FF-SEZ6SOFT2 software	▪ Software (version V2.0.4) ▪ Manual (three languages) ▪ RS232 Interface cable (needed for programming)
FF-SEZ6BRAC3	FF-SE Mounting bracket
FFSEZ6POST	FF-SE Floor mounting post
FF-SEZ6PLAT	FF-SE Mounting plate
FF-SEZ6POWC	FF-SE Power & Signal cable
FF-SEZ6RS2C	FF-SE 6 RS232 Interface cable
FF-SEZ6POST	Mounting post for FF-SE
FF-SEZ6BRAC3	Adjustable bracket for FF-SE

8. Warranty information

8.1 Warranty and Remedy

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during that period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is the Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

While we provide application assistance, personally and through our literature and the Honeywell website, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

8.2 Sales and Service

Honeywell serves its customers through a world-wide network of sales offices and distributors. For application assistance, current specifications, pricing or the name of the nearest distributor, contact a nearby sales office or call:

TELEPHONE

+ 61 (0) 2 9370 4303	Australia
1-800-737-3360	Canada
+ 33 (0) 1 60 19 80 41	France
+ 49 (0) 69 8064 444	Germany
1-815-235-6847	International
+ 44 (0) 161 251 4079	UK
1-800-537-6945	USA

FAX

+ 61 (0) 2 9353 7406	Australia
1-800-565-4130	Canada
+ 33 (0) 1 60 19 81 73	France
+ 49 (0) 69 8064 442	Germany
+ 44 (0) 161 251 4141	UK
1-815-235-6847	USA

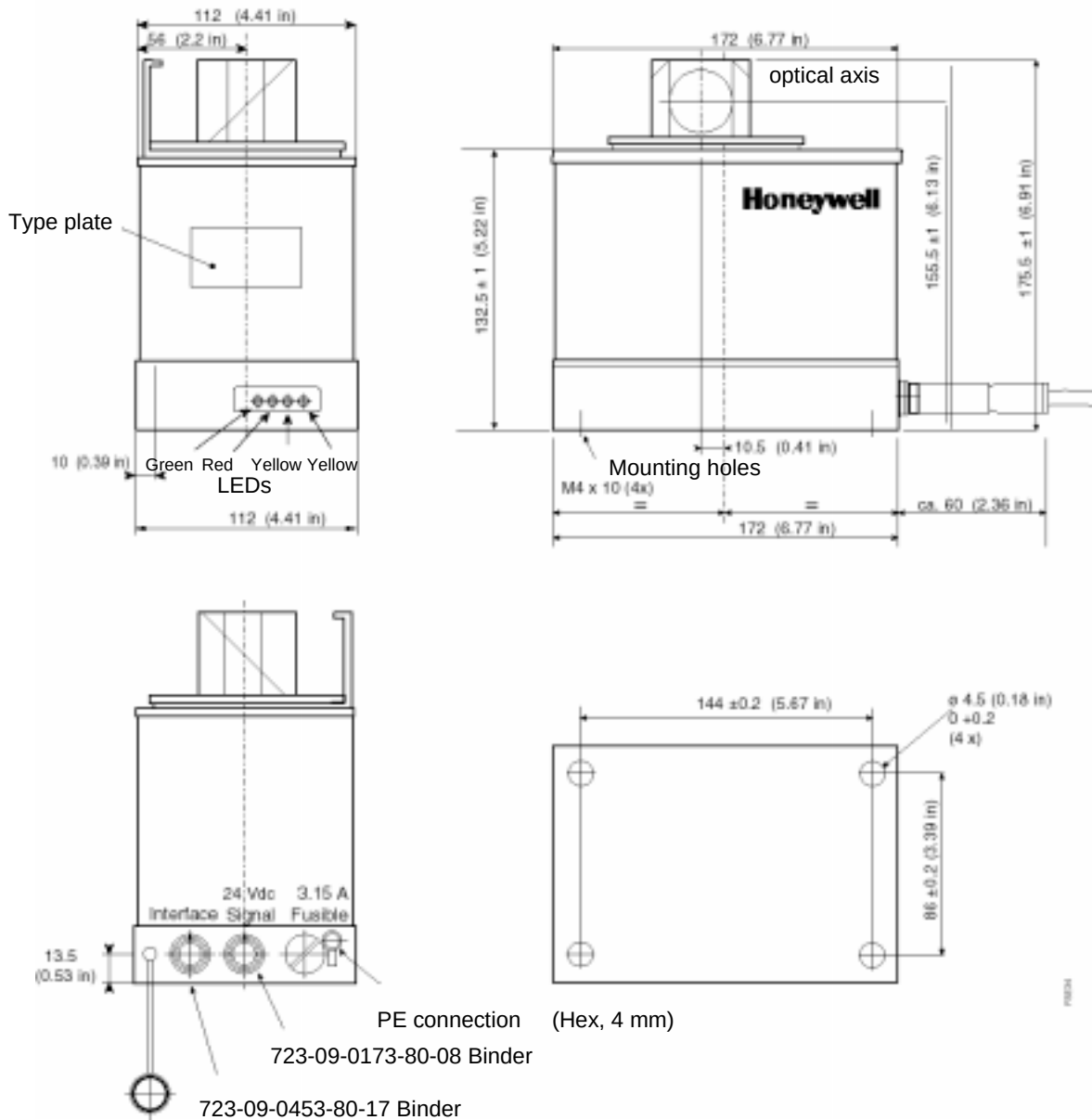
INTERNET

<http://www.honeywell.com/sensing/>
info@micro.honeywell.com

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9. Appendix

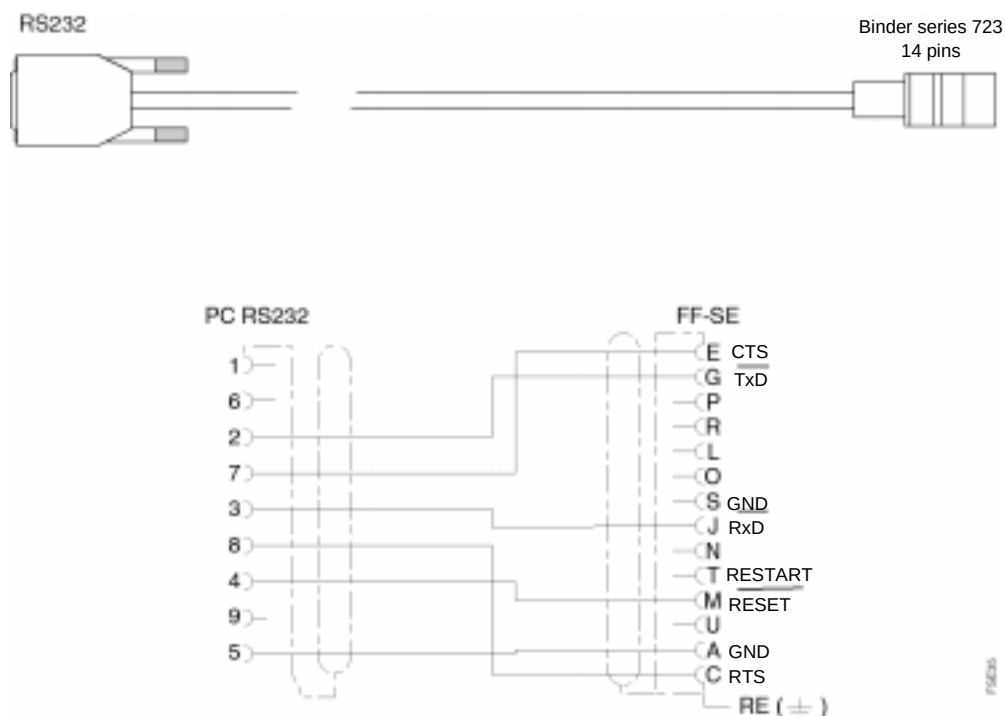
9.1 Mechanical Dimensions (mm / In) : for reference only



Protection cap interface

The power cable is delivered with the **sensor**, the interface cable is delivered with the software

9.2 Cable Wiring



Connecting the power supply and the signal cables

Pin no.	Signal	Identification	Colour	Description
1	24 V	+	White	24 V DC supply
2	GND24	-	Brown	0 V DC supply
3	SAFETY2.1	S2	Blue	relay output SAFETY 2.1
4	SAFETY2.2	S2	Violet	relay output SAFETY 2.2
5	SAFETY1.1	S1	Grey	relay output SAFETY 1.1
6	SAFETY1.2	S1	Pink	relay output SAFETY 1.2
7	ALARM1	A	Black (thin)	relay output ALARM 1.1
8	ALARM2	A	Red	relay output ALARM 1.2
Screen / Connector	PE	PE	Black (thick)	protection earth / case

9.3 Declaration of conformity

European Photoelectric Center
Honeywell-Cométa
B.P. 81
38243 Meylan Cedex - France
Phone : (33) 04 76 41 72 00
Fax : (33) 04 76 41 72 56

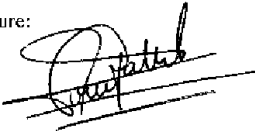
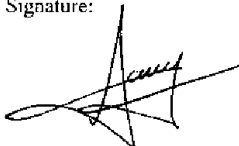


HONEYWELL EUROPEAN PHOTOELECTRIC CENTER QUALITY ASSURANCE DEPARTMENT

CE declaration of conformity

- We:** Honeywell-Cométa
ZIRST BP 81
21, chemin du Vieux Chêne
38240 Meylan Cedex - France
- Declare:** under our sole responsibility that the Electrosensitive Protective Equipment catalogued:

Safety Laser Scanner, FF-SE Series

to which this declaration relates is in conformity with the technical requirements of the standards and the provisions of the essential requirements of the directives detailed below.
- Directives:**
- **Machine Directive 89/392 EEC** and its amendments 91/368 EEC, 94/44 EEC and 93/68 EEC, to which the EC-type examination certificate delivered by the *Berufsgenossenschaftliches Institut für Arbeitssicherheit* relates.
 - **Low Voltage Directive 73/23 EEC**
 - **Electromagnetic Compatibility Directive 89/336 EEC**
- Standards:**
- **IEC 61496 - part 1** : Safety of machinery - Electrosensitive protective equipment - General requirements for tests.
- Safety level:** *Category 3 per EN 954-1*
- Legal Representative in Europe**
- | | |
|---|--|
| Place of issue: Meylan
Quality Manager: Patrick Goud | Date of issue : 20/04/98
General Manager: Jean-Pierre Sany |
| Signature:
 | Signature:
 |
- Issue nb:** 01

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Honeywell provides Servicing on this product through the following offices:

ASIA PACIFIC

Australia

Honeywell Limited
Tel: (61) 2-9353-7400
Fax: (61) 2-9353-7406
Toll Free 1300-36-39-36
Toll Free Fax: 1300-36-04-30

China - PRC

Honeywell China Ltd.
Tel: (86-10) 6595-6898
Fax: (86-10) 6591-3002

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Fax: (852) 2953-6767

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Honeywell Inc.
Tel: (91) 22-204-5827
Fax: (91) 22-640-9513

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Honeywell Indonesia
Tel: (622)1-521-3330
Fax: (622)1-384-8949

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Yamatake-Honeywell Co., Ltd
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Fax: (81) 466-20-2309

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Fax: (822) 792-9013

Malaysia

Honeywell Engineering Sdn Bhd
Tel: (603) 758-4988
Fax: (603) 758-8922

New Zealand

Honeywell Limited
Tel: (64-9) 623-5050
Fax: (64-9) 623-5060

Singapore / SE Asia Regional Offc.

Honeywell Southeast Asia Pte. Ltd.
Tel: (65) 249-0341
Fax: (65) 445-3033

Taiwan

Honeywell Taiwan Ltd.
Tel: (886-2) 245-1000
Fax: (886-2) 245-3242

Thailand

Honeywell Systems Ltd.
Tel: (662) 693-3099
Fax: (662) 693-3085

NORTH AMERICA

Canada

Honeywell LAD
Tel: 1-800-737-3360
Fax: 1-800-565-4130

USA

MICRO SWITCH Sensing and Control
International Headquarters
Tel: 1-800-537-6945
1-815-235-6847
Fax: 1-815-235-6545

EUROPE

Austria

Honeywell Austria GmbH
Tel: (43) 1-727-80-0
Fax: (43) 1-727-80-337

Belgium

Honeywell SA/NV
Tel: 32-2-728 2403
Fax: 32-2-728 2502

Bulgaria

Honeywell EOOD
Tel: (359) 2-79-40-27
Fax: (359) 2-79-40-90

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Honeywell spol. s r.o.
Tel: (42-2) 6112-3469/3424
Fax: (42-2) 6112 3461

Denmark

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Tel: 45 39-55-55-55
Fax: 45 39-55-55-58

Finland

Honeywell OY
Tel: (358) 0-3480101
Fax: (358) 0-34801375

France

Honeywell SA
Tel: (33) -1-60 19 80 40
Fax: (33) -1-60 19 81 73

Germany

Honeywell AG
Tel: 49- 69-8064-444
Fax: 49-69-8064-442

Hungary

Honeywell Kft.
Tel: (36) 1-252-6363
Fax: (36) 1-252-1541

MICRO SWITCH Centre

Honeywell Control Systems Ltd.
Tel: (44) 1698-481400
Fax: (44) 1698-481014

Italy

Honeywell S.p.A.
Tel: 39 (2) 92146 1
Fax: 39 (2) 92146 888

The Netherlands

Honeywell B.V.
Tel: (020) 565 69 11
Fax: (020) 565 66 00

Norway

Honeywell A/S
Tel: (47) 66-90-20-30
Fax: (47) 66-78 03 04

Poland

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Tel: (48) 642 2570
Fax: (48) 640 45 99

Portugal

Honeywell Portugal Lda
Tel: (35) 1 4172602
Fax: (35) 1 4172600

Romania

Honeywell Bucharest
Tel: (40) 1 2110076
Fax: (40) 1 2103375

Commonwealth of Independence States (CIS)

Honeywell-Sterch
Tel: (7-095) 140 4153
Fax: (7-095) 415 2976

Slovak Republic

Honeywell sro.
Tel: 42 (7) 5247 403/404
Fax: 42 (7) 5247 415

South Africa (Republic of)

Honeywell Southern
Honeywell S.A. Pty. Ltd
Tel: (27) 11 805-1201
Fax: (27) 11 805-1554

Spain

Honeywell S.A.
Tel: (34) 1- 320 21 12
Fax: (34) 1 -320 24 39

Sweden

Honeywell AB
Tel: (46) 8 775 55 00
Fax: (46) 8 775 56 00

Switzerland

Honeywell AG
Tel: (41) 1 839 25 25
Fax: (41) 1 831 03 14

United Kingdom

Honeywell Control Systems Ltd
Tel: (44) 1344 656000
Fax: (44) 1344 656015

Mediterran & Africa

Distributors & Turkey

Honeywell SpA
Tel: (39) 2 6773 532
Fax: (39) 2 6773 555

Middle East Headquarters

Honeywell Middle East Ltd.
Tel: (9712) 322530



Characteristics and dimensions of equipment listed in this manual are for reference only and are subject to change without prior notice.

Safety Mat Installation Manual

FF-SM Series
Safety Mat

PK 107007 Issue 1

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Important Information

Overview

Thank you for purchasing this Honeywell safety product. The FF-SM Series safety mat is a pressure sensitive protective device designed to detect an intruder inside a dangerous zone. This permanent self-checking device meets the highest standards of control reliability.

Organization of Installation Manual

This installation manual has the following sections:

- **Important Information** contains important highlighted information, the manual's organization, control reliability information, approvals, standards, regulations and directives.
- **Description and Operation** provides operation and specification information.
- **Installation** explains how to properly install safety mats.
- **Connections and Setup** covers electrical installation, interfacing and setup procedures.
- **Inspection and Maintenance** contains inspection, maintenance, and indicator status information.
- **Order Guides** provide catalog listings of mats, control unit boxes, accessories, and spare parts.
- **Warranty Information** provides important contact information related to sales and service.
- **Index** contains keywords and their associated pages related to topics found throughout this manual.

Important Highlighted Information

Important danger, warning, caution and notice information are highlighted throughout the manual as follows:

DANGER

A DANGER symbol indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.

WARNING

A WARNING symbol indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.

CAUTION

A CAUTION symbol indicates a potentially hazardous situation that, if not avoided, may result in property damage.

NOTICE

A NOTICE symbol indicates important information that must be remembered and aids in job performance.

Control Reliability

“Control Reliability” means that, “the device, system or interface shall be designed, constructed and installed such that a single component failure within the device, interface or system shall not prevent normal stopping action from taking place but shall prevent a successive machine cycle.” (ANSI B11.19-1990, 5.5)

OSHA 29 CFR 1910.217 states that, “the control system shall be constructed so that a failure within the system does not prevent the normal stopping action from being applied to the press when required, but does prevent initiation of a successive stroke until the failure is corrected. The failure shall be detectable by a simple test, or indicated by the control system.”

Honeywell has developed a self-checking technique that combines reliability with safety. The FF-SM Series mat functions with dual channel redundancy and positive self-check monitoring. This means that a faulty component in our product will make the safety mat fail in a safe mode.

This design meets the highest safety requirements (sensor : category 3 / control unit : category 4) described in the EN1760-1 and EN 954-1 European norms. Category 3 devices are designed and manufactured in such a way that a single breakdown does not lead to the loss of the safety function when a dangerous situation arises. Category 4 devices are designed and manufactured in such a way that a single breakdown or an accumulation of failures does not lead to the loss of the safety function when a dangerous situation arises.

The combination of both devices ensures the safety function is maintained on a permanent basis.

Approvals

Approvals	Description
CE Compliance with the EN1760-1 Standard (sensor : cat. 3 as per EN 954-1; control unit : cat.4 as per EN954-1)	Only the packaging and the documentation of FF-SM Series products carry the CE mark; the CE declaration of conformity is at the back of this manual
CSA NRTL/C	Canadian Standards Association - Nationally Recognized Testing Laboratory (NRTL)

Safety Mat Installation and Use

Installation and use of this product must be performed by a qualified person thoroughly familiar with all instructions contained within this manual and all applicable safety regulations including those described below.

European Directives Compliance

Directives	Number
Machine Directive	89/392 EEC
Low Voltage Directive	73/23 EEC
Electromagnetic Compatibility Directive	89/336 CEE

Conformity to European Directives

The EC type examination certificate granted by the French Institute National de la Recherche et de la Sécurité (INRS) guarantees the conformity of the product with respect to the essential requirements of the Machine 89/392 EEC and its successive amendments. To complete the EC type examination, further tests have been carried out by external laboratories to guarantee the conformity of the product with respect to the Low Voltage 73/23 EEC and the Electromagnetic Compatibility 89/336 CEE.

An EC declaration of conformity will be found at the back of this manual when this product has been CE approved.

European Standards Compliance

Regulation	Title
EN 292	Safety of Machinery - Basic concepts, general principles for design
EN 60204	Safety of Machinery - Electrical equipment of machines
EN 954	Safety of Machinery - Safety related parts of control systems
EN 1760	Safety of Machinery - Pressure sensitive protective devices
prEN 999	Safety of Machinery - The positioning of protective equipment in respect of approach speeds of parts of the human body
prEN 811	Safety of Machinery - Safety distances to prevent danger zones from being reached by the lower limbs

United States Regulations Compliance

Regulation	Title
OSHA 29 CFR 1910.212	General Requirements for (guarding of) All Machines
OSHA 29 CFR 1910.217	(Guarding of) Mechanical Power Presses

- Safety mats may be used as primary protection for machines where the movement of the functional parts can be interrupted at any moment in a dangerous phase.
- Safety mats may be used as primary protection for machines on which the control circuit has been designed in such a manner that a fault in one component does not result in any risk.
- Cancellation of the safety mat stop signal must not cause the restart of the moving parts. The function to restart can only be initiated by means of a control designed for this purpose.

United States Standards Compliance

Standards	Title
ANSI B11.19 - 1990	Safeguarding when Referenced by the Other B11 Machine Tool Safety Standards
ANSI/RIA R15.06 - 1992	Safety Requirements for Industrial Robots and Robot Systems

Additional Protection

In some applications, it may be necessary to provide additional protection to augment the protection provided by the safety mat. Hard guards or safety light curtains, combined with safety mats, may be used to ensure the operator is either forced to move through the sensing field to enter the danger zone, or forced to stand on the sensing mat inside the danger zone.

Hard guards may be installed permanently with the aid of a tool or welded (if possible). If hard guards need to be automatically positioned, their positioning must be checked. It must not be possible for operators to neutralize the detectors associated with these hard guards. Hard guards shall comply with the following European Standards:

Standards	Title
prEN 953	Safety of Machinery - General requirements for the design and construction of guards
EN 294	Safety of Machinery - Safety distances to prevent danger zones from being reached by the upper limbs
pr EN 811	Safety of Machinery - Safety distances to prevent danger zones from being reached by the lower limbs
EN 1088	Safety of Machinery - Interlocking devices with and without guard locking
EN 954	Safety of Machinery - Safety related parts of control system

Honeywell FF-SR Series safety control modules may be used as an interface between protective safety equipment and machine control circuitry. These products offer redundancy, monitoring, and control reliability features that ensure the highest level of industrial safety.

Honeywell safety switches and sensors that may be used to check the position of guards include:

- 50FY multi-sensor door interrupt safety system
- GSS safety limit switches
- GK and GKM key operated safety switches
- 24/924CE miniature safety limit switch

Safety light curtains used as additional protection must comply with the following European standards:

Standards	Title
EN 61496	Parts 1 & 2 - Safety of machinery- Electrosensitive protective equipment
EN 954	Safety of machinery - Safety related parts of control system
prEN 999	Safety of machinery - The positioning of protective equipment in respect of approach speeds of parts of the human body

Honeywell safety optoelectronic products that may be used with the safety mat and comply with European standards include:

- FF-SB safety light curtains
- FF-SCAN modular light curtains
- FF-SPS4 single beam safety device

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Description and Operation

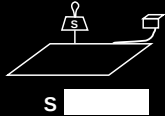
Overview

This section contains identification, theory of operation and specification information related to the safety mat system. The FF-SM Series product includes a safety mat, a control unit, fiber optic cables and an instruction manual.

Control Unit Identification (see figure 1-1)

Each control unit has one identification plate located on the front face of the control unit housing. The approval certifies that the product conforms to the technical examination endorsement issued by the listed notified body and is valid in Europe and associate countries.

Figure 1-1 Control Unit Identification Plate

FF-SM	TYPE		N			Honeywell
	V		T		Global response time (Sensor + control)	(F) 38240 Meylan
S	P		F		IP	
	I _{max} /V _{max}		NEMA			
EC type examination certificate delivered by Attestation d'examen CE de type délivrée par EG Baumusterprüfbescheinigung von			INRS		Made in France	
			EN 1760-1 Control: Category 4 according to EN 954-1 Sensor: Category 3 according to EN 954-1			

S : Detection sensitivity (≥ 30 kg)
Type : Product listing
V : Power supply voltage
P : Power consumption
F : Power supply frequency
I_{max}/V_{max} : Relay output switching capacity
N° : Serial code and date code (month and year)
T : Global response including safety mats (ms)
NEMA/IP : Sealing

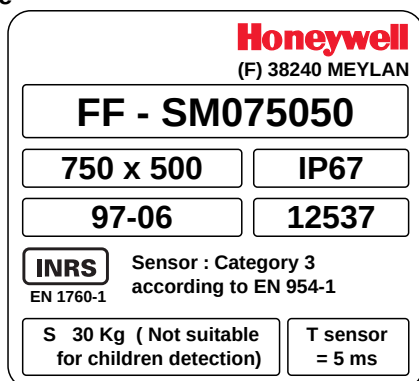
Mat Identification

Each mat has one rating plate located on the back side of the mat. The approval certifies that the product conforms to the technical examination endorsement issued by the listed notified body and is valid in Europe and other countries.

The rating plate (see figure 1-2) contains the following information:

- Catalog listing
- Size and sealing
- Date code (year - month) and serial code
- Approvals
- Detection sensitivity and response time of sensor (ms)

Figure 1-2 Mat Rating Plate



Theory of Operation

The FF-SM Series product is a pressure sensitive protective system designed to detect an operator inside a work area. This protective equipment will stop any dangerous machine motion when the safety mat is activated. The FF-SM Series has been designed in compliance with the EN 1760-1 European Standard (« Safety of machinery - Pressure sensitive protective devices - Part 1 : General principle for the design and testing of pressure sensitive mats and pressure sensitive floors »).

Safety Mat (sensor)

The sensor uses an **infrared modulated light** source spread by a **fiber optic cable** and operates in a **positive break** light mode. The presence of a load greater than 30 kg (66.1 lb.) on any point of the sensing surface will bend the mat's fiber optic cable. The loss in signal due to this bending de-energizes the control unit's positive guided output relays and initiates an emergency stop signal to stop the machine's dangerous movement.

Fiber optic technology allows longer connections than electrical wires. Up to five nitrile mats or four aluminum mats can be connected in series and monitored by one control unit.

Theory of Operation (cont'd)

Using fiber optic technology, the safety mat is designed to be immune to electromagnetic disturbances.

A **load distributor** is part of the sensor mechanics and **protects the sensing surface from damage** caused by the falling of heavy objects (such as a 5 kg (11 lb.) steel sphere dropped from a 1 m (3.3 ft) height). Due to the mechanical structure of the sensor, the safety mat is resistant to occasional overloads due to fork lift trucks, and features an exceptional life expectancy when used in normal conditions.

The available industrial mat surface coatings provide excellent chemical resistance. This sensor (mat), with its **IP 67 (NEMA 6) sealing rating**, may be **used in the food and beverage industry**.

The design of this safety mat (sensor) complies with the requirements of the EN 954-1 European standard for **category 3 protective equipment**.

Control Unit

The control unit operates in an **automatic restart mode** (the machine operating condition is restored after power up and after any actuation and de-actuation of the mat sensor). In this mode another part of the safety control circuitry (for instance, Honeywell's safety control modules) must keep the latched function engaged in a safe way.

The control unit has **two safety relays with positive guided contacts** that can be directly used to stop the dangerous movement. However, for most applications, additional safety control modules or safety relays sometimes called Final Switching Devices (FSDs) are necessary between the control unit safety outputs and the machine control circuitry.

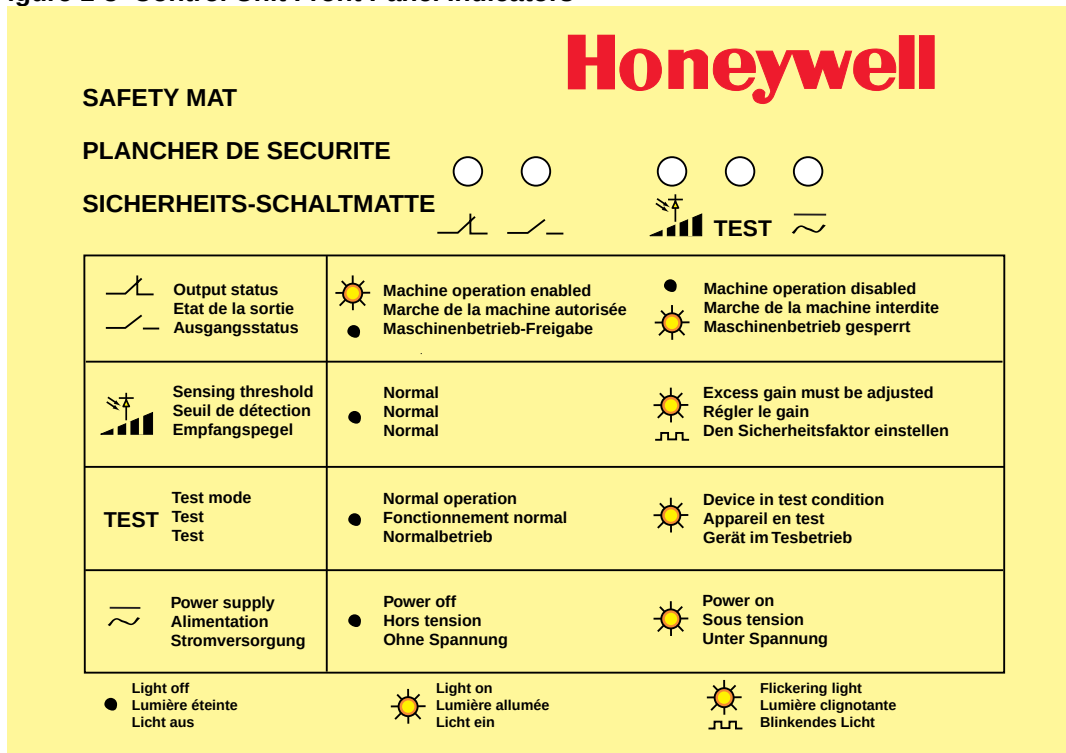
The control unit complies with EN 954 (Safety Related Parts Of Control System) for **category 4 protective equipment based on its permanent self-checking** principle.

A test input is also available on the control unit. The test input allows an operator to set the equipment in an alarm condition for test purposes. This function simulates an activation of the protective equipment and allows external circuitry to check the correct operation of the external machine control circuitry (external relays, etc.).

Theory of Operation (cont'd)

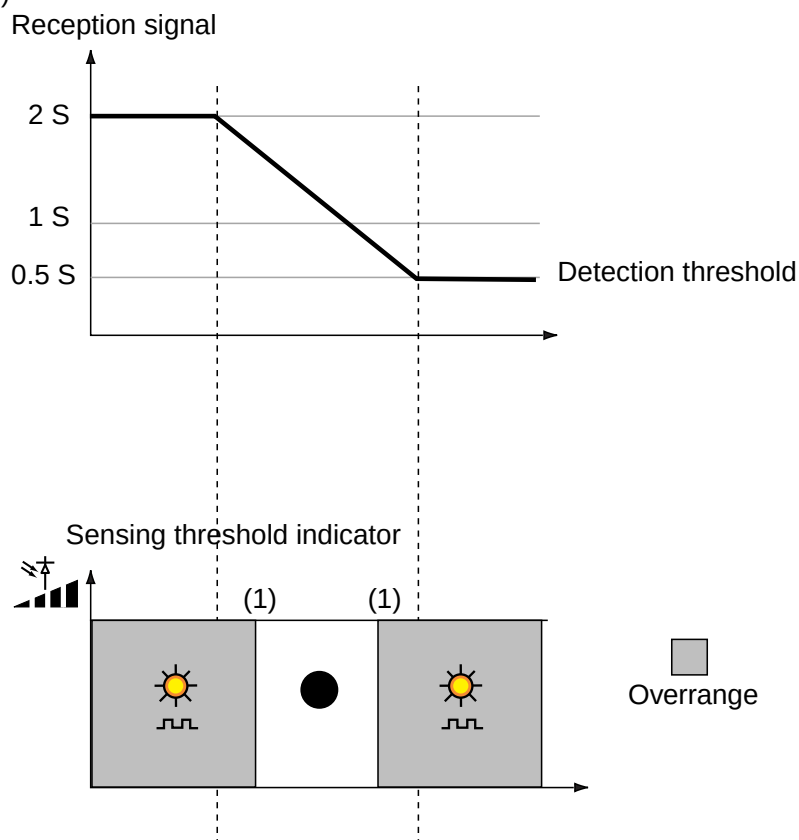
Control unit LED indicators provide visual information related to equipment status during installation and operation. The five light emitting diodes (LEDs) located on the front panel of the control unit are illustrated and described in figures 1-3 and 1-4.

Figure 1-3 Control Unit Front Panel Indicators



The sensing threshold indicator flickers when the signal drift becomes high (see figure 1-4).

Figure 1-4 FF-SM Series Operation Diagram (reception signal/output status and sensing threshold indicator)



(1) The sensing threshold indicator flickers when the signal drift becomes high : an adjustment is then necessary.

Mat Specifications

MAT CHARACTERISTICS	
Meets applicable parts of	EN 1760-1 and EN 954-1 standards; ANSI B11.19 - 1990 standard; ANSI/RIA 15.06 - 1992 standard; OSHA 1910.212, 217 regulation
Compliance	Type 3 per pr EN 954-1
Detection sensitivity	30 kg (66.1 lb.)
Number of operations	Tested to six million operations with a 80 mm (3.1 in) dia. cylinder, 75 kg (165.3 lb.) force applied at the same location
Shock resistance	Fifty joules, the energy released by the falling of a 5 kg (11 lb.) steel sphere dropped from 1 m (3.3 ft)
Overload resistance	Resistant to fork lift trucks; tested with a 200 mm (7.9 in) dia. cylinder, 500 kg (1102.3 lb.) force applied at various locations
Mat Surface coating	Aluminum plate: welding splash resistant, 3 mm (0.1 in) thickness Nitrile (rubber): oil resistant, 5 mm (0.2 in) thickness
Operating temperature	0° C to 55° C (32° F to 131°F)
Thickness	< 20 mm (0.79 in)
Weight	Aluminum: 27 kg/m ² (5.5 lb/ft ²) Nitrile: 23 kg/m ² (4.6 lb/ft ²)
Sealing	Mat: IP 67 (NEMA 6) ST connectors: IP 60
Control unit connection	A fiber optic cable equipped with two ST connectors (5 m cable length, PVC sheath)
Reference floor mounting	Placed on reference floor and secured by edge trim and double face adhesive tape; or embedded in the reference floor
Serial connection	Aluminum: Up to four mats per control unit Nitrile: Up to five mats per control unit

MAT CHEMICAL RESISTANCE CHARACTERISTICS		
Coating	Aluminum (metal)	Nitrile (rubber)
Chemical Resistance		
Hydrocarbons		excellent
Aromatic solvents	excellent	poor
Chlorinated solvents		poor
Aliphatic hydrocarbons		excellent
Acetone	excellent	extremely poor
Animal oils		excellent
Vegetable oil		excellent
Water (absorption)	excellent	good
Dilute acid	excellent	poor
Concentrated acid		poor
Bases		excellent

Control Unit Specifications

CONTROL UNIT CHARACTERISTICS	
Compliance	Type 4 per pr EN 954-1; ANSI B11.19-1990
Supply voltage	120 Vac (+ 10%, - 20%)
	240 Vac (+ 10%, - 20%)
	24 Vdc ($\pm$ 15%)
Frequency	50 to 60 Hz
Power consumption	6 VA / 9 W
Response time	25 ms
Connection	Snap-in clips for electrical wires
	ST connectors for fiber optic cables
Fastener	M5 screws (4 ea.)
Weight	3,6 kg (7.9 lb.)
Sealing	IP 65, NEMA 4 and 13
Dimensions	238 x 203 x 100 (cable glands and reducer included)
Electrical noise immunity	According to IEC 801-4; level IV (VAC) or level III (VDC)
Outputs	2NO+1NC (two safety relays with positive guided contacts, 2A/250 Vac, 50 mA min.)
Functions	Test input; automatic restart

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Installation

Overview

This section contains safety mat information related to machine guarding, point-of-operation guarding, safety distance, connection considerations, configuration considerations and mounting dimensions. A complete FF-SM Series safety mat system includes a mat, a control unit, and some accessories such as cable extensions, connecting boxes and edge trim.

DANGER

- **FULL REVOLUTION MECHANICAL POWER PRESSES CANNOT BE STOPPED IN MID-STROKE (OSHA 29CFR 1910.217).**

- Do NOT use FF-SM Series safety mats on full revolution mechanical power presses.

Failure to comply with these instructions will result in death or serious injury.

DANGER

IMPROPER USE OF THE FF-SM SERIES SAFETY MAT

- The 30 kg sensitivity of the FF-SM Series safety mats is suitable for the detection of adults weighing more than 35 kg according to the EN1760-1 European standard.
- Do NOT use FF-SM Series safety mats in public places where children may have to be detected.
- Use of an additional protective sheet laid on the safety mat (sensor) surface is forbidden since it may alter the 30 kg sensitivity.

Failure to comply with these instructions will result in death or serious injury.

WARNING

IMPROPER INSTALLATION

- Install FF-SM safety mats in accordance with this installation manual and applicable local safety regulations and standards (OSHA, ANSI, European standards).
- Allow entry into protected area by activation of sensing zone or other safeguarding device only.

Failure to comply with these instructions could result in death or serious injury.

WARNING

IMPROPER SYSTEM PERFORMANCE

- Comply with local safety requirements when designing machine control circuitry and all control elements that affect safety.
- Use two independent stop circuit safety relays with mechanically linked contacts to reliably detect a welded contact.
- Install two independent safety relay contacts into machine control stop circuit monitored by machine control circuitry.

Failure to comply with these instructions could result in death or serious injury.

WARNING

IMPROPER MACHINE REACTION

- Ensure the machine control is capable of stopping the machine at any point in the cycle.
- Ensure that a loss of power does NOT impair stopping action of the machine.

Failure to comply with these instructions could result in death or serious injury.

Machine Guarding Protection

WARNING

IMPROPER MACHINE GUARDING PROTECTION

- Refer to and comply with pr EN 999 and ANSI standards when calculating safety distances.
- Design a large enough sensing zone of safety mat(s) to ensure an operator cannot reach a dangerous machine operation before it can be stopped.
- Ensure operator detection is effective for the entire sensing zone.
- When using FF-SM Series safety mats for point-of-operation guarding, DO NOT allow an operator to stand undetected between the safety mat and dangerous machine operation.
- If safety mat location allows possible access to dangerous machine operation, install additional protective safety equipment.
- To prevent safety mat removal and possible operator injury, secure the safety mat to the ground using edge trim.
- Clearing the sensing zone must not start dangerous machine operation. When restarting machine operation, a normal machine control start sequence must be used.
- Ensure the location of the manual restart function is outside of the danger zone and provides the operator with a clear view of the zone.
- Ensure each safety mat activation immediately stops machine operation within the response time of the components.
- Ensure the control unit status indicators operate properly and are visible from the dangerous area.

Failure to comply with these instructions could result in death or serious injury.

FF-SM Series safety mats are contact machine guarding devices designed to increase the protection of operators of power driven machinery. The safety mat is designed for zone and point-of-operation machine guarding protection of dangerous machine areas.

The FF-SM Series safety mat will generate a stop signal if the mat is actuated. Further operation is prevented until the mat is clear. The FF-SM Series safety mat monitors itself continuously for component failures.

FF-SM Series safety mat is designed so that a malfunction or an actuation of the mat will cause the control unit to generate a stop signal. This stop signal is generated automatically if a malfunction occurs in the mat or control unit. All other machine control components that affect safety shall be designed to the same high level of safe operation.

Point-of-operation Guarding

DANGER

IMPROPER POINT-OF-OPERATION INSTALLATION.

- DO NOT allow an operator to stand undetected between the safety mat and the machine when using FF-SM Series safety mats for point-of-operation guarding.
- Ensure a manual restart function is required before further machine operation can occur.
- Ensure the location of the manual restart function provides the operator with a clear view of the danger zone.
- Ensure a Programmable Logic Controller cannot override a manual restart function.

Failure to comply with these instructions will result in death or serious injury.

Point-of-operation is defined as that area where a machine performs work (such as cutting, shaping, boring, or forming) on a material. For point-of-operation guarding the safety mat(s) and any mechanical guards must be installed so no one can stand undetected between the mat and the dangerous machine zone. Additional hard guarding, or mats may be required.

Safety Distances

WARNING

IMPROPER SAFETY DISTANCE

- Calculate safety distance using formula $D_s > V(t_1 + t_2) + C$ where:
 - ⇒ D_s is the safety distance OSHA 29 CFR 1910.217; ANSI B11.19-1990
 - ⇒ V is the approach speed constant of 63 inches per second
 - ⇒ t_1 is the response time of the FF-SM safety mat
 - ⇒ t_2 is the stopping time of the machine including interconnected components such as relays, solenoids, and brakes
 - ⇒ C is the additional safety distance (obtained from your local safety agency).

Failure to comply with these instructions could result in death or serious injury.

The safety distance is the **minimum** distance between the sensing zone and the danger zone. This distance ensures that the dangerous machine area cannot be reached until the machine motion has been stopped. The average operator has a reach of about 66 to 84 inches. For mat control, the safety distance should be increased by the maximum reach of the operator.

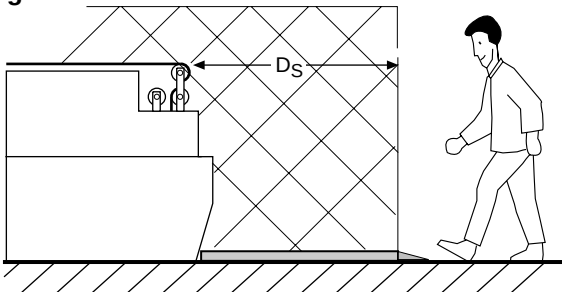
Determine the dimensioning and position of the safety mats in such a way that access to the hazardous parts of the machine is impossible without safety mat activation. The ANSI B11.19 1990 standard provides a formula for the calculation of the **minimum** safety distance between the dangerous point and the external edge of a safety mat. Compliance with this formula ensures machine movement will stop before the operator can reach the dangerous machine area.

Calculate the safety distance using the following formula:

FLOOR MOUNTING SAFETY DISTANCE FORMULA

$D_s \geq V(t_1 + t_2) + C$	US (in)	EUROPE (mm or in)
Standards	ANSI B11.19-1990 E44.33.1	prEN 999
D_s = minimum safety distance	application dependent	application dependent
V = approach speed	63 in/sec	1600 mm/sec or 63 in/sec
t_1 = response time of the safety mat	0.025 sec	0.025 sec
t_2 = stopping time of the machine (sec)	application dependent	application dependent
C = additional distance	66 to 84 in	1200 mm or 47.3 in

Figure 2-1 Floor Mounting



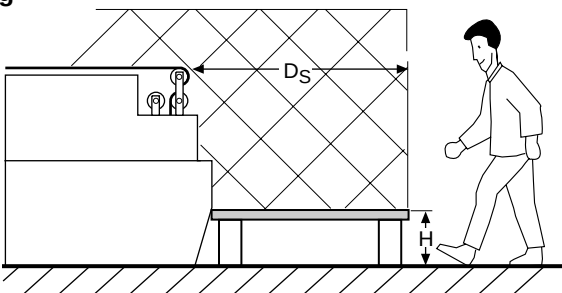
Floor Mounting Safety Distance Formula (European/US)

$D_s \text{ mm} \geq 1600(t_1 + t_2) + 1200 \text{ (European)}$

$D_s \text{ in} \geq 63(t_1 + t_2) + C$, where C is between 66 to 84 inches (US)

Note: Ensure hardguarding protection is installed on the rear face and on both sides.

Figure 2-2 Step Mounting



Step Mounting Safety Distance Formula (European)

$D_s \text{ mm} > 1600(t_1 + t_2) + (1200 - 0.4H)$ or

$D_s \text{ in} > 63(t_1 + t_2) + (47.3 - 0.4H)$, where:

D_s = minimum safety distance (mm or in)

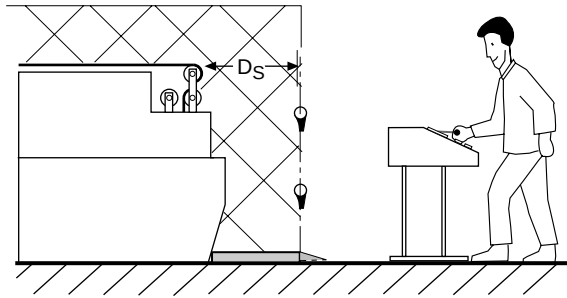
t_1 = response time of the safety mat (sec)

t_2 = stopping time of the machine (sec)

H = height of the platform (mm or in)

Note: Ensure hardguarding protection is installed on the rear face and on both sides.

Figure 2-3 Combined Protective Devices



⌚ : multi-beam trip device for access control.

Combined Protective Devices Safety Distance Formula (European)

$$D_s \text{ mm} > 1600(t_1 + t_2) + 850 \text{ or}$$

$$D_s \text{ in} > 63(t_1 + t_2) + 33.5, \text{ where:}$$

D_s = minimum safety distance (mm or in)

t_1 = response time of the multi-beam trip device (sec)

t_2 = stopping time of the machine (sec)

Note: Ensure hardguarding protection is installed on the rear face and on both sides.

⚠ WARNING

IMPROPER INSTALLATION OF COMBINED MAT AND MULTI-BEAM TRIP DEVICES

- Ensure the operator cannot stand between the machine and the sensing zone without activating the safety mat.
- Ensure the operator cannot cross the safety mat without activating the multi-beam trip devices.

Failure to comply with these instructions could result in death or serious injury.

If zone guarding protection is required, and the machine stopping time is too long in duration to allow the use of a safety mat alone, use a mat with a multi-beam trip device.

Safety Distance Example One (Point-of-operation Guarding)

Point-of-operation is defined as that area where a machine performs work (such as cutting, shaping, boring, or forming) on a material.

⚠ DANGER**IMPROPER POINT-OF-OPERATION PROTECTION**

Install the FF-SM Series safety mats and mechanical guards so that NO person can stand between the safety mat and the danger zone without being detected.

Failure to comply with these instructions will result in death or serious injury.

Country: USA
Application: Mechanical or hydraulic power press
Protection: Point-of-operation guarding
Formula: $D_s \geq V(t_1 + t_2) + C$

$V = 63 \text{ in./sec.}$

$t_1 = 0.025 \text{ sec (FF-SM)}$

$t_2 = 0.200 \text{ sec (machine stop time; including the response time of all interconnected components, such as relays, solenoids, brakes, etc.)}$

$C = 66 \text{ in. (ANSI B11.1 and ANSI B11.2) [FF-SM]}$

$D_s = 63 (0.025 + 0.200) + 66 \text{ in.} = 80.18 \text{ in.}$

Safety Distance Example Two (Zone Guarding) with Combined Protective Devices

WARNING

IMPROPER MACHINE GUARDING PROTECTION

- DO NOT allow an operator to stand undetected between the safety mat and the machine when using FF-SM Series safety mats for point-of-operation guarding.
- Ensure the machine control circuitry is designed in such a way that a malfunction of a component still allows correct operation of the control circuitry but prevents next cycle activation.
- Ensure a manual restart function is required before further machine operation can occur.
- Ensure the location of the manual restart function provides the operator with a clear view of the danger zone.
- Ensure a Programmable Logic Controller cannot override a manual restart function.
- Ensure each safety mat activation immediately stops machine operation within the response time of the components.
- Ensure clearing the sensing zone does not start machine operation.
- Ensure the application of electrical power does not initiate machine operation after a cycle interruption. Ensure it is necessary to initiate machine operation using a normal control sequence.
- Ensure additional safety devices (those used for other functions of the machine) work correctly.

Failure to comply with these instructions could result in death or serious injury.

Country: Europe
 Application: Robotics
 Protection: Zone guarding
 Formula: $D_s \geq V(t_1 + t_2) + C$

$V = 1600 \text{ mm/sec}$ (or 63 in./sec)

$t_1 = 0.025 \text{ sec}$ (FF-SM)

$t_2 = 0.200 \text{ sec}$ (robotics stop time, including the response time of all interconnected components, such as relays, solenoids, brakes, etc.)

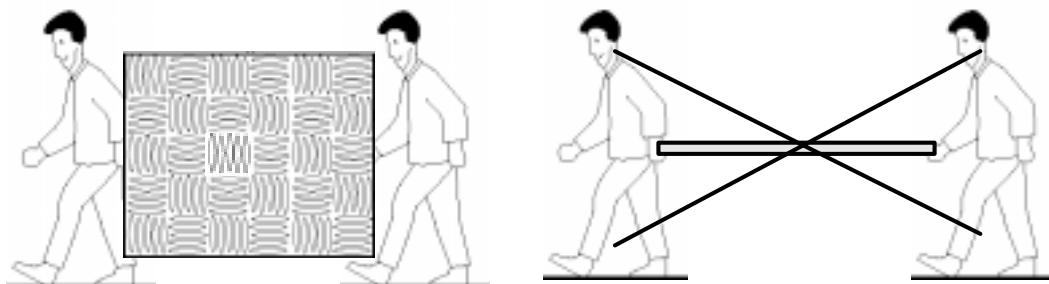
$C = 1200 \text{ mm}$ (or 47.3 in.) (Europe)

$D_s = 1600 (0.025 + 0.200) + 1200 = 1560 \text{ mm}$ (or 63 (0.025+0.200)+ 47.3 = 61.47 in.)

Use and Installation Considerations

Transport and Storage

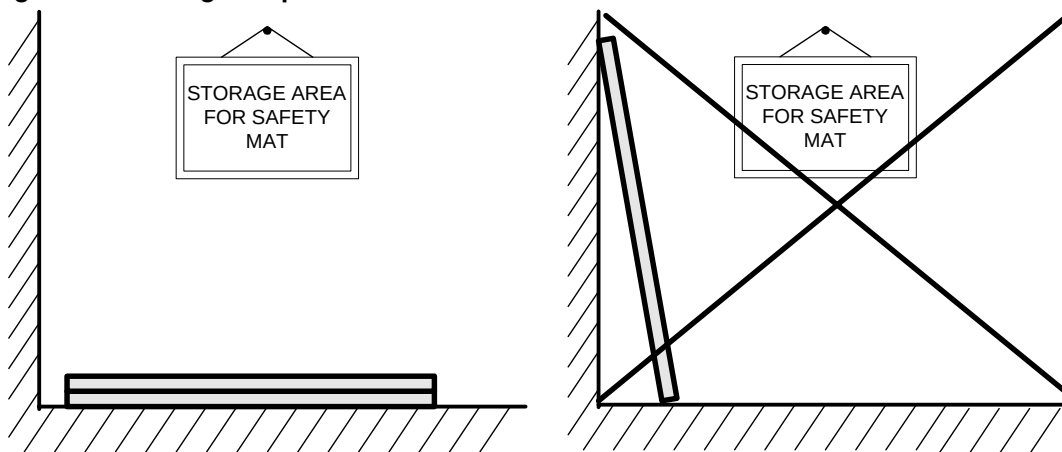
Figure 2-4 Transport Requirement

**CAUTION****SENSOR (MAT) DAMAGE**

- Always transport the safety mat in a vertical position (see figure 2-4).
- Always store the safety mats in a horizontal position (see figure 2-5).
- Never fold the safety mat.

Failure to comply with these instructions will result in product damage.

Figure 2-5 Storage Requirement



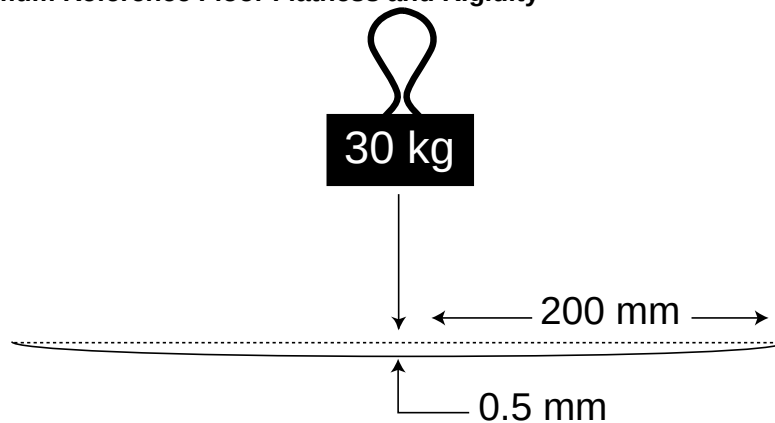
Reference Floor Flatness and Rigidity Considerations

Like all pressure sensitive devices, the response of the mat depends on the surface on which it lays. Ideally, the safety mat should be laid on a flat, rigid, hard and smooth reference floor. The coating on the bottom of the mat (sensor) can absorb some irregularities of the floor, such as particles of a diameter of less than 1 mm (0.04 in). If significant floor irregularities exist, place a 2.5 mm (0.10 in) thick piece of sheet metal under the mat to ensure a constant response on the whole mat surface. The flatness of the floor must be lower than 5 mm (0.20 in) per meter (3.28 ft) without taking into account the irregularities.

NOTICE

If a floor is not rigid, strengthen the rigidity of the surface so the maximum allowed bending shall be 5 mm (0.20 in) under 30 kg (66.1 lb.) with a 200 mm (7.87 in) radius. See figure 2-6.

Figure 2-6 Maximum Reference Floor Flatness and Rigidity

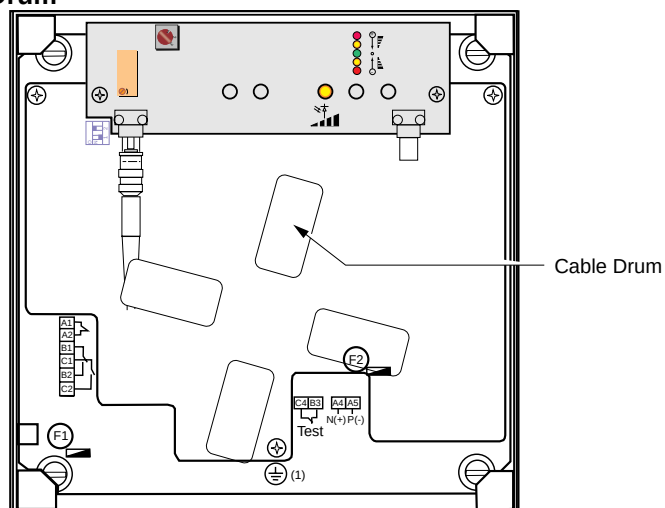


Fiber Optic Cable Considerations

The connection of the safety mat to the control unit is made with a fiber optic cable pair and two ST optical connectors. The handling of the fiber optic cables and the optical connectors requires special attention. The fiber optic cable pair is protected by a rigid PVC sheath and is resistant to sectioning and traction. Resistance of the cable is strengthened by a protective sleeve located where the cable exits the safety mat. Another sleeve tube is installed on the other end tip of the fiber optic cable. This sleeve tube must be used with the cable gland of the control unit to ensure IP65 (NEMA 4) control unit sealing. Do not bend the optical cable too much to prevent significant signal attenuation. A minimum bending radius of 30 mm (1.18 in) is recommended.

The control unit and connecting box are equipped with a cable drum (see figure 2-7). This drum stores excess cable and ensures the recommended 30 mm (1.18 in) minimum bending radius.

Figure 2-7 Cable Drum



CAUTION

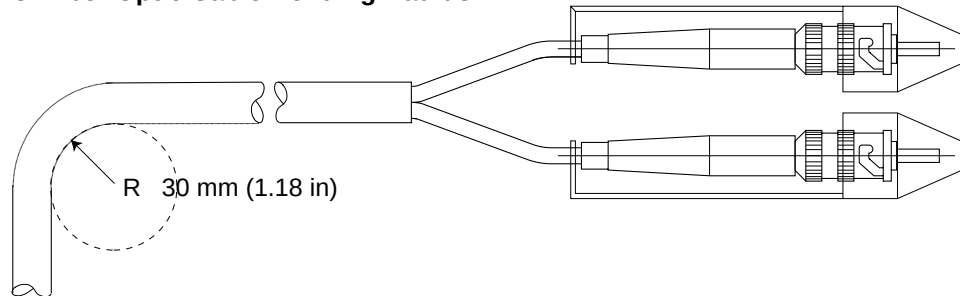
FIBER OPTIC CABLE DAMAGE

- Do not cut the fiber optic cable. Roll the excess cable around the cable drum of the control unit (or connecting box).
- Do not trap the fiber optic cable with the trim edges.
- Do not lay the safety mat down on the fiber optic cable.

Failure to comply with these instructions will result in product damage.

The openings, cable ducts, and chutes must be dimensioned so that the fiber optic cable and connectors can run easily through them. The cable ducts and chutes should comply with the minimum recommended bending radius of 30 mm (1.18 in). See figure 2-8 below.

Figure 2-8 Fiber Optic Cable Bending Radius



Connector Considerations

Two ST connectors are used to connect the safety mat to the control unit. These circular metal connectors provide IP60 sealing (dust proof) and feature good mechanical resistance.

CAUTION

CONNECTOR DAMAGE

Make fiber optic connections inside the control unit or connecting box to ensure proper IP sealing (of connectors) and protection from mechanical damage.

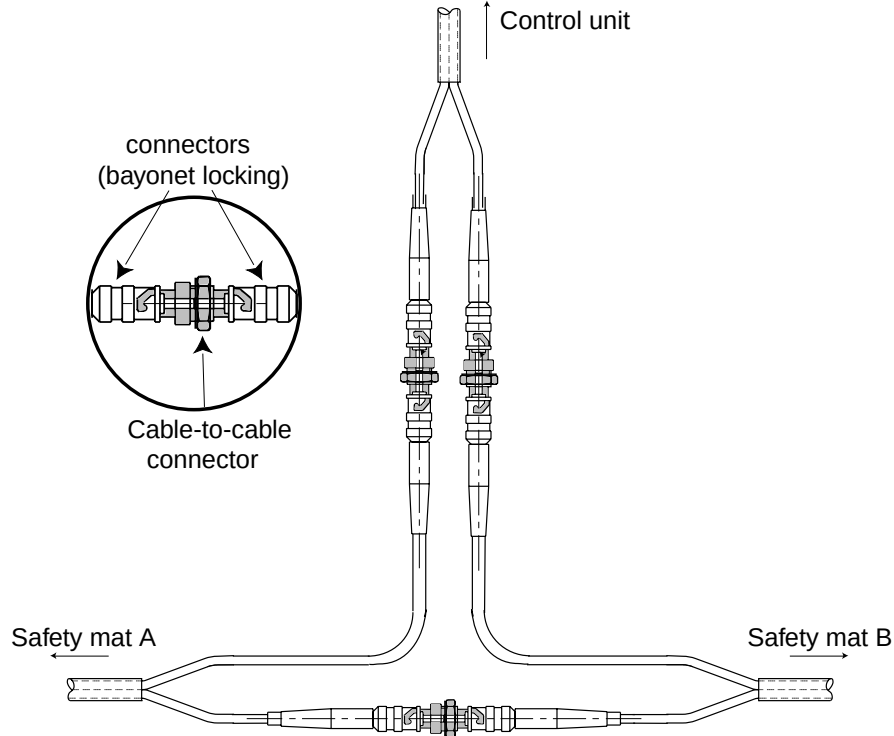
Failure to comply with these instructions will result in product damage.

If a fiber optic cable extension is necessary, or if several safety mats must be connected together, one or more ST cable-to-cable connectors must be used to interconnect the cables (order the FF-SMZ175196 kit for a pair of cable-to-cable connectors). See figures 2-9 and 2-10. All fiber optic connectors (including the two optoelectronic components inside the control unit) are equipped with rubber caps. See figure 2-11. Place the rubber caps on the fiber optic connectors each time the connectors are disconnected. The caps will prevent dust accumulation on the end tips of the cables.

NOTICE

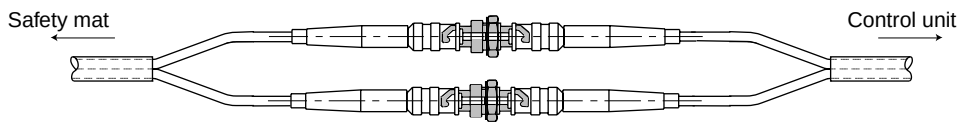
Do not touch the fiber optic end tips with fingers to prevent dramatically altering the optical signal. If end tips are dirty, clean with lens paper soaked with alcohol.

Figure 2-9 Cable Extension Between Two Mats



A cable extension is used to connect two safety mats to the control unit. Using either the connecting box or heat shrinkable sleeves will improve connector protection.

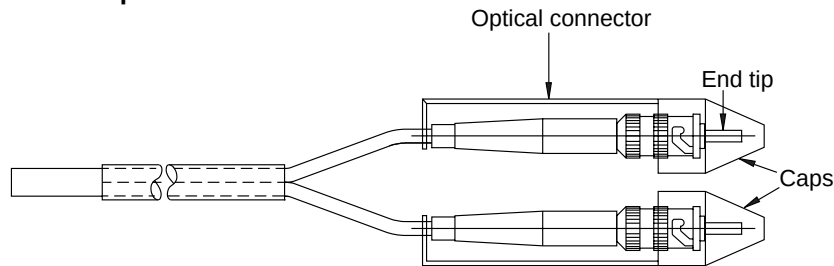
Figure 2-10 Cable Extension Single Mat



Cable extension used to connect a single safety mat to a control unit. Use either the connecting box or heat shrinkable sleeves to improve the connector's protection.

All of the fiber optic connectors (including the two optoelectronic components inside the control unit) are equipped with rubber caps. Place the caps on the connectors each time the connectors are disconnected to avoid dust accumulation on the fiber optic cable end tips.

Figure 2-11 Fiber Optic Connector Protection



Safety Mat Installation

On Floor Installation

If the safety mat is installed on the floor, EN 1760-1 European standard requires mandatory use of edge trim all around the accessible periphery of the sensing zone. ANSI states that "... the mat should be fixed in place in such a manner so as to prevent easy relocation or removal by the operator or other unauthorized personnel." (ANSI B11.19-1990) These edges prevent people from stumbling over the safety mat and keep the mat in position. Edge trim is delivered as 3 m (9.84 ft) strips and must be cut to length based on application requirements. Edges must be cut so the fiber optic connectors and cables can be easily installed. Ensure the fiber optic cable is not trapped along the cable duct. A gap of 1.5 mm (0.06 in) shall be between the safety mat and the trim edge to avoid any edge stress. See figure 2-12 below.

⚠ DANGER

IMPROPER USE OF THE FF-SM SERIES SAFETY MAT

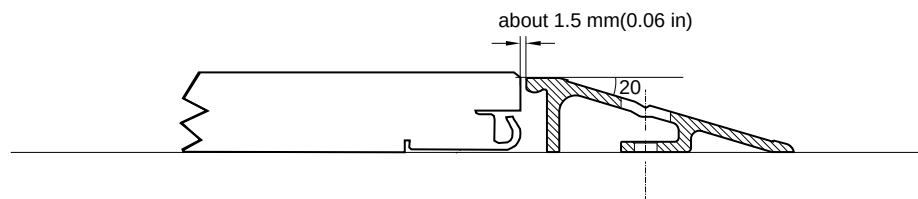
- The 30 kg sensitivity of the FF-SM Series safety mats is suitable for the detection of adults weighing more than 35 kg according to the EN1760-1 European standard.
- Do NOT use FF-SM Series safety mats on public places where Children may have to be detected.
- Use of an additional protective sheet laid on the safety mat (sensor) surface is forbidden since it may alter the 30 kg sensitivity.

Failure to comply with these instructions will result in death or serious injury.

NOTICE

Before cutting the edge trim, add 3 mm (0.12 in) to the width and length dimensions of the mat to obtain the correct trim dimensions. This additional length is to accommodate for the 1.5 mm (0.06 in) gap needed to avoid any stress on the mat edge.

Figure 2-12 On Floor Installation Using Trim Edges (FF-PSZS1030)



Double face adhesive tape (TESA Ref. 4952) may be used to affix the safety mat to the reference floor.

In Floor Installation

If the safety mat is embedded into the floor, edge trim is not required. To avoid edge stress, a gap of about 1.5 mm (0.06 in) must exist between the safety mat and the edge of the flush fitting. See figure 2-13 below.

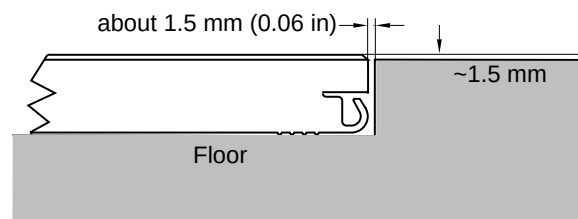
 **DANGER**

IMPROPER USE OF THE FF-SM SERIES SAFETY MAT

- The 30 kg sensitivity of the FF-SM Series safety mats is suitable for the detection of adults weighing more than 35 kg according to the EN1760-1 European standard.
- Do NOT use FF-SM Series safety mats in public places where children may have to be detected.
- Use of an additional protective sheet laid on the safety mat (sensor) surface is forbidden since it may alter the 30 kg sensitivity.

Failure to comply with these instructions will result in death or serious injury.

Figure 2-13 In Floor Installation



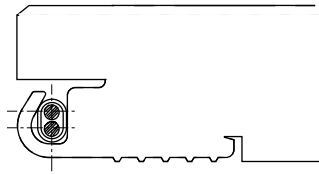
Double face adhesive tape can be used to affix the safety mat on the reference floor. The TESA Ref. 4952 adhesive tape can be used for this purpose.

Fiber Optic Cable Connections

The fiber optic cable exits the safety mat at the mid-point of the mat length. All safety mats are equipped with a peripheral cable duct to allow fiber optic cable exit alternatives during installation. The protective sleeve of the cable duct is designed to bend as required to allow the cable to fit completely into the duct. This feature allows easy installation of two safety mats in a side-by-side configuration. See figure 2-14.

The rigid PVC sheath and protective sleeve allow bending of the fiber optic cable at exits and corners of the safety mat while ensuring protection.

Figure 2-14 Cable Duct



The fiber optic cable pairs must be protected against damage. The openings, cable ducts, and chutes must be dimensioned so that the fiber optic cable and connectors can be installed into them with ease. The cable duct and chutes must comply with the minimum recommended bending radius of 30 mm (1.18 in).

CAUTION

FIBER OPTIC CABLE DAMAGE

- Do not trap the fiber optic cable with the trim edges.
- Do not lay the safety mat down on the fiber optic cable.

Failure to comply with these instructions will result in product damage.

NOTICE

Fiber optic cables and power cables from other sensors may be installed in the cable duct together without disturbing the operation of the safety mat.

Serial Connection of Several Safety Mats

Area Controlled by Several Safety Mats via a Single Control Unit

⚠ WARNING

IMPROPER ACCESS GUARDING

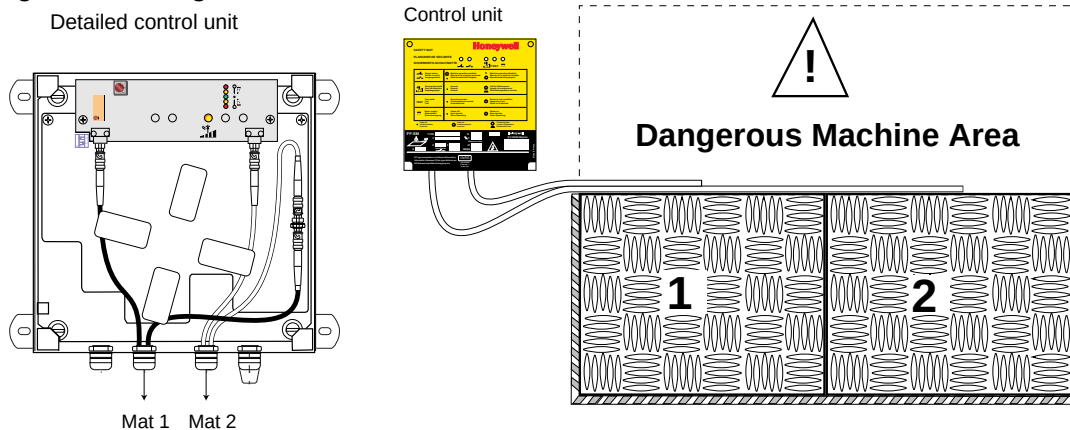
When using safety mats, install additional hard guarding to protect the sides of the dangerous machine area.

Failure to comply with these instructions could result in death or serious injury.

According to ANSI B11.19 - 1990, the safety mat device shall be of sufficient size and located such that an individual cannot reach the recognized hazard before hazardous motion of the machine has ceased. This may require the use of more than one safety mat or additional safety protective equipment. This product's use of fiber optic technology allows the covering of a larger detection zone using several mats connected in series via a single channel control unit. The following configurations are possible:

- Protection of a **single zone** with two mats operated by a single control unit (figure 2-15)
- Protection of **several zones** with more than two mats operated by a single control unit **using a connecting box** (figure 2-16)

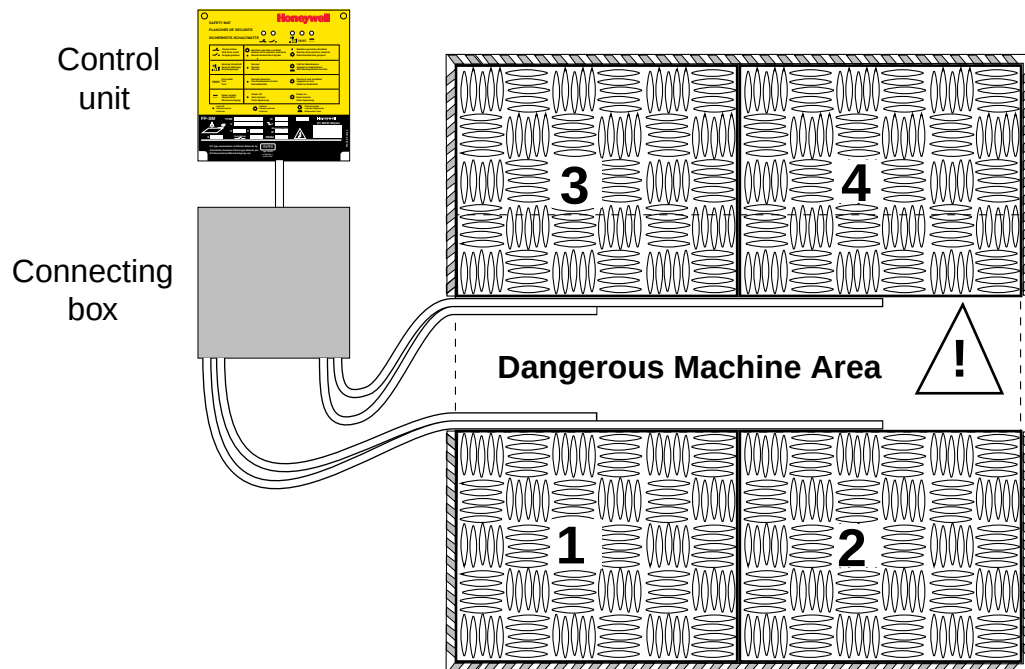
Figure 2-15 Single Zone Protection



Serial connection of two safety mats inside a control unit.

Figure 2-16 Several Zone Protection (with connecting box)

⚠ WARNING
IMPROPER ACCESS GUARDING
When using safety mats, install additional hard guarding to protect the sides of the dangerous machine area.
Failure to comply with these instructions could result in death or serious injury.



Serial connection of more than two safety mats requires the use of an additional connecting box.

Determining the Number of Safety Mats Controlled by a Control Unit

The maximum number of safety mats used with one control unit depends on the mat surface coating. See below.

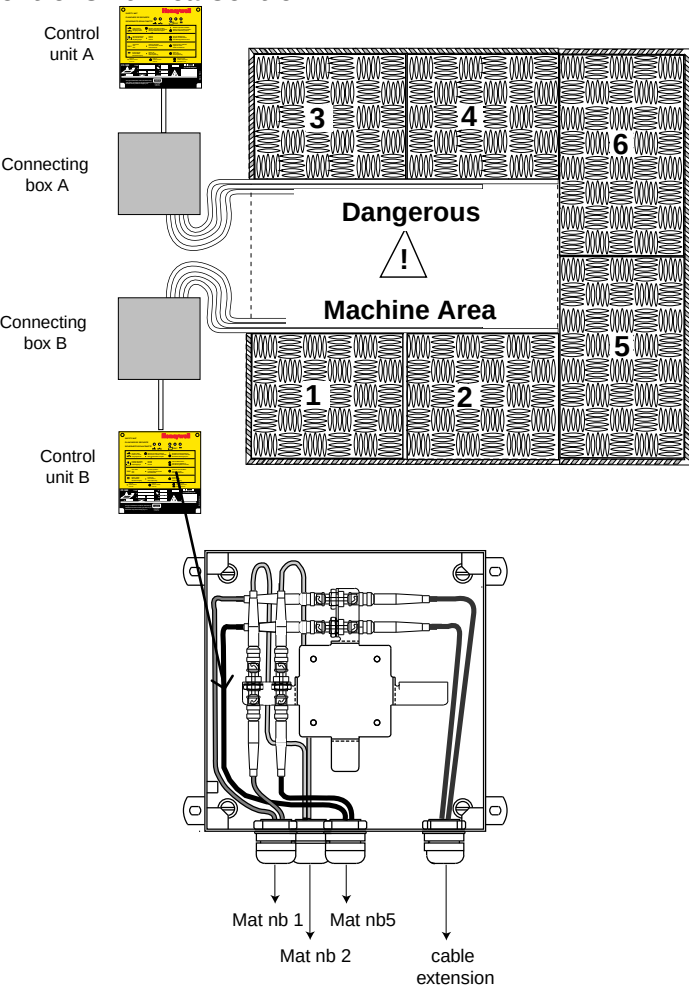
Aluminum (metal)	Up to 4 mats with a standard size of up to 6 m² (65 ft²) per control unit.
Nitrile (rubber)	Up to 5 mats with a standard size of up to 7.5 m² (81 ft²) per control unit.

If the number of mats necessary to cover an area exceeds these quantities, use more than one control unit.

Area Controlled by Several Safety Mats Run by Several Control Units

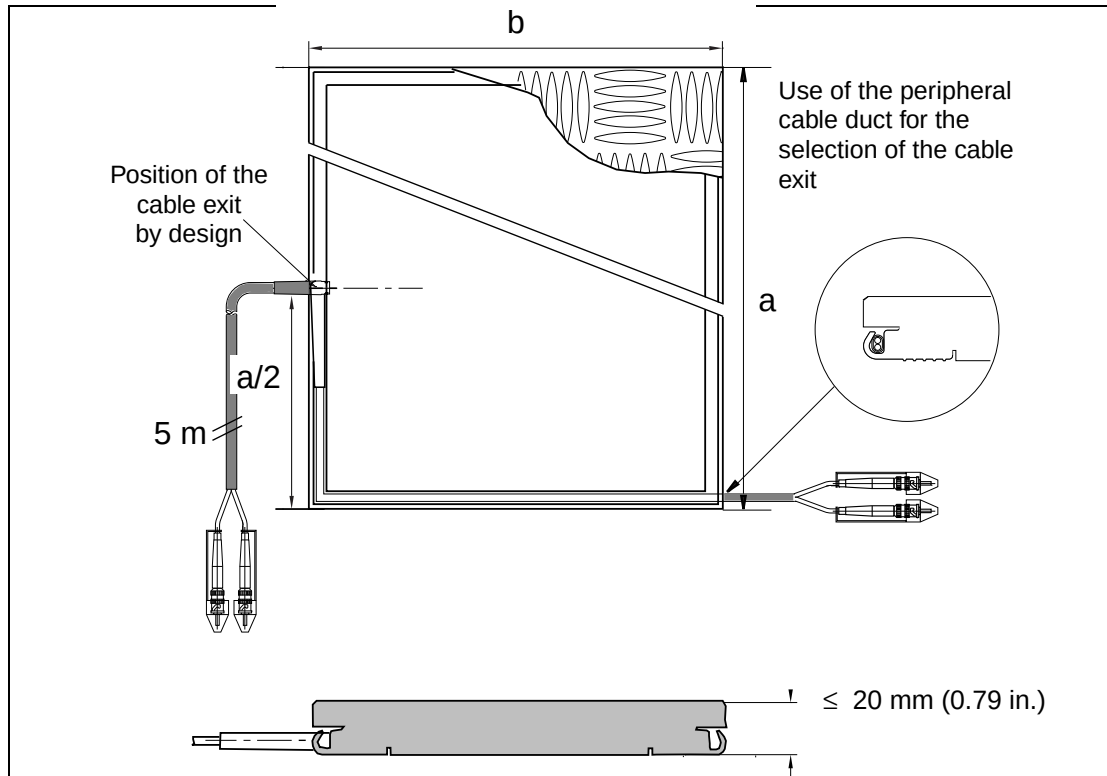
When the total surface to be covered is larger than the maximum recommended surface per control unit, use several control units. See figure 2-17. Refer to the Connections and Setup section of the manual for proper interface to the machine stop circuitry.

Figure 2-17 Two Control Unit Area Control



Mounting Dimensions (for reference only)

Refer to figures 2-18 through 2-23 for important mounting dimension information.

Figure 2-18 Mat Mounting Dimensions

Catalog Listing	a mm (ft)	b mm (ft)	Protective Coating	Weight kg (lb.) without packaging	Weight kg (lb.) with packaging
FF-SM075050-105	750 (2.5)	500 (1.6)	Aluminum (metal)	10.10 (22.27)	12.0 (26.5)
FF-SM075075-105	750 (2.5)	750 (2.5)	Aluminum (metal)	13.20 (29.10)	16.0 (35.3)
FF-SM100050-105	1000 (3.3)	500 (1.6)	Aluminum (metal)	13.50 (29.76)	16.0 (35.3)
FF-SM100075-105	1000 (3.3)	750 (2.5)	Aluminum (metal)	20.30 (44.75)	24.5 (54)
FF-SM100100-105	1000 (3.3)	1000 (3.3)	Aluminum (metal)	30.40 (67.02)	36.0 (79.37)
FF-SM150050-105	1500 (4.9)	500 (1.6)	Aluminum (metal)	20.30 (44.75)	24.5 (54)
FF-SM150075-105	1500 (4.9)	750 (2.5)	Aluminum (metal)	30.40 (67.02)	36.0 (79.37)
FF-SM150100-105	1500 (4.9)	1000 (3.3)	Aluminum (metal)	40.50 (89.29)	47.5 (104.7)
FF-SM075050-205	750 (2.5)	500 (1.6)	Nitrile (rubber)	8.70 (19.18)	10.7 (23.6)
FF-SM075075-205	750 (2.5)	750 (2.5)	Nitrile (rubber)	11.50 (25.35)	14.5 (32)
FF-SM100050-205	1000 (3.3)	500 (1.6)	Nitrile (rubber)	11.50 (25.35)	14.0 (30.9)
FF-SM100075-205	1000 (3.3)	750 (2.5)	Nitrile (rubber)	17.30 (38.14)	22.0 (48.5)
FF-SM100100-205	1000 (3.3)	1000 (3.3)	Nitrile (rubber)	25.90 (57.10)	31.5 (69.4)
FF-SM150050-205	1500 (4.9)	500 (1.6)	Nitrile (rubber)	17.30 (38.14)	21.5 (47.4)
FF-SM150075-205	1500 (4.9)	750 (2.5)	Nitrile (rubber)	25.90 (57.10)	31.5 (69.4)
FF-SM150100-205	1500 (4.9)	1000 (3.3)	Nitrile (rubber)	34.50 (76.06)	41.5 (91.5)

Figure 2-19 Control Unit Mounting Dimensions (100 mm = 3.94 in)

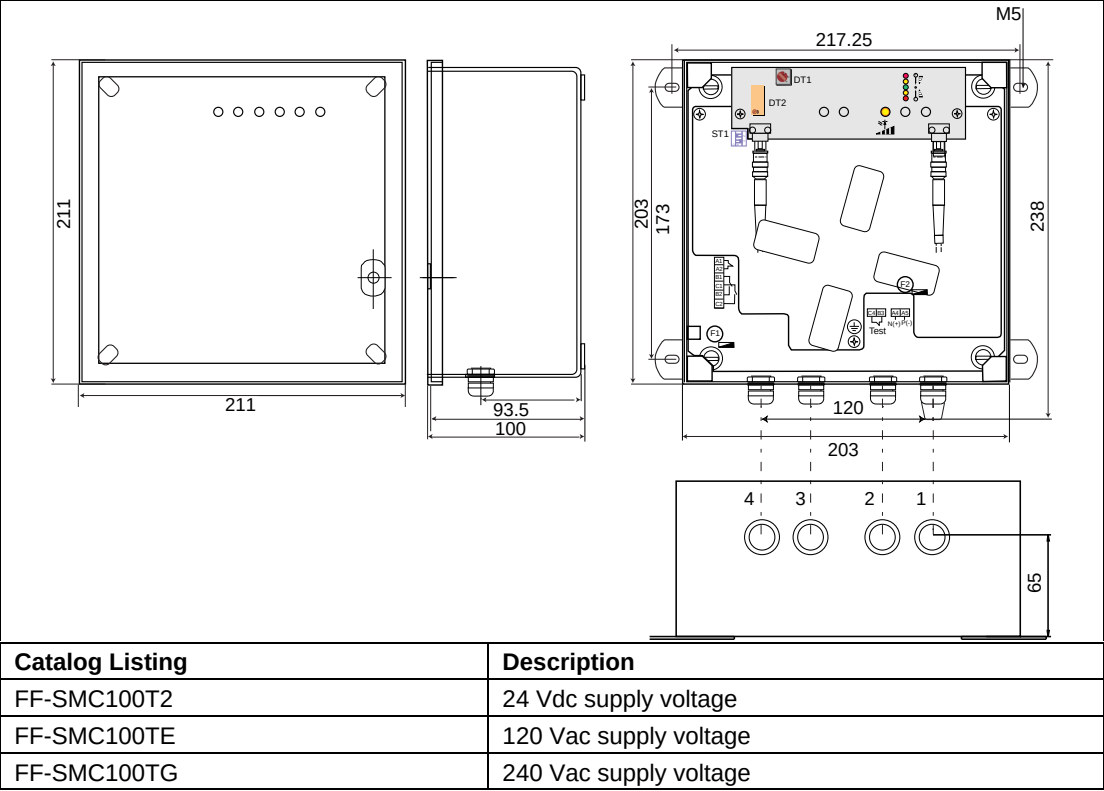


Figure 2-20 Connecting Box Mounting Dimensions (100 mm = 3.94 in)

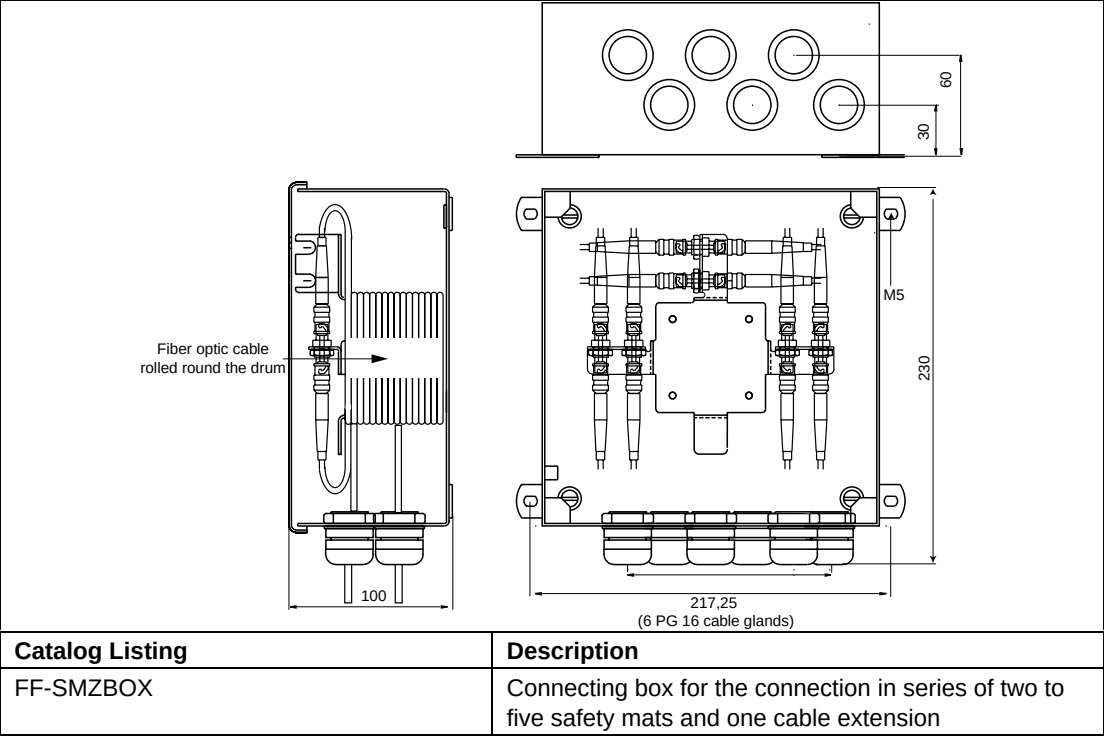


Figure 2-21 Cable Extensions (100 mm = 3.94 in)

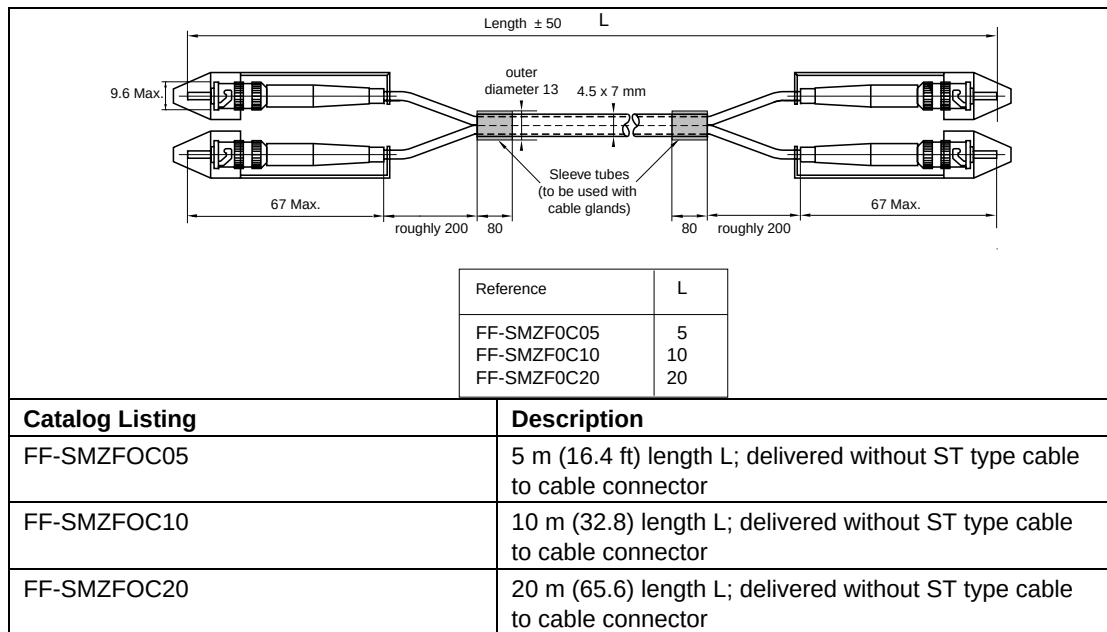


Figure 2-22 Cable-to-cable Connector (100 mm = 3.94 in)

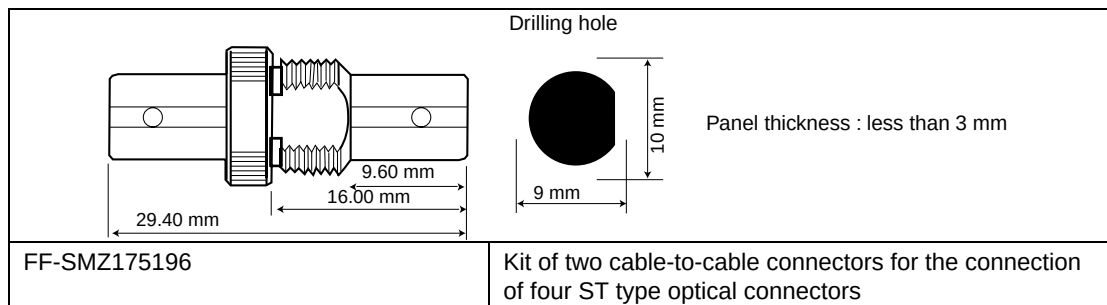
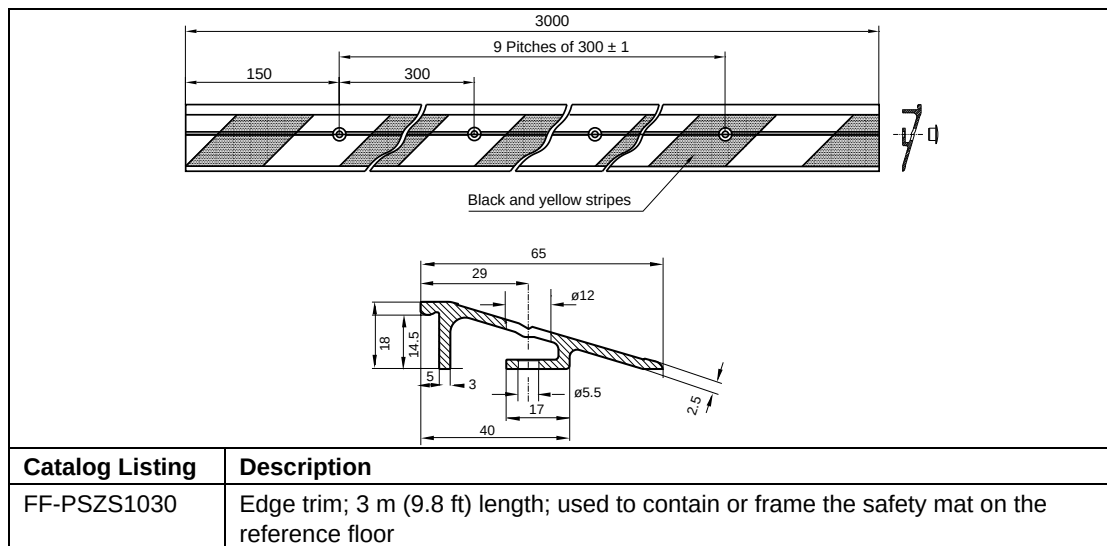


Figure 2-23 Edge Trim (10 mm = 0.39 in)



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Connections and Setup

Overview

WARNING

IMPROPER ELECTRICAL INSTALLATION

- Each safety mat activation must stop dangerous machine operation within the response time of the components.
- Clearing the sensing zone must not start dangerous machine operation. When restarting machine operation, a normal machine control start sequence must be used.
- If electrical power is removed from a machine, its restoration must not initiate dangerous machine operation; a normal machine control start sequence must be used.
- If a safety mat system is activated, the machine must NOT be able to restart.
- The external safety relays located between the safety outputs and the machine control circuitry must be monitored.
- In the event of component failure, the machine control circuitry must stop dangerous machine operation and prevent the next machine cycle activation.
- A Programmable Logic Controller must NOT be able to override a manual restart function.
- Strictly adhere to all electrical connection instructions and local wiring standards.
- If the module is in the automatic operation mode, another part of the safety control circuitry must keep the latched function engaged.
- To keep the latched function engaged and maintain control reliability, use safety components only. Do not use a programmable logic controller (PLC).

Failure to comply with these instructions could result in death or serious injury.

This section contains information about fiber optic and electrical connections, interfacing and the setup of the control unit and safety mat. According to ANSI B11.19 - 1990, the safety mat shall be interfaced with the machine control system so the mat's stop signal causes immediate stopping action of the machine and shall require the reinitiation of the operator's control prior to the start or continuation of machine motion. Connection of the safety mat to the machine control circuitry must be carried out in such a way that the external relaying (safety relays with positive-guided contacts) used in the interface are systematically self-checked (monitored) before each machine cycle. Using safety relay technology, Honeywell safety control modules (FF-SR Series) provide cross monitoring and ensure proper machine control operation.

Fiber Optic Connections

NOTICE

Do not touch the fiber optic end tips with fingers to prevent dramatically altering the optical signal. If end tips are dirty, clean with lens paper soaked with alcohol.

Fiber Optic Cable Connection to the Control Unit

CAUTION

CONTROL UNIT DAMAGE

- Install the power supply cable through the small cable gland only.
- Install one fiber optic cable per cable gland.
- Properly install the sleeve tube into the cable gland and hand tighten the plastic cap screw onto the cable gland to ensure proper cable sealing.

Failure to comply with these instructions will result in product damage.

1. Remove the plastic cap screw from the cable gland to gain access to the rubber seal inside.
2. Remove the precut hole from the rubber seal.
3. Remove protective caps on the control unit optical receptacles and the optical fiber cable ends. Keep the protective caps for future use.

NOTICE

ST fiber optic connectors can be installed without regard to emitter and receiver orientation.

4. Slide one ST connector of the fiber optic cable through the plastic cap screw and the rubber seal inside the cable gland.
5. Repeat step 4 with the second ST connector.
6. Engage both ST fiber optic connectors onto the control unit receptacles. Turn each ST connector until the control unit receptacle tabs are aligned with the connector slots. Further engage each ST connector and turn it until secured.
7. Gently pull the 2 inch sleeve tube through the rubber seal of the cable gland. Ensure the sleeve tube is visible from both sides of the cable gland.
8. Install the plastic cap screw onto the cable gland and hand tighten to ensure proper sealing.

ST Connector with the Cable-to-cable Connector

1. Remove protective caps on the cable-to-cable connector and the optical fiber cable ends. Keep the protective caps for future use.
2. Engage the ST fiber optic connector onto one side of the cable-to-cable connector. Turn the ST connector until the cable-to-cable receptacle tabs are aligned with the ST connector slots. Further engage the ST connector and turn it until secured.

Fiber Optic Cable Connection to the Connecting Box**CAUTION****CONNECTING BOX DAMAGE**

- Install one fiber optic cable per cable gland.
- Properly install the sleeve tube into the cable gland and hand tighten the plastic cap screw onto the cable gland to ensure proper cable sealing.

Failure to comply with these instructions will result in product damage.

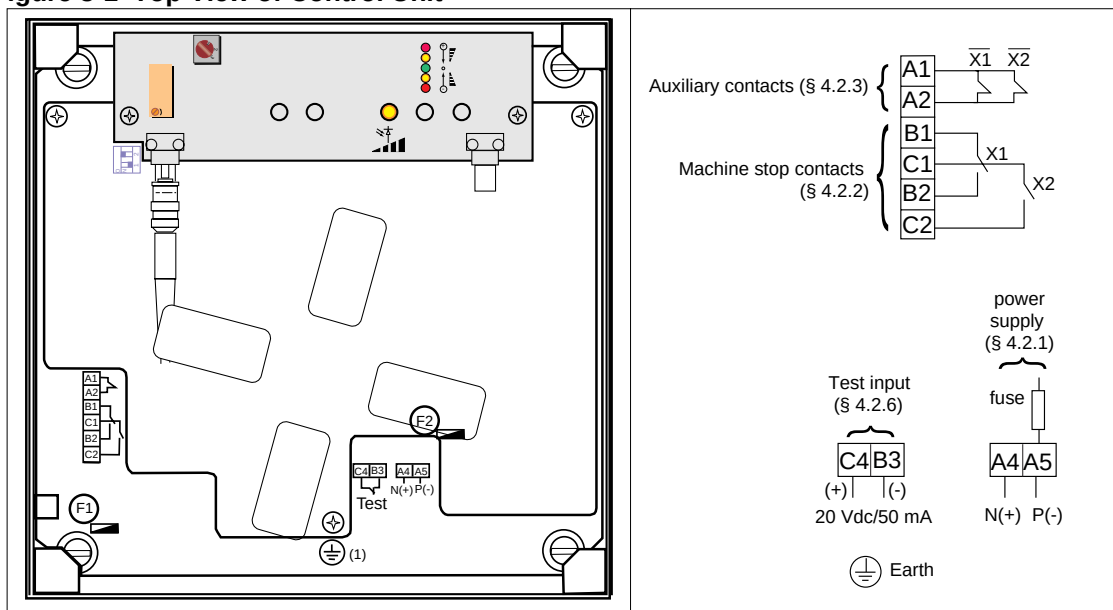
1. Remove the plastic cap screw from the cable gland to gain access to the rubber seal inside.
2. Remove the precut hole from the rubber seal.
3. Remove protective caps on the cable-to-cable connector and the optical fiber cable ends. Keep the protective caps for future use.
4. Slide one ST connector of the fiber optic cable through the plastic cap screw and the rubber seal inside the cable gland.
5. Repeat step 4 with the second ST connector.
6. Repeat steps 1 through 5 for all the safety mat optical cables as required.
7. Engage the ST fiber optic connector of mat 1 onto one side of the cable-to-cable connector. Turn the ST connector until the cable-to-cable receptacle tabs are aligned with the ST connector slots. Further engage the ST connector and turn it until secured.
8. Engage the ST fiber optic connector of mat 2 on the other side of the cable-to-cable connector. Turn the ST connector until the cable-to-cable receptacle tabs are aligned with the ST connector slots. Further engage the ST connector and turn it until secured.
9. Repeat steps 7 and 8 in order to have the safety mats optically connected in series.
10. Gently pull the 2 inch sleeve tube for all safety mat cables through the rubber seal of the cable gland. Ensure the sleeve tube is visible from both sides of the cable gland.
11. Install the plastic cap screw onto the cable gland and hand tighten to ensure proper sealing.

Electrical Connections

Overview

Refer to figure 3-1 for terminal block wiring locations inside the control unit.

Figure 3-1 Top View of Control Unit



NOTICE

The terminal strip contact points for B1/B2 and C1/C2 (normally open safety contacts) are not in sequence on the strip.

Power Supply Wiring

All of the FF-SM Series mats have the same connections for power. Figure 3-2 illustrates the power connections. The fuse on the power line provides additional protection (400 mA/AC or 800 mA/DC).

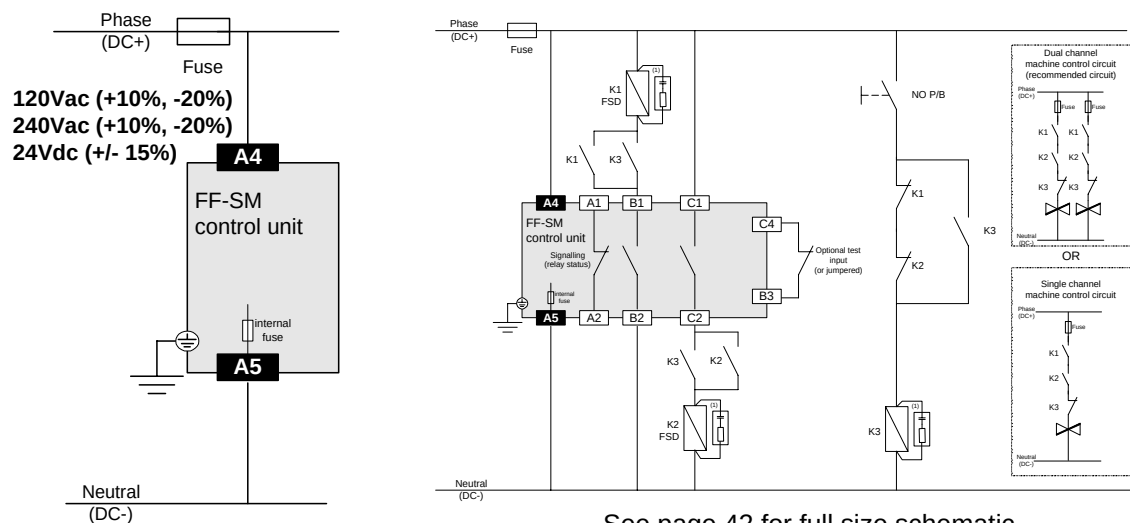
NOTICE

- The wire gauge of the ground connection should be equal to the power supply wire gauge.
- The length of the ground connection wire should be as short as possible (refer to EN 60 204).
- To minimize noise interference, the ground terminal of the mat must be connected to the main ground of the machine.
- Snap-in clip connections do not require tinning of wires.

FF-SM Series safety mats operate on 120 (+10%, -20%) or 240 volts AC (+10%, -20%). A 24 volt ($\pm 15\%$) DC version is also available. **DC versions are equipped with DC/DC converters to provide the galvanic insulation made mandatory by IEC64196 European norms for type 4 equipment. An additional galvanic insulated means (a dedicated power supply with a DC/DC converter) is not required.**

The frequency range is from 50 to 60 Hz. Power consumption is either 6 VA (AC) or 9 W (DC). When wiring, use (1.5 mm²) 16 or (1 mm²) 18 gauge wire.

Figure 3-2 Power Connection



See page 42 for full size schematic.

Machine Stop Contacts (2 normally open contacts)

Permanent Self-checking (Monitoring)

Two internal relays are switched simultaneously. An internal permanent self-check (monitoring) verifies that both safety relays have the same status. If one of the two normally open contacts remains accidentally welded, the remaining contact would no longer be able to close. It is therefore important to use the two contacts to prevent operation of the machine.

Protection of Internal Relay Contacts (NO contacts)

WARNING

IMPROPER ARC SUPPRESSORS INSTALLATION

- Never install an arc suppressor across the safety output contact of the control unit.
- Always install arc suppressors across the coils of external safety relays.

Failure to comply with these instructions could result in death or serious injury.

Inductive loads will generate high voltage transients that will degrade the life expectancy of the relay contacts. To increase the life expectancy of the relay contacts, connect RC components ($220\ \Omega + 0,22\ \text{mF}$, catalog listing FF-SBZ000220) for AC interfaces or varistors for DC interfaces in parallel with the loads.

Final Switching Devices (FSD) K1 and K2

⚠ WARNING

IMPROPER EXTERNAL SAFETY RELAYS PERFORMANCE

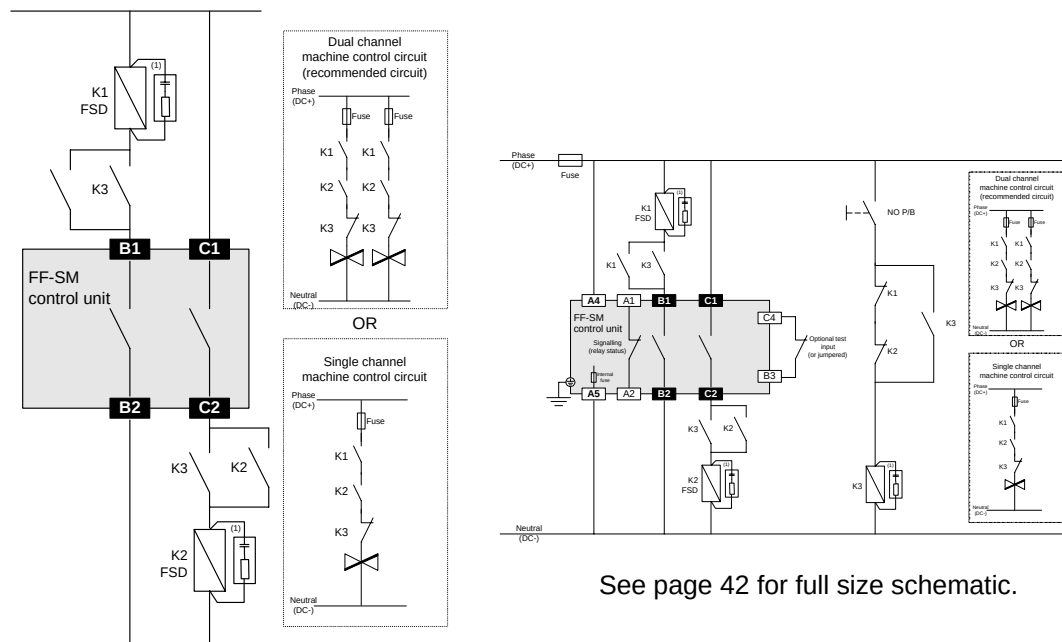
- Use three independent stop circuit safety relays with mechanically linked contacts to reliably detect a welded contact.
- Use fuses with the correct rating to protect the safety contacts.

Failure to comply with these instructions could result in death or serious injury.

The limited switching capacity of internal relays, combined with the number of available contacts displayed by the equipment (2NO+1NC contacts) means that most of the time the equipment must be electrically interfaced to the machine circuitry through at least two external safety relays K1 and K2. See figure 3-3. Their features (switching capacity and number of contacts) will depend upon the machine stopping circuitry. These external safety relays are sometimes called Final Switching Devices and their correct operation must be continuously monitored or checked.

Figure 3-3 External Safety Relays Connection

Connection of One Control Unit



See page 42 for full size schematic.

(1) : RC (220Ω + 0,22 μF) for AC interfaces or varistors for DC interfaces

Internal Auxiliary Contacts (normally closed contact) (see figure 3-4)

! WARNING

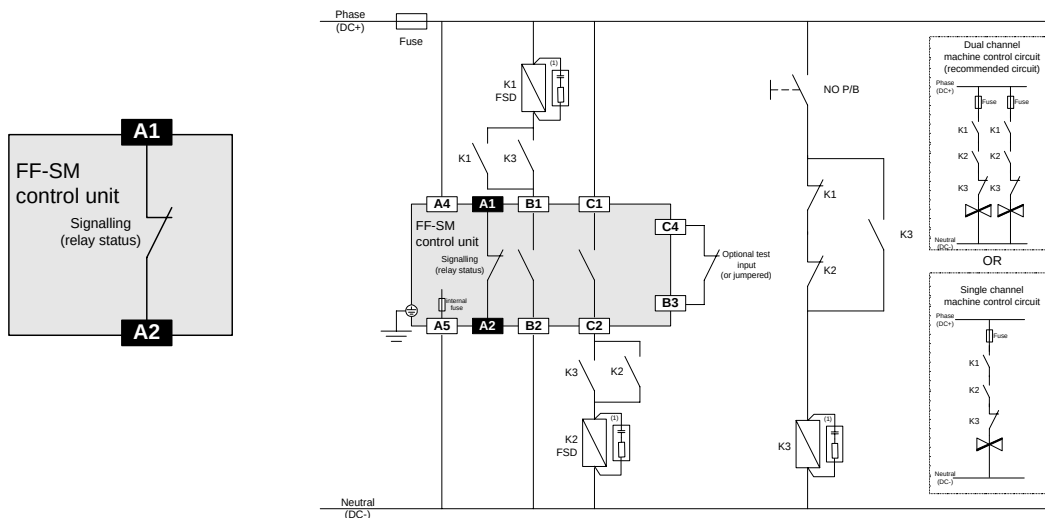
IMPROPER SYSTEM PERFORMANCE

- Comply with local safety requirements when designing machine control circuitry and all control elements that affect safety.
- Install two independent relay contacts into machine control stop circuit controlled by FF-SM Series safety mat.
- Use two independent stop circuit safety relays with mechanically linked contacts to reliably detect a welded contact.

Failure to comply with these instructions could result in death or serious injury.

Always use two safety output contacts from the control unit for machine shutdown. The normally closed contact A1/A2 is also a safety contact. This safety contact may be used to relay the stopping information to the machine control circuitry, indicate the safety equipment output status, or provide a redundant complement (secondary) to the main safety stop chain system.

Figure 3-4 Internal Auxiliary Contact Connection



See page 42 for full size schematic.

(1) RC ($220\Omega + 0,22\ \mu\text{F}$) for AC interfaces or varistors for DC interfaces

Minimum of 10 mA through the internal auxiliary contact; additional resistor may be used with programmable logic controller (PLC) to reach this minimum value.

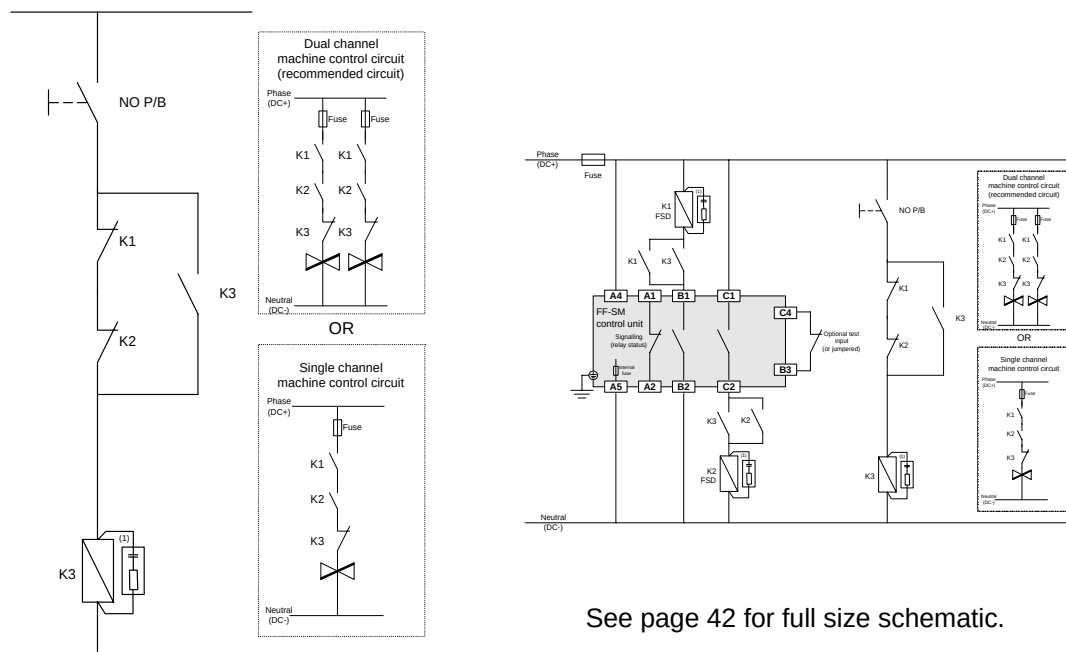
Final Switching Device (FSD) Monitoring

Overview

Monitoring a machine control system requires two machine primary control elements. British Standards define an element as an “...electrically powered element which directly controls the machine's normal operating motion in such a way that it is last (in time) to operate when motion is initiated or arrested.” (BS 6491: Part 1 (2.8): 1984). Element types vary based on the method of arresting the hazardous motion. If the element is a relay, it must be a captive (positive-guided) contact type. The secondary control element is defined as “a machine control element independent of the machine primary control element(s) and capable of removing the source of power from the prime mover of the relevant dangerous parts in an emergency.” (BS 6491: Part 1 (2.9): 1984)

Final switching device monitoring allows the control circuitry to regularly and automatically check the external safety relays K1 and K2 (connected to the equipment outputs) after each activation of the safety mat. See figure 3-5. After deactivation of the mat sensor, the control unit will automatically restart and the safety outputs (normally open contacts) will close. If safety relays K1 and K2 are operating correctly, the activation of the restart push button will first energize safety relay K3 and then the final switching devices K1 and K2. After release of the push button, the safety relay K3 will de-energize allowing the next machine operation.

Figure 3-5 Final Switching Device (FSD) Monitoring Connection



(1) : RC ($220\Omega + 0,22 \mu F$) for AC interfaces or varistors for DC interfaces

Test Input

The safety mat system is a fail safe device based on a permanent self-checking principle. This means that the system's integrity does not rely on the test facility. The test input may be used to check the correct operation of the Final Switching Devices K1 and K2 when the protective equipment is interfaced to the machine control circuitry. This is especially important if the protective equipment is not often triggered by frequent intrusion on the safety mat. See figure 3-6 below.

CAUTION

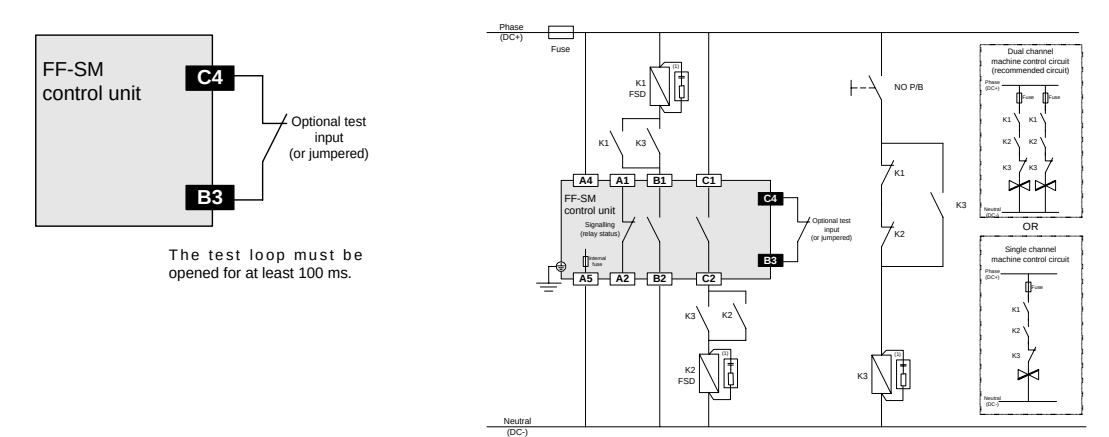
PREMATURE INTERNAL RELAY CONTACT DAMAGE

The switching capacity of the normally open contacts is limited to the following values: I_{max} = 2A, U_{max} = 250 VAC, P_{max} = 500 VA and I_{min} = 50mA. Do not exceed these value ranges.
Failure to comply with these instructions will result in product damage.

When the test contact (dry contact) is open, the control unit safety output contacts (normally open contacts) are open (stopping the machine via K1 and K2). Also, the auxiliary safety output contact of the control unit (normally closed contact) is closed and the normally closed contacts of the external safety relays (K1 and K2) are closed. If this normally closed contact test input is not used, leave the jumper installed between C4 and B3 located inside the control unit.

A time of 140 milliseconds is required for the system to restart after the test contact is closed.

Figure 3-6 Test Input Wiring Diagram



See page 42 for full size schematic.

Contact Status (safety mat in working condition, not activated)

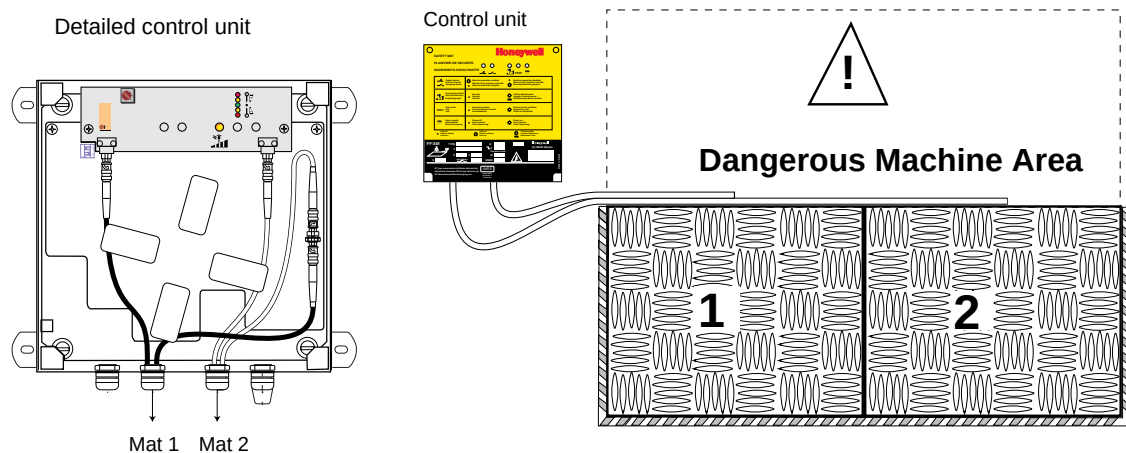
Test	Safety outputs (NO contacts)	Auxiliary output (NC contacts)	K1, K2 (external relays)
ON (C4-B3 closed)	ON* (closed)	OFF* (opened)	ON* (energized/closed)
OFF (C4-B3 open)	OFF (opened)	ON (closed)	OFF (de-energized/opened)
*Press the restart push button if necessary.			

Physical Configuration and Wiring Diagram Examples

Refer to figures 3-7 through 3-11 for examples of interface drawings including the physical configuration and wiring. **Ensure the control units are located where they will be visible to the operator** and that the mat detects the presence of an individual on the sensing surface (ANSI B11.19).

⚠ WARNING
IMPROPER ACCESS GUARDING
 When using safety mats, install additional hard guarding to protect the sides of the dangerous machine area.
Failure to comply with these instructions could result in death or serious injury.

Figure 3-7 Physical Configuration - Area Controlled by Two Safety Mats Run by a Single Control Unit



NOTICE

The wiring diagrams that follow depend on the number of control units connected to the machine control circuitry, but are independent of the number of mat sensor(s) connected to each control unit.

Physical Configuration and Wiring Diagram Examples (cont'd)

⚠ WARNING**IMPROPER EXTERNAL SAFETY RELAYS PERFORMANCE**

- Use three independent stop circuit safety relays with mechanically linked contacts to reliably detect a welded contact.
- Use fuses with the correct rating to protect the safety contacts.

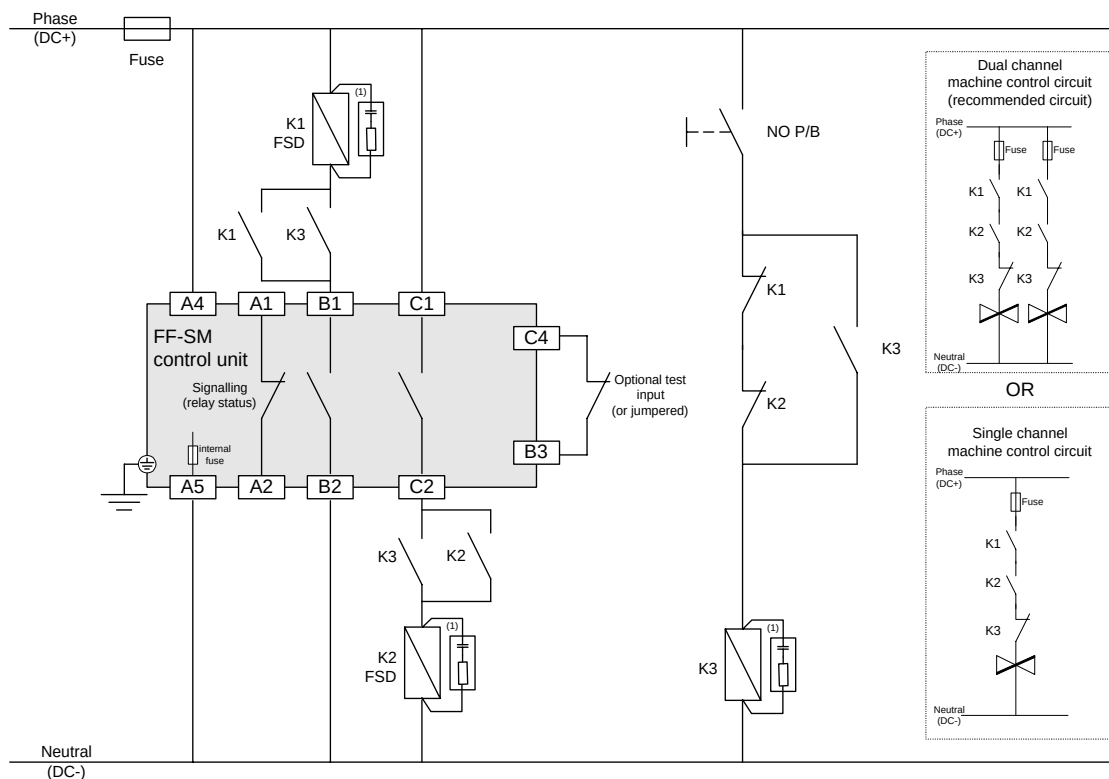
Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING**IMPROPER ARC SUPPRESSORS INSTALLATION**

- Never install an arc suppressor across the safety output contact of the control unit.
- Always install arc suppressors across the coils of external safety relays.

Failure to comply with these instructions could result in death or serious injury.

Figure 3-8 Wiring Diagram Using Additional External Safety Relays (Area Controlled by Two Safety Mats Run by a Single Control Unit)

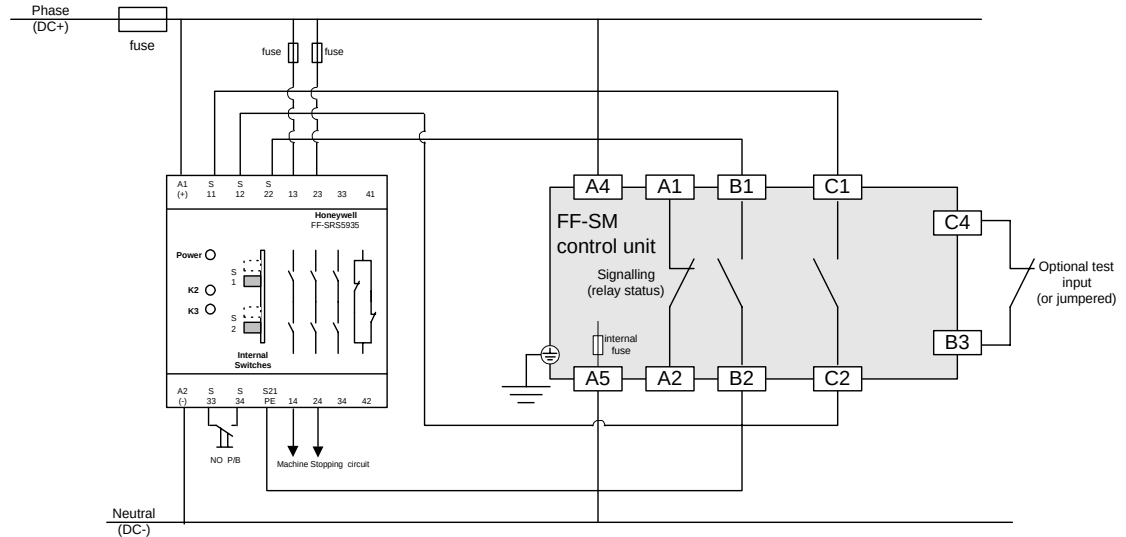


(1) RC (220Ω + 0,22 μF) for AC interfaces or varistors for DC interfaces.

NO P/B : normally open contact of a push button; press and release the push button.

Physical Configuration and Wiring Diagram Examples (cont'd)

Figure 3-9 Wiring Diagram Using Additional External Safety Control Module (Area Controlled by Two Safety Mats Run by a Single Control Unit)



NO P/B is a normally open contact of a push button.

In this example, a Honeywell FF-SRS5935 dual channel emergency stop safety control module is used. This dual channel device provides a control reliable solution that meets the highest level of safety.

Physical Configuration and Wiring Diagram Examples (cont'd)



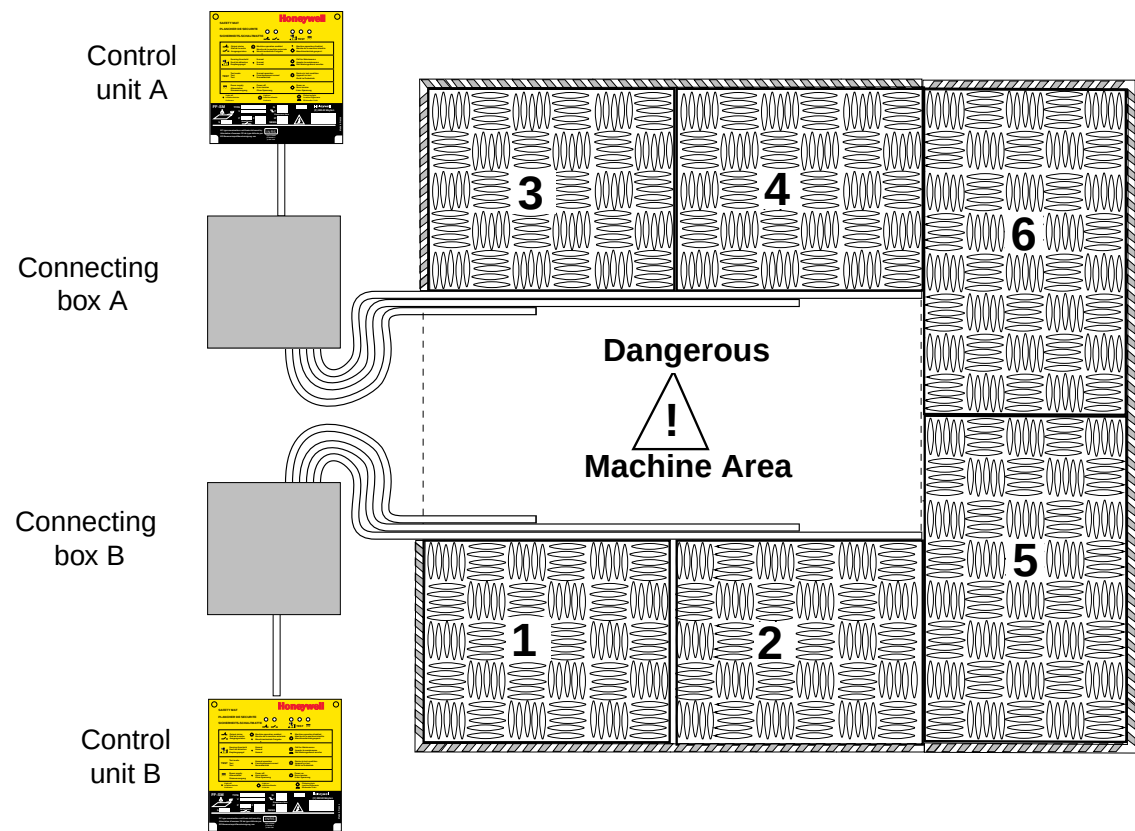
WARNING

IMPROPER ACCESS GUARDING

When using safety mats, install additional hard guarding to protect the sides of the dangerous machine area.

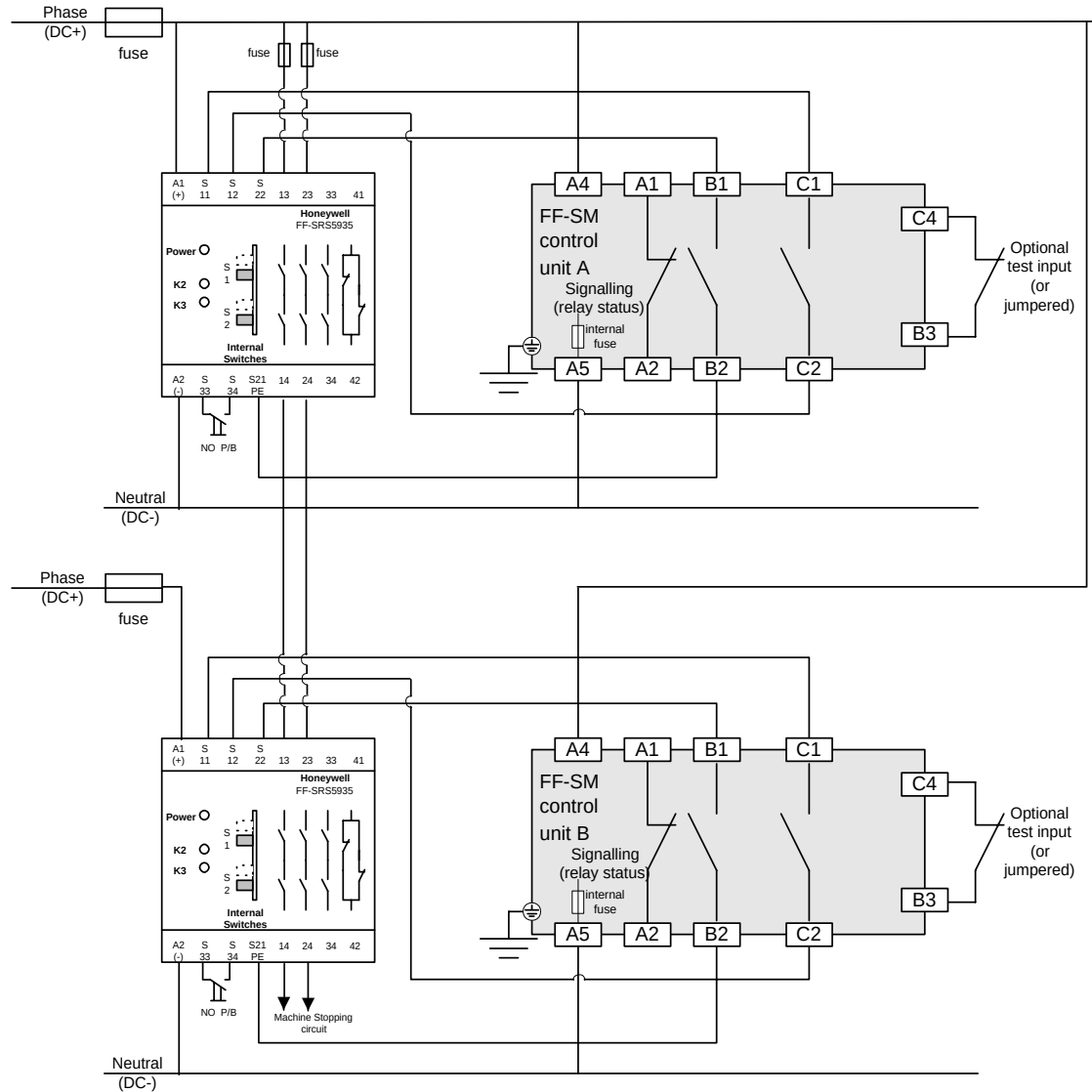
Failure to comply with these instructions could result in death or serious injury.

Figure 3-10 Physical Configuration - Area Controlled By Several Safety Mats Run By Two Control Units (if more than two safety mats are connected in series, additional connecting boxes are necessary)



Physical Configuration and Wiring Diagram Examples (cont'd)

Figure 3-11 Wiring Diagram Using Two Control Units (Area Controlled By Several Safety Mats)



NO P/B : Two normally open contacts of a single push button may be used.

Setup

Excess Gain Adjustment After Installation

DANGER

IMPROPER USE OF THE FF-SM SERIES SAFETY MAT

- The 30 kg sensitivity of the FF-SM Series safety mats is suitable for the detection of adults weighing more than 35 kg according to the EN1760-1 European standard.
- Do NOT use FF-SM Series safety mats in public places where children may have to be detected.
- Use of an additional protective sheet laid on the safety mat (sensor) surface is forbidden since it may alter the 30 kg sensitivity.

Failure to comply with these instructions will result in death or serious injury.

NOTICE

IMPROPER GAIN ADJUSTMENT

- Never perform the excess gain adjustment with an individual or object on the sensing surface of the safety mat.
- Do not use the safety mat until the excess gain adjustment has been performed correctly as indicated by an illuminated green light on the control box.

Improper gain adjustment will result in keeping the product in alarm.

WARNING

IMPROPER CONTROL UNIT MAINTENANCE

- Access to the control unit is restricted to adjusting excess gain (DT1, DT2), making ST optical connections using snap-in clips, replacing supply fuses, and connecting wires.
- Do not touch any other components inside the control unit.

Failure to comply with these instructions could result in death or serious injury.

NOTICE

Perform an excess gain adjustment twenty-four hours after installation to compensate for mat (sensor) settling and to ensure proper operation.

This excess gain adjustment must be performed after all mats and accessories are installed and without any target (object) on the sensing zone. This adjustment corrects for any initial signal attenuation due to conditions of use (e.g., number of safety mats connected in series to a single control unit, type of coating, quality of floor on which safety mat is laid). The control unit is preset to detect a minimum mass of 30 kg (66.1 lb.) after the adjustment is made. Therefore, this adjustment is not a sensitivity adjustment. The control unit remains in an alarm condition if the adjustment is not done correctly.

A range selector switch and multi-turn potentiometer are used to adjust excess gain. These adjustments are located on a printed circuit board in the control unit. A status indicator can be seen on the front panel of the control unit. Five additional light emitting diodes (LEDs) are located on the same circuit board and provide visual information related to signal margin (these LEDs cannot be seen by the operator when the cover is installed).

Figure 3-12 Adjustments and Indicators

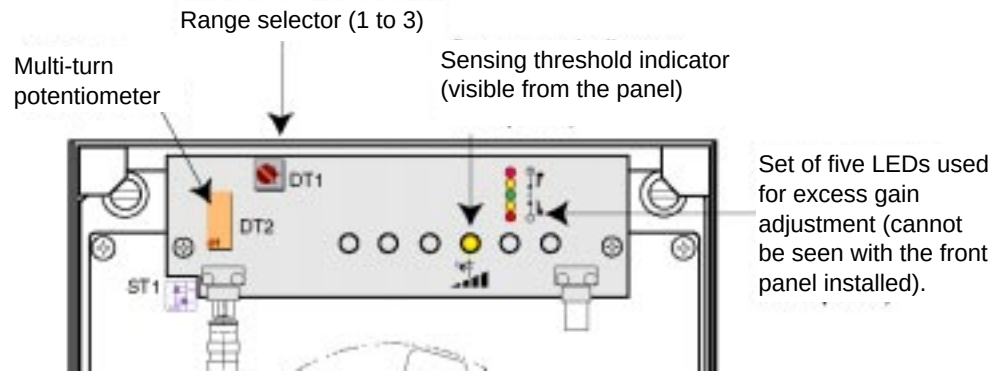


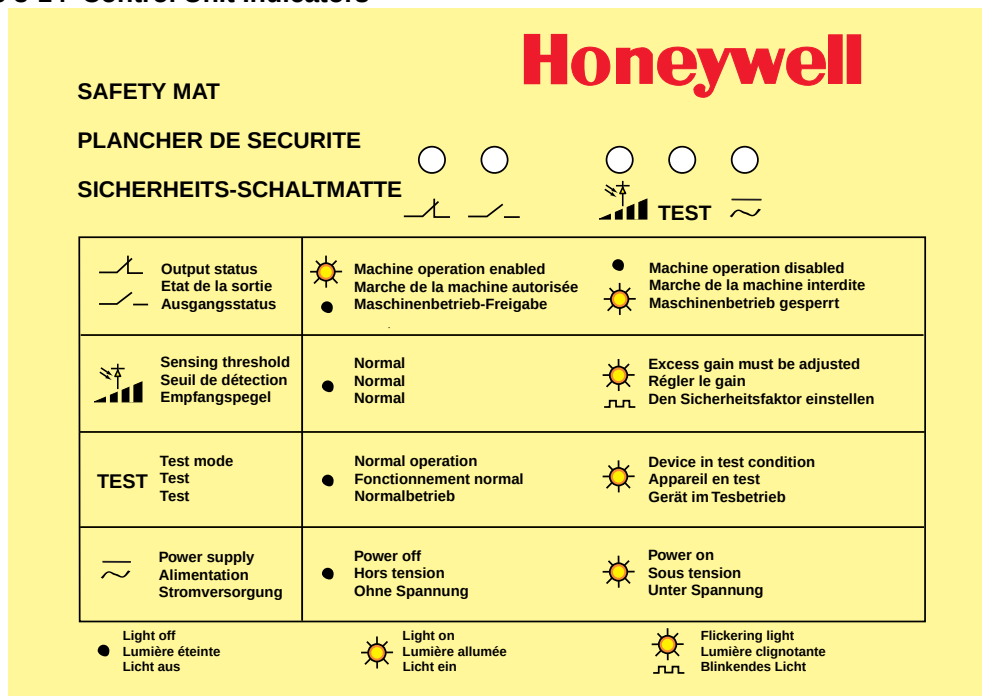
Figure 3-13 Excess Gain Adjustment Procedure

		Adjustment procedure
1 DT1 		1. Select range number "3" with selector switch DT1.
2 DT2 		2. Turn the 25-turn potentiometer DT2 against the arrow until the limit of travel is reached. At the extreme position, a clicking sound will be heard.
3 DT2 		3. Slowly turn the potentiometer DT2 in the direction of the arrow until the green LED illuminates.
		4. If the green LED remains off and the potentiometer has reached its limit of travel, select DT1 range number "2" and repeat the operation. 5. If the green LED still remains off, repeat the operation by selecting DT1 range number "1".
	Light on	Light off

Indicator Status

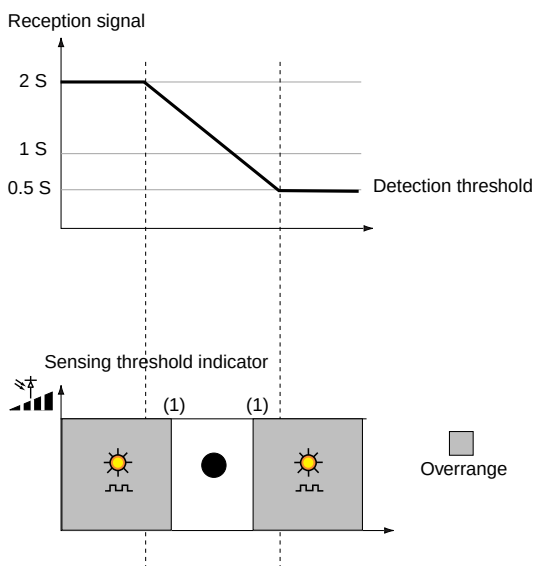
Refer to figure 3-14 below for a description of the six visible LEDs located on the control unit front panel.

Figure 3-14 Control Unit Indicators



Sensing Threshold Indicator (See figure 3-15)

Figure 3-15 Operating Diagram (Reception Signal/Output Status and Sensing Threshold Indicator)



(1) The sensing threshold indicator flickers when the signal drift becomes too great : an adjustment is then necessary.

Excess Gain Adjustment During Operation

DANGER

IMPROPER USE OF THE FF-SM SERIES SAFETY MAT

- The 30 kg sensitivity of the FF-SM Series safety mats is suitable for the detection of adults weighing more than 35 kg according to the EN1760-1 European standard.
- Do NOT use FF-SM Series safety mats in public places where children may have to be detected.
- Use of an additional protective sheet laid on the safety mat (sensor) surface is forbidden since it may alter the 30 kg sensitivity.

Failure to comply with these instructions will result in death or serious injury.

NOTICE

IMPROPER GAIN ADJUSTMENT

- Never perform the excess gain adjustment with an individual or object on the sensing surface of the safety mat.
- Do not use the safety mat until the excess gain adjustment has been performed correctly as indicated by an illuminated green light on the control box.

Improper gain adjustment will result in keeping the product in alarm.

NOTICE

Perform an excess gain adjustment twenty-four hours after installation to compensate for mat (sensor) settling and to ensure proper operation.

Operating conditions may change, especially if objects have been dropped on the sensor (mat), and it may be necessary to adjust excess gain. If the sensing threshold indicator flickers while there is an absence of an object on the sensing surface of the safety mat, adjust excess gain as follows:

1. Open the control unit to obtain access to the adjustments and five LEDs.
2. Turn the potentiometer DT2 clockwise if the lower red LED is illuminated and counterclockwise if the upper red LED is illuminated until the orange LED illuminates.
3. Keep turning the potentiometer until the green LED illuminates.

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Inspection and Maintenance

Overview

This section contains an operational test procedure, inspection criteria, maintenance instructions, an indicator status and corrective actions table, and a troubleshooting flow diagram.

WARNING

IMPROPER MAINTENANCE

- Strictly adhere to all test, inspection, troubleshooting and maintenance instructions.
- Access to the control unit is restricted to adjusting excess gain (DT1, DT2), making ST optical connections using snap-in clips, replacing supply fuses, and connecting wires.
- Do not touch any other components inside the control unit.

Failure to comply with these instructions could result in death or serious injury.

Operational Test

To ensure functional readiness, perform the operational test at least once a day and every time the safety mat system is repaired or powered up. The operational test consists of **one person activating each mat sensor at a time** by walking on each individual safety mat in the sensing zone. The alarm output indicator must go immediately to the red condition and shall never switch off while an operator is stepping in the sensing zone (see Connections and Setup). All safety mats shall be activated and tested to ensure correct operation.

The control unit continuously checks the optical signal delivered by the safety mat sensors that make up the sensing zone. If a significant signal shift is detected, the machine stop contacts will open immediately. This feature ensures the nominal detection sensitivity of the safety mat.

Inspection

Important Information

The important examination criteria listed in the following two warnings must be strictly followed, especially if any installation modifications have occurred that may affect operator safety. The condition of the control unit must be examined regularly. A competent person designated in writing shall perform regular examinations of the protective safety equipment and document the examination results. **After each maintenance intervention, perform an operational test and examination of the system.**

If a system malfunction occurs, refer to the Indicator Status and Corrective Actions (see page 54) table and the Troubleshooting Flow Diagram for guidance (see pages 55 and 56).

WARNING

IMPROPER MACHINE GUARDING PROTECTION

- Refer to and comply with prEN 999 and ANSI standards when calculating safety distances.
- Design a large enough sensing zone of safety mat(s) to ensure an operator cannot reach a dangerous machine operation before it can be stopped.
- Ensure operator detection is effective for the entire sensing zone.
- When using FF-SM Series safety mats for point-of-operation guarding, DO NOT allow an operator to stand undetected between the safety mat and dangerous machine operation.
- If safety mat location allows possible access to dangerous machine operation, install additional protective safety equipment.
- To prevent safety mat removal and possible operator injury, secure the safety mat to the ground using edge trim.
- Clearing the sensing zone must not start dangerous machine operation. When restarting machine operation, a normal machine control start sequence must be used.
- Ensure the location of the manual restart function is outside of the danger zone and provides the operator with a clear view of the zone.
- Ensure each safety mat activation immediately stops machine operation within the response time of the components.
- Ensure FF-SM status indicators operate properly and are visible from the dangerous area.

Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING

IMPROPER ELECTRICAL INSTALLATION

- Each safety mat activation must stop dangerous machine operation within the response time of the components.
- Clearing the sensing zone must not start dangerous machine operation. When restarting machine operation, a normal machine control start sequence must be used.
- If electrical power is removed from a machine, its restoration must not initiate dangerous machine operation; a normal machine control start sequence must be used.
- If a safety mat system is activated, the machine must NOT be able to restart.
- The external safety relays located between the safety outputs and the machine control circuitry must be monitored.
- In the event of component failure, the machine control circuitry must stop dangerous machine operation and prevent the next machine cycle activation.
- A Programmable Logic Controller must NOT be able to override a manual restart function.
- As the control unit operates in a automatic restart mode, another part of the safety control circuitry must keep the latched function engaged.
- To keep the latched function engaged and maintain control reliability, use safety components only. Do not use a programmable logic controller (PLC).
- Strictly adhere to all electrical connection instructions and local wiring standards.

Failure to comply with these instructions could result in death or serious injury.

Maintenance

⚠ WARNING

POWER APPLIED TO MACHINE CONTROL SYSTEM

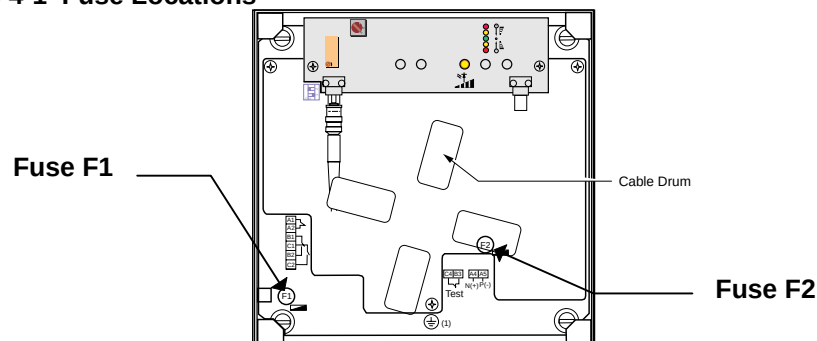
Turn off and disconnect power from FF-SM Series safety mat/control unit and machine.

Failure to comply with these instructions could result in death or serious injury.

Fuse Replacement

The control unit is equipped with an emitting and receiving circuit board. Each circuit board is protected by a power supply fuse. These power supply fuses are rated to protect the equipment against high over voltage. See figure 4-1 for fuse F1 and F2 locations.

Figure 4-1 Fuse Locations



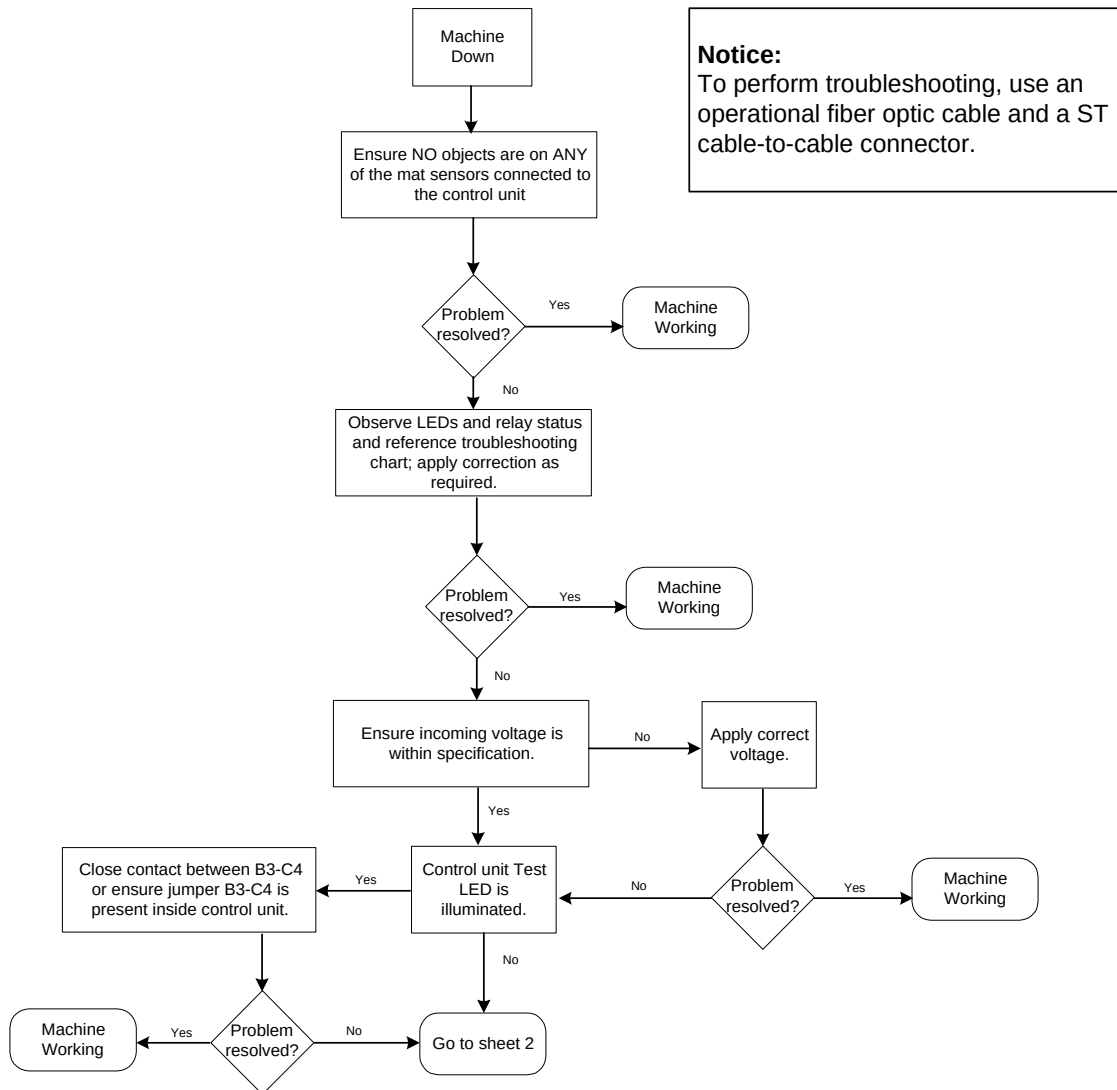
Replace fuse as follows:

1. Remove power from safety mat system.
2. Replace blown fuse with new fuse (see order guide).
3. Perform the operational test and inspection to ensure proper functional readiness.

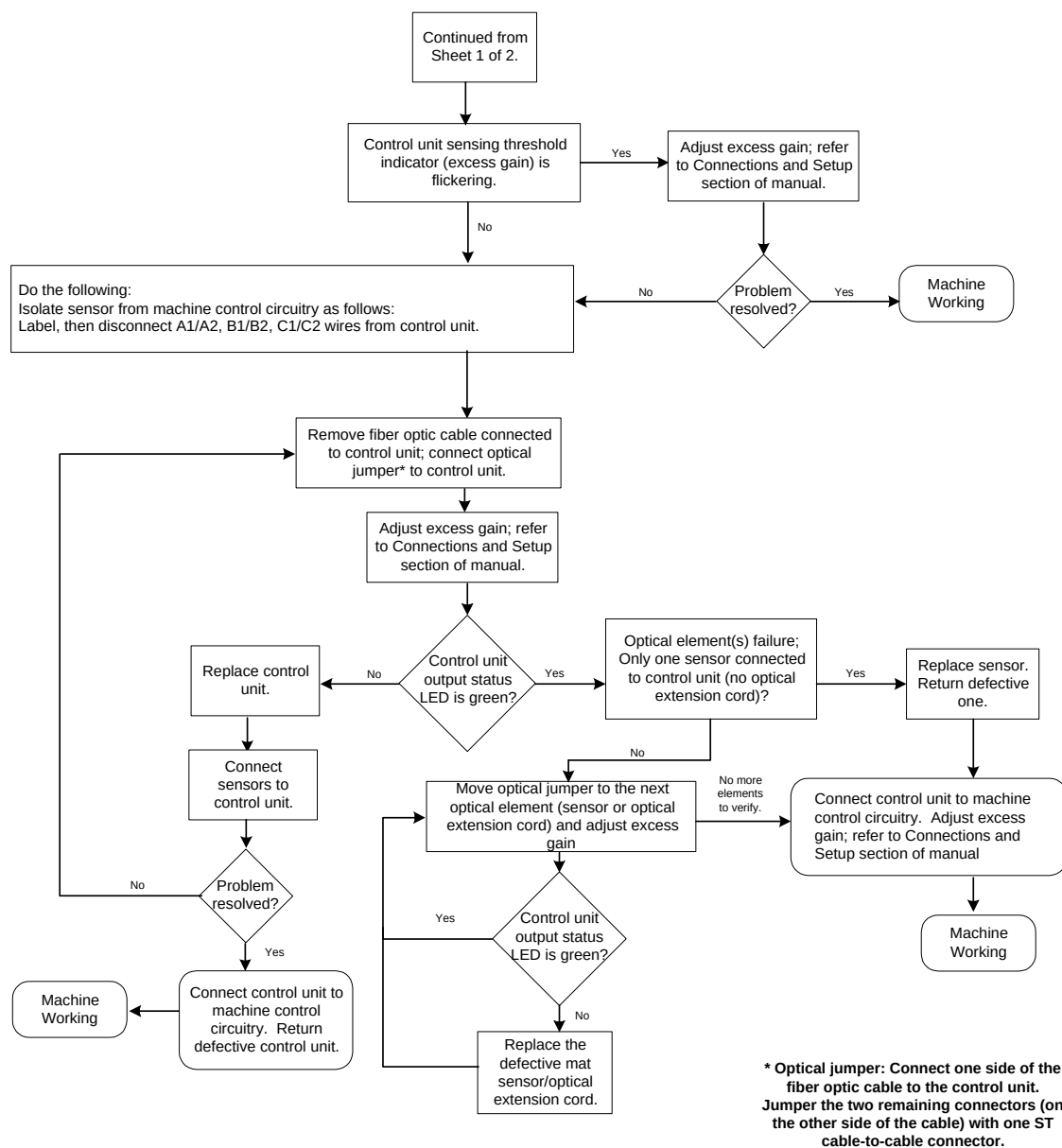
Indicator Status and Corrective Actions

Indicators status	Causes	Corrective actions
● Off ☀ On ☀ Flickering    TEST 	NO power is applied to the equipment.	Ensure connection to the main power supply is secure ; ensure power supply fuses are not blown; change fuse as required (see Fuse Replacement).
   TEST 	Equipment is in test mode.	Check the quality of the connection made on the test input (see Connections and Setup).
   TEST 	Equipment operates correctly, but signal drift is detected.	Ensure there are no objects on the mat; ensure the fiber optic cable and ST optical connectors are in good conditions; adjust the detection threshold; if the equipment remains in an alarm condition, perform a diagnostic failure check.
   TEST 	Equipment is in an alarm condition.	
   TEST 	Equipment is in an alarm condition.	
   TEST 	Equipment operates correctly and no object is detected.	None, equipment is operating correctly.

Troubleshooting Flow Diagram (Sheet 1 of 2)



Troubleshooting Flow Diagram (Sheet 2 of 2)



For product return information, see Warranty Information on page 61.

Order Guides

Safety Mat Order Guide

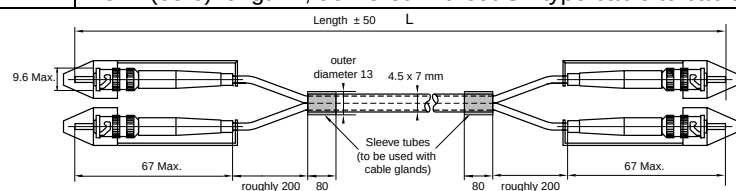
Each safety mat has a standard size and is delivered with a 5 m (16.4 ft) fiber optic cable pair equipped with two ST type fiber optic connectors.

Catalog Listing	Description		
	Dimensions mm (ft.)	Coating	Fiber optic cable length
FF-SM075050-105	750 x 500 (2.5 x 1.6)	Aluminum (metal)	5 m (16.4 ft)
FF-SM100050-105	1000 x 500 (3.3 x 1.6)		
FF-SM150050-105	1500 x 500 (4.9 x 1.6)		
FF-SM075075-105	750 x 750 (2.5 x 2.5)		
FF-SM100075-105	1000 x 750 (3.3 x 2.5)		
FF-SM150075-105	1500 x 750 (4.9 x 2.5)		
FF-SM100100-105	1000 x 1000 (3.3 x 3.3)		
FF-SM150100-105	1500 x 1000 (4.9 x 3.3)		
FF-SM075050-205	750 x 500 (2.5 x 1.6)	Nitrile (rubber)	5 m (16.4 ft)
FF-SM100050-205	1000 x 500 (3.3 x 1.6)		
FF-SM150050-205	1500 x 500 (4.9 x 1.6)		
FF-SM075075-205	750 x 750 (2.5 x 2.5)		
FF-SM100075-205	1000 x 750 (3.3 x 2.5)		
FF-SM150075-205	1500 x 750 (4.9 x 2.5)		
FF-SM100100-205	1000 x 1000 (3.3 x 3.3)		
FF-SM150100-205	1500 x 1000 (4.9 x 3.3)		

Cable Extension Order Guide

Each fiber optic cable extension is equipped with four ST fiber optic connectors.

Catalog Listing	Description
FF-SMZFOC05	5 m (16.4 ft) length L; delivered without ST type cable to cable connector
FF-SMZFOC10	10 m (32.8) length L; delivered without ST type cable to cable connector
FF-SMZFOC20	20 m (65.6) length L; delivered without ST type cable to cable connector

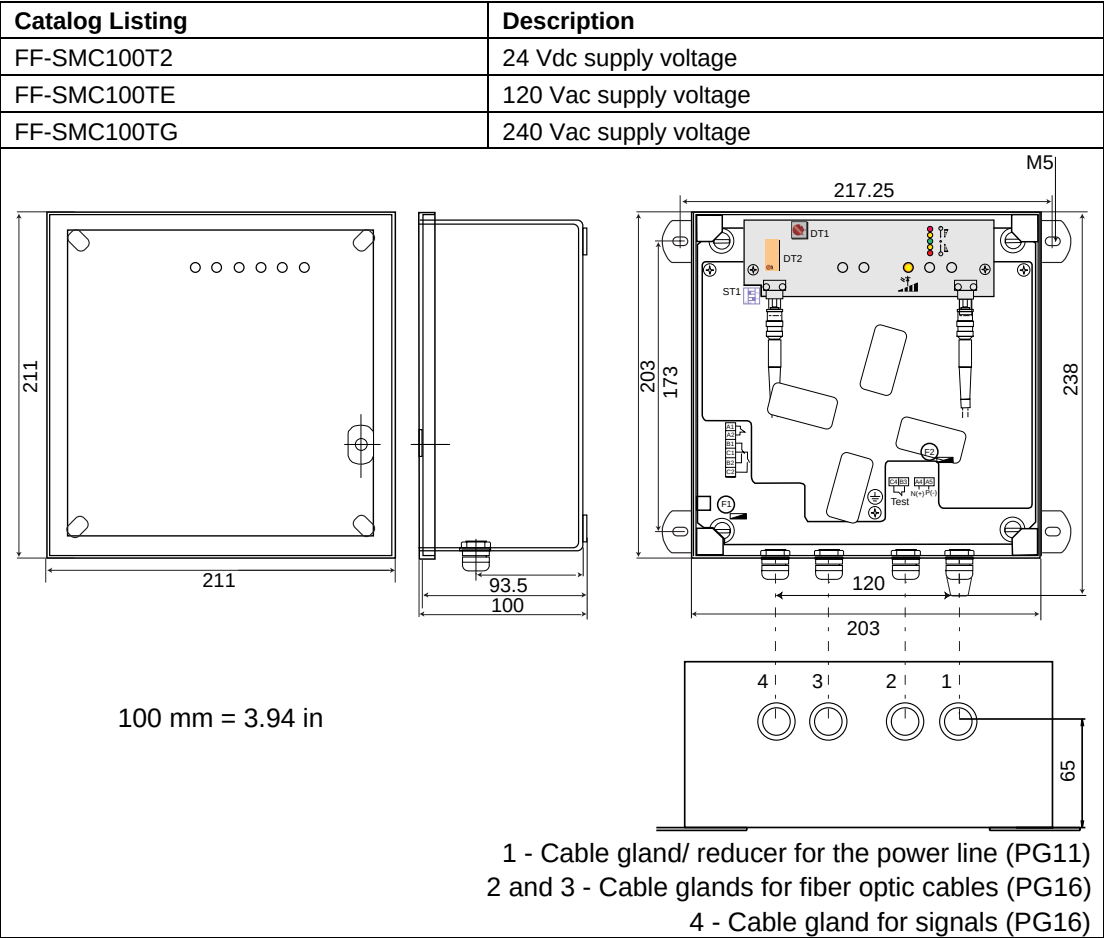


100 mm = 3.94 in

Reference	L
FF-SMZFOC05	5
FF-SMZFOC10	10
FF-SMZFOC20	20

Control Unit Order Guide

Order one control unit for up to four aluminum mats or up to five nitrile (rubber) mats connected in series. See the Accessories and Spare Parts Order Guide (see page 59) for additional connectors and a connecting box.



Accessories and Spare Parts Order Guide

Catalog Listing	Description
FF-SMZ175196	Kit of two cable-to-cable connectors for the connection of four ST type optical connectors
FF-SMZ1921092	Kit of 10 power supply fuses 0.5A time delayed for AC control unit
FF-SMZ1921093	Kit of 10 power supply fuses 1A time delayed for DC control unit
FF-SMZ666149	Kit of six PG16 cable glands and one PG11 reducer for control unit or for the connecting box
PK107007	10 installation manuals
FF-SMZBOX	Connecting box for the connection in series of two to five safety mats and one cable extension
FF-SMZMAINT1	Maintenance kit which includes four rubber caps for two ST type optical connectors, four rubber caps for the optoelectronic components located inside the control unit and one cable clip
FF-SBZ000220	Arc suppressor (two ea.)

Edge Trim Order Guide

Catalog Listing	Description
FF-PSZS1030	Edge trim; 3 m (9.8 ft) length used to contain or frame the safety mat on the reference floor

100 mm = 3.94 in.

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Warranty Information

Warranty and Remedy

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during that period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is the Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

While we provide application assistance, personally and through our literature, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

Sales and Service

Honeywell's MICRO SWITCH Division serves its customers through a worldwide network of sales offices and distributors. For application assistance, current specifications, pricing or the name of the nearest distributor, contact a nearby sales office or call:

TELEPHONE

+ 61 (0) 2 9370 4303	Australia
1-800-737-3360	Canada
+ 33 (0) 4 76 41 7200	France
+ 49 (0) 69 8064 444	Germany
1-815-235-6847	International
+ 44 (0) 161 251 4079	UK
1-800-537-6945	USA

FAX

+ 61 (0) 2 9353 7406	Australia
1-800-565-4130	Canada
+ 33 (0) 4 76 41 7256	France
+ 49 (0) 69 8064 442	Germany
+ 44 (0) 161 251 4141	UK
1-815-235-6847	USA

INTERNET

<http://www.honeywell.com/sensing/>
info@micro.honeywell.com

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Declaration of Conformity

European Photoelectric Center
Honeywell-Comète
B.P. 81
38243 Meylan Cedex - France
Phone : (33) 04 76 41 72 00
Fax : (33) 04 76 41 72 56



HONEYWELL EUROPEAN PHOTOELECTRIC CENTER QUALITY ASSURANCE DEPARTMENT	
CE declaration of conformity	
■ We:	Honeywell-Comète ZIRST BP 81 21, chemin du Vieux Chêne 38240 Meylan Cedex - France
■ Declare:	under our sole responsibility that the Electrosensitive Protective Equipment catalogued: <i>Safety Mat, FF-SM Series</i> to which this declaration relates is in conformity with the technical requirements of the standards and with the provisions of the essential requirements of the directives detailed below.
■ Directives:	• Machine Directive 89/392 EEC and its amendments 91/368 EEC, 94/44 EEC and 93/68 EEC, to which the EC-type examination certificate (6) delivered by the Institut National de Recherche et de Sécurité (INRS) relates. • Low Voltage Directive 73/23 EEC • Electromagnetic Compatibility Directive 89/336 EEC
■ Standards:	• pr EN 1766-1 : Safety of Machinery - Pressure sensitive protective device - part 1 : Requirements and test procedures for pressure sensitive mats and pressure sensitive floors.
■ Safety level:	Sensor : Category 3 per EN 954-1 Control unit : Category 4 per EN 954-1
■ Legal Representative in Europe	Place of issue: Meylan Quality Manager: Patrick Goud Date of issue : 18/12/97 General Manager: Jean-Pierre Sany Signature: Signature:
Issue n°:	03

(1) Available upon request

Safety Perimeter Guarding Installation Manual

**FF-SPS4 Series
Safety Perimeter Guarding**

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Important Information

Overview

This manual contains description, operation, installation, electrical connection, maintenance and troubleshoot information related to the FF-SPS4 Series safety perimeter device. This chapter provides the following important information :

- Important Highlighted Information
- Organization of Manual
- Warranty and Remedy
- Sales and Service
- Identification and Approval Plates

Important Highlighted Information

Important danger, warning, caution and notice information are highlighted throughout this manual as follows:

DANGER

A DANGER symbol indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

A WARNING symbol indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

A CAUTION symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

NOTICE

A NOTICE symbol indicates important information that must be remembered and aids in job performance.

Single Beam Device Installation and Use

The installation and use of a safety single beam device requires compliance with strict rules. Correct installation is necessary to ensure safety and must be carried out by personnel thoroughly familiar with all instructions and the following safety regulations.

Approvals

 Type 4 ESPE	Only the packaging and the documentation of FF-SPS4 Series products carry the CE mark; the CE declaration of conformity is at the back of this manual
 C US	Canadian Standards Association

Standards Compliance (applicable parts of)

Standard	Title
ANSI B11.19	Safeguarding when Referenced by the Other B11 Machine Tool Safety Standards
ANSI/RIA R15.06	Safety Requirements for Industrial Robots and Robot Systems
UL508	Underwriters Laboratory
IEC1496 PART 1 and 2 EN 61496 PART 1 and 2	International Electrotechnical Commission; European Normalisation; Safety of Machinery - Electrosensitive Protective Equipment
EN 292	Safety of Machinery - Basic Concepts, General Principles for Design
EN 60204	Safety of Machinery - Electrical Equipment of Machines
pr EN 999	Safety of Machinery - Positioning of Protective Equipment Related to Approach Speeds of Parts of the Human Body
EN 294	Safety of Machinery - Safety Distances to Prevent Upper Limbs from Reaching Danger Zones
pr EN 811	Safety of Machinery - Safety Distances to Prevent Lower Limbs from Reaching Danger Zones

Regulations

OSHA 29 CFR 1910.212	General Requirements for (guarding of) All Machines

Directives Compliance

Machine Directive 89/392 EEC
Low Voltage Directive 73/23 EEC
Electromagnetic Compatibility Directive 89/336

Control Reliability

Control Reliability means that “the device, system or interface shall be designed, constructed and installed such that a single component failure within the device, interface or system shall not prevent normal stopping action from taking place but shall prevent a successive machine cycle.” (ANSI B11.19-1990, 5.5)

OSHA 29 CFR 1910.217 states that “the control system shall be constructed so that a failure within the system does not prevent the normal stopping action from being applied to the press when required, but does prevent initiation of a successive stroke until the failure is corrected. The failure shall be detectable by a simple test, or indicated by the control system.”

Honeywell has developed self-checking techniques which combine control reliability with safety. The FF-SPS4 Series perimeter devices function with dual channel redundancy and positive self-checking monitoring. This means that a faulty component in our system will make the safety barrier fail in a safe mode.

This design meets the requirements for Category 4 Electrosensitive Protective equipment as described in the EN 61496-1/2 European standard. Category 4 safety products are designed and manufactured in such a way that a single breakdown or an accumulation of failures does not lead to the loss of the safety function when a dangerous situation arises. **The safety function is maintained on a permanent basis.**

Organization of Manual

This installation manual consists of the following sections:

- **Important Information** contains important highlighted information, the manual's organization, control reliability information, approvals, standards, regulations and directives.
- **Description and Operation** discusses operation and specification information.
- **Installation** explains how to properly mount and align the FF-SPS4 device. The calculation of safety distance is also discussed.
- **Connections** covers electrical connection and wiring diagram information.
- **Inspection and Maintenance** contains operational test, inspection, maintenance, troubleshooting and repair information.
- **Order Guides** provide catalog listings of single beam devices, accessories, and spare parts.
- **Warranty Information** provides important contact information related to sales and service.
- **Index** contains keywords and their associated pages related to topics found throughout this manual.

Description and Operation

Overview

This section discusses FF- SPS4 identification, perimeter protection, specifications and operation. This section also highlights the customer's responsibility of properly designing and installing this perimeter guarding system.

Identification and Approval Plates

Emitter and receiver have two plates, an identification plate and an approval plate (see figures 1-1 and 1-2).

The identification plate contains the following:

- Scanning range (m)
- Catalog listing (Type)
- Power supply voltage (V)
- Power consumption (P)
- Power supply frequency (F)
- Max. switching capacity of output relays
- Serial number and date code (month and year)
- Response time
- Sealing

The approval plate certifies that the product conforms to the technical examination endorsement issued by the approval institutes of different countries.

Figure 1-1 Identification Plate

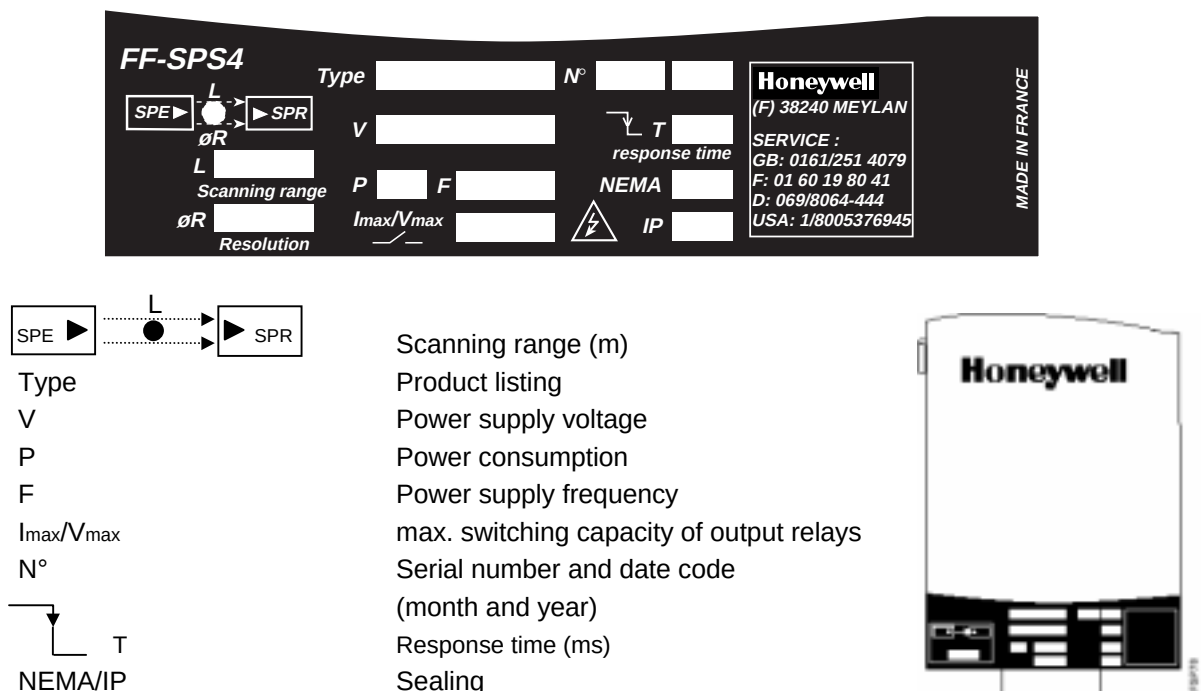


Figure 1-2 Approval Plate



Perimeter Protection

⚠ WARNING

IMPROPER INSTALLATION OF FF-SPS4 SERIES PERIMETER DEVICE

- Install FF-SPS4 perimeter devices in accordance with this installation manual and applicable safety regulations and standards (OSHA, ANSI, European standards).
- Only allow entry into protected area by interruption of sensing field or other safeguarding device.

Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING

IMPROPER PERIMETER PROTECTION

- Design control circuit to allow a manual restart before further machine operation can occur.
- Locate manual restart outside of danger zone where operator has a clear view of zone.
- Operator should NOT be able to reach manual restart from within danger zone.
- Design control circuit to prevent Programmable Logic Controller from overriding manual restart.
- Install two FF-SPS4 perimeter devices (two beam minimum) per safety application.

Failure to comply with these instructions could result in death or serious injury.

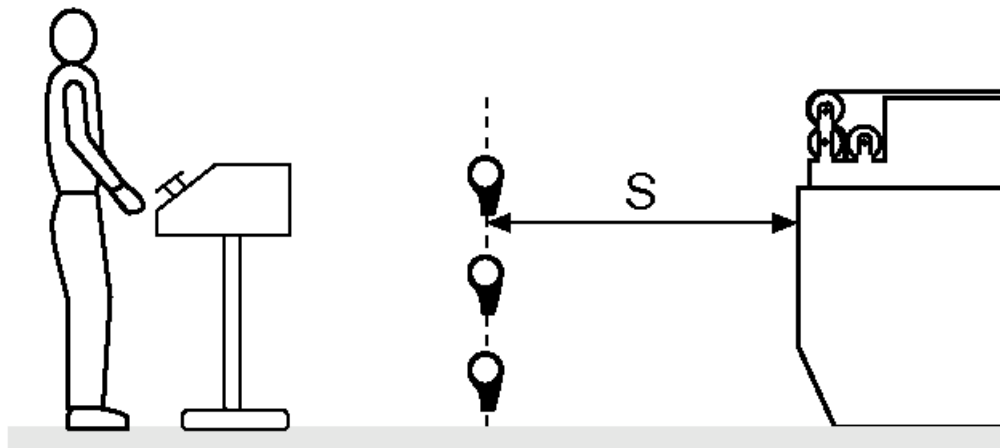
Honeywell's FF-SPS4 Series device is a self-contained, perimeter protection device designed to detect the body of an operator before gaining access to a dangerous area (see figure 1-3). This device is a single thru-scan type that uses an invisible modulated infrared beam. The interruption of the beam results in the opening of the output contacts and the generation of a stop signal. The stop signal causes additional circuitry to arrest machine motion. Continued operation of the machinery is prevented until the sensing beam is cleared. Misalignment or dirt accumulation is indicated by a flashing indicator to allow timely preventive maintenance.

⚠ DANGER**IMPROPER POINT OF OPERATION PROTECTION**

Do NOT use FF-SPS4 Series safety perimeter devices in point of operation applications.
Failure to comply with these instructions will result in death or serious injury.

Point-of-operation is defined as that area where a machine performs work (such as cutting, shaping, boring, or forming) on a material.

Figure 1-3 Perimeter Protection (two beam minimum)



FF-SPS4 circuitry is based on a permanent self-checking principle and meets the requirements of IEC 1996 EN 61496 part 1/2 European standard for type 4 Electrosensitive Protective Equipment (ESPE). A faulty component in the device will be immediately detected and will generate an emergency stop signal to initiate the arrest of machine motion. If an internal failure is detected, operation of the machinery is prevented until the condition is corrected.

Operation

The FF-SPS4 Series safety perimeter devices are designed so that a malfunction or an interruption of the sensing field will cause the perimeter device to generate a STOP signal within a maximum of 20 milliseconds. This STOP signal will be generated automatically if a malfunction occurs within the safety device. All other machine control components that affect safety should also be designed to the same high level of operation.

WARNING

IMPROPER CONTROL SYSTEM

Ensure the safety related parts of the control system and/or its protection devices, as well as its components, are designed, selected, and combined so as not to prevent the loss of safety. **Failure to comply with these instructions could result in death or serious injury.**

WARNING

IMPROPER MACHINE REACTION

- Ensure the machine control is capable of stopping the machine at any point in the cycle.
- Ensure that a loss of power does NOT impair stopping action of machine.

Failure to comply with these instructions could result in death or serious injury.

DANGER

IMPROPER POINT OF OPERATION PROTECTION

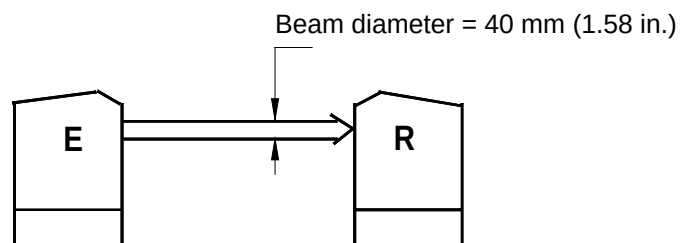
Do NOT use FF-SPS4 Series safety perimeter devices in point of operation applications. **Failure to comply with these instructions will result in death or serious injury.**

The FF-SPS4 devices are thru-scan devices. The emitter sends an infrared light beam that is detected by a photoreceiver in the receiver unit. The emitter is optically synchronized with the receiver. No interconnecting cables are required. In addition, the emitter and the receiver are not matched, easing maintenance.

Detection

The beam diameter (see figure 1-4) of a FF-SPS4 device is 40 mm (1.58 in.). A beam diameter is the smallest width that will block the beam of a perimeter device.

Figure 1-4 Beam Diameter



Response Time

The response time is the maximum time it takes the perimeter device to generate a STOP signal after the sensing field has been interrupted. All FF-SPS4 catalog listing versions have the same response time (20 ms).

Scan Range

⚠ WARNING

IMPROPER REFLECTIVE SURFACE

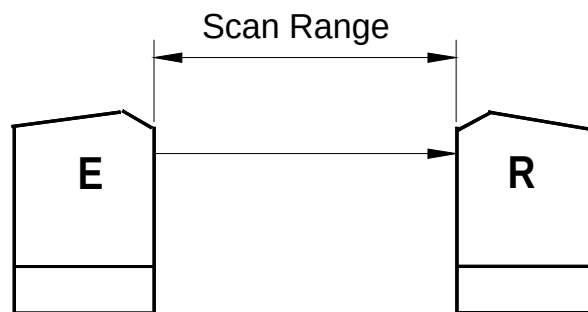
- To prevent two optical beam paths to the receiver, do NOT use the long range version safety perimeter device if the application distance required between the emitter and receiver is less than 30 m (131 ft).
- Use the standard scan range product if the application distance required between the emitter and receiver is less than 30 m (131 ft).

Failure to comply with these instructions could result in death or serious injury.

Scan range is the maximum distance allowed between the emitter and the receiver (see figure 1-5). See below for scan range availability.

FF-SPS4 Version	Scan Range
Standard	40 m (131 ft).
Long range	75 m (246 ft.).
Low temperature	20 m (66 ft.).

Figure 1-5 Scan Range



Indicators

Safety perimeter device receivers have five light emitting diode (LED) indicators. The emitters have three LED indicators (see figures 1-6 and 1-7). These indicators provide important information about the operational status of the perimeter devices.

Emitter Indicators

An illuminated yellow Power On indicator indicates that power is applied to the unit.

The red test mode indicator is illuminated when the test is effectuated.

⚠ WARNING

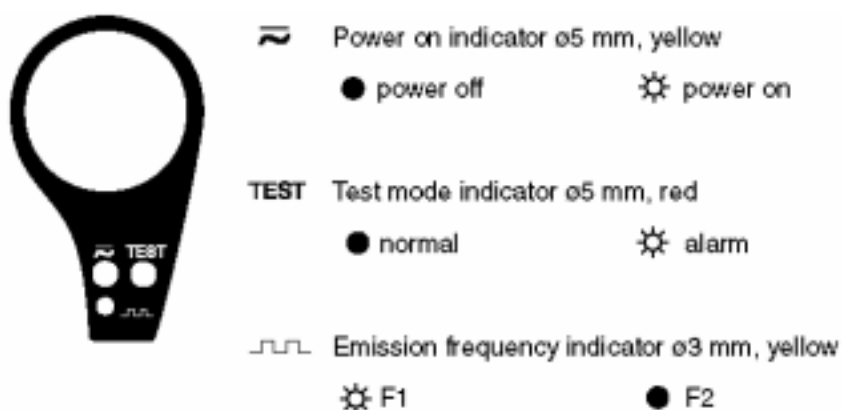
IMPROPER PERIMETER DEVICE OPERATION

The emitter and receiver must be set to the same light emission frequency for proper operation.

Failure to comply with these instructions could result in death or serious injury.

The yellow emission frequency indicator is illuminated when the F1 frequency is set. The indicator is not illuminated if the F2 frequency is set. Frequency selection allows the close placement of two perimeter devices without mutual interference or cross-talk. Each device is set to a different frequency to prevent cross-talk.

Figure 1-6 Emitter Indicators



LED	Location	Color	Function
E1	Emitter	Yellow	Power On
E2	Emitter	Red	Test Mode
E3	Emitter	Yellow	Emission Frequency

Receiver Indicators

The receiver has five LED indicators (see figure 1-7). The yellow signal margin indicator located at the top aids in the alignment of the perimeter device. The signal margin indicator will flash repeatedly if the light received by the receiver is less than required. This condition will alert maintenance personnel that preventive maintenance must be performed to prevent a shutdown condition.

The yellow reset mode indicator illuminates during normal operation (manual mode). This indicator flickers when a reset is required (press and release the system restart push-button).

The red and green LEDs indicate output relay status or the interruption of the sensing beam. The green indicator is illuminated when the perimeter device is operating normally (no interruption of the sensing beam) and the output relay is closed. This indication must be present before a machine is put into operation. If the sensing beam is interrupted, the output relay is de-energized (opens) and the perimeter device generates a STOP signal within 20 milliseconds. During this condition, the red LED illuminates and the green LED turns off. When the sensing beam is no longer interrupted and reset is actuated, the red LED turns off and the green LED is illuminated.

⚠ WARNING

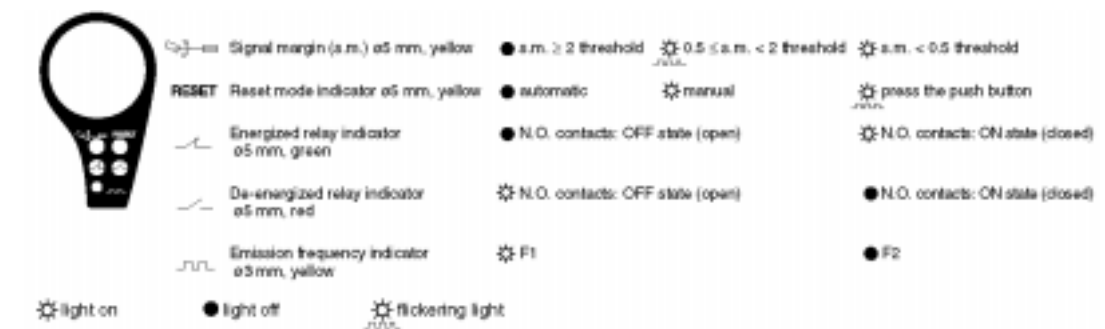
IMPROPER PERIMETER DEVICE OPERATION

The emitter and receiver must be set to the same light emission frequency for proper operation.

Failure to comply with these instructions could result in death or serious injury.

The yellow emission frequency indicator is illuminated if set for the F1 frequency. The indicator is not illuminated if the device is set to the F2 frequency.

Figure 1-7 Receiver Indicators



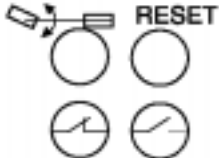
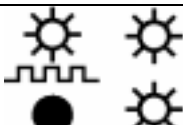
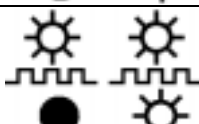
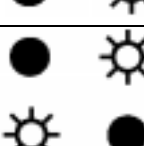
LED	Location	Color	Function
R1	Receiver	Yellow	Signal Margin (alignment)
R2	Receiver	Yellow	Reset Mode
R3	Receiver	Green	Energized Relay (output status)
R4	Receiver	Red	De-energized Relay (output status)
R5	Receiver	Yellow	Emission Frequency

Indicator Status

Refer to table 1-1 for indicator status.

1. If both yellow LED indicators (signal margin/reset mode) are illuminated, the receiver is not receiving light (an optical signal) from the emitter. Align the emitter and receiver.
2. If the signal margin indicator flickers and the reset mode indicator is illuminated, the optical signal is too weak for the perimeter device to operate correctly. Continue to align the emitter and receiver.
3. If both yellow indicators (signal margin/reset mode) flicker, the optical signal is close to the limit. The receiver is receiving enough of a signal to operate correctly. However, continue to align the emitter and receiver for optimum performance.
4. If the signal margin indicator is not illuminated and the reset mode indicator is flickering, the alignment is correct. Press and release the push-button within the correct time frame (**$100\text{ ms} < t < 3,4\text{ s}$**).
5. If the signal margin indicator is not illuminated, and the reset indicator is illuminated, the device is 100% aligned and operating correctly.

Table 1-1 Alignment Indicators

Receiver Indicator Status 	Optical Signal	Relay Status	Action
	signal absent	de-energized, open	align emitter and receiver
	signal too weak	de-energized, open	continue to align emitter and receiver; cannot reset
	signal close to the limit	de-energized, open	continue to align emitter and receiver; cannot reset
	signal sufficient	de-energized, open	optimal alignment (can reset). press and release reset push-button within time frame t ; ($100\text{ ms} \leq t \leq 3,4\text{ s}$)
	signal sufficient	energized, closed	100% aligned and reset; final optimum operating condition

 light on
 light off
 flickering light

Mirrors

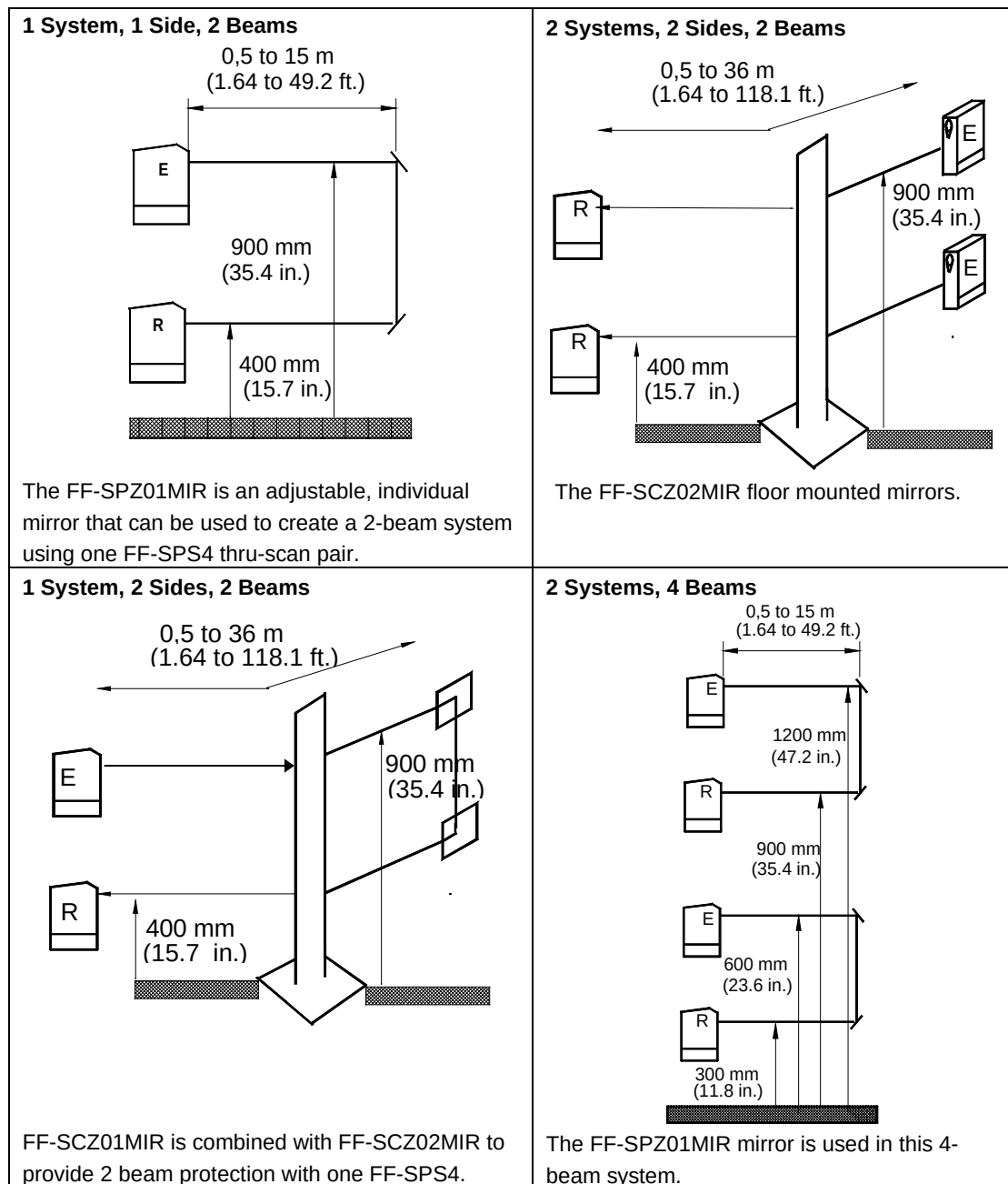
Refer to table 1-2 for multi-beam beam height information. Each mirror will reduce the overall scanning range by 10 percent (25% for FF-SPS11MIR and FF-MSK1). See figure 1-8 to check the value of each mirror.

Table 1-2 Multi-beams, Beam Height

Number of Beams	Height Above Floor mm (in)
2	400 (15.7)
	900 (35.4)
3	300 (11.8)
	700 (27.6)
	1100 (43.3)
4	300 (11.8)
	600 (23.6)
	900 (35.4)
	1200 (47.2)

NOTICE

The deep groove on the top of each device is used for alignment. Emitter alignment must be precise, especially when using mirrors. Always align the emitter with a mirror first, then align the receiver.

Figure 1-8 Mirror Beam Configurations

Catalog Listing	Description
FF-MSK1	single mirror 30% attenuation
FF-SPZ01MIR	single mirror 10% attenuation
FF-SPZ02MIR	2 mirrors post 10% attenuation
FF-SPZ03MIR	3 mirrors post 10% attenuation
FF-SPZ04MIR	4 mirrors post 10% attenuation
FF-SPZ11MIR	single mirror 30% attenuation

Specifications

OPERATING CHARACTERISTICS		
Scanning Range	Standard	0.5 to 40.0 m (1.64 to 131.2 ft)
	Low temperature	0.5 to 20.0 m (1.64 to 65.6 ft)
	Long range	30 to 75 m (98.4 to 246 ft)
Minimum Detected Object Size		40 mm (1.57 in.) diameter
Effective Aperture Angle		± 2° meets IEC 1946-2 requirements
Emission		infrared, pulsed, 880 nm, two selectable emission frequencies
Immunity to Ambient Light	Sun	20,000 lux
	Lamplight	15,000 lux
ELECTRICAL CHARACTERISTICS		
Power Supply Voltage	115 VAC, + 10 %, -15 %	24 VDC, ± 15 %
Power Supply Frequency	48 to 62 Hz	—
Power Consumption	Emitter: 3 VA	Emitter: 3 W
	Receiver: 6 VA	Receiver: 6 W
Output Switching Capacity	2 A/250 VAC, 2 safety relays with guided contacts (50 mA min.)	
Response Time	20 ms	
Noise Immunity	Electrical: IEC 801-4, level IV	
	Electromagnetic: IEC 801-3, level IV	
ENVIRONMENTAL/PHYSICAL CHARACTERISTICS		
Ambient Temperature	Standard and long range versions	0° to +55°C (32° to +131°F)
	Low temperature version	-25° to +55° C (-13° to +131°F)
Sealing	Terminal	IP 67 or NEMA 6
	Quick connect	IP 65 or NEMA 4 and 13
Dimensions	Housing terminal	187 mm (7.36 in.) high 120 mm (4.72 in.) deep
	Housing quick connect	277 mm (10.90 in.) high 120 mm (4.72 in.) deep 50 mm (1.97 in.) wide
	Emitter lens diameter	35 mm (1.38 in.)
	Receiver lens diameter	40 mm (1.57 in.)
Material	Housing	Aluminum alloy, yellow painted according to RAL 1021 (polyurethane)
	Front face	Polycarbonate
Weight	Emitter	1,150 g (2.5 lb.)
	Receiver	1,350 g (3 lb.)

Installation

Overview

This section discusses the calculation of safety distance, mounting and alignment of the FF-SPS4 Series safety perimeter guarding system.

WARNING

IMPROPER INSTALLATION OF FF-SPS4 SERIES PERIMETER GUARDING SYSTEM

- Install FF-SPS4 perimeter guarding system in accordance with this installation manual and applicable safety regulations and standards (OSHA, ANSI, European standards).
- Allow entry into protected area by interruption of sensing field or other safeguarding device only.

Failure to comply with these instructions could result in death or serious injury.

WARNING

IMPROPER CONTROL SYSTEM

Ensure the safety related parts of the control system and/or its protection devices, as well as its components, are designed, selected, and combined so as not to prevent the loss of safety.

Failure to comply with these instructions could result in death or serious injury.

WARNING

IMPROPER PERIMETER PROTECTION

- Design control circuit to allow a manual restart before further machine operation can occur.
- Locate manual restart outside of danger zone where operator has a clear view of zone.
- Operator should NOT be able to reach manual restart from within danger zone.
- Design control circuit to prevent Programmable Logic Controller from overriding manual restart.
- Install two FF-SPS4 perimeter devices (two beam minimum) per safety application.

Failure to comply with these instructions could result in death or serious injury.

WARNING

IMPROPER MACHINE REACTION

- Ensure the machine control is capable of stopping the machine at any point in the cycle.
- Ensure that a loss of power does NOT impair stopping action of machine.

Failure to comply with these instructions could result in death or serious injury.

How to Calculate Safety Distance

WARNING

IMPROPER SAFETY DISTANCE

- Calculate safety distance using formula $D_s > V(t_1 + t_2) + C$ where,
 - D_s is the safety distance (OSHA 29 CFR 1910.217)
 - V is the hand speed constant of 63 inches per second
 - t_1 is the response time of the FF-SPS4 perimeter guarding system
 - t_2 is the stopping time of the machine including interconnecting components such as relays, solenoids, and brakes
 - C is additional safety distance obtained from local safety agency.
- Position the FF-SPS4 perimeter guarding system at the proper distance to allow a machine to arrive at a complete stop before an operator reaches a danger zone.

Failure to comply with these instructions could result in death or serious injury.

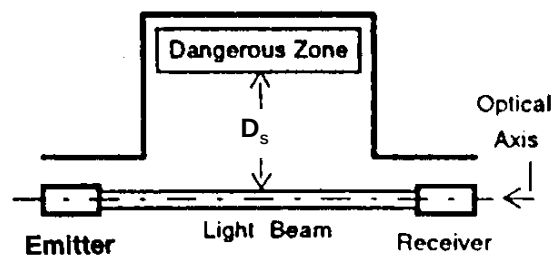
The safety distance is the minimum distance between the sensing field and the danger zone. This distance ensures that the danger zone cannot be reached until the machine motion has been stopped.

Calculate the safety distance (see figure 2-1) using the following formula:

$$D_s \geq V \times (t_1 + t_2) + C, \text{ where}$$

- D_s is the safety distance from the safety perimeter device sensing field to the danger zone.
- V is the velocity of movement into the danger zone; the OSHA hand speed constant is 63 inches per second; see health and safety regulations for current value.
- t_1 is the response time of the FF-SPS4 safety perimeter device (20 ms).
- t_2 is the stopping time of the equipment guarded by the safety perimeter device including interconnecting components such as all mechanical, electromechanical, and electronic parts such as relays, solenoids, and brakes.
- C is additional safety distance. See health and safety regulations for this value.

Figure 2-1 Perimeter Guarding System Safety Distance Diagram



⚠ WARNING

IMPROPER FF-SPS4 SERIES APPLICATION

- A minimum of two beams are required to properly apply the FF-SPS4 Series safety perimeter guarding devices.
- Entry into the protected area must be allowed only by interruption of the sensing beams.

Failure to comply with these instructions could result in death or serious injury.

Number of Beams	Height Above Floor mm (in.)
2	400 (15.7)
	900 (35.4)
3	300 (11.8)
	700 (27.6)
	1100 (43.3)
4	300 (11.8)
	600 (23.6)
	900 (35.4)
	1200 (47.2)

Sample Calculation

Country: USA

Application: Robotics

Protection: Perimeter Guarding

Formula: $D_s \geq V(t_1 + t_2) + C$

– $V = 63 \text{ in./sec.}$

– $t_1 = 20 \text{ ms (FF-SPS4)}$

– $t_2 = 200 \text{ ms (machine stop time; including response time of all interconnecting components, such as relays, solenoids, brakes, etc.)}$

– $C = 33.5 \text{ in. (USA)}$

– $D_s = 63 (0.020 + 0.200) + 33.5 \text{ in.} = 47.36 \text{ in.}$

Reflective Surfaces Considered

⚠ WARNING

IMPROPER REFLECTIVE SURFACES

- To prevent two optical paths to the receiver, install FF-SPS4 Series safety perimeter guarding devices so there are no reflective surfaces within the beam angles of the emitter and receiver.
- Calculate reflective safety distance using formula $D = L/2(\tan 2^\circ) + R + C$, where
 - D is minimum distance to reflective surface (**always greater than 100 mm or 3.94 in**)
 - L is installed scanning range
 - R is effective beam radius
 - C is additional safety distance obtained from local safety agency.

Failure to comply with these instructions could result in death or serious injury.

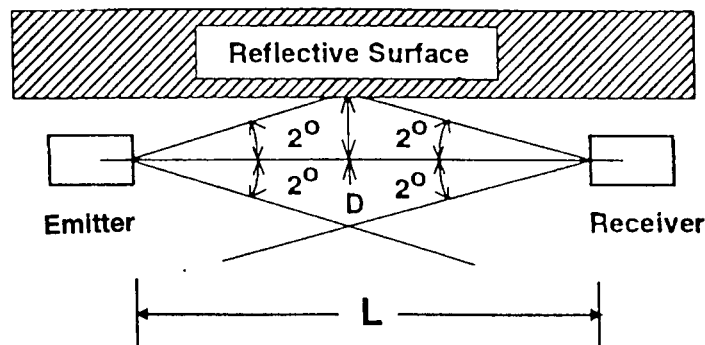
Reflective surfaces near the sensing field can cause the reflection of the sensing beams and result in two optical paths to the receiver. The FF-SPS4 Series safety perimeter devices must be installed so there are no reflective surfaces within the beam angles of the emitter and receiver. Figure 2-2 illustrates the beam angles.

Calculate the safety distance using the following formula:

$$D = L/2(\tan 2^\circ) + R + C$$

- D = Minimum distance to reflective surface (**always greater than 100 mm or 3.94 in**)
- L = Installed scanning range
- R = Effective beam radius
- C = Additional safety distance as required by local safety agency.

Figure 2-2 Angle of Divergence and Distance from Reflective Surfaces



The emitter and receiver must have the same protected height and resolution. The emitter and receiver must be mounted at the same height and aligned with each other.

Sample Calculation

$$D = L/2(\tan 2^\circ) + R + C$$

- L = 1200 in. (100 ft)
- R = 0.79 in. (SPS4)
- C = 0
- $D = (1200/2) \tan 2^\circ + 0.79 \text{ in.} + 0$
- D = 21.75 in. (552 mm)

The minimum distance required in the United States is 100 mm (3.94 in.). Additional distance may be required depending on the installed scanning distance.

Mounting Considerations

This section contains optical alignment and mounting information (see figures 2-3 and 2-4). There are various ways to mount FF-SPS4 Series perimeter guarding devices (singularly, in groups, and in different orientations). The customer is responsible for determining which mounting method will guard the machine most effectively.

Figure 2-3 Mounting Dimensions - Terminal Strip Style (for reference only)

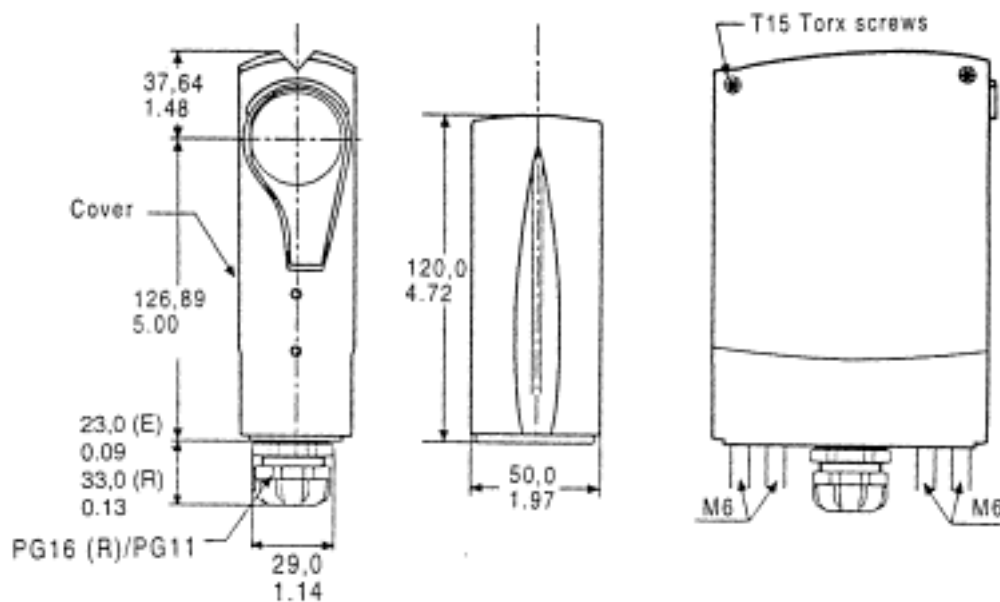
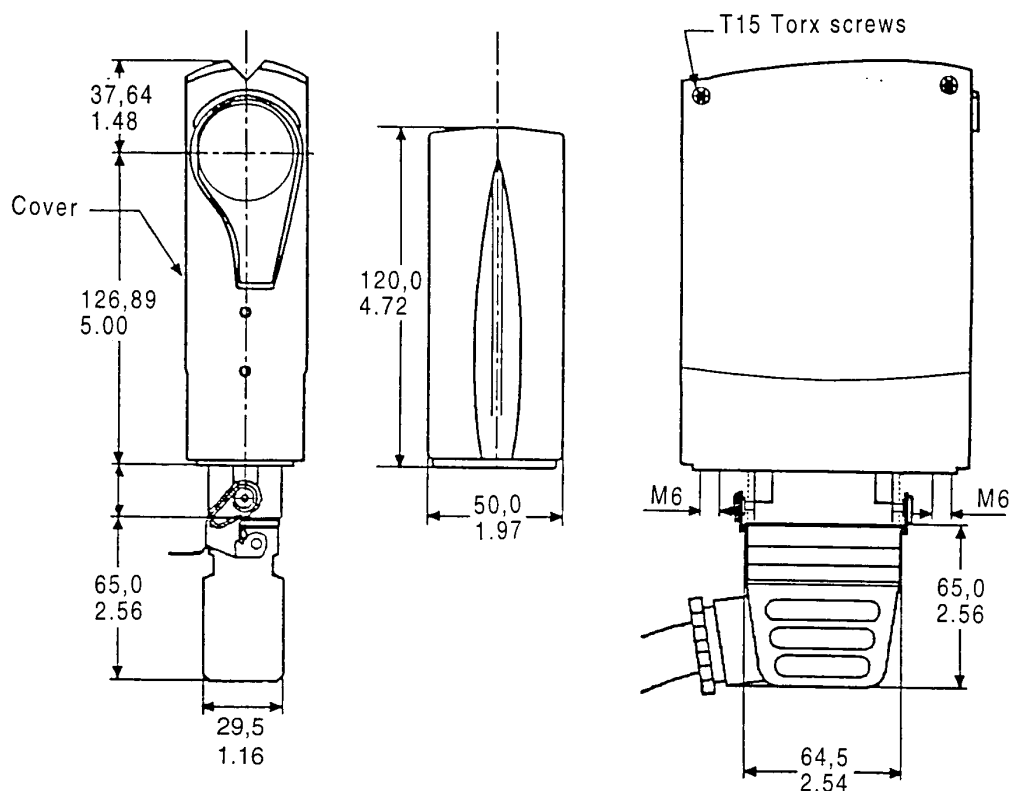
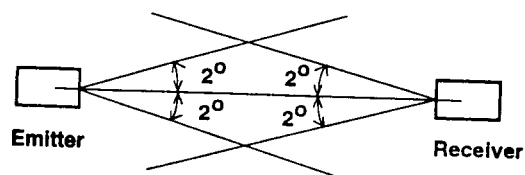


Figure 2-4 Mounting Dimensions - Quick-connect Style (for reference only)

Optical Alignment

To ensure optimum operation, the proper optical alignment of the FF-SPS4 Series perimeter guarding devices is essential. The emitter and receiver devices must be mounted in parallel, at the same height, and with an angular displacement of no more than $\pm 2^\circ$ (see figure 2-5).

Figure 2-5 Emitter and Receiver Optical Alignment

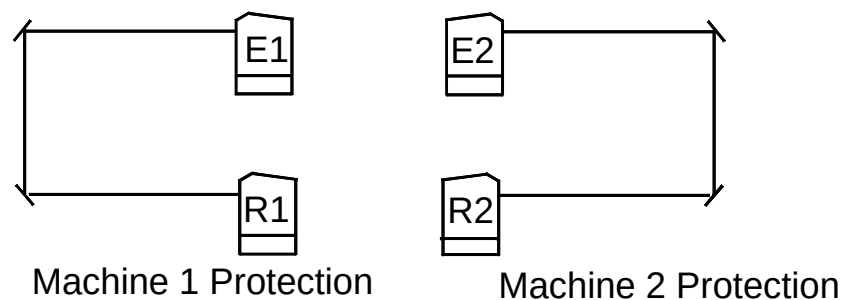
Side by Side or Multiple System Installation

NOTICE

To prevent mutual interference or cross talk, pointing emitters in opposite directions may be necessary in side-by-side or multiple system installations to ensure proper operation.

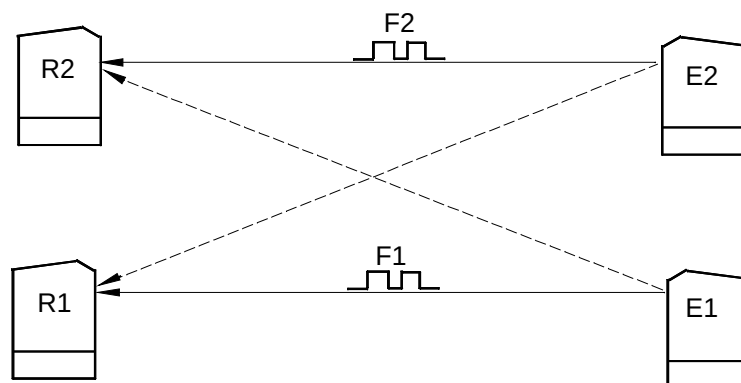
If two or more FF-SPS4 safety perimeter systems are installed, optical interference may occur if a receiver receives signals from two emitter devices. This condition may occur due to the $\pm 2^\circ$ effective aperture angle of the emitter/receiver and the nominal scanning range (up to 75 m [246 ft]). To provide side protection, point the emitters in opposite directions (see figure 2-6).

Figure 2-6 Side by Side Installation



To ease installation (wiring), emitters may be pointed in the same direction, especially when multiple systems are perimeter guarding the same side of a machine. To prevent any mutual interference or crosstalk, select two different emission frequencies of infrared modulated light by using the two internal switches F1 or F2 (see figure 2-7).

Figure 2-7 Selection of Different Emission Frequencies



Emission Frequency Selection

**WARNING**

IMPROPER PERIMETER DEVICE OPERATION
The emitter and receiver must be set to the same light emission frequency for proper operation.
Failure to comply with these instructions could result in death or serious injury.

The FF-SPS4 Series safety perimeter guarding system has internal switches that are used to select the emission frequency (F1 or F2) of the infrared modulated light. To avoid crosstalk or mutual interference when two perimeter guarding systems are close to each other, these switches need to be set to different frequencies.

Remember, each emitter must be set to the same frequency as its corresponding receiver. If a receiver receives a signal from two emitters of the same emission frequency, the receiver remains in an alarm condition permanently. To return to a normal condition, the emission frequency of the second emitter must be changed; then receiver power must be turned off and on.

All emitter and receiver devices are factory set to the emission frequency F1 or 50 kHz (see figures 2-8 and 2-9).

Figure 2-8 Receiver Frequency Selection

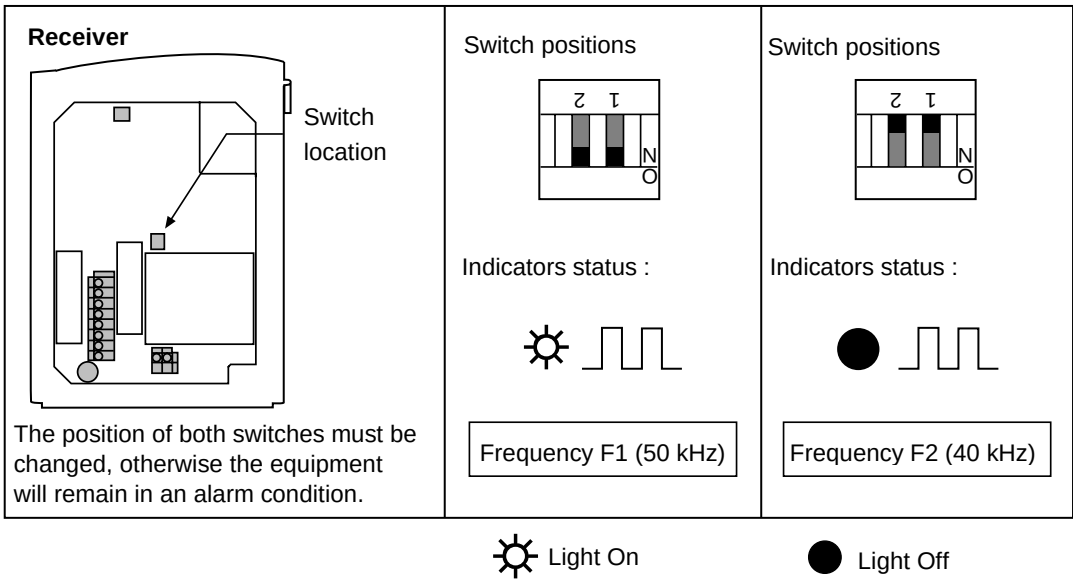
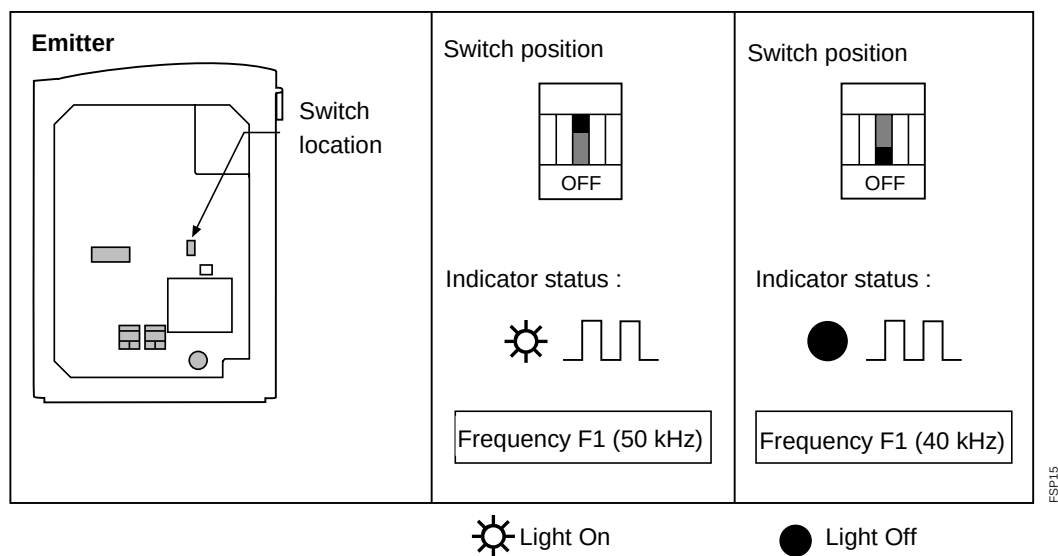


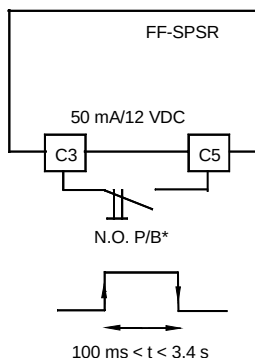
Figure 2-9 Emitter Frequency Selection**Check Emission Frequency Setting**

Observe the status of both the emitter and receiver emission frequency indicators. The status of these indicators must be identical. If it is not, make the necessary setting changes. If the status of the indicators is identical, interrupt the sensing beam of the emitter and observe the status of the red output indicator on the receiver. The red indicator must be illuminated (see figures 2-8 and 2-9).

Start and Restart (Cycle) Interlock Mode of Operation

The start and restart interlock mode of operation causes the system to remain in an alarm condition after power up or a beam interruption. To restart the equipment, a normally open (N.O.) contact of a push button (P/B) or manual restart must be actuated (see figure 2-10).

Figure 2-10 Wiring Diagram



To restart the perimeter safety system, press and release the P/B within the specified time frame. If the P/B is not pushed, the safety system remains in an alarm condition. Restart is only possible if the sensing beam is not interrupted (no object is present). A short press and release of the P/B is enough to restart the system. The safety system restarts after the release of the push-button.

⚠ WARNING

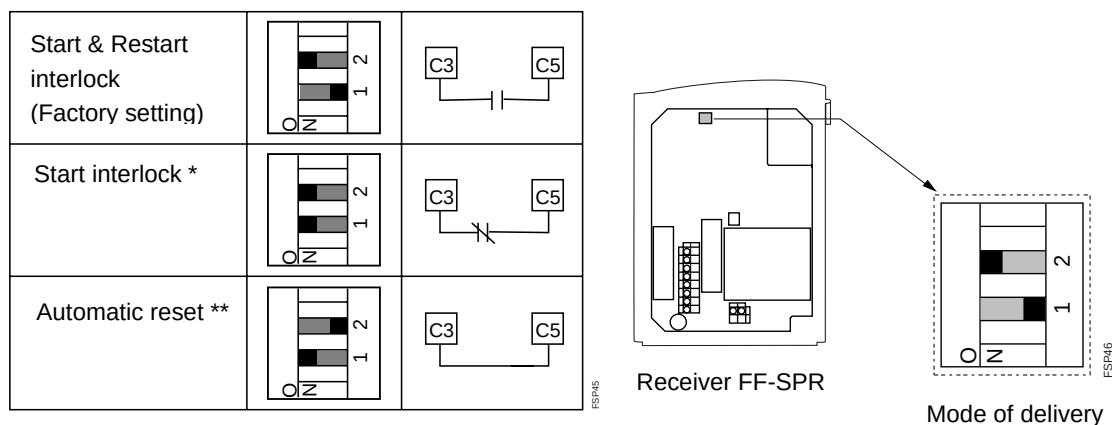
IMPROPER PERIMETER PROTECTION

- Design control circuit to allow a manual restart before further machine operation can occur.
- Locate manual restart outside of danger zone where operator has a clear view of zone.
- Operator should NOT be able to reach manual restart from within danger zone.
- Design control circuit to prevent Programmable Logic Controller from overriding manual restart.
- Install two FF-SPS4 perimeter devices (two beam minimum) per safety application.

Failure to comply with these instructions could result in death or serious injury.

The FF-SPS4 Series perimeter guarding system is factory set (see figure 2-11) to operate in the start and restart interlock mode to control access to a dangerous zone. The restart push button must be installed outside the dangerous area. If an application requires an alternate mode of operation (start interlock and automatic reset), consult the Application Center for additional information.

Figure 2-11 Start and Restart Interlock, Start interlock and Automatic Reset Switch Setting

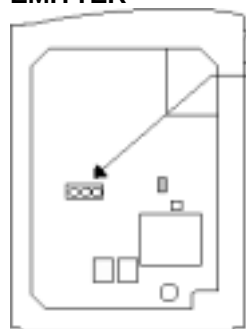


Test input option

This fail-safe equipment is based upon a permanent self-checking principle which means that its integrity does not rely upon the use of the test option. However, the test input may be used to interface the equipment with the machine circuitry to check the correct operation of the Final Switching Devices K1 and K2 when the equipment is not often triggered by frequent beam occultations :

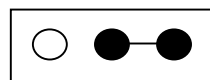
A test cycle can be triggered when closing an external NO test contact or when opening an external NC test contact. The configuration of the type of external test contact (NO or NC contact) is be done by setting a jumper located behind the emitter side cover. In order to change the jumper setting, open the emitter by unscrewing the side covers and follow the following indications :

EMITTER

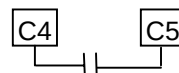


Jumper location

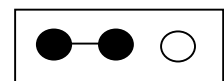
Jumper position



Test NO test contact (Factory setting)



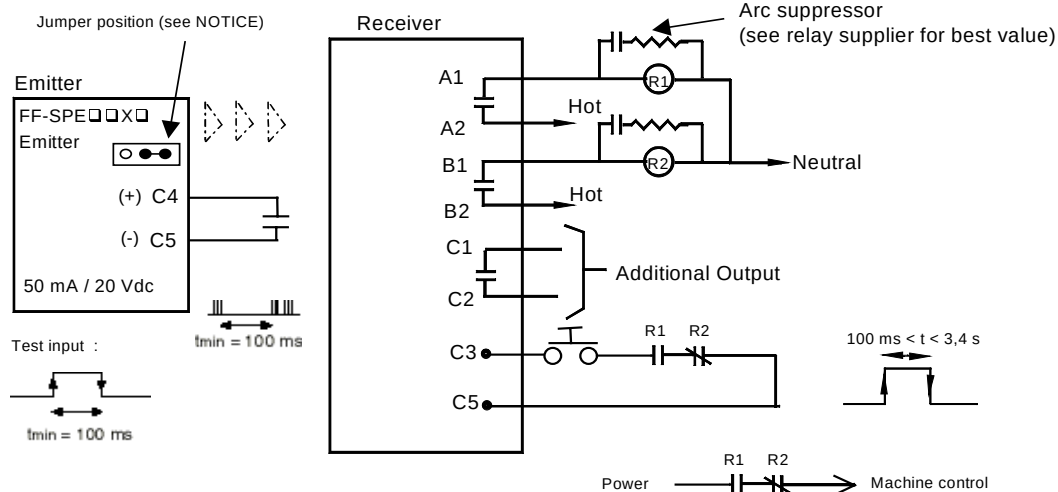
Jumper position



Test NC test contact



Wiring diagram



Contacts status

TEST-CONTACT	NO contacts X1 and X2	NC contacts X1 and X2	NO contacts K1 and K2
De-activated	Closed	Open	Closed
Activated	Open *	Closed *	Open *

*Press the restart push-button if necessary.

After activation of the test contact, the NO contacts of the equipment (X1 and X2) are open, the NC contact of the equipment is closed and the NO contacts of the FSD (K1 and K2) are open.

NOTICE

- 1) On delivery, the equipment is configured for the use of a NO test contact.
- 2) The cyclic use of the test input is easier in the Automatic restart mode or in the start interlock mode.
- 3) In the Automatic restart mode, it takes 140 ms for the system to restart after the test contact is released.

Mounting Hardware

The FF-SPS4 Series perimeter devices are delivered with rotatable brackets and include the hardware necessary to install them (see figures 2-12 and 2-13). The bracket is fastened to the bottom of the perimeter device. Two additional holes, located at the back of the device, can also be used to install the product. However, the customer must supply the brackets if the holes on the back are used.

Figure 2-12 Rotatable Mounting Brackets

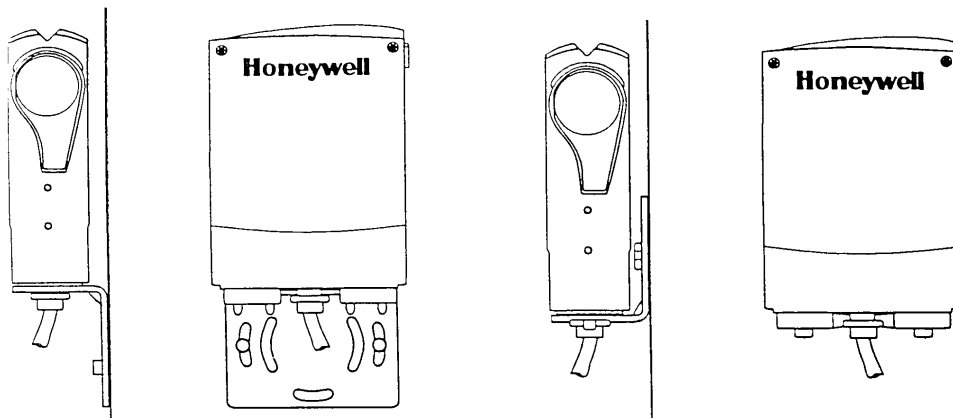
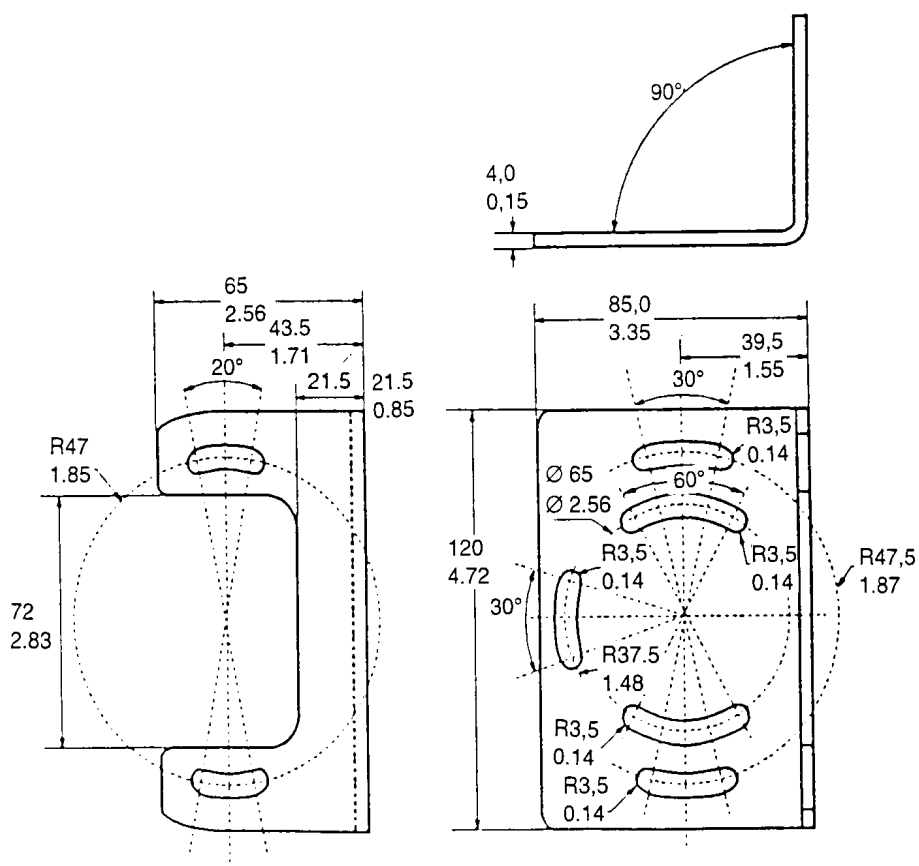


Figure 2-13 Mounting Bracket Dimensions (for reference only)



Mirror Hardware

The individual mirror includes all mounting brackets and hardware necessary for installation. The mounting brackets allow rotation of the mirror to a desired angle (see figure 2-14). The FF-SCZ0 _ MIR Series floor-mounted deflection mirrors are designed for perimeter protection (see figure 2-15). Optical alignment is made easy because of the mechanical support of the deflection mirrors. The bracket is rigidly fixed to the column for special adjustment of the mirror. Refer to figure 2-16 for the mounting dimensions of the FF-MSK1 white glass rear surface reflective mirror.

Figure 2-14 Single-beam Mirror (FF-SPZ01MIR/FF-SPZ11MIR) Mounting (for reference only)

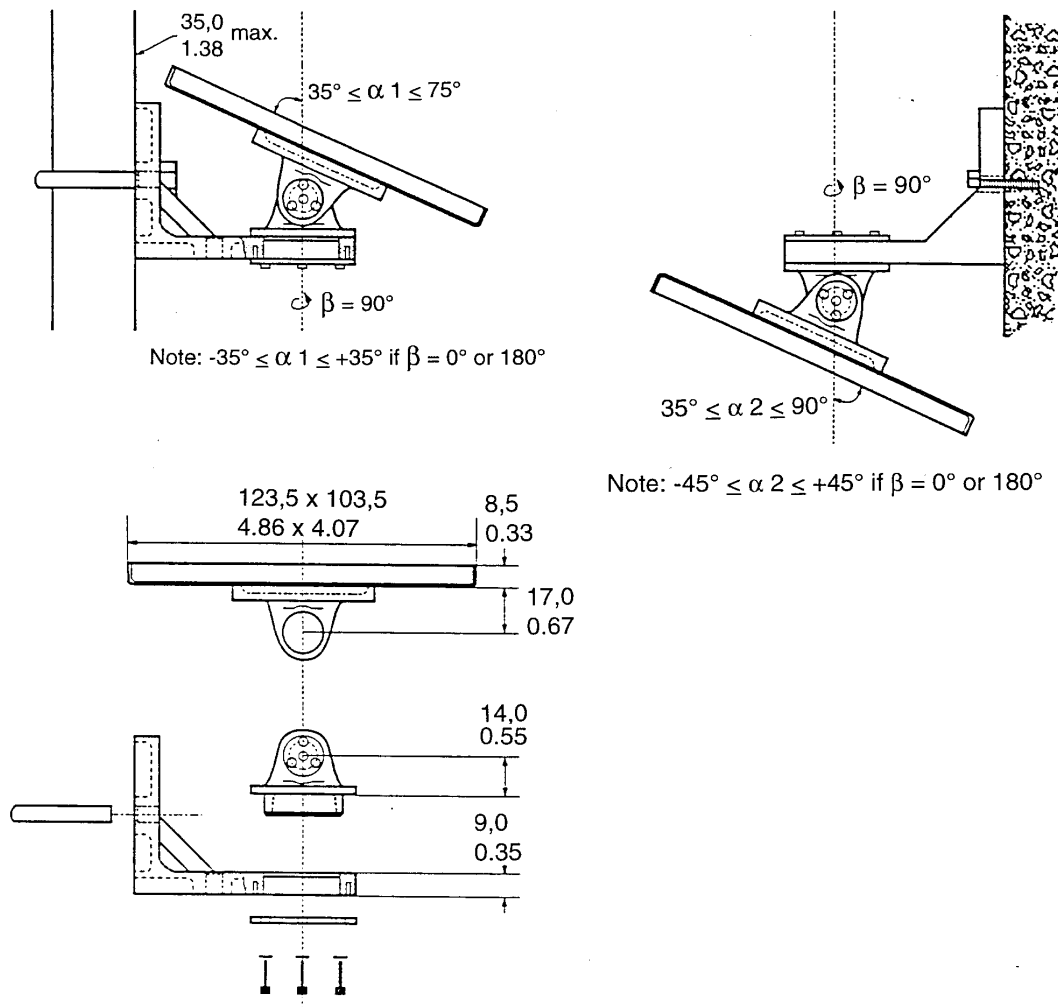
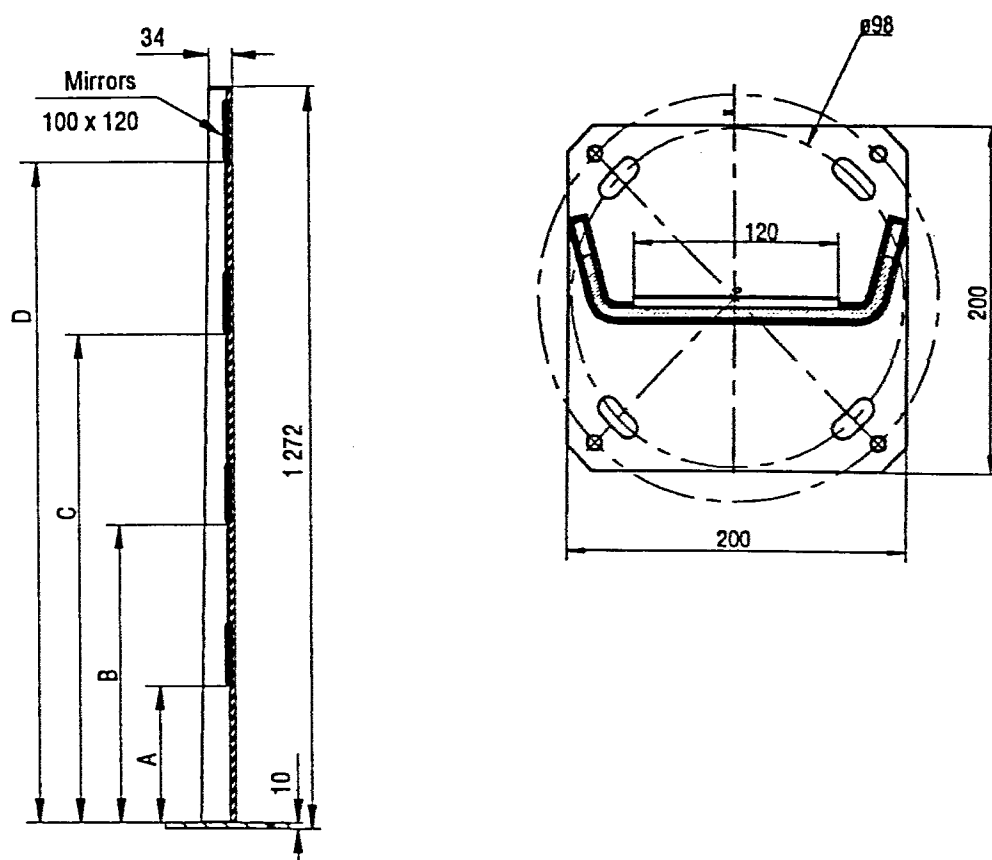
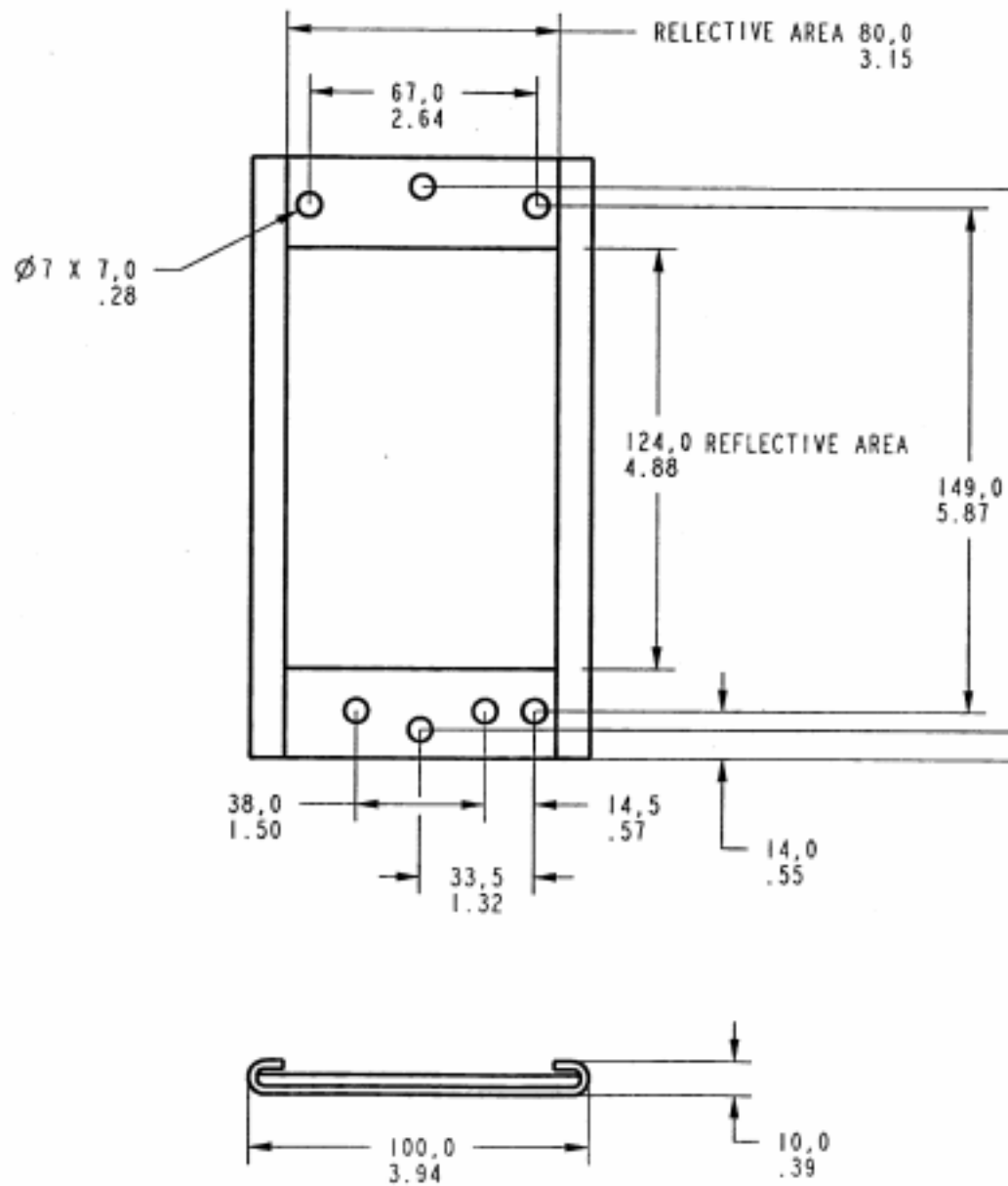


Figure 2-15 Floor-mounted Deflection Mirrors (for reference only)

Number of Beams	Heights in mm (in.)			
	A	B	C	D
FF-SCZ02MIR (2 beams)	400 (15.7)	900 (35.4)	—	—
FF-SCZ03MIR (3 beams)	300 (11.8)	700 (27.6)	1100 (43.3)	—
FF-SCZ04MIR (4 beams)	300 (11.8)	600 (23.6)	900 (35.4)	1200 (47.2)

Figure 2-16 FF-MSK1 White Glass Rear Surface Reflective Mirror (for reference only)



Connections

Overview

This section contains information about electrical connections and wiring. The FF-SPS4 Series safety perimeter guard devices are easy to install using quick-connect and terminal strip style termination.

⚠ WARNING

IMPROPER INSTALLATION

Strictly adhere to all electrical connection instructions.

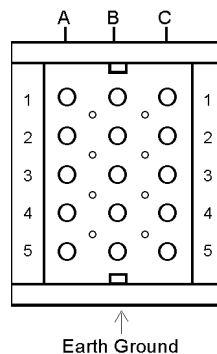
Failure to comply with these instructions could result in death or serious injury.

Terminations

Quick-connect Style

The quick-connect style termination is a metal connector. The user emitter connector catalog listing is FF-SBZ1721137 and the user receiver connector catalog listing is FF-SBZ1721202. Figure 3-1 illustrates the metal quick-connect connector as viewed from the rear. Both connectors use the same type of crimped pins and are provided with each quick-connect product.

Figure 3-1 Quick-connect Connector (rear view)



Quick-connect Connector Wiring (see figures 3-2, 3-4, 3-5 and 3-6)

The following tools are necessary:

- A set of wire strippers.
- A medium-sized flat-head screwdriver.
- A crimping tool (reference FF-SBZCRIMP)
- A removal tool for crimped contacts (reference FF-SBZREMOV).

NOTICE

To ensure the specified immunity to electrical noise, the ground terminal of FF-SPS4 must be connected to the main ground of the machine.

Install a wired pin into the quick-connect connector as follows:

NOTICE

Ensure cable wire is installed through reducer and user plug before wiring pins to connector.

1. Strip about 8 mm (0.3 inch) of insulation from the wire end.
2. Using a FF-SBZCRIMP crimping tool, crimp the pin onto the wire.
3. Push the pin into the correct slot in the connector and through all reducers. Tabs on the sides of the pin will expand into slots and hold the pin in place when properly seated.

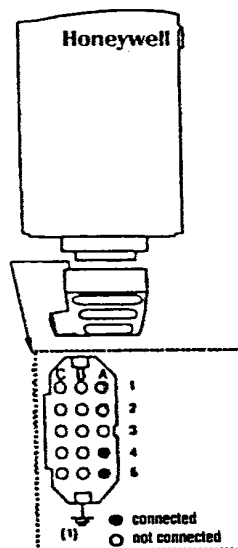
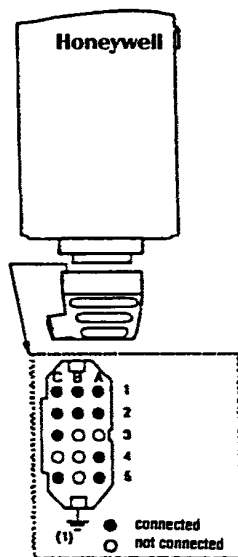
Remove a pin from the connector as follows:

1. Remove the gray plastic receptacle from the plug.
2. Remove the ground screw.
3. Using a screwdriver, pry up the edges of the plastic retainer piece on each side of the receptacle.
4. Slide the plastic retainer up and remove it.
5. Slide the metal part on each side down, and remove it.
6. Using a screw driver in the side slots, push the top part off.
7. Using a FF-SBZREMOV removal tool, slide the tool over the pin and push it until the spring releases the pin; remove pin.

Figure 3-2 Quick-connect Connector Pinouts

Receiver

Emitter

**Terminal Strip Connector Wiring** (see figure 3-3)

The terminal strip is a plastic connector. To ensure compliance with the rated sealing, install only one cable through the connector and attach firmly (see figures 3-3, 3-4, 3-5 and 3-6).

CAUTION**CONNECTOR DAMAGE**

To prevent irreversible connector damage, do NOT pull on wires during removal. Always push the orange tab first before removing a wire.

Failure to comply with these instructions may result in product damage.

NOTICE**ELECTRICAL NOISE IMMUNITY**

To ensure the specified immunity to electrical noise, the ground terminal of FF-SPS4 must be connected to the main ground of the machine.

The following tools are necessary:

- A set of wire strippers.
- A small-sized, flat-head screwdriver.
- A Torx T15 screwdriver.

Emitter Wiring:

Wire the emitter connector as follows:

NOTICE

Ensure cable wire is installed through reducer and user plug before wiring.

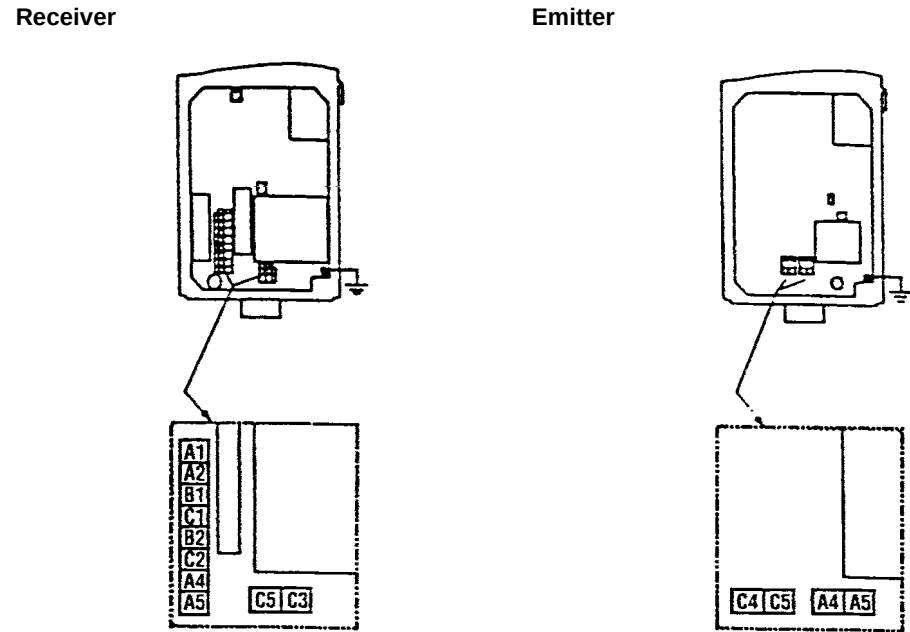
1. Using a Torx T15 screwdriver, remove the four cover screws and cover.
2. Strip 8 mm (0.3 in.) of insulation from the wire end.
3. While pushing on the orange tab of the green terminal strip connector, slide the stripped wire into the connector and release the tab. Check the correct position of the wire cable by pulling gently on it.
4. Crimp the electric open-end key to the wire ground.
5. Attach the ground wire to the screw located at the bottom right side of the housing.
6. Replace the cover. Using a Torx T15 screwdriver, tighten the four cover screws.

Receiver Wiring:

Wire the receiver connector as follows:

1. Using a Torx T15 screwdriver, remove the four cover screws and cover.
2. Strip 8 mm (0.3 in.) of insulation from the wire end.
3. While pushing on the orange tab of the green terminal strip connector, slide the stripped wire into the connector and release the tab. Check the correct position of the wire cable by pulling gently on it.
4. Crimp the electric open-end key to the wire ground.
5. Attach the ground wire to the screw located at the bottom right side of the housing.
6. Replace the cover.
7. Using a Torx T15 screwdriver, tighten the four cover screws.

Figure 3-3 Terminal Strip Connector Pinouts



Power Supply Wiring

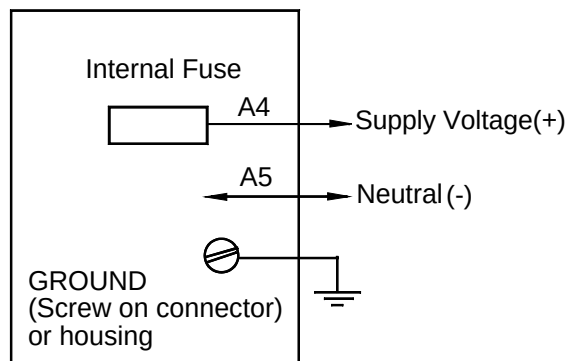
The FF-SPS4 Series safety perimeter guarding devices operate at 115 VAC. A low voltage version (24 VDC) is also available. All of the safety perimeter devices have the same connection for power. The low-voltage perimeter devices have a reverse polarity protection feature to ease installation.

The ground connection cable should be at least equal to the voltage supply cable and the cable length should be as short as possible. A screw is located inside the housing of the terminal strip at the bottom on the lens side. On the quick-connect version, the ground must be connected to the screw on the connector. Refer to figure 3-4 for power connections.

NOTICE

To ensure the specified immunity to electrical noise, the ground terminal of FF-SPS4 must be connected to the main ground of the machine.

Figure 3-4 Power Connection



For DC versions, the supply connection is as follows:

- Terminal A4: Supply Voltage (+)
- Terminal A5: Neutral (-)

Perimeter System Wiring

⚠ WARNING

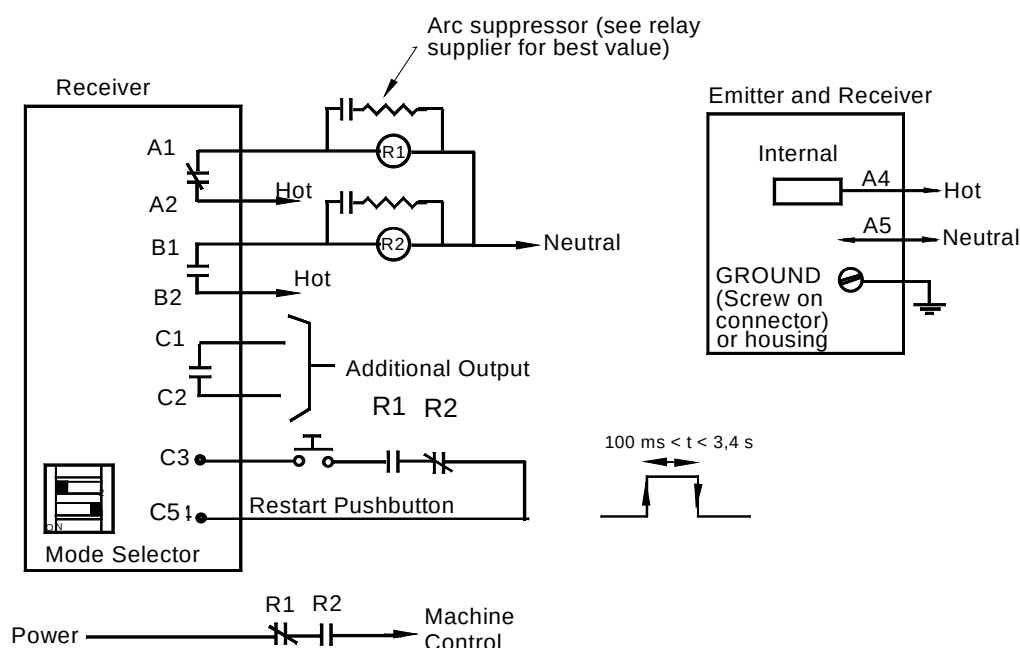
IMPROPER CONTROL SYSTEM

Ensure independent stop circuit relays have mechanically linked contacts that prevent contact overlapping in the event of a welded contact.

Failure to comply with these instructions could result in death or serious injury.

The following figures illustrate the electrical wiring of the safety perimeter systems. The customer is responsible for providing the safety relays, R, the restart push-button, the arc suppressors, and the test circuit. The two NO safety contacts and the NC safety contact of the FF-SPS4 are designed to switch at a minimum of 50 mA.

Figure 3-5 Wiring Diagram for One Perimeter System



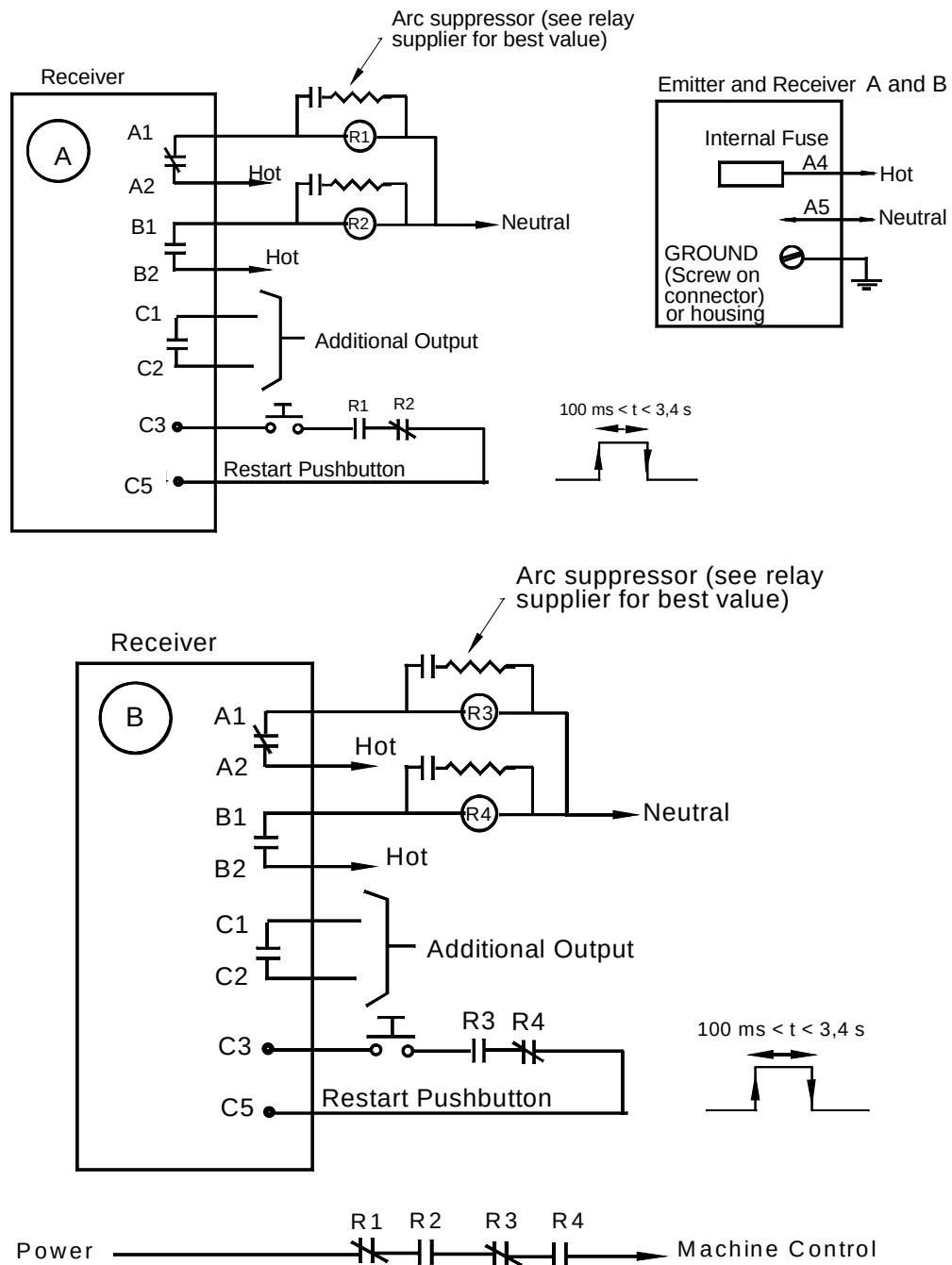
A1, A2: One Normally Closed (NC) safety contact

B1, B2 and C1, C2: Two Normally Open (NO) safety contacts

C3, C5: Restart the safety perimeter guarding system and monitor the external relays

Figure 3-6 Wiring Diagram for Two Perimeter Systems**NOTICE**

Ensure the two NO contacts of the same push-button are used to restart the two safety systems at the same time.



* Connect ground for proper operation.

Inspection and Maintenance

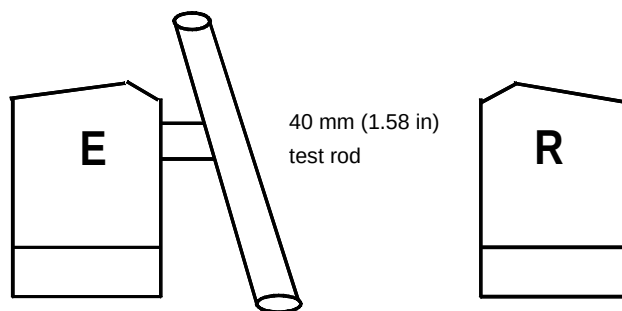
Overview

This section discusses the operational test, maintenance, troubleshooting and repair of the FF-SPS4 Series safety perimeter guarding devices.

Operational Test

Perform the operational test at least once a day, every time maintenance has been performed and every time the system is powered up. The operational test consists of interrupting the sensing beam with a 40 mm (1.58 in) **test rod placed in front of the emitter**. This test will ensure the safety perimeter system will detect the interruption and provide an output signal to the machine control (see figure 4-1). The receiver's output relay indicator (red) must illuminate and the machine control must go to a safe condition.

Figure 4-1 Operational Test with the Test Rod



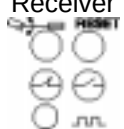
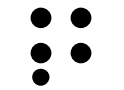
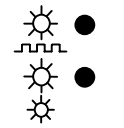
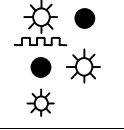
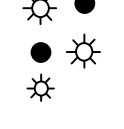
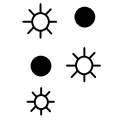
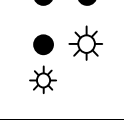
Troubleshooting Procedures

If the FF-SPS4 Series safety perimeter system is working properly and the sensing field is not interrupted, the receiver's output relay indicator (green) must be illuminated. If these conditions are not met, refer to the table 4-1 and corresponding maintenance procedures.

LED	Location	Color	Function
E1	Emitter	Yellow	Power On
E2	Emitter	Red	Test Mode
E3	Emitter	Yellow	Emission Frequency
R1	Receiver	Yellow	Signal Margin (alignment)
R2	Receiver	Yellow	Reset Mode
R3	Receiver	Green	Energized Relay (output status)
R4	Receiver	Red	De-energized Relay (output status)
R5	Receiver	Yellow	Emission Frequency

Table 4-1 Troubleshooting Chart

Possible incidents in any modes

Symptoms		Causes	Corrective actions
Emitter	Receiver		
			
		The equipment is not powered	Check for both emitter and receiver: - Supply voltage specified on the plate - Main supply - Wiring of the supply plugs - The supply fuse
		Slight beam misalignment or slight lens contamination	The equipment is still operating correctly, but the following should be carried out before unexpected alarm: - Clean the front plates or - Readjust the beam alignment
		Heavy beam misalignment or heavy lens contamination	The equipment is in alarm: - Clean the front plates or - Readjust the beam alignment
		Heavy beam misalignment or heavy lens contamination or beam occultation	The equipment is in alarm: - Clean the front plates or - Readjust the beam alignment or - Remove the object from the detection field or - Send the emitter and receiver back to the plant
		The equipment is in test mode	Check: The external contact connected to the emitter test input and jumper link position
		The emission frequencies of the emitter and the receiver are different	Select an identical emission frequency F1 or F2 both emitter and receiver

		The emission frequencies of the emitter and the receiver are different	Select an identical emission frequency F1 or F2 on both emitter and receiver
		Beam occultation	Remove the detected object from the sensing area
	 The equipment operate correctly with random false detections	Unacceptable high voltage line transients (over the IEC 801-4 specified level)	Check: • Presence of RC components or varistors on inductive loads • Quality of the power supply • Earth connections • Quality of connections of the test input and the FSD monitoring input (cables should be installed away from any high power cables)
	 The equipment operate correctly with random false detections	Unacceptable light interference (over the product allowance)	Check: • Protect the receiver unit against direct exposure to an external infrared light source or • Select a different emission frequency F1 or F2 if several equipments are used in the same area

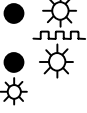
 Light on
  Light off
  Flickering light

Possible incidents in the Automatic mode

Symptoms		Causes	Corrective actions
Emitter	Receiver		
			
	 The equipment is detecting a failure or the receiver receives a signal from two emitters with the same emission frequency		• Check connections on the Final Switching Devices monitoring loop or • Change the emission frequency of the second emitter and switch off and on the power of the receiver

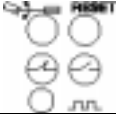
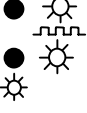
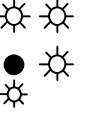
 Light on
  Light off
  Flickering light

Possible incidents in the start interlock modes

Symptoms		Causes	Corrective actions
Emitter	Receiver		
			
 ●		The power has been switched off then restored	• Check the quality of the connections on the FSD monitoring loop and the contacts of the Final Switching Devices • Press and release the start push button to restart the equipment within the specified time frame

 Light on
 ● Light off
  Flickering light

Possible incidents in the start and restart interlock mode

Symptoms		Causes	Corrective actions
Emitter	Receiver		
			
 ●		The power has been switched off then restored or an object has been detected	• Check the quality of the connections on the FSD monitoring loop and the contacts of the Final Switching Devices • Press and release the start push button to start the equipment within the specified time frame
 ●		The equipment is detecting an object	• Remove the object from the sensing area • Press and release the start push button to start the equipment within the specified time frame

 Light on
 ● Light off
  Flickering light

Maintenance and Repair

CAUTION

PRODUCT DAMAGE

- FF-SPS4 printed circuit boards are sealed to prevent unauthorized maintenance and damage to the product.
- Do not break FF-SPS4 printed circuit board sealing.

Failure to comply with these instructions may result in product damage and/or the voiding of the Honeywell warranty.

This section provides step-by-step instructions related to the maintenance and repair of the FF-SPS4 perimeter guard system. The printed circuit boards within the emitter and receiver units are sealed with sealing wax. Honeywell's warranty only covers the maintenance operations discussed in this manual. The tool required to perform maintenance is a #15 Torx driver. Maintenance and repair includes the following tasks:

- Cleaning
- Power Supply Fuse Replacement (FF-SPZ192109: kit 10 fuses, 0.5 A)
- Perimeter Guarding Device Removal and Replacement (Terminal Strip Version)
- Emission Frequency Selection

Interchangeability

Emitter and receiver units are not matched. An emitter unit from one FF-SPS4 system may be used with the receiver unit from another if the catalog listings of the systems are the same. Ensure the frequencies are set to the same value.

WARNING

IMPROPER PERIMETER DEVICE OPERATION

The emitter and receiver must be set to the same light emission frequency for proper operation.

Failure to comply with these instructions could result in death or serious injury.

Cleaning

FF-SPS4 Series perimeter guarding devices and mirrors are designed to operate in harsh industrial environments. Dirt, dust, grease, and oil are unavoidable in harsh environments. Clean the mirrors and the emitter and receiver units to ensure proper operation. This section provides specific, step-by-step instructions related to the proper cleaning techniques for the emitters, receivers, and mirrors.

Dry Cloth

WARNING

POWER APPLIED TO MACHINE CONTROL SYSTEM

Turn off and disconnect power from FF-SPS4 Series perimeter guarding device and machine.
Failure to comply with these instructions could result in death or serious injury.

CAUTION

FRONT PLATE AND FINISH DAMAGE

Gently wipe soiled areas with soft, clean, non-abrasive cloth. To prevent scratching clear plastic front plate or finish, do NOT rub hard.

Failure to comply with these instructions may result in product damage.

Clean dust or loose, dry dirt from the emitter and receiver units using a soft, clean, non-abrasive cloth as follows:

1. Turn off and disconnect power to both the perimeter guarding device and the machine.
2. Gently wipe the soiled areas with a soft, clean, non-abrasive cloth. Do not rub hard to prevent scratching the clear plastic front plate or finish. If the dirt will not wipe off with a dry cloth, clean units with a soap and water solution. See Cleaning with Soap and Water below.
3. Connect power to the machine and perimeter guarding device.
4. Perform the operational test to ensure proper functional readiness.

Soap and Water

WARNING

POWER APPLIED TO MACHINE CONTROL SYSTEM

Turn off and disconnect power from FF-SPS4 Series perimeter guarding device and machine.
Failure to comply with these instructions could result in death or serious injury.

CAUTION

FRONT PLATE AND FINISH DAMAGE

Do NOT use solvents to clean emitter or receiver to prevent damage to clear plastic front plate and paint finish.

Failure to comply with these instructions may result in product damage.

If the emitter or receiver has been soiled with oily or greasy dirt, use a solution of mild soap and water as follows:

1. Turn off and disconnect power to the perimeter guarding device and machine.
2. Dampen a soft, clean, non-abrasive cloth in the solution of mild soap and water. Squeeze excess solution from the cloth.
3. Wipe the soiled areas gently with the damp cloth. Do not rub hard to prevent scratching the clear plastic front plate or paint finish.
4. Rinse the cloth in clean water and gently wipe off any excess soap.

5. Dry the emitter and receiver with a soft, dry, non-abrasive cloth. Ensure there is no moisture left on the emitter and receiver units before power is applied.
6. Connect power to the machine and perimeter guarding device.
7. Perform the operational test to ensure proper functional readiness.

Mirrors

CAUTION

MIRROR DAMAGE

Use soft, clean, non-abrasive cloth to clean dust or dirt from mirror to prevent scratching surface.

Failure to comply with these instructions may result in product damage.

1. Dampen a soft, clean, non-abrasive cloth with 90% alcohol.
2. Wipe the face of the mirror gently with the damp cloth. Do not rub hard to prevent scratching the finish.
3. Dry the mirror with a soft, dry, non-abrasive cloth.
4. Perform the operational test to ensure proper alignment.

Fuse Replacement

⚠ WARNING

POWER APPLIED TO MACHINE CONTROL SYSTEM

Turn off and disconnect power from FF-SPS4 Series perimeter guarding device and machine. **Failure to comply with these instructions could result in death or serious injury.**

1. Turn off and disconnect power to the perimeter guarding system and the machine.
2. Remove the perimeter guarding device (emitter or receiver) from its mounting and place it on a clean, level working surface.
3. Using a #15 TORX driver, loosen the four captive screws on the side of the unit (see figure 4-2). The captive screws cannot be removed from the cover.
4. Remove the cover.
5. Refer to figure 4-3 for fuse location. In the receiver unit, the fuse is located on the left side of the circuit board, close to the eight point connector. In the emitter unit, the fuse is located on the right side of the circuit board below the transformer.
6. If the perimeter guarding device is a 110 or 220 VAC version, replace the fuse with a 0.5 amp, slow blow fuse. If the device is a low voltage version, replace the fuse with a 1 amp slow blow fuse.
7. Replace the cover and tighten screws using a #15 TORX driver.
8. Perform the operational test to ensure proper functional readiness.

Figure 4-2 Cover Removal

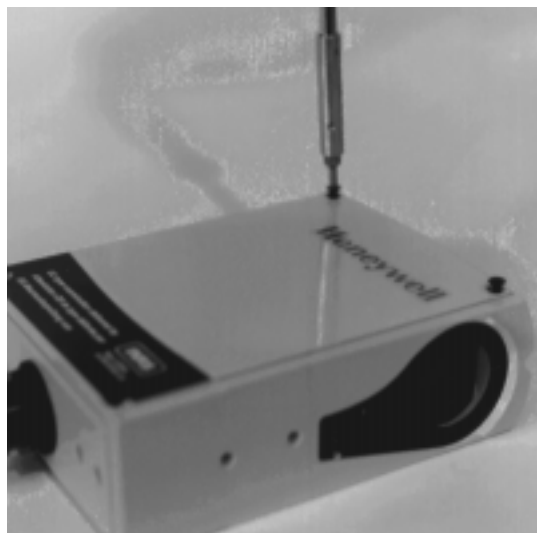
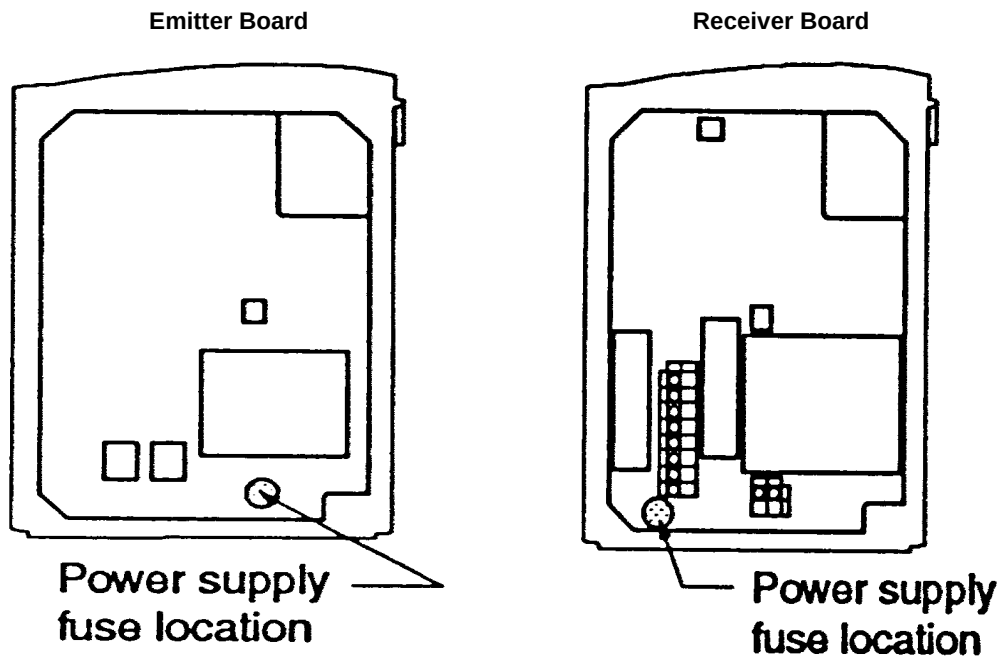


Figure 4-3 Fuse Location**Ground Connection**

1. If the perimeter guarding device is a quick-connect version, ensure the ground is connected securely to the screw in the user plug.
2. If the perimeter guarding device is a terminal strip version, remove the cover (see Fuse Replacement) and ensure the ground connection is connected securely to the screw located at the bottom right.
3. Perform the operational test to ensure proper functional readiness.

Perimeter Guarding Device Removal (Terminal Strip Version Only)**⚠ WARNING****POWER APPLIED TO MACHINE CONTROL SYSTEM**

Turn off and disconnect power from FF-SPS4 Series perimeter guarding device and machine.
Failure to comply with these instructions could result in death or serious injury.

1. Turn off and disconnect power to the perimeter guarding system and the machine.
2. Remove the perimeter guarding device (emitter or receiver) from its mounting and place it on a clean, level working surface.
3. Using a #15 TORX driver, loosen the four captive screws on the side of the unit (see figure 4-2). The captive screws cannot be removed from the cover.
4. Remove the cover.
5. Identify all connected wires (see figure 4-4). Refer to the inside cover for connection point designations.

CAUTION**CONNECTOR DAMAGE**

- Do NOT pull on wires during removal to prevent irreversible connector damage.
- Always push the orange tab first before removing a wire.

Failure to comply with these instructions may result in product damage.

6. Push on the orange connector tab and remove each wire by pulling the wire gently from the connector.
7. Remove the black screw located outside of the device to release the cable; then remove the cable from the conduit.

Figure 4-4 Wire Disconnection



Perimeter Guarding Device Replacement (Terminal Strip Version Only)**⚠ WARNING****POWER APPLIED TO MACHINE CONTROL SYSTEM**

Turn off and disconnect power from FF-SPS4 Series perimeter guarding device and machine.

Failure to comply with these instructions could result in death or serious injury.

1. Turn off and disconnect power to the perimeter guarding system and the machine.
2. Remove the perimeter guarding device (emitter or receiver) from its mounting and place it on a clean, level working surface.
3. Using a #15 TORX driver, loosen the four captive screws on the side of the unit (see figure 4-2). The captive screws cannot be removed from the cover.
4. Remove the cover.
5. Remove the rubber part of the plastic conduit and make a hole to allow the cable to go through.
6. Put the cable through the plastic conduit and connect the wires back in the correct locations.
7. Push gently but firmly on the orange tab on the green connector with a small, flat-head screwdriver.
8. Slide the wire inside the hole and release the orange tab.
9. Pull gently on the wire to ensure a secure connection.
10. Repeat for all wires.
11. Install the ground located on the bottom, right side of the device.
12. Check, and change, if necessary, the frequency selection before closing the cover (see Frequency Selection procedure).
13. Replace the cover and secure the cover with four screws using a #15 TORX driver.
14. Perform the operational test to ensure proper functional readiness.

Emission Frequency Selection

This safety perimeter guarding device is designed to avoid mutual interference or cross-talk with another device by using different emission frequencies. To set the frequency, perform the following:

Emitter Frequency Selection:

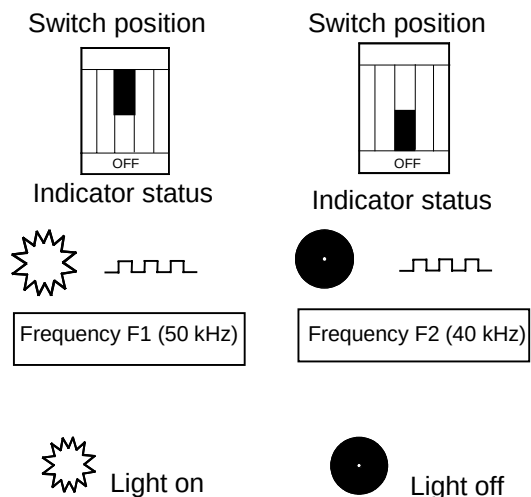
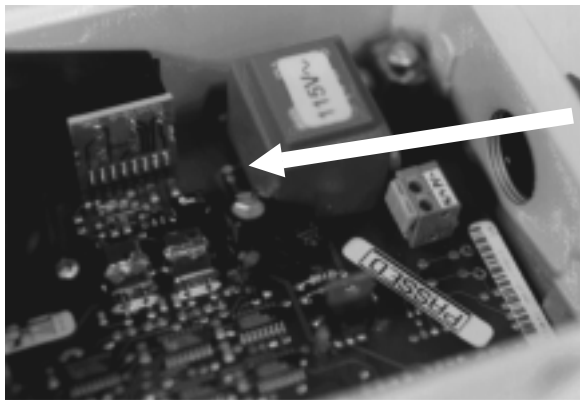
⚠ WARNING

POWER APPLIED TO MACHINE CONTROL SYSTEM

Turn off and disconnect power from FF-SPS4 Series perimeter guarding device and machine. **Failure to comply with these instructions could result in death or serious injury.**

1. Turn off and disconnect power to the perimeter guarding system and the machine.
2. Remove the perimeter guarding emitter from its mounting and place it on a clean, level working surface.
3. Using a #15 TORX driver, loosen the four captive screws on the side of the device (see figure 4-2). The captive screws cannot be removed from the cover.
4. Remove the cover.
5. Locate the frequency selection switch above the transformer (see figure 4-5). The factory setting is F1.
6. Using a pen or small screwdriver, slide the frequency selection switch to the position required (see figure 4-5).

Figure 4-5 Emitter Frequency Selection



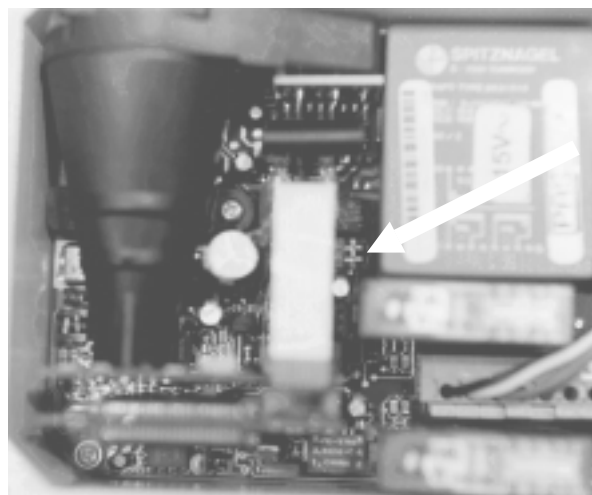
Receiver Frequency Selection:**⚠ WARNING****POWER APPLIED TO MACHINE CONTROL SYSTEM**

Turn off and disconnect power from FF-SPS4 Series perimeter guarding device and machine.

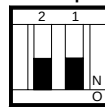
Failure to comply with these instructions could result in death or serious injury.

1. Turn off and disconnect power to the perimeter guarding system and the machine.
2. Remove the perimeter guarding emitter from its mounting and place it on a clean, level working surface.
3. Using a #15 TORX driver, loosen the four captive screws on the side of the device (see figure 4-2). The captive screws cannot be removed from the cover.
4. Remove the cover.
5. Locate the frequency selection switch above the transformer (see figure 4-6). The factory setting is F1.
6. Using a pen or small screwdriver, slide the frequency selection switch to the position required (see figure 4-6).

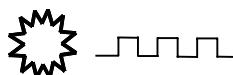
Figure 4-6 Receiver Frequency Selection



Switch position

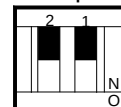


Indicator status

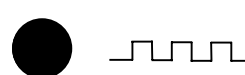


Frequency F1 (50 kHz)

Switch position



Indicator status



Frequency F2 (40 kHz)

Order Guides

Order Guide information

A catalog listing for a FF-SPS4 Series safety perimeter system includes: one emitter, one receiver, two mating plugs for the metal quick-connect version, two mounting brackets (including bolts, nuts, and washer), and this installation manual.

The customer will provide the two safety relays with guided contacts (R1 and R2), the cycle start push button, arc suppressors, and the wiring cable (as shown in the wiring diagram in chapter 3).

Accessories and mirrors must be ordered separately. The highly-reflective mirrors are fixed on a strong metal post. Mirror posts with two, three, or four beams are available. These options allow the posts to be aligned instead of the individual mirrors and provide multiple beam guarding solutions. Individual mirrors are also available for customized protective solutions.

A catalog listing for a FF-SPS4 Series safety perimeter system includes:

Item	Quantity
Emitter	1
Receiver	1
Mating Plugs (metal quick-connect style only)	2
Rotatable Brackets	2
Installation Manual	1

Order Guide

Catalog Listing	Scanning Distance	Temperature Range	Termination Type	Voltage ¹
FF-SPS4 Series Standard Version				
FF-SPS44CRE	0.5 to 40 m (1.65 to 131 ft.)	0° to 55° C (32° to 131° F)	Quick-connect	110 VAC
FF-SPS44TRE	0.5 to 40 m (1.65 to 131 ft.)	0° to 55° C (32° to 131° F)	Terminal strip	110 VAC
FF-SPS44CR2	0.5 to 40 m (1.65 to 131 ft.)	0° to 55° C (32° to 131° F)	Quick-connect	24 VDC
FF-SPS44TR2	0.5 to 40 m (1.65 to 131 ft.)	0° to 55° C (32° to 131° F)	Terminal strip	24 VDC
FF-SPS4 Series Long Range Version				
FF-SPS47CRE	30 to 75 m* (98.4 to 246 ft.)	0° to 55° C (32° to 131° F)	Quick-connect	110 VAC
FF-SPS47TRE	30 to 75 m* (98.4 to 246 ft.)	0° to 55° C (32° to 131° F)	Terminal strip	110 VAC
FF-SPS47TR2	30 to 75 m* (98.4 to 246 ft.)	0° to 55° C (32° to 131° F)	Terminal strip	24 VDC
FF-SPS47CR2	30 to 75 m* (98.4 to 246 ft.)	0° to 55° C (32° to 131° F)	Quick-connect	24 VDC
FF-SPS4 Series Low Temperature Version				
FF-SPS42TRE	0.5 to 20 m (1.65 to 65 ft.)	-25° to 55° C (-13° to 131° F)	Terminal strip	110 VAC
Mirrors				
FF-MSK1	Individual mirror on metal plate with several mounting holes, 25% scanning range reduction.			
FF-SPZ01MIR	Individual adjustable mirror (includes tube adapter, mirror plate, and brackets) for a single beam; 10% scanning range reduction.			
FF-SCZ02MIR	Post with two individual mirrors (located 400 and 900 mm from floor); 10% scanning range reduction.			
FF-SCZ03MIR	Post with three individual mirrors (located 300, 700, and 1100 mm from floor); 10% scanning range reduction.			
FF-SCZ04MIR	Post with four individual mirrors (located 300, 600, 900, and 1200 mm from floor); 10% scanning range reduction.			
FF-SPZ11 MIR	Individual adjustable mirror (includes tube adapter, mirror plate, and brackets) for a single beam; 25% scanning range reduction.			

¹230 VAC available upon request

*For scan ranges below 30 m (98.4 ft.), use standard range products

Accessories Order Guide

FF-SPZ661121	Tube adapter for FF-SPZ01MIR
FF-SPZ680149	FF-SPZ01MIR mirror plate L = 100 mm; 10% scanning range reduction.
FF-SPZSPX001	One set of brackets for FF-SPS4 Series perimeter guarding system (Emitter and Receiver)
FF-SPZ666149	Kit of one cable grip and conduit reducer PG16/11
FF-SPZSPE005	Emitter separate metal plug (for FF- SPS4 with quick-connect)
FF-SPZSPR005	Receiver separate metal plug (for FF-SPS4 with quick-connect)
FF-SBZ0000220	Arc suppressors (2)
FF-SPZ192109	Kit of 10 power supply fuses, 0.5 A time delay, FF-SPS4 Series
FF-SB-KIT1	Adapter (PG 11/0.5 in. NPT) conduit for quick connect version
FF-SB-KIT2	100 female + 100 male pins for quick-connect version

Sample Order

Item	Quantity
FF-SBZ0000220 (arc suppressors)	2
FF-SCZ02MIR (post with 2 mirrors)	1
FF-SPS44TRE (brackets included)	2

Warranty Information

Warranty And Remedy

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during that period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is the Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

While we provide application assistance, personally and through our literature, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

Sales And Service

Honeywell's MICRO SWITCH Division serves its customers through a worldwide network of sales offices and distributors. For application assistance, current specifications, pricing or the name of the nearest distributor, contact a nearby sales office or call:

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+ 44 (0) 161 251 4079	UK
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34 91 313 61 29	Spain
+ 44 (0) 161 251 4141	UK
1-815-235-6847	USA

INTERNET

<http://www.honeywell.com/sensing/>
info@micro.honeywell.com



EN 60947-5-1-3



pending

Issue 3

PK 80108

Installation Instructions for the Dual Entry Solenoid Key Operated Safety Interlock Switch (GKR/GKL Series)

Instrucciones de instalación para interruptores de seguridad de solenoide con llave de doble entrada (serie GKR/GKL)

Einbauanweisungen für den Doppeleingangs-Sicherheits-Verriegelungsschalter mit separatem Betätiger und Magnetspule (Serie GKR/GKL)

Instructions d'installation de l'interrupteur de sécurité avec interverrouillage à clé à double entrée et à électro-aimant (séries GKR/GKL)

Istruzioni per l'installazione dell'interruttore con interblocco di sicurezza azionato a chiave a solenoide a doppio ingresso (Serie GKR/GKL)

Instruções de Instalação para o Switch de Bloqueio de Segurança Operado por Chave com Solenóide de Duas Entradas (Séries GKR/GKL)

⚠ WARNING**IMPROPER INSTALLATION**

- Consult with local safety agencies and their requirements when designing a machine-control link, interface and all control elements that affect safety.
- Strictly adhere to all installation instructions.

Failure to comply with these instructions could result in death or serious injury.

MOUNT, WIRE, SEAL AND TEST SWITCH**⚠ WARNING****IMPROPER OPERATION**

- Ensure key travels to the given minimum insertion distance to ensure switch contact transfer.
- Ensure key travels to maximum extraction distance to ensure correct operation of the positive break mechanism.
- Do not exceed 100 N (22.4 lb) actuation force or 1000 N (224 lb) extraction force to actuator key to prevent switch failure.
- Do not use the key as a stop for the door.

Failure to comply with these instructions could result in death or serious injury.

1. Refer to:
 - Page 5 for wiring configurations for both lock types.
 - Page 6 for switch mounting dimensions, specifications.
 - Page 7 for key mounting dimensions.
2. Rotate head (if desired):
 - Rotate the auxiliary release to the unlocked position (requires cover to be in place).
 - Using the TORX tamper resistant bit (included), loosen tamper-proof screws and remove head.
 - Rotate head to desired position (90° increments), ensuring seal and plunger remain in correct position while reassembling head.
 - Torque tamper-proof screws 1,36-1,80 N m (12-16 in lb).
 - Return auxiliary release to the locked position.
3. Ensure proper clearance for switch and key at mounting location.
4. Align switch and key together before mounting.
5. Mount switch and key:
 - Torque switch to mounting surface: 4,9-5,9 N m (43-52 in lb) using M5 or #10 screws.
 - Torque key to mounting surface: 4-2,8 N m (21-25 in lb) using M5 or #10 screws.
6. Refer to circuit diagram on switch housing. Diagram depicts safety switch when key is inserted.
7. Remove tamper-proof screws on cover plate.
8. Connect stranded wire (0,75 mm²-2,5 mm², 18-14 AWG) or solid wire (0,75 mm² to 1,5 mm², 18-16 AWG) to connector terminals (use 90 °C wire when ambient temperature is over 75 °C):
 - Torque connector to secure cable to switch enclosure (if required): 1,8-2,2 N m (16-19 in lb).
 - Torque switch terminal screws: 0,8-1,0 N m (7-9 in lb) M3.
 - Torque ground screw: 0,8-1,0 N-m (7-9 in lb) M3.

9. Seal conduit opening according to instructions in PK 80112.
10. Reassemble cover plate.
11. Plug unused conduit entry (plug included). Seal with Teflon tape or pipe sealant.
12. Plug unused key entry window with snap fit cover (included).
13. Perform functional tests:
 - Open and close protective guard several times to ensure key slides easily into switch head.
 - Close protective guard and ensure switch locks. It must not be possible to open protective guard when hazardous motion is present.
 - After the switch unlocks, open protective guard. The hazardous motion must not start when protective guard is unlocked or open.
14. Apply a strip of paint or wax over the auxiliary release knob and the switch body cover to detect actuation of the auxiliary release.

AUXILIARY RELEASE**⚠ WARNING****IMPROPER OPERATION**

- Do NOT use the auxiliary release for general maintenance, repair of the machine, or to start and stop the machine. Use in an emergency situation only.
- Failure to comply with these instructions could result in death or serious injury.**

CAUTION**PRODUCT DAMAGE**

- Do NOT rotate auxiliary release greater than 90° from either the locked or the unlocked position.
- Failure to comply with these instructions may result in product damage.**

Mechanical Lock: Occurs by internal spring force when machine protective guard is closed and key is inserted. Applying voltage to the solenoid unlocks this version (or by actuating the auxiliary release when power failure occurs).

Solenoid Lock: Occurs by applying voltage to the solenoid after machine protective guard is closed and key is inserted. Removing the voltage to the solenoid unlocks protective guard.

The auxiliary release of the switch lock mechanism allows protective guard to be opened. Refer to drawing on switch cover plate for proper rotation direction.

⚠ ADVERTENCIA**INSTALACIÓN INCORRECTA**

- Consulte las normas de seguridad y sus requisitos al realizar el diseño del enlace de control de una máquina, la interfaz, y los elementos de control que afecten a la seguridad.
- Siga estrictamente todas las instrucciones para la instalación.

El incumplimiento de estas recomendaciones puede ocasionar lesiones graves o peligro de muerte.

**MONTAJE, CABLEADO, SELLADO Y
COMPROBACIÓN DEL INTERRUPTOR**
⚠ ADVERTENCIA**FUNCIONAMIENTO INCORRECTO**

- Asegúrese que la llave circule hasta la dimensión mínima de inserción para asegurar la transferencia de contacto del interruptor.
- Asegúrese que la llave circule hasta la distancia máxima de extracción para asegurar el funcionamiento correcto del mecanismo de interrupción positiva.
- No exceda los 100 N (22,4 lb) en la fuerza de accionamiento o los 1000 N (224 lb) en la fuerza de extracción sobre la llave actuadora para evitar un fallo del interruptor.
- No utilice la llave como un tope para la puerta.

El incumplimiento de estas recomendaciones puede ocasionar lesiones graves o la muerte.

1. Consulte:
 - La página 5 para las configuraciones de cableado para ambos tipos de trabas.
 - La página 6 para las dimensiones de montaje de los interruptores y las especificaciones.
 - La página 7 para las dimensiones de montaje de la llave.
2. Gire el cabezal (si lo desea):
 - Gire el dispositivo auxiliar de liberación a la posición de destrabar (es preciso que la tapa esté en su sitio).
 - Con el tornillo TORX resistente a alteraciones (incluido), afloje los tornillos garantizados contra toda alteración y retire el cabezal.
 - Gire el cabezal a la posición deseada (en incrementos de 90°), asegurándose que el sellado y el émbolo permanecen en la posición correcta al volver a colocar el cabezal.
 - Ajuste los tornillos garantizados contra toda alteración 1,36-1,80 Nm (12-16 pulg. lb).
 - Vuelva a dejar el dispositivo auxiliar de liberación en la posición de traba.
3. Asegúrese que exista la separación adecuada para el interruptor y la llave en el lugar de montaje.
4. Alinee el interruptor y la llave juntos antes de montarlos.
5. Monte el interruptor y la llave:
 - Ajuste el interruptor a la superficie de montaje: 4,9-5,9 Nm (43-52 pulg. lb) usando tornillos M5 o del número 10.
 - Ajuste la llave a la superficie de montaje: 4-2,8 Nm (21-25 pulg. lb) usando tornillos M5 o del N 10.
6. Consulte el diagrama del circuito para la carcasa del interruptor. El diagrama representa el interruptor de seguridad cuando la llave está insertada.
7. Retire los tornillos garantizados contra toda alteración de la tapa.
8. Conecte cable trenzado (0,75 mm²-2,5 mm², 18-14 AWG) o cable sólido (0,75 mm² a 1,5 mm², 18-16 AWG) a los terminales del conector (utilice cable de 90 °C cuando la temperatura ambiente supere los 75 °C).

- Ajuste el conector para asegurar el cable al receptáculo del interruptor (si es preciso): 1,8-2,2 Nm (16-19 pulg. lb).
 - Ajuste los tornillos del terminal del interruptor: 0,8-1,0 Nm (7-9 pulg. lb) M3.
 - Ajuste el tornillo a tierra: 0,8-1,0 Nm (7-9 pulg. lb) M3.
9. Selle el conducto de entrada según las instrucciones en PK 80112.
 10. Vuelva a colocar la tapa en su sitio.
 11. Tape cualquier entrada de conducto no utilizada (tapón incluido). Selle con cinta de Teflón o sellamiento para tuberías.
 12. Selle la ventana de la entrada de llaves no utilizada con la tapa de ajuste instantánea (incluida).
 13. Realice las comprobaciones funcionales:
 - Abra y cierre varias veces la barrera protectora para asegurar que la llave se desliza fácilmente en el cabezal del interruptor.
 - Cierre la barrera protectora y asegúrese que el interruptor se traba. No debe ser posible abrir la barrera protectora cuando existe movimiento peligroso.
 - Tras destrabar el interruptor, abra la barrera protectora. El movimiento peligroso no debe comenzar cuando la barrera protectora esté destrabada o abierta.
 14. Aplique una capa de pintura o cera sobre la patilla del dispositivo auxiliar de liberación y la tapa del cuerpo del interruptor para detectar el accionamiento del dispositivo auxiliar de liberación.

DISPOSITIVO AUXILIAR DE LIBERACIÓN
⚠ ADVERTENCIA**FUNCIONAMIENTO INCORRECTO**

- NO utilice el dispositivo auxiliar de liberación para mantenimiento general, reparación de la máquina o para poner en marcha y detener la máquina. Utilícelo solamente en caso de emergencia.

El incumplimiento de estas recomendaciones puede ocasionar lesiones graves o peligro de muerte.

PRECAUCIÓN**DAÑOS AL PRODUCTO**

- NO gire el dispositivo auxiliar de liberación más de 90° tanto desde la posición de traba como desde la posición de destrabar.

El incumplimiento de estas instrucciones puede ocasionar daños al producto.

Traba mecánica: Se obtiene mediante una fuerza interna de resorte cuando la barrera protectora de la máquina está cerrada y se introduce la llave. Cuando se aplica voltaje al solenoide se destraba esta versión (o bien accionando el dispositivo auxiliar de liberación cuando se produce una interrupción en el suministro de energía).

Traba de solenoide: Se obtiene aplicando voltaje al solenoide después de que la barra protectora de la máquina esté cerrada y la llave introducida. Si se quita el voltaje al solenoide se destraba la barrera protectora.

El dispositivo auxiliar de liberación del mecanismo de traba del interruptor permite abrir la barrera protectora. Consulte el dibujo de la tapa del interruptor para conocer las instrucciones de rotación adecuadas.

⚠️ WARNUNG**UNSACHGEMÄSSER EINBAU**

- Beraten Sie sich mit den zuständigen Sicherheitsbehörden beim Entwurf von Verbindungen zu Maschinensteuerungen, Schnittstellen und sämtlichen Steuerelementen, welche die Sicherheit betreffen.
 - Halten Sie sich genau an die Einbau-Anweisungen.
- Das Nichtbeachten dieser Anweisungen könnte zum Tod oder zu schweren Verletzungen führen.**

SCHALTER MONTIEREN, VERDRAHTEN, VERSIEGELN ABDICHTEN UND TESTEN**⚠️ WARNUNG****UNSACHGEMÄSSER BETRIEB**

- Sicherstellen, daß der Schlüssel bis zur Mindesttiefe eingeführt werden kann, um die Schalter-Kontaktgabe zu gewährleisten.
- Sicherstellen, daß der Schlüssel bis zum Maximalabstand herausgezogen wird, um die einwandfreie Betätigung des Zwangstrennungs-Mechanismus zu gewährleisten.
- Um einem Schalterausfall vorzubeugen, darf die Betätigungskraft 100 N oder die Ausziehkraft 1000 N nicht überschreiten.
- Den Schlüssel nicht als Stoppvorrichtung für die Tür verwenden.

Das Nichtbeachten dieser Anweisungen könnte zum Tod oder zu schweren Verletzungen führen.

1. Weitere Informationen:
 - Schaltungskonfigurationen für beide Verriegelungstypen auf Seite 5.
 - Abmessungen für die Schaltermontage und technische Daten auf Seite 6.
 - Montage-Hauptabmessungen auf Seite 7
2. Kopf drehen (falls gewünscht):
 - Die Hilfsentriegelung zurück in die Entriegelungsposition drehen (Abdeckung muß angebracht sein).
 - Mit Hilfe des manipulationssicheren TORX - Einsatzes die manipulationssicheren Schrauben lösen und den Kopf abnehmen.
 - Den Kopf in die gewünschte Position drehen (90°-Stufen), wobei sichergestellt werden muß, daß während des Zusammenbaus des Kopfes die Abdichtung und der Stößel in der vorgesehenen Position bleiben.
 - Die manipulationssicheren Schrauben mit 1,36...1,80 Nm anziehen.
 - Die Hilfsentriegelung in die Verriegelungsposition drehen.
3. Sicherstellen, daß am Anbringungsort zwischen dem Schalter und dem Betätiger genügend Freiraum ist.
4. Schalter und Betätiger vor der Montage ausrichten.
5. Schalter und Betätiger montieren:
 - Schalter-Festziehmoment an der Befestigungsoberfläche: 4,9 ... 5,9 Nm mit M5-Schrauben oder Schrauben Nr.10. .
 - Schlüssel-Festziehmoment an der Befestigungsoberfläche: 4 ... 2,8 Nm mit M5-Schrauben oder Schrauben Nr.10.
6. Siehe Anschlußschaltbild am Schaltergehäuse. Das Schaltbild stellt den Sicherheitsschalter bei eingeführtem Betätiger dar.
7. Die manipulationssicheren Schrauben auf der Deckplatte entfernen.

8. Den Litzendraht (0,75 mm² ... 2,5 mm², 18 ... 14 AWG) oder Draht (0,75 mm² ... 1,5 mm², 18 ...16 AWG) an die Klemmleisten anschließen (90 °C-Draht verwenden, wenn die Umgebungstemperatur über 75 °C liegt).
 - Stecker anziehen, um das Kabel am Schaltergehäuse zu sichern (falls erforderlich): 1,8 ... 2,2 Nm.
 - Schalter-Klemmschrauben anziehen: 0,8...1,0 Nm M3.
 - Erdungsschraube anziehen: 0,8...1,0 Nm M3.
9. Die Kabeleinführung entsprechend den Anweisungen in PK 80112 versiegeln.
10. Die Deckplatte wieder montieren.
11. Den mitgelieferten Blindstopfen für die unbenutzte Kabeleinführung verwenden. Mit Teflonband oder Rohrdichtungsmasse abdichten.
12. Mit der mitgelieferten Einschnapp-Abdeckung die unbenutzte Betätigereinführungsöffnung abdecken.
13. Funktionstests durchführen:
 - Die Schutzvorrichtung mehrmals öffnen und schließen, um sicherzustellen, daß sich der Schlüssel leicht in den Schalterkopf einführen läßt.
 - Die Schutzvorrichtung schließen und sich vergewissern, daß sich der Schalter verriegelt. Die Schutzvorrichtung darf sich nicht öffnen lassen, solange gefahrbringende Bewegungen stattfinden.
 - Die Schutzvorrichtung öffnen, nachdem sich der Schalter entriegelt. Die gefahrbringende Bewegung darf nicht anlaufen, wenn die Schutzvorrichtung unverriegelt oder geöffnet ist.
14. Über den Hilfsentriegelungsknopf und die Schaltergehäuseabdeckung einen Streifen Farbe oder Wachs geben, um eine Betätigung der Hilfsentriegelung feststellen zu können.

HILFSENTRIEGLUNG**⚠️ WARNUNG****UNSACHGEMÄSSER BETRIEB**

- Die Hilfsentriegelung NICHT zu allgemeinen Wartungszwecken, für Reparaturen an der Maschine oder zum Starten und Anhalten der Maschine verwenden. Sie darf nur in Notfällen verwendet werden.

Das Nichtbeachten dieser Anweisungen könnte zum Tod oder zu schweren Verletzungen führen.

VORSICHT**PRODUKTBSCHÄDIGUNG**

- Die Hilfsentriegelung nicht weiter als 90° von der gesperrten oder entsperrten Position wegdrehen.

Mißachtung dieser Anweisungen kann zur Produktbeschädigung führen.

Mechanische Verriegelung: Erfolgt durch interne Federkraft, sobald die Schutzvorrichtung der Maschine geschlossen und der Betätiger eingeführt ist. Durch das Anlegen einer Spannung an die Magnetspule wird diese Ausführung entriegelt (oder durch Betätigen der Hilfsentriegelung im Falle eines Stromausfalls).

Magnetspulen-Verriegelung: Erfolgt, indem man die Magnetspule unter Spannung setzt, nachdem die Schutzvorrichtung der Maschine geschlossen und der Betätiger eingeführt wurde. Unterbricht man die Spannung an der Magnetspule, wird die Schutzvorrichtung entriegelt. Die Hilfsentriegelung des Verriegelungsmechanismus ermöglicht das Öffnen der Schutzvorrichtung. Die Zeichnung auf der Schalterabdeckplatte zeigt die korrekte Drehrichtung an.

⚠ Avertissement**INSTALLATION INCORRECTE**

- Faites appel à des organismes locaux de sécurité et prenez en compte leurs exigences lorsque vous concevez une liaison de commande ou interface de machine, ou tout autre dispositif de commande mettant en jeu la sécurité.
- Respectez scrupuleusement l'ensemble des instructions d'installation.

L'inobservation de ces instructions peut entraîner la mort ou de graves blessures.

MONTEZ, CABLEZ, ETANCHEIFIEZ ET ESSAYEZ L'INTERRUPTEUR**⚠ Avertissement****MAUVAIS FONCTIONNEMENT**

- Vérifiez que la course de la clé corresponde à la longueur minimale d'insertion indiquée, afin d'assurer le transfert du contact de l'interrupteur.
- Vérifiez que la course de la clé corresponde à la longueur maximale d'extraction, afin d'assurer le bon fonctionnement du mécanisme de coupure positive.
- Ne pas dépasser 100 N (22,4 lb) d'effort de commande ni 1000 N (224 lb) d'effort d'extraction de la clé de l'actionneur afin d'éviter d'endommager l'interrupteur.
- Ne pas utiliser la clé comme arrêt de porte.

L'inobservation de ces instructions peut entraîner la mort ou de graves blessures.

1. Consultez :

- La page 5 pour les configurations de câblage des deux types de verrouillage.
 - La page 6 pour les dimensions de montage de l'interrupteur et ses caractéristiques techniques.
 - La page 7 pour les cotes de montage de la clé.
- 2. Faites pivoter la tête (si vous le souhaitez) :**
- Faites pivoter le mécanisme auxiliaire de libération jusqu'en position déverrouillée (il faut pour cela que le couvercle soit en place).
 - A l'aide de l'embout TORX inviolable (inclus), desserrez les vis inviolables et retirez la tête.
 - Faites pivoter la tête pour l'amener dans la position voulue (par incréments de 90°), en veillant à ce que le joint et le poussoir restent en position correcte lors du remontage de la tête.
 - Serrez les vis inviolables avec un couple de 1,36 à 1,80 N.m (12 à 16 in.lb).
 - Ramenez le mécanisme auxiliaire de libération pour la position verrouillée.

- 3. Assurez-vous que l'emplacement de montage de l'interrupteur et de la clé offre suffisamment d'espace.**
- 4. Alignez interrupteur et la clé avant le montage.**
- 5. Montage de l'interrupteur et de la clé :**
- Serrez l'interrupteur sur la surface de montage avec un couple de 4,9 à 5,9 N.m (43 à 52 in.lb) à l'aide de vis M5 ou n°10.
 - Serrez la clé sur la surface de montage avec un couple de 2,4 à 2,8 N.m (21 à 25 in.lb) à l'aide de vis M5 ou n°10.
- 6. Consultez le schéma du circuit sur le boîtier de l'interrupteur. Ce schéma représente l'interrupteur de sécurité lorsque la clé est introduite.**
- 7. Retirez les vis inviolables du couvercle.**
- 8. Connectez du fil souple (0,75 mm² à 2,5 mm², 18 à 14 AWG) ou rigide (0,75 mm² à 1,5 mm², 18 à 16 AWG) aux bornes du connecteur (utilisez du fil 90 °C lorsque la température ambiante est supérieure à 75 °C) :**

- Serrez le connecteur pour fixer le câble à l'enveloppe de l'interrupteur (si besoin) avec un couple de 1,8 à 2,2 N.m (16 à 19 in.lb).
 - Serrez les vis des bornes avec un couple de 0,8 à 1,0 N.m (7 à 9 in.lb) M3.
 - Serrez la vis de terre avec un couple de 0,8 à 1,0 N.m (7 à 9 in.lb) M3.
- 9. Réalisez l'étanchéité de l'ouverture du conduit conformément aux instructions données en PK 80112.**
- 10. Remontez le couvercle.**
- 11. Obtenez l'entrée de conduit non utilisée (bouchon inclus). Appliquez du ruban de Téflon ou un produit d'étanchéité pour tuyaux.**
- 12. Obtenez l'ouverture de serrure inutilisée à l'aide du capuchon pression (inclus).**
- 13. Effectuez des essais fonctionnels :**
- Ouvrez et fermez plusieurs fois le protecteur pour vous assurer que la clé glisse facilement dans la tête d'interrupteur.
 - Fermez le protecteur et vérifiez le verrouillage de l'interrupteur. L'ouverture du protecteur doit être impossible en présence d'un mouvement dangereux.
 - Après déverrouillage de l'interrupteur, ouvrez le protecteur. Le mouvement dangereux ne doit pas commencer lorsque le protecteur est ouvert ou déverrouillé.
- 14. Appliquez une couche de peinture ou de cire sur le bouton de libération auxiliaire et le couvercle du corps de l'interrupteur pour détecter l'actionnement du mécanisme auxiliaire de libération.**

MECANISME AUXILIAIRE DE LIBERATION**⚠ Avertissement****MAUVAIS FONCTIONNEMENT**

- NE PAS utiliser le mécanisme auxiliaire de libération pour l'entretien général, la réparation de la machine, ou pour la démarrer ou l'arrêter. Ne l'utiliser qu'en cas d'urgence.

L'inobservation de ces instructions peut entraîner la mort ou de graves blessures.

ATTENTION**DETERIORATION DU PRODUIT**

- Ne PAS faire pivoter le mécanisme auxiliaire de libération de plus de 90° par rapport à la position verrouillée ou déverrouillé.

L'inobservation de ces instructions risque d'entraîner la détérioration du produit.

Verrouillage mécanique : il est obtenu grâce à la force d'un ressort interne lorsque le protecteur de la machine est fermé et que la clé est en place. Avec cette version, le déverrouillage se produit lorsque l'on applique la tension aux bornes de l'électro-aimant (ou en actionnant le mécanisme auxiliaire de libération en cas de panne d'électricité).

Verrouillage par électro-aimant : il est obtenu en appliquant la tension aux bornes de l'électro-aimant après fermeture du protecteur de la machine et insertion de la clé. La suppression de la tension aux bornes de l'électro-aimant déverrouille le protecteur.

Le mécanisme auxiliaire de libération du dispositif de verrouillage de l'interrupteur permet d'ouvrir le protecteur. Consultez le schéma sur le couvercle de l'interrupteur pour connaître le bon sens de rotation.)

⚠ ATTENZIONE**INSTALLAZIONE SCORRETTA**

- Consultare gli enti locali in materia di antinfortunistica e le rispettive normative nel momento in cui ci si avvia alla progettazione di un qualsiasi collegamento controllo macchina, o di un'interfaccia, o di tutti gli elementi di controllo che possano influire sulla sicurezza.
- Attenersi rigorosamente a tutte le istruzioni relative all'installazione.

L'inosservanza di tali istruzioni può essere causa di gravi lesioni, con conseguenze addirittura fatali.

MONTARE, CABLARE, SIGILLARE E SOTTOPORRE A PROVA L'INTERRUTTORE**⚠ ATTENZIONE****IMPIEGO SCORRETTO**

- Verificare che la chiave scorra fino alla distanza di inserimento minima al fine di garantire la commutazione dei contatti dell'interruttore.
- Verificare che la chiave scorra fino alla distanza di estrazione massima al fine di garantire il corretto funzionamento del meccanismo di interruzione forzata.
- Non applicare sulla chiave dell'attuatore una forza di attuazione superiore a 100 N (22,4 lb) o una forza di estrazione superiore a 1000 N (224 lb) onde evitare guasti all'interruttore.
- Non utilizzare la chiave come arresto per la porta.

L'inosservanza di tali istruzioni può essere causa di gravi lesioni, con conseguenze addirittura fatali.

1. Consultare:
 - Pagina 5, per le configurazioni di cablaggio relative ad entrambi i tipi di chiusura.
 - Pagina 6, per le dimensioni di montaggio dell'interruttore e per i dati tecnici.
 - Pagina 7, per le dimensioni di montaggio della chiave.
2. Eventualmente, ruotare la testa (in base alle esigenze):
 - Ruotare lo sblocco ausiliario verso la posizione di sblocco (con il riparo presente nella relativa sede).
 - Allentare le viti a prova di manomissione utilizzando la punta a prova di manomissione TORX (compresa) e rimuovere la testa.
 - Ruotare la testa nella posizione prescelta (incrementi di 90°), accertandosi che gli elementi di tenuta e il pulsante rimangano nella posizione corretta in fase di rimontaggio della testa.
 - Serrare le viti a prova di manomissione ad una coppia di 1,36-1,80 N m (12-16 poll. lb).
 - Riportare lo sblocco ausiliario in posizione di blocco.
3. Garantire la presenza di un adeguato spazio libero per l'interruttore e la chiave in corrispondenza della sede di montaggio.
4. Prima del montaggio, allineare l'interruttore e la chiave.
5. Montare l'interruttore e la chiave:
 - Serrare l'interruttore sulla superficie di montaggio alla coppia: 4,9-5,9 N m (43-52 poll. lb) con viti M5 o #10.
 - Serrare la chiave sulla superficie di montaggio alla coppia: 4-2,8 N m (21-25 poll. lb) con viti M5 o #10.
6. Fare riferimento allo schema elettrico riportato sull'involucro dell'interruttore. Tale schema rappresenta l'interruttore di sicurezza quando la chiave è inserita.
7. Rimuovere le viti a prova di manomissione dal pannello di copertura.

8. Collegare cavi flessibili (0,75 mm²-2,5 mm², 18-14 AWG) o cavi rigidi (0,75 mm²-1,5 mm², 18-16 AWG) ai morsetti dei connettori (se la temperatura ambiente supera i 75 °C, utilizzare cavi che hanno una temperatura di esercizio pari a 90 °C):
 - Serrare il connettore in modo da fissare il cavo all'involucro dell'interruttore (se necessario) alla coppia: 1,8-2,2 N m (16-19 poll.-lb).
 - Serrare i morsetti a vite dell'interruttore alla coppia: 0,8-1,0 N m (7-9 poll. lb), M3.
 - Serrare la vite di massa alla coppia: 0,8-1,0 N m (7-9 poll. lb), M3.
9. Sigillare l'apertura del tubo isolante in base alle istruzioni riportate in PK 80112.
10. Rimontare la piastra di copertura.
11. Tappare eventuali entrate inutilizzate del tubo isolante (il tappo è compreso). Sigillare con nastro in Teflon o sigillante per tubi.
12. Chiudere l'apertura di entrata della chiave, eventualmente non utilizzata, con un riparo munito di chiusura a scatto (compreso).
13. Eseguire le prove di funzionamento:
 - Aprire e chiudere il riparo di protezione più volte per garantire un agevole inserimento della chiave nella testa dell'interruttore.
 - Chiudere il riparo di protezione e verificare il bloccaggio dell'interruttore. L'apertura del riparo di protezione deve risultare impedita in presenza di movimenti pericolosi.
 - Dopo lo sblocco dell'interruttore, aprire il riparo di protezione. Evitare l'avvio del movimento pericoloso quando il riparo di protezione è sbloccato o aperto.
14. Applicare una striscia di vernice o di cera sopra la manopola di sblocco ausiliario e sul riparo del corpo dell'interruttore al fine di rilevare l'attivazione dello sblocco ausiliario.

SBLOCCO AUSILIARIO**⚠ ATTENZIONE****FUNZIONAMENTO SCORRETTO**

- NON utilizzare lo sblocco ausiliario per la manutenzione ordinaria, per la riparazione della macchina o per avviare ed arrestare la macchina. Utilizzarlo esclusivamente in situazioni di emergenza.

L'inosservanza di tali istruzioni può essere causa di gravi lesioni, con conseguenze addirittura fatali.

AVVERTENZA**DANNEGGIAMENTO DEL PRODOTTO**

- NON ruotare dalla posizione di blocco né da quella di sblocco lo sblocco ausiliario di un angolo superiore a 90°.

L'inosservanza di tali istruzioni può comportare il danneggiamento del prodotto.

Bloccaggio meccanico: Si verifica in seguito all'applicazione di una forza/azione quando il riparo di protezione della macchina è chiuso e la chiave inserita. Questa versione viene sbloccata applicando tensione all'elettromagnete (oppure azionando lo sblocco ausiliario in caso di interruzione dell'energia elettrica).

Bloccaggio ad elettromagnete: Si verifica applicando tensione all'elettromagnete dopo avere chiuso il riparo di protezione della macchina ed inserito la chiave. Interrompendo l'alimentazione dell'elettromagnete, il riparo di protezione si sblocca.

Lo sblocco ausiliario del meccanismo di blocco dell'interruttore consente di aprire il riparo di protezione. Per il corretto senso di rotazione, fare riferimento allo schema presente sulla piastra di copertura dell'interruttore.

⚠ ADVERTÊNCIA**INSTALAÇÃO INCORRETA**

- Consulte os requisitos da agência de segurança local ao projetar unidades de conexão ou interface para controle de máquinas, bem como todos os elementos de controle que possam afetar a segurança.
- Obedeça rigorosamente todas as instruções de segurança.

Desobediência a essas instruções pode resultar em morte ou ferimentos graves.

MONTAGEM, CABEAMENTO, VEDAÇÃO E TESTE DO SWITCH**⚠ ADVERTÊNCIA****INSTALAÇÃO INCORRETA**

- Para garantir o estabelecimento de contato no switch, assegure-se de que a chave faça o percurso na distância mínima de inserção.
- Para garantir a operação correta do mecanismo de desconexão do positivo, assegure-se de que a lingüeta se movimente ao longo da distância máxima de extração.
- Não exceda 100 N (10,17Kg) de força de atuação ou 1000 N (101,70Kg) de força de extração para a chave de atuação, a fim de evitar falha no switch.
- Não use a lingüeta como escora para a porta.

Desobediência a essas instruções pode resultar em morte ou ferimentos graves.

1. Consulte:
 - A página 5 para ver configurações de cabeamento para ambos os tipos de trava.
 - A página 6 para ver as dimensões de montagem e especificações do switch.
 - A página 7 para ver as dimensões de montagem da cabeça.
2. Gire a cabeça (se desejado):
 - Gire a liberação auxiliar para a posição destravada (é necessário que a tampa esteja em seu lugar).
 - Utilizando a broca resistente à violação da TORX® (inclusa), solte os parafusos invioláveis e remova a cabeça.
 - Gire a cabeça para a posição desejada (em incrementos de 90°), certificando-se de que a vedação e o pistão permaneçam na posição correta quando você montar novamente a cabeça.
 - Aperte os parafusos invioláveis com um torque de 1,36-1,80 N-m (30,48-40,64cm-lb).
 - Gire a liberação auxiliar de volta à posição travada.
3. Certifique-se de que haja espaço apropriado para o switch e a chave no local de montagem.
4. Alinhe o switch e a chave juntos antes de montar.
5. Monte o switch e a chave:
 - Aperte o switch com torque na superfície de montagem: 4,9-5,9 N-m (109,22-132,08cm-lb) usando parafusos M5 ou nº10.
 - Aperte a chave com torque na superfície de montagem: 4-2,8 N-m (53,34-63,5cm-lb) usando parafusos M5 ou nº10.
6. Consulte o diagrama do circuito no gabinete do switch. O diagrama mostra o switch de segurança quando a chave está inserida.
7. Remova os parafusos invioláveis da placa de cobertura.

8. Conecte cabos trançados (0,75 mm²-2,5 mm², 18-14 AWG) ou sólidos (0,75 mm² to 1,5 mm², 18-16 AWG) aos terminais do conector (utilize cabos para 90 °C quando a temperatura ambiente passar dos 75 °C).
 - Aperte o conector que prende o cabo ao gabinete do switch (se necessário): 1,8-2,2 N-m (40,64-48,26cm-lb).
 - Aperte os parafusos de terminação do switch: 0,8-1,0 N-m (17,78-22,86cm-lb) M3.
 - Aperte o parafuso terra: 0,8-1,0 N-m (17,78-22,86cm-lb) M3.
9. Sele a abertura do conduíte de acordo com as instruções descritas em PK 80112.
10. Coloque a placa de cobertura novamente.
11. Feche todas as entradas de conduíte que não forem utilizadas (incluindo conectores). Vede com fita Teflon ou selador de canos.
12. Encaixe a tampa na janela de entrada para chave não-utilizada (inclusa).
13. Execute testes de funcionamento:
 - Abra e feche a guarda protetora várias vezes para garantir que a chave se encaixe facilmente na cabeça do switch.
 - Feche a guarda protetora e certifique-se do travamento do switch. Deverá ser impossível abrir a guarda protetora enquanto houver algum movimento perigoso.
 - Quando o switch destravar, abra a guarda protetora. Deverá ser impossível operar o equipamento enquanto a guarda protetora estiver destravada ou aberta.
14. Aplique uma camada de tinta ou cera sobre o botão de liberação auxiliar e a tampa do corpo do switch para detectar atuação da liberação auxiliar.

LIBERAÇÃO AUXILIAR**⚠ ADVERTÊNCIA****INSTALAÇÃO INCORRETA**

- NÃO use a liberação auxiliar para prestar manutenção geral, reparar a máquina ou ligar e desligar a máquina. Use apenas em situações de emergência.

Desobediência a essas instruções pode resultar em morte ou ferimentos graves.

ATENÇÃO**DANOS AO PRODUTO**

- NÃO gire a liberação auxiliar mais de 90° a partir das posições travada ou destravada.

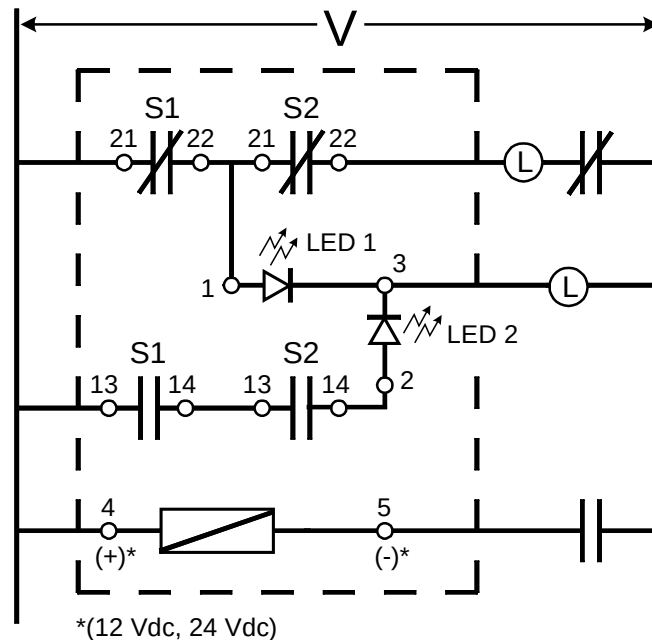
Desobediência a essas instruções poderá resultar em danos ao produto.

Trava Mecânica: Ocorre através de um sistema interno de molas quando a guarda protetora estiver fechada e a chave estiver inserida. A aplicação de voltagem no solenóide destrava esta versão (ou a atuação da liberação auxiliar na falta de energia elétrica).

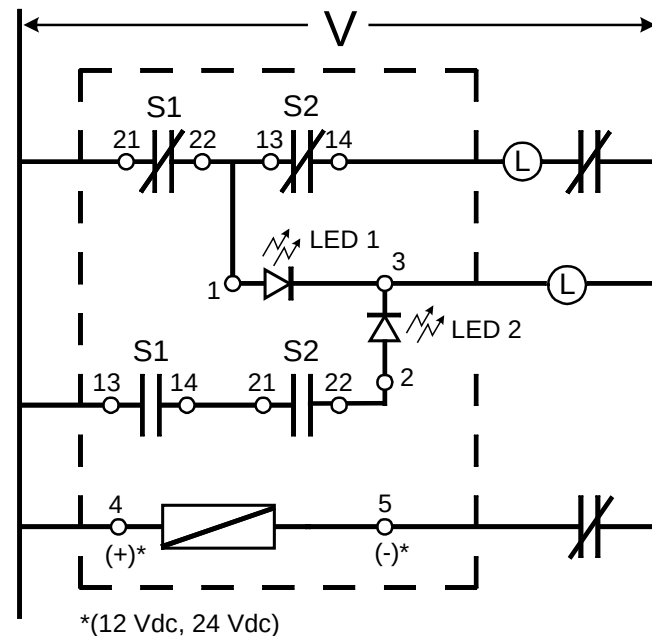
Trava Acionada por Solenóide: É ativada quando se aplica uma determinada voltagem ao solenóide depois que a guarda protetora da máquina estiver fechada e a chave estiver inserida. **A interrupção da voltagem** aplicada ao solenóide destravar a guarda protetora.

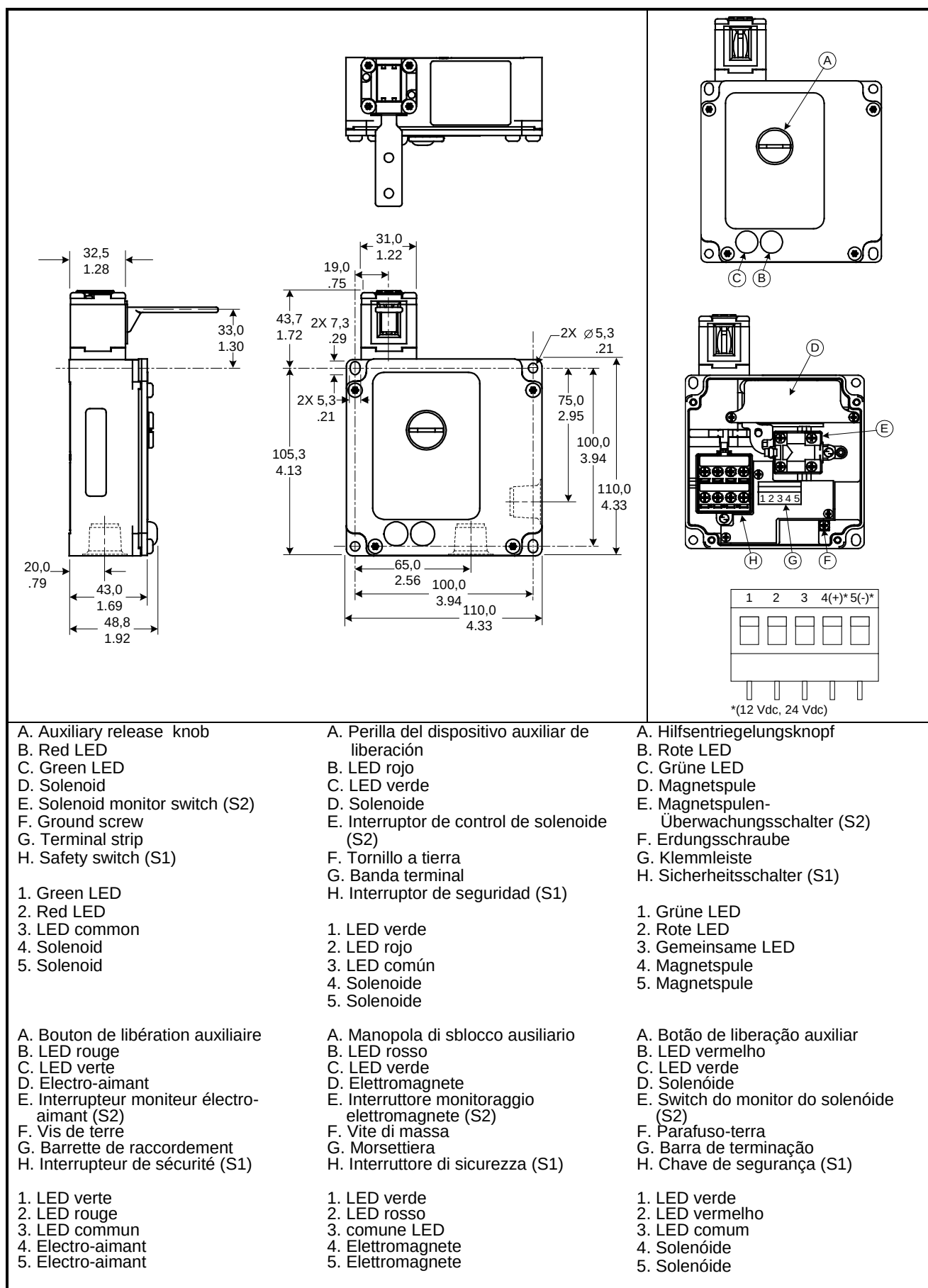
A liberação auxiliar do mecanismo de trava do switch permite a abertura da guarda protetora. Consulte o desenho na placa de cobertura do switch para ver a direção apropriada de giro.

Mechanical Lock Circuitry: Protective guard closed and locked
 Circuitos de la traba mecánica: Barrera protectora cerrada y trabada
 Schaltkreis der mechanischen Verriegelung: Schutzvorrichtung geschlossen und verriegelt
 Circuit de verrouillage mécanique: Protecteur fermé et verrouillé
 Circuito di bloccaggio meccanico: Riparo di protezione chiuso e bloccato
 Circuito da Trava Mecânica: Guarda protetora fechada e travada



Solenoid Lock Circuitry: Protective guard closed and locked
 Circuitos de la traba de solenoide: Barrera protectora cerrada y trabada
 Schaltkreis der Magnetspulen-Verriegelung: Schutzvorrichtung geschlossen und verriegelt
 Circuit de verrouillage par électro-aimant: Protecteur fermé et verrouillé
 Circuito di bloccaggio ad elettromagnete: Riparo di protezione chiuso e bloccato
 Circuito da Trava Acionada por Solenóide: Guarda protetora fechada e travada)





Designation and Utilization Category		Rated Operational Current I _e (A) at Rated Operational Voltage U _e (V)		
		24 V	120 V	240 V
AC15	A300	--	6 A	3 A
DC13	Q300	2,8 A	0,55 A	0,27 A
Rated Thermal Current (I _{th})			10 A	
Rated Impulse Withstand (U _{imp})			2500 Vdc	
Sealing			IP68; NEMA 1, 4, 6, 6P, 12, 13	
Temperature Range			-25 °C to 40 °C (-13 °F to 104 °F)	
Solenoid Power			12 W	
Solenoid and LED Indicator Operating Voltage			12 Vdc: +10%, -20%	24 Vac: +10%, -15%
			24 Vdc: +10%, -20%	120 Vac: +10%, -15%
			48 Vdc: +10%, -20%	240 Vac: +10%, -15%
Nominal Forces (Device in Unlocked State)				
Insertion			35 N (8 lbs)	
Extraction			28 N (6 lbs)	
Mechanical Life			1,000,000	
Complies with:				
• Machinery Directive 89/392/EEC (as amended by Directive 91/368/EEC) • EN60947-5-1				

Head Code L	Head Code M	Head Code N	Head Code P
GKZ56 			
GKZ57 			
GKZ58 			
GKZ59 			
1. Minimum insertion distance 2. Maximum insertion distance 3. Minimum swing radius 4. Swing adjustment screw 1. Longueur minimum d'insertion 2. Longueur maximum d'insertion 3. Rayon de pivotement minimum 4. Vis de réglage du pivotement	1. Distancia mínima de inserción 2. Distancia máxima de inserción 3. Radio mínimo de giro 4. Tornillo de ajuste de giro 1. Distanza di inserimento minima 2. Distanza di inserimento massima 3. Raggio di deviazione minimo 4. Vite di regolazione deviazione	1. Mindesteinfahrtiefe 2. Maximale Einfahrtiefe 3. Mindestausschlagradius 4. Ausschlag-Einstellschraube 1. Distância mínima de inserção 2. Distância máxima de inserção 3. Raio mínimo de oscilação 4. Parafuso de ajuste da oscilação	

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Bien que nous apportons notre aide pour les applications, de façon individuelle, par notre littérature et par le site web Honeywell, il incombe au client de déterminer si le produit convient à l'application.

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Especificações podem ser alteradas sem prévio aviso. As informações fornecidas são tidas como precisas e confiáveis por ocasião da impressão desta publicação. No entanto, não assumimos qualquer responsabilidade por seu uso.

Independentemente de proporcionarmos assistência pessoal, através de nossos impressos e nosso site da Web, cabe ao comprador determinar a adequação do produto à sua aplicação.

1-800-537-6945 USA
1-800-737-3360 Canada
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+49 (0) 69 8064 444 Germany
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+33 (0) 4 76 41 7200 France

FAX: 1-815-235-6545 USA
info@micro.honeywell.com

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Honeywell

Sensing and Control

Honeywell Inc.
11 West Spring Street
Freeport, Illinois 61032



www.honeywell.com/sensing



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Issue 2

PK 80109

Installation Instructions for the Dual Entry Key Operated Safety Interlock Switch (GK Series)

Instrucciones de instalación para el interruptor de seguridad con llave de doble entrada (serie GK)

Einbauanweisungen für den Doppeleingangs-Sicherheits-Verriegelungsschalter mit separatem Betätiger (Serie GK)

Instructions d'installation de l'interrupteur de sécurité avec interverrouillage à clé à double entrée (série GK)

Istruzioni per l'installazione dell'interruttore con interblocco di sicurezza azionato a chiave a doppio ingresso (Serie GK)

Instruções de Instalação para o Switch de Bloqueio de Segurança Operado por Chave de Duas Entradas (Série GK)



WARNING

IMPROPER INSTALLATION

- Consult with local safety agencies and their requirements when designing a machine-control link, interface and all control elements that affect safety.
 - Strictly adhere to all installation instructions.
- Failure to comply with these instructions could result in death or serious injury.**

MOUNT, WIRE, SEAL AND TEST SWITCH



WARNING

IMPROPER OPERATION

- Ensure key travels to the given minimum insertion distance to ensure switch contact transfer.
 - Ensure key travels to maximum extraction distance to ensure correct operation of the positive break mechanism.
 - Do not exceed 100 N (22.4 lb) actuation force.
 - Do not use the key as a stop for the door.
- Failure to comply with these instructions could result in death or serious injury.**

1. Refer to:
 - Page 6 for wiring configurations, switch mounting dimensions, specifications.
 - Page 7 for key mounting dimensions.
2. Rotate head (if desired):
 - Using the TORX® tamper resistant bit (included), loosen tamper-proof screws and remove head.
 - Rotate head to desired position (90° increments), ensuring seal remains in correct position while reassembling head.
 - Torque tamper-proof screws 1,36-1,80 N m (12-16 in lb).
3. Ensure proper clearance for switch and key at mounting location.
4. Align switch and key together before mounting.
5. Mount switch and key:
 - Torque switch to mounting surface: 4,9-5,9 N m (43-52 in lb) using M5 or #10 screws.
 - Torque key to mounting surface: 4-2,8 N m (21-25 in lb) using M5 or #10 screws.
6. Refer to circuit diagram on switch housing. Diagram depicts safety switch when key is inserted.
7. Remove tamper-proof screws on cover plate.
8. Connect stranded wire (0,75 mm²-2,5 mm², 18-14 AWG) or solid wire (0,75 mm² to 1,5 mm², 18-16 AWG) to connector terminals (use 90 °C wire when ambient temperature is over 75 °C):
 - Torque connector to secure cable to switch enclosure (if required): 1,8-2,2 N m (16-19 in lb).
 - Torque switch terminal screws: 0,8-1,0 N m (7-9 in lb) M3.
 - Torque ground screw: 0,8-1,0 N m (7-9 in lb) M3.
9. Seal conduit opening according to instructions in PK 80112.
10. Reassemble cover plate.
11. Plug unused key entry window with snap fit cover (included).
12. Perform functional tests:
 - Open and close protective guard several times to ensure key slides easily into switch head.
 - Open and close protective guard several times to ensure switch contacts transfer (change state) in each state.
 - Ensure the normally closed contacts open when protective guard is open.
 - Ensure hazardous motion does not start when protective guard is open.

⚠ ADVERTENCIA**INSTALACIÓN INCORRECTA**

- Consulte las normas de seguridad y sus requisitos al realizar el diseño del enlace de control de una máquina, la interfaz, y los elementos de control que afecten a la seguridad.
- Siga estrictamente todas las instrucciones para la instalación.

El incumplimiento de estas recomendaciones puede ocasionar lesiones graves o peligro de muerte.

MONTAJE, CABLEADO, SELLADO Y COMPROBACIÓN DEL INTERRUPTOR**⚠ ADVERTENCIA****FUNCIONAMIENTO INCORRECTO**

- Asegúrese que la llave circule hasta la dimensión mínima de inserción para asegurar la transferencia de contacto del interruptor.
- Asegúrese que la llave circule hasta la distancia máxima de extracción para asegurar el funcionamiento correcto del mecanismo de interrupción positiva.
- No exceda los 100 N (22,4 lb) en la fuerza de accionamiento.
- No utilice la llave como un tope para la puerta.

El incumplimiento de estas recomendaciones puede ocasionar lesiones graves o peligro de muerte.

1. Consulte:
 - La página 6 para las configuraciones del cableado, las dimensiones de montaje del interruptor y las especificaciones.
 - La página 7 para las dimensiones de montaje de la llave.
2. Rote el cabezal (si lo desea):
 - Con el tornillo TORX® resistente a alteraciones (incluido), afloje los tornillos garantizados contra toda alteración y retire el cabezal.
 - Gire el cabezal a la posición deseada (en incrementos de 90°), asegurándose que el sellado permanece en la posición correcta al volver a colocar el cabezal.
 - Ajuste los tornillos garantizados contra toda alteración 1,36-1,80 Nm (12-16 pulg. lb).
3. Asegúrese que exista la separación adecuada para el interruptor y la llave en el lugar de montaje.
4. Alinee el interruptor y la llave juntos antes de montarlos.
5. Monte el interruptor y la llave:
 - Ajuste el interruptor a la superficie de montaje: 4,9-5,9 Nm (43-1.320,80 mm pulg. lb) usando tornillos M5 o del número 10.
 - Ajuste la llave a la superficie de montaje: 4-2,8 Nm (21-25 pulg. lb) usando tornillos M5 o del número 10.
6. Consulte el diagrama del circuito para la carcasa del interruptor. El diagrama representa el interruptor de seguridad cuando la llave está insertada.
7. Retire los tornillos garantizados contra toda alteración de la tapa.

8. Conecte cable trenzado (0,75 mm²-2,5 mm², 18-14 AWG) o cable sólido (0,75 mm² a 1,5 mm², 18-16 AWG) a los terminales del conector (utilice cable de 90 °C cuando la temperatura ambiente supere los 75 °C).
 - Ajuste el conector para asegurar el cable al receptáculo del interruptor (si es requerido): 1,8-2,2 Nm (16-19 pulg. lb).
 - Ajuste los tornillos de terminal del interruptor: 0,8-1,0 Nm (7-9 pulg. lb) M3.
 - Ajuste el tornillo a tierra: 0,8-1,0 Nm (7-9 pulg. lb) M3.
9. Selle el conducto de entrada según las instrucciones en PK 80112.
10. Vuelva a colocar la tapa en su sitio.
11. Selle la ventana de la entrada de llaves no utilizada con la tapa de ajuste instantánea (incluida).
12. Realice las comprobaciones funcionales:
 - Abra y cierre varias veces la barrera protectora para asegurar que la llave se desliza fácilmente en el cabezal del interruptor.
 - Abra y cierre la barrera protectora varias veces para asegurarse que los contactos del interruptor transfieren (cambian de estado) en cada estado.
 - Asegúrese que los contactos normalmente cerrados se abren cuando la barrera protectora esté abierta.
 - Asegúrese que no se inicien movimientos peligrosos cuando la barrera protectora esté abierta.

⚠ WARNUNG**UNSACHGEMÄSSER EINBAU**

- Beraten Sie sich mit den zuständigen Sicherheitsbehörden beim Entwurf von Verbindungen zu Maschinensteuerungen, Schnittstellen und sämtlichen Steuerelementen, welche die Sicherheit betreffen.
- Halten Sie sich genau an die Einbau-Anweisungen.

Das Nichtbeachten dieser Anweisungen könnte zum Tod oder zu schweren Verletzungen führen.

SCHALTER MONTIEREN, VERDRAHTEN, ABDICHTEN UND TESTEN**⚠ WARNUNG****UNSACHGEMÄSSER BETRIEB**

- Sicherstellen, daß der Schlüssel bis zur Mindestdtiefe eingeführt werden kann, um die Schalter-Kontaktgabe zu gewährleisten.
- Sicherstellen, daß der Schlüssel bis zum Maximalabstand herausgezogen wird, um die einwandfreie Betätigung des Zwangstrennungs-Mechanismus zu gewährleisten.
- Eine Betätigungskraft von 100 N nicht überschreiten.
- Den Schlüssel nicht als Stoppvorrichtung für die Tür verwenden.

Das Nichtbeachten dieser Anweisungen könnte zum Tod oder zu schweren Verletzungen führen.

1. Weitere Informationen:
 - Schaltungskonfigurationen, Abmessungen für die Schaltermontage und technische Daten auf Seite 6.
 - Montage-Hauptabmessungen auf Seite 7
2. Kopf drehen (falls gewünscht):
 - Mit Hilfe des manipulationssicheren TORX®-Einsatzes die manipulationssicheren Schrauben lösen und den Kopf abnehmen.
 - Den Kopf in die gewünschte Position drehen (90°-Stufen), wobei sichergestellt werden muß, daß während des Zusammenbaus des Kopfes die Dichtung in der vorgesehenen Position bleibt.
 - Die manipulationssicheren Schrauben mit 1,36...1,80 Nm anziehen.
3. Sicherstellen, daß am Anbringungsort zwischen dem Schalter und dem Betätiger genügend Freiraum ist.
4. Schalter und Betätiger vor der Montage ausrichten.
5. Schalter und Betätiger montieren:
 - Schalter-Festziehmoment an der Befestigungsoberfläche: 4,9 ... 5,9 Nm mit M5-Schrauben oder Schrauben Nr.10.
 - Schlüssel-Festziehmoment an der Befestigungsoberfläche: 4 ... 2,8 Nm mit M5-Schrauben oder Schrauben Nr.10.
6. Siehe Anschlußschaltbild am Schaltergehäuse. Das Schaltbild stellt den Sicherheitsschalter bei eingeführtem Betätiger dar.
7. Die manipulationssicheren Schrauben auf der Deckplatte entfernen.
8. Den Litzendraht (0,75 mm² ... 2,5 mm², 18 ... 14 AWG) oder Draht (0,75 mm² ... 1,5 mm², 18 ... 16 AWG) an die Klemmleisten anschließen (90 °C-Draht verwenden, wenn die Umgebungstemperatur über 75 °C liegt).
 - Stecker anziehen, um das Kabel am Schaltergehäuse zu sichern (falls erforderlich): 1,8 ... 2,2 Nm.
 - Schalter-Klemmschrauben anziehen: 0,8...1,0 Nm M3.
 - Erdungsschraube anziehen: 0,8...1,0 Nm M3.
9. Die Kabeleinführung entsprechend den Anweisungen in PK 80112 versiegeln.
10. Die Deckplatte wieder montieren.
11. Mit der mitgelieferten Einschnapp-Abdeckung die unbenutzte Betätigereinführungsöffnung abdecken.
12. Funktionstests durchführen:
 - Die Schutzvorrichtung mehrmals öffnen und schließen, um sicherzustellen, daß sich der Schlüssel leicht in den Schalterkopf einführen läßt.
 - Die Schutzvorrichtung mehrmals öffnen und wieder schließen, um sicherzustellen, daß für die Schalterkontakte immer eine Zustandsveränderung eintritt.
 - Sicherstellen, daß bei offener Schutzvorrichtung die Öffnerkontakte öffnen.
 - Sicherstellen, daß bei geöffneter Sicherheitsvorrichtung keine gefahrbringende Bewegung einsetzt.

**AVERTISSEMENT****INSTALLATION INCORRECTE**

- Faites appel à des organismes locaux de sécurité et prenez en compte leurs exigences lorsque vous concevez une liaison de commande ou interface de machine, ou tout autre dispositif de commande mettant en jeu la sécurité.
- Respectez scrupuleusement l'ensemble des instructions d'installation.

L'inobservation de ces instructions peut entraîner la mort ou de graves blessures.

**MONTEZ, CABLEZ, ETANCHEIFIEZ ET
ESSAYEZ L'INTERRUPTEUR**
**AVERTISSEMENT****MAUVAIS FONCTIONNEMENT**

- Vérifiez que la course de la clé corresponde à la longueur minimale d'insertion indiquée, afin d'assurer le transfert du contact de l'interrupteur.
- Vérifiez que la course de la clé corresponde à la longueur maximale d'extraction, afin d'assurer le bon fonctionnement du mécanisme de coupure positive.
- Ne pas dépasser 100 N (22,4 lb) d'effort de commande.
- Ne pas utiliser la clé comme arrêt de porte.

L'inobservation de ces instructions peut entraîner la mort ou de graves blessures.

1. Consultez :
 - La page 6 pour les configurations de câblage, les dimensions de montage de l'interrupteur et ses caractéristiques techniques.
 - La page 7 pour les cotes de montage de la clé.
2. Faites pivoter la tête (si vous le souhaitez):
 - A l'aide de l'embout TORX® inviolable (inclus), desserrez les vis inviolables et retirez la tête.
 - Faites pivoter la tête pour l'amener dans la position voulue (par incréments de 90°), en veillant à ce que le joint reste en position correcte lors du remontage de la tête.
 - Serrez les vis inviolables avec un couple de 1,36 à 1,80 N.m (12 à 16 in.lb).
3. Assurez-vous que l'emplacement de montage de l'interrupteur et de la clé offre suffisamment d'espace.
4. Alignez interrupteur et la clé avant montage.
5. Montage de l'interrupteur et de la clé:
 - Serrez l'interrupteur sur la surface de montage avec un couple de 4,9 à 5,9 N.m (43 à 52 in.lb) à l'aide de vis M5 ou n°10.
 - Serrez la clé sur la surface de montage avec un couple de 2,4 à 2,8 N.m (21 à 25 in.lb) à l'aide de vis M5 ou n°10.
6. Consultez le schéma du circuit sur le boîtier de l'interrupteur. Ce schéma représente l'interrupteur de sécurité lorsque la clé est introduite.
7. Retirez les vis inviolables du couvercle.
8. Connectez du fil souple (0,75 mm² à 2,5 mm², 18 à 14 AWG) ou rigide (0,75 mm² à 1,5 mm², 18 à 16 AWG) aux bornes du connecteur (utilisez du fil 90 °C lorsque la température ambiante est supérieure à 75 °C):

- Serrez le connecteur pour fixer le câble à l'enveloppe de l'interrupteur (si besoin) avec un couple de 1,8 à 2,2 N.m (16 à 19 in.lb).
 - Serrez les vis des bornes avec un couple de 0,8 à 1,0 N.m (7 à 9 in.lb) M3.
 - Serrez la vis de terre avec un couple de 0,8 à 1,0 N.m (7 à 9 in.lb) M3.
9. Réalisez l'étanchéité de l'ouverture du conduit conformément aux instructions données en PK 80112.
 10. Remontez le couvercle.
 11. Obturez l'ouverture de serrure inutilisée à l'aide du capuchon pression (inclus).
 12. Effectuez des essais fonctionnels:
 - Ouvrez et fermez plusieurs fois le protecteur pour vous assurer que la clé glisse facilement dans la tête d'interrupteur.
 - Ouvrez et fermez plusieurs fois le protecteur pour vous assurer que les contacts de l'interrupteur changent d'état dans les deux sens.
 - Vérifiez que les contacts normalement fermés s'ouvrent lorsque le protecteur est ouvert.
 - Vérifiez que le mouvement dangereux ne commence pas lorsque le protecteur est ouvert.

ATTENZIONE

INSTALLAZIONE SCORRETTA

- Consultare gli enti locali in materia di antinfortunistica e le rispettive normative nel momento in cui ci si avvia alla progettazione di un qualsiasi collegamento controllo macchina, o di un'interfaccia, o di tutti gli elementi di controllo che possano influire sulla sicurezza.
- Attenersi rigorosamente a tutte le istruzioni di installazione.

L'inosservanza di tali istruzioni può essere causa di gravi lesioni, con conseguenze addirittura fatali.

MONTARE, CABLARE, SIGILLARE E SOTTOPORRE A PROVA L'INTERRUTTORE

ATTENZIONE

FUNZIONAMENTO SCORRETTO

- Verificare che la chiave scorra fino alla distanza di inserimento minima al fine di garantire il trasferimento di contatto dell'interruptore.
- Verificare che la chiave scorra fino alla distanza di estrazione massima al fine di garantire il corretto funzionamento del meccanismo di interruzione forzata.
- Non applicare una forza di attuazione superiore a 100 N (22,4 lb).
- Non usare la chiave come arresto per la porta.

L'inosservanza di tali istruzioni può essere causa di gravi lesioni, con conseguenze addirittura fatali.

1. Consultare:
 - Pagina 6, per le configurazioni di cablaggio, le dimensioni di montaggio dell'interruptore e i dati tecnici.
 - Pagina 7, per le dimensioni di montaggio della chiave.

2. Eventualmente, ruotare la testa (in base alle esigenze):
 - Svitare le viti a prova di manomissione utilizzando la punta a prova di manomissione TORX® (compresa) e rimuovere la testa.
 - Ruotare la testa nella posizione richiesta (incrementi di 90°), accertandosi che gli elementi di tenuta rimangano nella posizione corretta in fase di rimontaggio della testa.
 - Serrare le viti a prova di manomissione ad una coppia di 1,36-1,80 N m (12-16 poll. lb).
3. Garantire la presenza di un adeguato spazio libero per l'interruptore e la chiave in corrispondenza della sede di montaggio.
4. Prima del montaggio, allineare l'interruptore e la chiave.
5. Montare l'interruptore e la chiave:
 - Serrare l'interruptore alla superficie di montaggio alla coppia: 4,9-5,9 N m (43-52 poll. lb) con viti M5 o #10.
 - Serrare la chiave alla superficie di montaggio alla coppia: 4-2,8 N m (21-25 poll. lb) con viti M5 o #10.
6. Fare riferimento allo schema elettrico riportato sull'involucro dell'interruptore. Tale schema rappresenta l'interruptore di sicurezza quando la chiave è inserita.
7. Rimuovere le viti a prova di manomissione dalla piastra di copertura.
8. Collegare cavi flessibili (0,75 mm²-2,5 mm², 18-14 AWG) o cavi rigidi (0,75 mm²-1,5 mm², 18-16 AWG) ai morsetti dei connettori (se la temperatura ambiente supera i 75 °C, utilizzare cavi che hanno una temperatura di esercizio pari a 90 °C):
 - Serrare il connettore in modo da fissare il cavo all'involucro dell'interruptore (se necessario) alla coppia: 1,8-2,2 N m (16-19 poll. lb).
 - Serrare i morsetti a vite dell'interruptore alla coppia: 0,8-1,0 N m (7-9 poll. lb), M3.
 - Serrare la vite di massa alla coppia: 0,8-1,0 N m (7-9 poll. lb), M3.
9. Sigillare l'apertura del tubo isolante in base alle istruzioni riportate in PK 80112.
10. Rimontare la piastra di copertura.
11. Chiudere l'apertura di entrata della chiave, eventualmente non utilizzata, con un riparo munito di chiusura a scatto (compreso).
12. Eseguire le prove di funzionamento:
 - Aprire e chiudere il riparo di protezione più volte per garantire un agevole inserimento della chiave nella testa dell'interruptore.
 - Aprire e chiudere il riparo di protezione più volte per garantire che i contatti dell'interruptore commutino (cambino stato) in ciascuno stato.
 - Verificare che i contatti normalmente chiusi si aprano quando il riparo di protezione è aperto.
 - Accertarsi che non si verifichi l'avvio di un movimento pericoloso quando il riparo di protezione è aperto.

⚠ ADVERTÊNCIA **INSTALAÇÃO INCORRETA**

- Consulte os requisitos da agência de segurança local ao projetar unidades de conexão ou interface para controle de máquinas, bem como todos os elementos de controle que possam afetar a segurança.
- Obedeça rigorosamente todas as instruções de segurança.

Desobediência a essas instruções pode resultar em morte ou ferimentos graves.

MONTAGEM, CABEAMENTO, VEDAÇÃO E TESTE DO SWITCH

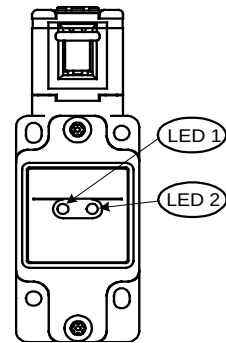
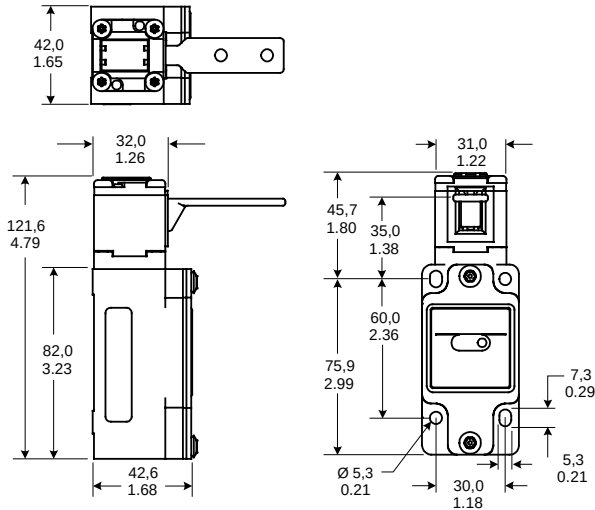
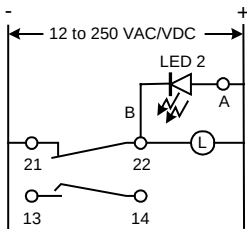
⚠ ADVERTÊNCIA **INSTALAÇÃO INCORRETA**

- Para garantir o estabelecimento de contato no switch, assegure-se de que a chave faça o percurso na distância mínima de inserção.
- Para garantir a operação correta do mecanismo positivo de interrupção, certifique-se de que a chave faça o percurso na distância máxima de extração.
- Não exceda a força de atuação de 100 N (10,17Kg).
- Não use a chave como escora para a porta.

Desobediência a essas instruções pode resultar em morte ou ferimentos graves.

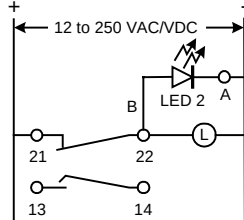
1. Consulte:
 - A página 6 para ver as configurações de cabeamento, dimensões de montagem do switch e especificações.
 - A página 7 para ver as dimensões de montagem da chave.
2. Gire a cabeça (se desejado):
 - Utilizando a broca resistente à violação da TORX® (inclusa), solte os parafusos invioláveis e remova a cabeça.
 - Gire a cabeça para a posição desejada (em incrementos de 90°), certificando-se de que a vedação permaneça na posição correta quando você montar novamente a cabeça.
 - Aperte os parafusos invioláveis com um torque de 1,36-1,80 N-m (30,48-40,64cm-lb).
3. Certifique-se de que haja espaço apropriado para o switch e a chave no local de montagem.
4. Alinhe o switch e a chave juntos antes de montar.
5. Monte o switch e a chave:
 - Aperte o switch com torque na superfície de montagem: 4,9-5,9 N-m (109,22-132,08cm-lb) usando parafusos M5 ou nº10.
 - Aperte a chave com torque na superfície de montagem: 4-2,8 N-m (53,34-63,5cm-lb) usando parafusos M5 ou nº10.
6. Consulte o diagrama do circuito no gabinete do switch. O diagrama mostra o switch de segurança quando a chave está inserida.
7. Remova os parafusos invioláveis da placa de cobertura.

8. Conecte cabos trançados (0,75 mm²-2,5 mm², 18-14 AWG) ou sólidos (0,75 mm² to 1,5 mm², 18-16 AWG) aos terminais do conector (utilize cabos para 90 °C quando a temperatura ambiente passar dos 75 °C).
 - Aperte o conector que prende o cabo ao gabinete do switch (se necessário): 1,8-2,2 N-m (40,64-48,26cm-lb).
 - Aperte os parafusos de terminação do switch: 0,8-1,0 N-m (17,78-22,86cm-lb) M3.
 - Aperte o parafuso terra: 0,8-1,0 N-m (17,78-22,86cm-lb) M3.
9. Sele a abertura do conduíte de acordo com as instruções descritas em PK 80112.
10. Coloque a placa de cobertura novamente.
11. Encaixe a tampa na janela de entrada para chave não-utilizada (inclusa).
12. Execute testes de funcionamento:
 - Abra e feche a guarda protetora várias vezes para garantir que a chave se encaixe facilmente na cabeça do switch.
 - Abra e feche a guarda protetora diversas vezes para garantir o estabelecimento de contato do switch (mudança de estado) em cada estado.
 - Certifique-se de que os contatos normalmente fechados estejam abertos quando a guarda protetora estiver aberta.
 - Certifique-se de que não ocorram movimentos perigosos quando a guarda protetora estiver aberta.

**GKC Series**

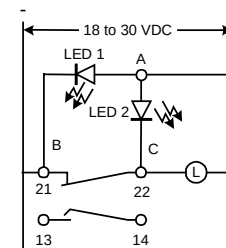
LED 1 = Green (power on)
 LED 2 = Yellow (output status)
 A = Terminal
 B = Red wire
 C = Black wire
 L = Load

LED 1 = Verte (sous tension)
 LED 2 = Jaune (état sortie)
 A = Borne
 B = Fil rouge
 C = Fil noir
 L = Charge

GKC Series

LED 1 = Verde (encendido)
 LED 2 = Amarillo (estado de salidas)
 A = Terminal
 B = Cable rojo
 C = Cable negro
 L = Carga

LED 1 = Verde (alimentazione inserita)
 LED 2 = Giallo (stato uscite)
 A = Morsetto
 B = Cavo rosso
 C = Cavo nero
 L = Carico

GKD Series

LED 1 = Grün (Betriebsspannung ein)
 LED 2 = Gelb (Ausgangszustand)
 A = Anschluß
 B = Roter Draht
 C = Schwarzer Draht
 L = Last

LED 1 = Verde (ligado)
 LED 2 = Amarelo (status de saída)
 A = Terminal
 B = Fio vermelho
 C = Fio preto
 L = Carga

Designation and Utilization Category		Rated Operational Current I _e (A) at Rated Operational Voltage U _e (V)						
		24 V	120 V	240 V	380 V	480 V	500 V	600 V
AC15	A300	--	6 A	3 A	--	--	--	--
AC15	A500	--	6 A	3 A	1,9 A	1,5 A	1,4 A	--
AC15	A600	--	6 A	3 A	1,9 A	1,5 A	1,4 A	1,2 A
DC13	Q300	2,8 A	0,55 A	0,27 A	--	--	--	--
Rated Thermal Current (I _{th})		10 A						
Rated Impulse Withstand (U _{imp})		2500 Vdc						
Sealing		IP67; NEMA 1, 4, 12, 13						
Temperature Range		-25 °C to 85 °C (-13 °F to 185 °F)						
Nominal Forces								
Insertion		35 N (8 lbs)						
Extraction		28 N (6 lbs)						
Mechanical Life		1,000,000						
Complies with:								
		- Machinery Directive 89/392/EEC (as amended by Directive 91/368/EEC) - EN60947-5-1						

Head Code L	Head Code M	Head Code N	Head Code P
GKZ56 			
GKZ57 			
GKZ58 			
GKZ59 			
1. Minimum insertion distance 2. Maximum insertion distance 3. Minimum swing radius 4. Swing adjustment screw	1. Distancia mínima de inserción 2. Distancia máxima de inserción 3. Radio mínimo de giro 4. Tornillo de ajuste de giro	1. Mindesteinfahrtiefe 2. Maximale Einfahrtiefe 3. Mindestausschlagradius 4. Ausschlag-Einstellschraube	1. Distância mínima de inserção 2. Distância máxima de inserção 3. Raio mínimo de oscilação 4. Parafuso de ajuste da oscilação

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While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

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Honeywell garantiert für seine hergestellten Produkte fehlerfreies Material und Qualitätsarbeit. Garantie-Informationen erhalten Sie von Ihrer nächstgelegenen Niederlassung. Wenn Produkte mit Garantie innerhalb der Garantiefrist an Honeywell zurückgesendet werden, ersetzt oder repariert Honeywell kostenlos die Teile, die als fehlerhaft angesehen werden. Das Vorgegangene gilt als einzige Entschädigung des Käufers und **ersetzt alle anderen ausdrücklichen oder stillschweigenden Garantien, einschließlich Qualitäts- und Sachmängelhaftung.**

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Les caractéristiques techniques peuvent changer sans préavis. Les informations que nous apportons sont présumées précises et fiables au moment de la mise sous presse. Cependant, nous déclinons toute responsabilité quant à leur utilisation.

Bien que nous apportions notre aide pour les applications, de façon individuelle, par notre littérature et par le site web Honeywell, il incombe au client de déterminer si le produit convient à l'application.

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A Honeywell garante seus produtos contra defeitos de material e de fabricação. Entre em contato com seu representante local para maiores informações sobre a garantia. Quando produtos garantidos forem devolvidos à Honeywell durante o prazo de garantia, a Honeywell se compromete a reparar ou substituir por um novo aqueles que consideramos defeituosos. O acima estipulado é a única garantia oferecida ao Comprador e **suplanta quaisquer outras garantias, expressas ou implícitas, incluindo as de comerciabilidade e adequação a um propósito específico.**

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1-800-537-6945 USA
1-800-737-3360 Canada
1-815-235-6847 International

+49 (0) 69 8064 444 Germany
+44 (0) 161 251 4079 UK
+33 (0) 4 76 41 7200 France

FAX: 1-815-235-6545 USA
info@micro.honeywell.com

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Sensing and Control

Honeywell Inc.
11 West Spring Street
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EN 60947-5-1-3



pending

Issue 2

PK 80110

Installation Instructions for the GKZL2 Lockout Device

Instrucciones de instalación para el dispositivo de bloqueo GKZL2

Einbau-Anweisungen für das Verriegelungsgerät GKZL2

Instructions d'installation du dispositif de verrouillage GKZL2

Istruzioni per l'installazione del dispositivo di blocco GKZL2

Instruções de Instalação para o Dispositivo de Travamento Elétrico GKZL2

WARNING

IMPROPER INSTALLATION

- Consult with local safety agencies and their requirements when designing a machine-control link, interface and all control elements that affect safety.
- Strictly adhere to all installation instructions.

Failure to comply with these instructions could result in death or serious injury.

GENERAL INFORMATION

WARNING

IMPROPER USE

- Do not use the lockout device as the main power lockout. Consult applicable OSHA requirements (OSHA 1910.213(b)(5)) for proper use.

Failure to comply with these instructions could result in death or serious injury.

The GKZL2 lockout device is for use with both the GK and GKR/GKL Series Dual Entry Head products. The lockout device prevents a key from being inserted either manually, or by the access door being closed while maintenance personnel are working on the machine. When inserted, the lockout device accommodates up to four padlocks to prevent unauthorized removal of the device.

ADVERTENCIA

INSTALACIÓN INCORRECTA

- Consulte las normas de seguridad y sus requisitos al realizar el diseño del enlace de control de una máquina, la interfaz, y los elementos de control que afecten a la seguridad.
- Siga estrictamente todas las instrucciones para la instalación.

El incumplimiento de estas recomendaciones puede ocasionar lesiones graves o peligro de muerte.

INFORMACIÓN GENERAL

ADVERTENCIA

UTILIZACIÓN INCORRECTA

- No utilice el dispositivo de bloqueo como el bloqueo de alimentación principal. Consulte la normativa OSHA aplicable (OSHA 1910.213(b)(5)) para su utilización adecuada.

El incumplimiento de estas recomendaciones puede ocasionar lesiones graves o peligro de muerte.

El dispositivo de bloqueo GKZL2 se utiliza tanto con los productos de cabezal de entrada doble de la serie GK como de las series GKR/GKL. El dispositivo de bloqueo evita que una llave se inserte manualmente, o bien por la puerta de acceso al cerrarse cuando el personal de mantenimiento trabaja en la máquina. Cuando está insertado, el dispositivo de bloqueo admite hasta cuatro candados para evitar que el dispositivo se retire sin autorización.

⚠️ AVVERTIMENTO

UNSAFEGEMÄSSER EINBAU

- Beraten Sie sich mit den zuständigen Sicherheitsbehörden beim Entwurf von Verbindungen zu Maschinensteuerungen, Schnittstellen und sämtlichen Steuerelementen, welche die Sicherheit betreffen.
- Halten Sie sich genau an die Einbau-Anweisungen.

Das Nichtbeachten dieser Anweisungen könnte zum Tod oder zu schweren Verletzungen führen.

ALLGEMEINE INFORMATIONEN

⚠️ AVVERTIMENTO

UNSAFEGEMÄSSER GEBRAUCH

- Das Verriegelungsgerät nicht als Verriegelung für die Netzstromversorgung verwenden. Zum ordnungsgemäßen Gebrauch die betreffenden OSHA- Richtlinien nachlesen (OSHA 1910.213(b)(5)).

Das Nichtbeachten dieser Anweisungen könnte zum Tod oder zu schweren Verletzungen führen.

Das Verriegelungsgerät GKZL2 dient zur Verwendung mit den Doppelseingangskopf-Produkten der Serien GK und GKR/GKL. Das Verriegelungsgerät hindert den Betätiger daran, manuell oder durch Schließen der Zugangstür während der Wartung der Maschine eingeführt zu werden. Wenn das Verriegelungsgerät installiert ist, können bis zu vier Vorhängeschlösser angebracht werden, um das unbefugte Entfernen des Geräts zu verhindern.

⚠️ ATTENZIONE

INSTALLAZIONE SCORRETTA

- Consultare gli enti locali in materia di antinfortunistica e le rispettive normative nel momento in cui ci si avvia alla progettazione di un qualsiasi collegamento controllo macchina, o di un'interfaccia, o di tutti gli elementi di controllo che possano influire sulla sicurezza.
- Attenersi rigorosamente a tutte le istruzioni di installazione.

L'inosservanza di tali istruzioni può essere causa di gravi lesioni, con conseguenze addirittura fatali.

INFORMAZIONI GENERALI

⚠️ ATTENZIONE

IMPIEGO SCORRETTO

- Non utilizzare il dispositivo di blocco come blocco per l'alimentazione principale. Consultare le direttive OSHA pertinenti (OSHA 1910.213(b)(5)) per un impiego corretto.

L'inosservanza di tali istruzioni può essere causa di gravi lesioni, con conseguenze addirittura fatali.

L'uso del dispositivo di blocco GKZL2 è previsto con i prodotti con testa a doppia entrata Serie GK e GKR/GKL. Il dispositivo di blocco impedisce che una chiave venga inserita manualmente o in seguito alla chiusura della porta di accesso durante gli interventi del personale di manutenzione sulla macchina. Quando il dispositivo di blocco è inserito, può alloggiare fino a quattro lucchetti al fine di impedire la rimozione non autorizzata del dispositivo.

⚠️ AVERTISSEMENT

INSTALLATION INCORRECTE

- Faites appel à des organismes locaux de sécurité et prenez en compte leurs exigences lorsque vous concevez une liaison de commande ou interface de machine, ou tout autre dispositif de commande mettant en jeu la sécurité.
- Respectez scrupuleusement l'ensemble des instructions d'installation.

L'inobservation de ces instructions peut entraîner la mort ou de graves blessures.

INFORMATIONS GENERALES

⚠️ AVERTISSEMENT

MAUVAISE UTILISATION

- Ne pas utiliser le dispositif de verrouillage comme verrouillage de l'alimentation secteur. Pour une utilisation correcte, consulter les exigences OSHA applicables (OSHA 1910.213(b)(5)).

L'inobservation de ces instructions peut entraîner la mort ou de graves blessures.

Le dispositif de verrouillage GKZL2 est prévu pour être utilisé avec les produits comportant une tête à double entrée des deux séries GK et GKR/GKL. Ce dispositif de verrouillage empêche l'insertion d'une clé soit manuellement, soit par la fermeture de la porte d'accès tandis que le personnel d'entretien travaille sur la machine. Une fois inséré, le dispositif de verrouillage peut recevoir jusqu'à quatre cadenas afin d'empêcher l'enlèvement illicite du dispositif.

⚠️ ADVERTÊNCIA

INSTALAÇÃO INCORRETA

- Consulte os requisitos da agência de segurança local ao projetar unidades de conexão ou interface para controle de máquinas, bem como todos os elementos de controle que possam afetar a segurança.
- Obedeça rigorosamente todas as instruções de segurança.

Desobediência a essas instruções pode resultar em morte ou ferimentos graves.

INFORMAÇÕES GERAIS

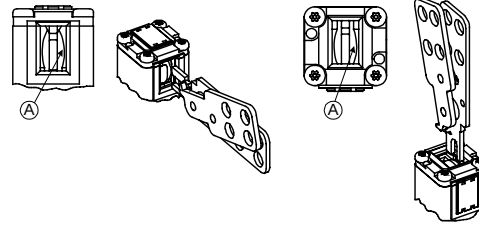
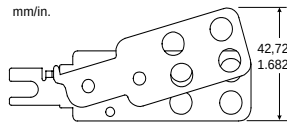
⚠️ ADVERTÊNCIA

USO INADEQUADO

- Não utilize este dispositivo como principal dispositivo de travamento da energia elétrica. Consulte os requisitos OSHA aplicáveis (OSHA 1910.213(b)(5)) para uso adequado.

Desobediência a essas instruções pode resultar em morte ou ferimentos graves.

O dispositivo de travamento elétrico GKZL2 é destinado para uso com os produtos de Cabeças de Duas Entradas das Séries GK e GKR/GKL. O dispositivo de travamento elétrico impede que uma chave seja inserida manualmente ou fechamento da porta de acesso enquanto o pessoal de manutenção está trabalhando na máquina. Quando inserido, o dispositivo de travamento elétrico aceita até quatro cadeados para impedir a remoção não-autorizada do dispositivo.

1

Rotate the lockout device to the unlocked position. Insert the forked end into the slot (A) between the metal cam and the right plastic lock in the switch head.

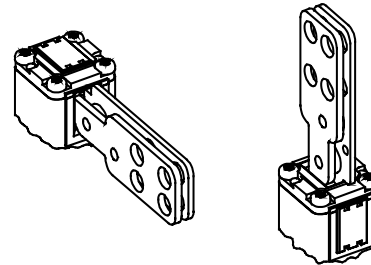
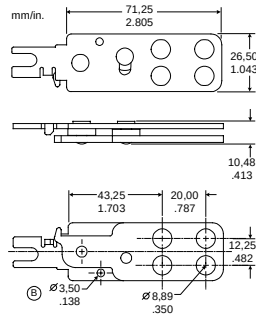
Gire el dispositivo de bloqueo a la posición destrabada. Introduzca el extremo ahorquillado en la ranura (A) entre la leva de metal y el mecanismo de traba de plástico derecho en el cabezal del interruptor.

Das Verriegelungsgerät in die entriegelte Position drehen. Das geteilte Ende in den Schitz (A) zwischen der Metallnocke und der rechten Plastikverriegelung im Schalterkopf einführen.

Faites pivoter le dispositif de verrouillage jusque en position déverrouillée. Insérez l'extrémité fourchue dans l'encoche (A) entre la came métallique et le verrou en plastique droit dans la tête d'interrupteur.

Ruotare il dispositivo di blocco nella posizione di sblocco. Inserire l'estremità a forcina nella scanalatura (A) tra la camma metallica e la chiusura destra in plastica nella testa dell'interruttore.

Gire o dispositivo de travamento elétrico para a posição destravada. Insira a extremidade bifurcada na fenda (A) entre o came metálico e a trava de plástico da direita na cabeça do switch.

2

Rotate the hooked end of the lockout device to the locked position, ensuring the hook engages the inside of the operating housing of the switch head.

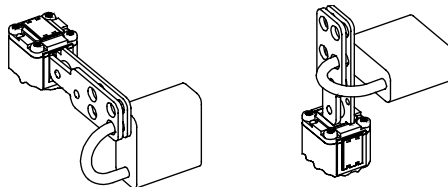
Gire el extremo curvado del dispositivo de bloqueo a la posición de traba, asegurándose que el gancho engancha el interior de la carcasa de funcionamiento del cabezal del interruptor.

Das hakenartige Ende des Verriegelungsgerät in die verriegelte Position drehen und dabei sicherstellen, daß der Haken im Innern des Betriebsgehäuses des Schalterkopfes eingreift.

Faites pivoter l'extrémité crochue du dispositif de verrouillage en position verrouillée, en veillant à ce que le crochet s'engage à l'intérieur du boîtier de commande de la tête d'interrupteur.

Ruotare l'estremità a forma di uncino del dispositivo di blocco in posizione di blocco, verificando che l'uncino si agganci all'interno dell'alloggiamento di attuazione della testa dell'interruttore.

Gire a extremidade curva do dispositivo de travamento elétrico para a posição travada, certificando-se que o gancho encaixe-se no interior do gabinete de operação da cabeça do switch.

3

Install padlock(s). If desired, tether the lockout device to mounting surface using hole (B) in Step 2.

Coloque el(los) candado(s). Si lo desea, ate el dispositivo de bloqueo a la superficie de montaje usando el orificio (B) en el paso 2.

Vorhängeschloss/-schlösser anbringen. Falls gewünscht, das Verriegelungsgerät mit einem Halteseil durch das Loch (B) in Schritt 2 an der Montageoberfläche befestigen.

Mettez le ou les cadenas en place. Si vous le souhaitez, attachez le dispositif de verrouillage à la surface de montage à l'aide du trou (B) de l'étape 2.

Montare il/i lucchetto/i. Eventualmente, in base alle esigenze, fissare il dispositivo di blocco alla superficie di montaggio utilizzando il foro (B) di cui al punto 2.

Instale um ou mais cadeados. Se desejar, prenda o dispositivo de travamento elétrico à superfície de montagem usando o orifício (B) da Etapa 2.

WARRANTY/REMEDY

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While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

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Les caractéristiques techniques peuvent changer sans préavis. Les informations que nous apportons sont présumées précises et fiables au moment de la mise sous presse. Cependant, nous déclinons toute responsabilité quant à leur utilisation.

Bien que nous apportons notre aide pour les applications, de façon individuelle, par notre littérature et par le site web Honeywell, il incombe au client de déterminer si le produit convient à l'application.

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Independentemente de proporcionarmos assistência pessoal, através de nossos impressos e nosso site da Web, cabe ao comprador determinar a adequação do produto à sua aplicação.

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FAX: 1-815-235-6545 USA
info@micro.honeywell.com

Honeywell

Sensing and Control
Honeywell Inc.
11 West Spring Street
Freeport, Illinois 61032



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Installation Instructions for the Safety Deadbolt Actuator

ISSUE 1

PK 80141

⚠ WARNING

IMPROPER INSTALLATION

- Consult with local safety agencies and their requirements when designing a machine-control link, interface and all control elements that affect safety.
- Strictly adhere to all installation instructions, including those for the GK or GKR/GKL Key Operated Safety Interlock Switch being used.

Failure to comply with these instructions could result in death or serious injury.

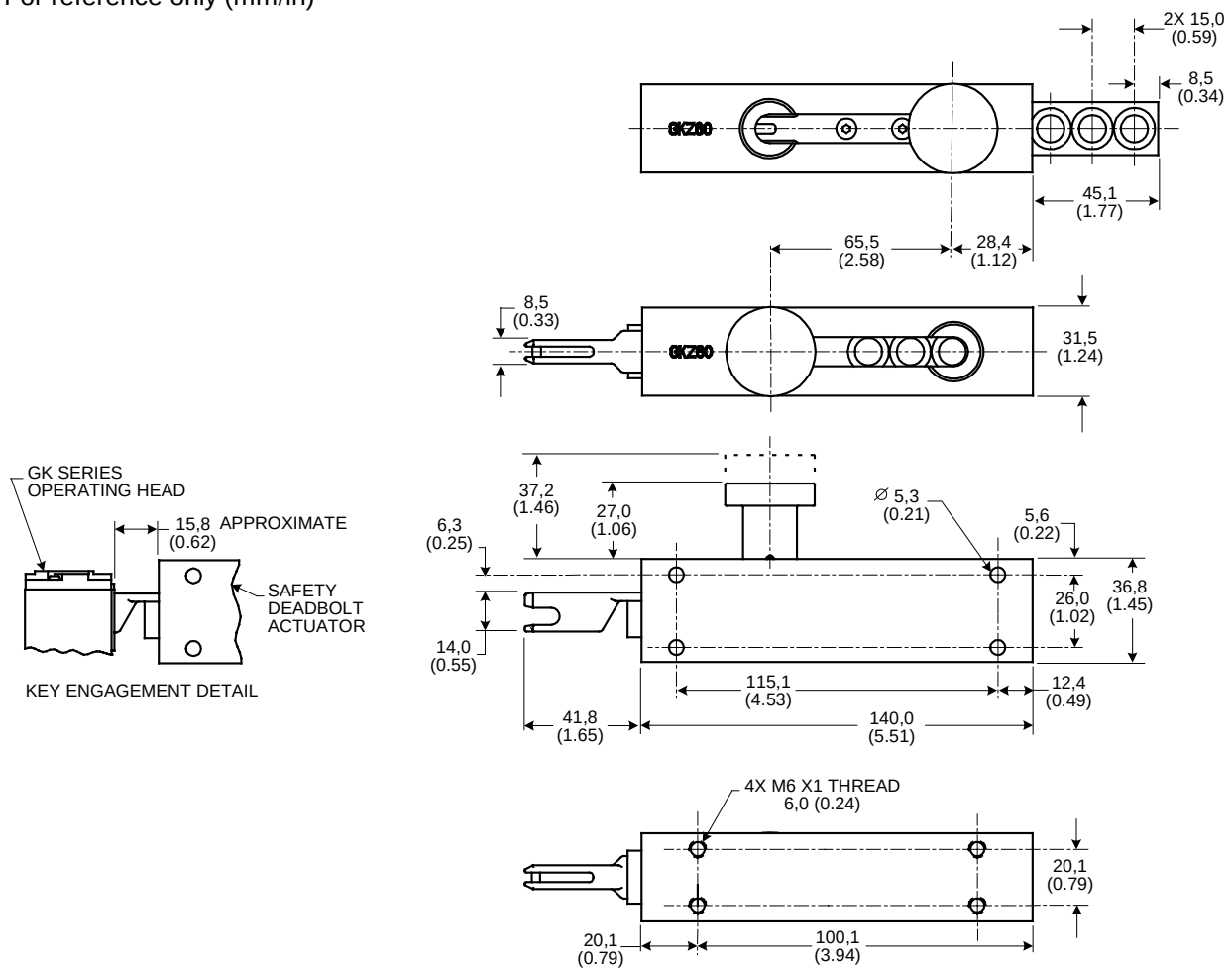
GENERAL INFORMATION

The Safety Deadbolt Actuator is used with the GK and GKR/GKL Key Operated Safety Interlock Switches to prevent the actuator key from being used as a doorstop or from protruding into the space of the protective guard or access door.

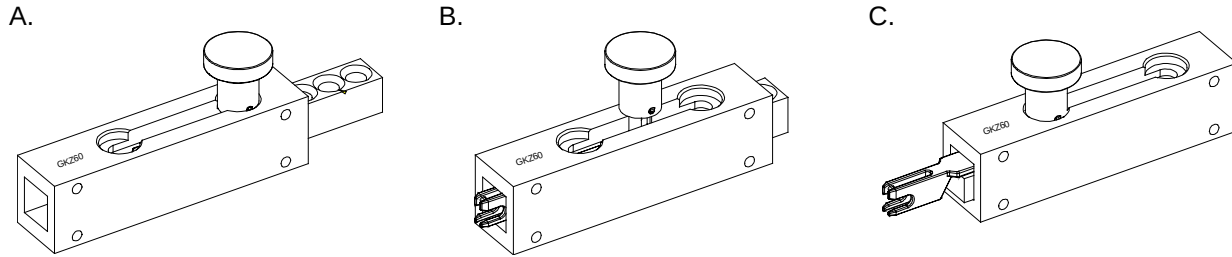
Padlock holes allow up to three user-provided padlocks for the purpose of GK Series actuator key lockout.

Step 1: Mount the Safety Deadbolt Actuator using the four mounting holes on the side or the four tapped mounting holes on the bottom of the device.

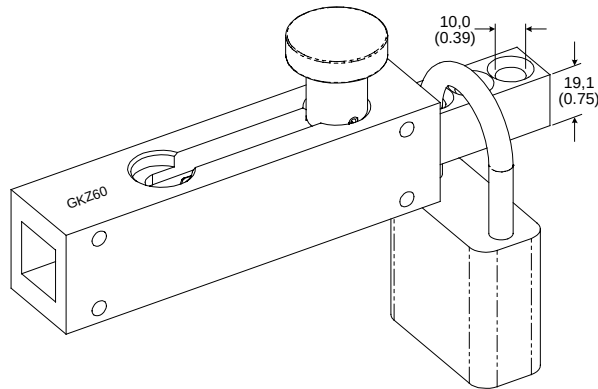
For reference only (mm/in)



Step 2: To engage the deadbolt actuator, pull up on button and slide forward. Ensure the button is fully seated in the extended position as shown in "C."



Step 3: Install padlock(s) if desired.



WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

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While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

For application assistance, current specifications, or name of the nearest Authorized Distributor, contact a nearby sales office. Or call:

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Installation Instructions for the Key Operated Safety Interlock Switch

ISSUE 2
PK 81590

ELECTRICAL DATA

Rated thermal current Ith: 10 A

- 1 AC Designation: A300/A600
- 2 AC Utilization Category: AC15
- 3 DC Designation: Q300
- 4 DC Utilization Category: DC13

Rated Impulse Withstand Uimp: 2500 VDC

Maximum fuse rating: 10 A quick acting

Degree of protection:

IP67; NEMA/UL types 1,4,12,13

Permissible Temperature Range:

Operating: -25° to 85°C (-13° to 185°)

Storage: -40° to 120°C (-40° to 248°)

Conductor cross section (screw connection):

Stranded: 0.75 mm² to 2.5 mm²,

18 to 14 AWG

Solid: 0.75 mm² to 1.5 mm², 18 to 16 AWG

NOTICE

Use 90° C wire when ambient is over 75°C.

This product complies with Machinery Directive (89/392/EEC as amended by Directive 91/369/EEC) and complies with EN60947-5-1.

WARNING

Improper installation of this device can cause personal injury to operating personnel. Strictly adhere to the following instructions.

RECOMMENDED TIGHTENING TORQUE AND SCREW SIZES

- Switch enclosure to mounting surface: 4.9-5.9 Nm (43-52 in./lb) M5 or #10
- Cover to switch enclosure: 1.2-1.4 Nm (10-12 in./lb) M4
- Connector to secure cable to enclosure (if required): 1.8-2.2 Nm (16-19 in./lb.)
- Operating head to switch enclosure (if changed): 1.36-1.80 Nm (12-16 in./lb) M4
- Switch terminal screws: 0.8-1 Nm (7-9 in./lb.) M3
- Ground Screw: .08-1 Nm (7-9 in./lb) M3
- Key to mounting surface: 2.4-2.8 Nm (21-25 in./lb) M5 or #10

CHANGE IN OPERATING HEAD KEY ENTRY LOCATION

Head options "E and K" are shipped unassembled from the switch housing and includes (4) one-way screws for customer assembly: Properly seat the factory-installed "O" ring in its seal groove. Determine the required key-entry location and-to prevent improper access to the switch mechanism as well as to ensure proper functioning of the switch-securely fasten the operating head to the switch housing with the (4) one-way screws provided and at the recommended tightening torque shown above. Honeywell's MICRO SWITCH Division warranty does not cover this version unless the one-way screws are installed.

Operating heads are not available as replacement parts.

INSTALLATION (See Figure 3)

Switch and key must be assembled together before mounting to equipment. Provide mounting holes as shown.

The key must travel to dimension X (Figure 3) to ensure reliable switch contact transfer. For safety, the operating mechanism must be moved to this dimension to ensure the correct operation of the positive break mechanism, which will ensure that a contact gap on the switch will withstand the insulation voltage of 2500V required by IEC 947-5-1 & UL508.

The positive break mechanism will come into effect on the N.C. (normally closed) circuit when the key is extracted from its full inward position to the dimension noted above.

Key actuation force: 22,3 N (5 lb.) max. The maximum force applied to the key must not exceed 100 N (22.4 lb.) to prevent mechanical damage that could lead to failure of the switch.

Key extraction force: 2.2 N (0.5 lb.) max. Head Codes F, G, H, J & K are adjustable up to 13,4 N (3 lb.). Max. key operating speed: 1 m (39 in) per second.

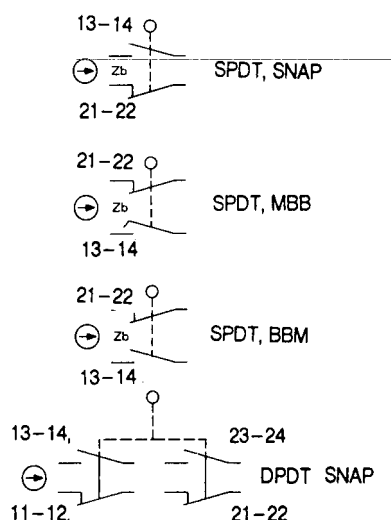
The key is not intended as a stop for the door. Ensure that the key is not traveled more than the maximum total travel shown in Figure 3.

NOTICE

Tamperproof screws must be used to mount the switch and key.

Correct functioning of the positive break switch must be checked during initial installation and periodically thereafter, noting any wear or drift which could occur in the application.

FIGURE 1



BASIC SWITCHES/WIRING

Basic switches are not available as replacement parts. Circuitries in Figure 1 are shown with the key inserted. M3 spade terminals, up to 6,35 mm (.25 in.) wide, may be used with all basic switches.

The positive break contact 21-22 and/or 11/12 must be correctly wired into the circuit to ensure disconnection of the supply, should the switch mechanism fail.

Before energizing associated equipment, always check for correct functioning of the switch mechanism and the positive break mechanism. After installation and often thereafter, check if any change or adjustment has been made to the switch or to the associated installation and, if so, readjust.

INDICATORS (See Figure 2)

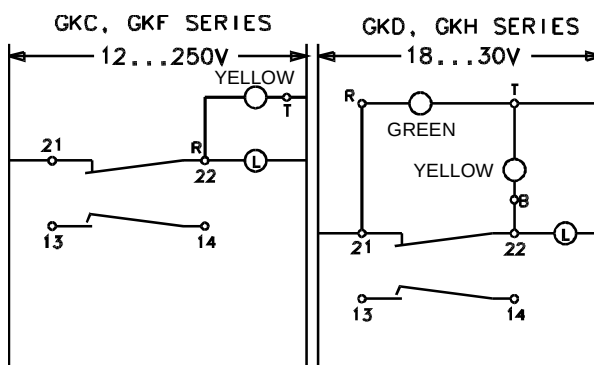
Diagrams are shown with key inserted; yellow indicates door closed, green indicates power on. Single LED, universal voltage, PLC-compatible, LED leakage current < 1.5mA

Dual LED, average current draw = 7 mA per LED

Circuits are shown with MBB slow action basic switch. Any basics shown in Figure 1 may be used with indicators.

T=Terminal
R=Red wire
B=Black wire

FIGURE 2



ROUTINE MAINTENANCE

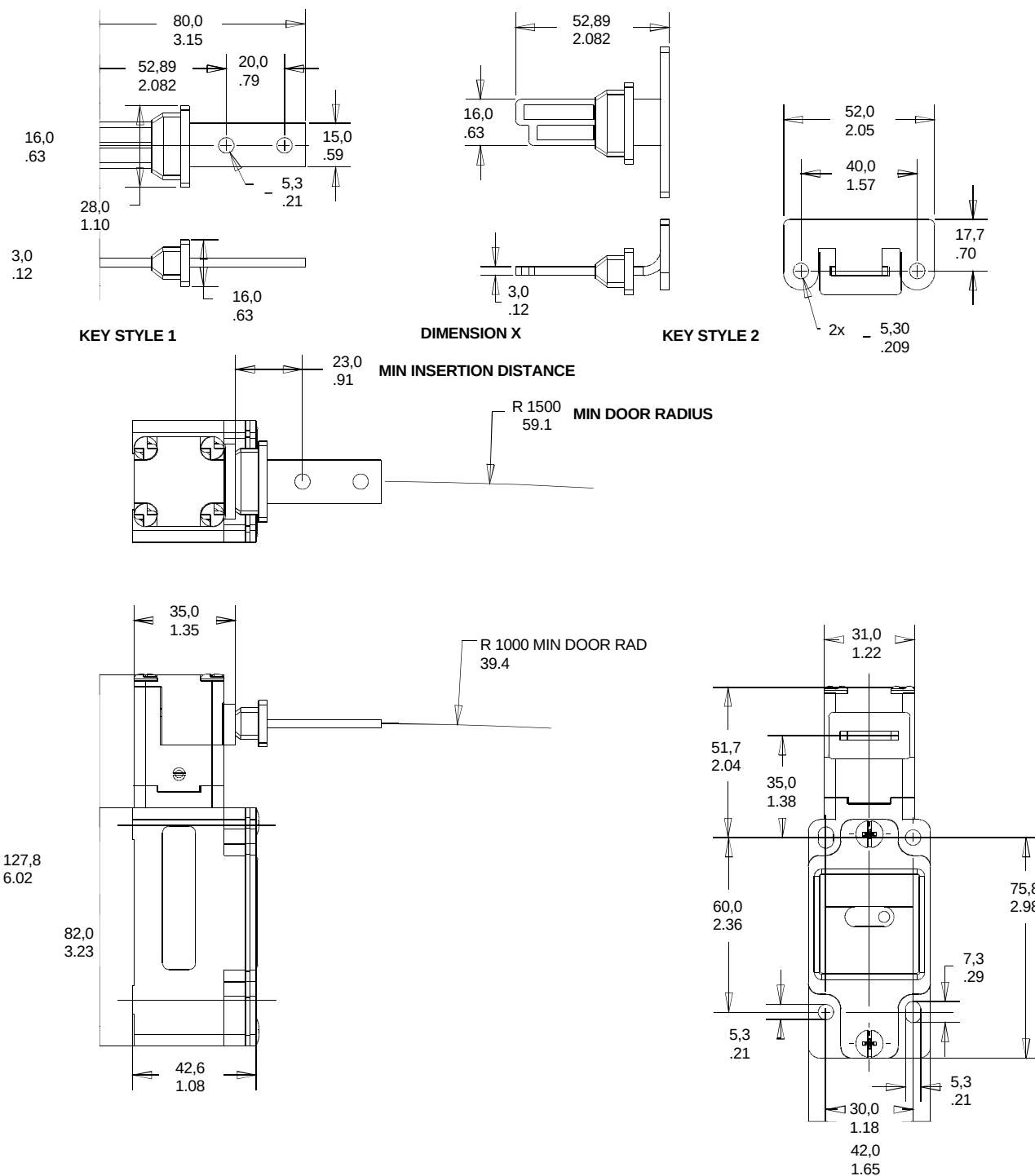
The safe operation of the machine will depend upon the safe working of all components and switches. A regular maintenance routine for the machine must be established, and that routine should specifically cover the complete application involving the switch. To enhance operator safety, inspect often for any wear on the actuator mechanism (including the key) operating the switch, or on the switch itself, or for any appreciable drift in the operating characteristics. Correct any such wear or drift as soon as it is detected.

As part of the routine maintenance, attention must be paid to that part of the machine which is in any contact with the actuator (key) and to the switch mounting, to ensure that the actuation is maintained to the specified travel.

During the routine maintenance, check for correct functioning of the positive break mechanism for electrical operation, which shall be carried out by a qualified person.

Periodic maintenance of the switch will ensure that continued safe operation of the switch is maintained. The frequency of maintenance will be determined by the type of machinery, the frequency of operation, the application and the local environment.

FIGURE 3 MOUNTING DIMENSIONS
(FOR REFERENCE ONLY)



KEY:
mm
in

GENERAL GUIDELINES

Switch alignment and its operation must be checked. The actuator (key) should move freely with no jamming in the switch during operation.

Ensure that there are no liquids in the switch enclosure. Check the sealing of the switch enclosure and conduits for the source of contamination and correct. Replace the switch, if contaminated.

Test the switch for correct electrical operation, which should only be carried out by a qualified person.

Visually check for mechanical damage on the body, actuator head or key. Damage could cause the product to become a safety hazard, and thus a damaged device must be replaced. Correct the cause of damage to ensure it does not reoccur.

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Commencing with date of shipment, Honeywell's warranty runs for 18 months. If warranted goods are returned to Honeywell during that period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

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While we provide application assistance, personally and through our literature, it is up to the customer to determine the suitability of the product in the application.

Honeywell

MICRO SWITCH
Honeywell Inc.
11 West Spring Street
Freeport, Illinois 61032



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Installation Instructions for the GKR/GKL Series Solenoid Key Operated Safety Interlock Switch

ISSUE 2

PK 81591



⚠ WARNING

IMPROPER INSTALLATION

- Consult with local safety agencies and their requirements when designing a machine-control link, interface and all control elements that affect safety.
- Strictly adhere to all installation instructions.
Failure to comply with these instructions could result in death or serious injury.



GENERAL INFORMATION

The MICRO SWITCH GK Solenoid Key Operated Safety Interlock Switch is designed to lock protective guards that prevent access to hazardous motion so that dangerous machine operations can only take place if the protective guard is closed and locked. Likewise, the protective guard cannot be opened if hazardous motion is present.

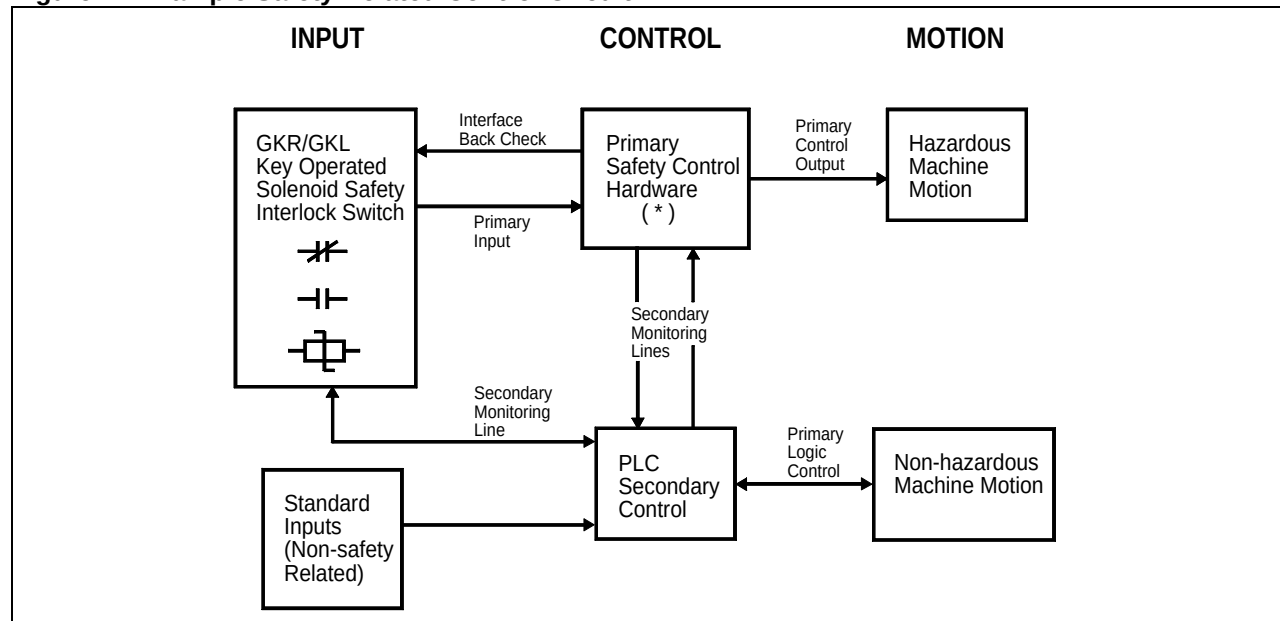
The control system must be designed so that hazardous motion can only take place when the protective guard is locked via the GKR/GKL Series Solenoid Key Operated Safety Interlock Switch. This control system design must ensure the guard locking device releases only when the dangerous conditions no longer exist (Figure 1).

The guard locking device can be specified as either Mechanical Lock or Solenoid Lock (see order guide).

Mechanical Lock occurs by internal spring force when the protective guard is closed and the key is inserted. Applying voltage to the solenoid unlocks the protective guard. When power failure occurs, the protective guard can be unlocked by actuating the auxiliary release.

Solenoid Lock occurs by applying voltage to the solenoid after the protective guard is closed and the key is inserted. Removing voltage to the solenoid unlocks the protective guard.

Figure 1: Example Safety Related Control Circuit



* Honeywell FF-SR Series safety control modules may be used as an interface between protective safety equipment and machine control circuitry. These products offer redundancy, monitoring, and control reliability features that ensure the highest level of industrial safety.

SAFETY ANALYSIS TECHNIQUES

1. Conduct Hazard Analysis and Risk Assessment

Refer to:

- OSHA Title 29, ANSI Standards.
- European Norm EN 1050, Safety of Machines Risk Assessment.

2. Review Requirements and Safety Related Parts of the Control System

- ANSI B11.19-1990 -- Safeguarding When Referenced by the Other B11 Machine Tool Safety Standards.
- ANSI B11.20 -- System Energy Stopping.
- European Norms:
 - EN954-1: Safety Related Parts of the Control Systems.
 - EN60204-1: Electrical Equipment of Machines.
 - prEN1088: Interlocking Devices With and Without Guard Locking.
- Any other appropriate industry safety standards.

PERFORM INSTALLATION AS FOLLOWS:

1. Assemble Switch Head (applies to Head Option “E” and “K” only)

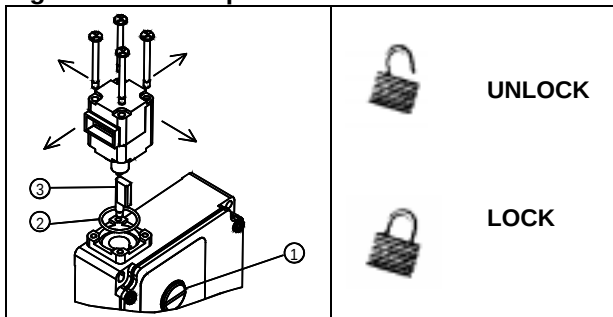
NOTICE

The one-way screws must be used on this head option to prevent voiding the warranty.

Head options “E” and “K” are shipped unattached and may be indexed in 90° increments (Figure 2).

- Rotate auxiliary release (1) to unlock position.
- Properly seat:
 - Factory-installed “O” ring (2) in its seal groove.
 - Plunger (3).
- Determine required key entry location.
- Securely fasten operating head to switch housing with the four one-way screws provided. Torque screws to 1,36-1,80 N-m (12-16 in-lb).
- Rotate auxiliary release back to lock position.

Figure 2: Head Options “E” and “K”



2. Mount, Wire and Seal Switch

Step 1 - Ensure you have the following:

- Switch and key.
- Wire (use 90°C wire when ambient temperature is over 75°C):
 - Stranded: 0.75 mm² 2.5 mm², 18-14 AWG, or
 - Solid: 0.75 mm² to 1.5 mm², 18-16 AWG.
- M5 or #10 screws.

Step 2 - Mount switch and key:

⚠ WARNING

IMPROPER INSTALLATION

- Ensure key travels to the minimum insertion dimension to ensure switch contact transfer (Figure 4).
- Ensure key travels to maximum extraction distance to ensure correct operation of the positive break mechanism.
- Do not exceed 100 N (22.4 lb) actuation force to key to prevent switch failure (Table 1).
- Do not use the key as a stop for the door.

Failure to comply with these instructions could result in death or serious injury.

Table 1: Force Characteristics*

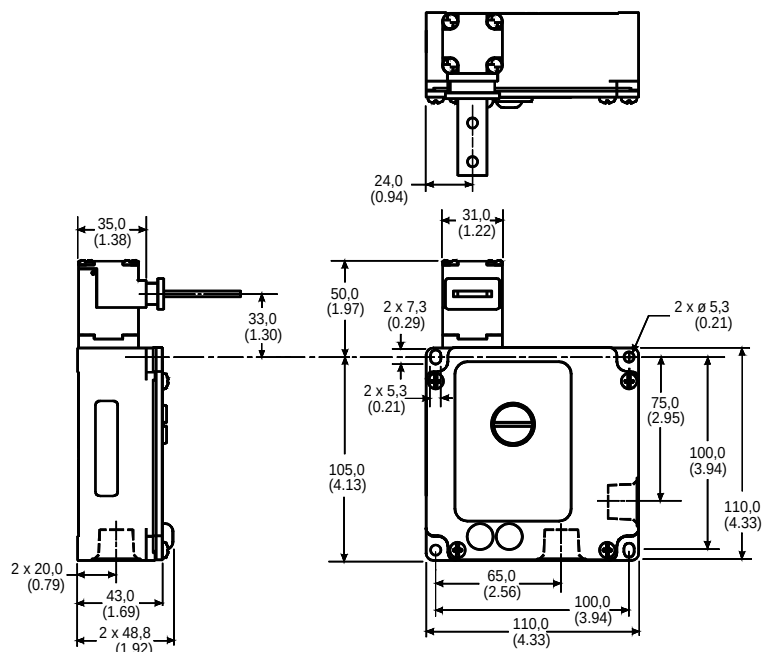
Key actuation force for head with detent	51 N (11.5 lb) minimum
Key extraction force for head with detent	31 N (7 lb) minimum
Key actuation force for head without detent	22 N (5 lb) minimum
Key extraction force for head without detent	2 N (0.5 lb) minimum

*Device is in unlocked state.

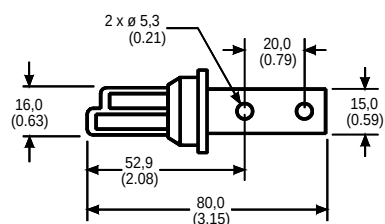
- Ensure proper clearance for switch and key at mounting location so that operation of the auxiliary release, as well as inspection and replacement, are possible.
- Properly align switch and key together before mounting to equipment.
- Mount switch and key (Figures 3 and 4).
 - Torque switch to mounting surface: 4,9-5,9 N-m (43-52 in-lb) M5 or #10.
 - Torque key to mounting surface: 2,4-2,8 N-m (21-25 in-lb) M5 or #10.

Figure 3: Switch and Key Mounting Dimensions (for reference only): mm/(in)

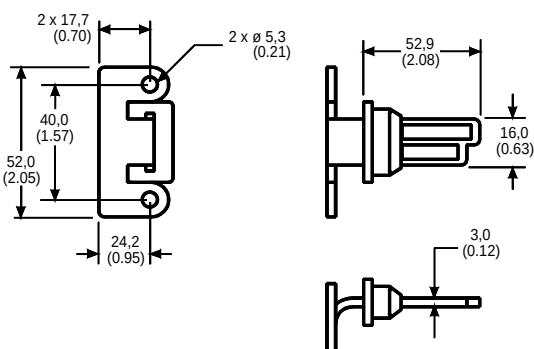
GKL Shown (head of GKR is on right side of switch)



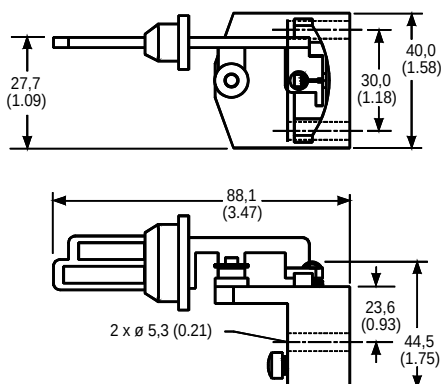
Straight Key



90° Key



Spring-loaded Key: Up/Down



Spring-loaded Key: Left/Right

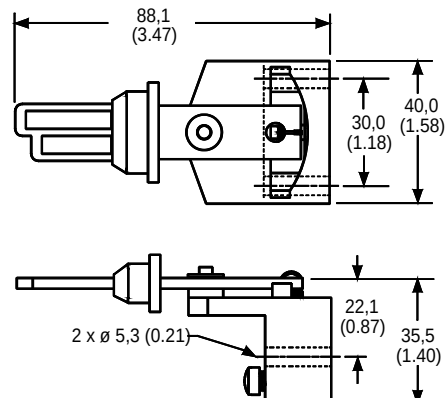


Figure 4: Minimum Key Insertion Dimensions

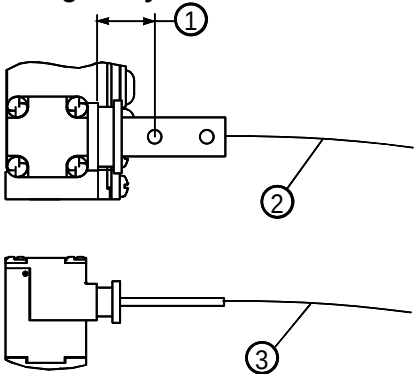
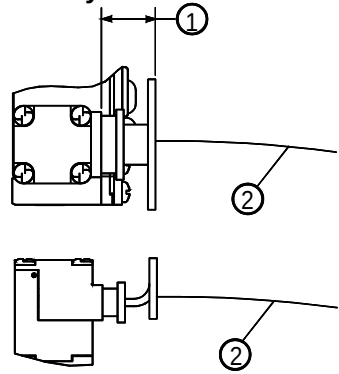
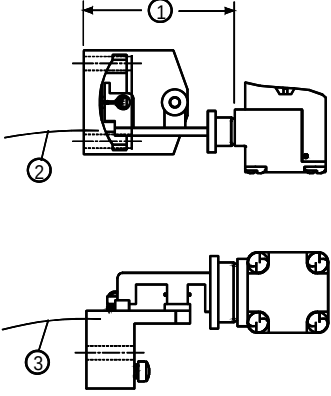
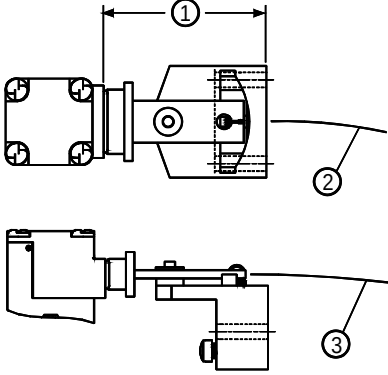
A. Straight Key 	B. 90° Key 	Key 1. 23,0 mm (0.91 in) minimum insertion distance 2. 1500 mm (59.1 in) minimum swing radius 3. 1000 mm (39.4 in) minimum swing radius
C. Spring-loaded Key: Up/Down 	D. Spring-loaded Key: Left/Right 	Key 1. 58,2 mm (2.29 in) minimum insertion distance 2. 150 mm (5.90 in) minimum swing radius 3. 1000 mm (39.4 in) minimum swing radius

Figure 5: External Switch Features

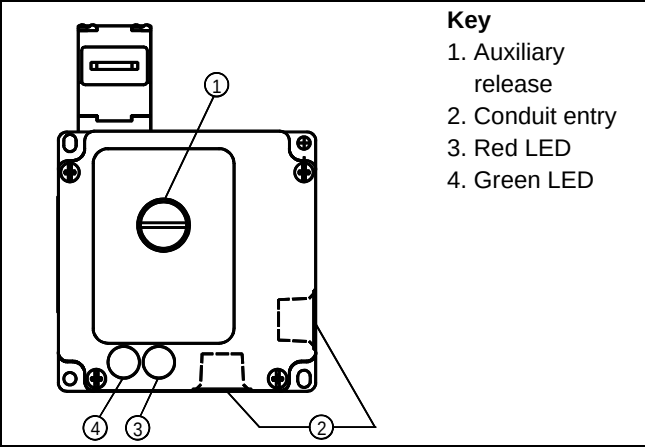
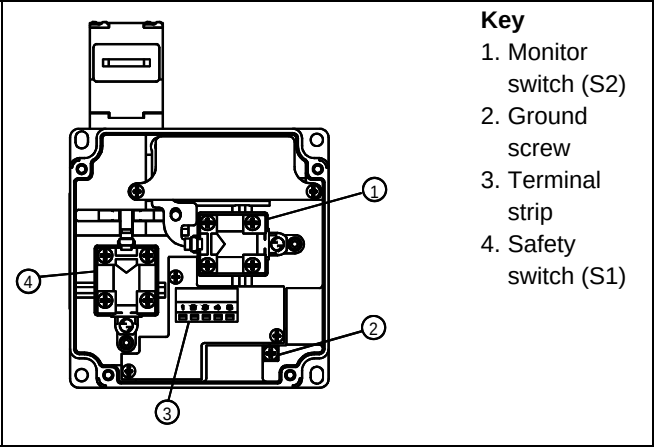


Figure 6: Internal Switch Features



Step 3 - Wire switch:

⚠ WARNING
IMPROPER INSTALLATION
 Strictly adhere to all electrical connection instructions.
Failure to comply with these instructions could result in death or serious injury.

- Refer to Figures 5, 6, 7, and 8 for 1NC - 1NO wiring configuration.

NOTICE

- M3 spade terminals up to 6,35 mm (0.25 in) wide may be used with contact block should additional wiring be required.
- Solenoid is prewired to the terminal strip.

- Torque wire connections as follows:
 - Torque connector to secure cable to switch enclosure (if required): 1,8-2,2 N-m (16-10 in-lb).
 - Torque switch terminal screws: 0,8-1,0 N-m (7-9 in-lb) M3.
 - Torque ground screw: 0,8-1,0 N-m (7-9 in-lb) M3.

Step 4 - Seal conduit entry:

- Seal with Teflon tape or pipe sealant.
- If connector is used to secure cable to switch enclosure, torque connector to 1,8-2,2 N-m (16-19 in-lb).
- Plug any unused conduit entry (plug included). Seal with Teflon tape or pipe sealant.

PERFORM MECHANICAL FUNCTION TEST

- Open and close protective guard several times to ensure key slides easily into switch head.

PERFORM ELECTRICAL FUNCTION TEST

- Close the protective guard and ensure switch locks. It must not be possible to open the protective guard when hazardous motion is present.
- After the switch unlocks, open the protective guard. The hazardous motion must not start when the protective guard is unlocked or open.

MAINTENANCE AND INSPECTION

⚠ WARNING
IMPROPER MAINTENANCE
 • Strictly adhere to all maintenance and inspection instructions.
 • If wear, damage, or contamination is found, replace the entire switch and key assembly. Do not replace individual parts.
 • Do not exceed one million switching operations.
Failure to comply with these instructions could result in death or serious injury.

Maintenance frequency will be determined by the type of machinery, the frequency of operation, the application, and the local environment. Inspect for and correct the following:

ROUTINE MAINTENANCE CHECKLIST

✓	Switch and key mounting. Mounting should be secure and permanent.
✓	Switch and key alignment. The key should move freely with no jamming in the switch during operation.
✓	Wear or mechanical damage.
✓	Correct electrical and mechanical switching function.
✓	Switch sealing. Ensure there are no liquids in switch enclosure.
✓	The complete safety switch assembly must be replaced after one million switch operations.

GK Solenoid Safety Interlock Switch

ISSUE 2 PK 81591

Figure 7: Modes of Operation for 1NO - 1NC Configuration

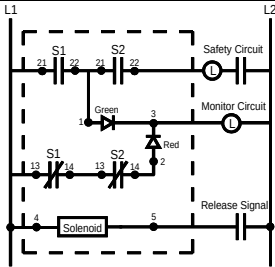
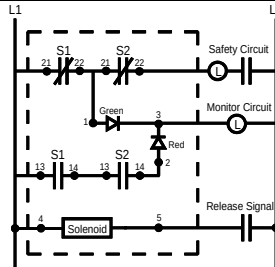
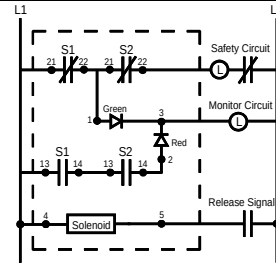
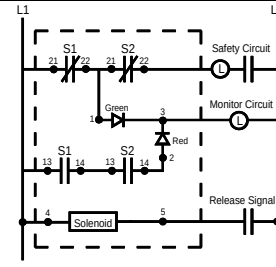
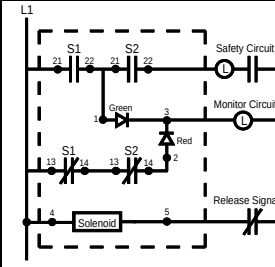
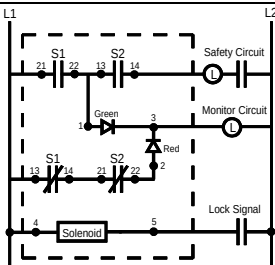
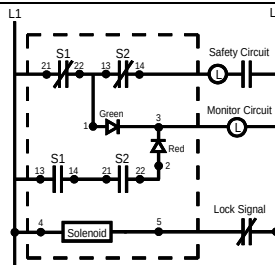
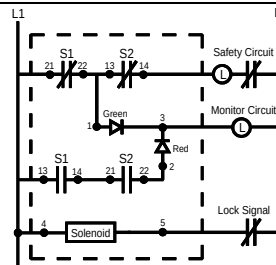
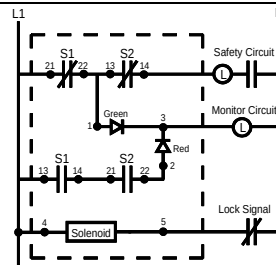
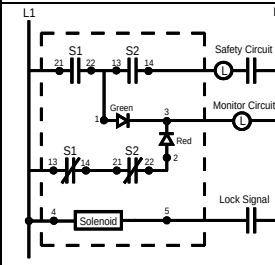
Sequence	1	2	3	4	5
Protective Guard Condition	Open	Closed	Closed	Closed	Open
Hazardous Motion	Absent	Absent	Present	Unknown	Absent
Key Actuator	Unlocked	Locked	Locked	Locked	Unlocked
Safety Circuit	Open	Closed	Closed	Closed	Open
Solenoid State: Mechanical Lock Solenoid Lock	Off Off	Off On	Off On	Off On	On Off
Mechanical Lock Circuitry S1 = Safety Switch S2 = Monitor Switch 1-5 = PCB Terminal Strip 13-14, 21-22 = Switch Terminals Dashed Line = Internal Switch Cavity					
Solenoid Lock Circuitry S1 = Safety Switch S2 = Monitor Switch 1-5 = PCB Terminal Strip 13-14, 21-22 = Switch Terminals Dashed Line = Internal Switch Cavity					
Green LED	Off	On	On	On	Off
Red LED	On	Off	Off	Off	On

Figure 8: Terminal Strip



AUXILIARY RELEASE DESCRIPTION (Figure 5)

⚠ WARNING

IMPROPER OPERATION

Do NOT use the auxiliary release for general maintenance, repair of the machine, or to start and stop the machine. Use in an emergency situation only.

Failure to comply with these instructions could result in death or serious injury.

The auxiliary (or manual) release of the switch lock mechanism allows the protective guard to be opened. The auxiliary release is to be used in an emergency situation only, such as a power failure when the mechanical lock version is used.

- Using a screwdriver, rotate the slotted screw as follows for the listed switch versions to release:
 - Clockwise for Head on Left, Mechanical Lock; Head on Right, Solenoid Lock.
 - Counterclockwise for Head on Left, Solenoid Lock; Head on Right, Mechanical Lock.

LOCKING TYPES DESCRIPTION

Mechanical Lock: Occurs by internal spring force when the protective guard is closed and the key is inserted. Applying voltage to the solenoid unlocks this version (or by actuating the auxiliary release when power failure occurs).

⚠ WARNING

IMPROPER INSTALLATION

Ensure that unintentional power failure on solenoid lock versions does not cause an unsafe condition.

Failure to comply with these instructions could result in death or serious injury.

Solenoid Lock: Occurs by applying voltage to the solenoid after the protective guard is closed and the key is inserted. Removing the voltage to the solenoid unlocks the protective guard.

LOCKING STRENGTH FEATURE

⚠ WARNING

IMPROPER OPERATION

Do not exert over 1000 N (224 lb) extraction force on actuator key.

Failure to comply with these instructions could result in death or serious injury.

The switch is equipped with a locking mechanism to prevent damage to the switch operating head. This mechanism is designed to withstand 1000 N (224 lb). If force over 1000 N is exerted on the actuator key, the mechanism will fracture and indicate an “open door” condition, requiring replacement of the entire switch.

ELECTRICAL RATING

A300 - AC15		Q300 - DC13	
Ue (Volts)	Ie (Amps)	Ue (Volts)	Ie (Amps)
120	6	24	2.9
240	3	125	.55
		250	.27

Rated Thermal Current (Ith) = 10 A

ENVIRONMENTAL RATING

Sealing	IP68 NEMA 1, 4, 6, 6P, 12, 13
Temperature Range	
Operating	-25° to 40°C (-13° to 104°F)
Storage	-40° to 120°C (-40° to 248°F)
Shock	50 G per IEC 68-2-27
Vibration	10 G per IEC 68-2-6

SPECIFICATIONS

Solenoid Power	12 W
Solenoid Operating Voltage	12 VDC: +10%, -20% 24 VDC: +10%, -20% 48 VDC: +10%, -20% 24 VAC: +10%, -15% 120 VAC: +10%, -15% 240 VAC: +10%, -15%
Contact Material	Fine Silver
Housing Material	Zinc Die Cast
Mechanical Life	One Million Operations

APPROVALS

- UL file #E37138, E157416
- CSA certified
- CE marked

REGULATION COMPLIANCE

- OSHA 29 CFR 1910.212 -- General Requirements for (Guarding of) All Machines.

STANDARDS/DIRECTIVES COMPLIANCE

- The forced disconnect mechanism on normally closed contacts conforms to IEC947-5-1.
- This product complies with Machinery Directive (89/392/EEC as amended by Directive 91/369/EEC) and complies with EN60947-5-1.

REPLACEMENT KEYS

Catalog Listing	Description
GKZ51	Straight Key
GKZ52	90° Key
GKZ53	Spring-Loaded Key: Up/Down
GKZ54	Spring-Loaded Key: Left/Right

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective material and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during that period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

While we provide application assistance, personally and through our literature, it is up to the customer to determine the suitability of the product in the application

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MICRO SWITCH

Honeywell Inc.
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EN 60947-5-1-3



pending

Issue 2

PK 80086

Installation Instructions for the Global Safety Limit Switch (GSS Series)

Instrucciones de instalación para los interruptores de fin de carrera (serie GSS)

Einbauanweisungen für den Sicherheits-Positionsschalter (Serie GSS)

Instructions d'installation du fin de course standard de sécurité (série GSS)

Istruzioni per l'installazione del finecorsa di sicurezza (Serie GSS)

Instruções de Instalação para o Switch de Fim de Curso de Segurança Global (Série GSS)

⚠ WARNING

IMPROPER INSTALLATION

- Consult with local safety agencies and their requirements when designing a machine-control link, interface, and all control elements that affect safety.
- Strictly adhere to all installation instructions.

Failure to comply with these instructions could result in death or serious injury.

MOUNT, WIRE AND SEAL SWITCH

⚠ WARNING

IMPROPER OPERATION

- Ensure switch actuator achieves sufficient travel for positive opening of normally closed (NC) contacts to occur.

Failure to comply with these instructions could result in death or serious injury.

- Refer to:
 - Page 3 for adjustments.
 - Page 4 for EN 50041 wiring configurations for each switch code. (Ag=silver contacts, Au=gold-plated contacts)
 - Pages 5 and 6 for specific travel distances for each switch code, and specifications.
 - Page 7 proper application of limit switches, and switch mounting dimensions.
- Perform adjustments (if desired). Use the TORX® tamper-resistant bit (included):
 - Head orientation (Figure 1).
 - Actuation direction (Figure 2).
 - Side rotary switches with 90° positive drive levers (catalog listings ending in A1A, A1B, A5A, A5B) (Figure 3):
 - Ensure flats of switch shaft engage groove in actuator lever.
 - Tighten locking screw (A) until tab (B) no longer moves.
- Mount switch using four M5 or #10 screws. Torque screws to 4,9-5,9 N m (43-52 in lb).
- Remove tamper-proof screws on cover plate.
- Connect stranded wire (0,75 mm²-2,5 mm², 18-14 AWG) or solid wire (0,75 mm² to 1,5 mm², 18-16 AWG) to connector terminals (use 90 °C wire when ambient temperature is over 75 °C). Torque switch terminal screws to 0,8-1,0 N m (7-9 in lb).
- Seal conduit opening according to instructions in PK 80112.
- Reassemble cover plate

⚠ ADVERTENCIA

INSTALACIÓN INCORRECTA

- Consulte las normas de seguridad y sus requisitos al realizar el diseño del enlace de control de una máquina, la interfaz, y los elementos de control que afecten a la seguridad.
- Siga estrictamente todas las instrucciones para la instalación.

El incumplimiento de estas recomendaciones puede ocasionar lesiones graves o peligro de muerte.

MONTAJE, CABLEADO Y SELLADO DEL INTERRUPTOR

⚠ ADVERTENCIA

FUNCIONAMIENTO INCORRECTO

- Asegúrese que el actuador del interruptor tenga la suficiente carrera para que se produzca la apertura positiva de los contactos normalmente cerrados (NC).

El incumplimiento de estas recomendaciones puede ocasionar lesiones graves o peligro de muerte.

- Consulte:
 - la página 3 para los ajustes
 - la página 4 para las configuraciones de cableado EN 50041 para cada código de interruptor. (Ag=contactos de plata, Au=contactos de oro)
 - las páginas 5 y 6 para las distancias de carrera específicas de cada código de interruptor y las especificaciones.
 - la página 7 para la correcta aplicación de los interruptores final de carrera y las dimensiones de montaje del interruptor.
- Realice los ajustes (si fuera necesario). Utilice el tornillo TORX® resistente a alteraciones (incluido):
 - Orientación del cabezal (véase la figura 1).
 - Dirección del accionamiento (véase la figura 2).
 - Interruptores de rotación lateral con palancas de impulsión positiva de 90° (las referencias del catálogo que terminen en A1A, A1B, A5A, A5B) (véase la figura 3):
 - Asegúrese de que las caras del eje del interruptor enganchen la ranura de la palanca del actuador.
 - Ajuste el tornillo de apriete (A) hasta que la lengüeta (B) deje de moverse.
- Para montar el interruptor, utilice cuatro tornillos M5 o del número 10. Ajuste los tornillos hasta 4,9-5,9 N m (43-52 pulg. lb).
- Retire los tornillos garantizados contra toda alteración de la tapa.
- Conecte cable trenzado (0,75 mm²-2,5 mm², 18-14 AWG) o cable sólido (0,75 mm² a 1,5 mm², 18-16 AWG) a los terminales del conector (utilice cable de 90 °C cuando la temperatura ambiente supere los 75 °C). Ajuste los tornillos de los terminales hasta 0,8-1,0 N m (7-9 pulg. lb).
- Selle el conducto de entrada según las instrucciones en PK 80112
- Vuelva a colocar en su sitio la tapa.

**WARNUNG****• UNSACHGEMÄSSER EINBAU**

- Beraten Sie sich mit den zuständigen Sicherheitsbehörden beim Entwurf von Verbindungen zu Maschinensteuerungen, Schnittstellen und sämtlichen Steuerelementen, welche die Sicherheit betreffen.
- Halten Sie sich genau an die Einbau-Anweisungen.

Das Nichtbeachten dieser Anweisungen könnte zum Tod oder zu schweren Verletzungen führen.

SCHALTER MONTIEREN, ANSCHLIESSEN UND ABDICHTEN**WARNUNG****UNSACHGEMÄSSER BETRIEB**

- Sicherstellen, daß der Betätiger genügend Laufweg hat, um die Öffnerkontakte (NC) zwangszuöffnen.

Das Nichtbeachten dieser Anweisungen könnte zum Tod oder zu schweren Verletzungen führen.

1. Weitere Informationen:
 - Einstellungen auf Seite 3.
 - EN 50041 Schaltungskonfigurationen für jeden Schaltercode auf Seite 4. (Ag=Silberkontakte, Au=Goldplattierte Kontakte)
 - Spezifische Laufwege für jeden Schaltercode und technische Daten auf Seite 5 und 6.
 - Ordnungsgemäße Anwendung von Positionsschaltern und Abmessungen für die Schaltermontage auf Seite 7.
2. Einstellungen vornehmen (falls gewünscht). Den im Lieferumfang enthaltenen, manipulationssicheren TORX®-Einsatz verwenden:
 - Ausrichtung des Kopfes (Abbildung 1).
 - Betätigungsrichtung (Abbildung 2).
 - Schalter mit seitlichem Schwenkhebel mit 90°-Zwangssteuerhebeln (Bestellnummern enden mit A1A, A1B, A5A, A5B) (Abbildung 3):
 - Sicherstellen, daß die gegenüberliegenden Flächen des Schalters in die Rille im Betätigerhebel eingreifen.
 - Die Sicherungsschraube (A) anziehen, bis die Nase (B) nicht mehr zu bewegen ist.
3. Den Schalter mit Hilfe von vier M5-Schrauben oder Schrauben Nr. 10 montieren. Schrauben mit 4,9 ...1,80 Nm anziehen.
4. Die manipulationssicheren Schrauben auf der Deckplatte entfernen.
5. Den Litzendraht (0,75 mm² ... 2,5 mm², 18 ... 14 AWG) oder Draht (0,75 mm² ... 1,5 mm², 18 ...16 AWG) an die Klemmleisten anschließen (90 °C-Draht verwenden, wenn die Umgebungstemperatur über 75 °C liegt). Die Klemmleistenschrauben des Schalters mit 0,8 ...1,0 Nm anziehen.
6. Die Kabeleinführung entsprechend den Anweisungen in PK 80112 abdichten.
7. Die Deckplatte wieder montieren.

**AVERTISSEMENT****INSTALLATION INCORRECTE**

- Faites appel à des organismes locaux de sécurité et prenez en compte leurs exigences lorsque vous concevez une liaison de commande ou interface de machine, ou tout autre dispositif de commande mettant en jeu la sécurité.
- Respectez scrupuleusement l'ensemble des instructions d'installation.

L'inobservation de ces instructions peut entraîner la mort ou de graves blessures.

MONTEZ, CABLEZ ET ETANCHEIFIEZ L'INTERRUPTEUR**AVERTISSEMENT****MAUVAIS FONCTIONNEMENT**

- Veillez à ce que l'actionneur de l'interrupteur parcourt une course suffisante afin de permettre une ouverture positive des contacts normalement fermés (NF).

L'inobservation de ces instructions peut entraîner la mort ou de graves blessures.

1. Consultez :
 - La page 3 pour les réglages.
 - La page 4 pour les configurations de câblage EN 50041 pour chaque code d'interrupteur. (Ag = contacts en argent, Au = contacts dorés)
 - Les pages 5 et 6 pour connaître les longueurs de courses pour chaque code d'interrupteur et les caractéristiques techniques.
 - La page 7 pour savoir comment réaliser une application correcte des interrupteurs de fin de course et connaître les cotes de montage de l'interrupteur.
2. Effectuez les réglages (le cas échéant). Utilisez l'embout inviolable TORX® (inclus) pour :
 - Orientation de la tête (figure 1).
 - Sens d'actionnement (figure 2).
 - Interrupteurs à rotation latérale avec leviers à 90° à action positive (numéros de référence se terminant par A1A, A1B, A5A, A5B) (figure 3) :
 - Veillez à ce que les méplats de l'axe de l'interrupteur s'engagent dans l'encoche du levier de l'actionneur.
 - Serrez la vis de blocage (A) jusqu'à ce que la languette (B) ne bouge plus.
3. Montez l'interrupteur à l'aide de vis M5 ou n°10. Serrez les vis avec un couple de 4,9 à 5,9 N.m (43 à 52 in.lb).
4. Retirez les vis inviolables du couvercle.
5. Connectez du fil souple (0,75 mm² à 2,5 mm², 18 à 14 AWG) ou rigide (0,75 mm² à 1,5 mm², 18 à 16 AWG) aux bornes du connecteur (utilisez du fil 90 °C lorsque la température ambiante est supérieure à 75 °C). Serrez les vis des bornes de l'interrupteur avec un couple de 0,8 à 1,0 N.m (7 à 9 in.lb).
6. Réalisez l'étanchéité de l'ouverture du conduit conformément aux instructions données en PK 80112.
7. Remontez le couvercle.

**ATTENZIONE****INSTALLAZIONE SCORRETTA**

- Consultare gli enti locali in materia di antinfortunistica e le rispettive normative nel momento in cui ci si avvia alla progettazione di un qualsiasi collegamento controllo macchina, o di un'interfaccia, o di tutti gli elementi di controllo che possano influire sulla sicurezza.
- Attenersi rigorosamente a tutte le istruzioni relative all'installazione.

L'inosservanza di tali istruzioni può essere causa di gravi lesioni, con conseguenze addirittura fatali.

MONTARE, CABLARE E SIGILLARE L'INTERRUTTORE.**ATTENZIONE****FUNZIONAMENTO SCORRETTO**

- Accertarsi che la corsa dell'attuatore dell'interruttore sia sufficiente a consentire l'apertura forzata dei contatti normalmente chiusi (NC).

L'inosservanza di tali istruzioni può essere causa di gravi lesioni, con conseguenze addirittura fatali.

1. Fare riferimento a:
 - Pagina 3, per le regolazioni.
 - Pagina 4, per le configurazioni di cablaggio conformi alla norma EN 50041 relative a ciascun codice di interruttore. (Ag=contatti in argento, Au=contatti dorati)
 - Pagina 5 e pagina 6, per gli specifici valori relativi a ciascun codice di interruttore e per i dati tecnici.
 - Pagina 7, per il corretto impiego degli interruttori fincorsa e per le dimensioni di montaggio.
2. Eventualmente eseguire le regolazioni (in base alle esigenze). Usare la punta a prova di manomissione TORX® (compresa):
 - Orientamento testa (Figura 1).
 - Direzione di attuazione (Figura 2).
 - Interruttori a rotazione laterale con leve ad azionamento meccanico a 90° (voci di catalogo che finiscono con A1A, A1B, A5A, A5B) (Figura 3):
 - Accertarsi che le alette dell'alberino dell'interruttore siano inserite nell'apposita scanalatura della leva dell'attuatore.
 - Serrare la vite di fermo (A) finché il movimento della linguetta (B) non risulta impedito.
3. Montare l'interruttore mediante quattro viti M5 o #10. Serrare le viti ad una coppia pari a 4,9-5,9 N m (43-52 poll. lb.).
4. Rimuovere le viti a prova di manomissione dalla piastra di copertura.
5. Collegare cavi flessibili (0,75 mm²-2,5 mm², 18-14 AWG) o cavi rigidi (0,75 mm²-1,5 mm², 18-16 AWG) ai morsetti dei connettori (se la temperatura ambiente supera i 75 °C, utilizzare cavi che hanno una temperatura di esercizio pari a 90 °C). Serrare le viti ad una coppia pari a 0,8-1,0 N m (7-9 poll. lb.).
6. Sigillare l'apertura del tubo isolante in base alle istruzioni della PK 80112.
7. Rimontare la piastra di copertura.

**ADVERTÊNCIA****INSTALAÇÃO INCORRETA**

Consulte as agências de segurança local e seus requisitos ao projetar unidades de conexão ou interface para controle de máquinas, bem como todos os elementos de controle que possam afetar a segurança.

Obedeça rigorosamente todas as instruções de segurança.

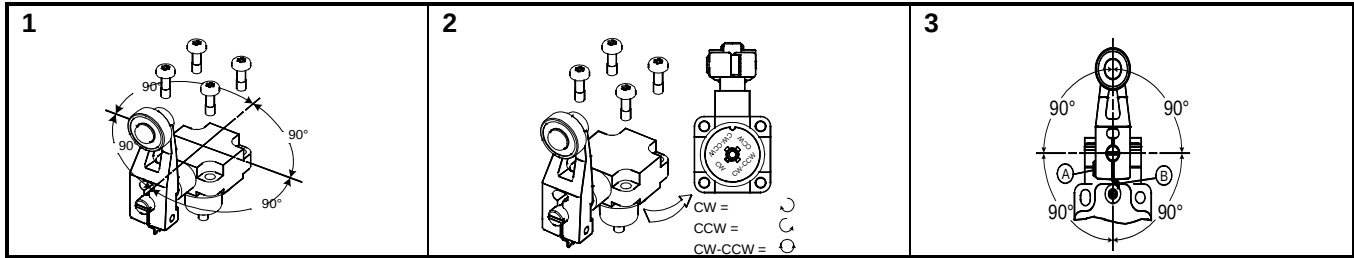
Desobediência a essas instruções pode resultar em morte ou ferimentos graves.

MONTAGEM, FIAÇÃO E VEDAÇÃO DO SWITCH**ADVERTÊNCIA****INSTALAÇÃO INCORRETA**

Certifique-se de que o atuador do switch atinja um percurso suficiente para que ocorra a abertura positiva de contatos normalmente fechados (NC, normally closed).

Desobediência a essas instruções pode resultar em morte ou ferimentos graves.

1. Consulte:
 - A página 3 para ajustes.
 - A página 4 para ver configurações de fiação do EN 50041 para cada código de switch. (Ag = contatos de prata, Au = contatos banhados a ouro)
 - As páginas 5 e 6 para saber as distâncias de percurso específicas para cada código de switch e especificações.
 - A página 7 para ver a aplicação adequada de switches de fim de curso e dimensões de montagem dos switches.
2. Efetue ajustes (se desejado). Utilize a broca resistente à violação da TORX® (inclusa):
 - Orientação da cabeça (Figura 1).
 - Direção de atuação (Figura 2).
 - Switches com acionamento lateral com alavancas de direção de 90° positivos (listas do catálogo com terminação A1A, A1B, A5A, A5B) (Figura 3):
 - Certifique-se de que os planos do eixo do switch encaixem-se nos sulcos da alavanca do atuador.
 - Aperte o parafuso de trava (A) até que a lingueta (B) não se desloque mais.
3. Monte o switch usando quatro parafusos M5 ou nº10. Aperte os parafusos com um torque de 4,9-5,9 N-m (109,22-132,08cm lb).
4. Remova os parafusos invioláveis da placa de cobertura.
5. Conecte cabos trançados (0,75 mm²-2,5 mm², 18-14 AWG) ou sólidos (0,75 mm² to 1,5 mm², 18-16 AWG) aos terminais do conector (utilize cabos para 90 °C quando a temperatura ambiente passar dos 75 °C). Aperte os parafusos do terminal do switch com um torque de 0,8-1,0 N-m (17,78-22,86cm-lb).
6. Sele a abertura do conduíte de acordo com as instruções descritas em PK 80112.
7. Coloque a placa de cobertura novamente.



	Contact Closed	Contacto cerrado	Kontakt geschlossen	Contact fermé	Contatto chiuso	Contato Fechado
	Contact Open	Contacto abierto	Kontakt offen	Contact ouvert	Contatto aperto	Contato Aberto
	Differential Travel	Carrera diferencial	Differenzwinkel	Course différentielle	Corsa differenziale	Percorso Diferencial
CAT	Catalog Listing	Referencias	Bestellnummer	Référence	Codice	Modelos de Catálogo
FP	Free Position	Posición libre	Freistellung	Position libre	Posizione libera	Posição Livre
OP1	Operating Position 1	Posición de funcionamiento 1	Schaltpunkt 1	Position de commutation 1	Posizione di funzionamento 1	Posição de Operação 1
OP2	Operating Position 2	Posición de funcionamiento 2	Schaltpunkt 2	Position de commutation 2	Posizione di funzionamento 2	Posição de Operação 2
PO1	Positive Opening 1 to IEC 947-5-1	Apertura positiva 1 según IEC 947-5-1	Zwangsöffnung 1 gemäß IEC 947-5-1	Ouverture positive 1 selon CEI 947-5-1	Apertura forzata 1 Conforme alla norma IEC 947-5-1	Abertura Positiva 1 para IEC 947-5-1
PO2	Positive Opening 2 to IEC 947-5-1	Apertura positiva 2 según IEC 947-5-1	Zwangsöffnung 2 gemäß IEC 947-5-1	Ouverture positive 2 selon CEI 947-5-1	Apertura forzata 2 Conforme alla norma IEC 947-5-1	Abertura Positiva 2 para IEC 947-5-1
DT1	Differential Travel 1	Carrera diferencial 1	Differenzweg 1	Course différentielle 1	Corsa differenziale 1	Percorso Diferencial 1
DT2	Differential Travel 2	Carrera diferencial 2	Differenzweg 2	Course différentielle 2	Corsa differenziale 2	Percorso Diferencial 2
OT	Over Travel	Sobrecarrera	Nachlaufweg	Surcourse	Oltre corsa	Sobrepercurso
MOF	Maximum Operating Force	Fuerza de funcionamiento máxima	Maximale Betätigungskraft	Force de commutation maximum	Forza massima di intervento	Força Máxima de Operação
MDF	Maximum Disconnect Force	Fuerza de desconexión máxima	Maximale Öffnungskraft	Force de déconnexion maximum	Forza massima di scollegamento	Força Máxima de Desconexão

01 (Ag) 07 (Au) 	21 (Ag) 28 (Au)
03 (Ag) 33 (Au) 	40 (Ag) 41 (Au)
04 (Ag) 34 (Au) 	42 (Ag) 43 (Au)
06 (Ag) 36 (Au) 	44 (Ag) 45 (Au)
20 (Ag) 22 (Au) 	46 (Ag) 47 (Au)

ANGULAR TRAVEL (°)
COURSE ANGULAIRE (°)

CARRERA ANGULAR (°)
CORSANGOLARE (°)

WINKELWEG (°)
PERCURSO ANGULAR (°)

CAT		FP	OP1	OP2	PO1	PO2	DT1	DT2	OT	MOF	MDF
Ag	Au										
GSA*01A*	GSA*07A*	0	26	---	55	---	12	---	85	0,33 N m (2.9 in lb)	0,385 N m (3.4 in lb)
GSA*03A*	GSA*33A*	0	26	38	38	---	---	---	85	0,33 N m (2.9 in lb)	0,385 N m (3.4 in lb)
GSA*42A*	GSA*43A*										
GSA*44A*	GSA*45A*										
GSA*46A*	GSA*47A*										
GSA*04A*	GSA*34A*	0	38	26	50	---	---	---	85	0,33 N m (2.9 in lb)	0,385 N m (3.4 in lb)
GSA*06A*	GSA*36A*	0	26	---	38	---	---	---	85	0,33 N m (2.9 in lb)	0,385 N m (3.4 in lb)
GSA*40A*	GSA*41A*										
GSA*20A*	GSA*22A*	0	26	---	55	---	12	---	85	0,33 N m (2.9 in lb)	0,400 N m (3.5 in lb)
GSA*21A*	GSA*28A*	0	27	42	55	70	7	6	85	0,33 N m (2.9 in lb)	---

CAM TRAVEL (mm)
COURSE DE CAME (mm)

CARRERA DE LA LEVA (mm)
CORSACAMMA (mm)

NOCKENLAUFWEG (mm)
PERCURSO DO CAME (mm)

CAT		FP	OP1	OP2	PO1	PO2	DT1	DT2	OT	MOF	MDF
Ag	Au										
GSA*01A*	GSA*07A*	-3,6	20	---	56	---	12	---	---	9,7 N (2.2 lb)	11,4 N (2.6 lb)
GSA*03A*	GSA*33A*	-3,6	20	32	32	---	---	---	---	9,7 N (2.2 lb)	11,4 N (2.6 lb)
GSA*42A*	GSA*43A*										
GSA*44A*	GSA*45A*										
GSA*46A*	GSA*47A*										
GSA*04A*	GSA*34A*	-3,6	32	20	45	---	---	---	---	9,7 N (2.2 lb)	11,4 N (2.6 lb)
GSA*06A*	GSA*36A*	-3,6	20	---	32	---	---	---	---	9,7 N (2.2 lb)	11,4 N (2.6 lb)
GSA*40A*	GSA*41A*										
GSA*20A*	GSA*22A*	-3,6	20	---	56	---	12	---	---	9,7 N (2.2 lb)	11,8 N (2.7 lb)
GSA*21A*	GSA*28A*	-3,6	20	38,5	56	74,5	7	8,5	---	9,7 N (2.2 lb)	---
GSA*01C	GSA*07C	11,3	15	---	18,3	---	1,8	---	---	9,3 N (2.1 lb)	15,6 N (3.5 lb)
GSA*03C	GSA*33C	11,3	15	16,8	18,3	---	---	---	---	9,3 N (2.1 lb)	15,6 N (3.5 lb)
GSA*42C	GSA*43C										
GSA*44C	GSA*45C										
GSA*46C	GSA*47C										
GSA*04C	GSA*34C	11,3	16,8	15	20,3	---	---	---	---	9,3 N (2.1 lb)	15,6 N (3.5 lb)
GSA*06C	GSA*36C	11,3	15	---	18,3	---	---	---	---	9,3 N (2.1 lb)	15,6 N (3.5 lb)
GSA*40C	GSA*41C										
GSA*20C	GSA*22C	11,3	15	---	18,3	---	1,8	---	---	9,3 N (2.1 lb)	21,4 N (4.8 lb)
GSA*21C	GSA*28C	11,3	15	16,9	18,3	20,3	1,4	1,4	---	9,3 N (2.1 lb)	15,6 N (3.5 lb)
GSA*01D	GSA*07D	9,1	20	---	29,1	---	4,1	---	---	5,5 N (1.2 lb)	7,0 N (1.6 lb)
GSA*03D	GSA*33D	9,1	20	24,1	29,1	---	---	---	---	5,5 N (1.2 lb)	7,0 N (1.6 lb)
GSA*42D	GSA*43D										
GSA*44D	GSA*45D										
GSA*46D	GSA*47D										
GSA*04D	GSA*34D	9,1	24,1	20	33,2	---	---	---	---	5,5 N (1.2 lb)	7,0 N (1.6 lb)
GSA*06D	GSA*36D	9,1	20	---	29,1	---	---	---	---	5,5 N (1.2 lb)	7,0 N (1.6 lb)
GSA*40D	GSA*41D										
GSA*20D	GSA*22D	9,1	20	---	29,1	---	4,1	---	---	5,5 N (1.2 lb)	9,6 N (2.2 lb)
GSA*21D	GSA*28D	9,1	20	25,5	29,1	31,1	3,7	3,7	---	5,5 N (1.2 lb)	7,0 N (1.6 lb)

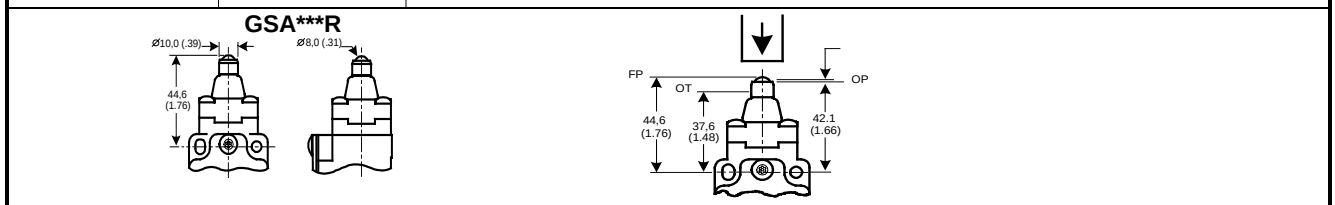
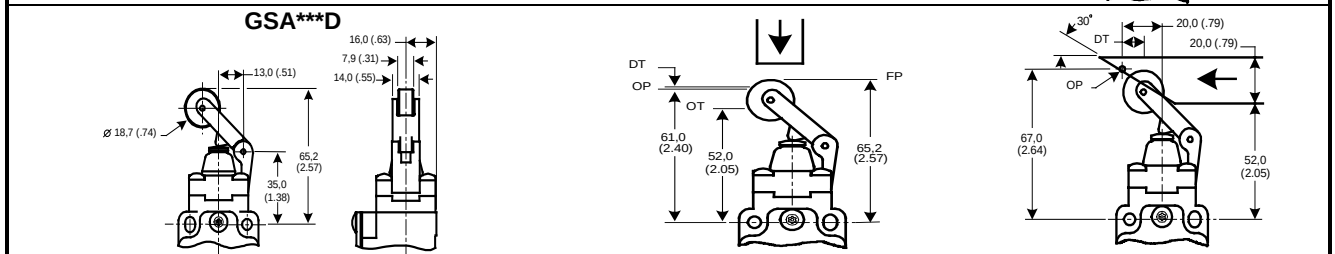
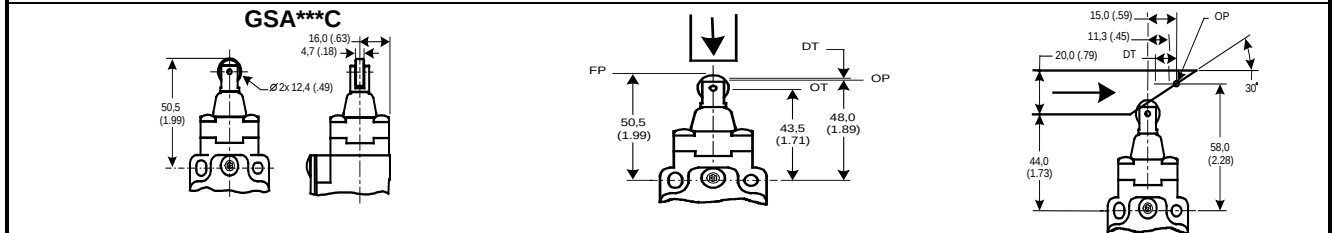
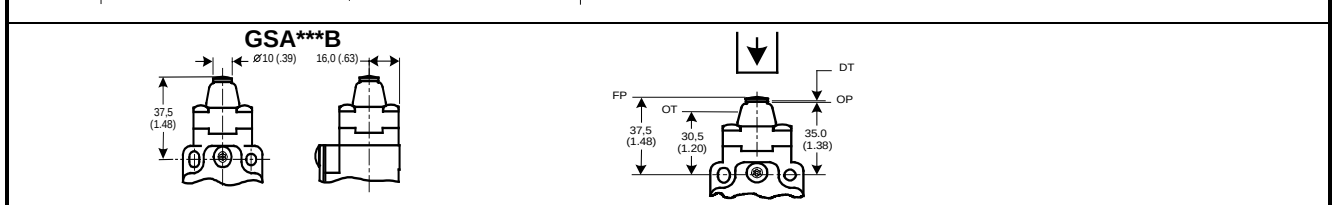
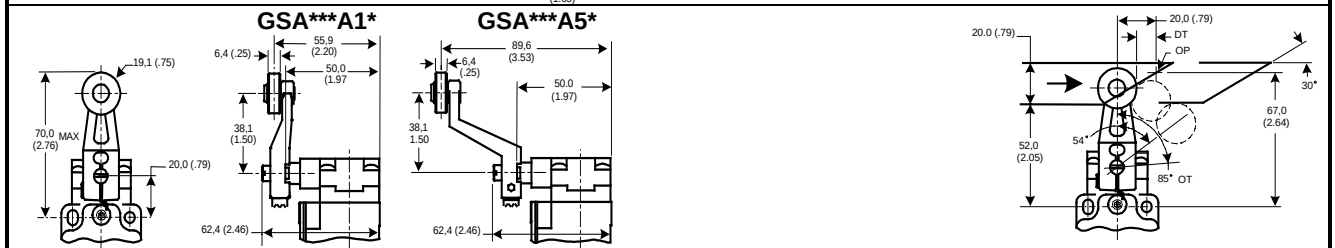
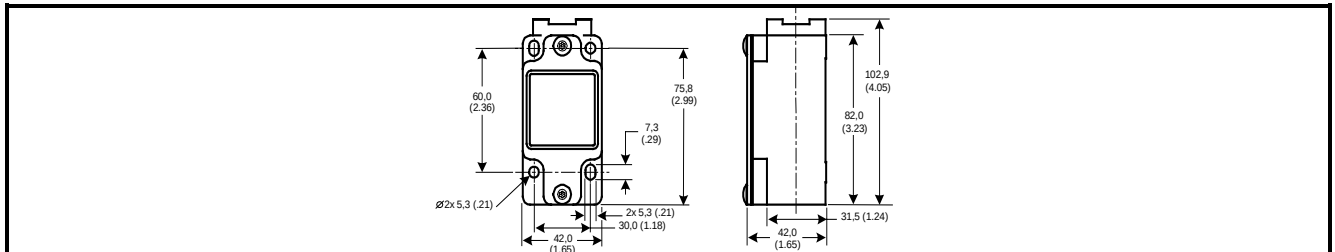
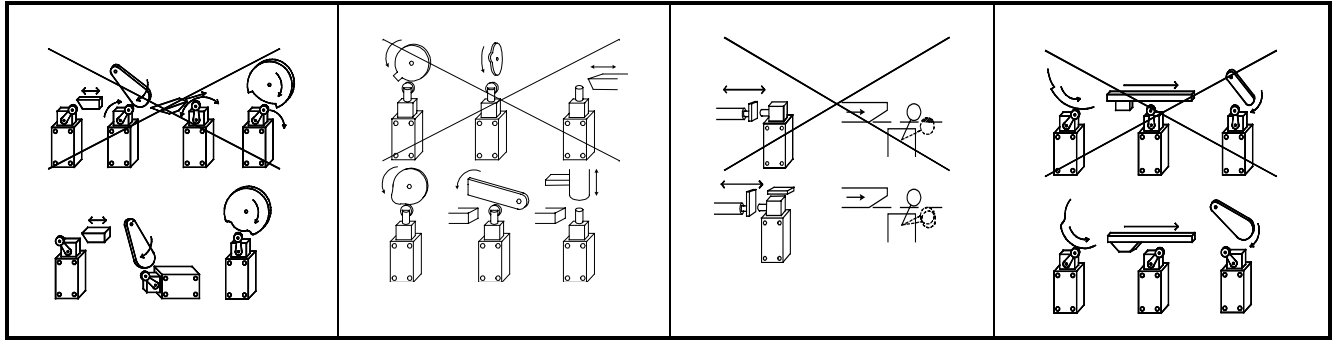
PIN TRAVEL (mm)
COURSE DE BROCHE (mm)

CARRERA DEL RODILLO(mm)
CORSO PERNO (mm)

STIFTLAUFWEG (mm)
PERCURSO DO PINO (mm)

CAT		FP	OP1	OP2	PO1	PO2	DT1	DT2	OT	MOF		MDF
Ag	Au											
GSA*01B	GSA*07B	37,5	35	---	33	---	0,9	---	30,5	16 N (3.6 lb)		27 N (6.0 lb)
GSA*03B	GSA*33B	37,5	35	34	33	---	---	---	30,5	16 N (3.6 lb)		27 N (6.0 lb)
GSA*42B	GSA*43B											
GSA*44B	GSA*45B											
GSA*46B	GSA*47B											
GSA*04B	GSA*34B	37,5	34	35	32	---	---	---	30,5	16 N (3.6 lb)		27 N (6.0 lb)
GSA*06B	GSA*36B	37,5	35	---	33	---	---	---	30,5	16 N (3.6 lb)		27 N (6.0 lb)
GSA*40B	GSA*41B											
GSA*20B	GSA*22B	37,5	35	---	33	---	0,9	---	30,5	16 N (3.6 lb)		37 N (8.2 lb)
GSA*21B	GSA*28B	37,5	35	33,8	33	31,8	0,8	0,8	30,5	16 N (3.6 lb)		27 N (6.0 lb)
GSA*01C	GSA*07C	50,5	48	---	46	---	0,9	---	43,5	16 N (3.6 lb)		27 N (6.0 lb)
GSA*03C	GSA*33C	50,5	48	47	46	---	---	---	43,5	16 N (3.6 lb)		27 N (6.0 lb)
GSA*42C	GSA*43C											
GSA*44C	GSA*45C											
GSA*46C	GSA*47C											
GSA*04C	GSA*34C	50,5	47	48	45	---	---	---	43,5	16 N (3.6 lb)		27 N (6.0 lb)
GSA*06C	GSA*36C	50,5	48	---	46	---	---	---	43,5	16 N (3.6 lb)		27 N (6.0 lb)
GSA*40C	GSA*41C											
GSA*20C	GSA*22C	50,5	48	---	46	---	0,9	---	43,5	16 N (3.6 lb)		37 N (8.2 lb)
GSA*21C	GSA*28C	50,5	48	46,8	46	44,8	0,8	0,8	43,5	16 N (3.6 lb)		27 N (6.0 lb)
GSA*01D	GSA*07D	65,2	61	---	56,9	---	1,7	---	52	9,5 N (2.1 lb)		12 N (2.7 lb.)
GSA*03D	GSA*33D	65,2	61	59,1	56,9	---	---	---	52	9,5 N (2.1 lb)		12 N (2.7 lb.)
GSA*42D	GSA*43D											
GSA*44D	GSA*45D											
GSA*46D	GSA*47D											
GSA*04D	GSA*34D	65,2	59,1	61	55	---	---	---	52	9,5 N (2.1 lb)		12 N (2.7 lb)
GSA*06D	GSA*36D	65,2	61	---	56,9	---	---	---	52	9,5 N (2.1 lb)		12 N (2.7 lb.)
GSA*40D	GSA*41D											
GSA*20D	GSA*22D	65,2	61	---	56,9	---	1,7	---	52	9,5 N (2.1 lb)		16,4 N (3.7 lb)
GSA*21D	GSA*28D	65,2	61	58,6	58	57,4	1,6	1,6	52	9,5N (2.1 lb)		12 N (2.7 lb)
GSA*01R	GSA*07R	44,6	42,1	---	40,1	---	0,9	---	37,6	16 N (3.6 lb)		27 N (6.0 lb)
GSA*03R	GSA*33R	44,6	42,1	41,1	40,1	---	---	---	37,6	16 N (3.6 lb)		27 N (6.0 lb)
GSA*42R	GSA*43R											
GSA*44R	GSA*45R											
GSA*46R	GSA*47R											
GSA*04R	GSA*34R	44,6	41,1	42,1	39,1	---	---	---	37,6	16 N (3.6 lb)		27 N (6.0 lb)
GSA*06R	GSA*36R	44,6	42,1	---	40,1	---	---	---	37,6	16 N (3.6 lb)		27 N (6.0 lb)
GSA*40R	GSA*41R											
GSA*20R	GSA*22R	44,6	42,1	---	40,1	---	0,9	---	37,6	16 N (3.6 lb)		37 N (8.2 lb)
GSA*21R	GSA*28R	44,6	42,1	40,9	40,1	38,9	0,8	0,8	37,6	16 N (3.6 lb)		27 N (6.0 lb)

Designation and Utilization Category		Rated Operational Current Ie (A) at Rated Operational Voltage Ue (V)						VA Rating	
		120 V	240 V	380 V	480 V	500 V	600 V	Make	Break
AC15	A600	6 A	3 A	1,9 A	1,5 A	1,4 A	1,2 A	7200	720
AC15	A300	6 A	3 A	--	--	--	--	7200	720
DC13	Q300	0,55 A	0,27 A	--	--	--	--	69	69
Rated Thermal Current (I _{th})		10 A							
Rated Impulse Withstand (U _{imp})		2500 Vdc							
Maximum Fuse Rating		10 A quick acting							
Sealing		IP66/67; NEMA/UL 1, 4, 12, 13							
Operating Temperature Range		-25 °C to 85 °C (-13 °F to 185 °F)							
Storage Temperature Range		-40 °C to 85 °C (-40 °F to 185 °F)							
Complies with:		- Machinery Directive 89/392/EEC (as amended by Directive 91/368/EEC) - EN60947-5-1							



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Honeywell

Installation Instructions for the Hinge Mount Safety Limit Switch (GSS Series)

ISSUE 1

PK 80138



pending

⚠ WARNING

IMPROPER INSTALLATION

- Consult with local safety agencies and their requirements when designing a machine-control link, interface and all control elements that affect safety.
 - Strictly adhere to all installation instructions.
- Failure to comply with these instructions could result in death or serious injury.**

MOUNT, WIRE AND SEAL SWITCH

⚠ WARNING

IMPROPER OPERATION

- Ensure switch actuator achieves sufficient travel for positive opening of normally closed (NC) contacts to occur.
 - Do not use the device as a stop for the door.
- Failure to comply with these instructions could result in death or serious injury.**

⚠ WARNING

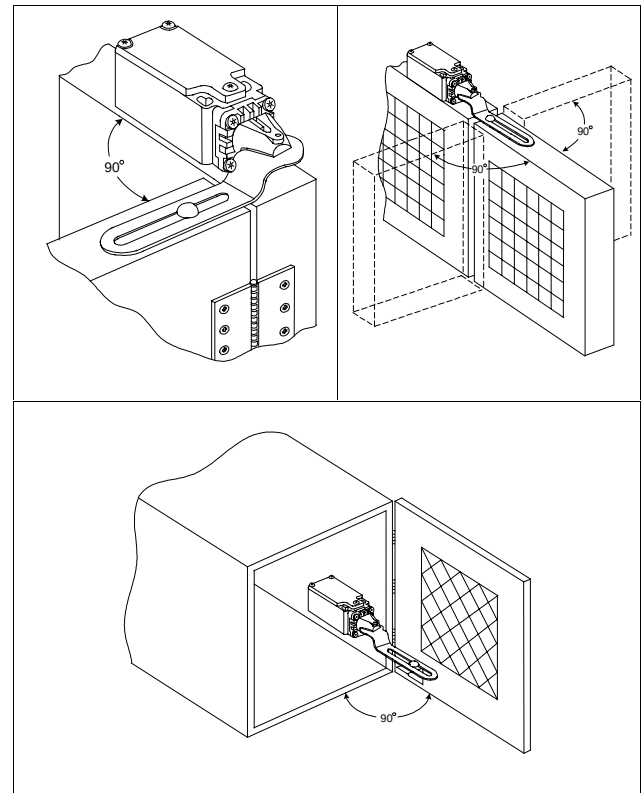
APPLIED POWER

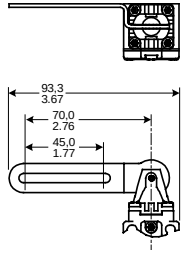
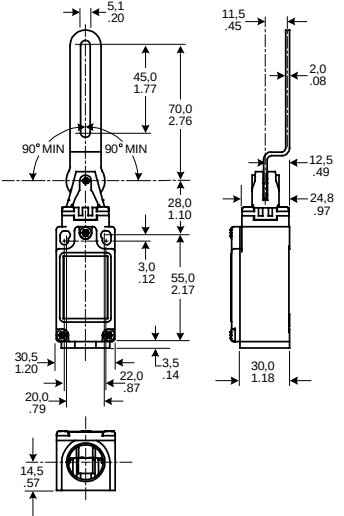
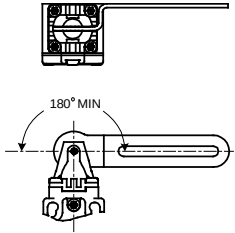
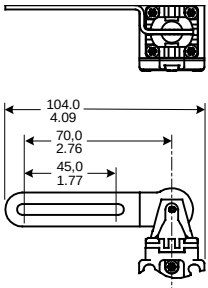
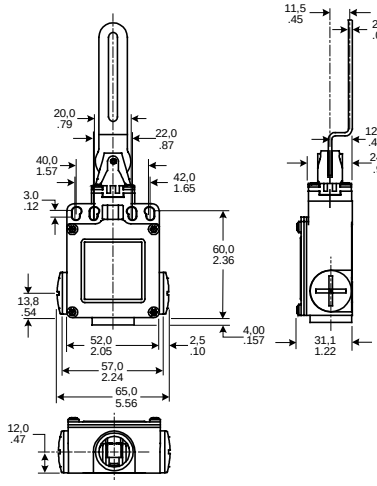
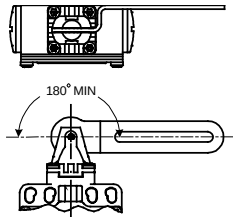
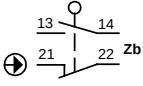
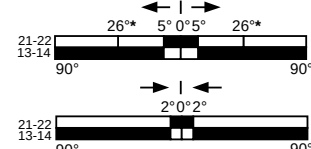
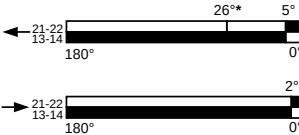
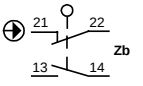
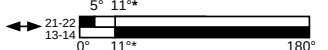
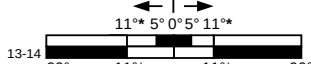
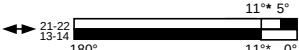
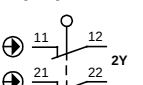
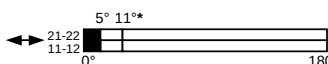
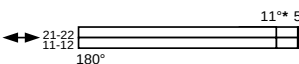
- During installation and functional testing, ensure power is not applied to the machine.
- Failure to comply with these instructions could result in death or serious injury.**

1. Refer to:
 - Pages 2 and 3 for EN 50047 wiring configurations, specific travel distances for each switch code (Ag=silver contacts, Au=gold-plated contacts) and switch mounting dimensions.
 - Page 4 for specifications.
2. Rotate switch head to desired position (90° increments). Use the TORX® tamper-resistant bit (included). Torque screws to 0,5 N m (4.4 in lb).
3. Mount switch:
 - Ensure the operating lever pivot point and the protective guard pivot points are as close to each other as possible. Ensure the pin (not included) fastened to the protective guard that actuates the lever cannot become disconnected from the lever.
 - Mount switch with lever using two M5 or #10 tamper-proof screws (not included). Torque screws to mounting surface to 4,9 N m - 5,9 N m (43 in lb - 52 in lb).
4. Refer to circuit diagram on switch housing. Diagram depicts safety switch in the "free position" (protective guard closed). NC contacts must be used for the safety circuit(s).
5. Remove tamper-proof screws on cover plate.

6. Connect stranded wire (0,75 mm² - 2,5 mm², 18 AWG - 14 AWG) or solid wire (0,75 mm² - 1,5 mm², 18 AWG - 16 AWG) to connector terminals (use 90 °C wire when ambient temperature is over 75 °C.):
 - Torque switch terminal screws to 0,8 N m - 1,0 N m (7 in lb - 9 in lb).
 - Torque ground screw to 0,8 N m - 1,0 N m (7 in lb - 9 in lb) (GSC and GSE versions).
 - Torque connector to secure cable to switch enclosure (if required) to 1,8 N m - 2,2 N m (16 in lb - 19 in lb).
7. GSE version only: Plug unused conduit entry(s) (plugs included). Seal conduit opening according to instructions in PK 80112.
8. Perform functional tests:
 - Open and close the protective guard several times to ensure proper travel of the operating lever.
 - Open the protective guard to ensure that the NC contacts open.
9. Reassemble cover plate. Torque cover screws 0,5 N m (4.4 in lb).

APPLICATION SUGGESTIONS



GSC and GSD Versions			
GSE Version			
01 (Ag) 07 (Au) 			
03 (Ag) 33 (Au) 			
06 (Ag) 36 (Au) 			

Contact Closed	Contact Open	Positive Opening to IEC 947-5-1
		*

GSE Version			
40 (Ag) 41 (Au)			
42 (Ag) 43 (Au)			
44 (Ag) 45 (Au)			
46 (Ag) 47 (Au)			

Contact Closed	Contact Open	Positive Opening to IEC 947-5-1
		*

Designation and Utilization Category		Rated Operational Current I _e (A) at Rated Operational Voltage U _e						Switch Version
		120 V	240 V	380 V	480 V	500 V	600 V	
AC15	A600	6 A	3 A	1,9 A	1,5 A	1,4 A	1,2 A	GLD
AC15	A500	6 A	3 A	1,9 A	1,5 A	1,4 A		GLD with 2 NC Basic Switch
AC15	A300	6 A	3 A					GLC and GLE
DC13	Q300	0,55 A	0,27 A					GLC, GLD, GLE
Rated Thermal Current (I _{th})		10 A						
Rated Impulse Withstand (U _{imp})		2500 Vdc						
Maximum Fuse Rating		10 A Quick Acting						
Sealing								
(GSC, GSE Versions)		IP66; NEMA 1, 4, 12, 13						
(GSD Version)		IP66; NEMA 1, 12, 13						
Operating Temperature Range		-25 °C to 85 °C (-13 °F to 185 °F)						
Storage Temperature Range		-40 °C to 85 °C (-40 °F to 185 °F)						
Maximum Operating Speed		100 operations/minute						
Mechanical Life		1,000,000						
Complies with:								
		- Machinery Directive 98/37/EC (as amended by Directive 91/369/EEC) - IEC 60947-5-1						

WARRANTY/REMEDY

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INTERNET

www.honeywell.com/sensing
info@micro.honeywell.com

Honeywell

Sensing and Control
Honeywell Inc.
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Freeport, Illinois 61032



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Installation Instructions for the MICRO SWITCH Maintained Cable Pull Limit Switch

ISSUE 3

PK 8156 0

⚠ WARNING

IMPROPER INSTALLATION

Do NOT use the Maintained Cable Pull Limit Switch in lieu of a safety interlock device. Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING

IMPROPER INSTALLATION

- Do NOT use input/output (I/O) function (look to see if SDS or Smart Distributed System is on nameplate) in emergency-stop applications. Ensure I/O is used for monitoring only.
- Failure to comply with these instructions could result in death or serious injury.

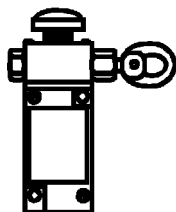
GENERAL INFORMATION

- The Maintained Cable Pull Limit Switch is designed for use in emergency stop applications.
- Single or duplex head Cable Pull Limit Switches are designed to forcibly disconnect a set of direct acting switch contacts.
- Direct acting switch contacts are held closed when actuating cable(s) are under proper tension. When cable is pulled, slackened or broken, a cam positively opens the switch contacts.
- Switch contacts remain open until switch is reset by manually depressing the reset button located on the actuated operating head.
- When direct acting switch contacts open, auxiliary contacts also actuate: open contacts close and closed contacts open.

SINGLE HEAD VERSION (Figure 1)

- Direct acting switch contact: 1 NC (normally closed).
- Auxiliary contact: 1 NO (normally open).
- Head may be positioned in any of four directions.

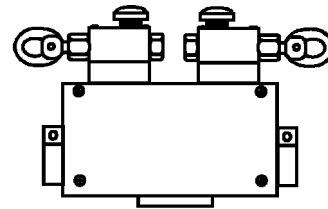
Figure 1: Single Head Version



DUPLEX HEAD VERSION (Figure 2)

- Primary basic switch (left side of switch):
 - Direct acting switch contact: 1 NC.
 - Auxiliary contact: 1 NO.
- Auxiliary Basic Switch (right side of switch):
 - Four options available.
- Heads may be positioned in any of three directions, allowing actuating cables to run in opposite directions or at right angles to one another.

Figure 2: Duplex Head Version



AUXILIARY CONTACTS

- Additional contacts are electrically isolated from the direct acting switch contacts. Used for monitoring or signaling, i.e., indicators, pilot lights and alarms.

MAXIMUM ACTUATING CABLE LENGTH

- Depending upon variations in ambient temperature, maximum cable length in a single direction is 200 ft. (60 m) for a total of 400 ft. (120 m).

TENSION INDICATOR

- Convenient tension indicator line on switch plunger indicates maximum preset cable tension.

OTHER AVAILABLE FEATURES

- Conduit openings and indicator/pilot light options.
- Hardware kits and cables for various length installations.

Figure 3: Typical Single Head Switch Installation

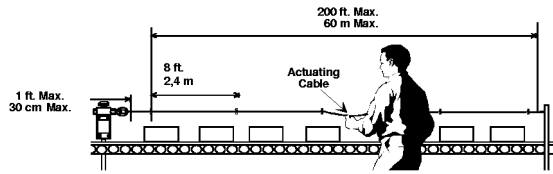
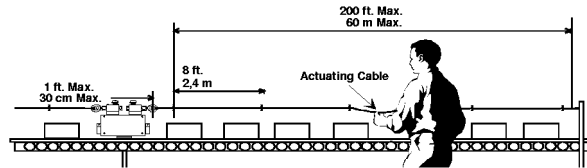


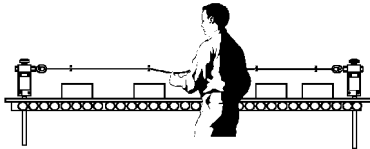
Figure 4: Typical Duplex Head Switch Installation



SWITCH MOUNTING, WIRING AND SEALING

NOTICE

In order to comply with EN418, install a cable pull switch at each end of the cable.



Step 1 - Ensure you have the following:

- Switch.
- (2) #10 - 32 UNF screws.
- #14 - #16 AWG stranded or #16 - #18 AWG solid wire.

Step 2 - Mount switch:

CAUTION

SWITCH DAMAGE

Do NOT mount switch upside down or at low point of conduit runs. Condensation problems may develop. Failure to comply with these instructions may result in product damage.

- Single head: Mount using (2) #10-32 UNF screws from either front or back of switch. Ensure a minimum of four threads of engagement. Torque to 43-52 in.-lb (4.9-5.9 N-m).
- Duplex head: Mount using (2) #10-32 UNF screws through mounting feet on left and right of switch enclosure. Ensure a minimum of four threads of engagement. Torque to 43-52 in.-lb (4.9-5.9 N-m).

Step 3 - Wire switch:

- Connect stranded or solid wire to switch's pressure type connector terminals. (Refer to circuit diagram on switch housing. Diagram depicts switch contacts when cable is at proper tension.) Torque terminal screws and ground screw to 7-9 in.-lb (0.8-1 N-m).

Step 4 - Seal conduit connection:

- Seal with Teflon tape or pipe dope. If connector is used to secure cable to enclosure, torque connector to 16-19 in. lb (1.8-2.2 N-m).

WARNING

IMPROPER SYSTEM PERFORMANCE

- Ensure the attendant circuitry is such that only the momentary interruption of the control circuit cable pull contacts is required to open and hold open the control circuit until such time as both the cable pull switch and the attendant circuitry are manually reset.
- The user is SOLELY RESPONSIBLE for determining the appropriate level of risk warranting this type of circuitry.
- Maintained Cable Pull Limit Switches must be installed in a fashion that complies with all codes and standards that are applicable to the particular application of the device.
- Failure to comply with these instructions could result in death or serious injury.

ACTUATING CABLE INSTALLATION

Step 1 - Ensure you have the following(Figures 3 and 4):

- Plastic coated aircraft cable 1/8 in. (3,18 mm) to 3/16 in. (4,76 mm) dia. Use a distinctive color, such as red, to differentiate actuating cable from other wires or cables in the area.
- Thimbles, U-bolt clamps.
Cable supports (eyebolts).

Step 2 -Attach cable to switch:

- Ensure cable is fully seated and tightly fitted in thimble groove.
- Attach using two U-bolt clamps. U-bolt clamps should be installed as close as possible to thimble.
- Tighten U-bolts to 4.5 in.-lb. (0,51 N-m) for 1/8 in. (3,18 mm) cable and 7.5 in.-lb. (0,85 N-m) for 3/16 in. (4,76 mm) cable.

Step 3 - Install cable supports:

CAUTION

SWITCH DAMAGE

Do NOT allow excessive side loads that could bend the switch operating shaft. Failure to comply with these instructions may result in product damage.

- Install a cable support as close as practical to end of shaft without interfering with switch operation.
- If cable tension adjusting turnbuckle is in mid-span of cable, the first cable support should be in line with, and no further than, 12 in. (30 cm) from the end (eye) of the shaft. If adjusting turnbuckle is attached directly to shaft eye, this distance may be increased to 18 in. (46 cm).
- Support cable at intervals no greater than 8 ft. (2,4 m).

REQUIRED ENDSPRING AND TURNBUCKLE INSTALLATION

Step 1 - Ensure you have the following(Figures 5 and 6):

- Endspring, turnbuckle, jam nuts (supplied with switch).
- Thimbles, U-bolt clamps.

Step 2 - Install endspring:Reduces effects of ambient temperature fluctuations and provides a measure of protection against excessive force being applied to cable.

- Install an endspring within cable span, preferably at end of cable opposite switch (see Actuating Cable Installation, Step 2).

Step 3 - Install turnbuckle:Ensures proper cable tension.

WARNING

IMPROPER INSTALLATION

Do NOT install turnbuckle too closely to cable supports or other barriers that may hinder proper operation. Failure to comply with these instructions could result in death or serious injury.

- Install within cable span in same manner as endspring. Use jam nuts to maintain adjustment.

Figure 5: Single Head Switch with Turnbuckle

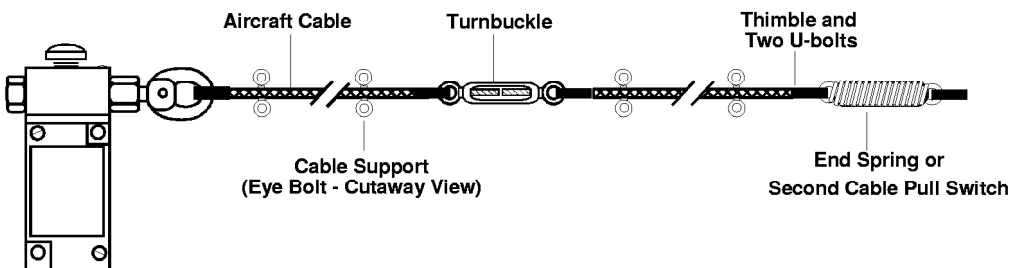
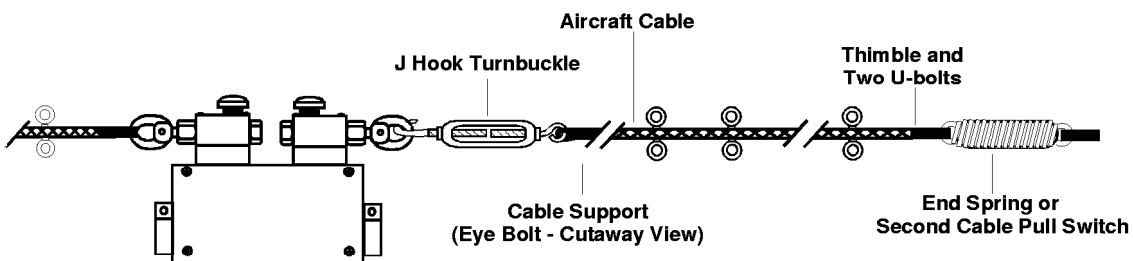


Figure 6: Duplex Head Switch with Turnbuckle

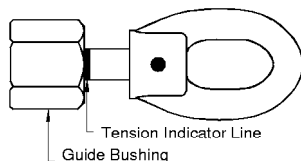


REQUIRED CABLE TENSION ADJUSTMENT**Step 1 - Align colored tension indicator line:**

- Tighten turnbuckle until colored tension indicator line on switch plunger starts to appear from within switch operating head.

Step 2 - Ensure proper adjustment (Figure 7):

- Ensure tension indicator line is visible and aligned with end of guide bushing on operating head.
- Periodically check and adjust cable tension as necessary.

Figure 7: Cable Tension at Proper Setting**WARNING****IMPROPER INSTALLATION**

Ensure both heads of the Maintained duplex version are under proper tension. Failure to comply with these instructions could result in death or serious injury.

With endspring installed, switch/cable will operate satisfactorily over a temperature range of $\pm 25^{\circ}\text{F}$ ($\pm 12^{\circ}\text{C}$), up to maximum cable length of 200 ft. (60 m).

Adjust cable tension when ambient temperature is near mid point of expected temperature extremes.

OPTIONAL CORNER INSTALLATION

When changing actuating cable direction, ensure cable runs freely through pulley or cable supports.

OTHER ADJUSTMENTS

To reposition operating head, loosen the four captive screws, place head in desired position. Securely tighten the four screws to 12-16 in.-lb (1,36-1,80 N-m).

RECOMMENDED REPLACEMENT

Replace entire switch every 100,000 operations.

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective material and faulty workmanship. Commencing with date of shipment, Honeywell's warranty runs for 18 months. If warranted goods are returned to Honeywell during that period of coverage, Honeywell will repair or replace without charge those items it finds defective. **The foregoing is Buyer's sole remedy and is in lieu of all other warranties, express or implied, including those of merchantability and fitness for a particular purpose.**

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INTERNET

<http://www.sensing.honeywell.com>
info@micro.honeywell.com

Honeywell

MICRO SWITCH

Honeywell Inc.
 11 West Spring Street
 Freeport, Illinois 61032



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Installation Instructions for the Cable Pull limit Switch Indicators

ISSUE 1

PK 8157 0

GENERAL INFORMATION

The Normally-Open (NO) and Normally-Closed (NC) terminals of the Cable Pull Limit Switch are electrically isolated from each other. This means you can use a common power source for both control and indicator circuits with neon indicators or separate power sources with LED indicators.

COMMON POWER SOURCE

For indicators rated at the same voltage as the control circuit there are two wiring methods.

METHOD 1

Do not connect any other contacts between the switch and the line or neutral. See Figure 1A and Figure 1B.

FIGURE 1A

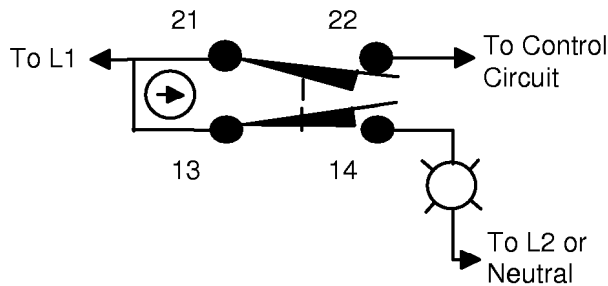
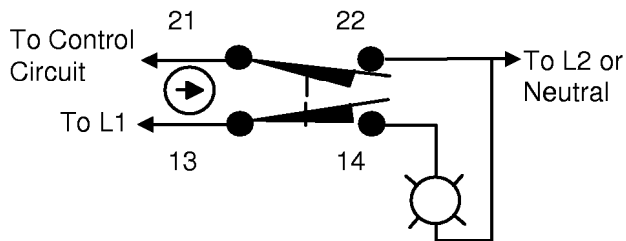


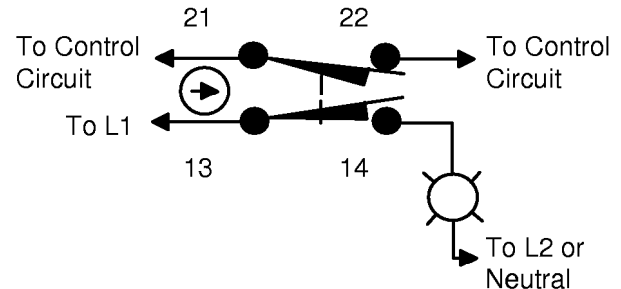
FIGURE 1B



METHOD 2

If the Cable Pull Switch can not be connected directly to the line voltage or the neutral, then the connection will require four wires. Two wires connect the Control Circuit and two the indicator. See to Figure 2.

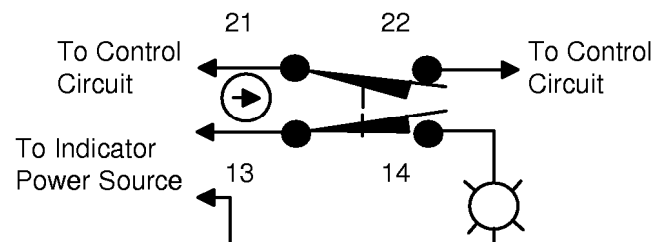
FIGURE 2



SEPARATE INDICATOR POWER SOURCE

For indicators with a separate power source, wire as shown in Figure 3.

FIGURE 3



WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Commencing with date of shipment, Honeywell's warranty runs for 18 months. If warranted goods are returned to Honeywell during that period of coverage, Honeywell will repair or replace without charge those items it finds defective. **The foregoing is Buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact a nearby sales office. Or call:

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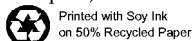
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While we provide application assistance, personally and through our literature, it is up to the customer to determine the suitability of the product in the application.

Honeywell

MICRO SWITCH

Honeywell Inc.
11 West Spring Street
Freeport, Illinois 61032



PK 81570 396 Printed in USA



Helping You Control Your World

Installation Instructions for the MICRO SWITCH Maintained Cable Pull Safety Limit Switch With Snap Action Head

ISSUE 3

PK 81592

⚠ WARNING

IMPROPER INSTALLATION

- Consult all local, state, and national law, rules, codes, and regulations relating to the use of safety switches, machine interfaces and safety monitoring that affect safety.
- Strictly adhere to all installation instructions.

Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING

IMPROPER INSTALLATION

- Do not use input/output (I/O) function (look to see if SDS or Smart Distributed System is on nameplate) in emergency-stop applications. Ensure I/O is used for monitoring only.

Failure to comply with these instructions could result in death or serious injury.

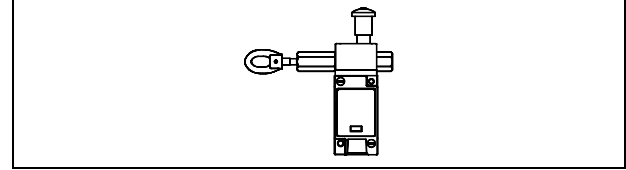
GENERAL INFORMATION

- The Maintained Cable Pull Safety Limit Switch is designed for use in emergency stop applications.
- Single or duplex head Cable Pull Safety Limit Switches are designed to forcibly disconnect a set of direct acting switch contacts.
- Direct acting switch contacts are held closed when actuating cables are under proper tension. When cable is pulled, slackened or broken, a cam positively opens the switch contacts.
- Snap action operating head causes switch contacts to change state and mechanically latch virtually simultaneously when the cable is pulled to the actuating position.
- Switch contacts remain open until switch is reset by manually depressing the reset button located on the actuated operating head.
- When direct acting switch contacts open, auxiliary contacts also actuate: open contacts close and closed contacts open.

SINGLE HEAD VERSION (Figure 1)

- Direct acting switch contact: 1 NC (normally closed).
- Auxiliary contact: 1 NO (normally open).
- Head may be positioned in any of four directions.

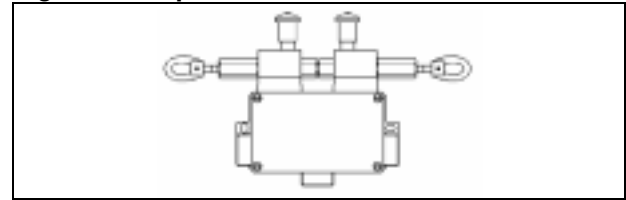
Figure 1: Single Head Version



DUPLEX HEAD VERSION (Figure 2)

- Primary basic switch (left side of switch):
 - Direct acting switch contact: 1 NC.
 - Auxiliary contact: 1 NO.
- Auxiliary basic switch (right side of switch):
 - Four options available.
- Heads may be positioned in any of three directions, allowing actuating cables to run in opposite directions or at right angles to one another.

Figure 2: Duplex Head Version



AUXILIARY CONTACTS

- Additional contacts are electrically isolated from the direct acting switch contacts. These are used for monitoring or signaling, i.e., indicators, pilot lights and alarms.

MAXIMUM CABLE LENGTH

- Depending upon variations in ambient temperature, maximum length in a single direction is 200 ft (60 m), for a total of 400 ft (120 m).

TENSION INDICATOR

- Convenient tension indicator line on switch plunger indicates proper preset cable tension.

OTHER FEATURES AVAILABLE

- Conduit openings and indicator/pilot light options.
- Hardware kits and cables for various length installations.

Figure 3: Typical Single Head Switch Installation

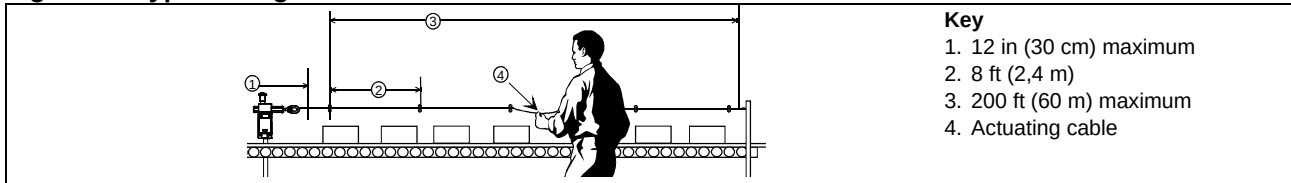


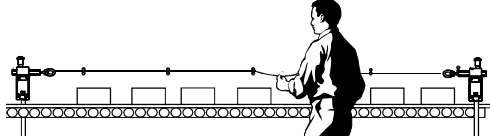
Figure 4: Typical Duplex Head Switch Installation



SWITCH MOUNTING, WIRING AND SEALING

NOTICE

In order to comply with EN418, install a cable pull switch at each end of the cable.



Step 1 - Ensure you have the following:

- Switch.
- (2) #10-32 UNF screws.
- #14-#16 AWG stranded or #16-#18 AWG solid wire.

Step 2 - Mount switch:

CAUTION

SWITCH DAMAGE

Do NOT mount switch upside down or at low point of conduit runs. Condensation problems may develop.

Failure to comply with these instructions may result in product damage.

- Single head: Mount using two #10-32 UNF screws from either front or back of switch. Ensure a minimum of four threads of engagement. Torque to 43-52 in-lb (4,-5,9 N-m).
- Duplex head: Mount using two #10-32 UNF screws through mounting feet on left and right of switch enclosure. Ensure a minimum of four threads of engagement. Torque to 43-52 in-lb (4,9-5,9 N-m).

Step 3 - Wire switch:

- Connect stranded or solid wire to switch's pressure type connector terminals. (Refer to circuit diagram on switch housing. Diagram depicts switch contacts when cable is at proper tension.) Torque terminal screws and ground screw to 7-9 in-lb (0,8-1 N-m).

Step 4 - Seal conduit connection:

- Seal with Teflon tape or pipe dope. If connector is used to secure cable to enclosure, torque connector to 16-19 in-lb (1,8-2,2 N-m).

⚠ WARNING

IMPROPER SYSTEM PERFORMANCE

- The Maintained Cable Pull Safety Limit Switch provides only the front end switching/sensing function. The external machine interfaces, and the safety monitoring of those interfaces, is the responsibility of the machine safety control system.
 - Consult all local, state, and national laws, rules, codes, and regulations relating to the use of safety switches, machine interfaces and safety monitoring that affect safety.
 - The user is SOLELY RESPONSIBLE for determining the appropriate level of risk warranting this type of machine safety control system.
 - Maintained Cable Pull Safety Limit Switches must be installed in a fashion that complies with all codes and standards that are applicable to the particular application of the device.
- Failure to comply with these instructions could result in death or serious injury.**

ACTUATING CABLE INSTALLATION

Step 1 - Ensure you have the following (Figures 3 and 4):

- Plastic coated aircraft cable 1/8 in (3,18 mm) to 3/16 in (4,76 mm) dia. Use a distinctive color, such as red, to differentiate the actuating cable from other wires or cables in the area.
- Thimbles, U-bolt clamps.
- Cable supports (eyebolts).

Step 2 - Attach cable to switch:

- Ensure cable is fully seated and tightly fitted in the thimble groove.
- Attach using two U-bolt clamps. U-bolt clamps should be installed as close as possible to thimble.
- Tighten U-bolts to 4.5 in-lb (0,51 N-m) for 1/8 in (3,18 mm) cable; 7.5 in-lb (0,85 N-m) for 3/16 in (4,76 mm) cable.

Step 3 - Install cable supports:

CAUTION

SWITCH DAMAGE

Do not allow excessive side loads that could bend the switch operating shaft.

Failure to comply with these instructions may result in product damage.

- Install a cable support as close as practical to end of shaft without interfering with switch operation.
- If cable tension adjusting turnbuckle is in mid-span of cable, the first cable support should be in line with, and no further than, 12 in (30 cm) from the end (eye) of the shaft. If adjusting turnbuckle is attached directly to shaft eye, this distance may be increased to 18 in (46 cm).
- Support cable at intervals no greater than 8 ft (2,4 m).

REQUIRED ENDSPRING AND TURNBUCKLE INSTALLATION

Step 1 - Ensure you have the following (Figures 5 and 6):

- Endspring, turnbuckle, jam nuts (supplied with switch).
- Thimbles, U-bolt clamps.

Step 2 - Install endspring: Reduces effects of ambient temperature fluctuations and provides a measure of protection against excessive force being applied to cable.

- Install an endspring within cable span, preferably at end of cable opposite switch (see Actuating Cable Installation, Step 2).

Step 3 - Install turnbuckle: Ensures proper cable tension.

⚠ WARNING

IMPROPER INSTALLATION

Do not install turnbuckle too closely to cable supports or other barriers that may hinder proper operation.

Failure to comply with these instructions could result in death or serious injury.

- Install within cable span in same manner as endspring. Use jam nuts to maintain adjustment.

Figure 5: Single Head Switch with Turnbuckle and Endspring

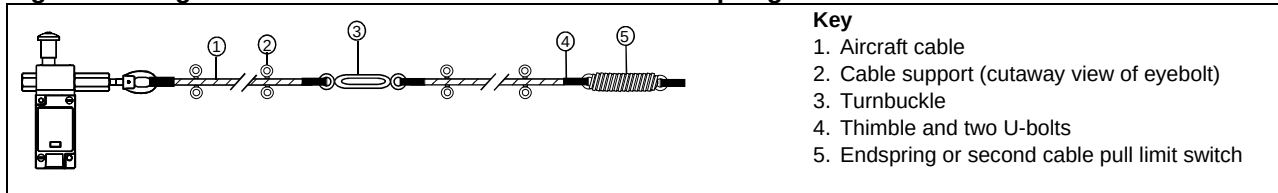
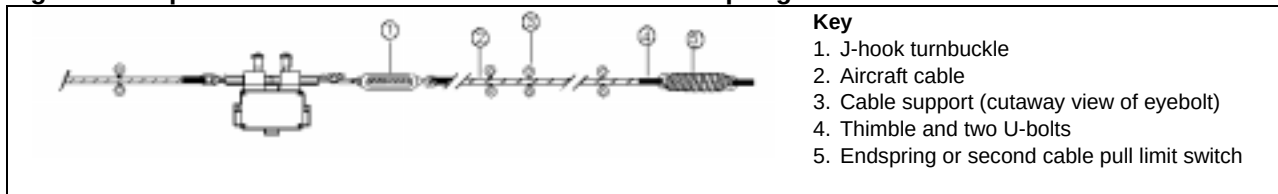


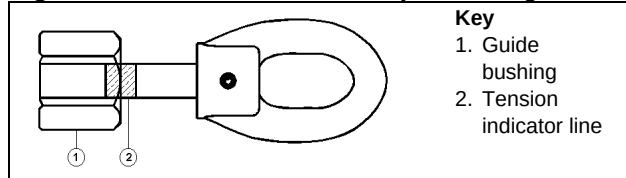
Figure 6: Duplex Head Switch with Turnbuckle and Endspring



REQUIRED CABLE TENSION ADJUSTMENT

- Tighten turnbuckle until middle of wide tension indicator line on switch plunger is aligned with end of guide bushing (Figure 7).
- Periodically check and adjust cable tension as necessary.

Figure 7: Cable Tension at Proper Setting



⚠ WARNING

IMPROPER INSTALLATION

Ensure both heads of the Maintained duplex version are under proper tension.

Failure to comply with these instructions could result in death or serious injury.

With endspring installed, switch/cable will operate satisfactorily over temperature range of $\pm 25^{\circ}\text{F}$ ($\pm 12^{\circ}\text{C}$), up to maximum cable length of 200 ft (60 m).

Adjust cable tension when ambient temperature is near mid point of expected temperature extremes.

OPTIONAL CORNER INSTALLATION

When changing actuating cable direction, ensure cable runs freely through pulley or cable supports.

REPOSITION OPERATING HEAD

Head may be positioned in any of four directions.

- Using the driver provided, loosen the four captive security screws.
- Place head in desired position.
- Securely tighten the four screws to 12-16 in-lb (1,36-1,80 N-m).

RECOMMENDED REPLACEMENT

Replace entire switch every 10,000 operations.

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective material and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during that period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

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Honeywell Inc.
11 West Spring Street
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Installation Instructions for the **MICRO SWITCH Explosion-proof Maintained Cable Pull Limit Switch**

ISSUE 1

PK 81593

⚠ WARNING

IMPROPER INSTALLATION

Do NOT use the Maintained Explosion-proof Cable Pull Limit Switch in lieu of a safety interlock device. Failure to comply with these instructions could result in death or serious injury.

GENERAL INFORMATION (Figure 1)

- Explosion-proof switches are designed specifically for use in hazardous location applications. Flame paths within the switch housing cool exploding gases below the kindling temperature of the atmosphere.
- Complies with NEMA standards: 1, 3, 4, 7, 9, 13. UL listed and CSA certified: Class I, Div 1, Groups B, C, D; Class II, Div 1, Groups E, F, G.
- The Explosion-proof Maintained Cable Pull Limit Switch is designed for use in emergency stop applications.
- Single head Cable Pull Limit Switch is designed to forcibly disconnect a set of direct acting switch contacts.
- Direct acting switch contacts are held closed when actuating cables are under proper tension. When cable is pulled, slackened or broken, a cam positively opens the switch contacts.
- Switch contacts remain open until switch is reset by manually depressing the reset button located on the actuated operating head.
- When direct acting switch contacts open, auxiliary contacts also actuate: open contacts close and closed contacts open.
- Available basic switch options:
 - Direct acting switch contact: 1 NC.
 - Direct acting switch contacts: 1 NO 1 NC.
- Head may be positioned in any of four directions.

AUXILIARY CONTACTS

- Additional contacts electrically isolated from the direct acting switch contacts. Used for monitoring or signaling, i.e., indicators, pilot lights and alarms.

MAXIMUM ACTUATING CABLE LENGTH

- Depending upon variations in ambient temperature, maximum cable length is 200 ft. (60 m).

TENSION INDICATOR

- Convenient tension indicator line on switch plunger indicates maximum preset cable tension.

OTHER AVAILABLE FEATURES:

- Conduit opening options.
- Hardware kits and cables for various length installations.

Figure 1: Maintained Switch

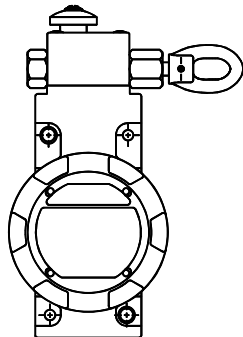
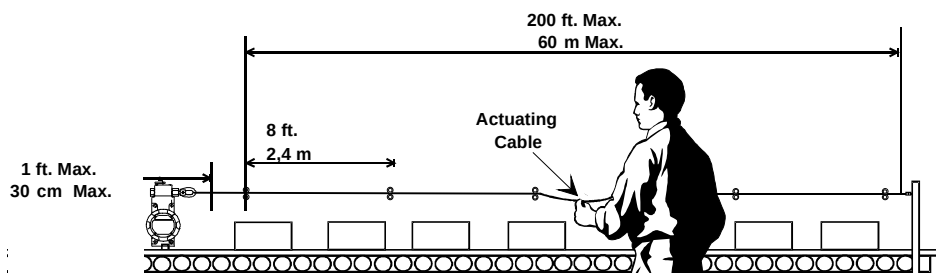


Figure 2: Installation



SWITCH MOUNTING, WIRING AND SEALING

Step 1 - Ensure you have the following:

- Switch.
- (2) 1/4-20 or (2) 5/15-18 screws.
- #14-#16 AWG stranded or #16-#18 AWG solid wire.

Step 2 - Mount switch:

CAUTION

SWITCH DAMAGE

Do NOT mount switch upside down or at low point of conduit runs. Condensation problems may develop. Failure to comply with these instructions may result in product damage.

- Mount using (2) 1/4-20 screws from front of switch, or with (2) 5/15-18 screws from back of switch. Torque to 43-52 in.-lb (4.9-5.9 N-m).

Step 3 - Wire switch:

- With a bar or screwdriver in the cover wrenching lugs, loosen and remove circular cover on front of switch.
- Connect stranded or solid wire to switch's pressure type connector terminals. (Refer to circuit diagram on switch housing. Diagram depicts switch contacts when cable is at proper tension.) Torque terminal screws and ground screw to 7-9 in.-lb (0,8-1 N-m).
- Reassemble cover and tighten securely.

Step 4 - Seal conduit connection: Proper sealing ensures explosion-proof integrity of the conduit system.

- Seal in accordance with National Electrical Code, paragraphs 500-2 and 501-4.

⚠ WARNING

IMPROPER SYSTEM PERFORMANCE

- Ensure the attendant circuitry is such that only the momentary interruption of the control circuit cable pull contacts is required to open and hold open the control circuit until such time as both the cable pull switch and the attendant circuitry are manually reset.
- The user is SOLELY RESPONSIBLE for determining the appropriate level of risk warranting this type of circuitry.
- Maintained Cable Pull Limit Switches must be installed in a fashion that complies with all codes and standards that are applicable to the particular application of the device.
- Failure to comply with these instructions could result in death or serious injury.

ACTUATING CABLE INSTALLATION

Step 1 - Ensure you have the following (Figure 2):

- Plastic coated aircraft cable 1/8 in. (3,18 mm) to 3/16 in. (4,76 mm) dia. Use a distinctive color, such as red, to differentiate actuating cable from other wires or cables in the area.
- Thimbles, U-bolt clamps.
- Cable supports (eyebolts).

Step 2 - Attach cable to switch:

- Ensure cable is fully seated and tightly fitted in the thimble groove.
- Attach using two U-bolt clamps. U-bolt clamps should be installed as close as possible to thimble.
- Tighten U-bolts to 4.5 in.-lb. (0,51 N-m) for 1/8 in. (3,18 mm) cable and 7.5 in.-lb. (0,85 N-m) for 3/16 in. (4,76 mm) cable.

Step 3 - Install cable supports:

CAUTION

SWITCH DAMAGE

Do NOT allow excessive side loads that could bend the switch operating shaft. Failure to comply with these instructions may result in product damage.

- Install a cable support as close as practical to end of shaft without interfering with switch operation.
- If cable tension adjusting turnbuckle is in mid-span of cable, the first cable support should be in line with, and no further than, 12 in. (30 cm) from end (eye) of shaft. If adjusting turnbuckle is attached directly to shaft eye, this distance may be increased to 18 in. (46 cm).
- Support cable at intervals no greater than 8 ft. (2,4 m).

REQUIRED ENDSRING AND TURNBUCKLE INSTALLATION (Figure 3)

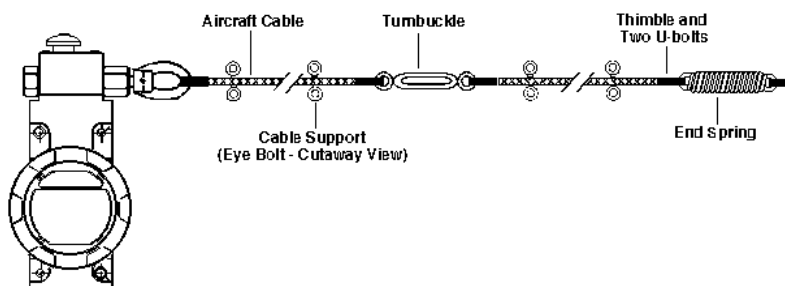
Step 1 - Ensure you have the following

- Endspring, turnbuckle, jam nuts (supplied with switch).
- Thimbles, U-bolt clamps.

Step 2 - Install endspring: Reduces effects of ambient temperature fluctuations and provides a measure of protection against excessive force being applied to cable.

- Install an endspring within cable span, preferably at end of cable opposite switch (see Actuating Cable Installation, Step 2).

Figure 3: Switch with Turnbuckle and Endspring



Step 3 - Install turnbuckle: Ensures proper cable tension.

⚠ WARNING

IMPROPER INSTALLATION

Do NOT install turnbuckle too closely to cable supports or other barriers that may hinder proper operation. Failure to comply with these instructions could result in death or serious injury.

- Install within cable span in same manner as endspring. Use jam nuts to maintain adjustment.

REQUIRED CABLE TENSION ADJUSTMENT

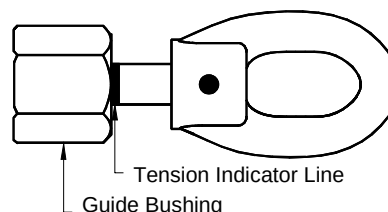
Step 1 - Align colored tension indicator line:

- Tighten turnbuckle until colored tension indicator line on switch plunger starts to appear from within switch operating head.

Step 2 - Ensure proper adjustment (Figure 4):

- Ensure tension indicator line is visible and aligned with end of guide bushing on operating head.
- Periodically check and adjust cable tension as necessary.

Figure 4: Cable Tension at Proper Setting



With endspring installed, switch/cable will operate satisfactorily over a temperature range of +/-25°F (+/-12°C), up to maximum cable length of 200 ft. (60 m).

Adjust cable tension when ambient temperature is near mid point of expected temperature extremes.

OPTIONAL CORNER INSTALLATION

To route actuating cable around a corner, use a free running pulley with a minimum of 4 in. (10 cm) dia.

Cable should bend no more than 30 degrees as it passes through cable supports spaced no closer than 6 in. (15 cm) apart.

OTHER ADJUSTMENTS

To reposition operating head, loosen the four captive screws, place head in desired position. Securely tighten the four screws to 12-16 in.-lb (1,36-1,80 N-m).

RECOMMENDED REPLACEMENT

Replace entire switch every 100,000 operations.

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective material and faulty workmanship. Commencing with date of shipment, Honeywell's warranty runs for 18 months. If warranted goods are returned to Honeywell during that period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

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SALES AND SERVICE

Honeywell serves its customers through a worldwide network of sales offices and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact a nearby sales office or call:

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Installation Instructions for the 40FY Series Hall Effect Door Interrupt Sensors

ISSUE 2
PK 80370



WARNING

IMPROPER INSTALLATION

- Variations in current or voltage, vibration or shock may cause an open collector output to fail in a closed position. When using this product, a safety control (relay) module must be used to ensure a fail-to-safe mode of operation.
- Consult with local safety agency and its requirements when designing a machine control link, interface and all control elements that affect safety.
- Strictly adhere to all installation instructions.

Failure to comply with these instructions could result in death or serious injury.

GENERAL

The 40FY Series Hall Effect Door Interrupt Sensor is a non-contact, magnetic device consisting of two parts: a sensor and a magnetic actuator. The magnetic actuator has a keyed magnetic field that must match the sensor to operate correctly. When exposed to this keyed magnetic field, the sensor responds with an output. This product should not be defeated by using a standard magnet/target actuator, an operator's hands, nonmagnetic metal, wire or tape.

INSTALLATION INSTRUCTIONS

Step 1 - Mount and align 40FY sensor as follows:

WARNING

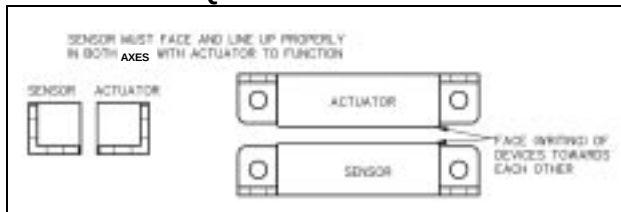
IMPROPER ALIGNMENT

Ensure the alignment of the sensor and magnetic actuator face each other and are aligned for proper operation.

Failure to comply with these instructions could result in death or serious injury.

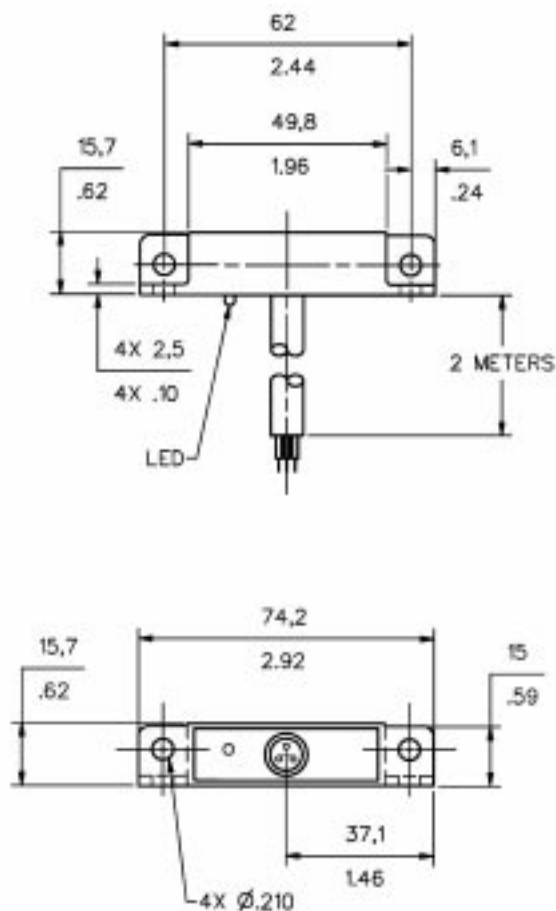
- Mount and align the sensor and magnetic actuator (see Mounting Requirements and Dimensions) as required.

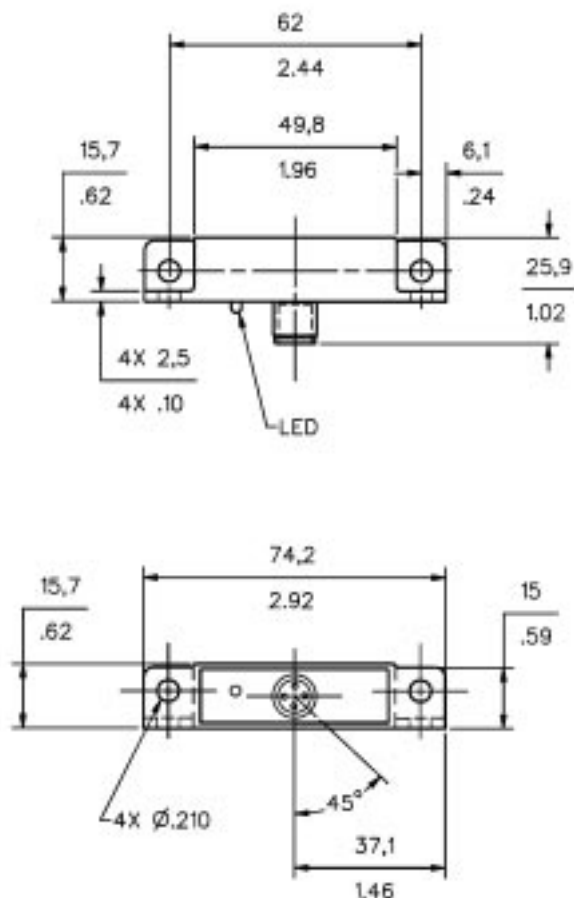
MOUNTING REQUIREMENTS



MOUNTING DIMENSIONS (for reference only)

Sensor Pre-leaded Termination (mm/in)



Sensor Connector Termination (mm/in)

- If wiring a 2-wire AC type sensor, refer to Wiring Diagrams (2-wire AC).

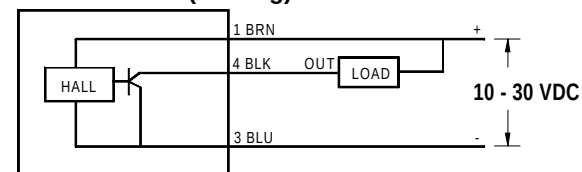
SENSOR DAMAGE

- Ensure the AC sensor is wired with a load to prevent damage to the sensor.
- Ensure a 630 mA fuse (Littelfuse part # 217.630) is installed in series with the output to prevent damage to the sensor.

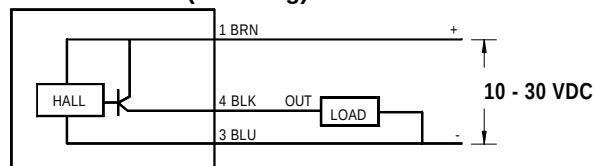
Failure to comply with these instructions could result in product damage.

- Wire the AC sensor with a load.
- Install a 630 mA fuse (Littelfuse part # 217.630) in series with the output of the AC sensor.
- If wiring a 3-wire DC type sensor, refer to Wiring Diagrams (3-wire DC) for sinking or sourcing configuration.

3-wire DC NPN (Sinking)



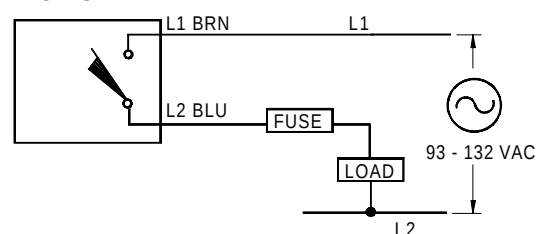
3-wire DC PNP (Sourcing)



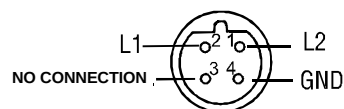
3-wire DC Pinout



2-wire AC



2-wire AC Pinout



Pollution degree 2. Utilization category: AC12

Step 3 - Test the 40FY sensor as follows:

- Actuate the door interrupt sensor and ensure the target indicator LED indicates as follows:

	Magnetic Actuator Present	Magnetic Actuator Absent
Normally Closed	LED OFF	LED ON
Normally Open	LED ON	LED OFF

- If the door interrupt sensor fails to operate correctly, ensure wiring and alignment are correct.
- If the sensor still does not work, return the product to Honeywell.

SPECIFICATIONS

Sensor Type	3-wire DC		2-wire AC	
Sensing Distance	41FY1	41FY2	41FY1	41FY2
Min. Operate	6,35 mm (.25 in.)	7,6 mm (.30 in.)	7,6 mm (.30 in.)	10,2 mm (.40 in.)
Max. Release	15,24 mm (.60 in.)	19,05 mm (.75 in.)	19,05 mm (.75 in.)	25,4 mm (1.0 in.)
Supply Voltage	10 to 30 VDC		93 to 132 VAC	
Load Current	0 to 200 mA		0 to 500 mA	
Leakage Current	30 mA		1.5 mA max.	
Voltage Drop, max.	PNP: 2.5 V NPN: 1.5 V		6 V @ 500 mA	
Current Consumption, max.	40 mA		—	
Inrush Current, max.	—		1.2 A/20 msec	
Repeatability*	± 3%		± 3%	
Operating Temperature	-30 to +85°C (-22 to +185°F)		-25 to +70°C (-13 to +158°F)	
Protection Class	IP 67 (Dust tight, temporary immersion) NEMA** 4, 6, 6P, 13			
Materials	Housing: Polycarbonate. Cable: 22 gage PVC			
Circuit Protection	Transients (power and output), incorrect wiring			

* Repeatability is the ability of the sensor to trigger at the same point, plus or minus a given tolerance, after every operation (at constant voltage and temperature) over the entire range of the sensor's specifications.

** **Application Note:** Enclosures are based, in general, on the broad definitions outlined in NEMA standards. Therefore, it will be necessary for the user to determine that a particular enclosure is adequate when exposed to the specific conditions that might exist in intended applications. Except as might otherwise be noted, all references to products relative to NEMA enclosure types are based on MICRO SWITCH evaluation only.

ELECTROMAGNETIC COMPATIBILITY

Characteristics	Standard	Level
Impulse Voltage Withstand	IEC255-5	1 KV
Radiated Electromagnetic Field Immunity	IEC801-3	3 V/m
Electrostatic Discharge (ESD) Immunity	IEC1000-4-2	8 KV
Fast Transient Immunity	IEC1000-4-4	1 KV
Radiated Emissions	CISPR 11	within specified limits
Conducted Emissions as Required	CISPR 11	within specified limits

WARRANTY AND REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

While we provide application assistance, personally and through our literature, it is up to the customer to determine the suitability of the product in the application.

Specifications may change at any time without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

SALES AND SERVICE

For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact a nearby sales office or call:

TELEPHONE

1-800-737-3360 Canada
+ 33 (0) 4 76 41 7200 France
+ 49 (0) 69 8064 444 Germany
1-815-235-6847 International
+ 44 (0) 161 251 4079 UK
1-800-537-6945 USA

FAX

+ (33) 76 41 72 56 France
1-815-235-6545 USA

INTERNET

<http://www.honeywell.com/sensing/>
info@micro.honeywell.com

SENSOR ORDER GUIDE

Description		Catalog Listing
3-wire DC, PNP N.O. output, connector	CE UL	40FY25-33
3-wire DC, PNP N.C. output, connector	CE UL	40FY22-33
3-wire DC, PNP N.O. output, leadwires	CE UL	40FY25-020
3-wire DC, PNP N.C. output, leadwires	CE UL	40FY22-020
3-wire DC, NPN N.O. output, connector	CE UL	40FY28-33
3-wire DC, NPN N.C. output, connector	CE UL	40FY24-33
3-wire DC, NPN N.O. output, leadwires	CE UL	40FY28-020
3-wire DC, NPN N.C. output, leadwires	CE UL	40FY24-020
2-wire AC, N.O. output, connector	CE	40FY35-33
2-wire AC, N.C. output, connector	CE	40FY32-33
2-wire AC, N.O. output, leadwires	CE	40FY35-020
2-wire AC, N.C. output, leadwires	CE	40FY32-020
Magnet actuator	CE UL	41FY1
Magnet actuator, extended range	UL	41FY2

CABLE ORDER GUIDE

Style	Cable Length	Catalog Listings
4-Pin DC Standard Key (12 mm Micro)		
Straight	2m (6')	80256-A
	5m (15')	80259-A
Right Angle	2m (6')	80296-A
	5m (15')	80299-A
Right Angle w/LED, NPN	2m (6')	80326-NE
	5m (15')	80329-NE
Right Angle w/LED, PNP	2m (6')	80326-PE
	5m (15')	80329-PE
4-Pin AC Inverted Key (12 mm Micro)		
Straight	2m (6')	80288-E
	5m (15')	80289-E
Right Angle	2m (6')	81291-E
	5m (15')	81294-E

Honeywell

MICRO SWITCH

Honeywell Inc.
11 West Spring Street
Freeport, Illinois 61032



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European Safety Center

Honeywell - Comète
21, Chemin du Vieux Chêne
38243 Meylan Cedex - FRANCE



Installation Instructions for the 50FY Series Hall Effect Door Interrupt System, EN954 Category III	1-6
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Installation Instructions for the 50FY Series Hall Effect Door Interrupt System, EN954 Category III

ISSUE 3

PK 80391



⚠ WARNING

IMPROPER INSTALLATION

- This product is designed to conform to the technical requirements of EN954 Category III and ANSI B11.19-1990. To ensure compliance with these requirements, 50FY41 sensors MUST be used with the FYQLA1-140R-3 logic amplifier.
- Consult with local safety agency and its requirements when designing a machine control link, interface and all control elements that affect safety.
- Strictly adhere to all installation instructions.

Failure to comply with these instructions could result in death or serious injury.

GENERAL

The 50FY Series Hall Effect Door Interrupt System is a non-contact, magnetic actuation system consisting of three devices: a sensor, a magnetic actuator and a logic amplifier.

The sensor contains two Hall Effect integrated circuits that are connected independently. Both circuits must turn on simultaneously to produce an output.

The magnet actuator has a keyed magnetic field that must match the sensor to operate correctly. When exposed to this keyed magnetic field and properly aligned, the sensor responds with an output.

The logic amplifier contains a logic input circuit card and controls a relay output. The input circuit will accept up to six sensors. When all of the connected sensors are actuated, the logic circuit will close the relay contacts. If any of the connected sensors are turned off, the logic circuit will open the relay contacts.

INSTALLATION INSTRUCTIONS

Step 1 - Mount and align 50FY sensor as follows:

⚠ WARNING

IMPROPER ALIGNMENT

Ensure the alignment of the sensor and magnetic actuator face each other and are aligned for proper operation. A 10 mm (0.39 in) separation distance will cause an OFF condition, regardless of offset distance.

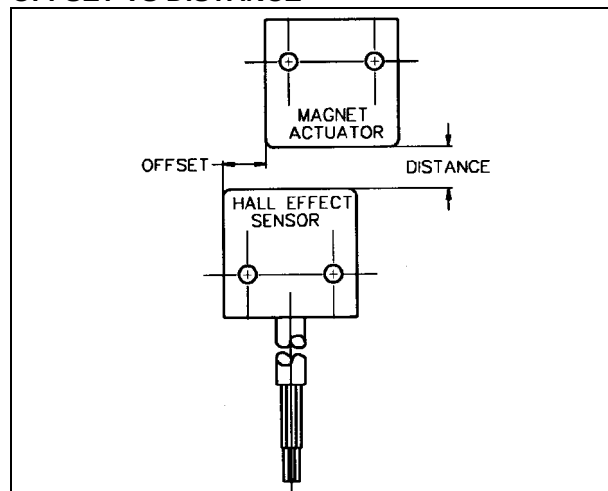
Failure to comply with these instructions could result in death or serious injury.

- Mount and align the sensor and magnetic actuator (see Mounting Dimensions, Nominal Sensing Distance, and Offset vs. Distance) within the allowable offset.

NOMINAL SENSING DISTANCE mm (in)

Offset	Distance
Zero	2,5 (0.100)
3,8 (0.150)	1,3 (0.050)
7,5 (0.300)	Zero

OFFSET VS DISTANCE



Step 2 - Mount FYQLA1 logic amplifier as follows:

CAUTION

LOGIC AMPLIFIER DAMAGE

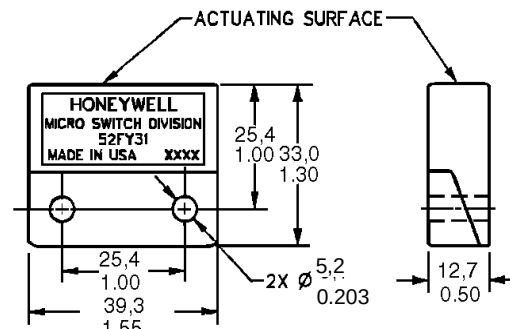
To prevent damage to the logic amplifier, it must be installed in a NEMA sealed enclosure as specified by EN60730-2-1.

Failure to comply with these instructions will result in product damage.

- Mount the amplifier (see Mounting Dimensions) in a NEMA sealed enclosure as required.

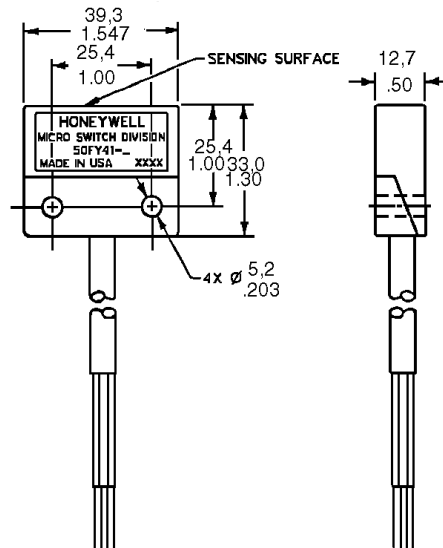
MOUNTING DIMENSIONS - for reference only

Magnet Actuator - 52FY31 (mm/in)

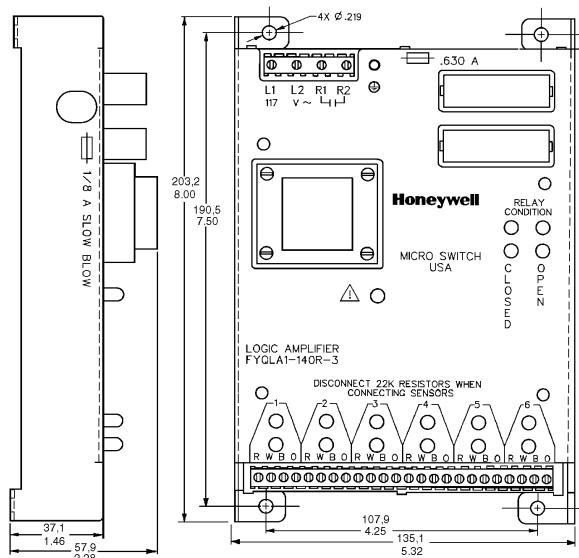


MOUNTING DIMENSIONS - for reference only (mm/in)

Hall Effect Sensor - 50FY41



Logic Amplifier - FYQLA1-140R-3



Step 3 - Wire sensors to logic amplifier as follows:

NOTICE

- Old component versions (amplifier, FYQLA-140R-1 and sensor, 50FY40) cannot be ordered. However, for maintenance purposes, the new components (amplifier, FYQLA-140R-3 and sensor, 50FY41) may be used in an old installation (see installation warning).
- The 52FY30 magnet actuators will work with 50FY41 sensors, however, the sensing distance will increase.

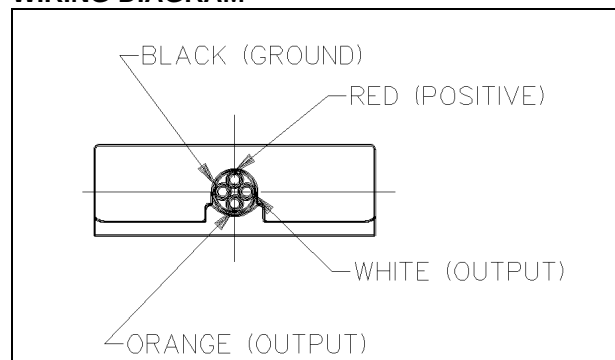
a. 50FY41 sensor (new) with FYQLA1-140R-3 amplifier (new)

- Connect each sensor (see Wiring Diagram) via its four leads as a set to the logic amplifier as follows:

FYQLA1-140R-3 (new)	50FY41 (new)
R (positive)	RED - positive
W (normally open)	WHITE - output
B (negative)	BLACK - ground
O (normally closed)	ORANGE - output

- To secure power and sensor leads, torque connector screws 0,56 Nm (5.0 in.-lb.).

WIRING DIAGRAM



- If less than six sensors are connected to the logic amplifier, install two 22 K Ω resistors across each unused logic amplifier terminal set as follows:

Logic Amplifier Terminals	Resistor*
R - W	22 K Ω resistor
B - O	22 K Ω resistor

*The resistors are necessary for the proper operation of the logic amplifier. Ten 22 K Ω resistors are supplied with each 50FY Series system.

⚠ WARNING

IMPROPER INSTALLATION

- This product is designed to conform to the technical requirements of EN954 Category III and ANSI B11.19-1990. To ensure compliance with these requirements, 50FY41 sensors **MUST** be used with the FYQLA1-140R-3 logic amplifier.
 - Strictly adhere to all installation instructions.
- Failure to comply with these instructions could result in death or serious injury.**

b. 50FY41 sensor (new) with FYQLA1-140R-1 amplifier (old)

- Cut and remove the ORANGE sensor leadwire.
- Connect the RED, WHITE and BLACK sensor leadwires to the logic amplifier terminals as follows:

FYQLA1-140R-1 (old)	50FY41 (new)
R (positive)	RED - positive
W (normally open)	WHITE - output
B (negative)	BLACK - ground
	ORANGE REMOVED

- To secure power and sensor leads, torque connector screws 0,56 Nm (5.0 in.-lb.).

c. 50FY40 sensor (old) with FYQLA1-140R-3 amplifier (new)

- Connect the RED, WHITE and BLACK sensor leadwires to the logic amplifier as follows:

FYQLA1-140R-3 (new)	50FY40 (old)
R (positive)	RED - positive
W (normally open)	WHITE - output
B (negative)	BLACK - ground
O (normally closed)	NO ORANGE LEAD

- Install one 22 K Ω resistor between the BLACK and ORANGE logic amplifier terminals.
- To secure power and sensor leads, torque connector screws 0,56 Nm (5.0 in.-lb.).

Special instructions related to 50FY40 sensors used with FYQLA1-140R-3 amplifier

If the door is open more than one second and power to the amplifier is ON, the ATTENTION INDICATOR LED will flash. To return to a green condition, close the door(s), shut amplifier power OFF and wait until the ATTENTION INDICATOR LED is completely OFF, then turn the amplifier power ON (power on reset).

Step 4 - Wire logic amplifier as follows:

- Connect 100 to 128 VAC to logic amplifier terminals L1 and L2.
- Connect load to logic amplifier relay contact terminals R1 and R2.

Step 5 - Perform troubleshooting procedure as required: (see logic amplifier indicators)

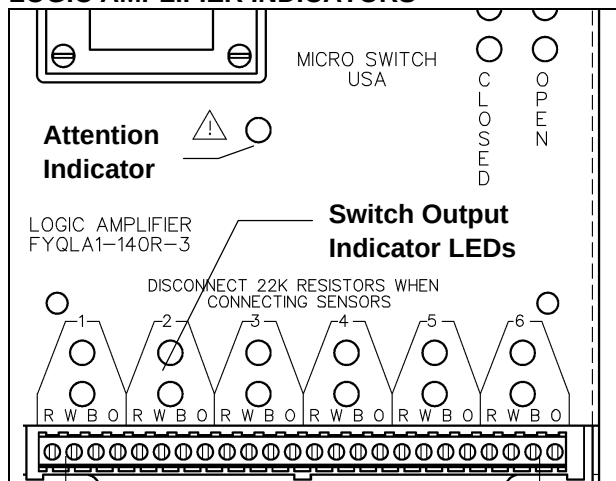
⚠ WARNING

IMPROPER SYSTEM PERFORMANCE

If the red ATTENTION INDICATOR LED, located on the logic amplifier is flashing, DO NOT OPERATE.

Failure to comply with these instructions could result in death or serious injury.

LOGIC AMPLIFIER INDICATORS



1. If the 50FY Series system appears to be operational, but the red ATTENTION INDICATOR LED is flashing, do the following:
 - Ensure the sensors are wired to the logic amplifier correctly.
 - Ensure the 22 K Ω resistors are installed in their proper locations on the logic amplifier.
 - Manually actuate sensors and ensure the corresponding red SWITCH OUTPUT LEDs above the logic amplifier terminal turn off.
 - Ensure sensors and magnet actuators are aligned and within specified sensing distance.
 - Shut amplifier power OFF and wait until the ATTENTION INDICATOR LED is completely OFF, then turn the amplifier power ON (power on reset).
 - If the red ATTENTION INDICATOR LED is still flashing, disconnect the logic amplifier and call the MICRO SWITCH Application Center (1-800-537-6945).

2. If the 50FY Series system is not operating and the red ATTENTION INDICATOR LED is not illuminated, do the following:
 - Ensure the installed fuses are rated properly and not blown (0.630A and 1/8A slow blow).
 - Ensure the sensors and logic amplifier are wired correctly.
 - Ensure the 22 K Ω resistors are installed in their proper locations on the logic amplifier.
 - Ensure the sensors and magnet actuators are aligned and within specified sensing distance.
 - Remove and restore power (power on reset).
 - If the 50FY Series system is still OFF, disconnect the logic amplifier and return to Honeywell.

Step 6 - Perform functional check as follows: (see logic amplifier indicators)

1. If the 50FY Series is operating and the red ATTENTION INDICATOR LED is not illuminated, do the following:
 - If any or all of the sensors are not actuated, observe the corresponding red SWITCH OUTPUT LEDs above the logic amplifier terminals for each sensor are illuminated. Also observe the red RELAY CONDITION OPEN LEDs are illuminated (logic amplifier contacts are open).
 - Actuate each sensor and observe the corresponding red SWITCH OUTPUT LED turns off.
 - If all twelve of the red SWITCH OUTPUT LEDs are off (all sensors are actuated), observe the red RELAY CONDITION OPEN LEDs are NOT illuminated. Also observe the green RELAY CONDITION CLOSED LEDs are illuminated (logic amplifier contacts are closed).
 - If the 50FY Series system performs as indicated above (step 3), the system is operating correctly.

SPECIFICATIONS

FYQLA1-140R-3 Logic Amplifier

Input voltage	100 - 128 VAC, 50-60 Hz
Power dissipation	3.0 VA max.
Temperature range	-40 to +70°C (-40 to +158°F)
Output relay	Contact rating: 5 A @ 120 VAC Action: single pole, single throw, N.O.; Positive guided safety relay; Dual relays connected in series, single output; Electrical life: 100,000 operations @ full load
*Sealing	Logic amplifier must be in a NEMA sealed enclosure.

50FY41 Hall Effect Sensor

Voltage	10 - 12 VDC
Load current (internally restricted)	0.50 mA max.
Current consumption	20 mA
Temperature range	-40 to +85°C (-40 to +185°F)
Sealing	NEMA 1, 3, 4, 6P, 12, 13 and **washdown test Units are resistant to repeated washdown with caustic solution, steam cleaning, food, juices and pulp.

***Sealing:** Enclosures are based on the broad definitions outlined in NEMA standards. Therefore, the customer must determine that a particular enclosure is adequate when exposed to a specific condition in an application. Except as otherwise noted, all references to products relative to NEMA enclosure types are based on MICRO SWITCH evaluation only.

****Washdown Test:** MICRO SWITCH Test Specifications 060.167, Issue 2, Paragraph 4.9 is a test specification for a high pressure (1200 psi), high temperature (140°F) chemical washdown. This test simulates cleaning procedures used by food and beverage processing plants which are more severe than standard NEMA 4 hosedown. A description of the washdown specification is available upon request.

NOTICE

This product conforms to the technical requirements of EN60730-2-1 as applicable to an Electronic Incorporated (for Class I equipment) sensing control with Type 2 and 2B action for continuous operation in normal pollution standards.

WARRANTY AND REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

While we provide application assistance, personally and through our literature, it is up to the customer to determine the suitability of the product in the application.

Specifications may change at any time without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

SALES AND SERVICE

For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact a nearby sales office or call:

TELEPHONE

1-800-737-3360 Canada
+ 33 (0) 4 76 41 7200 France
+ 49 (0) 69 8064 444 Germany
1-815-235-6847 International
+ 44 (0) 161 251 4079 UK
1-800-537-6945 USA

FAX

+ (33) 76 41 72 56 France
1-815-235-6545 USA

INTERNET

<http://www.honeywell.com/sensing/>
info@micro.honeywell.com

ORDER GUIDE

Catalog Listing	Description
50FY41-6	Sensor, 2 meters (6 ft) leadwires, normally open (NO)
50FY41-12	Sensor, 4 meters (12 ft) leadwires
50FY41-50	Sensor, 15 meters (50 ft) leadwires
52FY31	Magnet actuator
FYQLA1-140R-3	Logic amplifier, one to six sensor interface

Honeywell

MICRO SWITCH

Honeywell Inc.
11 West Spring Street
Freeport, Illinois 61032



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European Safety Center

Honeywell - Comète
21, Chemin du Vieux Chêne
38243 Meylan Cedex - FRANCE

Instrucciones de instalación para el Sistema interruptor de puerta por efecto Hall Serie 50FY, EN954 Categoría III

NÚMERO 3

PK 80391



⚠ ADVERTENCIA

INSTALACIÓN INADECUADA

- Este producto está diseñado para cumplir con los requerimientos técnicos de EN954 Categoría III y ANSI B11.19-1990. Para asegurar el cumplimiento con estos requerimientos, los sensores 50FY41 DEBEN utilizarse con el amplificador lógico FYQLA1-140R-3.
- Consulte con una oficina local de seguridad y sus requerimientos cuando diseñe el enlace de control de una máquina, la interfaz, y todos los elementos de control que afecten la seguridad.
- Siga estrictamente todas las instrucciones de instalación.

El incumplimiento de estas instrucciones podría provocar la muerte o lesiones graves.

GENERALIDADES

El Sistema interruptor de puerta por efecto Hall Serie 50FY es un sistema de accionamiento magnético sin contacto que consta de tres dispositivos: un sensor, un accionador magnético y un amplificador lógico.

El sensor tiene dos circuitos integrados de Efecto Hall conectados independientemente. Ambos circuitos deben accionarse simultáneamente para generar una salida.

El accionador del imán tiene un campo magnético enclavado, el cual debe concordar con el sensor para funcionar correctamente. El sensor responde con una salida cuando está expuesto a este campo magnético enclavado y alineado adecuadamente.

El amplificador lógico tiene una plaqueta de circuito lógico de entrada y controla la salida de un relé. El circuito de entrada puede aceptar hasta seis sensores. Cuando se accionen todos los sensores conectados, el circuito lógico cerrará los contactos del relé. Si alguno de los sensores conectados está apagado, el circuito lógico abrirá los contactos del relé.

INSTRUCCIONES DE INSTALACIÓN

Paso 1 - Realice el montaje y alineado del sensor 50FY de la siguiente manera:

⚠ ADVERTENCIA

ALINEACIÓN INADECUADA

Asegúrese de que el sensor y el accionador magnético estén enfrentados y alineados para un funcionamiento correcto. Una distancia de separación de 10 mm (0.39 pulg.) ocasionará una condición de APAGADO (OFF), independientemente de la distancia de excentricidad.

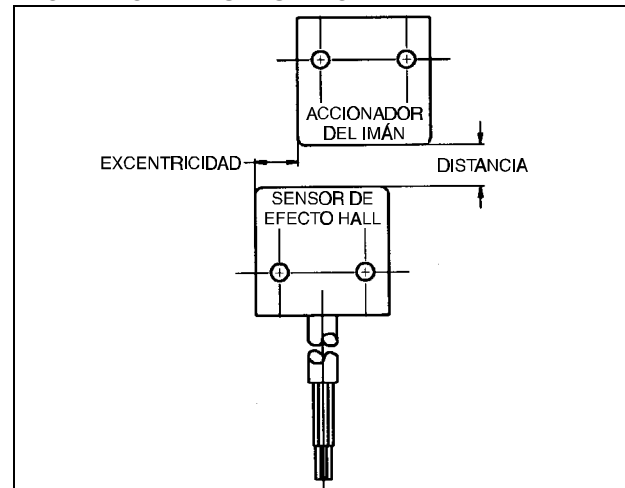
El incumplimiento de estas instrucciones podría provocar la muerte o lesiones graves.

- Realice el montaje y alineado del sensor y el accionador magnético (véanse las Dimensiones de montaje, la Distancia nominal de detección, y Excentricidad vs. Distancia) dentro de la excentricidad permitida.

DISTANCIA NOMINAL DE DETECCIÓN mm (pulg)

Excentricidad	Distancia
Cero	2,5 (0.100)
3,8 (0.150)	1,3 (0.050)
7,5 (0.300)	Cero

EXCENTRICIDAD VS. DISTANCIA



Paso 2 - Realice el montaje del amplificador lógico FYQLA1 de la siguiente manera:

PRECAUCIÓN

DAÑOS EN EL AMPLIFICADOR LÓGICO

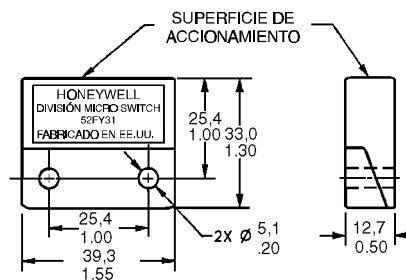
Para evitar daños en el amplificador lógico, éste debe instalarse en un receptáculo sellado NEMA, de acuerdo a las especificaciones de EN60730-2-1.

El incumplimiento de estas instrucciones provocará daños en el producto.

- Realice el montaje del amplificador (véanse las Dimensiones de montaje) en un receptáculo sellado NEMA tal como se especifica.

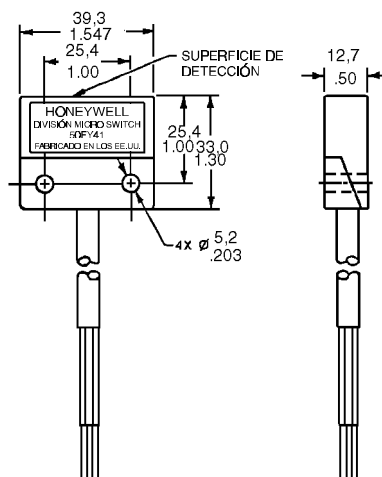
DIMENSIONES DE MONTAJE - sólo para consulta

Accionador del imán - 52FY31 (mm/pulg)

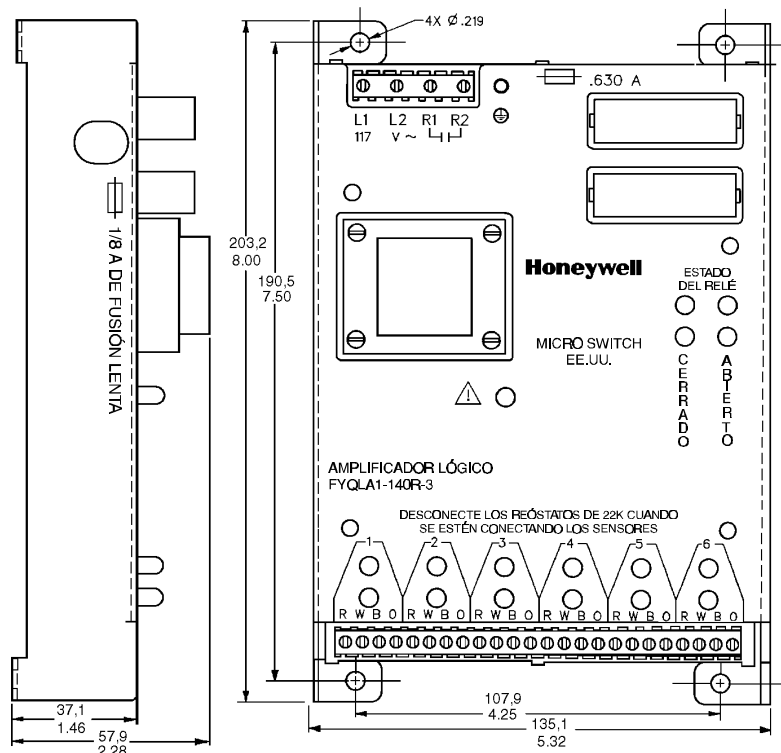


DIMENSIONES DE MONTAJE - sólo para consulta (mm/pulg)

Sensor de Efecto Hall - 50FY41



Amplificador Lógico - FYQLA1-140R-3



Paso 3 - Conecte los sensores al amplificador lógico de la siguiente manera:

AVISO

- No pueden solicitarse versiones antiguas de los componentes (amplificador FYQLA-140R-1 y sensor 50FY40). No obstante, para propósitos de mantenimiento, los componentes nuevos (amplificador FYQLA-140R-3 y sensor 50FY41) pueden utilizarse en una instalación antigua (véase la advertencia sobre la instalación).
- Los accionadores de imán 52FY30 funcionarán con sensores 50FY41, no obstante, la distancia de detección aumentará.

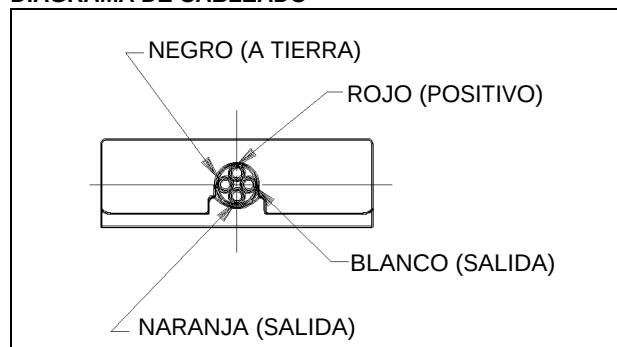
a. Sensor 50FY41 (nuevo) con amplificador FYQLA1-140R-3 (nuevo)

- Conecte cada sensor (véase el Diagrama de cableado) al amplificador lógico por medio de sus cuatro conectores de la siguiente manera:

FYQLA1-140R-3 (nuevo)	50FY41 (nuevo)
R (positivo)	ROJO - positivo
B (normalmente abierto)	BLANCO - salida
Ne (negativo)	NEGRO - a tierra
Na (normalmente cerrado)	NARANJA - salida

- Para asegurar los conductores de alimentación y del sensor, ajuste los tornillos conectores con un par torsor de 0,56 Nm (5.0 pulg.-lb).

DIAGRAMA DE CABLEADO



- Si están conectados menos de seis sensores al amplificador lógico, instale dos reóstatos de 22 K Ω a través de cada conjunto terminal sin utilizar del amplificador lógico de la siguiente manera:

Terminales del amplificador lógico	Reóstato*
R - B	reóstato de 22 K Ω
Ne -Na	reóstato de 22 K Ω

*Los reóstatos son necesarios para el correcto funcionamiento del amplificador lógico. Se suministran diez reóstatos de 22 K Ω con cada sistema de la Serie 50FY.

⚠ ADVERTENCIA

INSTALACIÓN INADECUADA

- Este producto está diseñado para cumplir con los requerimientos técnicos de EN954 Categoría III y ANSI B11.19-1990. Para asegurar el cumplimiento con estos requerimientos, los sensores 50FY41 DEBEN utilizarse con el amplificador lógico FYQLA1-140R-3.
 - Siga estrictamente todas las instrucciones de instalación.
- El incumplimiento de estas instrucciones podría provocar la muerte o lesiones graves.**

b. Sensor 50FY41 (nuevo) con amplificador FYQLA1-140R-1 (antiguo)

- Corte y retire el cable conductor NARANJA del sensor.
- Conecte los cables conductores ROJO, BLANCO y NEGRO del sensor a las terminales del amplificador lógico de la siguiente manera:

FYQLA1-140R-1 (antiguo)	50FY41 (nuevo)
R (positivo)	ROJO - positivo
B (normalmente abierto)	BLANCO - salida
Ne (negativo)	NEGRO - a tierra
	NARANJA ELIMINADO

- Para asegurar los conductores de alimentación y del sensor, ajuste los tornillos conectores con un par torsor de 0,56 Nm (5.0 pulg.-lb).

c. Sensor 50FY40 (antiguo) con amplificador FYQLA1-140R-3 (nuevo)

- Conecte los cables conductores ROJO, BLANCO y NEGRO del sensor al amplificador lógico de la siguiente manera:

FYQLA1-140R-3 (nuevo)	50FY40 (antiguo)
R (positivo)	ROJO - positivo
B (normalmente abierto)	BLANCO - salida
Ne (negativo)	NEGRO - a tierra
Na (normalmente cerrado)	SIN CONDUCTOR NARANJA

- Instale un reóstato de 22 K Ω entre las terminales NEGRA y NARANJA del amplificador lógico.
- Para asegurar los conductores de alimentación y del sensor, ajuste los tornillos conectores con un par torsor de 0,56 Nm (5.0 pulg.-lb).

Instrucciones especiales para los sensores 50FY40 utilizados con el amplificador FYQLA1-140R-3

Si la puerta permanece abierta por más de un segundo y la energía hacia el amplificador está CONECTADA (ON), el LED INDICADOR DE ATENCIÓN destellará. Para regresar a una condición verde, cierre la(s) puerta(s), DESCONECTE (OFF) la energía del amplificador, y espere hasta que el LED INDICADOR DE ATENCIÓN esté completamente APAGADO (OFF), luego CONECTE (ON) la energía del amplificador (energía en reposición).

Paso 4 - Conecte el amplificador lógico de la siguiente manera:

- Conecte 100 a 128 Vca las terminales L1 y L2 del amplificador lógico.
- Conecte la carga a las terminales R1 y R2 de contacto del relé del amplificador lógico.

Paso 5 - Solucione problemas comunes según sea necesario: (véanse los indicadores del amplificador lógico)

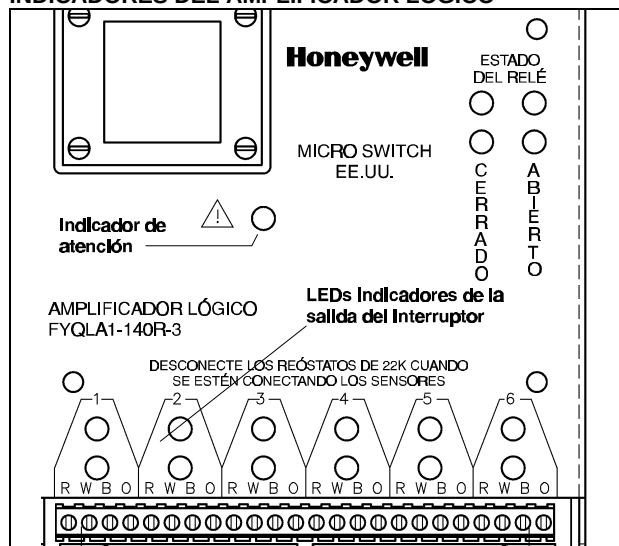
⚠ ADVERTENCIA

FUNCIONAMIENTO INCORRECTO DEL SISTEMA

Si el LED INDICADOR DE ATENCIÓN rojo ubicado en el amplificador lógico está destellando, NO LO ACTIVE.

El incumplimiento de estas instrucciones podría provocar la muerte o lesiones graves.

INDICADORES DEL AMPLIFICADOR LÓGICO



1. Si el sistema de la Serie 50FY parece estar funcionando, pero el LED INDICADOR DE ATENCIÓN rojo está destellando, realice lo siguiente:

- Asegúrese de que los sensores estén correctamente conectados al amplificador lógico.
- Asegúrese de que los reóstatos de 22 K Ω estén instalados en sus posiciones correctas en el amplificador lógico.
- Accione los manualmente sensores y asegúrese de que se apaguen los correspondientes LED rojos DE SALIDA DEL INTERRUPTOR ubicados arriba de la terminal del amplificador lógico.
- Asegúrese de que los sensores y los accionadores de imán estén alineados y dentro de la distancia de detección especificada.
- DESCONECTE (OFF) la energía del amplificador y espere hasta que el LED INDICADOR DE ATENCIÓN esté completamente APAGADO (OFF), luego CONECTE (ON) la energía del amplificador (energía en reposición).
- Si el LED INDICADOR DE ATENCIÓN rojo continúa destellando, desconecte el amplificador lógico y llame al Centro de aplicaciones de MICRO SWITCH (1-800-537-6945 [EE.UU.]).

2. Si el sistema de la Serie 50FY no está funcionando y el LED INDICADOR DE ATENCIÓN rojo no está iluminado, realice lo siguiente:

- Asegúrese de que los fusibles instalados tengan la capacidad adecuada y que no estén quemados (0,630 A y 1/8 A de fusión lenta).
- Asegúrese de que los sensores y el amplificador lógico estén conectados correctamente.
- Asegúrese de que los reóstatos de 22 K Ω estén instalados en sus posiciones correctas en el amplificador lógico.
- Asegúrese de que los sensores y los accionadores de imán estén alineados y dentro de la distancia de detección especificada.
- Desconecte y restablezca la energía (energía en reposición).
- Si el sistema de la Serie 50FY continúa APAGADO (OFF), desconecte el amplificador lógico y devuélvalo a Honeywell.

Paso 6 - Compruebe el funcionamiento de la siguiente manera: (véanse los indicadores del amplificador lógico)

1. Si el sistema de la Serie 50FY está funcionando y el LED INDICADOR DE ATENCIÓN rojo no está iluminado, realice lo siguiente:
 - Si alguno o todos los sensores no están activados, verifique que estén iluminados los LED rojos DE SALIDA DEL INTERRUPTOR correspondientes para cada sensor, ubicados arriba de las terminales del amplificador lógico. Verifique además que estén iluminados los LED rojos DE CONDICIÓN ABIERTA DEL RELÉ (los contactos del amplificador lógico están abiertos).
 - Accione cada sensor y verifique que se apaguen los LED rojos DE SALIDA DEL INTERRUPTOR correspondientes.
 - Si los doce LED rojos DE SALIDA DEL INTERRUPTOR están apagados (todos los sensores están activados), verifique que los LED DE CONDICIÓN ABIERTA DEL RELÉ NO estén iluminados. Verifique además que estén iluminados los LED verdes DE CONDICIÓN CERRADA DEL RELÉ (los contactos del amplificador lógico están cerrados).
 - El sistema de la Serie 50FY está funcionando correctamente si se comporta como se indica más arriba (paso 3).

ESPECIFICACIONES

Amplificador lógico FYQLA1-140R-3

Voltaje de entrada	100 - 128 Vca, 50-60 Hz
Disipación de energía	3,0 VA máx.
Límites de temperatura	-40 a +70 °C (-40 a +158 °F)
Relé de salida	Clase de contacto: 5 A a 120 Vca Acción: unipolar de vía única, normalmente abierto; Relé positivo guiado de seguridad, Relés dobles conectados en serie, salida única; Vida eléctrica útil: 100.000 operaciones con carga total
*Sellado	El amplificador lógico debe estar en un receptáculo sellado NEMA.

Sensor de Efecto Hall 50FY41

Voltaje	10 - 12 Vcc
Corriente de carga (restringida internamente)	0,50 mA máx.
Consumo de corriente	20 mA
Límites de temperatura	-40 a +85 °C (-40 a +185 °F)
Sellado	NEMA 1, 3, 4, 6P, 12, 13 y **prueba de lavado Las unidades son resistentes al lavado repetido con solución cáustica, limpieza con vapor, comida, jugos y pulpa.

***Sellado:** Los receptáculos se basan en las amplias definiciones listadas en las normas NEMA. Por lo tanto, el cliente debe determinar que un receptáculo en particular es adecuado cuando se lo expone a condiciones específicas en una aplicación. Excepto cuando se indique lo contrario, todas las referencias a productos con relación a tipos de receptáculos NEMA, están basadas solamente en una evaluación de MICRO SWITCH.

****Prueba de lavado:** Las Especificaciones de prueba 060.167, Número 2, Párrafo 4.9 de MICRO SWITCH contienen las especificaciones para un lavado químico a alta presión (1.200 psi) y alta temperatura (140 °F). Esta prueba simula los procedimientos de limpieza utilizados por plantas de procesamiento de alimento y bebidas, las cuales requieren lavados con manguera más severos que la norma NEMA 4. Puede obtenerse una descripción de la especificación de lavado a petición.

AVISO

Este producto satisface los requerimientos técnicos de EN60730-2-1 en lo referente a un control de detección con Electrónicos Incorporados (para equipos Clase I) con acción Tipo 2 y 2B para un funcionamiento continuo en estándares normales de contaminación.

GARANTÍA Y RECURSO

Honeywell garantiza que todos los productos que fabrica están libres de defectos de mano de obra o materiales. Contacte su oficina local de ventas para obtener información sobre la garantía. Si se devuelven productos con garantía a Honeywell durante el período de cobertura, Honeywell los reparará o reemplazará si determina que están defectuosos. Lo antes mencionado será el único recurso del Comprador y **sustituye a cualquier otra garantía, sea expresa o implícita, incluyendo garantías de comerciabilidad e idoneidad para un uso específico.**

Aunque Honeywell ofrece asistencia para las aplicaciones de manera personal y por medio de publicaciones, el consumidor debe determinar si el producto es adecuado para la aplicación.

Las especificaciones pueden cambiar en cualquier momento sin previo aviso. Se cree que la información suministrada es correcta y confiable al momento de esta impresión. No obstante, Honeywell no asume responsabilidad por su uso.

VENTAS Y SERVICIO

Para asistencia con las aplicaciones, especificaciones actuales, precios o el nombre del Distribuidor autorizado más cercano, contacte una oficina de ventas local o llame a:

TELÉFONO

1-800-737-3360 Canadá
+ 33 (0) 4 76 41 7200 Francia
+ 49 (0) 69 8064 444 Alemania
1-815-235-6847 Internacional
+ 44 (0) 161 251 4079 Inglaterra
1-800-537-6945 EE.UU.

FAX

+ (33) 76 41 72 56 Francia
1-815-235-6545 EE.UU.

INTERNET

<http://www.honeywell.com/sensing/>
info@micro.honeywell.com

GUÍA DE PEDIDO

Listado de catálogo	Descripción
50FY41-6	Sensor, cables conductores de 2 metros (6 pies), normalmente abiertos (N.O., Normally Open)
50FY41-12	Sensor, cables conductores de 4 metros (12 pies)
50FY41-50	Sensor, cables conductores de 15 metros (50 pies)
52FY31	Accionador del imán
FYQLA1-140R-3	Amplificador lógico, interfaz de uno a seis sensores

Honeywell**MICRO SWITCH**

Honeywell Inc.
11 West Spring Street
Freeport, Illinois 61032



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**European Safety Center****Honeywell - Cométo**

21, Chemin du Vieux Chêne
38243 Meylan Cedex - FRANCIA

Instructions d'installation pour le système de détection de proximité de passage de porte, EN954 catégorie III, série 50FY à effet Hall

NUMERO 3

PK 80391



⚠ AVERTISSEMENT

MAUVAISE INSTALLATION

- Ce produit est conçu de façon à respecter les exigences techniques des normes EN954 catégorie III et ANSI B11.19-1990. Pour garantir la conformité à ces exigences, il FAUT utiliser les capteurs 50FY41 avec l'amplificateur de sécurité FYQLA1-140R-3.
- Faites appel à un organisme local de sécurité et prenez en compte leurs exigences lorsque vous concevez une liaison de commande ou interface de machine, ou tout autre dispositif de commande mettant en jeu la sécurité.
- Respectez scrupuleusement l'ensemble des instructions d'installation.

L'inobservation de ces instructions peut entraîner la mort ou de graves blessures.

GENERALITES

Le système de détection de proximité de passage de porte à effet Hall série 50FY est un dispositif sans contact à commande magnétique composé de trois éléments : un capteur, un actionneur magnétique et un amplificateur de sécurité.

Le capteur renferme deux circuits intégrés à effet Hall connectés de façon indépendante. Les deux circuits doivent être activés simultanément pour que la sortie soit activée.

L'actionneur magnétique engendre un champ magnétique codé qui doit être reconnu par le capteur pour un bon fonctionnement. Le capteur est activé lorsqu'il est soumis à ce champ magnétique codé et qu'il est bien aligné.

L'amplificateur de sécurité renferme une carte d'entrées logiques et commande un relais de sortie. La carte d'entrée peut recevoir six capteurs au plus. Lorsque tous les capteurs raccordés sont activés, le circuit logique ferme les contacts du relais. Si l'un quelconque des capteurs raccordés est désactivé, le circuit logique ouvre les contacts du relais.

INSTRUCTIONS D'INSTALLATION

Etape 1 - Montez et alignez le capteur 50FY de la façon suivante :

⚠ AVERTISSEMENT

MAUVAIS ALIGNEMENT

Pour un bon fonctionnement, assurez-vous que le capteur et l'actionneur magnétique se font face et sont bien alignés. En cas d'éloignement de plus de 10 mm, la sortie du capteur sera désactivée quelque soit la valeur du décalage.

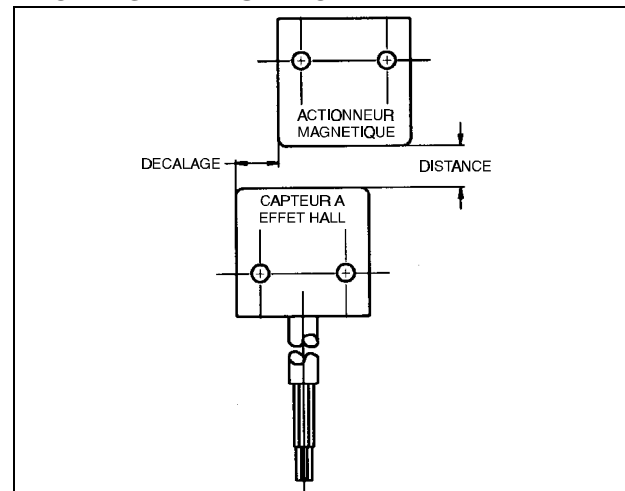
L'inobservation de ces instructions peut entraîner la mort ou de graves blessures.

- Montez et alignez le capteur et l'actionneur magnétique (voir Cotes de montage, Distance nominale de détection et Décalage/Distance) sans excéder le décalage permis.

DISTANCE NOMINALE DE DÉTECTION en mm (in)

Décalage	Distance
Zéro	2,5 (0.100)
3,8 (0.150)	1,3 (0.050)
7,5 (0.300)	Zéro

DECALAGE ET DISTANCE



Etape 2 - Montez l'amplificateur de sécurité FYQLA1 de la façon suivante :

ATTENTION

DETERIORATION DE L'AMPLIFICATEUR DE SÉCURITÉ

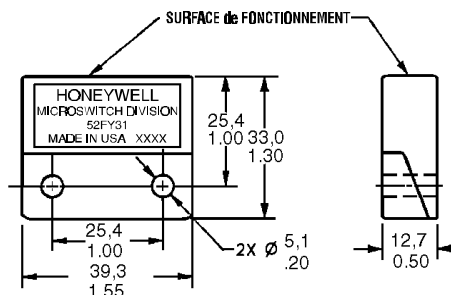
Afin d'éviter la détérioration de l'amplificateur de sécurité, il faut l'installer dans un coffret étanche NEMA suivant la norme EN60730-2-1.

L'inobservation de ces instructions entraînera la détérioration du produit.

- Montez l'amplificateur (voir Cotes de montage) dans un coffret étanche NEMA convenable.

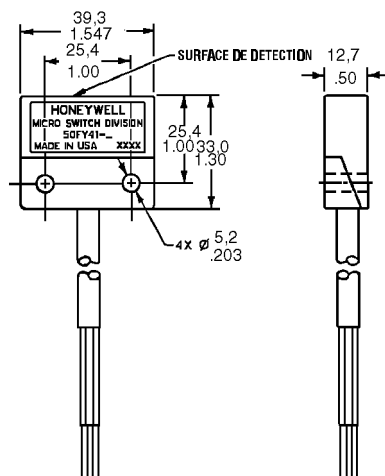
COTES DE MONTAGE - à titre indicatif uniquement

Actionneur magnétique - 52FY31 (mm/in)

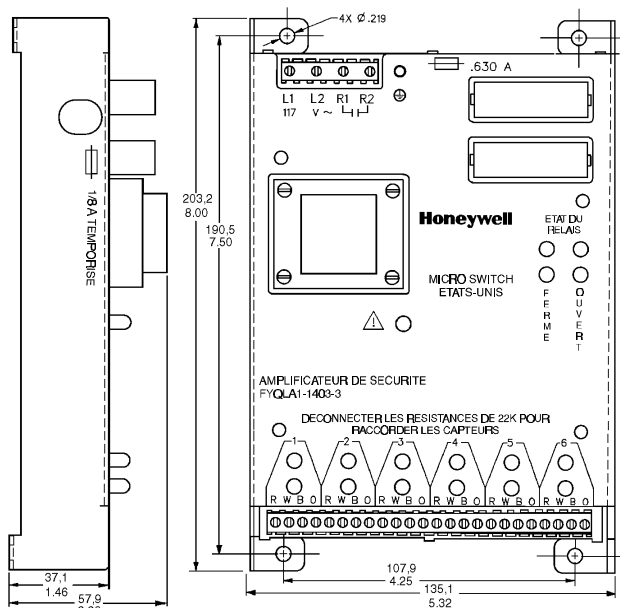


COTES DE MONTAGE - à titre indicatif uniquement (mm/in)

Capteur à effet Hall - 50FY41



Amplificateur de sécurité - FYQLA1-140R-3



Etape 3 - Raccordez les capteurs à l'amplificateur de sécurité de la façon suivante :

NOTICE

- Il n'est pas possible de commander d'anciennes versions de composants (amplificateur FYQLA-140R-1 et capteur 50FY40). Il est cependant possible, dans le cadre de l'entretien, d'utiliser les nouveaux composants (amplificateur FYQLA-140R-3 et capteur 50FY41) sur une installation ancienne (consulter l'avertissement d'installation).
- Les actionneurs magnétiques 52FY30 fonctionneront avec les capteurs 50FY41, mais la distance de détection augmentera.

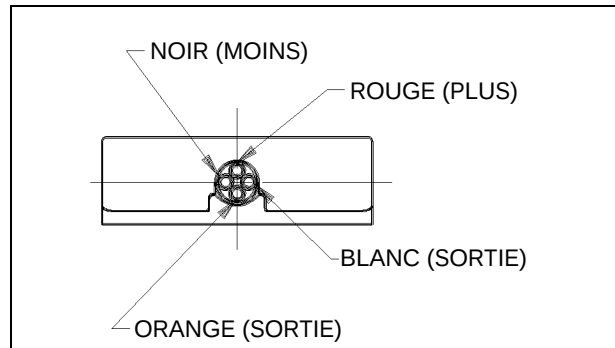
a. Capteur 50FY41 (nouveau) avec amplificateur FYQLA1-140R-3 (nouveau)

- Raccordez les quatre fils de chaque capteur (consulter le schéma de câblage) l'amplificateur de sécurité de la façon suivante :

FYQLA1-140R-3 (nouveau)	50FY41 (nouveau)
R (plus)	ROUGE - plus
W (normalement ouvert)	BLANC - sortie
B (moins)	NOIR - moins
O (normalement fermé)	ORANGE - sortie

- Pour fixer les fils d'alimentation et du capteur, serrez les vis des connecteurs sous un couple de 0,56 Nm (5.0 in.-lb.).

SCHEMA DE CABLAGE



- S'il n'y a pas six capteurs reliés à l'amplificateur de sécurité, installez deux résistances de 22 K Ω aux bornes de chaque ensemble de bornes inutilisées de l'amplificateur de sécurité de la façon suivante :

Bornes de l'amplificateur de sécurité	Résistance*
R - W	résistance de 22 K Ω
B - O	résistance de 22 K Ω

*Les résistances sont nécessaires au bon fonctionnement de l'amplificateur de sécurité. Dix résistances de 22 k Ω sont fournies avec chaque système de la série 50FY.

⚠ AVERTISSEMENT

MAUVAISE INSTALLATION

- Ce produit est conçu de façon à respecter les exigences techniques des normes EN954 catégorie III et ANSI B11.19-1990. Pour garantir la conformité à ces exigences, il FAUT utiliser les capteurs 50FY41 avec l'amplificateur de sécurité FYQLA1-140R-3.
- Respectez scrupuleusement l'ensemble des instructions d'installation.

L'inobservation de ces instructions peut entraîner la mort ou de graves blessures.

b. Capteur 50FY41 (nouveau) avec amplificateur FYQLA1-140R-1 (ancien)

- Coupez et supprimez le fil ORANGE du capteur.
- Branchez les fils ROUGE, BLANC et NOIR du capteur aux bornes de l'amplificateur de sécurité de la façon suivante :

FYQLA1-140R-1 (ancien)	50FY41 (nouveau)
R (plus)	ROUGE - plus
W (normalement ouvert)	BLANC - sortie
B (moins)	NOIR - moins
	ORANGE SUPPRIME

- Pour fixer les fils d'alimentation et du capteur, serrez les vis des connecteurs sous un couple de 0,56 Nm (5.0 in.-lb.).

c. Capteur 50FY40 (ancien) avec amplificateur FYQLA1-140R-3 (nouveau)

- Branchez les fils ROUGE, BLANC et NOIR du capteur à l'amplificateur de sécurité de la façon suivante :

FYQLA1-140R-3 (nouveau)	50FY40 (ancien)
R (plus)	ROUGE - plus
W (normalement ouvert)	BLANC - sortie
B (moins)	NOIR - moins
O (normalement fermé)	PAS DE FIL ORANGE

- Installez une résistance de 22 k Ω entre les bornes NOIRE et ORANGE de l'amplificateur de sécurité.
- Pour fixer les fils d'alimentation et du capteur, serrez les vis des connecteurs sous un couple de 0,56 Nm (5.0 in.-lb.).

Instructions particulières concernant l'utilisation de capteurs 50FY40 avec un amplificateur FYQLA1-140R-3

Si la porte est ouverte plus d'une seconde et que l'amplificateur est alimenté, l'INDICATEUR d'ETAT à LED ROUGE clignotera. Pour retrouver l'état vert, fermez la ou les porte(s), coupez l'alimentation de l'amplificateur et attendez l'extinction totale de l'INDICATEUR d'ETAT à LED ROUGE, puis mettez l'amplificateur sous tension (réinitialisation à la mise sous tension).

Etape 4 - Câblez l'amplificateur de sécurité de la façon suivante :

- Raccordez une tension alternative de 100 à 128 volts aux bornes L1 et L2 de l'amplificateur de sécurité.
- Raccordez la charge aux bornes R1 et R2 du contact de relais de l'amplificateur de sécurité.

Etape 5 - Effectuez la procédure de recherche de panne de la façon suivante : (voir les indicateurs d'état de l'amplificateur de sécurité)



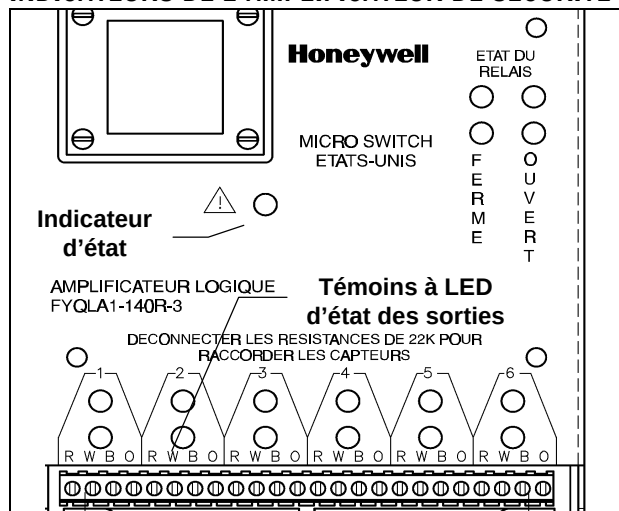
AVERTISSEMENT

MAUVAIS COMPORTEMENT DU SYSTEME

Si l'INDICATEUR D'ETAT A LED rouge se trouvant sur l'amplificateur de sécurité clignote, NE PAS FAIRE FONCTIONNER.

L'inobservation de ces instructions peut entraîner la mort ou de graves blessures.

INDICATEURS DE L'AMPLIFICATEUR DE SECURITE



1. Si le système série 50FY semble opérationnel, mais que l'INDICATEUR D'ETAT A LED rouge clignote, faites les choses suivantes :
 - Vérifiez que les capteurs sont bien raccordés à l'amplificateur de sécurité.
 - Vérifiez qu'il y a des résistances de 22 K Ω là où il faut sur l'amplificateur de sécurité.
 - Actionnez les capteurs manuellement et vérifiez que les LED rouges des ENTREES correspondantes au-dessus des bornes de l'amplificateur de sécurité s'éteignent.
 - Vérifiez que les capteurs et actionneurs magnétiques sont alignés et écartés d'une distance inférieure à la distance de détection spécifiée.
 - Coupez l'alimentation de l'amplificateur et attendez l'extinction totale de l'INDICATEUR D'ETAT A LED rouge, puis mettez l'amplificateur sous tension (réinitialisation à la mise sous tension).
 - Si l'INDICATEUR D'ETAT A LED rouge clignote toujours, déconnectez l'amplificateur de sécurité et appelez le Centre d'assistance technique MICRO SWITCH (1-800-537-6945).

2. Si le système série 50FY ne fonctionne pas et que l'INDICATEUR D'ETAT A LED rouge n'est pas allumé, faites les choses suivantes :
 - Vérifiez que les fusibles en place sont du bon calibre et en bon état (0,630 A et 1/8 A temporisé).
 - Vérifiez que les capteurs et l'amplificateur de sécurité sont bien raccordés.
 - Vérifiez qu'il y a des résistances de 22 K Ω là où il faut sur l'amplificateur de sécurité.
 - Vérifiez que les capteurs et actionneurs magnétiques sont alignés et écartés d'une distance inférieure à la distance de détection spécifiée.
 - Coupez puis remettez l'alimentation (réinitialisation à la mise sous tension).
 - Si le système série 50FY est toujours éteint, déconnectez l'amplificateur de sécurité et retournez-le à Honeywell.

Etape 6 - Effectuez les contrôles fonctionnels suivants : (voir les indicateurs d'état de l'amplificateur de sécurité)

1. Si le système série 50FY fonctionne et que l'INDICATEUR D'ETAT A LED rouge n'est pas allumé, faites les choses suivantes :
 - Si l'un des capteurs ou plusieurs ne sont pas activés, regardez si les LED rouges au-dessus des bornes d'ENTREES de l'amplificateur de sécurité correspondant à chaque capteur sont allumées. Regardez également si les LED rouges d'état du RELAIS sont allumées (contacts du relais de l'amplificateur de sécurité ouverts).
 - Actionnez chaque capteur et regardez si les LED rouges des ENTREES correspondantes s'éteignent.
 - Si les douze LED rouges des ENTREES sont éteintes (tous les capteurs activés), vérifiez que les LED rouges d'état du RELAIS ne sont PAS allumées. Regardez également si les LED vertes d'état du RELAIS sont allumées (contacts du relais de l'amplificateur de sécurité fermés).
 - Si le système série 50FY se comporte suivant les indications ci-dessus (étape 3), c'est qu'il fonctionne correctement.

CARACTERISTIQUES TECHNIQUES**Amplificateur de sécurité FYQLA1-140R-3**

Tension d'alimentation	100 à 128 V~, 50-60 Hz
Puissance consommée	3,0 VA max.
Gamme de température	-40 à +70 °C (-40 à +158 °F)
Relais de sortie	Pouvoir de coupure des contacts : 5 A sous 120 V~ Action : unipolaire, N.O. ; 2 relais à sécurité positive et à contacts liés en série. Durée de vie : 100.000 manoeuvres à pleine charge
*Etanchéité	L'amplificateur de sécurité doit être dans un coffret étanche NEMA.

Capteur à effet Hall 50FY41

Tension	10 - 12 V=
Courant de charge (limitation interne)	0,50 mA max.
Courant consommé	20 mA
Gamme de températures	-40 à +85 °C (-40 à +185 °F)
Etanchéité	NEMA 1, 3, 4, 6P, 12, 13 et **essai de lavage intensif Les appareils résistent aux lavages répétés à l'aide d'une solution caustique, au nettoyage à la vapeur, aux aliments, aux jus et à la pulpe.

***Etanchéité :** Les coffrets sont basées sur les définitions générales décrites dans les normes NEMA. Le client doit donc déterminer si un coffret donné convient lorsqu'il est soumis à des conditions particulières dans une application. Sauf indication contraire, toute référence à un produit concernant les types de coffrets NEMA repose uniquement sur une évaluation MICRO SWITCH.

****Essai de lavage intensif :** Les spécifications d'essais MICRO SWITCH 060.167, Numéro 2, paragraphe 4.9 concernent le lavage chimique à haute pression (1200 psi) et haute température (140 °F/+60 °C). Cet essai simule les procédures de nettoyage utilisées dans les usines de transformation de produits alimentaires et boissons, plus rigoureuses que le lavage ordinaire NEMA 4. Une description de la spécification du lavage intensif peut être obtenue sur demande.

NOTICE

Ce produit est conforme aux exigences techniques de la norme EN60730-2-1 relatives aux dispositifs de détection à composants électroniques intégrés (pour matériel de classe I) à action de type 2 et 2B pour fonctionnement continu dans des conditions normales de pollution.

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Honeywell garantit que les articles de sa fabrication sont exempts de défauts de pièces et main d'oeuvre. Contactez votre bureau de vente local pour obtenir des informations sur la garantie. Si les articles garantis sont retournés à Honeywell pendant la période de couverture, Honeywell réparera ou remplacera gratuitement ceux qui auront été trouvés défectueux. Ce qui précède constitue le seul recours de l'acheteur et **se substitue à toutes autres garanties, explicites ou implicites, y compris celles relatives à la commercialisation ou la compatibilité avec une application particulière.**

Bien que nous apportions notre aide pour les applications, de façon individuelle ou par notre littérature, il incombe au client de déterminer si le produit convient à l'application.

Les spécifications peuvent changer à tout moment et sans préavis. Les informations que nous apportons sont présumées précises et fiables au moment de la mise sous presse. Cependant, nous déclinons toute responsabilité quant à leur utilisation.

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INTERNET

<http://www.honeywell.com/sensing/>
info@micro.honeywell.com

GUIDE DE COMMANDE

Référence	Description
50FY41-6	Capteur, fils de 2 mètres (6 ft), normalement ouvert (NO)
50FY41-12	Capteur, fils de 4 mètres (12 ft)
50FY41-50	Capteur, fils de 15 mètres (50 ft)
52FY31	Actionneur magnétique
FYQLA1-140R-3	Amplificateur de sécurité, interface de un à six capteurs

Honeywell**MICRO SWITCH**

Honeywell Inc.
11 West Spring Street
Freeport, Illinois 61032



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**European Safety Center**

Honeywell - Cométa
21, Chemin du Vieux Chêne
38243 Meylan Cedex - FRANCE

Einbau-Anweisungen für das Halleffekt-Türverriegelungssystem der Serie 50FY, EN 954 Kategorie III

AUSGABE 3

PK 80391



⚠️ WARNUNG

FEHLERHAFTER EINBAU

- Dieses Produkt wurde gemäß den technischen Anforderungen von EN 954 Kategorie III und ANSI B11.19-1990 entwickelt. Um diesen Anforderungen zu entsprechen, MÜSSEN 50FY41 Sensoren mit dem Sicherheitsverstärker FYQLA1-140R-3 betrieben werden.
- Beraten Sie sich mit den zuständigen Sicherheitsbehörden beim Entwurf von Verbindungen zu Maschinensteuerungen, Schnittstellen und sämtlichen Steuerelementen, welche die Sicherheit betreffen.
- Halten Sie sich genau an alle Einbau-Anweisungen.

Mißachtung dieser Anweisungen kann zu schweren Verletzungen oder zum Tod führen.

ALLGEMEINE INFORMATIONEN

Das Halleffekt-Türverriegelungssystem der Serie 50FY ist ein kontaktfreies, magnetisch betätigtes System und besteht aus folgenden drei Geräten: Sensor, Magnetbetätiger und Sicherheitsverstärker.

Der Sensor enthält zwei eingebaute Halleffekt-Schaltkreise, die unabhängig voneinander angeschlossen sind. Beide Schaltkreise müssen gleichzeitig einschalten, um ein Ausgangssignal zu erzeugen.

Der Magnetbetätiger hat ein kodiertes Magnetfeld, das zum Sensor passen muß, um einwandfrei zu funktionieren. Wenn der Sensor diesem kodierten Magnetfeld ausgesetzt und richtig ausgerichtet ist, reagiert er mit einem Ausgangssignal.

Der Sicherheitsverstärker enthält eine Steckkarte mit Logikeingängen und steuert einen Relaisausgang. Die Eingangsschaltung ist für bis zu sechs Sensoren ausgelegt. Wenn alle angeschlossenen Sensoren betätigt werden, schließt die Logikschaltung die Relaiskontakte. Wenn einer der angeschlossenen Sensoren abschaltet, öffnet die Logikschaltung die Relaiskontakte.

EINBAU-ANWEISUNGEN

Schritt 1 - Sensor 50FY montieren und ausrichten:

⚠️ WARNUNG

FEHLERHAFTE AUSRICHTUNG

Für einen einwandfreien Betrieb müssen Sensor und Magnetbetätiger einander gegenüberliegen und richtig ausgerichtet sein. Ein Trennungsabstand von 10 mm bewirkt unabhängig vom Versatz den AUS-Zustand.

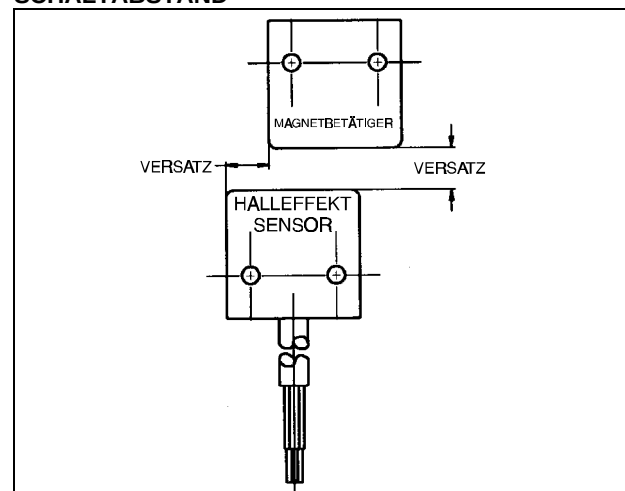
Mißachtung dieser Anweisungen kann zu schweren Verletzungen oder zum Tod führen.

- Sensor und Magnetbetätiger einbauen und innerhalb des zulässigen Versatzes ausrichten (siehe Einbaumaße, Nennschaltabstand und Versatz in Abhängigkeit vom Schaltabstand).

NENN SCHALTABSTAND in mm

Versatz	Schaltabstand
Null	2,5 (0.100)
3,8 (0.150)	1,3 (0.050)
7,5 (0.300)	Null

VERSATZ IN ABHÄNGIGKEIT VOM SCHALTABSTAND



EINBAUMASSE - nur als Richtwerte

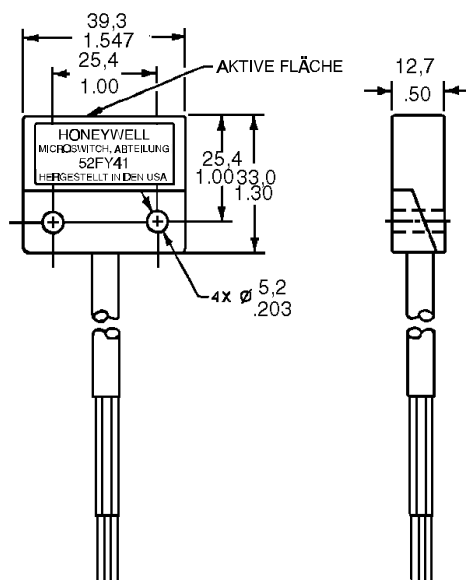
Magnetbetätiger - 52FY31 (mm)

Technical drawing of a Honeywell microswitch assembly. The drawing includes a front view and a side view. The front view shows a rectangular component with a label that reads "HONEYWELL MICROSWITCH, ABTEILUNG 52FY31 HERGESTELLT IN DEN USA". The label is mounted on a base. The base has two circular terminals, one with a minus sign (-) and one with a plus sign (+). Dimensions for the front view include: overall width 39.3, overall height 33.0, label width 1.00, label height 25.4, and terminal spacing 25.4. The side view shows the component's profile with a height of 12.7 and a base width of 0.50. A dimension of 5.1 is shown for the terminal spacing. The drawing is labeled "AKTIVE FLÄCHE" (Active Area) with arrows pointing to the label and the terminal area.

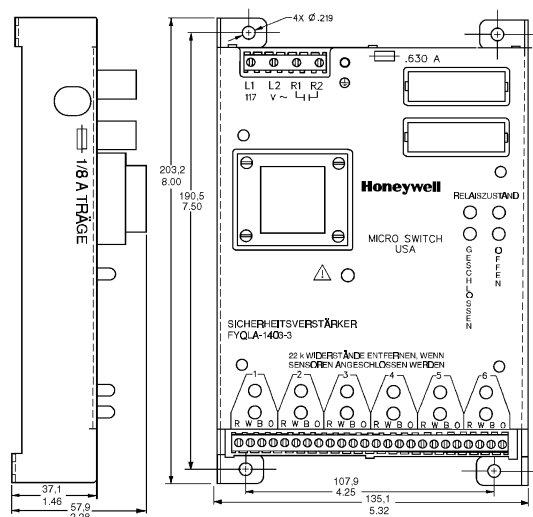
Mißachtung dieser Anweisungen führt zur Produktbeschädigung.

- Den Verstärker (siehe Einbaumaße) entsprechend den Anforderungen in einem gemäß NEMA abgedichteten Gehäuse einbauen.

Halleffektsensor - 50FY41



Sicherheitsverstärker - FYQLA-140R-3



Schritt 3 - Sensoren an Sicherheitsverstärker anschließen:

HINWEIS

- Alte Komponenten-Ausführungen (Verstärker FYQLA-140R-1 und Sensor, 50FY40) können nicht bestellt werden. Zu Wartungszwecken dürfen jedoch neue Komponenten (Verstärker FYQLA-140R-3 und Sensor, 50FY41) in alten Anlagen verwendet werden (siehe Einbau-Warnung).
- Die 52FY30 Magnetbetätiger können mit 50FY41 Sensoren arbeiten. In diesem Fall nimmt jedoch der Schaltabstand zu.

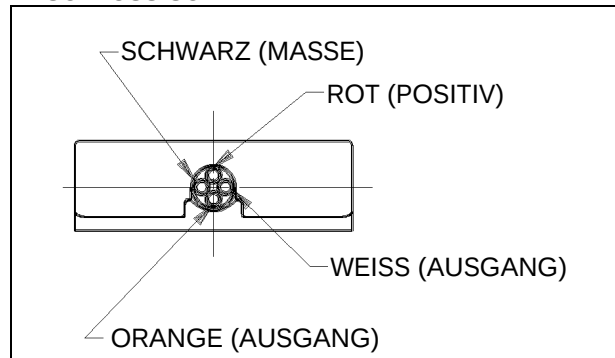
a. 50FY4 Sensor (neu) mit FYQLA1-140R-3 Verstärker (neu)

- Schließen Sie jeden einzelnen Sensor (siehe Anschlußschaltbild) über seine vier Anschlußdrähte wie folgt an den Sicherheitsverstärker an:

FYQLA1-140R-3 (neu)	50FY41 (neu)
R (positiv)	ROT - positiv
W (Schließer)	WEISS - Ausgang
B (negativ)	SCHWARZ - Masse
O (Öffner)	ORANGE - Ausgang

- Stromversorgungs- und Sensoranschlüsse sichern, indem man die Klemmschrauben mit 0,56 Nm festzieht.

ANSCHLUSS-SCHALTBIKD



- Wenn weniger als sechs Sensoren am Sicherheitsverstärker angeschlossen sind, für jeden fehlenden Sensor zwei 22-kΩ-Widerstände folgendermaßen an jedes nicht verwendete Anschluß-Paar des Sicherheitsverstärkers anschließen:

Sicherheitsverstärker-Anschlüsse	Widerstand*
R - W	22 kΩ Widerstand
B - O	22 kΩ Widerstand

*Die Widerstände sind für den einwandfreien Betrieb des Sicherheitsverstärkers erforderlich. Jedes System der Serie 50FY wird mit zehn 22 kΩ Widerständen geliefert.

⚠ WARNUNG

FEHLERHAFTER EINBAU

- Dieses Produkt wurde gemäß den technischen Anforderungen von EN 954 Kategorie III und ANSI B11.19-1990 entwickelt. Um diesen Anforderungen zu entsprechen, MÜSSEN 50FY41 Sensoren mit dem Sicherheitsverstärker FYQLA1-140R-3 betrieben werden.
 - Halten Sie sich genau an alle Einbau-Anweisungen.
- Mißachtung dieser Anweisungen kann zu schweren Verletzungen oder zum Tod führen.**

b. 50FY4 Sensor (neu) mit FYQLA1-140R-1 Verstärker (alt)

- Den ORANGEFARBENEN Anschlußdraht des Sensors abschneiden und entfernen.
- Die ROTEN, WEISSEN und SCHWARZEN Sensor-Anschlußdrähte folgendermaßen an die Sicherheitsverstärker-Anschlüsse anschließen:

FYQLA1-140R-1 (alt)	50FY41 (neu)
R (positiv)	ROT - positiv
W (Schließer)	WEISS - Ausgang
B (negativ)	SCHWARZ - Masse
	ORANGE ENTFERNT

- Stromversorgungs- und Sensoranschlüsse sichern, indem man die Klemmschrauben mit 0,56 Nm festzieht.

c. 50FY40 Sensor (alt) mit FYQLA1-140R-3 Verstärker (neu)

- Die ROTEN, WEISSEN und SCHWARZEN Sensor-Anschlußdrähte folgendermaßen an die Sicherheitsverstärker-Anschlüsse anschließen:

FYQLA1-140R-3 (neu)	50FY40 (alt)
R (positiv)	ROT - positiv
W (Schließer)	WEISS - Ausgang
B (negativ)	SCHWARZ - Masse
O (Öffner)	KEIN ORANGEFARBENER DRAHT

- Einen 22 kΩ Widerstand am SCHWARZEN und ORANGEFARBENEN Anschluß des Sicherheitsverstärkers anschließen.
- Stromversorgungs- und Sensoranschlüsse sichern, indem man die Klemmschrauben mit 0,56 Nm festzieht.

Besondere Anweisungen zu 50FY40 Sensoren, die mit dem FYQLA1-140R-3 Verstärker betrieben werden

Wenn die Tür länger als einer Sekunde geöffnet ist, und der Verstärker EINGeschaltet ist, blinkt die LED-WARNANZEIGE. Um zum grünen Zustand zurückzukehren, schließen Sie die Tür(en), schalten die Verstärker-Spannung AUS und dann wieder EIN (Rückstellung durch Einschalten).

Schritt 4 - Sicherheitsverstärker wie folgt anschließen:

- 100 bis 128 V~ an die Sicherheitsverstärker-Anschlüsse L1 und L2 anschließen.
- Last an die Relaiskontakt-Anschlüsse R1 und R2 des Sicherheitsverstärkers anschließen.

Schritt 5 - Fehlerbehebung durchführen, falls erforderlich: (siehe Anzeigen des Sicherheitsverstärkers)



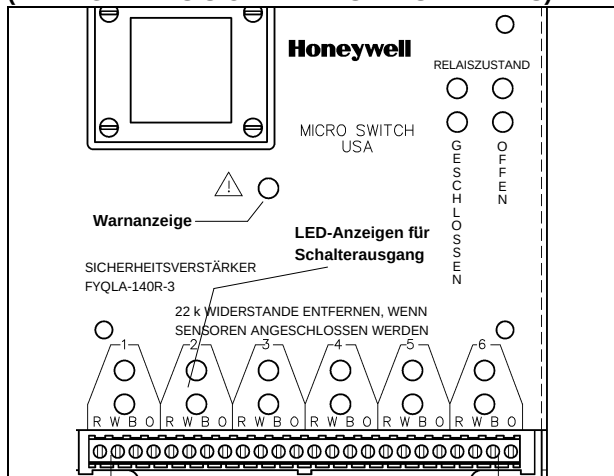
WARNUNG

FEHLERHAFTES SYSTEMLEISTUNG

GERÄT NICHT BETREIBEN, wenn die rote LED-WARNANZEIGE am Sicherheitsverstärker blinkt.

Mißachtung dieser Anweisungen kann zu schweren Verletzungen oder zum Tod führen.

(ANZEIGEN DES SICHERHEITSVERSTÄRKERS)



1. Wenn das System der Serie 50FY in Betrieb zu sein scheint, die LED-WARNANZEIGE jedoch blinkt, wie folgt vorgehen:
 - Sicherstellen, daß die Sensoren am Sicherheitsverstärker richtig angeschlossen sind.
 - Sicherstellen, daß die 22 kΩ Widerstände an der jeweils richtigen Position am Sicherheitsverstärker eingebaut sind.
 - Die Sensoren von Hand betätigen und sicherstellen, daß die entsprechenden roten LEDs für die SCHALTERAUSGÄNGE über den Sicherheitsverstärker-Anschlüssen erlöschen.
 - Sicherstellen, daß die Sensoren und Magnetbetätiger ausgerichtet sind und sich innerhalb des vorgegebenen Schaltabstands befinden.
 - Den Verstärker AUSschalten und warten, bis die LED-WARNANZEIGE vollständig ERLOSCHEN ist, dann die Verstärker-Spannung wieder EINSchalten (Rückstellung durch Einschalten).
 - Falls die rote LED-WARNANZEIGE immer noch blinkt, den Sicherheitsverstärker abtrennen und sich mit dem MICRO SWITCH-Anwendungszentrum (1-800-537-6945) in Verbindung setzen.

2. Wenn das System der Serie 50FY nicht in Betrieb ist, und die LED-WARNANZEIGE nicht leuchtet, wie folgt vorgehen:

- Sicherstellen, daß die richtigen Sicherungen eingebaut und nicht durchgebrannt sind (0,630 A und 1/8 A träge Sicherungen).
- Sicherstellen, daß die Sensoren und der Sicherheitsverstärker richtig angeschlossen sind.
- Sicherstellen, daß die 22 kΩ Widerstände an der jeweils richtigen Position am Sicherheitsverstärker eingebaut sind.
- Sicherstellen, daß die Sensoren und Magnetbetätiger ausgerichtet sind und sich innerhalb des vorgegebenen Schaltabstands befinden.
- Schalten Sie aus und wieder ein (Rückstellung durch Einschalten).
- Wenn das System der Serie 50FY noch immer AUSgeschaltet ist, den Sicherheitsverstärker abtrennen und an Honeywell zurücksenden.

Schritt 6 - Funktionsprüfungen folgendermaßen durchführen: (siehe Anzeigen des Sicherheitsverstärkers)

1. Wenn die Serie 50FY in Betrieb ist und die rote LED-WARNANZEIGE nicht leuchtet, wie folgt vorgehen:
 - Wenn irgendein oder alle Sensoren nicht betätigt sind, darauf achten, daß über den Sicherheitsverstärker-Anschlüssen die entsprechende LED für den SCHALTERAUSGANG jedes einzelnen Sensors aufleuchtet. Ebenfalls darauf achten, daß die roten LEDs für OFFENEN RELAISZUSTAND aufleuchten (Sicherheitsverstärker-Kontakte sind offen).
 - Jeden Sensor einzeln betätigen und darauf achten, daß die rote SCHALTERAUSGANGS-LED erlischt.
 - Darauf achten, daß die roten LEDs für OFFENEN RELAISZUSTAND nicht aufleuchten, wenn alle zwölf roten SCHALTERAUSGANGS-LEDs ERLOSCHEN sind (alle Sensoren sind betätigt). Ebenfalls darauf achten, daß die grünen LEDs für GESCHLOSSENEN RELAISZUSTAND aufleuchten (Sicherheitsverstärker-Kontakte sind geschlossen).
 - Wenn sich das System der Serie 50FY wie oben beschrieben (Schritt 3) verhält, arbeitet es ordnungsgemäß.

TECHNISCHE DATEN

FYQLA-140R-3 Sicherheitsverstärker

Eingangsspannung	100...128 V~, 50...60 Hz
Leistungsaufnahme	3,0 VA max.
Temperaturbereich	-40 to +70°C (-40 to +158°F)
Ausgangsrelais	Kontaktbelastbarkeit: 5 A/120 V~ Schaltfunktion: einpoliger Schließer; Sicherheitsrelais mit zwangsgeführten Kontakten, zwei in Serie geschaltete Relais, nur ein Ausgang; elektrische Lebensdauer: 100.000 Schaltspiele bei voller Last
*Schutzart	Sicherheitsverstärker muß sich in einem nach NEMA abgedichteten Gehäuse befinden.

50FY41 Halleffektsensor

Spannung	10...12 V–
Laststrom (intern begrenzt)	0,50 mA max.
Stromaufnahme	20 mA
Temperaturbereich	-40 bis +85 °C
Schutzart	NEMA 1, 3, 4, 6P, 12, 13 und **Abspritztest Die Einheiten vertragen wiederholtes Abspritzen mit Lauge, Dampfreinigung, Lebensmittel, Säfte und Zellstoff.

***Schutzart:** Die Gehäuse richten sich nach den ausführlichen Definitionen der NEMA-Vorschriften. Daher liegt es beim Kunden, zu ermitteln, ob ein bestimmtes Gehäuse einem bestimmten Zustand in einer Anwendung ausgesetzt werden kann. Wenn nicht anders angegeben, basieren alle Verweise auf Produkte in Verbindung mit NEMA-Gehäusetypen lediglich auf Auswertungen durch MICRO SWITCH.

****Abspritztest:** Die MICRO SWITCH-Prüfbedingungen 060.167, Ausgabe 2, Abschnitt 4.9 schreiben die Prüfbedingungen für chemisches Abspülen unter Hochdruck (83 bar) und Hochtemperatur (+60 °C) vor. In diesem Test werden Reinigungsverfahren simuliert, die in Industrieanlagen für Lebensmittel und Getränke angewandt werden und strengeren Bedingungen unterliegen als das Abspritzen gemäß der NEMA 4 Vorschrift. Eine Beschreibung des Abspritztests kann angefordert werden.

HINWEIS

Dieses Produkt entspricht den technischen Anforderungen von EN 60 730-2-1 für Sensorsteuerungen mit eingebauter Elektronik (für Anlagen der Klasse I) mit Schaltfunktion des Typs 2 und 2B für Dauerbetrieb bei normaler Umweltverschmutzung.

GARANTIE UND HAFTUNGSANSPRÜCHE

Honeywell garantiert für seine hergestellten Produkte fehlerfreies Material und Qualitätsarbeit. Garantie-Informationen erhalten Sie von Ihrer nächstgelegenen Niederlassung. Wenn Produkte mit Garantie innerhalb der Garantifrist an Honeywell zurückgesendet werden, ersetzt oder repariert Honeywell kostenlos die Teile, die als fehlerhaft angesehen werden. Das Vorangegangene gilt als einzige Entschädigung des Käufers und **ersetzt alle anderen ausdrücklichen oder stillschweigenden Garantien, einschließlich Qualitäts- und Sachmängelhaftung.**

Obwohl Honeywell persönliche und schriftliche Anwendungshilfe bietet, muß der Kunde selbst entscheiden, ob das Produkt sich für die entsprechende Anwendung eignet.

Änderungen der technischen Daten sind vorbehalten. Die von uns bereitgestellten Informationen halten wir für exakt und zuverlässig, wie bei dieser Druckschrift. Wir übernehmen jedoch keine Haftung für deren Anwendung.

VERTRIEB UND SERVICE

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+ (33) (0) 4 76 41 72 56 Frankreich
1-815-235-6545 USA

INTERNET

<http://www.honeywell.com/sensing/>
info@micro.honeywell.com

BESTELLANGABEN

Bestellnummer	Beschreibung
50FY41-6	Sensor, 2 Meter Anschlußdrähte, Schließer
50FY41-12	Sensor, 4 Meter Anschlußdrähte
50FY41-50	Sensor, 15 Meter Anschlußdrähte
52FY31	Magnetbetätiger
FYQLA1-140R-3	Sicherheitsverstärker, Schnittstelle mit ein bis sechs Sensoren

Honeywell

MICRO SWITCH

Honeywell Inc.
11 West Spring Street
Freeport, Illinois 61032



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European Safety Center

Honeywell - Cométa

21, Chemin du Vieux Chêne
38243 Meylan Cedex - FRANKREICH

Istruzioni per l'installazione del sistema di interruzione porte ad effetto "hall" Serie 50FY, Categoria III EN954

EDIZIONE 3

PK 80391



⚠ ATTENZIONE

INSTALLAZIONE INADEGUATA

- Questo prodotto è stato studiato per rispettare le caratteristiche tecniche EN954 Categoria III e ANSI B11.19-1990. Per garantire la conformità a tali caratteristiche, È NECESSARIO che i sensori 50FY41 vengano utilizzati con l'amplificatore della logica FYQLA1-140R-3.
- Consultare l'agenzia locale per l'antinfornistica e le sue normative all'atto della progettazione di un collegamento controllo macchina, di un'interfaccia e di tutti gli elementi di controllo che possano influire sulla sicurezza.
- Rispettare attentamente tutte le istruzioni per l'installazione.

Il mancato rispetto di queste istruzioni potrebbe provocare la morte o gravi danni.

NOTE GENERALI

Il sistema di interruzione porte ad effetto "hall" serie 50FY è un sistema ad attivazione magnetica, senza contatto, composto da tre dispositivi: un sensore, un attuatore a magnete ed un amplificatore della logica.

Il sensore contiene due circuiti integrati ad effetto "hall" che sono collegati indipendentemente. È necessario che entrambi i circuiti vengano accesi contemporaneamente onde poter produrre un risultato.

L'attuatore a magnete presenta un campo magnetico codificato che per funzionare correttamente deve corrispondere al sensore. Quando il sensore viene esposto a questo campo magnetico codificato ed è correttamente allineato, risponde con un risultato.

L'amplificatore della logica contiene una scheda logica del circuito di alimentazione e controlla un'uscita a relè. Il circuito di alimentazione accetta fino a sei sensori. Quando tutti i sensori collegati sono stati azionati, il circuito logico chiuderà i contatti a relè. Se uno dei sensori collegati è stato spento, il circuito della logica aprirà i contatti a relè.

ISTRUZIONI PER L'INSTALLAZIONE

Fase 1 - Montare ed allineare i sensori 50FY come segue:

⚠ ATTENZIONE

ALLINEAMENTO INADEGUATO

Accertarsi che l'allineamento del sensore e dell'attuatore a magnete siano uno di fronte all'altro e che siano allineati per garantire un funzionamento corretto. Una distanza di separazione di 10 mm (0.39 in) provocherà una condizione di OFF (Spegnimento), indipendentemente dalla distanza di derivazione.

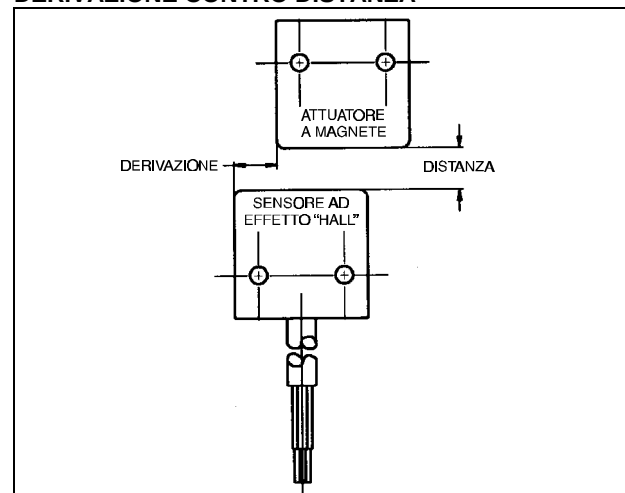
Il mancato rispetto di queste istruzioni potrebbe provocare la morte o gravi danni.

- Montare ed allineare il sensore e l'attuatore a magnete (vedi le dimensioni di montaggio, la distanza di rilevamento nominale e la derivazione rispetto alla distanza) entro i limiti di derivazione consentiti.

DISTANZA DI RILEVAMENTO NOMINALE mm (in)

Derivazione	Distanza
Zero	2,5 (0.100)
3,8 (0.150)	1,3 (0.050)
7,5 (0.300)	Zero

DERIVAZIONE CONTRO DISTANZA



Fase 2 - Montare gli amplificatori della logica FYQLA1 come segue:

⚠ ATTENZIONE

DANNI ALL'AMPLIFICATORE DELLA LOGICA

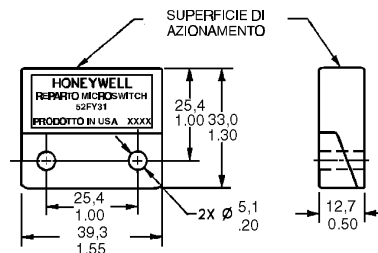
Per evitare danni all'amplificatore della logica, è necessario installarlo in un alloggiamento a tenuta NEMA come specificato dalla normativa EN60730-2-1.

Il mancato rispetto di queste istruzioni potrebbe provocare danni al prodotto.

- Montare l'amplificatore (vedi dimensioni di montaggio) in un alloggiamento a tenuta NEMA, come richiesto.

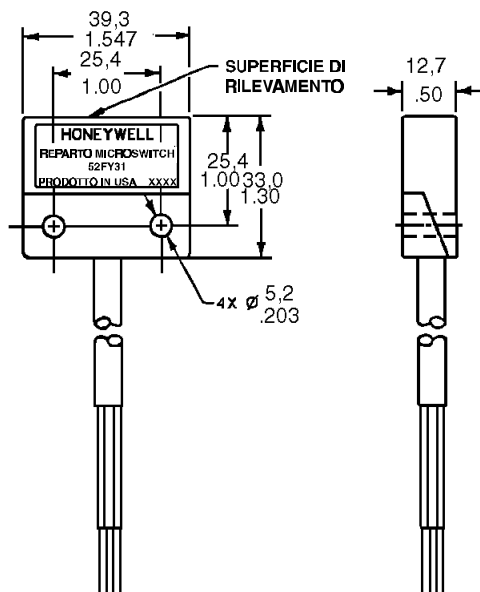
DIMENSIONI DI MONTAGGIO - (misure di riferimento)

Attuatore a magnete - 52FY31 (mm/in)

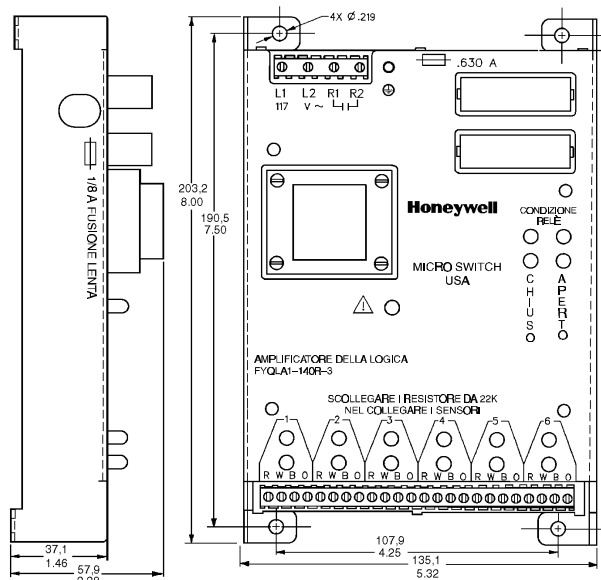


DIMENSIONI DI MONTAGGIO - (misure di riferimento) (mm/in)

Sensore ad effetto "hall" - 50FY41



Amplificatore della logica - FYQLA1-140R-3



Fase 3 - Collegare i sensori agli amplificatori della logica come segue:

AVVISO

- Non è possibile ordinare le precedenti versioni dei componenti (amplificatore, FYQLA-140R-1 e sensore, 50FY40). Tuttavia, per motivi di manutenzione, è possibile usare i nuovi componenti (amplificatore FYQLA-140R-3 e sensore, 50FY41) nelle precedenti installazioni (vedi avvertenza installazione).
- Gli attuatori a magnete funzioneranno con sensori 50FY41, però la distanza di rilevamento aumenterà.

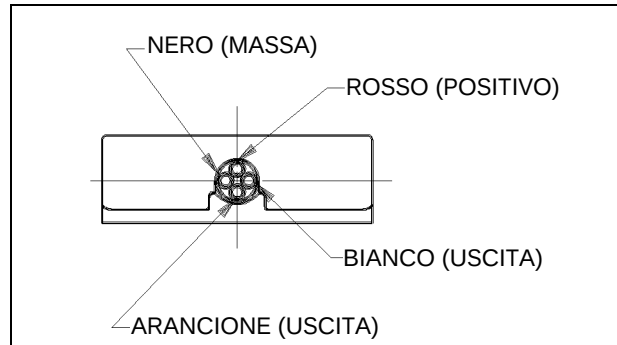
a. Sensore 50FY41 (nuovo) con amplificatore FYQLA1-140R-3 (nuovo)

- Collegare ogni sensore (Vedi Schema di cablaggio) tramite i suoi quattro conduttori isolati, come una serie, all'amplificatore della logica, come segue:

FYQLA1-140R-3 (nuovo)	50FY41 (nuovo)
R (positivo)	ROSSO - positivo
W (normalmente aperto)	BIANCO - uscita
B (negativo)	NERO - massa
O (normalmente chiuso)	ARANCIONE - uscita

- Per fissare i conduttori di alimentazione e del sensore, rispettare una coppia di serraggio di 0,56 Nm (5.0 in.-lb.).

SCHEMA DI CABLAGGIO



- Se all'amplificatore della logica sono collegati meno di sei sensori, installare due resistori da 22 KΩ attraverso ogni serie terminale di amplificatore della logica non utilizzata, come segue:

Terminali dell'amplificatore della logica	Resistore*
R - W	Resistore da 22 KΩ
B - O	Resistore da 22 KΩ

*I resistori sono necessari per il corretto funzionamento dell'amplificatore della logica. Con ogni sistema Serie 50FY sono in dotazione dieci resistori da 22 KΩ.

⚠ ATTENZIONE

INSTALLAZIONE INADEGUATA

- Questo prodotto è stato studiato per rispettare le caratteristiche tecniche EN954 Categoria III e ANSI B11.19-1990. Per garantire la conformità a tali caratteristiche, È NECESSARIO che i sensori 50FY41 vengano utilizzati con l'amplificatore della logica FYQLA1-140R-3.
- Rispettare attentamente tutte le istruzioni per l'installazione.

Il mancato rispetto di queste istruzioni potrebbe provocare la morte o gravi danni.

b. Sensore 50FY41 (nuovo) con amplificatore FYQLA1-140R-1 (precedente)

- Tagliare e rimuovere il filo conduttore del sensore ARANCIONE.
- Collegare i fili conduttori del sensore ROSSI, BIANCHI e NERI che portano ai terminali dell'amplificatore della logica, come segue :

FYQLA1-140R-1 (precedente)	50FY41 (nuovo)
R (positivo)	ROSSO - positivo
W (normalmente aperto)	BIANCO - uscita
B (negativo)	NERO - massa
	ARANCIONE RIMOSSO

- Per fissare i conduttori di alimentazione e del sensore, rispettare una coppia di serraggio di 0,56 Nm (5.0 in.-lb.).

c. Sensore 50FY41 (precedente) con amplificatore FYQLA1-140R-3 (nuovo)

- Collegare i fili conduttori del sensore ROSSI, BIANCHI e NERI che portano all'amplificatore della logica, come segue:

FYQLA1-140R-3 (nuovo)	50FY40 (precedente)
R (positivo)	ROSSO - positivo
W (normalmente aperto)	BIANCO - uscita
B (negativo)	NERO - massa
O (normalmente chiuso)	CONDUTTORE ARANCIONE ASSENTE

- Installare un resistore da 22 KΩ tra i terminali dell'amplificatore della logica NERO e ARANCIONE.
- Per fissare i conduttori di alimentazione e del sensore, rispettare una coppia di serraggio di 0,56 Nm (5.0 in.-lb.).

Istruzioni speciali per sensori 50FY40 usati con amplificatori FYQLA1-140R-3

Se la porta resta aperta per più di un secondo e l'alimentazione all'amplificatore è attiva (ON), il LED di ALLARME lampeggerà. Per tornare alla condizione normale (verde) chiudere la(e) porta(e), interrompere l'erogazione di tensione all'amplificatore (OFF) ed attendere finché il LED di ALLARME non si spenga completamente, poi accendere l'amplificatore (ON) (ripristino alimentazione).

Fase 4 - Collegare gli amplificatori della logica come segue :

- Connettere da 100 a 128 V c.a. ai terminali dell'amplificatore della logica L1 ed L2.
- Connettere il carico ai terminali del contatto del relè dell'amplificatore della logica R1 ed R2.

Fase 5 - Eseguire la procedura di diagnostica come richiesto : (vedi indicatori dell'amplificatore della logica)

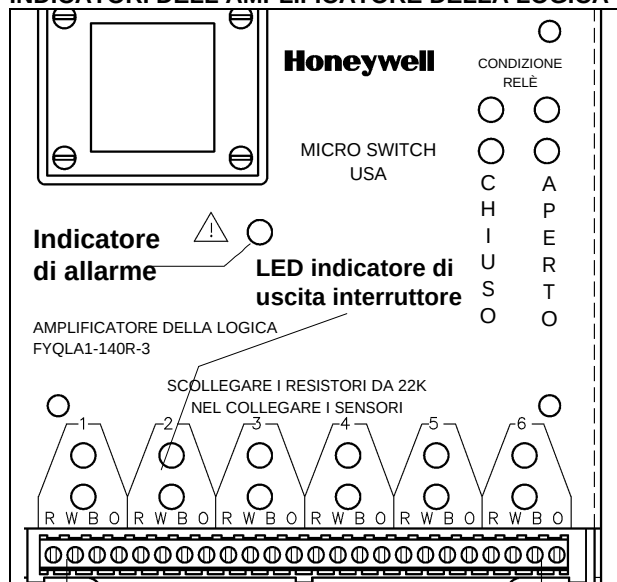
⚠ ATTENZIONE

ERRATO FUNZIONAMENTO DI SISTEMA

Se il LED rosso di ALLARME, posto sull'amplificatore della logica, lampeggia, NON METTERE IN FUNZIONE IL SISTEMA.

Il mancato rispetto di queste istruzioni potrebbe provocare la morte o gravi danni.

INDICATORI DELL'AMPLIFICATORE DELLA LOGICA



1. Se il sistema Serie 50FY sembra funzionare, ma il LED di ALLARME rosso lampeggia, fare quanto segue:
 - Accertarsi che i sensori siano collegati correttamente all'amplificatore della logica.
 - Accertarsi che i resistori da 22 K Ω siano installati nei rispettivi alloggiamenti sull'amplificatore della logica.
 - Attivare a mano i sensori ed accertarsi che i corrispondenti LED rossi di ALIMENTAZIONE sull'amplificatore della logica siano spenti.

- Accertarsi che i sensori e gli attuatori a magnete siano allineati ed entro i limiti della distanza di rilevamento specificati.
 - INTERROMPERE l'erogazione di tensione all'amplificatore (OFF) ed attendere finché il LED di ALLARME non si spenga completamente, poi accendere l'amplificatore (ON) (ripristino alimentazione).
 - Se il LED rosso di ALLARME lampeggia ancora, scollegare l'amplificatore della logica e telefonare al Centro Applicativo MICRO SWITCH (+1-800-537-6945).
2. Se il sistema Serie 50FY non funziona ed il LED rosso di ALLARME non lampeggia, fare quanto segue:
 - Accertarsi che i fusibili installati siano debitamente tarati e non bruciati (0.630A e 1/8A fusione lenta).
 - Accertarsi che i sensori e l'amplificatore della logica siano collegati correttamente.
 - Accertarsi che i resistori da 22 K Ω siano installati nei rispettivi alloggiamenti sull'amplificatore della logica.
 - Accertarsi che i sensori e gli attuatori a magnete siano allineati ed entro i limiti della distanza di rilevamento specificati.
 - Interrompere e ripristinare l'alimentazione (ripristino alimentazione)
 - Se il sistema Serie 50FY è ancora spento (OFF), scollegare l'amplificatore della logica e restituirlo alla Honeywell.

Fase 6 - Eseguire un controllo funzionale come segue: (vedi indicatori dell'amplificatore della logica)

1. Se la Serie 50FY funziona ed il LED rosso di ALLARME non lampeggia, fare quanto segue:
 - Se uno o tutti i sensori non sono stati azionati, osservare i corrispondenti LED rossi di ALIMENTAZIONE sui terminali dell'amplificatore della logica per verificare che ogni sensore sia acceso. Osservare, inoltre, che i LED rossi di ALLARME RELÈ APERTO siano illuminati (i contatti dell'amplificatore della logica sono aperti).
 - Attivare ogni sensore ed accertarsi che il corrispondente LED rosso di ALIMENTAZIONE si spenga.
 - Se i dodici LED di ALIMENTAZIONE sono spenti (tutti i sensori sono stati azionati), verificare che i LED rossi di ALLARME RELÈ APERTO NON siano illuminati. Osservare, inoltre, che i LED verdi di RELÈ CHIUSO siano illuminati (i contatti dell'amplificatore della logica sono chiusi).
 - Se la Serie 50FY si comporta come indicato precedentemente (fase 3), il sistema sta funzionando correttamente.

DATI TECNICI

Amplificatore della logica FYQLA1-140R-3

Tensione di alimentazione	100 - 128 V c.a., 50-60 Hz
Dissipazione di alimentazione	3.0 VA max.
Intervallo di temperatura	da -40°C a +70°C (da -40 a +158°F)
Relè uscita	Potenza nominale di contatto: 5 A @ 120 V c.a. Azione: unipolare, inserimento unico, N.A., relè di sicurezza a guida positiva, relè doppi collegati in serie, uscita singola; Durata elettrica : 100.000 funzionamenti @ pieno carico
*Tenuta	L'amplificatore della logica deve trovarsi in un alloggiamento a tenuta NEMA.

Sensore ad effetto "hall" 50FY41

Tensione	10 - 12 V c.c.
Corrente di carico (limitata internamente)	0.50 mA, max.
Consumo di corrente	20 mA
Intervallo di temperatura	da -40°C a +85°C (da -40 a +185°F)
Tenuta	NEMA 1, 3, 4, 6P, 12, 13 e **prova di lavaggio Le unità sono resistenti a prove di lavaggio ripetute con soluzioni caustiche, pulizia a vapore, cibo, succhi e polpa.

***Tenuta:** Gli alloggiamenti si basano sulle definizioni orientative delineate dalle normative NEMA. Pertanto, il cliente dovrà determinare l'adeguatezza di un particolare alloggiamento quando esposto a condizioni specifiche per un'applicazione. Se non diversamente specificato, tutti i riferimenti a prodotti relativi ai tipi di alloggiamenti NEMA si basano esclusivamente su valutazioni della MICRO SWITCH.

****Prova di lavaggio:** I dati tecnici prove MICRO SWITCH 060.167, Edizione 2, Paragrafo 4.9 costituiscono l'insieme dei dati tecnici relativi alla prova per una prova chimica ad alta pressione (1200 psi) e ad alta temperatura (140°F/+60°C). Questa prova rappresenta le procedure di pulizia usate in impianti per la lavorazione di cibo e bevande che sono più severe rispetto al lavaggio a getto d'acqua della normativa NEMA 4. Una descrizione dei dati tecnici relativi al lavaggio a getto d'acqua è disponibile a richiesta.

AVVISO

Questo prodotto è conforme ai requisiti tecnici della EN60730-2-1 per un controllo di rilevamento elettronico (per apparecchiatura di Classe I) con azione di tipo 2 e 2B per il funzionamento in condizioni di inquinamento normale.

GARANZIA E RIMBORSO

Honeywell garantisce i propri prodotti, essere privi di materiali difettosi ed errori di manodopera. Per ulteriori informazioni sulla garanzia, contattare il proprio ufficio vendite. Nel caso di materiali in garanzia da restituire alla Honeywell, quest'ultima provvederà a proprie spese, alla riparazione o sostituzione dei materiali trovati difettosi. Il succitato costituisce l'unico rimborso spettante al compratore **e sostituisce tutte le altre garanzie esplicite od implicite, comprese quella di commerciabilità e di idoneità ad un uso particolare.**

Benché la Honeywell fornisca assistenza applicativa, attraverso il proprio personale ed il materiale informativo, è responsabilità del cliente verificare l'idoneità del prodotto nell'applicazione

I dati tecnici possono essere modificati in qualunque momento senza preavviso. Le informazioni fornite sono ritenute essere accurate ed affidabili. La Honeywell non si assume però, alcuna responsabilità per il loro uso.

VENDITA ED ASSISTENZA

Per assistenza applicativa, dati tecnici attuali, prezzi o nominativi del distributore autorizzato più vicino, contattare l'ufficio vendite di zona oppure telefonare:

TELEFONO

Tel.: +1-800-737-3360 (Canada)
+33 (0) 4 76 41 7200 Francia
+49 (0) 69 8064 444 Germania
Tel.: +1-815-235-6847 (Internazionale)
+44 (0) 161 251 4079 Regno Unito
Tel.: +1-800-537-6945 (USA)

FAX

+ (33) 76 41 72 56 Francia
Tel.: +1-815-235-6545 (USA)

INTERNET

<http://www.honeywell.com/sensing/>
info@micro.honeywell.com

GUIDA ALL'ORDINAZIONE

Codice	Descrizione
50FY41-6	Sensore, fili conduttori da 2 metri (6 ft), normalmente aperto (NA)
50FY41-12	Sensore, fili conduttori da 4 metri (12 ft)
50FY41-50	Sensore, fili conduttori da 15 metri (50 ft)
52FY31	Attuatore a magnete
FYQLA1-140R-3	Amplificatore della logica, interfaccia sensore uno a sei

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38243 Meylan Cedex - FRANCIA

Installatie-instructies voor het Hall-effect deuronderbrekingssysteem van de serie 50FY, EN954 Categorie III

NUMMER 3

PK 80391



⚠ WAARSCHUWING

ONJUISTE INSTALLATIE

- Dit product is ontworpen in overeenstemming met de technische vereisten van EN954 Categorie III en ANSI B11.19-1990. Om te voldoen aan deze vereisten, MOETEN 50FY41 sensors gebruikt worden met de FYQLA1-140R-3 logische versterker.
- Raadpleeg uw plaatselijke veiligheidsinstelling aangaande de vereisten bij het ontwerpen van een machineregelingsverbinding, interface en alle besturingselementen die de veiligheid beïnvloeden.
- Volg alle installatie-instructies nauwkeurig op.

Het niet nakomen van deze instructies kan leiden tot dodelijk of ernstig letsel.

ALGEMEEN

Het Hall-effect deuronderbrekingssysteem van de serie 50FY is een contactloos magnetisch bedieningssysteem dat bestaat uit drie apparaten: een sensor, een magnetische aandrijver en een logische versterker.

De sensor bevat twee Hall-effect geïntegreerde circuits die onafhankelijk zijn aangesloten. Beide circuits moeten tegelijkertijd aangezet worden om uitvoer te produceren.

De magnetische aandrijver heeft een gesleuteld magnetisch veld dat overeen dient te komen met de sensor om juist te kunnen functioneren. Als de sensor blootgesteld wordt aan dit gesleutelde magnetische veld en juist uitgericht is, dan reageert deze met een uitvoer.

De logische versterker bevat een logische invoercircuitkaart en regelt een relaisuitvoer. Het invoercircuit accepteert maximaal zes sensors. Als alle verbonden sensors in werking worden gebracht, zal het logische circuit de relaiscontacten sluiten. Als er verbonden sensors zijn die uit zijn, zal het logische circuit de relaiscontacten openen.

INSTALLATIE-INSTRUCTIES

Stap 1 – Monteer en richt de 50FY als volgt uit:

⚠ WAARSCHUWING

ONJUISTE UITRICHTING

Zorg ervoor dat de sensor en de magnetische aandrijver tegenover elkaar staan en zijn uitgericht om een juiste bediening te waarborgen. Een scheidingsafstand van 10 mm zal voor een UIT-conditie zorgen, niettegenstaande de offsetafstand.

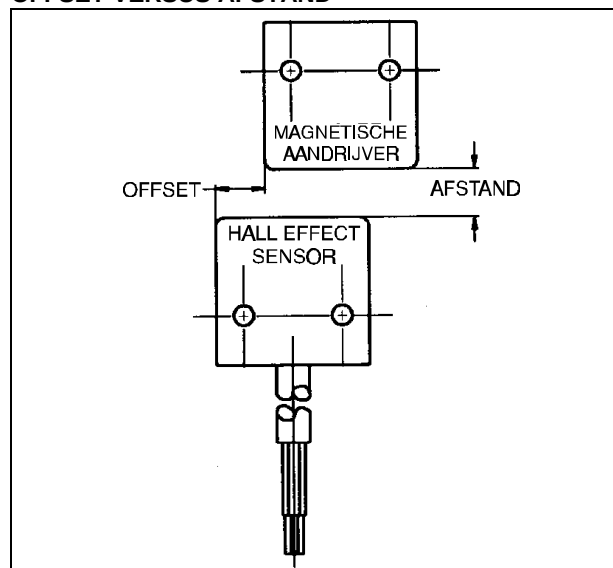
Het niet nakomen van deze instructies kan leiden tot dodelijk of ernstig letsel.

- Monteer en richt de sensor en magnetische aandrijver uit (zie montage-afmetingen, nominale sensingafstand en offset versus afstand) binnen de toegestane offset.

NOMINALE SENSINGAFSTAND mm

Offset	Afstand
Nul	2,5
3,8	1,3
7,5	Nul

OFFSET VERSUS AFSTAND



Stap 2 – Monteer de FYQLA1 logische versterker als volgt:

VOORZICHTIG

SCHADE AAN DE LOGISCHE VERSTERKER

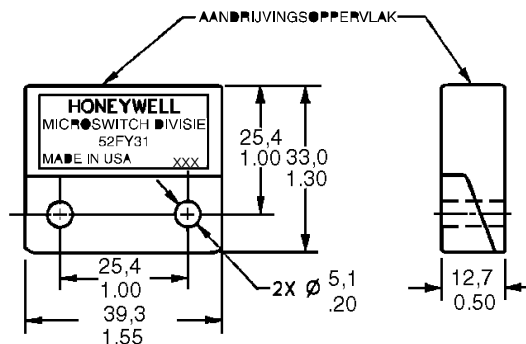
Om schade aan de logische versterker te voorkomen, dient deze geïnstalleerd te worden in een NEMA afgesloten omhulling zoals gespecificeerd door EN60730-2-1.

Het niet nakomen van deze instructies kan leiden tot dodelijk of ernstig letsel.

- Monteer de versterker (zie montage-afmetingen) in een NEMA afgesloten omhulling zoals vereist.

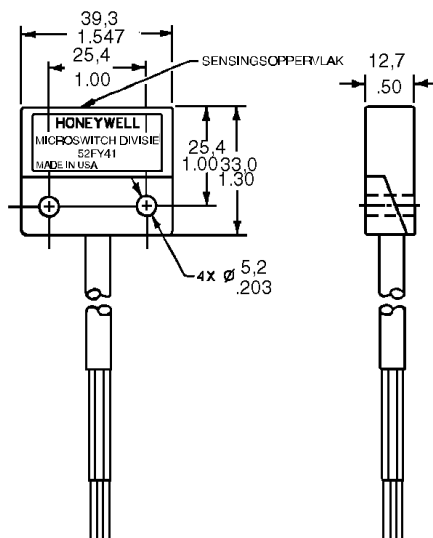
MONTAGE-AFMETINGEN – alleen ter verwijzing

Magnetische aandrijver - 52FY31 (mm)

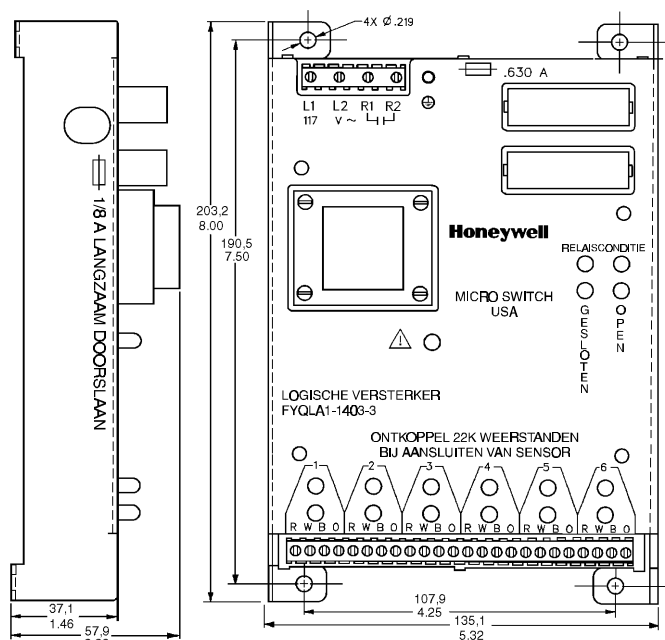


MONTAGE-AFMETINGEN – alleen ter verwijzing (mm)

Hall-effect sensor - 50FY41



Logische versterker - FYQLA1-140R-3



Step 3 – Sluit de draden van de sensors als volgt op de logische versterker aan:

ATTENTIE

- Oude componentversies (versterker, FYQLA-140R-1 en sensor, 50FY40) kunnen niet besteld worden. Voor onderhoudsdoeleinden mogen de nieuwe componenten (versterker, FYQLA-140R-3 en sensor, 50FY41) in een oude installatie worden gebruikt (zie installatie-waarschuwing).
- De 52FY30 magnetische aandrijvers werken met 50FY41 sensors, maar de sensingafstand zal groter worden.

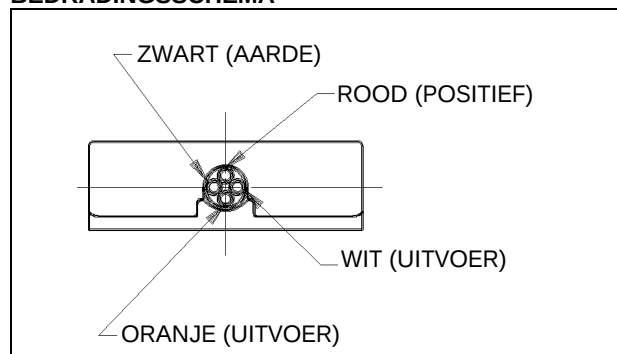
a. 50FY41 sensor (nieuw) met FYQLA1-140R-3 versterker (nieuw)

- Sluit elke sensor via de vier verbindingdraden als volgt als een set aan op de logische versterker (zie bedradingsschema):

FYQLA1-140R-3 (nieuw)	50FY41 (nieuw)
R (positief)	ROOD – positief
W (normaal open)	WIT – uitvoer
Z (negatief)	ZWART – aarde
O (normaal gesloten)	ORANJE - uitvoer

- Om de stroom- en sensordraden goed te bevestigen, dient u de verbindingsschroeven tot 0,56 Nm aan te draaien.

BEDRADINGSSCHEMA



- Als er minder dan zes sensors op de logische versterker worden aangesloten, installeer dan als volgt twee 22 K Ω weerstanden over de set aansluitpunten van elke ongebruikte logische versterker:

Aansluitpunten van logische versterker	Weerstand*
R – W	22 K Ω weerstand
Z - O	22 K Ω weerstand

*De weerstanden zijn noodzakelijk voor de juiste installatie van de logische versterker. Tien 22 K Ω weerstanden worden geleverd bij elk systeem van de 50FY serie.

⚠ WAARSCHUWING

ONJUISTE INSTALLATIE

- Dit product is ontworpen in overeenstemming met de technische vereisten van EN954 Categorie III en ANSI B11.19-1990. Om te voldoen aan deze vereisten, MOETEN 50FY41 sensors gebruikt worden met de FYQLA1-140R-3 logische versterker.
 - Volg alle installatie-instructies nauwkeurig op.
- Het niet nakomen van deze instructies kan leiden tot dodelijk of ernstig letsel.**

b. 50FY41 sensor (nieuw) met FYQLA1-140R-1 versterker (oud)

- Snijd de ORANJE sensor draad door en verwijder hem.
- Sluit de RODE, WITTE en ZWARTE sensordraden als volgt op de aansluitpunten van de logische versterker aan:

FYQLA1-140R-1 (oud)	50FY41 (nieuw)
R (positief)	ROOD – positief
W (normaal open)	WIT – uitvoer
Z (negatief)	ZWART – aarde
	ORANJE VERWIJDERD

- Om de stroom- en sensordraden goed te bevestigen, dient u de verbindingsschroeven tot 0,56 Nm aan te draaien.

c. 50FY40 sensor (oud) met FYQLA1-140R-3 versterker (nieuw)

- Sluit de RODE, WITTE en ZWARTE sensordraden als volgt op de logische versterker aan:

FYQLA1-140R-3 (nieuw)	50FY40 (oud)
R (positief)	ROOD – positief
W (normaal open)	WIT – uitvoer
Z (negatief)	ZWART – aarde
O (normaal gesloten)	GEEN ORANJE DRAAD

- Installeer één 22 K Ω weerstand tussen de ZWARTE en ORANJE aansluitpunten van de logische versterker.
- Om de stroom- en sensordraden goed te bevestigen, dient u de verbindingsschroeven tot 0,56 Nm aan te draaien.

Speciale instructies voor 50FY40 sensors die gebruikt worden met de FYQLA1-140R-3 versterker

Als de deur meer dan een seconde lang open is en de stroom naar de versterker AAN is, dan zal het ATTENTIE-INDICATORLICHTJE oplichten. Om terug te keren naar een groene conditie, dient u de deur(en) te sluiten, de stroom naar de versterker UIT te schakelen en te wachten totdat het ATTENTIE-INDICATORLICHTJE helemaal UIT is. Schakel de stroom naar de versterker vervolgens weer IN (stroom bij opnieuw instellen).

Stap 4 – Sluit de draden op de logische versterker als volgt aan:

- Sluit 100-128 V⁻ op de aansluitpunten L1 en L2 van de logische versterker aan.
- Sluit belasting op de relaiscontacten R1 en R2 van de logische versterker aan.

Stap 5 – Verricht storingsprocedure indien vereist: (zie indicators op logische versterker)



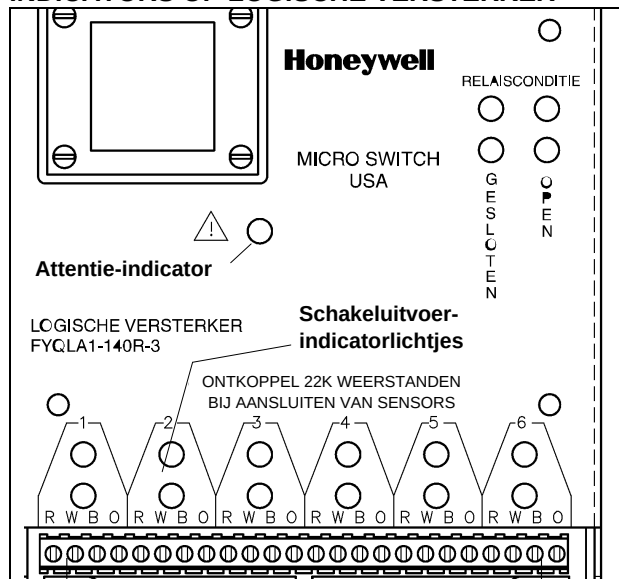
WAARSCHUWING

ONJUISTE SYSTEEMPRESTATIE

Als het rode ATTENTIE-INDICATORLICHTJE op de logische versterker flakkert, DIENT U HET SYSTEEM NIET TE BEDIENEN.

Het niet nakomen van deze instructies kan leiden tot dodelijk of ernstig letsel.

INDICATORS OP LOGISCHE VERSTERKER



1. Als het 50FY serie systeem lijkt te werken, maar het rode ATTENTIE-INDICATORLICHTJE flakkert, doe dan het volgende:
 - Zorg ervoor dat de sensors juist op de logische versterker zijn aangesloten.
 - Zorg ervoor dat de 22 K Ω weerstanden op de juiste locaties op de logische versterker zijn geïnstalleerd.
 - Schakel de sensors in en zorg ervoor dat de corresponderende rode SCHAKELAAR UITVOERLICHTJES boven de terminal voor de logische versterker uitgaan.
 - Zorg ervoor dat de sensors en magnetische aandrijvers uitgericht en binnen de opgegeven sensingafstand zijn.
 - Sluit de stroom naar de versterker UIT en wacht totdat het ATTENTIE-INDICATORLICHTJE helemaal UIT is. Schakel vervolgens de stroom naar de versterker weer in (stroom bij opnieuw instellen).
 - Als het rode ATTENTIE-INDICATORLICHTJE nog steeds flakkert, ontkoppel dan de logische versterker
- 4 Honeywell • MICRO SWITCH Sensing en regeling**

en bel het MICRO SWITCH Application Center (1-800-537-6945).

2. Als het 50FY serie systeem niet werkt en het rode ATTENTIE-INDICATORLICHTJE niet oplicht, doe dan het volgende.
 - Zorg ervoor dat de geïnstalleerde zekeringen van de juiste klasse en niet doorgeslagen zijn (0,630A en 1/8A langzaam doorslaan).
 - Zorg ervoor dat de sensors en de logische versterker juist bedraad zijn.
 - Zorg ervoor dat de 22 K Ω weerstanden op de juiste locaties op de logische versterker geïnstalleerd zijn.
 - Zorg ervoor dat de sensors en magnetische aandrijvers uitgericht en binnen de opgegeven sensingafstand zijn.
 - Schakel de stroom uit en opnieuw in (stroom bij opnieuw instellen).
 - Als het 50FY serie systeem nog steeds UIT is, ontkoppel dan de logische versterker en zend hem terug naar Honeywell.

Stap 6 – Verricht functionele controle als volgt: (zie indicators op logische versterker)

1. Als het 50FY serie systeem werkt en het rode ATTENTIE-INDICATORLICHTJE niet oplicht, doe dan het volgende:
 - Als één, meerdere of alle sensors uit zijn, kijk dan of de corresponderende rode SCHAKELAAR UITVOERLICHTJES boven de aansluitpunten van de logische versterker voor elke sensor oplichten. Kijk bovendien of de rode RELAISCONDITIE OPEN LICHTJES oplichten (contacten van logische versterker zijn open).
 - Schakel elke sensor in en kijk of het corresponderende rode SCHAKELUITVOERLICHTJE uitgaat.
 - Als alle twaalf van de rode SCHAKELUITVOERLICHTJES uit zien (d.w.z. dat alle sensors ingeschakeld zijn), kijk dan of de rode RELAISCONDITIE OPEN LICHTJES NIET oplichten. Kijk tevens of de groene RELAISCONDITIE DICHT LICHTJES oplichten (contacten van logische versterker zijn gesloten).
 - Als het 50FY serie systeem werkt zoals hierboven (in stap 3) is aangegeven, dan werkt het systeem correct.

SPECIFICATIES

FYQLA1-140R-3 Logische versterker

Invoerspanning	100 - 128 V _r , 50-60 Hz
Vermogensdissipatie	3.0 VA max.
Temperatuurbereik	-40 tot +70°C (-40 tot +158°F)
Uitvoerrelais	Contactkwalificatie: 5 A @ 120 V~ Actie: enkele pool, enkele slag, N.O.: Positief geleid veiligheidsrelais; Dubbele relais verbonden in serie, enkele uitvoer; Elektrische levensduur: 100.000 bedieningen bij volledige belasting
*Afsluiting	Logische versterker moet zich in een NEMA afgesloten omhulling bevinden.

50FY41 Hall-effect sensor

Voltage	10 – 12 VDC
Laadstroom (intern beperkt)	0,50 mA max.
Huidige consumptie	20 mA
Temperatuurbereik	-40 tot +85°C (-40 tot +185°F)
Afsluiting	NEMA 1, 3, 4, 6P, 12, 13 en **diepspoeltest Eenheden zijn resistent tegen herhaaldelijke diepspoelingen met bijtende oplossing, reinigen met stoom, voedsel, sappen en pulp.

***Afsluiting:** Omhullingen zijn gebaseerd op de brede definities die worden beschreven in de NEMA-normen. De klant moet derhalve beslissen of een bepaalde omhulling voldoende bescherming biedt wanneer het aan een specifieke conditie in een applicatie wordt blootgesteld. Tenzij anders wordt aangegeven, zijn alle verwijzingen naar producten die te maken hebben met NEMA-omhullingstypes alleen maar gebaseerd op de evaluatie van MICRO SWITCH.

****Diepspoeltest:** MICRO SWITCH testspecificaties 060.167, Nummer 2, Paragraaf 4.9 is een testspecificatie voor een chemische diepspoeling met hoge druk (1200 psi) en een hoge temperatuur (140°F/+60°C). Deze test simuleert reinigingsprocedures die gebruikt worden door fabrieken die voedsel en dranken verwerken en die strenger zijn dan de normale NEMA 4 afspuiting. Een beschrijving van de diepspoelspecificatie is op aanvraag verkrijgbaar.

ATTENTIE

Dit product voldoet aan de technische vereisten van EN60730-2-1 zoals van toepassing op een elektronisch opgenomen sensingregeling (voor uitrusting van Klasse I) met Type 2 en 2B actie voor continue bewerking onder normale milieuverontreinigingsnormen.

GARANTIE EN REMEDIE

Honeywell garandeert dat door haar geproduceerde goederen geen defecte materialen bevatten of gebrekkig gefabriceerd zijn. Neem contact op met uw plaatselijke verkoopkantoor voor informatie over uw garantie. Als goederen onder garantie aan Honeywell worden teruggezonden tijdens de garantieperiode, zal Honeywell deze kosteloos repareren of vervangen als deze door Honeywell defect worden verklaard. Het voorafgaande is de enige remedie die de klant heeft en is **in plaats van alle andere garanties, expliciet of impliciet, inclusief garanties van verkoopbaarheid en geschiktheid voor een bepaald doel.**

Hoewel wij toepassingsondersteuning verlenen, persoonlijk en d.m.v. onze lectuur, is het de verantwoordelijkheid van de klant om de geschiktheid van een product voor een bepaalde toepassing te bepalen.

Specificaties kunnen op elk moment zonder voorafgaande kennisgeving worden gewijzigd. Wij geloven dat de informatie die wij verschaffen accuraat en betrouwbaar is op het tijdstip dat dit materiaal gedrukt werd. We nemen echter geen verantwoordelijkheid voor het gebruik ervan.

VERKOOP EN SERVICE

Voor toepassingsondersteuning, huidige specificaties, prijzen of de naam van de dichtstbijzijnde geautoriseerde distributeur, kunt u contact opnemen met een naburig verkoopkantoor of de volgende nummers bellen:

TELEFOON

1-800-737-3360 Canada
+ 33 (0) 4 76 41 7200 Frankrijk
+ 49 (0) 69 8064 444 Duitsland
+1-815-235-6847 Internationaal
+ 44 (0) 161 251 4079 Verenigd Koninkrijk
1-800-537-6945 USA

FAX

+ (33) 76 41 72 56 Frankrijk
1-815-235-6545 USA

INTERNET

<http://www.honeywell.com/sensing/>
info@micro.honeywell.com

BESTELGIDS

Cataloguslijst	Beschrijving
50FY41-6	Sensor, 2 meter draad, normaal open (NO)
50FY41-12	Sensor, 4 meter draad
50FY41-50	Sensor, 15 meter draad
52FY31	Magnetische aandrijver
FYQLA1-140R-3	Logische versterker, 1-6 sensor interface

Honeywell**MICRO SWITCH**

Honeywell Inc.
11 West Spring Street
Freeport, Illinois 61032

**European Safety Center**

Honeywell - Cométa
21, Chemin du Vieux Chêne
38243 Meylan Cedex - FRANKRIJK



Gedrukt met soja-inkt
op 50% kringlooppapier

Instruções para Instalação do Sistema de Detecção de Abertura de Porta com Efeito Hall, Série 50FY, EN954 Categoria III

NÚMERO 3

PK 80391



⚠ ADVERTÊNCIA

INSTALAÇÃO INCORRETA

- Esse produto foi projetado de acordo com os padrões EN954 Categoria III e ANSI B11.19-1990. Para garantir o cumprimento desses padrões, é NECESSÁRIO usar os sensores 50FY41 com o amplificador lógico FYQLA1-140R-3
- Consulte os requisitos da agência de segurança local ao projetar unidades de conexão ou interface para controle de máquinas, bem como todos os elementos de controle que possam afetar a segurança
- Obedeça rigorosamente todas as instruções de segurança.

Desobediência a essas instruções pode resultar em morte ou ferimentos graves.

INFORMAÇÕES GERAIS

O Sistema de detecção de abertura de Porta com Efeito Hall da Série 50FY é um sistema ativado magneticamente, sem contatos, que consiste de três dispositivos: um sensor, um atuador magnético e um amplificador lógico.

O sensor contém dois circuitos integrados de Efeito Hall conectados independentemente. Ambos os circuitos precisam ser ativados simultaneamente para produzir um sinal na saída.

O atuador magnético possui um campo magnético chaveado que deverá ser idêntico ao do sensor para operar corretamente. Quando o sensor é exposto a esse pré determinado campo magnético, e se encontra alinhado corretamente, ele responde com um sinal na saída.

O amplificador lógico contém uma placa de circuito de entrada lógica e controla uma saída de relé. O circuito de entrada pode acomodar até seis sensores. Quando todos os sensores conectados forem ativados, o circuito lógico fechará os contatos de relé. Se qualquer dos sensores conectados for desativado, o circuito lógico abrirá os contatos de relé.

INSTRUÇÕES PARA INSTALAÇÃO

Passo 1 - Monte e alinhe o sensor 50FY de acordo com as seguintes instruções:

⚠ ADVERTÊNCIA

ALINHAMENTO INCORRETO

Assegure-se de que o sensor e o atuador magnético estejam posicionados face a face e devidamente alinhados, para operação correta. Uma distância de separação de 10mm provocará uma condição "OFF" (Desligado), independente da distância de deslocamento.

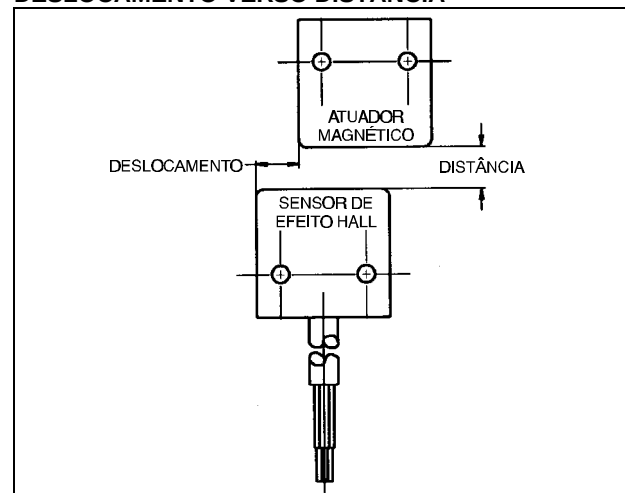
Desobediência a essas instruções pode resultar em morte ou ferimentos graves.

- Monte e alinhe o sensor e o atuador magnético (verifique Dimensões para Montagem, Distância de Sensibilidade Nominal e Deslocamento x Distância) dentro do deslocamento permitido.

DISTÂNCIA DE SENSIBILIDADE NOMINAL MM (POL.)

Deslocamento	Distância
Zero	2,5 (0.100)
3,8 (0.150)	1,3 (0.050)
7,5 (0.300)	Zero

DESLOCAMENTO VERSO DISTÂNCIA



Passo 2 - Monte e alinhe o amplificador lógico FYQLA1 de acordo com as seguintes instruções:

ATENÇÃO

RISCO DE DANIFICAR O AMPLIFICADOR

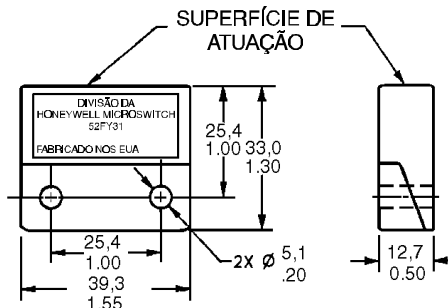
Para evitar o risco de danificar o amplificador lógico, o mesmo deve ser instalado em um invólucro lacrado NEMA de acordo com as especificações EN60730-2-1.

Desobediência a essas instruções causará danos ao produto.

- Instale o amplificador (consulte Dimensões da Montagem) em um invólucro lacrado NEMA como exigido.

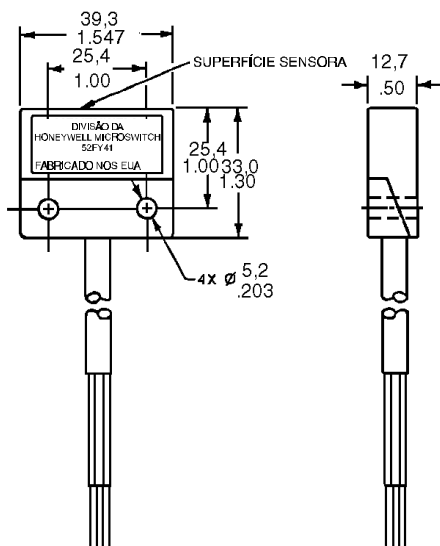
DIMENSÕES DE MONTAGEM (somente para referência)

Atuador Magnético - 52FY31 (mm/pol)

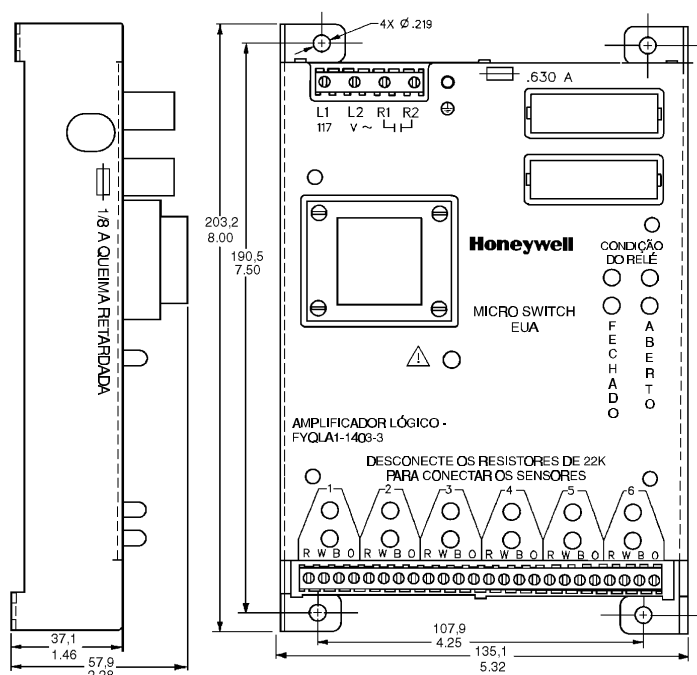


DIMENSÕES DE MONTAGEM - somente para referência (mm/pol)

Sensor de Efeito de Hall – 50FY41



Amplificador Lógico - FYQLA1-140-3



Passo 3 - Ligue os sensores ao amplificador lógico de acordo com as seguintes instruções:

OBSERVAÇÃO

- Versões de componentes antigos (amplificador, FYQLA-140R-1 e sensor, 50FY40) já não se encontram disponíveis. No entanto, para fins de manutenção, os novos componentes (amplificador, FYQLA-140R-3 e sensor, 50FY41) podem ser usados em instalações antigas (consulte a advertência sobre instalação).
- Os atuadores magnéticos 52FY30 funcionam com os sensores 50FY41, no entanto, a distância sensora será incrementada.

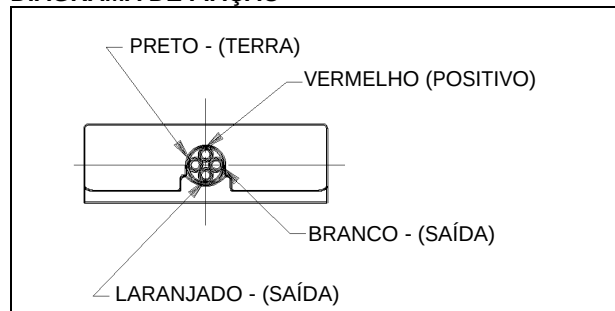
a. sensor 50FY41 (novo) com amplificador FYQLA1-140R-3 (novo)

- Ligue cada sensor (consulte o Diagrama de Fiação) através de seus quatro fios ao amplificador lógico como indicado abaixo:

FYQLA1-140R-3 (novo)	50FY41 (novo)
V (positivo)	VERMELHO (positivo)
B (normalmente aberto)	BRANCO - saída
P (negativo)	PRETO - terra
L (normalmente fechado)	LARANJADO - saída

- Para assegurar energização na conexão dos fios do sensor, aperte os parafusos do conector com um torque de 0,56 Nm (5.0 pol-lb).

DIAGRAMA DE FIAÇÃO



- Quando menos de seis sensores forem conectados ao amplificador lógico, instale dois resistores de 22 K Ω em ponte sobre cada terminal aberto, como indicado abaixo:

Terminais do Amplificador Lógico	Resistor*
V - B	Resistor de 22 K Ω
P - L	Resistor de 22 K Ω

*Os resistores são necessários para que o amplificador funcione corretamente. Dez resistores de 22 K Ω são fornecidos com cada sistema da Série 50FY.

⚠️ ADVERTÊNCIA

INSTALAÇÃO INCORRETA

- Esse produto foi projetado de acordo com os padrões EN954 Categoria III e ANSI B11.19-1990: Para garantir o cumprimento desses padrões, é **NECESSÁRIO** usar os sensores 50FY41 com o amplificador lógico FYQLA1-140R-3
- Obedeça rigorosamente todas as instruções de segurança.

Desobediência a essas instruções pode resultar em morte ou ferimentos graves.

b. sensor 50FY41 (novo) com amplificador FYQLA1-140R-1 (antigo)

- Corte e remova o fio LARANJADO do sensor.
- Ligue o fios VERMELHO, BRANCO e PRETO do sensor ao amplificador lógico como indicado abaixo:

FYQLA1-140R-1 (antigo)	50FY41 (novo)
V (positivo)	VERMELHO (positivo)
B (normalmente aberto)	BRANCO - saída
P (negativo)	PRETO - terra
	LARANJADO REMOVIDO

- Para assegurar energização na conexão dos fios do sensor, aperte os parafusos do conector com um torque de 0,56 Nm (5.0 pol-lb).

c. sensor 50FY40 (antigo) com amplificador FYQLA1-140R-3 (novo)

- Ligue o fios VERMELHO, BRANCO e PRETO do sensor ao amplificador lógico como indicado abaixo:

FYQLA1-140R-3 (novo)	50FY40 (antigo)
V (positivo)	VERMELHO (positivo)
B (normalmente aberto)	BRANCO - saída
P (negativo)	PRETO - terra
L (normalmente fechado)	NÃO HÁ FIO LARANJADO

- Instale um resistor de 22 K Ω entre os terminais PRETO e LARANJA do amplificador lógico.
- Para assegurar energização na conexão dos fios do sensor, aperte os parafusos do conector com um torque de 0,56 Nm (5.0 pol-lb).

Instruções especiais relacionadas aos sensores 50FY40 usados com o amplificador FYQLA1-140R-3:

Se a porta for aberta por mais de um segundo e o amplificador estiver ligado, o LED INDICADOR DE ATENÇÃO irá piscar. Para retornar à condição verde, feche a(s) porta(s), desligue o amplificador, espere até que o LED INDICADOR DE ATENÇÃO esteja totalmente apagado e, em seguida, ligue novamente o amplificador ("power on reset").

Passo 4 - Ligue o amplificador lógico como indicado abaixo:

- Conecte de 100 a 128 VAC aos terminais L1 e L2 do amplificador.
- Conecte carga aos terminais de contato R1 e R2 do relé do amplificador.

Passo 5 - Execute o devido procedimento para verificação de problemas: (consulte os indicadores do amplificador lógico)

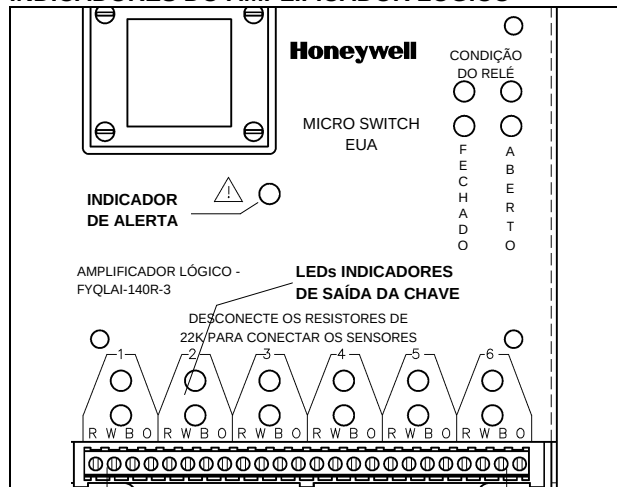
⚠ ADVERTÊNCIA

DESEMPENHO INCORRETO DO SISTEMA

Se o LED VERMELHO INDICADOR DE ATENÇÃO localizado no amplificador lógico estiver piscando, **NÃO USE O SISTEMA.**

Desobediência a essas instruções pode resultar em morte ou ferimentos graves.

INDICADORES DO AMPLIFICADOR LÓGICO



1. Se o sistema Série 50FY parecer normal mas a o LED VERMELHO INDICADOR DE ATENÇÃO estiver piscando, faça o seguinte:
 - Verifique se os sensores estão ligados corretamente ao amplificador lógico.
 - Assegure-se de que os resistores de 22 KΩ estão instalados corretamente no amplificador lógico.
 - Ative manualmente cada sensor e verifique se o LED VERMELHO DE CHAVEAMENTO DE SAÍDA correspondente, acima do terminal do amplificador lógico, se apaga.
 - Certifique-se de que os sensores e os atuadores magnéticos estão devidamente alinhados e de acordo com a distância de sensibilidade especificada.
 - DESLIGUE o amplificador, espere até que o LED INDICADOR DE ATENÇÃO esteja totalmente APAGADO e, em seguida, LIGE novamente o amplificador ("power on reset").

- Se o LED VERMELHO INDICADOR DE ATENÇÃO continuar piscando, desligue completamente o amplificador e ligue para o "MICRO SWITCH Application Center" (1-800-537-6945).
- 2. Se o sistema Série 50FY não estiver funcionando e o LED VERMELHO INDICADOR DE ATENÇÃO não estiver aceso, faça o seguinte:
 - Assegure-se de que os valores dos fusíveis instalados estejam de acordo com as exigências do sistema e funcionando (0.630A e 1/8A "slow blow").
 - Verifique se os fios dos sensores e do amplificador lógico estão ligados corretamente.
 - Assegure-se de que os resistores de 22 KΩ estão instalados corretamente no amplificador lógico.
 - Certifique-se de que os sensores e os atuadores magnéticos estão devidamente alinhados e de acordo com a distância de sensibilidade especificada.
 - Remova e restaure a alimentação ("power on reset").
 - Se o sistema Série 50FY continuar DESLIGADO, desconecte o amplificador lógico e devolva-o à Honeywell.

Passo 6 - Execute um teste de funcionalidade como indicado abaixo: (consulte os indicadores do amplificador lógico)

1. Se o sistema Série 50FY estiver funcionando e o LED VERMELHO INDICADOR DE ATENÇÃO não estiver aceso, faça o seguinte:
 - Se qualquer um dos sensores não estiver ativado (ou todos eles), verifique se o LED VERMELHO INDICADOR DE ATENÇÃO correspondente a cada sensor, localizado acima dos terminais do amplificador lógico, está aceso. Além disso, verifique se o LED DO RELÉ DE CONDIÇÃO ABERTA está aceso (indicando que os contatos do amplificador lógico estão abertos).
 - Ative cada sensor e verifique se o LED VERMELHO DE CHAVEAMENTO DE SAÍDA correspondente se apaga.
 - Quando todos os 12 LEDS DE CHAVE DE SAÍDA estiverem apagados (todos os sensores ativados), certifique-se de que o LED DO RELÉ DE CONDIÇÃO ABERTA NÃO está aceso. Verifique se o LED VERDE DO RELÉ DE CONDIÇÃO FECHADA está aceso (indicando que os contatos do amplificador lógico estão fechados).
 - Se o sistema da Série 50FY estiver funcionando de acordo como indicado acima (passo 3), o sistema está operando corretamente.

ESPECIFICAÇÕES

Amplificador Lógico FYQLA1-140-3

Tensão de Entrada	100 - 128 VAC, 50-60 Hz
Dissipação de Potência	3.0 VA máx.
Variação de Temperatura	-40 to +70°C (-40 to +158°F)
Saída de Relé	Tipo de contato 5 A @ 120 VAC Ação: polo simples, acionamento único, N.O.; Relé de segurança guiado por positivo; Relés duplos ligados em série, saída simples; Vida elétrica: 100,000 comutações com carga total
*Vedação	Amplificador Lógico deve ser contido em um invólucro lacrado NEMA.

Sensor de Efeito de Hall - 50FY41

Voltagem	10 - 12 VDC
Corrente de Carga(restrita internamente)	0.50 mA max.
Consumo de Corrente	20 mA
Variação de Temperatura	-40 to +85°C (-40 to +185°F)
Vedação	NEMA 1, 3, 4, 6P, 12, 13 e **teste de lavagem química As unidades são resistentes a lavagens contínuas com soluções cáusticas, vapor quente, comida, sucos e polpa.

***Vedação:** Os invólucros são baseados nas definições generalizadas estabelecidas pelos padrões NEMA. Conseqüentemente, é responsabilidade do cliente determinar que tipo de invólucro seria o mais adequado para o equipamento quando exposto às condições específicas de sua aplicação. Exceto como observado acima, todas as referências a produtos relativos a invólucros NEMA são baseados apenas em avaliações da MICRO SWITCH.

**Teste de Lavagem Química de Alta Pressão e

Temperatura: As especificações de teste da 060.167, Item 2, Parágrafo 4.9 da MICRO SWITCH referem-se a um teste de alta pressão (1200 psi), alta temperatura (140°F/+60°C) e lavagem química. Esse teste simula os procedimentos de lavagem utilizados em plantas de processamento de alimentos e bebidas, os quais são mais rigorosos que os de padrão NEMA 4. A descrição das especificações de lavagem podem ser obtidas sob pedido.

OBSERVAÇÃO

Esse produto obedece todos os requisitos técnicos do padrão EN60730-2-1 como aplicáveis a um controle sensor com Eletrônica Incorporada (para equipamento de Classe 1) com ação Tipo2 e 2B para operação contínua sob padrões normais de poluição.

GARANTIA/SOLUÇÕES

A Honeywell garante seus produtos contra defeitos de material e de fabricação. Entre em contato com seu representante local para maiores informações sobre a garantia. Quando produtos garantidos forem devolvidos à Honeywell durante o prazo de garantia, a Honeywell se compromete a reparar ou substituir por um novo aqueles que considerar defeituosos. O acima estipulado é a única garantia oferecida ao Comprador e **suplanta quaisquer outras garantias, expressas ou implícitas relacionadas a valor no mercado e adequabilidade para um determinado fim.**

Independente do fato de proporcionarmos assistência pessoal e através de nossos impressos, cabe ao comprador determinar a adequabilidade do produto à sua aplicação.

Especificações podem ser alteradas sem aviso prévio. Crê-se que a informação aqui contida, era a mais correta e confiável quando da impressão desta publicação. No entanto, não assumimos qualquer responsabilidade pelo uso das mesmas.

VENDAS E SERVIÇOS

Para assistência com sua aplicação, especificações atuais, preços ou nome do Revendedor Autorizado mais próximo, entre em contato com o escritório de vendas em sua área ou telefone para:

TELEFONE

1-800-737-3360 Canadá
+ 33 (0) 4 76 41 7200 França
+ 49 (0) 69 8064 444 Alemanha
1-815-235-6847 Internacional
+ 44 (0) 161 251 4079 Reino Unido
1-800-537-6945 EUA

FAX

+ (33) 76 41 72 56 França
1-815-235-6545 EUA

INTERNET

<http://www.honeywell.com/sensing/>
info@micro.honeywell.com

GUIA PARA ENCOMENDA

Modelos de Catálogo	Descrição
50FY41-6	Sensor, Fios de 2 metros (6 pés), normalmente aberto (NO)
50FY41-12	Sensor, Fios de 4 metros (12 pés), normalmente aberto (NO)
50FY41-50	Sensor, Fios de 15 metros (50 pés)
52FY31	Atuador Magnético
FYQLA1-140R-3	Amplificador lógico, interface de um até seis sensores

Honeywell**MICRO SWITCH**

Honeywell Inc.
11 West Spring Street
Freeport, Illinois 61032



Impresso com tinta de Soja
em Papel 50% Reciclado

**European Safety Center****Honeywell - Cométa**

21, Chemin du Vieux Chêne
38243 Meylan Cedex - FRANÇA

Installationsanvisning til model 50FY halleffektafbryder til låger, EN954, kategori III

3. UDGAVE

PK 80391



⚠ ADVARSEL

KORREKT INSTALLATION

- Dette produkt er konstrueret til at holde de tekniske forskrifter iht. EN954, kategori III, og ANSI B11.19-1990. Disse forskrifter kan KUN holdes hvis man anvender 50FY41 følere sammen med FYQLA1-140R-3 logikforstærkere.
- Montage af maskinstyring, brugerflader og styringskomponenter skal udføres efter gældende regler fra arbejdstilsynet.
- Alle installationsanvisninger skal nøje følges.

Hvis man ikke følger anvisningerne, kan det medføre livsfarlig personskade.

BESKRIVELSE

Model 50FY halleffektafbryder til låger er et kontaktfrit, magnetisk aktiveringssystem bestående af tre komponenter: en føler, en elektromagnet og en logikforstærker.

Føleren har to halleffektkredse med særskilt forbindelse. Begge kredse skal slå til samtidigt for at afgive effekt.

Føleren skal passe til elektromagnetens feltprofil for at de kan fungere rigtigt. Når føleren udsættes for dette magnetfelt og er korrekt rettet ind, reagerer den med et udgangssignal.

Logikforstærkeren har et printkort til logiske indgangssignaler og styrer et relæudgangssignal. Indgangskredsen kan modtage signaler fra op til seks følere. Når alle de forbundne følere er aktive, lukker logikkredsen relækontakterne. Slås en eller flere af de forbundne følere fra, åbner logikkredsen relækontakterne.

INSTALLATIONSANVISNING

Punkt 1 - 50FY føleren monteres og justeres på følgende måde:

⚠ ADVARSEL

KORREKT JUSTERING

Man skal sørge for at føleren og elektromagneten vender mod hinanden og er rettet ind for at kunne fungere rigtigt. Hvis de er 10 mm (0,39 in) fra hinanden, er systemet afbrudt uanset forskydningsafstanden.

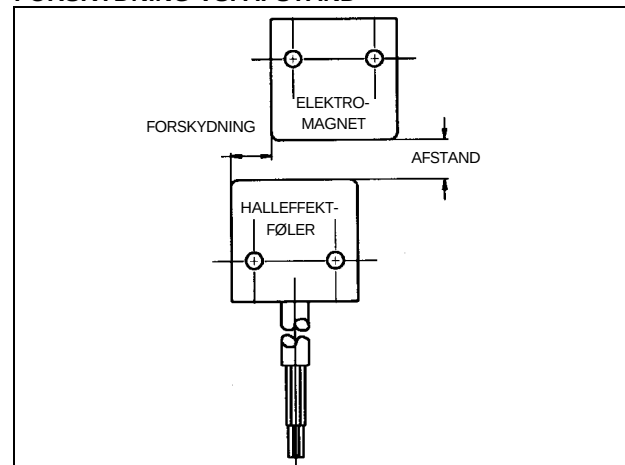
Hvis man ikke følger anvisningerne, kan det medføre livsfarlig personskade.

- Monter og justér føleren og elektromagneten inden for det tilladte forskydningsområde (jf. Monteringsdimensioner, Nominel detektionsafstand og Forskydning vs. afstand).

NOMINEL DETEKTIONSAFSTAND i mm (in)

Forskydning	Afstand
Nul	2,5 (0.100)
3,8 (0.150)	1,3 (0.050)
7,5 (0.300)	Nul

FORSKYDNING VS. AFSTAND



Punkt 2 - FYQLA1 logikforstærkeren monteres på følgende måde:

FORSIGTIG

LOGIKFORSTÆRKEREN SKAL BESKYTTES

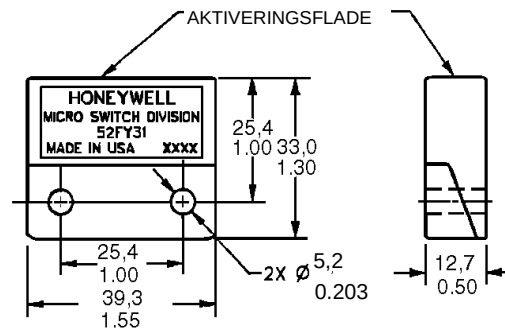
Af sikkerhedshensyn skal logikforstærkeren monteres i en forseglet dåse af NEMA-typen iht. EN60730-2-1.

Hvis man ikke følger anvisningerne, kan det medføre livsfarlig personskade.

- Montér logikforstærkeren i en forseglet dåse af NEMA-typen som foreskrevet (jf. Monteringsdimensioner).

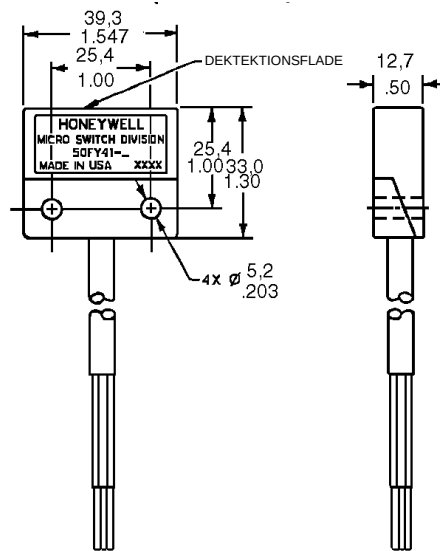
MONTERINGSDIMENSIONER - kun til information

Elektromagnet - 52FY31 (mm/in)

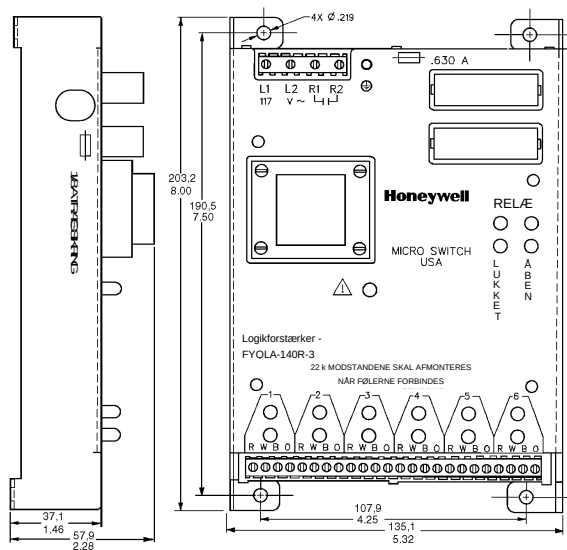


MONTERINGSDIMENSIONER - kun til information (mm/in)

Halleffektfølér - 50FY41



Logikforstærker - FYQLA1-140R-3



Punkt 3 - Følerne forbindes til logikforstærkeren på følgende måde:

BEMÆRK

- Ældre komponentversioner (forstærker FYQLA-140R-1 og føler 50FY40) er udgået, men nye komponenter (forstærker FYQLA-140R-3 og føler 50FY41) kan monteres til vedligeholdelse af ældre installationer (jf. advarsel vedr. installation).
- 52FY30 elektromagneter virker sammen med 50FY41 følere, men detektionsafstanden øges.

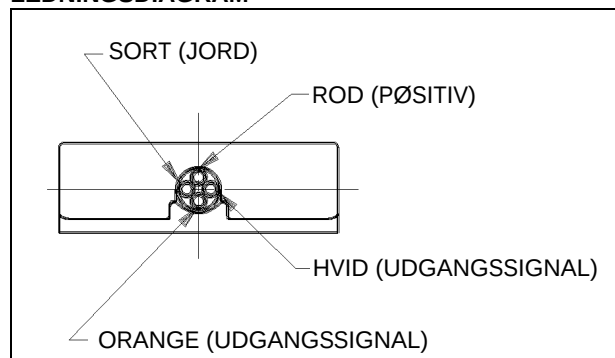
a. 50FY41 føler (ny) til FYQLA1-140R-3 forstærker (ny)

- Forbind hver følers fire ledninger til logikforstærkeren på følgende måde (jf. Ledningsdiagram):

FYQLA1-140R-3 (ny)	50FY41 (ny)
R (positiv)	RØD - positiv
W (normalt åben)	HVID - udgangssignal
B (negativ)	SORT - jord
O (normalt lukket)	ORANGE - udgangssignal

- Klemskruerne skal spændes til et moment på 0,56 Nm (5,0 in.-lb.).

LEDNINGSDIAGRAM



- Hvis der benyttes færre end seks følere til logikforstærkeren, skal man montere 2 stk. 22 kΩ modstande over hver uanvendt pol på logikforstærkere på følgende måde:

Logikforstærkerpoler	Modstand*
R - W	22 kΩ modstand
B - O	22 kΩ modstand

*Modstandene skal til for at logikforstærkeren kan fungere rigtigt. Der følger 10 stk. 22 kΩ modstande med hvert sæt 50FY.

⚠ ADVARSEL

KORREKT INSTALLERING

- Dette produkt er konstrueret til at holde de tekniske forskrifter i EN954, kategori III, og ANSI B11.19-1990. Disse forskrifter kan KUN holdes, hvis man anvender 50FY41 følere sammen med FYQLA1-140R-3 logikforstærkere.

- Installationsanvisningerne skal nøje følges.

Hvis man ikke følger anvisningerne, kan det medføre livsfarlig personskade.

b. 50FY41 føler (ny) til FYQLA1-140R-1 forstærker (ældre)

- Klip den ORANGE følerledning over, og fjern den.
- Forbind RØD, HVID og SORT følerledning til logikforstærkeren på følgende måde:

FYQLA1-140R-1 (ældre)	50FY41 (ny)
R (positiv)	RØD - positiv
W (normalt åben)	HVID - udgangssignal
B (negativ)	SORT - jord
	ORANGE FJERNET

- Klemskruerne skal spændes til et moment på 0,56 Nm (5,0 in.-lb.).

c. 50FY40 føler (ældre) til FYQLA1-140R-3 forstærker (ny)

- Den RØDE, HVIDE og SORTE følerledning forbindes til logikforstærkeren på følgende måde:

FYQLA1-140R-3 (ny)	50FY40 (ældre)
R (positiv)	RØD - positiv
W (normalt åben)	HVID - udgangssignal
B (negativ)	SORT - jord
O (normalt lukket)	INGEN ORANGE LEDNING

- Monter 1 stk. 22 kΩ modstand mellem den SORTE og ORANGE pol på logikforstærkeren.
- Klemskruerne skal spændes til et moment på 0,56 Nm (5,0 in.-lb.).

Særlig anvisning vedr. 50FY40 følere der anvendes sammen med en FYQLA1-140R-3 forstærker

Hvis lågen står åben i over et sekund, og strømmen til forstærkeren er tændt, blinker ADVARSELSINDIKATOREN. Man vender tilbage til grønt lys ved at lukke lågen eller lågerne, slukke for forstærkeren og vente til ADVARSELSINDIKATOREN slukker; dernæst tænder man for forstærkeren igen (tilbagestilling).

Punkt 4 - Forstærkeren forbindes på følgende måde:

- Forbind 100-128 V vekselstrøm til pol L1 og L2 på logikforstærkeren.
- Forbind effekt til relækontaktpol R1 og R2 på logikforstærkeren.

Punkt 5 - Fejlfinding udføres som foreskrevet: (jf. Indikatorer på logikforstærkeren)

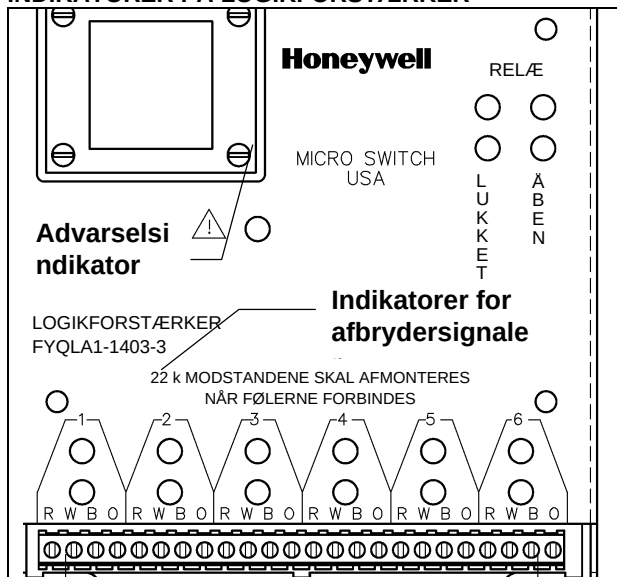
⚠ ADVARSEL

SYSTEMFEJL

Hvis den røde ADVARSELSINDIKATOR på logikforstærkeren blinker, MÅ FORSTÆRKEREN IKKE ANVENDES.

Hvis man ikke følger anvisningerne, kan det medføre livsfarlig personskade.

INDIKATORER PÅ LOGIKFORSTÆRKER



1. Hvis 50FY-systemet synes at fungere, men den røde ADVARSELSINDIKATOR blinker, skal man gøre følgende:
 - Se efter, at følerne er korrekt forbundet til logikforstærkeren.
 - Se efter, at 22 kΩ modstandene er monteret de korrekte steder på logikforstærkeren.
 - Aktivér følerne manuelt, og se efter, at den tilsvarende røde INDIKATOR for AFBRYDERSIGNAL slukker.
 - Se efter at følere og elektromagneter er rettet ind og holder detektionsafstanden.
 - Sluk for strømmen til forstærkeren, og vent til ADVARSELSINDIKATOREN slukker; tænd dernæst for strømmen til forstærkeren (tilbagestilling).
 - Hvis den røde ADVARSELSINDIKATOR stadig blinker, skal man afbryde forbindelsen til logikforstærkeren og ringe til MICRO SWITCH Application Center (tlf. 1-800-537-6945 i USA).

2. Hvis 50FY systemet ikke fungerer, og den røde ADVARSELSINDIKATOR ikke lyser, skal man gøre følgende:

- Se efter, at sikringerne har den korrekte størrelse og ikke er sprunget (0,630 A og 1/8 A træg).
- Se efter, at følerne og logikforstærkeren er korrekt forbundet.
- Se efter, at 22 kΩ modstandene er monteret de korrekte steder på logikforstærkeren.
- Se efter, at følerne og elektromagneterne er rettet ind og holder detektionsafstanden.
- Sluk og tænd for strømmen (tilbagestilling).
- Hvis 50FY systemet stadig ikke virker, skal man afmontere logikforstærkeren og returnere den til Honeywell.

Punkt 6 - Funktionerne kontrolleres på følgende måde: (jf. Indikatorer på logikforstærker)

1. Hvis 50FY systemet fungerer, og den røde ADVARSELSINDIKATOR ikke lyser, skal man gøre følgende:
 - Hvis en eller flere af følerne ikke aktiveres, skal man se efter, at de tilsvarende røde INDIKATORER for AFBRYDERSIGNAL oven over polerne på logikforstærkeren lyser. Man skal også se efter at den røde INDIKATOR for ÅBENT RELÆ lyser (kontakter på logikforstærkeren er åbne).
 - Aktivér én enkelt ad gangen, og se efter at den tilsvarende røde INDIKATOR for AFBRYDERSIGNAL slukker.
 - Hvis alle tolv røde INDIKATORER for AFBRYDERSIGNAL er slukkede (dvs. alle følere er aktiverede), skal man se efter, at de røde INDIKATORER for ÅBENT RELÆ ikke lyser. Man skal også se efter, at de grønne INDIKATORER for LUKKET RELÆ lyser (dvs. kontakterne på logikforstærkeren er lukkede).
 - Hvis 50FY systemet fungerer som ovenfor angivet (punkt 3), er det i orden.

SPECIFIKATIONER

FYQLA1-140R-3 logikforstærker

Indgangsspænding	100-128 V vekselstrøm, 50-60 Hz
Effektforbrug	3,0 VA maks.
Temperaturområde	-40 til +70 °C (-40 til +158 °F)
Udgangssignalrelæ	Nominel kontaktydelse: 5 A ved 120 V vekselstrøm Type: Enkeltpolet, tovejs, normalt åben; positivt styret sikkerhedsrelæ; serieforbundne dobbeltrelæer, et udgangssignal; elektrisk livstid: 100.000 tilslutninger ved fuld belastning
*Forsegling	Logikforstærkeren skal monteres i en NEMA-type forseglet dåse.

50FY41 halleffektføler

Spænding	10-12 V jævnstrøm
Belastningsstrøm (internt spærret)	0,50 mA maks.
Strømforbrug	20 mA
Temperaturområde	-40 til +85 °C (-40 til +185 °F)
Forsegling	NEMA 1, 3, 4, 6P, 12, 13 og **spulingsprøve Komponenterne er modstandsdygtige over for gentagen spuling med kaustisk opløsning, damp, fødevarestænk, saft og halvflydende masser.

***Forsegling:** Komponenthusene er udført efter de brede definitioner i NEMA-standarderne. Derfor skal kunden afgøre, om de enkelte dåser er passende til de givne driftsforhold. Medmindre andet er udtrykkeligt nævnt, gælder samtlige henvisninger til produkter mht. NEMA-type dåser udlukkende på grundlag af MICRO SWITCH-vurderinger.

****Spulingsprøve:** MICRO SWITCH prøvespecifikation 060.167, udgave 2, paragraf 4.9 angår kemisk spuling ved højt tryk (1200 psi) og høj temperatur (140°F/+60°C). Denne prøve simulerer rengøringsprocedurer på føde- og drikkevarefabrikker og er hårdere end en standardspuling iht. NEMA 4. Beskrivelse af spulingsspecifikationen fås ved henvendelse.

BEMÆRK

Produktet holder teknisk forskrift i EN60730-2-1 ang. elektronisk inkorporeret (klasse I-udstyr) detektionsstyring med type 2- og 2B-funktion til kontinuerlig drift med normal forurening.

GARANTI

Honeywell garanterer dets produkter mod materiale- og fabrikationsfejl. Kontakt den lokale forhandler vedr. oplysninger om garanti. På varer der returneres til Honeywell i garantiperioden, vil Honeywell vederlagsfrit reparere eller udskifte de dele der findes at være defekte. Ovenstående er købers eneste retsmiddel og **erstatte alle andre garantier, udtrykkelige eller underforståede, inklusive garanti for salgbarhed og anvendelighed til givne formål.**

Vi assisterer ved anvendelse af produktet i form af personlig rådgivning og publikationer, men det er op til kunden selv at bedømme, hvorvidt produktet egner sig til givne driftsforhold.

Ret til specifikationsændring forbeholdes uden varsel. Vore oplysninger anses for at være nøjagtige og pålidelige på det tidspunkt de går i trykken; men vi påtager os intet ansvar for hvordan de benyttes.

SALG OG SERVICE

Assistance ved anvendelse af produkter og oplysninger om specifikationer, priser og nærmeste autoriserede forhandler fås på et salgskontor eller pr. telefon:

TELEPHONE

1-800-737-3360 Canada
+ 33 (0) 4 76 41 7200 Frankrig
+ 49 (0) 69 8064 444 Tyskland
1-815-235-6847 Internationalt
+ 44 (0) 161 251 4079 England
1-800-537-6945 USA

FAX

+ (33) 76 41 72 56 Frankrig
1-815-235-6545 USA

INTERNET

<http://www.honeywell.com/sensing/>
info@micro.honeywell.com

BESTILLING

Katalognr.	Beskrivelse
50FY41-6	Føler med 2 m (6 ft) ledninger, normalt åben
50FY41-12	Føler med 4 m (12 ft) ledninger
50FY41-50	Føler med 15 m (50 ft) ledninger
52FY31	Elektromagnet
FYQLA1-140R-3	Logikforstærker, brugerflade til 1-6 stk. følere

Honeywell

MICRO SWITCH

Honeywell Inc.
11 West Spring Street
Freeport, Illinois 61032



Trykt med sojablæk
på 50% genbrugspapir



European Safety Center

Honeywell - Cométa
21, Chemin du Vieux Chêne
38243 Meylan Cedex - FRANKRIG

Asennusohjeet

NUMERO 3

50FY-sarjan Hall-katkaisujärjestelmälle ovia varten, EN954 luokka III

PK 80391



VAROITUS

VIRHEELLINEN ASENNUS

- Tämä tuote on suunniteltu noudattamaan EN954-standardin luokan III ja ANSI B11.19-1990 -standardin teknisiä vaatimuksia. Jotta näitä vaatimuksia noudatettaisiin, 50FY41-antureita TÄYTYY käyttää FYQLA1-140R-3 -logiikkavahvistimen kanssa.
- Tarkista paikallisten turvallisuusviranomaisten vaatimukset suunnitellessasi koneen-ohjausjärjestelmää, liitäntöjä ja kaikkia turvallisuuteen vaikuttavia ohjauselementtejä.
- Noudata tarkkaan kaikkia asennusohjeita.

Näiden ohjeiden laiminlyöminen voi aiheuttaa kuoleman tai vakavia vammoja.

YLEISTÄ

50FY-sarjan Hall-katkaisujärjestelmä ovia varten on kosketukseton, magneettitoiminen järjestelmä, joka koostuu kolmesta laitteesta: anturi, magneetti ja logiikkavahvistin.

Anturissa on kaksi Hall-ilmiöön perustuvaa integroitua piiriä, joilla on itsenäiset kytkennät. Kummankin piirin samanaikainen kytkeytyminen tuottaa lähtösignaalin.

Magneetissa on avainnettu magneettikenttä, jonka on sovittava anturiin oikean toiminnan varmistamiseksi. Avainnetulle magneettikentälle altistettu ja oikein kohdistettu anturi tuottaa lähtösignaalin.

Logiikkavahvistin sisältää logiikan tulokortin ja ohjaa relelähtöä. Tulopiiriin voidaan kytkeä kuusi anturia. Kun kaikki kytketyt anturit aktivoidaan, logiikkapiiri sulkee releen koskettimet. Jos jokin kytketyistä antureista käännetään pois päältä, logiikkapiiri avaa releen koskettimet.

ASENNUSOHJEET

Vaihe 1 - Asenna ja kohdista 50FY-anturi seuraavasti:

VAROITUS

VIRHEELLINEN KOHDISTUS

Varmista, että anturi ja magneetti ovat vastakkain ja kohdistettuina. 10 mm:n (0,39") väli kytkee järjestelmän POIS PÄÄLTÄ poikkeamaetäisyydestä riippumatta.

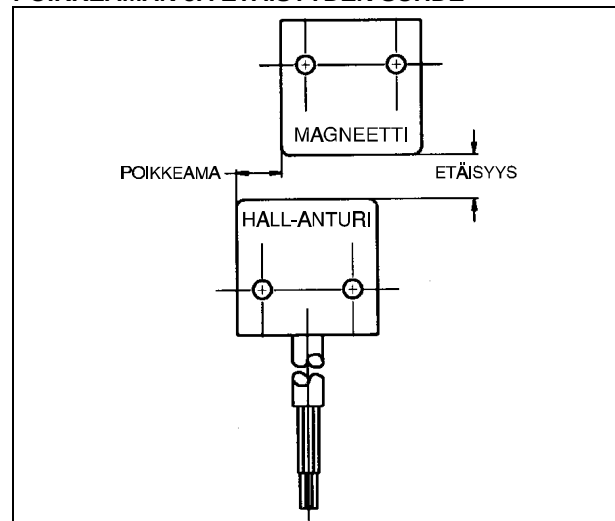
Näiden ohjeiden laiminlyöminen voi aiheuttaa kuoleman tai vakavia vammoja.

- Asenna ja kohdista anturi ja magneetti (ks. asennusmitat, nimellinen havaintoetäisyys ja poikkeaman ja etäisyyden suhde) sallitun poikkeaman rajoissa.

NIMELLINEN HAVAINTOETÄISYYS mm (in)

Poikkeama	Etäisyys
0	2,5 (0.100)
3,8 (0.150)	1,3 (0.050)
7,5 (0.300)	0

POIKKEAMAN JA ETÄISYYDEN SUHDE



Vaihe 2 - Asenna FYQLA1- logiikkavahvistin seuraavasti:

HUOMAA

LOGIikkAVAHVISTIMEN VAURIOITUMINEN

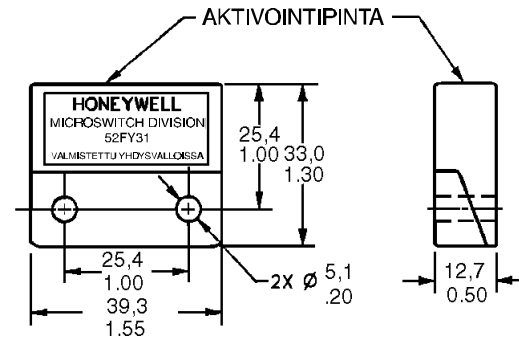
Jotta estetään logiikkavahvistimen vaurioituminen, se on asennettava standardissa EN60730-2-1 määritellyn NEMA-suljettuun koteloon.

Näiden ohjeiden laiminlyöminen vaurioittaa laitetta.

- Asenna vahvistin (ks. asennusmitat) NEMA-suljettuun koteloon vaatimusten mukaisesti.

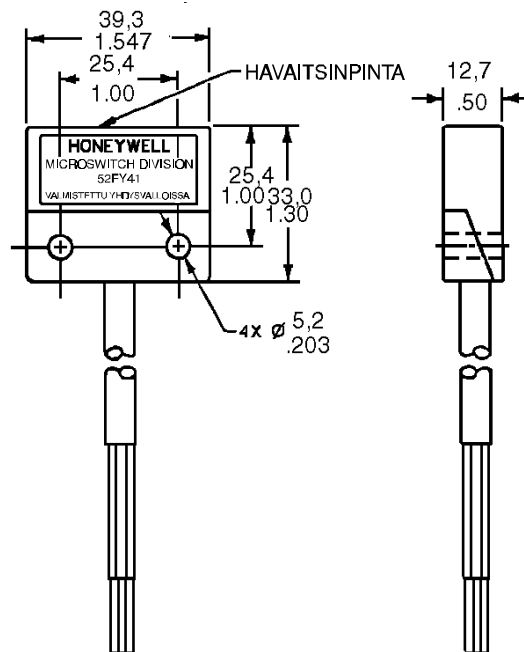
ASENNUSMITAT - viitteelliset

Magneetti - 52FY31 (mm/tuumaa)

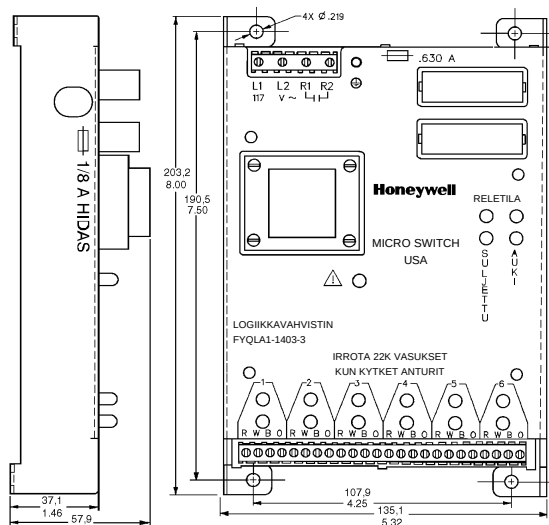


ASENNUSMITAT - viitteelliset (mm/tuumaa)

Hall-anturi - 50FY41



Logiikkavahvistin - FYQLA1-140R-3



Vaihe 3 - Johdota anturit logiikkavahvistimeen seuraavasti:**HUOMATUS**

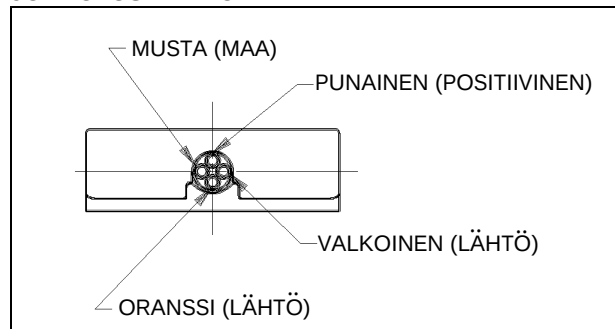
- Vanhoja komponenttiversioita (vahvistin FYQLA-140R-1 ja anturi 50FY40) ei enää toimiteta. Huoltoa varten uusia komponentteja (vahvistin FYQLA-140R-3 ja anturi 50FY41) voidaan käyttää vanhassa järjestelmässä (ks. asennusta koskeva varoitus).
- 52FY30 magneetit toimivat 50FY41-antureiden kanssa, mutta havaintoetäisyys kasvaa.

a. 50FY41-anturi (uusi) FYQLA1-140R-3-vahvistimen (uusi) kanssa

- Kytke kukin anturi (ks. johdotuskaavio) neljällä johtimellaan logiikkavahvistimeen seuraavasti:

FYQLA1-140R-3 (uusi)	50FY41 (uusi)
PUNAINEN (positiivinen)	PUNAINEN - positiivinen
VALKOINEN (normaalisti auki)	VALKOINEN - lähtö
MUSTA (negatiivinen)	MUSTA - maa
ORANSSI (normaalisti suljettu)	ORANSSI - lähtö

- Kiristä sähkö- ja anturijohtimien kytkinruuvit 0,56 Nm (5.0 in.-lb.) tiukkuuteen.

JOHDOTUSKAAVIO

- Jos logiikkavahvistimeen on kytketty vähemmän kuin kuusi anturia, asenna kaksi 22 kΩ -kuhunkin käyttämättömään anturiliitäntään seuraavasti:

Logiikkavahvistimen liittimet	Vastus*
PUNAINEN - VALKOINEN	22 kΩ vastus
MUSTA -ORANSSI	22 kΩ vastus

*Vastusten käyttö on välttämätöntä, jotta logiikkavahvistin toimisi oikein. Kunkin 50FY-sarjan järjestelmän mukana toimitetaan kymmenen 22 kΩ vastusta.

VAROITUS**VIRHEELLINEN ASENNUS**

- Tämä tuote on suunniteltu noudattamaan EN954-standardin luokan III ja ANSI B11.19-1990 -standardin teknisiä vaatimuksia. Jotta näitä vaatimuksia noudatettaisiin, 50FY41-antureita TÄYTYY käyttää FYQLA1-140R-3 -logiikkavahvistimen kanssa.

- Noudata tarkkaan kaikkia asennusohjeita.

Näiden ohjeiden laiminlyöminen voi aiheuttaa kuoleman tai vakavia vammoja.

b. 50FY41-anturi (uusi) FYQLA1-140R-1-vahvistimen (vanha) kanssa

- Katkaise ja irrota anturin ORANSSI johdin.
- Kytke anturin PUNAINEN, VALKOINEN ja MUSTA johdin logiikkavahvistimen liittimiin seuraavasti:

FYQLA1-140R-1 (vanha)	50FY41 (uusi)
PUNAINEN (positiivinen)	PUNAINEN - positiivinen
VALKOINEN (normaalisti auki)	VALKOINEN - lähtö
MUSTA (negatiivinen)	MUSTA - maa
	ORANSSI IRROTETTU

- Kiristä sähkö- ja anturijohtimien kytkinruuvit 0,56 Nm (5.0 in.-lb.) tiukkuuteen.

c. 50FY40-anturi (vanha) FYQLA1-140R-3-vahvistimen (uusi) kanssa

- Kytke anturin PUNAINEN, VALKOINEN ja MUSTA johdin logiikkavahvistimeen seuraavasti:

FYQLA1-140R-3 (uusi)	50FY40 (vanha)
PUNAINEN (positiivinen)	PUNAINEN - positiivinen
VALKOINEN (normaalisti auki)	VALKOINEN - lähtö
MUSTA (negatiivinen)	MUSTA - maa
ORANSSI (normaalisti suljettu)	EI ORANSSIA JOHDINTA

- Asenna yksi 22 kΩ vastus logiikkavahvistimen MUSTAN ja ORANSSIN liittimen väliin.
- Kiristä sähkö- ja anturijohtimien kytkinruuvit 0,56 Nm (5.0 in.-lb.) tiukkuuteen.

FYQLA1-140R-3-vahvistimen kanssa käytettyjä 50FY40-antureita koskevat erikoisohjeet

Jos ovi on auki kauemmin kuin sekunnin ajan ja vahvistimen virta on PÄÄLLÄ, VAROITUSMERKKIVALO vilkkuu. Palaa vihreään tilaan seuraavasti: sulje ovi/ovet, katkaise vahvistimen virta ja odota kunnes VAROITUSMERKKIVALO on kokonaan SAMMUNUT. Kytke sen jälkeen vahvistimen virta PÄÄLLE (virta päälle -alkutila).

Vaihe 4 - Johdota logiikkavahvistin seuraavasti:

- Kytke 100-128 V AC logiikkavahvistimen liittimiin L1 ja L2.
- Kytke kuormitus logiikkavahvistimen relekosketinliittimiin R1 ja R2.

Vaihe 5 - Suorita tarvittaessa

vianetsintätoimenpiteet: (ks. logiikkavahvistimen merkkivalot)



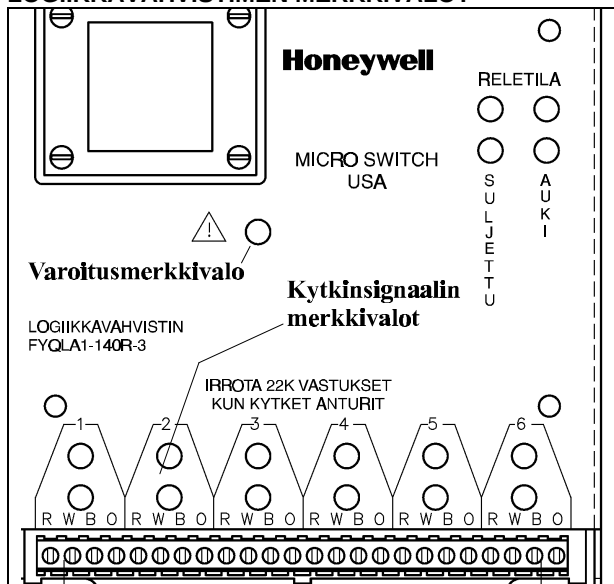
VAROITUS

JÄRJESTELMÄN VIRHEELLINEN TOIMINTA

Jos logiikkavahvistimen punainen VAROITUSMERKKIVALO vilkkuu, ÄLÄ KÄYTÄ laitetta.

Näiden ohjeiden laiminlyöminen voi aiheuttaa kuoleman tai vakavia vammoja.

LOGIKKAVAHVISTIMEN MERKKIVALOT



1. Jos 50FY-sarjan järjestelmä vaikuttaa toimintakuntoiselta mutta punainen VAROITUSMERKKIVALO vilkkuu, toimi seuraavasti:
 - Varmista, että anturit on johdotettu logiikkavahvistimeen oikein.
 - Varmista, että 22 kΩ vastukset on asennettu oikeille paikoilleen logiikkavahvistimessa.
 - Aktivoi anturit manuaalisesti ja varmista, että logiikkavahvistimen liittimien yläpuolella olevat antureita vastaavat punaiset KYTKINSIGNAALIN MERKKIVALOT sammuvat.
 - Varmista, että anturit ja magneetti ovat kohdakkain ja määritellyn havaintoetäisyyden päässä toisistaan.
 - Kytke vahvistimen virta POIS PÄÄLTÄ, odota kunnes VAROITUSMERKKIVALO on kokonaan SAMMUNUT, ja kytke sen jälkeen vahvistimen virta PÄÄLLE (virta päälle -alkutila).
 - Jos punainen VAROITUSMERKKIVALO vilkkuu yhä, kytke logiikkavahvistin irti ja soita MICRO SWITCH -sovelluskeskukseen (1-800-537-6945 [USA]).

2. Jos 50FY-sarjan järjestelmä ei toimi ja punainen VAROITUSMERKKIVALO ei pala, toimi seuraavasti:
 - Varmista, että sulakkeet ovat oikeankokoiset ja toimivat (0,630 A ja 1/8 A hidas).
 - Varmista, että anturit ja logiikkavahvistin on johdotettu oikein.
 - Varmista, että 22 kΩ vastukset on asennettu oikeille paikoilleen logiikkavahvistimessa.
 - Varmista, että anturit ja magneetti ovat kohdakkain ja määritellyn havaintoetäisyyden päässä toisistaan.
 - Kytke virta pois päältä ja päälle (virta päälle -alkutila).
 - Jos 50FY-sarjan järjestelmä on yhä POIS PÄÄLTÄ, kytke logiikkavahvistin irti ja palauta se Honeywellille.

Vaihe 6 - Suorita toiminnan tarkastus seuraavasti:

(ks. logiikkavahvistimen merkkivalot)

1. Jos 50FY-sarja toimii ja punainen VAROITUSMERKKIVALO ei pala, toimi seuraavasti:
 - Jos antureita ei ole aktivoitu, tarkista logiikkavahvistimen liittimien yläpuolella olevista KYTKINSIGNAALIN MERKKIVALOISTA, että kutakin anturia vastaava valo palaa. Tarkista myös, että punaiset AVOINTA RELETILAA ILMAISEVAT MERKKIVALOT palavat (logiikkavahvistimen kytkimet ovat auki).
 - Aktivoi anturit ja varmista, että niitä vastaavat punaiset KYTKINSIGNAALIN MERKKIVALOT sammuvat.
 - Jos kaikki kaksitoista punaista KYTKINSIGNAALIN MERKKIVALOA ovat sammuneina (kaikki anturit aktivoitu), tarkista, että punaiset AVOINTA RELETILAA ILMAISEVAT MERKKIVALOT EIVÄT pala. Tarkista myös, että vihreät SULJETTUA RELETILAA ILMAISEVAT MERKKIVALOT palavat (logiikkavahvistimen kytkimet ovat suljetut).
 - Jos 50FY-sarja toimii kuten edellä on kuvattu (vaihe 3), järjestelmä toimii oikein.

TEKNISET TIEDOT

FYQLA1-140R-3 logiikkavahvistin

Käyttöjännite	100 - 128 V AC, 50-60 Hz
Tehohäviö	3,0 VA maks.
Käyttölämpötila	-40 - +70°C (-40 - +158°F)
Antorele	Liitännän nimellisvirta: 5 A jännitteellä 120 V AC Tyyppi: yksinapainen, normaalisti auki; positiivinen ohjattu turvarele; kaksi relettä sarjaan kytkettyinä, yksi lähtösignaali; sähköinen käyttöikä: 100 000 käyttökertaa täydellä kuormituksella
*Kotelo	Logiikkavahvistimen on oltava NEMA-suljetussa kotelossa.

50FY41 Hall-anturi

Jännite	10 - 12 V DC
Kuormitusvirta (sisäisesti rajoitettu)	0,50 mA maks.
Virrankulutus	20 mA
Käyttölämpötila	-40 - +85°C (-40 - +185°F)
Kotelo	NEMA 1, 3, 4, 6P, 12, 13 ja **painepestutesti Kestävät toistuvaa altistumista emäksisille liuoksille, höyrypuhdistukselle, elintarvikkeille, mehuille ja selluloosalle.

***Kotelo:** Koteloiden ominaisuudet perustuvat NEMA-standardeissa luonnostelluille laajoille määrityksille. Tästä syystä asiakkaan on itse määritettävä koteloiden sopivuus eri olosuhteissa ja sovelluksissa. Ellei toisin ole ilmoitettu, kaikki viittaukset NEMA-tyypin koteloita vastaaviin tuotteisiin perustuvat ainoastaan MICRO SWITCH -arvioihin.

****Painepestutesti:** MICRO SWITCH -testimääritykset 060.167, numero 2, kappale 4.9 (Test Specifications 060.167, Issue 2, Paragraph 4.9) koskevat korkeapaineista (1200 psi), korkeaa lämpötilaa käyttävää (60°C/140°F) kemiallista huuhtelua. Tässä testissä simuloidaan elintarvike- ja juomatehtaissa käytettyjä puhdistusmenetelmiä, jotka ovat tehokkaampia kuin tavanomainen NEMA 4:n mukainen pesu. Huuhtelumenettelyn kuvaus on saatavana pyynnöstä.

HUOMATUS

Tämä tuote noudattaa standardin EN60730-2-1 teknisiä vaatimuksia, joita sovelletaan Electronic Incorporated (luokan I laitteet) antureille tyyppin 2 ja 2B toiminnassa jatkuvassa käytössä normaaleissa saastepitoisuuksissa.

TAKUU JA KORVAUKSET

Honeywell antaa valmistamilleen tuotteille virheettömyystakuun materiaalien ja työn osalta. Takuuta koskevia lisätietoja antaa paikallinen myyntikonttori. Jos takuun piiriin kuuluvat tuotteet palautetaan Honeywellille takuuajana, Honeywell korjaa tai vaihtaa vialliset tuotteet maksutta. Edellämainittu on ainoa ostajalle annettu korvaus ja **korvaa kaikki muut, suorat tai epäsuorat takuut, mukaanlukien kaupattavuutta ja tiettyyn tarkoitukseen sopivuutta koskevat.**

Vaikka sovellustukea on saatavana henkilökohtaisesti ja kirjallisen materiaalin avulla, on tuotteen sopivuus sovellukseen asiakkaan vastuulla.

Teknisiä tietoja voidaan muuttaa milloin tahansa ilman ennakkoilmoitusta. Annetut tiedot ovat tarkkoja ja luotettavia tämän julkaisun painatushetkellä. Emme kuitenkaan ota vastuuta tietojen käytöstä.

MYYNТИ JA HUOLTO

Sovellustukea, voimassaolevia teknisiä ominaisuuksia, hintoja tai lähimmän valtuutetun jälleenmyyjän sijaintia koskevia tietoja saat ottamalla yhteyttä lähimpään myyntikonttoriin tai soittamalla numeroon:

PUHELIN

1-800-737-3360 Kanada
+ 33 (0) 4 76 41 7200 Ranska
+ 49 (0) 69 8064 444 Saksa
+1-815-235-6847 Kansainvälinen
+ 44 (0) 161 251 4079 Iso-Britannia
+1-800-537-6945 USA

FAX

+ (33) 76 41 72 56 Ranska
+1-815-235-6545 USA

INTERNET

<http://www.honeywell.com/sensing/>
info@micro.honeywell.com

TILAUSOHJE

Tilausnumero	Kuvaus
50FY41-6	Anturi, 2 metrin (6 ft) johtimet, normaalisti auki
50FY41-12	Anturi, 4 metrin (12 ft) johtimet
50FY41-50	Anturi, 15 metrin (50 ft) johtimet
52FY31	Magneetti
FYQLA1-140R-3	Logiikkavahvistin, 1-6 liitäntää antureille

Honeywell**MICRO SWITCH**

Honeywell Inc.
11 West Spring Street
Freeport, Illinois 61032



Painettu soijapainovärillä
50 % kierrätyspaperille

**European Safety Center**

Honeywell - Cométa
21, Chemin du Vieux Chêne
38243 Meylan Cedex - RANSKA

Installationsanvisningar för 50FY-seriens halleffektbrytsystem för dörrar, EN954, kategori III

3:e UTGÅVAN
PK 80391



⚠ VARNING

FELAKTIG INSTALLATION

- Denna produkt har konstruerats för att uppfylla de tekniska kraven i EN954, kategori III, och i ANSI B11.19-1990. För att garantera att kraven uppfylls MÅSTE sensor 50FY41 användas tillsammans med logikförstärkare FYQLA1-140R-3.
- Rådgör med den lokala säkerhetsmyndigheten angående krav vid konstruktion av maskinstyrlänk, gränssnitt och samtliga styrelement som påverkar säkerheten.
- Följ installationsanvisningarna noggrant.

Följs inte anvisningarna kan det resultera i dödsfall eller svår kroppsskada.

ALLMÄNT

50FY-seriens halleffektbrytsystem för dörrar är ett kontaktfritt, magnetiskt aktiverat system bestående av tre komponenter: sensor, elektromagnet och logikförstärkare.

Sensorn består av två halleffektintegrerade kretsar som anslutes separat. Båda kretsarna måste slås på samtidigt för att ge utsignal.

Elektromagneten avger ett nycklat magnetfält som måste passa sensorn för att fungera riktigt. Rätt injusterad ger sensorn utsignal när den utsätts för det nycklade magnetfältet.

Logikförstärkaren innehåller ett kretskort för inkommande logiksignaler och styr reläutspänningen. Inkretsen klarar upp till sex sensorer. När samtliga anslutna sensorer aktiveras sluter logikkretsen reläkontakterna. Slås någon av de anslutna sensorerna av öppnar logikkretsen reläkontakterna.

INSTALLATIONSANVISNINGAR

Steg 1 - Montera och justera in sensor 50FY enligt följande:

⚠ VARNING

FELAKTIG INJUSTERING

Se till att sensorn och elektromagneten riktas mot varandra samt är injusterade så att de fungerar riktigt. Ett separationsavstånd på 10 mm (0.39 in) STÄNGER AV systemet oavsett offsetavstånd.

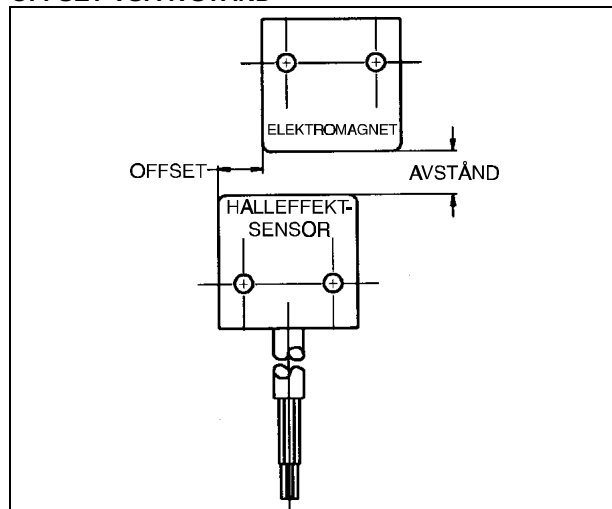
Följs inte anvisningarna kan det resultera i dödsfall eller svår kroppsskada.

- Montera och justera in sensorn och elektromagneten (se monteringsdimensioner, nominellt avkänningsavstånd och offset vs. avstånd) inom det tillåtna offsetområdet.

NOMINELLT AVKÄNNINGSAVSTÅND mm (in)

Offset	Avstånd
Noll	2,5 (0.100)
3,8 (0.150)	1,3 (0.050)
7,5 (0.300)	Noll

OFFSET VS. AVSTÅND



Steg 2 - Montera logikförstärkare FYQLA1 enligt följande:

IAKTTA FÖRSIKTIGHET

LOGIKFÖRSTÄRKAREN KAN SKADAS

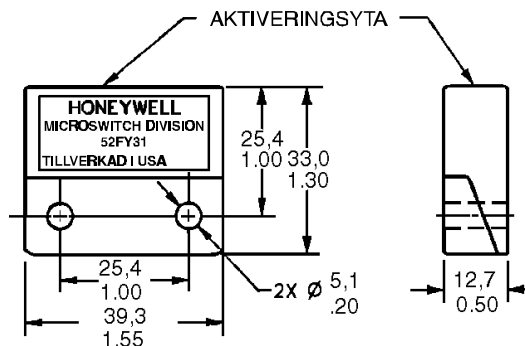
För att förhindra att logikförstärkaren skadas måste den installeras i en box tätad enligt NEMA, EN60730-2-1.

Följs inte anvisningarna kan det resultera i att produkten skadas.

- Montera enligt krav förstärkaren (se monteringsdimensionerna) i en box tätad enligt NEMA.

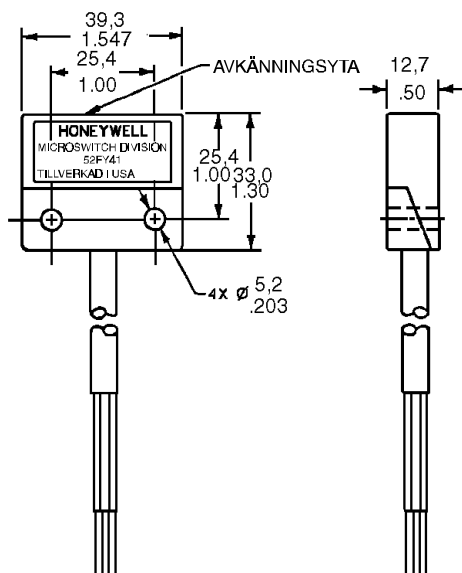
MONTERINGSDIMENSIONER - endast för information

Elektromagnet - 52FY31 (mm/in)

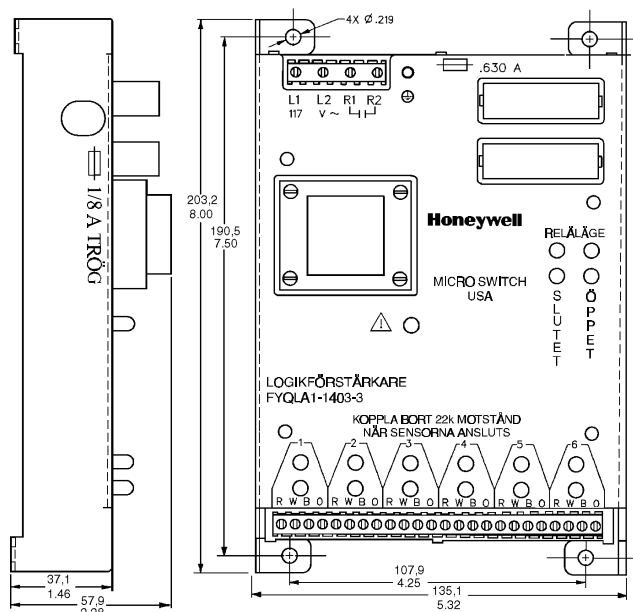


MONTERINGSDIMENSIONER - endast för information (mm/in)

Halleffektsensor - 50FY41



Logikförstärkare - FYQLA1-140R-3



Steg 3 - Anslut sensorerna till logikförstärkaren enligt följande:

OBS

- Komponentversioner av äldre typ (förstärkare FYQLA-140R-1 och sensor 50FY40) kan ej beställas. Däremot kan nya komponenter (förstärkare FYQLA-140R-3 och sensor 50FY41) installeras i system av äldre typ (se installationsvarning).
- Elektromagnet 52FY30 fungerar tillsammans med sensor 50FY41 men avkänningsavståndet ökar.

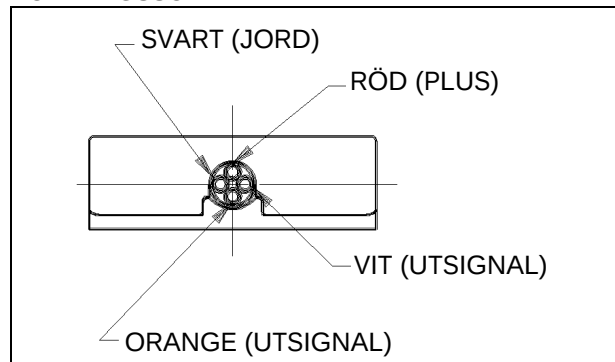
a. Sensor 50FY41 (ny) och förstärkare FYQLA1-140R-3 (ny)

- Anslut samtliga sensorer (se kopplingsschema) till logikförstärkaren via deras fyrtrådiga ledningar enligt följande:

FYQLA1-140R-3 (ny)	50FY41 (ny)
R (plus)	RÖD - plus
W (normalt öppen)	VIT - utsignal
B (minus)	SVART - jord
O (normalt sluten)	ORANGE - utsignal

- För att låsa spännings- och sensorledningarna, dra åt anslutningsskruvarna med 0,56 Nm (5.0 in.-lb.).

KOPPLINGSSCHEMA



- Om färre än sex sensorer ansluts till logikförstärkaren, anslut två 22 kΩ motstånd över varje oanvänd förstärkarterminal enligt följande:

Logikförstärkarens anslutningar	Motstånd*
R - W	22 kΩ motstånd
B - O	22 kΩ motstånd

*Motstånden behövs för att logikförstärkaren skall fungera riktigt. Tio 22 kΩ motstånd medföljer system i 50FY-serien.

⚠ VARNING

FELAKTIG INSTALLATION

- Denna produkt har konstruerats för att uppfylla de tekniska kraven i EN954, kategori III, och i ANSI B11.19-1990. För att garantera att kraven uppfylls MÅSTE sensor 50FY41 användas tillsammans med logikförstärkare FYQLA1-140R-3.

- Följ installationsanvisningarna noggrant.

Följs inte anvisningarna kan det resultera i dödsfall eller svår kroppsskada.

b. Sensor 50FY41 (ny) och förstärkare FYQLA1-140R-1 (äldre)

- Klipp av och ta bort den ORANGE sensorledningen.
- Anslut de RÖDA, VITA och SVARTA sensorledningarna till logikförstärkarens anslutningar enligt följande:

FYQLA1-140R-1 (begagnad)	50FY41 (ny)
R (plus)	RÖD - plus
W (normalt öppen)	VIT - utsignal
B (minus)	SVART - jord
	ORANGE LEDNING BORTTAGEN

- För att låsa spännings- och sensorledningarna, dra åt anslutningsskruvarna med 0,56 Nm (5.0 in.-lb.).

c. Sensor 50FY40 (äldre) och förstärkare FYQLA1-140R-3 (ny)

- Anslut de RÖDA, VITA och SVARTA sensorledningarna till logikförstärkaren enligt följande:

FYQLA1-140R-3 (ny)	50FY40 (äldre)
R (plus)	RÖD - plus
W (normalt öppen)	VIT - utsignal
B (minus)	SVART - jord
O (normalt sluten)	ORANGE LEDNING SAKNAS

- Installera ett 22 kΩ motstånd mellan de SVARTA och ORANGE anslutningarna på logikförstärkaren.
- För att låsa spännings- och sensorledningarna, dra åt anslutningsskruvarna med 0,56 Nm (5.0 in.-lb.).

Specialanvisningar gällande sensor 50FY40 vid användning tillsammans med förstärkare FYQLA1-140R-3

Om dörren förblir öppen längre än en sekund och strömmen till förstärkaren är PÅ, blinkar VARNINGSINDIKATORN (LED). För att återgå till grönt läge, stäng dörren (-arna), stäng AV spänningen till förstärkaren och vänta tills VARNINGSINDIKATORN (LED) SLÄCKTS helt; slå sedan PÅ spänningen till förstärkaren (spänningen i återställningsläget).

Steg 4 - Anslut logikförstärkaren enligt följande:

- Anslut 100 till 128 V AC till anslutning L1 och L2 på logikförstärkaren.
- Anslut last till reläkontakt R1 and R2 på logikförstärkaren.

Steg 5 - Utför eventuell felsökning: (se logikförstärkarens indikatorer)

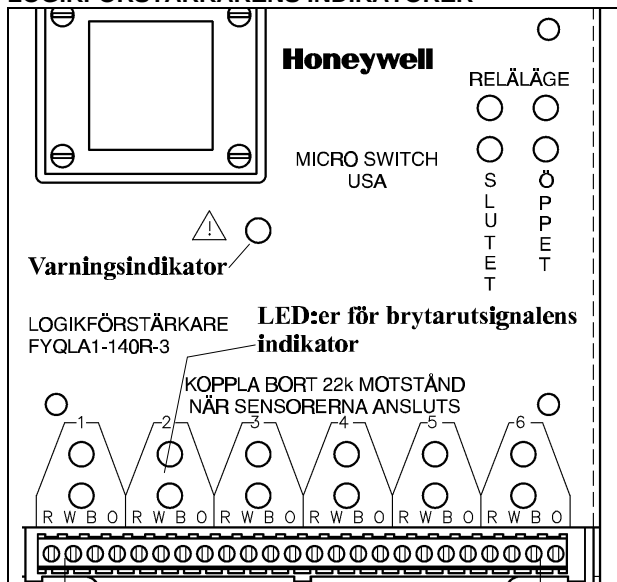
⚠ VARNING

SYSTEMFEL

Blinkar den röda VARNINGSINDIKATORN (LED) på logikförstärkaren FÅR DEN EJ ANVÄNDAS.

Följs inte anvisningarna kan det resultera i dödsfall eller svår kroppsskada.

LOGIKFÖRSTÄRKARENS INDIKATORER



1. Om 50FY-seriens system förefaller fungera, men den röda VARNINGSINDIKATORN (LED) blinkar skall följande utföras:
 - Kontrollera att sensorernas anslutning till logikförstärkaren är riktig.
 - Kontrollera att 22 kΩ motståndet installerats riktigt på logikförstärkaren.
 - Aktivera sensorerna manuellt och kontrollera att motsvarande röda LED:s för BRYTARUTSIGNALEN ovanför logikförstärkarens anslutningar släckts.
 - Kontrollera att sensorerna och elektromagneterna injusterats riktigt och ställts in på angivet avkänningsavstånd.
 - Slå AV spänningen till förstärkaren och vänta tills VARNINGSINDIKATORN (LED) SLÄCKTS helt; slå sedan PÅ spänningen till förstärkaren (spänningen i återställningsläget).
 - Om den röda VARNINGSINDIKATORN (LED) fortfarande blinkar skall logikförstärkaren kopplas bort och MICRO SWITCH tillämpningscenter kontaktas (1-800-537-6945 [USA]).

2. Om 50FY seriens system inte fungerar och den röda VARNINGSINDIKATORN (LED) ej tänts skall följande utföras:

- Kontrollera att installerade säkringar är av rätt märkström och ej brända (0,630A och 1/8A trög).
- Kontrollera att sensorernas och logikförstärkarens anslutningar är riktiga.
- Kontrollera att 22 kΩ motståndet installerats på rätt plats på logikförstärkaren.
- Kontrollera att sensorerna och elektromagneterna är rätt injusterade och ställts in på rätt avkänningsavstånd.
- Slå av och slå på spänningen (spänningen i återställningsläget).
- Om 50FY-seriens system fortfarande är AVSLAGET skall logikförstärkaren kopplas bort och skickas tillbaka till Honeywell.

Steg 6 - Utför funktionskontroll enligt följande: (se logikförstärkarens indikatorer)

1. Om 50FY-seriens system fungerar och den röda VARNINGSINDIKATORN (LED) ej tänts skall följande utföras:
 - Om någon av sensorerna eller samtliga ej aktiverats skall motsvarande röda LED:s för BRYTARUTSIGNALEN ovanför logikförstärkarens anslutningar för respektive sensor tändas. Kontrollera också att de röda LED:erna för ÖPPET RELÄLÄGE är tända (logikförstärkarens kontakter är öppna).
 - Aktivera varje sensor och kontrollera att motsvarande röda LED:s för BRYTARUTSIGNALEN släcks.
 - Om alla tolv röda LED:er för BRYTARUTSIGNALEN är släckta (samtliga sensorer aktiverade), skall kontroll utföras för att se om de röda LED:erna för ÖPPET RELÄLÄGE är SLÄCKTA. Kontrollera också om de gröna LED:erna för SLUTET RELÄLÄGE är tända (logikförstärkarens kontakter är slutna).
 - Om 50FY-seriens system fungerar enligt ovan (steg 3) fungerar systemet riktigt.

SPECIFIKATIONER

Logikförstärkare FYQLA1-140R-3

Inspänning	100 - 128 V AC, 50-60 Hz
Effektförbrukning	3,0 VA max.
Temperaturområde	-40 till +70°C (-40 till +158°F)
Utsignalrelä	Kontaktmärkström: 5 A vid 120 V AC Typ: enpolig, tvåvägs, N.O.; positivt styrt säkerhetsrelä; dubbla reläer anslutna i serie, en utsignal; elektrisk livtid: 100 000 slutningar vid full last
*Tätning	Logikförstärkaren måste placeras i en box tätad enligt NEMA.

Halleffektsensor 50FY41

Spänning	10 - 12 V DC
Belastningsström (internt begränsad)	0,50 mA max.
Strömförbrukning	20 mA
Temperaturområde	-40 till +85°C (-40 till +185°F)
Tätning	NEMA 1, 3, 4, 6P, 12, 13 och **begjutningsprov Enheterna är motståndskraftiga mot upprepade begjutningar med alkalisk lösning, ångtvätt, matstänk, joser och massa.

***Tätning:** Boxar utförs på grundval av de breda definitioner som skisseras i NEMA-standarderna. Därför måste kunden avgöra om en box kan användas vid en viss tillämpning. Om ej annat anges baseras samtliga hänvisningar till produkter avseende NEMA-box typer endast på MICRO SWITCH-utvärdering.

****Begjutningsprov:** MICRO SWITCH-provspecifikation 060.167, 2:a utgåvan, paragraf 4.9 avser kemisk begjutning under högt tryck (1200 psi) vid hög temperatur (140°F/+60°C). Provet simulerar de tvättmetoder som används på mat- och dryckbearbetningsfabriker, vilka är mer påfrestande än standardbegjutning enligt NEMA 4. Beskrivning av specifikationen finns att få på begäran.

OBS

Produkten uppfyller de tekniska kraven i EN60730-2-1 vad gäller Electronic Incorporated (avser klass I-utrustning) avkänningsstyrordning med funktion av typ 2 och 2B för kontinuerlig användning enligt vanliga föroreningsstandarder.

GARANTI OCH GOTTGÖRELSE

Honeywell garanterar att dess produkter ej innehåller defekta material samt att utförandet ej är bristfälligt. Kontakta ditt lokala försäljningskontor avseende garanti-information. Om garanterade produkter returneras till Honeywell under garantiperioden reparerar eller ersätter Honeywell de delar som befinner sig vara defekta utan krav på ersättning. Det föregående utgör köparens enda möjlighet till gottgörelse och **ersätter övriga uttryckliga eller antydda garantier, inklusive de som gäller säljbarhet och ändamålsenlighet.**

Även om vi tillhandahåller tillämpningssupport i form av personlig rådgivning och genom våra publikationer, är det kunden som avgör hur lämplig en produkt är vad gäller en viss tillämpning.

Specifikationerna kan ändras närsomhelst utan föregående varning. Informationen vi tillhandahåller antas vara riktig och pålitlig vid aktuell tryckning. Dock äger vi inget ansvar vad gäller dess användning.

FÖRSÄLJNING OCH SERVICE

För att få tillämpningssupport, aktuella specifikationer, priser eller namnet på närmaste auktoriserade distributör, kontakta närmaste försäljningskontor eller ring:

TELEFON

1-800-737-3360 Kanada
+ 33 (0) 4 76 41 7200 Frankrike
+ 49 (0) 69 8064 444 Tyskland
1-815-235-6847 Övriga världen
+ 44 (0) 161 251 4079 Storbritannien och Nordirland
1-800-537-6945 USA

FAX

+ (33) 76 41 72 56 Frankrike
1-815-235-6545 USA

INTERNET

<http://www.honeywell.com/sensing/>
info@micro.honeywell.com

BESTÄLLNINGSSUPPGIFTER

Katalogbeteckning	Beskrivning
50FY41-6	Sensor, 2 meter (6 ft) ledningar, normalt öppen (N.O.)
50FY41-12	Sensor, 4 meter (12 ft) ledningar
50FY41-50	Sensor, 15 meter (50 ft) ledningar
52FY31	Elektromagnet
FYQLA1-140R-3	Logikförstärkare, gränssnitt för upp till sex sensorer

Honeywell**MICRO SWITCH**

Honeywell Inc.
11 West Spring Street
Freeport, Illinois 61032



Tryckt med sojabläck på
återvinningspapper (50 %)

**European Safety Center**

Honeywell - Cométa
21, Chemin du Vieux Chêne
38243 Meylan Cedex - FRANKRIKE

Οδηγίες Εγκατάστασης για το Σύστημα Διακοπής Θύρας Hall Effect Σειράς 50FY, EN954 Κατηγορία III

ΤΕΥΧΟΣ 3

PK 80391



▲ ΠΡΟΕΙΔΟΠΟΙΗΣΗ

ΑΚΑΤΑΛΛΗΛΗ ΕΓΚΑΤΑΣΤΑΣΗ

- Το προϊόν έχει σχεδιαστεί έτσι ώστε να πληροί τις τεχνικές προδιαγραφές EN954 Κατηγορία III και ANSI B11.19-1990. Για να διασφαλίζεται η τήρηση των προδιαγραφών αυτών, ΠΡΕΠΕΙ να χρησιμοποιούνται αισθητές 50FY41 με τον ενισχυτή λογικής FYQLA1-140R-3.
- Συμβουλευτείτε τις τοπικές αρχές ασφάλειας και τις διατάξεις τους όταν σχεδιάζετε ένα μηχανικό κόμβο ελέγχου, τη διασύνδεση και όλα τα στοιχεία ελέγχου που επηρεάζουν την ασφάλεια.
- Τηρείτε αυστηρά όλες τις οδηγίες εγκατάστασης.

Η μη τήρηση των οδηγιών αυτών μπορεί να προκαλέσει θάνατο ή σοβαρό ατύχημα.

ΓΕΝΙΚΑ

Το Σύστημα Διακοπής Θύρας Hall Effect Σειρά 50FY είναι ένα σύστημα μαγνητικής ενεργοποίησης χωρίς επαφή αποτελούμενο από τρεις συσκευές: έναν αισθητή, ένα μαγνητικό ενεργοποιητή και έναν ενισχυτή λογικής.

Ο αισθητής περιέχει δύο ολοκληρωμένα κυκλώματα Hall Effect με ανεξάρτητη σύνδεση. Και τα δύο κυκλώματα πρέπει να ανοίξουν ταυτόχρονα για να παράγουν απόδοση.

Ο μαγνητικός ενεργοποιητής διαθέτει ένα κλειδαριθμημένο μαγνητικό πεδίο που πρέπει να αντιστοιχεί στον αισθητή για να λειτουργήσει σωστά. Όταν εκτίθεται σ' αυτό το κλειδαριθμημένο μαγνητικό πεδίο και ευθυγραμμίζεται σωστά, ο αισθητής ανταποκρίνεται με απόδοση.

Ο ενισχυτής λογικής περιέχει περιέχει μια κάρτα κυκλώματος εισόδου λογικής και ελέγχει την απόδοση του ηλεκτρονόμου. Το κύκλωμα εισόδου δέχεται μέχρι και έξι αισθητές. Όταν όλοι οι συνδεδεμένοι αισθητές ενεργοποιούνται, το κύκλωμα λογικής κλείνει τις επαφές του ηλεκτρονόμου. Εάν οποιοσδήποτε από τους συνδεδεμένους αισθητές κλείσει, το κύκλωμα λογικής θα ανοίξει τις επαφές του ηλεκτρονόμου.

ΟΔΗΓΙΕΣ ΕΓΚΑΤΑΣΤΑΣΗΣ

Βήμα 1 - Μοντάρετε και ευθυγραμμίζετε τον αισθητή 50FY ως εξής:

▲ ΠΡΟΕΙΔΟΠΟΙΗΣΗ

ΑΚΑΤΑΛΛΗΛΗ ΕΥΘΥΓΡΑΜΜΙΣΗ

Φροντίστε ώστε η ευθυγράμμιση του αισθητή και του μαγνητικού ενεργοποιητή να είναι αντιμέτωπες και ευθυγραμμισμένες για σωστή λειτουργία. Μια απόσταση διαχωρισμού 10 mm (0,39 in) θα προκαλέσει κατάσταση «OFF», ανεξάρτητα από την απόσταση αντιστάθμισης.

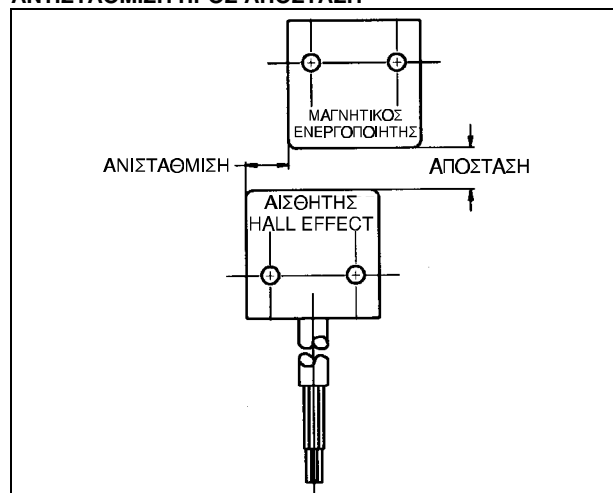
Η μη τήρηση των οδηγιών αυτών μπορεί να προκαλέσει θάνατο ή σοβαρό ατύχημα.

- Μοντάρετε και ευθυγραμμίζετε τον αισθητή και το μαγνητικό ενεργοποιητή (δείτε τις ενότητες Διαστάσεις Μονταρίσματος, Ονομαστική Απόσταση Ανίχνευσης, και Αντιστάθμιση προς Απόσταση) εντός της επιτρεπτής αντιστάθμισης.

ΟΝΟΜΑΣΤΙΚΗ ΑΠΟΣΤΑΣΗ ΑΙΣΘΗΤΗ mm (in)

Αντιστάθμιση	Απόσταση
Μηδέν	2,5 (0.100)
3,8 (0.150)	1,3 (0.050)
7,5 (0.300)	Μηδέν

ΑΝΤΙΣΤΑΘΜΙΣΗ ΠΡΟΣ ΑΠΟΣΤΑΣΗ



Βήμα 2 - Μοντάρετε τον ενισχυτή λογικής FYQLA1 ως εξής:

ΠΡΟΣΟΧΗ

ΒΛΑΒΗ ΤΟΥ ΕΝΙΣΧΥΤΗ ΛΟΓΙΚΗΣ

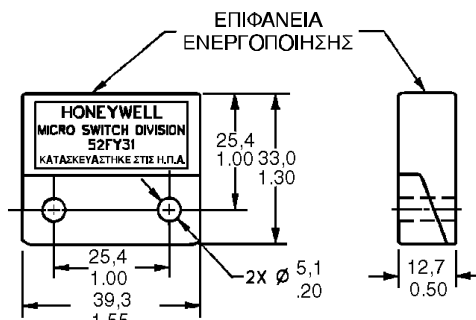
Για να αποτραπεί η βλάβη του ενισχυτή λογικής, πρέπει να τοποθετηθεί σε περίφραγμα σφραγισμένο με NEMA σύμφωνα με το EN60730-2-1.

Η μη τήρηση αυτών των οδηγιών θα οδηγήσει σε βλάβη του προϊόντος.

- Μοντάρετε τον ενισχυτή (δείτε Διαστάσεις Μονταρίσματος) μέσα σε περίφραγμα σφραγισμένο με NEMA όπως ορίζεται.

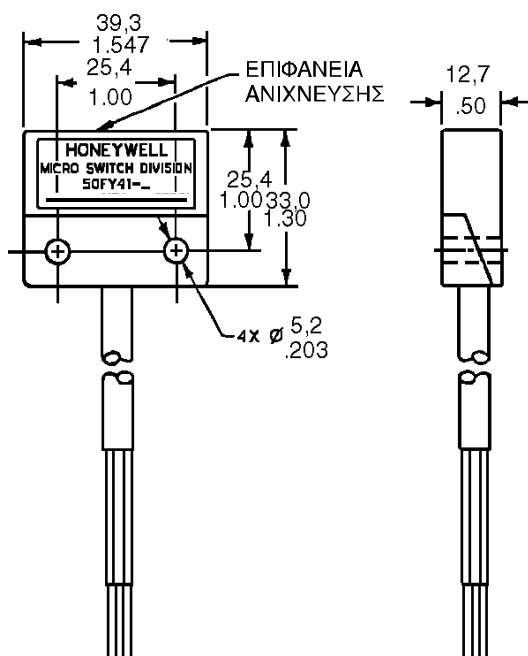
ΔΙΑΣΤΑΣΕΙΣ ΜΟΝΤΑΡΙΣΜΑΤΟΣ - Απλώς ενδεικτικές

Μαγνητικός Ενεργοποιητής - 52FY31 (mm/in)

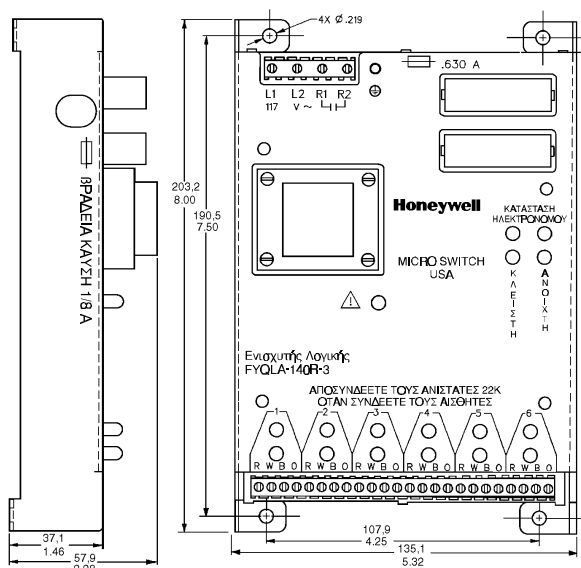


ΔΙΑΣΤΑΣΕΙΣ ΜΟΝΤΑΡΙΣΜΑΤΟΣ - Απλώς ενδεικτικές (mm/in)

Αισθητής Hall Effect - 50FY41



Ενισχυτής Λογικής - FYQLA1-140R-3



Βήμα 3 - Καλωδιώστε τους αισθητές στον ενισχυτή λογικής ως εξής:

ΣΗΜΕΙΩΣΗ

- Οι εκδόσεις με παλιά εξαρτήματα (ενισχυτής, FYQLA-140R-1 και αισθητής, 50FY40) δεν μπορούν να παραγγελθούν. Ωστόσο, για λόγους συντήρησης, τα νέα εξαρτήματα (ενισχυτής, FYQLA-140R-3 και αισθητής, 50FY41) μπορούν να χρησιμοποιηθούν σε μια παλιά εγκατάσταση (δείτε την προειδοποίηση εγκατάστασης).
- Οι μαγνητικοί ενεργοποιητές 52FY30 συνδυάζονται με αισθητές 50FY41, ωστόσο, η απόσταση ανίχνευσης θα αυξηθεί.

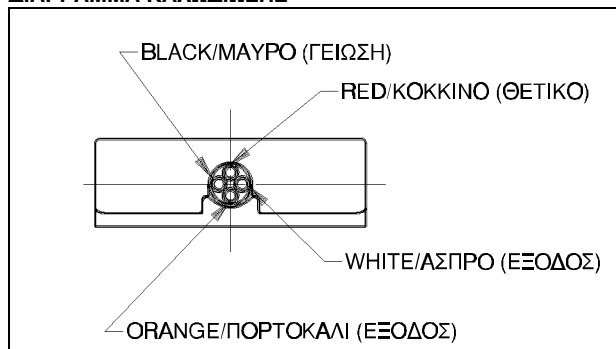
α. Αισθητής (νέος) 50FY41 με ενισχυτή (νέο) FYQLA1-140R-3

- Συνδέστε κάθε αισθητή (δείτε το Διάγραμμα Καλωδίωσης) μέσω των τεσσάρων αγωγών του ως σεντ με τον ενισχυτή λογικής ως εξής:

FYQLA1-140R-3 (νέος)	50FY41 (νέος)
R (θετικός)	RED (ΚΟΚΚΙΝΟ)-θετικός
W (ανοιχτός κανονικά)	WHITE (ΑΣΠΡΟ)-έξοδος
B (αρνητικός)	BLACK (ΜΑΥΡΟ)-γείωση
O (κλειστός κανονικά)	ORANGE (ΠΟΡΤΟΚΑΛΙ) - έξοδος

- Για να στερεώσετε τους αγωγούς ρεύματος και αισθητή, στρέψτε τις συνδετικές βίδες 0,56 Nm (5.0 in.-lb.).

ΔΙΑΓΡΑΜΜΑ ΚΑΛΩΔΙΩΣΗΣ



- Εάν λιγότεροι από έξι αισθητές είναι συνδεδεμένοι με τον ενισχυτή λογικής, τοποθετήστε δύο αντιστάτες 22 ΚΩ σταυρωτά σε κάθε αχρησιμοποίητο σεντ ακροδέκτη ενισχυτή λογικής ως εξής:

Ακροδέκτες Ενισχυτή Λογικής	Αντιστάτης*
R - W	22 ΚΩ αντιστάτης
B - O	22 ΚΩ αντιστάτης

*Οι αντιστάτες είναι απαραίτητοι για τη σωστή λειτουργία του ενισχυτή λογικής. Δέκα αντιστάτες των 22 ΚΩ παρέχονται με κάθε σύστημα της Σειράς 50FY.

ΠΡΟΕΙΔΟΠΟΙΗΣΗ

ΑΚΑΤΑΛΛΗΛΗ ΕΓΚΑΤΑΣΤΑΣΗ

- Το προϊόν έχει σχεδιαστεί έτσι ώστε να πληροί τις τεχνικές προδιαγραφές EN954 Κατηγορία III και ANSI B11.19-1990. Για να διασφαλίζεται η τήρηση των προδιαγραφών αυτών, ΠΡΕΠΕΙ να χρησιμοποιούνται αισθητές 50FY41 με τον ενισχυτή λογικής FYQLA1-140R-3.
 - Τηρείτε αυστηρά όλες τις οδηγίες εγκατάστασης.
- Η μη τήρηση των οδηγιών αυτών μπορεί να προκαλέσει θάνατο ή σοβαρό ατύχημα.**

β. Αισθητής (νέος) 50FY41 με ενισχυτή (παλιό) FYQLA1-140R-1

- Κόψτε και αφαιρέστε το ΠΟΡΤΟΚΑΛΙ μολύβδινο σύρμα του αισθητή.
- Συνδέστε το ΚΟΚΚΙΝΟ, ΤΟ ΑΣΠΡΟ, ΚΑΙ ΤΟ ΜΑΥΡΟ μολύβδινο σύρμα του αισθητή με τους ακροδέκτες του ενισχυτή λογικής ως εξής:

FYQLA1-140R-1 (παλιό)	50FY41 (νέο)
R (θετικός)	RED (ΚΟΚΚΙΝΟ)-θετικός
W (ανοιχτός κανονικά)	WHITE (ΑΣΠΡΟ)-έξοδος
B (αρνητικός)	BLACK (ΜΑΥΡΟ) - γείωση
	ΠΟΡΤΟΚΑΛΙ ΒΓΑΛΜΕΝΟ

- Για να στερεώσετε τους αγωγούς ρεύματος και αισθητή, στρέψτε τις συνδετικές βίδες 0,56 Nm (5.0 in.-lb.).

γ. Αισθητής (παλιός) 50FY40 με ενισχυτή (νέο) FYQLA1-140R-3

- Συνδέστε το ΚΟΚΚΙΝΟ, το ΑΣΠΡΟ και το ΜΑΥΡΟ μολύβδινο σύρμα του αισθητή με τον ενισχυτή λογικής ως εξής:

FYQLA1-140R-3 (new)	50FY40 (παλιός)
R (θετικός)	RED (ΚΟΚΚΙΝΟ) - θετικός
W (ανοιχτός κανονικά)	WHITE (ΑΣΠΡΟ)-έξοδος
B (αρνητικός)	BLACK (ΜΑΥΡΟ)-γείωση
O (κλειστός κανονικά)	ΧΩΡΙΣ ΠΟΡΤΟΚΑΛΙ ΑΓΩΓΟ

- Τοποθετήστε έναν αντιστάτη 22 ΚΩ μεταξύ του ΜΑΥΡΟΥ και του ΠΟΡΤΟΚΑΛΙ ακροδέκτη του ενισχυτή λογικής.
- Για να στερεώσετε τους αγωγούς ρεύματος και αισθητή, στρέψτε τις συνδετικές βίδες 0,56 Nm (5.0 in.-lb.).

Ειδικές οδηγίες που αφορούν τους αισθητές 50FY40 που χρησιμοποιούνται με ενισχυτή FYQLA1-140R-3

Εάν η θύρα είναι ανοιχτή πάνω από ένα δευτερόλεπτο και το ρεύμα στον ενισχυτή είναι στη θέση «ON», αναβοσβήνει η ΦΩΤΕΙΝΗ ΕΝΔΕΙΞΗ ΠΡΟΣΟΧΗΣ. Για να επανέλθετε σε πράσινη κατάσταση, κλείστε την/τις πόρτα/-ες, κλείστε («OFF») το ρεύμα στον ενισχυτή και περιμένετε ώπου να σβήσει η ΦΩΤΕΙΝΗ ΕΝΔΕΙΞΗ ΠΡΟΣΟΧΗΣ εντελώς («OFF»). Ύστερα ανοίξτε το ρεύμα («ON») στον ενισχυτή (ρεύμα στη θέση reset)

Βήμα 4 - Καλωδιώστε τον ενισχυτή λογικής ως εξής:

- Συνδέστε 100 έως 128 VAC (βολτ εναλλασσόμενου ρεύματος) με τους ακροδέκτες ενισχυτή λογικής L1 και L2.
- Συνδέστε το φορτίο με τους ακροδέκτες R1 και R2.επαφής του ηλεκτρονόμενου ενισχυτή λογικής.

Βήμα 5 - Εκτελέστε τη διαδικασία επίλυσης προβλημάτων αν χρειάζεται: (δείτε τις ενδείξεις του ενισχυτή λογικής)

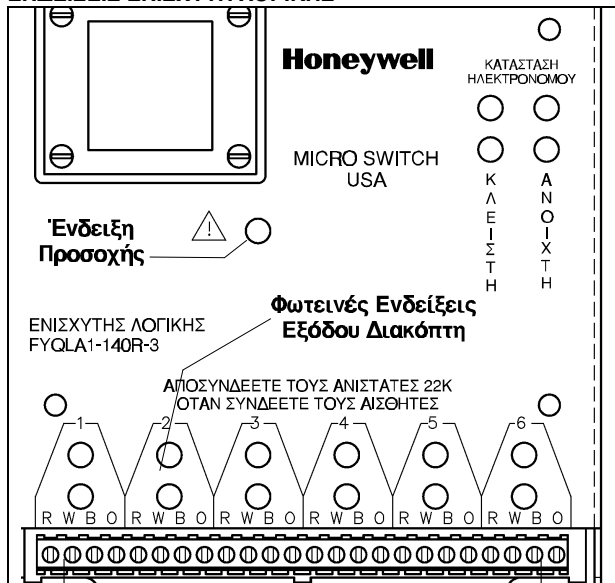
ΠΡΟΕΙΔΟΠΟΙΗΣΗ

ΑΝΑΚΡΙΒΗΣ ΑΠΟΔΟΣΗ ΣΥΣΤΗΜΑΤΟΣ

Εάν η κόκκινη ΦΩΤΕΙΝΗ ΕΝΔΕΙΞΗ ΠΡΟΣΟΧΗΣ, του ενισχυτή λογικής αναβοσβήνει, ΜΗΝ ΤΟ ΧΕΙΡΙΖΕΣΤΕ.

Η μη τήρηση των οδηγιών αυτών μπορεί να προκαλέσει θάνατο ή σοβαρό ατύχημα.

ΕΝΔΕΙΞΕΙΣ ΕΝΙΣΧΥΤΗ ΛΟΓΙΚΗΣ



- Εάν το σύστημα της Σειράς 50FY φαίνεται ενεργό, αλλά η ΦΩΤΕΙΝΗ ΕΝΔΕΙΞΗ ΠΡΟΣΟΧΗΣ αναβοσβήνει, κάντε τα εξής:
 - Βεβαιωθείτε ότι οι αισθητές είναι καλωδιωμένοι στον ενισχυτή λογικής σωστά.
 - Βεβαιωθείτε ότι οι αντιστάτες 22 K Ω είναι τοποθετημένοι στις σωστές θέσεις τους πάνω στον ενισχυτή λογικής.
 - Ενεργοποιήστε με το χέρι τους αισθητές και βεβαιωθείτε ότι οι αντίστοιχες κόκκινες ΕΝΔΕΙΞΕΙΣ ΕΞΟΔΟΥ ΔΙΑΚΟΠΤΗ πάνω από τον ακροδέκτη του ενισχυτή λογικής σβήνουν («OFF»).
 - Βεβαιωθείτε ότι οι αισθητές και οι μαγνητικοί ενεργοποιητές είναι ευθυγραμμισμένοι και μέσα στην προβλεπόμενη απόσταση ανίχνευσης.
 - Κλείστε το ρεύμα του ενισχυτή («OFF») και περιμένετε ώπου η ΦΩΤΕΙΝΗ ΕΝΔΕΙΞΗ ΠΡΟΣΟΧΗΣ να σβήσει

τελείως («OFF»), και στη συνέχεια ανοίξτε το ρεύμα στον ενισχυτή («ON») (ρεύμα στη θέση reset).

- Εάν η κόκκινη ΦΩΤΕΙΝΗ ΕΝΔΕΙΞΗ ΠΡΟΣΟΧΗΣ συνεχίσει να αναβοσβήνει, αποσυνδέστε τον ενισχυτή λογικής και τηλεφωνήστε στο Κέντρο Εφαρμογών MICRO SWITCH (1-800-537-6945).
- Εάν το σύστημα της Σειράς 50FY δε λειτουργεί και η κόκκινη ΦΩΤΕΙΝΗ ΕΝΔΕΙΞΗ ΠΡΟΣΟΧΗΣ δεν είναι αναμμένη, κάντε τα εξής:
 - Βεβαιωθείτε ότι οι τοποθετημένες ασφάλειες είναι οι ορθά προβλεπόμενες και δεν είναι καμμένες (0.630A και 1/8A βραδείας καύσης).
 - Βεβαιωθείτε ότι οι αισθητές και ο ενισχυτής λογικής είναι καλωδιωμένοι σωστά.
 - Βεβαιωθείτε ότι οι αντιστάτες 22 K Ω είναι τοποθετημένοι στις σωστές θέσεις τους στον ενισχυτή λογικής.
 - Βεβαιωθείτε ότι οι αισθητές και οι μαγνητικοί ενεργοποιητές είναι ευθυγραμμισμένοι και μέσα στην προβλεπόμενη απόσταση ανίχνευσης.
 - Κλείστε και ξαναοίξτε την τροφοδοσία (ρεύμα στη θέση reset).
 - Εάν το σύστημα της Σειράς 50FY εξακολουθεί να είναι κλειστό («OFF»), αποσυνδέστε τον ενισχυτή λογικής και επιστρέψτε τον στη Honeywell.

Βήμα 6 - Διενεργήστε λειτουργικό έλεγχο ως εξής: (δείτε τις ενδείξεις του ενισχυτή λογικής)

- Εάν το σύστημα της Σειράς 50FY λειτουργεί και η κόκκινη ΦΩΤΕΙΝΗ ΕΝΔΕΙΞΗ ΠΡΟΣΟΧΗΣ είναι αναμμένη, κάντε τα εξής:
 - Εάν κάποιος ή όλοι οι αισθητές είναι ενεργοποιημένοι, διαπιστώστε ότι οι αντίστοιχες κόκκινες ΕΝΔΕΙΞΕΙΣ ΕΞΟΔΟΥ ΔΙΑΚΟΠΤΗ πάνω από τους ακροδέκτες του ενισχυτή λογικής για κάθε αισθητή είναι αναμμένες. Επίσης διαπιστώστε ότι οι κόκκινες ΕΝΔΕΙΞΕΙΣ ΑΝΟΙΧΤΗΣ ΚΑΤΑΣΤΑΣΗΣ ΗΛΕΚΤΡΟΝΟΜΟΥ είναι αναμμένες (οι επαφές του ενισχυτή λογικής είναι ανοιχτές).
 - Ενεργοποιήστε κάθε αισθητή και διαπιστώστε ότι η αντίστοιχη κόκκινη ΕΝΔΕΙΞΗ ΕΞΟΔΟΥ ΔΙΑΚΟΠΤΗ σβήνει («OFF»).
 - Εάν και οι δώδεκα ΕΝΔΕΙΞΕΙΣ ΕΞΟΔΟΥ ΔΙΑΚΟΠΤΗ είναι σβηστές «OFF» (όλοι οι αισθητές είναι ενεργοποιημένοι), διαπιστώστε ότι οι ΕΝΔΕΙΞΕΙΣ ΑΝΟΙΧΤΗΣ ΚΑΤΑΣΤΑΣΗΣ ΗΛΕΚΤΡΟΝΟΜΟΥ ΔΕΝ είναι αναμμένες. Επίσης διαπιστώστε ότι οι πράσινες ΕΝΔΕΙΞΕΙΣ ΚΛΕΙΣΤΗΣ ΚΑΤΑΣΤΑΣΗΣ ΗΛΕΚΤΡΟΝΟΜΟΥ είναι αναμμένες (οι επαφές του ενισχυτή λογικής είναι κλειστές).
 - Εάν το σύστημα της Σειράς 50FY αποδίδει όπως σημειώνεται παραπάνω (βήμα 3) το σύστημα λειτουργεί κανονικά.

ΠΡΟΔΙΑΓΡΑΦΕΣ

FYQLA1-140R-3 Ενισχυτής Λογικής

Τάση εισόδου	100 - 128 VAC, 50-60 Hz
Διασκεδασμός ισχύος	3.0 VA max.
Διακύμανση θερμοκρασίας	-40 έως +70°C (-40 έως +158°F)
Ηλεκτρονόμος εξόδου	Προβλεπόμενη επαφή: 5 A @ 120 VAC Δράση: μονοπολική, απλής βολής, N.O. (ανοιχτός κανονικά)· Θετικά κατευθυνόμενος ηλεκτρονόμος ασφάλειας· Διπλοί ηλεκτρονόμοι συνδεδεμένοι εν σειρά, απλή έξοδος· Ηλεκτρική διάρκεια ζωής: 100.000 λειτουργίες με πλήρες φορτίο
*Στεγανότητα	Ο ενισχυτής λογικής πρέπει να βρίσκεται μέσα σε περίφραγμα σφραγισμένο με NEMA.

50FY41 Αισθητής τύπου Hall Effect

Τάση	10 - 12 VDC
Ρεύμα φορτίου (με εσωτερικό περιορισμό)	0.50 mA max.
Κατανάλωση ρεύματος	20 mA
Διακύμανση θερμοκρασίας	-40 έως +85°C (-40 έως +185°F)
Στεγανότητα	NEMA 1, 3, 4, 6P, 12, 13 και **τεστ καθαρισμού Οι συσκευές είναι ανθεκτικές στον επανειλημμένο καθαρισμό με καυστικό διάλυμα, στο καθάρισμα με ατμό, στις τροφές, στους χυμούς, και στον πολτό.

***Στεγανότητα:** Τα περιφράγματα βασίζονται στους γενικούς ορισμούς που περιγράφονται στα πρότυπα NEMA. Συνεπώς, ο πελάτης πρέπει να διαπιστώσει εάν το συγκεκριμένο περίφραγμα είναι επαρκές όταν εκτίθεται στις συγκεκριμένες συνθήκες κάποιας εφαρμογής. Αν δεν υπάρχει αντίθετη δήλωση, όλες οι αναφορές σε προϊόντα σχετικά με τύπους περιφραγμάτων NEMA βασίζονται μόνο σε εκτιμήσεις της MICRO SWITCH.

****Τεστ Καθαρισμού:** MICRO SWITCH 060.167, Τεύχος 2, Παράγραφος 4.9 είναι προδιαγραφές τεστ για υψηλή πίεση (1200 psi), υψηλή θερμοκρασία (140°F/+60°C) χημικό καθαρισμό. Το τεστ αυτό έχει ως πρότυπο τις διαδικασίες καθαρισμού που χρησιμοποιούνται στα εργοστάσια επεξεργασίας τροφίμων και ποτών που είναι αυστηρότερες από το βασικό ξέπλυμα με μάνικα NEMA 4. Αν ζητηθεί, παρέχεται περιγραφή της προδιαγραφής καθαρισμού.

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Το προϊόν αυτό πληροί τις τεχνικές προδιαγραφές EN60730-2-1 που ισχύουν για το ηλεκτρονικό ενσωματωμένο (για εξοπλισμό Κλάσης I) χειριστήριο αισθητή με δράση Τύπου 2 και 2β για συνεχή λειτουργία σε κανονικά επίπεδα ρύπων.

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<http://www.honeywell.com/sensing/>
info@micro.honeywell.com

ΟΔΗΓΟΣ ΠΑΡΑΓΓΕΛΙΑΣ

Αριθ. Καταλόγου	Περιγραφή
50FY41-6	Αισθητής, μολύβδινα σύρματα 2 μέτρων (6 ft), ανοιχτός κανονικά (NO)
50FY41-12	Αισθητής, μολύβδινα σύρματα 4 μέτρων (12 ft)
50FY41-50	Αισθητής, μολύβδινα σύρματα 15 μέτρων (50 ft)
52FY31	Μαγνητικός ενεργοποιητής
FYQLA1-140R-3	Ενισχυτής λογικής, διασύνδεση ενός έως έξι αισθητών

Honeywell**MICRO SWITCH**

Honeywell Inc.
11 West Spring Street
Freeport, Illinois 61032



Τυπώθηκε με Μελάνη Σόγιας
σε 50% Ανακυκλωμένο Χαρτί

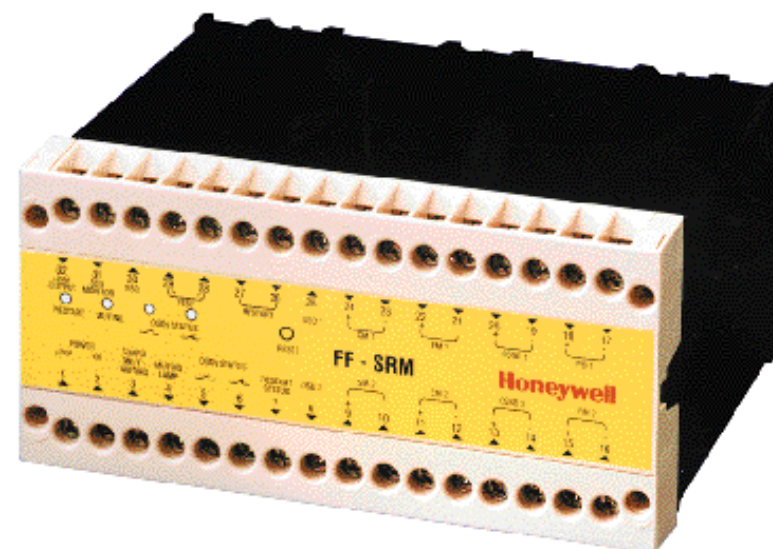
**European Safety Center**

Honeywell - Coméa
21, Chemin du Vieux Chene
38243 Meylan Cedex - ΓΑΛΛΙΑ

English

Muting Interface FF-SRM100P2

Category 4 according to EN 954-1

**⚠ WARNING****IMPROPER INSTALLATION**

Consult with US and/or European safety agencies and their requirements when designing a machine control link, interface and all control elements that affect safety.

Strictly adhere to all installation instructions.

Failure to comply with these instructions could result in death or serious injury.

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1. Important Information

1.1 Overview

Thank you for purchasing this Honeywell safety product. This manual contains description, operation, installation, electrical connections, maintenance and troubleshooting information related to the FF-SRM Series muting module.

1.2 Organization of Installation Manual

This installation manual has the following sections:

- **Important Information** contains important highlighted information, the manual's organization, control reliability information, approvals, standards, regulations and directives.
- **Description and Operation** provides operation and specification information.
- **Installation** explains how to properly install the muting module.
- **Connections and Setup** covers electrical installation, interfacing and setup procedures.
- **Inspection and Maintenance** contains inspection, maintenance, and indicator status information.
- **Order Guides** provide catalog listing of the muting module.
- **Warranty Information** provides important contact information related to sales and service.
- **Index** contains keywords and their associated pages related to topics found throughout this manual.

1.3 Important Highlighted Information

Important danger, warning, caution and notices are highlighted throughout the manual as follows:

DANGER

A DANGER symbol indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

A WARNING symbol indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

A CAUTION symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

NOTICE

A NOTICE symbol indicates important information that must be remembered and aids in job performance.

1.4 Control Reliability

“Control Reliability” means that, “the device, system or interface shall be designed, constructed and installed such that a single component failure within the device, interface or system shall not prevent normal stopping action from taking place but shall prevent a successive machine cycle.” (ANSI B11.19-1990, 5.5)

OSHA 29 CFR 1910.217 states that, “the control system shall be constructed so that a failure within the system does not prevent the normal stopping action from being applied to the press when required, but does prevent initiation of a successive stroke until the failure is corrected. The failure shall be detectable by a simple test, or indicated by the control system.”

Honeywell has developed a self-checking technique that combines reliability with safety. The FF-SRM Series muting module functions with dual channel redundancy and positive self-check monitoring. This means that a faulty component in our product will make the muting module fail in a safe mode.

This design meets the highest safety requirements (category 4) described in the EN 954-1 norm. The French Institut National de la Recherche et de la Sécurité has delivered an EC type examination certificate for an equipment made of a type 4 electrosensitive protective equipment and the FF-SRM muting module. The whole set complies with the requirements of the IEC/EN 61496-1 and IEC / pr EN 61496-2 norms.

Category 4 devices are designed and manufactured in such a way that a single breakdown or an accumulation of failures does not lead to the loss of the safety function when a dangerous situation arises. **The safety function is maintained on a permanent basis.**

1.5 Approvals

Approvals	Description
CE Compliance with the EN954 - parts 1 Standard for category 4 safety related parts of control systems	Only the packaging and the documentation of FF-SRM Series products carry the CE mark; the CE declaration of conformity is at the back of this manual
cCSAus	Canadian Standards Association

1.6 Muting module Installation and Use

Installation and use of this product must be performed by a qualified person thoroughly familiar with all instructions contained within this manual and all applicable safety regulations including those described below.

1.7 European Directives Compliance

The FF-SRM muting module is designed to interface electrosensitive protective equipment such as safety light curtains with the control circuitry of a machine. This safety component complies with the requirements of the category 4 as per the EN 954 -1 European standard, and its connection to the machine control circuitry must comply with this category.

Directives	Number
Machine Directive	89/392 EEC
Low Voltage Directive	73/23 EEC
Electromagnetic Compatibility Directive	89/336 CEE

The EC type examination certificate granted by the French Institut National de la Recherche et de la Sécurité (INRS) guarantees the conformity of the product with respect to the essential requirements of the Machinery Directive 89/392 EEC and its successive amendments 91/368/EEC, 93/44/EEC, and 93/68/EEC. To complete the EC type examination, further tests have been carried out by external laboratories to guarantee the conformity of the product with respect to the Low Voltage 73/23 EEC and the Electromagnetic Compatibility 89/336 CEE.

An EC declaration of conformity will be found at the back of this manual.

1.8 European Standards Compliance

- The Honeywell safety light curtains combined with the FF-SRM Series muting module comply with the following European standards :

Regulation	Title
EN 292	Safety of Machinery - Basic concepts, general principles for design
EN 60204 - 1	Safety of Machinery - Electrical equipment of machines
EN 954 - 1	Safety of Machinery - Safety related parts of control systems
IEC / EN 61496 - 1	Safety of Machinery - Electrosensitive protective equipment - part 1 : General requirements and tests
IEC/prEN 61496-2	Safety of Machinery - Electrosensitive protective equipment - part 2 : Active optoelectronic Protective Devices

- Installation and use of the FF-SRM muting module combined with a Honeywell safety light curtain must comply with the following applicable European standards (non complete list) :

Regulation	Title
EN 292	Safety of Machinery - Basic concepts, general principles for design
EN 60204 - 1	Safety of Machinery - Electrical equipment of machines
EN 954 - 1	Safety of Machinery - Safety related parts of control systems
IEC/EN 61496-1	Safety of Machinery - Electrosensitive protective equipment - part 1 : General requirements and tests
IEC/prEN 61496-2	Safety of Machinery - Electrosensitive protective equipment - part 2 : Active optoelectronic Protective Devices
prEN 999	Safety of Machinery - The positioning of protective equipment in respect of approach speeds of parts of the human body
EN 294	Safety of Machinery - Safety distances to prevent danger zones from being reached by the upper limbs
prEN 811	Safety of Machinery - Safety distances to prevent danger zones from being reached by the lower limbs

- When existing, machine standards give accurate requirements and prevail against any other European standards :

Regulation	Title
pr EN 692	« Machine-tool - Safety - Mechanical Presses »
pr EN 693	« Machine-tool - Safety - Hydraulic Presses »
pr EN 12622	« Hydraulic press brakes - Safety »
pr EN 201	« Injection plastic moulding machines »
pr EN 289	« Compression moulding and transfer machines »
pr EN 11553	« Laser for material processing »
EN 775	« Manipulating Industrial Robots »
EN 415-1	« Safety of packaging machines - Part 1 : Common requirements »
EN 415-2	« Safety of packaging machines - Part 2 : Preformed rigid container packaging machinery »
EN 415-3	« Safety of packaging machines - Part 3 : Form, fill and seal machines »
EN 415-4	« Safety of packaging machines - Part 4 : palletisers and depalletisers »

1.9 United States Regulations Compliance

US Regulation	Title
OSHA 29 CFR 1910.212	General Requirements for (guarding of) All Machines
OSHA 29 CFR 1910.217	(Guarding of) Mechanical Power Presses

- Safety light curtains may be used as primary protection for machines where the movement of the functional parts can be interrupted at any moment in a dangerous phase.

- Safety light curtains may be used as primary protection for machines on which the control circuit has been designed in such a manner that a fault in one component does not result in any risk.
- Cancellation of the safety light curtain stop signal must not cause the restart of the moving parts. The function to restart can only be initiated by means of a control designed for this purpose.

1.10 United States Standards Compliance

- Installation and use of the FF-SRM muting module combined with a Honeywell safety light curtain must comply with the following applicable American standards :

US Standards	Title
ANSI B11.1	Mechanical Power Presses
ANSI B11.2	Hydraulic Power Presses
ANSI B11.19	Safeguarding when Referenced by the Other B11 Machine Tool Safety Standards
ANSI/RIA R15.06	Safety Requirements for Industrial Robots and Robot Systems

1.11 Additional Protection

The FF-SRM module needs a number of auxiliary sensors to initiate and interrupt a muting sequence in safe conditions. The installation of these sensors and the installation of the safety light curtain must be done in accordance with the FF-SRM module specifications, and additional mechanical guarding must be used as follows:

- auxiliary sensors must be installed in such a way that a muting sequence cannot be started by a person.
- the additional mechanical guardings must be designed and installed in such a way that people cannot enter the dangerous area without being detected by the safety light curtain and the auxiliary sensors, if relevant. In particular, a person following parts vehiculed towards the dangerous zone must be detected when interrupting the safety light curtain detection field. The design and the installation of these additional mechanical guardings must comply with the requirements of the below mentioned European standards.

Moreover, it may be necessary to provide additional protection to maintain the protection level provided by the safety light curtain. Hard guards or additional presence sensing devices such as safety mats or laser scanner, may be used to ensure the operator is either forced to move through the sensing field to enter the danger zone, or forced to stand on the sensing area inside the danger zone.

Hard guards should be installed permanently with the aid of a tool or welded (if possible). If hard guards need to be automatically positioned, their positioning must be checked. It must not be possible for operators to override the detectors associated with these hard guards. Hard guards shall comply with the following applicable European Standards:

Standards	Title
prEN 953	Safety of Machinery - General requirements for the design and construction of guards
EN 294	Safety of Machinery - Safety distances to prevent danger zones from being reached by the upper limbs
pr EN 811	Safety of Machinery - Safety distances to prevent danger zones from being reached by the lower limbs
EN 1088	Safety of Machinery - Interlocking devices with and without guard locking
EN 954 - 1	Safety of Machinery - Safety related parts of control system

Other Honeywell FF-SR Series safety control modules may be used in addition to the FF-SRM muting module in the interface between protective safety equipment and machine control circuitry. The following safety control modules are particularly recommended :

- FF-SRS : safety interface control module designed for emergency stop
- FF-SRD Series : safety control module designed for door monitoring
- FF-SR2 : safety relay control module designed for two-hand controls
- FF-SR0 Series : safety control module designed for standstill detection on a synchronous motors
- FF-SRT Series : time delay module
- FF-SRE Series : expansion relay module

They offer redundancy, monitoring, and control reliability features that ensure the highest level of industrial safety.

Honeywell safety switches and sensors that may be used to check the position of guards include:

- 50FY and 40FY Hall effect safety sensors
- GSS safety limit switches
- GK and GKM key operated safety switches
- GKR/L solenoid key operated safety interlock switches
- 24/924CE miniature safety limit switch

Honeywell safety optoelectronic products that may be used with the FF-SRM muting module include:

- FF-LS, FF-SB and FF-SYA safety light curtains
- FF-SM safety mat
- FF-SE laser scanner
- FF-SPS4 single beam safety device
- FF-SCAN modular safety light curtain

2. Description and Operation

2.1 Overview

This chapter contains terms and concepts related to safety and the application of the FF-SRM muting module. The importance of the installer's role in the set-up and installation of the machine guarding systems is discussed. The section also contains specification information.

2.2 Muting function

The FF-SRM module is an interface between the safety ESPE and the control circuitry of a dangerous machine, on which the muting of the protective equipment outputs is necessary at certain steps of the process. For example, on a machine automatically fed by a conveyor, parts must be vehiculed through the detection field of the safety light curtain towards the dangerous area without causing the immediate stoppage of the machine. Similarly, manual loading and unloading of a press may be allowed while the press tool goes back to its upper position.

The FF-SRM module is a permanently self-checked electrical interface which complies with the requirements of the EN 954 -1 European standard for category 4 protective devices : any failure is immediately detected and prevents any muting sequence from being activated. Connected with any of the ESPE from the Honeywell range, the FF-SRM module reliably controls muting sequences.

When the protective equipment is not muted, the FF-SRM module output status is identical to the light curtain output status, and the intrusion of an object or a person inside the ESPE detection field immediately stops the machine. The machine can only restart after pressing a restart push-button connected to the FF-SRM module terminals.

The muting sequence is controlled by two or four regular sensors (such as photoelectric controls, limit switches or inductive proximity sensors) which reliably detect the manufactured parts initiating and interrupting the muting sequence. When sequence conditions are met, the FF-SRM module allows the machine to operate during the muting sequence without taking into account the signal delivered by the ESPE. Correct operation of the sensors is monitored at each muting sequence and any sensor failure prevents the muting from being performed. If manufactured parts remain accidentally in the light curtain detection field during a muting sequence, two push-buttons allow the override of the light curtain and restart of the machine is easily achieved. A white lamp informs the operator of each muting sequence. Correct operation of this lamp is controlled in accordance with IEC/EN 61496-1 European standard, and any muting lamp failure prevents the muting from being performed.

A Final Switching Device monitoring loop is available for the control of the relays commanded by the two fail-safe static outputs of the module. The module also integrates an alarm output (or « Secondary Switching Device ») which switches off in case of internal failure, and signalling static outputs status indicator located on the module cover. These LED status indicators provide the operator with information on the output status, on the occurrence of a muting sequence, on a possible internal failure and warn the operator when a manual restart of the module is necessary.

2.3 Approval and rating plates

Figure 2.1 Approval and Rating plate

FF - SRM

MUTING INTERFACE

Honeywell
(F) 38240 Meylan

Type

V

P

POWER + Inputs

P +24V OUTPUT without outputs

P +24V OUTPUT max.

N°

T
Response time

IP / NEMA

Imax
OSD - SSD
Muting lamp

Made in France

Complies with the requirements of the Machine Directive 89/392 EEC

Conforme aux exigences de la Directive Machine 89/392 CEE

Entspricht den Anforderungen der Maschinen-Richtlinie 89/392 EWG

Tested by

INRS

According to:

IEC 61496-1

EN 60204

Category 4 acc. to EN 954-1

671606-0010

Type	Product Part Number	N°	Serial Number and Date Code
V	Supply Voltage	T	Response Time
P	Maximum Power Consumption of the module and all inputs	response time	
POWER + inputs	Minimum Power Consumption of the module without loads	IP / NEMA	Sealing
P		Imax	OSD, SSD and Muting Lamp
+24V OUTPUT without outputs		OSD - SSD	Outputs Switching Capacity
		Muting lamp	
P	Maximum Power Consumption of the module with loads	L load	Loads specifications (max. impedance and min. turn-on voltage)
+24V OUTPUT max.			

CE	Only the packaging and the documentation of FF-SRM Series product carry the CE mark; the CE declaration of conformity is at the back of this manual
INRS	Institut National de Recherche et de Sécurité (French body notified for the CE certification of Electrosensitive protective Equipment)
cCSAus	The Canadian Standard Association has been accredited as a Nationally Recognized Testing Laboratory (NRTL) by the US Occupational Safety and Health Administration (OSHA). The CSA is able to carry out tests according to the Canadian and UL standards and delivers a single certificate which is valid for both Canada and the United States.

2.4 Operation

2.4.1 Selection of the appropriate mode (switch ST1)

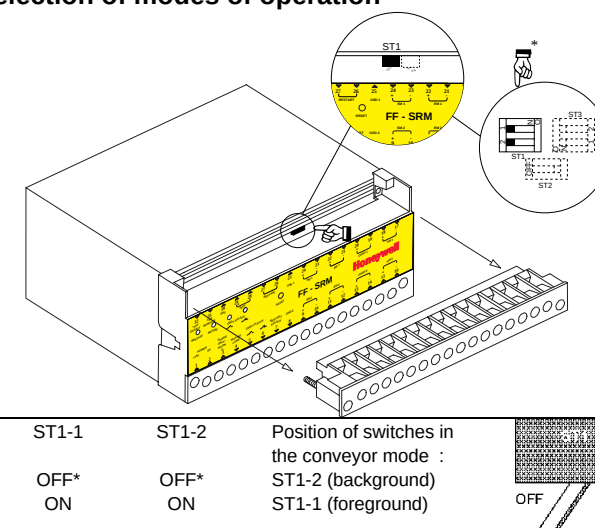
NOTICE

FACTORY SETTINGS

- The muting module is set in the conveyor mode on delivery. The muting module can be used with this mode of operation on machines where the protective equipment controls the access across a conveyor belt.
- Select the press mode on machines where the operator carries out manual operations during non dangerous phases of the machine working cycle.

The selection of modes is done with 2 switches ST1 located inside the module. The removal of the upper terminal strip eases access to the switches ST1 :

Figure 2.2 : Selection of modes of operation



(*) : position of switches on delivery

NOTICE

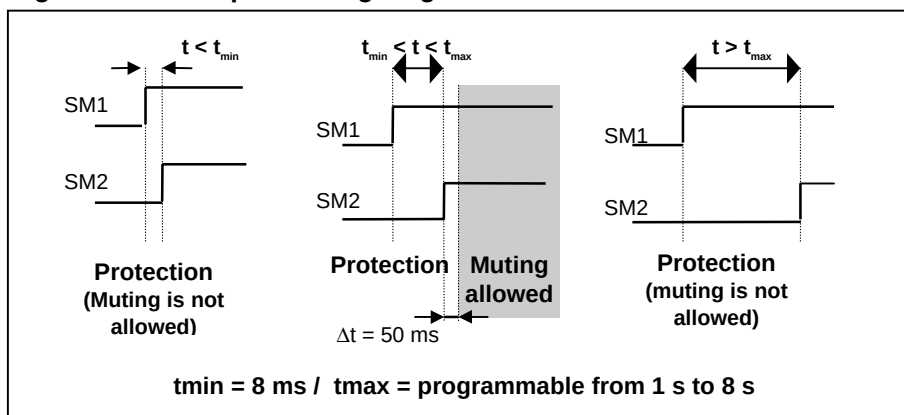
MAXIMUM MUTING SEQUENCE DURATION

- The duration of the muting sequence is voluntarily limited to avoid the permanent mute of the protective equipment. The actuation of the 2 start muting sensors SMs initiates a timing, and if this timing ends before the information delivered by the 2 end muting sensors EMs are issued, then the muting sequence is interrupted and the OSDs outputs of the muting module remains permanently open.
- The selection of the appropriate mode of operation sets the maximum duration of the muting sequence to the values given in chapter 2.4.2 SM inputs .
- If this timing is exceeded, press and release the restart push-button to go back to normal conditions of operation (refer to chapter 2.4.5 Manual restart of the module).
- In the conveyor mode, it may be necessary to press push- buttons P/B1 and P/B2 to clear the detection field before restarting the module (see chapter 2.4.4 Override function).

2.4.2 SM inputs (start of a muting sequence) (switch ST3)

At least two auxiliary sensors are necessary to start a muting sequence. These two sensors may be ultrasonic sensors, photoelectric controls, limit switches or inductive proximity sensors. Correct operation of these sensors is monitored by the muting module and a muting sequence is allowed if both sensor outputs switch ON within a time frame set between $t_{min} = 8ms$ and $t_{max} = \text{programmable from 1s to 8s}$.

Figure 2.3 : SM inputs timing diagram

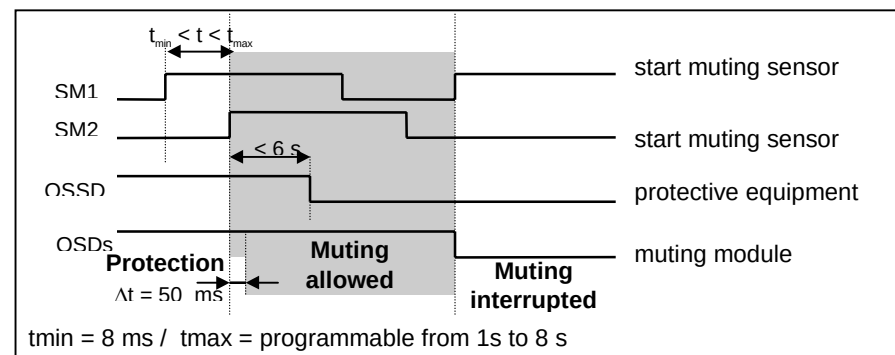


NOTICE

TIMING CONDITIONS

- The 8 ms minimum time difference between the two SMs inputs guarantees the detection of a permanent short circuits of one of the SMs inputs. Physically, the 2 sensors must be separated so that someone cannot actuate both of them.
- If a new transition of a sensor SM occurs during a muting sequence, the muting sequence is immediately stopped to avoid the permanent muting of the safety function. The relative position of sensors SMs and EMs define a minimum distance between 2 successive moving objects.
- In the conveyor mode, the object must interrupt the safety light curtain detection beams, before releasing both sensors SMs and 6s max. after the actuation of the second sensor SM.

Figure 2.4 : Example of an incorrect installation



The muting sequence starts 50 ms after both sensors SMs have been actuated. The second transition of the sensor SM1 stops the muting sequence in progress and the status of the module OSDs outputs is identical to the status of the protective equipment OSSDs outputs.

NOTICE

SENSOR FAILURE

- If a sensor SM fails, the muting sequence is not allowed. In this case the muting lamp remains permanently off (refer to chapter 4.8.3 Muting lamp output).
- After clearing the detection field, the muting module can be restarted either by pressing the restart push-button in the press mode or by using the override function in the conveyor mode. However, the next muting sequence will not be allowed.
- Normal operation can be achieved by switching the power off, replacing the defective SM sensor, switching the power on and restarting the module (refer to chapter 2.4.5 Manual restart of the module).

Setting the maximum timing tmax of sensors SMs

Simultaneous action of the sensors SMs is monitored by the module which detects possible failure of a sensor.

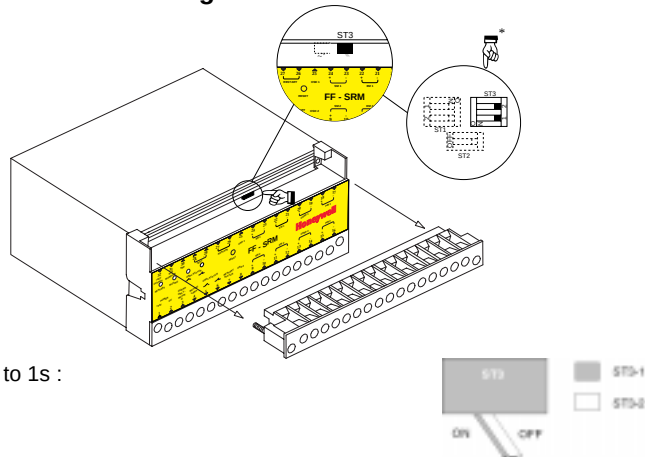
NOTICE

FACTORY SETTINGS

- The maximum timing tmax is set to 1 s on delivery.
- It can be modified to the following values : 2 s, 4 s, or 8 s.
- The setting of the timing tmax also sets the muting maximum duration. In the conveyor mode (factory setting), the muting duration is set to 2 mn on delivery.

The setting is done with 2 switches ST3 located inside the module. The removal of the upper terminal strip eases access to the switches ST3 :

Figure 2.5 : Setting the maximum timing tmax of sensors SMs



Selection of the maximum timing t _{max} .	Position of switches ST3		Corresponding muting durations $\Delta_{\max}$	
	ST3-1	ST3-2	Press Mode	Conveyor Mode
8 s	ON	ON	60 mn	60 mn
4 s	OFF	ON	4 mn	8 mn
2 s	ON	OFF	2 mn	4 mn
1 s*	OFF	OFF	1 mn	2 mn

(*) : settings factory settings

WARNING

COINCIDENCE TIMING BETWEEN SMs SENSORS AND MUTING DURATION

- Select the t_{max} timing corresponding to the shortest muting duration $\Delta_{\max}$ enabling the object transfer on a conveyor.
- On a press, both SMs sensors must be activated within the following time frame : 8 ms < t < 1s. The maximum duration $\Delta_{\max}$ of the muting sequence must be set to 1 mn. These are the factory settings.

Failure to comply with these instructions could result in death or serious injury.

2.4.3 EM inputs (end of a muting sequence)

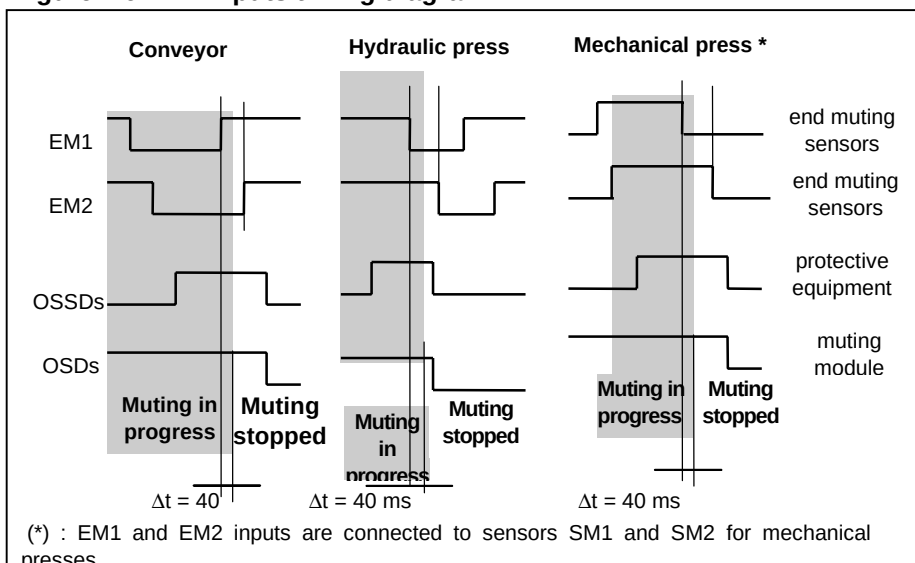
Two auxiliary sensors may be necessary to stop a muting sequence. These two sensors may be ultrasonic sensors, photoelectric controls, limit switches or inductive proximity sensors. Correct operation of these sensors is monitored by the muting module.

NOTICE

FACTORY SETTINGS

- The muting module is set in the conveyor mode on delivery. In this mode, the muting sequence stops when the first EM sensor switches ON.
- In the press mode, the muting sequence stops when the first EM sensor switches off (for the selection of the press mode, refer to the chapter 2.4.1 Selection of the appropriate mode).

Figure 2.6 : EM inputs timing diagram



NOTICE

SENSOR FAILURE

- If a sensor EM fails, the next muting sequence is not allowed even if the condition of simultaneity between sensors SMs is satisfied. In this case the muting lamp remains permanently off (refer to chapter 4.8.3 Muting lamp output).
- Restarting the module either by pressing the restart push-button in the press mode or by using the override function in the conveyor mode., will allow the performance of a single muting sequence ONLY.
- Resetting the module by switching off and on the power supply, will allow the performance of a single muting sequence ONLY.
- Normal operation can be achieved by switching the power off, replacing the defective EM sensor, switching the power on and restarting the module (refer to chapter 2.4.5 Manual restart of the module).

2.4.4 Override function

The override function is mainly used when the muting module is used in the conveyor mode. The override function allows the evacuation of an object if it accidentally remains in the detection field of the protective equipment after a muting sequence. Two push-buttons P/B and P/B2 must be connected on the appropriate terminals to manually start a muting sequence. The muting sequence is interrupted as soon as the detection field is cleared, and the OSDs outputs of the module switches ON automatically.

WARNING

VERRIDE PUSH-BUTTONS LOCATION

- Access to these push-buttons shall be restricted to the people allowed to intervene in case of problem. The operators shall not be able to use these push-buttons which shall be kept under lock and key (2 key selector switches may be used as an alternative).
- Moreover, the allowed person shall have a wide visibility on the installation and permanently check that nobody enters the dangerous area while the muting sequence is manually performed.

Failure to comply with these instructions could result in death or serious injury.

NOTICE

VERRIDE FUNCTION CONDITIONS

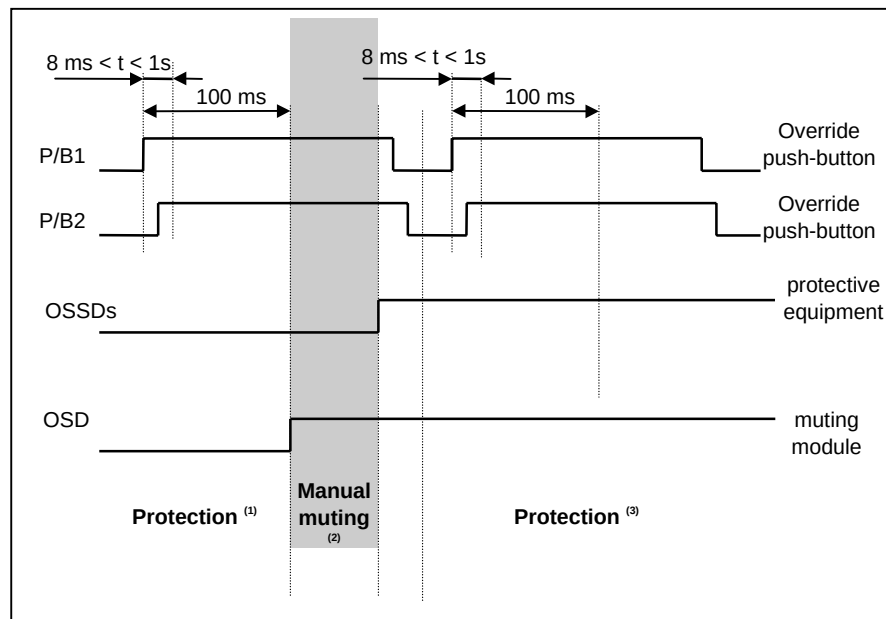
- The override function is only allowed if the detection field of the protective equipment is interrupted.
- Contacts of the two push-buttons must be closed within a time frame set between 8 ms and 1 s. They must remain closed for 100 ms as a minimum.

NOTICE

MUTING LAMP FAILURE

If the muting lamp fails, the release of the protection field does not lead to the automatic restart of the module. However, the manual restart is possible and leads to the closing of the OSDs outputs (refer to chapter 4.8.3 Muting lamp output).

Figure 2.7 : Override function timing diagram



- (1)** The override function is allowed :
- if the OSSDs outputs of the protective equipment are open and an object is inside the protection field,
 - if the contacts of the push-buttons are closed within the preset time frame.
- (2)** The override function is automatically interrupted as soon as the OSSDs outputs switch ON when the protection field is released.
- (3)** The override function is not allowed if the protection field is clear.

2.4.5 Manual restart of the module

The manual restart of the module is necessary after each power reset and after each time the OSDs outputs switch off .

The opening of the OSDs outputs may be due to one of the following events :

- interruption of the protection field while the protective equipment is not muted,
- failure of a sensor SM or EM,
- module internal failure,
- failure of the FSD relays used to interface the module with the machine control circuitry.

NOTICE**MUTING SEQUENCE DURATION**

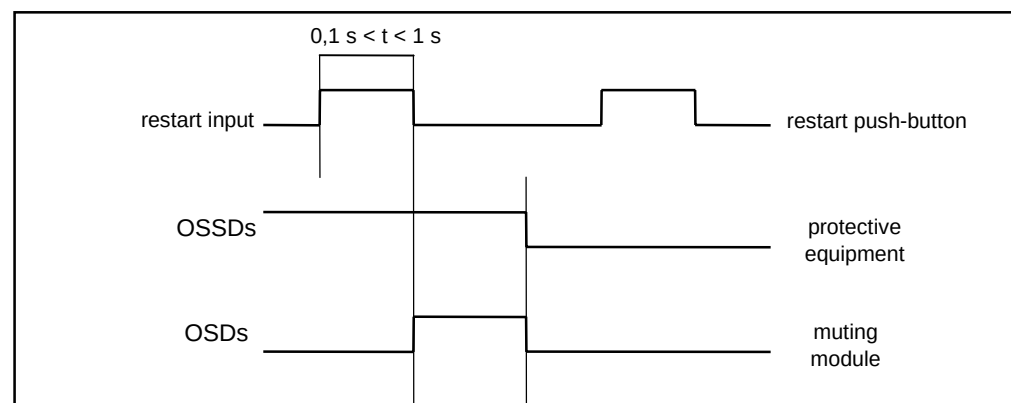
- If the allowed timing for the muting sequence is exceeded, clear the detection field of the protective equipment before restarting the module.
- In the conveyor mode, use the override function to clear the detection field (see chapter 2.4.2 Override function).

NOTICE**GUARD-ONLY MODE**

- In the guard-only mode, a manual restart of the muting module is necessary after each beam interruption to go back to normal conditions (see chapter 2.4.6 guard-only mode).

NOTICE**MANUAL RESTART CONDITIONS**

- The restart is allowed if no failure is detected and if the detection field of the protective equipment is clear.
- In the conveyor mode, it may be necessary to press push-buttons P/B1 and P/B2 to clear the detection field before restarting the module (see chapter 2.4.2 Override function).
- The effective restart of the module is achieved 30 ms after the push-button is released, and after a short pulse (between 0.1s and 1s) is sent on the appropriate input of the module.

Figure 2.8 : Manual restart timing diagram

2.4.6 Guard-only mode

The muting function can be deactivated at any time and the muting module then operates in the guard-only mode. In the guard-only mode, the module does not take into account signals delivered by the auxiliary sensors SM and EM, and the unexpected intrusion of an object or a person in the protection field stops the dangerous movement of the machine.

NOTICE

GUARD-ONLY MODE

- In the guard-only mode, a manual restart of the muting module is necessary after each beam interruption to go back to normal conditions (see chapter 2.4.5 Manual restart of the module).
- The following inputs/outputs remain active in the guard-only mode : RESTART STATUS, OSDs STATUS, SSD, OSD1 & OSD2, TEST, OSSD1 & OSSD2, RESTART, SSD MONITOR. These inputs/outputs are described in chapter 4. Electrical connections.

The possibility to switch from one mode to the other provides flexibility on machines with 2 loading modes : continuous operation with automatic loading via a conveyor, or cyclic operations with manual loading.

2.4.7 RESET push-button

The reset push-button is located on the front cover of the housing. It must be used to return to normal conditions of operation after an error has been detected. Most of the time, the failure must be eliminated before resetting the module. The reset may also reveal the failure of one or several of the LEDs status indicators or a failure of one of the “ MUTING LAMP ”, “ OSDs STATUS ” and “ RESTART STATUS ” outputs.

2.4.8 Indicators

LEDs status indicators

Indicators status	Module status
Yellow white red green ○ ○ ○ ○ RESTART MUTING OSDs STATUS  	
● ● ● ●	Either the module is not powered, or internal fuses are blown, or the LEDs status indicators are failing. Check the presence of the 24Vdc voltage supply between terminals 1 and 2, or reset the module with the RESET push-button to check correct operation of the LEDs indicators (see chapter 2.4.7 Reset push button)
● ●  ●	Either the module is carrying out a test after power up and waits for the OSSDs switching before allowing the manual restart, or the module has detected a failure (see chapter 5. Troubleshooting).
 ●  ●	The module needs to be restarted. Press and release the restart push-button (see chapter 2.4.5 Manual restart of the module)
 ● ● 	The module is ready to operate : the protection field is clear and the ESPE is not muted.
  ● 	The module is ready to operate : the protection field is either clear or interrupted and the ESPE is muted (the OSDs outputs of the module are closed).
● ●  ●	The ESPE is not muted. The interruption of the protection field by an object sets the module in the alarm mode (The OSDs outputs of the module are open). Evacuate the object and restart the module (see chapter s 2.4.4 override function and 2.4.5 Manual restart of the module)

 Light OFF
  Light ON
  Flickering light

2.5 Specifications

Supply voltage	24 Vdc +/-15%
Power consumptions	+24V POWER : 6W for the module and all inputs +24V OUTPUT : 6W to 60W for the module and all outputs
Response time	5 ms
Operating temperature	0 to 55 °C
Relative Humidity	25 to 75 %
Sealing	IP 20
Outputs	OSD1 & OSD2 (for machine shutdown): 2 fail-safe static outputs (switching capacity : 0.5A/24Vdc) SSD (for failure alarm) : 1 static output tested at power up (switching capacity : 0,5 A/24 Vdc) MUTING LAMP (for the muting lamp) : 1 self-checked static output (switching capacity : 0,5 A/24 Vdc) TEST (for testing the ESPE connection) : 1 programmable NO/NC static output (switching capacity : 16 mA/24 Vdc)
Allowed loads impedance (OSD1 & OSD2)	55.2 Ω min. / 5 kΩ max.
Allowed loads turn-on voltage (OSD1 & OSD2)	5 V min. on 100 % resistive loads / 7 V min. on inductive loads
Inputs	OSSD1 & OSSD2 (for the ESPE NO contacts) : 2 inputs with optocoupler (consumption : 30 mA/24 Vdc) SM1/2 & EM1/2 (for the sensors NO/NF contacts) : 4 inputs with optocoupler (consumption : 10 mA/24 Vdc) P/B1 & P/B2 (push buttons NO contacts) : 2 inputs with optocoupler (consumption : 10 mA/24 Vdc) RESTART (for the module restart and the FSDs monitoring): 1 input with optocoupler (50 mA current pic) SSD MONITOR (for the SSD monitoring): 1 input with optocoupler (consumption : 10 mA/24 Vdc)
LEDs indicators	OSDs outputs status, restart condition, muting sequence, unwanted condition
Cable length	between the FSDs or SSD and the module : 100 m*
Connection	removable terminal strips (2 Ø1.5mm ² /AWG16 wires per screw terminal)
Mounting	Omega rail DIN 50 022-35 (35 x 15 mm)
Dimensions	152,0 x 118,2 x 73,2 (overall size)
Weight	600g without packaging - 1,10kg with packaging

* The cable length is given for a maximum load resistance of 250 Ω for the OSDs and SSD outputs. If the load resistance is > 250 Ω, the cable length must be $L_{cable} \leq 25\,000 / R_{load}$ (in meters).

3. Installation

3.1 Overview

This chapter contains information about possible applications and properly installing muting sensors.

3.2 Sensors installation

3.2.1 Use in the conveyor mode

The conveyor mode can be used on machines automatically fed by a conveyor belt. On such machines, the muting module FF-SRM can be used to mute the light curtain while parts are conveyed through the light curtain detection field, and to allow automatic loading without causing the immediate stoppage of the machine.

NOTICE

FACTORY SETTINGS

- The muting module is set in the conveyor mode on delivery.
- The maximum timing t_{max} allowed between SM sensors is set to 1 s on delivery. It can be modified to the following values : 2 s, 4 s, or 8 s
- The setting of the timing t_{max} also sets the muting maximum duration Δ_{max} . In the conveyor mode (delivery setting), the muting duration is set to 2 mn (factory settings). It can be modified to the following values : 4, 8 or 60 mn.
- Refer to chapter 2.4.2 SM inputs, to select t_{max} and Δ_{max} .

On a conveyor application, the FF-SRM muting module can be used to perform either a two-direction muting or a one-way muting :

Two-direction muting using 2 sensors

In the following example, two thru-scan (or retro-polarised) photoelectric controls SM1 & SM2 are used to start the muting sequence whatever the direction of the movement of the objects (correct operation of these sensors is monitored by the muting module). The muting of the protective equipment is allowed when the detected objects enter and leave the dangerous area. This installation is recommended on applications where the entry and exit points of the material into the dangerous zone are the same.

WARNING

IMPROPER INSTALLATION

- The interruption of the beams SM1 & SM2 starts the muting sequence, but the electrical connections must be made in such a way that the release of the protective equipment beams stops the muting sequence (refer to the figure 4.18 of the chapter 4.9.1 Conveyor applications).
- The distance between SM1 & SM2 beams shall not allow a person to actuate both sensors within the preset time frame t_{max} , and the intersection between beams must be located inside the dangerous area to avoid the unexpected start of a muting sequence.
- Both beams must be interrupted within a preset time frame $8\text{ ms} < t < t_{max}$. The setting of the timing t_{max} also sets the muting maximum duration Δt_{max} : select the t_{max} timing corresponding to the shortest muting duration Δt_{max} enabling the object transfer (refer to chapter 2.4.2 SM inputs).

Failure to comply with these instructions could result in death or serious injury.

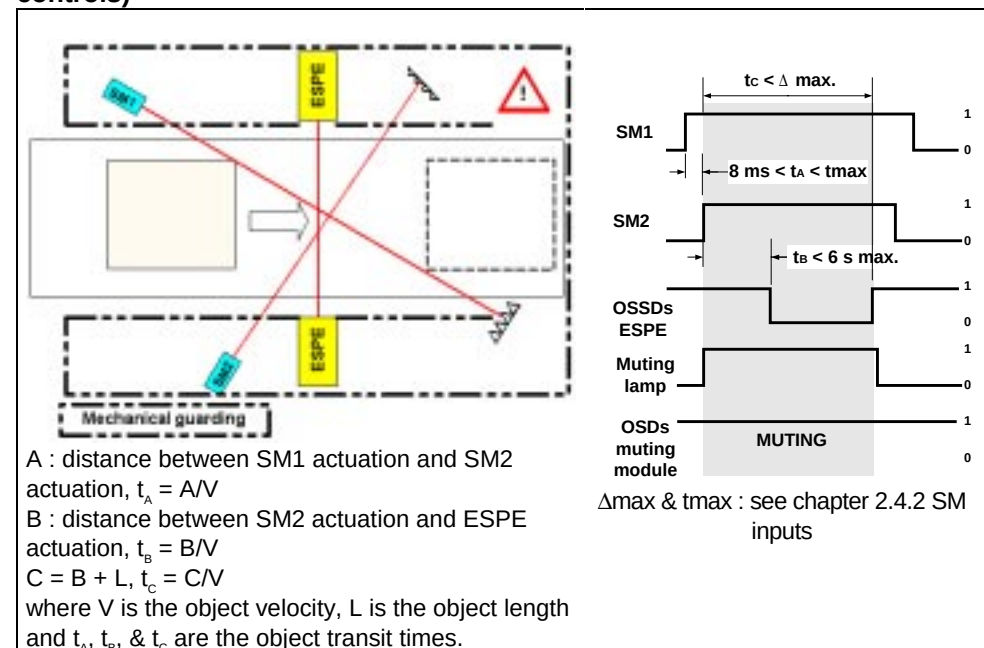
WARNING

ADDITIONAL PROTECTIONS

Additional hard guardings must be designed and installed in such a way that people cannot enter the dangerous area without being detected by the protective equipment. Particularly, a person following parts vehiculed towards the dangerous zone must be detected when interrupting the safety light curtain detection field.

Failure to comply with these instructions could result in death or serious injury.

Figure 3.1 : Two-direction muting on a conveyor (using two photoelectric controls)



NOTICE

FACTORY SETTINGS

- The muting module is set in the conveyor mode on delivery.
- The maximum timing t_{max} allowed between SM sensors is set to 1 s on delivery. It can be modified to the following values : 2 s, 4 s, or 8 s.
- The setting of the timing t_{max} also sets the muting maximum duration Δmax . In the conveyor mode (delivery setting), the muting duration is set to 2 mn (on delivery). It can be modified to the following values : 4, 8 or 60 mn.
- Refer to chapter 2.4.2 SM inputs, to select t_{max} and Δmax .

NOTICE

TIMING CONDITIONS

- The 8 ms minimum time difference between the two SMs inputs guarantees the detection of a permanent short circuits of any of the SMs inputs. Physically, the 2 sensors must be separated so that someone cannot actuate both of them.
- If a new transition of a sensor SM occurs during a muting sequence, the muting sequence is immediately stopped to avoid the permanent muting of the safety function. The relative position of sensors SMs and the protective equipment ESPE defines a minimum distance between 2 successive moving objects.
- In the conveyor mode, the object must interrupt the safety light curtain detection beams, before releasing both sensors SMs and 6s max. after the actuation of the second sensor SM.

Two-direction muting using 4 sensors

The following example is a variation of the previous application, where 4 limit switches are used to start a muting sequence whatever the direction of the movement of the objects. These sensors could also be ultrasonic sensors, photoelectric controls or inductive proximity sensors (correct operation of these sensors is monitored by the muting module). The muting of the protective equipment is allowed when the detected objects enter and leave the dangerous area. This installation is recommended on applications where the entry and exit points of the material into the dangerous zone are the same.

WARNING

IMPROPER INSTALLATION

- The activation of the SM sensors starts the muting sequence, but the electrical connections must be made in such a way that the release of the protective equipment beams stops the muting sequence (refer to the figure 4.18 of the chapter 4.9.1 Use in the conveyor mode).
- The distance between SM1a & SM2a switches and the distance between SM1b & SM2b switches must not allow a person to actuate both sensors within the preset time frame t_{max} to avoid the unexpected start of a muting sequence.
- To start a muting sequence, SM1a & SM2a must be interrupted within the preset time frame $8\text{ ms} < t < t_{max}$. This condition must also be respected for SM1b & SM2b. The setting of the timing t_{max} also sets the muting maximum duration Δ_{max} : select the t_{max} timing corresponding to the shortest muting duration Δ_{max} enabling the object transfer (refer to chapter 2.4.2 SM inputs).

Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING**ADDITIONAL PROTECTIONS**

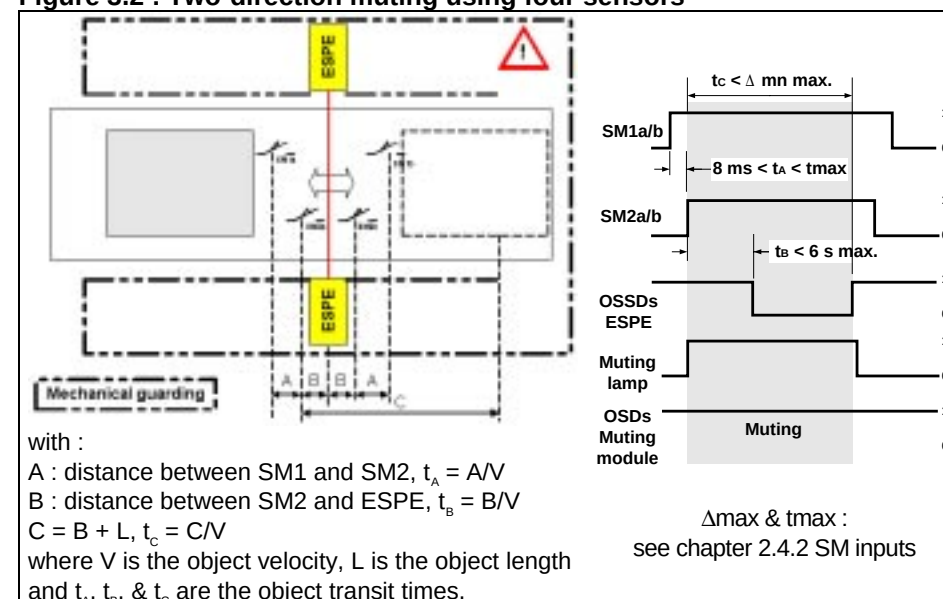
Additional hard guardings must be designed and installed in such a way that people cannot enter the dangerous area without being detected by the protective equipment. Particularly, a person following parts vehiculed towards the dangerous zone shall be detected when interrupting the safety light curtain detection field.

Failure to comply with these instructions could result in death or serious injury.

NOTICE**INCORRECT INSTALLATION**

The distances between sensors SM1a & SM2a and the safety light curtain shall be calculated taking into account the size of the object which must be detected : the object must interrupt the safety light curtain detection beams, before releasing both sensors SMs. The distance between the first sensor SM1a & SM2a and the protective field must be smaller than the size of the vehiculed object, otherwise the muting sequence stops as soon as the first sensor SM1a & SM2a is released and the intrusion of the object inside the protective field leads to the immediate stoppage of the machine.

Figure 3.2 : Two-direction muting using four sensors



NOTICE

FACTORY SETTINGS

- The muting module is set in the conveyor mode on delivery.
- The maximum timing t_{max} allowed between SM sensors is set to 1 s on delivery. It can be modified to the following values : 2 s, 4 s, or 8 s.
- The setting of the timing t_{max} also sets the muting maximum duration Δ_{max} . In the conveyor mode (delivery settings), the muting duration is set to 2 mn (on delivery). It can be modified to the following values : 4, 8 or 60 mn.
- Refer to chapter 2.4.2 SM inputs, to select t_{max} and Δ_{max} .

NOTICE

TIMING CONDITIONS

- The 8 ms minimum time difference between the two SMs inputs guarantees the detection of a permanent short circuits of any of the SMs inputs. Physically, the 2 sensors must be slightly apart.
- If a new transition of a sensor SM occurs during a muting sequence, the muting sequence is immediately stopped to avoid the permanent muting of the safety function. The relative position of sensors SMs and the protective equipment ESPE defines a minimum distance between 2 successive moving objects.
- In the conveyor mode, the object must interrupt the safety light curtain detection beams, before releasing both sensors SMs and 6s max. after the actuation of the second sensor S_{ms}.

One-way muting using 4 sensors

In the following example, two thru-scan (or retro-polarized) photoelectric controls SM1&SM2 are used to start the muting sequence, and two additional thru-scan (or retro-polarized) photoelectric controls EM1 & EM2 are used to stop it. These sensors could also be ultrasonic sensors, inductive proximity sensors or limit switches (correct operation of these sensors is monitored by the muting module). This installation enables the muting of the protective equipment in one direction only. It is recommended on applications where the entry and the exit points of the material into the dangerous zone are different. The use of 4 sensors to perform a muting sequence provides a high level of safety.

⚠ WARNING**IMPROPER INSTALLATION**

- The distance between sensors SM1 & SM2 shall not allow a person to actuate both sensors within the preset time frame.
- Both beams must be interrupted within a preset time frame $8\text{ ms} < t < t_{\text{max}}$. The setting of the timing t_{max} also sets the muting maximum duration Δ_{max} : select the t_{max} timing corresponding to the shortest muting duration Δ_{max} enabling the object transfer (refer to chapter 2.4.2 SM inputs).

Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING**ADDITIONAL PROTECTIONS**

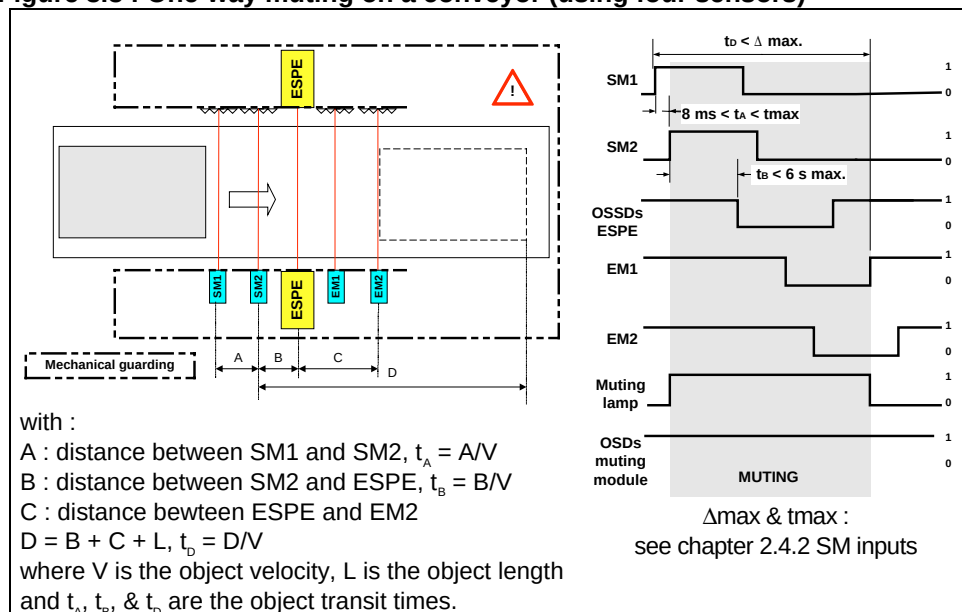
Additional hard guardings must be designed and installed in such a way that people cannot enter the dangerous area without being detected by the protective equipment. Particularly, a person following parts vehiculed towards the dangerous zone shall be detected when interrupting the safety light curtain detection field.

Failure to comply with these instructions could result in death or serious injury.

NOTICE

- Sensors SMs and EMs must be installed respectively before and after the protective equipment detection field. Their relative position shall be calculated taking into account the selected maximum muting duration Δ_{max} (see chapter 2.4.2 SM inputs).
- The distances between sensors SM1 & SM2 and the safety light curtain shall be calculated taking into account the size of the object which must be detected : the object must interrupt the safety light curtain detection beams, before releasing either sensors SMs. The distance between the first sensor SM1 and the protective field must be smaller than the size of the vehiculed object, otherwise the muting sequence stops as soon as the first sensor SM1 is released and the intrusion of the object inside the protective field leads to the immediate stoppage of the machine.

Figure 3.3 : One-way muting on a conveyor (using four sensors)



NOTICE

FACTORY SETTINGS

- The muting module is set in the conveyor mode on delivery.
- The maximum timing t_{max} allowed between SM sensors is set to 1 s on delivery. It can be modified to the following values : 2 s, 4 s, or 8 s.
- The setting of the timing t_{max} also sets the muting maximum duration Δ_{max} . In the conveyor mode (delivery settings), the muting duration is set to 2 mn (on delivery). It can be modified to the following values : 4, 8 or 60 mn.
- Refer to chapter 2.4.2 SM inputs, to select t_{max} and Δ_{max} .

NOTICE**TIMING CONDITIONS**

- The 8 ms minimum time difference between the two SMs inputs guarantees the detection of a permanent short circuits of one or both of the SMs inputs. Physically, the 2 sensors must be slightly apart.
- If a new transition of a sensor SM occurs during a muting sequence, the muting sequence is immediately stopped to avoid the permanent muting of the safety function. The relative position of sensors SMs and EMs define a minimum distance between 2 successive moving objects.
- In the conveyor mode, the object must interrupt the safety light curtain detection beams, before releasing both sensors SMs and 6s max. after the actuation of the second sensor SMs.

One-way muting using 2 sensors

The following example is a variant of the previous application, where two thru-scan (or retro-polarized) photoelectric controls SM1 & SM2 are used to start a muting sequence and where the electrical connections are made in such a way that the release of the protective equipment beams stops the muting sequence (refer to the figure 4.18 of the chapter 4.9.1 Use in the conveyor mode). The sensors could also be ultrasonic sensors, inductive proximity sensors or limit switches (correct operation of these sensors is monitored by the muting module). This installation enables the muting of the protective equipment in one direction only. It is recommended on applications where the entry and the exit points of the material into the dangerous zone are different.

** WARNING****IMPROPER INSTALLATION**

- The distance between sensors SM1 & SM2 shall not allow a person to actuate both sensors within the preset time frame.
- Both beams must be interrupted within a preset time frame $8 \text{ ms} < t < t_{\text{max}}$. The setting of the timing t_{max} also sets the muting maximum duration Δt_{max} : select the t_{max} timing corresponding to the shortest muting duration Δt_{max} enabling the object transfer (refer to chapter 2.4.2 SM inputs).

Failure to comply with these instructions could result in death or serious injury.

** WARNING****ADDITIONAL PROTECTIONS**

Additional hard guardings must be designed and installed in such a way that people cannot enter the dangerous area without being detected by the protective equipment. Particularly, a person following parts vehiculed towards the dangerous zone shall be detected when interrupting the safety light curtain detection field.

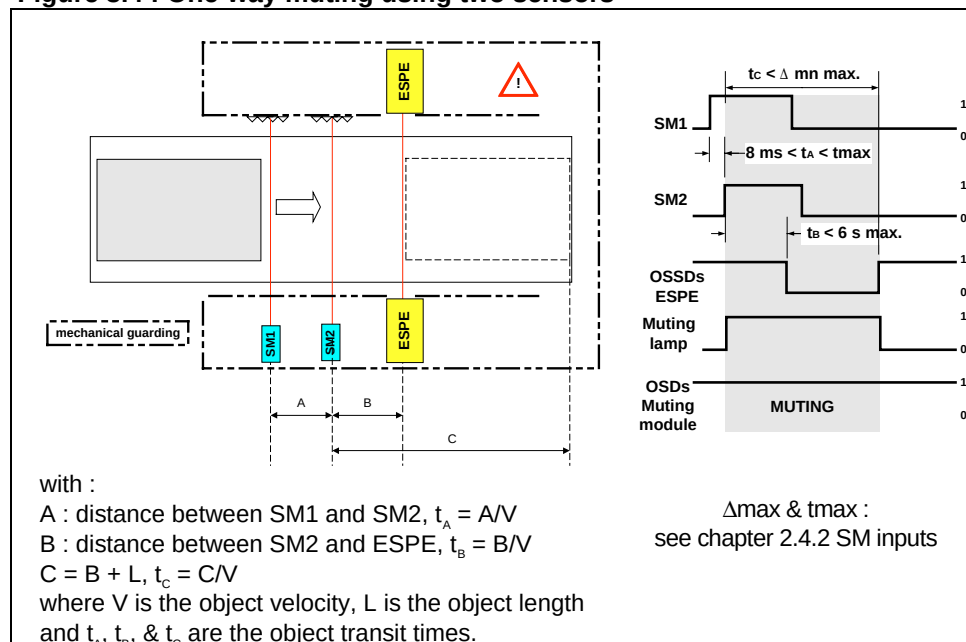
Failure to comply with these instructions could result in death or serious injury.

NOTICE

INCORRECT INSTALLATION

The distances between sensors SM1 & SM2 and the safety light curtain shall be calculated taking into account the size of the object which must be detected : the object must interrupt the safety light curtain detection beams, before releasing both sensors SMs. The distance between the first sensor SM1 and the protective field must be smaller than the size of the vehiculed object, otherwise the muting sequence stops as soon as the first sensor SM1 is released and the intrusion of the object inside the protective field leads to the immediate stoppage of the machine.

Figure 3.4 : One-way muting using two sensors



NOTICE

FACTORY SETTINGS

- The muting module is set in the conveyor mode on delivery.
- The maximum timing t_{max} allowed between SM sensors is set to 1 seconde on delivery. It can be modified to the following values : 2 s, 4 s, or 8 s.
- The setting of the timing t_{max} also sets the muting maximum duration Δ_{max} . In the conveyor mode available on delivery , the muting duration is set to 2 mn on delivery. It can be modified to the following values : 4, 8 or 60 mn.
- Refer to chapter 2.4.2 SM inputs, to select t_{max} and Δ_{max} .

NOTICE**TIMING CONDITIONS**

- The 8 ms minimum time difference between the two SMs inputs guarantees the detection of a permanent short circuits of one of the SMs inputs. Physically, the 2 sensors must be slightly apart.
- If a new transition of a sensor SM occurs during a muting sequence, the muting sequence is immediately stopped to avoid the permanent muting of the safety function. The relative position of sensors SMs and the protective equipment ESPE defines a minimum distance between 2 successive moving objects.
- In the conveyor mode, the object must interrupt the safety light curtain detection beams, before releasing both sensors SMs and 6s max. after the actuation of the second sensor SMs.

3.2.2 Use in the press mode**NOTICE****FACTORY SETTINGS**

- The muting module is set in the conveyor mode on delivery.
- Select the press mode on machines where the operator carries out manual operations during non dangerous phases of the machine working cycle (see chapters 2.4.1 Selection of the appropriate mode).

** WARNING****IMPROPER USE OF THE MUTING MODULE**

NEVER mute the protective equipment during a dangerous phase of the machine working cycle.

Failure to comply with these instructions could result in death or serious injury.

The muting module can be used on any kind of machine to mute the protective equipment beyond dangerous phases of the working cycle, when the power must be maintained although the protective equipment is activated.

The following examples show how the muting module FF-SRM can be used on a mechanical press and on a hydraulic press. On a press, the safety light curtain can be muted as soon as the press tool reaches the bottom dead center, allowing the operator to unload the press during the opening stroke without causing the stoppage of the machine.

Mechanical presses

In this example, two limit switches SM1 & SM2 are used to start and stop a muting sequence (on a different machine, the sensors could also be photoelectric controls, ultrasonic sensors or inductive proximity sensors). Correct operation of these sensors is monitored by the muting module.

As soon as the press tool reaches the bottom dead center, the SM sensors are activated by the rotation of the rotating disk cam and start the muting sequence. The limit switches keep their position till the press tool reaches the top dead center. The rotation of the rotating disk cam releases both limit switches and interrupt the muting sequence.

WARNING

INCORRECT INSTALLATION

- The position of the second sensor SM2 cam must be adjusted so that the SM2 sensor is activated when the press tool reaches the bottom dead center (or when the press tool reaches a position at 6 mm above the bottom dead center).
- Do NOT mute the light curtain during the closing stroke of the press

Failure to comply with these instructions could result in death or serious injury.

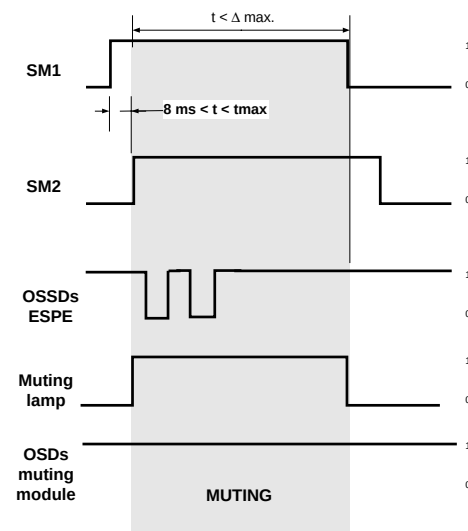
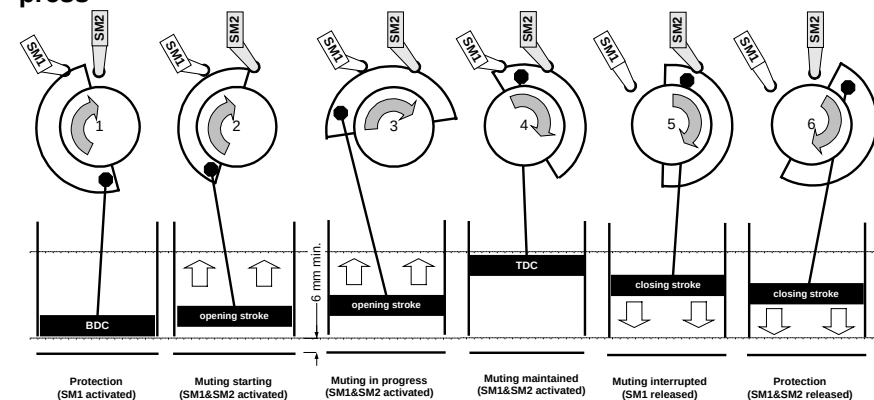
WARNING

SENSORS COINCIDENCE TIMING (t_{max}) AND MUTING DURATION (Δ_{max})

- Both sensors SM1 & SM2 must be activated within a preset time frame $8\text{ ms} < t < t_{max}$. The setting of the timing t_{max} also sets the muting maximum duration Δ_{max} : select the t_{max} timing corresponding to the shortest muting duration Δ_{max} allowing the operator to carry out the manual operation (refer to chapter 2.4.2 SM inputs).
- On a press, both limit switches must be activated within the following time frame : $8\text{ ms} < t < 1\text{ s}$. The maximum duration Δ_{max} of the muting sequence must be set to 1 mn. These settings are available on delivery.

Failure to comply with these instructions could result in death or serious injury.

Figure 3.5 : Muting of a safety light curtain on a mechanical press



BDC (Bottom Dead Center)

point at which the tool is closest to the die

TDC (Top dead Center)

point at which the tool is furthest to the die

The muting sequence starts when the output of the second sensor SM2 switches ON, and stops as soon as the output of the first sensor SM1 switches OFF. Both sensors must be maintained to prolong the muting sequence to its maximum duration ($\Delta\max$).

Note :

It is possible to start a muting sequence as soon as the press tool reaches a position at 6 mm above the BDC. At this position, the operator is no more exposed to a dangerous situation, and the starting of the muting sequence avoids damaging the part if the detection field of the light curtain is unexpectedly interrupted.

$\Delta\max = 1 \text{ mn}$, $t_{\max} = 1 \text{ s}$ for a press (For machines different than presses, refer to chapter 2.4.2 SM inputs, to change $t_{\max}$ and $\Delta\max$).

NOTICE

FACTORY SETTINGS

- The muting module is set in the conveyor mode on delivery.
- Refer to chapter 2.4.1 Selection of the appropriate mode, to select the press mode.
- The maximum timing t_{max} allowed between SM sensors is set to 1 second on delivery. For machines different than presses, it can be modified to the following values : 2 s, 4 s, or 8 s.
- The setting of the timing t_{max} also sets the muting maximum duration Δ_{max} . In the press mode, the muting duration is set to 1 mn on delivery. For machines different than presses, it can be modified to the following values : 2, 4 or 60 mn.
- Refer to chapter 2.4.2 SM inputs, to select t_{max} and Δ_{max} .

NOTICE

TIMING CONDITIONS

- The 8 ms minimum time difference between the two SMs inputs guarantees the detection of a permanent short circuits of any of the SMs inputs. Physically, the 2 sensors must be slightly apart.
- If both sensors are maintained while the press tool is at the top dead center, the muting sequence stops when the next press cycle starts or when the Δ_{max} muting timing has passed.
- If the Δ_{max} muting timing has passed, the muting module must be restarted before restarting the press (refer to chapters 2.4.5. Manual restart of the module and 4.8.2. Restart input).

Hydraulic presses

In this example, A pair of limit switches SM1&SM2 is used to start the muting sequence, and another pair of limit switches EM1&EM2 is used to stop the muting sequence (on a different machine, the sensors could also be photoelectric controls, ultrasonic sensors or inductive proximity sensors). Correct operation of these sensors is monitored by the muting module.

NOTICE**INCORRECT INSTALLATION**

- Both SMs sensors should detect the presence of the tool when it reaches the bottom dead center of the press to start a muting sequence. The second sensor SM2 effectively starts the muting sequence. If the first sensor SM1 is released before the tool reaches the bottom dead center, the re-activation of this sensor during the opening stroke stops the muting sequence, and the intrusion of an object inside the safety light curtain detection field stops the press (see figure 3.9).
- The EMs sensors should detect the tool when it reaches the top dead center of the press. The first sensor EM1 effectively stops the muting sequence. If the second sensor EM2 is not activated when the tool reaches the top dead center, the next muting sequence is not allowed, and the intrusion of an object inside the safety light curtain detection field stops the press.

** WARNING****INCORRECT INSTALLATION**

- The position of the second sensor SM2 must be adjusted so that the SM2 sensor is activated when the press tool reaches the bottom dead center (or when the press tool reaches a position at 6 mm above the bottom dead center).
- Do NOT mute the light curtain during the closing stroke of the press

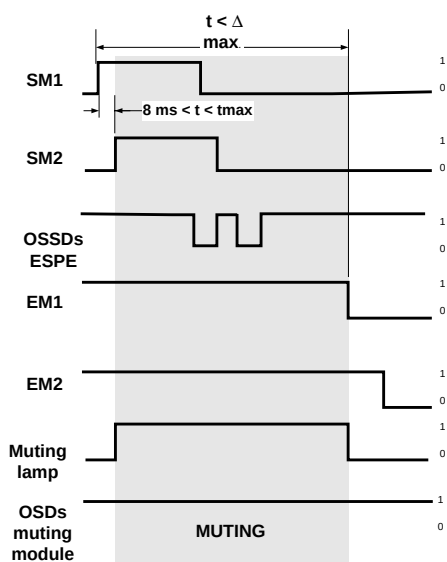
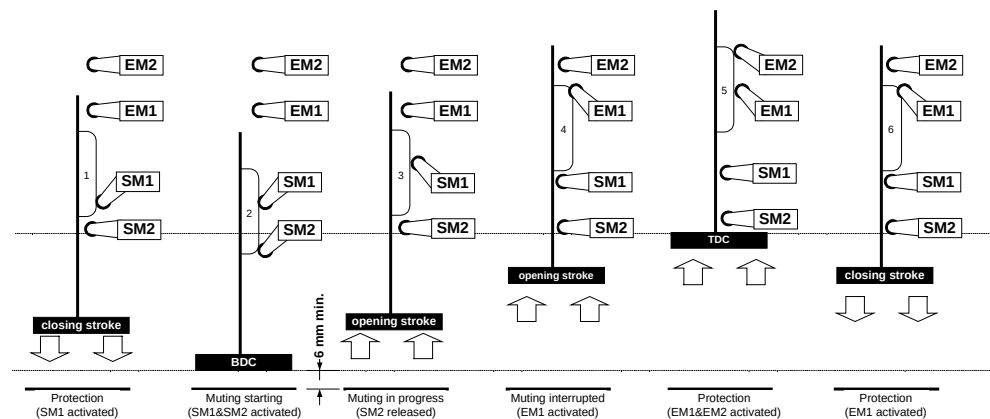
Failure to comply with these instructions could result in death or serious injury.

** WARNING****SENSORS COINCIDENCE TIMING (t_{max}) AND MUTING DURATION (Δ_{max})**

- Both sensors SM1 & SM2 must be activated within a preset time frame $8\text{ ms} < t < t_{max}$. The setting of the timing t_{max} also sets the muting maximum duration Δ_{max} : select the t_{max} timing corresponding to the shortest muting duration Δ_{max} allowing the operator to carry out the manual operation (refer to chapter 2.4.2 SM inputs).
- On a press, both limit switches must be activated within the following time frame : $8\text{ ms} < t < 1\text{ s}$. The maximum duration Δ_{max} of the muting sequence must be set to 1 mn. These settings are available on delivery.

Failure to comply with these instructions could result in death or serious injury.

Figure 3.8 : Muting of a safety light curtain on a hydraulic press



BDC (Bottom Dead Center)

point at which the tool is closest to the die

TDC (Top dead Center)

point at which the tool is furthest to the die

The muting sequence starts when the output of the second sensor SM2 switches ON, and it stops as soon as the output of the first sensor EM1 switches OFF.

Note :

It is possible to start a muting sequence as soon as the press tool reaches a position at 6 mm above the BDC. At this position, the operator is no more exposed to a dangerous situation, and the starting of the muting sequence avoids damaging the part if the detection field of the light curtain is unexpectedly interrupted.

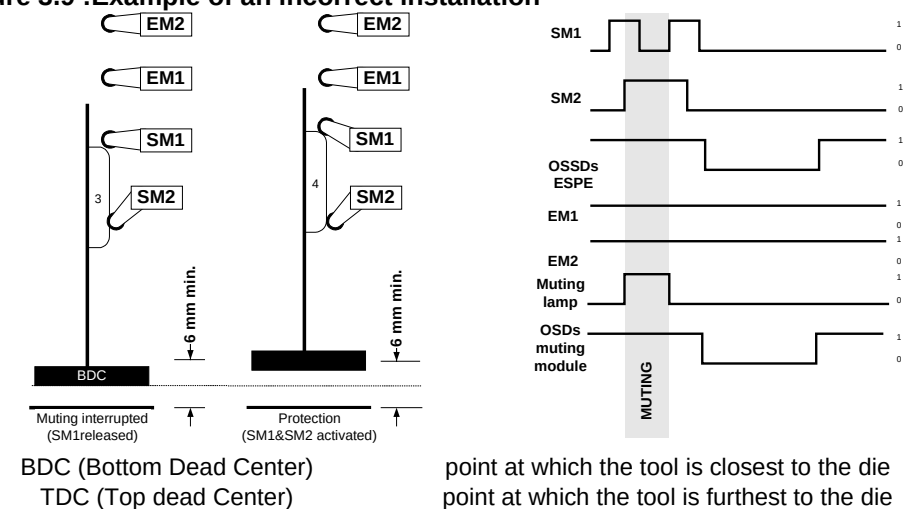
$\Delta_{max} = 1 \text{ mn}$, $t_{max} = 1 \text{ s}$ for a press (For machines different than presses, refer to chapter 2.4.2 SM inputs, to change t_{max} and Δ_{max}).

NOTICE**FACTORY SETTINGS**

- The muting module is set in the conveyor mode on delivery.
- Refer to chapter 2.4.1 Selection of the appropriate mode, to select the press mode.
- The maximum timing t_{max} allowed between SM sensors is set to 1 seconde on delivery. For machines different than presses, it can be modified to the following values : 2 s, 4 s, or 8 s.
- The setting of the timing t_{max} also sets the muting maximum duration Δ_{max} . In the press mode, the muting duration is set to 1 mn on delivery. For machines different than presses, it can be modified to the following values : 2, 4 or 60 mn.
- Refer to chapter 2.4.2 SM inputs, to select t_{max} and Δ_{max} .

NOTICE**TIMING CONDITIONS**

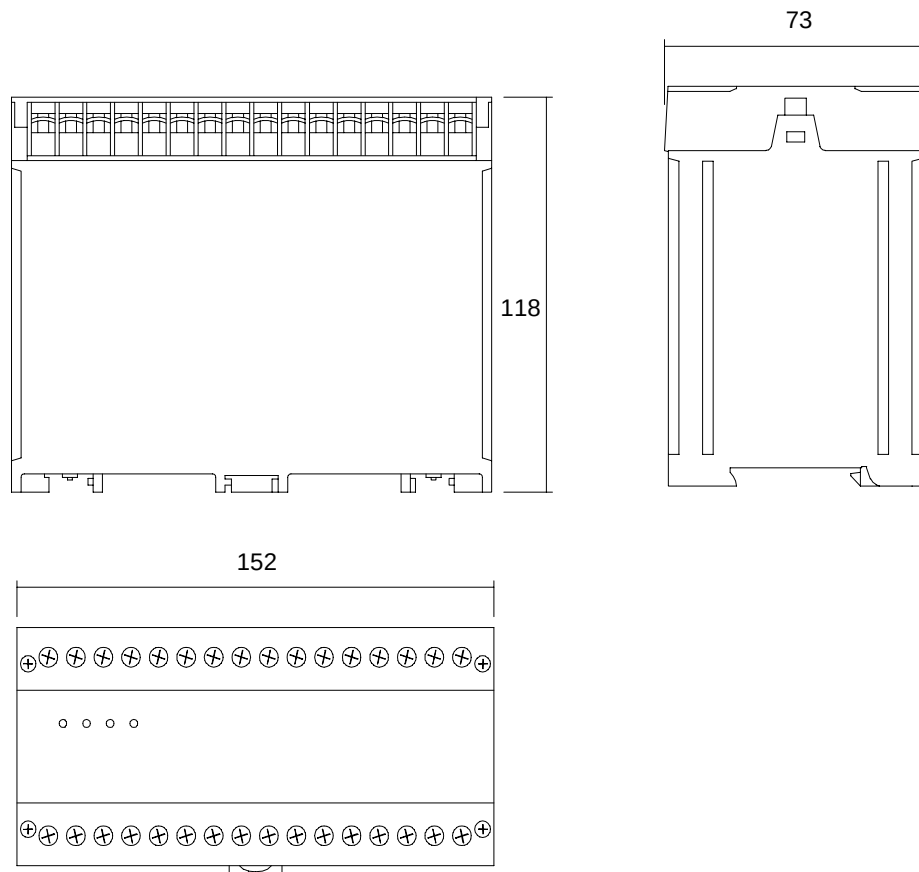
- The 8 ms minimum time difference between the two SMs inputs guarantees the detection of a permanent short circuits of one of the SMs inputs. Physically, the 2 sensors must be slightly apart.
- The activation of both EMs sensors must occur before the Δ_{max} muting timing has passed otherwise the muting module need to be restarted before restarting the press (refer to chapters 2.4.5. Manual restart of the module and 4.8.2. Restart input).

Figure 3.9 :Example of an incorrect installation

Because of the overtravel, the release and second actuation of the sensor SM1 interrupts the muting sequence. The intrusion of an object inside the dangerous area immediately stops the machine.

3.3 Dimensions

Figure 3.10 : Dimensions drawing (in mm/in.)



Mounting Omega rail DIN EN 50 022-35 (35 x 15 mm / 1.38 x 0.59 in. size)
 Cross sectional area of wires 2 Ø1.5 mm² (or AWG 16) wires per screw terminal

NOTICE

Use of crimp type sockets is recommended.

4. Electrical Connections

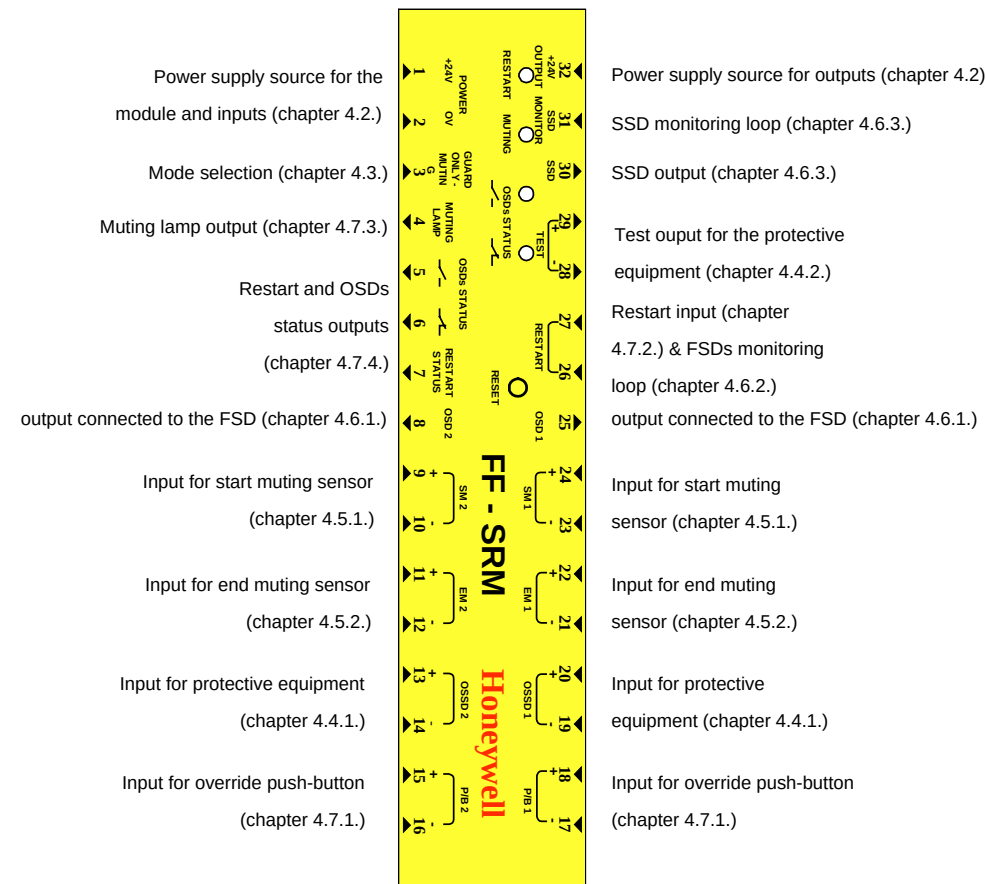
4.1 Overview

This chapter contains information about electrical installation and wiring

⚠ WARNING
IMPROPER INSTALLATION
 Strictly adhere to all electrical connection instructions.
Failure to comply with these instructions could result in death or serious injury.

4.2 Wiring diagram

Figure 4.1 : FF-SRM module inputs and outputs



CAUTION

PROTECTIONS

All outputs are protected against overload, short-circuits and reversed polarity with following exceptions :

- The test output is not protected against overloads and short circuits. Overloads and short-circuits may damage this output, however the module will still operate correctly provided the detection field of the protective equipment is interrupted after power up (see chapter 4.5.2 Test output).
- OSDs STATUS and RESTART STATUS outputs are not protected against short circuits. Short circuits may damage these outputs, but the module will still operate correctly (see chapter 4.8.4 OSDs STATUS and RESTART STATUS outputs).

4.3 Power supply sources, POWER & OUTPUT

The power supply voltage of the muting module and its inputs/outputs is **24 Vdc $\pm$ 15%**. The module is protected against reversed polarity. The EN 61496-1 European standard makes mandatory the galvanic insulation of category 4 safety components as defined by the EN 954-1 European standard. An integrated DC/DC converter guarantees the galvanic insulation of the module (500 Vdc). Therefore, no specific power supply source is necessary.

Power consumptions are as follows :

- “ +24V POWER ” : 6W max . for the module and all inputs
- “ +24V OUTPUT ” : 6W to 60W max. for the module and all outputs

CAUTION

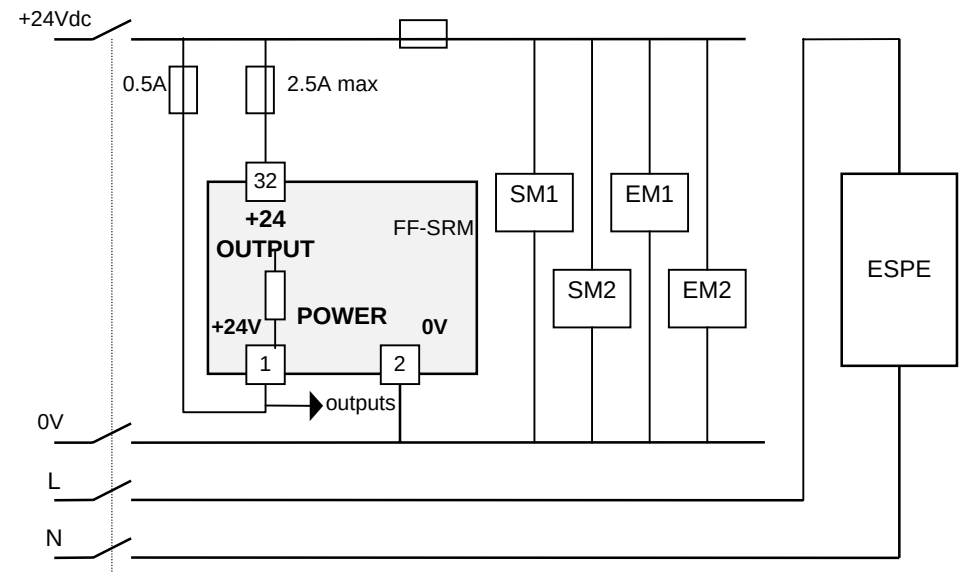
FUSES PROTECTION

The module supply input is protected by an internal fuse (which cannot be replaced by the user) but all inputs must be protected by an external 0.5 A fuse connected on terminal 1 (+24 V POWER), and all outputs must be protected by an external 2.5A max. fuse connected on terminal 32 (+24 V OUTPUT).

NOTICE

POWER SUPPLY SOURCE

- The protective equipment, the muting module must be powered with the same power supply source. If the supply voltage of the protective equipment is different than the muting module supply voltage, a common switching device must be used to switch on power of both equipment (see chapter 4.5.2 Test output).
- The power supply source connected on the terminal +24 V OUTPUT must be protected against shutdowns greater than 5 ms (the muting response time is 5 ms only).



4.4 Mode selection, Guard Only-Muting

The guard-only mode is selected when the terminal 3 (GUARD ONLY-MUTING) is connected to the terminal 1 (+24 V POWER). If no connection is set between these 2 terminals, the muting mode is selected.

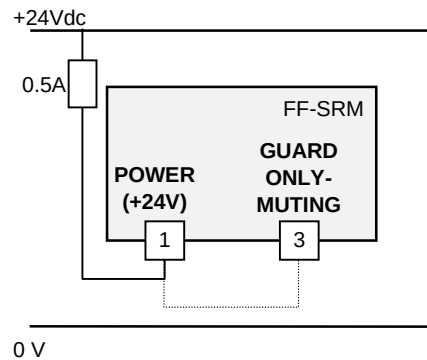
Use of a standard switch is recommended to select the muting or the guard-only mode, for applications where goods can be alternately loaded manually or automatically.

CAUTION

FUSES PROTECTION

The GUARD ONLY-MUTING input must be protected by an external 0.5 A fuse connected on terminal 1 (+24 V POWER).

Figure 4.4 : Selection of the guard-only mode :



4.5 Connection of the electrosensitive protective equipment (ESPE)

The muting module can be used with most of the electrosensitive protective equipment (ESPE) distributed by Honeywell :

- safety light curtains FF-SYA series,
- safety light curtains FF-SB series,
- safety light curtain FF-LS,
- modular light curtains FF-SCAN series,
- single safety beam and access control systems FF-SPS4 series (with test input).
- safety mat FF-SM series,
- laser scanner FF-SE (needs a special interface, please consult Honeywell).

NOTICE

TEST SEQUENCE AT POWER UP / SETTING ON DELIVERY

- A test of the protective equipment is automatically done at start up to control the connection of its outputs to the module terminals. For this reason, it is recommended to use the same power supply source for the module and the protective equipment (or make sure power is switched on simultaneously with the same switching device).
- On delivery, the muting module provides a normally closed contact between terminals 28 and 29. All the above mentioned protective equipment need a normally closed contact on their test input with the exception of the FF-SCAN, the FF-LS and the FF-SPS4 which need a normally open contact.
- The test output can be changed to a normally open contact. Refer to chapter 4.5.2 test output, for this selection.

NOTICE

PROTECTIVE EQUIPMENT RESTART MODE

The electrosensitive protective equipment must be set in the automatic restart mode to operate correctly with the muting module (refer to the installation manual of the protective equipment).

4.5.1 OSSD1 & OSSD2 inputs

The two Normally Open contacts delivered by the electrosensitive protective equipment must be connected on terminals 13-14 and terminals 19-20 respectively.

WARNING

IMPROPER INSTALLATION

NEVER connect one Normally Open contact of the protective equipment only on both OSSD1 and OSSD2 inputs.

Failure to comply with these instructions could result in death or serious injury.

NOTICE

TIMING CONDITIONS

- The switching of both ESPE contacts must occur within a 30 ms window time, which is controlled through the two OSSD1 & OSSD2 inputs at power up and after each protective beam interruption beyond muting sequences.
- If this condition is not satisfied, the outputs OSD1, OSD2 and SSD switch off and remain permanently open (see chapter 4.7.3). As a result, the muting is not allowed.

CAUTION

FUSES PROTECTION

The OSSD1 & OSSD2 inputs must be protected by an external 0.5A fuse connected on terminal 1 (+24 V POWER).

NOTICE

PROTECTIVE EQUIPMENT RESTART MODE

The electrosensitive protective equipment must be set in the automatic restart mode to operate correctly with the muting module (refer to the installation manual of the protective equipment).

NOTICE

PROTECTION AGAINST SHUTDOWNS

The power supply source connected on the terminal +24 V OUTPUT must be protected against shutdowns greater than 5 ms (the muting response time is 5 ms only).

Figure 4.5 : OSSD1 & OSSD2 inputs timing diagram

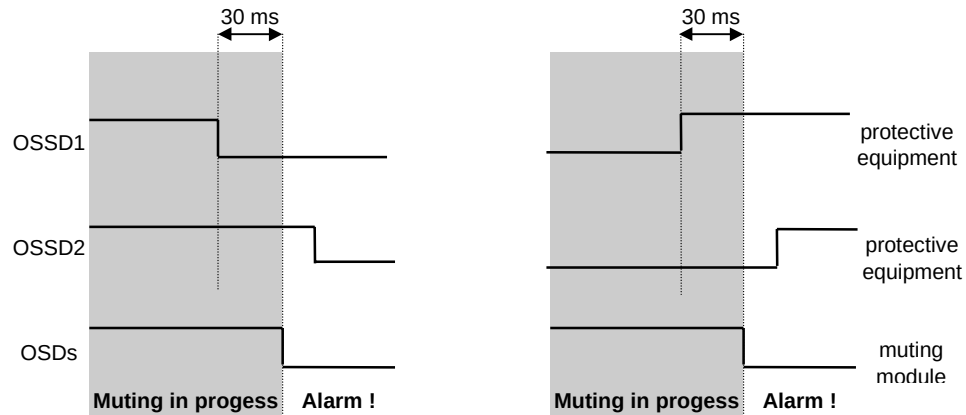
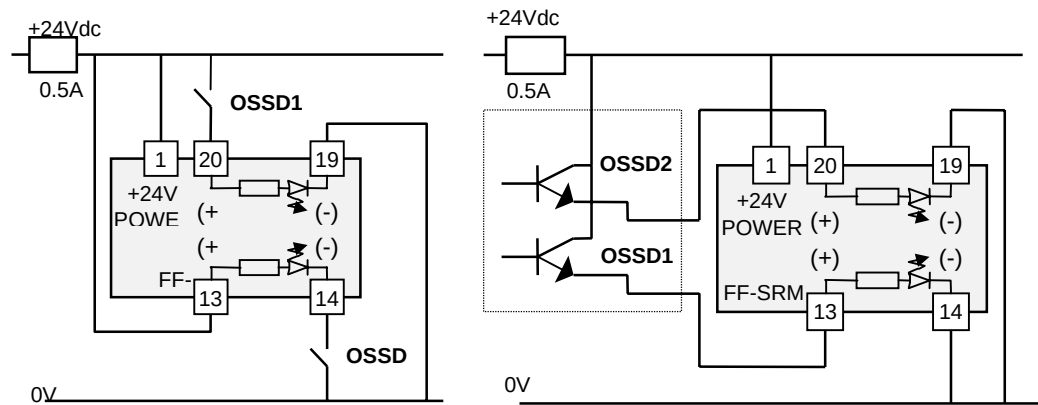


Figure 4.6 : Connection of the protective equipment outputs
The following reversed connection is recommended for a better failure resistance :



Features	OSSD1 & OSSD2 inputs
Type	voltage free and without reference potential
Consumption	30 mA/24 Vdc
low level	10 mA max.
high level	19 mA min.
Protections	galvanic insulation: 500 Vdc, reversed polarity

4.5.2 TEST output

NOTICE

TEST SEQUENCE AT POWER UP / SETTING ON DELIVERY

- A test of the protective equipment is automatically done at start up to control the connection of its outputs to the module terminals. For this reason, it is recommended to use the same power supply source for the module and the protective equipment (or make sure power is switched on simultaneously with the same switching device).
- On delivery, the muting module provides a normally closed contact between terminals 28 and 29. All the above mentioned protective equipment need a normally closed contact on their test input with the exception of the FF-SCAN, the FF-LS and the FF-SPS4 which need a normally open contact.
- The test output can be changed to a normally open contact.
- If the test output is not used, the detection field of the protective equipment must be interrupted 100 ms after power up, before restarting the module.

CAUTION

PROTECTIONS

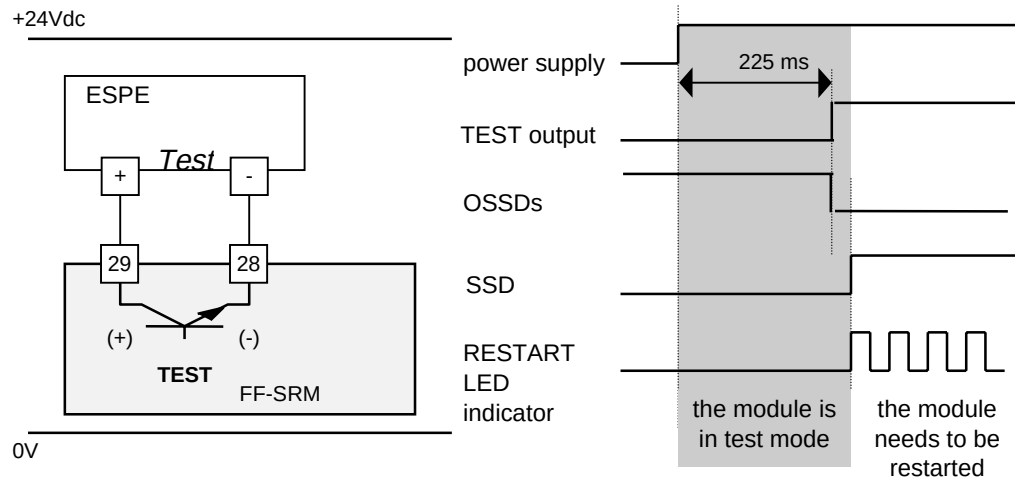
The test output is not protected against overloads and short circuits. Overloads and short-circuits may damage this output, however the module will still operate correctly provided the detection field of the protective equipment is interrupted after power up.

NOTICE

REVERSED POLARITY

This output is protected against reversed polarity, but the module cannot detect a reversed polarity on the test input of the protective equipment. In such a case, the SSD and OSDs outputs remain open and the manual restart of the module is impossible. It is recommended to check correct wiring of the test output by checking the status of the test LED of the protective equipment. If this connection is made correctly and if no failure is detected, the SSD output switches ON and the RESTART LED flickers to indicate that manual restart is necessary (see figure 4.6 Connection of the test output and timing diagram).

Figure 4.7 : Connection of the test output and timing diagram



Features	TEST output
Type	voltage free and without reference potential
Switching capacity	16 mA/24 Vdc
Voltage drop	< 1 Vdc
Protections	galvanic insulation : 500 Vdc, reversed polarity

The contact delivered by the test output can be either Normally Closed or Normally Open according to the protective equipment (refer to the protective equipment installation manual). This setting is done with the switch ST2 located inside the module. The removal of the upper terminal strip eases access to the switch ST2 (ST2 is located below the 2 sets of switches ST3 and ST1) :

NOTICE

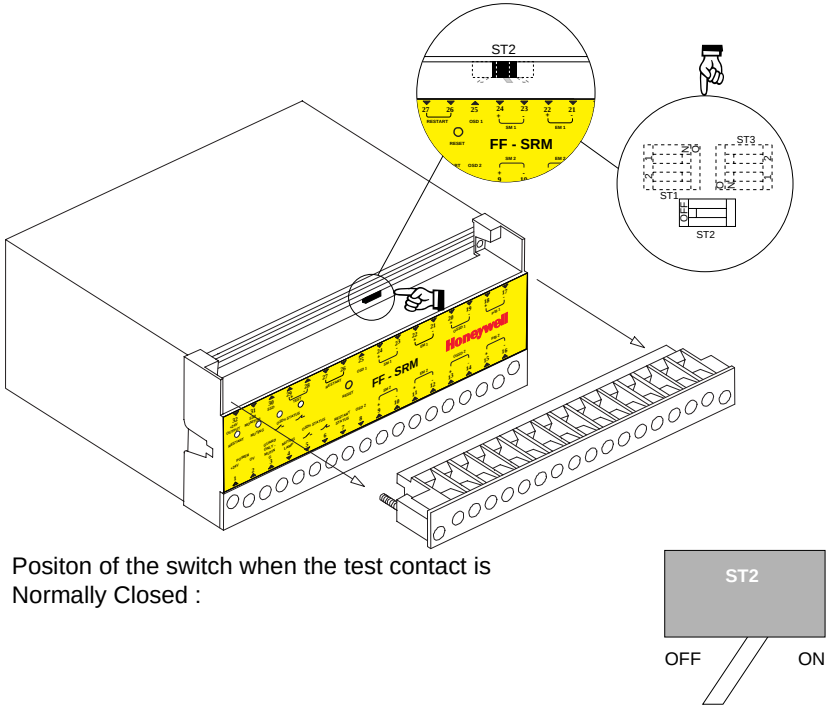
SETTING ON DELIVERY

On delivery, the muting module provides a normally closed contact between terminals 28 and 29. Most of Honeywell protective equipment need a normally closed contact on their test input with the exception of the FF-SCAN, FF-LS and FF-SPS4 modular light curtains which needs a normally open contact.

muting module FF-SRM		the ESPE is in
switch ST2	TEST output	test mode when :
ON	NO contact	contact is closed
OFF *	NC contact*	contact is open *

(*) : position of the switch on delivery

Figure 4.8 : Selection of the test contact



4.6 Connection of sensors SM and EM

4.6.1 SM1 & SM2 inputs (terminals 9-10 & 23-24)

The SM1 and SM2 sensors outputs connected on module terminals 9-10 and 23-24 must be open when the object is absent.

NOTICE

TIMING CONDITIONS

- The SM sensors outputs must switch within a specific time frame.
- The muting sequence starts 50 ms after reception of the second SM sensor signals.
- For more information, refer to chapter 2.4.2 SM inputs.

CAUTION

FUSES PROTECTION

The SM1 and SM2 inputs must be protected by an external 0.5A fuse connected on terminal 1 (+24 V POWER).

NOTICE

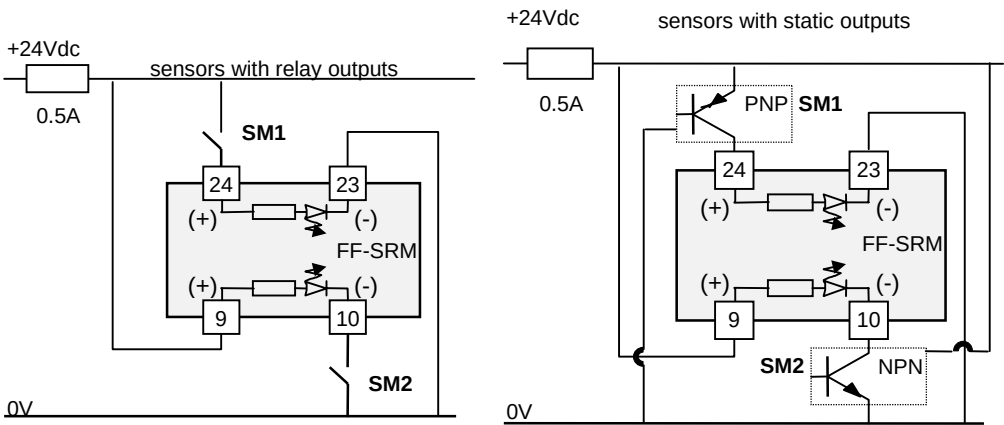
DETECTED FAILURES

The following failures are detected and prevent a muting sequence from starting : absence of one or both SMs sensors, permanent short-circuit on one of the SM inputs, connection of a single sensor on both SM inputs.

Features	SM1 & SM2 inputs
Type	voltage free and without reference potential
Consumption	10 mA / 24 Vdc
Low level	2 mA max.
High level	5 mA min.
Protections	galvanic insulation : 500 Vdc, reversed polarity

Figure 4.9 : Connection of the SMs sensors

The following reversed connection is recommended for a better failure resistance



4.6.2 EM1 & EM2 inputs (terminals 11-12 & 21-22)

The EM1 and EM2 sensors outputs connected to the module terminals 11-12 and 21-22 must be closed if no object is detected.

⚠ WARNING

IMPROPER INSTALLATION

- ALWAYS use two EM sensors to interrupt a muting sequence.
- If the safety light curtain is used to interrupt the muting sequence on a conveyor application, NEVER connect one Normally Open contact of the protective equipment only on both EM1 and EM2 inputs (see chapter 4.9.1 Conveyor applications / One-way muting using two sensors).
- On a mechanical press, NEVER connect one SM sensor only on both EM1 and EM2 inputs (see chapter 4.9.1 Press applications / Muting of a safety light curtain on a mechanical press).

Failure to comply with these instructions could result in death or serious injury.

NOTICE

TIMING CONDITION

The muting sequence stops 40 ms after the release of the first EM sensor. For more information, refer to chapter 2.4.3 EM inputs.

CAUTION

FUSES PROTECTION

The EM1 and EM2 inputs must be protected by an external 0.5A fuse connected on terminal 1 (+24 V POWER).

NOTICE

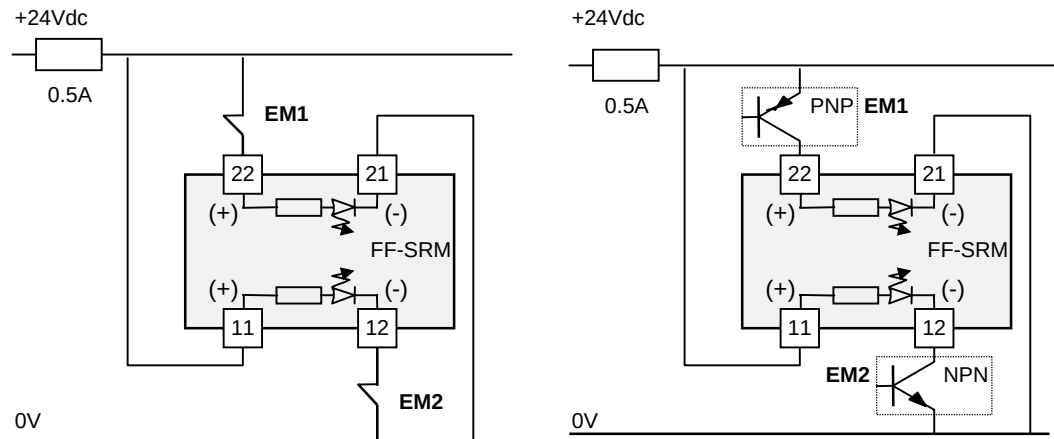
DETECTED FAILURES

The following failures are detected and prevent a muting sequence from starting : absence of one or both EMs sensors, permanent short-circuit on one of the EM inputs.

Features	EM1 & EM2 inputs
Type	voltage free and without reference potential
Consumption	10 mA/24 Vdc
Low level	2 mA max.
High level	5 mA min.
Protections	galvanic insulation : 500 Vdc, reversed polarity

Figure 4.10 : Connection of the EMs sensors

The following reversed connection is recommended for a better failure resistance



4.7 Connection to the machine control circuitry

4.7.1 OSD1 and OSD2 outputs (terminals 8 & 25)

Fail-safe static outputs OSD1 and OSD2 are switched simultaneously. An internal permanent self-check (monitoring) verifies that both static outputs always have the same status. If one of the two outputs remains accidentally closed, the remaining output would no longer be able to close. Similarly, a possible short-circuit of one of the two outputs will immediately bring about the opening of the other output. A short-circuit between the two outputs will also lead to the opening of the light curtain outputs. **It is therefore important to use the two outputs to prevent operation of the machine.**

WARNING

IMPROPER USE OF THE MACHINE STOP CONTACTS

Always use the two fail-safe outputs to control the machine movement.

Failure to comply with these instructions could result in death or serious injury.

It is necessary to connect the terminal 32 to the +24V to energize the relays K1 and K2 through the OSD1 and OSD2 outputs. The 2 OSD's static outputs must be connected to 2 external relays with guided contacts K1 and K2 on FF-SRE extension module (usually called " Final Switching Devices " - FSDs) to be interfaced to the machine control circuitry. The FSDs must be regularly controlled. Correct operation of the FSDs relays is checked at each module restart (see chapter 4.7.2).

WARNING

IMPROPER EXTERNAL SAFETY RELAYS PERFORMANCE

- Use two independent stop circuit safety relays K1 and K2 with mechanically linked contacts (such as GE CR120 BP Machine Tool Relay or Telemecanique CA3-KN31BD3 or CA3-DN31BD relay to reliably detect a welded contact or FF-SRE extension module.
- Always use the FSD monitoring loop to check correct operation of relays K1 and K2 (See chapter 4.7.2 FSD monitoring loop).

Failure to comply with these instructions could result in death or serious injury.

CAUTION

FUSES PROTECTION

- The OSD1 and OSD2 outputs must be protected by an external 2.5A max. fuse connected on terminal 32 (+24 V OUTPUT).
- In case of accidental overload, press the RESET push-button located on the front cover of the module and restart the module.

NOTICE

- It is recommended to connect varistors in parallel with the FSDs relay coils.
- Use of a RC circuit would prevent the module from operating.

WARNING

IMPROPER PROTECTION INSTALLATION

- Never install varistor across the safety output of the muting module.
- Always install varistors across the coils of the external safety relays.

Failure to comply with these instructions could result in death or serious injury

NOTICE

TIMING CONDITIONS

- The module response time is 5 ms
- It takes 30 ms for the module to restart after the release of the restart push-button.

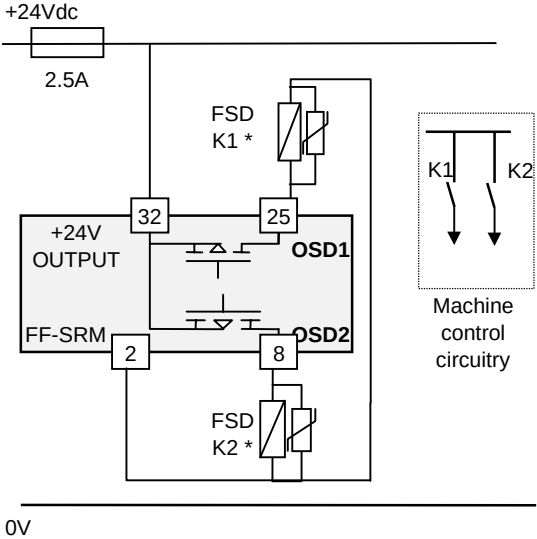
NOTICE

- The load impedance allowed by the FF-SRM failsafe static outputs must be 55.2 Ω minimum and 5k Ω maximum. The turn-on voltage must be greater than 5 V on resistive loads or greater than 7 V on inductive loads.
- The maximum cable length between the FF-SRM static outputs and the loads mainly depends upon the loads resistance : the cable length must be $L_{\text{cable}} \leq 50000 / R_{\text{load}}$
- If the FF-SRM module outputs are connected on safety relays with mechanically linked contacts, the maximum cable length between the FF-SRM outputs and the relays is greater than 100 m.

Figure 4.11 : Connection of the FSD's onto the module

Wiring diagram

Connection of the « +24V OUTPUT » to the power supply is necessary to be able to use the OSDs outputs :



(*) : protect the FSDs relay coils with a varistor

WARNING

IMPROPER CONNECTION OF LOAD

For safety reasons, the loads must be connected between terminals 2-8 and between terminals 2-25 .

Failure to comply with these instructions could result in death or serious injury.

Features	OSD1 & OSD2 outputs
Type	static DC (Normally Open contacts)
Switching capacity	0.5 A/24 Vdc
Voltage drop	< 2 Vdc
Protections	galvanic insulation : 500 Vdc, short-circuits, overloads, micro-cutoff (4.5 ms).

NOTICE

POWER CUT OFF PROTECTION

The FF-SRM failsafe static outputs withstand 4.5 ms power cutoff. The DC power supply shall withstand power cutoff of up to 20 ms.

4.7.2 FSDs monitoring loop (terminals 26-27)

The FSDs monitoring loop is provided by the RESTART input. (see chapter 4.8.2).
The Normally Closed contacts of the two FSDs relays K1 and K2 or FF-SRE extension module must be connected in series between terminals 26-27 to check correct operation of the FSDs each time the OSDs outputs switch. If a failure of the FSDs relays K1 and K2 or FF-SRE extension module is detected, the OSDs outputs remain open until the failure is removed.



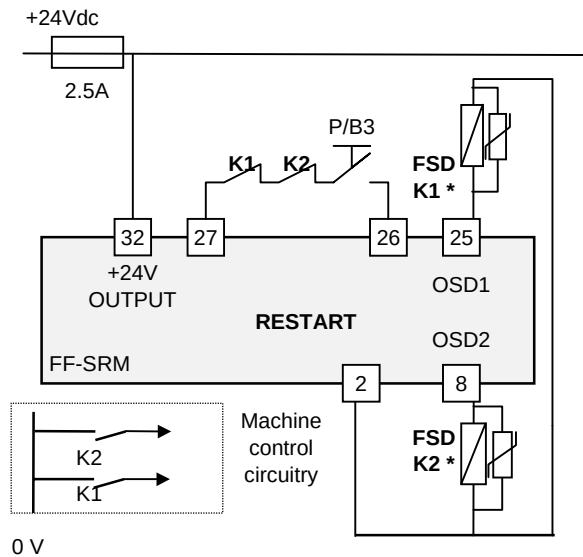
WARNING

IMPROPER EXTERNAL SAFETY RELAYS PERFORMANCE

- Use two independent stop circuit safety relays K1 and K2 with mechanically linked contacts (such as GE CR120 BP Machine Tool Relay or Telemecanique CA3-KN31BD3 or CA3-DN31BD relay) or FF-SRE extension module to reliably detect a welded contact.
- Always use the FSD monitoring loop to check correct operation of relays K1 and K2.

Failure to comply with these instructions could result in death or serious injury

Figure 4.12 : Connection of the FSDs monitoring loop



Features	RESTART input
Type	voltage presence and without reference potential
Dynamic signal	pic of 50 mA min.
NC contacts	50 Ohms max. resistance
Protections	galvanic insulation : 500 Vdc

4.7.3 SSD output and SSD MONITOR input (terminals 30 & 31)

The SSD output is a Normally Closed static output which switches off if a failure is detected (internal failure or wiring error). The opening of the SSD output causes the opening of the OSDs outputs. In such a case, eliminate the failure and reset the module with the RESET push-button located on the front cover before restarting the module (see chapter 2.4.7 Reset push-button).

It can be used for failure alarm or to shutdown the machine power:

- *Failure alarm*

When the SSD output is connected to an external lamp, it provides a visual indication on the module status.

NOTICE

SSD MONITORING LOOP

If an external lamp is connected to the SSD output, then it is necessary to connect the terminals 30 and 31 together otherwise the module cannot operate correctly.

NOTICE

SSD MONITORING LOOP

It is necessary to connect the terminals 30 and 31 together if the SSD output is not used otherwise the module cannot operate correctly.

CAUTION

FUSES PROTECTION

- The SSD output must be protected by an external 2.5A max. fuse connected on terminal 32 (+24 V OUTPUT).
- In case of accidental overload, press the RESET push-button located on the front cover of the module and restart the module.

- **Machine shutdown**

The SSD static output must be connected to a relay with guided contact K3 (called "Secondary Switching Device" - SSD) to be used in the machine stopping circuitry. Correct operation of the SSD output is tested at each power on through the "SSD MONITOR" input and a Normally Open contact of the SSD relay must be connected to the terminal 31. The terminal 32 must be connected to the +24Vdc to energize the relay K3 or the alarm lamp through the SSD output.

WARNING

IMPROPER EXTERNAL SAFETY RELAYS PERFORMANCE

- Use one stop circuit safety relay K3 with mechanically linked contacts (such as GE CR120 BP Machine Tool Relay or Telemecanique CA3-KN31BD3 or CA3-DN31BD relay) to reliably detect a welded contact.
- Always use the SSD monitoring loop to check correct operation of relays K3.

Failure to comply with these instructions could result in death or serious injury

NOTICE

TIMING CONDITIONS

The closing response time of the SSD relay shall be less than 140 ms.

NOTICE

- It is recommended to connect varistors in parallel with the SSD relay coil.
- Use of a RC circuit would prevent the module from operating.

WARNING

IMPROPER PROTECTION INSTALLATION

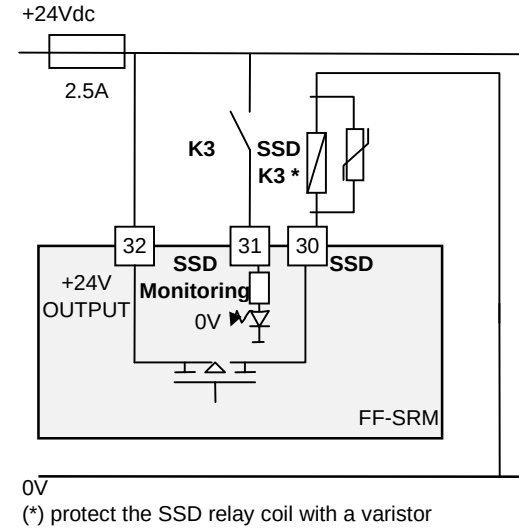
- Never install varistor across the safety output of the muting module.
- Always install varistors across the coils of the external safety relays.

Failure to comply with these instructions could result in death or serious injury.

Features	SSD output
Type	static DC (NO contact)
Switching capacity	0.5 A / 24Vdc
Voltage drop	< 1.5 Vdc
Protections	galvanic insulation : 500 Vdc, short-circuits, overloads

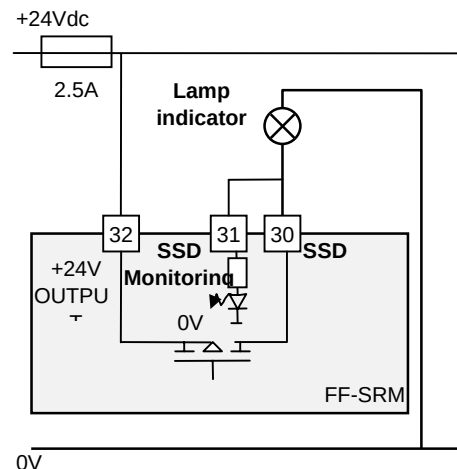
Features	SSD MONITOR input
Type	voltage free and without reference potential
Consumption	10 mA/24 Vdc
Low level	2 mA max.
High level	5 mA min.
Protections	galvanic insulation : 500 Vdc

Figure 4.13 : Use of the SSD output for the machine shutdown



(*) protect the SSD relay coil with a varistor

Figure 4.14 : Use of the SSD output for failure alarm :



4.8 Connection of man/machine interfaces

4.8.1 Inputs for push-buttons P/B1 & P/B2 (terminals 15-16 & 17-18)

The Normally Open contacts of two push-buttons P/B1 and P/B2 must be connected to terminals 15-16 and 17-18. P/B1 and P/B2 inputs are active if a pressure is applied on the 2 push-buttons.

⚠ WARNING

OVERRIDE PUSH-BUTTONS LOCATION

- Access to these push-buttons shall be restricted to the people allowed to intervene in case of problem. The operators shall not be able to use these push-buttons which shall be kept under lock and key (2 key selector switches may be used as an alternative).
- Moreover, the authorized person shall have a wide visibility on the installation and permanently check that nobody enters the dangerous area while he is performing the over-ride sequence.

Failure to comply with these instructions could result in death or serious injury.

NOTICE

OVERRIDE FUNCTION CONDITIONS

- The override function is allowed if the detection field of the protective equipment is interrupted and if the muting mode is selected (see chapter 2.4.6 Guard-only mode).
- Contacts of the two push-buttons must be closed within a time frame set between 8 ms and 1 s. They must remain closed for 100 ms as a minimum.

NOTICE

DETECTED FAILURES

The following failures are detected and prevent a muting sequence from starting : absence of one push-button, permanent short-circuit on one of the P/B inputs, connection of a single push-button on both P/B inputs.

CAUTION

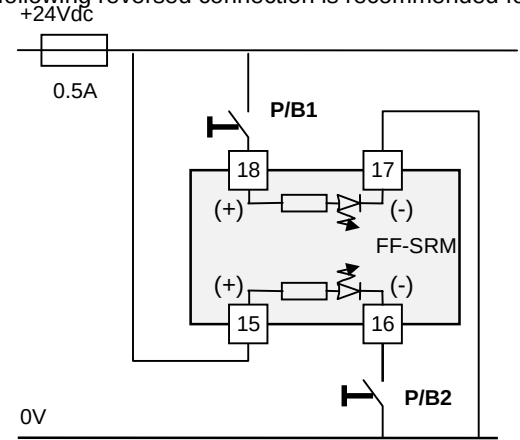
FUSES PROTECTION

The P/B1 and P/B2 inputs must be protected by an external 0.5A fuse connected on terminal 1 (+24 V POWER).

Features	P/B1 & P/B2 inputs
Type	voltage free and without reference potential
Consumption	10 mA/24 Vdc
Low level	2 mA max.
High level	5 mA min.
Protections	galvanic insulation : 500 Vdc, reversed polarity

Figure 4.15 : Connection of the override push-buttons

The following reversed connection is recommended for a better failure resistance



4.8.2 RESTART input (terminals 26-27)

The Normally Open contact of a restart push-button must be connected in series with the Normally Closed contacts of the FSDs relays. The use of a key switch is recommended to avoid unexpected restart during maintenance operations for example (the maintenance personnel shall keep the key with him during the intervention).

NOTICE

MANUAL RESTART CONDITIONS

- By design, the manual restart of the muting module is required after each power reset and after each opening of the OSDs outputs caused by the interruption of the protective beam.
- The restart is allowed if no failure is detected and if the detection field of the protective equipment is clear.
- If one of the following element fails, the manual restart of the module is impossible : OSDs outputs, FSDs, or SSD relay or muting lamp.
- In the conveyor mode, it may be necessary to press the override push-buttons P/B1 and P/B2 to clear the detection field before restarting the module (see chapter 2.4.2 Override function).

NOTICE

TIMING CONDITIONS

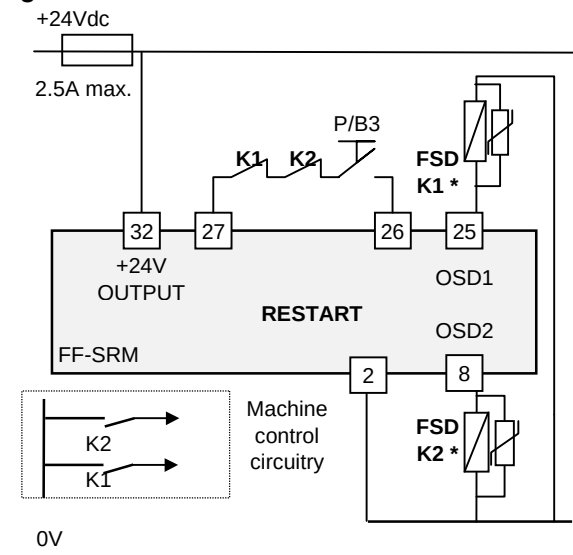
The effective restart of the module is achieved 30 ms after the push-button is released, and after a short pulse (between 0.1s and 1s) is sent on the appropriate input of the module.

Features	RESTART input
Type	voltage free and without reference potential
Dynamic signal	50 mA min. plak
NC contact	50 Ohms max. resistance
Protections	galvanic insulation : 500 Vdc

Wiring diagram

Connection of the restart push-button :

Figure 4.16 :



(*) : protect the FSDs relay coils with a varistor

4.8.3 MUTING LAMP output (terminal 4)

The IEC/EN 61496-1 norm makes mandatory the use of a white lamp which indicates to the operators that a muting sequence is being performed, and that the protective equipment is inactive. The "MUTING LAMP" output is permanently self-checked, and correct operation of the lamp is monitored each time the muting sequence starts (open circuit and short-circuit detection). An orange LED indicator located on the front cover gives an indication of the external lamp status.

⚠ WARNING

MUTING LAMP SPECIFICATIONS

- According to the IEC/EN 61496-1 norm, the lighting surface of the muting lamp must be greater or equal to 1 cm² and its brightness must be 200 cd/m² as a minimum. It must be seen from anywhere around the machine.
- ALWAYS use an incandescent filament lamp (the standard forbids the use of any other type of lamp such as condenser discharge lights or neon lights).
- The maximum controlling current of the lamp must be 1 A, its transient state must be less than 25ms, its power must be limited to 10 W / 24 Vdc and its resistance must be less than 80 kΩ.

Failure to comply with these instructions could result in death or serious injury.

NOTICE

MUTING LAMP FAILURE

- Any failure of the “ MUTING LAMP ” output or any failure of the lamp prevents the muting sequence from starting, and the intrusion of an object in the protective equipment detection field stops the machine.
- The override function must then be used to clear the area (see chapter 2.4.4 Override function).
- If the muting lamp fails, the release of the protection field does not lead to the automatic restart of the module. However, the manual restart is possible and leads to the closing of the OSDs outputs (refer to chapter 4.8.3 Muting lamp output).

CAUTION

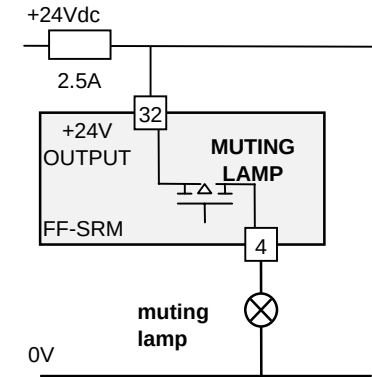
FUSES PROTECTION

- The “ MUTING LAMP ” output must be protected by an external 2.5 A max. fuse connected on terminal 32 (+24 V OUTPUT).
- In case of accidental overload, the muting is forbidden and the OSDs outputs remain permanently open.

Features	MUTING LAMP output
Type	static DC (Normally Open contact)
Switching capacity	0.5 A/24Vdc
Protections	galvanic insulation : 500 Vdc, short-circuits, overloads

Figure 4.17 : Connection of the muting lamp

The “ +24V OUTPUT ” input must be connected to the +24Vdc to supply the external muting lamp



4.8.4 OSDs STATUS & RESTART STATUS outputs (terminals 5, 6 & 7)

The OSDs STATUS and RESTART STATUS outputs provide the same information as the LEDs indicators located on the front cover of the module. These outputs provide remote indications on the muting module status.

CAUTION

PROTECTIONS

- The OSDs STATUS and RESTART STATUS outputs must be protected by an external 2.5 A max. fuse connected on terminal 32 (+24 V OUTPUT).
- OSDs STATUS and RESTART STATUS outputs are not protected against short circuits. Short circuits may damage these outputs, but the module will still operate correctly.

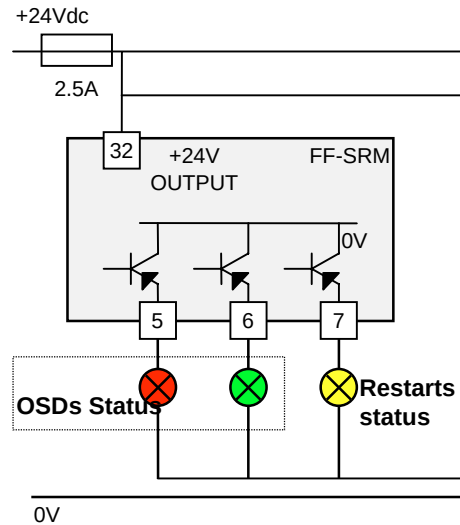
NOTICE

PROTECTION AGAINST OVERLOADS

- The OSDs STATUS and RESTART STATUS outputs are protected by circuit breakers which are triggered by an accidental overload.
- In case of accidental overload, eliminate the failure and reset the muting module to reactivate the OSDs STATUS and RESTART STATUS outputs. Then reset the module by switching off and on the power, or by pressing the RESET push-button located on the front face cover of the module (see chapter 2.4.7 Reset push-button). Finally, restart the module by pressing and releasing the restart push-button (see chapter 2.4.5 Manual restart of the module).
- In case of accidental overload, the LEDs status indicators located on the front cover of the module keep operating correctly and the muting is still allowed.

Features	OSDs STATUS & RESTART STATUS outputs
Type	static DC
Switching capacity	100 mA/24 Vdc
Protections	galvanic insulation : 500 Vdc

Figure 4.18 : Connection of the external status lamps



4.9 Wiring diagrams

The wiring diagrams on the next paragraphs illustrate the electrical connection of the FF-SRM muting module for the examples described in chapter 3. Installation. The customer must supply all components listed in chapter 6.2 Components list.

⚠ WARNING

IMPROPER INSTALLATION OF FF-SRM MUTING MODULE

Use the recommended wiring diagrams to ensure external relay monitoring by the module.
Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING

IMPROPER EXTERNAL SAFETY RELAYS PERFORMANCE

- Use three independent stop circuit safety relays K1, K2 and K3 with mechanically linked contacts (such as GE CR120 BP Machine Tool Relay or Telemecanique CA3-KN31BD3 or CA3-DN31BD relay) that prevent contact overlapping in the event of a welded contact.
- Always use the FSD monitoring loop to check correct operation of relays K1 and K2.
- Always use the SSD monitoring loop to check correct operation of relay K3.

Failure to comply with these instructions could result in death or serious injury.

CAUTION

FUSES PROTECTION

The module supply input is protected by an internal fuse (which cannot be replaced by the user) but all inputs must be protected by an external 0.5 A fuse connected on terminal 1 (+24 V POWER), and all outputs must be protected by an external 2.5A max. fuse connected on terminal 32 (+24 V OUTPUT).

NOTICE

- The loads impedance allowed by the FF-SRM failsafe static outputs must be 55.2 Ω minimum and 5k Ω maximum. The turn-on voltage must be greater than 5 V on resistive loads or greater than 7 V on inductive loads.
- The maximum cable length between the FF-SRM static outputs and the loads mainly depends upon the loads resistance : the cable length must be $L_{\text{cable}} \leq 50000 / R_{\text{load}}$.
- If the FF-SRM module outputs are connected to safety relays with mechanically linked contacts, the maximum cable length between the FF-SRM outputs and the relays is greater than 100 m.

NOTICE

- It is recommended to connect varistors in parallel with the FSDs relay coils.
- Use of a RC circuit would prevent the module from operating.

⚠ WARNING

IMPROPER PROTECTION INSTALLATION

- Never install varistor across the safety output of the muting module.
- Always install varistors across the coils of the external safety relays.

Failure to comply with these instructions could result in death or serious injury.

4.9.1 Conveyor applications

NOTICE

FACTORY SETTINGS

- The muting module is set in the conveyor mode on delivery (Refer to chapter 2.4.1 Selection of the appropriate mode, to select the press mode).
- The maximum timing t_{max} allowed between SM sensors is set to 1 second on delivery. It can be modified to the following values : 2 s, 4 s, or 8 s.
- The setting of the timing t_{max} also sets the muting maximum duration Δ_{max} . In the conveyor mode factory setting, the muting duration is set to 2 mn on delivery. It can be modified to the following values : 4, 8 or 60 mn.
- On delivery, the muting module provides a normally closed test contact between terminals 28 and 29. All the Honeywell protective equipment need a normally closed contact on their test input with the exception of the FF-SCAN, the FF-LS and the FF-SPS4 which need a normally open contact. The test output can be changed to a normally open contact.
- Refer to chapter 2.4.2 SM inputs to select t_{max} and Δ_{max} , and refer to chapter 4.5.2 Test output to select the appropriate test contact.

Two-direction muting using two sensors

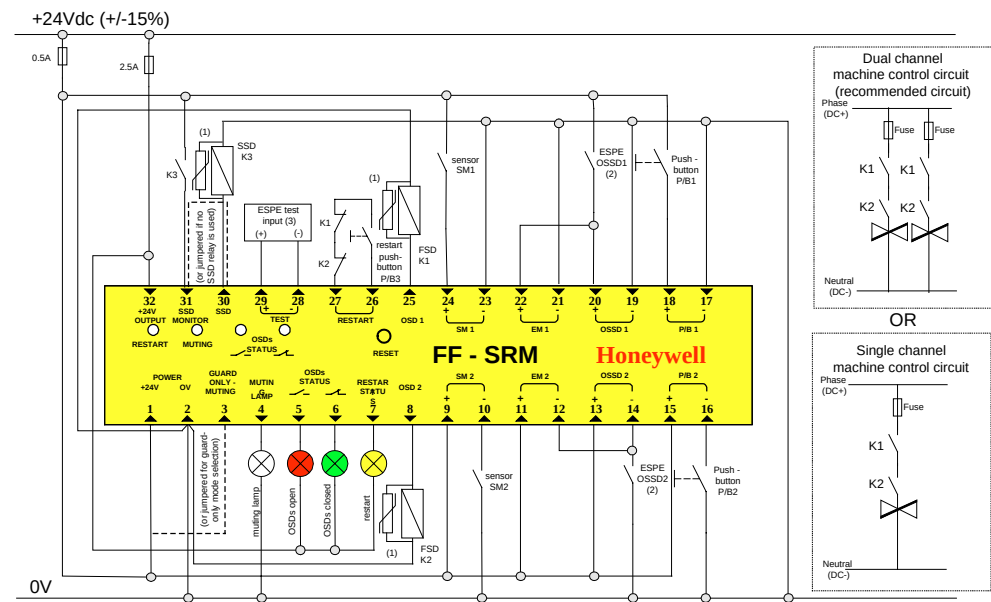
WARNING

IMPROPER INSTALLATION

- The interruption of the beams starts the muting sequence, but the electrical connections must be made in such a way that the release of the protective equipment beams stops the muting sequence.
- For sensors installation, strictly adhere to instructions given in chapter 3.2.1 Use in the conveyor mode.

Failure to comply with these instructions could result in death or serious injury.

Figure 4.19 : Two-direction muting on a conveyor (using two sensors)



(1) varistor	see chapter 6.2
(2) the ESPE must be set in the automatic restart mode	see ESPE installation manual
(3) Comply with the ESPE test input polarity and correct test contact (ST2 switch)	see ESPE installation manual and chapter 4.5.2.
-
SSD relay	possibly used for machine power shutdown	see chapter 4.7..3
FSD relays	used for emergency stop in the machine control circuit	see chapter 4.7..2
ESPE OSSD1	light curtain normally open contact	see chapter 4.5.1
ESPE OSSD2	light curtain normally open contact	see chapter 4.5..1
P/B3	restart is achieved 30ms after release	see chapter 4.8..2
P/B1 & P/B2	for the override function	see chapter 4.8.1.
SM1 & SM2	start and end muting sensors (ST3 switches)	see chapter 4.6.1.

⚠ WARNING

IMPROPER CONNECTION OF LOAD

For safety reasons, the loads must be connected between terminals 2-8 and between terminals 2-25 .

Failure to comply with these instructions could result in death or serious injury.

Two-direction muting using four sensors

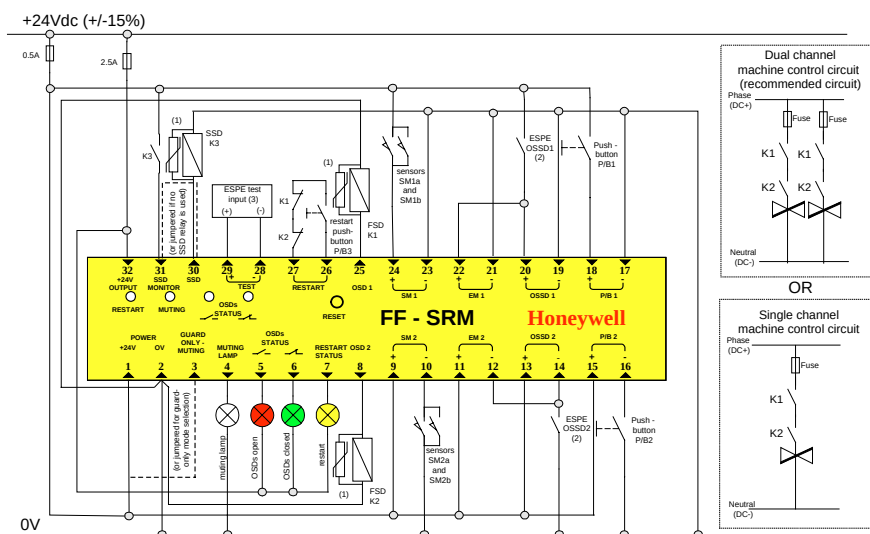
WARNING

IMPROPER INSTALLATION

- The activation of the SM sensors starts the muting sequence, but the electrical connections must be made in such a way that the release of the protective equipment beams stops the muting sequence.
- For sensor installation, strictly adhere to instructions given in chapter 3.2.1 Use in the conveyor mode.

Failure to comply with these instructions could result in death or serious injury.

Figure 4.20 : Two-direction muting on a conveyor (using four sensors)



- (1) varistor see chapter 6.2
 (2) the ESPE must be set in the automatic restart mode see ESPE installation manual
 (3) Comply with the ESPE test input polarity and correct test contact (ST2 switch) see ESPE installation manual and chapter 4.5.2.

SSD relay	possibly used for machine power shutdown	see chapter 4.7..3
FSD relays	used for emergency stop in the machine control circuit	see chapter 4.7..2
ESPE OSSD1	light curtain normally open contact	see chapter 4.5.1
ESPE OSSD2	light curtain normally open contact	see chapter 4.5..1
P/B3 :	restart is achieved 30ms after release	see chapter 4.8..2
P/B1 & P/B2	for the override function	see chapter 4.8.1.
SM1a/b, SM2a/b	start and end muting sensors (ST3 switches)	see chapter 4.6.1.

⚠ WARNING

IMPROPER CONNECTION OF LOAD

For safety reasons, the loads must be connected between terminals 2-8 and between terminals 2-25 .

Failure to comply with these instructions could result in death or serious injury.

One-way muting using four sensors

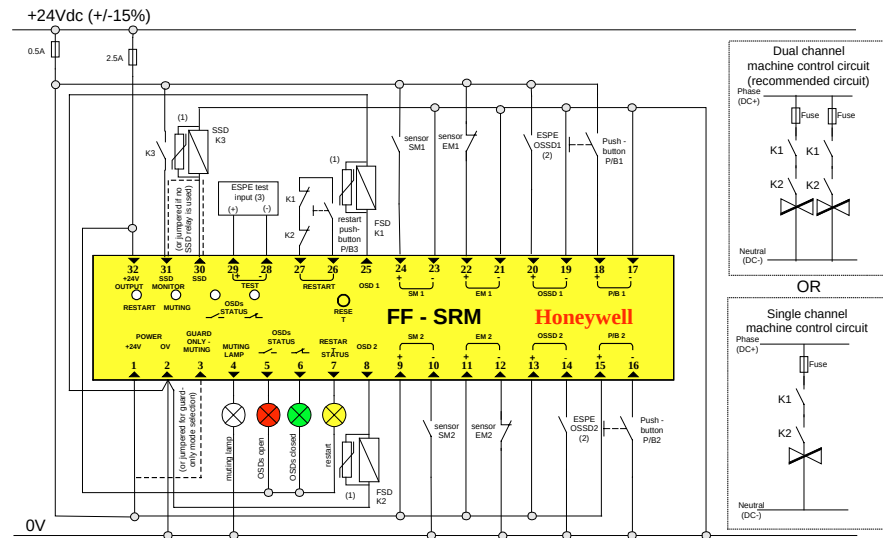
⚠ WARNING

IMPROPER INSTALLATION

For sensors installation, strictly adhere to instructions given in chapter 3.2.1 Use in the conveyor mode.

Failure to comply with these instructions could result in death or serious injury.

Figure 4.21 : One-way muting on a conveyor (using four sensors)



- (1) varistor
- (2) the ESPE must be set in the automatic restart mode
- (3) Comply with the ESPE test input polarity and correct test contact (ST2 switch)

SSD relay possibly used for machine power shutdown
 FSD relays used for emergency stop in the machine control circuit
 ESPE OSSD1 light curtain normally open contact
 ESPE OSSD2 light curtain normally open contact
 P/B3 restart is achieved 30ms after release
 P/B1 & P/B2 for the override function
 SM1 & SM2 start muting sensors (ST3 switches)
 EM1 & EM2 end muting sensors

see chapter 6.2
 see ESPE installation manual
 see ESPE installation manual
 and chapter 4.5.2.
 see chapter 4.7..3
 see chapter 4.7..2
 see chapter 4.5.1
 see chapter 4.5..1
 see chapter 4.8..2
 see chapter 4.8.1.
 see chapter 4.6.1.
 see chapter 4.6.2.

⚠ WARNING

IMPROPER CONNECTION OF LOAD

For safety reasons, the loads must be connected between terminals 2-8 and between terminals 2-25 .

Failure to comply with these instructions could result in death or serious injury.

One-way muting using two sensors

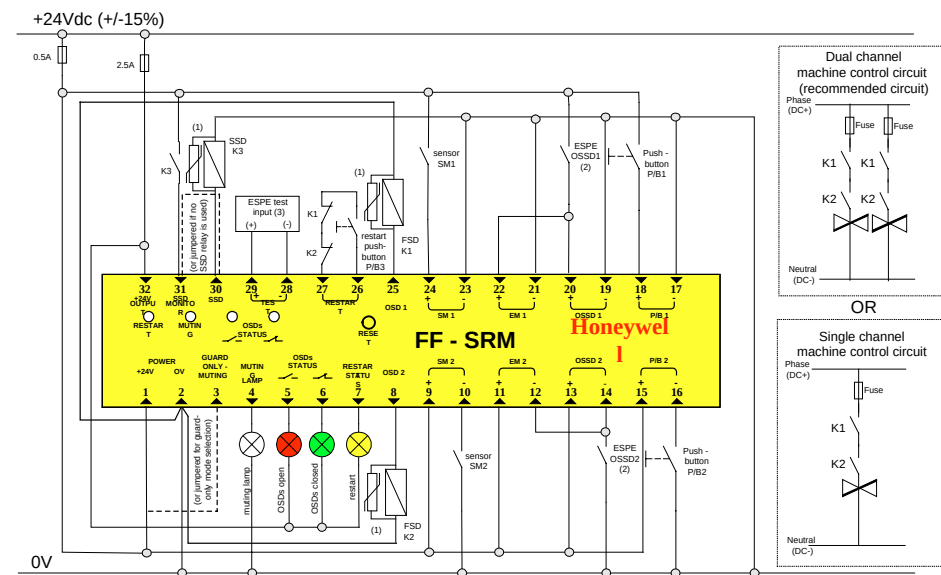
⚠ WARNING

IMPROPER INSTALLATION

For sensors installation, strictly adhere to instructions given in chapter 3.2.1 Use in the conveyor mode.

Failure to comply with these instructions could result in death or serious injury.

Figure 4.22 : One-way muting on a conveyor (using two sensors)



- (1) varistor
- (2) the ESPE (light curtain) must be set in the automatic restart mode
- (3) Comply with the ESPE test input polarity and correct test contact (ST2 switch)

SSD relay
FSD relays
ESPE OSSD1
ESPE OSSD2
P/B3
P/B1 & P/B2
SM1 & SM2

possibly used for machine power shutdown
used for emergency stop in the machine control circuit
light curtain normally open contact
light curtain normally open contact
restart is achieved 30ms after release
for the override function
start muting sensors (ST3 switches)

see chapter 6.2
see ESPE installation manual
see ESPE installation manual and chapter 4.5.2.

see chapter 4.7.3
see chapter 4.7.2
see chapter 4.5.1
see chapter 4.5.1
see chapter 4.8.2
see chapter 4.8.1.
see chapter 4.6.1.

⚠ WARNING

IMPROPER CONNECTION OF LOAD

For safety reasons, the loads must be connected connected between terminals 2-8 and between terminals 2-25 .

Failure to comply with these instructions could result in death or serious injury.

4.9.2 Press applications

NOTICE

FACTORY SETTINGS

- The muting module is set in the conveyor mode on delivery.
- Refer to chapter 2.4.1 Selection of the appropriate mode, to select the press mode.
- The maximum timing t_{max} allowed between SM sensors is set to 1 second on delivery. For machines different than presses, it can be modified to the following values : 2 s, 4 s, or 8 s.
- The setting of the timing t_{max} also sets the muting maximum duration Δ_{max} . In the press mode, the muting duration is set to 1 mn on delivery. In the press mode, it can be modified to the following values for machines different than presses: 2, 4 or 60 mn.
- On delivery, the muting module provides a normally closed test contact between terminals 28 and 29. All the Honeywell protective equipment need a normally closed contact on their test input with the exception of the FF-SCAN, the FF-LS and the FF-SPS4 which need a normally open contact. The test output can be changed to a normally open contact.
- Refer to chapter 2.4.2 SM inputs to select t_{max} and Δ_{max} , and refer to chapter 4.5.2 Test output to select the appropriate test contact.

⚠ WARNING

IMPROPER USE OF THE MUTING MODULE

NEVER mute the protective equipment during a dangerous phase of the machine working cycle.

Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING

SENSORS COINCIDENCE TIMING (t_{max}) AND MUTING DURATION (Δ_{max})

On a press, both SM sensors must be activated within the following time frame : $8 \text{ ms} < t < 1 \text{ s}$. The maximum duration Δ_{max} of the muting sequence must be set to 1 mn. These are the factory settings.

Failure to comply with these instructions could result in death or serious injury.

Muting of a safety light curtain on a mechanical press (using 2 sensors)

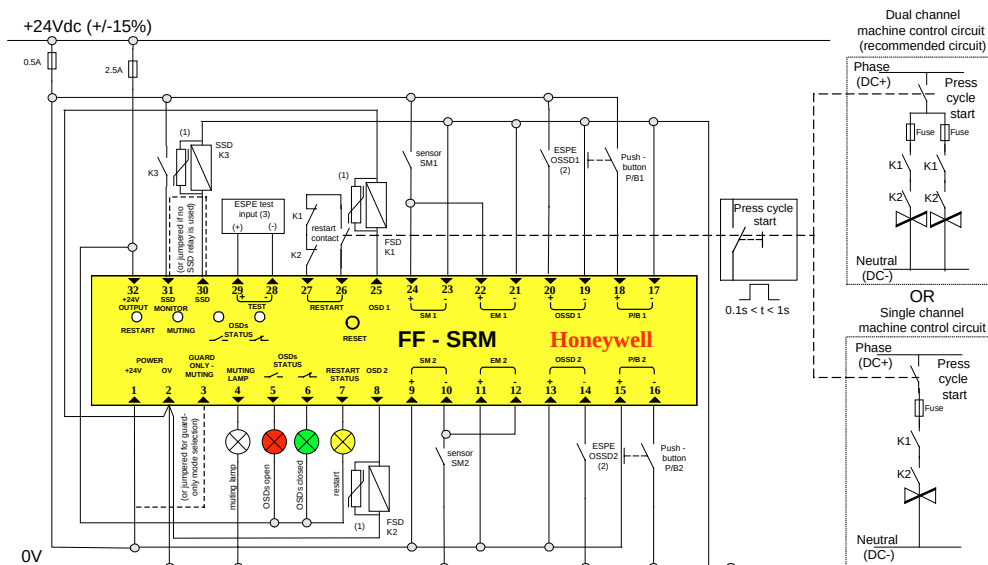
WARNING

IMPROPER INSTALLATION

For sensor installation, strictly adhere to instructions given in chapter 3.2.2 Use in the press mode.

Failure to comply with these instructions could result in death or serious injury.

Figure 4.23 : Muting of a safety light curtain on a mechanical press (using two sensors)



(1) varistor	see chapter 6.2
(2) the ESPE must be set in the automatic restart mode	see ESPE installation manual
(3) Comply with the ESPE test input polarity and correct test contact (ST2 switch)	see ESPE installation manual and chapter 4.5.2.
SSD relay	possibly used for machine power shutdown
FSD relays	used for emergency stop in the machine control circuit
ESPE OSSD1	light curtain normally open contact
ESPE OSSD2	light curtain normally open contact
Restart contact	restart is achieved 30ms after release
P/B1 & P/B2	for the override function
SM1 & SM2	start and end muting sensors (ST3 switches)
	see chapter 4.7..3
	see chapter 4.7..2
	see chapter 4.5.1
	see chapter 4.5..1
	see chapter 4.8..2
	see chapter 4.8.1.
	see chapter 4.6.1.

⚠ WARNING

IMPROPER CONNECTION OF LOAD

For safety reasons, the loads must be connected connected between terminals 2-8 and between terminals 2-25 .

Failure to comply with these instructions could result in death or serious injury.

NOTICE

MANUAL RESTART

- The restart contact can be provided by the press cycle start command.
- The effective restart of the module is achieved 30 ms after the push-button is released, and after a short pulse (between 0.1s and 1s) is sent on the appropriate input of the module.

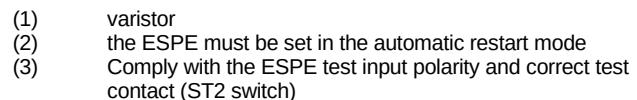
Muting of a safety light curtain on a hydraulic press (using 4 sensors)

⚠ WARNING

IMPROPER INSTALLATION

For sensors installation, strictly adhere to instructions given in chapter 3.2.2 Use in the press mode.

Failure to comply with these instructions could result in death or serious injury.



- see chapter 6.2
- see ESPE installation manual
- see ESPE installation manual and chapter 4.5.2
- see chapter 4.7.3
- see chapter 4.7.2
- see chapter 4.5.1
- see chapter 4.5.1
- see chapter 4.8.2
- see chapter 4.8.1.
- see chapter 4.6.1.
- see chapter 4.6.2.

IMPROPER CONNECTION OF LOAD

For safety reasons, the loads must be connected between terminals 2-8 and between terminals 2-25 .

NOTICE

MANUAL RESTART

- The restart contact can be provided by the press cycle start command.
- The effective restart of the module is achieved 30 ms after the push-button is released, and after a short pulse (between 0.1s and 1s) is sent on the restart input of the module.

Connection of two ESPEs on a single muting module

The following wiring diagrams may be used on presses or machines where two operators are working together and where the muting of both ESPEs can be done simultaneously without exposing operators to any hazard.



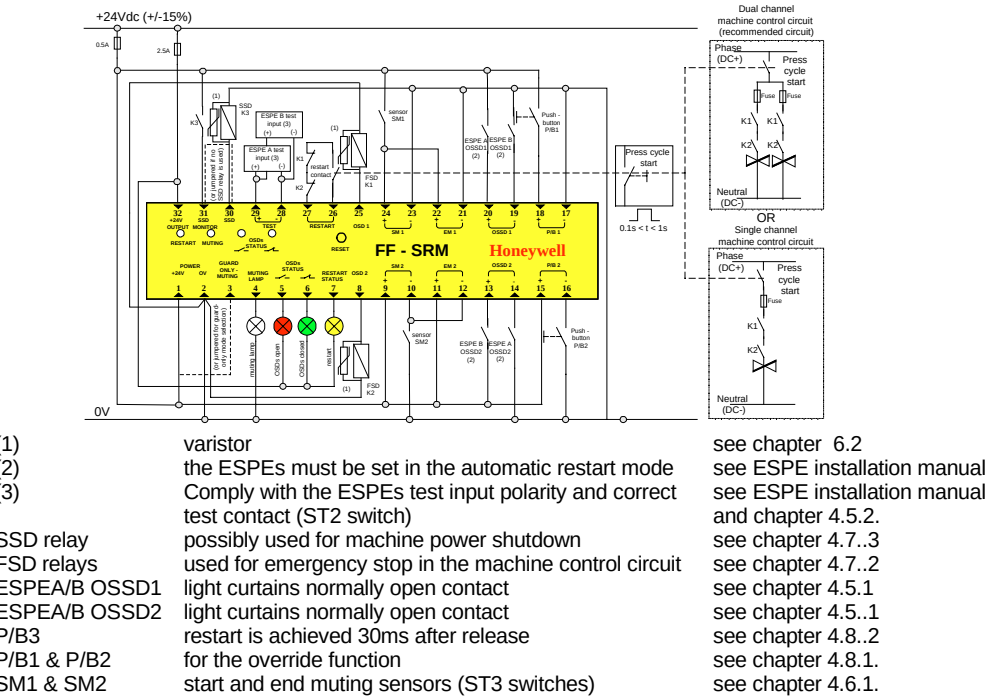
WARNING

IMPROPER INSTALLATION

- The muting of two protective equipment is forbidden on a conveyor application where the two protective equipment protect the entrance and the exit of a dangerous area.
- For sensors installation, strictly follow to instructions given in chapter 3.2.2 Use in the press mode.

Failure to comply with these instructions could result in death or serious injury.

Figure 4.25 : Muting of two safety light curtains on a mechanical press



WARNING

IMPROPER CONNECTION OF LOAD

For safety reasons, the loads must be connected between terminals 2-8 and between terminals 2-25 .

Failure to comply with these instructions could result in death or serious injury.

NOTICE

MANUAL RESTART

- The restart contact can be provided by the press cycle start command.
- The effective restart of the module is achieved 30 ms after the push-button is released, and after a short pulse (between 0.1s and 1s) is sent on the restart input of the module.

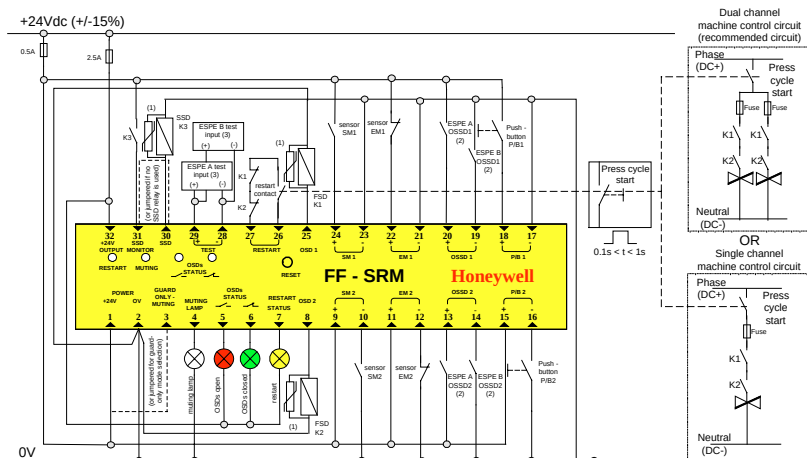
WARNING

IMPROPER INSTALLATION

- The muting of two protective equipment is forbidden on a conveyor application where the two protective equipment protect the entrance and the exit of a dangerous area.
- For sensors installation, strictly follow instructions given in chapter 3.2.2 Use in the press mode.

Failure to comply with these instructions could result in death or serious injury.

Figure 4.26 : Muting of two safety light curtains on a hydraulic press



- (1) varistor
(2) the ESPEs must be set in the automatic restart mode
(3) Comply with the ESPEs test input polarity and correct test contact (ST2 switch)
SSD relay possibly used for machine power shutdown
FSD relays : used for emergency stop in the machine control circuit
ESPEA/B OSSD1 light curtains normally open contacts
ESPEA/B OSSD2 light curtains normally open contacts
P/B3 restart is achieved 30ms after release
P/B1 & P/B2 for the override function
SM1 & SM2 start muting sensors (ST3 switches)
EM1 & EM2 end muting sensors

see chapter 6.2
see ESPE installation manual
see ESPE installation manual
and chapter 4.5.2.
see chapter 4.7..3
see chapter 4.7..2
see chapter 4.5.1
see chapter 4.5..1
see chapter 4.8..2
see chapter 4.8.1.
see chapter 4.6.1.
see chapter 4.6.2.

WARNING

IMPROPER CONNECTION OF LOAD

For safety reasons, the loads must be connected between terminals 2-8 and between terminals 2-25 .

Failure to comply with these instructions could result in death or serious injury.

NOTICE

MANUAL RESTART

- The restart contact can be provided by the press cycle start command.
- The effective restart of the module is achieved 30 ms after the push-button is released, and after a short pulse (between 0.1s and 1s) is sent on the appropriate input of the module.

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5. Troubleshooting

5.1 Overview

This chapter contains troubleshooting instructions.

5.2 Troubleshooting Chart

Figure 5.1 :Unwanted conditions beyond a muting sequence

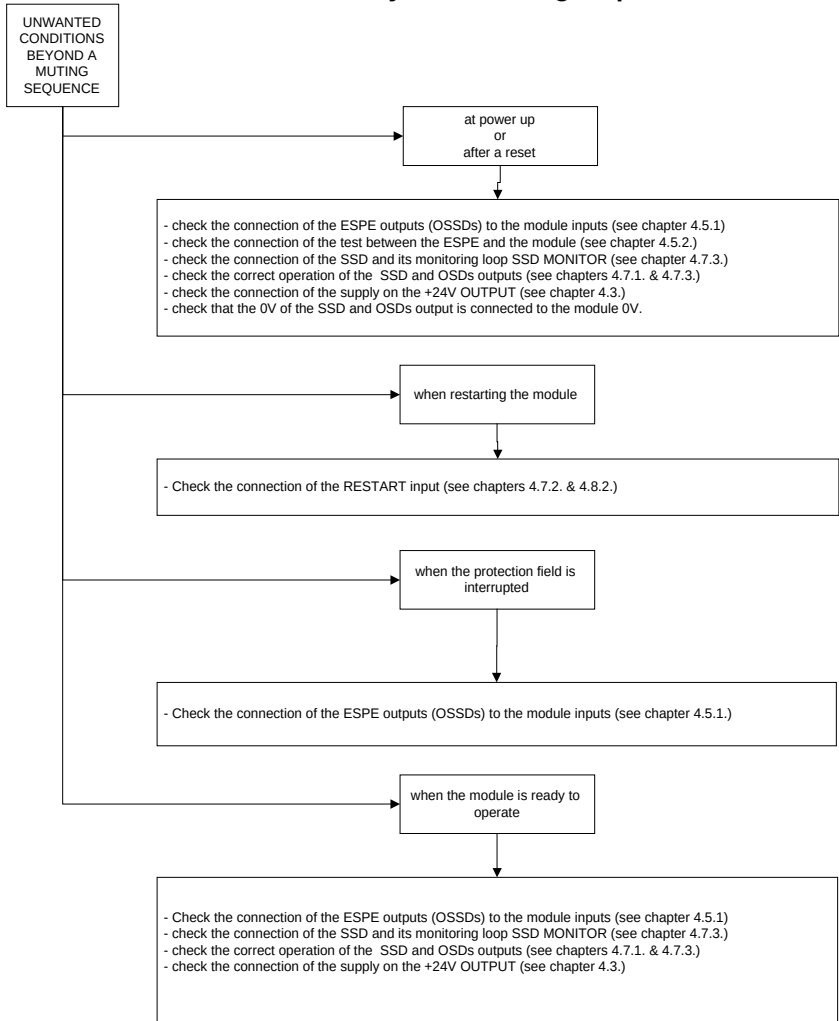
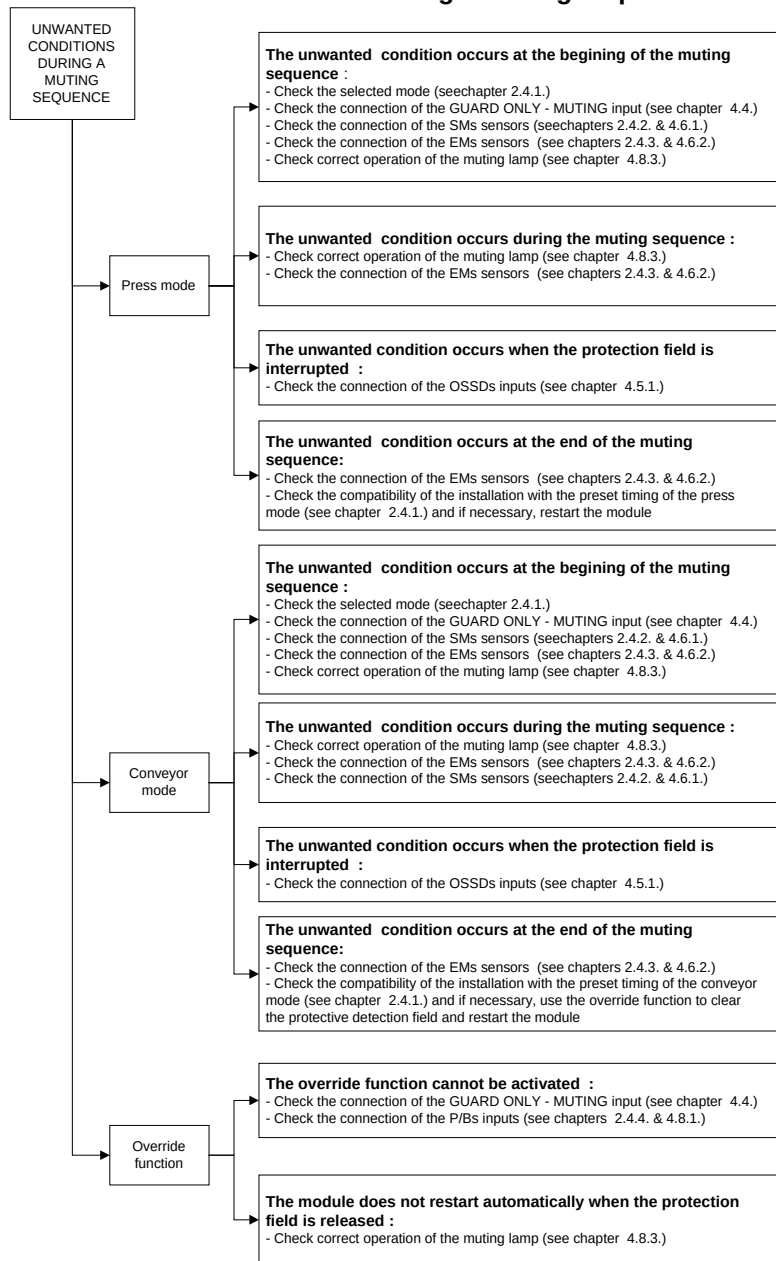


Figure 5.2 :Unwanted conditions during a muting sequence



6. Order Guide

6.1 Order Guide

FF-SRM100P2 (24 Vdc)

6.2 Components list

Components	Typical supplies	C	P
ESPE PROTECTIVE EQUIPMENT (1)			
Safety Light Curtains	Honeywell serie FF-SB, FF-SYA, FF-LS	X	X
or Modular Light Curtain	Honeywell serie FF-SCAN	X	
or Single safety beam or access control systems	Honeywell serie FF-SPS4 with test option	X	
or safety laser scanner	Hoeynwell serie FF-SE	X	
or safety mat	Honeywell serie FF-SM	X	
SENSORS (choose 2 to 4 sensors among the following) (2)			
Photoelectric control			
through-scan, LO/DO, relay SPDT or static PNP/NPN	Honeywell GP5-TC1S-T or GP5-TC7S-T	X	
retro-polarized, LO/DO, relay SPDT or static PNP/NPN	Honeywell GP5-PC1S-T or GP5-PC7S-T	X	
diffuse, LO/DO, relay SPDT or static PNP/NPN	Honeywell GP5-DC1S-T or GP5-DC7S-T	X	
Ultrasonic sensor	Honeywell 946-A4V-2D-001-175E	X	
Limit switches			
NO/NC contact, static PNP	Honeywell GLDB07A1B or GLDB07C	X	
NO/NC limit switch	Honeywell 24CE16-S1G or 24CE2-S1G		X
Inductive proximity sensor			
NO/NC contact, static PNP	Honeywell 922FS5-C9P-F or 922H26Q-C9P-L	X	X
NO/NC contact, static NPN	Honeywell 922FS5-C9N-F or 922H26Q-C9N-L	X	X
FSDs relays			
Expansion module 24 Vdc	Honeywell SRE30812, or Télémécanique CA3-KN31BD3 or CA3-D or GE CR120BP	X	X
SSD relays			
3 relays with guided contacts	Télémécanique CA3-KN31BD3 or CA3-DN31BD, or GE CR120BP	X	X
ARC SUPPRESSORS			
3 varistors 31 Vdc (recommended for cable length longer than 1 m)	Murr elektronik VG-A/24	X	X
MUTING LAMP			
white incandescent filament lamp	Télémécanique XVA-L37 and DL1-BL024	X	X
RESTART VISUAL INDICATOR			
yellow indicator	Télémécanique XB2-BV65	X	X
OSDs STATUS VISUAL INDICATORS			
red and green indicators	Télémécanique XB2-BV64 et XB2-BV63	X	X
RESTART PUSH-BUTTON			
key selector switch (1 position with return movement)	Télémécanique XB2-BG61	X	X
OVERRIDE PUSH-BUTTONS			
key selector switch (2 positions, 1 with return movement)	Télémécanique XB2-BG61	X	X
GUARD ONLY MODE SELECTOR			
key selector switch (2 fixed positions)	Télémécanique XB2-BG41	X	X
POWER SUPPLY 24 VDC			
power supply (power greater than 120 W) (support : Din L-DIN 100 rail)	Lambda coutant JWS 100-24/A	X	X
POWER SECTION SWITCH			
selector switch (2 fixed positions)	Télémécanique XB2-BD21 with additional contact blocks	X	X

(1) Refer to Honeywell Industrial Safety Products catalog

C : Conveyor / P : Press

(2) Refer to the following catalogues :

Honeywell photoelectric controls catalog

Honeywell ultrasonic distance sensors catalog

Honeywell switches catalog

Honeywell proximity sensors catalog

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7. Warranty Information

7.1 Warranty and Remedy

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during that period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is the Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

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INTERNET

<http://www.honeywell.com/sensing/>
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8. CE Declaration of Conformity

European Photoelectric Center
Honeywell-Cométa
B.P.81
38243 Meylan Cedex - France
Phone: (33) 04 76 41 72 00
Fax: (33) 04 76 41 72 56



HONEYWELL - EUROPEAN PHOTOELECTRIC CENTER QUALITY ASSURANCE DEPARTMENT

EC Declaration of conformity

■ We: Honeywell-Cométa
ZIRST B.P. 81
21, chemin du Vieux Chêne
38240 Meylan Cedex - France

■ Declare: under our sole responsibility that the Electrosensitive Protective Equipment catalogued:
Muting module FF-SRM series
to which this declaration relates is in conformity with the technical requirements of the standards and the provisions of the essential requirements of the directives detailed below.

■ Directives:

- **Machine Directive 89/392 EEC** and its amendments 91/368 EEC, 94/44 EEC and 93/68 EEC ⁽¹⁾
- **Low Voltage Directive 73/23 EEC**
- **Electromagnetic Compatibility Directive 89/336 EEC**

■ Standards: **EN 954-1: Safety of machinery - Safety related parts of control systems - Part 1: General principles for design.**

■ Safety level: *Type 4 per EN 954-1*

■ Legal representative in Europe Place of issue: Meylan
Quality Manager:
Patrick Goud
Signature: 

Date of issue: 09/10/97
General Manager:
Jean-Pierre Sany
Signature: 

(1): The INRS has delivered an EC type examination certificate for an equipment made of a single safety beam FF-SPS4 and the muting module FF-SRM. The whole set complies with the requirements of the EN 61496-1/2 norms for type 4 devices.
This document is available upon request.

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Characteristics and dimensions of equipment listed in this manual are for reference only and are subject to change without prior notice.



Installation Instructions for the FF-SR05936 Standstill Monitor Module

0217353

ISSUE 1

PK 107010-01



⚠ WARNING

IMPROPER INSTALLATION

- Consult with US and/or European safety agencies and their requirements when designing a machine control, interface and all control elements that affect safety.
 - Strictly adhere to all installation instructions.
- Failure to comply with these instructions could result in death or serious injury.**

PRODUCT DESCRIPTION

If the stopping time of the machinery is unpredictable, use the FF-SR05936 Standstill Monitor.

This module measures (between Z1/Z2) the back EMF of the disconnected motor from the terminals of one stator winding. When the EMF has decreased to a near zero value, the FF-SR05936 detects that the motor has stopped and energizes its output relays. In addition, FF-SR05936 monitors the connections to the motor for broken wires on terminals Z1, Z2. If an open (line break) is detected, the output relay contacts latch in the de-energized position as if the motor was running. After the break has been repaired, the module is reset by removing power to the module momentarily.

APPROVALS

CE	The product, packaging and documentation of FF-SR Series products carry the CE mark; the CE declaration of conformity is available upon request.



DIRECTIVES COMPLIANCE

Machine Directive 89/392 EEC
Low Voltage Directive 73/23 EEC
Electromagnetic Compatibility Directive 89/336

REGULATIONS COMPLIANCE

Regulation	Title
OSHA 29 CFR 1910.212	General Requirements for (guarding of) All Machines
OSHA 29 CFR 1910.217	(Guarding of) Mechanical Power Presses

STANDARDS COMPLIANCE

Standard	Title
ANSI B11.1	Mechanical Power Presses
ANSI B11.2	Hydraulic Power Presses
ANSI B11.19	Safeguarding when Referenced by the Other B11 Machine Tool Safety Standards
ANSI/RIA R15.06	Safety Requirements for Industrial Robots and Robot Systems
UL508	Underwriters Laboratories
EN 292	Safety of Machinery - Basic Concepts, General Principles for Design
EN 60204	Safety of Machinery - Electrical Equipment of Machines
EN 954	Safety of Machinery - Safety related parts of control system

SPECIFICATIONS

Input		
Nominal voltage	120 VAC (-15%, +10%), 230 VAC (-20%, +10%), 24 VDC (-20%, +10%)	
Nominal consumption	120 or 230 VAC: 4 VA; 24 VDC: 2.5 W	
Nominal frequency	50 to 60 Hz	
Measuring input protection	690 VAC	
Engaging voltage	40 mV	
Release voltage	20 mV	
Output		
Contact complement	2 NO contacts, 2 NC contacts	
Contact time	Safety relay, positive-guided	
Response time	2s after EMF drops below 20 mV	
Switching Capability	Power factor = 1 with resistive load	
Current Range (min. to max.)	10mA to 10A	
Voltage Range (min. to max.)	10 to 250VAC/DC	
Typical Electrical Life Expectancy	Power factor = 1 at 230 VAC/DC (note 1)	
3A	1,000,000 operations	
5A	500,000 operations	
10A	220,000 operations	
Typical Power Factor (cos ϕ)	Limitation Factor (note 2)	
0.3	0.45	
0.5	0.70	
0.7	0.85	
1.0	1.00	
Fuse rating	6 A gL (max.)	
Mechanical life	Ten million switching operations	
General		
Temperature range	-15°C to + 55°C (5°F to 131°F) at max. 90% humidity	
Sealing	Housing IP40 Terminals IP 20	
Housing material	Thermoplastic	
Vibration resistance	Amplitude 0.35 mm Frequency 10 to 55 Hz	
Conductor connection	1 x 4 mm ² solid (max.) [12 AWG] or 2 x 1.5 mm ² (max.) [16 AWG] stranded wire with sleeve DIN 46288	
Conductor attachment	M 3,5 screw terminals; wire contacts are enclosed to prevent electrical shock	
Mounting	Quick install rail mounting EN 50022-35	
Weight	325 g (0.72 lb.)	

NOTE 1: Install arc suppression device across load to avoid module contact arcing and ensure specified relay life expectancy.

NOTE 2: Total operations = operations at power factor 1 multiplied by the limitation factor. if the power factor is 0.5 at 230 vac, 3A (1,000,000 operations), the limitation factor is 0.70. 1,000,000 x 0.70 = 700,000 total operations.

FIG 1. CONTACT LIFE FOR 100% RESISTIVE LOAD (typical) (note 1)
power factor = 1 (cos ϕ)

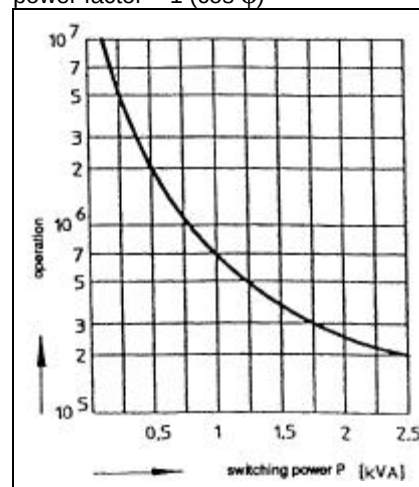


FIG 2. LIMITATION FACTOR FOR INDUCTIVE LOADS (note 2)
power factor < 1 (cos ϕ)

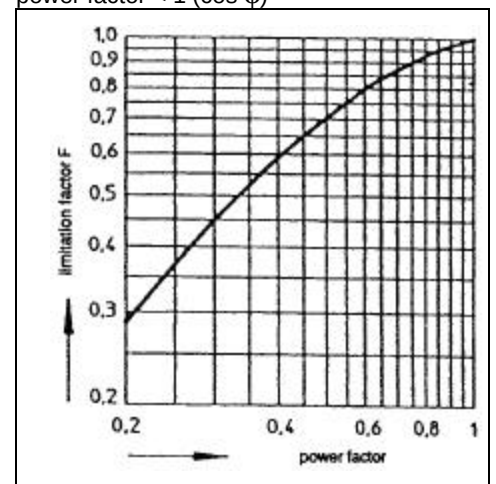


FIG 3. CURRENT VS. TEMPERATURE LIMIT

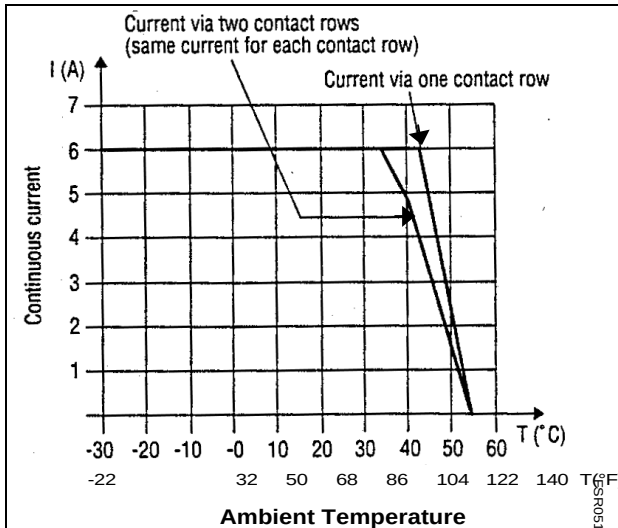


Figure 3. displays the maximal recommended external temperature versus the total load of all the safety module contacts. To use this curve, do the following:

- (1) Follow the horizontal line from the value (vertical axis) equal to the current inside the safety module contacts and note intersection of the appropriate curve.
- (2) Follow the intersection point down to determine the maximal recommended ambient temperature. (Ex: 4 A current inside each two safety contacts, then $T = 43^{\circ}\text{C}$ (109°F)).

If the module is located in a higher temperature environment, the lifetime of the electronic components may be reduced. Ventilation of the cabinet may be required.

MECHANICAL INSTALLATION

The FF-SR05936 must be installed inside a NEMA 3 (IEC IP54) rating enclosure or better. The module can be clipped easily onto a 45mm width DIN rail (see figures 4 and 5 below for installation and removal).

FIG 4. MOUNTING DIMENSIONS

(for reference only)

- a Width: 45 mm 1.77 in.
- b Height: 74 mm 2.91 in.
- c Depth: 121 mm 4.76 in

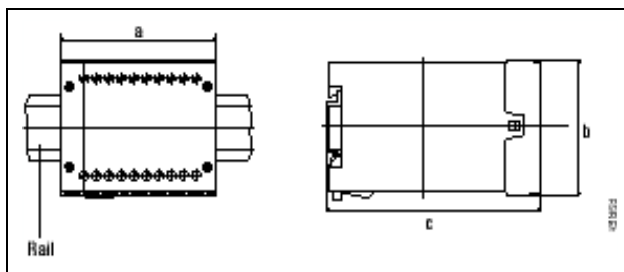
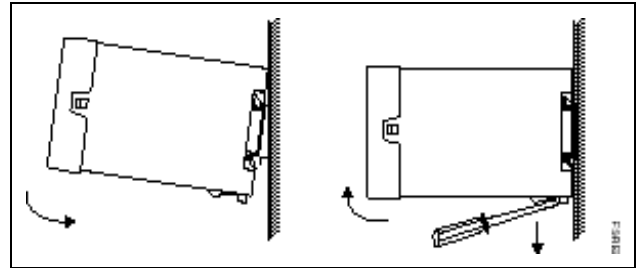


FIG 5. INSTALLATION DIAGRAM



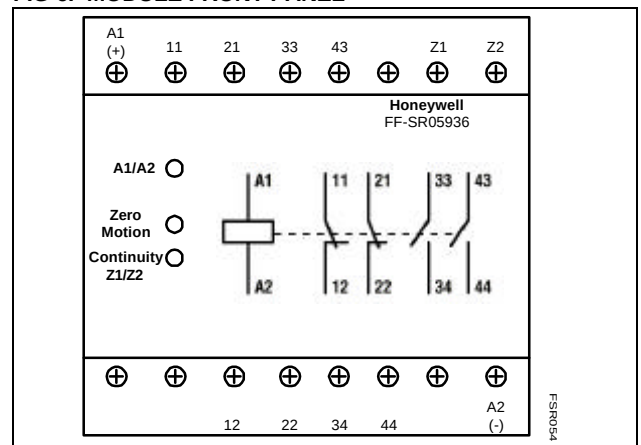
CONTROL RELIABILITY

"Control Reliability" means that "the device, system or interface shall be designed, constructed and installed such that a single component failure within the device, interface or system shall not prevent normal stopping action from taking place but shall prevent a successive machine cycle." (ANSI B11.19-1990, 5.5)

OSHA 29 CFR 1910.217 states that "the control system shall be constructed so that a failure within the system does not prevent the normal stopping action from being applied to the press when required, but does prevent initiation of a successive stroke until the failure is corrected. The failure shall be detectable by a simple test, or indicated by the control system."

Honeywell uses self-checking techniques which combine reliability with safety. This means that a faulty component in our system will make the safety control modules fail in a safe mode.

FIG 6. MODULE FRONT PANEL



ELECTRICAL INSTALLATION

⚠ WARNING**ELECTRICAL SHOCK**

Remove power from FF-SR Series control modules and machine during installation.

Failure to comply with these instructions could result in death or serious injury.

Multiple wiring configurations are possible for the FF-SR05936 single channel standstill monitor safety module. General guidelines are provided because there are various ways to interface the module to machine control circuitry. **Refer to the important warnings (page 5)** and the application examples (page 6).

FUNCTIONAL DESCRIPTION

This module measures (between Z1/Z2) the back EMF of the disconnected motor from the terminals of one stator winding. When the EMF has decreased to a near zero value, the FF-SR05936 detects that the motor has stopped and energizes its output relays. In addition, FF-SR05936 monitors the connections to the motor for broken wires on terminals Z1, Z2. If an open (line break) is detected, the output relay contacts latch in the de-energized position as if the motor was running. After the break has been repaired, the module is reset by removing power to the module momentarily.

One or more FF-SRE3081 Extension Modules or external contactors with positively driven contacts can be used to multiply the number of contacts of the FF-SR05936 standstill monitor module. If multiple safety contacts are used in parallel with one load, the maximum admissible current can be increased.

FIG 7. FUNCTIONAL DIAGRAM

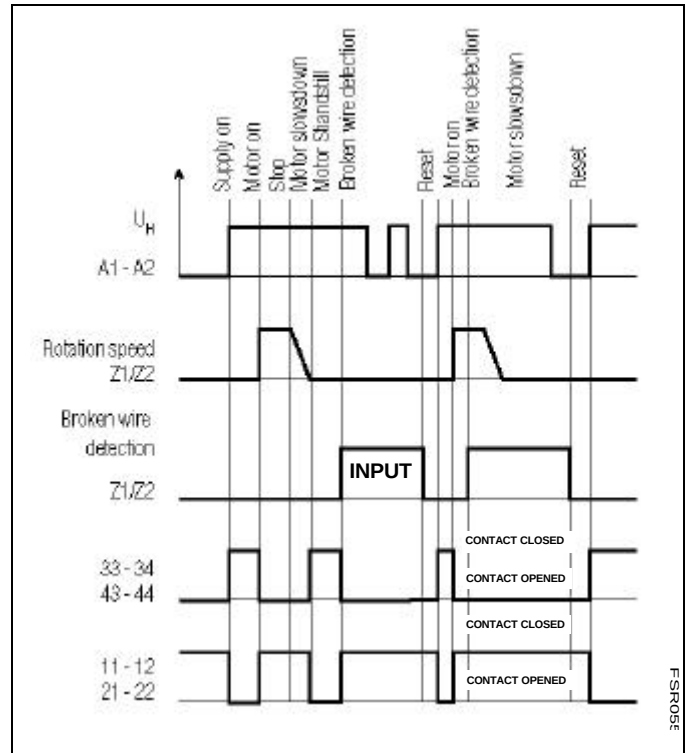
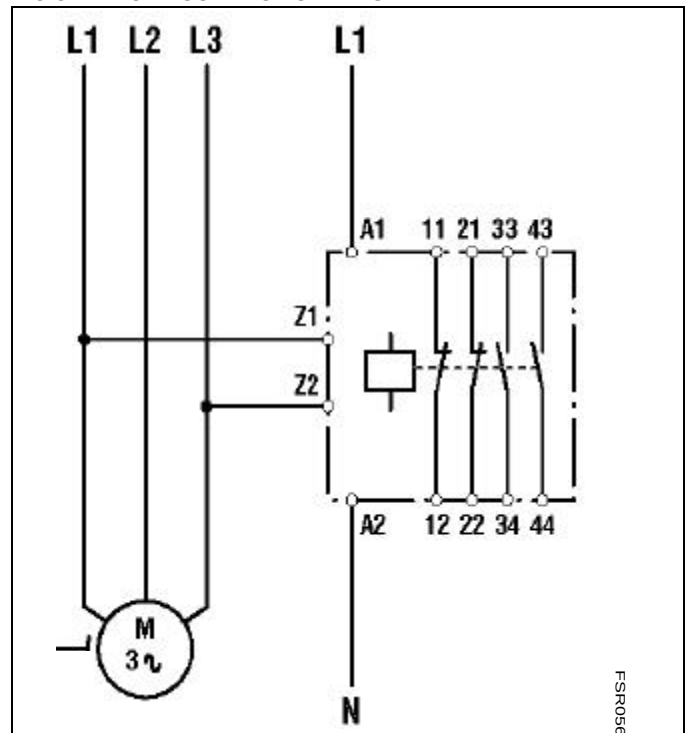


FIG 8. TYPICAL CONNECTION DIAGRAM



APPLICATION WARNINGS

⚠ WARNING**IMPROPER TIME DELAY USE**

- Always use stand still monitor module connected to non safety related machine operation and use safety control modules as e-stop, door, two-hand control to immediately stop dangerous motion.

CONTACT WELDING

- Always protect all safety contacts with correctly rated fuses. These fuses must never exceed the rated FF-SR05936 safety output capability to prevent contact welding.

IMPROPER EXTERNAL SAFETY RELAY MONITORING

- When using additional safety relays, always connect one normally closed contact of each relay in series inside the Final Switching Device (FSD) monitoring loop circuit. This connection will ensure correct operation of the external relays after each FF-SR05936 activation.

IMPROPER ARC SUPPRESSOR INSTALLATION

- Never install an arc suppressor across the safety output contact of the safety control module.
- Always install arc suppressors across the coils of external safety relays.

Failure to comply with these instructions could result in death or serious injury.

DOOR PROTECTION (refer to application example)**Start Sequence**

Initially, the motor is not operating and the door is open. To initiate the start sequence, close the door. This action will close the two normally closed contacts of the key operated interlock switch. It will also automatically restart the emergency stop modules. As the Unlock push button is open, the solenoid coil of the key operated interlock switch is de-energized and the door is locked. The motor may now be started.

To start the motor, press the On push button. This action will energize the self maintained external safety relay K4 and will start the motor.

Stop Sequence

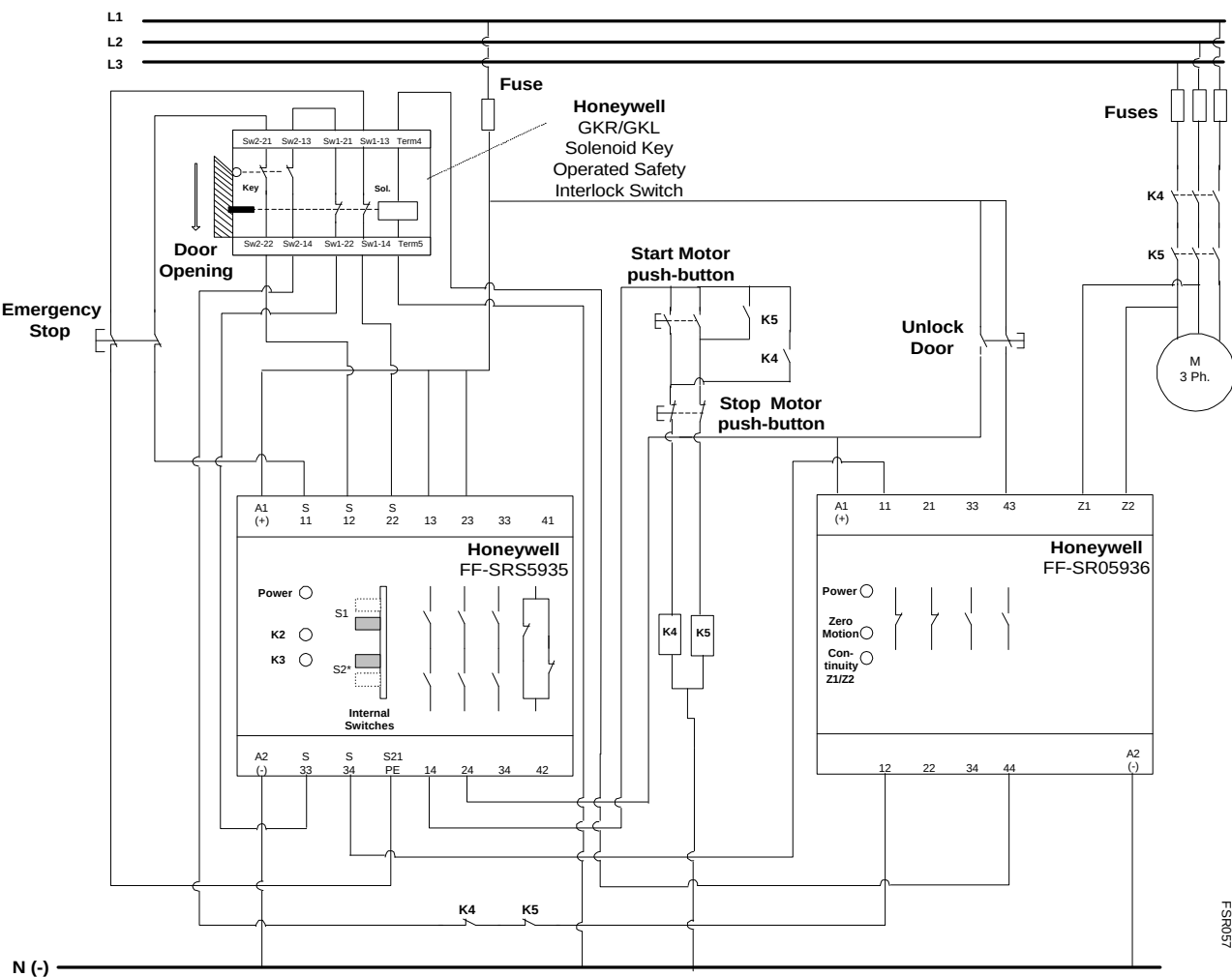
Initially, the motor is operating and the door is closed and locked. To initiate the stop sequence, press the Off push button. This action will de-energize the external safety relay K4 and immediately stop the motor.

To unlock the door when the motor has reached zero motion, press the Unlock push button. This action will energize the coil of the solenoid of the key operated interlock switch and unlock the door. The door may now be opened safely. No hazardous motor motion is present.

Emergency-stop Sequence

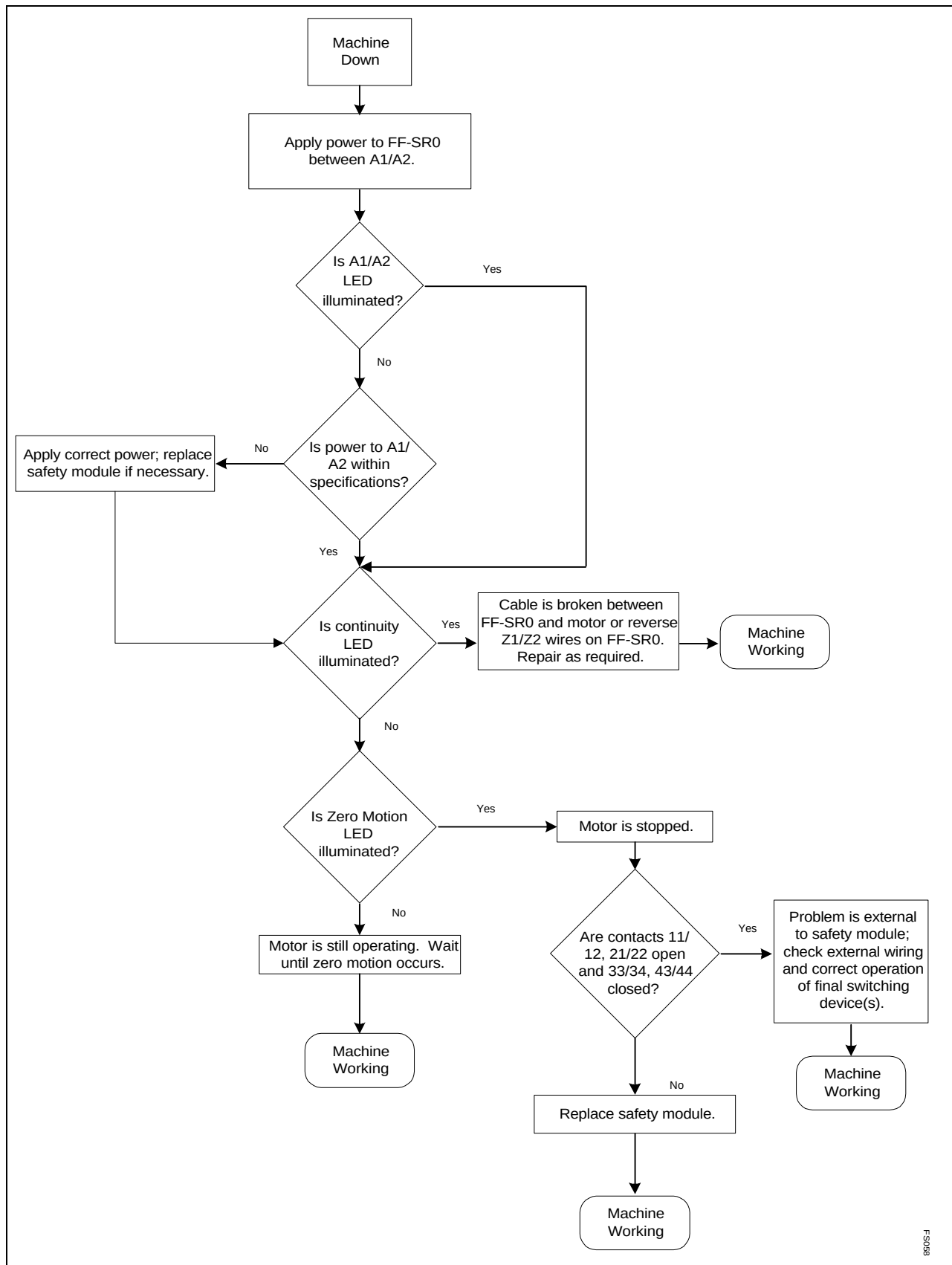
In case of an emergency stop situation, the two channel inputs of the FF-SRS5935 emergency stop control module will open. This action de-energizes the external safety relay K4, stopping the motor. All other steps remain the same as described above (Stop Sequence).

APPLICATION EXAMPLE



FF-SR057

FF-SR05936 TROUBLESHOOTING FLOW DIAGRAM



FS098

WARRANTY AND REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

While we provide application assistance, personally and through our literature, it is up to the customer to determine the suitability of the product in the application.

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For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact a nearby sales office or call:

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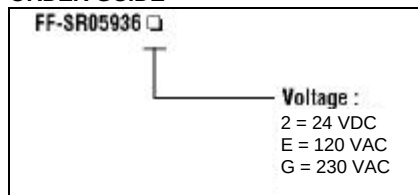
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Honeywell Cométa
European Photoelectric Center
21, Chemin du Vieux Chêne
38243 Meylan Cedex - FRANCE

FF-SR25980

Two-hand Safety Module Installation Instructions



⚠ WARNING

IMPROPER INSTALLATION

- Consult with US and/or European safety agencies and their requirements when designing a machine control, interface and all control elements that affect safety.
- Strictly adhere to all installation instructions.

Failure to comply with these instructions could result in death or serious injury.

PRODUCT DESCRIPTION

Two-hand safety controls ensure protection against hand injury due to dangerous machine movement. A two-hand safety control system is made up of two elements: a control board and a safety control module. The control board has two control devices that force the use of two-hand activation simultaneously. The safety control element is a device like the FF-SR25980 two-hand safety module. This control module is linked to the control board and is located in an enclosure.

This device has two safety relays with positive-guided contacts to ensure redundancy. This safety control module provides an emergency stop signal to the machine control circuitry when the two-hand safety device inputs are removed or released. FF-SR25980 helps to create a control reliable safety solution by providing redundancy and self-checking circuitry. Other features include high current capability, external relay monitoring and input closure timing.

APPROVALS

CE	The product, packaging and documentation of FF-SR Series products carry the CE mark; the CE declaration of conformity is available upon request.
cULus (pending)	This product is pending approval by Underwriters Laboratories Inc. according to Canadian and U.S. safety requirements.
BG	German Berufsgenossenschaft E+MIII



DIRECTIVES COMPLIANCE

Machine Directive 89/392 EEC
Low Voltage Directive 73/23 EEC
Electromagnetic Compatibility Directive 89/336

REGULATIONS COMPLIANCE

Regulation	Title
OSHA 29 CFR 1910.212	General Requirements for (guarding of) All Machines
OSHA 29 CFR 1910.217	(Guarding of) Mechanical Power Presses

STANDARDS COMPLIANCE

Standard	Title
ANSI B11.1	Mechanical Power Presses
ANSI B11.2	Hydraulic Power Presses
ANSI B11.19	Safeguarding when Referenced by the Other B11 Machine Tool Safety Standards
ANSI/RIA R15.06	Safety Requirements for Industrial Robots and Robot Systems
UL508	Underwriters Laboratories
EN 292	Safety of Machinery - Basic Concepts, General Principles for Design
EN 60204	Safety of Machinery - Electrical Equipment of Machines
EN 954	Safety of Machinery - Safety related parts of control system
prEN 574	Two-hand control devices

SPECIFICATIONS

Input		
Nominal voltage	120 VAC (-15%, +10%), 230 VAC (-20%, +10%), 24 VDC (-10%, +10%)	
Nominal consumption	120, 230 VAC: 4 VA; 24 VDC: 2.5 W	
Nominal frequency	50 to 60 Hz	
Nominal voltage at S13/S23	24 VDC / 0 VDC (provided by control module)	
Nominal input current between S13/S14 and S23/S24	35 mA (control line length must not exceed 30 m (98 ft) and must be routed separately from power cables)	
Time required for simultaneous contact closure S13/S14 and S23/S24	0.5 s	
Output		
Contact complement	2 NO contacts	
Contact type	Safety relay, positive-guided	
Response time	Activation/deactivation by inputs S13/S14 and S23/S24: 30 ms	
Switching Capability	Power factor = 1 with resistive load	
Current Range (min. to max.)	1 mA to 10A (see caution)	
Voltage Range (min. to max.)	0.1 to 250 VAC/DC	
Typical Electrical Life Expectancy	Power factor = 1 at 230 VAC/DC (note 1)	
3A	1,000,000 operations	
5A	500,000 operations	
10A	220,000 operations	
Typical Power Factor (cos ϕ)	Limitation Factor (note 2)	
0.3	0.45	
0.5	0.70	
0.7	0.85	
1.0	1.00	
Fuse rating	6 A gL (max.)	
Mechanical life	Ten million switching operations	
General		
Temperature range	-15°C to + 55°C (5°F to 131°F) at 90% humidity (max.)	
Sealing	Housing IP 40; Terminals IP 20	
Housing material	Thermoplastic	
Vibration resistance	Amplitude 0.35 mm; Frequency 10 to 55 Hz	
Conductor connection	1 x 4 mm ² solid (max.) [12 AWG] or 2 x 1.5 mm ² (max.) [16 AWG] stranded wire with sleeve	
Conductor attachment	M 3,5 screw terminals; wire contacts are enclosed to prevent electrical shock	
Mounting	Quick install rail mounting EN 50022-35	
Weight	410 g (0.90 lb.)	

NOTE 1: Install arc suppression device across load to avoid module contact arcing and ensure specified relay life expectancy.

NOTE 2: Total operations = operations at power factor 1 multiplied by the limitation factor. If the power factor is 0.5 at 230 VAC, 3A (1,000,000 operations), the limitation factor is 0.70. 1,000,000 x 0.70 = 700,000 total operations.

FIG 1. CONTACT LIFE FOR 100% RESISTIVE LOAD (typical) (note 1)
power factor = 1 (cos ϕ)

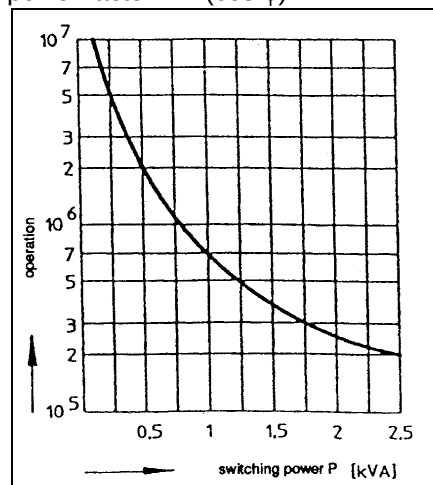
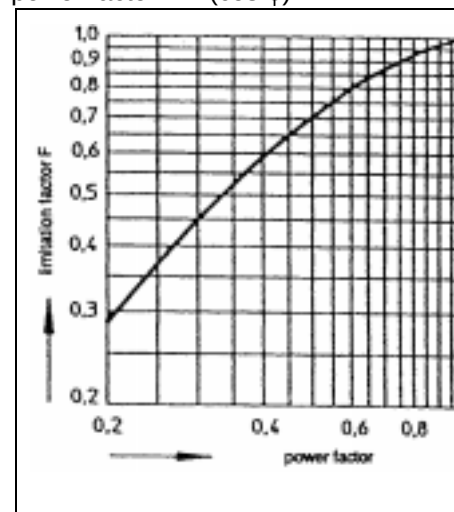


FIG 2. LIMITATION FACTOR FOR INDUCTIVE LOADS (note 2)
power factor < 1 (cos ϕ)



CAUTION CONTACT DAMAGE

To ensure the 1 mA capability during the lifetime of the contact, NEVER exceed 300 mA and 60 V.

Failure to comply with these instructions will result in product damage.

FIG 3. CURRENT VS. TEMPERATURE LIMIT

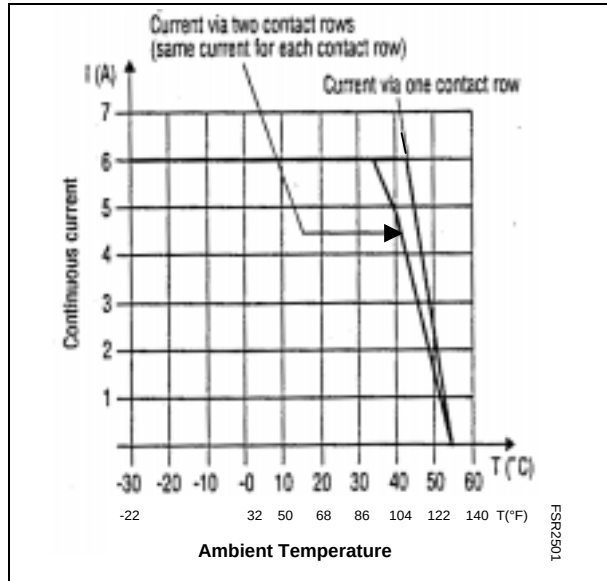


Figure 3. displays the maximal recommended external temperature versus the total load of all the safety module contacts. To use this curve, do the following:

- (1) Follow the horizontal line from the value (vertical axis) equal to the current inside the safety module contacts and note intersection of the appropriate curve.
- (2) Follow the intersection point down to determine the maximal recommended ambient temperature.
(Ex: 4 A current inside each two safety contacts, then $T = 43^{\circ}\text{C}$ (109°F).

If the module is located in a higher temperature environment, the lifetime of the electronic components may be reduced. Ventilation of the cabinet may be required.

MECHANICAL INSTALLATION

The FF-SR25980 must be installed inside a NEMA 3 (IEC IP54) rating enclosure or better. The module can be mounted easily onto a 45mm width DIN rail (see figures 4 and 5 below for installation and removal).

FIG 4. MOUNTING DIMENSIONS (for reference only)

- a Width: 45 mm 1.77 in.
- b Height: 74 mm 2.91 in.
- c Depth: 121 mm 4.76 in.

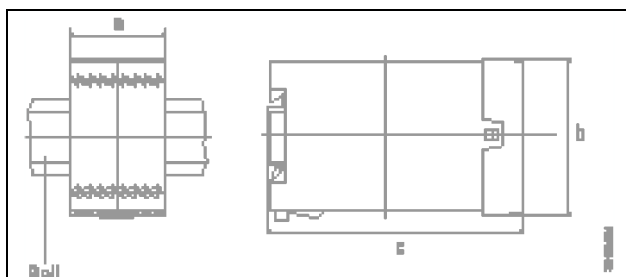
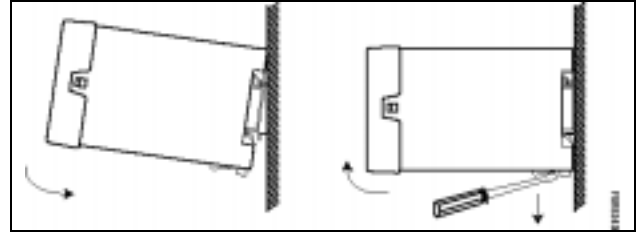


FIG 5. INSTALLATION DIAGRAM



CONTROL RELIABILITY

"Control Reliability" means that "the device, system or interface shall be designed, constructed and installed such that a single component failure within the device, interface or system shall not prevent normal stopping action from taking place but shall prevent a successive machine cycle." (ANSI B11.19-1990, 5.5)

OSHA 29 CFR 1910.217 states that "the control system shall be constructed so that a failure within the system does not prevent the normal stopping action from being applied to the press when required, but does prevent initiation of a successive stroke until the failure is corrected. The failure shall be detectable by a simple test, or indicated by the control system."

Honeywell uses self-checking techniques that combine reliability with safety. This means that a faulty component in our system will make the safety control modules fail in a safe mode.

The FF-SR25980 safety control module functions with dual internal channel redundancy and positive self-check monitoring.

ELECTRICAL INSTALLATION

⚠ WARNING

ELECTRICAL SHOCK

Remove power from FF-SR Series control modules and machine during installation.

Failure to comply with these instructions could result in death or serious injury.

Multiple wiring configurations are possible for the FF-SR25980 single channel two-hand safety module. General guidelines are provided because there are various ways to interface the module to machine control circuitry. **Refer to the important warnings (page 5) and the application examples (page 6).**

FUNCTIONAL DESCRIPTION

The module operates in an **automatic restart** mode and accepts immediate input from the safety devices (safety hand switches)

If the module receives input (between S13/S14 and S23/24) from two safety hand switches that are monitoring hand presence, and this occurs in less than half a second (assuming the external monitoring loop circuitry (Y1/Y2) is closed), the two normally open safety contacts (13/14 and 23/24) will close. If these input contacts fail to close within half a second, or if power has been removed, another activation is required.

When one of the input contacts opens, the two normally open safety contacts of the FF-SR25980 module will open immediately.

One or more FF-SRE3081 Extension Modules or external contactors with positively driven contacts can be used to multiply the number of contacts of the FF-SR25980 Two-hand safety Module. If multiple safety contacts are used in parallel with one load, the maximum admissible current can be increased.

FIG 6. FUNCTIONAL DIAGRAM

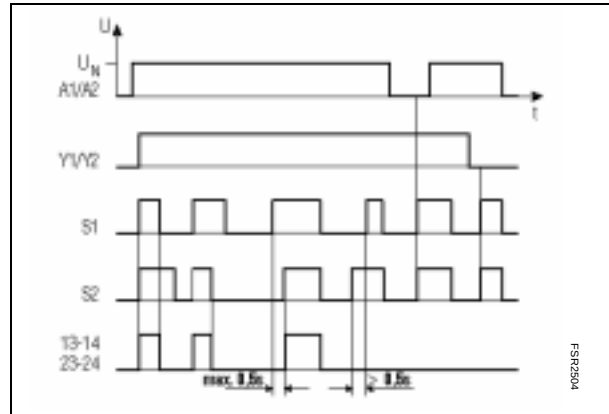


FIG 7. BLOCK DIAGRAM

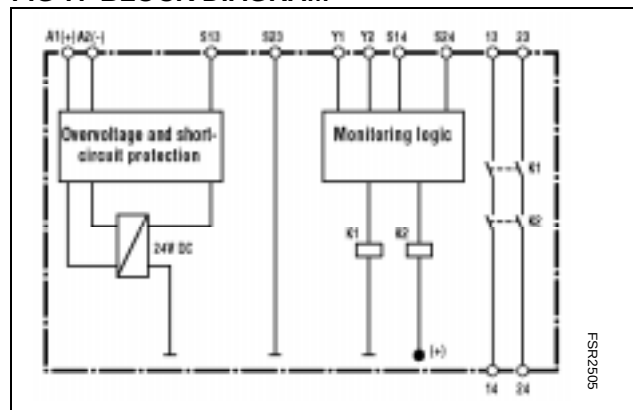
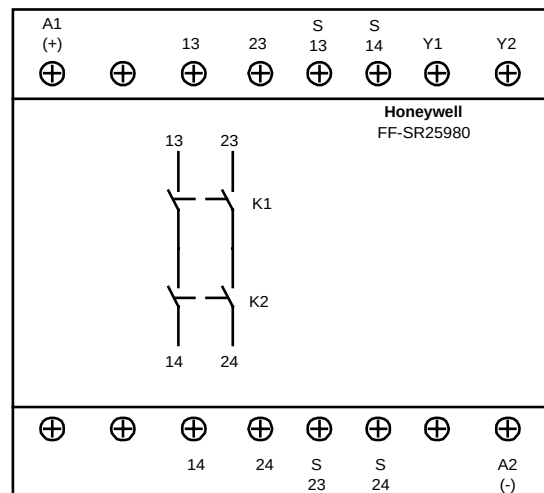


FIG 8. MODULE FRONT PANEL



APPLICATION WARNINGS

WARNING

IMPROPER INPUT CONNECTIONS

- To ensure the proper operation of the FF-SR25980, always connect each two-hand safety switch output to the input channels of the two-hand safety module.

IMPROPER HAND SWITCHES USE

- Always use safety hand switches designed for a two hand control solution.
- Strictly follow the manufacturer's installation manual for the proper use and location of these safety hand switches.

CONTACT WELDING

- Always protect all safety contacts with correctly rated fuses. These fuses must never exceed the rated FF-SR25980 safety output capability to prevent contact welding.

IMPROPER EXTERNAL SAFETY RELAY MONITORING

- When using additional safety relays, always connect one normally closed contact of each relay in series inside the Final Switching Device (FSD) monitoring loop circuit (Y1/Y2). This connection will ensure correct operation of the external relays after each FF-SR25980 activation.

IMPROPER ARC SUPPRESSOR INSTALLATION

- Never install an arc suppressor across the safety output contact of the safety control module.
- Always install arc suppressors across the coils of external safety relays.

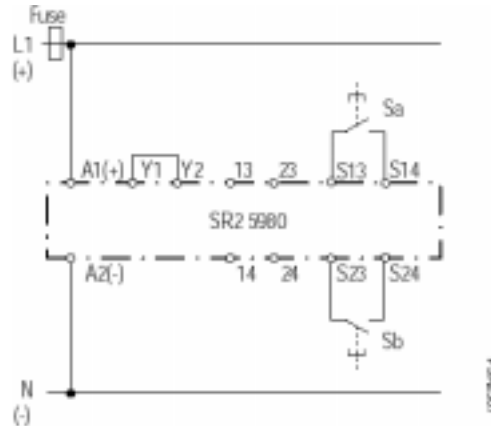
IMPROPER SYSTEM SAFETY LEVEL

- Always connect a single control board (consisting of two hand control switches) to the FF-SR25980 module to ensure the proper level of safety.
- The two hand control solution only protects a single operator per control board. If additional personnel protection is required, use additional control boards, door(s) and/or electrosensitive protective equipment.
- Always use additional guarding protection when necessary (some applications require more protection) to prevent access to hazardous machine motion.

Failure to comply with these instructions could result in death or serious injury.

APPLICATION EXAMPLES

TWO-HAND CONTROL (WITHOUT EXTERNAL CONTACTORS)

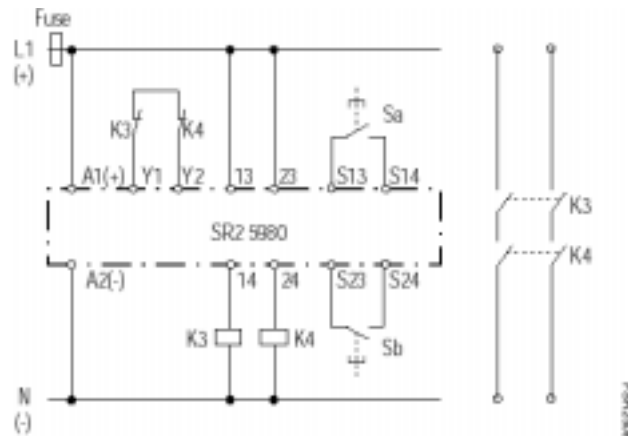


FUNCTIONAL DESCRIPTION

After releasing one of the two external hand switch contacts Sa or Sb (as illustrated above), the two internal safety relays K1 and K2 will de-energize. The normally open safety outputs 13/14 and 23/24 will open and relay the stop condition to the machine control circuitry. After closing Sa and Sb in less than half a second, the safety relays K1 and K2 will energize. This action will occur only if both external hand switches Sa and Sb have been previously deactivated. The two normally open safety contacts 13/14 and 23/24 will close and the machine will be allowed to operate.

The Final Switching Device (FSD) monitoring loop has to be closed (Y1-Y2, jumpered).

TWO-HAND CONTROL (WITH EXTERNAL CONTACTORS)



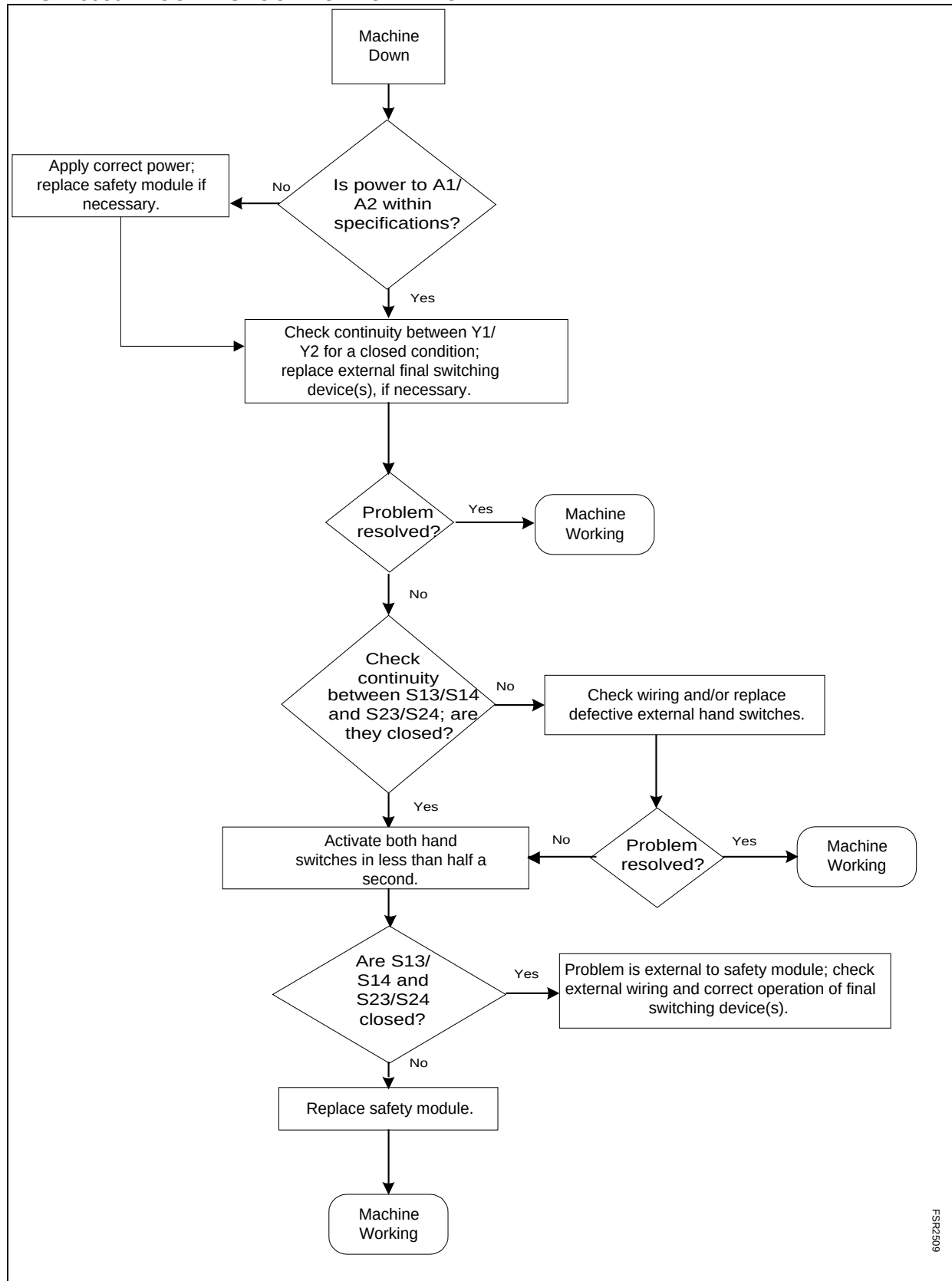
FUNCTIONAL DESCRIPTION

For high current, the output contacts should be reinforced by using external safety relays.

The proper operation of the external contactors is monitored by looping the NC contacts into the FSD monitoring circuit (terminals Y1/Y2).

After releasing one of the two external hand switch contacts Sa or Sb (as illustrated above), the two internal safety relays K1 and K2 will de-energize. The normally open safety outputs 13/14 and 23/24 will open, de-energizing the external contactors K3 and K4. This action will relay the stop condition to the machine control circuitry. After closing Sa and Sb in less than half a second, if the two contactors K3 and K4 are working properly, the internal safety relays K1 and K2 will energize. This action will occur only if both external hand switches Sa and Sb have been previously deactivated. The two normally open safety contacts 13/14 and 23/24 will close, energizing the external contactors K3 and K4, and the machine will be allowed to operate.

FF-SR25980 TROUBLESHOOTING FLOW DIAGRAM



FSR2509

WARRANTY AND REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

While we provide application assistance, personally and through our literature, it is up to the customer to determine the suitability of the product in the application.

Specifications may change at any time without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

SALES AND SERVICE

For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact a nearby sales office or call:

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+ 44 (0) 161 251 4079	UK
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34 91 313 61 29	Spain
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1-815-235-6847	USA

INTERNET

<http://www.honeywell.com/sensing/>
info@micro.honeywell.com

ORDER GUIDE

FF-SR25980 

Voltage :

2 = 24VDC
E = 120 VAC
G = 230 VAC

Installation Instructions for the FF-SRD5985 Safety Door Monitor Module

0217355

Issue 1

PK 107013-01



(pending)

⚠ WARNING

IMPROPER INSTALLATION

- Consult with US and/or European safety agencies and their requirements when designing a machine control, interface and all control elements that affect safety.
 - Strictly adhere to all installation instructions.
- Failure to comply with these instructions could result in death or serious injury.**

PRODUCT DESCRIPTION

Protective gates are designed to limit or block access to the moving parts of dangerous machinery. These gates can be equipped with locking or interlocking devices, usually safety limit switches or any other safety sensors.

The FF-SRD5985 Safety Door Monitor module monitors the status of these safety sensor positions. When the protective gate is open, the initiation of dangerous motion is prevented. When the door is closed again, the next machine cycle can start, but only after initiating a manual restart sequence.

This device has two safety relays with positive-guided contacts to ensure redundancy.

This safety control module provides an emergency stop signal to the machine control circuitry. FF-SRD5985 helps to create a control reliable safety solution by providing redundancy and self-checking circuitry. Other features include high current capability, an increased number of contacts (using an extension control module FF-SRE3081), external relay monitoring and input closure timing.

APPROVALS

CE	The product, packaging and documentation of FF-SR Series products carry the CE mark; the CE declaration of conformity is available upon request.
cULus (pending)	This product is pending approval by Underwriters Laboratories Inc. according to Canadian and U.S. safety requirements.
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DIRECTIVES COMPLIANCE

Machine Directive 89/392 EEC
Low Voltage Directive 73/23 EEC
Electromagnetic Compatibility Directive 89/336

REGULATIONS COMPLIANCE

Regulation	Title
OSHA 29 CFR 1910.212	General Requirements for (guarding of) All Machines
OSHA 29 CFR 1910.217	(Guarding of) Mechanical Power Presses

STANDARDS COMPLIANCE

Standard	Title
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ANSI/RIA R15.06	Safety Requirements for Industrial Robots and Robot Systems
UL508	Underwriters Laboratories
EN 292	Safety of Machinery - Basic Concepts, General Principles for Design
EN 60204	Safety of Machinery - Electrical Equipment of Machines
EN 954	Safety of Machinery - Safety related parts of control system

SPECIFICATIONS

Input	
Nominal voltage	120 VAC (-15%, +10%), 230 VAC (-20%, +10%), 24 VDC (-10%, +20%)
Nominal consumption	120 VAC, 230 VAC: 4 VA; 24 VDC: 2.5 W
Nominal frequency	50 to 60 Hz
Control contacts	Two NO contacts
Nominal voltage at S13/S23	24 VDC / 0VDC (provided by control module)
Nominal input current between S13/S14 and S23/S24	35 mA (ensure 10 mA switching capability with sensors connected to two inputs)
Time required for simultaneous contact closure of S13/S14 and S23/S24	3 sec (max.)
Output	
Contact complement	2 NO contacts
Contact type	Safety relay, positive-guided
Response time	Activation/deactivation by inputs S13/S14 and S23/S24 : 30 ms
Switching Capability	Power factor = 1 with resistive load
Current Range (min. to max.)	1 mA to 10A (see caution)
Voltage Range (min. to max.)	0.1 to 250 VAC/DC
Typical Electrical Life Expectancy	Power factor = 1 at 230 VAC/DC (note 1)
3A	1,000,000 operations
5A	500,000 operations
10A	220,000 operations
Typical Power Factor (cos ϕ)	Limitation Factor (note 2)
0.3	0.45
0.5	0.70
0.7	0.85
1.0	1.00
Fuse rating	6 A gL (max.)
Mechanical life	Ten million switching operations
General	
Temperature range	-15°C to + 55°C (5°F to 131°F) at 90% humidity (max.)
Sealing	Housing IP 40 Terminals IP 20
Housing material	Thermoplastic
Vibration resistance	Amplitude 0.35 mm; Frequency 10 to 55 Hz
Conductor connection	1 x 4 mm ² solid (max.) [12 AWG] or 2 x 1.5 mm ² (max.) [16 AWG] stranded wire with sleeve DIN 46288
Conductor attachment	M 3,5 screws terminals; wire contacts are enclosed to prevent electrical shock
Mounting	Quick install rail mounting EN 50022-35
Weight	450 g (0.99 lb.)

NOTE 1: Install arc suppression device across load to avoid module contact arcing and ensure specified relay life expectancy.

NOTE 2: Total operations = operations at power factor 1 multiplied by the limitation factor. If the power factor is 0.5 at 230 vac, 3A (1,000,000 operations), the limitation factor is 0.70. 1,000,000 x 0.70 = 700,000 total operations.

FIG 1. CONTACT LIFE FOR 100% RESISTIVE LOAD (typical) (note 1)
power factor = 1 (cos ϕ)

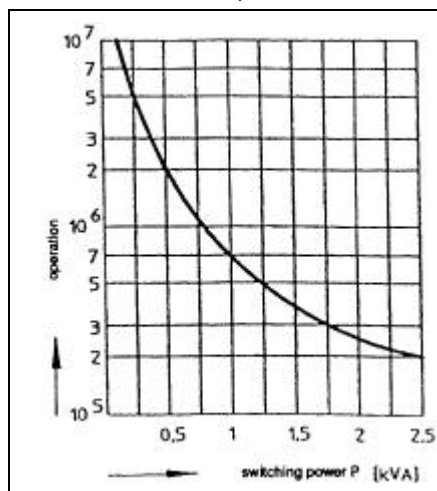
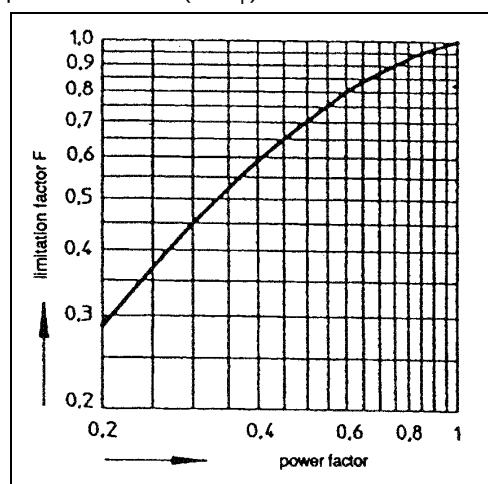


FIG 2. LIMITATION FACTOR FOR INDUCTIVE LOADS (note 2)
power factor < 1 (cos ϕ)

**CAUTION****CONTACT DAMAGE**

To ensure the 1 mA capability during the lifetime of the contact, NEVER exceed 300 mA and 60 V.
Failure to comply with these instructions will result in product damage.

FIG 3. CURRENT VS. TEMPERATURE LIMIT

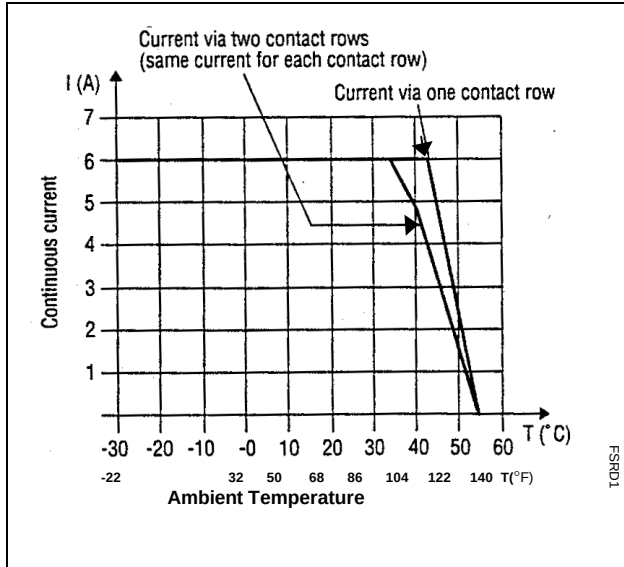


Figure 3. displays the maximal recommended external temperature versus the total load of all the safety module contacts. To use this curve, do the following:

- (1) Follow the horizontal line from the value (vertical axis) equal to the current inside the safety module contacts and note intersection of the appropriate curve.
- (2) Follow the intersection point down to determine the maximal recommended ambient temperature. (Ex: 4 A current inside each two safety contacts, then $T = 43^{\circ}\text{C}$ (109°F).

If the module is located in a higher temperature environment, the lifetime of the electronic components may be reduced. Ventilation of the cabinet may be required.

MECHANICAL INSTALLATION

The FF-SRD5985 must be installed inside a NEMA 3 (IEC IP54) rating enclosure or better. The module can be mounted easily onto a 45mm width DIN rail (see figures 4 and 5 below for installation and mounting).

FIG 4. MOUNTING DIMENSIONS (for reference only)

- a Width: 45 mm 1.77 in.
- b Height: 74 mm 2.91 in.
- c Depth: 121 mm 4.76 in.

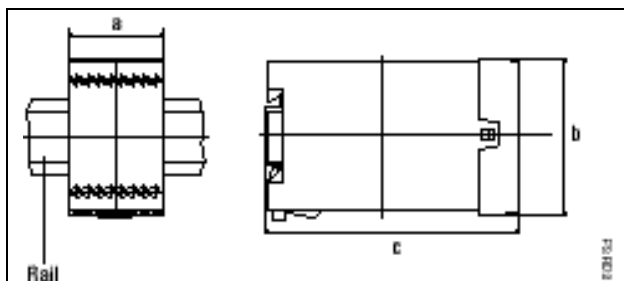
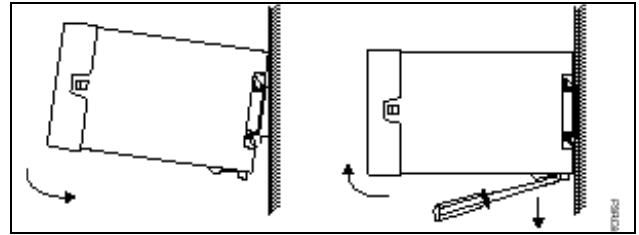


FIG 5. INSTALLATION DIAGRAM



CONTROL RELIABILITY

“Control Reliability” means that “the device, system or interface shall be designed, constructed and installed such that a single component failure within the device, interface or system shall not prevent normal stopping action from taking place but shall prevent a successive machine cycle.” (ANSI B11.19-1990, 5.5)

OSHA 29 CFR 1910.217 states that “the control system shall be constructed so that a failure within the system does not prevent the normal stopping action from being applied to the press when required, but does prevent initiation of a successive stroke until the failure is corrected. The failure shall be detectable by a simple test, or indicated by the control system.”

Honeywell uses self-checking techniques that combine reliability with safety. This means that a faulty component in our system will make the safety control modules fail in a safe mode.

The FF-SRD5985 safety control module functions with dual internal channel redundancy and positive self-check monitoring.

The design of this device meets the highest requirements (Category 4 as described in the EN 954 European norm). Category 4 safety control modules are designed and manufactured in such a way that a single breakdown or an accumulation of internal failures does not lead to the loss of the safety function when a dangerous situation arises. **The safety function is maintained on a permanent basis.**

ELECTRICAL INSTALLATION



WARNING

ELECTRICAL SHOCK

Remove power from FF-SR Series control modules and machine during installation.

Failure to comply with these instructions could result in death or serious injury.

Multiple wiring configurations are possible for the FF-SRD5985 Safety door monitor module. General guidelines are provided because there are various ways to interface the module to machine control circuitry. Refer to the important warnings (page 5) and the application examples (page 6).

FUNCTIONAL DESCRIPTION

The module operates in an **automatic restart** mode and accepts immediate input from the safety device (safety switch).

If the module receives input (between S13/S14 and S23/24) from two safety position switches that are monitoring door closure, and this occurs in less than three seconds (assuming the external monitoring loop circuitry (Y1/Y2) is closed), the two normally open contacts of the module (13/14 and 23/24) will close.

When the door opens, the two normally open contacts (13/14 and 23/24) will open relaying the emergency stop condition to the machine control circuitry to arrest dangerous motion and/or remove power.

One or more FF-SRE3081 Extension modules or external contactors with positively driven contacts can be used to multiply the number of contacts of the FF-SRD5985 Safety door monitor module. If multiple safety contacts are used in parallel with one load, the maximum admissible current can be increased.

FIG 6. FUNCTIONAL DIAGRAM

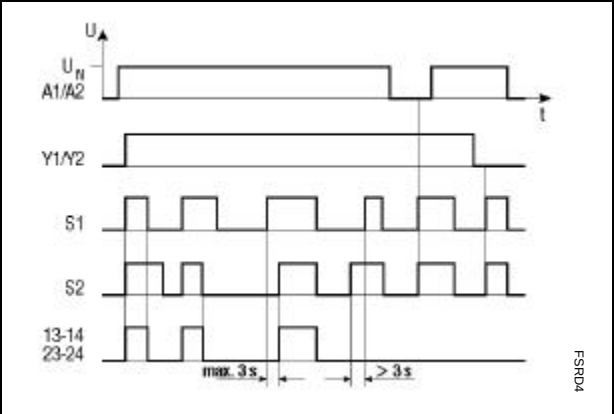


FIG 7. BLOCK DIAGRAM

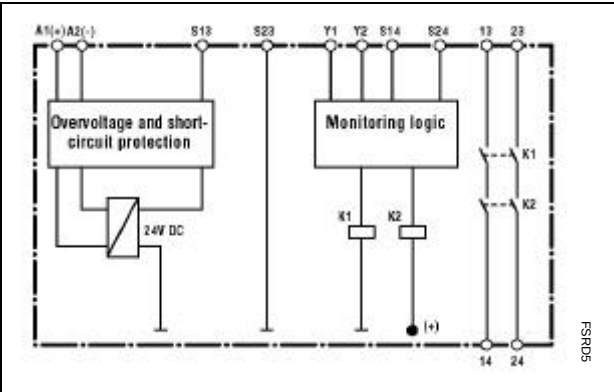
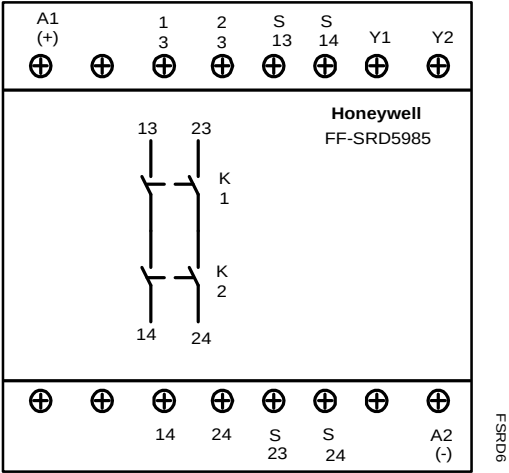


FIG 8. MODULE FRONT PANEL



APPLICATION WARNINGS

⚠ WARNING**IMPROPER INPUT CONNECTIONS**

- To ensure the proper operation of the FF-SRD5985, always connect the two safety device outputs to the input channels of the safety door monitor module.

IMPROPER AUTOMATIC RESTART MODE

- As the module operates in an automatic restart mode, a part of the safety control circuitry must keep the latched function engaged.
- To keep the latched function engaged and maintain control reliability, use control reliable safety components (redundancy, self checking) only. Do NOT use a programmable logic controller (PLC).

IMPROPER PUSH BUTTON USE

- Ensure the location of the manual restart function is outside of the danger zone and provides the operator with a clear view of the zone.
- A Programmable Logic Controller must NOT be able to override a manual restart function.

CONTACT WELDING

- Always protect all safety contacts with correctly rated fuses. These fuses must never exceed the rated FF-SRD5985 safety output capability to prevent contact welding.

IMPROPER EXTERNAL SAFETY RELAY MONITORING

- When using additional safety relays, always connect one normally closed contact of each relay in series inside the Final Switching Device (FSD) monitoring loop circuit (Y1/Y2). This connection will ensure correct operation of the external relays after each FF-SRD5985 activation.
- If the FF-SRD5985 is not activated often, the customer is responsible for accomplishing any additional test procedures of the external safety components. For instance, this testing can be done by removing the power from the FF-SRD5985 every day at machine power up.

IMPROPER ARC SUPPRESSOR INSTALLATION

- Never install an arc suppressor across the safety output contact of the safety control module.
- Always install arc suppressors across the coils of external safety relays.

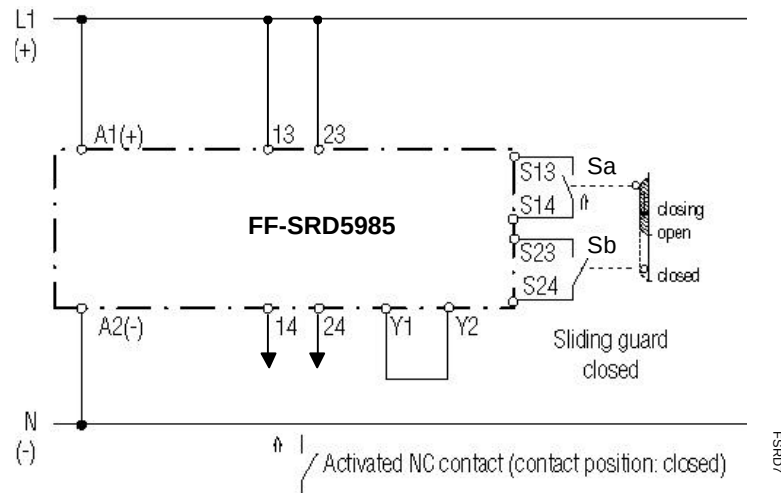
IMPROPER SYSTEM SAFETY LEVEL

- Multiple machine locations and/or applications can be protected by using several safety components (more than two) connected to one FF-SRD5985 control module. To ensure maximum safety, always use devices approved for safety applications. Keep in mind that this type of installation will degrade the overall safety level of the solution.

Failure to comply with these instructions could result in death or serious injury.

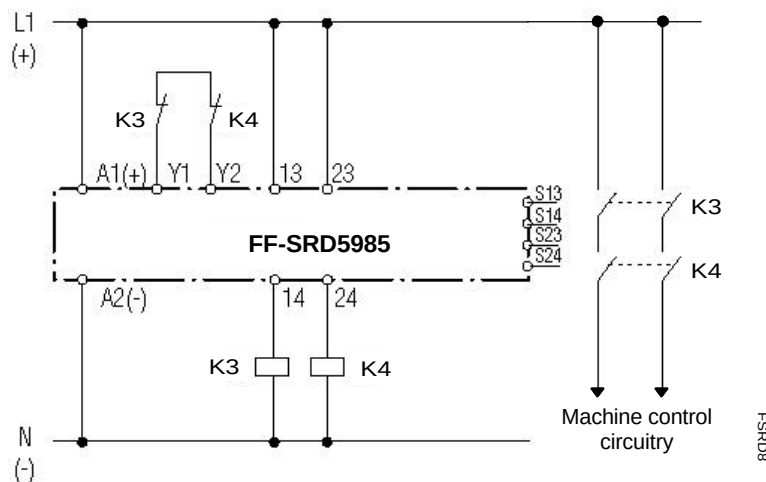
APPLICATION EXAMPLES

TWO-CHANNEL SAFETY DOOR MONITORING (WITHOUT EXTERNAL CONTACTORS)

**FUNCTIONAL DESCRIPTION:**

After opening the door, the two external safety switch contacts Sa and Sb will open (as illustrated above) and the two internal safety relays K1 and K2 will de-energize. The normally open safety outputs 13/14 and 23/24 will open relaying the stop condition to the machine control circuitry. After closing the door and if Sa and Sb close in less than three seconds, the safety relays K1 and K2 will energize. The two normally open safety contacts will close and a manual restart sequence of the control system may then be initiated (allowing the machine to operate). The Final Switching Device monitoring loop (FSD) has to be closed (Y1-Y2, jumpered).

TWO-CHANNEL SAFETY DOOR MONITORING (WITH EXTERNAL CONTACTORS)

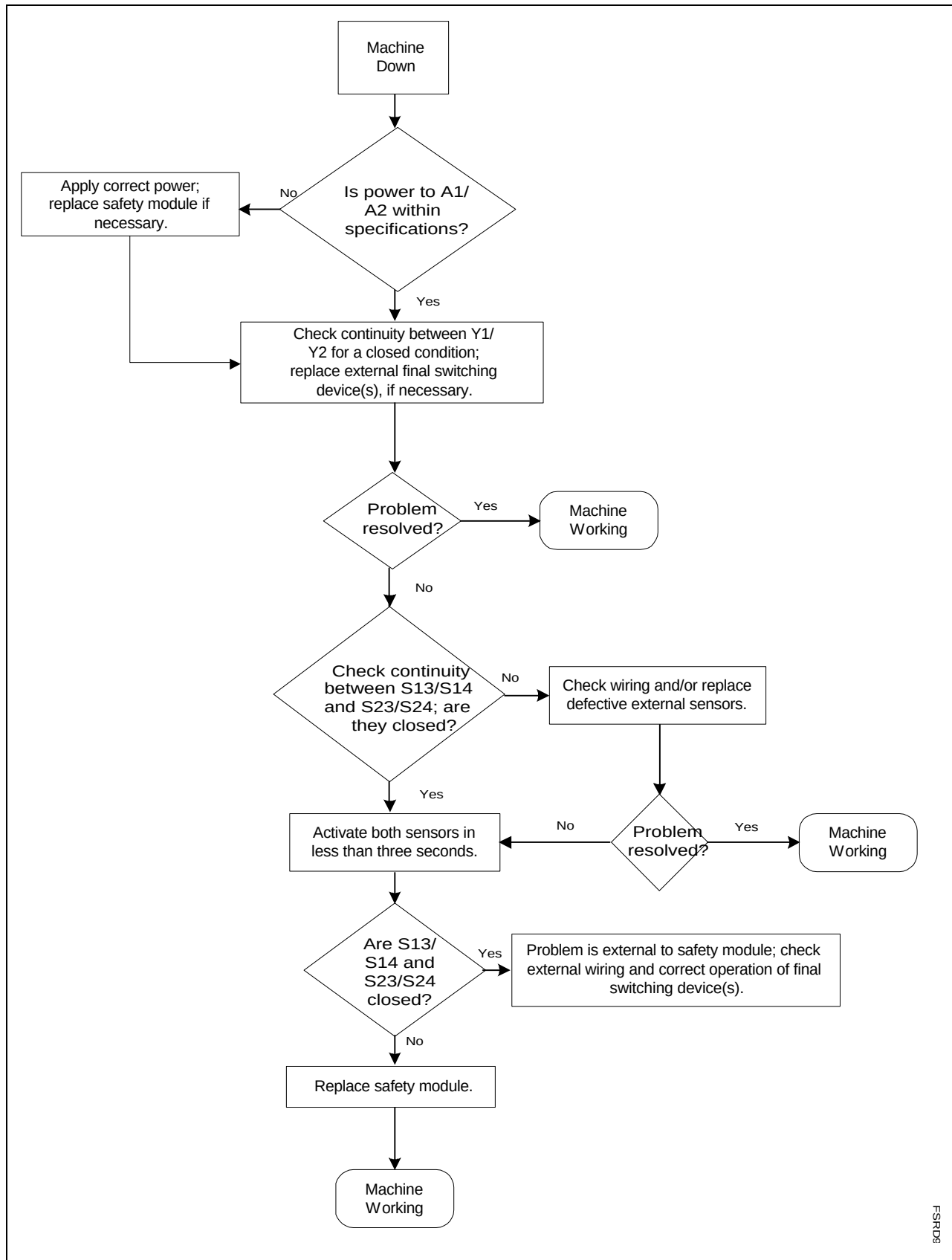
**FUNCTIONAL DESCRIPTION:**

For high current, the output contacts should be reinforced by using external safety relays.

The proper operation of the external contactors is monitored by connecting the NC contacts into the Final Switching Device monitoring loop (terminals Y1-Y2).

After opening the door, the two external safety switch contacts connected to S13/S14 and S23/S24 will open and the two internal safety relays K1 and K2 will de-energize. The normally open safety outputs 13/14 and 23/24 will open and de-energize the external contactors K3 and K4. After closing the door if the two inputs (S13/S14 and S23/S24) close in less than three seconds and if the two contactors K3 and K4 are working properly, the internal safety relays K1 and K2 will energize. The two normally open safety contacts will close and energize the external contactors K3 and K4. A manual restart sequence of the control system may then be initiated (allowing the machine to operate).

FF-SRD5985 TROUBLESHOOTING FLOW DIAGRAM



FSRD5

WARRANTY AND REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

While we provide application assistance, personally and through our literature, it is up to the customer to determine the suitability of the product in the application.

Specifications may change at any time without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

SALES AND SERVICE

For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact a nearby sales office or call:

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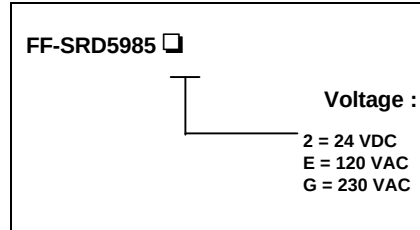
1-800-737-3360 Canada
+ 33 (0) 4 76 41 7200 France
+ 49 (0) 69 8064 444 Germany
1-815-235-6847 International
+ 44 (0) 161 251 4079 UK
1-800-537-6945 USA

FAX

+ (33) 76 41 72 56 France
1-815-235-6545 USA

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ORDER GUIDE**Honeywell**

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38243 Meylan Cedex - FRANCE

FF-SRE3081

Extension Module Instructions for use



⚠ WARNING

IMPROPER INSTALLATION

- Consult with US and/or European safety agencies and their requirements when designing a machine control, interface and all control elements that affect safety.
- Strictly adhere to all installation instructions.

Failure to comply with these instructions could result in death or serious injury.

PRODUCT DESCRIPTION

The FF-SRE3081 Extension Module provides contact multiplication of emergency stop modules, safety door modules and other safety devices with external relay monitoring capability (safety light curtain, etc.). This product has two safety relays with positive-guided contacts to ensure redundancy. As with other Honeywell safety control modules, this device allows high current capabilities.

APPROVALS

CE	The product, packaging and documentation of FF-SR Series products carry the CE mark; the CE declaration of conformity is available upon request.
cULus (pending)	This product is pending approval by Underwriters Laboratories Inc. according to Canadian and U.S. safety requirements.
BG	German Berufsgenossenschaft E+MIII



DIRECTIVES COMPLIANCE

Machine Directive 89/392 EEC
Low Voltage Directive 73/23 EEC
Electromagnetic Compatibility Directive 89/336

REGULATIONS COMPLIANCE

Regulation	Title
OSHA 29 CFR 1910.212	General Requirements for (guarding of) All Machines
OSHA 29 CFR 1910.217	(Guarding of) Mechanical Power Presses

STANDARDS COMPLIANCE

Standard	Title
ANSI B11.1	Mechanical Power Presses
ANSI B11.2	Hydraulic Power Presses
ANSI B11.19	Safeguarding when Referenced by the Other B11 Machine Tool Safety Standards
ANSI/RIA R15.06	Safety Requirements for Industrial Robots and Robot Systems
UL508	Underwriters Laboratories
EN 292	Safety of Machinery - Basic Concepts, General Principles for Design
EN 60204	Safety of Machinery - Electrical Equipment of Machines
EN 954	Safety of Machinery - Safety related parts of control system

SPECIFICATIONS

Input		
Nominal voltage		120 (-15%, +10%), 230 VAC (-20%, +10%), 24 VDC (-10%, +20%)
Nominal consumption		24 VDC: 2.8 W; 230 VAC: 5 VA
Nominal frequency		50 to 60 Hz
Output		
Contacts		7 NO, 1 NC contacts
Contact type		Safety relay, positive-guided
Response time		15 ms
Switching Capability		Power factor = 1 with resistive load
Current Range (min. to max.)		10 mA to 10A (see caution)
Voltage Range (min. to max.)		0.1 to 250 VAC/DC
Typical Electrical Life Expectancy		Power factor = 1 at 230 VAC/DC (note 1)
3A		1,000,000 operations
5A		500,000 operations
10A		220,000 operations
Typical Power Factor (cos ϕ)		Limitation Factor (note 2)
0.3		0.45
0.5		0.70
0.7		0.85
1.0		1.00
Operating frequency		6000 operating cycles/h
Fuse rating		10 A gL (max.)
Mechanical life		Ten million operating cycles
General		
Temperature range		-15°C to + 55°C (5°F to 131°F) at 90% humidity (max.)
Sealing		Housing IP 40; Terminals IP 20
Housing material		Thermoplastic
Vibration resistance		Amplitude 0.35 mm; Frequency 10 to 55 Hz
Wire connection		2 x 2,5 mm ² [14 AWG] solid or 2 x 1.5 mm ² [16 AWG] stranded wire with sleeve
Wire attachment		Removable terminal strip ; flat terminals with self-lifting wire clamp; DIN 46206 and
Mounting		Quick install rail mounting EN 50022-35
Weight		510 g (1.12 lb.)

NOTE 1: Install arc suppression device across load to avoid module contact arcing and ensure specified relay life expectancy.

NOTE 2: Total operations = operations at power factor 1 multiplied by the limitation factor. if the power factor is 0.5 at 230 vac, 3A (1,000,000 operations), the limitation factor is 0.70. 1,000,000 x 0.70 = 700,000 total operations.

FIG 1. CONTACT LIFE FOR 100% RESISTIVE LOAD (typical) (note 1)
power factor = 1 (cos ϕ)

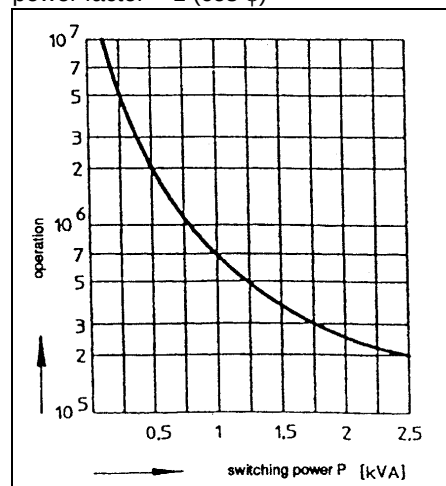
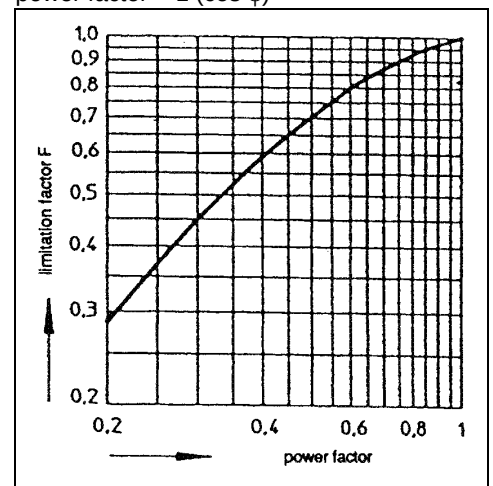


FIG 2. LIMITATION FACTOR FOR INDUCTIVE LOADS (note 2)
power factor < 1 (cos ϕ)



MECHANICAL INSTALLATION

The FF-SRE3081 must be installed inside a NEMA 3 (IEC IP54) rating enclosure or better. The module can be clipped easily onto a 45mm width DIN rail (see figure below for DIN rail installation and removal). Specific features of this product include removable block terminals. This feature provides easy access to wiring during installation and reduces machine downtime during maintenance.

To remove a terminal block, loosen the two captive screws (located off center and on the extreme sides of block - see arrows for removal rotation), then slide the terminal block out.

FIG 3. MOUNTING DIMENSIONS

(for reference only)

- a Width: 100 mm 3.94 in.
- b Height: 74 mm 2.91 in.
- c Depth: 121 mm 4.76 in.

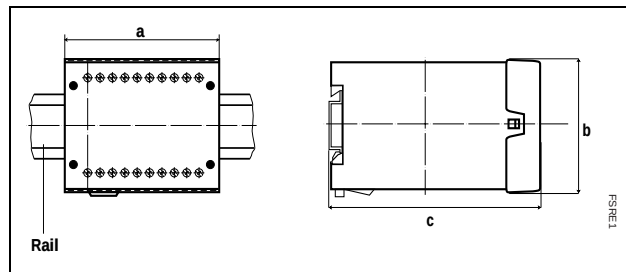


FIG 4. INSTALLATION DIAGRAM

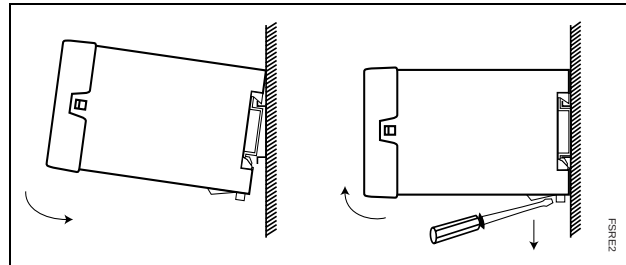
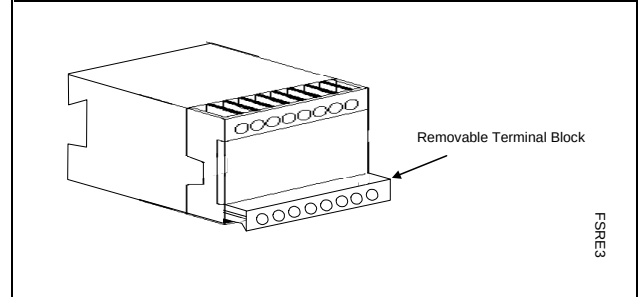


FIG 5. REMOVABLE TERMINAL BLOCKS



CONTROL RELIABILITY

“Control Reliability” means that “the device, system or interface shall be designed, constructed and installed such that a single component failure within the device, interface or system shall not prevent normal stopping action from taking place but shall prevent a successive machine cycle.” (ANSI B11.19-1990, 5.5)

OSHA 29 CFR 1910.217 states that “the control system shall be constructed so that a failure within the system does not prevent the normal stopping action from being applied to the press when required, but does prevent initiation of a successive stroke until the failure is corrected. The failure shall be detectable by a simple test, or indicated by the control system.”

Honeywell has developed new patented self-checking techniques which combine reliability with safety. The FF-SR Series safety control modules function with dual channel redundancy. A emergency stop module, a safety door module, or any other safety device with external relay monitoring capability will provide the necessary positive self-check monitoring required for the FF-SRE3081. This means that a faulty component in our system will make the safety control modules fail in a safe mode.

This design meets the highest requirements (Category 4 as described in the EN 954 European norm). Category 4 safety control modules are designed and manufactured in such a way that a single breakdown or an accumulation of failures does not lead to the loss of the safety function when a dangerous situation arises. **The safety function is maintained on a permanent basis.**

ELECTRICAL INSTALLATION

⚠ WARNING

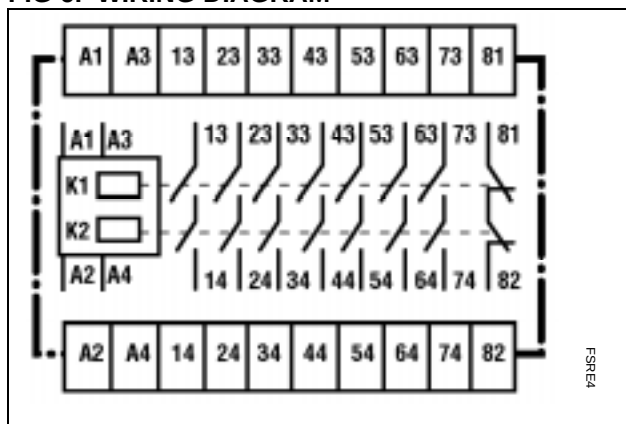
ELECTRICAL SHOCK

Remove power from FF-SR Series control modules and machine during installation.

Failure to comply with these instructions could result in death or serious injury.

Multiple wiring configurations are possible for the FF-SRE3081 extension control module. General guidelines are provided because there are various ways to interface the module to machine control circuitry. Refer to the important warnings (page 5) and the application examples (pages 6 through 7).

FIG 6. WIRING DIAGRAM

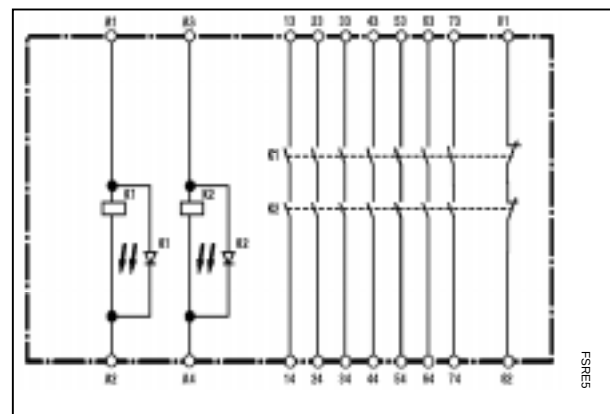


FUNCTIONAL DESCRIPTION

This module receives two safety inputs between A1/A2 and A3/A4 from a connected safety device. Immediately, the normally open safety contacts (13...73/14...74) will close and the normally closed safety contacts (81/82) will open.

If a safety device is actuated (an emergency stop condition occurs), the normally open contact will open immediately and the normally closed contact will close. This emergency stop condition is relayed via the safety contacts of the module to the machine control circuitry to arrest dangerous motion and/or remove power.

FIG 7. BLOCK DIAGRAM



The normally closed contact of the extension module (81/82) must be connected to the external loop monitoring circuit of the connected safety device. This configuration will ensure that the two safety relays in the extension module are operating correctly.

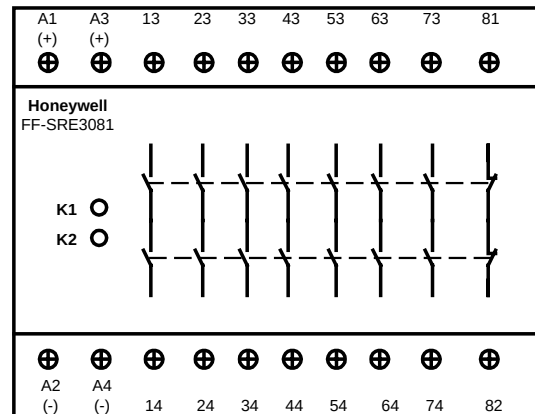
One or more FF-SRE3081 Extension Modules or external contactors with positively driven contacts can be used to multiply the number of contacts of the FF-SRE3081 Emergency Stop Module. If multiple safety contacts are used in parallel with one load, the maximum admissible current can be increased.

LED INDICATORS

The FF-SRE3081 module has two green LED status indicators (K1 and K2) as illustrated below.

Illuminated K1 and/or K2 LEDs indicate(s) that the corresponding internal safety relay is energized. Both K1 and K2 relays must be energized to have the normally open contacts 13/14...73/74 in a closed condition. If one of the safety relays de-energizes, the normally open contacts will immediately open. The normally closed contact 81/82 must be connected to the monitoring loop of the Honeywell safety control modules (except FF-SR05936 and FF-SRT Series) or any other safety device that has monitoring loop capability.

FIG 8. MODULE FRONT PANEL



APPLICATION WARNINGS

⚠ WARNING

IMPROPER INPUT CONNECTIONS

- To ensure the highest level of safety, connect two safety device outputs into the input channel of the FF-SRE3081 safety module.
- If only one safety output is used, connect the FF-SRE3081 module as shown in the single input channel example. In this case, take extra precaution to avoid any short circuit possibilities on this single input channel. Conduit may be used to protect wiring. Additional protection may also be applied to the terminal strips inside the machine cabinets to avoid any possible short circuits.

IMPROPER FF-SRE3081 MONITORING

- Always connect the normally closed contact of the extension module (81/82) to the external loop monitoring circuit of the Honeywell safety control modules (except FF-SR05936 and FF-SRT Series) or any other safety device that has monitoring loop capability. This configuration will ensure that the two safety relays in the extension module are monitored and operate correctly.

CONTACT WELDING

- Always protect all safety contacts with correctly rated fuses. These fuses must never exceed the rated FF-SRE3081 safety output capability to prevent contact welding.

IMPROPER EXTERNAL SAFETY RELAY MONITORING

- When using additional safety relays, always connect one normally closed contact of each relay in series inside the Final Switching Device (FSD) monitoring loop circuit of the Honeywell safety control modules (except FF-SR05936 and FF-SRT Series) or any other safety device that has monitoring loop capability. This connection will ensure correct operation of the external relays after each FF-SRE3081 activation.
- If the FF-SRE3081 is not activated often, the customer is responsible for accomplishing any additional test procedures of the external safety components. For instance, this testing may be done every day by removing the power from the FF-SRE3081 at machine power up.

IMPROPER ARC SUPPRESSOR INSTALLATION

- Never install an arc suppressor across the safety output contact of the safety control module.
- Always install arc suppressors across the coils of external safety relays.

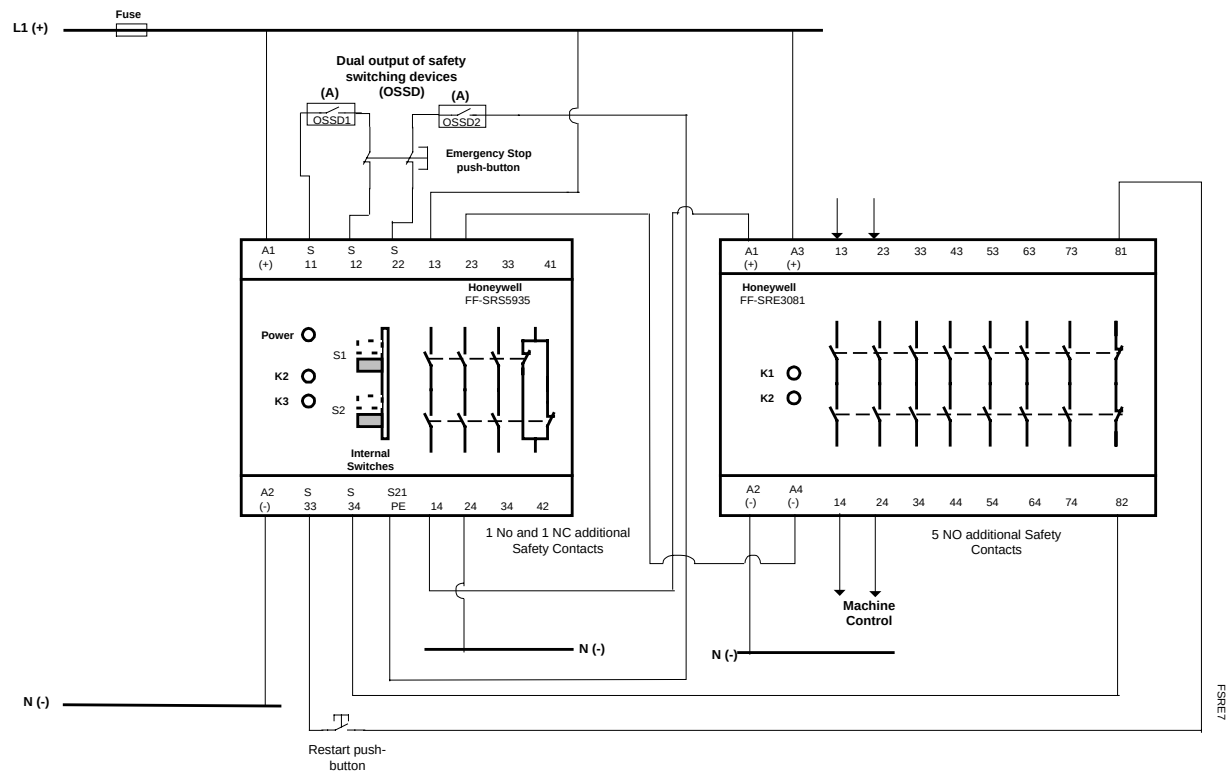
Failure to comply with these instructions could result in death or serious injury.

NOTICE

- The FF-SRE3081 will immediately change state when the two input channels A1/A2 and A3/A4 receive power. No timing limitation exists when power is applied to each of these two safety inputs.

APPLICATION EXAMPLES

FIG 9. DUAL CHANNEL CONNECTION OF AN EXTENSION MODULE FF-SRE3081 TO AN EMERGENCY STOP MODULE FF-SRS5935 (RECOMMENDED INTERFACE)



(A) This may be the output of one of the following safety switching devices (OSSD) :

- safety light curtains (FF-SB, FF-LS),
- safety mat (FF-SM),
- single beam (FF-SPS), modular safety light curtains (FF-SC),
- safety laser scanner (FF-SE),
- dual output safety limit or interlock switches (for example: CLS and GK).

This circuit has redundancy in the extension module circuit, because of its two channel connection to the emergency stop module. It offers the highest possible safety level.

FUNCTIONAL DESCRIPTION:

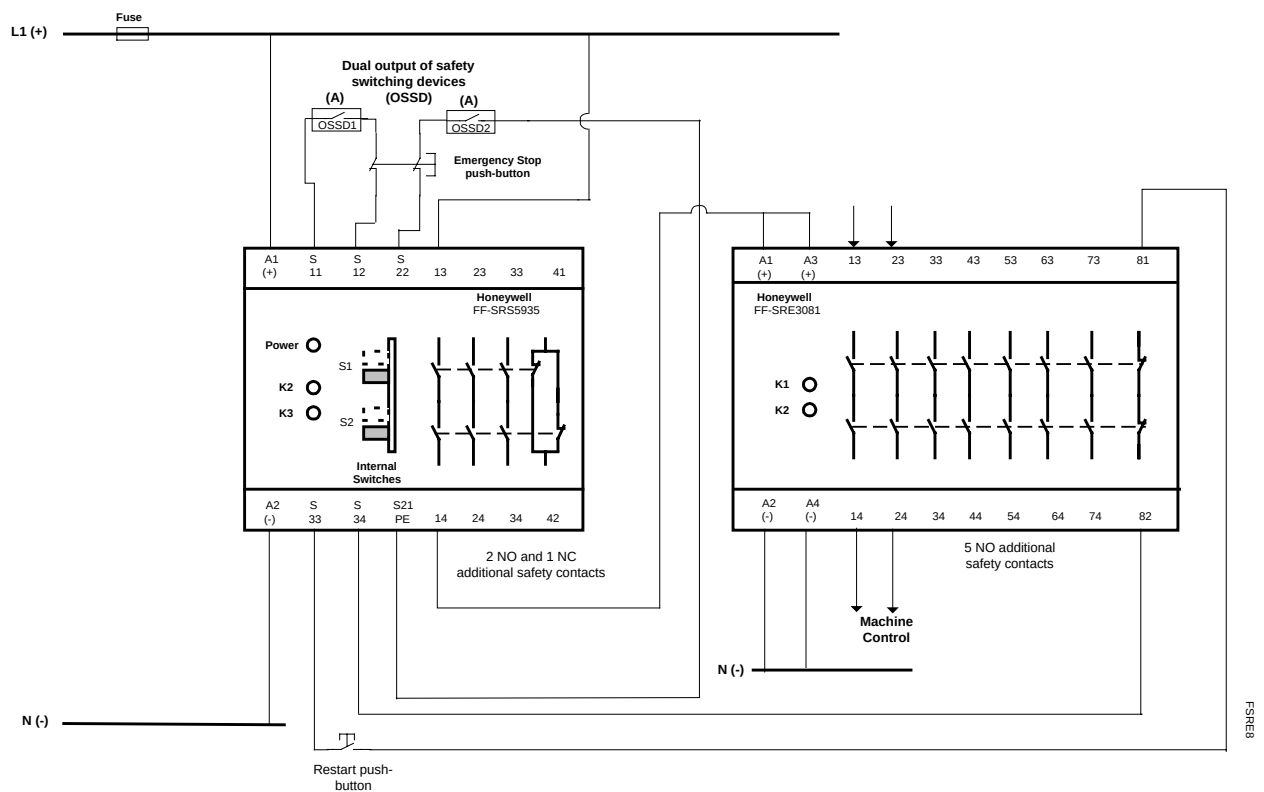
After activation of the safety device or emergency stop push button, the two K2 and K3 LEDs of the FF-SRS5935 Emergency Stop module will turn OFF, indicating that the two internal safety relays K2 and K3 are de-energized. The normally open safety outputs 13/14, 23/24 and 33/34 will open and the normally closed safety output will close. Then the K1 and K2 LEDs on the FF-SRE extension modules go off indicating that the two internal safety relays are de-energized. The safety contacts 13/14.....73/74 open and 81/82 closes.

1. After removing the stop condition, press and release the RESTART push button to restart the safety control module.

2. If the FF-SRE extension module is operating properly, the K2 and K3 LEDs illuminate, indicating that the safety relays K2 and K3 are energized. At this time, the three normally open safety contacts will close and the normally closed safety contact will open. The FF-SRE LEDs for K1 and K2 illuminate while the safety contacts 13/14....73/74 close and 81/82 opens. This action will allow the machine to operate.

The proper operation of the FF-SRE extension module is monitored by looping the NC contacts 81/82 in the restart circuit.

FIG 10. ONE CHANNEL CONNECTION OF AN EXTENSION MODULE FF-SRE3081 TO AN EMERGENCY STOP MODULE FF-SRS5935



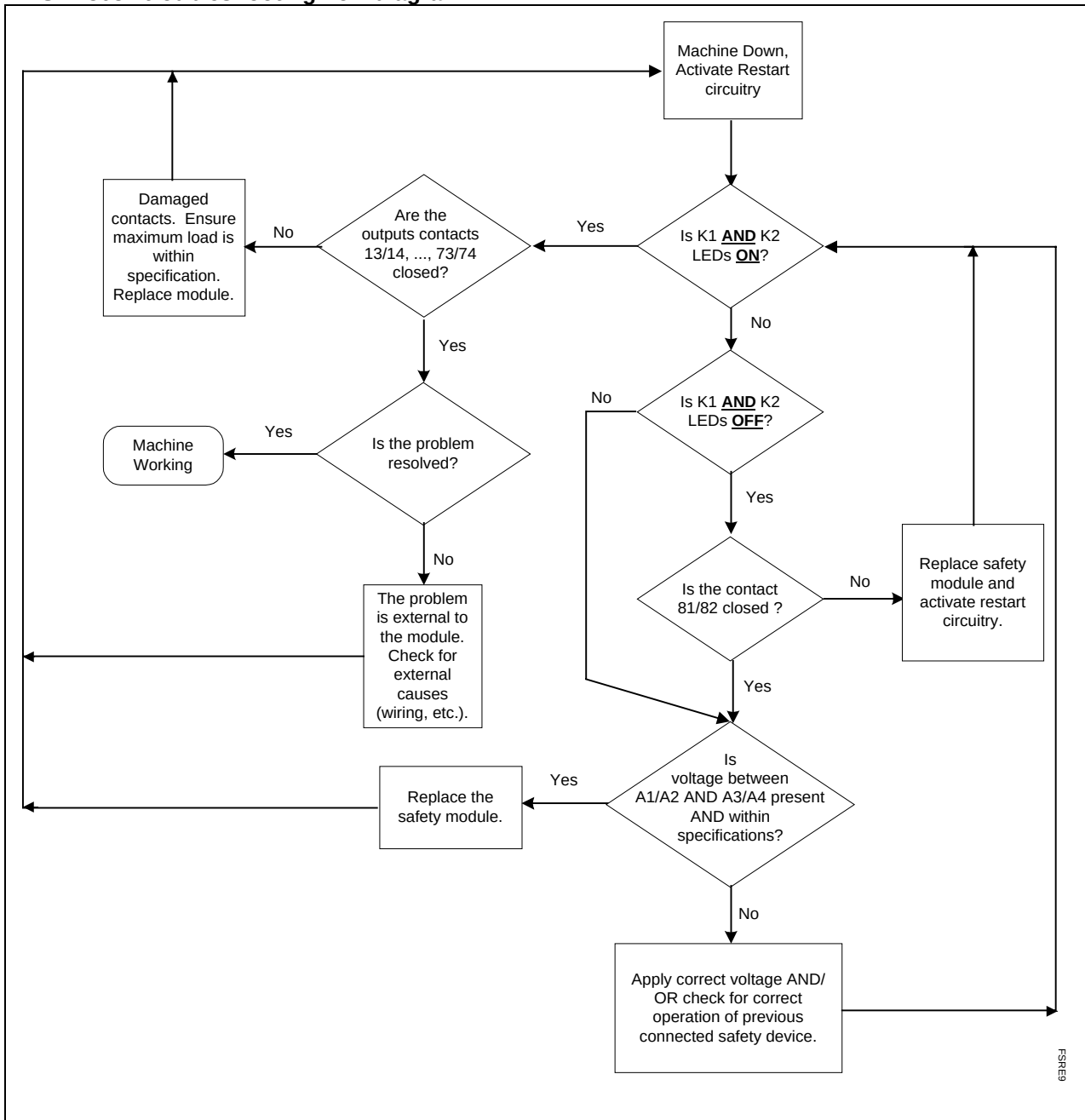
(A) Output of safety switching device (OSSD, see page 6 for examples)

This circuit has NO redundancy in the extension module circuit due to the one channel connection to the emergency stop module. This interface offers a minor safety level only.

FUNCTIONAL DESCRIPTION:

See page 6

FF-SRE3081 troubleshooting flow diagram



WARRANTY AND REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

While we provide application assistance, personally and through our literature, it is up to the customer to determine the suitability of the product in the application. Specifications may change at any time without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

SALES AND SERVICE

For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact a nearby sales office or call:

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+ 44 (0) 161 251 4079	UK
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+ 49 (0) 69 8064 442	Germany
34 91 313 61 29	Spain
+ 44 (0) 161 251 4141	UK
1-815-235-6847	USA

INTERNET

<http://www.honeywell.com/sensing/>
info@micro.honeywell.com

ORDER GUIDE

FF-SRE3081□	
	Voltage :
	2 = 24 Vdc
	E = 120 Vac
	G = 230 Vac

FF-SRS5924

Single Channel Emergency Stop Module

Instructions for use



WARNING

IMPROPER INSTALLATION

- Consult with US and/or European safety agencies and their requirements when designing a machine control, interface and all control elements that affect safety.
- Strictly adhere to all installation instructions.

Failure to comply with these instructions could result in death or serious injury.

PRODUCT DESCRIPTION

The FF-SRS5924 Emergency Stop control modules are designed to be used in emergency stop circuits when danger to personnel or machinery is present. This device has two internal safety relays with positive-guided contacts to ensure redundancy in its output circuit.

This safety control module relays the stopping information to the machine control circuitry. It allows high number of contacts and additional features like an automatic or manual start mode and external relay monitoring.

Its slim housing of only 22.5 mm (0.89 in.) width allows this Safety control module to fit into every cabinet or even helps to reduce the overall cabinet size.

The FF-SRS5924 is a single channel device and relies on a single safety input. If a single safety input does not provide the level of safety required, use one of the dual channel safety control modules (FF-SRS5925, FF-SRS5935, FF-SRS5988).



DIRECTIVES COMPLIANCE

Machine Directive 98/37/EEC
Low Voltage Directive 73/23 EEC
Electromagnetic Compatibility Directive 89/336

REGULATIONS COMPLIANCE

Regulation	Title
OSHA 29 CFR 1910.212	General Requirements for (guarding of) All Machines

STANDARDS COMPLIANCE

Standard	Title
EN 292	Safety of Machinery - Basic Concepts, General Principles for Design
EN 60204-1	Safety of Machinery - Electrical Equipment of Machines
EN 954-1	Safety of Machinery - Safety related parts of control system
ANSI B11.19	Safeguarding when Referenced by the Other B11 Machine Tool Safety Standards
ANSI/RIA R15.06	Safety Requirements for Industrial Robots and Robot Systems
UL508	Underwriters Laboratories

APPROVALS

CE	The product, packaging and documentation of FF-SR Series products carry the CE mark, following the examination by BG (German Berufsgenossenschaft E+MIII). The CE declaration of conformity is available upon request.
cULus (pending)	This product is pending approval by Underwriters Laboratories Inc. according to Canadian and U.S. safety requirements.

SPECIFICATIONS

Input	
Nominal voltage	24 VDC (-10%, +10%)
Nominal consumption	1.2 W
Output	
Contact complement	Three NO contacts, one NC contact
Contact type	Safety relay, positive-guided
Response time	Opening in supply circuit (A1(+)/A2(-)): 35ms
Start time	Manual/automatic START function: 100ms
Switching Capability Current Range (min. to max.) Voltage Range (min. to max.) Switching Capability per AC15 (EN 60947-5-1)	Power factor = 1 with resistive load 10 mA to 4 A 10 to 250 VAC/DC NO contact: 3 A / 250 V NC contact: 2 A / 250 V
Typical Electrical Life Expectancy 2A 3A 4A	Power factor = 1 at 230 VAC/DC (see fig. 1, note 1) 1,000,000 operations 500,000 operations 300,000 operations
Typical Power Factor (cos ϕ) 0.3 0.5 0.7 1.0	Limitation Factor (see fig. 2, note 2) 0.45 0.70 0.85 1.00
Output contact fuse rating	Time delay 4 A (max.)
Mechanical life	Ten million switching operations
General	
Temperature range	-15°C to + 55°C (5°F to 131°F) at 90% humidity (max.)
Sealing	Housing IP 40 Terminals IP 20
Housing material	Thermoplastic
Vibration resistance	Amplitude 0.35 mm; Frequency 10 to 55 Hz
Wire/conductor connection	1 x 2.5 mm ² solid (max.) [14 AWG] or 2 x 1.5 mm ² (max.) [16 AWG] stranded wire with sleeve DIN 46288
Wire/conductor attachment	Removable terminal strips with M 3,5 screws; wire contacts are enclosed to prevent electrical shock
Mounting	Quick install rail mounting EN 50022-35, width:35 mm (1.38 in.)
Weight	210 g (0.46 lb.)

NOTE 1: Install arc suppressor devices across load to avoid module contact arcing and ensure specified relay life expectancy.

NOTE 2: Total operations = operations at power factor 1 multiplied by the limitation factor. If the power factor is 0.5 at 230 Vac, 2A (1,000,000 operations), the limitation factor is 0.70. 1,000,000 x 0.70 = 700,000 total operations.

FIG 1. CONTACT LIFE FOR 100% RESISTIVE LOAD (TYPICAL) (NOTE 1)
power factor = 1 (cos ϕ)

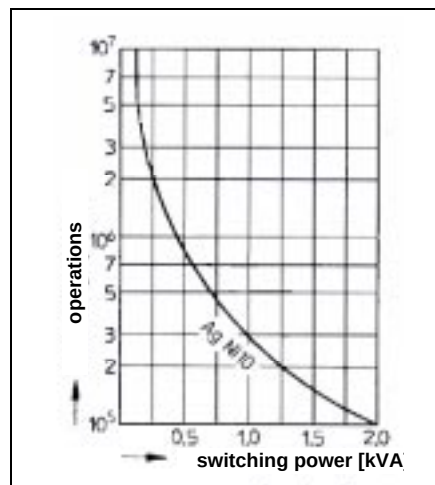


FIG 2. LIMITATION FACTOR FOR INDUCTIVE LOADS (note 2)
power factor < 1 (cos ϕ)

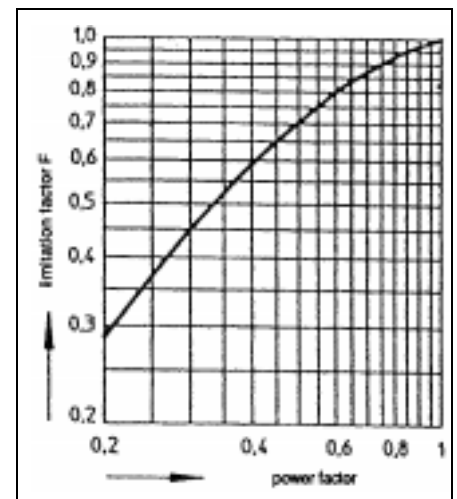


FIG 3. QUADRATIC TOTAL CURRENT LIMIT

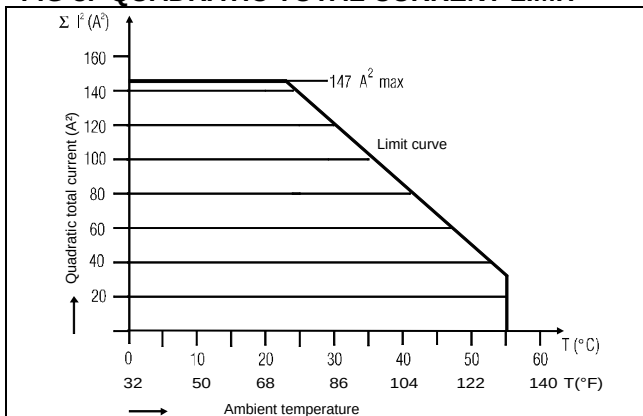


Figure 3. displays the maximal recommended external temperature versus the total load of all the safety module contacts. To use this curve, do the following:

- (1) Square the current in each contact branch, then sum all the results to obtain the vertical axis value.
- (2) Follow the horizontal line from the obtained value and note intersection of the appropriate curve.
- (3) Follow the intersection point down to determine the maximal recommended external temperature. (Ex: $\sum I^2 = 100 A^2$ current inside safety contacts, then $T = 35^\circ C$ ($95^\circ F$)).

If the module is located in a higher temperature environment, the lifetime of the electronic components may be reduced. Ventilation of the cabinet may be required.

MECHANICAL INSTALLATION

The FF-SRS5924 must be installed inside a NEMA 3 (IEC IP54) rating enclosure or better. The module can be mounted easily onto a 35mm (1.38 in.) width DIN rail (see figures 4 and 5 below for installation and mounting).

Specific features of this product include removable block terminals. This feature provides easy access to wiring during installation and reduces machine downtime during maintenance.

FIG 4. MOUNTING DIMENSIONS (for reference only)

- a Width: 22.5 mm 0.89 in.
- b Height: 84 mm 3.31 in.
- c Depth: 121 mm 4.77 in.

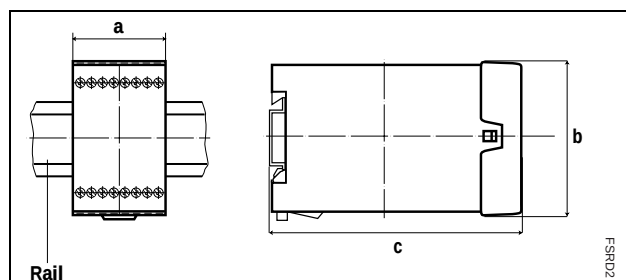


FIG 5. INSTALLATION DIAGRAM

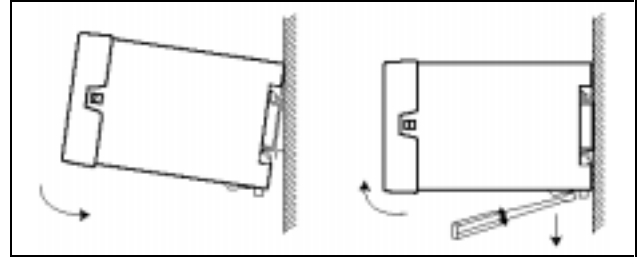
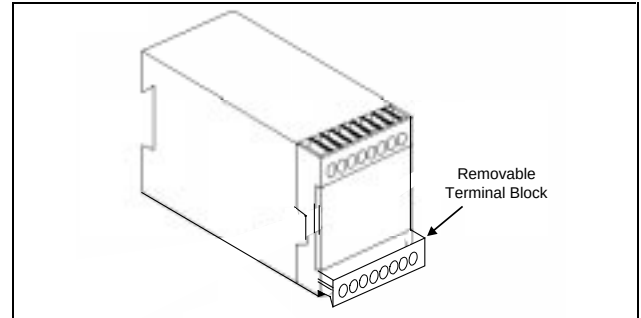


FIG 6. REMOVABLE TERMINAL BLOCKS



CONTROL RELIABILITY

“Control Reliability” means that “the device, system or interface shall be designed, constructed and installed such that a single component failure within the device, interface or system shall not prevent normal stopping action from taking place but shall prevent a successive machine cycle.” (ANSI B11.19-1990, 5.5)

SAFETY LEVEL OF INTERFACES

The safety function of the FF-SRS5924 Safety control module relies on a single safety input only. Therefore this module can only be used in interfaces up to Category 2 per EN 954-1 European norm. If a single safety input does not provide the level of safety required, use one of the dual channel safety control modules (FF-SRS5925, FF-SRS5935, FF-SRS5988).

INTERNAL DESIGN

However, the *internal* design of this device meets the highest requirements (Category 4 as described in the EN 954-1 European norm). Category 4 safety control modules are designed and manufactured in such a way that a single breakdown or an accumulation of internal failures does not lead to the loss of the safety function when a dangerous situation arises. The FF-SRS5924 safety control module functions with internal redundancy and positive self-check monitoring.

ELECTRICAL INSTALLATION

⚠ WARNING

ELECTRICAL SHOCK

Remove power from FF-SR Series control modules and machine during installation.

Failure to comply with these instructions could result in death or serious injury.

ELECTRICAL INSTALLATION (continued)

Multiple wiring configurations are possible for the FF-SRS5924 Emergency stop module. General guidelines are provided because there are various ways to interface the module to machine control circuitry. Refer to the important warnings (page 5) and the application examples (pages 6 through 7).

FUNCTIONAL DESCRIPTION

In an **automatic start** configuration, the module accepts immediate input from the safety device (emergency stop push button or safety switch) at A1 (see application example). If S33/S34 are jumpered, the normally open safety contacts (13/14 ... 33/34) will close and the normally closed contact (41/42) will open.

In a **manual start** configuration (start push button is inserted between S33/S34), the module accepts input from the safety device (emergency stop push button or safety switch) at A1 after activation of the start push button (see application example).

In either mode, if the safety device is actuated (emergency stop condition occurs), the normally open contact will open immediately and the normally closed contacts will close. This emergency stop condition is relayed via the safety contacts of the module to the machine control circuitry to arrest dangerous motion and/or remove power.

EXTENSION MODULES AND EXTERNAL CONTACTORS

One or more FF-SRE3081 Extension control modules or external contactors with positively driven contacts can be used to multiply the number of contacts of the FF-SRS5924 Emergency stop control module. If multiple safety contacts are used in parallel with one load, the maximum admissible current can be increased.

⚠ WARNING

CONTACT MULTIPLICATION VIA EXTERNAL RELAYS/CONTACTORS

- If contact multiplication via external safety relays/contactors (or the FF-SRE3081 Extension module) is necessary, connect one normally closed contact of each relay in series (or 81/82) into the restart loop between terminals S33/S34 (Final Switching Device (FSD) monitoring).
- Use two independent safety relays/contactors with mechanically linked contacts to reliably detect a welded contact.

Failure to comply with these instructions could result in death or serious injury.

LED INDICATORS

The FF-SRS5924 module has two green LED status indicators (Power, K1/K2) as illustrated below.

The Power LED indicates power is applied to the safety control module. Illuminated K1/K2 LED's indicate that the internal safety relays are energized. Both K1 and K2 relays must be energized to have the normally open contacts 13/14...33/34 in a closed condition. If one of the safety relays de-energizes, the normally closed contact will close.

FIG 7. FUNCTIONAL DIAGRAM

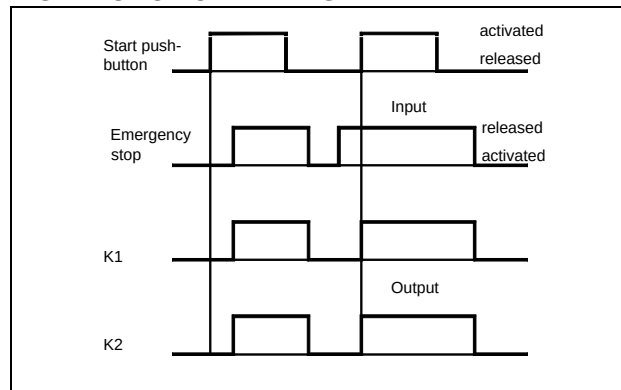


FIG8. BLOCK DIAGRAM

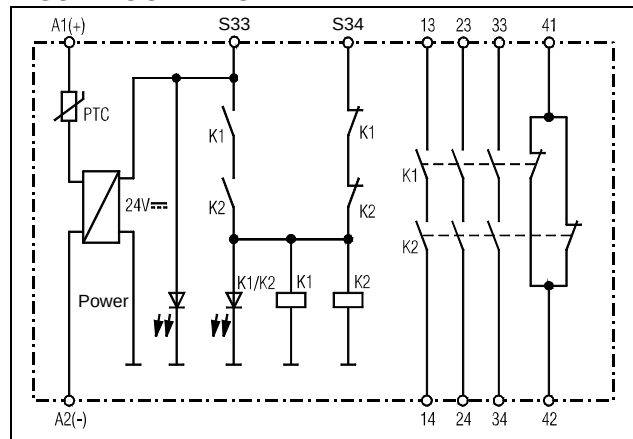
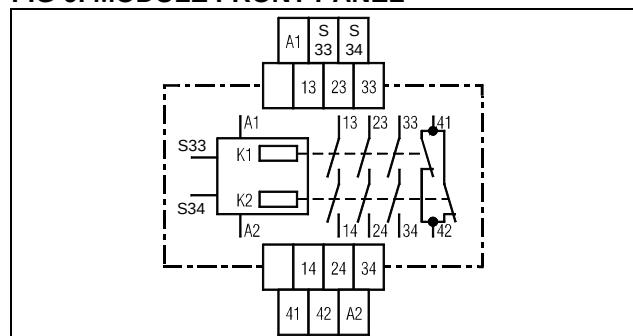


FIG 9. MODULE FRONT PANEL



APPLICATION WARNINGS

WARNING

IMPROPER INPUT CONNECTIONS

- Because the FF-SRS5924 is a single channel device and relies on a single safety input, avoid any short circuit possibilities on this channel. Precautions include using conduit and protecting the terminal strips inside the machine cabinets.
- Use the FF-SRS5925, FF-SRS5935 or FF-SRS5988 dual channel safety control module if a single safety input solution does not provide the level of safety required.

IMPROPER AUTOMATIC OPERATION MODE IN PERIMETER GUARDING APPLICATIONS

- If the module is in the automatic operation mode, another part of the safety control circuitry must keep the latched function engaged.

IMPROPER PUSH BUTTON USE

- Ensure the location of the manual start function is outside of the danger zone and provides the operator with a clear view of the zone.
- For perimeter guarding applications, the operator should not be able to reach manual start from the danger zone.
- A Programmable Logic Controller must NOT be able to override a manual start function.

CONTACT WELDING

- Always protect all safety contacts with correctly rated fuses. These fuses must never exceed the rated FF-SRS5924 safety output capability to prevent contact welding.

IMPROPER EXTERNAL SAFETY RELAYS/CONTACTORS MONITORING

- When using additional safety relays/contactors, always connect one normally closed contact of each relay in series inside the Restart loop circuit (S33/S34). This connection will ensure correct operation of the external relays/contactors after each FF-SRS5924 activation.
- If the FF-SRS5924 is not activated often, the customer is responsible for accomplishing any additional test procedures of the external safety components. For instance, this testing can be done by removing the power from the FF-SRS5924 at machine power up every day.

IMPROPER ARC SUPPRESSOR INSTALLATION

- NEVER install an arc suppressor across the safety output contact of the safety control module.
- ALWAYS install arc suppressors across the coils of external safety relays.

IMPROPER SYSTEM SAFETY LEVEL

- Multiple machine locations and/or applications can be protected by using several safety components (more than 2) connected to one FF-SRS5924 control module. Keep in mind that this type of installation will degrade the overall safety level of the solution. To ensure maximum safety, always use safety devices.

IMPROPER EMERGENCY STOP PUSH BUTTON

- The Emergency Stop push button must be designed according to the European (EN 418) and US safety standards (NFPA 19). Under any condition, the Emergency Stop switch must be able to open its contacts when activated.

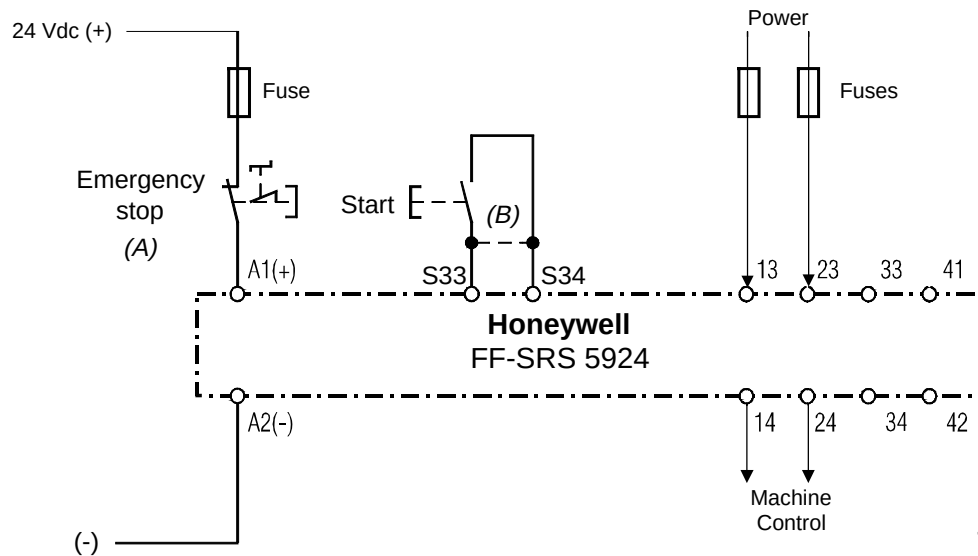
IMPROPER MANUAL START MODE

- The proper operation of an external start push button is not monitored by the FF-SRS5924. If the push button is held closed, or fails in a closed position, the FF-SRS5924 module will operate in an automatic start mode. The customer is responsible for ensuring that this automatic start mode does not lead to an unsafe condition. Use the FF-SRS5925, FF-SRS5935 or FF-SRS5988 dual channel safety control module if the external start push button must be monitored to provide the desired level of safety.

Failure to comply with these instructions could result in death or serious injury.

APPLICATION EXAMPLES

FIG 10. SINGLE-CHANNEL EMERGENCY STOP CONNECTION



FUNCTIONAL DESCRIPTION

After activation of the Emergency-stop push button, the K1/K2 LED will turn OFF, indicating that the three internal safety relays K1 and K2 are de-energized. The normally open safety outputs 13/14...33/34 will open. There exist two different start modes:

Manual start mode: see *note (B)* next page

1. After removing the stop condition, press the START push button to start the safety control module.
2. The K1/K2 LED will turn ON indicating that the internal safety relays K1 and K2 are energized. The three normally open safety contacts will close allowing the machine to operate.

Automatic start mode: see *note (B)* next page

1. After removing the stop condition, the safety control module will immediately reset.
2. The K1/K2 LED will turn ON indicating that the safety relays K1 and K2 are energized. The three normally open safety contacts will close allowing the machine to operate.

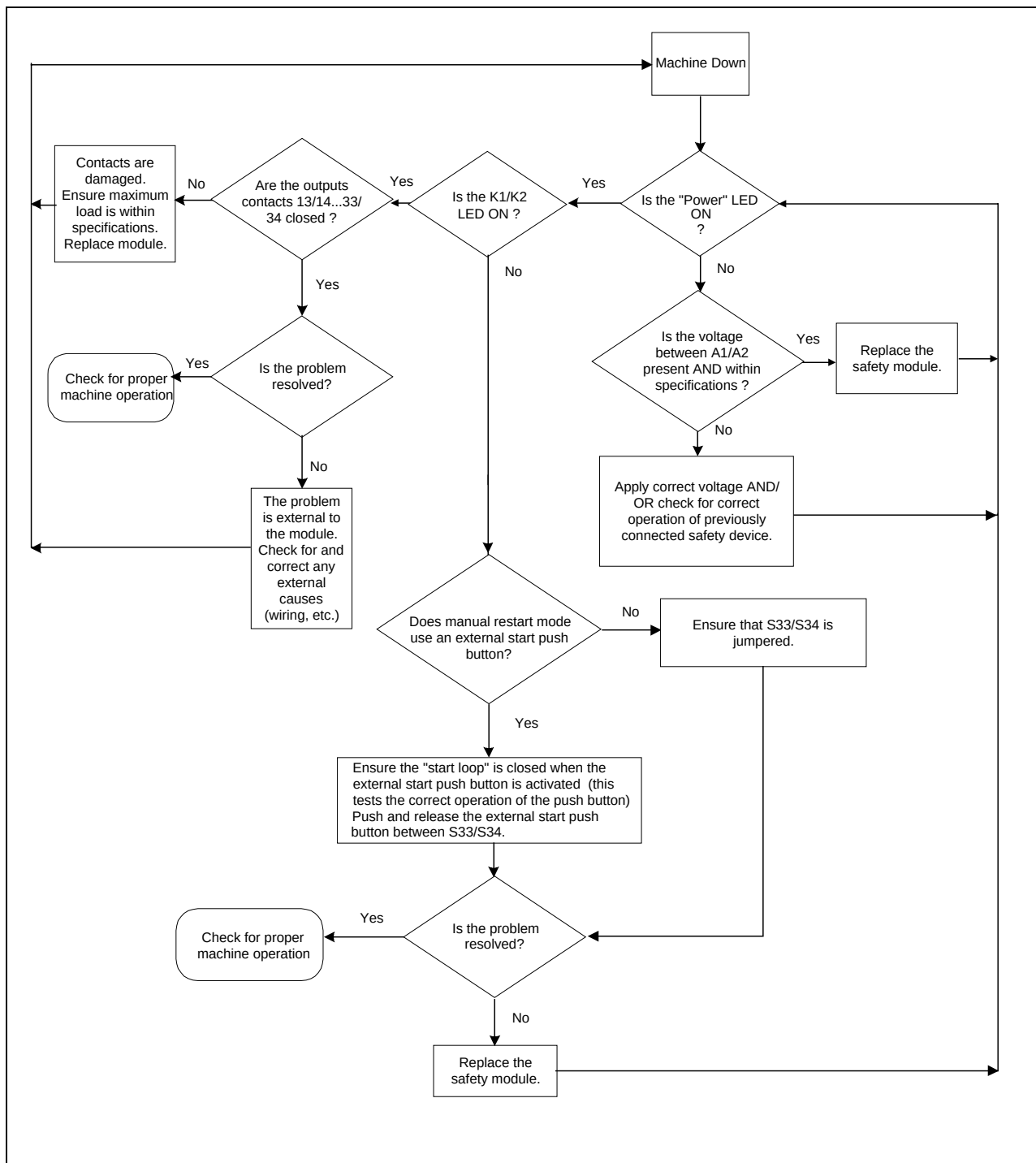
⚠ WARNING

IMPROPER AUTOMATIC START MODE IN PERIMETER GUARDING APPLICATIONS

- If the module is in the automatic start mode, another part of the safety control circuitry must keep the latched function engaged.

Failure to comply with these instructions could result in death or serious injury.

FF-SRS5924 TROUBLESHOOTING FLOW DIAGRAM



WARRANTY AND REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

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Specifications may change at any time without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

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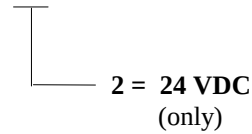
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INTERNET

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ORDER GUIDE

FF-SRS5924 □



HONEYWELL COMETA

European Photoelectric Center

21, Chemin du Vieux Chêne
38243 Meylan Cedex - FRANCE

FF-SRS5934

Single Channel Emergency Stop Module

Instructions for use



⚠ WARNING

IMPROPER INSTALLATION

- Consult with US and/or European safety agencies and their requirements when designing a machine control, interface and all control elements that affect safety.
- Strictly adhere to all installation instructions.

Failure to comply with these instructions could result in death or serious injury.

PRODUCT DESCRIPTION

The FF-SRS5934 Emergency Stop modules are designed to be used in emergency stop circuits when danger to personnel or machinery is present. This device has two safety relays with positive-guided contacts to ensure redundancy.

This safety control module relays the stopping information to the machine control circuitry. It allows higher current capability, higher number of contacts, and additional features versus a regular safety sensors (automatic or manual start mode, external relays monitoring).

The FF-SRS5934 is a single channel device and relies on a single safety input. If a single safety input does not provide the level of safety required, use one of the dual channel safety control modules (FF-SRS5925, FF-SRS5935, FF-SRS5988).



DIRECTIVES COMPLIANCE

Machine Directive 98/37 EEC
Low Voltage Directive 73/23 EEC
Electromagnetic Compatibility Directive 89/336

REGULATIONS COMPLIANCE

Regulation	Title
OSHA 29 CFR 1910.212	General Requirements for (guarding of) All Machines
OSHA 29 CFR 1910.217	(Guarding of) Mechanical Power Presses

APPROVALS

CE	The product, packaging and documentation of FF-SR Series products carry the CE mark; the CE declaration of conformity is available upon request.
cULus	This product is approved by Underwriters Laboratories Inc. according to Canadian and U.S. safety requirements.
BG	German Berufsgenossenschaft E+MIII

STANDARDS COMPLIANCE

Standard	Title
ANSI B11.1	Mechanical Power Presses
ANSI B11.2	Hydraulic Power Presses
ANSI B11.19	Safeguarding when Referenced by the Other B11 Machine Tool Safety Standards
ANSI/RIA R15.06	Safety Requirements for Industrial Robots and Robot Systems
UL508	Underwriters Laboratories
EN 292	Safety of Machinery - Basic Concepts, General Principles for Design
EN 60204	Safety of Machinery - Electrical Equipment of Machines
EN 954	Safety of Machinery - Safety related parts of control system

SPECIFICATIONS

Input		
Nominal voltage	120 (-15%, +10%), 230 VAC (-20%, +10%), 24 VDC (-10%, +10%)	
Nominal consumption	24 VDC: 1.6 W	
Output		
Contact complement	2 NO contacts	
Contact type	Safety relay, positive-guided	
Response time	Opening in supply circuit (L1 (+)/A1): 35 ms	
Start time	Manual/automatic START function: 100 ms	
Switching Capability	Power factor = 1 with resistive load	
Current Range (min. to max.)	10 mA to 10A (see caution)	
Voltage Range (min. to max.)	0.1 to 250 VAC/DC	
Typical Electrical Life Expectancy	Power factor = 1 at 230 VAC/DC (note 1)	
3A	1,000,000 operations	
5A	500,000 operations	
10A	220,000 operations	
Typical Power Factor (cos ϕ)	Limitation Factor (note 2)	
0.3	0.45	
0.5	0.70	
0.7	0.85	
1.0	1.00	
Mechanical life	Ten million switching operations	
Fuse rating	6 A gL (max.)	
General		
Temperature range	-15°C to + 55°C (5°F to 131°F) at max. 90% humidity	
Sealing	Housing IP 40; Terminals IP 20	
Housing material	Thermoplastic	
Vibration resistance	Amplitude 0.35 mm; Frequency 10 to 55 Hz	
Conductor connection	1 x 4 mm ² solid (max.) [12 AWG] or 2 x 1.5 mm ² (max.) [16 AWG] stranded wire with sleeve DIN 46288	
Conductor attachment	M 3,5 screws terminals; wire contacts are enclosed to prevent electrical shock	
Mounting	Quick install rail mounting EN 50022-35	
Weight	450 g (0.99 lb.)	

NOTE 1: Install arc suppression device across load to avoid module contact arcing and ensure specified relay life expectancy.

NOTE 2: Total operations = operations at power factor 1 multiplied by the limitation factor. if the power factor is 0.5 at 230 vac, 3A (1,000,000 operations), the limitation factor is 0.70. 1,000,000 x 0.70 = 700,000 total operations.

FIG 1. CONTACT LIFE FOR 100% RESISTIVE LOAD (typical) (note 1)
power factor = 1 (cos ϕ)

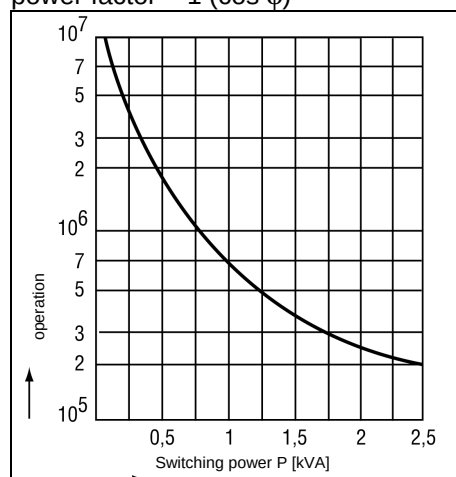


FIG 2. LIMITATION FACTOR FOR INDUCTIVE LOADS (note 2)
power factor < 1 (cos ϕ)

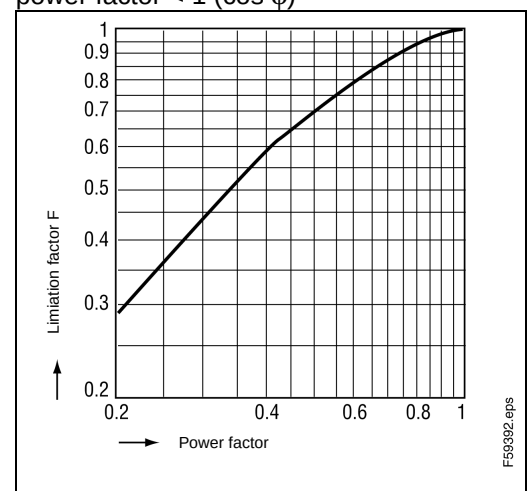


FIG 3. CURRENT VS. TEMPERATURE LIMIT

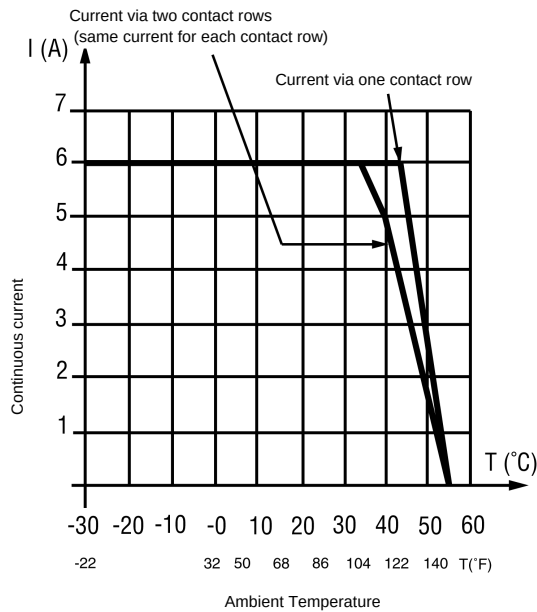


Figure 3. displays the maximal recommended external temperature versus the total load of all the safety module contacts. To use this curve, do the following:

- (1) Follow the horizontal line from the value (vertical axis) equal to the current inside the safety module contacts and note intersection of the appropriate curve.
- (2) Follow the intersection point down to determine the maximal recommended ambient temperature. (Ex: 4 A current inside each two safety contacts, then $T = 43^{\circ}\text{C}$ (109°F).

If the module is located in a higher temperature environment, the lifetime of the electronic components may be reduced. Ventilation of the cabinet may be required.

MECHANICAL INSTALLATION

The FF-SRS5934 must be installed inside a NEMA 3 (IEC IP54) rating enclosure or better. The module can be clipped easily onto a 45mm width DIN rail (see figures 4 and 5 below for installation and removal).

FIG 4. MOUNTING DIMENSIONS (for reference only)

- a Width: 45 mm 1.77 in.
- b Height: 74 mm 2.91 in.
- c Depth: 121 mm 4.76 in.

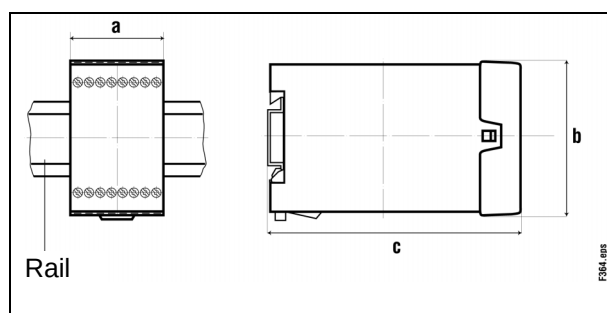
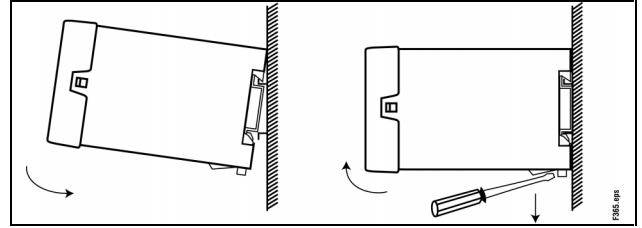


FIG 5. INSTALLATION DIAGRAM



CONTROL RELIABILITY

“Control Reliability” means that “the device, system or interface shall be designed, constructed and installed such that a single component failure within the device, interface or system shall not prevent normal stopping action from taking place but shall prevent a successive machine cycle.” (ANSI B11.19-1990, 5.5)

OSHA 29 CFR 1910.217 states that “the control system shall be constructed so that a failure within the system does not prevent the normal stopping action from being applied to the press when required, but does prevent initiation of a successive stroke until the failure is corrected. The failure shall be detectable by a simple test, or indicated by the control system.”

Honeywell uses self-checking techniques which combine reliability with safety. This means that a faulty component in our system will make the safety control modules fail in a safe mode.

The FF-SRS5934 safety control module functions with dual internal channel redundancy and positive self-check monitoring, but relies on a single safety input. If a single safety input does not provide the level of safety required, use one of the dual channel safety control modules (FF-SRS5925, FF-SRS5935, FF-SRS5988).

The design of this device meets the highest requirements (Category 4 as described in the EN 954 European norm). Category 4 safety control modules are designed and manufactured in such a way that a single breakdown or an accumulation of internal failures does not lead to the loss of the safety function when a dangerous situation arises. **The safety function is maintained on a permanent basis.**

ELECTRICAL INSTALLATION

⚠ WARNING

ELECTRICAL SHOCK

Remove power from FF-SR Series control modules and machine during installation.

Failure to comply with these instructions could result in death or serious injury.

Multiple wiring configurations are possible for the FF-SRS5934 single channel emergency stop module. General guidelines are provided because there are various ways to interface the module to machine control circuitry. Refer to the important warnings (page 5) and the application examples (page 6).

FUNCTIONAL DESCRIPTION

In an **automatic start** configuration, the module accepts immediate input from the safety device (emergency stop push button or safety switch) between L1/A1 (see application example). If S33/S34 and Y1/Y2 are jumpered (or closed), the normally open safety contacts (13/14 and 23/24) will close.

In a **manual start** configuration (start push button is between S33/S34), the module accepts input from the safety device (emergency stop push button or safety switch) between L1/A1 after activation of the start push button (see application example). If Y1/Y2 are jumpered (or closed) when the start push button closes, the normally open safety contacts (13/14 and 23/24) will close.

FIG 6. FUNCTIONAL DIAGRAM

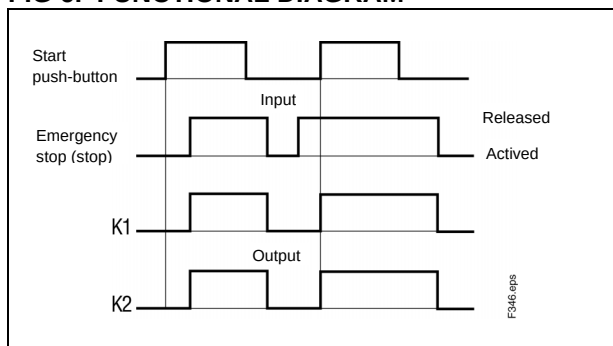
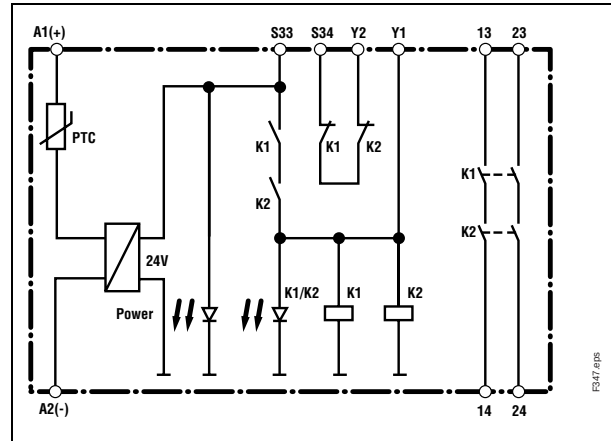


FIG 7. BLOCK DIAGRAM



In either configuration, if the safety device is actuated (emergency stop condition occurs), the normally open contacts will open immediately. This emergency stop condition is relayed via the safety contacts of the module to the machine control circuitry to arrest dangerous motion and/or remove power.

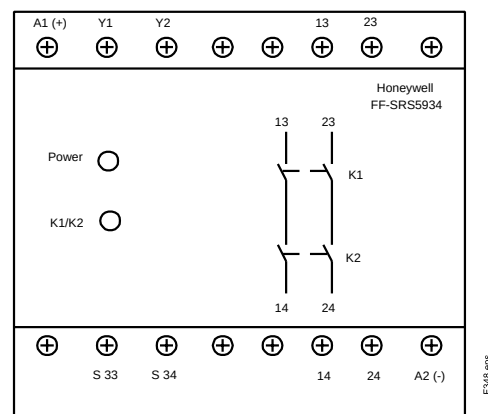
One or more FF-SRE3081 Extension Modules or external contactors with positively driven contacts can be used to multiply the number of contacts of the FF-SRS5934 Emergency Stop Module. If multiple safety contacts are used in parallel with one load, the maximum admissible current can be increased.

LED INDICATORS

The FF-SRS5934 module has two green LED status indicators (Power, K1/K2) as illustrated below.

The Power LED indicates power is applied to the safety control module. Illuminated K1/K2 LED indicates that both internal safety relays are energized. Both K1 and K2 relays must be energized to have the normally open contacts 13/14 and 23/24 in a closed condition.

FIG 8. MODULE FRONT PANEL



APPLICATION WARNINGS

WARNING

IMPROPER INPUT CONNECTIONS

- Because the FF-SRS5934 is a single channel device and relies on a single safety input, avoid any short circuit possibilities on this channel. Precautions include using conduit and protecting the terminal strips inside the machine cabinets.
- Use the FF-SRS5925, FF-SRS5935 or FF-SRS5988 dual channel safety control module if a single safety input solution does not provide the level of safety required.

IMPROPER AUTOMATIC OPERATION MODE

- If the module is in the automatic operation mode, another part of the safety control circuitry must keep the latched function engaged.

IMPROPER PUSH BUTTON USE

- Ensure the location of the manual start function is outside of the danger zone and provides the operator with a clear view of the zone.
- For perimeter guarding solution, the operator should not be able to reach manual start from the danger zone.
- A Programmable Logic Controller must NOT be able to override a manual start function.

CONTACT WELDING

- Always protect all safety contacts with correctly rated fuses. These fuses must never exceed the rated FF-SRS5934 safety output capability to prevent contact welding.

IMPROPER EXTERNAL SAFETY RELAY MONITORING

- When using additional safety relays, always connect one normally closed contact of each relay in series inside the Final Switching Device (FSD) monitoring loop circuit (Y1/Y2). This connection will ensure correct operation of the external relays after each FF-SRS5934 activation.
- If the FF-SRS5934 is not activated often, the customer is responsible for accomplishing any additional test procedures of the external safety components. For instance, this testing can be done by removing the power from the FF-SRS5934 at machine power up every day.

IMPROPER ARC SUPPRESSOR INSTALLATION

- NEVER install an arc suppresser across the safety output contact of the safety control module.
- ALWAYS install arc suppressers across the coils of external safety relays.

IMPROPER SYSTEM SAFETY LEVEL

- Multiple machine locations and/or applications can be protected by using several safety components (more than 2) connected to one FF-SRS5934 control module. To ensure maximum safety, always use safety devices. Keep in mind that this type of installation will degrade the overall safety level of the solution.

IMPROPER EMERGENCY STOP PUSH BUTTON

- The Emergency Stop push button must be designed according to safety standards (US and European). Under any condition, the Emergency Stop switch must be able to open its contacts when activated.

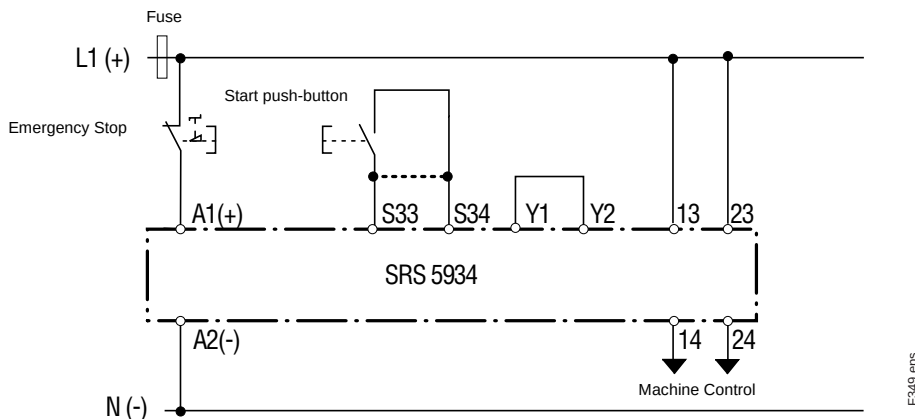
IMPROPER MANUAL START OPERATION MODE

- The proper operation of an external start push button is not monitored by the FF-SRS5934. If the push button is held closed, or fails in a closed position, the FF-SRS5934 module will operate in an automatic start mode. The customer is responsible for ensuring that this automatic start mode does not lead to an unsafe condition. Use the FF-SRS5935 or FF-SRS5988 dual channel safety control module if the external start push button must be monitored to provide the desired level of safety.

Failure to comply with these instructions could result in death or serious injury.

APPLICATION EXAMPLES

FIG 9. ONE-CHANNEL EMERGENCY STOP CONNECTION



(A) This may be an emergency stop push button with a single output safety device in series such as - safety limit or interlock switches (for example: CLS, GK and GSS).

(B) Manual start mode: Insert start push-button; the jumper between Y1/Y2 is omitted;
Automatic start mode: Insert shunt between Y1/Y2

FUNCTIONAL DESCRIPTION

After activation of the Emergency-stop push button, the K1/K2 will turn OFF, indicating that the two internal safety relays K1 and K2 are de-energized. The normally open safety outputs 13/14 and 23/24 will open. There exist two different start modes:

Manual start mode:

The jumper between S33/S34 is omitted (see (B)).

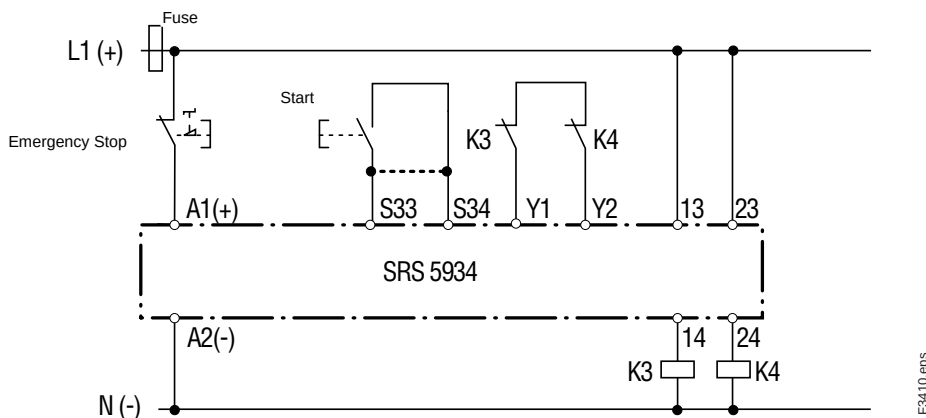
1. After removing the stop condition, press the START push button to start the safety control module.
2. The K1/K2 LED will turn ON indicating that the safety relays K1 and K2 are energized. The two normally open safety contacts will close allowing the machine to operate.

Automatic start mode:

Set the connection between S33/S34 (see (B)).

1. After removing the stop condition, the safety control module will immediately reset.
2. The K1/K2 LED will turn ON indicating that the safety relays K1 and K2 are energized. The two normally open safety contacts will close allowing the machine to operate.

FIG 10. ONE-CHANNEL EMERGENCY STOP CONNECTION (WITH EXTERNAL CONTACTORS)



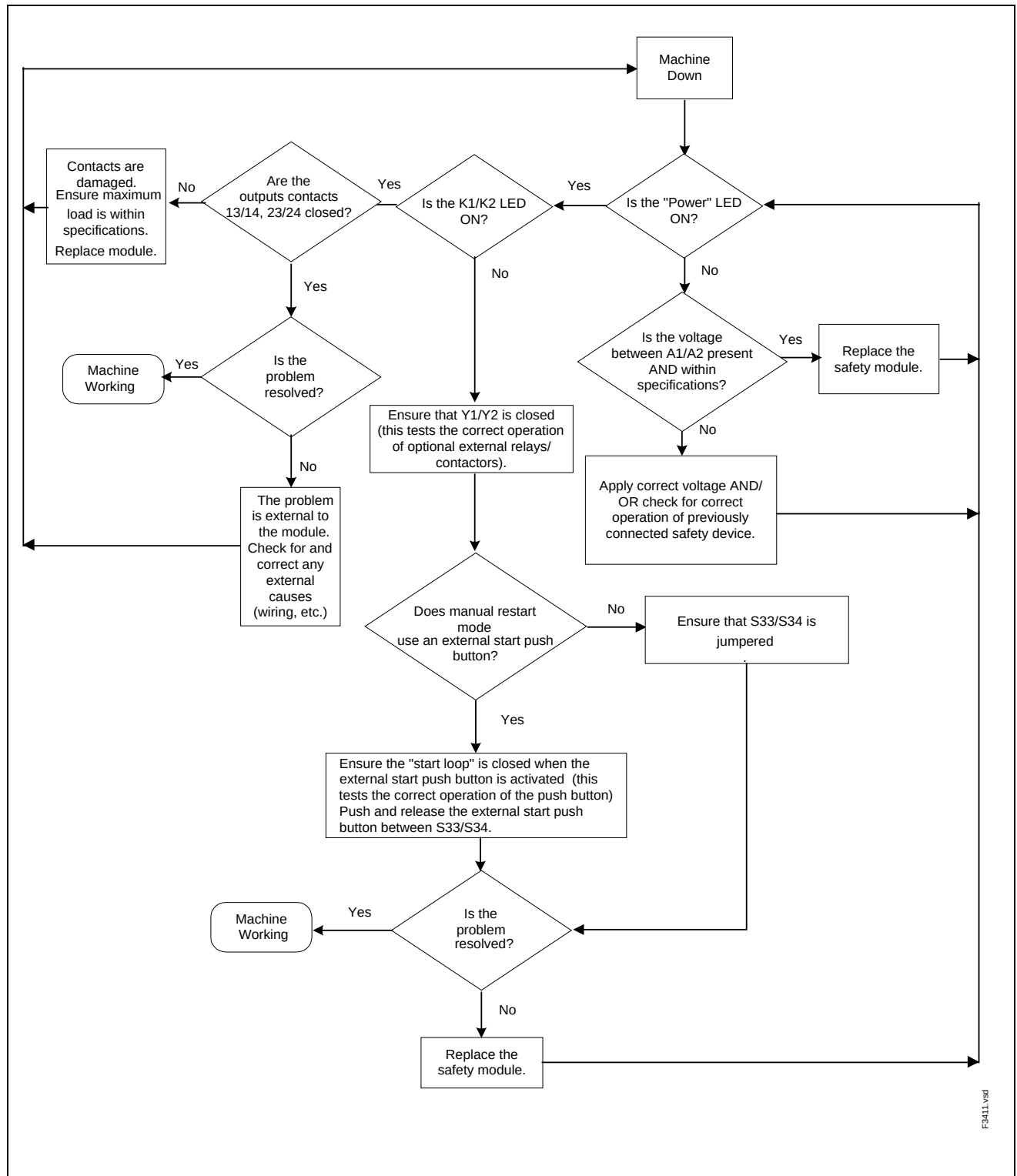
Contact reinforcement through external relays:

For currents higher than 5A, the output contacts can be reinforced by external safety relays. The proper operation of the external contactors is monitored by looping the NC contacts into the Final Switching Device (FSD) loop between terminals Y1/Y2.

After activation of the Emergency-stop push button, the K1/K2 LED will turn OFF, indicating that the two internal safety relays K1 and K2 are de-energized. The normally open safety outputs 13/14 and 23/24 will open and de-energize the external contactors K3 and K4.

After removing the stop condition, press and release the START push button to start the safety control module. If the two contactors K3 and K4 are working properly, the K1/K2 LED will turn ON indicating that the safety relays K1 and K2 are energized. The two normally open safety contacts will close and energize the external contactors K3 and K4.

FF-SRS5934 TROUBLESHOOTING FLOW DIAGRAM



WARRANTY AND REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

While we provide application assistance, personally and through our literature, it is up to the customer to determine the suitability of the product in the application.

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INTERNET

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ORDER GUIDE

FF-SRS5934 ☐	
	
Voltage :	
2 = 24 VDC	
E = 120 VAC	
G = 230 VAC	

Centre Européen de la Photoélectronique
 Honeywell-Cométa
 B.P. 81
 38243 Meylan Cedex - France
 Tel : (33) 04 76 41 72 00
 Fax : (33) 04 76 41 72 50



HONEYWELL - EUROPEAN PHOTOELECTRIC CENTER QUALITY ASSURANCE DEPARTMENT

CE declaration of conformity

We : Honeywell-Cométa
 ZIRST B.P. 81
 21, chemin du Vieux Chêne
 38240 Meylan Cedex - France

Declare : under our sole responsibility that the protective equipments catalogued:

Emergency stop modules:

- FF-SRS5924 series
- FF-SRS5925 series
- FF-SRS5934 series
- FF-SRS5935 series
- FF-SRS5988 series

to which this declaration relates is in conformity with the technical requirements of the standards and the provisions of the essential requirements of the Directives detailed below.

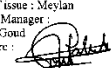
Directives : • **Machine Directive 89/392 EEC** and its amendments 91/368 EEC, 94/44 EEC and 93/68 EEC, to which the EC-type examination certificate ⁽¹⁾ delivered by the *Berufsgenossenschaft - Köln* relates. Our Quality Assurance System guarantees that the presently delivered product is identical to the sample which passed the EC-type examination.

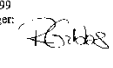
• **Low Voltage Directive 73/23 EEC**

• **Electromagnetic Compatibility Directive 89/336 EEC**

Standards : EN 954-1 : Safety of Machinery - Safety related parts of control systems - part 1 : General principles for design
 GS-ET-20 : Fundamental basis for testing safety relay interfaces

Safety category : Category 4 as per EN 954-1

Legal Representative in Europe : Place of issue : Meylan
 Quality Manager : Patrick Gond
 Signature : 

Date: 22/03/1999
 General Manager: Richard Gibbs
 Signature : 

(1) : Available upon request

FF-SRS5935

Dual Channel Emergency Stop Module Instructions for use



(pending)

WARNING

IMPROPER INSTALLATION

- Consult with US and/or European safety agencies and their requirements when designing a machine control, interface and all control elements that affect safety.
- Strictly adhere to all installation instructions.

Failure to comply with these instructions could result in death or serious injury.

PRODUCT DESCRIPTION

The FF-SRS5935 Emergency Stop modules are designed to be used in emergency stop circuits when danger to personnel or machinery is present. This device has two safety relays with positive-guided contacts to ensure redundancy.

This safety control module provides an emergency stop signal to the machine control circuitry. FF-SRS5935 helps to create a control reliable safety solution by providing redundancy and self-checking circuitry. Other features include higher current capability, a greater number of contacts (using an extension control module FF-SRE3081) and more capability than regular safety relays (an automatic restart and start/restart operation mode, cross fault monitoring, and external relays monitoring).



REGULATIONS COMPLIANCE

Regulation	Title
OSHA 29 CFR 1910.212	General Requirements for (guarding of) All Machines
OSHA 29 CFR 1910.217	(Guarding of) Mechanical Power Presses

APPROVALS

CE	The product, packaging and documentation of FF-SR Series products carry the CE mark; the CE declaration of conformity is available upon request.
cULus (pending)	This product is pending approval by Underwriters Laboratories Inc. according to Canadian and U.S. safety requirements.
BG	German Berufsgenossenschaft E+MIII

DIRECTIVES COMPLIANCE

Machine Directive 89/392 EEC
Low Voltage Directive 73/23 EEC
Electromagnetic Compatibility Directive 89/336

STANDARDS COMPLIANCE

Standard	Title
ANSI B11.1	Mechanical Power Presses
ANSI B11.2	Hydraulic Power Presses
ANSI B11.19	Safeguarding when Referenced by the Other B11 Machine Tool Safety Standards
ANSI/RIA R15.06	Safety Requirements for Industrial Robots and Robot Systems
UL508	Underwriters Laboratories
EN 292	Safety of Machinery - Basic Concepts, General Principles for Design
EN 60204	Safety of Machinery - Electrical Equipment of Machines
EN 954	Safety of Machinery - Safety related parts of control system

SPECIFICATIONS

Input	
Nominal voltage	120 VAC (-15%, +10%), 230 VAC (-15%, +10%), 24 VDC (-10%, +20%)
Nominal power consumption	24 VDC: 2 W; 230 VAC: 4 VA
Nominal frequency	50 to 60 Hz
Start time	Manual START function: 50 ms (-25%, +50%); Automatic START function: 1 s (-25%, +50%)
Nominal voltage at S11	24 VDC with 35 mA current $\pm 25\%$ (provided by control module)
Minimum voltage at S11	21 VDC when activated
Cable resistance between S11/S12 and S21/S22	68 Ω (max.)
Output	
Contact complement	3 NO, 1 NC contacts
Response time	After opening of input (S11/12 or S21/22): 25 ms; Opening in supply circuit (L1(+)/A1): 50 ms
Contact type	Safety relay, positive-guided
Switching capability	Power factor = 1 with resistive load
Current range (min. to max.)	1 mA to 10 A (see caution)
Voltage range (min. to max.)	0.1 to 250 VAC/DC
Typical Electrical Life Expectancy	Power factor = 1 at 230 VAC/DC (note 1)
3A	1,000,000 operations
5A	500,000 operations
10A	220,000 operations
Typical Electrical Life Expectancy	Limitation factor (note 2)
0.3	0.45
0.5	0.70
0.7	0.85
1.0	1.00
Operating frequency	600 switching cycles/h
Fuse rating	6 A gL (max.)
Mechanical life	Ten million switching operations
General	
Temperature range	-15°C to +55°C (5°F to 131°F) at 90% humidity (max.)
Sealing	Housing IP 40; Terminals IP 20
Housing material	Thermoplastic
Vibration resistance	Amplitude 0.35 mm: Frequency 10 to 55 Hz
Conductor connection	1 x 4 mm ² solid (max.) [12 AWG] or 2 x 1.5 mm ² (max.) [16 AWG] stranded wire with sleeve
Conductor attachment	Removable block terminals with M3,5 screws; wire contacts are enclosed to prevent
Mounting	Quick install rail mounting EN 50022-35
Weight	450 g (0.99 lb.)

NOTE 1: Install arc suppression device across load to avoid module contact arcing and ensure specified relay life expectancy.

NOTE 2: Total operations = operations at power factor 1 multiplied by the limitation factor. if the power factor is 0.5 at 230 vac, 3A (1,000,000 operations), the limitation factor is 0.70. 1,000,000 x 0.70 = 700,000 total operations.

FIG 1. CONTACT LIFE FOR 100% RESISTIVE LOAD (typical) (note 1)
power factor = 1 (cos ϕ)

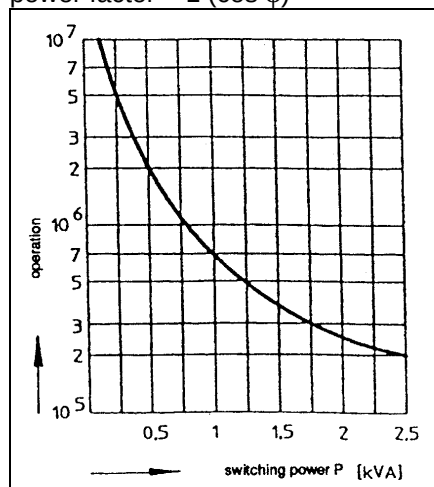
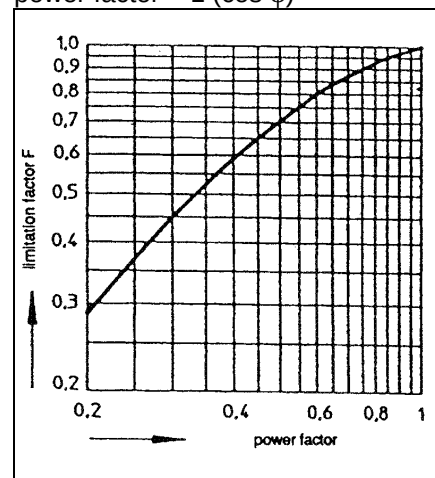


FIG 2. LIMITATION FACTOR FOR INDUCTIVE LOADS (note 2)
power factor < 1 (cos ϕ)



CAUTION

CONTACT DAMAGE

To ensure the 1 mA capability during the lifetime of the contact, NEVER exceed 300 mA and 60 V. Failure to comply with these instructions will result in product damage.

FIG 3. QUADRATIC TOTAL CURRENT LIMIT

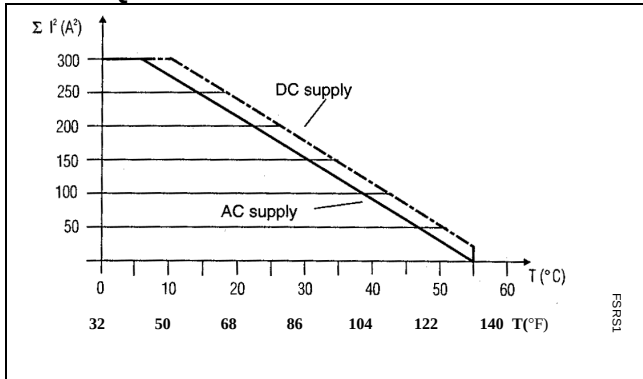


Figure 3. displays the maximal recommended external temperature versus the total load of all the safety module contacts. To use this curve, do the following:

- (1) Square the current in each contact branch, then sum all the results to obtain the vertical axis value.
- (2) Depending on what current is inside the safety module contacts (AC or DC), follow the horizontal line from the obtained value and note intersection of the appropriate curve.
- (3) Follow the intersection point down to determine the maximal recommended external temperature.

(Ex: $\sum I^2 = 200 \text{ A}^2$, AC current inside safety contacts, then $T = 22^\circ \text{C}$ (72°F)).

If the module is located in a higher temperature environment, the lifetime of the electronic components may be reduced. Ventilation of the cabinet may be required.

MECHANICAL INSTALLATION

The FF-SRS5935 must be installed inside a NEMA 3 (IEC IP54) rating enclosure or better. The module can be clipped easily onto a 45mm width DIN rail (see figures 4 and 5 for installation and removal). Specific features of this product include removable block terminals. This feature provides easy access to wiring during installation and reduces machine downtime during maintenance.

FIG 4. MOUNTING DIMENSIONS (for reference only)

- a Width: 45 mm 1.77 in.
- b Height: 74 mm 2.91 in.
- c Depth: 121 mm 4.76 in.

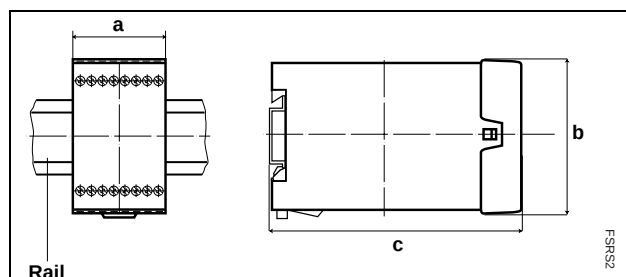


FIG 5. INSTALLATION DIAGRAM

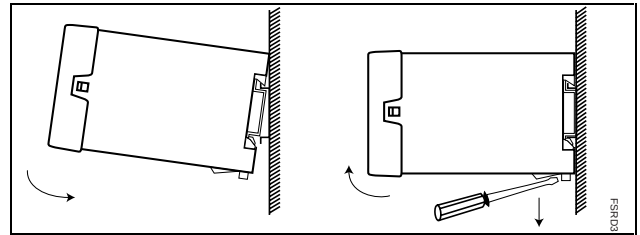
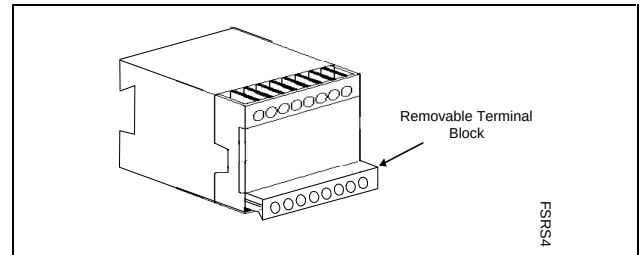


FIG 6. REMOVABLE TERMINAL BLOCKS



CONTROL RELIABILITY

“Control Reliability” means that “the device, system or interface shall be designed, constructed and installed such that a single component failure within the device, interface or system shall not prevent normal stopping action from taking place but shall prevent a successive machine cycle.” (ANSI B11.19-1990, 5.5)

OSHA 29 CFR 1910.217 states that “the control system shall be constructed so that a failure within the system does not prevent the normal stopping action from being applied to the press when required, but does prevent initiation of a successive stroke until the failure is corrected. The failure shall be detectable by a simple test, or indicated by the control system.”

Honeywell has developed new patented self-checking techniques which combine reliability with safety. The FF-SR Series safety control modules function with dual channel redundancy and positive self-checking monitoring. This means that a faulty component in our system will make the safety control modules fail in a safe mode.

This design meets the highest requirements (Category 4 as described in the EN 954 European norm). Category 4 safety control modules are designed and manufactured in such a way that a single breakdown or an accumulation of failures does not lead to the loss of the safety function when a dangerous situation arises. **The safety function is maintained on a permanent basis.**

MODE SETTING

⚠ WARNING

ELECTRICAL SHOCK

Remove power from FF-SR Series control modules and machine during installation and before setup.

Failure to comply with these instructions could result in death or serious injury.

To set the desired mode of operation, remove the front panel (see figure 7). Refer to the back of the front panel for switch setting options (see figure 8). Set switches as required, then replace front panel.

S1 AND S2 SWITCHES

Refer to the important warnings on page 6.

This module contains two internal switches (S1 and S2) that are used to set various modes of operation. This feature ensures application flexibility.

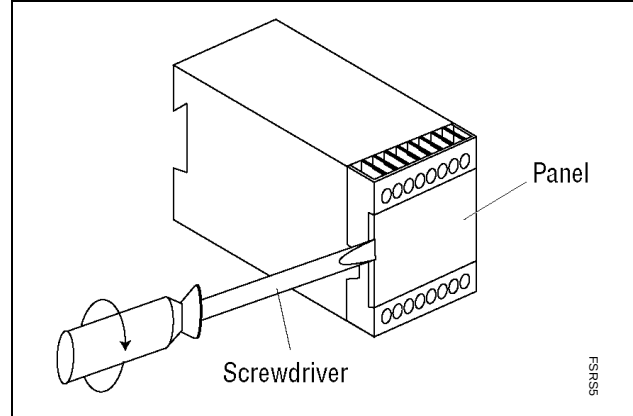
Switches S1 and S2 are used to select automatic start and manual start with or without cross fault detection.

Switch S1 is used to select an operating mode for **cross fault detection** between the two inputs. Cross fault monitoring must be used when two independent safety inputs are provided to this module to increase the overall safety level of the solution (see typical application examples).

Switch S2 is used to select **automatic start ("Autostart")** or **manual start ("Handstart")**. Terminals S33 and S34 must be connected for automatic start to function.

In either mode, if the safety device is actuated (emergency stop condition occurs), the normally open contact will open immediately and the normally closed contact will close. This emergency stop condition is relayed via the safety contacts of the module to the machine control circuitry to arrest dangerous motion and/or remove power.

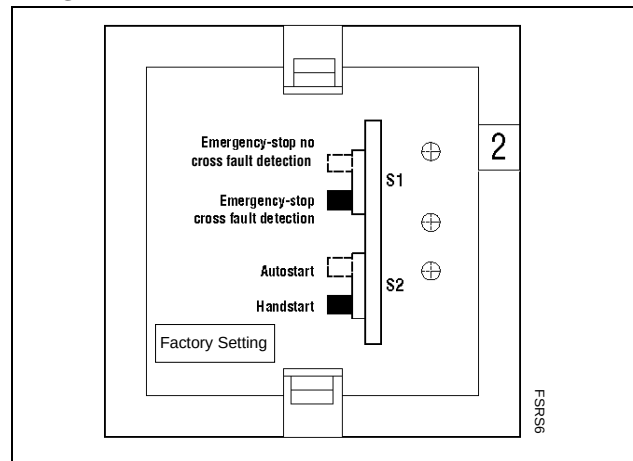
FIG 7. FRONT PANEL REMOVAL



NOTICE

To gain access to the two internal switches, it is not necessary to remove the terminal blocks.

FIG 8. FRONT PANEL SWITCH SETTING DIAGRAM



ELECTRICAL INSTALLATION

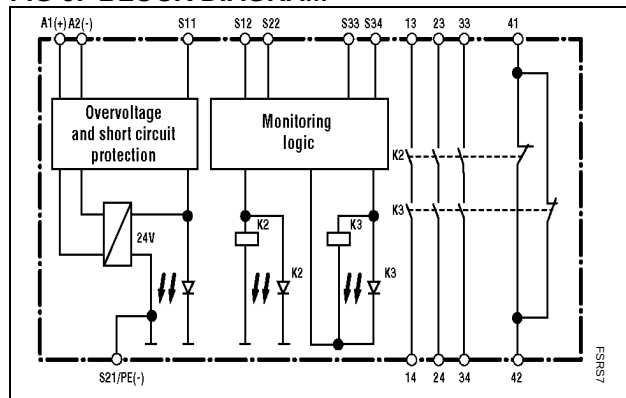
Multiple wiring configurations are possible for the FF-SRS5935 dual channel emergency stop module. General guidelines are provided because there are various ways to interface the module to machine control circuitry. **Refer to the important warnings (page 6) and the application examples (pages 7 through 8).**

CAUTION

SAFETY CONTROL MODULE DAMAGE

Do not supply any current/voltage to the FF-SRS5935 safety module control inputs. These inputs receive their voltage (24 vdc under a 35-50 mA current) from external power via pins A1 and A2. **Failure to comply with these instructions will result in product damage.**

FIG 9. BLOCK DIAGRAM



FUNCTIONAL DESCRIPTION

In the **manual start mode**, the module accepts input from the safety device (light curtain, safety mat, safety switches, etc.) between S11/S12 and S21/S22 after activation of the push button between S33 and S34; then, the normally open safety contacts (13/14, 23/24, 33/34) will close and the normally closed contact (41/42) will open.

In the **automatic start mode**, the module accepts immediate input from the safety device (light curtain, mat, safety switches, etc.) between S11/S12 and S21/S22 (S33 and S34 are jumpered if external relay monitoring is not needed); then, the normally open safety contacts (13/14, 23/24, 33/34) will close and the normally closed contact (41/42) will open.

In either mode, if the safety device is actuated (emergency stop condition occurs), the normally open contact will open immediately and the normally closed contact will close. This emergency stop condition is relayed via the safety contacts of the module to the machine control circuitry to arrest dangerous motion and/or remove power.

EXTENSION MODULES AND EXTERNAL CONTACTORS

One or more FF-SRE3081 Extension modules or external contactors with positively driven contacts can be used to multiply the number of contacts of the FF-SRS5935 Emergency Stop Module. If multiple safety contacts are used in parallel with one load, the maximum admissible current can be increased. For connection of the FF-SRE 3081 to the FF-SRS 5935 module, see the Installation Instructions for the FF-SRE 3081 Extension Module.

LED INDICATORS

The FF-SRS5935 module has three green LED status indicators (Power, K2 and K3) as illustrated below. The Power LED indicates power is applied to the safety control module. Illuminated K2 and/or K3 LED's indicate(s) that the corresponding internal safety relay is energized. Both K2 and K3 relays must be energized to have the normally open contacts 13/14, 23/24 and 33/34 in a closed condition. If one of the safety relays de-energizes, the normally closed contact will close (see Mode Setting, page 4, for additional information).

FIG 10. MODULE FRONT PANEL

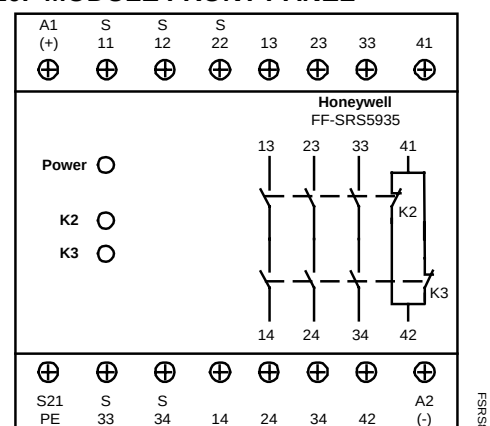
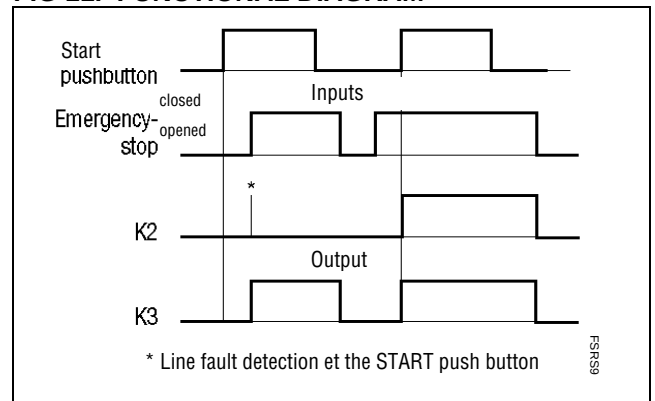


FIG 11. FUNCTIONAL DIAGRAM



If the start push button is closed before voltage is applied to S12 and S22 (also, if a line fault occurs via the start push button), the output contacts cannot be switched to START.

APPLICATION WARNINGS

WARNING

IMPROPER INPUT CONNECTIONS

- To ensure the highest level of safety, connect two safety device outputs into the input channel of the FF-SRS5935 safety module and always select the cross fault detection monitoring mode.
- If the safety device provides one safety output only (e.g., a switch driven by a direct acting mechanism like some GK, GSS, CLS or Emergency Stop push buttons), connect the FF-SRS5935 module as shown in the single input channel example. To avoid any short circuit possibilities on this single input channel, use conduit to protect the wiring and additional protection for the terminal strips inside the machine cabinets.

IMPROPER EMERGENCY STOP CONNECTION

- To ensure maximum safety, connect two normally closed contacts of the Emergency Stop into the input channel of the FF-SRS5935 module.

IMPROPER AUTOMATIC OPERATION MODE

- If the module is in the automatic operation mode, another part of the safety control circuitry must keep the latched function engaged.

IMPROPER PUSH BUTTON USE

- To ensure maximum safety when using an external start push button, always select manual start mode (handstart).
- Ensure the location of the manual restart function is outside of the danger zone and provides the operator with a clear view of the zone.
- For perimeter guarding solution, the operator should not be able to reach manual restart from the danger zone.
- A Programmable Logic Controller must NOT be able to override a manual restart function.

CONTACT WELDING

- Always protect all safety contacts with correctly rated fuses. These fuses must never exceed the rated FF-SRS5935 safety output capability to prevent contact welding.

IMPROPER EXTERNAL SAFETY RELAY MONITORING

- When using additional safety relays, always connect one normally closed contact of each relay in series inside the Final Switching Device (FSD) monitoring loop circuit (S33/S34). This connection will ensure correct operation of the external relays after each FF-SRS5935 activation.
- If the FF-SRS5935 is not activated often, the customer is responsible for accomplishing any additional test procedures of the external safety components. For instance, this testing can be done by removing the power from the FF-SRS5935 at machine power up every day.

IMPROPER ARC SUPPRESSOR INSTALLATION

- Never install an arc suppresser across the safety output contact of the safety control module.
- Always install arc suppressers across the coils of external safety relays.

IMPROPER SYSTEM SAFETY LEVEL

- Several safety components can be connected to a FF-SRS5935 control module. If more than one safety output is connected to one of the two input channels of the control module, always connect these safety outputs in series. Parallel wiring of multiple outputs into a single channel can defeat the channel and cause an unsafe condition.
- Individually activate and check all of the safety devices connected to a FF-SRS5935 control module to ensure proper operation.

IMPROPER EMERGENCY STOP PUSH BUTTON

- The Emergency Stop push button must be designed according to safety standards (US and European).
- Under any condition, the Emergency Stop switch must be able to open its contacts when activated.

IMPROPER SAFETY CONTROL MODULE OPERATION

- The cable resistance between S11/S12 and S21/S22 must be less than 68 Ω (ohms) for correct operation of the safety control module.
- A minimum of 21 Vdc must be present between each channel input (S11/S12 and S21/S22) to ensure the correct detection of sensor(s) output status.

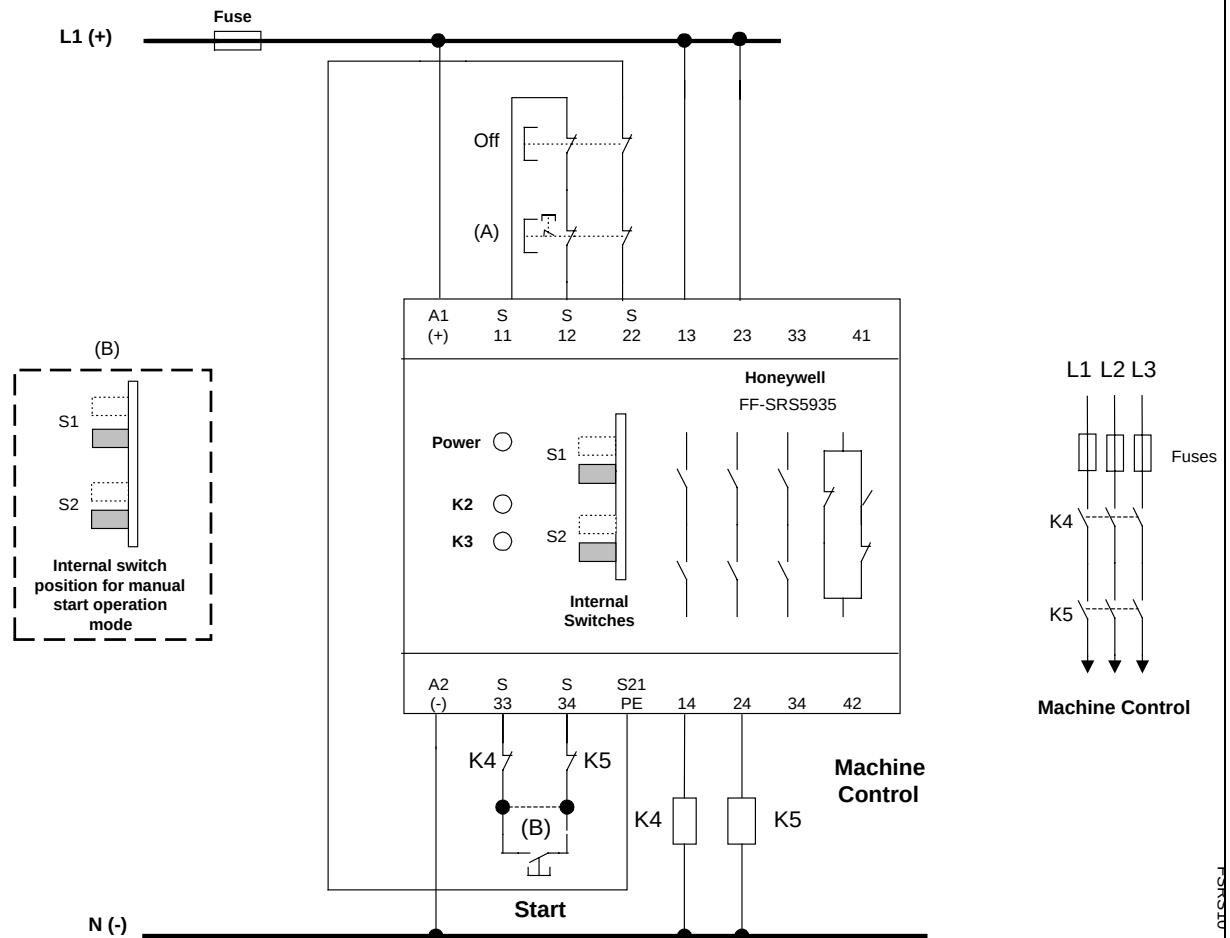
LONGER RESPONSE TIME

- The FF-SRS5935 module will have a longer response time (when the emergency push button is activated) if the emergency stop push button is connected in series with the power supply of the module. However, connecting the emergency stop push button to the safety input channels will result in a shorter response time.

Failure to comply with these instructions could result in death or serious injury.

APPLICATION EXAMPLES

FIG 12. DUAL CHANNEL EMERGENCY STOP CIRCUITRY WITH MANUAL OR AUTOMATIC START, CROSS-FAULT MONITORING AND EXTERNAL CONTACTORS.



(A) This may be an emergency stop push button in series with dual output safety switching devices (OSSD) such as safety light curtains (FF-SB, FF-LS), safety mat (FF-SM), single beam (FF-SPS), modular safety light curtains (FF-SC), safety laser scanner (FF-SE), dual output safety limit or interlock switches (for example: CLS and GK).

(B) Manual start mode: Insert start push-button and select internal switch S2 as illustrated above

Automatic start mode: Insert shunt and select internal switch S2 to automatic start mode

This circuit has redundancy in the emergency-stop control circuit and therefore offers the highest possible safety level.

Manual start mode

1. After removing the stop condition, press and release the START push button to restart the safety control module.
2. The K2 and K3 LED's will turn ON indicating that the safety relays K2 and K3 are energized. The three normally open safety contacts will close and the normally closed safety contact will open allowing the machine to operate.

Automatic start mode

1. After removing the stop condition, the safety control module will immediately reset.
2. The K2 and K3 LED's will turn ON indicating that the safety relays K2 and K3 are energized. The three normally open safety contacts will close and the normally closed safety contact will open allowing the machine to operate.

External contactors:

With switching current >10 A, the output contacts should be reinforced by external contactors (K4 and K5) with positive-guided contacts. The proper operation of the external contactors is monitored by looping the NC contacts into the restart circuit (terminals S33-S34).

1. After activation of the E-stop push button, the two K2 and K3 LED's will turn OFF, indicating that the two internal safety relays K2 and K3 are de-energized. The normally open safety outputs 13/14, 23/24 and 33/34 will open and de-energize the external contactors K4 and K5. The normally closed safety output will also close.
2. After removing the stop condition, press and release the START push button to restart the safety control module. If the two contactors K4 and K5 are working properly, the K2 and K3 LED's will turn ON indicating that the safety relays K2 and K3 are energized. The three normally open safety contacts will close and the normally closed safety contacts will open allowing the machine to operate.

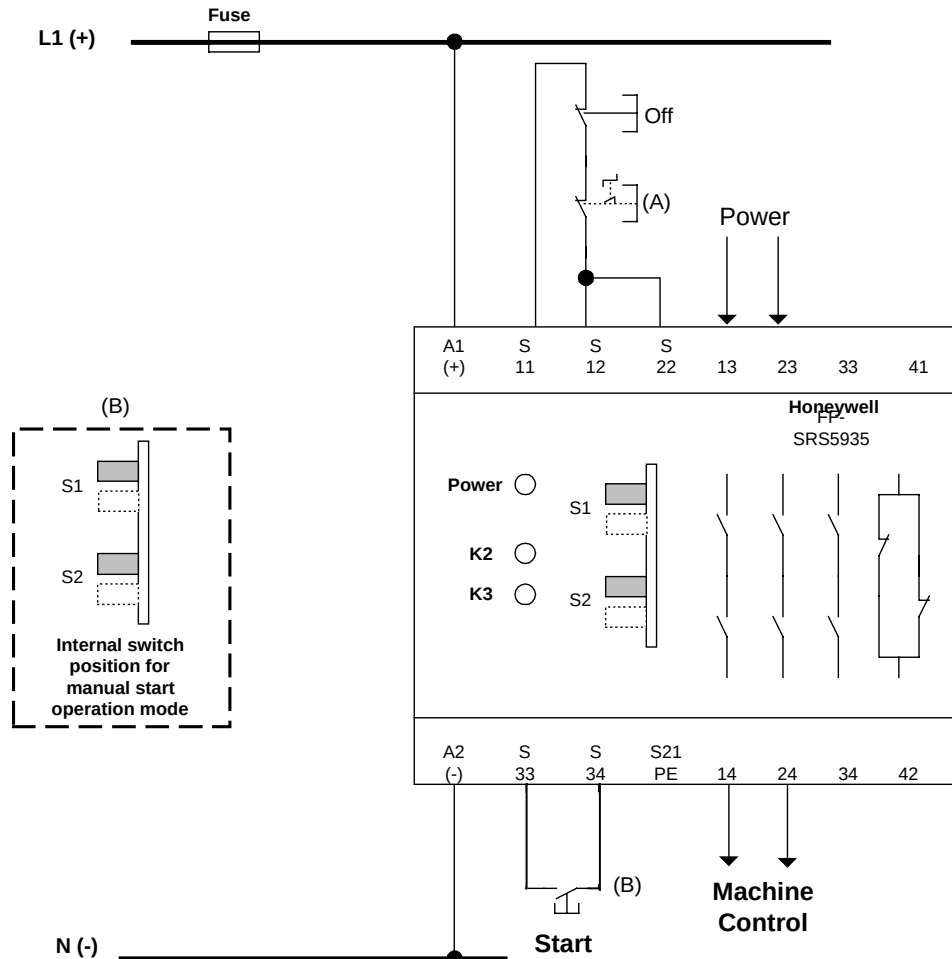
! WARNING

IMPROPER EXTERNAL SAFETY RELAYS PERFORMANCE

- Use two independent stop circuit safety relays with mechanically linked contacts to reliably detect a welded contact.

APPLICATION EXAMPLES (continued)

FIG 13. SINGLE CHANNEL EMERGENCY STOP CIRCUITRY WITH MANUAL START.



(A) This may be an emergency stop push button with a single output safety device in series such as - safety limit or interlock switches (for example: CLS, GK and GSS).

(B) Automatic start mode: Insert a shunt and select internal switch S2 to automatic start mode

This circuit has NO redundancy in the emergency-stop control circuit and therefore offers a minor safety level.

NOTICE

- If using a single safety input, position the S1 switch to the “no cross-fault monitoring” mode to remove the cross fault monitoring feature.
- If a safety control module is used in an automatic start mode, position the S2 switch to the “automatic start” mode. In addition, the start push button must be replaced by a jumper (between terminals S33/S34). If external safety relay monitoring is necessary, connect one contact of each relay required to be monitored, in series between S33/S34.

! WARNING

IMPROPER AUTOMATIC START MODE

- If the module is in the automatic operation mode, another part of the safety control circuitry must keep the latched function engaged.

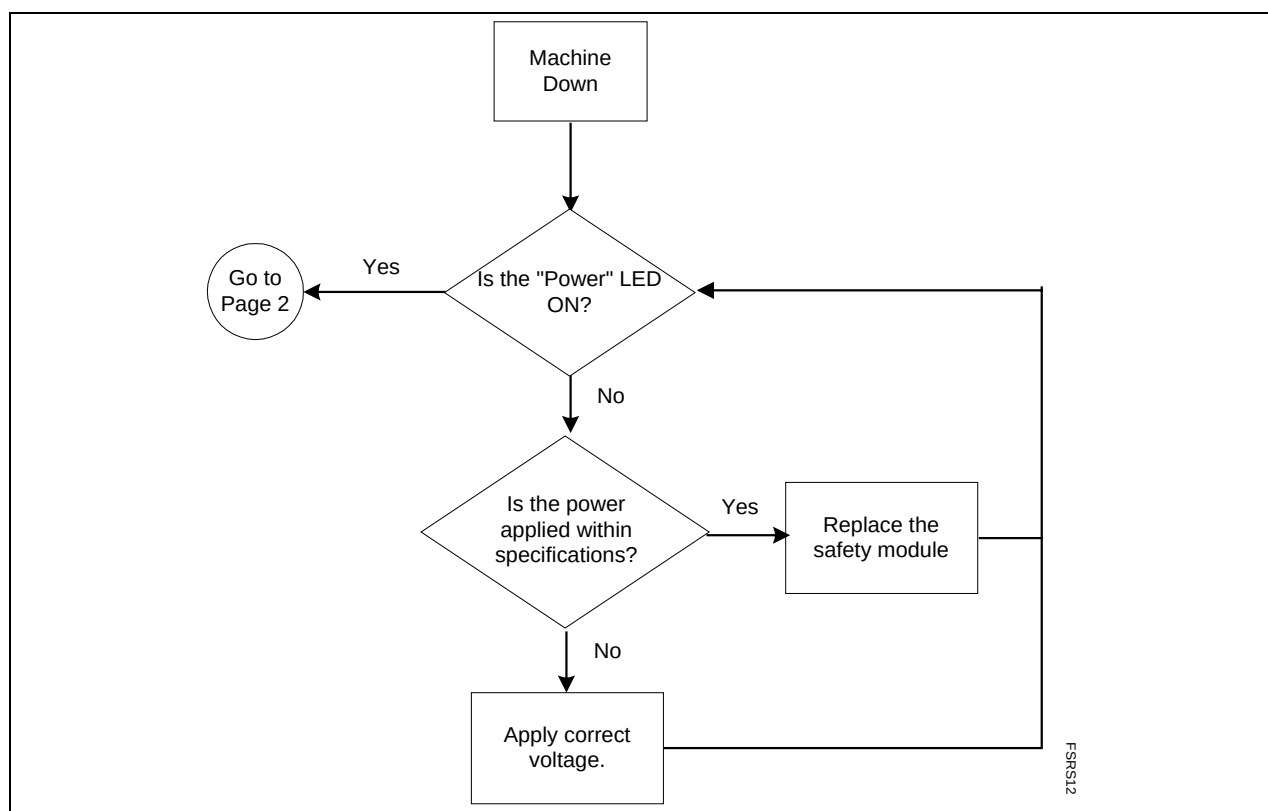
Failure to comply with these instructions could result in death or serious injury.

IMPORTANT NOTICES

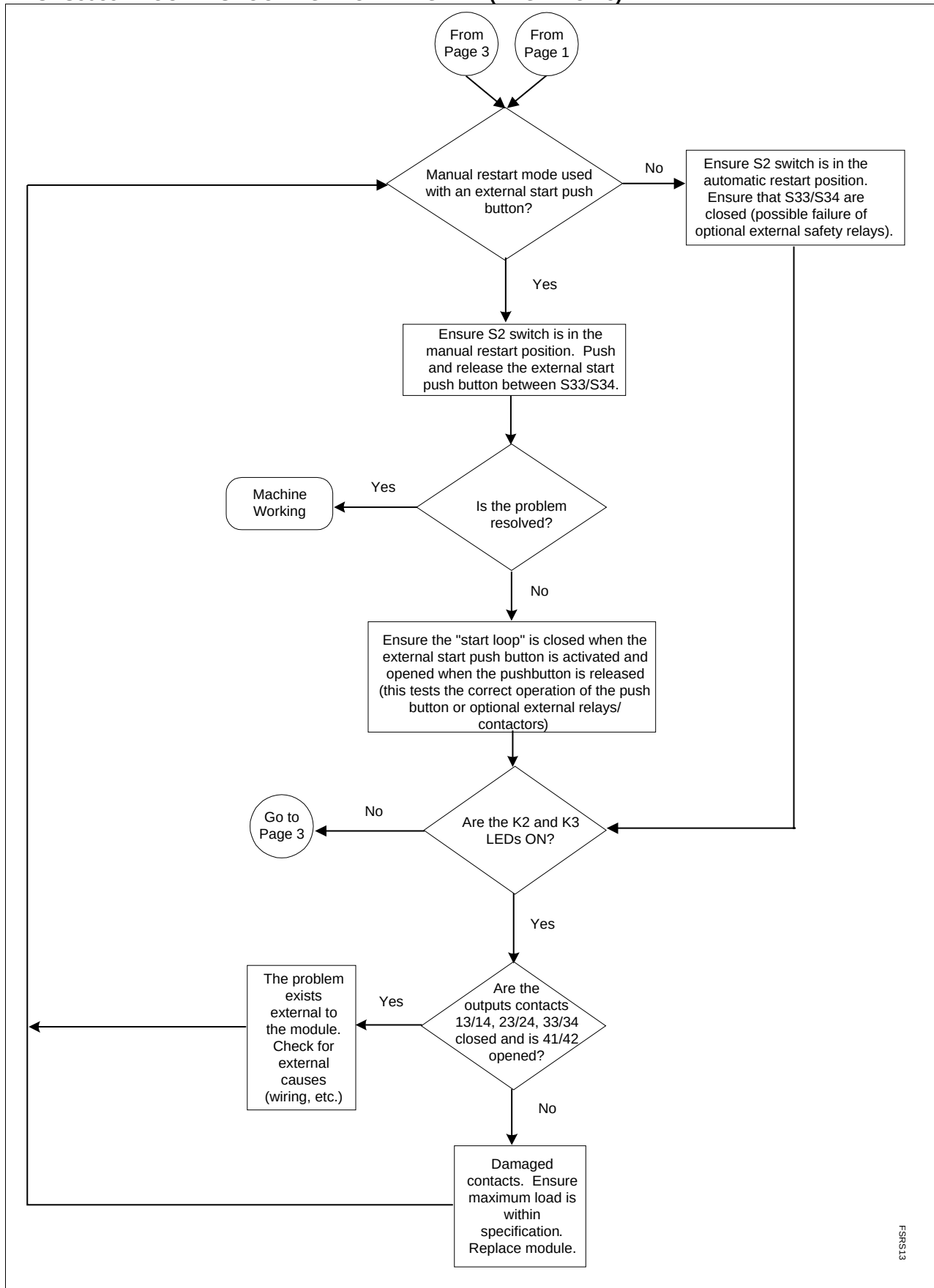
NOTICE

- The FF-SRS5935 will only restart after the two input channels have been opened and then closed (an activation). There is no timing limitation between the activations of these two safety inputs.
- In the manual start mode, closing the start push button will immediately close the normally open contacts of the safety control module and initiate a machine start cycle. The push button must be released before the next start cycle is allowed. This will prevent automatic restart in case the push button is broken in the closed position.
- If a safety control module is used in an automatic start mode, position the S2 switch to the "automatic start" mode. In addition, the start push button must be replaced by a jumper (between terminals S33/S34). If external safety relay monitoring is necessary, connect one contact of each relay required to be monitored, in series between S33/S34.

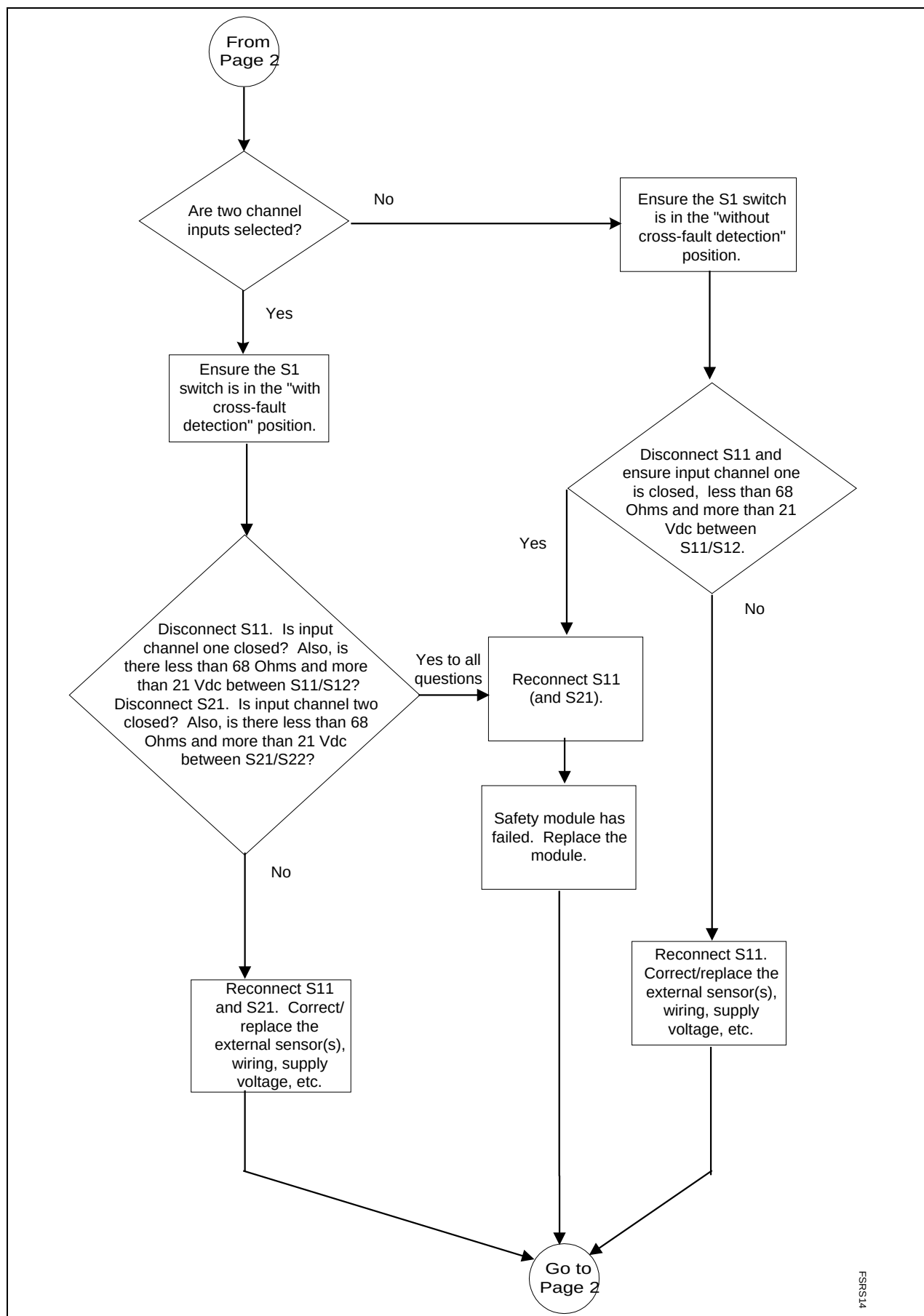
FF-SRS5935 TROUBLESHOOTING FLOW DIAGRAM (PAGE 1 OF 3)



FF-SRS5935 TROUBLESHOOTING FLOW DIAGRAM (PAGE 2 OF 3)



FF-SRS5935 TROUBLESHOOTING FLOW DIAGRAM (PAGE 3 OF 3)



WARRANTY AND REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

While we provide application assistance, personally and through our literature, it is up to the customer to determine the suitability of the product in the application.

Specifications may change at any time without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

SALES AND SERVICE

For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact a nearby sales office or call:

TELEPHONE

+ 61 (0) 2 9370 4303 Australia
1-800-737-3360 Canada
+ 33 (0) 1 60 19 80 41 France
+ 49 (0) 69 8064 444 Germany
34 91 313 61 00 Spain
1-815-235-6847 International
+ 44 (0) 161 251 4079 UK
1-800-537-6945 USA

FAX

+ 61 (0) 2 9353 7406 Australia
1-800-565-4130 Canada
+ (33) 76 41 72 56 France
+ 49 (0) 69 8064 442 Germany
34 91 313 61 29 Spain
+ 44 (0) 161 251 4141 UK
1-815-235-6545 USA

INTERNET

<http://www.honeywell.com/sensing/>
info@micro.honeywell.com

ORDER GUIDE

FF-SRS5935 ☐

Voltage:

2 = 24 V DC

E = 120 V AC

G = 230 V AC

FF-SRS5988

Dual Channel Emergency Stop Module

Instructions for use



⚠ WARNING

IMPROPER INSTALLATION

- Consult with US and/or European safety agencies and their requirements when designing a machine control, interface and all control elements that affect safety.
- Strictly adhere to all installation instructions.

Failure to comply with these instructions could result in death or serious injury.

PRODUCT DESCRIPTION

The FF-SRS5988 Emergency Stop modules are designed to be used in emergency stop circuits when danger to personnel or machinery is present. This device, offering six NO and one NC closed contact, has two internal safety relays with positive-guided contacts to ensure redundancy.

This safety control module provides an emergency stop signal to the machine control circuitry. FF-SRS5988 helps to create a control reliable safety solution by providing redundancy and self-checking circuitry. Other features include high current capability, a great number of contacts as well as an automatic or manual start mode, cross fault monitoring, and external relays monitoring.

APPROVALS

CE	The product, packaging and documentation of FF-SR Series products carry the CE mark, following the examination by BG (German Berufsgenossenschaft E+MIII). The CE declaration of conformity is available upon request.
cULus (pending)	This product is pending approval by Underwriters Laboratories Inc. according to Canadian and U.S. safety requirements.



DIRECTIVES COMPLIANCE

Machine Directive 89/392 EEC
Low Voltage Directive 73/23 EEC
Electromagnetic Compatibility Directive 89/336

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STANDARDS COMPLIANCE

Standard	Title
EN 292	Safety of Machinery - Basic Concepts, General Principles for Design
EN 60204-1	Safety of Machinery - Electrical Equipment of Machines
EN 954-1	Safety of Machinery - Safety related parts of control system
ANSI B11.1	Mechanical Power Presses
ANSI B11.2	Hydraulic Power Presses
ANSI B11.19	Safeguarding when Referenced by the Other B11 Machine Tool Safety Standards
ANSI/RIA R15.06	Safety Requirements for Industrial Robots and Robot Systems
UL508	Underwriters Laboratories

SPECIFICATIONS

Input	
Nominal voltage (Dual voltage device)	120 Vac (-20%, +10%) / 24Vdc (-10%, +20%) 230 Vac (-20%, +10%) / 24Vdc (-10%, +20%)
Nominal power consumption	DC: 3 W; AC: 6 VA
Nominal frequency	50 to 60 Hz
Start time	Manual START function: 30ms Automatic START function: 1 s
Nominal voltage at S11 at S21	24 Vdc (provided by control module) 0 V
Input current between S11/S12 and S21/S23	110 mAdc
Minimum voltage at S12/A4 and at S22/A4	21 Vdc when activated
Cable resistance between S11/S12 and S21/S23	68 Ω (max.)
Output	
Contact complement	6 NO, 1 NC contacts
Response time	Opening of inputs (S11/S12; S21/S23): 30 ms; Opening in supply circuit: 50 ms
Contact type	Safety relay, positive-guided
Switching Capability	Power factor = 1 with resistive load
Current Range (min. to max.)	1 mA to 10A (see Caution)
Voltage Range (min. to max.)	0.1 to 250 Vac/dc
Switching Capability per AC15 (EN 60 947-5-1)	NO contact: 5 A / 230 V NC contact: 2 A / 230 V
Typical Electrical Life Expectancy 3A	Power factor = 1 at 230 Vac/dc (see fig. 1, note 1)
5A	1,000,000 operations
10A	500,000 operations 220,000 operations
Typical Power Factor (cos φ)	Limitation Factor (see fig. 2, note 2)
0.3	0.45
0.5	0.70
0.7	0.85
1.0	1.00
Operating frequency	600 switching cycles/hour
Output contact fuse rating	Time delay 6 A (max.)
Mechanical life	Thirty million switching operations
General	
Temperature range	-15°C to + 55°C (5°F to 131°F) at 90% humidity (max.)
Sealing	Housing IP 40; Terminals IP 20
Housing material	Thermoplastic
Vibration resistance	Amplitude 0.35 mm; Frequency 10 to 55 Hz
Wire/connector connection	1 x 4 mm ² solid (max.) [12 AWG] or 2 x 1.5 mm ² (max.) [16 AWG] stranded wire with sleeve DIN 46288
Wire/connector attachment	Removable terminals block with M3.5 screws; wire contacts are enclosed to prevent electrical shock
Mounting	Quick install rail mounting EN 50022-35; width: 35 mm (1.38 in.)
Weight	840 g (1.85 lb.)

NOTE 1: Install arc suppression device across load to avoid module contact arcing and ensure specified relay life expectancy.

NOTE 2 Total operations = operations at power factor 1 multiplied by the limitation factor. If the power factor is 0.5 at 230 Vac, 3A (1,000,000 operations), the limitation factor is 0.70. 1,000,000 x 0.70 = 700,000 total operations.

FIG 1. CONTACT LIFE FOR 100% RESISTIVE LOAD (typical) (note 1)
power factor = 1 (cos φ)

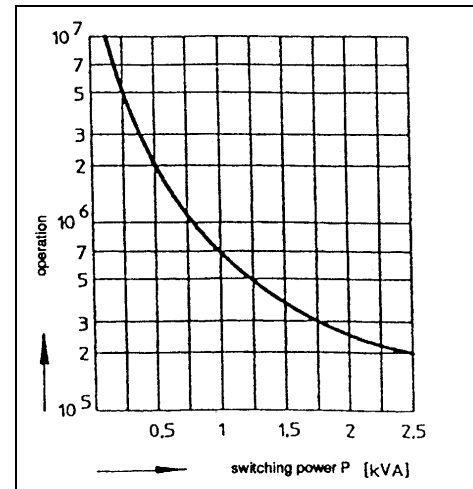
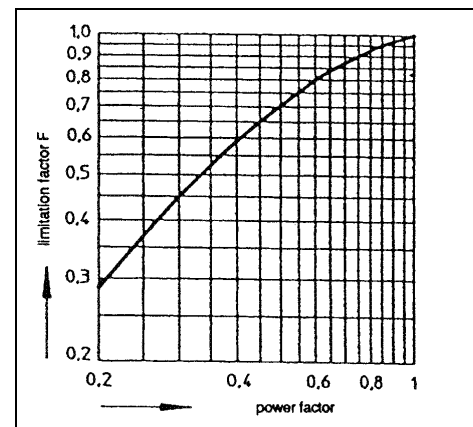


FIG 2. LIMITATION FACTOR FOR INDUCTIVE LOADS (note 2)
power factor < 1 (cos φ)



CAUTION

CONTACT DAMAGE

To ensure the 1 mA capability during the lifetime of the contact, NEVER exceed 300 mA and 60V.

Failure to comply with these instructions will result in loss of low current switching capability.

FIG 3. QUADRATIC TOTAL CURRENT LIMIT

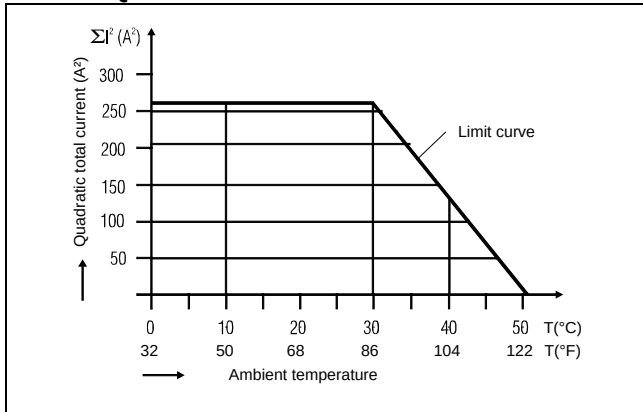


Figure 3. displays the maximal recommended external temperature versus the total load of all the safety module contacts. To use this curve, do the following:

- (1) Square the current in each contact branch, then sum all the results to obtain the vertical axis value.
- (2) Follow the horizontal line from the obtained value and note intersection of the appropriate curve.
- (3) Follow the intersection point down to determine the maximal recommended external temperature. (Ex: $\sum I^2 = 200 \text{ A}^2$ current inside safety contacts, then $T = 35^\circ\text{C}$ (95°F).

If the module is located in a higher temperature environment, the lifetime of the electronic components may be reduced. Ventilation of the cabinet may be required.

MECHANICAL INSTALLATION

The FF-SRS5988 must be installed inside a NEMA 3 (IEC IP54) rating enclosure or better. The module can be clipped easily onto a 35 mm (1.38 in.) width DIN rail (see figures 5 and 6 for installation and removal). Specific features of this product include removable terminal strips. This feature provides easy access to wiring during installation and reduces machine downtime during maintenance.

FIG 4. MOUNTING DIMENSIONS (for reference only)

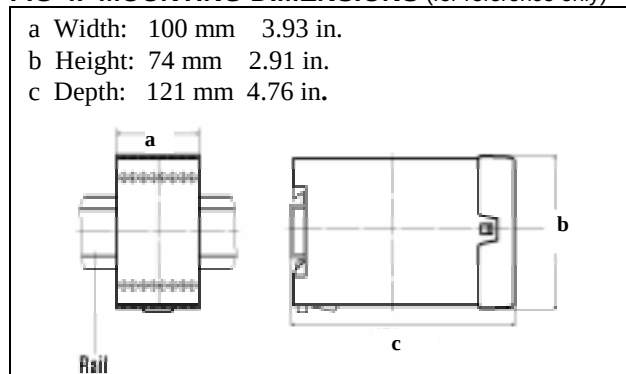


FIG 5. INSTALLATION DIAGRAM

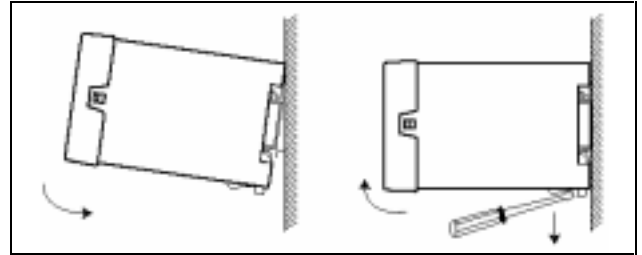
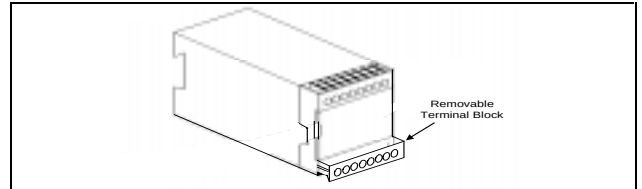


FIG 6. REMOVABLE TERMINAL BLOCKS



CONTROL RELIABILITY

“Control Reliability” means that “the device, system or interface shall be designed, constructed and installed such that a single component failure within the device, interface or system shall not prevent normal stopping action from taking place but shall prevent a successive machine cycle.” (ANSI B11.19-1990, 5.5)

OSHA 29 CFR 1910.217 states that “the control system shall be constructed so that a failure within the system does not prevent the normal stopping action from being applied to the press when required, but does prevent initiation of a successive stroke until the failure is corrected. The failure shall be detectable by a simple test, or indicated by the control system.”

SAFETY LEVEL OF INTERFACES

The safety function of the FF-SRS5988 Safety control module relies on dual channel safety inputs. Therefore this module can be used in interfaces up to Category 4 per EN 954-1 European norm.

INTERNAL DESIGN

The *internal* design of this device also meets the highest requirements (Category 4 as described in the EN 954-1 European norm).

Category 4 safety control modules are designed and manufactured in such a way that a single breakdown or an accumulation of internal failures does not lead to the loss of the safety function when a dangerous situation arises.

The FF-SRS5988 safety control modules function with dual channel redundancy and positive self-checking monitoring. This means that a faulty component in our system will make the safety control modules fail in a safe mode.

The safety function is maintained on a permanent basis.

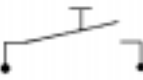
MODE SETTING

⚠ WARNING

ELECTRICAL SHOCK

- Remove power from FF-SR Series control modules and machine during installation and before setup.
- Failure to comply with these instructions could result in death or serious injury.**

This module offers the possibility to function in the automatic start mode or manual start mode. To set the desired mode of operation, insert the start push-button between terminals S33/S34 for **manual start mode** or insert a jumper between X1/X2 for **automatic start mode** to function (see table below)

Mode	Start push-button between S33/S34	Jumper between X1/X2
Manual start mode		• • not connected
Automatic start mode	• •	• — • connected

ELECTRICAL INSTALLATION

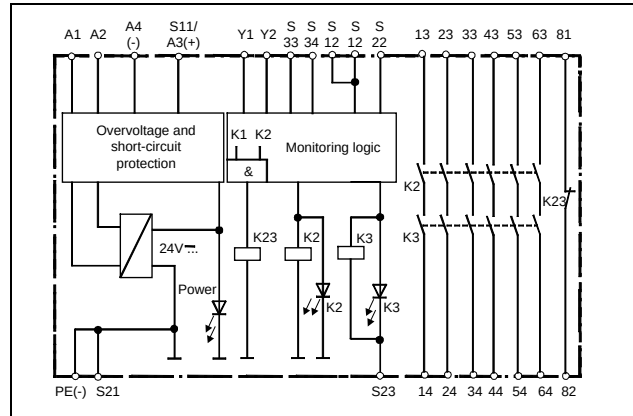
Multiple wiring configurations are possible for the FF-SRS5988 dual channel emergency stop module. General guidelines are provided because there are various ways to interface the module to machine control circuitry. Refer to the important warnings (page 6) and the application examples (pages 7 through 9).

CAUTION

SAFETY CONTROL MODULE DAMAGE

- Do not supply any current/voltage to the FF-SRS5988 safety module control inputs (S11/S12 S21/S22). These inputs receive their voltage (24 vdc under a 110 mA current) from external power via pins A1/A2 or via A3(+)/A4(-)
- Failure to comply with these instructions will result in product damage.**

FIG 7. BLOCK DIAGRAM



FUNCTIONAL DESCRIPTION

In the **manual start mode**, the module accepts input from the safety device (light curtain, safety mat, safety switches, etc.) between S11/S12 and S21/S23 after activation of the start push button between S33 and S34. The two internal safety relays (K2, K3) will then energize and the normally open safety contacts (13/14...63/64) will close and the normally closed contact (81/82) will open

In the **automatic start mode**, the module accepts immediate input from the safety device (light curtain, mat, safety switches, etc.) between S11/S12 and S21/S23 (Y1 and Y2 are jumpered if external relay monitoring is not needed). The two internal safety relays (K2, K3) will then energize and the normally open safety contacts (13/14...63/64) will close and the normally closed contact (81/82) will open.

In either mode, if the safety device is actuated (emergency stop condition occurs), the normally open contact will open immediately and the normally closed contacts will close. This emergency stop condition is relayed via the safety contacts of the module to the machine control circuitry to arrest dangerous motion and/or remove power.

NOTICE

INPUT SIGNAL SEQUENCE

- The voltage at terminal S23 must be applied before terminal S12, in order to let the automatic start function work properly.
- In the manual start mode the input signal sequence order has no impact.

EXTENSION MODULES AND EXTERNAL CONTACTORS

One or more FF-SRE3081 Extension Modules or external contactors with positively driven contacts can be used to multiply the number of contacts of the FF-SRS5988 Emergency Stop Module. If multiple safety contacts are used in parallel with one load, the maximum allowed current can be increased.

For connection of the FF-SRE 3081 to the FF-SRS 5988 module, see the Installation Instructions for the FF-SRE 3081 Extension Module.

⚠ WARNING

CONTACT MULTIPLICATION VIA EXTERNAL RELAYS

- If contact multiplication via external safety relays (or the FF-SRE3081 Extension module) is necessary, connect one normally closed contact of each relay (or 81/82 of the Extension module) in series into the Final Switching device monitoring loop (terminals Y1/Y2).

Failure to comply with this instruction could result in death or serious injury.

LED INDICATORS

The FF-SRS5988 module has three green LED status indicators (Power, K2 and K3) as illustrated below.

The Power LED indicates power is applied to the safety control module. Illuminated K2 and/or K3 LED's indicate(s) that the corresponding internal safety relay is energized. Both K2 and K3 relays must be energized to have the normally open contacts 13/14...63/64 in a closed position. If one of the safety relays de-energizes, the normally closed contact will close.

FIG 8. MODULE FRONT PANEL

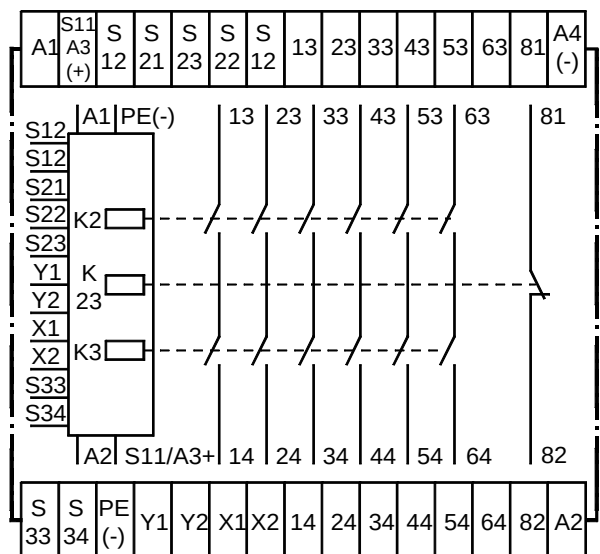
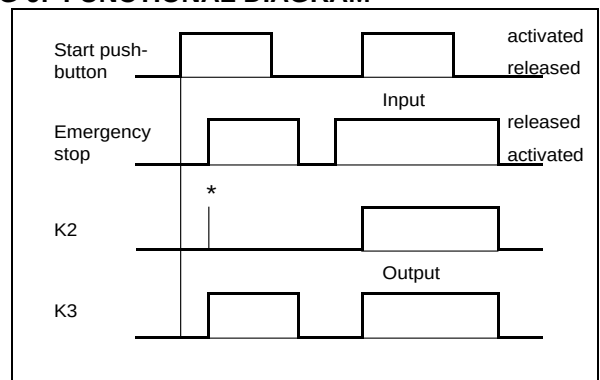


FIG 9. FUNCTIONAL DIAGRAM



*** Line fault Detection on Start push-button:**

If the start push button is closed before voltage is applied to S12 and S23 the safety contacts of the module cannot close.

This additional feature ensures the detection of a line fault via the start push-button or a blocked start push button. In case of a push-button failure the module can not be restarted.

In order to let the line fault detection work properly, the internal safety relays should have been de-energised for at least 10 seconds before.

APPLICATION WARNINGS

WARNING

IMPROPER INPUT CONNECTIONS

- To ensure the highest level of safety, connect two safety device outputs into the two input channels of the FF-SRS5988 safety module. Then, a cross fault between the two channels will shut down the module.
- If the safety device provides one safety output only (e.g., a switch driven by a direct acting mechanism like some GK, GSS, CLS or Emergency Stop push buttons), connect the FF-SRS5988 module as shown in the single input channel example. To avoid any short circuit possibilities on this single input channel, use conduit to protect wiring and additional protection for the terminal strips inside the machine cabinets.
- The cable resistance between S11/S12 or S21/S23 should not exceed 68Ω and the voltage between S12/A4 and S22/A4 should not be lower than 21Vdc.

IMPROPER EMERGENCY STOP CONNECTION

- To ensure maximum safety, connect two normally closed contacts of the Emergency Stop into the input channel of the FF-SRS5988 module.

IMPROPER AUTOMATIC START MODE IN PERIMETER GUARDING APPLICATIONS

- If the module is in the automatic start mode, another part of the safety control circuitry must keep the latched function engaged.

IMPROPER PUSH BUTTON USE (MANUAL START MODE)

- To ensure maximum safety when using an external start push button, always design the circuitry for manual start mode (see Mode Setting, page 4).
- Ensure the location of the manual start function is outside of the danger zone and provides the operator with a clear view of the zone.
- For perimeter guarding solutions, the operator should not be able to reach manual start from the danger zone.
- A Programmable Logic Controller (PLC) must NOT be able to override a manual start function.

CONTACT WELDING

- Always protect all safety contacts with correctly rated fuses. These fuses must never exceed the rated FF-SRS5988 safety output capability to prevent contact welding.

IMPROPER EXTERNAL SAFETY RELAY MONITORING

- When using additional safety relays (or the FF-SRE Extension module), always connect one normally closed contact of each relay in series (or 81/82) inside the Final Switching Device (FSD) monitoring loop circuit (Y1/Y2). This connection will ensure correct operation of the external relays or the Extension module after each FF-SRS5988 activation.
- If the FF-SRS5988 is not activated often, the customer is responsible for accomplishing any additional test procedures of the external safety components. For instance, this testing can be done by removing the power from the FF-SRS5988 at machine power up every day.

IMPROPER ARC SUPPRESSOR INSTALLATION

- NEVER install an arc suppressor across the safety output contact of the safety control module.
- ALWAYS install arc suppressors across the coils of external safety relays.

IMPROPER DOOR MONITORING

- If two safety switches are used to monitor a door's closed position, connect one safety contact of the first switch between input S11/S12 and one safety contact of the second switch between S21/S23 of the FF-SRS 5988 Emergency stop module.

IMPROPER SYSTEM SAFETY LEVEL

- Several safety components can be connected to a FF-SRS5988 control module. If more than one safety output is connected to one of the two input channels of the control module, always connect these safety outputs in series. Parallel wiring of multiple outputs into a single channel can defeat the channel and cause an unsafe condition.
- Individually activate and check all of the safety devices connected to a FF-SRS5988 control module to ensure proper operation.

IMPROPER EMERGENCY STOP PUSH BUTTON

- The Emergency Stop push button must be designed according to European (EN 418) and US safety standards (NFPA 19). Under any condition, the Emergency Stop switch must be able to open its contacts when activated.

LONGER RESPONSE TIME

- The FF-SRS5988 module will have a longer response time (when the emergency push button is activated) if the emergency stop push button is connected in series with the power supply of the module. However, connecting the emergency stop push button to the safety input channels will result in a shorter response time.

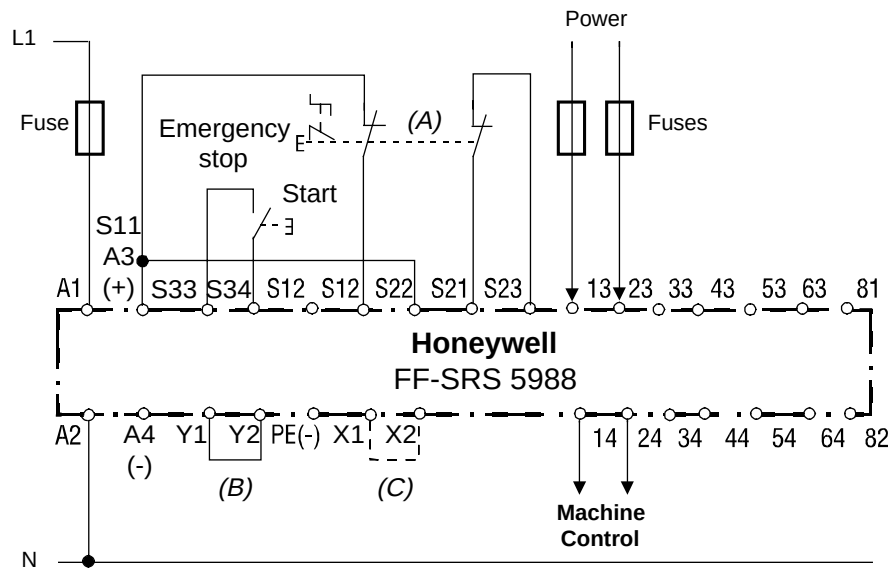
IMPROPER USE OF THE NORMALLY CLOSED OUTPUT CONTACT

- Use the normally closed output contact (81/82) for monitoring purpose only.
- Do not use this 81/82 contact in the safety control circuitry of the machine.

Failure to comply with these instructions could result in death or serious injury.

APPLICATION EXAMPLES

FIG 10. DUAL CHANNEL EMERGENCY STOP CIRCUITRY (WITH CROSS-FAULT MONITORING)



This circuit has redundancy in the emergency-stop control circuit and therefore offers the highest possible safety level.

FUNCTIONAL DESCRIPTION:

After activation of the Emergency-stop push button, the K1 and K2 LED's will turn OFF, indicating that the two internal safety relays K1 and K2 are de-energized. The normally open safety outputs 13/14... 63/64 will open.

There exist two different start modes:

Manual start mode

1. After removing the stop condition, press and release the START push button to restart the safety control module.
2. The K2 and K3 LED's will turn ON indicating that the safety relays K2 and K3 are energized. The six normally open safety contacts will close and the normally closed monitoring contact will open allowing the machine to operate.

Automatic start mode

1. After removing the stop condition, the safety control module will reset within 1 sec.

The K2 and K3 LED's will turn ON indicating that the safety relays K2 and K3 are energized. The six normally open safety contacts will close and the normally closed monitoring contact will open allowing the machine to operate.

APPLICATION NOTES:

NOTE (A): Dual channel safety devices:

This may be an emergency stop push button in series with dual output safety switching devices (OSSD) such as

- safety light curtains (FF-SB, FF-LS),
- safety mat (FF-SM),
- single beam (FF-SPS), modular safety light curtains (FF-SC),
- safety laser scanner (FF-SE),
- dual output safety limit or interlock switches (for example, 2CLS and GK, see fig. 12).

NOTE (B): Y1 and Y2 are jumpered if no external contactors have to be monitored

NOTE (C): Start mode:

Manual start mode: Insert start push-button between S33/S34; no jumper must be set between X1/X2

Automatic start mode: Insert jumper between X1/X2

⚠ WARNING

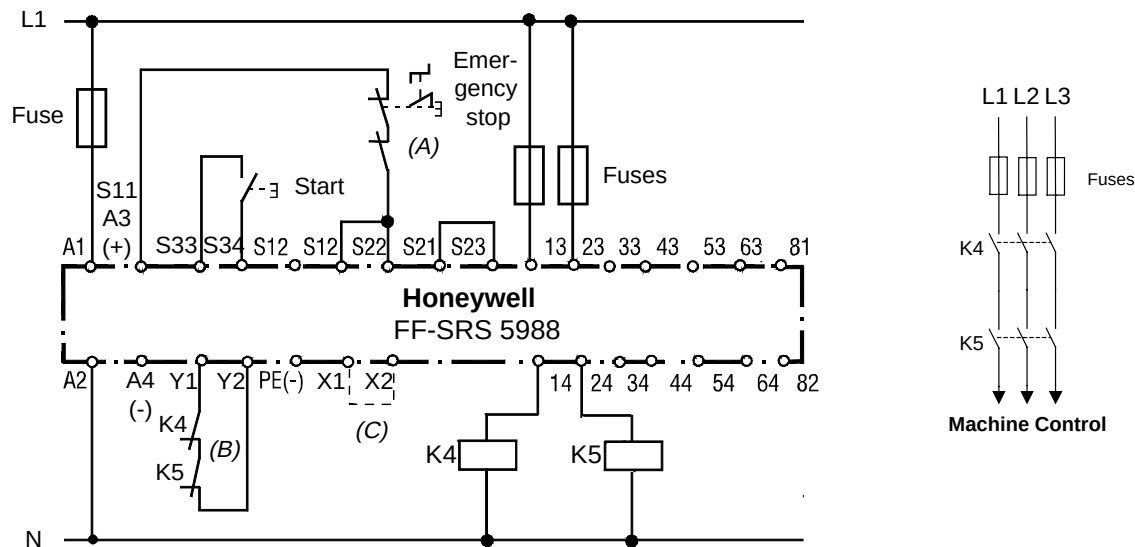
IMPROPER AUTOMATIC START MODE IN PERIMETER GUARDING APPLICATIONS

- If the module is in the automatic start mode, another part of the safety control circuitry must keep the latched function engaged.

Failure to comply with these instructions could result in death or serious injury.

APPLICATION EXAMPLES (continued)

FIG 11. SINGLE CHANNEL EMERGENCY STOP CIRCUITRY (WITH EXTERNAL CONTACTORS)



This circuit has no redundancy in the emergency-stop control circuit and therefore offers a minor safety level only.

CONTACT REINFORCEMENT VIA EXTERNAL CONTACTORS:

With switching current >10 A, the output contacts should be reinforced by external contactors (K4 and K5) with positive-guided contacts. (see *note (B)*)

1. After activation of the E-stop push button, the two K2 and K3 LED's will turn OFF, indicating that the two internal safety relays K2 and K3 are de-energized. The normally open safety outputs 13/14..63/64 will open and de-energize the external contactors K4 and K5. The normally closed monitoring output will also close.
2. After removing the stop condition, press and release the START push button to restart the safety control module. If the two contactors K4 and K5 are working properly, the K2 and K3 LED's will turn ON indicating that the safety relays K2 and K3 are energized. The six normally open safety contacts will close and the normally closed monitoring contacts will open allowing the machine to operate.

APPLICATION NOTES:

Note (A): SINGLE CHANNEL SAFETY DEVICES:

This may be a single output safety device such as a safety limit or interlock switch (for example: CLS, GK and GSS).

Note (B): EXTERNAL CONTACTORS:

If contact reinforcement via external safety relays is necessary, the output contacts should be reinforced by external safety relays. The proper operation of the external contactors must be monitored by looping the NC contacts into the Final Switching Device (FSD) monitoring loop between terminals Y1/Y2.

Note (C): START MODE:

Manual start mode: Insert start push-button between S33/S34; no jumper must be set between X1/X2

Automatic start mode: Insert jumper between X1/X2

⚠ WARNING

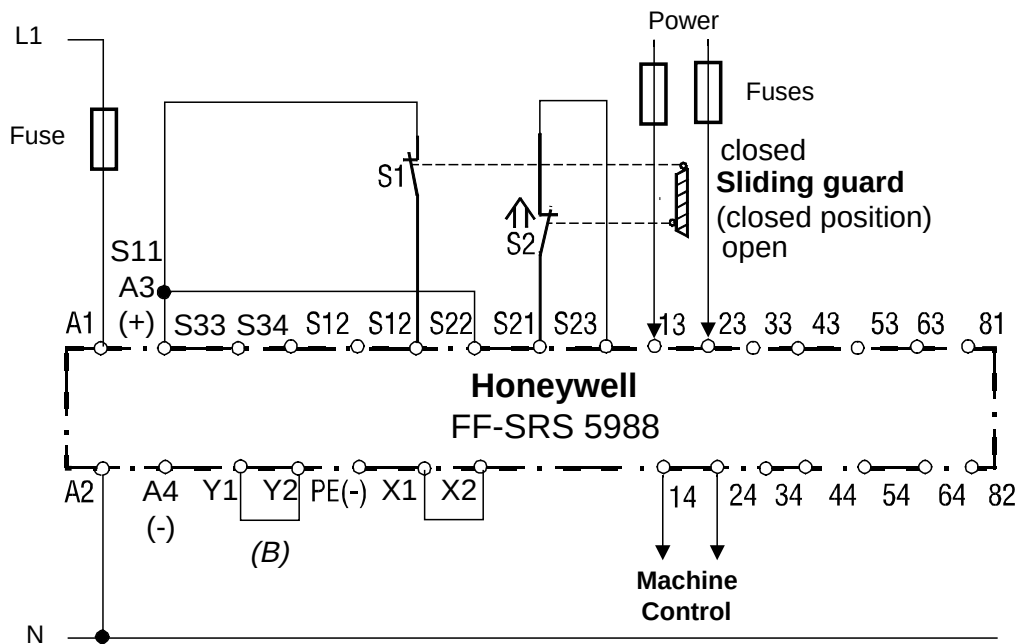
CONTACT MULTIPLICATION VIA EXTERNAL RELAYS

- If contact multiplication via external safety relays (or the FF-SRE3081 Extension module) is necessary, connect one normally closed contact of each relay (or 81/82) in series into the Final Switching Device monitoring loop (terminals Y1/Y2).
- Use two independent stop circuit safety relays with mechanically linked contacts to reliably detect a welded contact.

Failure to comply with these instructions could result in death or serious injury.

APPLICATION EXAMPLES (continued)

FIG. 12.: DUAL-CHANNEL SAFETY DOOR MONITORING
(WITH CROSS-FAULT MONITORING, AUTOMATIC START MODE)



GENERAL DESCRIPTION OF SAFETY DOOR APPLICATIONS

Protective gates are designed to limit or block access to the moving parts of dangerous machinery. These gates can be equipped with locking or interlocking devices, usually safety limit switches or any other safety sensors/switches.

The FF-SRS5988 Emergency Stop module monitors the status of these safety sensor positions. When the protective gate is open, the initiation of dangerous motion is prevented. When the door is closed again, the next machine cycle can start, but only after initiating a manual restart sequence.

FUNCTIONAL DESCRIPTION

After opening the door, the two external safety switch contacts S1 and S2 will open (as illustrated above) and the two internal safety relays K2 and K3 will de-energize. The normally open safety outputs 13/14.. 63/64 will open relaying the stop condition to the machine control circuitry. After closing the door, S1 and S2 close and the internal relays K2 and K3 will energize. The six normally open safety contacts will close and an external manual restart sequence may then be initiated (allowing the machine to operate).

IMPORTANT NOTICES

NOTICE

SAFETY LIMIT SWITCH SEQUENCE

- In order to let the module restart automatically, safety limit switch S1 must not close before switch S2. The FF-SRS5988 will only restart after the two input channels have been opened and then closed (an activation).
- In the manual start mode the safety limit switch sequence has no impact.
- In the manual start mode, closing the start push button will immediately close the normally open contacts of the safety control module and initiate a machine start cycle. The push button must be released before the next start cycle is allowed. This will prevent automatic start in case the push button is broken in the closed position.
- The cable resistance between S11/S12 and S21/S23 must be less than 68Ω (ohms) for correct operation of the safety control module.
- A minimum of 21 vdc must be present between each channel input (S11/S12 and S21/S23) to ensure the correct detection of sensor(s) outputs status.

FIG. 13. FF-SRS5988 TROUBLESHOOTING FLOW DIAGRAM (PAGE 1 OF 3)

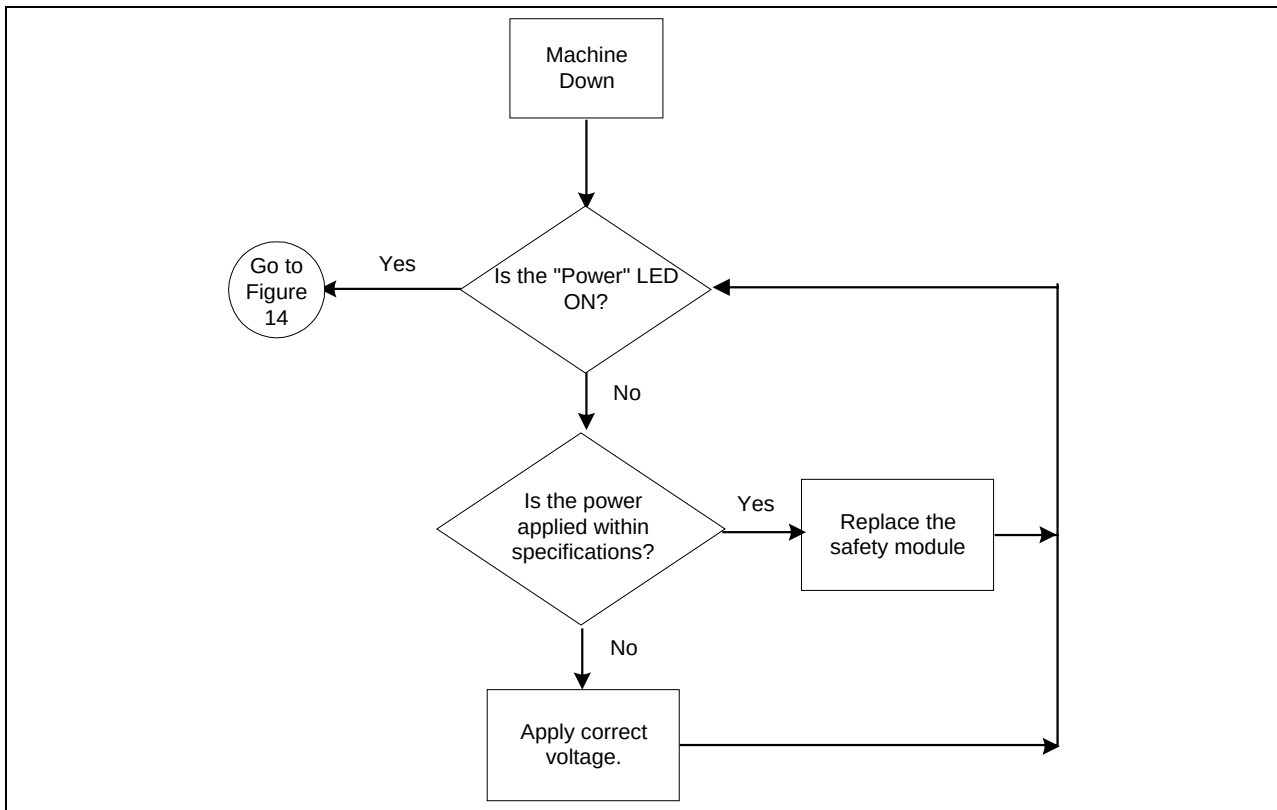


FIG. 14. FF-SRS5988 TROUBLESHOOTING FLOW DIAGRAM (PAGE 2 OF 3)

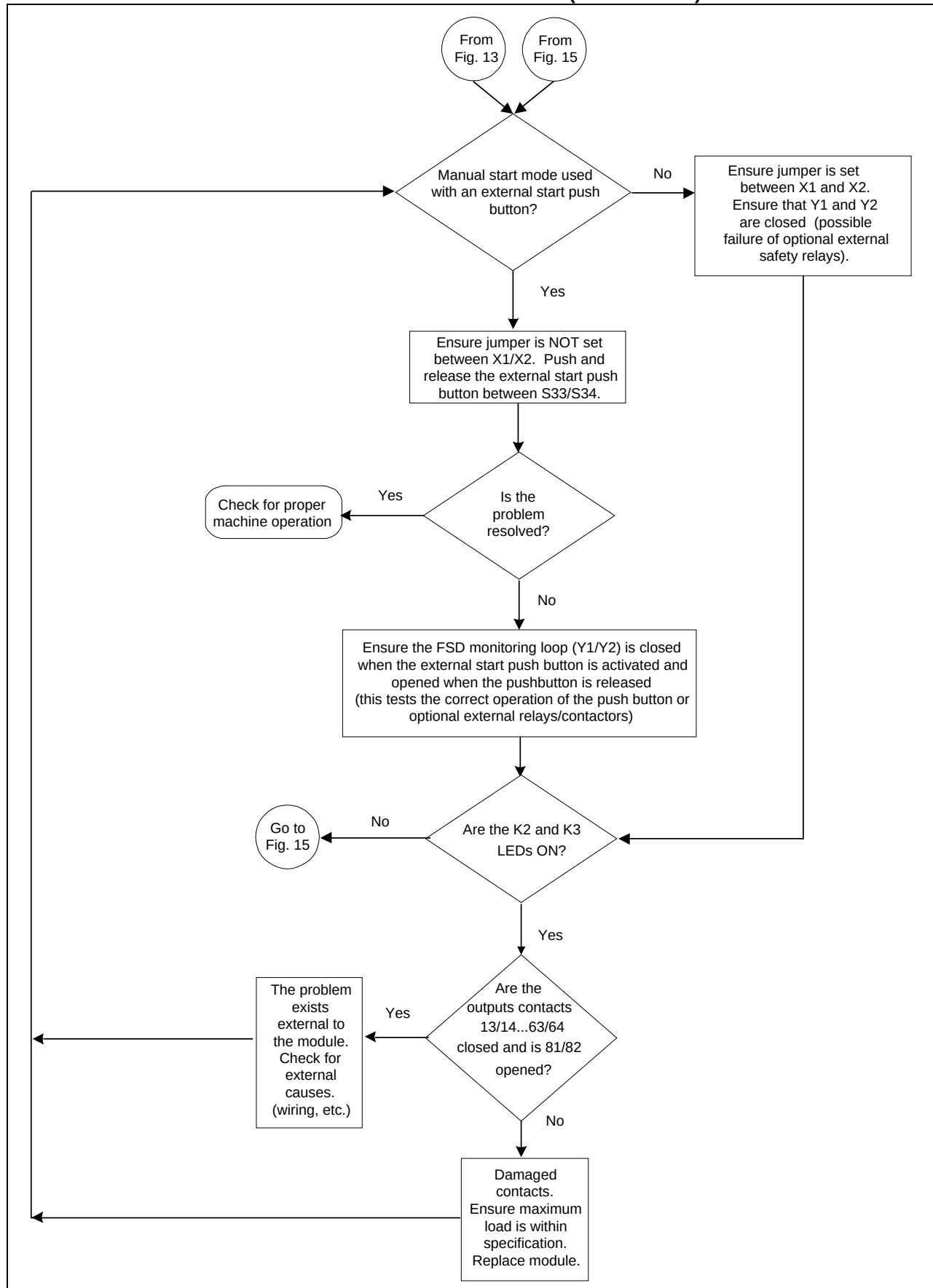
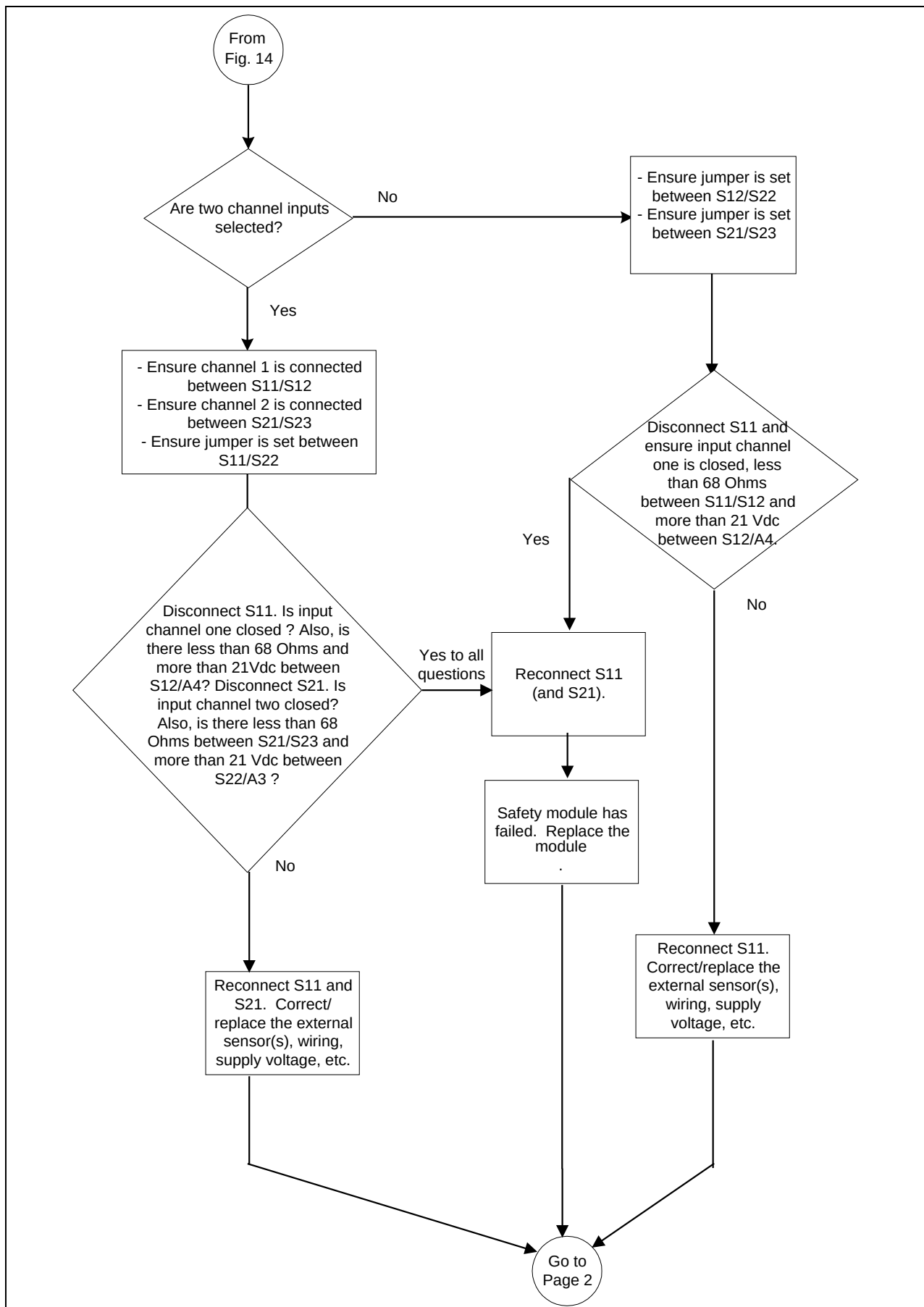


FIG. 15. FF-SRS5988 TROUBLESHOOTING FLOW DIAGRAM (PAGE 3 OF 3)



WARRANTY AND REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

While we provide application assistance, personally and through our literature and the Honeywell Website, it is up to the customer to determine the suitability of the product in the application.

Specifications may change at any time without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

SALES AND SERVICE

For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact a nearby sales office or call:

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+ 33 (0) 4 76 41 7200 France
+ 49 (0) 69 8064 444 Germany
1-815-235-6847 International
+ 44 (0) 161 251 4079 UK
1-800-537-6945 USA

FAX

+ (33) 76 41 72 56 France
1-815-235-6545 USA

INTERNET

<http://www.honeywell.com/sensing/>
info@micro.honeywell.com

ORDER GUIDE

FF-SRS 5988 □



P= 120Vac / 24Vdc
R = 230Vac / 24Vdc

Installation Instructions for the FF-SRT Time Delay Module

0217359

Issue 1

PK 107019-01



⚠ WARNING

IMPROPER INSTALLATION

- Consult with US and/or European safety agencies and their requirements when designing a machine control, interface and all control elements that affect safety.
 - Strictly adhere to all installation instructions.
- Failure to comply with these instructions could result in death or serious injury.**

PRODUCT DESCRIPTION

The FF-SRT Time Delay module provides a time delay before a safety interface circuit is opened safely.

If a two-channel version is used, the output contacts of the two time delay circuits are connected in series. This device has two safety relays with positive-guided contacts to ensure redundancy.

When the displayed time has elapsed, the safety contacts within the module open safely, even if one of the other contacts is welded.

For example, this module may be used with an emergency stop module. The emergency stop module will immediately forward the emergency stop condition to the machine control circuitry. The time delay module can be used to keep some non-safety related machinery operating (door locked) for a short period of time to avoid an unsafe condition or simplify the machine startup cycle.

APPROVALS

CE	The product, packaging and documentation of FF-SR Series products carry the CE mark; the CE declaration of conformity is available upon request.



DIRECTIVES COMPLIANCE

Machine Directive 89/392 EEC
Low Voltage Directive 73/23 EEC
Electromagnetic Compatibility Directive 89/336

REGULATIONS COMPLIANCE

Regulation	Title
OSHA 29 CFR 1910.212	General Requirements for (guarding of) All Machines
OSHA 29 CFR 1910.217	(Guarding of) Mechanical Power Presses

STANDARDS COMPLIANCE

Standard	Title
ANSI B11.1	Mechanical Power Presses
ANSI B11.2	Hydraulic Power Presses
ANSI B11.19	Safeguarding when Referenced by the Other B11 Machine Tool Safety Standards
ANSI/RIA R15.06	Safety Requirements for Industrial Robots and Robot Systems
UL508	Underwriters Laboratories
EN 292	Safety of Machinery - Basic Concepts, General Principles for Design
EN 60204	Safety of Machinery - Electrical Equipment of Machines
EN 954	Safety of Machinery - Safety related parts of control system

SPECIFICATIONS

General technical data	
Available time ranges	Adjustable 1 channel: SRT ___ 1R: 0,3 to 1 sec; 0,3 to 3 sec; 0,5 to 5 sec, 1 to 10 sec; 3 to 30 sec. Fixed, 1 channel : SRT ___ 1F: 1; 3; 5, 10 and 30 sec. Adjustable 2 channels: SRT ___ 2R: 0,5 - 5 sec, 1 - 10 sec. Fixed, 2 channels: SRT ___ 2F: 5, 10 sec.
Repeatability precision	±15 % from selected value
Input	
Nominal voltage	120 VAC (-15%, +10%), 230 VAC (-20%, +10%), 24 VDC (-10%, +20%)
Nominal consumption	Channel one model: 0.85 W, 4.5 VA; Channel two model: 1.7 W, 4.5 VA
Nominal frequency	50/60 Hz
Output	
Contact complement	1 NO, 1 NC contacts
Contact type	Safety relay, positive-guided
Switching Capability Current Range (min. to max.) Voltage Range (min. to max.)	Power factor = 1 with resistive load 30 mA to 8A
DC	10 to 110 VDC
AC	10 to 250 VAC
Typical Electrical Life Expectancy	Power factor = 1 at 230 VAC/DC (note 1) 2A 300,000 operations 5A 150,000 operations 8A 100,000 operations
Typical Power Factor (cos ϕ)	Limitation Factor (note 2) 0.3 0.45 0.5 0.70 0.7 0.85 1.0 1.00
Operating frequency	2000 switching cycles/hour (max.)
Fuse rating	6 A gL (max.)
Mechanical life	Ten million switching operations
General	
Temperature range	-20°C to + 60°C (-4°F to 140°F) at max. 90% humidity
Sealing	Housing IP 40; Terminals IP 20
Housing material	Thermoplastic
Vibration resistance	Amplitude 0,35 mm; Frequency 10 to 55 Hz
Conductor connection	2 x 2,5 mm ² [14 AWG] solid (max.) or 2 x 1.5 mm ² [16 AWG] (max.) stranded wire with sleeve DIN 46288
Conductor attachment	Flat terminal according to DIN 46206 and DIN 57609/VDE
Mounting	Quick install rail mounting DIN EN 50022-35
Weight	200 g (0.44 lb.) for VDC 350 g (0.77 lb.) for VAC

NOTE 1: Install arc suppression device across load to avoid module contact arcing and ensure specified relay life expectancy.

NOTE 2: Total operations = Operations at power factor 1 multiplied by the limitation factor. If the power factor is 0.5 at 230 VAC, 2A (300,000 operations), the limitation factor is 0.70. 300,000 x 0.70 = 210,000 total operations.

FIG 1. CONTACT LIFE FOR 100% RESISTIVE LOAD (typical) (note 1)
power factor = 1 (cos ϕ)

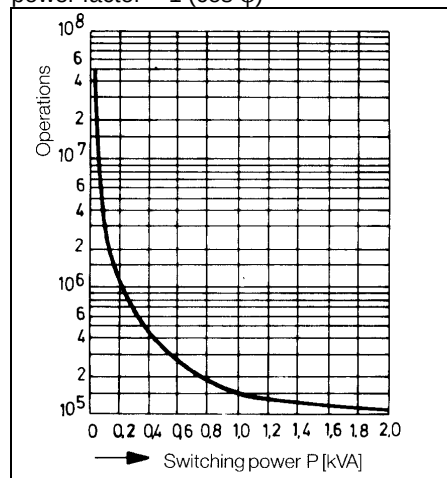
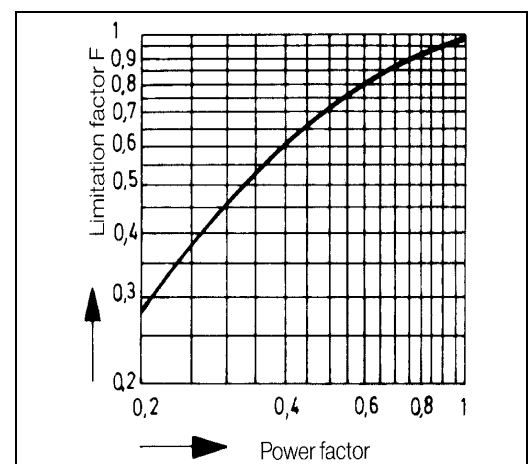


FIG 2. LIMITATION FACTOR FOR INDUCTIVE LOADS (note 2)
power factor < 1 (cos ϕ)



MECHANICAL INSTALLATION

The FF-SRT must be installed inside a NEMA 3 (IEC IP54) rating enclosure or better. The module can be clipped easily onto a 45mm width DIN rail (see figures 3 and 4 below for installation and removal).

FIG 3. MOUNTING DIMENSIONS
(for reference only)

- a Width: 45 mm 1.77 in.
- b Height: 74 mm 2.91 in.
- c Depth: 121 mm 4.76 in.

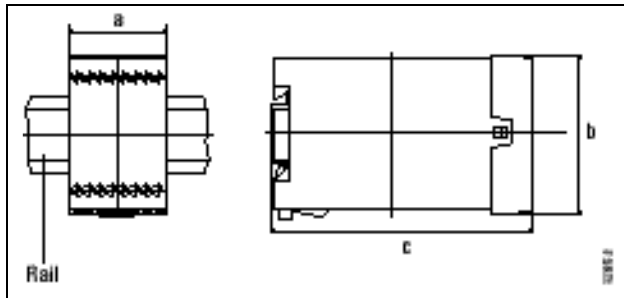
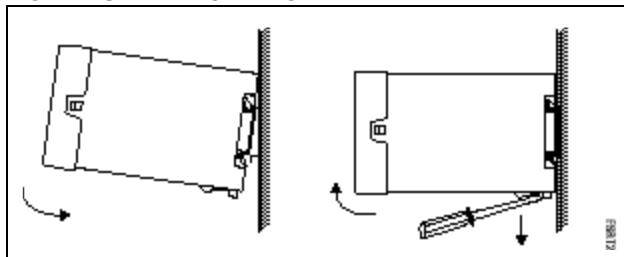


FIG 4. INSTALLATION DIAGRAM

**CONTROL RELIABILITY**

"Control Reliability" means that "the device, system or interface shall be designed, constructed and installed such that a single component failure within the device, interface or system shall not prevent normal stopping action from taking place but shall prevent a successive machine cycle." (ANSI B11.19-1990, 5.5)

OSHA 29 CFR 1910.217 states that "the control system shall be constructed so that a failure within the system does not prevent the normal stopping action from being applied to the press when required, but does prevent initiation of a successive stroke until the failure is corrected. The failure shall be detectable by a simple test, or indicated by the control system."

Honeywell uses self-checking techniques which combine reliability with safety. This means that a faulty component in our system will make the safety control modules fail in a safe mode.

Use the two channel time delay module if dual internal channel redundancy and self checking are required for the application.

ELECTRICAL INSTALLATION**⚠ WARNING****ELECTRICAL SHOCK**

Remove power from FF-SR Series control modules and machine during installation.

Failure to comply with these instructions could result in death or serious injury.

Multiple wiring configurations are possible for the FF-SRT time delay module. General guidelines are provided because there are various ways to interface the module to machine control circuitry. Refer to the important warnings (page 4) and the application example (page 6).

FUNCTIONAL DESCRIPTION

When power is applied to the module (A1/A2), the normally closed contact (15/16) will open immediately and the normally open contact (27/28) will close.

After power is removed from the module (A1/A2), the normally closed contact (15/16) will close and the normally open contact (27/28) will open after the fixed or set time has elapsed.

One or more FF-SRE3081 Extension Modules or external contactors with positively driven contacts can be used to multiply the number of contacts of the FF-SRT Time delay Module. If multiple safety contacts are used in parallel with one load, the maximum admissible current can be increased.

FIG 5. FUNCTIONAL DIAGRAM

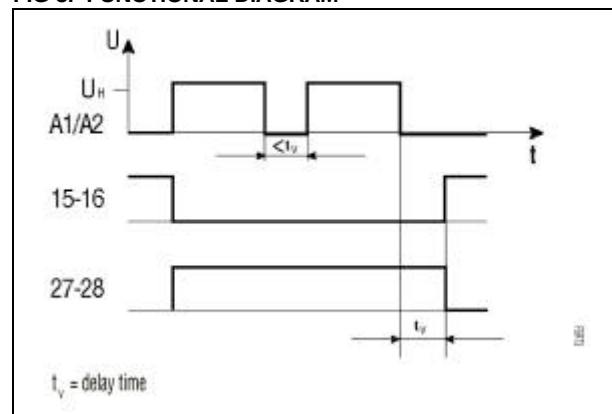
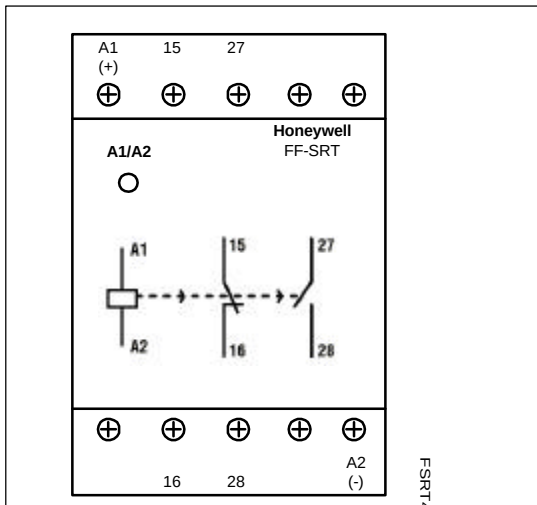
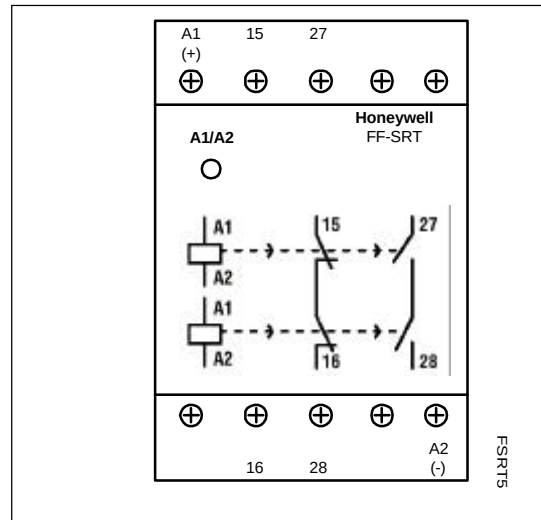


FIG 6. MODULE FRONT PANELS

ONE CHANNEL



TWO CHANNELS



APPLICATION WARNINGS

⚠ WARNING**IMPROPER TIME DELAY USE**

- Always use time delay module connected to non safety related machine operation and use safety control modules as e-stop, door, two-hand control to immediately stop dangerous motion.
- Never use a time delay when the machine reaction time is not consistent in this case use a standstill monitor control module FF-SR05936.
- The FF-SRT module time delay value must be selected or adjusted to be greater than the time necessary to stop the hazardous machine motion for both regular and emergency stop conditions (includes power removal).

CONTACT WELDING

- Always protect all safety contacts with correctly rated fuses. These fuses must never exceed the rated FF-SRT safety output capability to prevent contact welding.

IMPROPER EXTERNAL SAFETY RELAY MONITORING

- When using additional safety relays, always connect one normally closed contact of each relay in series inside the Final Switching Device (FSD) monitoring loop circuit (Y1/Y2). This connection will ensure correct operation of the external relays after each FF-SRT activation.

IMPROPER ARC SUPPRESSOR INSTALLATION

- Never install an arc suppressor across the safety output contact of the safety control module.
- Always install arc suppressors across the coils of external safety relays.

Failure to comply with these instructions could result in death or serious injury.

DOOR PROTECTION USING GKL/GKR KEY OPERATED SOLENOID INTERLOCK SWITCH (MECHANICAL LATCH) AND FF-SRT TIME DELAY MODULE (refer to application example)

Start Sequence

Initially, the motor is not operating and the door is open. To initiate the start sequence, close the door. This action will close the two normally closed contacts (SW2 - 21/SW2 - 22, SW2 - 13/SW2 - 14) of the key portion of the key operated interlock switch.

To lock the door, press the Lock Door push button. This action will energize the external safety relays K1 and K2 and lock the door.

To reset the emergency stop module and verify that K1, K2, K4, K5 and K6 are operating correctly, press the Start push button. This action will cause the normally open safety outputs (13/14, 23/24, 33/34) of the FF-SRS5935 safety module to close. The motor may now be started.

To start the motor, press the On Motor push button. This action will energize the self maintained safety relays K4 and K5 and allow the motor to start.

Stop Sequence

Initially, the motor is operating and the door is closed and locked. To initiate the stop sequence, press the Off Motor push button. This action will de-energize the external safety relays K4 and K5 and immediately stop the motor. The external safety relays K1 and K2 will also de-energize and allow the FF-SRT time delay module (de-energize) to initiate the selected elapsed time sequence. At the end of this elapsed time, the normally closed contact 15/16 will close. This action will allow the door to be unlocked.

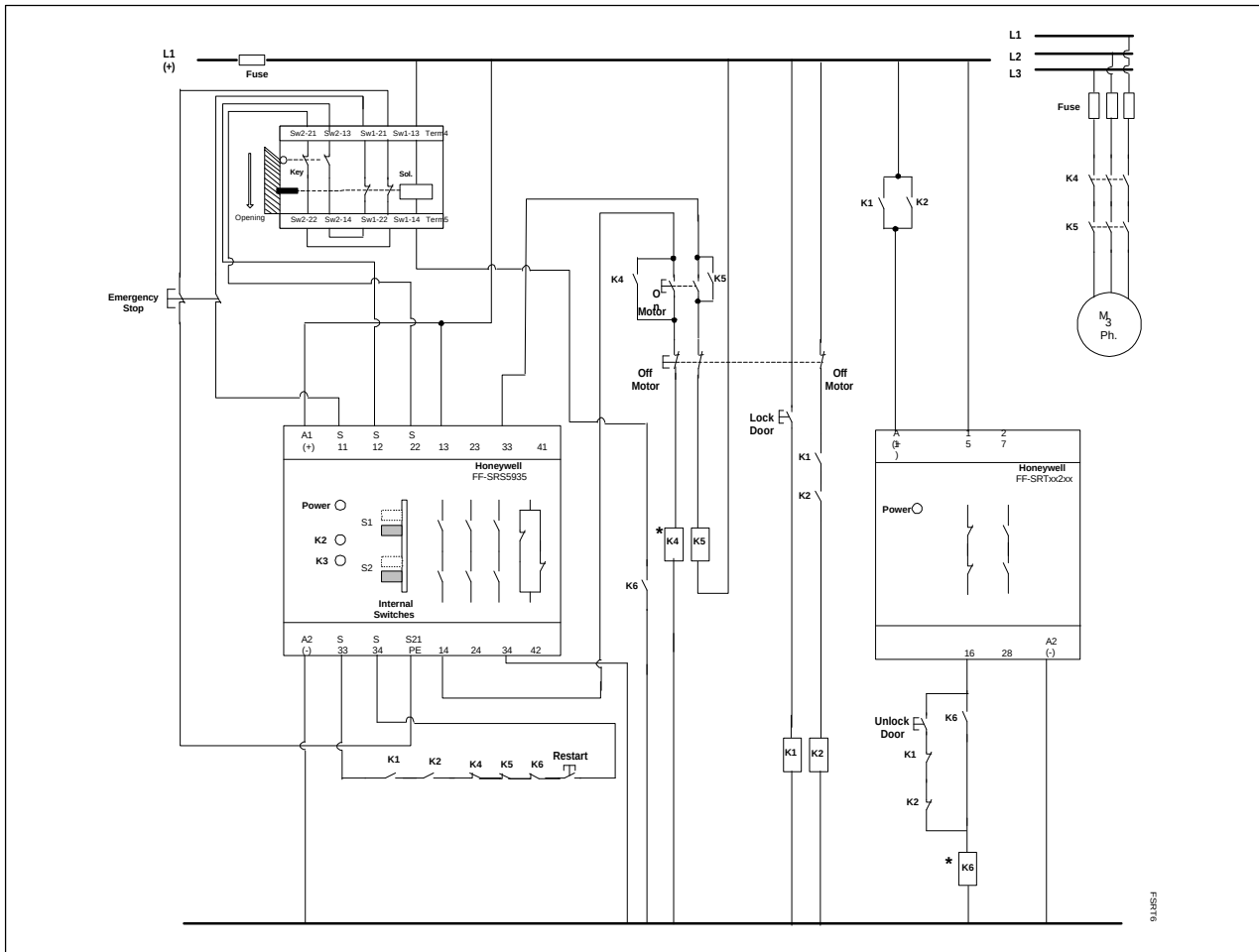
To unlock the door, press the Unlock Door push button. This action will verify that the external safety relays K1 and K2 are operating correctly and then energize the external safety relay K6. The solenoid coil of the key operated interlock switch will now activate and unlock the door. At the same time this action will open the two channel inputs of the FF-SRS5935 emergency stop control module. The door can now be opened safely. No hazardous motor motion is present.

Emergency-stop Sequence

In case of an emergency stop situation, the two channel inputs of the FF-SRS5935 emergency stop control module will open. This action de-energize the external safety relays K4 and K5, stopping the motor. To unlock the door, it will be necessary to press the Off Motor push button even if the motor is completely stopped. All other steps remain the same as described above (Stop Sequence).

APPLICATION EXAMPLE

DOOR PROTECTION USING SOLENOID KEY OPERATING SWITCH (MECHANICAL LATCH) AND FF-SRT TIME DELAY MODULE

**WARNING****IMPROPER TIME DELAY USE**

- Always use time delay module connected to non safety related machine operation and use safety control modules as e-stop, door, two-hand control to immediately stop dangerous motion.
- Never use a time delay when the machine reaction time is not consistent in this case use a standstill monitor control module FF-SR05936.
- The FF-SRT module time delay value must be selected or adjusted to be greater than the time necessary to stop the hazardous machine motion for both regular and emergency stop conditions (includes power removal).

Failure to comply with these instructions could result in death or serious injury.

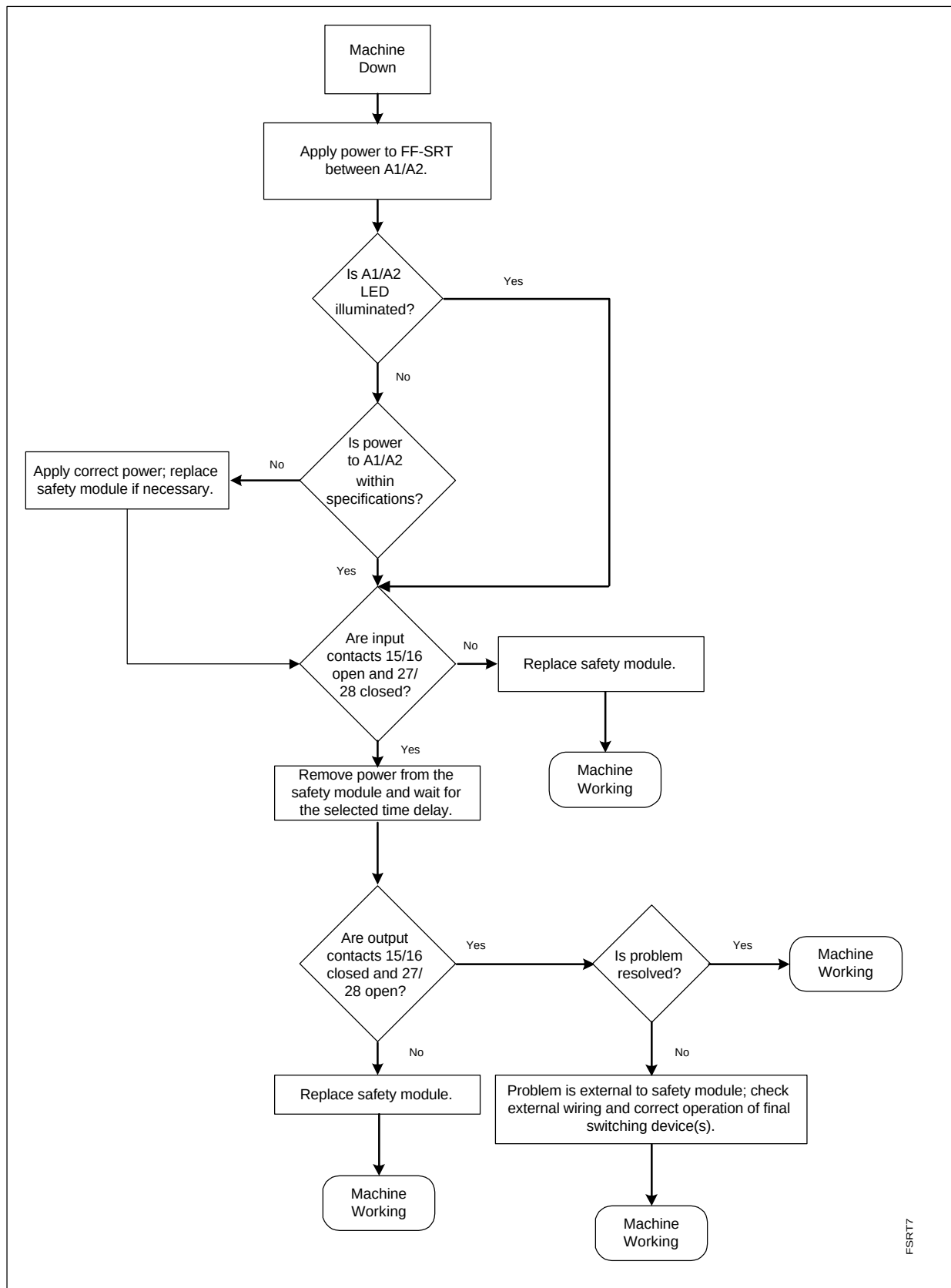
CAUTION**MODULE CONTACTS DAMAGE**

Use arc suppressors across the coil of the safety relays K1, K2, K4, K5 and K6 to increase the life of the modules.
Failure to comply with these instructions will result in product damage.

NOTICE

The cable resistance between S11-S12 and S21-S22 of the FF-SRS5935 e-stop module must be less than 68 Ohms for correct operation of the module.

FF-SRT TROUBLESHOOTING FLOW DIAGRAM



FSRT7

WARRANTY AND REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

While we provide application assistance, personally and through our literature, it is up to the customer to determine the suitability of the product in the application.

Specifications may change at any time without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

SALES AND SERVICE

For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact a nearby sales office or call:

TELEPHONE

1-800-737-3360 Canada
+ 33 (0) 4 76 41 7200 France
+ 49 (0) 69 8064 444 Germany
1-815-235-6847 International
+ 44 (0) 161 251 4079 UK
1-800-537-6945 USA

FAX

+ (33) 76 41 72 56 France
1-815-235-6545 USA

INTERNET

<http://www.honeywell.com/sensing/>
info@micro.honeywell.com

ORDER GUIDE

FF-SRT	☐	☐	☐	☐
				Voltage: 2 = 24 DC E = 120 VAC G = 230 VAC
				R : Time adjustable F : Time fixed
				Number of channels: 1 = 1 Channel 2 = 2 Channels (24 V DC only)
				Max delay time: 01: 1 s 03: 3 s 05: 5 s 10: 10 s 30: 30 s

Honeywell

Honeywell Cométa
European Photoelectric Center
21, Chemin du Vieux Chêne
38243 Meylan Cedex - FRANCE

Installation Instructions for the FF-SRS5939 Interface Control Module for Safety Light Curtains



PK 107033-EN

⚠ WARNING

IMPROPER INSTALLATION

- Consult with US and/or European safety agencies and their requirements when designing a machine control, interface and all control elements that affect safety.
 - The FF-SRS5939 interface control module is designed to be used with Honeywell electrosensitive protective equipment using fail-safe solid state outputs. These equipment perform cross-fault detection between their outputs. The FF-SRS5939 module does not perform the cross-fault detection between its inputs. To ensure the highest safety category, do NOT use the FF-SRS5939 with any other equipment. For electrosensitive protective equipment equipped with relay outputs, use the FF-SRS5935 or FF-SRS5925 dual channel emergency stop module, and for the electromechanical safety switches, use the FF-SRD5985 door monitoring module. These three modules perform the cross-fault detection between their inputs.
 - Strictly adhere to all installation instructions.
- Failure to comply with these instructions could result in death or serious injury.**

PRODUCT DESCRIPTION

The FF-SRS5939 interface control module is designed to be used in emergency stop circuits when danger to personnel or machinery is present. This device has two internal safety relays with positive-guided contacts to ensure redundancy.

This safety module provides an emergency stop signal to the machine control circuitry. FF-SRS5939 helps to create a control reliable safety solution by providing redundancy and self-checking circuitry. Other features include high current capability, an automatic start and manual start mode and external relays monitoring.

APPROVALS

CE	The product, packaging and documentation of FF-SR Series products is pending CE mark following an examination by BG (German Berufsgenossenschaft E+MIII)
cULus (pending)	This product is pending approval by Underwriters Laboratories Inc. according to Canadian and U.S. safety requirements.



DIRECTIVES COMPLIANCE

Machine Directive 98/37/EEC
Low Voltage Directive 73/23 EEC
Electromagnetic Compatibility Directive 89/336

REGULATIONS COMPLIANCE

Regulation	Title
OSHA 29 CFR 1910.212	General Requirements for (guarding of) All Machines
OSHA 29 CFR 1910.217	(Guarding of) Mechanical Power Presses

STANDARDS COMPLIANCE

Standard	Title
EN 292	Safety of Machinery - Basic Concepts, General Principles for Design
EN 60204 - 1	Safety of Machinery - Electrical Equipment of Machines
EN 954 - 1	Safety of Machinery - Safety related parts of control system
EN 61496 - 1	Safety of Machinery- ElectroSensitive Protective Equipment.
UL508	Underwriters Laboratories
ANSI B11.1	Mechanical Power Presses
ANSI B11.2	Hydraulic Power Presses
ANSI B11.19	Safeguarding when Referenced by the Other B11 Machine Tool Safety Standards
ANSI/RIA R15.06	Safety Requirements for Industrial Robots and Robot Systems

SPECIFICATIONS

Supply Voltage			
Nominal voltage (A1/A2)	24 Vdc (-15%, +15%)		
Power consumption	3.5 W		
Fuse protection	315 mA, time delayed (see fig. 7 for location)		
Restart Functions			
Restart push-button input (S33/S34)	for the connection of a NO contact, 0.1s to 1.5s closing time, permanent short-circuit detection, 20 Vdc min. voltage (without pressing the push-button), 10 mA/24Vdc min. current, 470Ω max. cable resistance		
Restart mode input (X1/X3)	for setting the manual or automatic restart mode, voltage presence		
Restart time	100 ms after the ESPE inputs are energized (automatic restart mode) or push-button release (manual restart mode)		
FSD Monitoring Loop			
FSD contacts input (Y1/Y2)	for the connection in series of the FSDs NC contacts (FSDs reaction time : 250 ms), permanent short-circuit detection, 20 Vdc min. voltage, 30 mA/24Vdc min. current , 150Ω max. cable resistance		
FSD monitoring input (X1/X2)	for setting the FSD monitoring loop, voltage presence		
ESPE inputs			
Input current	30 mA / 24Vdc (when relays are energized); 5mA / 24 Vdc (when relays are deenergized)		
Input voltage	19 to 27.6 Vdc		
Protection	reversed polarity, over-voltages up to 32 Vdc		
Outputs			
Contacts available	2 NO, 1 NC (2 safety relays with guided contacts)		
Response time	15 ms max. (see timing diagrams)		
Start time at power up	100 ms (automatic restart mode)		
Current Range	1 mA min., 6A max. (see caution)		
Voltage Range	0.1 Vac/dc min., 250 Vac/dc max.		
Switching Capability per AC15 (EN 60947-5-1)	NO contact: 3 A / 230 Vac NC contact: 2A / 230 Vac		
Typical electrical life expectancy on 100 % resistive load (see fig.1, note 3)	1A	2,000,000 AC	400,000 DC
	3A	500,000 AC	300,000 DC
	5A	300,000 AC	200,000 DC
	6A	200,000 AC	150,000 DC
Typical Power Factor /AC voltage (see fig. 2, note 2)	Limitation Factor : 0.45 (cos φ = 0.3), 0.70 (cos φ = 0.5), 0.85 (cos φ = 0.7), 1.00 (cos φ = 1.0)		
Operating frequency	1200 switching cycles/h (max.)		
External fuse rating	6 A max. time delayed		
Mechanical life	10 million switching operations		
Environmental Specifications			
Temperature range	Operation : 0 to 55°C (32 to 131°F) / Storage : -20 to 70°C (-4 to 170°F), at 90% humidity max.		
Sealing	Housing IP 40; Terminals IP 20 (need to be installed in an IP54 enclosure)		
Housing material	Thermoplastic		
Vibration resistance	Amplitude 0.35 mm (0.014 in.); Frequency 10 to 55 Hz		
Connection	Removable terminal strips, one Ø2.5 mm ² (14 AWG) or two Ø1.5 mm ² (16 AWG) stranded wires per terminal		
Mounting	Quick install rail mounting EN 50022-35, 35 x 15 mm (1.38 x 0.59 in.) size		
Weight	280 g (0.61 lb.)		

NOTE 1: Install arc suppression device across loads to avoid module contact arcing and ensure specified relay life expectancy.

NOTE 2 Total operations = operations at power factor 1 multiplied by the limitation factor. If the power factor is 0.5 at 230 Vac, 3A (500,000 operations), the limitation factor is 0.70. and the number of operations is 500,000 x 0.70 = 350,000.

FIG. 1. CONTACT LIFE FOR 100% RESISTIVE LOAD / AC VOLTAGE (typical) (note 1)
power factor = 1 (cos φ)

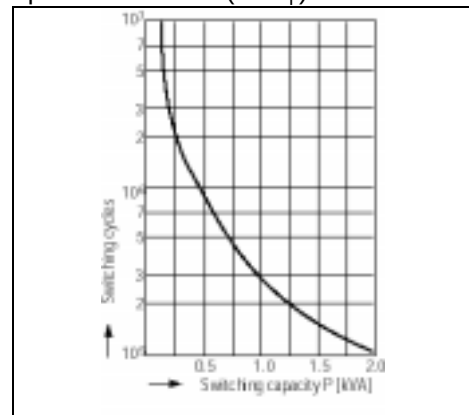
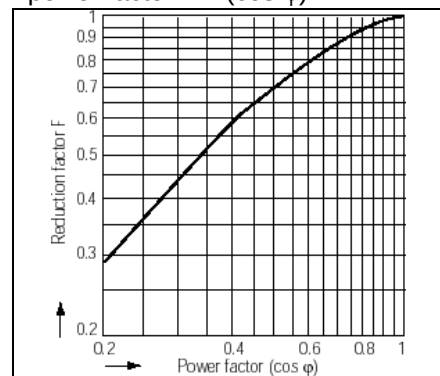


FIG. 2. LIMITATION FACTOR FOR INDUCTIVE LOADS / AC VOLTAGE (note 2)
power factor < 1 (cos φ)



CAUTION CONTACT DAMAGE

To ensure the 1 mA capability during the lifetime of the contact, **NEVER** exceed 300 mA and 60 V.

FIG. 3. TOTAL CURRENT LIMIT

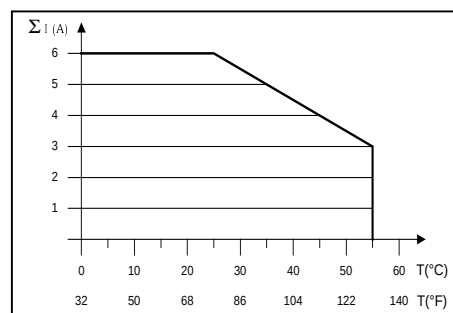


Figure 3. displays the maximal recommended external temperature versus the total load of all the control module contacts. To use this curve, do the following:

- (1) Sum all the current in each contact branch to obtain the vertical axis value.
- (2) Follow the horizontal line from the obtained value and note intersection of the appropriate curve.
- (3) Follow the intersection point down to determine the maximal recommended external temperature. (Ex: $\sum I = 5 \text{ A}$ current inside safety contacts, then $T = 35 \text{ }^{\circ}\text{C} / 95 \text{ }^{\circ}\text{F}$).

If the module is located in a higher temperature environment, the lifetime of the electronic components may be reduced. Ventilation of the cabinet may be required.

MECHANICAL INSTALLATION

The FF-SRS5939 must be installed inside a IP54 / NEMA 3 rating enclosure or better. The module can be clipped easily onto a 45 mm width EN 50022-35 rail (see figures 4 and 5 for installation and removal). Specific features of this product include removable terminal strips. This feature provides easy access to wiring during installation and reduces machine downtime during maintenance.

FIG. 4. MOUNTING DIMENSIONS (for reference only)

- a Width: 45 mm 1.77 in.
- b Height: 74 mm 2.91 in.
- c depth: 121 mm 4.76 in.

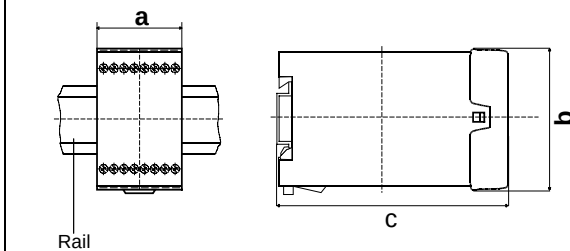


FIG. 5. INSTALLATION DIAGRAM

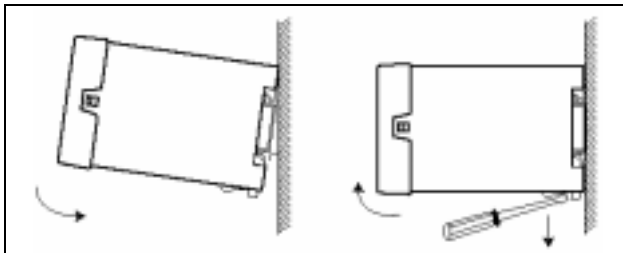


FIG. 6. REMOVABLE COVER PANEL AND TERMINAL BLOCKS

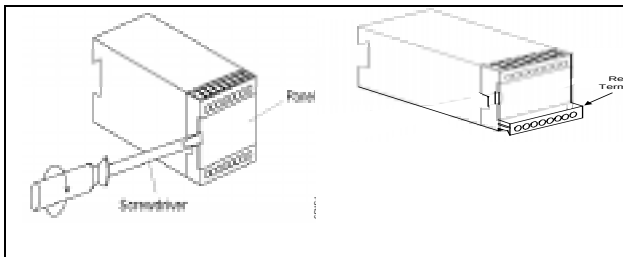
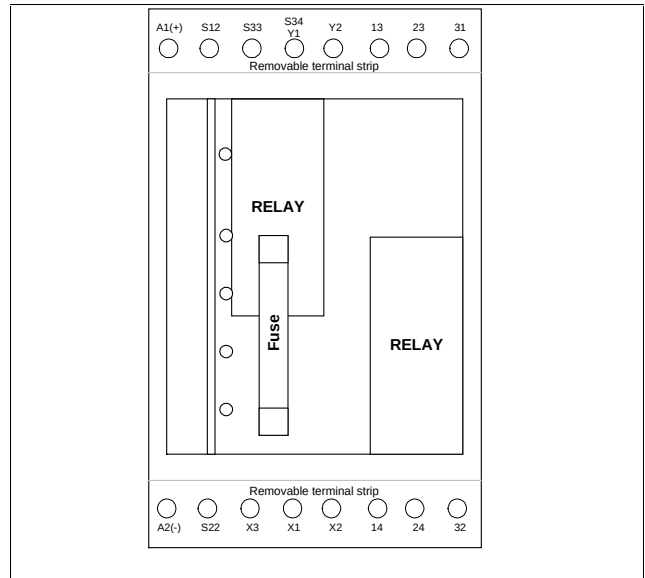


FIG. 7. FUSE LOCATION



REPLACING FUSE

This internal fuse will protect the control module against overvoltage. To replace it, remove the front cover as describe in fig.6. Replace the fuse and install back the protective cover.

EUROPEAN REGULATION

The internal design meets the highest requirements (Category 4 as described in the EN 954-1 European norm). Category 4 control modules are designed and manufactured in such a way that a single breakdown or an accumulation of failures does not lead to the loss of the safety function when a dangerous situation arises. **The safety function is maintained on a permanent basis.**

The FF-SRS5939 control module functions with dual channel redundancy and positive self-checking monitoring. This means that a faulty component in our system will make the safety control module fail in a safe mode.

CONTROL RELIABILITY (US REGULATION)

“Control Reliability” means that “the device, system or interface shall be designed, constructed and installed such that a single component failure within the device, interface or system shall not prevent normal stopping action from taking place but shall prevent a successive machine cycle.” (ANSI B11.19-1990, 5.5)

OSHA 29 CFR 1910.217 states that “the control system shall be constructed so that a failure within the system does not prevent the normal stopping action from being applied to the press when required, but does prevent initiation of a successive stroke until the failure is corrected. The failure shall be detectable by a simple test, or indicated by the control system.”

MODE SETTING

⚠ WARNING**ELECTRICAL SHOCK**

Remove power from FF-SR Series control modules and machine during installation and before setup.

Failure to comply with these instructions could result in death or serious injury.

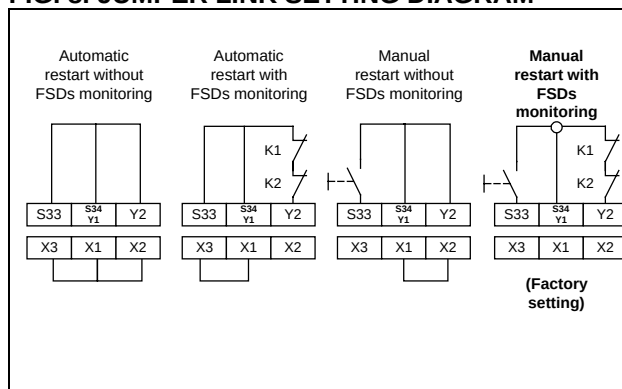
To set the desired mode of operation, some external jumper links may have to be wired on the lower removable terminal block. Refer to the module serigraphy for jumper links setting options (see figure 8). Set jumper links as required.

External jumper links may be set between terminals X1, X2 and X3 to set various modes of operation. This feature ensures application flexibility.

Terminals X1 and X3 are used to select **automatic** or **manual restart**. No jumper link shall be set between terminals X1 and X3 when a push-button is connected between terminals S33 and S34 for the manual restart mode. Jumper links must be wired between terminals S33 and S34 and between terminals X1 and X3 for the automatic restart mode.

Terminals X1 and X2 are used to select or not the FSD monitoring function. Jumper links must be wired between terminals Y1 and Y2 and between terminals X1 and X2 if the FSD monitoring is not required. No jumper link shall be set between terminals X1 and X2 when the FSDs Normally Closed contacts are connected in series between terminals Y1 and Y2 if the FSD monitoring is required.

FIG. 8. JUMPER LINK SETTING DIAGRAM

**ELECTRICAL INSTALLATION**

Multiple wiring configurations are possible for the FF-SRS5939 interface control module. General guidelines are provided because there are various ways to interface the module to machine control circuitry. **Refer to the important warnings (page 6)** and the application examples (pages 7 through 8).

CAUTION**SAFETY CONTROL MODULE DAMAGE**

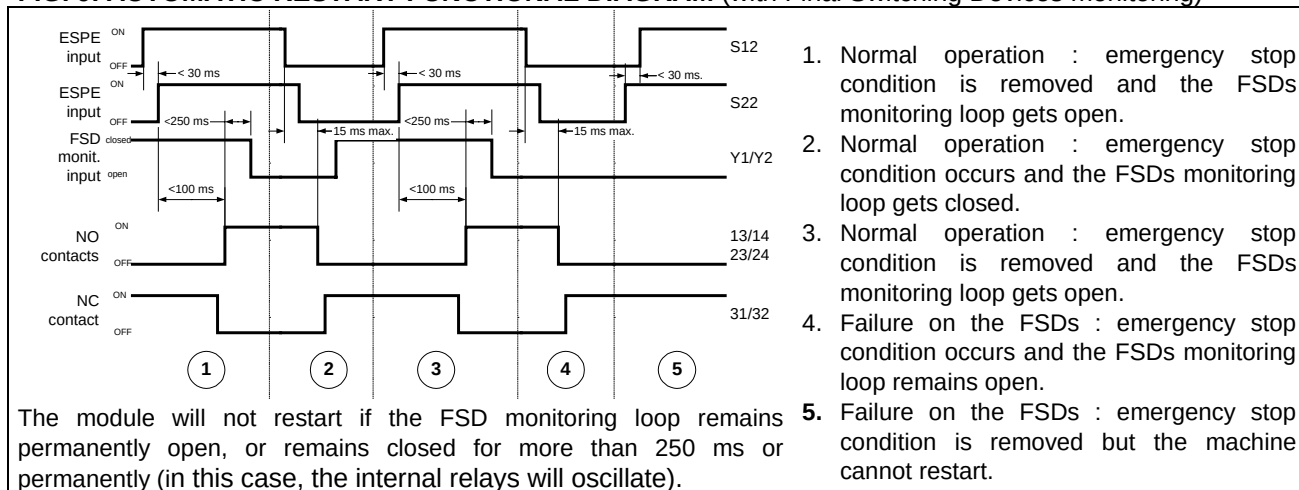
Supply the FF-SRS5939 safety module inputs with the specified input current/voltage (see Specifications table on page 2).

Failure to comply with these instructions may result in product damage.

FUNCTIONAL DESCRIPTION

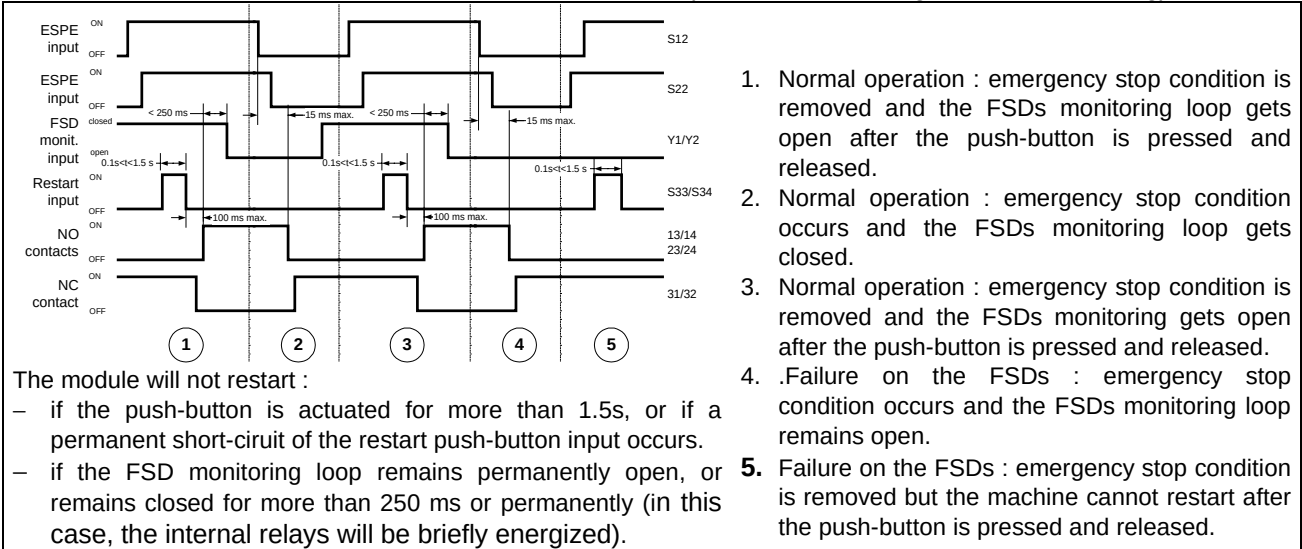
In the **automatic restart mode**, the Normally Open contacts (13/14, 23/24) will close and the Normally Closed contact (31/32) will open 100 ms after the closing of the 2 Electrosensitive Protective Equipment outputs, provided **these signals are coincident** and the FSDs reaction time is within the specification (if the FSD monitoring loop is set). The ESPE signals are considered to be coincident when both outputs switch on within a 30 ms time frame.

FIG. 9. AUTOMATIC RESTART FUNCTIONAL DIAGRAM (with Final Switching Devices monitoring)



In the **manual restart mode**, the Normally Open contacts (13/14, 23/24) will close and the Normally Closed contact (31/32) will open 100 ms after releasing the push-button, provided the 2 Electrosensitive Protective Equipment signals are available and the FSDs monitoring loop is closed (if the FSD monitoring loop is set).

FIG. 10. MANUAL RESTART FUNCTIONAL DIAGRAM (with Final Switching Devices monitoring)



MODULE INPUTS S12/S22

The S12 and S22 input signals respectively energize the internal relays K1 and K2. In the automatic restart mode, the module checks that both input signals switch ON simultaneously within a 30 ms time frame. If a permanent short-circuit occurs on one of the module input (S12 for example), the corresponding internal relay (K1) will remain energized whatever happen. As soon as the ESPE is actuated, this failure leads to the immediate stoppage of the machine. This fault condition is cancelled if the input signals switch OFF.

WARNING

IMPROPER USE OF THE RELAY OUTPUT CONTACTS

Always connect 2 contacts out of the 3 contacts delivered by the FF-SRS5939 to the machine control circuitry.

Failure to comply with these instructions could result in death or serious injury.

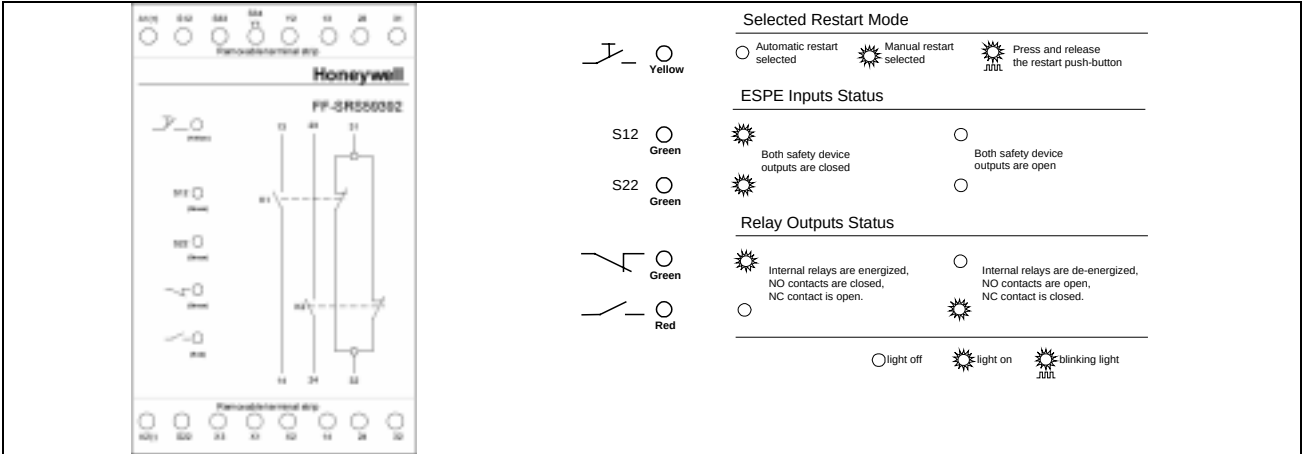
EXTENSION MODULES AND EXTERNAL CONTACTORS

One or more FF-SRE3081 Extension modules or external contactors with positively driven contacts can be used to multiply the number of contacts of the FF-SRS5939 interface control module. If multiple safety contacts are used in parallel with one load, the maximum admissible current can be increased. For connection of the FF-SRE 3081 to the FF-SRS 5939 module, see the Installation Instructions for the FF-SRE 3081 Extension Module.

LED INDICATORS

The FF-SRS5939 module has five LED status indicators as illustrated below.

FIG. 11. MODULE FRONT PANEL



APPLICATION WARNINGS

⚠ WARNING**IMPROPER INPUT CONNECTIONS**

- The FF-SRS5939 interface control module is designed to be used with Honeywell electrosensitive protective equipment using fail-safe solid state outputs. These equipment perform cross-fault detection between their outputs. The FF-SRS5939 module does not perform the cross-fault detection between its inputs. To ensure the highest safety category, do NOT use the FF-SRS5939 with any other equipment. For electrosensitive protective equipment equipped with relay outputs, use the FF-SRS5935 or FF-SRS5925 dual channel emergency stop module, and for the electromechanical safety switches, use the FF-SRD5985 door monitoring module. These three modules perform the cross-fault detection between their inputs.

IMPROPER EMERGENCY STOP CONNECTION

- To ensure the highest level of safety, connect the two fail-safe solid state outputs of a single safety device onto the two input channels of the FF-SRS5939 safety module.

IMPROPER AUTOMATIC START MODE IN PERIMETER GUARDING APPLICATIONS

- If the module is in the automatic start mode, another part of the safety control circuitry must keep the latched function engaged.

IMPROPER PUSH BUTTON USE (MANUAL START MODE)

- To ensure maximum safety when using an external start push button, always design the circuitry for manual start mode (see Mode Setting, page 4).
- Ensure the location of the manual start function is outside of the danger zone and provides the operator with a clear view of the zone.
- For perimeter guarding solutions, the operator should not be able to reach manual start from the danger zone.
- A Programmable Logic Controller (PLC) must NOT be able to override a manual start function.

CONTACT WELDING

- Always protect all safety contacts with correctly rated fuses. These fuses must never exceed the rated FF-SRS5939 safety output capability to prevent contact welding.

IMPROPER EXTERNAL SAFETY RELAY MONITORING

- When using additional safety relays or the FF-SRE Extension module, always connect one normally closed contact of each relay in series inside the FSDs monitoring loop circuit (Y1/Y2). This connection will ensure correct operation of the external relays after each FF-SRS5939 activation.
- If the FF-SRS5939 is not activated often, the customer is responsible for accomplishing any additional test procedures of the external safety components. For instance, this testing can be done by using the safety device test input at machine power up every day.

IMPROPER ARC SUPPRESSOR INSTALLATION

- NEVER install an arc suppressor across the safety output contact of the safety control module.
- ALWAYS install arc suppressors across the coils of external safety relays.

IMPROPER SYSTEM SAFETY CATEGORY

- Other safety components with relay outputs can be connected in series with the electrosensitive protective equipment fail safe solid state outputs on both inputs of the FF-SRS5939 control module. Parallel wiring of multiple outputs into a single channel can defeat the channel and cause an unsafe condition.
- A permanent short-circuit of one equipment relay output will be detected after the actuation of the corresponding equipment, but this fault condition may be cancelled by the actuation of a another equipment connected in series. In any case, the above mentioned short-circuit will be detected again after a new actuation of the first equipment (see MODULE INPUTS S12/S22 on page 5). Individually activate and check all of the safety devices connected to a FF-SRS5939 control module to ensure proper operation.

IMPROPER EMERGENCY STOP PUSH BUTTON

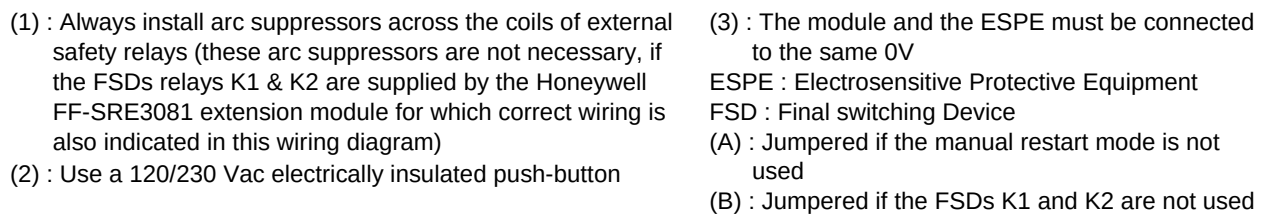
- The Emergency Stop push button must be designed according to the EN 418 safety standards (or US standard). Under any condition, the Emergency Stop switch must be able to open its contacts when activated.

IMPROPER USE OF THE RELAY OUTPUT CONTACTS

- Always connect two contacts out of the three contacts delivered by the FF-SRS5939 to the machine control circuitry (see APPLICATION EXAMPLES, page 8).

Failure to comply with these instructions could result in death or serious injury.

FIG. 12. WIRING DIAGRAM (USING TWO NORMALLY OPEN CONTACTS)



The safety control module will restart a 100 ms after removing the stop condition, or after releasing the START push button. In the manual restart mode, pressing the START push-button for less than 0.1 s or for more than 1.5 s will not restart the module (permanent short-circuit detection is performed through this input). The green relay outputs status indicator will turn ON indicating that the internal relays are energized. The two normally open safety contacts will close and the normally closed contact will open (this contact can be used for signalling purpose) allowing the machine to operate.

The output contacts switching capacity can be reinforced by using external contactors (K1 and K2) with positive-guided contacts. The proper operation of the external contactors is monitored by looping the NC contacts into the FSDs monitoring loop (terminals Y1/Y2). The module will not restart if the FSD monitoring loop remains permanently open, or remains closed for more than 250 ms after the closing of the module normally open contacts. In this case, the internal relays will be briefly energized.

Failure to comply with these instructions could result in death or serious injury.

FIG. 13. FF-SRS5939 TROUBLESHOOTING FLOW DIAGRAM (SHEET 1)

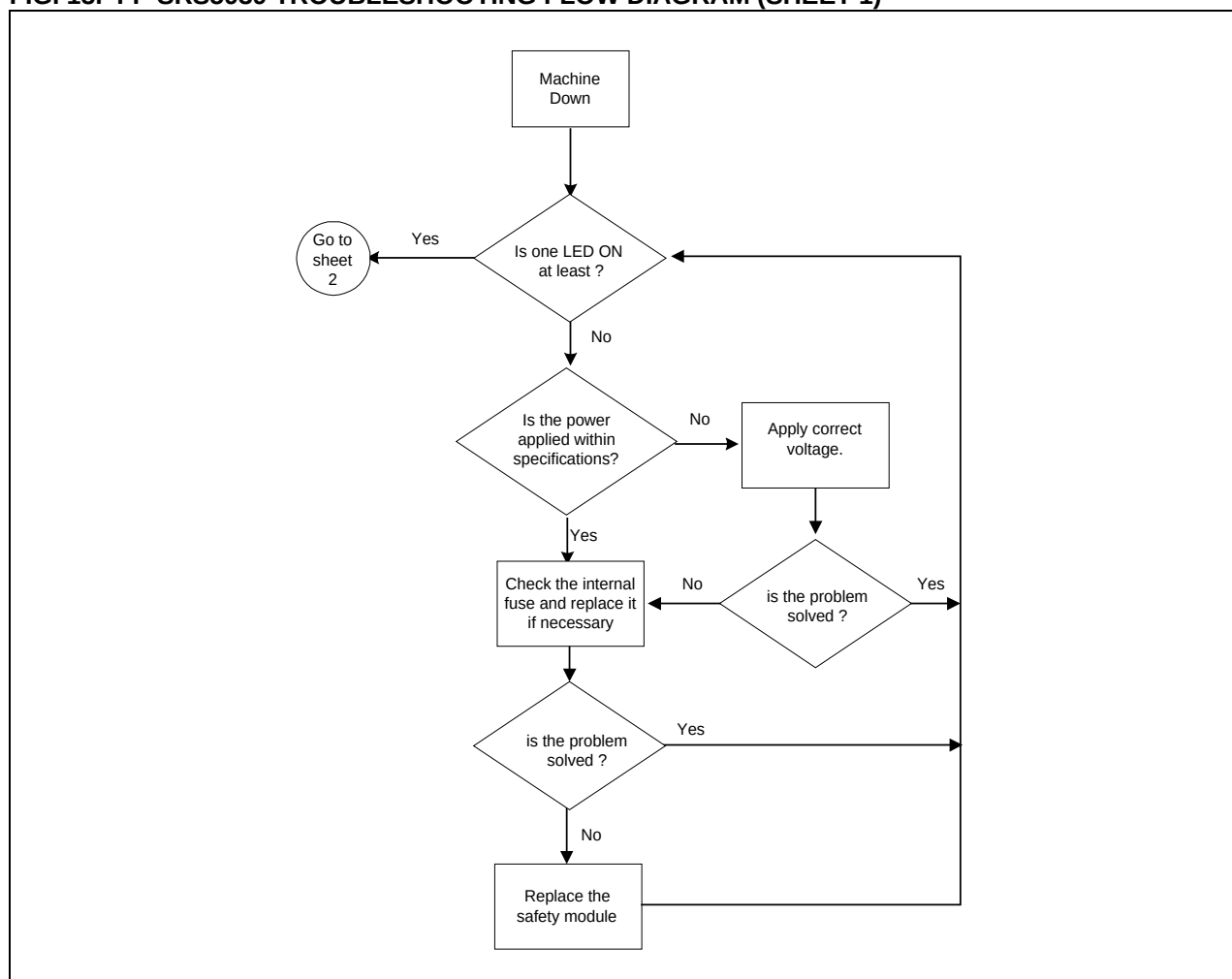


FIG. 14. FF-SRS5939 TROUBLESHOOTING FLOW DIAGRAM (SHEET 2)

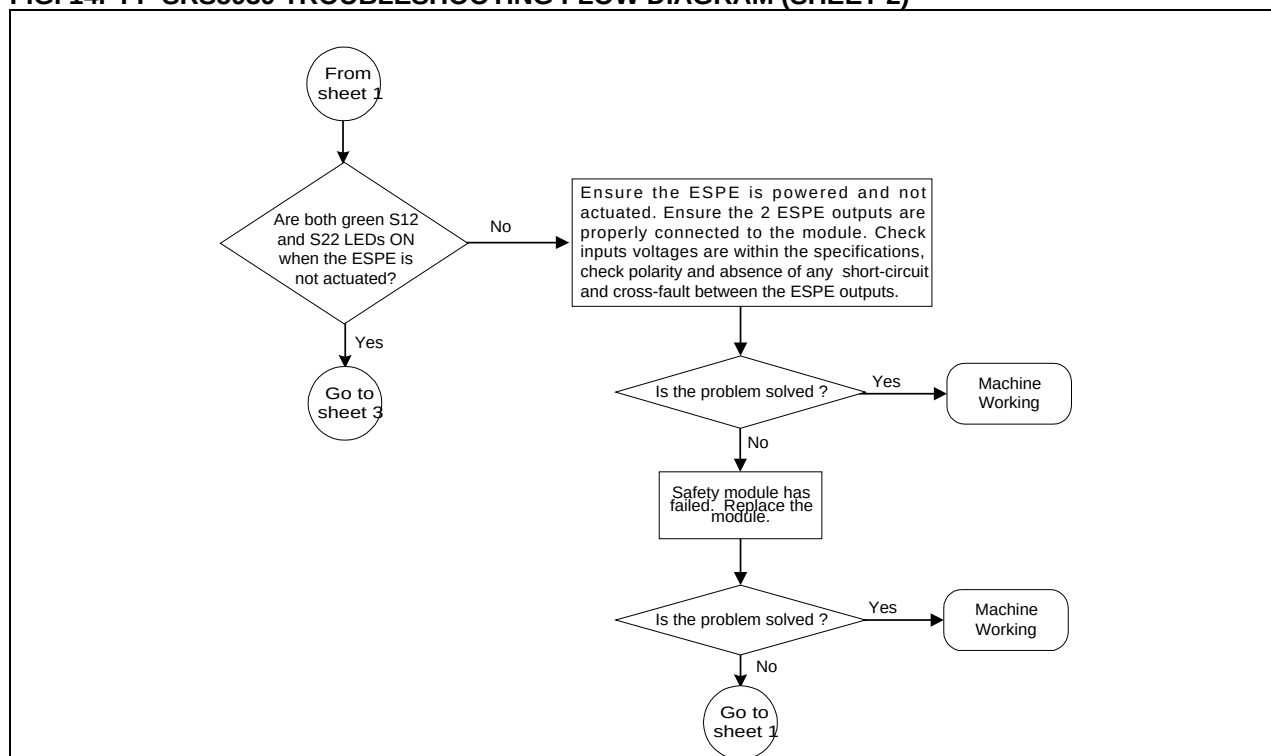


FIG. 15. FF-SRS5939 TROUBLESHOOTING FLOW DIAGRAM (SHEET 3)

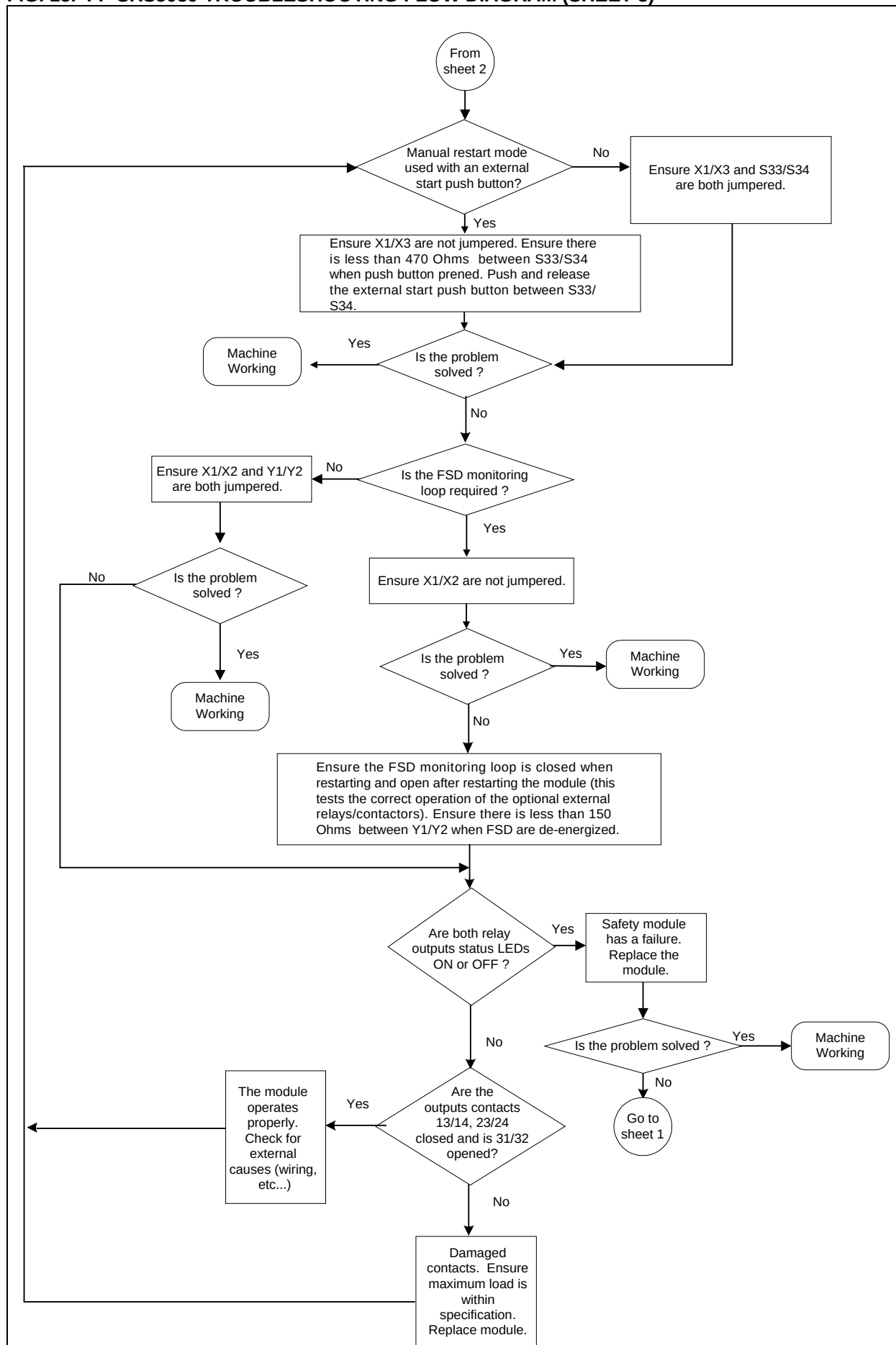


FIG. 16. FF-SRS5939 TROUBLESHOOTING TABLES

AUTOMATIC RESTART MODE

 (YELLOW)	S12 (GREEN)	S22 (GREEN)	 (GREEN) &  (RED)	Output contact status	Comments
					 NORMAL OPERATION : DETECTION FIELD IS CLEAR AND MACHINE OPERATION IS ENABLED
					 NORMAL OPERATION : DETECTION FIELD IS INTERRUPTED AND MACHINE OPERATION IS DISABLED
					 INTERNAL FAILURE ON THE MODULE OUTPUTS OR EXTERNAL SHORT-CIRCUIT ON S12/S22 : DETECTION FIELD IS CLEAR BUT MACHINE OPERATION IS DISABLED
					 INTERNAL FAILURE ON THE MODULE OUTPUTS OR EXTERNAL SHORT-CIRCUIT ON S12/S22 : DETECTION FIELD IS CLEAR BUT MACHINE OPERATION IS DISABLED
					 FAILURE ON ONE OF THE INPUTS OR ON WIRING : DETECTION FIELD IS CLEAR OR INTERRUPTED AND MACHINE OPERATION IS DISABLED
					 FAILURE ON ONE OF THE INPUTS OR ON WIRING : DETECTION FIELD IS CLEAR OR INTERRUPTED AND MACHINE OPERATION IS DISABLED
					 WITHOUT FSD MONITORING : ABSENCE OF THE JUMPER LINK BETWEEN TERMINALS Y1 AND Y2 : DETECTION FIELD IS CLEAR BUT MACHINE OPERATION IS DISABLED WITH FSD MONITORING : A FAILURE OF ONE OF THE FSDs OPENS THE FSDs MONITORING LOOP, OR PERMANENT SHORT CIRCUIT BETWEEN Y1 AND Y2 (RELAYS OSCILLATE)
					 NO CONNECTION BETWEEN TERMINALS S34 AND S33 : DETECTION FIELD IS CLEAR BUT MACHINE OPERATION IS DISABLED

 LIGHT OFF
  LIGHT ON
  BLINKING LIGHT

MANUAL RESTART MODE

 (YELLOW)	S12 (GREEN)	S22 (GREEN)	 (GREEN) &  (RED)	Output contact status	Comments
					 NORMAL OPERATION : DETECTION FIELD IS CLEAR AND MACHINE OPERATION IS ENABLED
					 NORMAL OPERATION : DETECTION FIELD IS INTERRUPTED AND MACHINE OPERATION IS DISABLED
					 INTERNAL FAILURE ON THE MODULE OUTPUTS : DETECTION FIELD IS CLEAR BUT MACHINE OPERATION IS DISABLED OR EXTERNAL SHORT-CIRCUIT ON S12/S22
					 INTERNAL FAILURE ON THE MODULE OUTPUTS : DETECTION FIELD IS CLEAR BUT MACHINE OPERATION IS DISABLED OR EXTERNAL SHORT-CIRCUIT ON S12/S22
					 FAILURE ON ONE OF THE INPUTS OR ON WIRING : DETECTION FIELD IS CLEAR OR INTERRUPTED AND MACHINE OPERATION IS DISABLED
					 FAILURE ON ONE OF THE INPUTS OR ON WIRING : DETECTION FIELD IS CLEAR OR INTERRUPTED AND MACHINE OPERATION IS DISABLED
					 WITHOUT FSD MONITORING : RESTART PUSH-BUTTON MUST BE PRESSED. IF NO RESULT, THEN FAILURE ON THE RESTART PUSH-BUTTON INPUT, OR ABSENCE OF THE JUMPER LINK BETWEEN TERMINALS Y1 AND Y2 : DETECTION FIELD IS CLEAR BUT MACHINE OPERATION IS DISABLED WITH FSD MONITORING : RESTART P/B MUST BE PRESSED. IF NO RESULT, THEN FAILURE ON THE RESTART PUSH-BUTTON INPUT, OR FAILURE ON ONE OF THE FSDs DETECTED THROUGH THE FSDs MONITORING LOOP

 LIGHT OFF
  LIGHT ON
  BLINKING LIGHT

WARRANTY AND REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

While we provide application assistance, personally through our literature, it is up to the customer to determine the suitability of the product in the application.

Specifications may change at any time without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

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1	

Honeywell

Honeywell Cometa
European Photoelectric Center
21, Chemin du Vieux Chêne
38243 Meylan Cedex - FRANCE

FF-SRS5925

Dual Channel Emergency Stop Module Instructions for use



⚠ WARNING

IMPROPER INSTALLATION

- Consult with US and/or European safety agencies and their requirements when designing a machine control, interface and all control elements that affect safety.
- Strictly adhere to all installation instructions.

Failure to comply with these instructions could result in death or serious injury.

PRODUCT DESCRIPTION

The FF-SRS5925 Emergency Stop modules are designed to be used in emergency stop circuits when danger to personnel or machinery is present.

This safety control module provides an emergency stop signal to the machine control circuitry. FF-SRS5925 helps to create a control reliable safety solution by providing redundancy and self-checking circuitry.

This device offers two channel inputs and two internal safety relay outputs with positive-guided contacts. This ensures redundancy in its in- and outputs.

The slim housing of only 22.5 mm (0.89 in.) width allows this Safety control module to fit into every cabinet or even helps to reduce the overall cabinet size.

Other features include high current capability, an automatic start and manual start mode, cross fault monitoring and external relays monitoring.



DIRECTIVES COMPLIANCE

Machine Directive 98/37/EEC
Low Voltage Directive 73/23 EEC
Electromagnetic Compatibility Directive 89/336

REGULATIONS COMPLIANCE

Regulation	Title
OSHA 29 CFR 1910.212	General Requirements for (guarding of) All Machines
OSHA 29 CFR 1910.217	(Guarding of) Mechanical Power Presses

STANDARDS COMPLIANCE

Standard	Title
EN 292	Safety of Machinery - Basic Concepts, General Principles for Design
EN 60204	Safety of Machinery - Electrical Equipment of Machines
EN 954-1	Safety of Machinery - Safety related parts of control system
UL508	Underwriters Laboratories
ANSI B11.1	Mechanical Power Presses
ANSI B11.2	Hydraulic Power Presses
ANSI B11.19	Safeguarding when Referenced by the Other B11 Machine Tool Safety Standards
ANSI/RIA R15.06	Safety Requirements for Industrial Robots and Robot Systems

APPROVALS

CE	The product, packaging and documentation of FF-SR Series products carry the CE mark, following an examination by BG (German Berufsgenossenschaft E+MIII). The CE declaration of conformity is available upon request.
cULus (pending)	This product is pending approval by Underwriters Laboratories Inc. According to Canadian and U.S. safety requirements.

SPECIFICATIONS

Input	
Nominal voltage	24 Vac/Vdc (-5%, +10%)
Nominal power consumption	DC: ca. 2 W
Nominal frequency	50 to 60 Hz
Start time	Manual START function: 40 ms Automatic START function: 500 ms
Nominal voltage at S11	23 Vdc (provided by control module)
Input current between S11/S12 and S21/S22	40 mAdc
Minimum voltage at S12/A2	21 Vdc when activated
Cable resistance between S11/S12 and S21/S22	68 Ω (max.)
Output	
Contact complement	2 NO, 1 NC contacts
Response time	Opening of inputs (S11/S12; S21/S22): 15 ms; Opening in supply circuit (A1(+)/A2(-)): 50 ms
Contact type	Safety relay, positive-guided
Current Range (min. to max.)	1 mA to 7A (see caution)
Voltage Range (min. to max.)	0.1 to 250 Vac/dc
Switching Capability per AC15 (EN 60947-5-1)	NO contact: 3 A / 230 V NC contact: 2A / 230 V
Typical Electrical Life Expectancy	Power factor = 1 at 230 Vac/dc (see fig. 1, note 1) 2A 750,000 operations 5A 220,000 operations 7A 110,000 operations
Typical Power Factor (cos φ)	Limitation Factor (see fig. 2, note 2) 0.3 0.45 0.5 0.70 0.7 0.85 1.0 1.00
Operating frequency	1200 switching cycles/hour (max.)
Output contact fuse rating	Time delay 6 A (max.)
Mechanical life	Ten million switching operations
General	
Temperature range	-15°C to + 55°C (5°F to 131°F) at 90% humidity (max.)
Sealing	Housing IP 40; Terminals IP 20
Housing material	Thermoplastic
Vibration resistance	Amplitude 0.35 mm; Frequency 10 to 55 Hz
Wire/conductor connection	1 x 2.5 mm ² solid (max.) [14 AWG] or 2 x 1.5 mm ² (max.) [16 AWG] stranded wire with sleeve DIN 46288
Wire/conductor attachment	Removable terminal strips with M3.5 screws; wire contacts are enclosed to prevent electrical shock
Mounting	Quick install rail mounting EN 50022-35, width: 35 mm (1.38 in.)
Weight	220 g (0.49 lb.)

NOTE 1: Install arc suppressors across load to avoid module contact arcing and ensure specified contact life expectancy.

NOTE 2: Total operations = operations at power factor 1 multiplied by the limitation factor. If the power factor is 0.5 at 230 Vac, 2A (750,000 operations), the limitation factor is 0.70. 750,000 x 0.70 = 525,000 total operations.

FIG 1. CONTACT LIFE FOR 100% RESISTIVE LOAD (typical) (note 1)
power factor = 1 (cos φ)

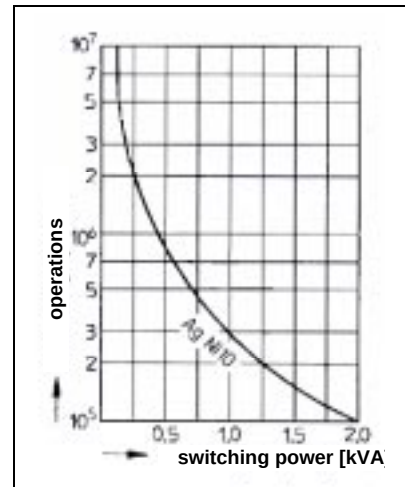
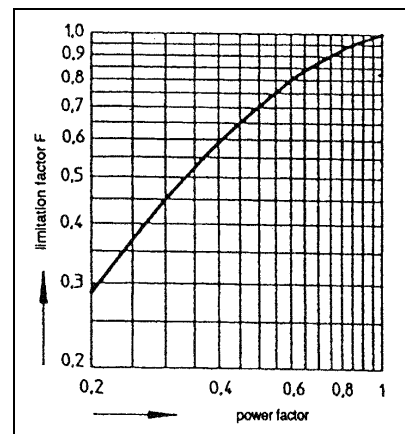


FIG 2. LIMITATION FACTOR FOR INDUCTIVE LOADS (note 2)
power factor < 1 (cos φ)



CAUTION

CONTACT DAMAGE

To ensure the 1 mA capability during the lifetime of the contact, NEVER exceed 300 mA or 60 V.

Failure to comply with these instructions will result in loss of low current switching capability.

FIG 3. QUADRATIC TOTAL CURRENT LIMIT

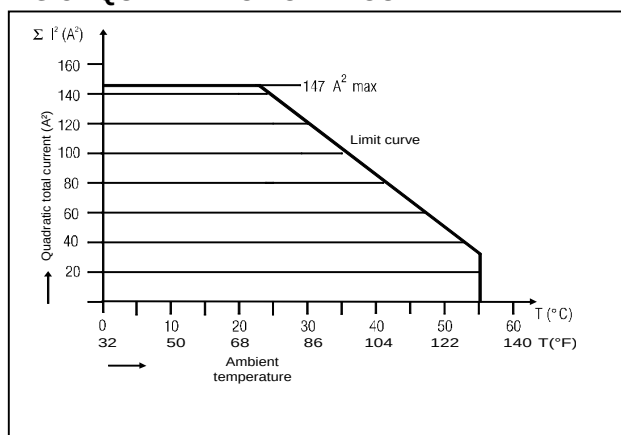


Figure 3. displays the maximal recommended external temperature versus the total load of all the safety module contacts. To use this curve, do the following:

- (1) Square the current in each contact branch, then sum all the results to obtain the vertical axis value.
- (2) Follow the horizontal line from the obtained value and note intersection of the appropriate curve.
- (3) Follow the intersection point down to determine the maximal recommended external temperature. (Ex: $\sum I^2 = 100 A^2$ current inside safety contacts, then $T = 35^\circ C$ ($95^\circ F$).

If the module is located in a higher temperature environment, the lifetime of the electronic components may be reduced. Ventilation of the cabinet may be required.

MECHANICAL INSTALLATION

The FF-SRS5925 must be installed inside a IEC IP54 (NEMA 3) rating enclosure or better. The module can be clipped easily onto a 35 mm (1.38 in.) width EN 50022-35 rail (see figures 5 and 6 for installation and removal). Specific features of this product include removable terminal strips. This feature provides easy access to wiring during installation and reduces machine downtime during maintenance.

FIG 4. MOUNTING DIMENSIONS (for reference only)

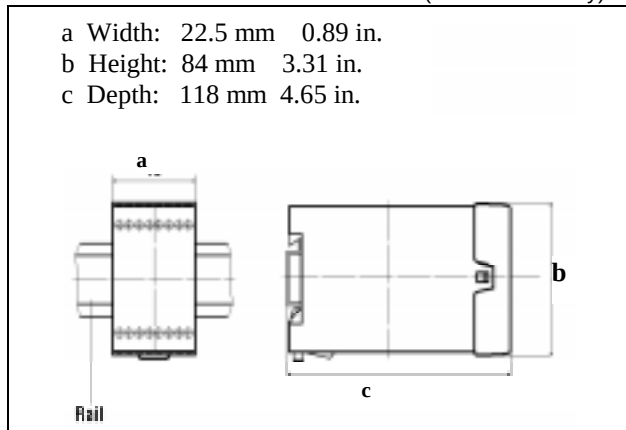


FIG 5. INSTALLATION DIAGRAM

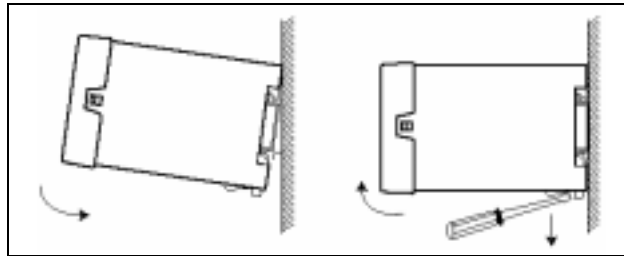
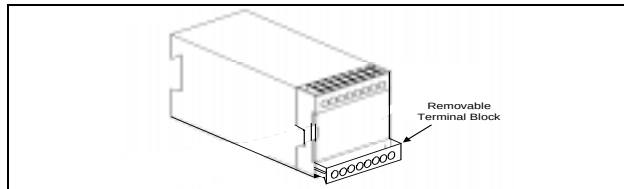


FIG 6. REMOVABLE TERMINAL BLOCKS



CONTROL RELIABILITY

“Control Reliability” means that “the device, system or interface shall be designed, constructed and installed such that a single component failure within the device, interface or system shall not prevent normal stopping action from taking place but shall prevent a successive machine cycle.” (ANSI B11.19-1990, 5.5)

OSHA 29 CFR 1910.217 states that “the control system shall be constructed so that a failure within the system does not prevent the normal stopping action from being applied to the press when required, but does prevent initiation of a successive stroke until the failure is corrected. The failure shall be detectable by a simple test, or indicated by the control system.”

SAFETY LEVEL OF INTERFACES

The safety function of the FF-SRS5925 Safety control module relies on dual channel safety inputs. Therefore this module can be used in interfaces up to Category 4 per EN 954-1 European norm.

INTERNAL DESIGN

The *internal* design of this device also meets the highest requirements (Category 4 as described in the EN 954-1 European norm).

Category 4 safety control modules are designed and manufactured in such a way that a single breakdown or an accumulation of internal failures does not lead to the loss of the safety function when a dangerous situation arises.

The FF-SRS5925 safety control modules function with dual channel redundancy and positive self-checking monitoring. This means that a faulty component in our system will make the safety control modules fail in a safe mode.

The safety function is maintained on a permanent basis.

MODE SETTING

⚠ WARNING

ELECTRICAL SHOCK

Remove power from FF-SR Series control modules and machine during installation and before setup.

Failure to comply with these instructions could result in death or serious injury.

To set the desired mode of operation, remove the front panel (see figure 7). Refer to the back of the front panel for switch setting options (see figure 8). Set switches as required, then replace front panel.

S1 AND S2 SWITCHES

(Refer to the important warnings on page 6.)

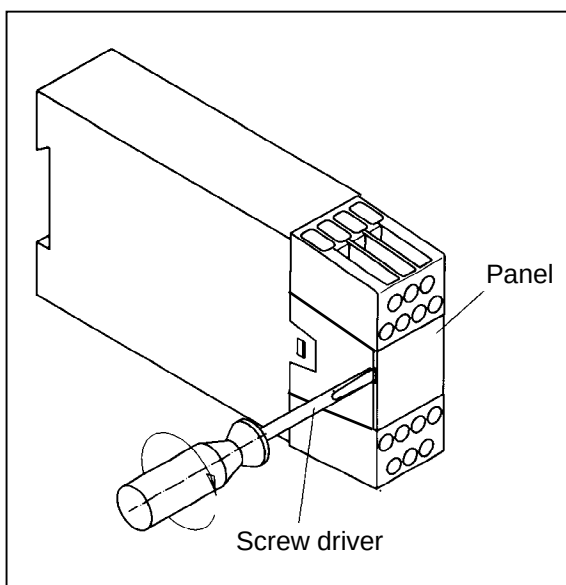
This module contains two internal switches (S1 and S2) that are used to set various modes of operation. This feature ensures application flexibility.

Switches S1 and S2 are used to select automatic start and manual start with or without cross fault detection.

Switch S1 is used to select an operating mode for **cross fault detection** between the two inputs. Cross fault monitoring must be used when two independent safety inputs are provided to this module to increase the overall safety level of the solution (see typical application examples).

Switch S2 is used to select **automatic start** or **manual start**. Terminals S33 and S34 must be connected for automatic start to function.

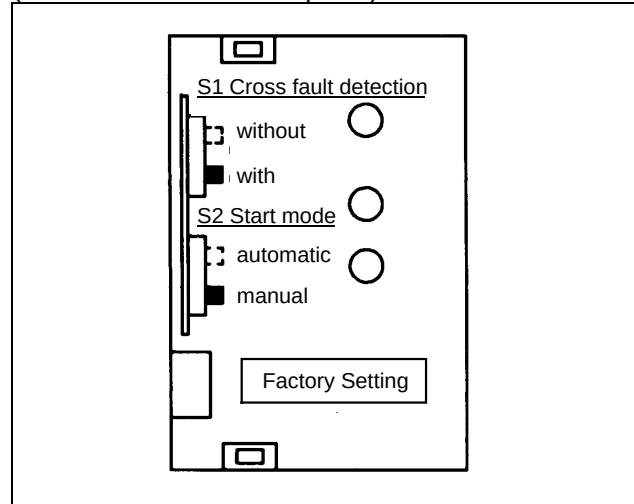
FIG 7. FRONT PANEL REMOVAL



NOTICE

To gain access to the two internal switches, it is not necessary to remove the terminal blocks. Just unclip the front panel as shown in figure 7.

FIG 8. INTERNAL SWITCH SETTING
(located behind the front panel)



ELECTRICAL INSTALLATION

Multiple wiring configurations are possible for the FF-SRS5925 dual channel emergency stop module. General guidelines are provided because there are various ways to interface the module to machine control circuitry. **Refer to the important warnings (page 6)** and the application examples (pages 7 through 9).

CAUTION

SAFETY CONTROL MODULE DAMAGE

Do not supply any current/voltage to the FF-SRS5925 safety module control inputs. These inputs receive their voltage (24 Vdc under a 40 mA current) from external power via pins A1 and A2.

Failure to comply with these instructions will result in product damage.

LED INDICATORS

The FF-SRS5925 module has three green LED status indicators (Power, K1 and K2) as illustrated below.

The Power LED indicates power is applied to the safety control module. Illuminated K1 and/or K2 LED's indicate(s) that the corresponding internal safety relay is energized. Both K1 and K2 relays must be energized to have the normally open contacts 13/14 and 23/24 in a closed position. If one of the safety relays de-energizes, the normally closed contact will close.

FUNCTIONAL DESCRIPTION

In the **manual start mode**, the module accepts input from the safety device (light curtain, safety mat, safety switches, etc.) between S11/S12 and S21/S22 after activation of the push button between S33 and S34; then, the normally open safety contacts (13/14, 23/24) will close and the normally closed contact (31/32) will open.

In the **automatic start mode**, the module accepts immediate input from the safety device (light curtain, mat, safety switches, etc.) between S11/S12 and S21/S22 (S33 and S34 are jumpered if external relay monitoring is not needed); then, the normally open safety contacts (13/14, 23/24) will close and the normally closed contact (31/32) will open.

In either mode, if the safety device is actuated (emergency stop condition occurs), the normally open contact will open immediately and the normally closed contact will close. This emergency stop condition is relayed via the safety contacts of the module to the machine control circuitry to arrest dangerous motion and/or remove power.

EXTENSION MODULES AND EXTERNAL CONTACTORS

One or more FF-SRE3081 Extension modules or external contactors with positively driven contacts can be used to multiply the number of contacts of the FF-SRS5925 Emergency Stop Module. If multiple safety contacts are used in parallel with one load, the maximum admissible current can be increased. For connection of the FF-SRE 3081 to the FF-SRS 5925 module, see the Installation Instructions for the FF-SRE 3081 Extension Module.

⚠ WARNING

CONTACT MULTIPLICATION VIA EXTERNAL RELAYS

- If contact multiplication via external safety relays (or the FF-SRE3081 Extension module) is necessary, connect one normally closed contact of each relay (or 81/82) in series into the restart loop between terminals S33/S34 (Final Switching Device (FSD) monitoring).
- Use two independent stop circuit safety relays with mechanically linked contacts to reliably detect a welded contact.

Failure to comply with these instructions could result in death or serious injury.

FIG 9. BLOCK DIAGRAM

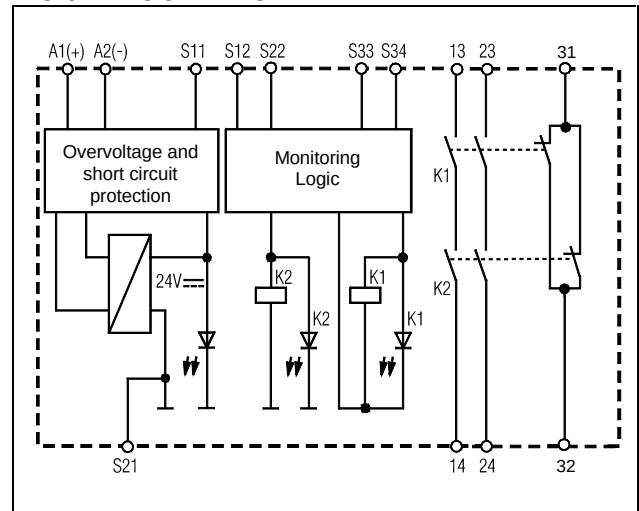


FIG 10. MODULE FRONT PANEL

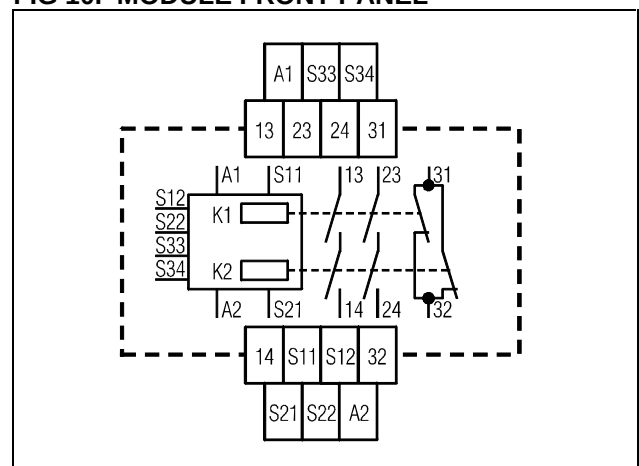
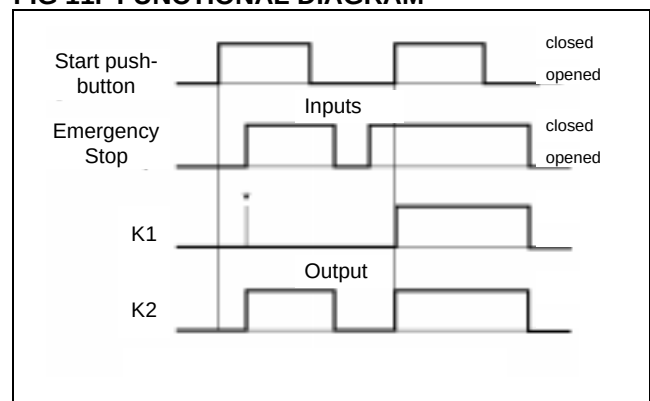


FIG 11. FUNCTIONAL DIAGRAM



* Line fault Detection on Start push-button:

If the start push button is closed before voltage is applied to S12 and S22 the safety contacts of the module cannot close.

This additional feature ensures the detection of a line fault via the start push-button or a blocked start push button. In case of a push-button failure the module can not be restarted.

APPLICATION WARNINGS

WARNING

IMPROPER INPUT CONNECTIONS

- To ensure the highest level of safety, connect two safety device outputs into the two input channels of the FF-SRS5925 safety module and select the internal switch S1 to "With Cross-Fault Detection". Then, a cross fault between the two channels S11/S12 and S21/S22 will shut down the module.
- If the safety device provides one safety output only (e.g. a switch driven by a direct acting mechanism like some GK, GSS, CLS or Emergency Stop push buttons), connect the FF-SRS5925 module as shown in the single input channel example. To avoid any short circuit possibilities on this single input channel, use conduit to protect wiring and additional protection for the terminal strips inside the machine cabinets.
- The cable resistance between S11/S12 or S21/S22 should not exceed 68 Ohms; the voltage between S12/A2 and S22/A1 should not be lower than 21Vdc.

IMPROPER EMERGENCY STOP CONNECTION

- To ensure maximum safety, connect two normally closed contacts of the Emergency Stop into the input channel of the FF-SRS5925 module.

IMPROPER AUTOMATIC START MODE IN PERIMETER GUARDING APPLICATIONS

- If the module is used in the automatic start mode, another part of the safety control circuitry must keep the latched function engaged.

IMPROPER PUSH BUTTON USE (MANUAL START MODE)

- To ensure maximum safety when using an external start push button, always design the circuitry for manual start mode (see Mode Setting, page 4).
- Ensure the location of the manual start function is outside of the danger zone and provides the operator with a clear view of the zone.
- For perimeter guarding solutions, the operator should not be able to reach manual start from the danger zone.
- A Programmable Logic Controller (PLC) must NOT be able to override a manual start function.

CONTACT WELDING

- Always protect all safety contacts with correctly rated fuses. These fuses must never exceed the rated FF-SRS5925 safety output capability to prevent contact welding.

IMPROPER EXTERNAL SAFETY RELAY MONITORING

- When using additional safety relays (or the FF-SRE Extension module), always connect one normally closed contact of each relay in series (or 81/82) inside the Restart loop circuit (S33/S34). This connection will ensure correct operation of the external relays after each FF-SRS5925 activation.
- If the FF-SRS5925 is not activated often, the customer is responsible for accomplishing any additional test procedures of the external safety components. For instance, this testing can be done by removing the power from the FF-SRS5925 at machine power up every day.

IMPROPER ARC SUPPRESSOR INSTALLATION

- NEVER install an arc suppressor across the safety output contact of the safety control module.
- ALWAYS install arc suppressors across the coils of external safety relays.

IMPROPER DOOR MONITORING

- If two safety switches are used to monitor a door's closed position, connect one safety contact of the first switch between input S11/S12 and one safety contact of the second switch between S21/S22 of the FF-SRS 5925 Emergency stop module.

IMPROPER SYSTEM SAFETY LEVEL

- Several safety components can be connected to a FF-SRS5925 control module. If more than one safety output is connected to one of the two input channels of the control module, always connect these safety outputs in series. Parallel wiring of multiple outputs into a single channel can defeat the channel and cause an unsafe condition.
- Individually activate and check all of the safety devices connected to a FF-SRS5925 control module to ensure proper operation.

IMPROPER EMERGENCY STOP PUSH BUTTON

- The Emergency Stop push button must be designed according to European (EN 418) and US safety standards (NFPA 19). Under any condition, the Emergency Stop switch must be able to open its contacts when activated.

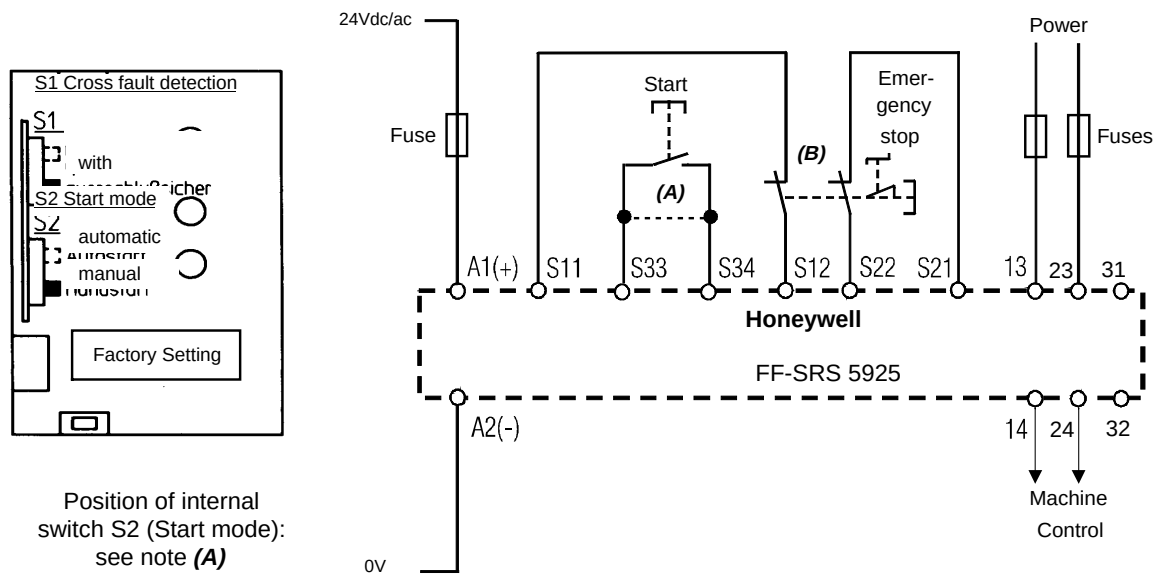
LONGER RESPONSE TIME

- The FF-SRS5925 module will have a longer response time (when the emergency push button is activated) if the emergency stop push button is connected in series with the power supply of the module. However, connecting the emergency stop push button to the safety input channels will result in a shorter response time.

Failure to comply with these instructions could result in death or serious injury.

APPLICATION EXAMPLES

FIG 9. DUAL CHANNEL EMERGENCY STOP CIRCUITRY
(WITH CROSS-FAULT MONITORING)



This circuit has redundancy in the emergency-stop control circuit and therefore offers the highest possible safety level.

FUNCTIONAL DESCRIPTION:

Manual start mode:

1. After removing the stop condition, press and release the START push button to restart the safety control module.
2. The K1 and K2 LED's will turn ON indicating that the safety relays K1 and K2 are energized. The two normally open safety contacts will close and the normally closed safety contact will open allowing the machine to operate.

Automatic start mode:

1. After removing the stop condition, the safety control module will immediately reset.
2. The K1 and K2 LED's will turn ON indicating that the safety relays K1 and K2 are energized. The two normally open safety contacts will close and the normally closed safety contact will open allowing the machine to operate.

APPLICATION NOTES:

Note (A): Manual start mode: Insert start push-button and select internal switch S2 as illustrated above

Automatic start mode: Insert jumper and select internal switch S2 to automatic start mode

Note (B): Dual channel safety devices: This may be an emergency stop push button in series with dual output safety switching devices (OSSD) such as

- safety light curtains (FF-SB, FF-LS), single beam (FF-SPS4), modular safety light curtains (FF-SCAN),
- safety mats (FF-SM),
- safety laser scanner (FF-SE),
- dual output safety limit or interlock switches (for example: CLS, GK and GSS).

WARNING

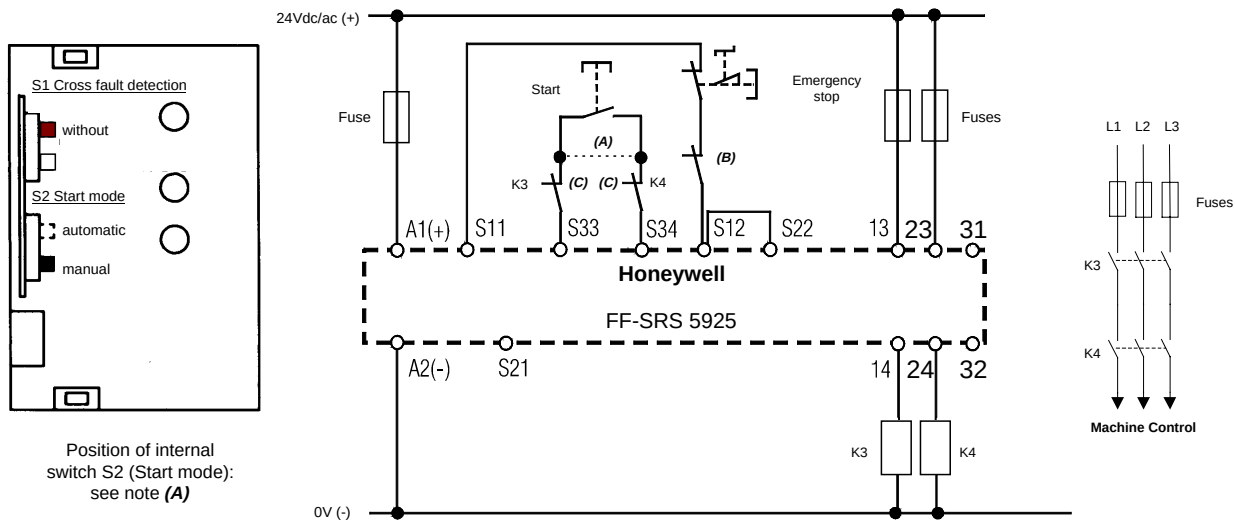
IMPROPER AUTOMATIC START MODE IN PERIMETER GUARDING APPLICATIONS

- If the module is in the automatic start mode, another part of the safety control circuitry must keep the latched function engaged.

Failure to comply with these instructions could result in death or serious injury.

APPLICATION EXAMPLES (continued)

FIG 10. SINGLE CHANNEL EMERGENCY STOP CIRCUITRY
(WITHOUT CROSS-FAULT MONITORING, WITH EXTERNAL CONTACTORS)



This circuit has no redundancy in the emergency-stop control circuit and therefore offers a minor safety level.

CONTACT REINFORCEMENT VIA EXTERNAL CONTACTORS:

With switching current >7 A, the output contacts should be reinforced by external safety contactors (K3 and K4). (see *Note(C)* and Warning).

1. After activation of the E-stop push button, the two K1 and K2 LED's will turn OFF, indicating that the two internal safety relays K1 and K2 are de-energized. The normally open safety outputs 13/14 and 23/24 will open and de-energize the external contactors K3 and K4. The normally closed safety output will also close.
2. After removing the stop condition, press and release the START push button to restart the safety control module. If the two contactors K3 and K4 are working properly, the K1 and K2 LED's will turn ON indicating that the safety relays K1 and K2 are energized. The two normally open safety contacts will close and the normally closed safety contacts will open allowing the machine to operate.

APPLICATION NOTES:

Note (A): Start modes:

Manual start mode: Insert start push-button and select internal switch S2 as illustrated above

Automatic start mode: Insert jumper and select internal switch S2 to automatic start mode

Note (B): Single Channel safety devices: This may be an emergency stop push button with a single output safety device in series such as safety limit or interlock switches (for example: CLS, GK and GSS).

Note (C) External contactors:

If contact reinforcement via external safety relays is necessary, the output contacts should be reinforced by external safety relays with positive-guided contacts. The proper operation of the external contactors must be monitored by looping the NC contacts into the Start loop between terminals S33/S34 (Final Switching Device (FSD) monitoring).

⚠ WARNING

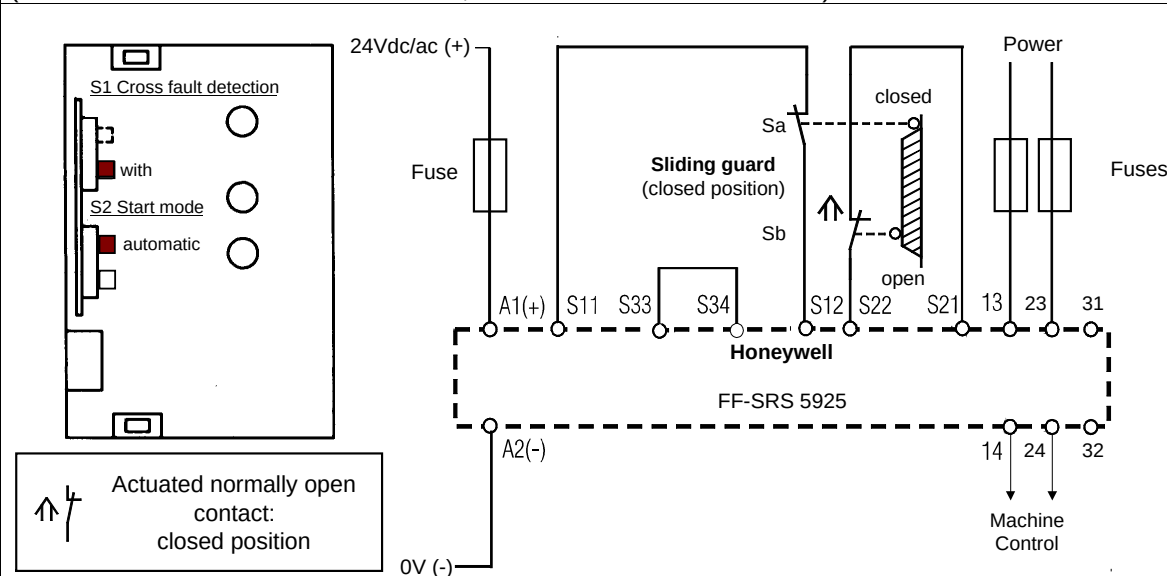
CONTACT MULTIPLICATION VIA EXTERNAL RELAYS

- If contact multiplication via external safety relays (or the FF-SRE3081 Extension module) is necessary, connect one normally closed contact of each relay in series (or 81/82) into the Start loop (terminals S33/S34).
- Use two independent stop circuit safety relays with mechanically linked contacts to reliably detect a welded contact.

Failure to comply with these instructions could result in death or serious injury.

APPLICATION EXAMPLES (continued)

FIG. 11.: DUAL-CHANNEL SAFETY DOOR MONITORING
(WITH CROSS-FAULT MONITORING, AUTOMATIC START MODE)



GENERAL DESCRIPTION OF SAFETY DOOR APPLICATIONS

Protective gates are designed to limit or block access to the moving parts of dangerous machinery. These gates can be equipped with locking or interlocking devices, usually safety limit switches or any other safety sensors/switches.

The FF-SRS5925 Emergency Stop module monitors the status of these safety sensor positions. When the protective gate is open, the initiation of dangerous motion is prevented. When the door is closed again, the next machine cycle can start, but only after initiating an external manual restart sequence.

FUNCTIONAL DESCRIPTION

After opening the door, the two external safety switch contacts Sa and Sb will open (as illustrated above) and the two internal safety relays K1 and K2 will de-energize. The normally open safety outputs 13/14 and 23/24 will open relaying the stop condition to the machine control circuitry. After closing the door, Sa and Sb close and the internal relays K1 and K2 will energize automatically. The two normally open safety contacts will close and an external manual restart sequence may then be initiated (allowing the machine to operate).

⚠ WARNING

IMPROPER AUTOMATIC START MODE IN PERIMETER GUARDING APPLICATIONS

- If the module is in the automatic start mode, another part of the safety control circuitry must keep the latched function engaged.

Failure to comply with these instructions could result in death or serious injury.

NOTICE

- The cable resistance between S11/S12 and S21/S22 must be less than 68Ω (ohms) for correct operation of the safety control module.
- A minimum of 21 Vdc must be present between each channel input (S12/A2 and S22/A1) to ensure the correct detection of sensor(s) outputs status.

FIG. 12. FF-SRS5925 TROUBLESHOOTING FLOW DIAGRAM (PAGE 1 OF 3)

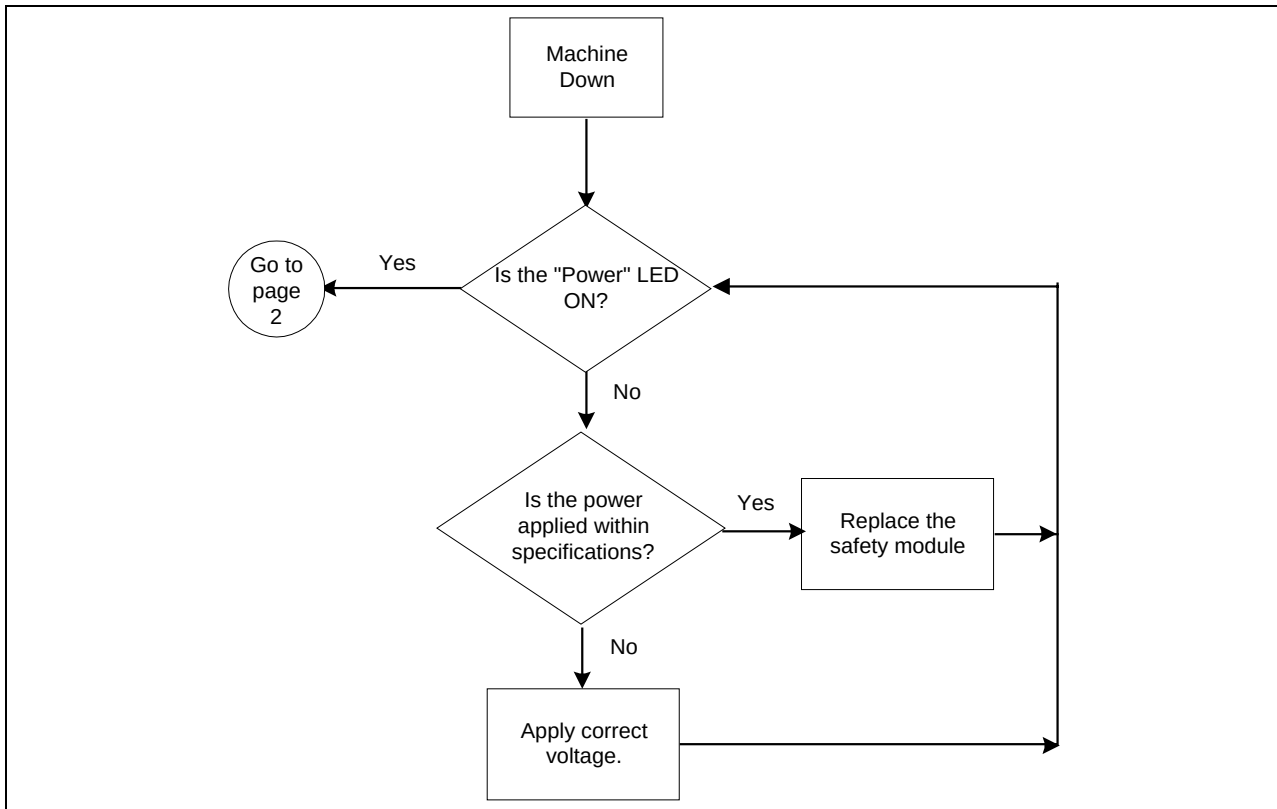


FIG. 13. FF-SRS5925 TROUBLESHOOTING FLOW DIAGRAM (PAGE 2 OF 3)

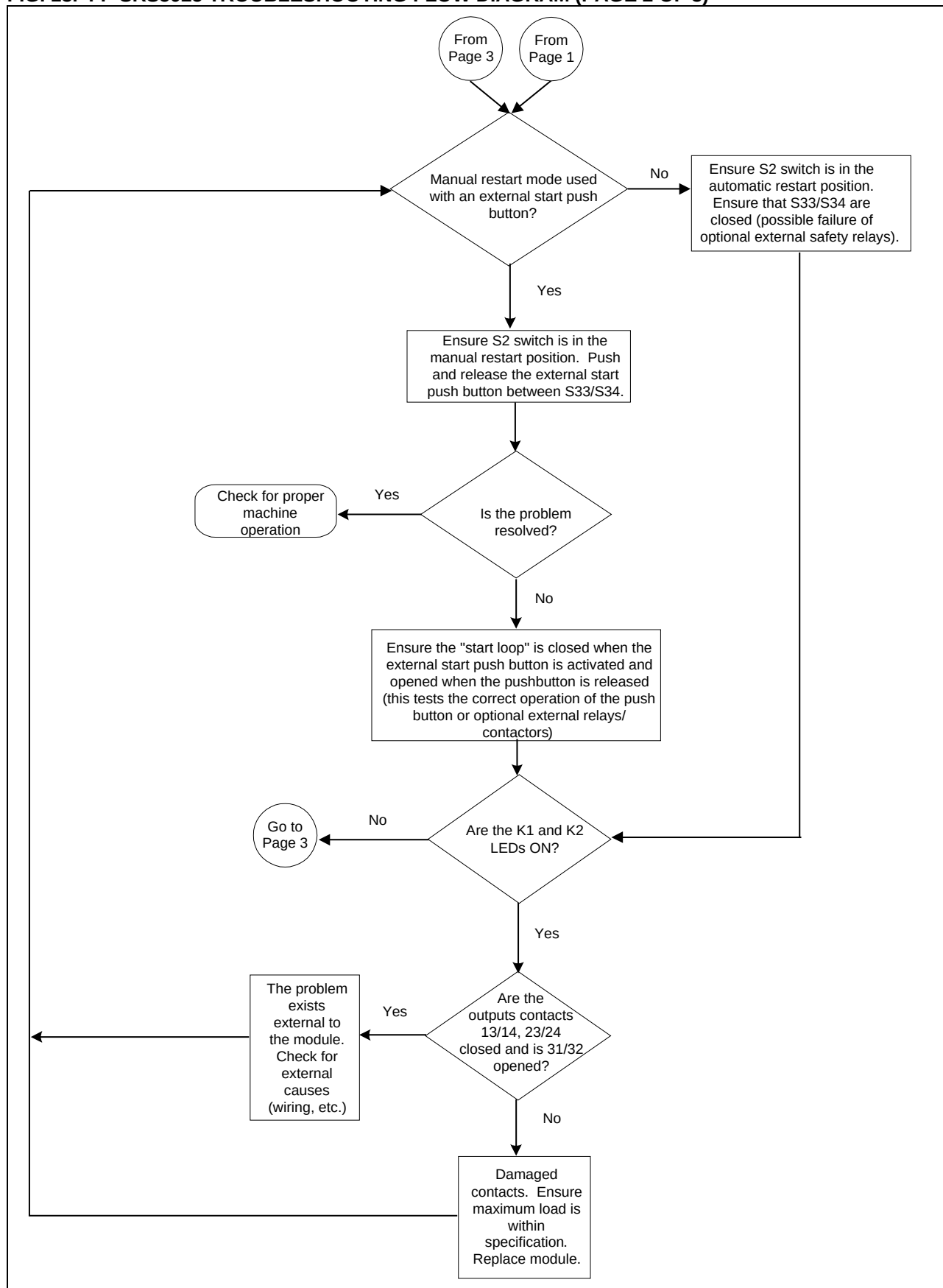
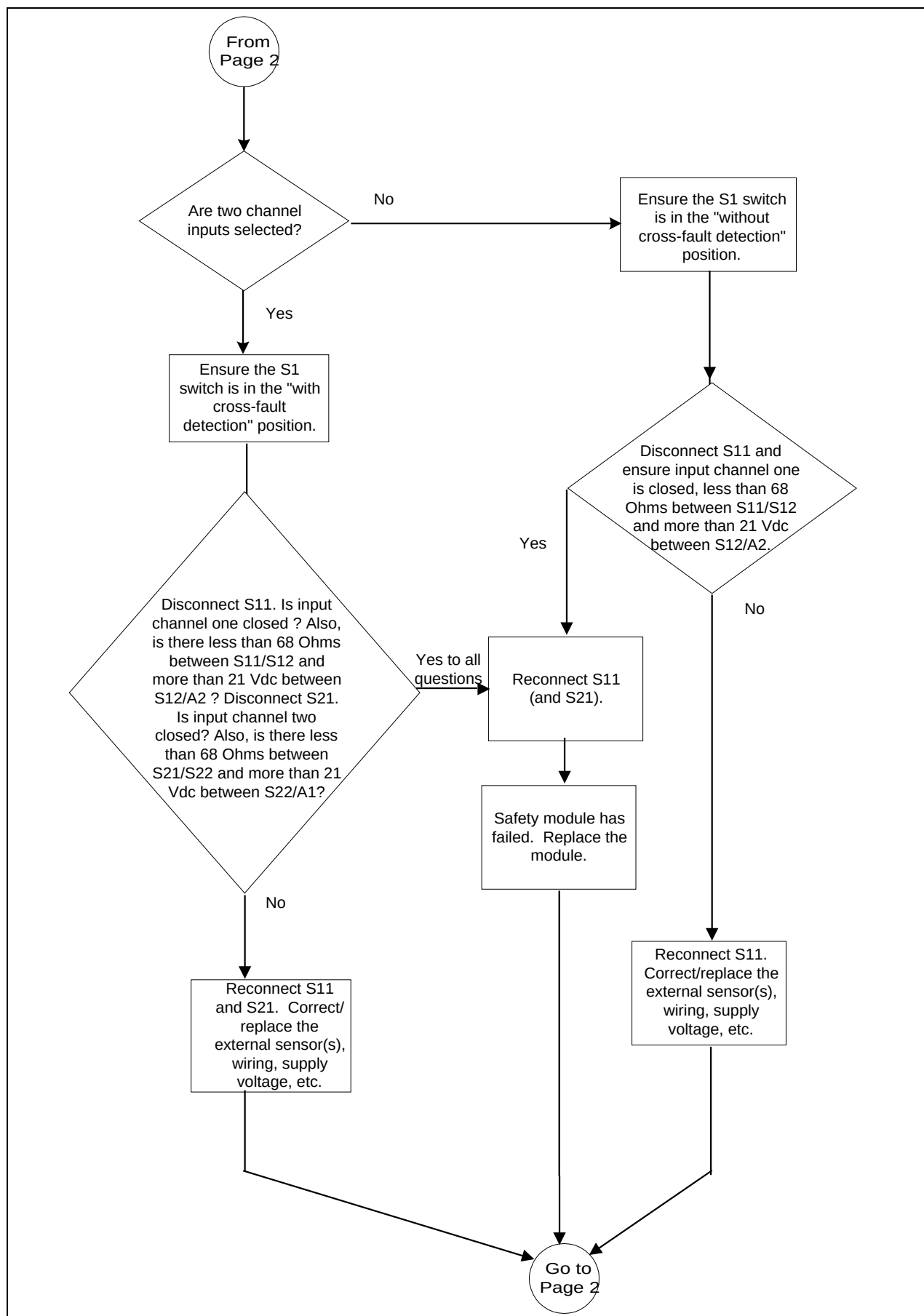


FIG. 14. FF-SRS5925 TROUBLESHOOTING FLOW DIAGRAM (PAGE 3 OF 3)



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FF-SRS5925 □

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