FF-SYA14, FF-SYA30 and FF-SYA60 Series
Safety Light Curtains

FF-SYA234
Multibeam Systems for Access Detection

⚠️ 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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## Revision History

<table>
<thead>
<tr>
<th>Reference</th>
<th>Circulation</th>
<th>Description</th>
<th>Languages</th>
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<td>107031-01</td>
<td>July 1998</td>
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<td>EN</td>
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<td>§ 2.4.5 “Response time” : Addition of a NOTICE.</td>
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<td>§2.4.6 Homogenisation of scanning range percentages</td>
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<td>Addition of FF-SYA models with terminal strips</td>
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<td>§4.8 Removal of the emergency stop in the Wiring Diagram (4-9) using the FF-SRS59392 safety relay module</td>
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</tr>
</tbody>
</table>

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Table of contents

1. IMPORTANT INFORMATION................................................................................................................................. 1
   1.1 Overview.......................................................................................................................................................... 1
   1.2 Organisation of Installation Manual .............................................................................................................. 1
   1.3 Important Highlighted Information .................................................................................................................. 1
   1.4 Control Reliability ........................................................................................................................................ 1
   1.5 Approvals ..................................................................................................................................................... 2
   1.6 Safety Light Curtain Installation and Use ...................................................................................................... 2
   1.7 European Directives Compliance .................................................................................................................. 2
   1.8 European Standards Compliance ................................................................................................................... 2
   1.9 United States Regulations Compliance ......................................................................................................... 3
   1.10 United States Standards Compliance ......................................................................................................... 3
   1.11 Additional Protection .................................................................................................................................. 3

2. DESCRIPTION AND OPERATION .......................................................................................................................... 4
   2.1 Overview ...................................................................................................................................................... 4
   2.2 Machine Guarding and Perimeter Protection ................................................................................................. 4
   2.3 Approval and rating plates ............................................................................................................................ 6
   2.4 Operation ..................................................................................................................................................... 7
       2.4.1 Synchronisation ..................................................................................................................................... 7
       2.4.2 Resolution (FF-SYA14, FF-SYA30 and FF-SYA60 Series) .................................................................. 7
       2.4.3 Protection Height (FF-SYA14, FF-SYA30 and FF-SYA60 series) ......................................................... 8
       2.4.4 Beam spacing and number of beams (FF-SYA234 Series) .................................................................. 8
       2.4.5 Response Time ..................................................................................................................................... 9
       2.4.6 Scanning Ranges .................................................................................................................................. 10
   2.5 Indicators ..................................................................................................................................................... 11
       2.5.1 Scanning range indicators (emitter) ................................................................................................. 11
       2.5.2 Alarm indicator (emitter) .................................................................................................................... 11
       2.5.3 Test Indicator (emitter) ...................................................................................................................... 12
       2.5.4 Operation Indicators (receiver) ......................................................................................................... 12
       2.5.5 Signal Strength Indicator (receiver) ................................................................................................... 12
       2.5.6 Cross-talk indicator (receiver) ........................................................................................................... 12
   2.6 Specifications ............................................................................................................................................... 13

3. INSTALLATION .................................................................................................................................................... 14
   3.1 Overview ...................................................................................................................................................... 14
   3.2 Point-of-operation Guarding ........................................................................................................................ 14
   3.3 Perimeter Guarding .................................................................................................................................... 14
   3.4 How to calculate safety distance ................................................................................................................... 15
       3.4.1 Safety distances per Europe’s EN 999 standard .................................................................................... 15
       3.4.2 Safety distances per USA’s OSHA/ANSI requirements ...................................................................... 15
       3.4.3 European EN 999 standard ................................................................................................................ 16
       3.4.4 US OSHA/ANSI/RIA standards requirements .................................................................................. 17
       3.4.4.1 Sample Calculation: Point-of-operation safeguarding .................................................................. 19
       3.4.4.2 Sample Calculation: Perimeter safeguarding (Access Detection) ................................................... 19
   3.5 How to Calculate Minimum Distance Considering Reflective Surfaces .................................................... 19
   3.6 Mutual Interference or cross-talk .................................................................................................................. 20
   3.7 Dimensions andWeights ............................................................................................................................... 21
       3.7.1 Dimensions and weights of the FF-SYA14, FF-SYA30 and FF-SYA60 Series light curtains .......... 22
       3.7.2 Dimensions and weights of the FF-SYA234 multibeam systems for access detection ................... 24
   3.8 Mounting Considerations ............................................................................................................................. 25
       3.8.1 Optical Alignment ............................................................................................................................... 25
       3.8.2 Vertical Mounting ............................................................................................................................... 25
       3.8.3 Vertical Mounting / Linear Assembly ................................................................................................ 27
       3.8.4 Vertical Mounting / Side by Side Installation ................................................................................... 28
       3.8.5 Horizontal mounting ............................................................................................................................ 29
       3.8.6 Diagonal and Right-Angle Mounting .................................................................................................. 29
   3.9 Mounting Hardware .................................................................................................................................. 30
1. Important Information

1.1 Overview

Thank you for purchasing this Honeywell safety product. This manual contains description, operation, installation, electrical connections, maintenance and trouble-shooting information related to the FF-SYA product. These installation instructions do not provide instructions for operating the machine on which the FF-SYA product is installed. Information about the machine operation can be found in the machine manufacturer’s operating instructions.

1.2 Organisation of Installation Manual

This installation manual has the following sections:

- **Important Information** contains important highlighted information, the manual's organisation, 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 or the multibeam system for access detection.
- **Connections and Setup** covers electrical installation, interfacing and set-up procedures.
- **Inspection and Maintenance** contains inspection, maintenance, and indicator status information.
- **Order Guides** provide catalog listings of light curtains or multibeam systems, 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** symbol indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
- **WARNING** symbol indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
- **CAUTION** symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.
- **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 optoelectronic safety device 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

<table>
<thead>
<tr>
<th>Approvals</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>CE</td>
<td>Compliance with the EN 61496 - parts 1 &amp; 2 Standards for type 4 Electrosensitive Protective Equipment. Only the packaging and the documentation of FF-SYA Series products carry the CE mark; the EC declaration of conformity is at the back of this manual.</td>
</tr>
<tr>
<td>cCSAus</td>
<td>Canadian Standards Association has been recognised as a National Recognised Testing Laboratory by the US OSHA. This product had been tested and certified to US and Canadian standards.</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Directives</th>
<th>Number</th>
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<tr>
<td>Machine Directive</td>
<td>98/37/EC</td>
</tr>
<tr>
<td>Low Voltage Directive</td>
<td>73/23/EC</td>
</tr>
</tbody>
</table>

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/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, as amended 91/263/EC, 92/31/EC, 93/108/EC and 93/97/EC.

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:

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

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

<table>
<thead>
<tr>
<th>Regulation</th>
<th>Title</th>
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<tbody>
<tr>
<td>EN 292</td>
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<td>Safety of Machinery - Electrosensitive protective equipment - part 1: General requirements and tests</td>
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<tr>
<td>IEC/pr EN 61496-2</td>
<td>Safety of Machinery - Electrosensitive protective equipment - part 2: Active optoelectronic Protective Devices</td>
</tr>
<tr>
<td>EN 999</td>
<td>Safety of Machinery - The positioning of protective equipment in respect of approach speeds of parts of the human body</td>
</tr>
<tr>
<td>EN 294</td>
<td>Safety of Machinery - Safety distances to prevent danger zones from being reached by the upper limbs</td>
</tr>
<tr>
<td>EN 811</td>
<td>Safety of Machinery - Safety distances to prevent danger zones from being reached by the lower limbs</td>
</tr>
<tr>
<td>EN 692</td>
<td>Machine-tool - Safety - Mechanical Presses</td>
</tr>
<tr>
<td>pr EN 693</td>
<td>Machine-tool - Safety - Hydraulic Presses</td>
</tr>
<tr>
<td>pr EN 12622</td>
<td>Hydraulic press brakes - Safety</td>
</tr>
<tr>
<td>EN 201</td>
<td>Injection plastic moulding machines</td>
</tr>
<tr>
<td>EN 289</td>
<td>Compression moulding and transfer machines</td>
</tr>
<tr>
<td>pr EN 11553</td>
<td>Laser for material processing</td>
</tr>
<tr>
<td>EN 775</td>
<td>Manipulating Industrial Robots</td>
</tr>
<tr>
<td>EN 415-1</td>
<td>Safety of packaging machines - Part 1: Common requirements</td>
</tr>
<tr>
<td>EN 415-2</td>
<td>Safety of packaging machines - Part 2: Preformed rigid container packaging machinery</td>
</tr>
<tr>
<td>EN 415-3</td>
<td>Safety of packaging machines - Part 3: Form, fill and seal machines</td>
</tr>
<tr>
<td>EN 415-4</td>
<td>Safety of packaging machines - Part 4: palletisers and depalletisers</td>
</tr>
</tbody>
</table>
1.9 United States Regulations Compliance

<table>
<thead>
<tr>
<th>US Regulation</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSHA 29 CFR 1910.212</td>
<td>General Requirements for (guarding of) All Machines</td>
</tr>
<tr>
<td>OSHA 29 CFR 1910.217</td>
<td>(Guarding of) Mechanical Power Presses</td>
</tr>
</tbody>
</table>

- 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):

<table>
<thead>
<tr>
<th>Standards</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSI B11.1</td>
<td>Mechanical Power Presses</td>
</tr>
<tr>
<td>ANSI B11.2</td>
<td>Hydraulic Power Presses</td>
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<tr>
<td>ANSI B11.19</td>
<td>Safeguarding when Referenced by the Other B11 Machine Tool Safety Standards</td>
</tr>
<tr>
<td>ANSI/RIA R15.06 - 1999</td>
<td>Safety Requirements for Industrial Robots and Robot Systems</td>
</tr>
</tbody>
</table>

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 neutralise the detectors associated with these hard guards. Hard guards shall comply with the following applicable European Standards:

<table>
<thead>
<tr>
<th>Standards</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN 953</td>
<td>Safety of Machinery - General requirements for the design and construction of guards</td>
</tr>
<tr>
<td>EN 294</td>
<td>Safety of Machinery - Safety distances to prevent danger zones from being reached by the upper limbs</td>
</tr>
<tr>
<td>EN 811</td>
<td>Safety of Machinery - Safety distances to prevent danger zones from being reached by the lower limbs</td>
</tr>
<tr>
<td>EN 1088</td>
<td>Safety of Machinery - Interlocking devices with and without guard locking</td>
</tr>
<tr>
<td>EN 954-1</td>
<td>Safety of Machinery - Safety related parts of control system</td>
</tr>
</tbody>
</table>

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: extension 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:

- 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.

**NOTICE**
In order to simplify this manual, the term “safety light curtain” is used for the FF-SYA14, FF-SYA30 and FF-SYA60 safety light curtains as well as for the FF-SYA234 safety multibeam systems for access detection.

2.2 Machine Guarding and Perimeter Protection
The FF-SYA14 and FF-SYA30 Series through-scan light curtains are non-contact machine guarding devices designed for point-of-operation protection at power driven machinery (see Figure 2-1) where fingers or hands need to be detected.

The FF-SYA60 Series light curtains are designed for presence detection in dangerous areas where legs or a body need to be detected.

The FF-SYA234 Series multibeam systems are used for access detection in dangerous areas where a body needs to be detected.

**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 another 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 accumulations 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 safe relay contacts to the machine control stop circuit.

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

FF-SYA 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)

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 the FF-SYA14 and FF-SYA30 light curtains only)

⚠️ DANGER

IMPROPER POINT-OF-OPERATION PROTECTION
Do NOT use FF-SYA60 Series light curtains or the FF-SYA234 multibeam systems 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-SYA234 multibeam systems with deflection mirrors)
2.3 Approval and rating plates

Figure 2-4 Rating plate of the FF-SYA14, FF-SYA30 and FF-SYA60 Series light curtains

Figure 2-5 Rating plate of the FF-SYA234 multibeam systems for access detection

<table>
<thead>
<tr>
<th>NSR</th>
<th>Nominal Scanning Range</th>
<th>I</th>
<th>Output Switching Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>PH</td>
<td>Protection Height</td>
<td>Type</td>
<td>Product Part Number</td>
</tr>
<tr>
<td>N</td>
<td>Number of beams</td>
<td>N°</td>
<td>Serial number</td>
</tr>
<tr>
<td>R</td>
<td>Resolution</td>
<td>Date</td>
<td>Date code (month/year)</td>
</tr>
<tr>
<td>BS</td>
<td>Beam spacing</td>
<td>S</td>
<td>Sealing</td>
</tr>
<tr>
<td>V</td>
<td>Supply Voltage</td>
<td>L</td>
<td>Loads specifications (max. impedance and min; turn-on voltage)</td>
</tr>
<tr>
<td>T</td>
<td>Response time</td>
<td>Service</td>
<td>Sales and Service phone numbers</td>
</tr>
</tbody>
</table>
CE Only the packaging and the documentation of FF-SYA Series products carry the CE mark; the EC declaration of conformity is at the back of this manual

INRS “Institut National de Recherche et de Sécurité” French notified body for the CE certification of Electrosensitive protective Equipment

cCSAus The Canadian Standard Association has been accredited as a Nationally Recognised 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-SYA Series are through-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 Synchronisation
The emitter and the receiver are optically synchronised. The synchronisation is an effective beam transmitted by the emitter towards the receiver. No electrical connection is necessary between the emitter and the receiver that simplifies installation and maintenance.

2.4.2 Resolution (FF-SYA14, FF-SYA30 and FF-SYA60 Series)
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 reasons, 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 2-8). Lens diameter is the smallest width that will block a single light beam. The combination of the beam diameter and centre distance gives the FF-SYA14 (see Figure 2-7) 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).
### 2.4.3 Protection Height (FF-SYA14, FF-SYA30 and FF-SYA60 series)

The Protection height is the height on which the test rod will be detected.

#### 2.4.4 Beam spacing and number of beams (FF-SYA234 Series)

For FF-SYA234 multibeam systems for access detection, beam spacing indicates the distance between the optical axis of two consecutive beams. The beam spacing of the FF-SYA multibeam system and the beam heights above the reference plane are in compliance with the European standards EN 999.

<table>
<thead>
<tr>
<th>Model</th>
<th>Resolution R</th>
<th>Beam pitch P</th>
<th>Lens size D</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF-SYA14</td>
<td>Ø 14 / 0.6</td>
<td>10 / 0.4</td>
<td>4 / 0.16</td>
</tr>
<tr>
<td>FF-SYA30</td>
<td>Ø 30 / 1.2</td>
<td>20 / 0.8</td>
<td>10 / 0.4</td>
</tr>
<tr>
<td>FF-SYA60</td>
<td>Ø 60 / 2.4</td>
<td>40 / 1.6</td>
<td>10 / 0.4</td>
</tr>
</tbody>
</table>

Dimensions in mm / in

### NOTICE

**NON COMPLIANCE TO ANSI/RIA 15.06–1999 WITH FF-SYA02500**

Only the three beam (FF-SYA03400 Series) and the four beam versions (FF-SYA04300 Series) are in compliance with the beam heights, specified in the US Standard ANSI/RIA R15.06-1999 (Industrial Robots and Robot Systems – Safety Requirements). The two beam version (FF-SYA02500 Series) does NOT comply with ANSI/RIA R15.06 and may require additional protection.

Refer to applicable standards. In the absence of an applicable standard, ANSI B11.19 and ANSI R15.06 may be used as reference for the USA, as well as EN 999 (or the relevant European Type C machine standard) for Europe.
2.4.5 Response Time

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.

<table>
<thead>
<tr>
<th>Model number</th>
<th>Response Time (FF-SYA14, FF-SYA30, FF-SYA60 Light Curtains)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FF-SYA14</td>
</tr>
<tr>
<td>032</td>
<td>14 ms</td>
</tr>
<tr>
<td>048</td>
<td>15 ms</td>
</tr>
<tr>
<td>064</td>
<td>15,5 ms</td>
</tr>
<tr>
<td>080</td>
<td>17,5 ms</td>
</tr>
<tr>
<td>096</td>
<td>19,5 ms</td>
</tr>
<tr>
<td>112</td>
<td>20,5 ms</td>
</tr>
<tr>
<td>128</td>
<td>22,5 ms</td>
</tr>
<tr>
<td>144</td>
<td>20 ms</td>
</tr>
<tr>
<td>160</td>
<td>21 ms</td>
</tr>
<tr>
<td>176</td>
<td>22,5 ms</td>
</tr>
</tbody>
</table>

NA : Not Available

<table>
<thead>
<tr>
<th>Model</th>
<th>Response Time (FF-SYA234 Multibeam Systems for Access Detection)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF-SYA02500</td>
<td>11,5 ms</td>
</tr>
<tr>
<td>FF-SYA03400</td>
<td>11,5 ms</td>
</tr>
<tr>
<td>FF-SYA04200</td>
<td>11,5 ms</td>
</tr>
</tbody>
</table>

**NOTICE**

Response time

Response times shown in the above table DO NOT include the response time of the optional FF-SRS59392 Interface Control Module (when used).
2.4.6 Scanning Ranges

The 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 3.6 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**

<table>
<thead>
<tr>
<th>Version</th>
<th>Minimum (see Note 1): 23%</th>
<th>Medium (see Note 2): 50%</th>
<th>Maximum: 100% (see Note 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF-SYA14</td>
<td>0 m to 1.4 m (0 ft to 4.59 ft)</td>
<td>0 m to 3 m (0 ft to 9.84 ft)</td>
<td>0 m to 6 m (0 ft to 20 ft)</td>
</tr>
<tr>
<td>FF-SYA30</td>
<td>0 m to 4.6 m (0 ft to 15.08 ft)</td>
<td>0 m to 10 m (0.6 ft to 32.8 ft)</td>
<td>0.6 m to 20 m (2 ft to 65 ft)</td>
</tr>
<tr>
<td>FF-SYA60</td>
<td>0 m to 4.6 m (0 ft to 15.08 ft)</td>
<td>0 m to 10 m (0.6 ft to 32.8 ft)</td>
<td>0.6 m to 20 m (2 ft to 65 ft)</td>
</tr>
<tr>
<td>FF-SYA02500</td>
<td>0.5 m to 18 m (1.6 ft to 59.1 ft)</td>
<td>15 m to 40 m (49.2 ft to 131.2 ft)</td>
<td>35 m to 80 m (114.8 ft to 262.5 ft)</td>
</tr>
<tr>
<td>FF-SYA03400</td>
<td>0.5 m to 18 m (1.6 ft to 59.1 ft)</td>
<td>15 m to 40 m (49.2 ft to 131.2 ft)</td>
<td>35 m to 80 m (114.8 ft to 262.5 ft)</td>
</tr>
<tr>
<td>FF-SYA04300</td>
<td>0.5 m to 18 m (1.6 ft to 59.1 ft)</td>
<td>15 m to 40 m (49.2 ft to 131.2 ft)</td>
<td>35 m to 80 m (114.8 ft to 262.5 ft)</td>
</tr>
</tbody>
</table>

**Note 1:** Factory setting for the FF-SYA234 is “Minimum”

**Note 2:** Factory setting for the FF-SYA14, FF-SYA30 and FF-SYA60 is “Medium”

---

**NOTICE**

**MINIMUM SCANNING RANGE (FF-SYA14, FF-SYA30 and FF-SYA60 only)**

Using the FF-SYA14, FF-SYA30 or FF-SYA60 light curtains 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 restore the power.

---

**WARNING**

**IMPROPER MINIMUM SCANNING RANGE (FF-SYA234 only)**

Always install the FF-SYA234 multibeam systems at a distance superior to the minimum value of the selected scanning range or select a lower scanning range on the emitter. When installed at a distance below the specified minimum scanning range, the FF-SYA234 multibeam systems for access detection may NOT comply with IEC/ pr EN 61496-2 optical requirements for aperture angle.

Failure to comply with these instructions could result in death or serious injury.
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 the light curtain status.

Figure 2-9 Emitter Indicators

2.5.1 Scanning range indicators (emitter)

<table>
<thead>
<tr>
<th>R3</th>
<th>R2</th>
<th>R1</th>
</tr>
</thead>
<tbody>
<tr>
<td>☀️</td>
<td>☀️</td>
<td>☀️</td>
</tr>
</tbody>
</table>

Maximum scanning range  

<table>
<thead>
<tr>
<th>R3</th>
<th>R2</th>
<th>R1</th>
</tr>
</thead>
<tbody>
<tr>
<td>☀️</td>
<td>☀️</td>
<td></td>
</tr>
</tbody>
</table>

Medium scanning range  

<table>
<thead>
<tr>
<th>R3</th>
<th>R2</th>
<th>R1</th>
</tr>
</thead>
<tbody>
<tr>
<td>☀️</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Minimum 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.

When the maximum emission power has been selected, the nominal scanning range can be achieved and three LEDs R1, R2 and R3 are lit on permanently. Lit on LEDs R2 and R3 indicate, that a medium emission power had been selected and scanning range is decreased to medium.

When emission power and nominal scanning range are decreased to MEDIUM respectively MINIMUM, then only two LEDs (R2 and R3) or respectively one LED (R3) remain permanently on (see chapter 2.4.6 Scanning Ranges for further information).

2.5.2 Alarm indicator (emitter)

<table>
<thead>
<tr>
<th>Alarm</th>
<th>Normal operation</th>
<th>Emitter failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>☀️ red</td>
<td></td>
<td>☀️ red</td>
</tr>
</tbody>
</table>

The alarm indicator is a red LED that 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)

<table>
<thead>
<tr>
<th>Test</th>
<th>Normal operation</th>
<th>Test</th>
<th>Test mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>red</td>
<td></td>
<td>red</td>
<td></td>
</tr>
</tbody>
</table>

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).

2.5.4 Operation Indicators (receiver)

The operation indicators are two green and red LED indicators that provide operation status. The green LED indicates the receiver operates 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 3.6. Mutual Interference or cross-talk).

2.6 Specifications

<table>
<thead>
<tr>
<th>OPERATING CHARACTERISTICS</th>
<th>FF-SYA14</th>
<th>0 m to 6 m / 0 ft to 20 ft</th>
<th>FF-SYA30</th>
<th>0.6 m to 20 m / 2 ft to 65 ft</th>
<th>FF-SYA60</th>
<th>0.6 m to 20 m / 2 ft to 65 ft</th>
<th>FF-SYA02500</th>
<th>0.5 m to 80 m / 1.6 ft to 262.5 ft</th>
<th>FF-SYA03400</th>
<th>0.5 m to 80 m / 1.6 ft to 262.5 ft</th>
<th>FF-SYA04300</th>
<th>0.5 m to 80 m / 1.6 ft to 262.5 ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Scanning Range</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Object Detection Size</td>
<td>FF-SYA14</td>
<td>14 mm (0.6 in) minimum (finger detection)</td>
<td>FF-SYA30</td>
<td>30 mm (1.2 in) minimum (hand detection)</td>
<td>FF-SYA60</td>
<td>60 mm (2.4 in) minimum (leg or body detection)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beam spacing</td>
<td>FF-SYA02500</td>
<td>500 mm (19.7 in) (body detection)</td>
<td>FF-SYA03400</td>
<td>400 mm (15.76 in) (body detection)</td>
<td>FF-SYA04300</td>
<td>300 mm (11.82 in) (body detection)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Angle of Divergence</td>
<td>± 2° ± 25 %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emitting Light Source</td>
<td>Sunlight</td>
<td>20 000 Lux</td>
<td>Lamplight</td>
<td>15 000 Lux</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ELECTRICAL CHARACTERISTICS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply Voltage (emitter or receiver)</td>
<td>24 Vdc ± 15 %, with dc to dc converter *</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Consumption (emitter or receiver)</td>
<td>Emitter: 7 W maximum / Receiver: 7 W maximum</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Output Type</td>
<td>Static safety outputs (PNP with normally open characteristic)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output Switching Capability</td>
<td>0.5 A at 24 Vdc max.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allowed loads impedance</td>
<td>55.2 Ω min. / 5 kΩ max.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allowed loads turn-on voltage</td>
<td>5 V min. on 100 % resistive loads / 7 V min. on inductive loads</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test Input</td>
<td>External dry contact required</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response Times</td>
<td>FF-SYA14</td>
<td>≤ 22.5 ms</td>
<td>FF-SYA30</td>
<td>≤ 17.5 ms</td>
<td>FF-SYA60</td>
<td>≤ 17.5 ms</td>
<td>FF-SYA02500</td>
<td>≤ 11.5 ms</td>
<td>FF-SYA03400</td>
<td>≤ 11.5 ms</td>
<td>FF-SYA04300</td>
<td>≤ 11.5 ms</td>
</tr>
<tr>
<td>Immunity to Electrical Noise</td>
<td>IEC 61000-4-4 (Replaces IEC 801-4 standard)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENVIRONMENT/PHYSICAL CHARACTERISTICS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td>0 °C to 55 °C (32 °F to 131 °F)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relative humidity</td>
<td>95 %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Storage Temperature Range</td>
<td>-20 °C to 75 °C (-4 °F to 167 °F)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Sealing</td>
<td>NEMA 4, 13, and IP 65</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Housing Dimension</td>
<td>Width, 42 mm (1.65 in); Depth, 55 mm (2.16 in); Height**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>Housing</td>
<td>Aluminium Alloy and polycarbonate</td>
<td>Front Plate</td>
<td>Polymethylmethacrylate (PMMA)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight per device</td>
<td>1 kg to 4.8 kg (2.20 lbs to 10.56 lbs)***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*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.
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**
- 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.

**DANGER**
IMPROPER POINT-OF-OPERATION INSTALLATION.
- Do NOT use the FF-SYA234 multibeam systems or the FF-SYA60 light curtains for point-of-operation guarding. Use the FF-SYA14 or FF-SYA30 light curtains only.
- 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.

**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.

**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 static safety 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 static safety contacts to the machine control stop circuit.
Failure to comply with these instructions could 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 FF-SYA14 and FF-SYA30 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, interlocked guarding, light curtain, safety mats or safety scanners may be required.

3.2 Point-of-operation Guarding

**WARNING**
IMPROPER INSTALLATION OF FF-SYA SERIES PERIMETER DEVICE
- Install the FF-SYA234 multibeam systems or the FF-SYA60 light curtain 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.

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

Honeywell’s FF-SYA234 multibeam systems and the FF-SYA60 are self-contained, perimeter protection devices designed to detect the body of an operator before gaining access to a dangerous area. After the detection of a body, the machine must stop and remain stopped until the operator performs a manual restart outside the danger zone.

### 3.4 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.

#### 3.4.1 Safety distances per Europe’s EN 999 standard

In Europe, 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.

#### 3.4.2 Safety distances per USA’s OSHA/ANSI requirements

In the USA, calculate the safety distance (see Figure 3-1) using the following formula:

\[ D_s \geq K (T_s + T_c + T_r) + D_{pf} \]

Where:
- \( D_s \) is the minimum safety distance from the light curtain sensing field to the danger zone
- \( K \) is the approach speed of movement to the danger zone
- \( T_s \) is the worst case stopping time of the machine
- \( T_c \) is the worst case response time of the machine’s control
- \( T_r \) is the response time of the safety devices (light curtain plus its interface — meaning the response time including the mechanical relay outputs)
- \( D_{pf} \): Depth penetration factor

*Figure 3-1 Light Curtain Safety Distance Diagram*
3.4.3 European EN 999 standard

All distances/heights in mm (100 mm = 3.9 in)

<table>
<thead>
<tr>
<th>LIGHT CURTAIN MODEL</th>
<th>FF-SYA14</th>
<th>FF-SYA30</th>
<th>FF-SYA60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal approach</td>
<td>S ≥ 2000 ((t_1 + t_2)), with S ≥ 100</td>
<td>S ≥ 2000 ((t_1 + t_2) + 128), with S ≥ 100</td>
<td>S ≥ 1600 ((t_1 + t_2) + 850) with Hu ≥ 900 mm, Hl ≤ 300 mm</td>
</tr>
<tr>
<td></td>
<td>if S ≥ 500, then use:</td>
<td>if S ≥ 500, then use:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S ≥ 1600 ((t_1 + t_2)), with S ≥ 500</td>
<td>S ≥ 1600 ((t_1 + t_2) + 128), with S ≥ 500</td>
<td></td>
</tr>
<tr>
<td>Parallel approach</td>
<td>(S ≥ 1600 ((t_1 + t_2) + (1200 - 0.4H)), with H ≤ 875)</td>
<td>(S ≥ 1600 ((t_1 + t_2) + 850), with 875 ≤ H ≤ 1000 (H ≥ 15 \text{ (R-50)}) where R is the light curtain resolution (with H ≥ 150 mm for the FF-SYA60 light curtain)</td>
<td></td>
</tr>
<tr>
<td>Angled approach</td>
<td>if (α ≥ 30°), then use the normal approach formula, with Hu ≥ 900 mm and Hl ≤ 300 mm for the FF-SYA60 light curtain.</td>
<td>if (α ≤ 30°), then use the parallel approach formula, with Hu ≤ 1000 mm and Hl ≥ 15 \text{ (R-50)}) where R is the light curtain resolution (with Hl ≥ 150 mm for the FF-SYA60 light curtain)</td>
<td></td>
</tr>
</tbody>
</table>

FF-SYA234

MULTIBEAM SYSTEM

<table>
<thead>
<tr>
<th>FF-SYA02500</th>
<th>FF-SYA03400</th>
<th>FF-SYA04300</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of beams</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Beam spacing</td>
<td>500</td>
<td>400</td>
</tr>
<tr>
<td>Recommended beam heights above the reference plane per EN 999</td>
<td>Hi = 300, Hu = 400</td>
<td>Hi = 700, Hu = 900</td>
</tr>
<tr>
<td>Normal approach</td>
<td>S ≥ 1600 ((t_1 + t_2) + 850)</td>
<td></td>
</tr>
</tbody>
</table>

Where:
- \(S\) is the minimum safety distance (in mm; 100 mm = 3.9 in)
- \(t_1\) is the light curtain response time (in s)
- \(t_2\) is the machine stopping time (in s)
- \(H\) is the height of the detection plane above the reference floor (in mm)
- \(Hu\) is the height of the uppermost beam above the reference floor (in mm)
- \(Hl\) is the height of the lowest beam above the reference floor (in mm)

For more information, refer to the 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.

**WARNING**

IMPROPER USE OF FF-SYA234 multibeam systems

Do not use the FF-SYA234 multibeam systems in parallel or angled approach applications. Use the FF-SYA234 only in normal approach applications.

Failure to comply with these instructions could result in death or serious injury.
### 3.4.4 US OSHA/ANSI/RIA standards requirements

All distances/heights in inches (1 in = 25.4 mm)

<table>
<thead>
<tr>
<th>LIGHT CURTAIN MODEL</th>
<th>FF-SYA14</th>
<th>FF-SYA30</th>
<th>FF-SYA60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal approach</td>
<td>Ds ≥ 63 (Ts + Tc + Tr) + 0.94</td>
<td>Ds ≥ 63 (Ts + Tc + Tr) + 3.08</td>
<td>Ds ≥ 63 (Ts + Tc + Tr) + 7.10</td>
</tr>
<tr>
<td></td>
<td>If Hi ≤ 12 and Hu &gt; 48 (Typical for Reach Thru).</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ds ≥ 63 (Ts + Tc + Tr) + 48</td>
<td>Ds ≥ 63 (Ts + Tc + Tr) + 48</td>
<td>Ds ≥ 63 (Ts + Tc + Tr) + 48</td>
</tr>
<tr>
<td></td>
<td>If Hi ≤ 12 and 36 ≤ Hu ≤ 48 (Typical for Reach Over)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parallel approach</td>
<td>Ds ≥ 63 x (Ts + Tc + Tr) + 48</td>
<td>Allowable field heights (for FF-SYA14 and FF-SYA30):</td>
<td>Allowable field heights (for FF-SYA60):</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 ≤ H ≤ 39</td>
<td>5.5 ≤ H ≤ 39</td>
</tr>
<tr>
<td>Angled approach</td>
<td>If α ≥ 30°, then use the normal approach formula</td>
<td>If Hi &lt; 12 and 36 ≤ Hu ≤ 48 then Dpf = 48 (Reach Over)</td>
<td>If Hi &lt; 12 and 36 ≤ Hu ≤ 48 then Dpf = 48 (Reach Over)</td>
</tr>
<tr>
<td></td>
<td>If α &lt; 30°, then use the parallel approach formula</td>
<td>If Hi &lt; 12 and Hu &gt; 48 then Dpf = 36 (Reach Thru)</td>
<td>If Hi &lt; 12 and Hu &gt; 48 then Dpf = 36 (Reach Thru)</td>
</tr>
</tbody>
</table>

**FF-SYA234 MULTIBEAM SYSTEMS**

<table>
<thead>
<tr>
<th>FF-SYA03400</th>
<th>FF-SYA04300</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of beams</td>
<td>3</td>
</tr>
<tr>
<td>Beam spacing</td>
<td>15.76</td>
</tr>
<tr>
<td>Beam heights above the reference plane</td>
<td>11.82</td>
</tr>
<tr>
<td></td>
<td>27.58</td>
</tr>
<tr>
<td></td>
<td>43.94</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Normal approach

<table>
<thead>
<tr>
<th>Ds ≥ 63 (Ts + Tc + Tr) + Dpf</th>
</tr>
</thead>
<tbody>
<tr>
<td>If Hi &lt; 12 and 36 ≤ Hu ≤ 48 then Dpf = 48 (Reach Over)</td>
</tr>
<tr>
<td>If Hi &lt; 12 and Hu &gt; 48 then Dpf = 36 (Reach Thru)</td>
</tr>
</tbody>
</table>

If Hi > 12, supplemental safeguarding may be required to detect crawling underneath.

Where: $Ds = K \times (Ts + Tc + Tr) + Dpf$

- $Ds$ is the Minimum safety distance (in inches, 1 in = 25.4 mm)
- $K$ is the Approach speed (called “hand speed”) = 63 in/s minimum
- $Ts$ is the Worst case stopping time of the machine (s)
- $Tc$ is the Worst case response of the machine’s control (s)
- $Tr$ is the Response time of the safety devices (light curtains plus its interface meaning the response time including the mechanical relay outputs in seconds)
- $Dpf$ is the Depth penetration factor (inches)
- $H$ is the Height of the detection plane above the reference floor (in)
- $Hu$ is the Height of the uppermost beam above the reference floor (in)
- $Hi$ is the Height of the lowest beam above the reference floor (in). For normal approach, assumption is that Hi is not greater than 12 inches unless the application prevents access even with Hi at a distance greater than 12 inches)
**WARNING**

**IMPROPER SAFETY DISTANCE**
- Calculate safety distance using formula $D_s = K \times (T_s + T_c + T_r) + D_{pf}$ (see explanations above)
- $D_s$ is the minimum safety distance from the light curtain sensing field to the danger zone (OSHA 29 CFR 1910.217 (c) (3) (iii) (e) and ANSI B11.1, B11.2, B11.19, and R15.06)
- The Depth penetration factor $D_{pf}$ is determined by both the installation of the product as well as the product’s resolution (Minimum Object Sensitivity).

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

---

**WARNING**

**IMPROPER PROTECTIVE HEIGHT**
- For “Reach Thru” applications, the light curtain’s protective field must be sufficiently great such that personnel can not reach over or under the light curtain without being detected.
- The protective height is determined by the installation, measuring from the reference floor to the top beam.
- A protective height of 48 in may be adequate to detect personnel reaching through the curtain light field. Reference ANSI R15.06 Annex B – supplemental information
- The installation may require a protective height greater than 48 in to properly safeguard personnel due to their height or working position (standing or sitting) or work station position relative to variations in floor elevations (or work platforms or stairs).
- Before use, verify that the protective heights are adequate for their intended use of safeguarding personnel.

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

---

**WARNING**

**IMPROPER USE OF FF-SYA234 multibeam systems**
Do not use the FF-SYA234 multibeam systems in parallel or angled approach applications. Use the FF-SYA234 only in normal approach applications.

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

---

**NOTICE**

**NON COMPLIANCE TO ANSI/RIA 15.06–1999 WITH FF-SYA02500**
Only the three beam (FF-SYA03400 Series) and the four beam versions (FF-SYA04300 series) are in compliance with the beam heights, specified in the US Standard ANSI/RIA R15.06-1999 (Industrial Robots and Robot Systems – Safety Requirements). The two beam version (FF-SYA02500 Series) does NOT comply with ANSI/RIA R15.06 and may require additional protection. Refer to applicable standards. In the absence of an applicable standard, ANSI B11.19 and ANSI R15.06 may be used as reference for the USA, as well as EN 999 (or the relevant European Type C machine standard) for Europe.
3.4.4.1 Sample Calculation: 
Point-of-operation safeguarding

Country: USA  
Application: Robot System  
Protection: Point-of-operation safeguarding (load station)

Formula: \( D_s \geq K \times (T_s + T_c + T_r) + D_{pf} \)
- \( K = 63 \) in/s minimum
- \( T_r = \) Either 14.5 ms or 29.5 ms:
  - 14.5 ms (FF-SYA30080Q2) when connecting the light curtain’s control reliable solid state outputs directly to the machine control
  - OR
  - 29.5 ms (14.5 ms + 15 ms FF-SRS59392 module) if relay contacts are needed to connect to the machine control
- \( T_s + T_c = 200 \) ms (robot and clamp stop time; including response time of all interconnecting components, etc.)
- \( H_i = 20 \) in (no access below 20 in due to load station table)
- \( H_u = 53 \) in (Reach thru for personnel)
- \( \Rightarrow D_{pf} = 3.08 \) in (ANSI R15.06) [FF-SYA30]

If \( T_r = 14.5 \) ms:
\[
D_s = 63 \text{ in/s} \times (0.0145 \text{ s} + 0.200 \text{ s}) + 3.08 \text{ in} \\
D_s = 16.59 \text{ in} \text{ minimum to the point-of-operation hazard}
\]

If \( T_r = 29.5 \) ms:
\[
D_s = 63 \text{ in/s} \times (0.0295 \text{ s} + 0.200 \text{ s}) + 3.08 \text{ in} \\
D_s = 17.54 \text{ in} \text{ minimum to the point-of-operation hazard}
\]

3.4.4.2 Sample Calculation: 
Perimeter safeguarding (Access Detection)

Country: USA  
Application: Robot System  
Protection: Perimeter safeguarding (detecting entrance or access to an area, such as the safeguarded space)

Formula: \( D_s \geq K \times (T_s + T_c + T_r) + D_{pf} \)
- \( K = 63 \) in/s minimum
- \( T_r = \) Either 11.5 ms or 26.5 ms
  - 11.5 ms (FF-SYA03400Q2 or FF-SYA04300Q2) when connecting the multi-beam’s control reliable solid state outputs directly to the machine control
  - OR
  - 26.5 ms (11.5 ms + 15 ms module FF-SRS59392) if relay contacts are needed to connect to the machine control
- \( T_s + T_c = 350 \) ms (robot system stop time, including response time of all interconnecting components, such as relays, solenoids, brakes, etc.)
- \( H_i = 10 \) in
- \( H_u = 38 \) in (Reach over of upper torso)
- \( \Rightarrow D_{pf} = 48 \) in (per ANSI R15.06)

If \( T_r = 11.5 \) ms:
\[
D_s = 63 \text{ in/s} \times (0.0115 \text{ s} + 0.350 \text{ s}) + 48 \text{ in} \\
D_s = 70.77 \text{ in} \text{ minimum to the closest hazard}
\]

If \( T_r = 26.5 \) ms:
\[
D_s = 63 \text{ in/s} \times (0.0265 \text{ s} + 0.350 \text{ s}) + 48 \text{ in} \\
D_s = 71.72 \text{ in} \text{ minimum to the closest hazard}
\]

3.5 How to Calculate Minimum Distance Considering Reflective Surfaces

⚠️ WARNING
REFLECTIVE SURFACES
- To prevent two optical paths to the receiver, install the 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 \( D = L \times \tan(2.5^\circ) \), 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:
- \( D = 131 \) mm, for scanning distances between 0 and 3 m
- \( D = L \times \tan(2.5^\circ) \), for scanning distances greater than 3 m
- \( D = \) Minimum distance to reflective surface (always greater than 131 mm or 5.16 in)
- \( L = \) 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
3.6 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/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 CROSS-TALK**

Reception of two infrared emissions will maintain the light curtain in a lockout 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, restore the power.

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 3-5 Emission Power selector switch

Maximum Scanning Range
(Nominal scanning range)

Medium Scanning Range
(1) (2)

Minimum Scanning Range
(1) (3)

(1) Nominal Scanning Range of the FF-SYA14 light curtain: 6 m (19.7 ft),
    Nominal Scanning Range of the FF-SYA30 / FF-SYA60 light curtains: 20 m (65.6 ft),
    Nominal Scanning Range of the FF-SYA234 multibeam systems for access detection: 80 m (262.4 ft)

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.

(2) Factory setting of the FF-SYA14, FF-SYA30 and FF-SYA60 light curtains: Medium scanning range
(3) Factory setting of the FF-SYA234 multibeam systems: Minimum scanning range

Figure 3-6 Cross-talk reduction

3.7 Dimensions and Weights

Different protection heights are available for the FF-SYA14 / FF-SYA30 / FF-SYA60 Series light curtains. The FF-SYA234
multibeam systems for access detection exist in two, three and four beam versions.

All emitter and receiver units of the FF-SYA Series are using the same housing profile and are having the same cross-sectional
size. Figure 3-7 illustrates the cross-sectional dimensions of the light curtain.

Figure 3-7 Emitter and Receiver overall sizes

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

For more information on dimensions and weights, please refer to the figures and tables on the following page.
3.7.1 Dimensions and weights of the FF-SYA14, FF-SYA30 and FF-SYA60 Series light curtains

*Figure 3-8 Emitter and Receiver Heights*

1/ FF-SYA light curtains with DIN 43651 connector

2/ FF-SYA light curtains with Brad-Harrison connector

3/ FF-SYA light curtains with terminal strips

Table 1

<table>
<thead>
<tr>
<th>Model</th>
<th>øR (resolution)</th>
<th>P (lens pitch)</th>
<th>D (lens diameter)</th>
<th>A (inactive zone)</th>
<th>B (inactive zone)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF-SYA14</td>
<td>ø 14 / 0.6</td>
<td>10 / 0.4</td>
<td>4 / 0.16</td>
<td>15.2 / 0.60</td>
<td>90.6 / 3.56</td>
</tr>
<tr>
<td>FF-SYA30</td>
<td>ø 30 / 1.2</td>
<td>20 / 0.8</td>
<td>10 / 0.4</td>
<td>22.2 / 0.87</td>
<td>87.6 / 3.45</td>
</tr>
<tr>
<td>FF-SYA60</td>
<td>ø 60 / 2.4</td>
<td>40 / 1.6</td>
<td>10 / 0.4</td>
<td>42.2 / 1.66</td>
<td>87.6 / 3.45</td>
</tr>
</tbody>
</table>

(1) Protection Height for the minimum detected object size or resolution
(2) Sensing Field Height or full screen height
(3) Total Height or overall size including the connector for the FF-SYA/G71/G71/G71/G71/G71 C2 versions, the male receptacle for the FF-SYA/G71/G71/G71/G71/G71 Q2 versions and cable glands for the FF-SYA/G71/G71/G71/G71/G71 T2 versions.
Emitter and Receiver Heights (values in mm / kg) - for reference only

<table>
<thead>
<tr>
<th>Model</th>
<th>032</th>
<th>048</th>
<th>064</th>
<th>080</th>
<th>096</th>
<th>112</th>
<th>128</th>
<th>144</th>
<th>160</th>
<th>176</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protection Height (mm) (1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FF-SYA14</td>
<td>334</td>
<td>494</td>
<td>654</td>
<td>814</td>
<td>974</td>
<td>1134</td>
<td>1294</td>
<td>1454</td>
<td>1614</td>
<td>1774</td>
</tr>
<tr>
<td>FF-SYA30</td>
<td>350</td>
<td>510</td>
<td>670</td>
<td>830</td>
<td>990</td>
<td>1150</td>
<td>1310</td>
<td>1470</td>
<td>1630</td>
<td>1790</td>
</tr>
<tr>
<td>FF-SYA60</td>
<td>390</td>
<td>550</td>
<td>710</td>
<td>870</td>
<td>1030</td>
<td>1190</td>
<td>1350</td>
<td>1510</td>
<td>1670</td>
<td>1830</td>
</tr>
<tr>
<td>Sensing Field Height (mm) (2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>FF-SYA14</td>
<td>314</td>
<td>474</td>
<td>634</td>
<td>794</td>
<td>954</td>
<td>1114</td>
<td>1274</td>
<td>1434</td>
<td>1594</td>
<td>1754</td>
</tr>
<tr>
<td>FF-SYA30</td>
<td>310</td>
<td>470</td>
<td>630</td>
<td>790</td>
<td>950</td>
<td>1110</td>
<td>1270</td>
<td>1430</td>
<td>1590</td>
<td>1750</td>
</tr>
<tr>
<td>FF-SYA60</td>
<td>290</td>
<td>450</td>
<td>610</td>
<td>770</td>
<td>930</td>
<td>1090</td>
<td>1250</td>
<td>1410</td>
<td>1570</td>
<td>1730</td>
</tr>
<tr>
<td>Total Height (mm) (3)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FF-SYA/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71T2</td>
<td>438</td>
<td>598</td>
<td>758</td>
<td>918</td>
<td>1078</td>
<td>1238</td>
<td>1398</td>
<td>1558</td>
<td>1718</td>
<td>1878</td>
</tr>
</tbody>
</table>

Weight per device (kg)  |
| 1 | 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

<table>
<thead>
<tr>
<th>Model</th>
<th>032</th>
<th>048</th>
<th>064</th>
<th>080</th>
<th>096</th>
<th>112</th>
<th>128</th>
<th>144</th>
<th>160</th>
<th>176</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protection Height (in) (1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FF-SYA14</td>
<td>13.1</td>
<td>19.4</td>
<td>25.7</td>
<td>32.07</td>
<td>38.3</td>
<td>44.6</td>
<td>50.9</td>
<td>57.2</td>
<td>63.5</td>
<td>69.8</td>
</tr>
<tr>
<td>FF-SYA30</td>
<td>13.7</td>
<td>20.09</td>
<td>26.3</td>
<td>32.7</td>
<td>39</td>
<td>45.3</td>
<td>51.6</td>
<td>57.9</td>
<td>64.2</td>
<td>70.47</td>
</tr>
<tr>
<td>FF-SYA60</td>
<td>15.3</td>
<td>21.6</td>
<td>27.9</td>
<td>34.2</td>
<td>40.5</td>
<td>46.8</td>
<td>53.1</td>
<td>59.4</td>
<td>65.7</td>
<td>72.05</td>
</tr>
<tr>
<td>Sensing Field Height (in) (2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FF-SYA14</td>
<td>12.3</td>
<td>18.6</td>
<td>24.9</td>
<td>31.2</td>
<td>37.5</td>
<td>43.8</td>
<td>50.1</td>
<td>56.5</td>
<td>62.8</td>
<td>69.1</td>
</tr>
<tr>
<td>FF-SYA30</td>
<td>12.2</td>
<td>18.5</td>
<td>24.8</td>
<td>31.1</td>
<td>37.4</td>
<td>43.7</td>
<td>50.03</td>
<td>56.3</td>
<td>62.6</td>
<td>68.9</td>
</tr>
<tr>
<td>FF-SYA60</td>
<td>11.4</td>
<td>17.7</td>
<td>24.03</td>
<td>30.3</td>
<td>36.6</td>
<td>42.9</td>
<td>49.2</td>
<td>55.1</td>
<td>61.8</td>
<td>68.11</td>
</tr>
<tr>
<td>Total Height (in) (3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FF-SYA/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71C2</td>
<td>19.0</td>
<td>25.3</td>
<td>31.6</td>
<td>37.9</td>
<td>44.2</td>
<td>50.5</td>
<td>56.8</td>
<td>63.1</td>
<td>69.4</td>
<td>75.72</td>
</tr>
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<td>FF-SYA/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71Q2</td>
<td>17.4</td>
<td>23.7</td>
<td>30.0</td>
<td>36.3</td>
<td>42.6</td>
<td>48.9</td>
<td>55.2</td>
<td>61.5</td>
<td>67.8</td>
<td>74.1</td>
</tr>
<tr>
<td>FF-SYA/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71/G71T2</td>
<td>17.2</td>
<td>23.5</td>
<td>29.8</td>
<td>36.1</td>
<td>42.4</td>
<td>48.7</td>
<td>55.0</td>
<td>61.3</td>
<td>67.6</td>
<td>73.9</td>
</tr>
<tr>
<td>Weight per device (lbs)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.20</td>
<td>3.04</td>
<td>3.88</td>
<td>4.71</td>
<td>5.55</td>
<td>6.39</td>
<td>7.23</td>
<td>8.90</td>
<td>9.74</td>
<td>10.56</td>
<td></td>
</tr>
</tbody>
</table>
3.7.2 Dimensions and weights of the FF-SYA234 multibeam systems for access detection

*Figure 3-9*

<table>
<thead>
<tr>
<th>Reference</th>
<th>Number of beams N</th>
<th>Beam Spacing BS</th>
<th>Total Height TH</th>
<th>A</th>
<th>B</th>
<th>Weight per device</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF-SYA02500C2</td>
<td>2</td>
<td>500 / 19.70</td>
<td>803 / 31.63</td>
<td>117 / 4.61</td>
<td>122 / 4.81</td>
<td>1.76 / 3.52</td>
</tr>
<tr>
<td>FF-SYA02500Q2</td>
<td>2</td>
<td>500 / 19.70</td>
<td>763 / 30.06</td>
<td>117 / 4.61</td>
<td>122 / 4.81</td>
<td>1.76 / 3.52</td>
</tr>
<tr>
<td>FF-SYA02500T2</td>
<td>2</td>
<td>500 / 19.70</td>
<td>758 / 29.8</td>
<td>117 / 4.61</td>
<td>122 / 4.81</td>
<td>1.76 / 3.52</td>
</tr>
<tr>
<td>FF-SYA03400C2</td>
<td>3</td>
<td>400 / 15.76</td>
<td>1123 / 44.24</td>
<td>147 / 5.79</td>
<td>112 / 4.41</td>
<td>2.52 / 5.54</td>
</tr>
<tr>
<td>FF-SYA03400Q2</td>
<td>3</td>
<td>400 / 15.76</td>
<td>1083 / 42.67</td>
<td>147 / 5.79</td>
<td>112 / 4.41</td>
<td>2.52 / 5.54</td>
</tr>
<tr>
<td>FF-SYA03400T2</td>
<td>3</td>
<td>400 / 15.76</td>
<td>1078 / 42.4</td>
<td>147 / 5.79</td>
<td>112 / 4.41</td>
<td>2.52 / 5.54</td>
</tr>
<tr>
<td>FF-SYA04300C2</td>
<td>4</td>
<td>300 / 11.82</td>
<td>1123 / 44.24</td>
<td>67 / 2.63</td>
<td>92 / 3.62</td>
<td>2.52 / 5.54</td>
</tr>
<tr>
<td>FF-SYA04300Q2</td>
<td>4</td>
<td>300 / 11.82</td>
<td>1083 / 42.67</td>
<td>67 / 2.63</td>
<td>92 / 3.62</td>
<td>2.52 / 5.54</td>
</tr>
<tr>
<td>FF-SYA04300T2</td>
<td>4</td>
<td>300 / 11.82</td>
<td>1078 / 42.4</td>
<td>67 / 2.63</td>
<td>92 / 3.62</td>
<td>2.52 / 5.54</td>
</tr>
</tbody>
</table>

TH: Total Height or overall size including the connector for the FF-SYA youngster C2 versions, the male receptacle for the FF-SYA youngster Q2 versions and cable glands for the FF-SYA youngster T2 versions.

BS: Beam Spacing

L: Lens diameter

(1) When using the recommended Brad-Harrison “Mini-Change” plugs. (See Accessories Order Guide).
### 3.8 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).

#### 3.8.1 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 ± 2.5°. See figure below for proper alignment.

**Figure 3-10 Emitter and Receiver Optical Alignment**

![Emitter and Receiver Optical Alignment Diagram](image)

#### 3.8.2 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 the 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 3-11 Vertical Mounting**

![Vertical Mounting Diagram](image)

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 Figure 3-12 et Figure 3-13).
**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 or FF-SYA234 multibeam systems for point-of-operation applications.

Failure to comply with these instructions will result in death or serious injury.
3.8.3 Vertical Mounting / Linear Assembly

NOTICE

MUTUAL INTERFERENCE OR CROSS-TALK
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 lockout 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 3-14). The units may be mounted with the overlapping housings to maintain the resolution throughout the protected height.

Figure 3-14 Linear Assembly
3.8.4 Vertical Mounting / Side by Side Installation

**NOTICE**

**MUTUAL INTERFERENCE OR CROSS-TALK**

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 lockout 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/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 3-15 Side by side installation of two light curtains](image)

Eliminating mutual interferences by reversing systems emission orientation.

Eliminating mutual interferences by using an opaque screen or by adjusting the emitter 1 emission power (see 3.6 Mutual Interference or cross-talk).

![Figure 3-16 Side by side installation of more than two light curtains](image)

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 3.6 Mutual Interference or cross-talk).
3.8.5 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 a height lower than 150 mm/5.90 in above the floor.
- DO NOT use the FF-SYA234 multibeam systems for presence sensing protection.

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

**Figure 3-17 Horizontal mounting**

3.8.6 Diagonal and Right-Angle 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 a height lower than 150 mm/5.90 in above the floor.
- DO NOT use the FF-SYA234 multibeam systems for presence sensing protection.

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

**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 millimetres (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 3-18 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 3-19).
3.9 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 require different types of mounting brackets based on application requirements.

---

NOTE
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 chapter Order Guide).
3.9.1 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 3-20). The two T-slots are designed to fit the head of the delivered M4 T-shape bolts.

**Figure 3-20 T-slots with Standard Mounting Bracket (Right angle and straight brackets)**

![T-slot Mounting System Diagram](image)

**Note:** On the FF-SYA/G71/G71/G71/G71/C2 version, the position of the Hirschmann connector can be adjusted with a 51° angular pitch.

3.9.2 Mounting Accessory Set

The mounting accessory set contains the following hardware:

<table>
<thead>
<tr>
<th>Mounting Hardware</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>M4 T-shape bolts</td>
<td>3</td>
</tr>
<tr>
<td>HM4 nuts</td>
<td>3</td>
</tr>
<tr>
<td>M4 Rip-lock washers</td>
<td>3</td>
</tr>
<tr>
<td>M6 Rip-lock washers</td>
<td>6</td>
</tr>
</tbody>
</table>

**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 between 1.5 Nm and 2.5 Nm.

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 Nm.

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

**Figure 3-21 Mounting brackets assembly (right-angle and straight brackets)**

![Mounting Accessory Set Diagram](image)
3.9.3 Fixed and adjustable mounting brackets

**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).

A kit of fixed 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. When additional bracket kits are needed, please order FF-SYZ001001.

*Figure 3-22 Straight Bracket Dimensions (in mm / in)*

*Figure 3-23 Right-angle Bracket Dimensions (in mm/in)*
Adjustable mounting brackets are available as an option, in order to ease the optical alignment of the emitter and the receiver. A kit of FF-SYZ003001 adjustable mounting brackets includes two pieces. Two pairs are required for one light curtain system (one pair for the emitter and one pair for the receiver).

**Figure 3-25 Adjustable Bracket Dimensions (in mm / in)**
3.10 Mirrors and floor mounting posts

Mirrors or mirror posts provide a means to guard more than one side of a danger zone with only one pair of light curtain (emitter / receiver). In this way, perimeters with an L- or U-shape can be protected in a cost-effective way.

*Figure 3-26 Protection of a U-shape using two plain mirrors and one FF-SYA Light Curtain*

![Diagram of protection using mirrors and FF-SYA light curtain]

However, each mirror or mirror post reduces the scanning range by between 10 % and 30 %. The protected height of the light curtain determines which mirrors or mirror posts are compatible with.

Refer to the following chapters

- to choose the correct type and size of mirror or mirror post for your application with your FF-SYA light curtain.
- to determine the resulting scanning range when combining your FF-SYA light curtain with 1 or two mirror or mirror posts.
3.10.1 FF-SBSMIR Series Plain Mirrors

The FF-SBSMIR Series Plain Mirrors can be used together with the FF-SYA14, FF-SYA30 and FF-SYA60 Series. One mirror reduces the scanning distance by 10%.

The plain mirrors include all mounting hardware necessary for installation. The mounting brackets allow rotation of the mirrors to the desired angle.

*Figure 3-27 FF-SBSMIR Plain Mirror Mounting Dimensions*
Size of plain mirrors FF-SBSMIR Series

<table>
<thead>
<tr>
<th>Mirror</th>
<th>Suitable FF-SYA light curtain model</th>
<th>Overall Mirror Frame Height without brackets</th>
<th>Weight per mirror (kg / lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF-SBSMIR04</td>
<td>FF-SYA032 / FF-SYA048</td>
<td>501 / 19.72</td>
<td>3.35 / 7.39</td>
</tr>
<tr>
<td>FF-SBSMIR06</td>
<td>FF-SYA064</td>
<td>704 / 27.72</td>
<td>4.65 / 10.25</td>
</tr>
<tr>
<td>FF-SBSMIR08</td>
<td>FF-SYA080</td>
<td>909 / 35.79</td>
<td>6 / 13.23</td>
</tr>
<tr>
<td>FF-SBSMIR10</td>
<td>FF-SYA096</td>
<td>1112 / 43.78</td>
<td>7.30 / 16.09</td>
</tr>
<tr>
<td>FF-SBSMIR12</td>
<td>FF-SYA112 / FF-SYA128</td>
<td>1315 / 51.77</td>
<td>8.60 / 18.96</td>
</tr>
<tr>
<td>FF-SBSMIR14</td>
<td>FF-SYA144</td>
<td>1520 / 59.84</td>
<td>10 / 22.05</td>
</tr>
<tr>
<td>FF-SBSMIR16</td>
<td>FF-SYA160</td>
<td>1723 / 67.83</td>
<td>11.30 / 24.91</td>
</tr>
</tbody>
</table>

Scanning range using plain mirrors FF-SBSMIR Series

<table>
<thead>
<tr>
<th>FF-SYA light curtain</th>
<th>Nominal scanning range (maximum)</th>
<th>Scanning range (Loss per mirror: 10 %)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 mirror</td>
</tr>
<tr>
<td>FF-SYA14</td>
<td>0 m to 6 m / 0 ft to 20 ft</td>
<td>0 m to 5.4 m / 0 ft to 17.8 ft</td>
</tr>
<tr>
<td>FF-SYA30</td>
<td>0,6 m to 20 m / 2 ft to 65.6 ft</td>
<td>0 m to 18 m / 0 ft to 59 ft</td>
</tr>
</tbody>
</table>

3.10.2 FF-SLCMIR Series Plain Mirrors

The FF-SLCMIR Series plain mirrors can be used together with the FF-SYA14, FF-SYA30 and FF-SYA60 Series. One mirror reduces the scanning distance by 30%.

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

Figure 3-28 FF-SLCMIR Mirror Mounting Dimensions (in mm)
### Size of plain mirrors FF-SLC0MIR Series

<table>
<thead>
<tr>
<th>Part Listings</th>
<th>Suitable FF-SYA light curtain model</th>
<th>Overall Mirror Frame Height without brackets</th>
<th>Weight per unit (kg / lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF-SLC02MIR</td>
<td>FF-SYA032</td>
<td>370 / 14.56</td>
<td>3 / 6.61</td>
</tr>
<tr>
<td>FF-SLC04MIR</td>
<td>FF-SYA048</td>
<td>540 / 21.26</td>
<td>3.5 / 7.72</td>
</tr>
<tr>
<td>FF-SLC06MIR</td>
<td>FF-SYA064</td>
<td>715 / 28.15</td>
<td>4.4 / 9.70</td>
</tr>
<tr>
<td>FF-SLC07MIR</td>
<td>FF-SYA080</td>
<td>885 / 34.84</td>
<td>4.9 / 10.80</td>
</tr>
<tr>
<td>FF-SLC09MIR</td>
<td>FF-SYA096</td>
<td>1060 / 41.73</td>
<td>5.8 / 12.79</td>
</tr>
<tr>
<td>FF-SLC11MIR</td>
<td>FF-SYA112</td>
<td>1230 / 48.42</td>
<td>6.3 / 13.89</td>
</tr>
<tr>
<td>FF-SLC13MIR</td>
<td>FF-SYA128</td>
<td>1400 / 55.12</td>
<td>7.8 / 17.20</td>
</tr>
<tr>
<td>FF-SLC16MIR</td>
<td>FF-SYA144 / FF-SYA160</td>
<td>1750 / 68.89</td>
<td>12 / 26.45</td>
</tr>
<tr>
<td>FF-SLC18MIR</td>
<td>FF-SYA176</td>
<td>1920 / 75.58</td>
<td>14 / 30.86</td>
</tr>
</tbody>
</table>

### Scanning range using plain mirrors FF-SLC0MIR Series

<table>
<thead>
<tr>
<th>FF-SYA Series</th>
<th>Nominal scanning range (maximum)</th>
<th>Scanning range (Loss per mirror: 30 %)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 mirror</td>
<td>2 mirrors</td>
</tr>
<tr>
<td>FF-SYA14</td>
<td>0 m to 6 m / 0 ft to 20 ft</td>
<td>0 m to 4.2 m / 0 ft to 13.8 ft</td>
</tr>
<tr>
<td>FF-SYA30</td>
<td>0.6 m to 20 m / 2 ft to 65.6 ft</td>
<td>0 m to 14 m / 0 ft to 45.9 ft</td>
</tr>
</tbody>
</table>
3.10.3 FF-SYZPF Fixed Post for FF-SYA Light Curtains

One Emitter or one receiver of the following FF-SYA Series light curtains can be mounted inside the FF-SYZPF fixed post using the right angle mounting brackets delivered with the FF-SYA light curtains. The posts do not include the mounting hardware necessary for the installation of the post on the ground.

Figure 3-29 Dimensions of FF-SYZPF Fixed Post for FF-SYA Light curtains (in mm/in)

<table>
<thead>
<tr>
<th>Part Listings</th>
<th>Suitable FF-SYA light curtain model</th>
<th>Overall Height (mm / in)</th>
<th>Weight per unit (kg / lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF-SYZPF</td>
<td>FF-SYA 032  FF-SYA 048  FF-SYA 064  FF-SYA 080  FF-SYA 096  FF-SYA 2500  FF-SYA 3400  FF-SYA 4300</td>
<td>1301 / 51.22</td>
<td>7.3 / 16.2</td>
</tr>
</tbody>
</table>
### 3.10.4 FF-SYZPFM Fixed Post with Plain Mirror

The FF-SYZPFM fixed post with pre-mounted and prealigned plain mirrors can be used together with the FF-SYA14, FF-SYA30 and FF-SYA60 Series mentioned in the table below.

Plain mirrors with 10% or 25% reduction of the scanning distance are available.

The mounting hardware necessary for the installation of the post on the ground is not included at delivery.

**Figure 3-30: Dimensions Plain mirror (mm/in)**
### Size of fixed post FF-SYZPFM

<table>
<thead>
<tr>
<th>Part Listings</th>
<th>Suitable FF-SYA light curtain model</th>
<th>Overall Height mm / in</th>
<th>Weight per unit (kg / lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF-SYZPFM*</td>
<td>FF-SYA032</td>
<td>1301 / 51.22</td>
<td>11.1 / 24.4</td>
</tr>
<tr>
<td></td>
<td>FF-SYA048</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FF-SYA064</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FF-SYA080</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FF-SYA096</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Q: loss per mirror: 0 for 10 %, 1 for 25 %

### Scanning range using fixed post with plain mirror FF-SYZPFM01

<table>
<thead>
<tr>
<th>FF-SYA light curtain</th>
<th>Nominal scanning range (maximum)</th>
<th>Scanning range (Loss per mirror: 10 %)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 mirror post</td>
</tr>
<tr>
<td>FF-SYA14</td>
<td>0 m to 6 m / 0 ft to 20 ft</td>
<td>0 m to 5.4 m / 0 ft to 17.8 ft</td>
</tr>
<tr>
<td>FF-SYA30</td>
<td>0.6 m to 20 m / 2 ft to 65.6 ft</td>
<td>0 m to 18 m / 0 ft to 59 ft</td>
</tr>
<tr>
<td>FF-SYA60</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Scanning range using fixed post with plain mirror FF-SYZPFM11

<table>
<thead>
<tr>
<th>FF-SYA light curtain</th>
<th>Nominal scanning Range (maximum)</th>
<th>Scanning range (Loss per mirror: 25 %)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 mirror post</td>
</tr>
<tr>
<td>FF-SYA14</td>
<td>0 m to 6 m / 0 ft to 20 ft</td>
<td>0 m to 4.5 m / 0 ft to 14.8 ft</td>
</tr>
<tr>
<td>FF-SYA30</td>
<td>0.6 m to 20 m / 2 ft to 65.6 ft</td>
<td>0 m to 15 m / 0 ft to 49.2 ft</td>
</tr>
<tr>
<td>FF-SYA60</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.10.5 FF-SYZPF: Fixed Post with Individual Mirrors

The FF-SYZPF fixed posts are available with 2, 3 or 4 pre-mounted and pre-aligned individual mirrors. They can be used for perimeter guarding applications together with the FF-SYA234 multibeam systems for access detection.

Posts with individual mirrors having 10% or 25% reduction of the scanning distance are available.

The mounting hardware necessary for the installation of the post on the ground is not included at delivery.

Figure 3-31 Dimensions (mm/in)
<table>
<thead>
<tr>
<th>Part Listings</th>
<th>Suitable FF-SYA multibeam system*</th>
<th>Beam heights above the reference plane per EN 999</th>
<th>Weight per unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF-SYZPF_J2*</td>
<td>FF-SYA02500 400 / 900</td>
<td>15.76 / 35.46</td>
<td>9.7 / 21.4</td>
</tr>
<tr>
<td>FF-SYZPF_J3*</td>
<td>FF-SYA03400 300 / 700 / 1100</td>
<td>11.82 / 27.58 / 43.34</td>
<td>10 / 22.1</td>
</tr>
<tr>
<td>FF-SYZPF_J4*</td>
<td>FF-SYA04300 300 / 600 / 900 / 1200</td>
<td>11.82 / 23.64 / 35.46 / 47.28</td>
<td>10.2 / 22.5</td>
</tr>
</tbody>
</table>

* Q: 0 for 10 % loss per mirror, Q: 1 for 25 % loss per mirror

<table>
<thead>
<tr>
<th>FF-SYA234 Multibeam systems</th>
<th>Nominal scanning Range (maximum)</th>
<th>Scanning distance (Loss per mirror: 10 %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF-SYA02500</td>
<td>0.5 m to 80 m / 1.64 ft to 262 ft</td>
<td>0 m to 72 m / 0 ft to 237 ft</td>
</tr>
<tr>
<td>FF-SYA03400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FF-SYA04300</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Q: 2 for 2 mirrors, 3 for 3 mirrors, 4 for 4 mirrors

<table>
<thead>
<tr>
<th>FF-SYA234 Multibeam systems</th>
<th>Nominal scanning Range (maximum)</th>
<th>Scanning distance (Loss per mirror: 25 %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF-SYA02500</td>
<td>0.5 m to 80 m / 1.64 ft to 262 ft</td>
<td>0 m to 60 m / 0 ft to 198 ft</td>
</tr>
<tr>
<td>FF-SYA03400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FF-SYA04300</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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)*

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.

The crimping tool can also be ordered at Honeywell under the reference FF-SBZCRIMP. Additional crimping contacts may be ordered under the reference FF-SBZ172115 (100 pieces)

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 polarising slot
3. Install the socket contact receptacle.
Figure 4-2 The position of the connector can be adjusted with a 51° 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 polarising 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)

4.4 Terminal strip wiring for the FF-SYA\-T2 light curtains
The FF-SYA\-T2 light curtain models are equipped with terminal strips. Both emitter and receiver include the same PG13 cable glands on delivery. The FF-SYA emitters and receivers are wired using internal terminal strips located behind the end caps.

Ensure the following tools are available:
• A flat-head and a crosspoint screwdriver.
• A stripping pliers

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: PG13 allows use of cable diameters from 8 mm to 13 mm (0.32 in to 0.51 in)

Remove end cap and wire the terminal strips as follows:
1. Unscrew and take off the end cap with the cable gland mounted.
2. Unplug the plugged in terminal strip using the Nylon® twine fixed to the terminal strip.
3. Insert the cable into the cable gland.
4. Strip about 7 mm (0.28 in) of insulation from the lead wire end.
5. Connect the lead wires to the terminal strips following the wiring diagrams shown below.

6. Screw the end cap tight.

7. Screw the PG 13 cable gland tight.

**Figure 4-4 View of the internal terminal strips**

![Terminal Strip Diagram]

(Screws this side)

**Top view of the emitter terminal strip**

**Top view of the receiver terminal strip**

### 4.5 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 electro-sensitive 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:

<table>
<thead>
<tr>
<th>Light Curtain Model</th>
<th>032</th>
<th>048</th>
<th>064</th>
<th>080</th>
<th>096</th>
<th>112</th>
<th>128</th>
<th>144</th>
<th>160</th>
<th>176</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power consumption (W)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FF-SYA14</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emitter</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Receiver</td>
<td>3.5</td>
<td>4</td>
<td>4.5</td>
<td>5</td>
<td>5</td>
<td>5.5</td>
<td>5</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>FF-SYA30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emitter</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Receiver</td>
<td>3.5</td>
<td>3.5</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4.5</td>
<td>4</td>
<td>4.5</td>
<td>4</td>
<td>4.5</td>
</tr>
<tr>
<td>FF-SYA60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emitter</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Receiver</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>4</td>
<td>4</td>
<td>4.5</td>
<td>4</td>
<td>4.5</td>
<td>4.5</td>
<td>4.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Multibeam System for Access Detection</th>
<th>FF-SYA02500/ FF-SYA03400 FF-SYA04300</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power consumption (W)</td>
<td></td>
</tr>
<tr>
<td>Emitter</td>
<td>5</td>
</tr>
<tr>
<td>Receiver</td>
<td>5</td>
</tr>
</tbody>
</table>

---

**CAUTION**

**EXTERNAL FUSES**

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.

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

---

**NOTICE**

- It takes 200 ms for the light curtain to start at power up.
- The FF-SYA receiver does not work without the power applied to the static safety outputs (terminal 3 of the receiver).

---

**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.

---

**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).
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.

**Figure 4-5 Emitter pin-out (incl. Minichange plug colour code)**

**Connector Pin-out**

```
<table>
<thead>
<tr>
<th>1 A Fuse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optional test input (or jumpered)</td>
</tr>
<tr>
<td>FF-SYA emitter</td>
</tr>
</tbody>
</table>
```

**Hirschmann N6RFF Emitter plug**

(Crimped contacts inserted this side)

1: (dc+) power supply
2: (dc-) power supply
3: unused
4: (+) Test input (voltage presence)
5: (-) Test input (voltage presence)
6: unused
7: earth

**Terminal strip Pin-out**

```
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>C2</td>
</tr>
<tr>
<td>1: (dc+) power supply</td>
</tr>
<tr>
<td>2: (dc-) power supply</td>
</tr>
<tr>
<td>3: unused</td>
</tr>
<tr>
<td>4: (+) Test input (voltage presence)</td>
</tr>
<tr>
<td>5: (-) Test input (voltage presence)</td>
</tr>
<tr>
<td>6: unused</td>
</tr>
<tr>
<td>7: earth</td>
</tr>
</tbody>
</table>
```

**Figure 4-6 Receiver pin-out (incl. Minichange plugs colour code)**

**Connector Pin-out**

```
<table>
<thead>
<tr>
<th>1 A Fuse</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5 A max fuse</td>
</tr>
<tr>
<td>FF-SYA receiver</td>
</tr>
<tr>
<td>K1 FSD</td>
</tr>
<tr>
<td>K2 FSD</td>
</tr>
<tr>
<td>FF-SYA receiver</td>
</tr>
</tbody>
</table>
```

**Hirschmann N6RFF Receiver plug**

(Crimped contacts inserted this side)

1: (dc+) main power supply
2: (dc-) main power supply
3: (dc+) outputs power supply
4: (dc-) outputs power supply
5: output (loads connection)
6: output (loads connection)
7: earth

**7-pole receiver receptacle (compatible with Brad Harrison Mini-Change plugs)**

```
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Q2</td>
</tr>
<tr>
<td>1 (WHITE): (dc+) power supply</td>
</tr>
<tr>
<td>2 (BLACK): (dc-) power supply</td>
</tr>
<tr>
<td>3 (GREEN): earth</td>
</tr>
<tr>
<td>4 (ORANGE): outputs (load connection)</td>
</tr>
<tr>
<td>5 (BLUE): (dc-) outputs power supply</td>
</tr>
<tr>
<td>6 (WHITE/BLACK): (dc+) power supply</td>
</tr>
<tr>
<td>7 (ORANGE): outputs (load connection)</td>
</tr>
</tbody>
</table>
```

(1) 31 Vdc varistors
Terminal strip Pin-out

FF-SYA000000T2

Terminal strip Receiver
(Top view)

1 : (dc+) main power supply
2 : (dc-) main power supply
3 : (dc+) outputs power supply
6 : (dc-) outputs power supply
4 : output (loads connection)
5 : output (loads connection)
0 : earth

4.6 Machine Stop contacts (Receiver terminals 4 and 5)

<table>
<thead>
<tr>
<th>Features</th>
<th>Machine Stop Contacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>static dc (Normally Open contacts)</td>
</tr>
<tr>
<td>Switching capacity</td>
<td>0.5 A/24 Vdc</td>
</tr>
<tr>
<td>Voltage drop</td>
<td>&lt; 2 Vdc</td>
</tr>
<tr>
<td>Protections</td>
<td>short-circuits, overloads, reversed polarity, micro-cut-off (4.5 ms)</td>
</tr>
</tbody>
</table>

**NOTICE**

**POWER CUT-OFF PROTECTION**
The FF-SYA safety static outputs withstand 4.5 ms power cut-off. The use of the optional ac to dc power supply improves the power cut of resistance up to 20 ms.

**4.6.1 Permanent Self-checking (Monitoring)**

Safety 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. An 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.**

**NOTICE**

**CONNECTION OF FF-SYA STATIC OUTPUTS TO THE POWER SUPPLY**
By-passing the FF-SYA static outputs by connecting them to the power supply will be detected by the FF-SYA safety light curtain.
If the static outputs are temporarily connected to +24 Vdc, the outputs will remain open for an additional 100 ms after the outputs are removed from this connection. This condition may be detected by the relaying interface.
If the static outputs are temporarily connected to 0 Vdc, the output will remain permanently open, even after the outputs are removed from this connection. Normal operation is achieved by switching the power off and on.

**WARNING**

**IMPROPER USE OF THE MACHINE STOP CONTACTS**
Always use the two static safety 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-SR59392 interface control module is primarily designed to be interfaced with Honeywell safety static outputs. Compatibility with any other emergency stop relay module is not guaranteed.

---

### 4.6.2 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 FSD’s relay coils.

**NOTICE**

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

**WARNING**

**IMPROPER PROTECTION INSTALLATION**
Never install varistors across the static safety 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.

---

### 4.6.3 Connection to the machine control circuitry

It is necessary to connect the terminal 3 to the +24 V to energise the relays K1 and K2 through the OSSD1 and OSSD2 outputs. The switching capacity of the static output (0.5A/24 Vdc) 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 safety static outputs must be 55.2 Ω minimum and 5 kΩ 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 

\[ L_{cable} \leq \frac{50000}{R_{load}} \]

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 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-SRS59392 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 20 pF / m capacitance per unit length).
4.7 Test Contact (emitter terminals 4 and 5)

<table>
<thead>
<tr>
<th>Features</th>
<th>Test Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Voltage presence, Normally Closed contact</td>
</tr>
<tr>
<td>External contact resistance</td>
<td>20 Ω max.</td>
</tr>
<tr>
<td>Protections</td>
<td>Galvanic insulation : 2000 Vdc, short-circuits, overloads</td>
</tr>
</tbody>
</table>

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 re-established.

**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.

**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.
4.8 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.**
IMPROPER USE OF THE FF-SYA LIGHT CURTAIN

The loads impedance allowed by the FF-SYA safety static outputs must be 55.2 Ω minimum and 5 kΩ 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 \( L_{\text{cable}} \leq \frac{50000}{R_{\text{load}}} \).

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-SRS59392 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 20 pF / 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 detects the output short-circuit and the short-circuit between the outputs (cross-fault detection). The FF-SRS59392 interface control module is primarily designed to be interfaced with Honeywell safety static outputs. Compatibility with any other emergency stop relay module is not guaranteed.

Figure 4-9  Wiring Diagram using the FF-SRS59392 safety relay module

(1) arc suppressors (220 Ω + 0.22 µF),
NO P/B: cycle-start push-button (Normally open contact)
(*) : use pin 3 for the FF-SYA/G71/G71/G71/G71/G71 Q2E emitter and pin 7 for the FF-SYA/G71/G71/G71/G71/G71 Q2R receiver
Figure 4-10  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 between terminals 4-6 and between terminals 5-6. Failure to comply with these instructions could result in death or serious injury.

Figure 4-11  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 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-SRS59392 safety control module. Indeed this will be detected by the units as a short-circuit between the outputs. Use in this case two FF-SRS59392 as shown below.

Figure 4-12 Connection of two safety light curtains (using two FF-SRS59392 safety control modules)

NO P/B : Cycle-start push-button (Normally Open contact)
Figure 4-13 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) : 31 Vdc varistors
NO P/B : Cycle-start push-button (Normally open contact)
(*) : use pin 3 for the FF-SYA88Q2E emitter and pin 7 for the FF-SYA88Q2R receiver

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.

NOTICE

If the sensing field of one safety light curtain is interrupted, the other goes immediately into the RED condition.
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 the installation is changed. 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 or the FF-SYA234 multibeam systems) through the sensing field to ensure the light curtain will detect it (see Figure 5-1). 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 and the FF-SYA234). The included test rod will have a diameter equal to the resolution of the light curtain.

<table>
<thead>
<tr>
<th>Light Curtain</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF-SYA14</td>
<td>14 mm / 0.6 in</td>
</tr>
<tr>
<td>FF-SYA30</td>
<td>30 mm / 1.2 in</td>
</tr>
<tr>
<td>FF-SYA60</td>
<td>60 mm / 2.4 in</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FF-SYA234 Multibeam System</th>
<th>Beam Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF-SYA02500</td>
<td>500 mm / 19.7 in</td>
</tr>
<tr>
<td>FF-SYA03400</td>
<td>400 mm / 15.76 in</td>
</tr>
<tr>
<td>FF-SYA04300</td>
<td>300 mm / 11.82 in</td>
</tr>
</tbody>
</table>

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 Figure 5-2 for indicator information)

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Probable Cause</th>
<th>Corrective Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>All light emitting diode (LED) indicators are NOT illuminated</td>
<td>No power.</td>
<td>Ensure external fuse is not blown. Ensure supply voltage and polarity are correct (see Specifications). Ensure electrical power connections are secure and correct. (see chapter Electrical Connections)</td>
</tr>
<tr>
<td>The emitter red « test » indicator and the receiver red « OFF » operation indicator are both illuminated</td>
<td>Test input is open.</td>
<td>Ensure the external circuit wiring connection between pins 4 and 5 on the emitter connector is secure (see chapter Electrical Connections and see chapter Mutual Interference or cross-talk) Ensure Test Contact (emitter terminals 4 and 5).</td>
</tr>
<tr>
<td>The emitter red « alarm » indicator is flickering and the receiver red « OFF » operation indicator is illuminated</td>
<td>Emitter is having a failure</td>
<td>Replace the emitter unit by a new one of the same resolution and protection height</td>
</tr>
<tr>
<td>The receiver red cross-talk indicator is « ON » and the receiver red « OFF » operation indicator is illuminated</td>
<td>Receiver is receiving a signal from a second emitter</td>
<td>Adjust the emission power of the second emitter (see chapter Installation)</td>
</tr>
<tr>
<td>The receiver yellow signal strength indicator is flickering and the green « ON » operation indicator is illuminated</td>
<td>Static safety outputs of receiver are not supplied with power</td>
<td>Connect terminal 3 of receiver to 24 Vdc Clean emitter lens, receiver lens and mirrors (see Chapter Cleaning Align emitter, receiver and mirrors Adjust the emission power of the emitter (see Chapter Installation, Mutual Interference or cross-talk)</td>
</tr>
<tr>
<td>The receiver yellow signal strength indicator is flickering and the red « OFF » operation indicator is illuminated</td>
<td>Static safety outputs of receiver are not supplied with power</td>
<td>Connect terminal 3 of receiver to 24 Vdc Clean emitter lens, receiver lens and mirrors (see Cleaning, Installation, Mutual Interference or cross-talk) Adjust the emission power of the emitter (see chapter Installation)</td>
</tr>
<tr>
<td>The receiver yellow signal strength indicator and the red « OFF » operation indicator are both illuminated</td>
<td>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</td>
<td>Remove obstacles interrupting sensing field Clean emitter lens, receiver lens and mirrors (see Cleaning, Installation, Mutual Interference or cross-talk) Replace receiver unit by a new one of the same resolution and protection height</td>
</tr>
<tr>
<td>Random alarms without apparent cause (i.e., erratic outputs, flickering LEDs)</td>
<td>Line voltage transients greater than IEC 801-4 Norm standard Unacceptable ambient light interference</td>
<td>Ensure the correct supply voltage is provided Ensure varistors on the inductive loads are present Ensure external circuit connection to pins 4 and 5 on the emitter connector are secure Ensure ground connection on emitter and receiver are secure</td>
</tr>
</tbody>
</table>
Figure 5-2 Emitter and Receiver LEDs

Emitter LEDs
- Scanning range indicators (yellow)
- Alarm indicator (red)
- Test indicator (red)

Receiver LEDs
- Operation indicators (red and green)
- Signal strength indicator (yellow)
- Cross-talk indicator (red)

Figure 5-3 Troubleshooting Flow Diagram (sheet 1)

On the receiver unit, the red "OFF" operation indicator is permanently on although no object stands in the light curtain sensing field.

On the receiver unit, is the yellow signal strength LED permanently off?

Are the emitter and receiver units properly aligned and are front windows clean?

On the emitter unit, does the status of the 3 yellow scanning range LEDs conform to the used scanning range?

On the emitter unit, is the red test LED permanently on?

Make correct alignment and clean front windows

Machine operates?

Machine working

Change the position of the emitter selector switch, and make sure the emission power conforms to the used scanning range

Machine operates?

Machine working

Make the connection between terminals 4 and 5 on the emitter

Machine operates?

Machine working

Go to sheet 2
Troubleshooting Flow diagram (sheet 2)

On the emitter unit, is the red alarm LED flickering?
- YES: Emitter failed. Replace it with an alternate one
- NO: Go to "***" (on sheet 1)

On the receiver unit, is the red cross-talk LED ON?
- YES: Reduce the emission power of the second emitter which interfere with the receiver unit
- NO: Machine operates?
  - YES: Machine working
  - NO: Receiver failed. Replace it with an alternate one

Machine operates?
- YES: Machine working
- NO: Invert the light curtains transmission directions or isolate the light curtains with an opaque barrier to prevent cross-talk

Return emitter and receiver units to Honeywell
- NO: Machine operates?
  - YES: Machine working
  - NO: Go to "***" (on sheet 1)

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.
6. Order Guide

6.1 Light Curtain Order Guide
Catalogue listings for the FF-SYA234 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.

6.2 Accessories Order Guide
6.2.1 Mounting Bracket Kit

<table>
<thead>
<tr>
<th>Part Listings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF-SYZ001001</td>
<td>Kit of 2 fix right-angle brackets and 2 fix straight brackets with mounting hardware (mounting hardware includes 3 T-shape bolts, 3 M4 nuts, 3 M4 Rip-lock washers, and 6 M6 Rip-lock washers).</td>
</tr>
</tbody>
</table>

**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).

<table>
<thead>
<tr>
<th>Part Listings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF-SYZ003001</td>
<td>Kit of 2 adjustable brackets with mounting hardware (mounting hardware includes 6 T-shape bolts, 6 M4 nuts and 6 M4 Rip-lock washers).</td>
</tr>
</tbody>
</table>

**NOTICE**
PROTECTION AGAINST HIGH VIBRATIONS
6.2.2 Plugs Kits

<table>
<thead>
<tr>
<th>Part Listings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF-SYZ172113</td>
<td><strong>For the FF-SYA/G71/G71/G71/G71/G71 C2 light curtains</strong>&lt;br&gt;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.&lt;br&gt;(already included in the FF-SYA package, to be ordered as spares only)</td>
</tr>
<tr>
<td>FF-SYZ172159</td>
<td><strong>For the FF-SYA/G71/G71/G71/G71/G71 C2 light curtains</strong>&lt;br&gt;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.&lt;br&gt;(to be ordered separately as an option)</td>
</tr>
</tbody>
</table>

**Male face view**

1- **WHITE**<br>2- **RED**<br>3- **GREEN**<br>4- **ORANGE**<br>5- **BLACK**

**Colour code**

| FF-41038            | **(for FF-SYA/G71/G71/G71/G71/G71 Q2E emitters)**<br>5-pole female straight Brad Harrison Mini-Change plug, 12 ft / 3,66 m cable length. Order one plug for the emitter.<br>To be ordered separately when using the FF-SYA/G71/G71/G71/G71/G71 Q2 light curtains. |
| FF-41322            | **(for FF-SYA/G71/G71/G71/G71/G71 Q2E emitters)**<br>5-pole female straight Brad Harrison Mini-Change plug, 20 ft / 6,10 m cable length. Order one plug for the emitter.<br>To be ordered separately when using the FF-SYA/G71/G71/G71/G71/G71 Q2 light curtains. |

**Male face view**

1- **WHITE/BLACK**<br>2- **BLACK**<br>3- **WHITE**<br>4- **RED**<br>5- **ORANGE**<br>6- **BLUE**<br>7- **GREEN**

**Colour code**

| FF-42033            | **(for FF-SYA/G71/G71/G71/G71/G71 Q2R receivers)**<br>7-pole female straight Brad Harrison Mini-Change plug, 12 ft / 3,66 m cable length. Order one plug for the receiver.<br>To be ordered separately when using the FF-SYA/G71/G71/G71/G71/G71 Q2 light curtains. |
| FF-42821            | **(for FF-SYA/G71/G71/G71/G71/G71 Q2R receivers)**<br>7-pole female straight Brad Harrison Mini-Change plug, 20 ft / 6,10 m cable length. Order one plug for the receiver.<br>To be ordered separately when using the FF-SYA/G71/G71/G71/G71/G71 Q2 light curtains. |

6.2.3 Test rods

<table>
<thead>
<tr>
<th>Part Listings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF-SYZROD14</td>
<td><strong>Test rod for ø 14 mm resolution safety light curtains</strong>&lt;br&gt;(already included in the FF-SYA package, to be ordered as spares only)</td>
</tr>
<tr>
<td>FF-SBZROD30</td>
<td><strong>Test rod for ø 30 mm resolution safety light curtains</strong>&lt;br&gt;(already included in the FF-SYA package, to be ordered as spares only)</td>
</tr>
</tbody>
</table>
6.2.4 Alignment aid

<table>
<thead>
<tr>
<th>Part Listings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF-SPZLASER</td>
<td>Laserpen for beam alignment</td>
</tr>
<tr>
<td></td>
<td>(To be ordered separately)</td>
</tr>
<tr>
<td>FF-SYZ604795</td>
<td>Laserpen adapter for FF-SYA Series</td>
</tr>
<tr>
<td></td>
<td>(To be ordered separately)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Part Listings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF-SBSMIR04</td>
<td>One deflection mirror for use with the 032 and 048 model light curtains</td>
</tr>
<tr>
<td>FF-SBSMIR06</td>
<td>One deflection mirror for use with the 064 model light curtain</td>
</tr>
<tr>
<td>FF-SBSMIR08</td>
<td>One deflection mirror for use with the 080 model light curtains</td>
</tr>
<tr>
<td>FF-SBSMIR10</td>
<td>One deflection mirror for use with the 096 model light curtain</td>
</tr>
<tr>
<td>FF-SBSMIR12</td>
<td>One deflection mirror for use with the 112 and 128 model light curtains</td>
</tr>
<tr>
<td>FF-SBSMIR14</td>
<td>One deflection mirror for use with the 144 model light curtain</td>
</tr>
<tr>
<td>FF-SBSMIR16</td>
<td>One deflection mirror for use with the 160 model light curtain</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Part Listings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF-SLC02MIR</td>
<td>One deflection mirror for use with the 032 model light curtain</td>
</tr>
<tr>
<td>FF-SLC04MIR</td>
<td>One deflection mirror for use with the 048 model light curtain</td>
</tr>
<tr>
<td>FF-SLC06MIR</td>
<td>One deflection mirror for use with the 064 model light curtains</td>
</tr>
<tr>
<td>FF-SLC07MIR</td>
<td>One deflection mirror for use with the 080 model light curtain</td>
</tr>
<tr>
<td>FF-SLC09MIR</td>
<td>One deflection mirror for use with the 096 model light curtain</td>
</tr>
<tr>
<td>FF-SLC11MIR</td>
<td>One deflection mirror for use with the 112 model light curtain</td>
</tr>
<tr>
<td>FF-SLC13MIR</td>
<td>One deflection mirror for use with the 128 model light curtain</td>
</tr>
<tr>
<td>FF-SLC16MIR</td>
<td>One deflection mirror for use with the 144 and 160 model light curtains</td>
</tr>
<tr>
<td>FF-SLC18MIR</td>
<td>One deflection mirror for use with the 176 model light curtain</td>
</tr>
</tbody>
</table>
### 6.2.7 FF-SYZPF Fixed Post for FF-SYA Light Curtain

<table>
<thead>
<tr>
<th>Part Listings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF-SYZPF</td>
<td>Fixed post for the installation of the following FF-SYA Light curtains:</td>
</tr>
<tr>
<td></td>
<td>- Light curtain models: FF-SYA032, FF-SYA048, FF-SYA080, FF-SYA096</td>
</tr>
<tr>
<td></td>
<td>- Multibeam models: FF-SYA02500, FF-SYA03400, FF-SYA04300</td>
</tr>
</tbody>
</table>

### 6.2.8 FF-SYZPF Fixed Post with Plain Mirror (10 % or 25 % reduction of scanning range)

<table>
<thead>
<tr>
<th>Part Listings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF-SYZPM01</td>
<td>Floorstanding post with 1 plain mirror (10 % of loss)</td>
</tr>
<tr>
<td>FF-SYZPM11</td>
<td>Floorstanding post with 1 plain mirror (25 % of loss)</td>
</tr>
<tr>
<td></td>
<td>Suitable for:</td>
</tr>
<tr>
<td></td>
<td>- Light curtain models: FF-SYA032, FF-SYA048, FF-SYA080, FF-SYA096</td>
</tr>
<tr>
<td></td>
<td>- Multibeam models: FF-SYA02500, FF-SYA03400, FF-SYA04300</td>
</tr>
</tbody>
</table>

### 6.2.9 FF-SYZPF Fixed Post with Individual Mirrors (10 % or 25 % reduction of scanning range)

<table>
<thead>
<tr>
<th>Part Listings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF-SYZPF02</td>
<td>Floorstanding post with 2 individual mirrors for use with the FF-SYA02500 multibeam system (*)</td>
</tr>
<tr>
<td>FF-SYZPF12</td>
<td>Floorstanding post with 3 individual mirrors for use with the FF-SYA03400 multibeam system (*)</td>
</tr>
<tr>
<td>FF-SYZPF03</td>
<td>Floorstanding post with 4 individual mirrors for use with the FF-SYA04300 multibeam system (*)</td>
</tr>
<tr>
<td>(*) FF-SYZPF0: 10 % loss per mirror</td>
<td></td>
</tr>
<tr>
<td>(*) FF-SYZPF1: 25 % loss per mirror</td>
<td></td>
</tr>
</tbody>
</table>


Warranty Information

6.3 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 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 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.

6.4 Sales and Service
Honeywell Sensing & Control 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 4500 Australia
+ 1-800-737-3360 Canada
+ 33 (0) 1 60 19 80 40 France
+ 49 (0) 69 8064 444 Germany
+ 34 91 313 61 00 Spain
+ 1-815-235-6847 International
+ 44 (0) 118 906 2600 UK
+ 1-800-537-6945 USA

FAX
+ 61 (0) 2 9370 4525 Australia
+ 1-800-565-4130 Canada
+ 33 (0) 1 60 19 81 73 France
+ 49 (0) 69 8064 442 Germany
+ 34 91 313 61 29 Spain
+ 44 (0) 118 981 7513 UK
+ 1-815-235-6545 USA

INTERNET
http://www.honeywell.com/sensing/
info.sc@honeywell.com
7. EC Declaration of Conformity

Honeywell Sensing & Control
B.P.81
38243 Meylan Cedex - France
Phone: (33) 4 76 41 72 00
Fax: (33) 4 76 41 72 56

HONEYWELL GRENOBLE
QUALITY ASSURANCE DEPARTMENT

EC declaration of conformity

We: Honeywell
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.

We implement a quality assurance system in accordance with the ISO 9001 standard certified by the French organisation AFAQ under the number QUAL/1994/2213a.

Directives:
- Machinery Directive 98/37/EC, to which the EC-type examination certificate delivered by the Institut National de Recherche et de Sécurité (INRS) relates.
- Low Voltage Directive 73/23/EC
- Electromagnetic Compatibility Directive 89/336/EC

Standards:
EN 61496-1: Safety of Machinery – Electrosensitive Protective Equipment – part 1: General requirements and tests.


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

The conformity to the European directives of the type model from the series above has been certified by:

Notified body: Institut National de Recherche et de Sécurité (INRS)
Avenue de Bourgogne – B.P. 27
54501 Vandoeuvre Cedex – France

Certificate number: 0070 510 0153 12 98 Date of certificate: 02/12/1998

Legal Representative in Europe: Place of issue: Meylan
Quality Manager:
Patrick Goud
Signature: Date: 19/09/2001
General Manager:
Richard Gibbs
Signature:
8. Index

A
access detection • 5
alarm indicator • 12
application assistance • 69 Approvals • 2
arc suppressors • 53

B
beam heights • 9
beam pitch • 8
Beam spacing • 9

C
cables • 45, 46
captive contact • 52
Catalogue listings • 63
centre distance • 8
connector • 45
consumption • 47
Control Reliability • 1
crimping tool • 45
cross-sectional size • 22
cross-talk • 21, 30
cross-talk indicator • 14

cables • 45, 46
captive contact • 52
Catalogue listings • 63
centre distance • 8
connector • 45
consumption • 47
Control Reliability • 1
crimping tool • 45
cross-sectional size • 22
cross-talk • 21, 30
cross-talk indicator • 14

D
diagonal mounting • 30
Directives • 2

e
emission power • 21
Emitter • 60
European standards • 2
European Standards • 3

F
fixed post • 39
fixed post with individual mirrors • 42
fixed post with plain mirror • 40
fuse • 50
galvanic insulation • 47

H
hard guarding • 6, 15, 30
Hard guards • 3
Horizontal mounting • 30

I
indicators • 12

L
light lens diameter • 8
Linear Assembly • 28

M
machine guarding • 5
maintenance • 58
mechanical guards • 6, 15, 26
Mirror posts • 35
Mirrors • 35
misalignments • 5
mounting accessory set • 32
mounting brackets • 31, 33
Mounting brackets assembly • 32
Mutual Interferences • 21

N
nominal scanning range • 21

O
object sensitivity • 8
operation indicators • 13
operational test • 58
optical alignment • 26

P
permanent self-check • 49
plain mirrors • 36
plain mirrors • 37
point-of-operation guarding • 6, 15, 30
point-of-operation protection • 5

R
RC circuit • 50
Reflective surfaces • 20
relays with guided contacts • 50
resolution • 8, 30
response time • 10
Right-Angle Mounting • 31

S
Safety control modules • 3
safety distance • 15, 16
Safety optoelectronic products • 3
safety relay module • 53
Safety switches • 3
Scanning range • 11
scanning range indicators • 12
selector switch • 21
Sensing Field Height • 23
Side by side installation • 29
signal strength indicator • 13

t
Test contact • 51
test indicator • 13
test rod • 58
Total Height • 23, 25
troubleshooting • 58
troubleshooting chart • 59
Troubleshooting Flow Diagram • 60

U
US Regulation • 3

V
varistors • 50
Vertical mounting • 26

W
warranty information • 69
wiring • 45, 52