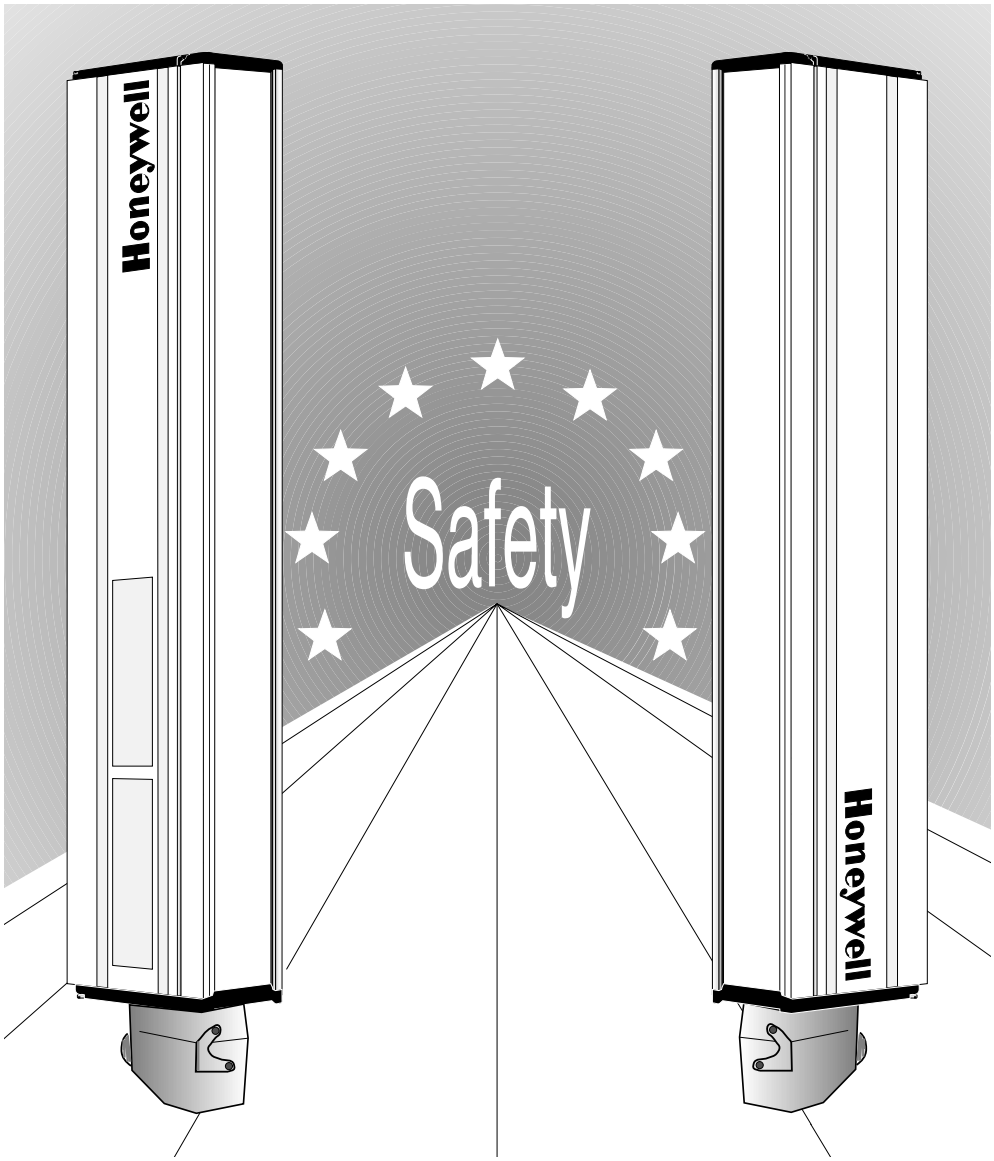
Industrial Safety Light Curtain
for the protection of machine operators
FF-SB14 Series

Berufsgenossenschaft E + M III EC type examination Type 4 ESPE
according to European Standards 50100 1/2

Installation and Maintenance Manual



⚠ 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.

107026-11-EN FR26 ROW 302 Printed in France

Revision History

Reference	Circulation	Description	Languages
671 434 001/1	November 1989	French original version	FR
671 435 001/1	November 1989	German original version	GE
671 436 001/1	December 1989	English original version	EN
671 552 002/0	March 1990	Various modifications	GE
671 552 0040	July 1990	Trilingual original version	EN, GE, FR
671 552 0047	October 1994	Various modifications	EN, GE, FR
671 552 0050	October 1995	Original CE version	EN, GE, FR
671 552 0051	April 1996	CE version with polarized slot on test input	EN, GE, FR, SP
671 552 0520	July 1996	CE version with jumper links for restart selection	EN, GE, FR, SP, IT
671 552 0521	March 1997	Various modifications (indicators, incidents, wiring)	EN, GE, FR, SP, IT
107026-10	July 1998	Change of tolerance on the supply + removal of the Amphenol + FF-SBZ109003 - § 9.3 references	EN, GE, FR, SP, IT
107026-11	March 2002	Update Machine Directive + various norms. Addition of the filtered versions Modifications in Troubleshooting and addition of a warning Update of rating and approval plates	EN

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Table of contents

1. Statutory provisions

1.1 Conformity to the European Directives

The EC type examination certificate granted by the Berufsgenossenschaft E+MIII guarantees the conformity of the product with respect to the essential requirements of the following EC Directives:
• Machine Directive 98/37/EC
• Low Voltage Directive 73/23/EC
• Electromagnetic Compatibility Directive 89/336/EC
An EC declaration of conformity is enclosed in this product installation manual.

1.2 Use

Conditions of use

This installation manual has the following sections:

- Photoelectric safety barriers may be used as principle protection for presses, punches or machines where the movement of the functional parts can be interrupted at any moment in a dangerous phase.
- Photoelectric safety barriers can only be used as principal protection on presses or 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.
- Photoelectric safety barriers cannot be used as principle protection for presses operating continuously or automatically.
- Photoelectric barriers are protective devices that output stop signals, not control signals.
- Cancellation of the photoelectric safety barrier stop signal must not cause the re-start of moving parts. A restart may only be initiated by means of a control designed for this purpose.

Additional protection

In some applications, it may be necessary to provide additional protection to that of the safety barrier. Material screens or more safety barriers can be used, in such a way that the operator is obliged to pass through the detection field in order to enter the danger zone, and is not able to stay between the danger zone and the safety barrier.
Additional protection must be placed and be of such dimensions that it will not permit an operator to reach the danger zone via the top, the bottom, the rear and laterally.

Additional protection devices will have to be:

- fixed (fitted with the aid of a tool, or welded if possible) ;
- or automatically positioned and checked, if their opening is necessary.

It must not be possible for operators to neutralize the detectors associated with these additional protection devices.

1.3 Installation

The installation of a photoelectric safety barrier is subject to very strict rules which may vary from country to country.
Correct installation is necessary to ensure safety and must be carried out according to European regulations.

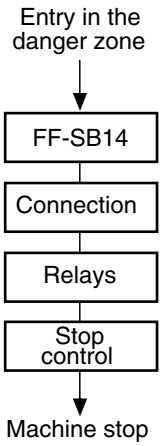
EN 292	”Safety of Machinery - Basic concepts, general principles for design”
EN 60204	”Safety of Machinery - Electrical equipment of machines”
IEC 61496-1/2	”Safety of Machinery - Electro-sensitive Protective Equipments”
EN 999	”Safety of machinery - The positioning of protective equipment in respect of approach speeds of parts of the human body“
EN 294	”Safety of machinery - Safety distances to prevent danger zones being reached by the upper limbs”
EN 811	”Safety of machinery - Safety distances to prevent danger zones being reached by the lower limbs”

In the absence of existing harmonized standards, the following local regulations may apply:

U.K.:	PM41
Germany:	DIN 31001
France:	NFE 09010

1.4 Important remarks on safety

The photoelectric barrier is only one part of an integrated safety system. A complete safety system can be compared to a chain, where correct functioning of each link is essential for overall security. And as the safety barrier only forms one link, the rest of the system is of the user's or machine manufacturer's responsibility.
Especially with regard to the stop relay, only use fail to safe schemes (if necessary, please consult the safety authorities of your country).



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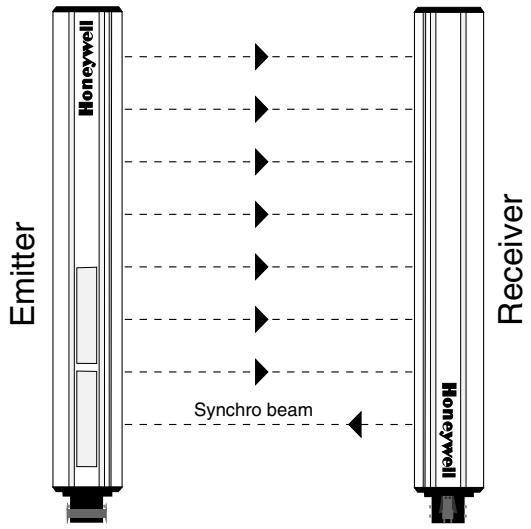
2. Description



2.1 General

The FF-SB14 is a multibeam photoelectric barrier with separate emitter and receiver.
The beams are modulated infrared light, which makes operation almost completely independent of ambient light conditions.
Interrupting one or more beams causes the output contacts to open, which then causes further circuitry to de-activate the machine.
The stability of the response time of the barrier - an important factor for safety - is assured by circuits controlled by a quartz time base.

2.2 Principle of operation

The beams of the barriers are successively scanned at a high frequency.
Infrared light is emitted from the transmitter side and received by the corresponding device in the receiver array. Synchronization between transmitter and receiver is achieved optically, which avoids any electrical link between the two elements.
The synchro beam is active and takes part in the definition of the protected zone.

2.3 Electronic system

The FF-SB14 functions with positive self-checking safety. This means that a faulty component in the system will make the barrier safe - whatever the problem: stopping the movement of dangerous machine parts.
For that purpose, Honeywell has developed new patented self-checking techniques which combine **reliability** and **safety.**

The equipment conception meets the requirements for a category 4 Electrosensitive Protective equipment described in the pr 50 100-1/2 European norm.

Nominal protected height	Number of beams (incl. Synchro.)
400 mm	17
600 mm	25
800 mm	33
1000 mm	41
1200 mm	49
1400 mm	57

2.4 Model reference

The couple (emitter + receiver)

FF-SB14 E/R ❑❑ ❑ ❑ ❑

- Nominal ranges:
  2: 0 m to 10 m
  2L: 3 m to 24 m (1)
  2F: 0 m to 6 m (2)
- Blank: plastic connector
  S: metal connector
- K: 120/240 Vac
  4: 24 Vdc to 48 Vdc
- Nominal protected height In decimetres
  (ex: 06 = 600 mm)

(1) Although the device is able to detect any opaque object greater than the ø 35 mm resolution between 0 and 3 meters, the power of light beams on this model requires a scanning distance of more than 3 meters to conform to IEC 61496 - part 2 norm. This model is available with metal connectors only.

(2) Preferred models for welding applications.

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3. Installation

3.1 Statutory mounting provisions

The installation of the barrier has to be carried out in such a way that access to dangerous moving parts is impossible without breaking the beams.
This is determined by the distance between the barrier and the dangerous parts in accordance with the following formula:

$$S \geq K (t1 + t2) + C$$

Where:

- S = distance (in mm)
- K = penetration velocity (in mm/ms)
- t1 = response time of the safety barrier (in ms)
- t2 = stopping time of the machine (in ms)
- C = guarded space for a barrier with 35 mm sensitivity.

Values of parameters:

• Response time of the FF-SB14 barrier (t1 in ms):

Nominal Height (in mm)	400	600	800	1000	1200	1400
Response time (in ms) non filtered	25	26	27	28	29	30
Response time (in ms) filtered	40	41	42	43	44	45

• Values of K and C according to the EN 999
("Safety of machinery - The positioning of protective equipment in respect of approach speeds of parts of the human body") European project norm:
The approach speed "K" depends on the position of the barrier and the guarding space "C" depends on the resolution of the barrier, “C” being 168.
According to the EN 999 norm, the 35 mm resolution of the FF-SB14 barrier is suitable for hand detection, when the barrier is not used for the initiation of the machine.

Normal approach:

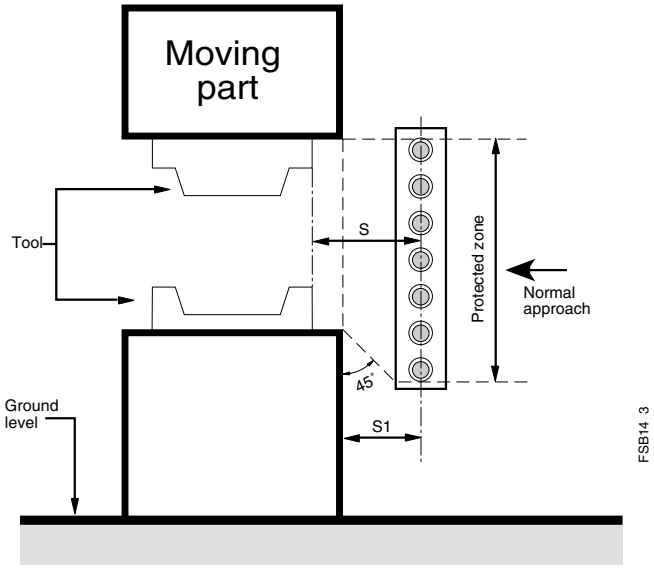
The safety distance "S" allowed from the danger zone to the vertical detection plane should be no less than that calculated using the following formula:

$$S \geq 2 \times (t1 + t2) + 168$$

This formula applies for all safety distances of "S" greater than 100 mm up to and including 500 mm.
If "S" is found to be greater than 500 mm using the above-mentioned formula, then the distance may be reduced using the following formula with a minimum distance of 500 mm:

$$S \geq 1.6 (t1 + t2) + 168$$

Then in any case ”S” should be greater or equal to 500 mm. When access to the danger zone can be gained over the top or underneath of the barrier, additional safeguarding devices should be provided to prevent access.



Parallel approach:

If the direction of approach is parallel to the plane of detection, e.g. if the barrier is horizontally mounted, the minimum safety distance "S" from the danger zone to the outer beam depends on the height "H" of the curtain above the ground. This safety distance "S" should be calculated using the following formula:

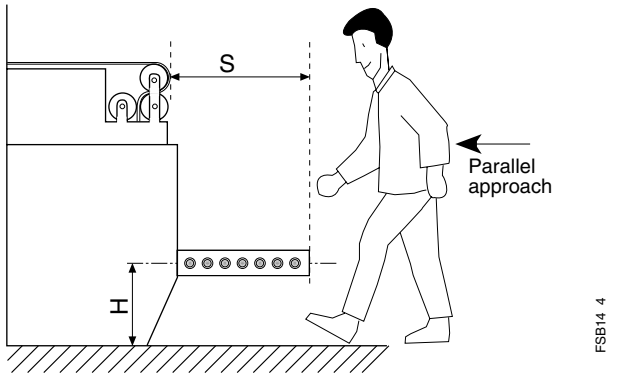
$$S \geq 1.6 (t1 + t2) + 850, 875 < H \leq 1000$$

Or

$$S \geq 1.6 (t1 + t2) + (1200 - 0.4 H), 0 < H \leq 875$$

The height "H" should be a maximum of 1000 mm from the ground. However, if the installation height "H" is greater than 300 mm, there is a risk of inadvertent undetected access beneath the curtain, and additional safety measures are required (see note 1).

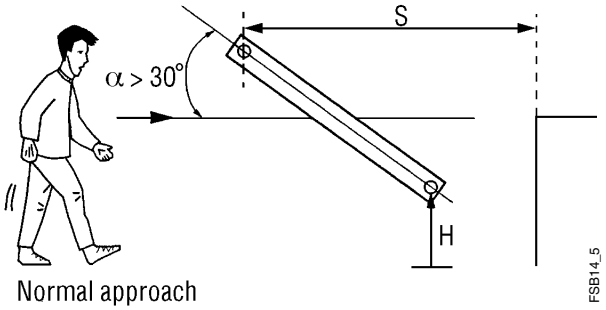
Example: if H = 300 mm then $S \leq 1.6 (t1 + t2) + 1080$.



Angled approach:

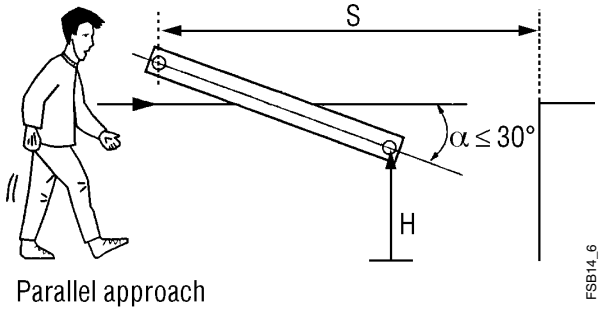
If the direction of approach and the detection plane forms an angle, the following applies:

• If the angle α is greater than 30°, then the approach is considered as a normal approach (see above mentioned formula)



Normal approach

• If the angle α is smaller or equal to 30°, then the approach is considered as a parallel approach (see above mentioned formula)



Parallel approach

Note 1

If a possible access from the top, the bottom or laterally can be foreseen, additional guards must be installed. Particularly, if the distance S1 between the table and the barrier is greater than 100 mm, the photoelectric barrier must be supplemented by a solid screen. According to the EN 294 norm, this solid screen must be:
- fixed, i.e. fitted with the aid of a tool or welded if disassembly is not necessary,
or
- automatically positioned and checked if opening is necessary.

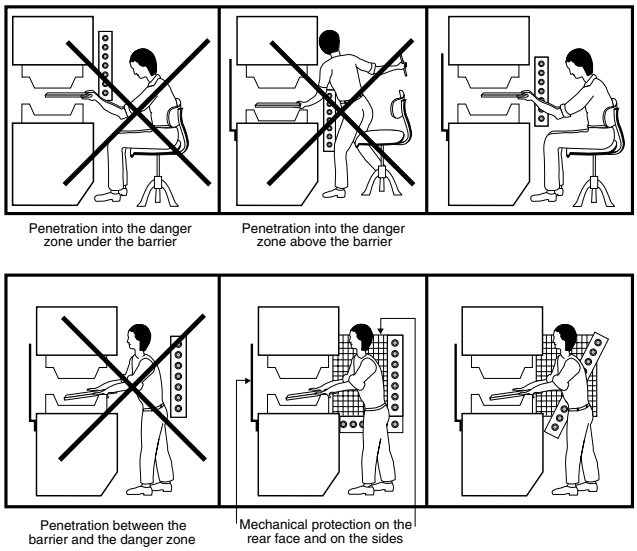
In this case, it must be impossible for the operators to neutralize the position sensors.
Positive break safety switches from Honeywell may be used with mechanical barriers as part of circuit.

Note 2

If the tool can be changed (for instance in a press), calculate the distance “S“ based on the tool that is the most bulky.

Note 3

It is most important that if distance “S“ is large, it must not be possible for the operator to stay undetected between the safety barrier and the danger zone from above, below or laterally.



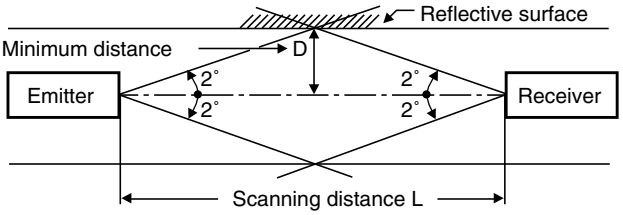
Reflecting surface

The beam angle of the optics and the alignment tolerance for emitter and receiver are approximately 2°. Since reflecting surfaces within the detection zone can lead to deflection and therefore non-detection of an obstacle, a minimum distance D to the optical axis should be observed. For a distance L between emitter and receiver, according to the pr 50 100 - 1/2 norm, the following applies:

D = 100 mm, for 0 < L ≤ 3 m

D = 0,035 L/2 + 5 (mm) for 3 < L ≤ 24 m

For L = 10 m, D = 180 mm



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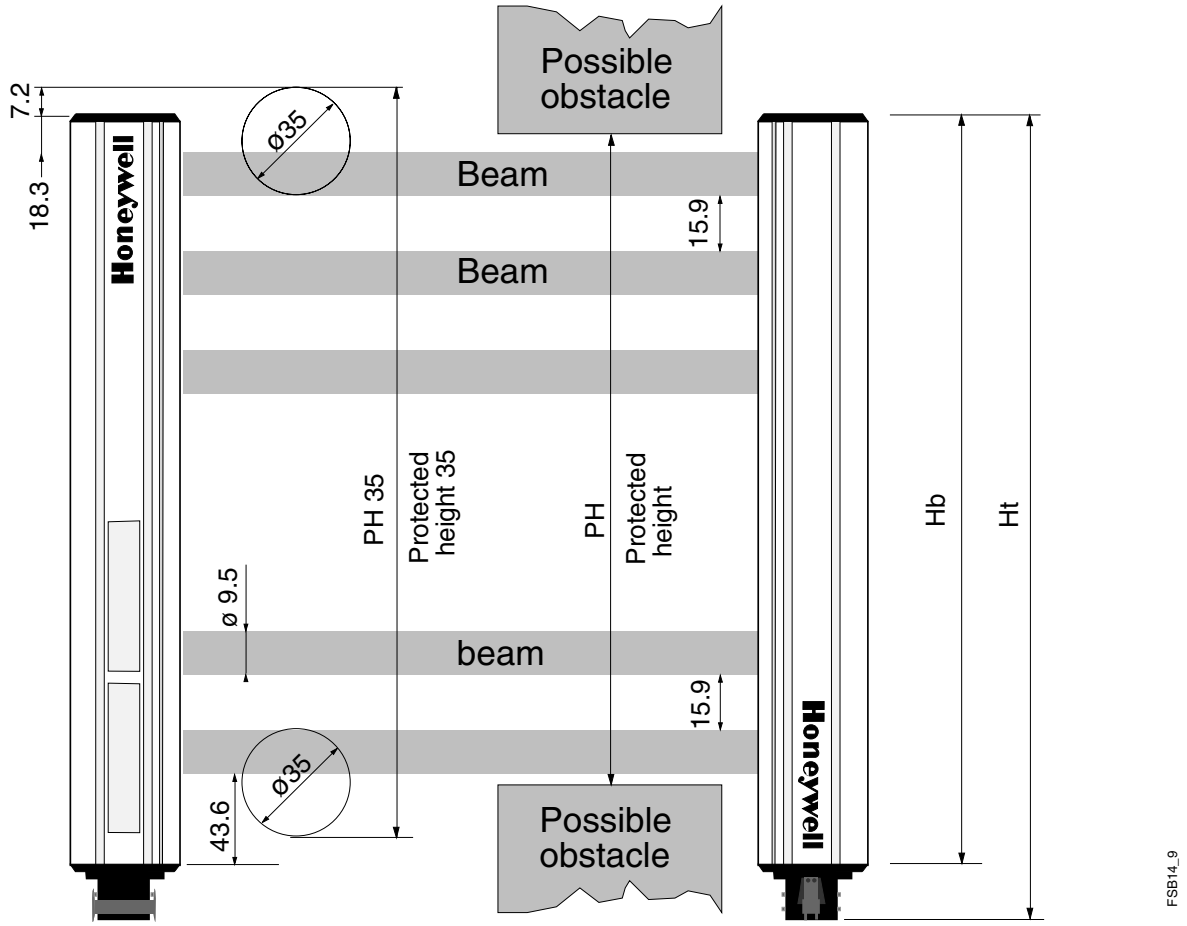
3.2 Protected height

The FF-SB14 is guaranteed to detect any opaque object with dimensions ≥ 35 mm.

- **Nominal protected height (NPH)**
  This is the rounded off protected height, used to simplify the specification.

- **Real protected height for an object of 35 mm (PH 35)**
  This is the height of the zone, in which an object of 35 mm is certain to be detected.

- **Practical protected height (minimum height to be left free)**
  Height in which no obstacle may obstruct the beams.

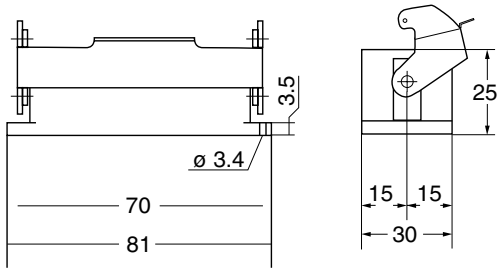


Dimensions in mm

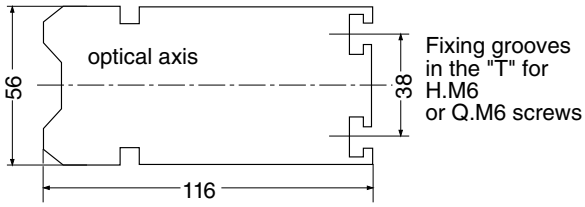
NPH Nominal Protection Height	400	600	800	1000	1200	1400
PH Protected Height	415,9	619,1	822,3	1025,5	1228,7	1431,9
PH35 Real protected Height for a 35 mm object	466,7	669,9	873,1	1076,3	1279,5	1482,7
Hb Barrier Height	477,8	681	884,2	1087,4	1290,6	1493,8
Ht Total Height incl plastic connectors.	547,8	751	954,2	1157,4	1360,6	1563,8
Ht Total Height incl. metal connectors	569,8	773	976,2	1179,4	1382,6	1585,8

Note: Detection sensitivity (35 mm) and protected height are fully independent of the scanning distance (range).

Amphenol-Tuchel connector (C146 type)

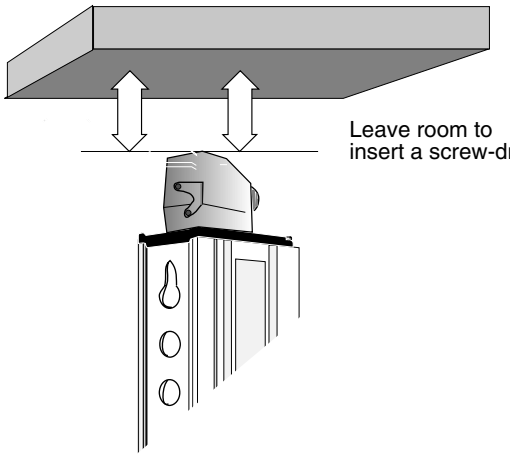


cross-section



Fixing grooves in the "T" for H.M6 or Q.M6 screws

All fixing items are delivered with Onduflex elastic washers: with pre-tightened nuts, adjustment is still possible



Leave room to insert a screw-driver

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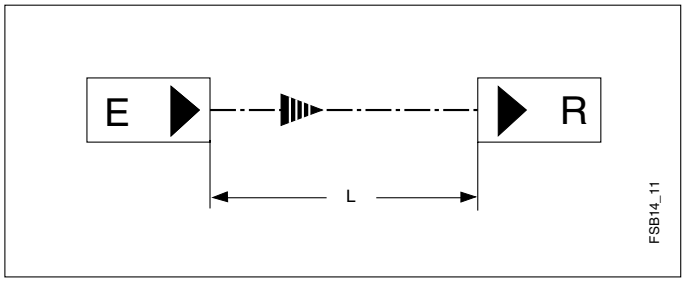
3.3 Range

Protection height (mm)	400	600	800	1000	1200	1400
Mass per device (kg)	4	5,2	6,4	7,5	8,6	9,7

Range: distance between emitter and receiver



Range:

FF-SB14E/R ❑❑❑ - ❑❑

2: 0 m to 10 m
2L: 3 m to 24 m (1)
2F: 0 m to 6 m (2)

1. although the device is able to detect any opaque object greater than the ø 35 mm resolution between 0 and 3 meters, the power of light beams on this model requires a scanning distance of more than 3 meters to conform to IEC 61496 - part 2 norm. This model is available with metal connectors only.
2. preferred models for welding applications.

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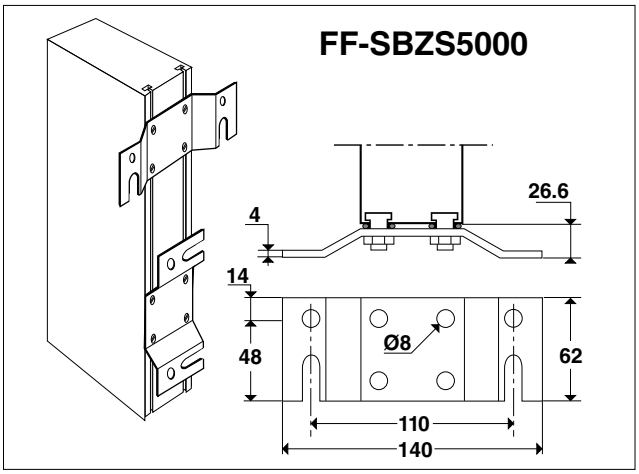
A separate mounting kit for emitter and receiver must be ordered.

- **FF-SBZ5000**

Kit of 2 “Omega“ supports with antivibration inserts. The “Omega“ can be assembled transversally or longitudinally (4 possible positions).

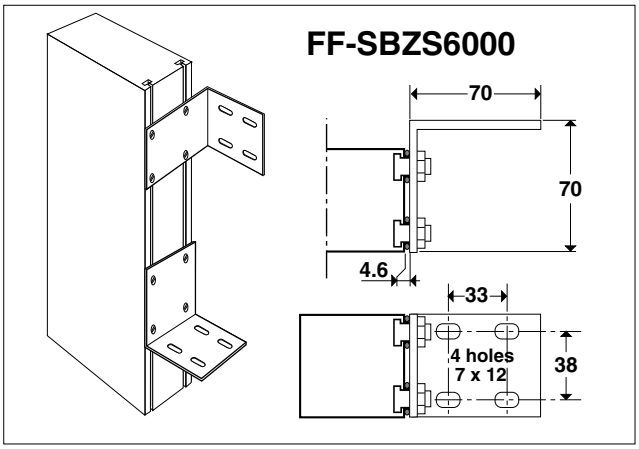
Application: recommended for vertical or horizontal mountings.



- **FF-SBZS6000**

Kit of 2 fixed brackets with anti-vibration inserts. The corner late can be fitted in 4 different positions at 90° to each other.

Application: recommended for vertical or horizontal mountings.



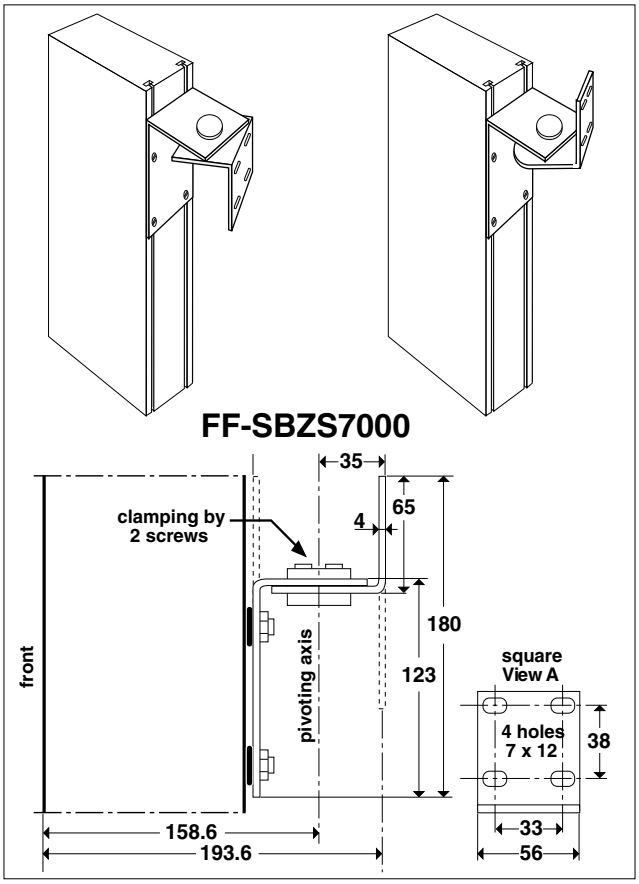
- **FF-SBZS7000**

Kit of 2 rotatable brackets with anti-vibration inserts. The bracket may be reversed.
These brackets are strongly recommended for precise optical alignment at maximum range.

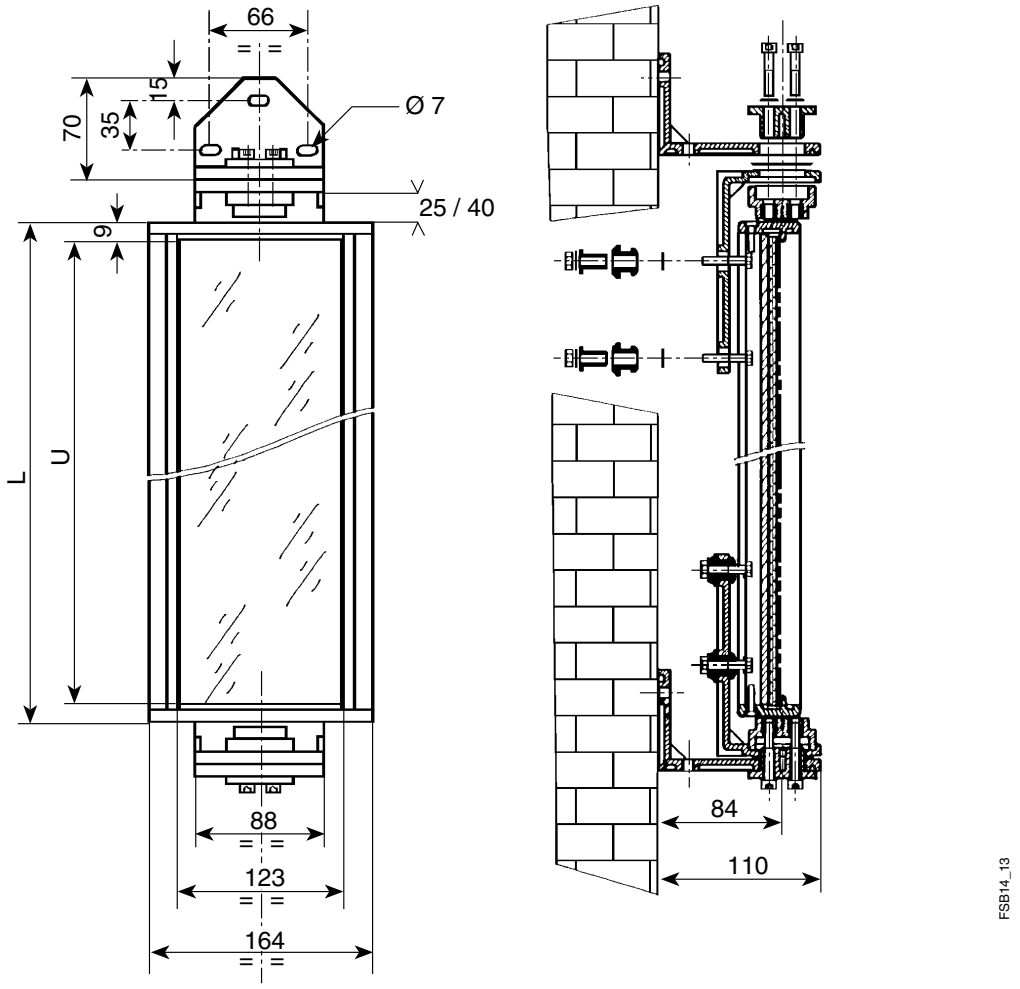
Application: recommended for vertical mountings only.

- **FF-SBZS8000**

Kit of accessories for direct mounting.
Note: all installation must use this kit (8 bolts, 8 nuts, 16 washers, 8 antivibration dampers, 8 metal hubs - see page 8).



- **Beam deflection mirror**



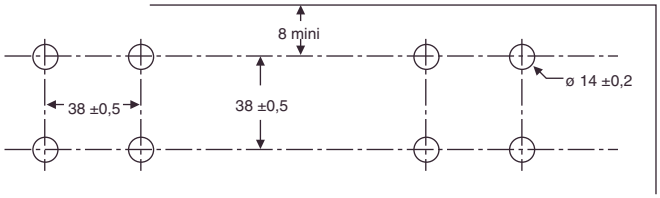
Reference mirror (in mm)	Height of (in mm) L	Overall height of mirror (in mm) U	Effective height device (excl.) bracket kg	Weight for device (excl. bracket) kg
FF-SBSMIR02	200	298	272	2,05
FF-SBSMIR04	400	501	475	3,35
FF-SBSMIR06	600	704	678	4,65
FF-SBSMIR08	800	909	883	6
FF-SBSMIR10	1000	1112	1086	7,30
FF-SBSMIR12	1200	1315	1289	8,60
FF-SBSMIR14	1400	1520	1494	10
FF-SBSMIR16	1600	1723	1697	11,30

Each mirror is sold with 2 mounting adjustable brackets (except for FF-SBSMIR02: 1 bracket).

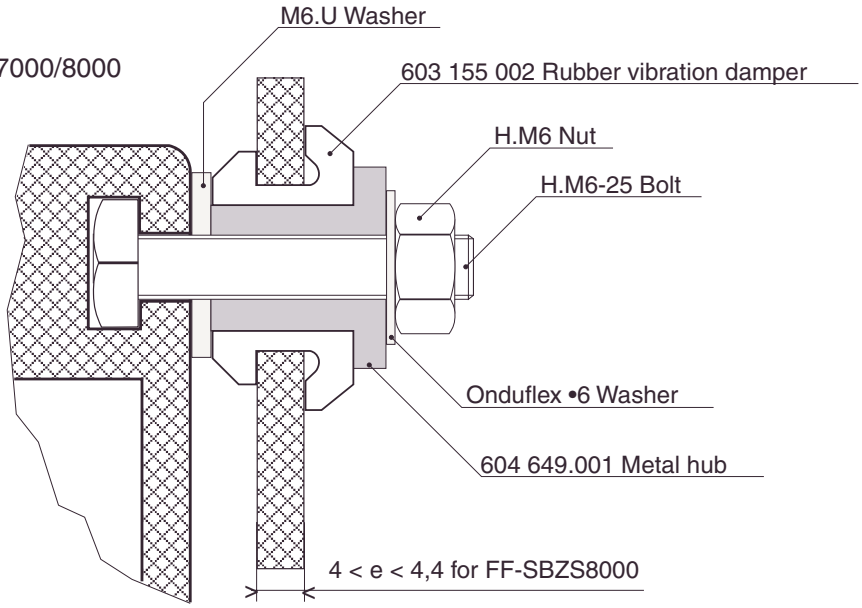
Maximum sensing distances guide according to safety system used:

Honeywell system	Nominal range without mirror	Total range with 1 mirror	Total range with 2 mirrors	Total range with 3 mirrors
FF-SB14E/R ❑❑❑ - ❑2	10 m	9 m	8,1 m	7,3 m
FF-SB14E/R ❑❑❑ - ❑2F	6 m	5,4 m	4,9 m	4,4 m
FF-SB14E/R ❑❑❑ - ❑2L	24 m	21,6 m	19,4 m	17,5 m

FF-SBZS8000
Drilling gauge



Detail of fastening
the FF-SBZS5000/6000/7000/8000
to the FF-SB14 body



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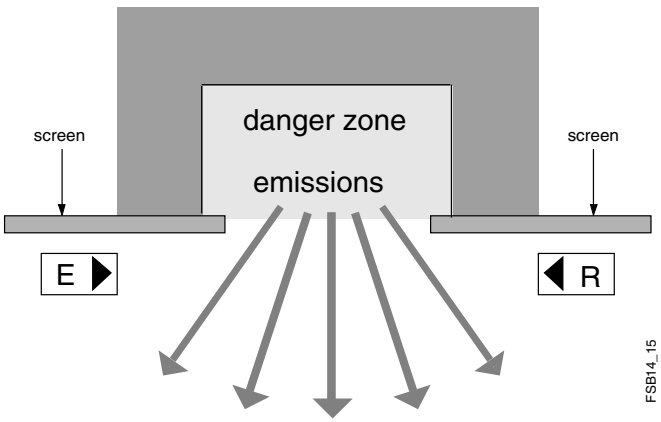
3.4 Remarks - Advice on use

- It is usually convenient to install the barriers on posts fixed directly into the ground.

This type of assembly is recommended for machines which are subjected to considerable shocks or vibrations during operation. This type of assembly greatly reduces the shocks and vibrations transmitted to the barrier.

- Protect the barriers against emissions (oil, grease, abrasive dust).



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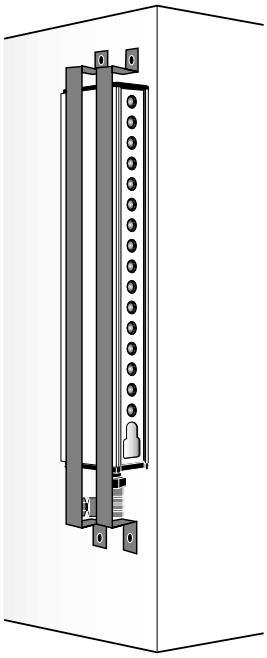

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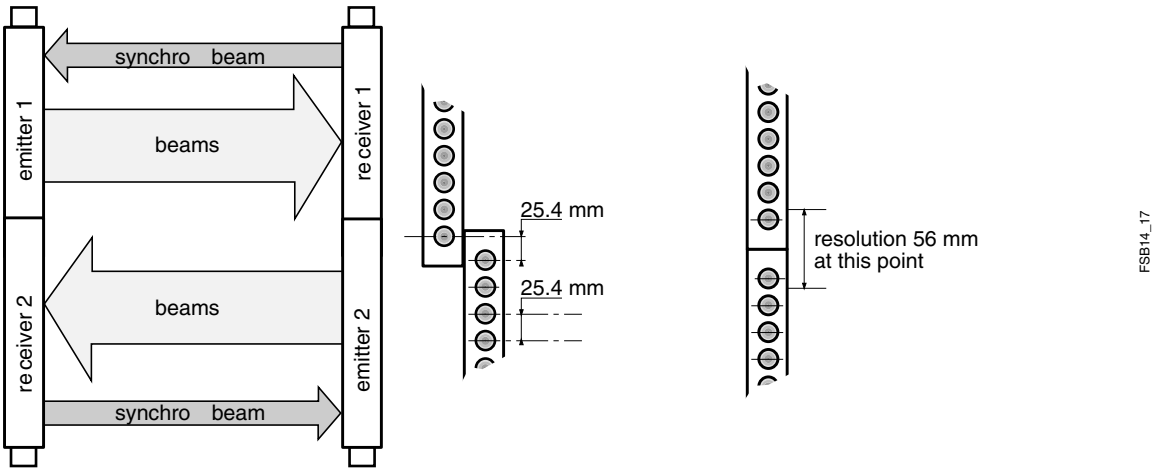
- Protect barriers against possible impact (trolleys, forklift trucks) by means of plates or metal tubes.

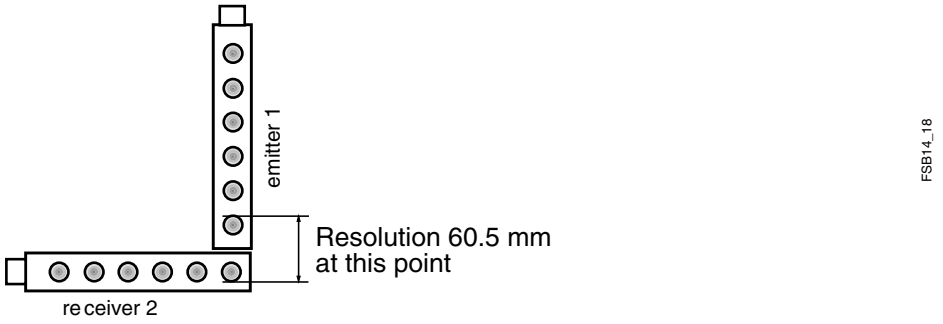
3.5 Grouping of several FF-SB14 safety barriers

To avoid the risk of possible malfunction of the barriers (interference between the synchro optical paths), it is recommended to assemble them as follows:

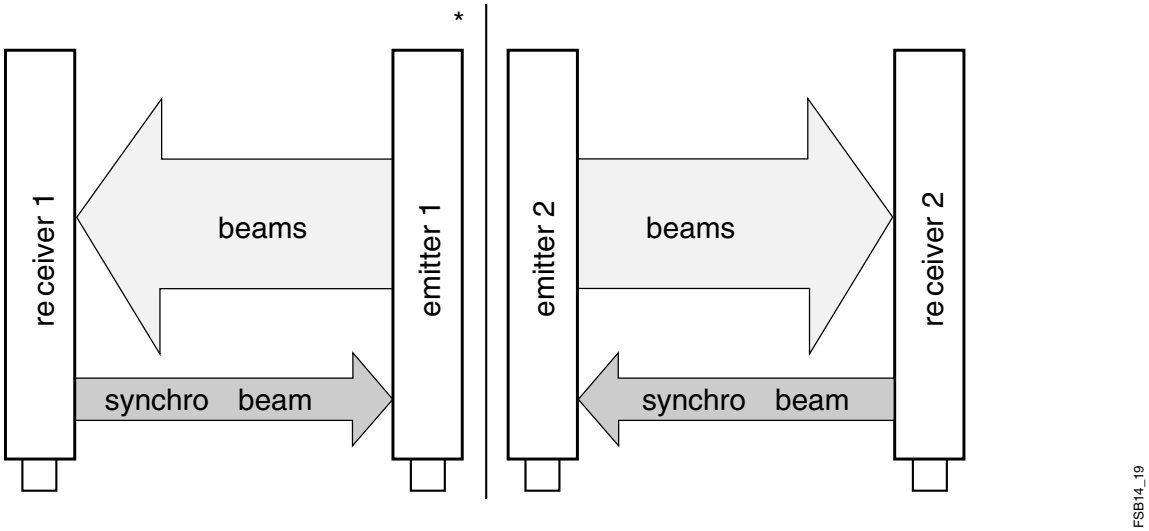
- **Linear assembly**



- **Right-angled assembly**



- **Side by side assembly**



*Note: When a risk of possible malfunction due to mutual interferences between barrier is foreseeable. It is strongly recommended to insert a screen between the light curtains.

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4. Electrical connection

4.1 Conditions of use

Connection of the photoelectric barriers to the control circuit of a press must be carried out in such a way that the outputs (relays with guided contacts) are systematically self-checked at each cycle.

After connection of a photoelectric barrier to the control circuit of a press, the following safety functions must be checked:

- each interruption of one or more beams of the barrier during a dangerous phase of the operating cycle of the moving parts of the press **must immediately cause a stoppage within the response time of the components**,
- **the clearing of the detection zone must not start the operation of the machine**. It is therefore necessary to set the press in motion using the normal control sequence of the press when re-starting,
- **the switching of the electrical supply must not set the machine parts in motion, especially after an interruption during a cycle**. It is therefore necessary to set the press in motion using the normal control sequence,
- the malfunction of a component of the control circuit of the press must not cause any risks,
- the additional safety devices, of those which are used for other functions of the press, must always be effective.

Wiring instructions

- Connection are made through quick disconnect metal DIN 43652 plugs delivered with the light curtain
- Cross sectional area of stranded wires to be crimped (metal DIN 43652 plugs only): 0,5 mm2 (AWG20) as a minimum, 1,5 mm^2 (AWG16) as a maximum
- Packing Glands and allowed cable diameters to guarantee the IP 65/NEMA 4, 13 sealing (metal DIN 43652 plugs only) : PG 9 for the emitter plug (allowed cable diameters : 5,5 mm to 8,7 mm / 0.22 in to 0.34 in), PG21 for the receiver plug (allowed cable diameters : 11 mm to 19 mm / 0.44 in to 0.74 in).
- **For the emitter plug:**

  PG 9: allowed cable diameters : 5 mm to 8,7 mm

- **For the receiver plug:**

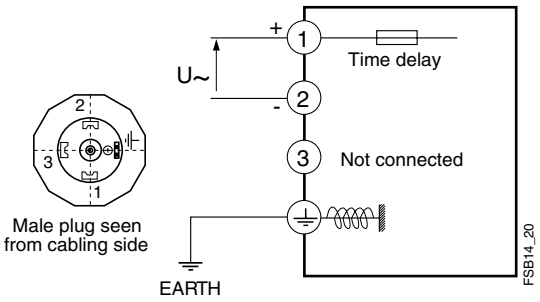
  PG 21: allowed cable diameters: 11 mm to 10 mm
  PG 13: allowed cable diameters: 8,5 mm to 13,5 mm

4.2 Electrical connection for plastic connector versions (DIN 43651)

FF-SB14E/Rooo-2o versions: connection by screw terminals for supply plugs (Hirschmann, **type GDM2009**) and for signal plug (Hirschmann, **type N6RFF).**

4.2.1 Emitter Main supply plug (see § 4.2.4)

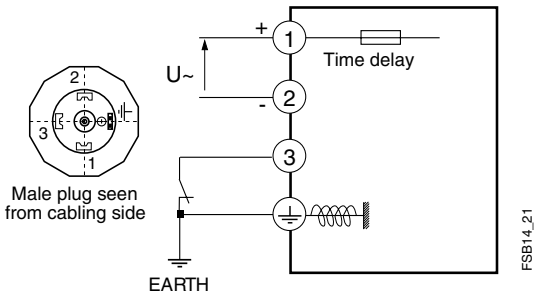
Connection drawing



Note: Earth connection: cable section should be at least equal to the supply cable section (refer to EN 60204), and cable length should be as short as possible. In order to get the specified electrical noise immunity, the earth terminal **must** be connected to the main earth of the machine.

4.2.2 Receiver Main supply plug (see § 4.2.4)

Connection drawing



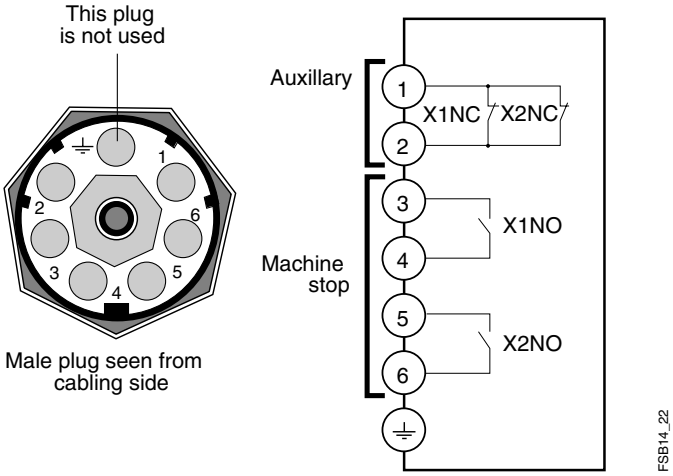
(3) ⏚ (Test input): connection between terminals (3) and EARTH established: barrier functioning (see § 4.2.7).

Note: Earth connection: cable section should be at least equal to the supply cable section (refer to EN 60204), and cable length should be as short as possible. In order to get the specified electrical noise immunity, the earth terminal **must** be connected to the main earth of the machine.

Warning: if the test function is not being used, then do not forget to establish the connection between terminal 3 and earth. If this is not done, the safety barrier will remain blocked.

4.2.3 Receiver Signal plug

Connection drawing



(3)(4) and (5)(6) N.O. contacts for machine stop. Contact rating 2 A - 250 Vac

Barrier free = contacts closed = machine operation enabled.
Barrier interrupted (or without supply) = contacts open = machine operation disabled (see § 4.2.5).

(1)(2) N.C. contacts for auxillary use only, must not be used for machine stopping (see § 4.2.6).

Note: Relays X1 and X2 are special safety relays with mechanically linked contacts (guided contacts).

For good operation, these contacts must switch currents of at least 50 mA (if necessary, increase current with additional resistors).

4.2.4 Electrical power supply

Supply voltage on (1)(2) are:
FF-SB14E/R ❑❑❑ - 2 ❑
- K: 120/240 Vac +10 %, -20 % (automatic switching) 48-62 Hz, 8 VA per unit
- 4: 24 to 48 Vdc, ±15 %, 8 W per unit

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Notes:

1/ For Vdc versions, the supply connection is the following: terminal (1): +
terminal (2): -
However, the FF-SB14 is protected against reversed polarity thanks to a rectifier.

2/ In order to get the specified immunity to electrical noise, the earth terminal must be connected to the main earth of the machine.

3/ Additional protection fuse on the power line:
- 500 mA (for 120 Vac mains) or 400 mA (for 240 Vac mains) on both emitter and receiver:
500 mA (for 24 Vdc mains) on both emitter and receiver.

4.2.5 Machine stop control

Relays X1 and X2 are switched simultaneously. An internal permanent check ensures that both relays have the same status. If one of the two contacts X1 or X2 becomes accidently welded, the remaining contact would no longer be able to close. **It is therefore important to use the two signals to prevent operation of the machine.**

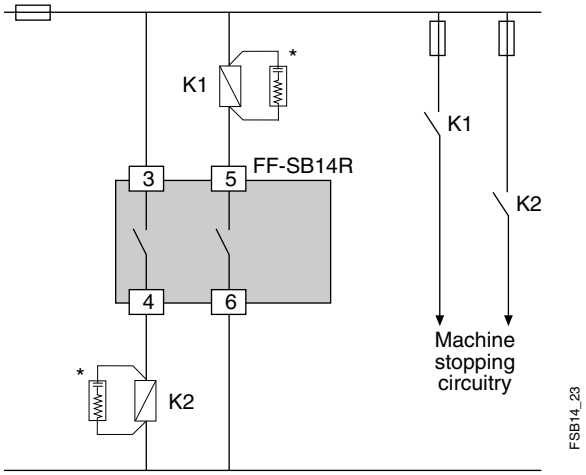
Protection of relays contacts

Warning: inductive loads will generate high voltage transients which will degrade the life expectancy of the relay contacts.
The delivered RC components (220 Ω + 0,22 µF) will avoid this problem and will allow the guarantee to apply.
Important: safety norms require that these RC components are connected in parallel with the load (see schematics).

Note: these RC components can be replaced by varistors for Vdc interfaces.

Machines with double stopping circuitry

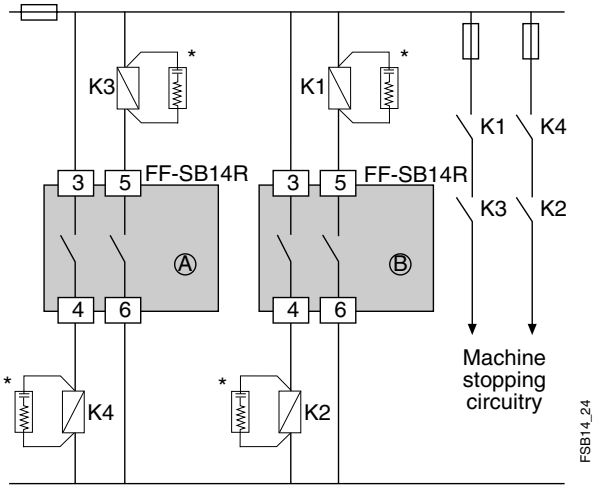
In this case, use the contacts (3) and (4) & (5) and (6) separately:



*RC component delivered with the unit:
220 Ω + 0.22 µF (see § 4.2.8 for correct interfacing of K1 and K2, the partial example here being more appropriate for ac power).

Connection of grouped barriers

4 relays K1, K2, K3 and K4 would be used in the following manner:

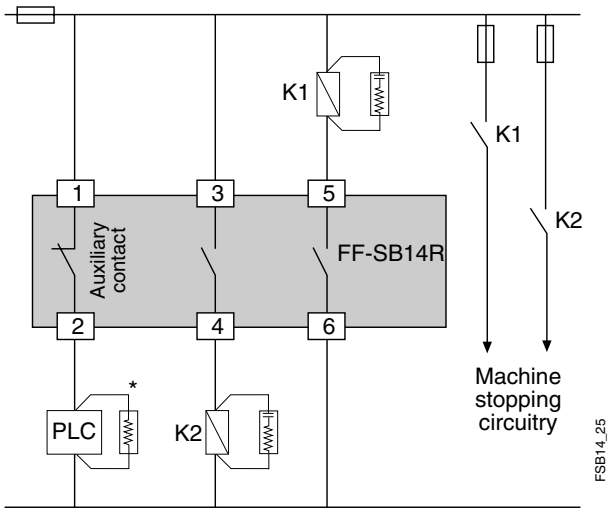


*RC component delivered with the unit: 220 Ω + 0,22 µF (see § 4.2.8 for correct interfacing of K1 and K2, the partial example here being more appropriate for ac power).

4.2.6 Use of auxillary N.C. contacts (pins 1 and 2 of receiver signal plug)

Never use this contact alone for machine shutdown.

These contacts can be used:
- either for indication of the stop signal from the barrier
- or as redundant complement to the main stop chain.



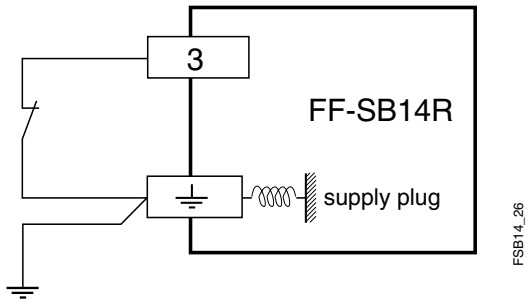
*Additive resistor to increase the current up to 50 mA at least. PLC: Programmable Logical Controller. The partial example here being more appropriate for ac power. See § 4.2.8 for correct interfacing of K1 and K2.

4.2.7 Test input

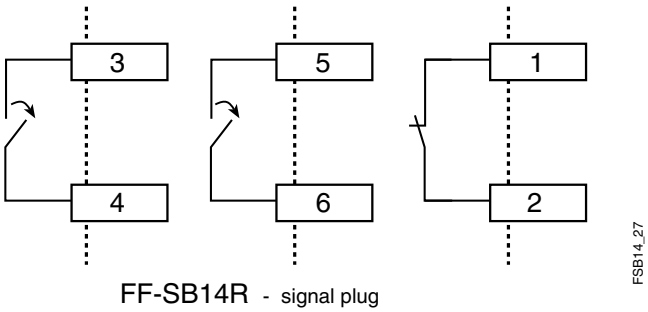
Principle

Interruption (by a contact) of the electrical connection between terminals EARTH and (3) of the power supply plug sets off the barrier even if the beams have not been broken.

Diagram - Operation

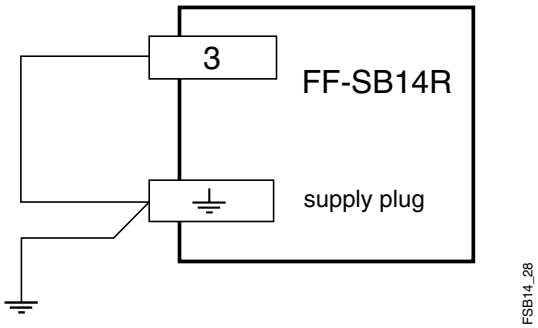


The barrier only functions when connection (3) - EARTH has been made.
Interruption of the connection (3) - EARTH causes: the opening of the machine stop contacts and the closing of the auxiliary contacts:



Once connection (3) - EARTH has been broken (tmin = 50 mS), it is enough to check that the relays, controlled directly by the outputs of the FF-SB14, have switched satisfactorily.

Warning: if the test function is not being used, then do not forget to make the connection (3) - EARTH in the supply plug.



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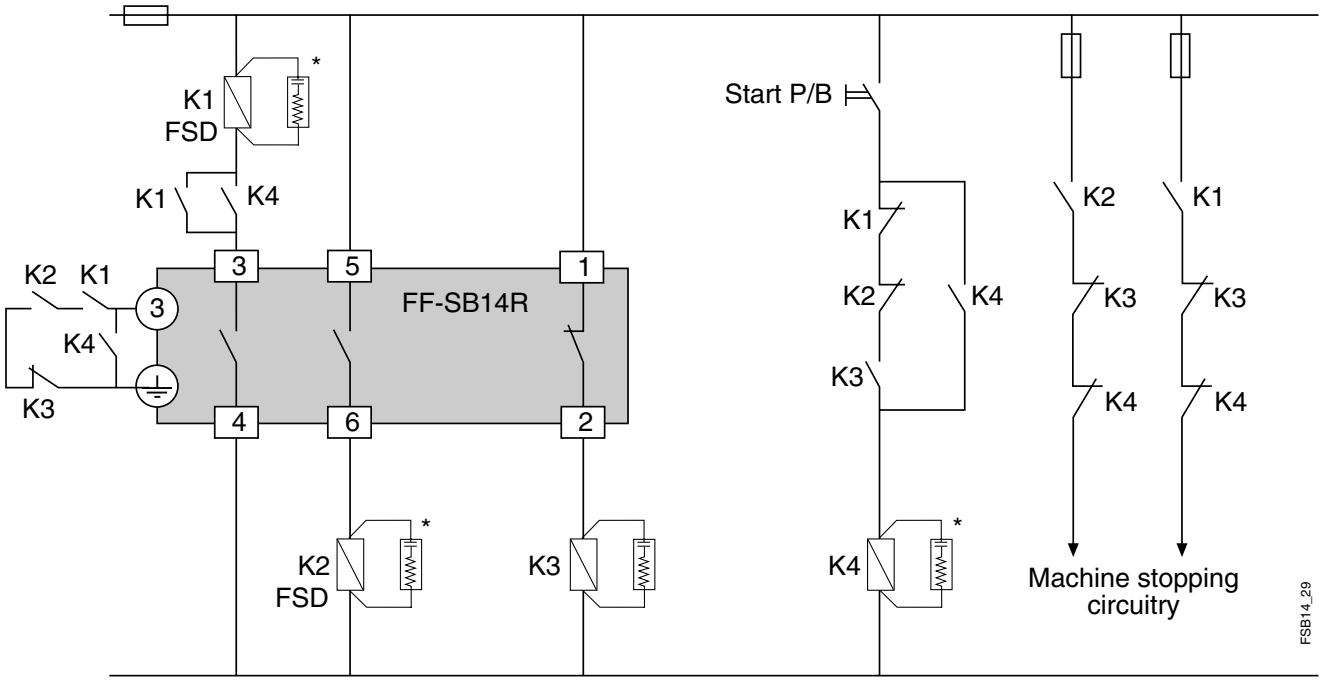
4.2.8 Example of electrical interface involving additional relaying

Note: If it is necessary to add relays between the barrier and the machine control circuitry, it would be advisable to monitor that these relays are functioning properly. The case described below should be considered as an example of use of the barriers. The adjustment of the machine to the electrical circuit should be carried out with great regard for safety (any breakdown of an additional relay should be detected automatically).

Example 1: Start & restart interlock and Final Switching Device (FSD) monitoring

performed by an additional relay circuitry (use of example 2 is strongly recommended)



* 220 Ω + 0.22 μF (3): supply plug [3]: signal plug

At power up, the FF-SB14 barrier is in test mode since no contact between terminal (3) and Earth is established. K3 is energized through NC contacts. To reset the barrier, the ”Start push-button” must be pressed which energizes the relay coil K4. Connection between (3) and Earth is then established which enables relay coils K1 and K2 to be energized and relay coil K3 to be de-energized. NO contacts of K1, K2 relays go to the ON state while NC contacts of K3 and K4 go to the ON state to enable the activation of a machine cycle. If one of the FSD (K1 and K2) contacts remains accidently closed, pressing the start push-button will have no effect and the safety function will be maintained. All external relays are safety relays.

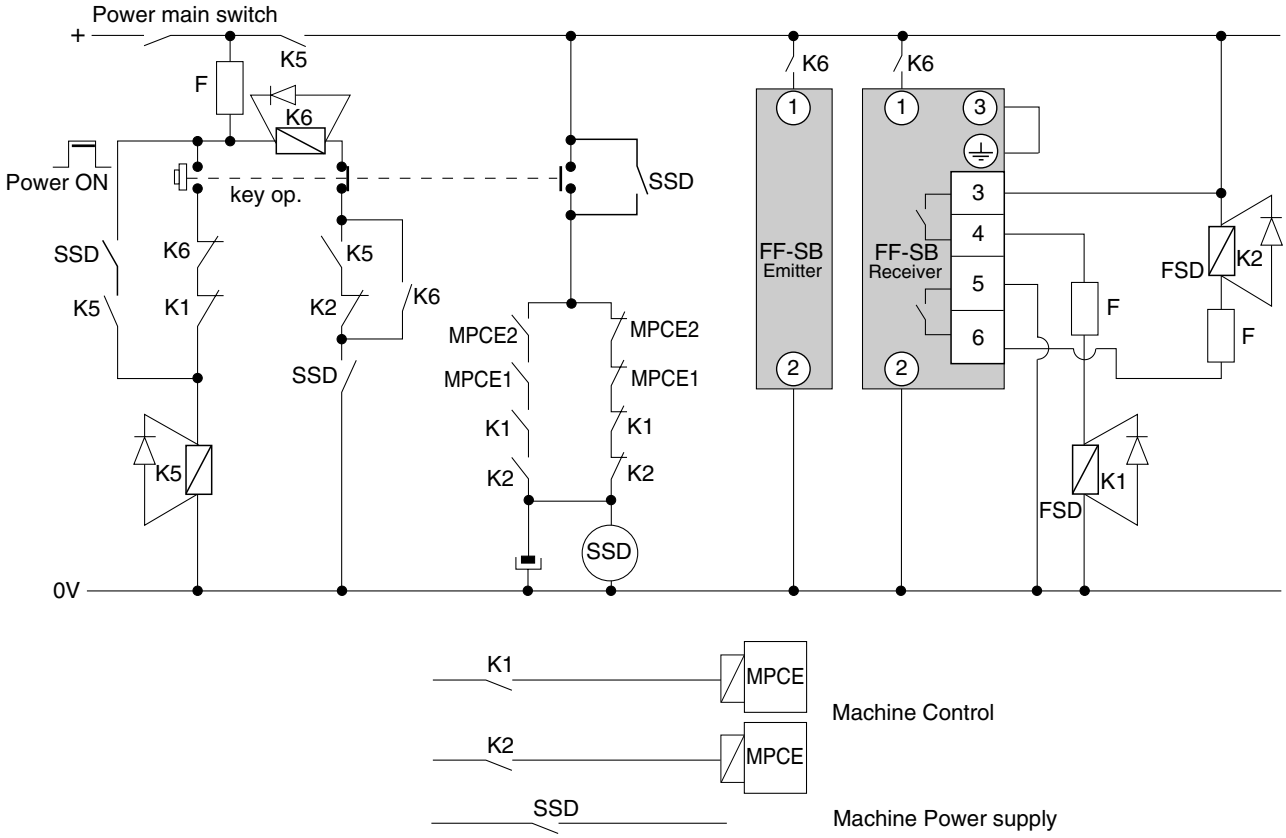
Notes:

1. **If NC contacts of K4 remain closed, then the NO contact of K4 remains open between terminals (3) and ⏚ and the light curtain remains in alarm even if the start push-button P/B is pressed.**

2. **Contacts of relays connected to the test input shall be golden plated in order to switch low currents.**

4.2.9 Example 2: The following example performs the same functions as in the first example but it takes into account the secondary Switching Device.

This interface drawing meets the requirements of the BS 6491 standard.



(3) : supply plug [3] : signal plug

FSD: Final Switching Device
SSD: Secondary Switching Device
MPCE: Machine Primary Control Element

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4.3 Electrical connection for metal connector versions (DIN 43652)

- FF-SB14E/R❑❑❑-S2❑ versions: connection by crimped terminals (not to be welded) for supply-and-signal plugs.

Recommended crimping tool: FA 0100-164.

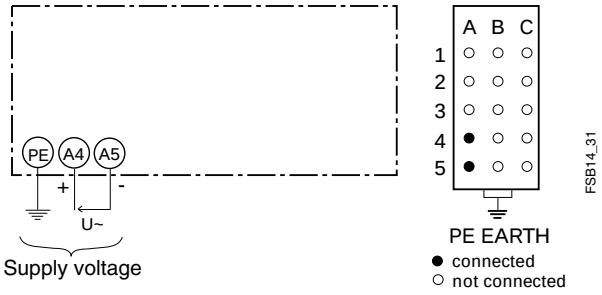
Removal tool: FG 0300-146.

- Do not weld the terminals

- Do not use any other crimping tool than the recommended one. Particularly, the use of engineer's pliers may generate bad contacts which may cause troubles in case of important vibrations (see § 9.3).

4.3.1 Emitter supply plug (FF-SB14E❑❑❑-S2❑) (see § 4.3.3)

Connection drawing

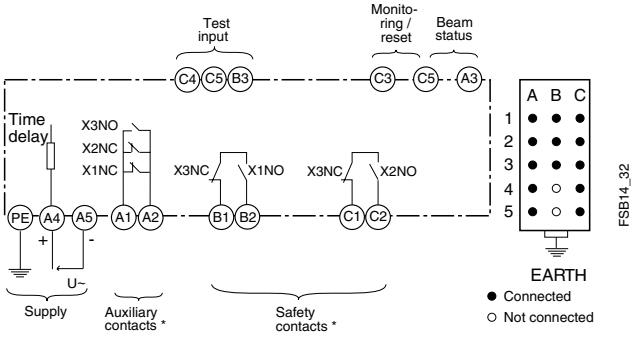


Note: Earth connection: cable section should be at least equal to the supply cable section (refer to EN 60204), and cable length should be as short as possible. In order to get the specified noise immunity, the earth terminal **must** be connected to the main earth of the machine.

4.3.2 Receiver supply and signal plug (FF-SB14R❑❑❑-S2❑) (see § 4.3.3)

Connection drawing

- load features: Umax = 250 Vac, I max = 2 A, Pmax = 500 VA



A1, A2: 2 NC contacts in parallel for auxiliary use (see § 4.3.5)
B1, B2 and C1, C2: 2 NO safety contacts (see § 4.3.4)
B3, C4, C5 (test input): if the connection between terminals C4/C5 or C4/B3 is set, the barrier operates correctly (see § 4.3.7)
C3, C5: monitoring of Final Switching Devices (see § 4.3.8 and 4.3.9).
A3, C5: beam status output (see § 4.3.6).

Note: Earth connection: cable section should be at least equal to the supply cable section (refer to EN 60204), and cable length should be as short as possible. In order to get the specified noise immunity, the earth terminal **must** be connected to the main earth of the machine.

Warning: If test function is not set, there must be a connection between C4/C5 or C4/B3.

Without this electrical connection, the barrier remains in permanent default state (see § 4.3.7).

Remark: X1, X2 and X3 relays are special safety relays with mechanically linked contacts (guided contacts).
For optimum operation, particularly low voltage, minimum switching current is 50 mA. Increase current with additional resistors, where necessary to maintain minimum current level.

4.3.3 Electrical power supply

Supply voltage on A4-A5, are:
FF-SB14E/R❑❑❑-S2❑
└ **K**: 120/240 Vac +10%, -20% (automatic switching) 48-62 Hz, 8 VA per unit
4: 24 to 48 Vdc, ±15 %, 8 W per unit

Notes:

1/ For Vdc versions, the supply connection is the following: terminal A4: +
terminal A5: -
However, the FF-SB14 is protected against reversed polarity thanks to a rectifier.

2/ In order to get the specified immunity to electrical noise, the earth terminal must be connected to the main earth of the machine.

3/ Additional protection fuse on the power line:
- 500 mA (for 120 Vac mains) or 400 mA (for 240 Vac mains) on both emitter and receiver.
- 500 mA (for 24 Vdc mains) on both emitter and receiver.

4.3.4 Machine stop control

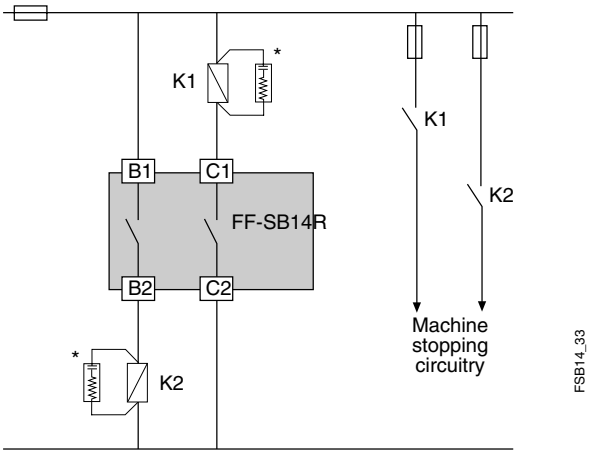
Relays X1 and X2 are switched simultaneously. An internal permanent check ensures that both relays have the same status. If one of the two contacts X1 or X2 becomes accidently welded, the remaining contact would no longer be able to close. **It is therefore important to use the two signals to prevent operation of the machine.**

Protection of relays contacts

Warning: inductive loads will generate high voltage transients which will degrade the life expectancy of the relay contacts.
The delivered RC components (220 Ω + 0,22 µF) will avoid this problem and will allow the guarantee to apply.
Important: safety norms require that these RC components are connected in parallel with the load (see schematics).
Note: these RC components can be replaced by varistors for Vdc interfaces.

Machines with double stopping circuitry

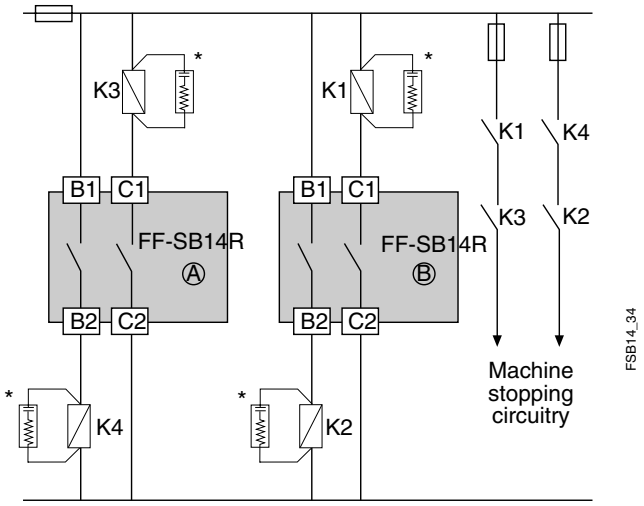
In this case, use the following contacts B1 and B2 & C1 and C2 separately:



*RC component delivered with the unit:
220 Ω + 0,22 µF (see § 4.3.10 for correct interfacing of K1 and K2, the partial example here being more appropriate for ac power).

Connection of grouped barriers

4 relays K1, K2, K3 and K4 would be used in the following manner:



*RC component delivered with the unit: 220 Ω + 0,22 µF (see § 4.3.10 for correct interfacing of K1 and K2, the partial example here being more appropriate for ac power).

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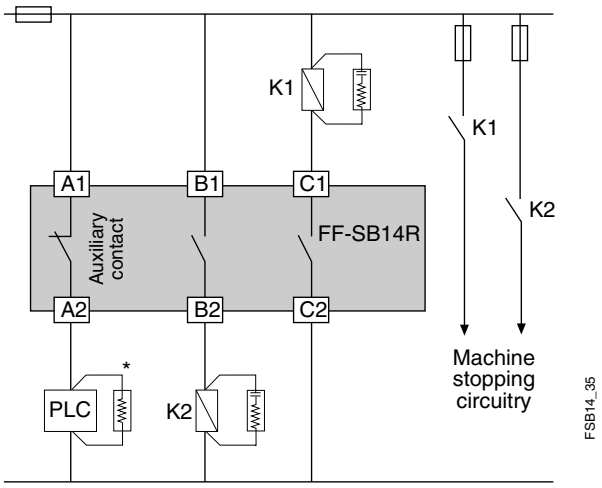
4.3.5 Use of auxillary N.C. contact (pins A1 and A2)

Never use this contact alone for machine shutdown.

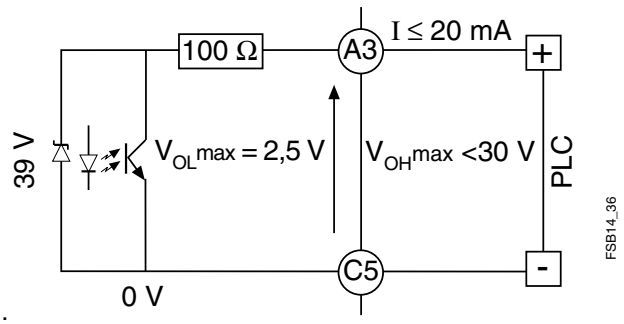
These contacts can be used:
- either for indication of the stop signal from the barrier
- or as redundant complement to the main stop chain.



*Additive resistor to increase the current up to 50 mA at least. PLC: Programable Logical Controller. The partial example here being more appropriate for ac power. See § 4.3.10 for correct interfacing of K1 and K2.

4.3.6 Beam status output (available on FF-SB14R❑❑❑-S2❑ models only)

A3 is internally connected to the 0 V when all the beams are unobstructed (NPN output) and when the light curtain is not in test mode. PLC: Programable Logical Controller. The partial example here being more appropriate for ac power. See § 4.3.10 for correct interfacing of K1 and K2.

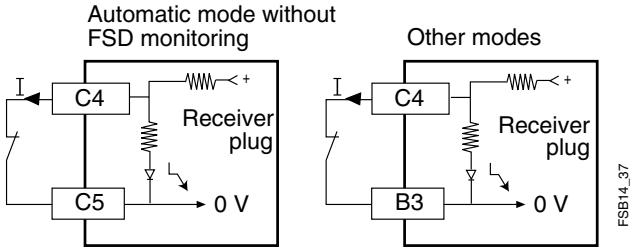


.

4.3.7 Test input

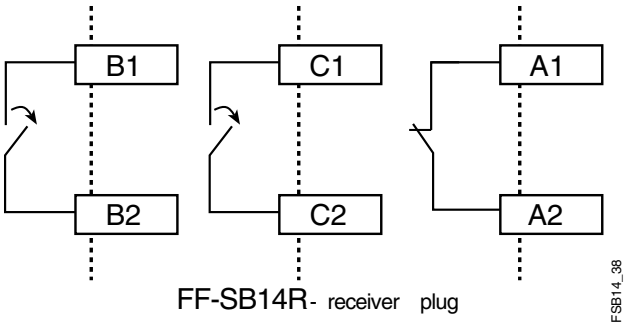
Principle

Interruption (by a contact Imax ≥ 20 mA, voltage drop ≤ 0,4 V) of the electrical connection between following terminals of the receiver plug sets off the barrier even if the beams have not been broken.



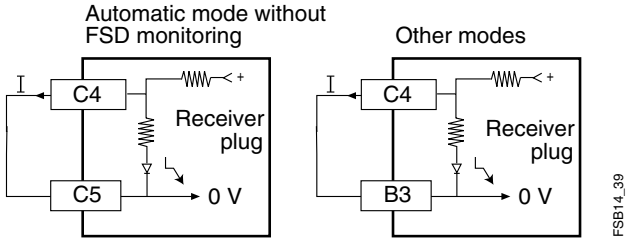
The barrier only functions when connection between these terminals has been made.

Interruption of the connection between these terminals causes: the opening of the machine stop contacts and the closing of the auxiliary contacts:



Once connection between C4/C5 or C4/B3 has been broken (tmini = 50 mS), it is enough to check that the relays, controlled directly by the outputs of the FF-SB14, have switched satisfactorily.

Warning: if the test function is not being used, then do not forget to make the connection between following terminals in the receiver plug:



4.3.8 Automatic restart/start & restart interlock (available on FF-SB14R❑❑❑-S2❑ models only)

Description of the different modes

Automatic mode

In the automatic mode, **the barrier is automatically reset at power up or after any intrusion in the detection field**. There's no need for pressing a push-button for reseting the system and closing contacts B1-B2 and C1-C2. There is no need to open the receiver unit in this mode except if the FSD monitoring is required (see § 8.6).

Start interlock mode

In the start interlock mode**, it is necessary to press a push-button to reset the system and close contacts B1-B2 and C1-C2 at power up only**. Normally closed contact of this push-button must be connected between terminals C3 and C5. The receiver unit must be opened to change the jumper links position (refer to § 8.6).

Start and Restart interlock mode

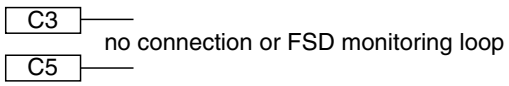
In that mode, **pushing a button is necessary at power up or after any intrusion in the detection field to reset the system and close contacts B1-B2 and C1-C2**. Normally open contacts of this push-button must be connected between terminals C3 and C5. The receiver unit must be opened to change the jumper links position (refer to § 8.6).

Selection of a restart mode

The selection of one of these modes is done with the jumper links position (refer to § 8.6).

Automatic mode

The device is delivered in this mode. If the FSD monitoring is required then the jumper links position must be changed (refer to § 8.6).



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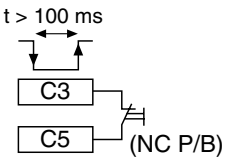
Start interlock mode

Change the jumper links position (refer to § 8.6)
NC contact of a push-button must be connected between C3 and C5



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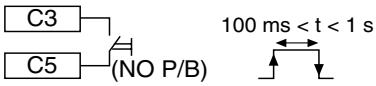
Start & Restart interlock mode

Change the jumper link position (refer to § 8.6)
NO contact of a push-button connected between C3 and C5



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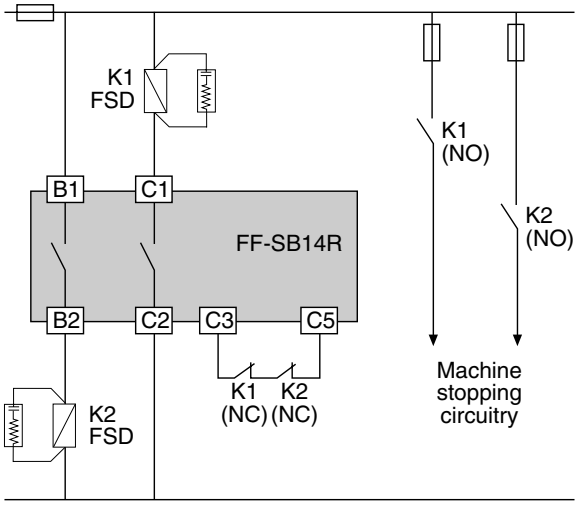
4.3.9 Monitoring / reset (available on FF-SB14R❑❑❑-S2❑ models only)

The Final Switching Device (FSD) monitoring function can be used with either the automatic mode, the start interlock mode or the start & restart interlock mode. Normally closed contacts of the relays used as final switching devices (FSD) can be wired between the terminals C3 and C5 as shown on the following figure:



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If the start interlock mode & restart interlock mode are used, refer to § 4.3.10 for correct interfacing of K1 and K2. The partial example here being more appropriate for ac power.

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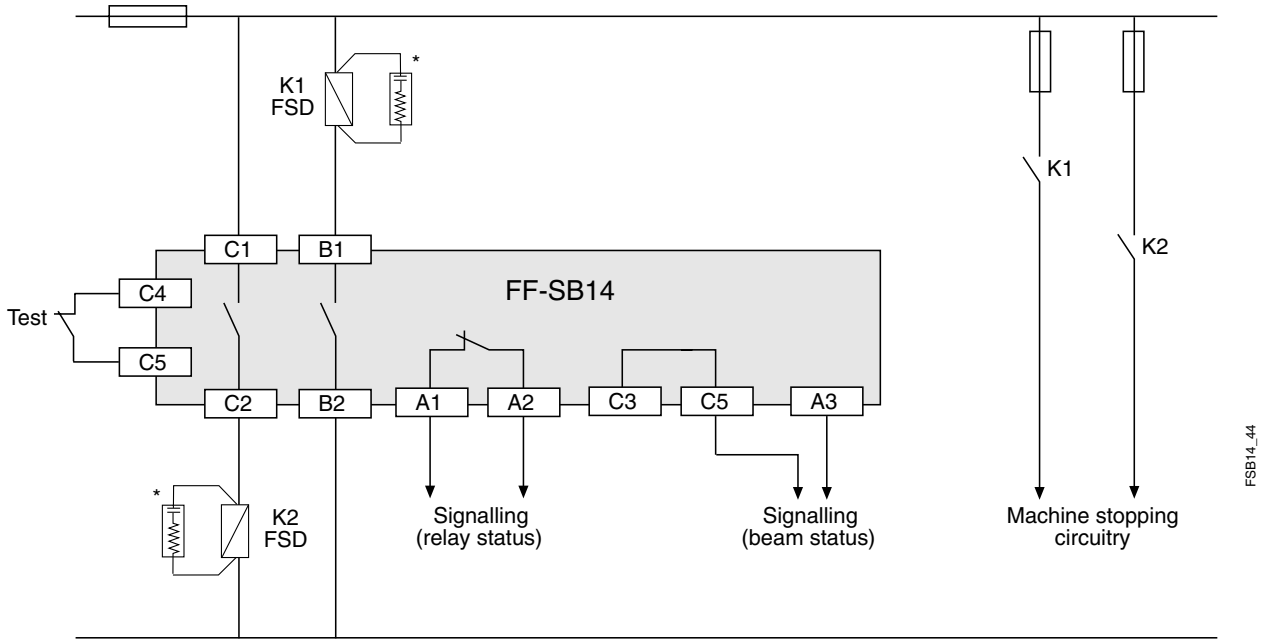
4.3.10 Examples of electrical interfaces involving additional relaying

Note 1: If it is necessary to add relays between the barrier and the machine control circuitry, it would be advisable to monitor that these relays are functioning properly. The cases described below should be considered as examples of use of the barriers. The adjustment of the machine to the electrical circuit should be carried out with great regard for safety (any breakdown of an additional relay should be detected automatically).

Note 2: Contacts of relays connected to the test input shall be golden plated in order to switch low currents.

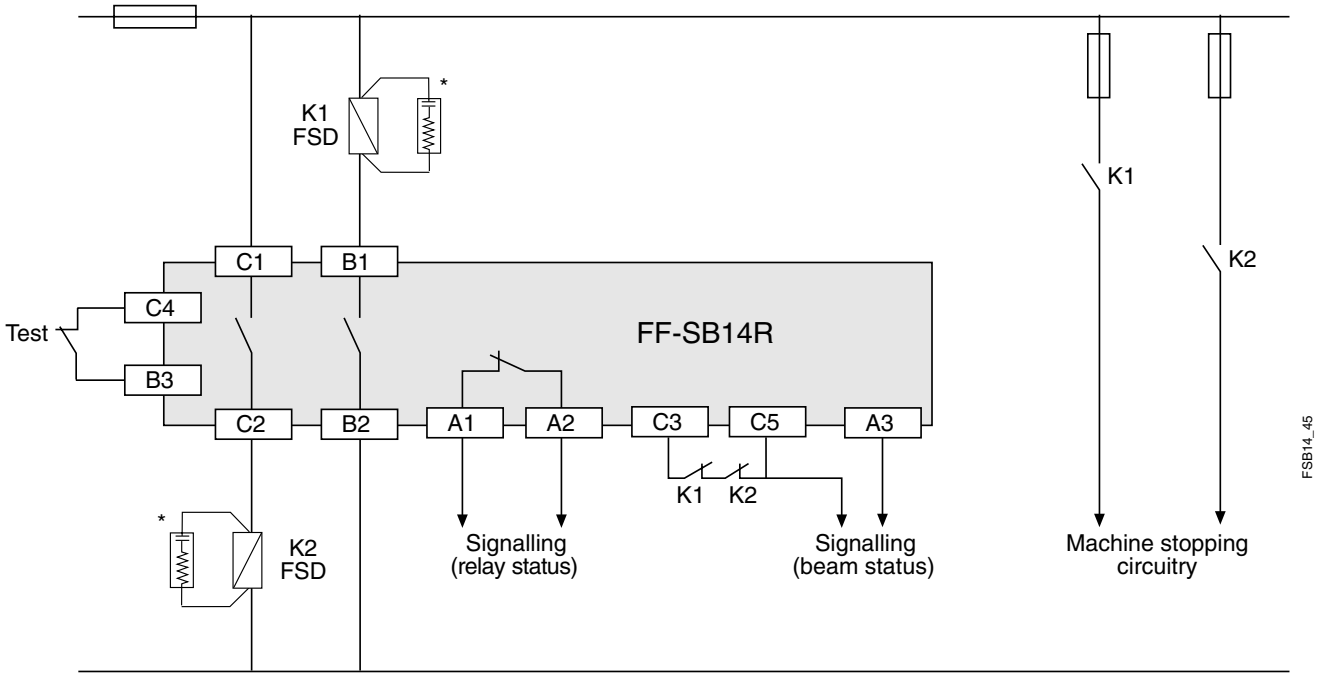
Example 1: Automatic reset without Final Switching Device monitoring
(use of example 7 is recommended)



FSD: Final Switching Device
* 220 Ω + 0.22 µF

In this example, the reset of the safety barrier is automatically performed at power up or after any intrusion in the detection field. However, **the additional relays are not monitored** and a possible failure of both relays K1 and K2 will not be detected. If a possible failure of K1 and K2 needs to be detected, please refer to example 2.

Example 2: Automatic reset with Final Switching Device monitoring
(use of example 7 is recommended)



FSD: Final Switching Device * 220 Ω + 0.22 µF

Do not forget to change the jumper links position (refer to § 8.6)

In this example, the reset of the safety barrier is automatically performed at power up or after any intrusion in the detection field. However, if the NO contact of one of the two additional relays K1 and K2 remains welded, automatic reset is forbidden until the failure is removed. Connecting NC contacts of K1 and K2 between terminals C3 and C5 will provide a fault-tolerant connection to the machine stopping circuitry. **All external relays are safety relays with guided contacts.**

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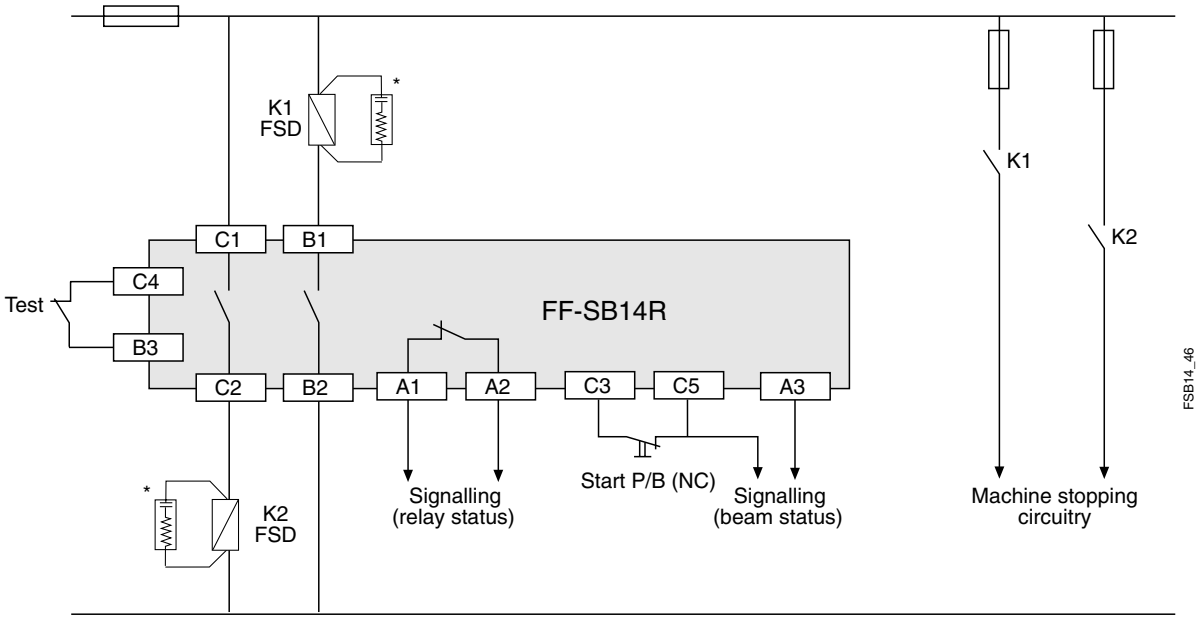
Example 3: Start interlock without Final Switching Device monitoring
(use of example 7 is recommended)



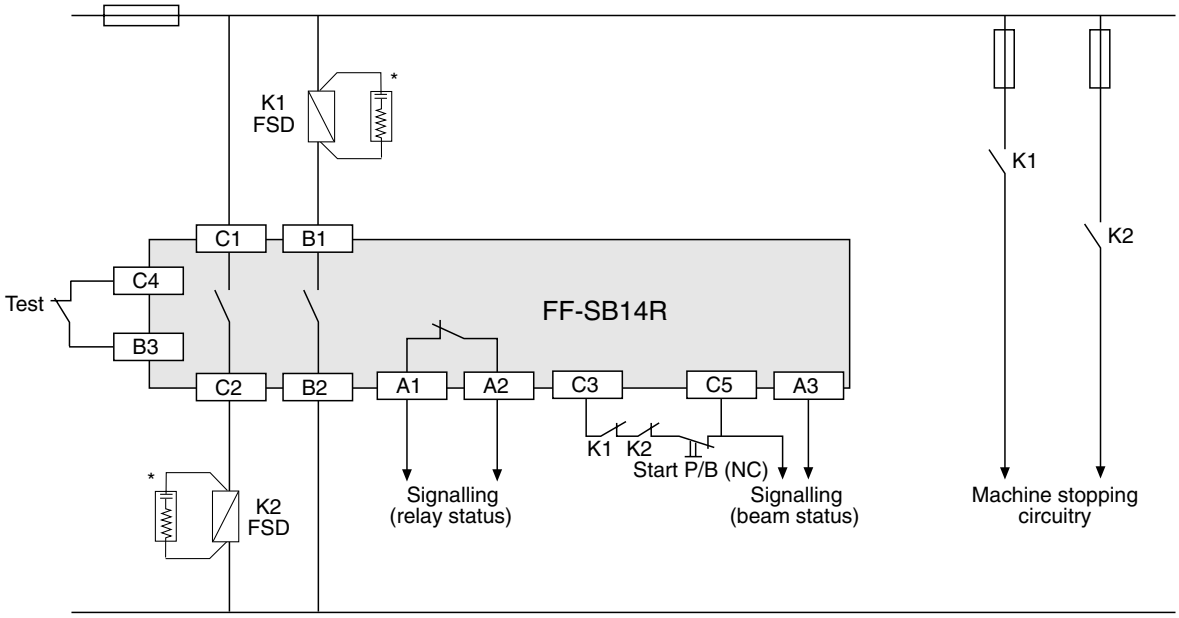
FSD: Final Switching Device * 220 Ω + 0.22 µF

Do not forget to change the jumper links position (refer to § 8.6)

In this example, it is necessary to press a NC push-button between terminal C3 and C5 to reset the safety barrier at power up only (automatic reset is performed after any intrusion in the detection field). However the additional relays are not monitored and a possible welded contact on both relays K1 and K2 will not be detected. If a possible failure of K1 and K2 needs to be detected, please refer to example 4.

Example 4: Start interlock with Final Switching Device monitoring

(use of example 7 is recommended)



FSD: Final Switching Device * 220 Ω + 0.22 µF

Do not forget to change the jumper links position (refer to § 8.6)

In this example, it is necessary to press a NC push-button between C3 and C5 to reset the safety barrier at power up only (automatic reset is performed after any intrusion in the detection field). If the NO contact one of the 2 relays K1 and K2 remains welded, reset is forbidden until the failure is removed. Connecting NC contacts of K1 and K2 in serial with the NC push-button between terminals C3 and C5 will provide a fault-tolerant connection to the machine stopping circuitry. **All external relays are safety relays with guided contacts.**

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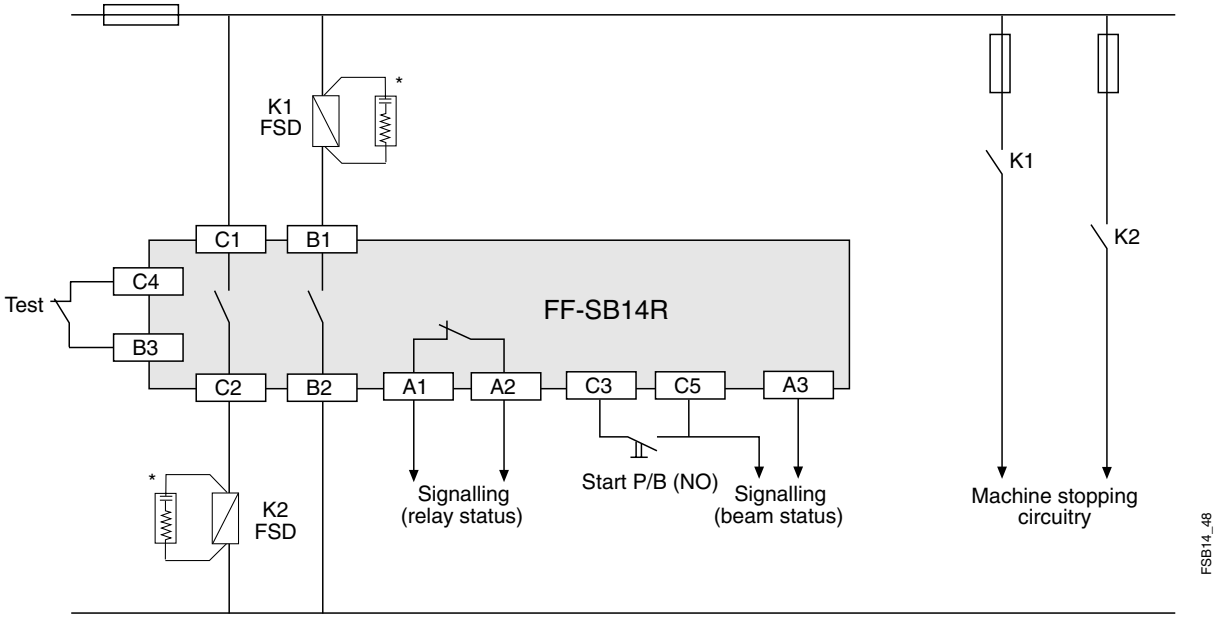
Example 5: Start/Restart interlock without Final Switching Device monitoring
(use of example 7 is recommended)



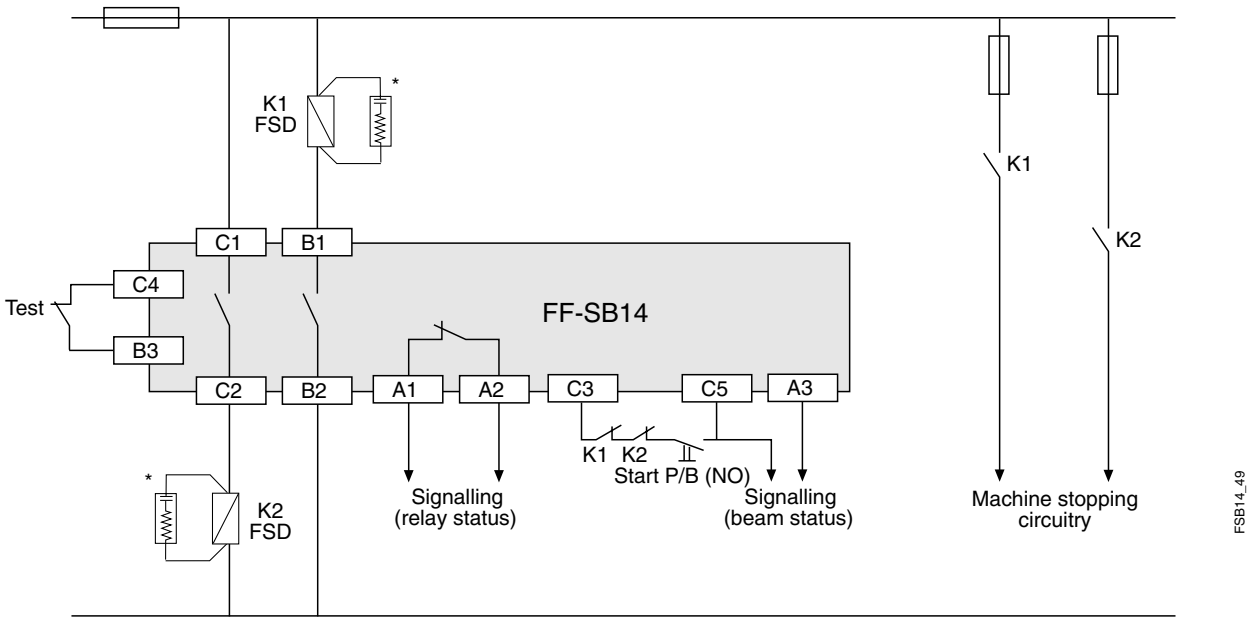
FSD: Final Switching Device * 220 Ω + 0.22 µF

Do not forget to change the jumper links position (refer to § 8.6)

In this example, it is necessary to press a NO push- button between C3 and C5 to reset the safety barrier at power up and after any intrusion in the detection field. However, additional relays are not monitored and a welded contact on both relays K1 and K2 will not be detected. If a possible failure of K1 and K2 needs to be detected, please refer to example 6.

Example 6: Start/Restart interlock with Final Switching Device monitoring

(use of example 7 is recommended)



FSD: Final Switching Device * 220 Ω + 0.22 µF

Do not forget to change the jumper links position (refer to § 8.6)

In this example, it is necessary to press a NO push -button between C3 and C5 to reset the safety barrier at power up and after any intrusion in the detection field. If one of the 2 additional relays K1 and K2 fails, reset is forbidden until the failure is removed. Connecting NC contacts of K1 and K2 in serial with NO push-button between terminal C3 and C5 will provide a fault-tolerant connection to the machine stopping circuitry. **All external relays are safety relays with guided contacts.**

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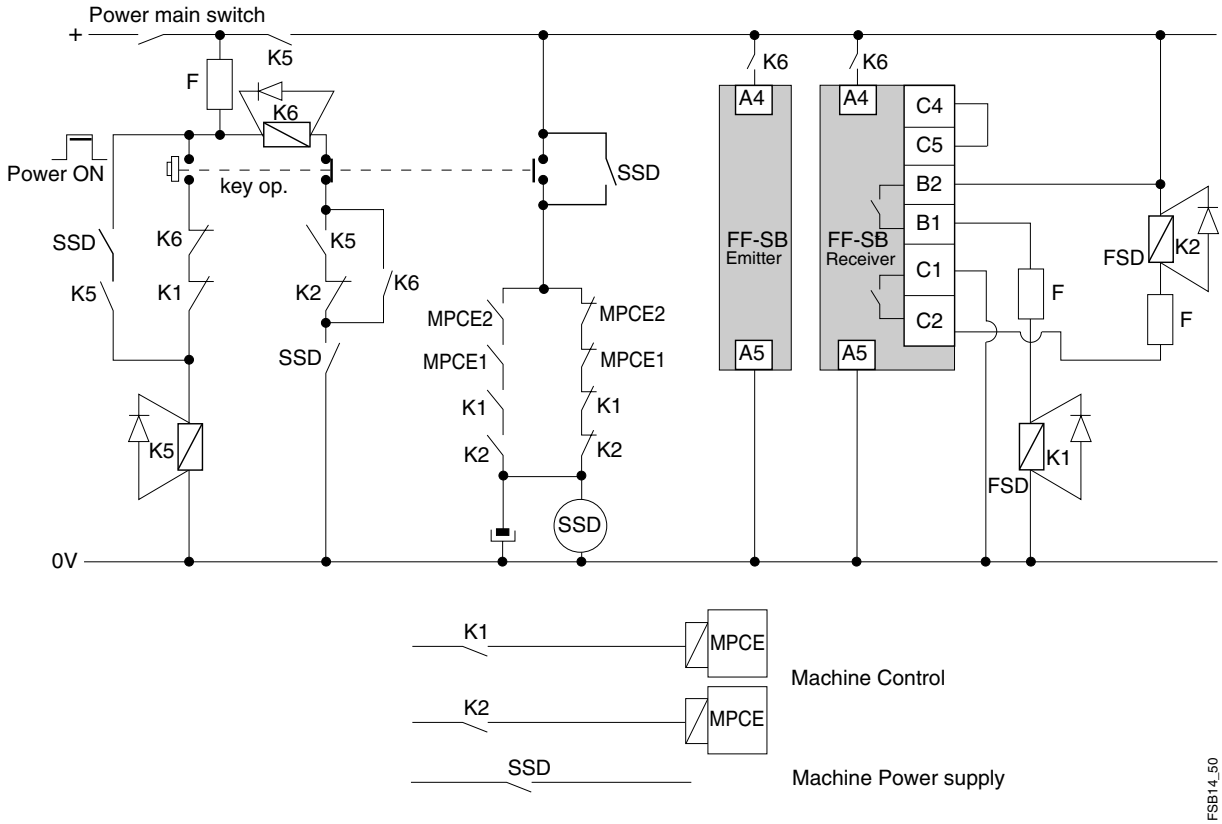
Example 7: The following example performs the same functions as the previous example but it takes into account the secondary Switching Device.

This interface drawing meets the requirements of the BS 6491 standard.



(3) : supply plug [3] : signal plug

FSD: Final Switching Device
SSD: Secondary Switching Device
MPCE: Machine Primary Control Element

*the FF-SB receiver unit should be preset in the Automatic reset mode without FSD monitoring (refer to § 4.3 and § 8.6)

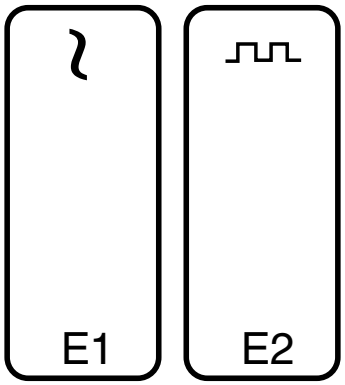
5. Setting up

5.1 Front panel indicators

- **Emitter**

E1: yellow indicator
Power on indicator
E2: yellow indicator
Synchronisation beam reception indicator
Lights on if the synchronisation beam is established

Note: E2 normally lights on if the occultation occurs near the emitter



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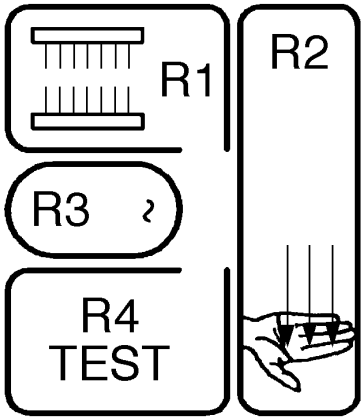
- **Receiver**

R1: red indicator. Normally OFF. Flickers when reception level is too low. Lits on during test or during a beam interruption near the receiver, or in case of important misalignment.
R2: red indicator. Lits on when relays are de-energized.
R3: green indicator. Lits on when relays are energized
R4: yellow indicator. Normally OFF.
Test input implementation. Lits during test and flickers if the system needs to be reset.



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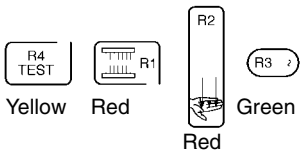
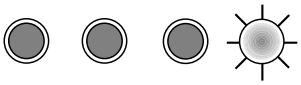
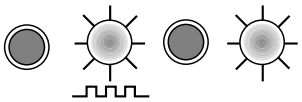
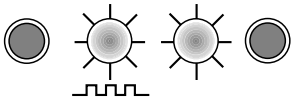
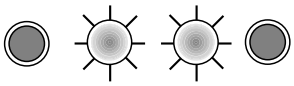
- **Beam and output LED status**

LED status  	Detection field	Machine stop contacts	Machine operation	Signal margin	Actions
	CLEAR	ON	ENABLED	sufficient	Normal operation: no action is required
	CLEAR	ON	ENABLED	close to the limit	Slight misalignment or dust accumulation: readjust optical alignment or clean front plates before the barrier goes to the off-state
	BREAK	OFF	DISABLED	too weak	- The barrier went to the off-state because of heavy misalignment or dust accumulation: readjust optical alignment or clean front plates - Or the beam is interrupted near the emitter
	BREAK	OFF	DESABLED	no signal at all	The beam is interrupted near the receiver, or totally misaligned or overranged: remove from test mode or make the beam free or reduce scanning range according specifications, or readjust beam alignment.

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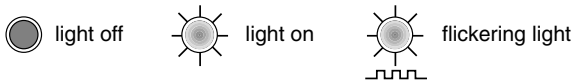
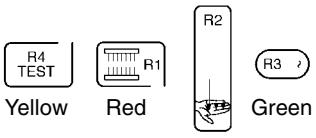
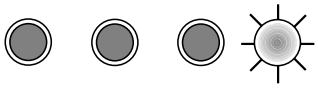
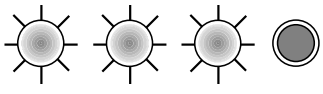
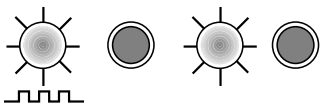


- **Test and restart LED status**

LED status  	**Detection field**	**Machine stop contacts**	**Machine operation**	**Actions**
	CLEAR	ON	ENABLED	Normal operation: no action is required
	CLEAR OR BREAK	OFF	DISABLED	The barrier is in test mode: check the connection between terminals: (3) - (⏚) or (C4) - (C5) (automatic mode) (C4) - (B3) (other modes)
	CLEAR	OFF	DISABLED	The start/restart interlock mode has been selected: press push-button connected between terminals [C3] and [C5] to restart the system, and go back to normal operation status

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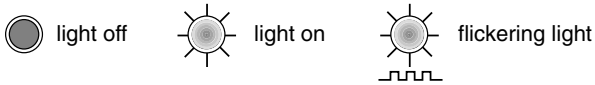
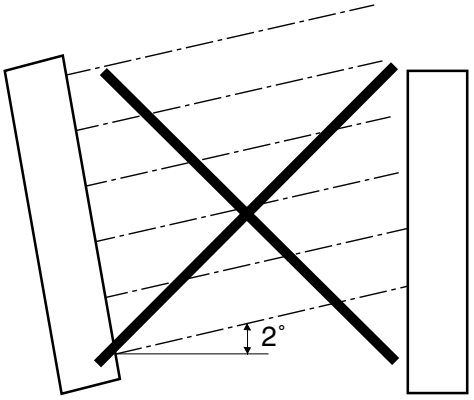


5.2 Optical alignment

Emitter and receiver must be parallel and at the same height.

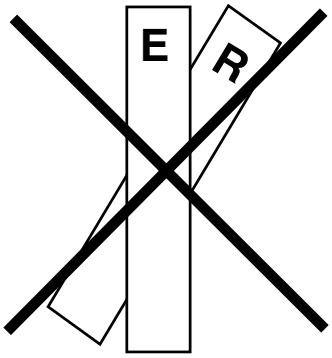
- Check the units are parallel in the plane of the beams.

The alignment tolerance between emitter and receiver is ±2°.



FSB14_55

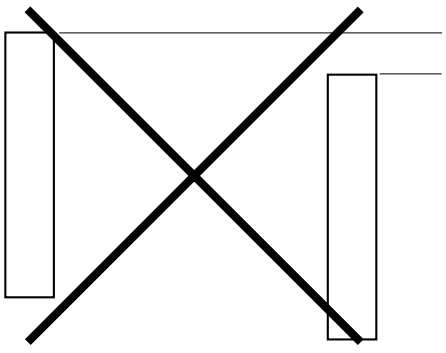
- Check the units are parallel in the plane perpendicular to the beams.



FSB14_56

- Check the relative height.

This adjustment is easily accomplished by sliding in the "T" grooves of the mountings.



FSB14_57

The tolerance on relative heights is ±10 cm for a scanning distance of 10 m, and decreases in respect with E/R distance.

- Check the angular alignment.

FSB14_58

The angular position tolerance of emitter and receiver is ≤ ± 2°.

For small scanning distances distances, the alignment of the units can be carried out very rapidly and simply using a rule:

FSB14_59

For long distances the alignment can be achieved using a bubble rule.

Reminder:

- Little irregular alignment results in flickering of signal R1 with the signal R3 on.
- Excessively irregular alignment results in flickering of signal R1 and in turning off the signal R3 and set off the barrier outputs.
- When an occultation occurs, R1 may flicker (and R2 turns on); this means that the receiver is still scanning, but with a missing beam due to occultation. If the occultation is made close to a receiver lens, R1 lights on, withoutflickering, as the receiver is no longer able to scan. Anyway, in both cases, output relays will be switched off, as there are missing beams.

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5.3 Check list of the installation

Before powering up, check the following points:

5.3.1 Compliance with mechanical installation:

• Barriers should be installed on posts fixed directly into the ground in order to reduce shocks and vibrations effects.

• Provided mechanical adjustment devices should be rigidly fixed.

• Fixing accessories should be equiped with vibration dampers.

• Optimum alignment between emitters and receivers should be achieved. Check it by applying small shocks on the unit.

• When grouping several safety barriers, no interference between devices should occur.

• Check the presence of the test rod.

5.3.2 Compliance with electrical installation:

• Electrical insulation of the barriers should be achieved through the use of the vibration dampers.

• Check crimping of terminals.

• Check quality of the ground.

• RC components should be connected in parallel with the loads.

• Check all the electrical connections and particularly test input, selected reset mode and monitoring input.

• Check that the output relays switch off when breaking the beams with the test rod.

5.4 Powering up

Please check that after having made the electrical connection and before applying power, the supply voltage corresponds to that of the device.

See rating plate on:

- emitter
- receiver

• Power up the devices after you have wired them in accordance with § 4.

• If installation has been correctly performed, the photoelectric barrier will operate after a few tenths of milliseconds (after pressing a push-button if necessary).

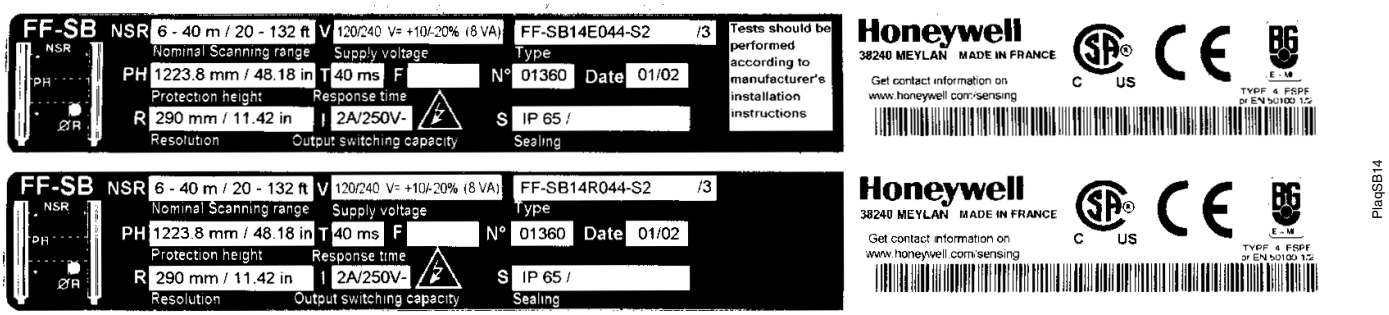
- The yellow indicator E1 and E2 on the emitter lit on.
- The red indicator R2 on the receiver extinguishes, whereas the green indicator R3 lights.

If not, check whether the photoelectric barrier is free of obstruction and properly aligned (see § 7).

6. Device Identification

Emitter and receiver each carry two plates:

- **Rating Plate and approval plate**



PlaqSB14

L:	Scanning range (m)
H:	Protection height (mm)
øR:	Resolution (mm)
Type :	Product listing
V:	Power supply voltage
P:	Power consumption
F:	Power supply frequency
—⁄— Imax./Vmax:	Max. switching capacity of the output relays
N°:	Serial number and date code (month and year)
T:	Response time (ms)
IP/NEMA:	Sealing

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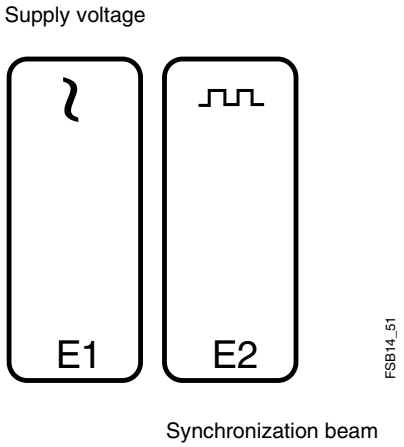
7. Troubleshooting

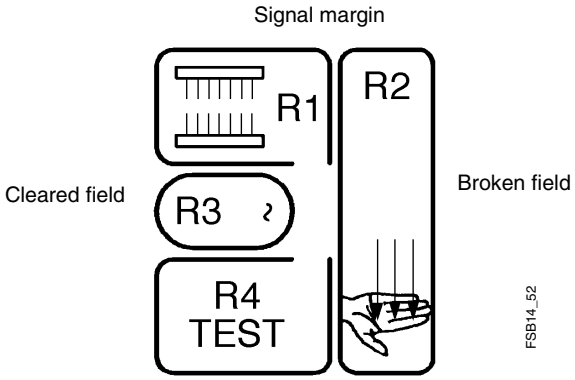
Symptom	Cause	Action
E1: on / E2: on R1: on / R2: on R3: off / R4: flickers	Relay contact stuck in the closed condition	Immediately exchange the relay board See 8.4.
No indicator lits on	Barrier not powered up	Check: - supply voltage specified on the plate - mains supply - wiring of the supply plugs - the fuses (See § 8.3)
E1 lits on **R4 lits on** R2 lits on R1 lits on	Barrier under test	Check: - connection ¬ - EARTH or C4-C5 (automatic mode without FSD monitoring), C4-B3 (other modes) in receiver supply plug
E1 lits on E2 lits on **R4 flickers** R2 lits on	Barrier in start/restart mode	Check: - connections on the monitoring loop C3-C5 - press the start and restart push-button - if the failure remains, change the relay board (See § 8.4)
E1 lits on E2 lits on R3 lits on **R1 flickers**	Barrier in function Reception signal margin is weak (Barrier dirty or misaligned)	Check: - cleanliness of the light paths (see § 8.2) - mechanical alignment (see § 5.2) - Scanning range
Barrier functions all right with random erratic detection E1 lits on R2 lits on **R1 lits on**	Unacceptable high voltage line transients (over the IEC 801-4 norm)	Check: - presence of RC elements on inductive loads - quality of the power supply - presence of electric connections on the earth - quality of connections on C3-C5: make it as short as possible - switch the power off and on
Barrier functions all right with random erratic detection E1 lits on E2 lits on R2 lits on	Unacceptable light interference (over the product allowance).	Use a special optical filter (refer to § 9.3).

Note: the other indicators are off.

- **Emitter**



- **Receiver**



⚠ DANGER

IMPROPER RELAY OUTPUT BOARD MAINTENANCE

- After a period of extended operation, it is possible that a switching relay can malfunction such that it remains stuck of fused in the closed position following a breach of the light curtain's protection field and the shutdown of the machine.
- In the case of such a relay malfunction, the machine will not restart following the clearing of the protection field (and pressing of the restart button when in manual restart mode) and the following warning diagnostic LED condition will be seen on the light curtain receiver unit:
- R2 (red) ON R1 (red) OFF R4 (yellow) FLASHING R3: OFF
- It is essential to immediately replace the relay board upon the first occurrence of a stuck or fused relay and the activation of the receiver operation status LED R2.

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

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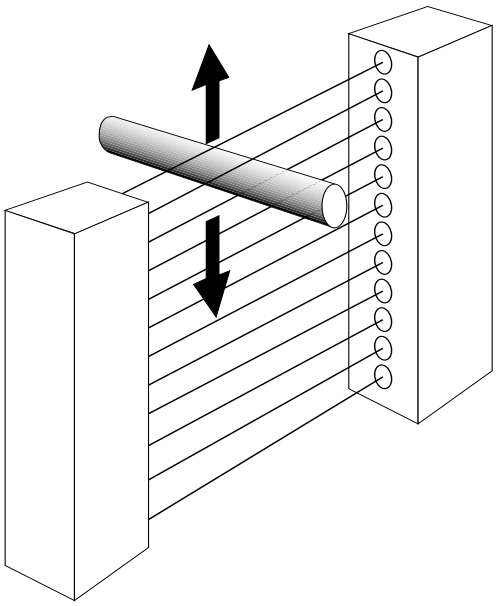
8. Inspection and maintenance

8.1 Inspection

Check	Method	Frequency
Detection and machine stop	Insert a 35 mm diameter object into the curtain Check that the machine stops	Daily, at each power up
General operation of the FF-SB14	Operation Test function generated by the machine	Each time the machine is to be used or as part of each cycle
Output relay	By counting machine cycles Evaluate the number of operations	1.000.000 operations roughly (1,5 A/220 Vac, 0,5 A/24 Vdc) or every 2 years if protective RC elements are mounted
Cleaning	Alignement indicator flicker see § 8.2 cleaning	According to the cleanliness of the environment

Checking correct detection



8.2 Cleaning

Clean the emitter and receiver

Wipe without rubbing

(rubbing causes streaks and static electricity which attracts dust).

Use a clean and soft cloth

- dry for dust removal
- with soapy water if there are greasy marks

Products designed for cleaning windows may be used.

Never use solvents like petrol, white spirit, trichlorœthane or trichlorœtylene, acetone, etc.

8.3 Changing a supply fuse

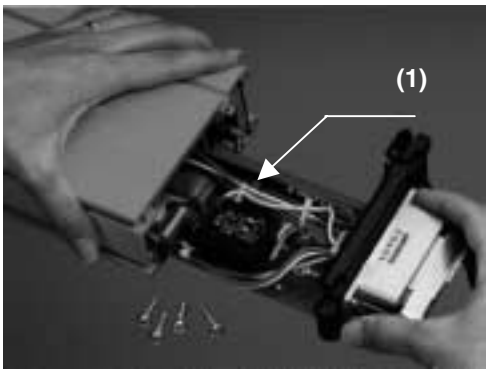


Fig 8-3-1

Necessary tools: 1 TORX T20 or ACX 20 screwdriver

Spare parts: see § 9-3

a) Unscrew the 4 screws of the cover plate that carries the connector

b) Remove the cover plate and the electronic board that is fixed to it by letting the card sliding out until the fuse (1) is exposed (fig. 8-3-1 and 8-3-2)

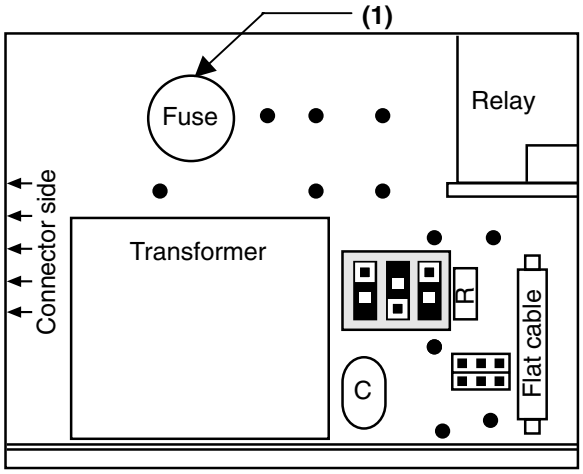


Fig 8-3-2

c) Change the fuse (See chapter 9), replace the card and screw the cover plate.

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Fig 8-4-1

Fig 8-4-2

Fig 8-4-3

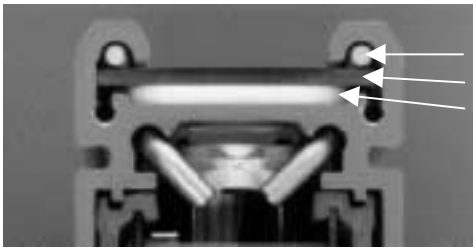

Fig 8-5-1

Fig 8-5-2

8.4 Changing output relays

Necessary tools:

- 1 TORX T20 or ACX20 screwdriver
- flot blade screwdriver (3 mm to 4 mm)
- 1 screwdriver for recessed head screws

Spare parts: see § 9.3

The output relays are located on the power supply board of the receiver unit.

a) Unscrew the 4 screws of the cover plate that carries the connector.

a) Remove the cover plate and the electronic board that is fixed to it by letting the card sliding out (fig. 8-3-1).

c) Disconnect the flat cable on the upper board when possible (fig. 8-4-1).

d) Continue to remove the card from the case until the 3 output relays are exposed (fig. 8-4-2).

e) Screw off the relay board from the power supply board (2 holes drilled through the orange rail ease access to the screws) (fig. 8-4-3).

f) Carefully disconnect the relay board.

g) Replace the relay board by a new one of the same reference; the position of the connectors should be identical to the previous mounting.

Note: The 3 output relays must be replaced at the same time. Although the procedure is easy, it must be carried out by qualified people.

8.5 Changing a transparent front plate

Necessary tools (see fig 8-5-2)

- TORX T20 or ACX 20 screw driver
- 2 to 4 joiner clamps (2 for a SB14 400 mm, 4 for FF-SB14 1000 mm)
- 2 wooden battens (section 30 x 30 mm for example).

Spare parts: Transparent front plates delivered with gasket (see § 9.3)

a) Unscrew the 4 screws of each of the 2 end covers and remove them. Remove the cover plate and the electronic board entirely (refer § 8.4 and fig. 8-5-3).

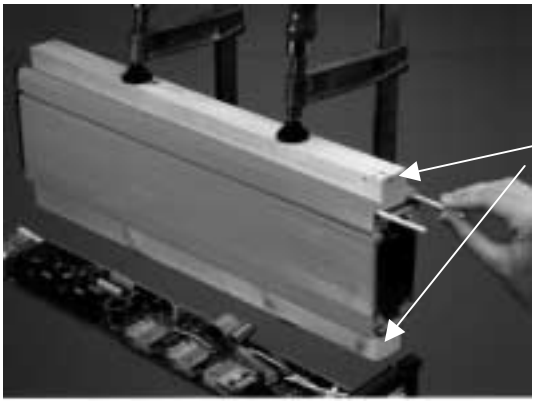

Fig 8-5-3

b) Depress the transparent front plate (2) with the clamp inserting wooden battens (4) between clamps and the equipment (see fig 8-5-3).

c) Remove the 2 pressing rods (1) (see fig 8-5-1 and fig. 8-5-3).

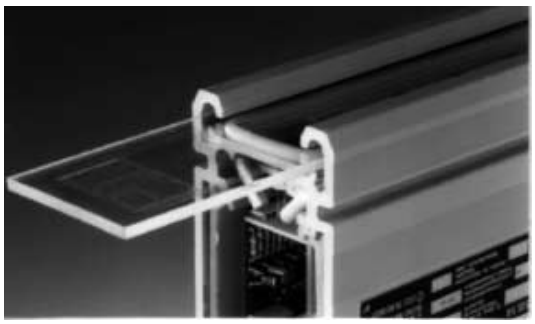

Fig 8-5-4

d) Remove the front plate and the gasket (fig. 8-5-4).

e) Install the new gasket.

f) Hold the gasket and let the new front plate slide in the appliance.

g) Press the front plate with clamps and replace the pressing rods.

Fig 8-5-5

h) Replace the end covers and the electronic board.

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8.6 Changing the jumper links position (for models with DIN 43652 connectors only)

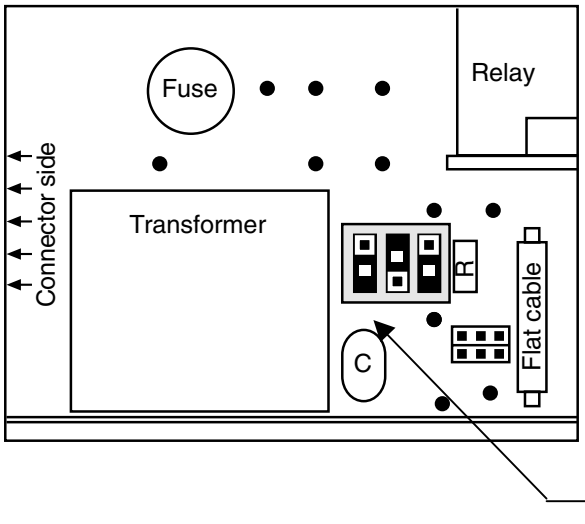
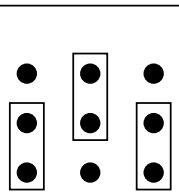
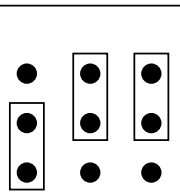
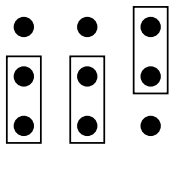
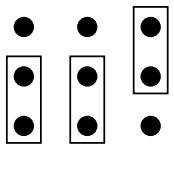
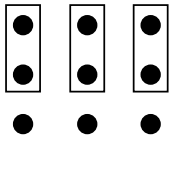
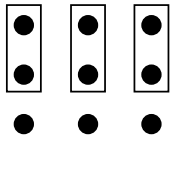


Fig. 8-3-2

Follow the steps 8.3.a to 8.3.b till the jumper links (1) are exposed (8.6.1). Then change the jumper links position as follows:

Jumper links position and external connections:

Re-start mode	Without FSD monitoring	With FSD monitoring
Automatic		
Start Interlock		
Start & Restart Interlock		

FSB14_64

: mode of delivery

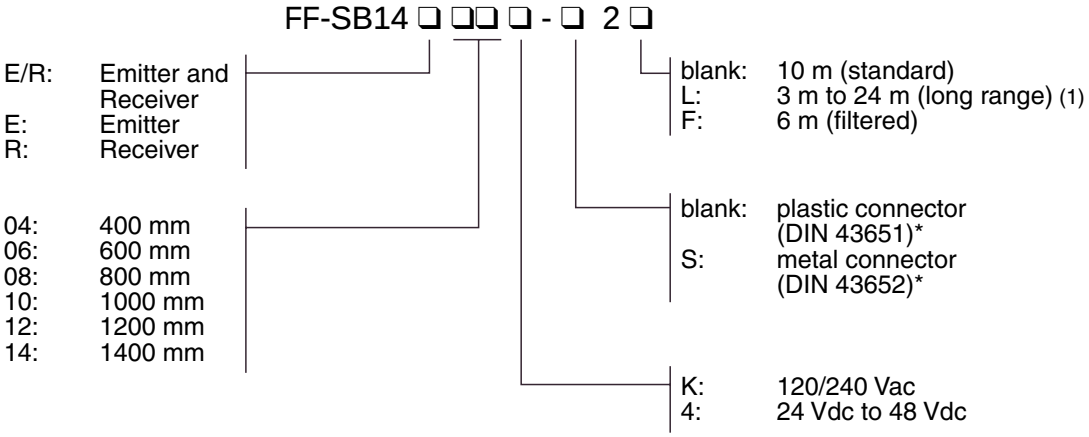
Notes:

- In many mode different than the “Automatic without FSD monitoring” mode, terminal B3 must be used for the test input. It will forbid correct operation of a barrier accidentaly set in the “Automatic without FSD monitoring mode”.

- If the mode of delivery is kept for the application, then terminal C5 shall be used for the test input, and this barrier remains compatible with former models (and can be used on installations made before November 95).

9. List of devices, accessories and spares, and warranty conditions

9.1 Barriers



(1) this model is available with metal connectors only

Note: the number of contacts available on the DIN 43651 plastic connector does not allow the detection field status output, FSD monitoring input and start / restart interlock programming to be performed by the unit.

* DIN 43651: Test input only
DIN 43652: Test/monitoring input, detection field status output, programmable start / restart interlock.

One system includes: emitter, receiver, 2 RC circuits as well as electric connection plugs.

9.2 Accessories

(to be ordered separately); see page 7.

Mounting accessories:

FF-SBZS5000 Kit of 2 "Omega" supports with antivibration inserts

FF-SBZS6000 Kit of 2 fixed brackets with antivibration inserts

FF-SBZS7000 Kit of 2 rotatable brackets with antivibration inserts

FF-SBZS8000 Kit of accessories for direct mounting
idem FF-SBZS6000 but without the brackets
(includes 8 screws + 8 nuts + 16 washers + 8 antivibration inserts + 8 metal hubs)

Deflection mirrors:

FF-SBSMIR❑❑ Deflection mirror with adjustable brackets
└ Nominal protected height in dm (04 to 16)

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9.3 Spare parts

Relays

FF-SBZ132001 Removable relay board for FF-SB14E/R❑❑❑-❑2❑
04 to 14

FF-SBZ132003 Removable relay board filtered for FF-SB14E/R❑❑❑-❑2❑

Fuses

FF-SBZ109002 Box of 10 fuses 0,5 A / time delay for FF-SB

Transparent front plates

FF-SBZ0100010	2 transparent front plates for emitter and receiver	H = 400 mm
FF-SBZ0100020	2 transparent front plates for emitter and receiver	H = 600 mm
FF-SBZ0100030	2 transparent front plates for emitter and receiver	H = 800 mm
FF-SBZ0100040	2 transparent front plates for emitter and receiver	H = 1000 mm
FF-SBZ0100060	2 transparent front plates for emitter and receiver	H = 1200 mm
FF-SBZ0100070	2 transparent front plates for emitter and receiver	H = 1400 mm

Special front plates

FF-SBZFL40❑❑ 1 special optical filter (shock-proof, improve immunity to light interference. Reduces scanning ranges by 40 %. For receiver units only)
Nominal protected height
(ex: FF-SBZFL4006 to be fixed on a FF-SB14R06… receiver unit)

FF-SBZFL00❑❑ 1 shock-proof transparent front plate (order 2 for a complete set emitter and receiver)
Nominal protected height (ex: order 2 FF-SBZFL0006 plates for a FF-SB14E/R06… set)

Connecting plugs (Parts supplied with the equipment)

DIN 43651 plastic connectors for FF-SB14E/R❑❑❑-2❑ models

FF-SBZ1721201	Female supply plug for emitter or receiver
FF-SBZ1721136	Female signal plug for receiver

DIN 43652 metal connectors for FF-SB14E/R❑❑❑-S2❑ models

FF-SBZ1721137	Female supply plug for emitter
FF-SBZ1721202	Female supply and signal plug for receiver

Accessories

FF-SBZ0130010	Assortment of torx screws for end covers and internal circuits
FF-SBZ172115	Kit of 100 female crimping contacts for DIN 43652 metal connector
FF-SBZ666144	Kit of reducer and cable glands for a complete set FF-SB14E/R❑❑❑-S2❑

Tools

FF-SBZROD35	ø 35 mm test rod for FF-SB14 series
FF-SBZ0140010	Torx screw driver AC x 20
FF-SBZCRIMP	Crimping tool for DIN 43652 metal connectors
FF-SBZREMOV	Removal tool for DIN 43652 metal connectors
FF-SBZSERV1	1st level maintenance kit for FF-SB series

Power supply boards (with male plugs)

FF-SBZE130K	120/240 Vac power supply module for emitter FF-SB14 with metal plugs (DIN 43652)
FF-SBZR130K	120/240 Vac power supply module for receiver FF-SB14 with metal plugs (DIN 43652)
FF-SBZE1302K	115/120 Vac power supply for emitter FF-SB14 filtered
FF-SBZR1302K	115/120 Vac power supply for receiver FF-SB14 filtered
FF-SBZE1384	24 to 48 Vdc power supply module for emitter FF-SB14 with metal plugs (DIN 43652)
FF-SBZR1384	24 to 48 Vdc power supply module for receiver FF-SB14 with metal plugs (DIN 43652)
FF-SBZE13824	24/48 Vdc power supply module for emitter FF-SB14 filtered
FF-SBZR13824	24/48 Vdc power supply module for receiver FF-SB14 filtered
FF-SBZE147K	120/240 Vac power supply module for emitter FF-SB14 with plastic plugs (DIN 43651)
FF-SBZR147K	120/240 Vac power supply module for receiver FF-SB14 with plastic plugs (DIN 43651)
FF-SBZE1464	24 to 48 Vdc power supply module for emitter FF-SB14 with plastic plugs (DIN 43651)
FF-SBZR1464	24 to 48 Vdc power supply module for receiver FF-SB14 with plastic plugs (DIN 43651)

Note: the mode of operation may be reprogrammed before changing the power supply boards.

10.Technical specifications

Supply voltage	120/240 Vac / +10 % / -20 % 48 Hz to 62 Hz	24 Vdc to 48 Vdc* / ±15 %
Power consumption	8 VA per unit	8 W per unit
Switching capacity	2 A / 250 Vac, 2 safety relays with guided contacts (50 mA minimum)	
Electrical connection	Plastic connector	Emitter: type GDM2009, Hirschmann Receiver: type GDM2009, Hirschmann type N6RFF, Hirschmann
	Metal connector	DIN 43652
Material	Housing: aluminium alloy yellow painted according to RAL 1021 Front face: polycarbonate (shock and welding splash resistant for filtered versions)	
Housing size	56 mm width, 116 mm depth, height according to protection height	
Emission	Modulated Light Source, infrared LED (880 nm)	
Scanning frequency	9,6 kHz	
Scanning distance	FF-SB14E/Rooo-oo 2: 0 m to 10 m 2L: 3 m to 24 m ** 2F: 0 m to 6 m	
Resolution	ø35 mm minimum target size	
Alignment tolerance	± 2° for emitter and receiver	
Ambient temperature	0 °C to 55 °C	
Sealing	IP 65	
Noise immunity	Electrical noise immunity according to IEC 801-4: level IV (120/240 Vac models) level III (24 Vdc to 48 Vdc models) Electromagnetic noise immunity according to IEC 801-3: level III	
Resistance to ambient light	Sun: 20 000 Lux; Lamp: 15 000 Lux	
Output indication	LED displays on unit front face	

* The dc version is featured with a galvanic insulation (dc to dc converter) that provides the immunity to external disturbances; this is essential to garantee the safety integrity of the device.

** Although the device is able to detect any opaque object greater than ø 35 mm resolution between 0 and 3 meters, the power of light beams on this model requires a scanning distance of more than 3 m to conform to IEC 61496 - 2 norm. This model is available with metal connectors only.

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Specific features for models with metal connectors

Standard supplementary functions supplied	Automatic reset
	Output interlock after power up
	Restart interlock after each operation
	Test input for additional relay control
	Detection area status output (optocoupler: 20 mAdc max / 30 Vdc max)

Response time (in ms)

Nominal Protected Height	**400**	**600**	**800**	**1000**	**1200**	**1400**
Number of beams	17	25	33	41	49	57
Response time (Frequency of operation: 10 Hz)	25	26	27	28	29	30
Response time filtered versions (Frequency of operation: 10 Hz)	40	41	42	43	44	45
Mass per device (kg per unit)	4	5,2	6,4	7,5	8,6	9,8

11.Warranty Information

11.1 Warranty and Remedy

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

While we provide application assistance personally, through our literature and the Honeywell 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.

11.2 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 82 68	France
+ 49 (0) 69 8064 444	Germany
+ 34 91 313 61 00	Spain
+ 1-815-235-6847	International
+ 44 (0) 1698 481 481	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) 1698 481 276	UK
+ 1-815-235-6545	USA

INTERNET

http://www.honeywell.com/sensing/
info.sc@honeywell.com

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12.EC Declaration of Conformity

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

HONEYWELL GRENOBLE
QUALITY ASSURANCE DEPARTMENT

CE 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-SB series

To which this declaration relates is in conformity with the techical requirements of the standards and the provisions of the essential requirements of the Directives detailed below.
We implement a quality insurance system in accordance with the ISO 9001 standard certified by the French organisation AFAQ under the number QUAL/1994/2213a.

Directives:
- **Machine 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:
- **pr EN 50100 :** Part 1(1) : Safety of machinery – Electrosensitive Protective Equipment – General Requirements and tests.
- **pr EN 50100 :** Part 2(1): Safety of machinery – Electrosensitive Protective Equipment – Active Optoelectronic Protective Devices.

Safety Category: Category 4 as per pr EN 50100 1/2

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

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

Certificate number: 1106 WB 1448 V 09 89 Date of certificate : 11/01/1990

Legal Representative In Europe :
Place of issue : Meylan
Quality Manager :
Patrick Goud
Signature :

Date : 10.04.2001
General Manager :
Richard Gibbs
Signature :

(1) : The IEC is adopting the European project norm. Finally, it will be codified EN 61496- parts 1 & 2.