

Focus Light Curtains and Light Grids

Point of operation guarding!
 Passable protection in risk areas!
 Built-in muting capabilities!



Why should I use Light Curtains and Light Grids?.....	6:2
How do Light Curtains and Light Grids work?.....	6:3
What are the safety requirements for an Optical Protective Device?	6:3
Minimal Safe Distance Calculation	6:4
Focus II Light Curtains and Light Grids.....	6:6
Muting with FMC and FMI Units.....	6:13
Muting with MFII and MFII-L Units	6:15
Muting with MFII-T Reflex and MFII-L Reflex Units.....	6:16
Focus Summary	6:17
Bjorn Stand System for Light Grids and Mirrors	6:19
Wet Wash Down Tubes	6:21
Spot Safety Light Beam.....	6:22
BP1 Blanking Programmer.....	6:27
Muting Sensor Mute R Retro/Reflective with Polarizing Filters	6:28
Muting Sensor Mute D Diffuse/Reflective with Background Rejection.....	6:29
JSRL-3 Laser Aligner	6:30
Connection Examples	6:31
Component List and Ordering Information	6:39

Why should I use Safety Light Curtains and Grids?

...to provide operator protection during production!

A Safety Light Curtain can be used on a machine or in a production plant in the same way as a hatch or door. There are great differences though when it comes to the component installation and functionality. When a Light Curtain is mounted on a hazardous machine, we are not only concerned with the response times of the safety systems, but also the Depth Penetration Factors. It is possible for the operator's fingers or hands to pass through the Light Curtain a certain distance before being detected. This becomes the Depth Penetration Factor. This distance must also be entered into the Minimal Safety Distance Calculation for the machine (see page 6:4).

It is also very important that the level of safety of the Light Curtain with dual supervised outputs be continued throughout the rest of the stopping control circuit. Even valves and contactors, which ultimately control dangerous movements, normally have to be redundant and monitored.

Automatic Machines

For Light Curtains on automatic machines there shall be a reset function which is active when the machine is set for automatic production, whether or not it is a passable protection. After an engagement one must first use a reset function, then the restart of the cycle should be made with a separate starting device. The same reset applies for machines with semi-automatic drives.

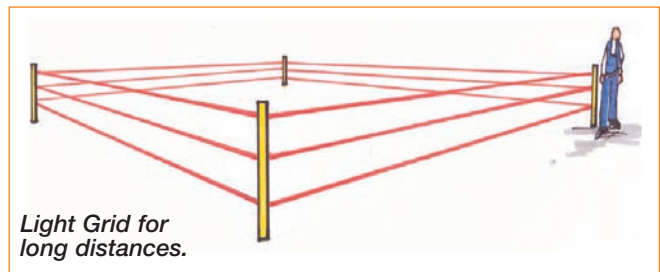
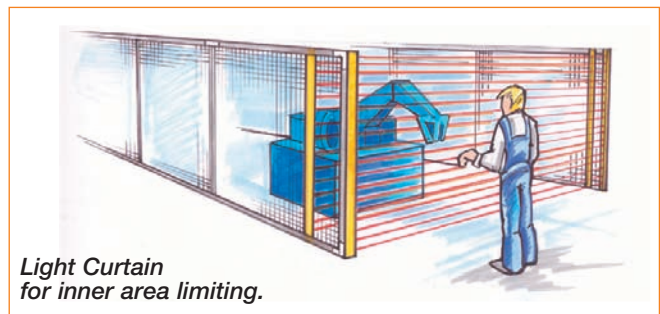
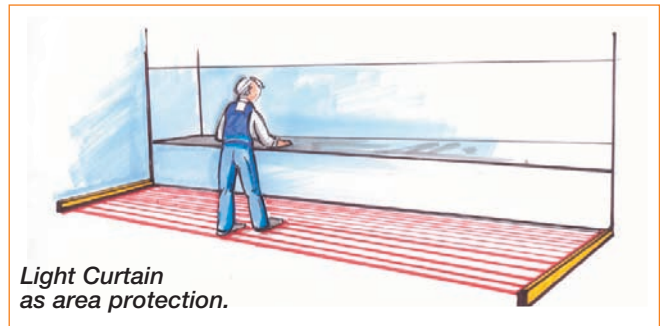
Mechanical and Hydraulic Presses

Light Curtain applications are often categorized by the type of guarding required. Protecting an operator from the hazards associated with material positioning or where a process is performed is called Point of Operation Guarding. The point of operation is often called the Zone of Hazardous Operation or the Pinch Point.

This type of guarding is associated with mechanical and hydraulic power presses, molding presses, stamping, forming, riveting, eyelet and automated assembly machinery. Light Curtains used in these applications are typically selected for finger and hand protection.

During Manual Servicing of Machines

With manually operated machines where one or more operators move parts in and out between every cycle. This type of application is the most risky because the number of engagements into the machine's dangerous area is often several times per minute.



...to provide passable protection into risk areas!

Both Light Curtains and Light Grids can often be used as passable protection into a risk area. This is called passable protection because it is possible to get in behind the safety device. Common applications are robot installations, openings for in and out passage of material, etc. The choice between Light Curtain or Light Grid is often a question of available safety distance, reach and price. Light Curtains are often chosen for short safety distances Light Grids are chosen for long reach—up to 50 m—and for a low price.

How do Light Curtains and Light Grids work?

Both Light Curtains and Light Grids utilize optical transmitter and receiver units. Beams of infrared light are sent to the receiver from the transmitters. When a light beam is interrupted, a dual stop signal is given to the dangerous machines inside the Light Curtain/Grid protected area.

What is the difference between a Light Curtain and a Light Grid?

A Light Curtain has several beams that are placed closely together, while a Light Grid consists of only one, two, three or four Light Beams.

The beams are closest on a Light Curtain that is used for finger detection, with a resolution of 14mm. Light Curtain beams are at their widest spacing when



Resolution for hands.



Resolution for fingers.

used for hand detection, with a resolution of 30mm. For Light Grids the beams are normally placed at a relative distance of 200 to 500mm.

What are the safety requirements for an Optical Protective Device?

High safety demands are stated in the standard EN 61 496-1 which deals with light protection. The main demands are on a safe stopping function and that light from light sources other than the transmitter or other disturbances do not affect the safety function.

Depending on how the safety function is built up, there are safety components of type 2 and 4 to choose between. Type 2 and 4 relates in principle category 2/PL c and category 4/PL e according to EN ISO 13849-1.

Type 4, which has the highest safety level, states that a fault is not allowed to affect the safety function and that the fault should be detected by the outputs falling immediately or that they do not reconnect after being disconnected. Maximum allowed scattering angle for the light is $\pm 2^\circ$.

Type 2 states that a simple but monitored safety function is required, which means that the safety function should be monitored through periodic tests which break the output when a fault occurs. Although, between the testing times there can be faults which result in the safety component malfunctioning. The test function can either be built into the safety device or an external unit (e.g. the machine's control system) can initiate a test. Maximum allowed scattering angle for the light is $\pm 4^\circ$.

Light Grids and Light Curtains are included among the products in the machine directive's appendix 4, which means that an external certifying procedure with an officially recognized institution is called for.

Safety Certifications



Minimal Safe Distance Calculation

The Minimal Safe Distance Calculation shall guarantee that a person is not able to reach a dangerous machine part before the machine movement has stopped. This is calculated with the formula as called for from the *ANSI B11.19-2003 Performance Criteria*

$$Ds = [K \times (Ts + Tc + Tr + Tspm)] + Dpf$$

Where:

Ds = minimum safe distance between the safeguarding device and the hazard

K = hand speed constant: 1.6 m/sec (63 inches/sec) minimum based on the movement being the hand/arm only and the body being stationary

Ts = worst stopping time of the machine/equipment

Tc = worst stopping time of the control system

for the Design, Construction, Care and Operation of Safeguarding Standard.

Note: The calculations below are examples only and cannot be used for any specific application.

Tr = response time of the safeguarding device including its interface

Tspm = the additional stopping time, in seconds, allowed by the stopping performance monitor before it detects stop time deterioration

Dpf = maximum travel towards the hazard within the presence sensing safeguarding devices (PSSD) field that may occur before a stop is signaled

Note: Ts + Tc are usually measured together with the ABB Jokab Safety Stop Time Analyzer.

Note: Dpf (depth penetration factors) will change depending on the type of device and application.

K = The maximum speed at which an individual can approach the hazard, expressed in inches per second

To quote *ANSI B11.19-2003*: "The factor *K* is the speed constant and includes hand and body movements of an individual approaching a hazard area. The following factors should be considered when determining *K*: a) Hand and arm movement; b) Twisting of the body or shoulder, or bending at the waist; c) Walking or running.

One of the accepted values for *K* is the hand speed constant (it is usually considered as the horizontal motion of the hand and arm while seated). Its common value is 63 in./s although other values (typically higher) are also used. The hand speed constant does not include other body movements, which can affect the actual approach speed. Consideration of the above factors should be included when determining the speed constant for a given application."

For Finger and Hand Detection Safety Light Curtains

$$Dpf \text{ in mm} = 3.4 \times (Os - 6.875\text{mm})$$

$$Dpf \text{ in inches} = 3.4 \times (Os - 0.275\text{'})$$

Where:

Os = minimum object sensitivity or resolution

For Horizontal Mounted Safety Light Curtains

$$Dpf \text{ in mm} = 1200\text{mm}$$

$$Dpf \text{ in inches} = 48\text{'}$$

For Multi Beam Safety Light Grids

$$Dpf \text{ in mm} = 1200\text{mm for a 2 beam system}$$

$$Dpf \text{ in inches} = 48\text{' for a 2 beam system}$$

$$Dpf \text{ in mm} = 900\text{mm for a 3 beam system}$$

$$Dpf \text{ in inches} = 36\text{' for a 3 beam system}$$



Resolution for hands.

Example 1: With the aid of the ABB Jokab Safety Smart Stop Time Analyzer, a mechanical power press has a measured stopping time ($T_s + T_c$) of 325 ms. This includes both the stopping time of the machine as well as the stopping time of the control circuit. The response time of the Focus II Safety Light Curtain FII-4-30-900 with 30mm (1.18") resolution and 900mm (35.43") protective height is 25ms (T_r). The stop time break monitor is set for 400 ms.

In this example the Safety Light Curtain must be mounted no closer than 767.63mm (30.22") from the hazardous pinch point.



Light Curtain as hand protection.

$$T_{spm} = 400ms - (T_s + T_c)$$

$$T_{spm} = 400ms - 325ms$$

$$T_{spm} = 75ms$$

$$D_{pf} = 3.4 \times (30mm - 6.875mm)$$

$$D_{pf} = 3.4 \times 23.125mm$$

$$D_{pf} = 78.625mm$$

$$D_{pf} = 3.4 \times (1.18'' - 0.275'')$$

$$D_{pf} = 3.4 \times 0.905''$$

$$D_{pf} = 3.077''$$

$$D_s = [K \times (T_s + T_c + T_r + T_{spm})] + D_{pf}$$

$$D_s = [1.6m/s \times (325ms + 25ms + 75ms)] + 78.625mm$$

$$D_s = [63inch/s \times (325ms + 25ms + 75ms)] + 3.077''$$

$$D_s = [1600mm/s \times 425ms] + 78.625mm$$

$$D_s = [63inch/s \times 425ms] + 3.077''$$

$$D_s = [1600mm/s \times .425s] + 78.625$$

$$D_s = [63inch/s \times .425s] + 3.077''$$

$$D_s = 680mm + 78.625mm$$

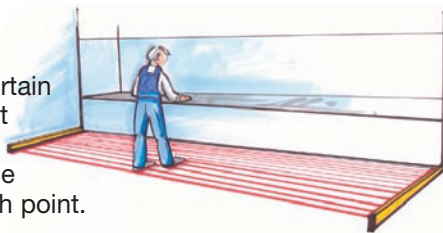
$$D_s = 26.78'' + 3.077''$$

$$D_s = 758.63mm$$

$$D_s = 29.86''$$

Example 2: With the aid of the ABB Jokab Safety Smart Stop Time Analyzer, a robotic loader has a measured stopping time ($T_s + T_c$) of 175 ms. This includes both the stopping time of the machine as well as the stopping time of the control circuit. The response time

In this example the horizontal Safety Light Curtain must be at least 1518.4mm (60.54") from the hazardous pinch point.



Light Curtain as area protection.

of the horizontally mounted Focus II Safety Light Curtain with 30mm (1.18") resolution is 29ms. The depth of penetration factor is fixed at 1200mm (48").

$$D_s = [K \times (T_s + T_c + T_r)] + D_{pf}$$

$$D_s = [1.6m/s \times (175ms + 29ms)] + 1200mm$$

$$D_s = [63inch/s \times (175ms + 29ms)] + 48''$$

$$D_s = [1600mm/s \times 204ms] + 1200mm$$

$$D_s = [63inch/s \times 204ms] + 48''$$

$$D_s = [1600mm/s \times .204s] + 1200mm$$

$$D_s = [63inch/s \times .209s] + 48''$$

$$D_s = 326.4mm + 1200mm$$

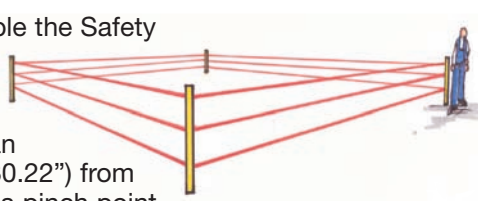
$$D_s = 12.85'' + 48''$$

$$D_s = 1526.4mm$$

$$D_s = 60.85''$$

Example 3: With the aid of the ABB Jokab Safety Smart Stop Time Analyzer, a transfer gantry system has a measured stopping time ($T_s + T_c$) of 212 ms. This includes both the stopping time of the machine as well as the stopping time of the control circuit. The response

In this example the Safety Light Curtain must be mounted no closer than 767.63mm (30.22") from the hazardous pinch point.



Light Curtain for long distances.

time of the Focus II Safety Light Grid FII-4-K4-900 is 13ms (T_r). For a 4 beam Safety Light Grid the depth of penetration factor is fixed at 900mm (35.43").

$$D_s = [K \times (T_s + T_c + T_r)] + D_{pf}$$

$$D_s = [1.6m/s \times (212ms + 13ms)] + 900mm$$

$$D_s = [63inch/s \times (212ms + 13ms)] + 35.43''$$

$$D_s = [1600mm/s \times 227ms] + 900mm$$

$$D_s = [63inch/s \times 227ms] + 35.43''$$

$$D_s = [1600mm/s \times .227s] + 900mm$$

$$D_s = [63inch/s \times .227s] + 35.43''$$

$$D_s = 363.2mm + 900mm$$

$$D_s = 14.3'' + 35.43''$$

$$D_s = 1263.2mm$$

$$D_s = 49.73''$$

Focus II Safety Light Curtains and Light Grids

Focus II is a new version of our previous Light Grid/Light Curtain Focus. Features such as muting and override are standard in all Focus II Light Curtains and Light Grids. For Light Curtains, blanking and break functions are also standard. The optical sensors on Focus II also have variable channel frequencies. The Focus II units are Light Curtains/ Grids with safety functions intended for applications where it is of great importance to protect persons from a dangerous machine, robot or other automated systems where it is possible to access to a dangerous area.

Focus II creates a protection field with infrared beams. If any beam is interrupted the safety mechanism is triggered and the dangerous machine is stopped. Focus II fulfills the requirements for non-contact safety equipment type 4 (Focus II series) according to the international regulation standard EN 61496-1.

Units are available with safety heights between 150 and 2400 mm. All electronic control and monitoring functions are included in the Light Curtain profiles. External connection is made via a M12 connection at the end of the profile. Synchronization between transmitter and receiver is achieved optically. No electrical connection between the units is required. Control and monitoring of the beam transmission is carried out by two micro-processors which also give information on the status and alignment of the Light Curtain via several LEDs.

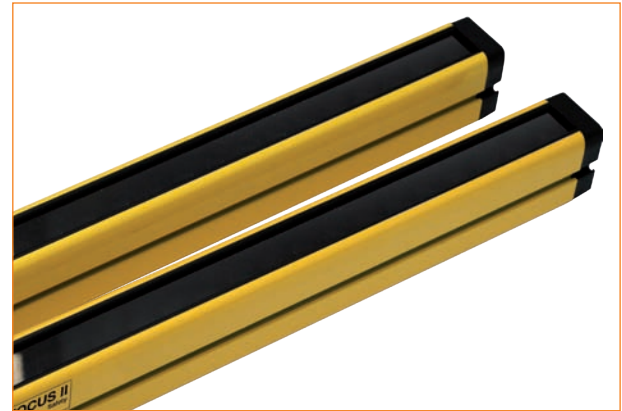
Muting and Override included in all Focus II

The “Muting” and “Override” functions are available on all Focus II Light Grids/Curtains and is enabled directly when an indication lamp LMS is connected. Muting implies that one or more segments or the whole Light Curtain can be bypassed during in and out passage of material.

In the Focus II with Muting there is also an Override function which makes it possible to bypass the Light Grid/ Curtain — i.e. activate the outputs if a machine start is necessary even if one or more Light Beams are interrupted. This is the case when the muting function is chosen and the A and B inputs are activated. If, for example, during the muting operation a loading pallet has stopped inside the safety field after a voltage loss, the override function is used to enable the pallet to be driven clear.

Floating Blanking or Fixed Blanking

The “Floating blanking or Fixed blanking” functions are available on all Focus II Light Curtains and is enabled directly via the internal dipswitches. Floating blanking makes it possible to ‘disconnect’ a defined number of beams from the safety field. The object is then free to move in the safety field without the safety function being triggered. During “fixed blanking” the object is not able to move in the safety field. The other beams are active with normal resolution.



Applications

Optical protection in an opening or around a risk area for —

- Mechanical and Hydraulic Power Presses
- Molding Presses
- Stamping, Riveting and Eyelet Operations
- Automated Machinery
- Robotic Cells
- Conveyors
- Material Handling Equipment
- Printing Presses
- Welding Equipment
- Machining Centers
- Packaging Machinery



Features

- Type 4 according to EN 61496
- Flexible assembly
- LED indication
- High protection class (IP65)
- Range 3 to 40 m
- Time reset
- Floating/Fixed Blanking
- Muting
- Single/Double Break function (PSDI)
- External Device Monitoring (EDM)
- Available with different resolutions
- Up to PL e according to EN 954-1/EN ISO 13849-1

Approvals



Safety Outputs OSSD1 and OSSD2

Focus II has two PNP outputs—OSSD1 and OSSD2. If the load to be switched is alternating current or requires a higher current than 500 mA then one should use a safety, e.g. E1T, Pluto PLC or the FRM-1 unit (converts the outputs to relay contacts) from ABB Jokab Safety. The FMC-Tina and Tina 10A/10B/10C converts the outputs to a dynamic signal for connection to Pluto or Vital. Pluto can also work directly with the OSSD-outputs.

Single/Double Break Function (PSDI)

This function is used for presses when the operator prepares or picks out a detail. With the Single Break function the Light Curtain allows operation after entry and withdrawal out of the curtain. Similarly, the Double Break function allows operation after entry and withdrawal twice.

External Device Monitoring (EDM)

In all Light Grids and Light Curtains an EDM function is available which allows Focus II to test if the external

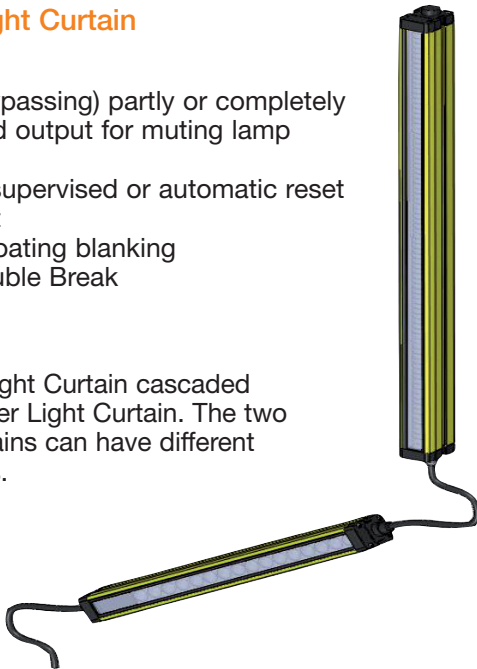
Focus II Light Curtain

Standard

- Muting (bypassing) partly or completely
- Supervised output for muting lamp
- Override
- Manually supervised or automatic reset
- Time-reset
- Fixed or floating blanking
- Single/Double Break
- EDM

Option

- CUT – a Light Curtain cascaded with another Light Curtain. The two Light Curtains can have different resolutions.



control element responds correctly. A test channel is connected through the respective contactor, in order to detect any faults and thereby prevent a reset.

Reset

On every Focus II there are inputs for reset and other functions—Reset, Alignment and Override (bypassing is only possible when muting is used.) The reset option is chosen through dual switches in the Focus II receiver. At delivery, Focus II is set to automatic reset.

- Automatic reset – When the light field is free the outputs are closed directly. (Setting when delivered).
- Manual reset – Focus II gives a ready signal when the light field is free and the reset button has been actuated.
- Time reset – During manual reset. To reset the Focus II a pre-reset button must first be actuated and after wards within 8 seconds a reset button outside the risk area must be actuated.

Note: For further technical information, please reference the Focus II Operating Manual.

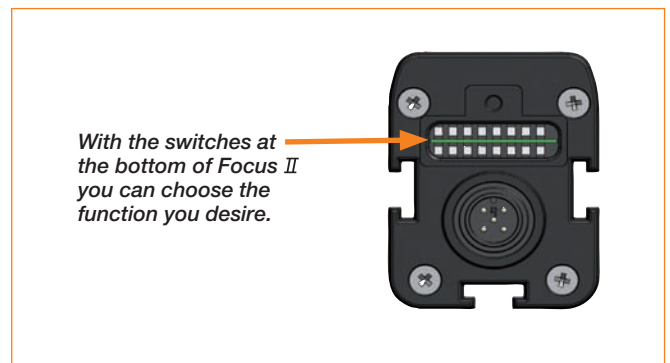
Focus II Light Grid

Standard

- Muting (bypassing) of one, two, three or four beams
- Supervised output for muting lamp
- Override
- Manually supervised or automatic reset
- Time-reset
- EDM

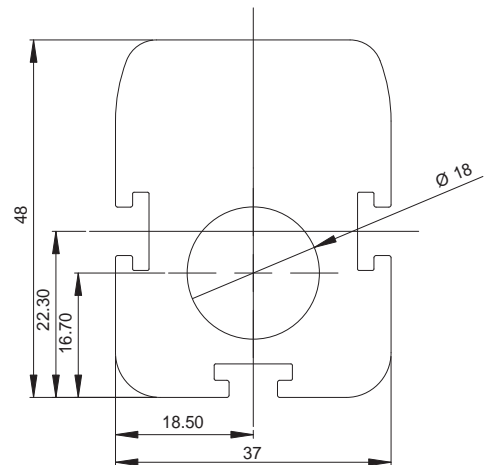
Option

- Light Grids for tough environments with parallel beams of light for improved reliability.



Focus II Technical Data

Manufacturer	ABB AB/Jokab Safety, Sweden
Ordering information	see page 6:46
Supply voltage	24VDC \pm 20%
Power consumption Transmitter Receiver	70 mA maximum 100 mA maximum
Safety level EN/IEC 61496 EN 954-1 EN ISO 13849-1 EN/IEC 61508	Type 4 Focus II type 4: Category 4 Focus II type 4: PL e Up to SIL 3
PFH _d	2.5×10^{-9}
Resolution	14 mm and 30 mm
Wavelength on transmitter LED	880 nm
Profile dimensions	37 x 48 mm
Protection class	IP65
Operating temperature	-10 to +55° C
Storage temperature	-25 to +70° C
Outputs	2 supervised PNP outputs with cross circuit monitoring
Max. load	500 mA (overload c.c. protection)
Response time	9 – 68 ms (depending on model)
Connection transmitter	M12 5-pin
Connection receiver	M12 8-pin
Indicator	LEDs on the transmitter and receiver indicating adjustment, dirt, power supply and outputs
Enclosure	Aluminium painted yellow
Conformity	2006/42/EG, EN/IEC 61496-1/2 EN 954-1, EN ISO 13849-1 EN/IEC 61508



Reset Alternatives

Reset

On the servicing side (i.e. the side/sides where there is an operator who moves parts in and out) there shall be a separate reset function for the Light Curtain. If there are several Light Curtains (e.g. on the front and back) there shall be one for each. If the Light Curtain is actuated during a dangerous movement, the press should not be able to restart without being reset. During engagement after the end of the cycle no reset is needed.

For a Light Curtain which is placed as protection on both sides which are not servicing sides, there shall be a reset button which always needs to be activated after an engagement.

Supervised Manual Reset

When a Light Curtain/Light Grid is interrupted it will give a stop signal to dangerous machines within the risk area it protects. For a new start of the machine the Light Curtain/Light Grid has to be reset. This is done with the reset button (Figure 1) which is placed where it cannot be reached from within the area which is protected. There are high requirements on the reset function — neither a short circuit nor a component fault shall give automatic reset. When the reset button has been affected the outputs are activated and the machine can initiate.

Automatic Reset

Automatic reset can only be used when it is impossible to get between the Safety Light Curtain and the hazardous pinch point. When the operator removes his hands from the protective field the dual safety outputs will energize starting the next machine cycle immediately. (Figure 2)

Pre-Reset Solution

If the machine start button is not located such that you have a clear view of the entire work area, additional safe guards must be used. Typical devices include Safety Laser Scanners, Safety Mats and Horizontal Safety Light Curtains.

Focus II Safety Light Curtains address this requirement without costly additional safety devices. By selecting the Pre-Reset mode through the Focus II Receiver's internal dipswitches, the primary requirement for accidental resets is satisfied. The Pre-Reset must first be cycled, which gives a clear view of the work area, then no longer than 8 seconds later the Final Reset must be cycled.

Figure 1
Reset button
with light indication.

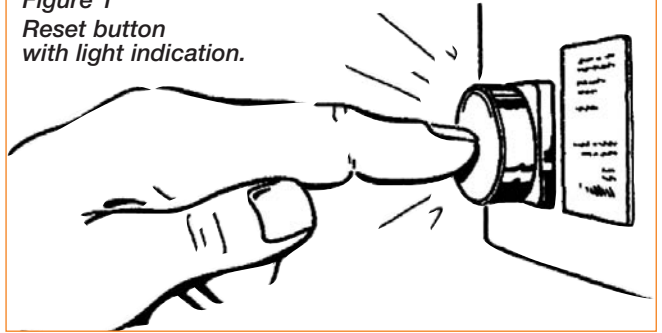
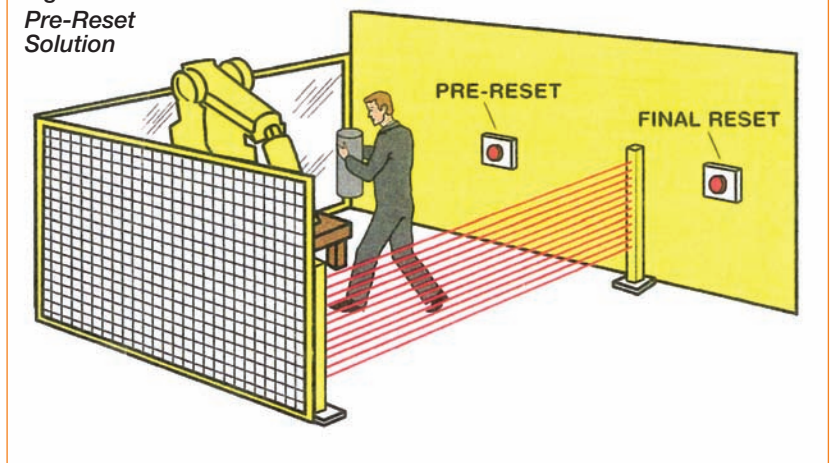


Figure 2
Automatic
Reset



Figure 3
Pre-Reset
Solution



Mounting Focus II Light Curtains and Light Grids

Vertical Safety Light Curtains

A vertically mounted Safety Light Curtain that is used as the primary safety device must be mounted so that the bottom beam is no higher than 300mm (12") from the ground. Mounting heights above 300mm (12") may require supplemental safeguarding to prevent crawling or ducking under the horizontal Light Curtain. The top beam must be no lower than 900mm for reach over applications and 1200mm (48") for reach through applications. Mounting heights lower than this will require additional safeguarding.



Vertical Safety Light Curtain

Horizontal Safety Light Curtains

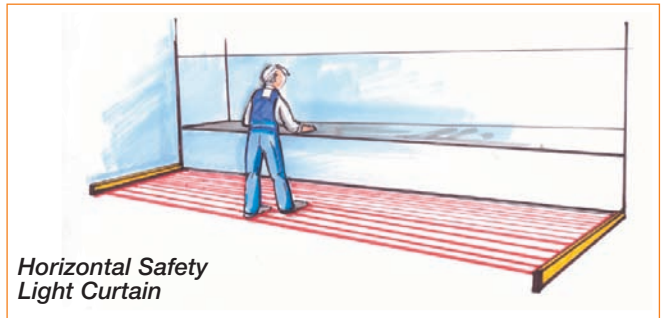
A horizontal Safety Light Curtain that is used as the primary safety device must be mounted no higher than 300mm (12") from the ground. Mounting heights above 300mm (12") may require supplemental safeguarding to prevent crawling or ducking under the horizontal Light Curtain. The minimal length the Safety Light Curtain can be 1200mm (48") long.

The formula below is for mounting different resolutions from a horizontal surface.

$$\text{Height} = 15 \times (Os - 50\text{mm})$$

$$\text{Height} = 15 \times (Os - 2")$$

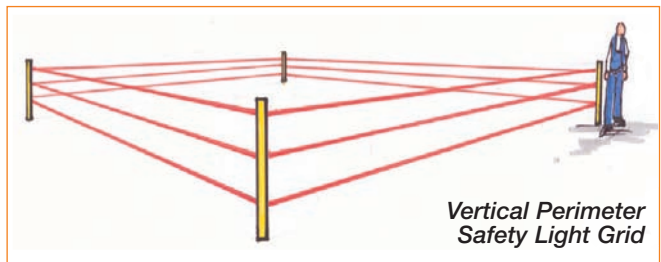
Note: Os represents the beam spacing.



Horizontal Safety Light Curtain

Vertical Perimeter Safety Light Grids

A vertically mounted Safety Light Grid must be mounted such that the bottom beam is no higher than 300mm (12") from the ground.



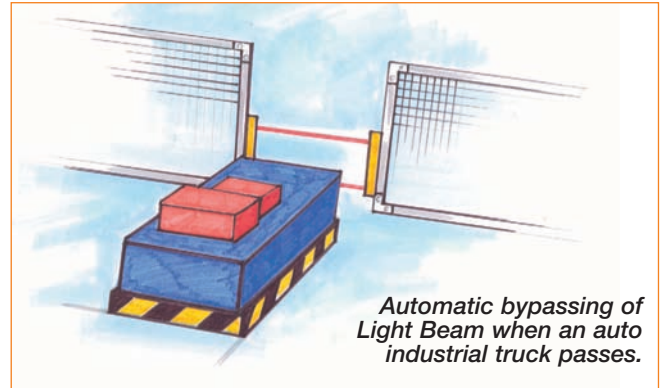
Vertical Perimeter Safety Light Grid

Muting (Bypassing)

Bypassing may be needed for different reasons. One of the most common reasons for bypassing is during in and out feeding of material on a conveyor, auto industrial trucks, etc. Another common application is bypassing while passing with a three-position device to the risk area.

Important aspects for bypassing are that it should be safe, not be activated by mistake and be difficult to defeat. In other words, it should give a reliable bypassing when a loading carrier comes but not allow a human to pass. To achieve the highest safety level a dual and supervised bypassing system is needed—usually with at least two independent signals.

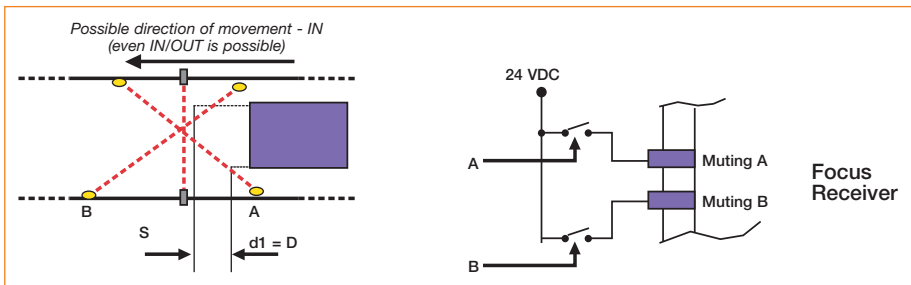
To avoid deliberate defeating/manipulation of the bypassing sensors/signals a safety relay or a safety PLC is connected, thereby monitoring that both sensors are activated and deactivated in every bypassing cycle. This monitoring is built into Focus II.



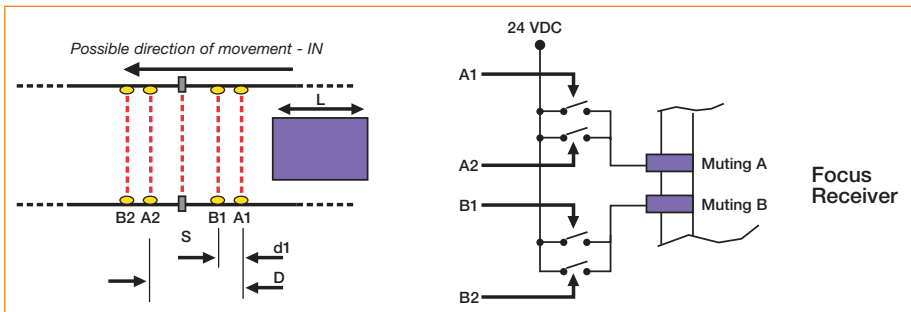
Automatic bypassing of Light Beam when an auto industrial truck passes.

The amount of variants of bypassing systems are almost infinite, depending on the specific requirements of each plant/machine. For Focus II there are a number of bypassing possibilities prepared.

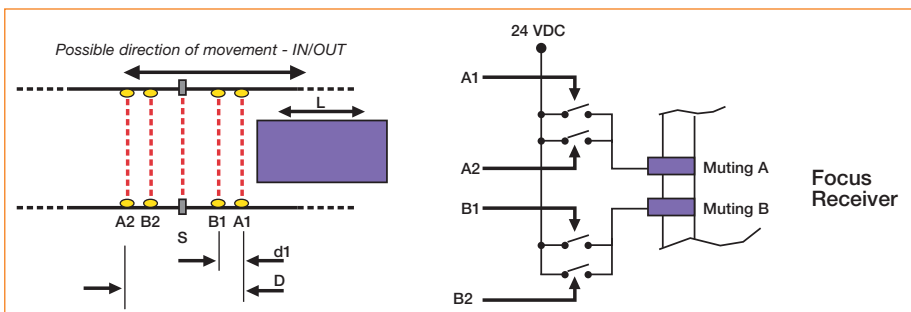
Examples on how the Muting Sensors can be placed



A solution with two sensors (photocells shown) and ONE (or TWO) movement directions for material transport.



A solution with four sensors and ONE movement direction for material transport.



A solution with four sensors and TWO movement directions for material transport.

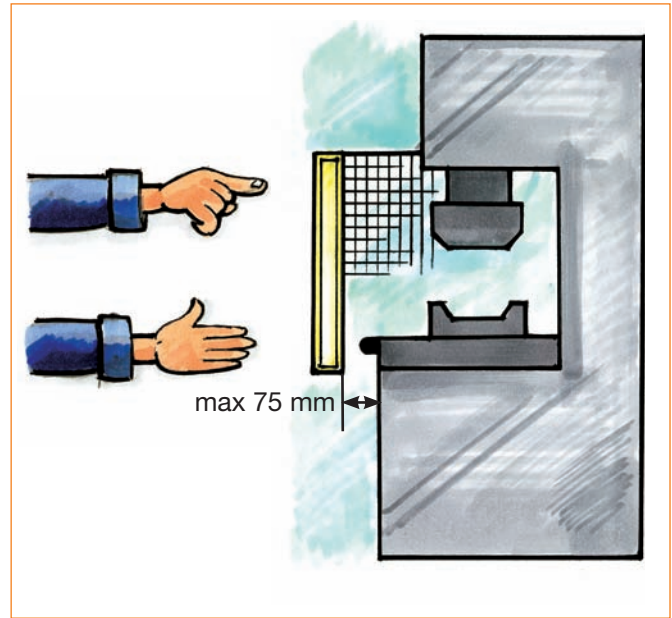
Cycle Initiation with Light Curtain (PSDI)

Cycle Initiation

Cycle initiation is a concept when the machine is designed so that a new cycle starts when you take your hand out from the Light Curtain. A cycle is defined as the hand being placed in and taken out once. Usually it is possible to choose between one-cycle and two-cycle operation. During one-cycle a new press stroke is started when the Light Curtain has been actuated once and during two-cycle when the Light Curtain has been actuated twice. The operator thereby operates the press by the action of putting parts in and out.

Because the press starts without any particular command there are some risks involved and therefore many conditions have to be met before the machine operates.

To restrict the usage to smaller presses which cannot be entered there are the following limitations: The table height may not be lower than 750 mm, the stroking length may not be larger than 600 mm and the table depth may not be larger than 1000 mm. The Light Curtain shall have 30 mm or higher resolution. If the press is not started within approx. 30 seconds after the end of the cycle, a new cycle should not be accepted without the Light Beam being again manually reset.



Note. For machines with cycle initiation, the installation of the Light Curtain must be in accordance with machine parameters and all relevant standards and regulations.

Installation of Light Curtain

The Light Curtain must be installed so no-one can reach a trapping/crushing risk without actuating the Light Curtain. The most important thing is that there are no gaps under, on the sides and over the top during cycle operation. The lower edge of the Light Curtain must therefore be slightly below the press table edge. Also if it is open above the Light Curtain the height must be adapted so that it is not possible to reach over the protection area (see ISO 13855). Possible physical adjustment possibilities must be limited so that no gaps can occur.

Between the Light Curtains protection area and mechanical parts there shall only be max 75 mm gap to prevent a human from standing there. In practise to achieve this demand and the required safety distance one usually has to complement with e.g. additional mechanical protection or additional horizontally positioned Light Curtains i.e. step-in Light Curtain. Another solution could be a lying or an angled Light Curtain.

Correct and Incorrect Installation



Correctly Installed

The operator cannot reach into the machine without actuating Light Curtain.



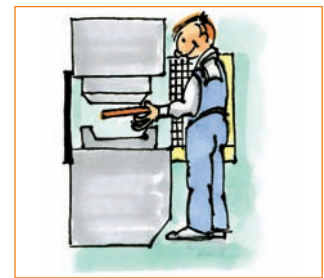
Incorrect Installation

Gap below Light Curtain. The operator can reach into the machine without actuating the Light Curtain.



Incorrect Installation

Gap above Light Curtain. The operator can reach into the machine without actuating Light Curtain.



Correctly Installed

Light Curtain complemented with a horizontal Light Curtain to detect the operator.

Muting with FMC and FMI Units

The FMC Focus Muting Connector is a small, optimal unit which is used when the Focus II Light Curtain or Light Grid is required to be bypassed for in and out passage to and from a dangerous area. The FMC unit is easily connected to Focus II with an M12 connector.

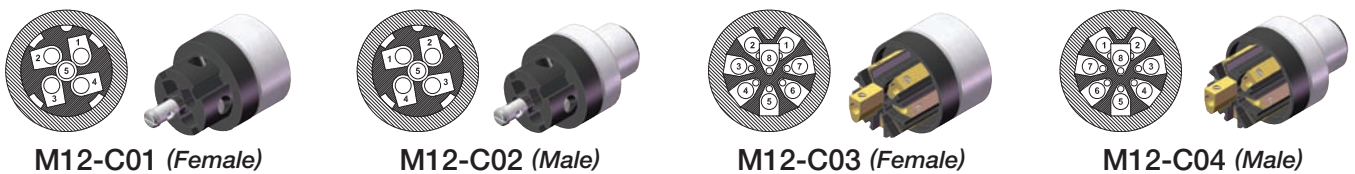
The FMI Focus Muting Indicator is a small unit with built-in muting lamp, reset button, "power off" (for alignment and override). The FMI unit is connected to the FMC unit with M12 connectors to facilitate the muting function connection.



Various FMC, FMI, FRM Versions and Tina Units

<p>FMC-1 2TLA022 042R0000</p> <p>M12-8</p>	<p>FMC-2 2TLA022 042R1000</p> <p>-8</p>	<p>FMI-1A 2TLA022 043R0000</p> <p>Muting Lamp LMS Reset Power Off -5</p>	<p>FMI-1B 2TLA022 043R0100</p> <p>Muting Lamp LMS Reset Power Off -5</p>	<p>FMI-1C 2TLA022 043R0200</p> <p>Reset Power Off -5</p>	<p>FMI-1D 2TLA022 043R0300</p> <p>Reset Power Off -5</p>	<p>JS SP-1 2TLA022 070R0000</p>	<p>JS AP-1 2TLA022 070R1000</p>	<p>FMC-1(2): With connectors for muting sensors (A+B), reset, power off and muting lamp (R) and muting lamp (M).</p> <p>FMI-1A: With muting lamp only.</p> <p>FMI-1B: With reset, power off and muting lamp.</p> <p>FMI-1C: with reset and power off.</p> <p>FMI-1D: With reset, power off and internal resistor for the muting lamp.</p> <p>FMI-1E: As pre reset connected to connector A (A2) on FMC-1(2) (Tina).</p> <p>FMI-1G: With reset, and internal resistor for the muting lamp.</p>
<p>FMC-1 Tina 2TLA022 045R0000</p> <p>M12-8</p>	<p>FMC-2 Tina 2TLA022 046R0000</p> <p>-8</p>	<p>Tina 10A 2TLA022 054R1200</p> <p>2 1 3 -5</p>	<p>Tina 10C 2TLA022 054R1500</p> <p>2 1 3 -5</p>	<p>FRM-1A 2TLA022 048R0000</p> <p>-8</p>	<p>FMI-1E 2TLA022 043R0400</p> <p>Reset -5</p>	<p>FMI-1G 2TLA022 043R0500</p> <p>Reset -5</p>	<p>FMC-1 (2) Tina: The same as FMC-1(2) but made for connecting to Vital or Pluto.</p> <p>Tina 10A: Adaptor unit for connecting Focus to Vital or Pluto.</p> <p>Tina 10B: Simplified FMC-1(2) Tina but with only the (R) connector.</p> <p>Tina 10C: Simplified FMC-1(2) Tina but with only power feed at connector #3.</p> <p>M12-3M Bypass unit for easy connection outside the enclosure</p> <p>FRM-1A: Converts the two OSSD outputs to relay outputs (and power feed)</p> <p>JS SP-1: Blanking plug for unused inputs</p> <p>JS AP-1: Adaptor for FMC units to use without FMI-1B or FMI-1D at (R) connector with muting resistor</p>	
<p>Tina 10B 2TLA022 054R1300</p> <p>2 1 3 -5</p>	<p>M12-3M 2TLA022 055R0400</p> <p>2 3 1 -5</p>							

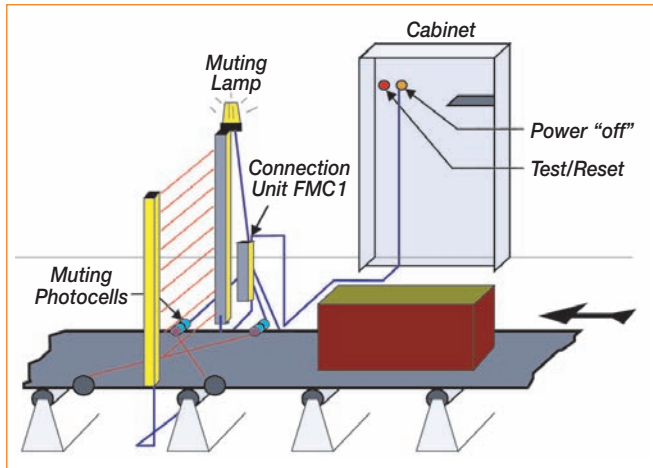
M12 Connection Device with Screw Connectors



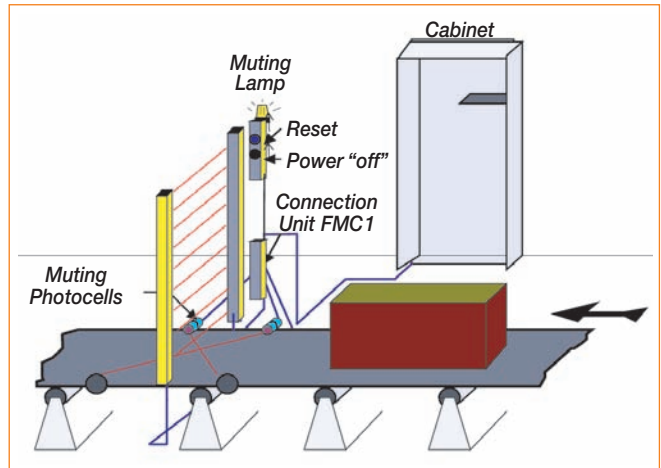
Note: Connector drawings are shown from cable side.

Connection of Focus II and Muting Components with FMC1 and FMI1

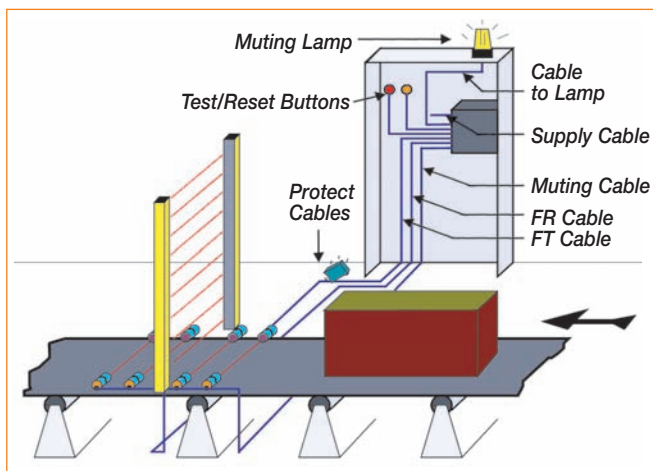
Connection of Light Curtain with connection block FMC 1, text/reset button 1 and switch for supply voltage placed in or by the control cabinet.



Connection of Light Curtain with connection block FMC1. The FMI reset unit must be placed out of reach from the risk area.



Connection of Focus II and Muting Components directly to Control Cabinet



The test/reset button shall be placed so the operator can see the protected area during reset, testing and bypassing. It should not be possible to reach the button from within the risk area.

The LMS lamp for indication of muting and bypassing shall be placed so that it can be seen from all directions from where it is possible to access the dangerous area.

If photocells are used as muting sensors, the sensor receivers should be assembled on the Light Curtain's transmitter side to minimize the interference risk.

The system is protected against dangerous functions caused by damage on the transmitter cable and/or the receiver cable. However, we recommend that the cables be protected so that physical damage to them can be minimized.

Focus II Modular Muting Capabilities

The Focus II Safety Light Curtain offers the selection of complete muting of the protective field during the in and out passage of material. Through dipswitch settings in the Focus standard version, it is also capable of muting only specific modules within the protective field.

The Focus II is capable of muting independent beam module packets or a combination of them (up

to 4). For example, a box travels down a conveyor and instead of muting the entire Light Curtain you can mute only modules 1 and 2—which equates to the height of the box—allowing continual protection on the remaining Safety Light Curtain modules.

The module size is directly dependent on the Focus II Light Curtain resolution and length.

Muting with MFII-T/MFII-L Units

MFII-T and MFII-L are muting units with integrated photocells in the same profile type as the Focus II Light Curtain/Grid. No additional sensors are required because the muting units contain the required components. MFII-T/MFII-L is connected directly to Focus II with M12 connectors.

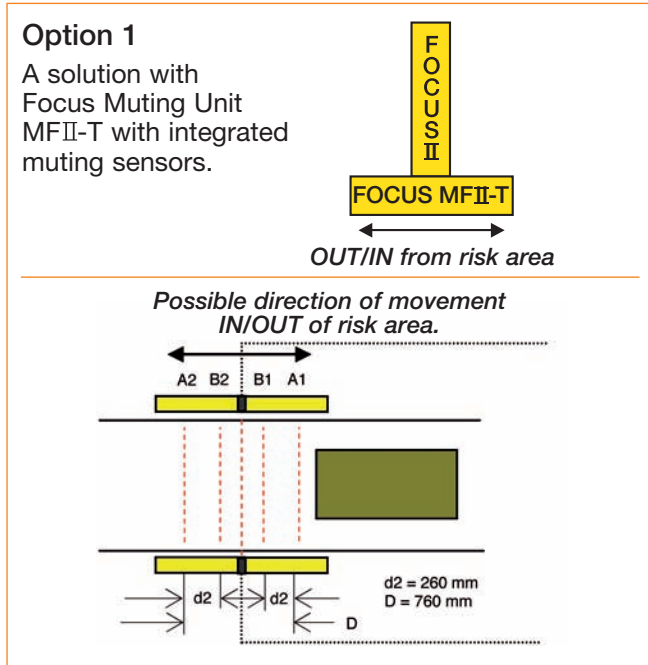
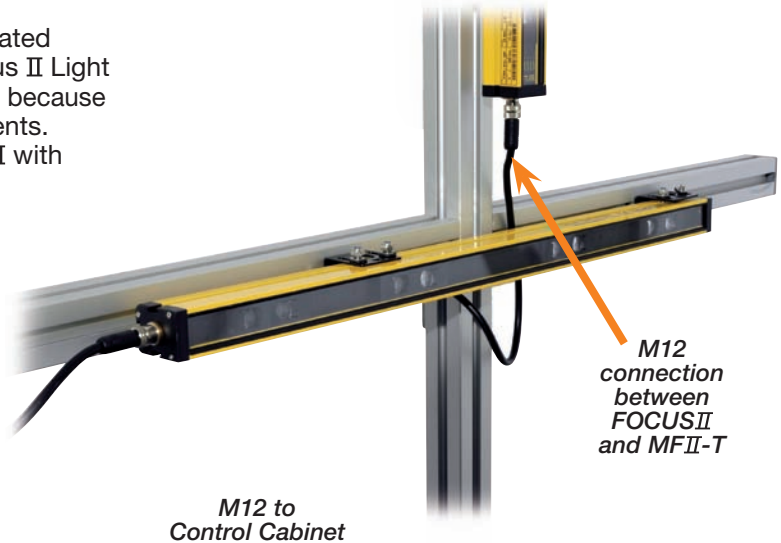
MFII-T (Option 1)

MFII-T contains four photocells—A1, B1, B2 and A2—arranged as shown. they are configured for installations where material is transported “in” or “out”—or in both directions “in and out”.

MFII-L (Option 2)

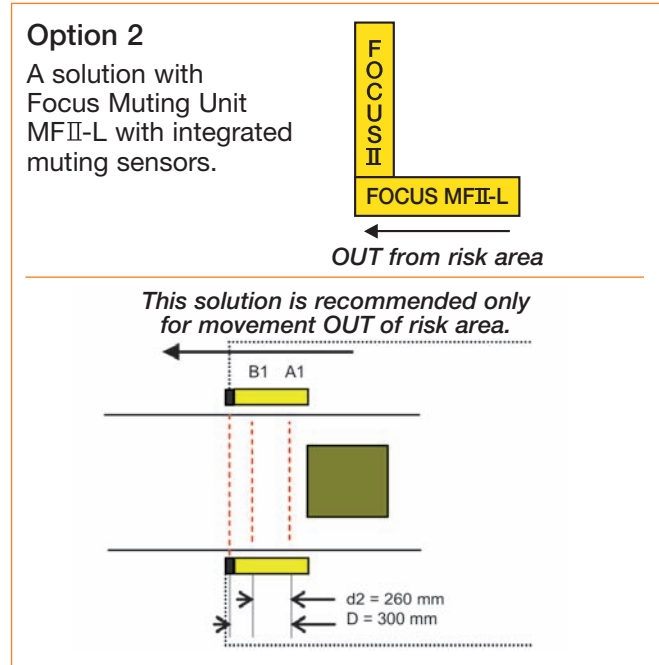
MFII-L contains two photocells—A1 and B1—which are actuated before and by material exiting through the Light Curtain/Grid. The Light Curtain/Grid remains bypassed just prior to the exit of the material.

Note: MFII-L is primarily intended for material transport “out” of a working area.



Note: The muting sensors A and B must be placed so that the sensor A is always activated at least 30 ms before sensor B.

D: indicates the minimum length of the material that is to actuate the muting sensors that must be maintained during the passage through the Light Curtain/grid.



d2: indicates the measurement between the two preassembled muting sensors within the MFII-T and MFII-L.

Muting with MFII-T Reflex/MFII-L Reflex Units

MFII-T Reflex and MFII-L Reflex are muting units with integrated retro-reflective photocells in the same profile type as the Focus Light Curtain/Grid. No additional sensors are required because the muting units contain the required components. The Reflex series simplifies the set up of muting sensors, as only 1 side requires a cable connection. The reflective side is a polarized reflector bar. MFII-T Reflex and MFII-L Reflex are connected directly to the Focus Receiver with M12 connectors.

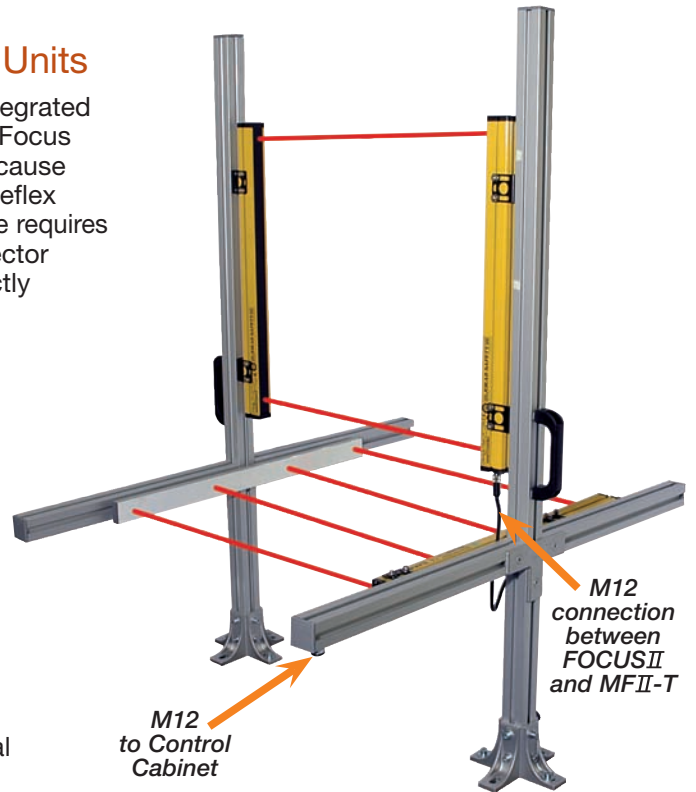
MFII-T Reflex (Option 3)

MFII-T Reflex contains four transmitters/receivers and a separate reflector unit. Range 6m. Used in the muting mode for transport of material into and/or out of hazardous areas. For other functions refer to Option 1. This unit, together with Light Beam FII-4-K1C-500 provides electrical connections on only one side.

MFII-L Reflex (Option 4)

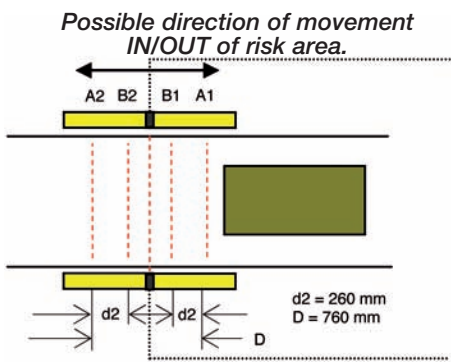
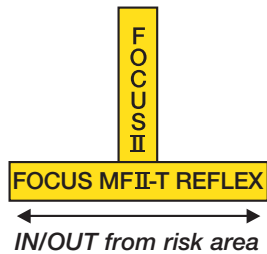
MFII-L Reflex contains two transmitters/receivers and a separate reflector unit. Range 6m. Used in the muting mode for transport of material into or out of hazardous areas. For other functions refer to Option 2. This unit, together with Light Beam FII-4-K1C-500 provides electrical connections on only one side.

Note: MFII-L Reflex unit is primarily intended for material transport "out" of a working area.



Option 3

A solution with Focus Muting Unit MFII-T Reflex with integrated retroreflective muting sensors.

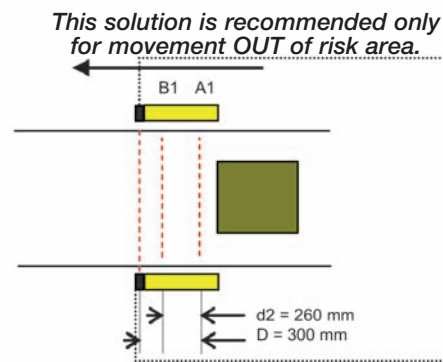
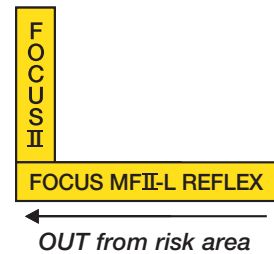


Note: The muting sensors A and B must be placed so that the sensor A is always activated at least 30 ms before sensor B.

D: indicates the minimum length of the material that is to actuate the muting sensors that must be maintained during the passage through the Light Curtain/grid.

Option 4

A solution with Focus Muting Unit MFII-L Reflex with integrated retroreflective muting sensors.



d2: indicates the measurement between the two preassembled muting sensors within the MFII-T Reflex and MFII-L Reflex (= 150mm).

Focus II Type 4 (FII-4) Summary

Note: For ordering information see the components list beginning on page 6:39. For more information visit www.jokabsafetyna.com

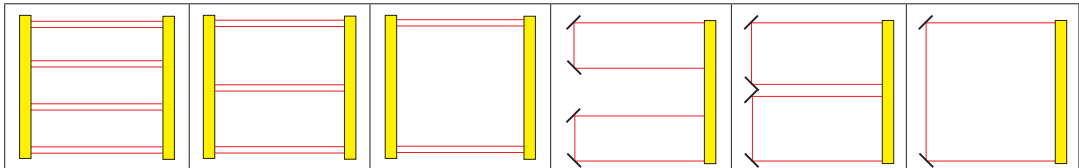
Type 4	FII-4-14-zzzz	FII-4-30-zzzz	FII-4-K4-zzzz		FII-4-K3-800	FII-4-K2-500
Resolution	14	30	300	400	400	500
Height (mm=zzzz)	150 300 450 600 750 900 1050 1200 1350 1500 1650 1800 1950 2100 2250 2400	150 300 450 600 750 900 1050 1200 1350 1500 1650 1800 1950 2100 2250 2400	900	1200	800	500
Range (m) SR LR	0.2-3 3-6	0.2-7 7-14	0.5-20 20-40		0.5-20 20-40	0.5-20 20-40
Reaction time off (ms)	12-68	9-31	13		13	13
Reaction time on (ms)	138-104	141-119	142		142	142
Manual reset	•	•	•		•	•
Automatic reset	•	•	•		•	•
Pre reset	•	•	•		•	•
Muting inputs	•	•	•		•	•
Muting lamp supervision	•	•	•		•	•
Override	•	•	•		•	•
Muting T/L/X	• / • / •	• / • / •	• / • / •		• / • / •	• / • / •
Blanking 3 types	• / • / •	• / • / •	- / - / -		- / - / -	- / - / -
Single/Double break	• / •	• / •	- / -		- / -	- / -
EDM	•	•	•		•	•
Dyn. Adaption to Vital/Pluto	☐	☐	☐		☐	☐

• Standard

☐ With Tina 10A/10B/10C or FMC_Tina.

Focus II Type 4 (FII-4) Summary (continued)

Note: For ordering information see the components list beginning on page 6:39. For more information visit www.jokabsafetyna.com



Type 4	FII-4-K4-zzzz D		FII-4-K3-800 D	FII-4-K2-500 D	FII-4-K2C-zzzz		FII-4-K2C-800	FII-4-K1C-500
Resolution	300	400	400	500	300	400	800	500
Height (mm=zzzz)	900	1200	800	500	900	1200	800	500
Range (m) SR LR	0.5-20 20-40		0.5-20 20-40	0.5-20 20-40	0.5-7		0.5-8	0.5-12
Reaction time off (ms)	13		13	13	13		13	13
Reaction time on (ms)	142		142	142	142		142	142
Manual reset	•		•	•	•		•	•
Automatic reset	•		•	•	•		•	•
Pre reset	•		•	•	•		•	•
Muting inputs	•		•	•	•		•	•
Muting lamp supervision	•		•	•	•		•	•
Override	•		•	•	•		•	•
Muting T/L/X	• / • / •		• / • / •	• / • / •	• / • / •		• / • / •	• / • / •
Blanking 3 types	- / - / -		- / - / -	- / - / -	- / - / -		- / - / -	- / - / -
Single/Double break	- / -		- / -	- / -	- / -		- / -	- / -
EDM	•		•	•	•		•	•
Dyn. Adaption to Vital/Pluto	☐		☐	☐	☐		☐	☐

• Standard

☐ With Tina 10A/10B/10C or FMC_Tina.

Bjorn Stand System for Light Grids and Mirrors

Bjorn is a very stable and flexible stand system in which Focus II Safety Light Beams and Mirrors are mounted in the stand. The hardware for the mirrors in the stand can be turned to provide either vertical or horizontal angles. The robust material of the Bjorn protects Focus II units from direct collisions, thus preventing unnecessary material damage and halts in production.

Applications

- Protects mirrors and Light Beams

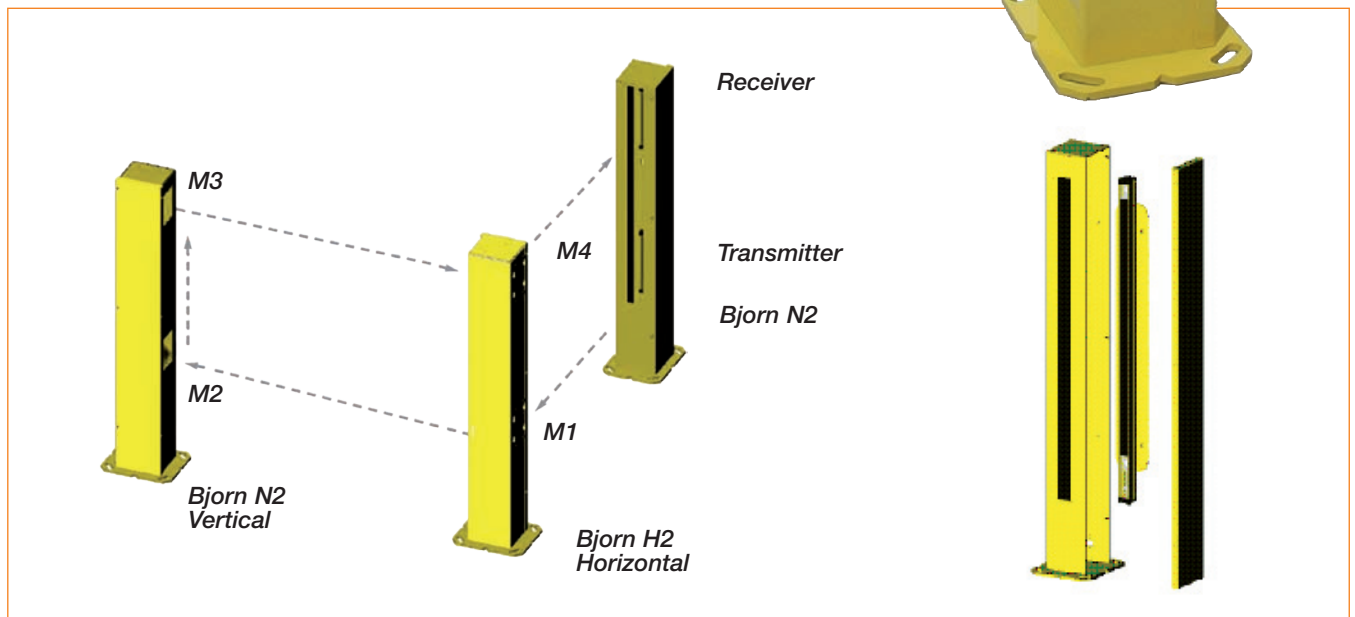
Features

- Robust
- Adjustable

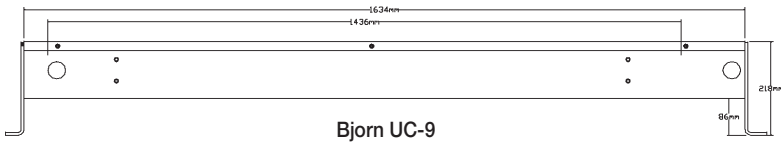
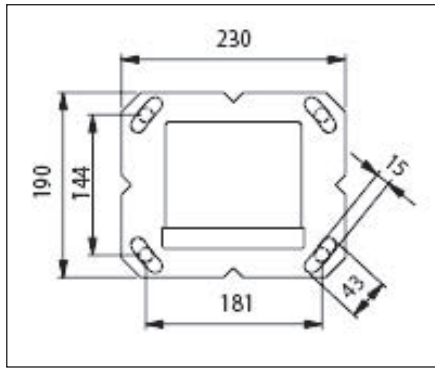


Bjorn Technical Data

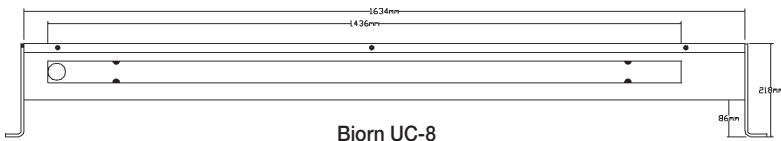
Manufacturer	ABB/Jokab Safety, North America
Ordering information	see page 6:39
Color	Yellow powder-coated (RAL 1018)
Material	3 mm steel
Dimensions Cross section Foot	146 mm x 130 mm 230 mm x 190 mm
Weight H2, V2 and N2 H3 H4-1, H4-2 N5	15 kg/piece 17 kg/piece 20 kg/piece 27 kg/piece
Mirror reduction	≤10 %



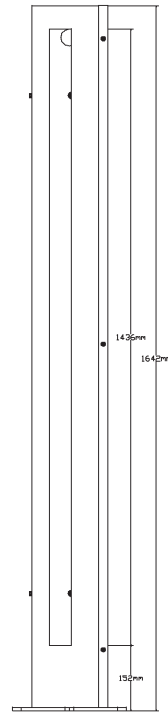
Bjorn Dimensions



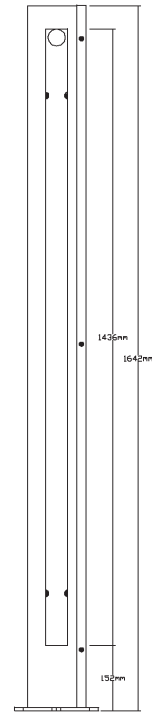
Bjorn UC-9



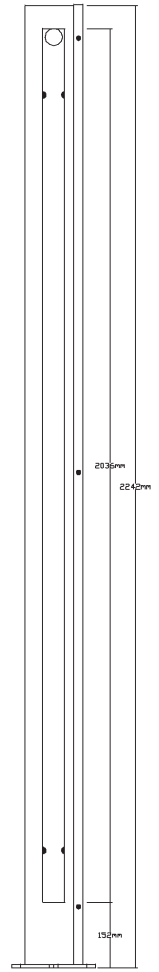
Bjorn UC-8



Bjorn UC-10



Bjorn UC-3

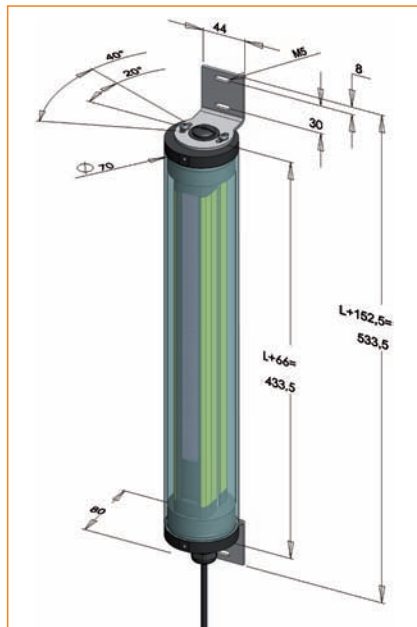


Bjorn UC-4

Wet Wash Down Tubes for Protection against Water and Dust

Wet Wash Down Tubes are used for protection against water (or dust) where extreme washing conditions are encountered. The protective encapsulation rating (IP68) now enables Focus II Light Curtains and Light Beams to be used for such applications as the food industry, where the use of high pressure washing for cleaning machinery often occurs. The draining and through ventilation capabilities mean that condensation can be avoided.

Wet, with Focus II Light Curtains/Beams, is pre-assembled complete with cabling on request. During installation on a machine, a Wet unit can be adjusted by +/- 20° with the accompanying angle bracket. The plastic tube is rotatable and the outside is easy to clean.



Applications

- Protection in severe environments

Features

- Adjustable +/-20°
- Rotatable and replaceable
- Capable of draining and through ventilation



Wet Technical Data

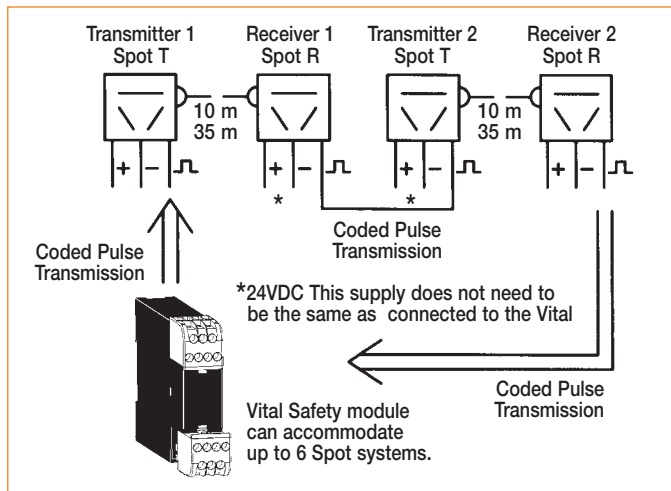
Manufacturer	ABB AB/Jokab Safety, Sweden
Ordering information	see page 6:40
Color	Transparent plastic
Length including lid	light curtain/Light Beam + 66 mm
Material	
Tube	PC
Lid	PEHD-300
Angle bracket	Stainless steel
Max. ambient temperature	+55°C
Installation adjustment	± 20°
Protection rating	IP68 (IP69K)

Spot Safety Light Beam for the Highest Level of Safety

The Light Beam is available in two versions—Spot 10 for distances up to 10 m and Spot 35 for up to 35 m. The Light Beams can be mounted at different heights and be angled around a machine using our mirrors and brackets.

Spot and Vital in combination fulfills the requirements for Category 4 according to EN-954-1/EN ISO 13849-1 and type 4 according to EN 61496. Several Light Beams, Eden sensors and Emergency Stops can be connected in series achieving the high safety level for the safety circuit. A number of solutions for bypassing of Light Beams for material transport are available.

For indication there are LEDs on the transmitter and on the receiver which indicate 'contact' between transmitter and receiver and safety status. The 'contact' information is available via the Light Beam receiver connection cables.



Function

The Spot Light Beam is supervised by the Vital Safety Module. A unique coded signal is sent out from the control unit (Vital) to the transmitter (Spot T). The signal which comes back from the receiver (Spot R) is then compared in the Vital. If the correct coded signal is received the Vital switches the necessary safety output contacts to permit dangerous machine movements. Coding guarantees that no output signals can be produced by light from other sources, interference or faults in components in the transmitter or receiver. The Light Beam is dynamically supervised which means that if the signal stops pulsating at the correct frequency it is immediately detected. By using this special code function in the sensors, the signal can travel via up to 6 transmitter/receiver pairs which are not electrically connected to the Vital unit.



Applications

- Photoelectric guarding of an entrance or around a risk area

Features

- Safety level type 4 according to EN 61496
- Versatile mounting
- LED indication
- Protection class IP67
- 10 m or 35 m range
- Bypassing possibility
- Can be connected with several other different safety devices in the same safety circuit at category 4 together with Vital according to EN ISO 13849-1.

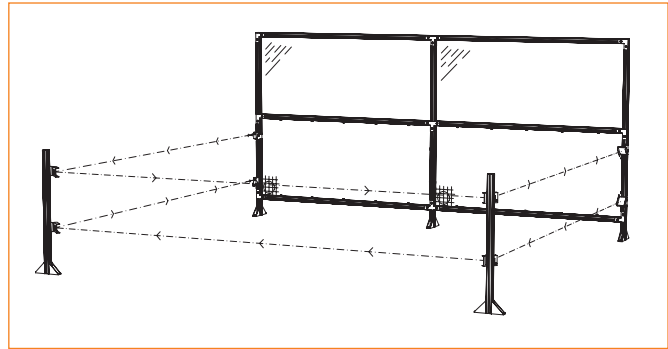
Approvals

TÜV Nord  

Spot Mounting and Alignment

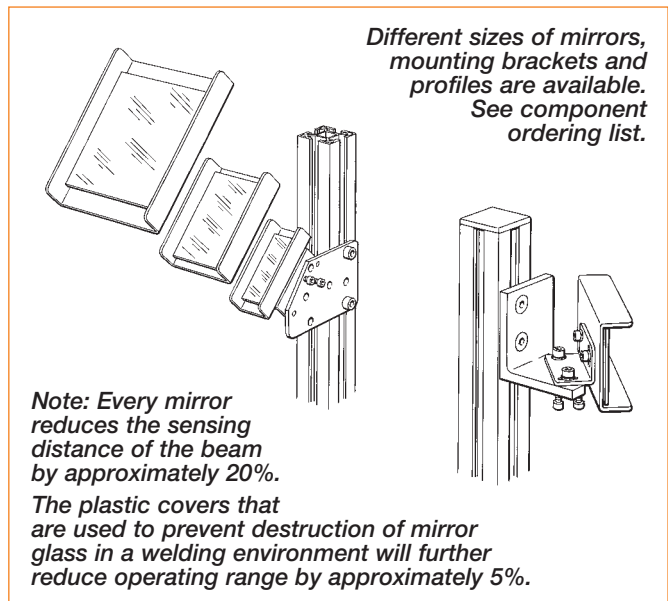
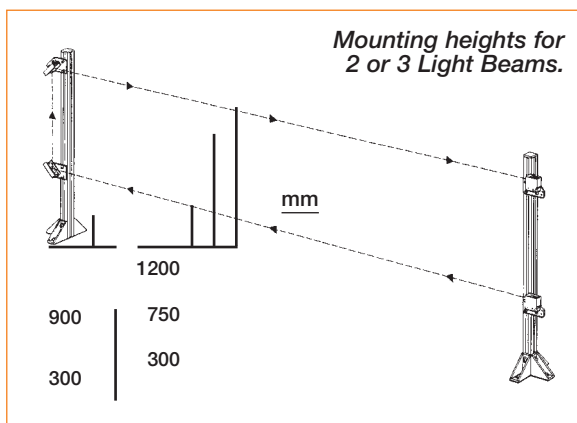
Safety Distance

The basic principle is that dangerous machine movements should be stopped before a person reaches the dangerous area, which should be at least 1200 mm from the Light Beams. When determining the correct safety distance the stopping time of the machine and the risk level must be taken into account (see also EN 999). Contact us for further information.



Accessories and Mounting

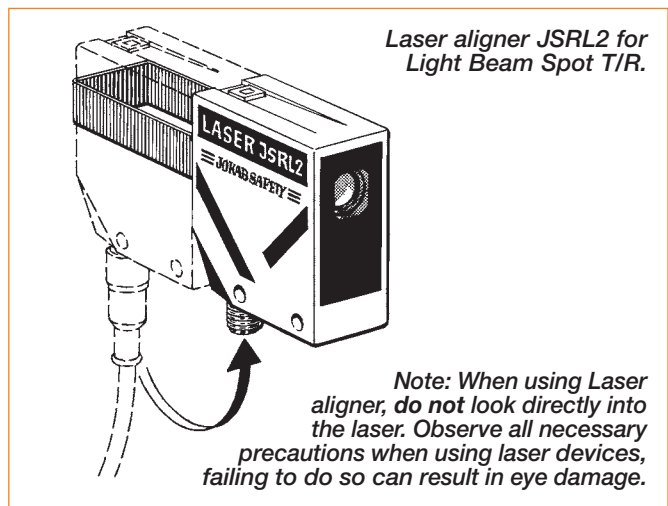
The Spot Light Beam can be mounted using a variety of brackets, posts and mirrors. See component list for further information.



Alignment

When aligning the Light Beam, look towards the transmitter. In the lens will be seen a strong red light. When this light is seen from the receiver (via mirrors if fitted) the Light Beam is basically aligned. The LED on the receiver is on when the receiver is aligned with the transmitter. By moving the transmitter up/down and left/right the best alignment can be found.

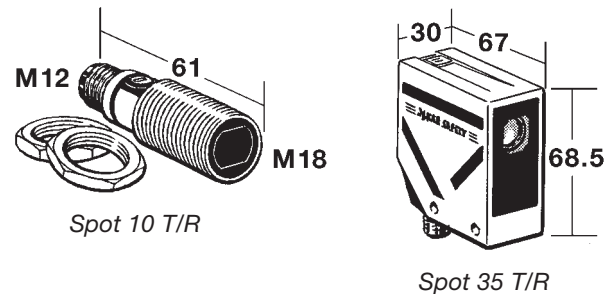
When vertically mounting, (as shown in the diagram) the receiver should be mounted above the transmitter as this will simplify the alignment and minimize the risk of extraneous light disturbance. In exceptional light disturbance environments the received light can be adjusted by a screw on the rear of the Spot 35 receiver. On Spot 10 this adjustment can be made on the transmitter. To make the alignment even easier the Laser Aligner (JSRL2) can be used for Spot 35. The laser has visible light (class IIa) and is easy to mount for aligning. Supply to the Laser Aligner is taken from the Spot 35 T/R connector.



Spot Technical Data

Manufacturer	ABB Jokab Safety, Sweden
Ordering information	see page 6:40
Safety level EN/IEC 61496 EN 954-1 EN ISO 13849-1	Type 4 with Vital/Pluto Category 4 PL e
PFH_d	1.14x10 ⁻⁸
Power supply	17 – 27 VDC, ripple ±10%
Current consumption	
Transmitter	< 25 mA
Receiver	< 15 mA
Output currents	
Info. output	10 mA max.
Dynamic signal out	30 mA max.
Light source	Red visible light, 660 nm, <±2°
Optical power	
Spot 10	< 0.1 mW
Spot 35	< 0.2 mW
Function indication	
Green LED on transmitter (power)	Power supply OK
Green LED on receiver status	
On	Alignment OK, safety circuit closed
Flashing	Align. OK, earlier safety circuit open
Off	Beam interrupted, safety circuit open
Protection class	IP 67
Range	
Spot 10	0 - 10 m
Spot 35	0 - 35 m
Range adjustment	
Spot 10	Trim pot. on transmitter
Spot 35	Trim pot. on receiver
Installation	
Spot 10	2xM18 nuts (provided)
Spot 35	Either via mounting holes in the casing or with angle bracket JSM63 (provided)
Operating temp. range	-25°C – +65°C
Cable connection	M12 fixed connector
Casing Material	
Spot 10	Steel housing with polyacryl lens protection
Spot 35	Polyamide housing with polyacryl lens protection

Color	
Spot 10	Steel grey
Spot 35	Yellow and black
Weight	
Spot 10	2 x 21 g
Spot 35	2 x 100 g
Connections	
Transmitter: Brown (1)	+24 VDC
White (2)	Dynamic signal in
Blue (3)	0 VDC
Receiver: Brown (1)	+24 VDC
White (2)	
Blue (3)	0 VDC
Black (4)	Dynamic signal out
Grey (5)	Info output
24 VDC when LED is green or flashing (tolerance -2 VDC) 0 VDC when LED is off (tolerance +2 VDC)	
Conformity	European Machinery Directive 2006/42/EC CE EN ISO 12100-1:2003 EN ISO 12100-2:2003 EN 60204-1:2006 + A1:2009 EN 954-1:1996, EN ISO 13849-1:2008 EN 62061:2005, EN 61496
Certifications	TÜV Nord



Spot Resetting - 3 Possibilities

Supervised Manual Reset (Figure 1)

When the Spot Light Beam is broken Vital gives stop signals to dangerous machines inside the guarded area and the reset indication lamp is on. A new start of the machine requires a reset of the Light Beam. The reset button must be placed so that it cannot be reached from inside the guarded area and so that it has to be activated from outside the machine. When the reset button has been activated, i.e. the reset inputs have been both closed and opened, the outputs from the Vital are activated, the reset indication lamp is off and the machine can be started. High demands are placed on the reset function, a fault must not lead to the ready signal being given when someone has interrupted the Light Beam. (See connection example HD3800A on page 4:46.)

Supervised Time Resetting (Figure 2)

To reset the Light Beam, push button 1 must first be pressed and then push button 2 (within the predetermined preset time). This prevents unintentional resetting when someone is within the hazardous area. This is especially important when the area which is being protected by the Light Beam is not clearly visible from outside.

When time resetting is performed the safety timer relay JSHT1 A/B is used together with the Vital. This allows pre-reset times (in steps from 5 to 40 seconds) to be set. (See connection example HE3811B on page 4:46.)

Automatic Reset (Figure 3)

Automatic reset is utilized for example when a light beam is used to monitor an area. In this case when the Light Beam is interrupted this indicates that the robot is operating in the area allowing it to be stopped if a person enters into the same area. When the Light Beam is clear, the Vital is reset automatically.

Bypassing

Automatic Bypassing (Figure 4)

For the transport of materials, the Light Beams, grids or curtains can be bypassed just before they are interrupted. The bypassing is achieved by sensors which detect the auto carrier and give signals direct or via a safety relay to the Vital.

In the connection examples you can find a number of different solutions. (See connection examples HE3824C-E on pages 4:47 and 4:48.)

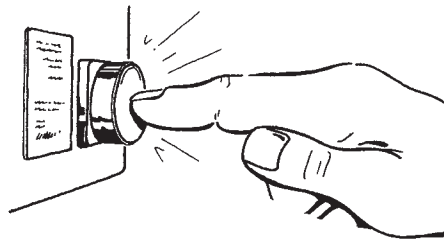


Figure 1 - Reset push button with lamp indication.

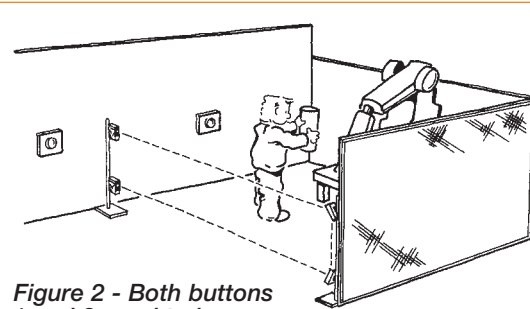


Figure 2 - Both buttons 1 and 2 need to be pressed (in sequence) within the pre-reset time to reset the Spot Light Beam

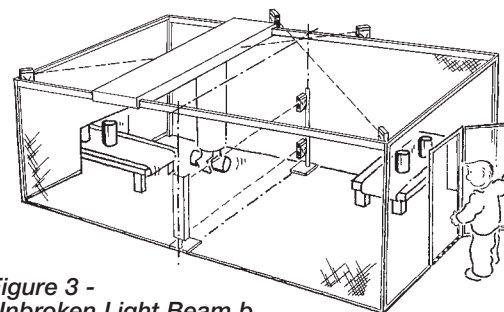


Figure 3 - Unbroken Light Beam b indicates that the industrial robot is outside area B. Area B can now be entered without stopping the robot.

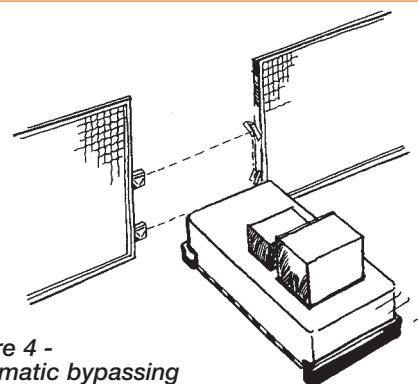


Figure 4 - Automatic bypassing when auto carrier passes.

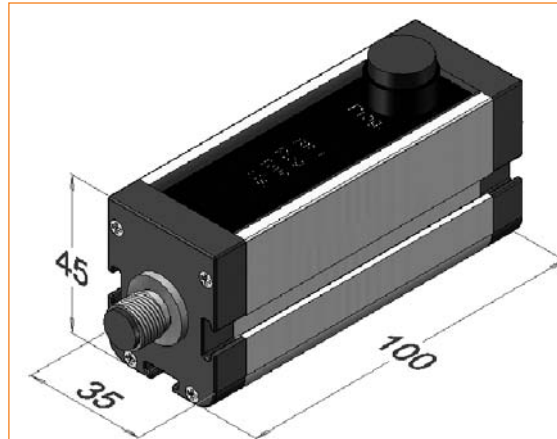
BP1 Blanking Programmer

A Quick Way to Program Blanking

A dipswitch at the cable connection of the Light Curtain receiver enables a choice of whether a blanking function is to be used. Once this choice has been made, programming of the unit in the light field is made easy by using the Blanking Programmer BP1.

If the extent of the object in the protected field then changes, the Light Curtain can be reprogrammed—only 11 seconds after the push button on the front of the BP1 has been pressed.

The BP1 is easily connected, in series with the cable to the Light Curtain receiver unit, using the M12 connector and the free length of the unit's cable.



The BPI must be removed before power is applied to the machine controls.



BP1 Technical Data

Manufacturer	ABB AB/Jokab Safety, Sweden
Ordering information	see page 6:42
Color	yellow and black

Muting Sensor Mute R Retro/Reflective with Polarizing Filters

Features

- Adjustable Range
- Light reserve warning indicator
- Transistor output, PNP
- 1000 Hz switching frequency
- Short-circuit protection, reverse polarity protection and power-up output suppression
- M12 connector
- EMC tested according to IEC 801 and EN 50081-1/En 50082-2



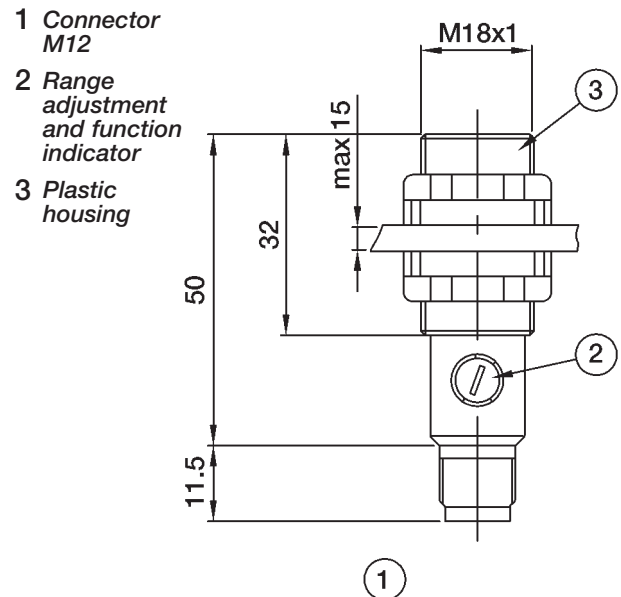
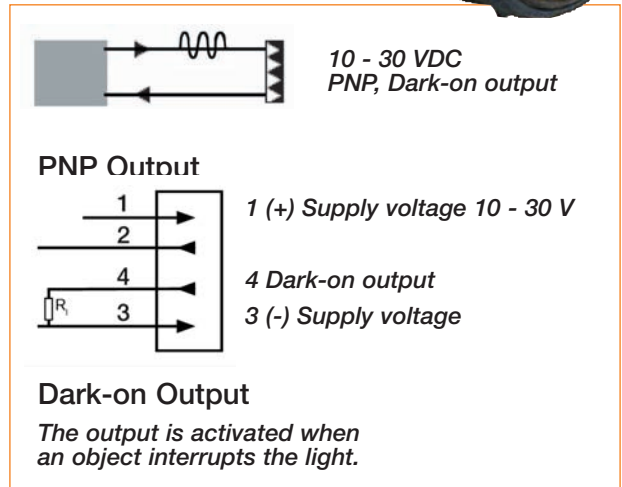
Approvals



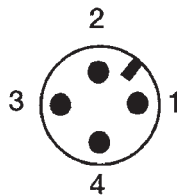
Mute R Technical Data

Manufacturer	ABB AB/Jokab Safety, Sweden
Ordering information	see page 6:42
Weight	approx. 15 g
Output	PNP, dark on
Connection	M12 connector
Range Adjustment	Yes
Range	0.15 - 2.5 m (with reflector FZR1) 0.15 - 5 m (with reflector FZR2)
Light Source	Visible-red, 660 nm, pulsed with polarizing filter
Supply Voltage	10 - 30 VDC
Allowable Ripple	+/- 10% of U_S
Current Consumption without Load	<15 mA
Maximum Load Current	100 mA
Residual Voltage	<1.6V
Maximum Switching Frequency	1000 Hz
Temperature (Operating and Storage)	-25°C to +65°C
Protection Class	IP67

Note: All technical data at 25°C and 24V



M12 Connector



Muting Sensor Mute D Diffuse with Background Rejection

Features

- Electronically adjustable background rejection
- Light reserve warning indicator
- Dual transistor outputs, PNP
- Short-circuit protection, reverse polarity protection and power-up output suppression
- Rotatable M12 connector
- EMC tested according to IEC 801 and EN 50081-1/EN 50082-2

Approvals

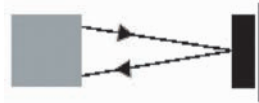
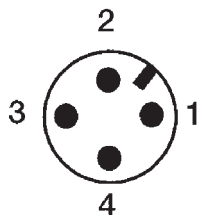


Mute D Technical Data

Manufacturer	ABB AB/Jokab Safety, Sweden
Ordering information	see page 6:42
Weight	approx. 130 g
Output	2 PNP (light-on and dark-on)
Connection	M12 connector
Range Adjustment	Yes
Range	0.2 - 0.8 m
Light Source	Infrared-LED, 880 nm, pulsed
Supply Voltage	10 - 30 VDC
Allowable Ripple	+/- 10% of U_S
Current Consumption without Load	<35 mA
Maximum Load Current	200 mA
Residual Voltage	<1.6V
Maximum Switching Frequency	200 Hz
Temperature (Operating and Storage)	-25°C to +65°C
Protection Class	IP67

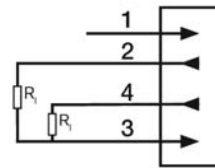
Note: All technical data at 25°C and 24V

M12 Connector



10 - 30 VDC
PNP, Light-on output
Dark-on output

PNP Output



1 (+) Supply voltage 10 - 30 V
2 Dark-on output
4 Light-on output
3 (-) Supply voltage

Light-on Output

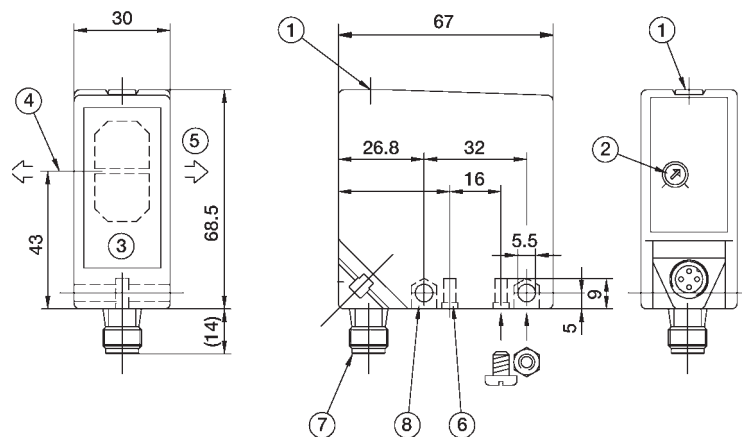
Output energized when object is present.

Dark-on Output

Output energized when no object is present.

- 1 Function indicator
- 2 Range adjustment
- 3 Glass-covered optics
- 4 Center of the optical axis

- 5 Preferred detection direction
- 6 Bore for 5mm self-tapping screw
- 7 M12 Connector
- 8 Opening for M5 nut



JSRL-3/JSRL-4 Laser Aligner

When the solution involves one or more mirrors, JSRL-3/4 facilitates alignment of Light Beams or Light Curtains. The JSRL-3/4 is easily secured using the accompanying elasticated tape around the transmitter and receiver unit, and must be placed so that the flat rear of the unit is up against the front glass of the Light Curtain. When the laser aligner is switched on, the red laserspot should be visible at the corresponding unit, even via mirrors.

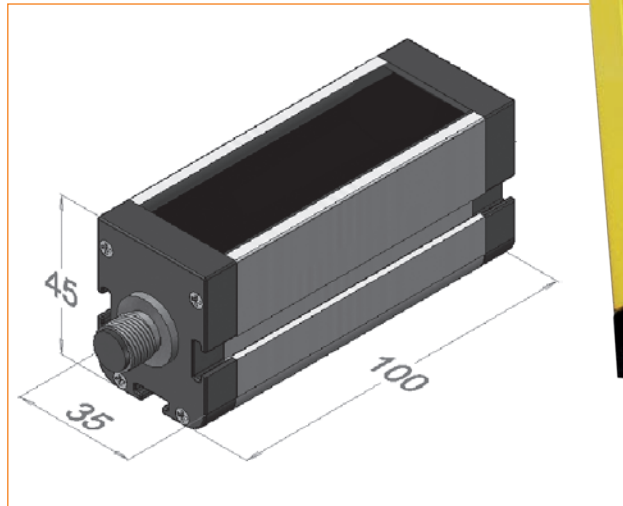
The JSRL-3/4 contains two type AAA batteries that are changed by unscrewing the bottom end cap.

Application

- Alignment of light curtains/beams

Features

- Facilitates alignment



JSRL-3/JSRL-4 Technical Data

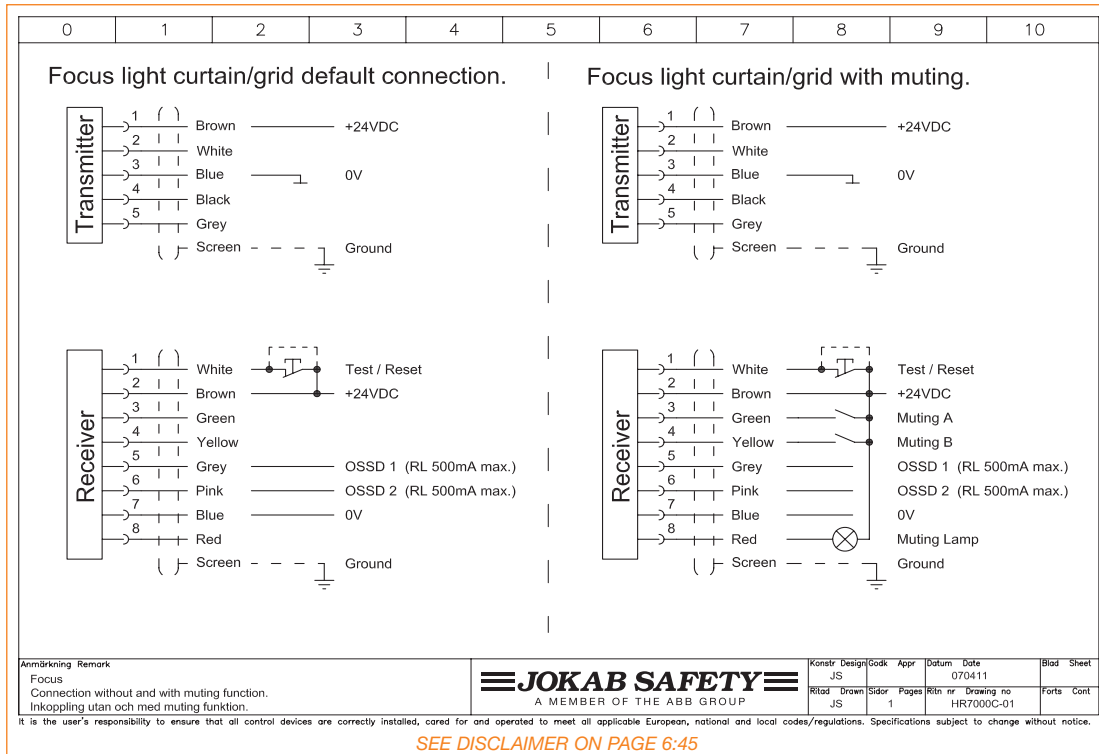
Manufacturer	ABB AB/Jokab Safety, Sweden
Ordering information	see page 6:41
Color	Yellow and black

Connection Examples Contents

Connection of Spot T/R to Vital 1.....	6:25
Vital 1 with 3 Lightbeams Spot.....	6:25
HR7000C-01	
Focus - Connection without and with Muting Function.....	6:32
HR7000E-01	
Focus - Connection with Pre-Reset Function.....	6:32
HR7000F-01	
Focus - Connection with Muting to Safety Relay.....	6:33
HR7000G-01	
Focus - Connection with MFII-T/MFII-L Units.....	6:33
HR7000H-01	
Focus - Connection with FMC/Tina Interface.....	6:34
HR7000I-01	
FMC.....	6:34
HR7000J-01	
FMC-1 or FMC-1 Tina with Muting Sensors and Reset Unit.....	6:35
HR7000K-01	
FMC-1 or FMC-1 Tina Connected with Pre Reset.....	6:35
HR7000L-01	
Tina 10A, 10B and 10C Connection	6:36
HR7000M	
FRM-1 Changing OSSD Outputs to Relay Contacts	6:36
HR7000O-01	
FMC/FMI Connection	6:37
HR7000P	
Cable Connection	6:37
HR7000Q	
Cable Connection	6:38
HR7000S	
Focus; Muting with the Aid of Pluto, FMC and a Transfer Cable	6:38

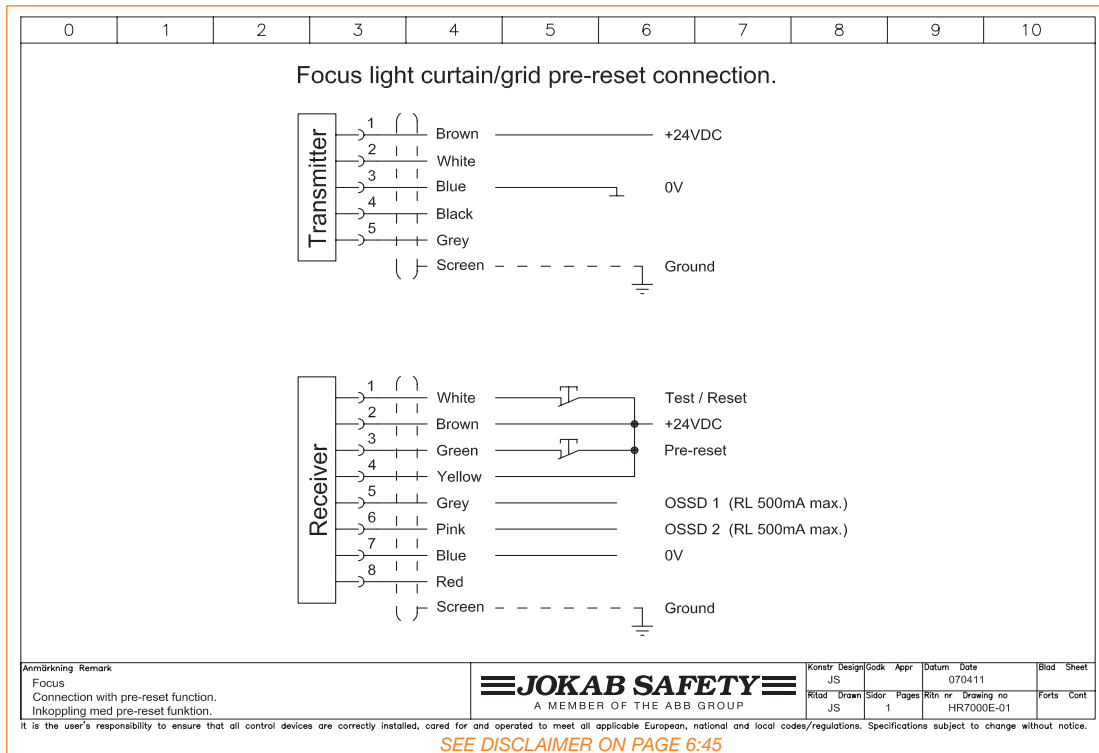
Connection Example

HR7000C-01 Focus - Connection without and with Muting Function



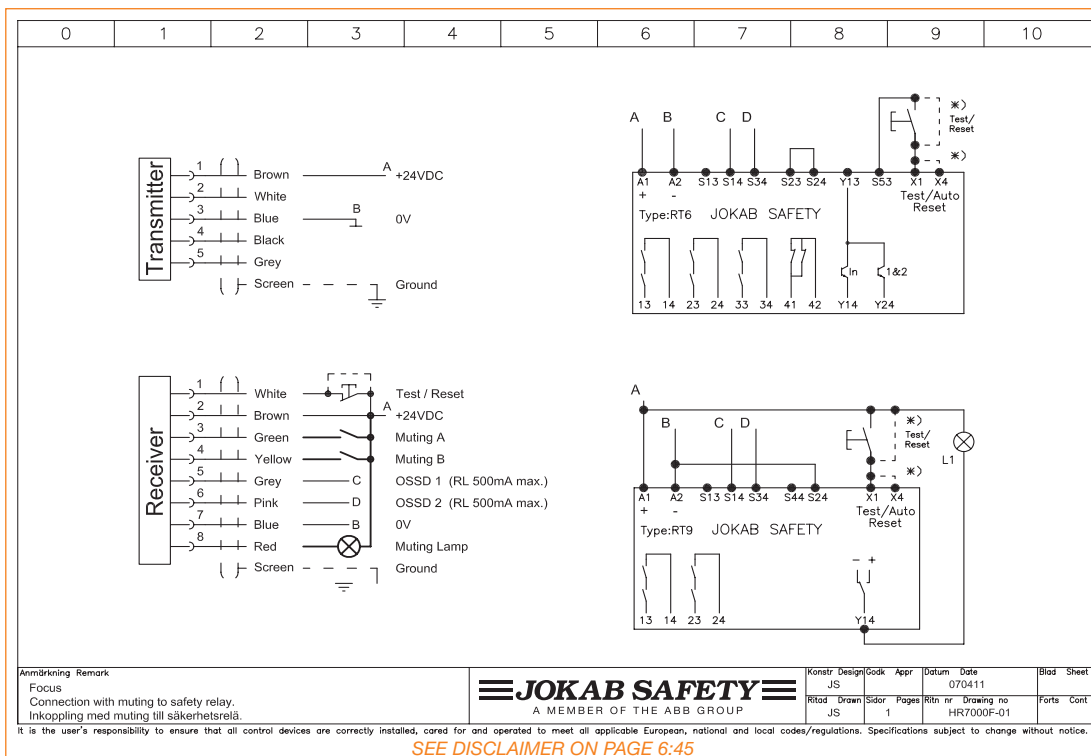
Connection Example

HR7000E-01 Focus - Connection with Pre-Reset Function



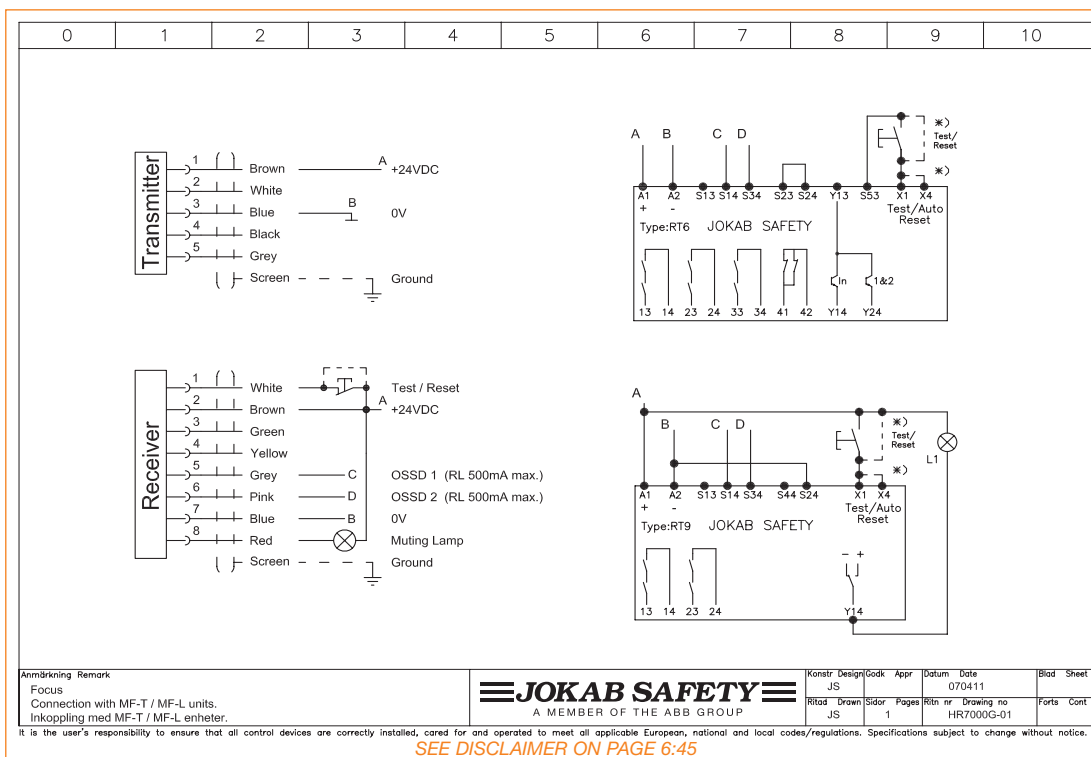
Connection Example

HR7000F-01 Focus - Connection with Muting to Safety Relay



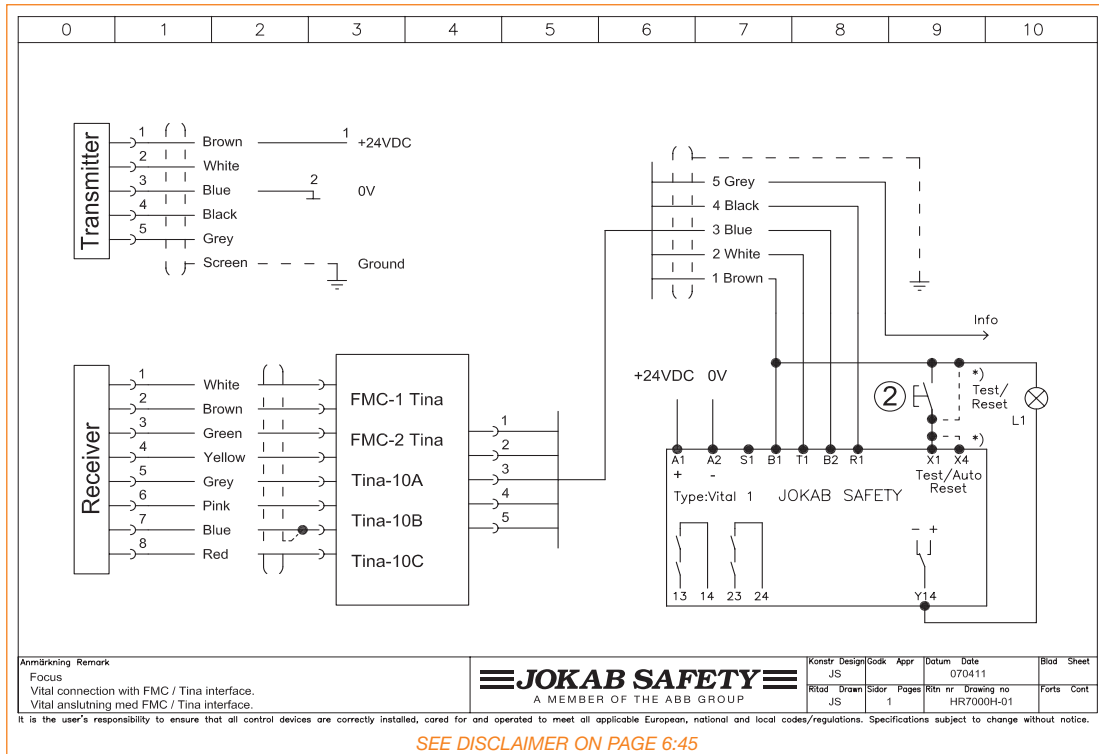
Connection Example

HR7000G-01 Focus - Connection with MFII-T/MFII-L Units



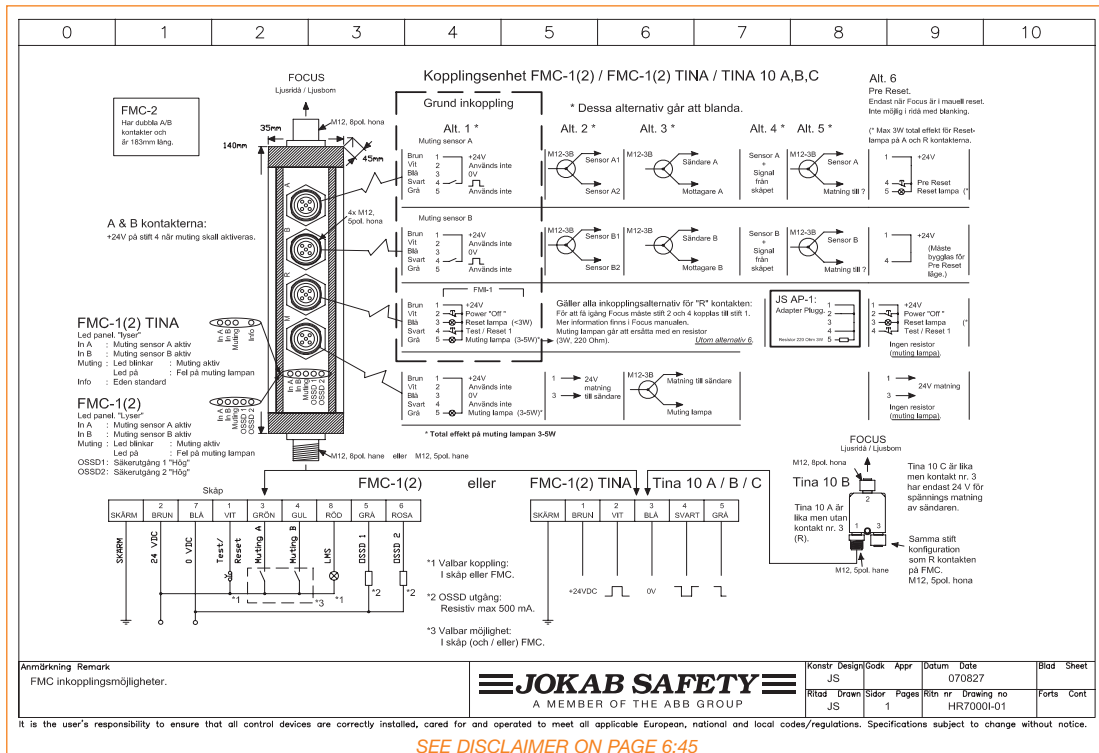
Connection Example

HR7000H-01 Focus - Connection with FMC/Tina Interface



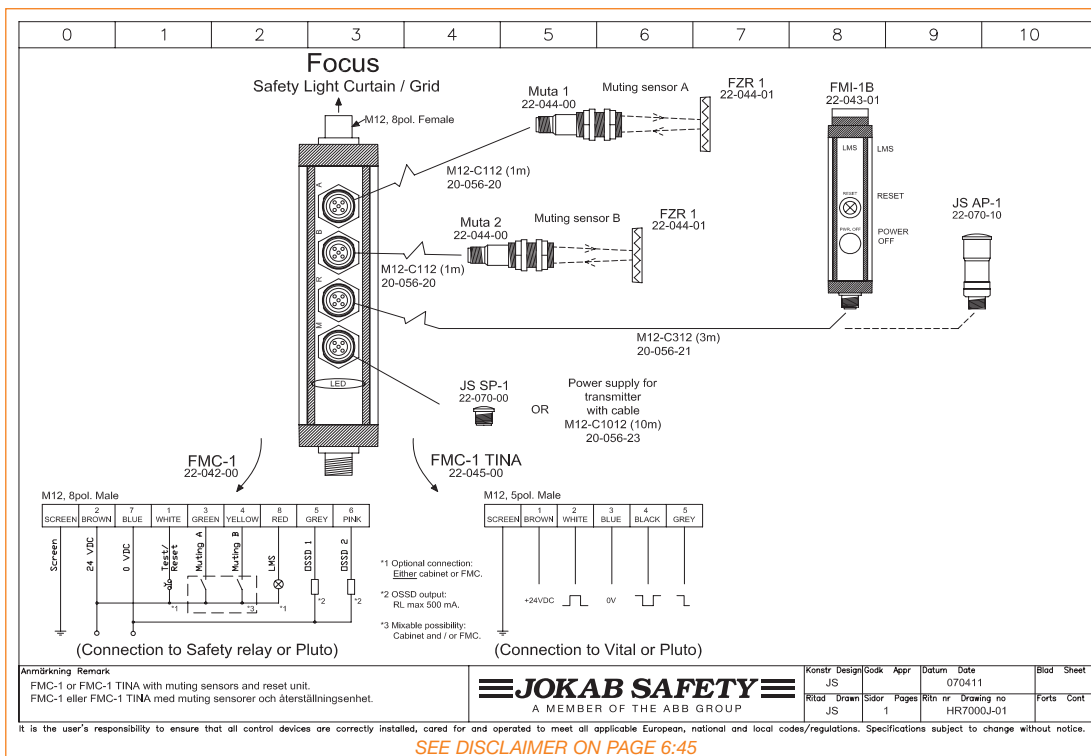
Connection Example

HR7000I-01 FMC



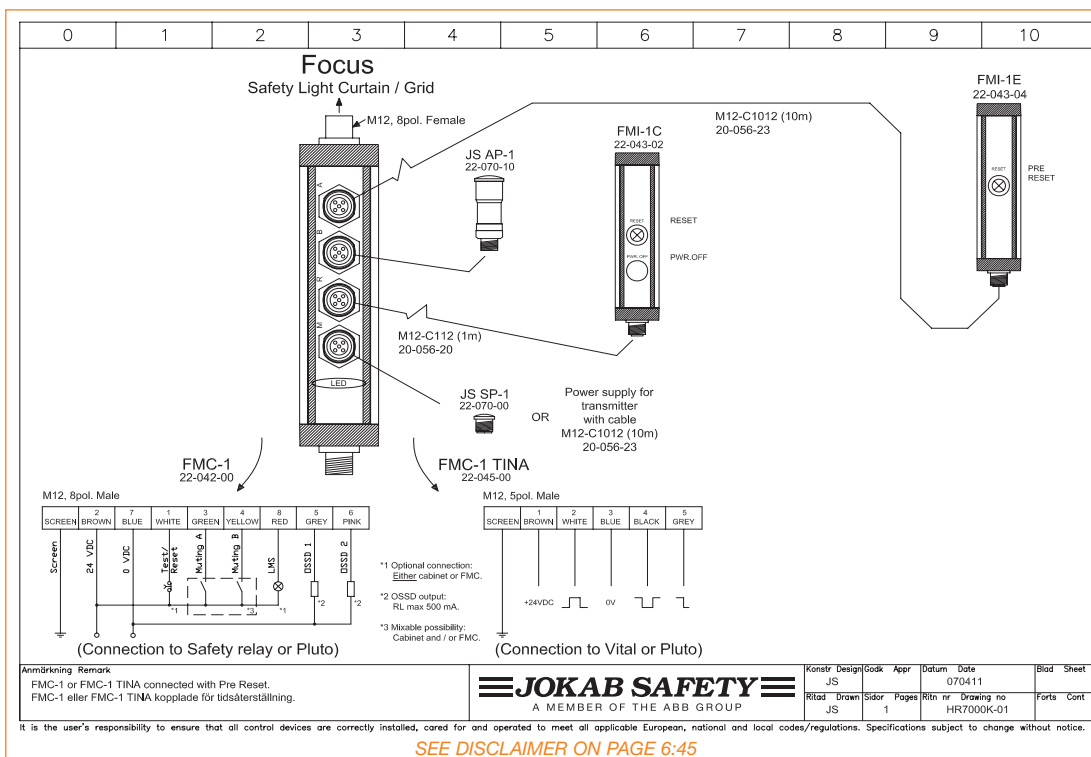
Connection Example

HR7000J-01 FMC-1 or FMC-1 Tina with Muting Sensors and Reset Unit



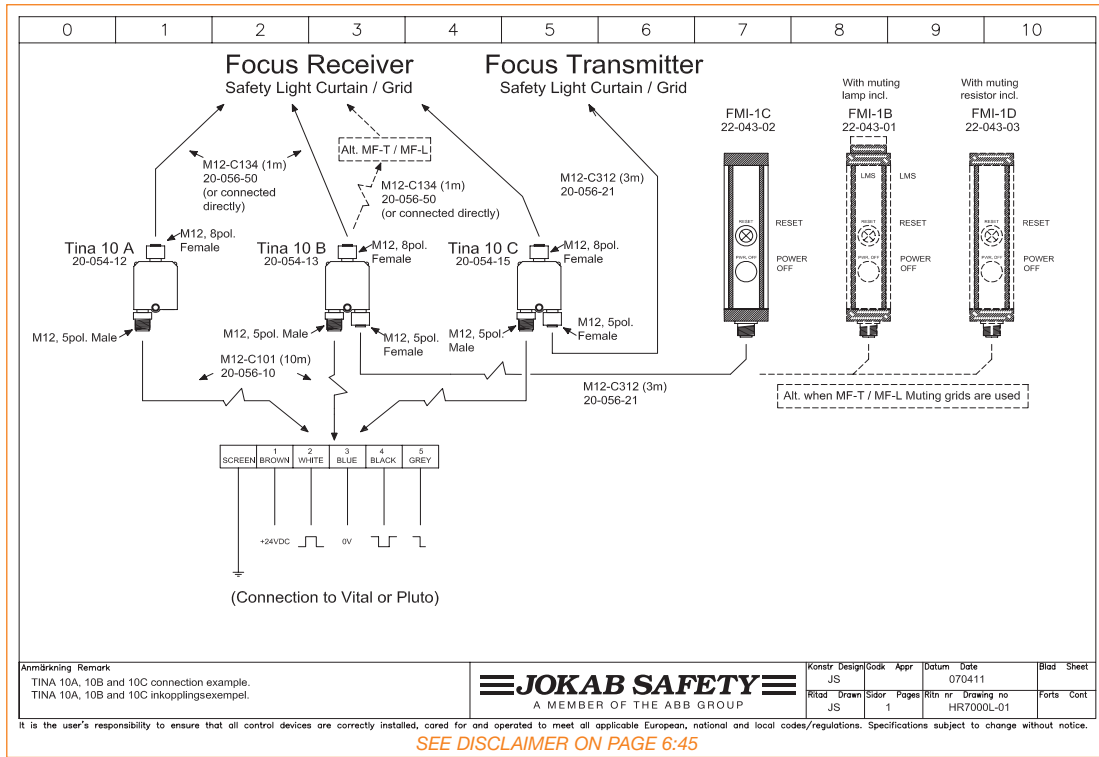
Connection Example

HR7000K-01 FMC-1 or FMC-1 Tina Connected with Pre Reset



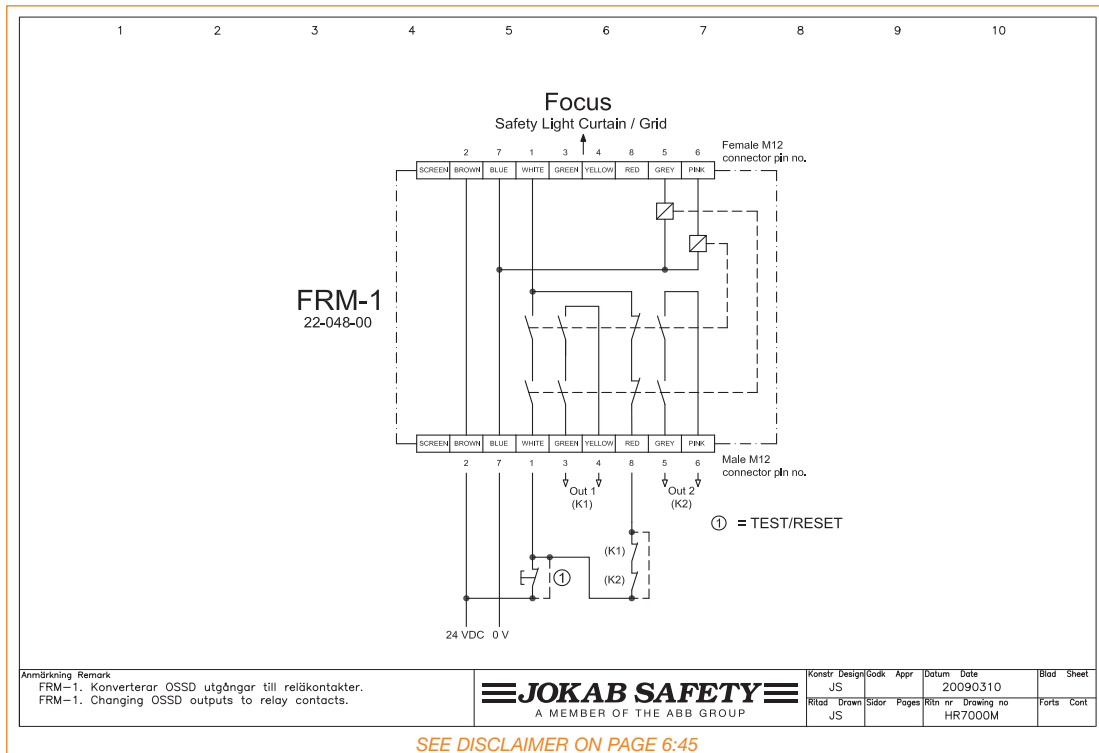
Connection Example

HR7000L-01 Tina 10A, 10B and 10C Connection



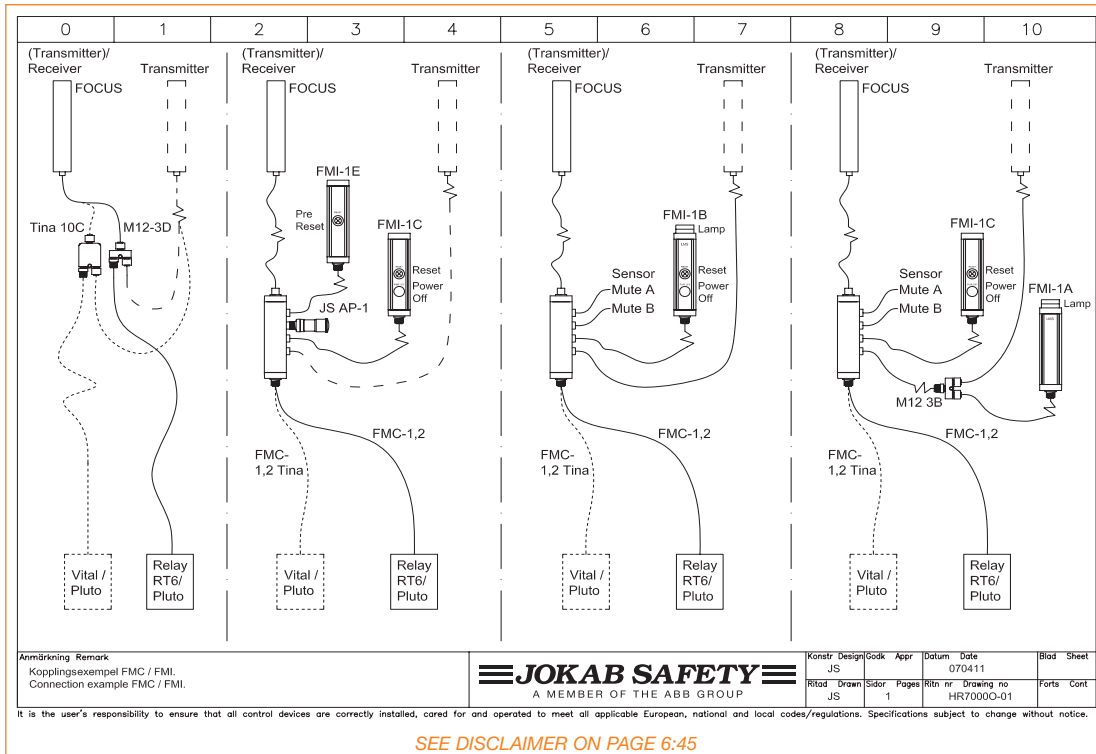
Connection Example

HR7000M FRM-1 Changing OSSD Outputs to Relay Contacts



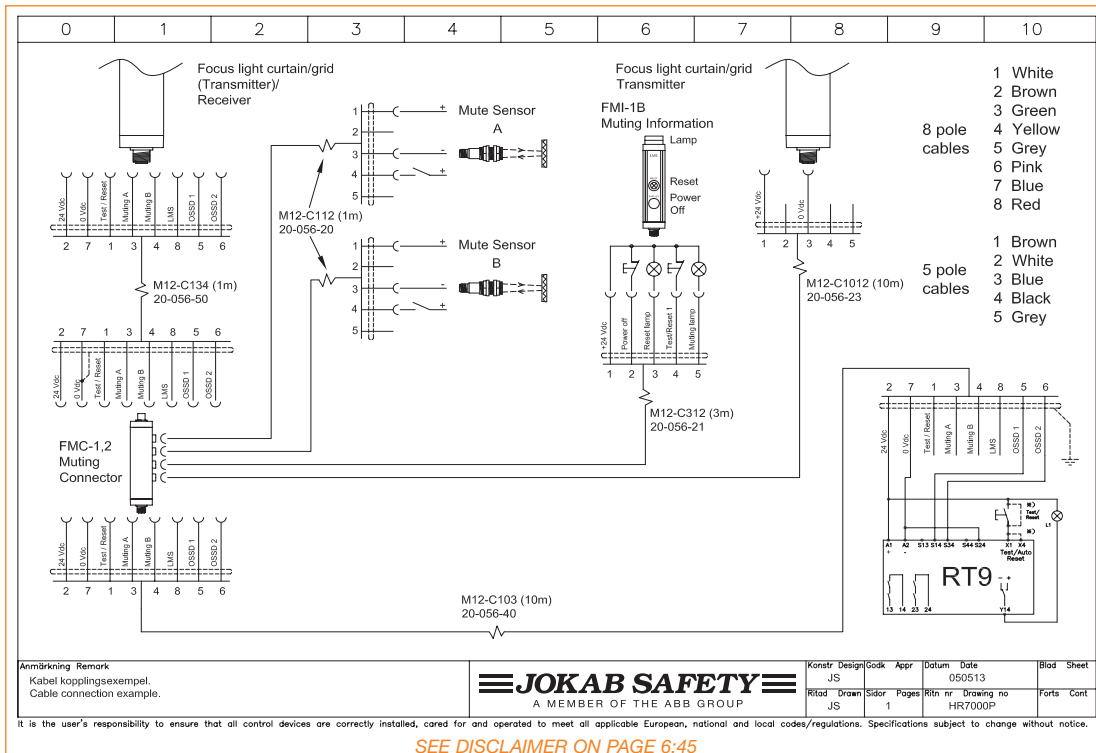
Connection Example

HR7000-01 FMC/FMI Connection



Connection Example

HR7000P Cable Connection



Component List - Mirrors

Designation	Ordering Information	Description
MF-150	2TLA850110R0800	Focus Light Curtain Mirror Kit, includes mirrors and mounting brackets. For use with 150mm Focus Safety Light Curtains.
MF-300	2TLA850110R0900	Focus Light Curtain Mirror Kit, includes mirrors and mounting brackets. For use with 300mm Focus Safety Light Curtains.
MF-450	2TLA850110R1000	Focus Light Curtain Mirror Kit, includes mirrors and mounting brackets. For use with 450mm Focus Safety Light Curtains..
MF-600	2TLA850110R1100	Focus Light Curtain Mirror Kit, includes mirrors and mounting brackets. For use with 600mm Focus Safety Light Curtains.
MF-750	2TLA850110R1200	Focus Light Curtain Mirror Kit, includes mirrors and mounting brackets. For use with 750mm Focus Safety Light Curtains.
MF-800	2TLA850110R1300	Focus Light Curtain Mirror Kit, includes mirrors and mounting brackets. For use with 800mm Focus Safety Light Curtains.
MF-900	2TLA850110R1400	Focus Light Curtain Mirror Kit, includes mirrors and mounting brackets. For use with 900mm Focus Safety Light Curtains.
MF-1050	2TLJ022041R1500	Focus Light Curtain Mirror Kit, includes mirrors and mounting brackets. For use with 1050mm Focus Safety Light Curtains.
MF-1200	2TLA850110R1600	Focus Light Curtain Mirror Kit, includes mirrors and mounting brackets. For use with 1200mm Focus Safety Light Curtains.
MF-1350	2TLA850110R1700	Focus Light Curtain Mirror Kit, includes mirrors and mounting brackets. For use with 1350mm Focus Safety Light Curtains.
MF-1500	2TLA850110R1800	Focus Light Curtain Mirror Kit, includes mirrors and mounting brackets. For use with 1500mm Focus Safety Light Curtains.
MF-1650	2TLA850110R1900	Focus Light Curtain Mirror Kit, includes mirrors and mounting brackets. For use with 1650mm Focus Safety Light Curtains.
MF-1800	2TLA850110R2000	Focus Light Curtain Mirror Kit, includes mirrors and mounting brackets. For use with 1800mm Focus Safety Light Curtains.
JSNA-FOCUS-MC	2TLA850010R0900	2000mm Quick-Guard Stand 44mm x 88mm Light Curtain/Mirror mounting post with endcaps and 2 floor mounts.
	2TLJ022041R2000	Brackets for MF mirrors for mounting to Quick-Guard extruded aluminum. 2 required for each mirror.

Component List - Bjorn Support for Light Grids and Mirrors

Designation	Ordering Information	Description
Bjorn UC-3	2TLA850210R6100	Protective floor mounted housing for 1 vertically mounted Focus Light Curtain or Grid up to 1200mm in length.
Bjorn UC-4	2TLA850310R1700	Protective floor mounted housing for 1 vertically mounted Focus Light Curtain or Grid up to 1800mm in length.
Bjorn UC-8	2TLA850210R8300	Left hand protective floor mounted housing for 1 horizontally mounted Focus Light Curtain or Grid up to 1200mm in length.
Bjorn UC-9	2TLA850210R8700	Right hand protective floor mounted housing for 1 horizontally mounted Focus Light Curtain or Grid up to 1200mm in length.
Bjorn UC-10	2TLA850120R5500	Protective floor mounted housing for 2 vertically mounted Focus Light Curtains or Grids at 90 degrees up to 1200mm in length.

Component Wet Wash Down Tubes

Designation	Ordering Information	Description
WET-150 FII	2TLJ022038R4000	Wash down tube kit for use with 150mm Focus II Safety Light Curtains.
WET-300 FII	2TLJ022038R4100	Wash down tube kit for use with 300mm Focus II Safety Light Curtains.
WET-450 FII	2TLJ022038R4200	Wash down tube kit for use with 450mm Focus II Safety Light Curtains.
WET-600 FII	2TLJ022038R4300	Wash down tube kit for use with 600mm Focus II Safety Light Curtains.
WET-750 FII	2TLJ022038R4400	Wash down tube kit for use with 750mm Focus II Safety Light Curtains.
WET-900 FII	2TLJ022038R4500	Wash down tube kit for use with 900mm Focus II Safety Light Curtains.
WET-1050 FII	2TLJ022038R4600	Wash down tube kit for use with 1050mm Focus II Safety Light Curtains.
WET-1200 FII	2TLJ022038R4700	Wash down tube kit for use with 1200mm Focus II Safety Light Curtains.
WET-1350 FII	2TLJ022038R4800	Wash down tube kit for use with 1350mm Focus II Safety Light Curtains.
WET-1500 FII	2TLJ022038R4900	Wash down tube kit for use with 1500mm Focus II Safety Light Curtains.
WET-1650 FII	2TLJ022038R5000	Wash down tube kit for use with 1650mm Focus II Safety Light Curtains.
WET-1800 FII	2TLJ022038R5100	Wash down tube kit for use with 1650mm Focus II Safety Light Curtains.
WET-K500 FII	2TLJ022038R5200	Wash down tube kit for use with 500mm Focus II Safety Light Grids.
WET-K800 FII	2TLJ022038R5300	Wash down tube kit for use with 800mm Focus II Safety Light Grids.
WET-K900 FII	2TLJ022038R5400	Wash down tube kit for use with 900mm Focus II Safety Light Grids.
WET-K1200 FII	2TLJ022038R5500	Wash down tube kit for use with 1200mm Focus II Safety Light Grids.
WET-MF-T FII	2TLJ022038R5700	Wash down tube kit for use with 500mm Focus II Safety Light Transceivers.
WET-MF-L FII	2TLJ022038R5600	Wash down tube kit for use with 500mm Focus II Safety Light Transceivers.

Component List - Spot Light Beams

Designation	Ordering Information	Description
Spot 10T/R	2TLJ020009R0600	Safety light beam with 10m range, 24VDC supply, multi-function status indicator LEDs, integrated information output 24VDC - 10mA on receiver, IP67 protection class, M18 barrel style steel housing, 5 pole M12 male quick disconnect. Requires Vital 1 controller/Pluto to function. Provides safety category level 4 according to EN954-1 with Vital 1 controller/Pluto. Maximum of 6 light beam pairs connected to one controller possible while maintaining category 4 level of safety.
Spot 35T/R	2TLJ020009R0500	Safety light beam with 35m range, 24VDC supply, multi-function status indicator LEDs, integrated information output 24VDC - 10mA on receiver, IP67 protection class, plastic housing, 5 pole M12 male quick disconnect. Requires Vital 1 controller/Pluto to function. Provides safety category level 4 according to EN954-1 with Vital 1 controller/Pluto. Maximum of 6 light beam pairs connected to one controller possible while maintaining category 4 level of safety. 2 pieces of JSM 63 brackets are included.
JSRL2	2TLJ020008R0100	Laser alignment aid for SPOT 35 single beams. Secured by an adjustable elastic fabric band around the sensing unit. Housed in the SPOT housing with 4 pole M12 connector for power connection via existing SPOT cable.

Component List - Focus Quick Connections

Designation	Ordering Information	Description
TINA 10A	2TLJ020054R1200	Tina dynamic adapter with 5 pole M12 male quick disconnect for connecting transistor output safety devices to the Vital 1 controller. 8 pole M12 female quick disconnect for direct connection to the safety device or safety device enclosure, 24VDC supply, multi-function status indicator LEDs, integrated information output 24VDC - 10mA.
TINA 10B	2TLJ020054R1300	Tina dynamic adapter with 5 pole M12 male quick disconnect for connecting transistor output safety devices to the Vital 1 controller. 8 pole M12 female quick disconnect for direct connection to the safety device or safety device enclosure. Additional 5 pole M12 connector for local reset capabilities, 24VDC supply, multi-function status indicator LEDs, integrated information output 24VDC - 10mA.
TINA 10C	2TLJ020054R1600	Tina dynamic adapter with 5 pole M12 male quick disconnect for connecting transistor output safety devices to the Vital 1 controller. 8 pole M12 female quick disconnect for direct connection to the safety device or safety device enclosure. Additional 5 pole M12 connector for connection of light curtain transmitter, 24VDC supply, multi-function status indicator LEDs, integrated information output 24VDC - 10mA.
FMC-1	2TLA022042R0000	Focus Muting Connector, connects from the Focus receiver. 4 M12, 5 pin female connections for 2 muting sensors, muting lamp and reset push button. M12, 8 pin male connector for machine interface.
FMC-1 Tina	2TLA022045R0000	Focus Muting Connector, connects from the Focus receiver. 4 M12, 5 pin female connections for 2 muting sensors, muting lamp and reset push button. Integrated Vital Tina M12, 5 pin male connector for machine interface.
FMC-2	2TLA022042R1000	Focus Muting Connector, connects from the Focus receiver. 6 M12, 5 pin female connections for 4 muting sensors, muting lamp and reset push button. M12, 8 pin male connector for machine interface.
FMC-2 Tina	2TLA022046R0000	Focus Muting Connector, connects from the Focus receiver. 6 M12, 5 pin female connections for 4 muting sensors, muting lamp and reset push button. Integrated Vital Tina M12, 5 pin male connector for machine interface.
FMI-1A	2TLA022043R0000	Focus Muting Lamp, 24VDC, 5W integrated muting lamp in a protective Focus housing.
FMI-1B	2TLA022043R0100	Focus Muting Connector, integrated 24VDC, 5W muting lamp, reset push button and power interrupt in a protective Focus housing.
FMI-1C	2TLA022043R0200	Focus Muting Connector, integrated reset push button and power interrupt in a protective Focus housing.
FMI-1D	2TLA022043R0300	Focus Muting Connector, integrated reset push button and power interrupt in a protective Focus housing. Muting resistor included.
FMI-1E	2TLA022043R0400	Focus Muting Connector, integrated reset push button for pre-reset or Tina Duo 2 in a protective Focus housing.
FMI-1G	2TLA022043R0500	Focus Muting Initiator, Integrated reset push button in a protective Focus housing. Internal resistor for muting lamp.
JSSP-1	2TLA022070R0000	FMC empty port cover.
JSAP-1	2TLA022070R1000	FMC "R" port terminator with terminal jumpers and integrated muting resistor.
FRM-1A	2TLA022048R0000	Focus convertor from 2 transistor outputs to relay outputs in a protective Focus housing. M12, 8 pole male/female connectors for integration between Focus and the control circuit.

Component List - Focus Quick Connections (continued)

Designation	Ordering Information	Description
M12-3A	2TLA020055R0000	M12 Y Connector for series connection. 2 M12 5 pole female connectors and 1 M12 5 pole male connector.
M12-3B	2TLA020055R0100	M12 Y Connector for parallel connection. 2 M12 5 pole female connectors and 1 M12 5 pole male connector.
M12-3D	2TLA020055R0300	M12 Y Connector, parallel Connection. 1 M12 8 pole female connector for connection of the Focus Receiver, 1 M12 5 Pole female connector for connection of the Focus Transmitter and 1 M12 8 pole male connector for panel connection.
BP1	2TLJ022090R2300	Focus FB version external teach box for inline connection to the Focus receiver for single push button teaching of fixed/floating blanking.

Component List - Muting Sensors and Indicators

Designation	Ordering Information	Description
FSTR1 - Mute R	2TLA022044R0000	Retro-reflective muting sensor with polarized filter. 24VDC 18mm barrel style with range adjustments from 0.15 to 5m, light reserve warning indicator, 1000Hz switching frequency and M12 4 pole male connector.
FZR 1	2TLA022044R0100	Polarized 80mm circular reflector for use with the FSTR1 muting sensors. Offers a range of 0.15 to 2.5m. 5mm center mount through hole for mounting capabilities.
FZR 2	2TLA022044R0400	Polarized 100mm x 100mm reflector for use with the FSTR1 muting sensors. Offers a range of 0.15 to 5m.
Muting Sensor Mute D	2TLJ022044R1000	Muting sensor, diffuse-reflective with back ground suppression. 24VDC, 2 pnp light, dark switching, M12 4 pin connector in a IP67 housing.
JSM63	2TLA040007R0100	Bracket for cubic style single beam. Fixed 90 degrees.
JSM64	2TLA040007R0200	Adjustable mounting bracket with rotational knuckle for 18mm barrel style sensors.
MF-T	2TLA022040R2000	Focus Muting Actuator 669mm overall length with 4 preadjusted and integrated muting sensors. Applicable for entry and exit of material through the Focus Light Curtain or Grid.
MFT-T	2TLA022040R2100	Focus transmitter bar with 669mm overall length with 4 preadjusted and integrated muting transmitting sensors. Applicable for entry and exit of material through the Focus Light Curtain or Grid. Must be used with the MFR-T receiving bar.
MFR-T	2TLA022040R2200	Focus receiver bar with 669mm overall length with 4 preadjusted and integrated muting receiver sensors. Applicable for entry and exit of material through the Focus Light Curtain or Grid. Must be used with the MFT-T transmitting bar.
MF-L	2TLA022040R3000	362mm overall length with 2 preadjusted and integrated muting sensors. Applicable for exit of material through the Focus Light Curtain or Grid.
MF-T Reflex	2TLA022040R4000	Focus Muting Actuator with 4 preadjusted and integrated, retro-reflective muting sensors and retro-reflective passive target. Applicable for entry and exit of material through the Focus Light Curtain or Grid with wiring only to one side.

Component List - Muting Sensors and Indicators (continued)

Designation	Ordering Information	Description
MFTR-T Reflex	2TLA022040R4100	Focus Muting Actuator with 4 preadjusted and integrated, retro-reflective muting sensors. Applicable for entry and exit of material through the Focus Light Curtain or Grid with wiring only to one side. Requires the M-T REFLEX passive target to operate.
M-T Reflex	2TLA022040R4200	Focus Muting Actuator, retro-reflective passive target. Applicable for entry and exit of material through the Focus Light Curtain or Grid with wiring only to one side. Requires the MFTR-T-REFLEX active sensor bar to operate.

Component List - Transmitter Cables

Designation	Ordering Information	Description
M12-C61	2TLA020056R0000	Cable single ended 6 meters black PVC jacket with straight 5 pole M12 female molded connector, 22AWG conductors, overall braid shield.
M12-C101	2TLA020056R1000	Cable single ended 10 meters black PVC jacket with straight 5 pole M12 female molded connector, 22AWG conductors, overall braid shield.
M12-C201	2TLA020056R1400	Cable single ended 20 meters black PVC jacket with straight 5 pole M12 female molded connector, 22AWG conductors, overall braid shield.

Component List - Transmitter Extension Cables

Designation	Ordering Information	Description
M12-C112	2TLA020056R2000	Extension cable, 1 meter, black PVC jacket with straight 5 pole M12 male/female connectors, 22AWG conductors, overall braid shield.
M12-C312	2TLA020056R2100	Extension cable, 3 meters, black PVC jacket with straight 5 pole M12 male/female connectors, 22AWG conductors, overall braid shield.
M12-C612	2TLA020056R2200	Extension cable, 6 meters, black PVC jacket with straight 5 pole M12 male/female connectors, 22AWG conductors, overall braid shield.
M12-C1012	2TLA020056R2300	Extension cable, 10 meters, black PVC jacket with straight 5 pole M12 male/female connectors, 22AWG conductors, overall braid shield.
M12-C2012	2TLA020056R2400	Extension cable, 20 meters, black PVC jacket with straight 5 pole M12 male/female connectors, 22AWG conductors, overall braid shield.
M12-C01	2TLA020055R1000	5 pole M12 female field retrofittable connector with screw terminals for connecting wires. Cable diameter range 2.5 - 6.5 mm.
M12-C02	2TLA020055R1100	5 pole M12 male field retrofittable connector with screw terminals for connecting wires. Cable diameter range 2.5 - 6.5 mm.
C5	2TLA020057R0000	5 conductors, 22AWG, black PVC jacket cable with overall braid shield. Per meter.

Component List - Receiver Cables

Designation	Ordering Information	Description
M12-C63	2TLA020056R3000	Cable single ended 6 meters black PVC jacket with straight 8 pole M12 female molded connector, 22AWG conductors, overall braid shield.
M12-C103	2TLA020056R4000	Cable single ended 10 meters black PVC jacket with straight 8 pole M12 female molded connector, 22AWG conductors, overall braid shield.
M12-C203	2TLA020056R4100	Cable single ended 20 meters black PVC jacket with straight 8 pole M12 female molded connector, 22AWG conductors, overall braid shield.

Component List - Receiver Extension Cables

Designation	Ordering Information	Description
M12-C134	2TLA020056R5000	Extension Cable, 1 meter, black PVC jacket with straight 8 pole M12 male/female connectors, 22AWG conductors, overall braid shield.
M12-C334	2TLA020056R5100	Extension Cable, 3 meter, black PVC jacket with straight 8 pole M12 male/female connectors, 22AWG conductors, overall braid shield.
M12-C03	2TLA020055R1600	8 pole M12 female field retrofittable connector with screw terminals for connecting wires. Cable diameter range 2.5 - 6.5 mm.
M12-C04	2TLA020055R1700	8 pole M12 male field retrofittable connector with screw terminals for connecting wires. Cable diameter range 2.5 - 6.5 mm.
C8	2TLA020057R1000	8 conductors, 22AWG, black PVC jacket cable with overall braid shield. Per meter.

Component List - FMC/FMI Connector Cables

Designation	Ordering Information	Description
M12-C62	2TLA020056R0200	Cable single ended 6 meters black PVC jacket with straight 5 pole M12 male molded connector, 22AWG conductors, overall braid shield.
M12-C102	2TLA020056R1200	Cable single ended 10 meters black PVC jacket with straight 5 pole M12 male molded connector, 22AWG conductors, overall braid shield.

Component List - Optional Interface Units

Designation	Ordering Information	Description
RT9-24VDC	2TLA010029R0000	Safety Relay with 2 safety outputs, 5 selectable input options (single or dual channel), automatic or manual supervised reset, test input for monitoring of external positive guided relays/contactors, 5 LED indicators, 1 dual purpose information output, quick release terminal blocks, 22.5mm wide, 24VDC supply. Meets safety category 1 to 4.
RT6-24VDC	2TLA010026R0000	Safety Relay with 3 safety outputs, 5 selectable input options (single or dual channel), automatic or manual supervised reset, test input for monitoring of external positive guided relays/contactors, 5 LED indicators, 1 NC information output and 2 potential free transistor information outputs, quick release terminal blocks, 45mm wide, 24VDC supply. Meets safety category 1 to 4.

Component List - Optional Interface Units (continued)

Designation	Ordering Information	Description
RT6-115VAC	2TLA010026R0400	Safety Relay with 3 safety outputs, 5 selectable input options (single or dual channel), automatic or manual supervised reset, test input for monitoring of external positive guided relays/contactors, 5 LED indicators, 1 NC information output and 2 potential free transistor information outputs, quick release terminal blocks, 45mm wide, 115VAC supply. Meets safety category 1 to 4.
VITAL 1	2TLJ020052R1000	Safety Controller with 2 safety outputs, uses unique dynamic signal technology, automatic or manual supervised reset, test input for monitoring of external positive guided relays/contactors, 5 LED indicators, 1 dual purpose information output, quick release terminal blocks, 22.5mm wide, 24VDC supply. Meets safety category 4, dynamic self test.
PLUTO		See Pluto Safety PLC section for proper product selection.

Focus II Ordering Data

Safety Light Curtains

To create a complete Focus II Safety Light Curtain Part Number, simply fill in the fields below.

FII-4- -
(A) (B)

A This letter represents the effective resolution of the Focus II Safety Light Curtain.

14	14mm (0.55") resolution for Finger Detection
30	30mm (1.18") resolution for Hand Detection

B This letter represents the protective height of the Focus II Safety Light Curtain.

150	150mm (5.91")	1350	1350mm (53.15")
300	300mm (11.81")	1500	1500mm (59.06")
450	450mm (17.72")	1650	1650mm (64.96")
600	600mm (23.62")	1800	1800mm (70.87")
750	750mm (29.53")	1950	1950mm (76.77")
900	900mm (35.43")	2100	2100mm (82.68")
1050	1050mm (41.34")	2250	2250mm (88.58")
1200	1200mm (47.24")	2400	2400mm (94.49")

Safety Light Grids

To create a complete Focus II Safety Light Grid Part Number, simply fill in the fields below.

FII-4-K-
(A)

A This letter represents the protective height of the Focus II Safety Light Grid.

4-900	4 beams spaced 300mm (11.81") apart with 900mm (35.43") protective height
4-1200	4 beams spaced 400mm (15.75") apart with 1200mm (47.24") protective height
3-800	3 beams spaced 400mm (15.75") apart with 800mm (31.50") protective height
2-500	2 beams spaced 500mm (19.69") apart with 500m (19.69") protective height

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