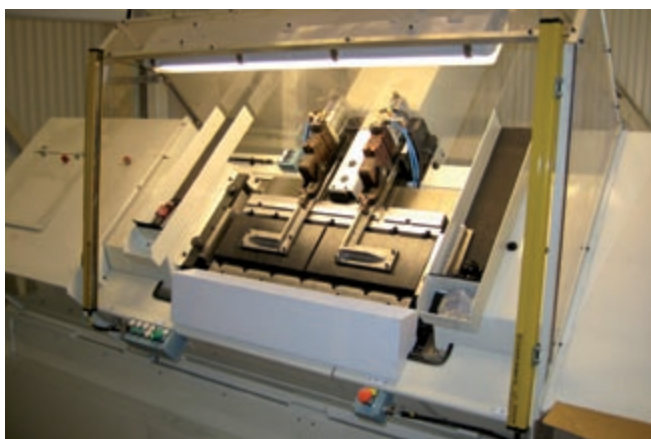


# Light curtains, Light grids, Light beams and Scanner



<b>Contents</b>	<b>Page</b>
<i>Why use light beams/light curtains?</i> _____	<b>7:2</b>
<i>Reset – 3 alternatives</i> _____	<b>7:4</b>
<i>Muting and blanking</i> _____	<b>7:5</b>
<i>Light curtain for short safety distance</i> _____	<b>7:6</b>
<i>Cycle initiation with light curtain</i> _____	<b>7:7</b>
<i>Safety distance</i> _____	<b>7:8</b>
<i>Focus II</i> _____	<b>7:10</b>
<i>Muting (bypassing) - Focus II</i> _____	<b>7:15</b>
<i>Muting sensors – Mute R</i> _____	<b>7:19</b>
<i>Muting sensors – Mute D</i> _____	<b>7:20</b>
<i>Bjorn</i> _____	<b>7:22</b>
<i>Focus Wet</i> _____	<b>7:24</b>
<i>Blanking programming – BP 1</i> _____	<b>7:25</b>
<i>Laser aligner JSRL-3</i> _____	<b>7:26</b>
<i>Connection examples Focus II</i> _____	<b>7:27</b>
<i>Safety Light Beam Spot</i> _____	<b>7:34</b>
<i>Laser scanner Look</i> _____	<b>7:38</b>

Descriptions and examples in this book show how the products work and can be used. This does not mean that they can meet the requirements for all types of machines and processes. The purchaser/user is responsible for ensuring that the product is installed and used in accordance with the applicable regulations and standards. We reserve the right to make changes in products and product sheets without previous notice. For the latest updates, refer to [www.jokabsafety.com](http://www.jokabsafety.com). 2011.

# Why use light grids and light curtains?

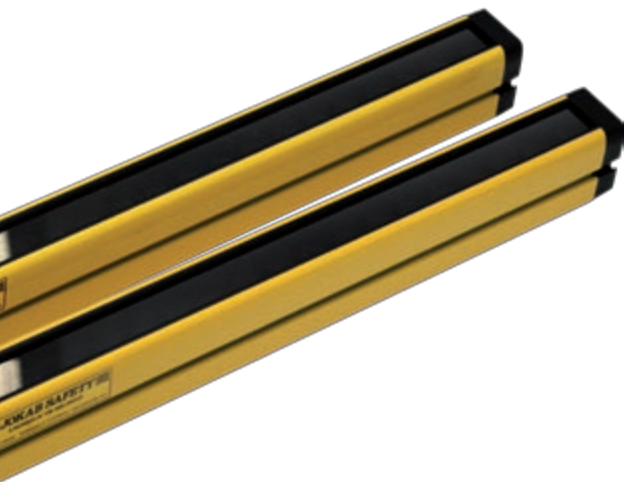
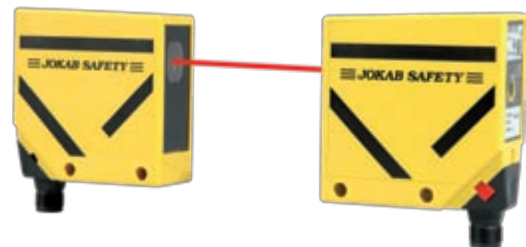
**Light beams and light curtains are a production friendly safety component that do not physically impact on the actions of the machine operator. Light barrier protection is also a good safety component for use when goods are to be passed in and out of a risk area.**

## How does a light beam/light curtain work?

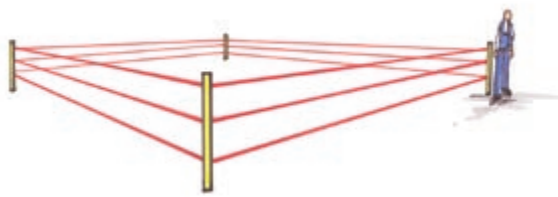
Both light grids and light curtains utilise optical transmitter and receiver units. From the transmitters beams of infrared light are sent to the receiver. When a light beam is interrupted a dual stop signal is given to the dangerous machines inside the light beam/curtain protected area.

## What is the difference between a light curtain and a light beam?

A light curtain has several beams that are placed closely together whereas 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. Then the resolution is 14 mm. Light curtain beams are at their widest spacing when used for thigh detection (90mm resolution). For light grids the beams are normally placed at a relative distance of 300 to 500 mm. The choice between light grid or light curtain 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 distances, up to 50 m, and for a low price.



## Light grids for long distances



## Light grids with monitored by-passing during material transport



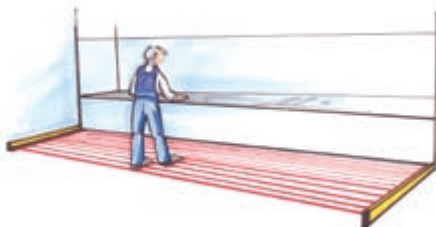
## Light curtain for short safety distances



## Light curtain to protect during cycle initiation



## Light curtain as area protection



## Light curtain for inner area limiting



## What safety requirements are there for a light protection 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 shall be detected by the outputs falling immediately or that they do not re-connect after being disconnected. Maximum allowed scattering angle for the light is  $\pm 2^\circ$ .

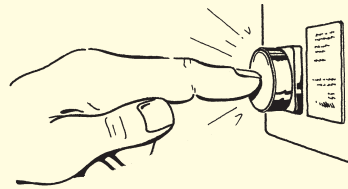
Type 2 states that a simple but monitored safety function is required, which means that the safety function shall be monitored through periodic tests which break the output when a fault occurs. Between the testing times there can be faults which result in the safety component malfunctioning. The test 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 beams 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 recognised institution is called for.

# Reset – 3 alternatives

## Supervised manual reset

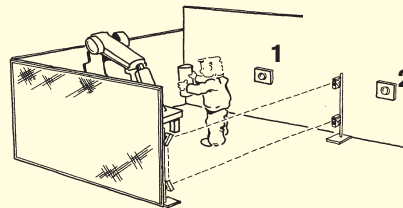
When a light beam/light curtain is interrupted it will give a stop signal to dangerous machines within the risk area it protects and a reset-lamp will be lit. For a new start of the machine the light beam/light curtain has to be reset. This is done with the reset button which is placed where it cannot 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 set the outputs are activated and the reset-lamp is turned off.



*Reset button with light indication.*

## Supervised time-reset

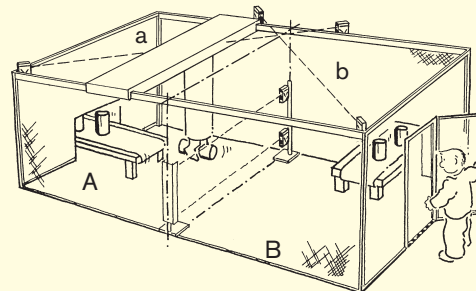
During time-reset unintentional reset is prevented when someone is inside the risk area. To reset the light beam (see figure) button 1 must first be pressed and afterwards button 2 within e.g. 5 seconds. This is especially important when one cannot see the entire area that is protected by the light beam.



*Button 1 is pressed and afterwards, within a chosen time e.g. 5 seconds, button 2 is pressed for resetting the light beam.*

## Automatic reset

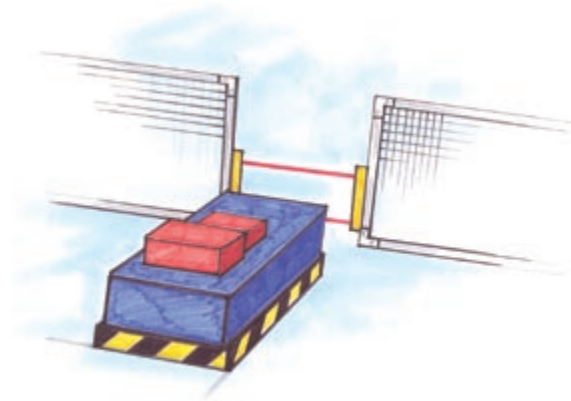
Automatic reset is used when the light beam is used for area monitoring. When the light beam is actuated this indicates that e.g. a robot is in the area. The robot is stopped if a person enters the same area e.g. through a gate. When the light beam is free again the control unit will be reset automatically.



*A light beam b indicates that the robot is situated in area A. In this position it is possible to walk in through the gate to area B without stopping the robot.*



# Muting (bypassing)



*Automatic bypassing of light beam when an auto industrial truck passes.*

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). If this is done with sensors, it is recommended they be of different kinds, because of the probability of them both malfunctioning for the same reason e.g. common mode failure. An example of a solution is to use a mechanical limit switch and a photo-cell sensor.

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

The number of variations in bypassing systems are almost infinite. This depending on the specific requirements of each plant/machine. For Focus there are a number of bypassing possibilities prepared.

---

## Blanking (fixed or floating)

Blanking, (fixed or floating,) means permanent switching off of a number of beams in the protected field of a light curtain. This is a function that is permitted and used when an object that is larger than the resolution of the light curtain is permanently located in the protected area, without breaking the safety outputs (OSSD). If the object is removed from the protected area, the safety outputs are broken.

"Fixed blanking" means that the area that is intentionally switched off does not change while the machinery is operating. Other protected areas remain unaffected, with unchanged resolution.

"Floating blanking" means that the area that is intentionally

switched off can be changed and follow the location of the object that is being moved around in the protected area while the machinery is operating. Other beams are active and providing normal protection, but often with reduced resolution.

When a "blanking" function is used, it is very important that the light curtain provides protection and can detect objects as small as a finger or hand, depending on the resolution, anywhere outside the area that is rendered inactive because the object is there.

It must not be possible to select the "blanking function" without using a key, tool or similar unlocking device.

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14

# Light curtain for short safety distance

A light curtain can be used in a machine or a production plant in the same way as a hatch. There is a great difference though when it comes to the risk situation. When one has a light curtain installed with a short safety distance in front of a dangerous machine, there is a high risk for spontaneous engagement into the machine, often called after-grasp. If the dangerous machine movement does not stop during such an engagement, one has a small chance of avoiding injury because one can reach the risk place within maybe 50 ms.

Therefore it is of great importance that the whole chain in the stopping circuit is fully dualled and supervised. Even valves and contactors which ultimately control dangerous movements normally have to be doubled up and supervised.

Regulations concerning safety distances are given in specific C-standards such as EN 692 for mechanical presses. If no specific C-standard is available, EN ISO 13855 is used.



*Hand resolution*

## 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 drive.

## Operator protection during manually serviced machines

With manually operated machines where one or more operators pick in and out parts 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.

## Light curtains on presses

Light curtains have traditionally been a common protection method among press applications and there has since long existed detailed information on the usage of light curtains on presses. (see next spread for presses)

## Safety level

Only light curtains of type 4 are accepted on presses.

## Reset

On the servicing side i.e. the side or sides where there is an operator that picks in and out parts, there shall be a separate reset function for the light curtain, usually a button. 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



*Finger resolution*

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 those sides which are not servicing sides, there shall be a reset button which always needs to be activated after an engagement.

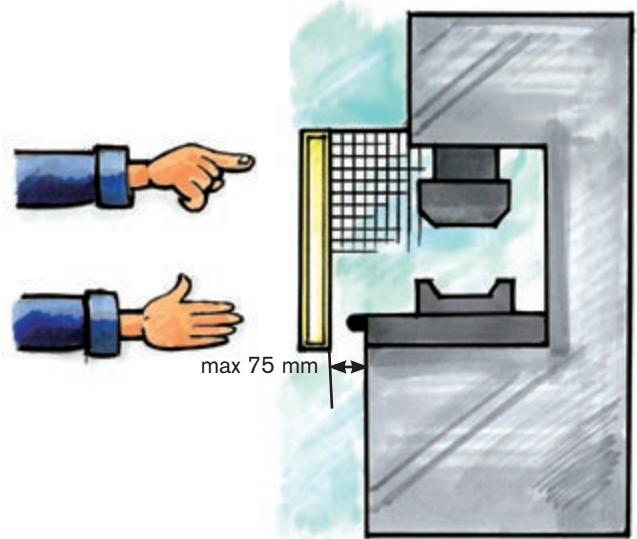
# Cycle initiation with light curtain

## 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 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.

## Installation – correct and incorrect during cycle initiation



**Correctly installed.**  
The operator cannot reach into the machine without actuating the light curtain.



**Incorrect installation.**  
Gap below the light curtain. The operator can reach into the machine without actuating the light curtain.



**Incorrect installation.** Gap above the light curtain. The operator can reach into the machine without actuating the light curtain.



**Correctly installed.**  
Light curtain complemented with a horizontal light curtain to detect the operator.



## Safety distance - light curtain according to EN ISO 13855

The safety distance 'S' is a minimum distance between a light curtain and a dangerous area. The safety distance 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 from EN ISO 13855 - Placement of safety devices with concern to the speed in which the body approaches the risk area.

$$S = (K \times T) + C$$

S = safety distance in mm

K = body/part of body (e.g. hand) speed in mm/s

T = T1 + T2

where

T1 = the safety device's reaction time in seconds

T2 = the machine's reaction time in seconds

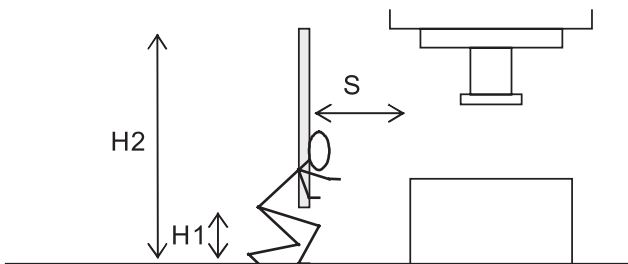
C = further distance in mm based upon the body's intrusion towards the risk area before the safety device has been actuated.



Resolution for finger  
(≤ 14 mm) gives C = 0

\* If it is possible to reach the hazard zone by reaching over the light beam, an addition is made to the formula. In table 1 in EN ISO 13855 an alternative safety distance addition (Cro) is given to the formula  $S = (K \times T) + C$ . The greatest value out of C and Cro is to be used to prevent reaching the hazard zone by reaching over the light curtain/light beam.

## Calculation of safety distances for vertical and horizontal installation according to EN ISO 13855



S = safety distance in mm

H1 = the lower beam may not be situated higher than 300 mm above the ground

H2 = the upper beam may not be situated lower than 900 mm above the ground

**The safety distance for vertical installation**  
For  $S \leq 500$  mm the safety distance is calculated with the following formula:

$$S = (2000 \times T) + 8 \times (d-14)$$

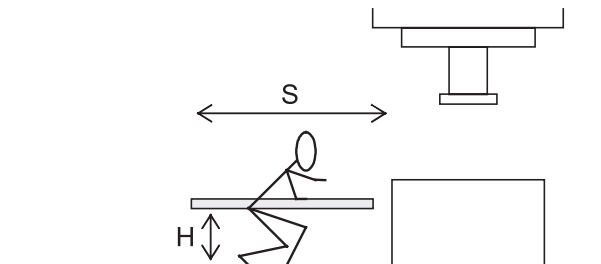
where d is the light curtain's resolution in mm.

K here is 2000 mm/s which represents the speed of the hand. The expression  $(8 \times (d-14))$  may never be less than 0. Minimum safety distance S is 100 mm.

**If the safety distance according to the formula above gets larger than 500 mm one can instead use:**

$$S = (1600 \times T) + 8 \times (d-14)$$

K is 1600 mm/s which represents the speed of the body. Minimum safety distance according to this formula is 500 mm.



S = safety distance in mm

H = the light curtain field must be positioned between 0 and 1000 mm above the floor

**The safety distance for horizontal installation is calculated with the following formula:**

$$S = (1600 \times T) + (1200 - 0,4 \times H)$$

where H is the safety field's height above the reference plane, e.g. the ground

$(1200 - 0,4 \times H)$  may not be less than 850 mm. Depending on the resolution, d, that the light curtain has, there is a minimum height that the safety field may be placed. This is calculated with:

$$H = 15 \times (d - 50).$$

H cannot be less than 0. With a resolution  $d=14$  or  $35$  mm one can therefore install the light curtain from  $H = 0$  and up. The higher it is situated, the shorter the safety distance gets. The highest permissible height H of the safety field is 1000 mm.

When you use a horizontal light curtain as entry protection, the depth of the light curtain should be at least 750 mm to prevent people from inadvertently stepping over it. The estimated safety distance is measured from the machine's hazardous section to the outermost beam of the horizontal light curtain (seen from the machine).

## Safety distance for light beams according to EN ISO 13855

For light beams the safety distance is calculated from the following:

$$S = (1600 \times T) + 850 \text{ mm}$$

The formula applies whether one installs 2,3 or 4 beams. It is the risk assessment that decides the number of beams that are to be chosen. The following possibilities must be considered.

- to crawl under the lowest beam;
- to reach over the top beam;
- to reach in between two beams;
- that the body passes in between two beams.

To fulfill the requirements the beams should be installed at the following heights:

Number of beams	Height over the reference plane, e.g. ground
4	300, 600, 900, 1200
3	300, 700, 1100
2	400, 900

## Safety distances for new and old presses

### New presses

For new CE-marked presses there are specific requirements from the standards **EN 692** Machine tools – Safety – Mechanical presses – Safety and **EN 693** Machine tools – Safety – Hydraulic presses.

The same requirements apply for vertical installation on presses as with vertical installation on other machines with the difference that C is given according to the following:

Resolution, d, (mm)	Safety distance addition, C (mm)	Cycle initiation
≤ 14	0	Permitted
>14 - 20	80	
>20 - 30	130	
>30 - 40	240	Not permitted
>40	850	

### Other manually serviced machines

The rules for presses may well be applied to other machines which function in a similar way and that have the same risk situation. There is no other standard which is as detailed on the usage of light curtains.

For cycle initiation the light curtains resolution, d, must be ≤ 30 mm. This applies to both old and new (CE-marked) presses.

### Old presses

N.B. For old presses there are different rules for each country.

The formula that applies here is:

$$S = 2500 \times T + C$$

The safety distance addition C for different resolutions of the light curtain is given in the following table

Resolution, d, (mm)	Safety distance addition, C (mm)
<16	0
16	70
20	110
25	130
30	140
35	240
40	270
45	300
50	330
55	360
>55	850

# Safety Light Grids and Safety Light Curtains

## Focus II



### A light grid/light curtain with many possibilities

Focus II is a new version of our previous light beam/light curtain Focus. Features such as muting and override are standard in all Focus II light curtains and light beams. For light curtains, blanking and break functions are also standard. The optical sensors on Focus II also have variable frequency. The Focus II units are light grids/curtains 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 2 (Focus 2 series) and type 4 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 connec-

tion 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

### Approvals:



### Application:

Optical protection in an opening or around a risk area

### Features:

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

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

It is also possible to obtain the Focus II light grids/curtains with either "floating blanking or fixed blanking". 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.

### 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 relay e.g. RT9, Pluto PLC or the FRM-1 unit (converts the outputs to relay contacts) from ABB Jokab Safety. The FMC-Tina and Tina 10A/10B 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

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 beams and light curtains an EDM function is available which allows Focus II to test if the external 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.

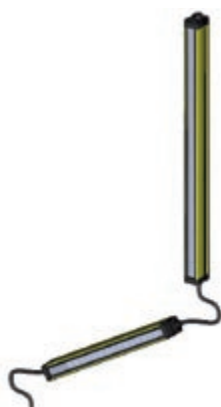
## Focus II light curtain

### 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.



## Focus II ljusbom

### Standard:

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

### Option:

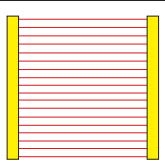
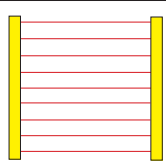
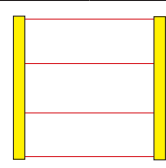
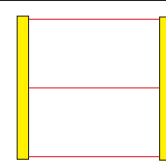
- Light grids for tough environments with parallel beams of light for improved reliability.



With the switches at the bottom of Focus II you can choose the function you desire.



## Summary - Focus II light curtain/grid, Type 4 (FII-4)

				
Type 4	FII-4-14-zzzz	FII-4-30-zzzz	FII-4-K4-zzzz	FII-4-K3-800
<b>Resolution</b>	14	30	300   400	400
<b>Height (mm=zzzz)</b>	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
<b>Range (m)</b> SR LR	0,2-3 3-6	0,2-7 7-14	0,5-20 20-40	0,5-20 20-40
<b>Reaction time off (ms)</b>	12-68	9-31	13	13
<b>Reaction time on (ms)</b>	138-104	141-119	142	142
<b>Manual reset</b>	•	•	•	•
<b>Automatic reset</b>	•	•	•	•
<b>Pre reset</b>	•	•	•	•
<b>Muting inputs</b>	•	•	•	•
<b>Muting lamp supervision</b>	•	•	•	•
<b>Override</b>	•	•	•	•
<b>Muting T/L/X</b>	• / • / •	• / • / •	• / • / •	• / • / •
<b>Blanking 3 types</b>	• / • / •	• / • / •	- / - / -	- / - / -
<b>Single/Double break</b>	• / •	• / •	- / -	- / -
<b>EDM</b>	•	•	•	•
<b>Dyn. Adaption to Vital/Pluto</b>	☒	☒	☒	☒

• Standard      ☒ With Tina 10A/10B/10C or FMC-Tina

Note!

For ordering data and article number see the product list. For more information see the manual on our home page.

FII-4-K2-500	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		
500	300	400	400	500	300	400	800	500
500	900	1200	800	500	900	1200	800	500
0,5-20 20-40	0,5-20 20-40	0,5-20 20-40	0,5-20 20-40	0,5-7	0,5-8	0,5-12		
13	13	13	13	13	13	13		
142	142	142	142	142	142	142		
•	•	•	•	•	•	•		
•	•	•	•	•	•	•		
•	•	•	•	•	•	•		
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- / - / -	- / - / -	- / - / -	- / - / -	- / - / -	- / - / -	- / - / -		
- / -	- / -	- / -	- / -	- / -	- / -	- / -		
•	•	•	•	•	•	•		
α	α	α	α	α	α	α		

## Accessories

### Muting-unit for Focus

#### Standard:

Muting (bypassing) of light curtain or light grid in one or two directions(L-form, T-form). The unit is connected directly to the light curtain/grid via a M12-connection.



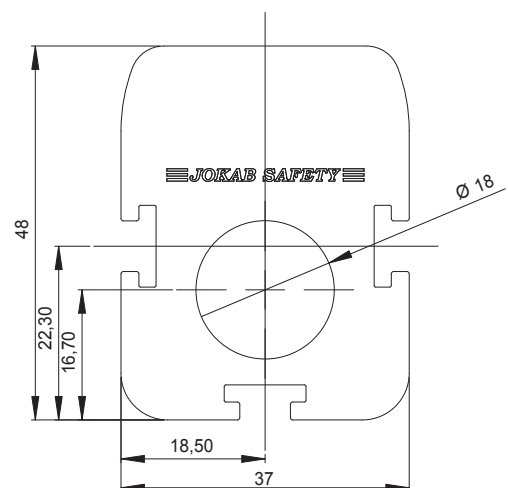
### FMC-Focus Muting Connector med M12-kontakt

#### Standard:

FMC is a small, optimised connection block with M12 inputs. FMC is used for M12-connection of muting sensors, muting lamp, pre-reset (for time reset), reset button with indication, override and safety outputs.



Technical data – Focus II	
<b>Manufacturer:</b>	ABB AB/Jokab Safety, Sweden
<b>Supply voltage:</b>	24VDC ±20%
<b>Power consumption:</b>	
Transmitter	70 mA maximum
Receiver	100 mA maximum
<b>Safety level</b>	
EN/IEC 61496	Type 4
EN 954-1	Focus II type 4: Category 4
EN ISO 13849-1	Focus II type 4: PL e
EN/IEC 61508	SIL 3
<b>PFH<sub>d</sub></b>	2,5x10 <sup>-9</sup>
<b>Resolution:</b>	14 mm and 30 mm
<b>Wavelength on transmitter LED:</b>	880 nm
<b>Profile dimensions:</b>	37 x 48 mm
<b>Protection class:</b>	IP65
<b>Operating temperature:</b>	-10 to +55° C
<b>Storage temperature:</b>	-25 to +70° C
<b>Outputs:</b>	2 supervised PNP outputs with cross circuit monitoring
<b>Max. load:</b>	500 mA (overload c.c. protection)
<b>Response time:</b>	9 – 68 ms (depending on model)
<b>Connection transmitter:</b>	M12 5-pin
<b>Connection receiver:</b>	M12 8-pin
<b>Indikering:</b>	Lysdioder på sändare och mottagare som indikerar injustering, smuts, matningsspänning och utgångar
<b>Enclosure:</b>	Aluminium painted yellow
<b>Conformity:</b>	2006/42/EG, EN/IEC 61496-1/2, EN 954-1, EN ISO 13849-1, EN/IEC 61508



# Muting (bypassing)

## - Focus II

Built-in muting for Focus is available in three ways:

- Pre-made muting units MFII-T and MFII-L, which have integral photo-cells. Units are manufactured with the same profile as Focus.
- Connection of muting sensors via a FMC.
- Separate connection of muting sensors (Mute R or Mute D) directly to the Focus receiver unit.

### Muting-lamp

In the Focus receiver unit it is also possible to directly connect a muting-lamp. It is also possible to connect the muting-lamp via a FMC. During bypassing the muting-lamp is lit. Bypassing is only possible if the muting-lamp is functioning.

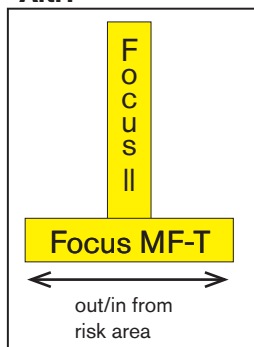
### Conditions for muting

- a) Muting input A must be actuated at least 30ms before muting input B for muting to be possible.
- b) Muting is activated as long as the conditions are fulfilled. See also requirements for muting in IEC/TS 62046 chapters 4.7.3 and 5.5.

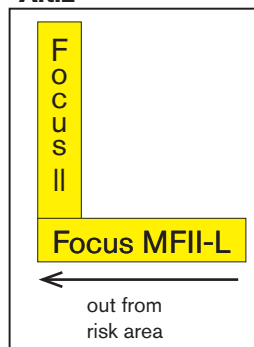
## Muting with MFII-T and MFII-L units

MFII-T and MFII-L are muting units with integrated photo cells in the same profile type as the Focus light grid/curtain. No additional sensors are required because the muting units contain the required components. MFII-T/MFII-L is connected directly to Focus with M12-connectors.

Alt.1



Alt.2



Alternative 3  
(Alternative 4)

### MFII-T (Diagram 1)

MFII-T contains four photo cells 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".

**NOTE.** All standard Focus light grids/curtains are delivered connected to function together with the MFII-T.

### MFII-L (Diagram 2)

MFII-L contains two photo cells A1 and B1 which are actuated before exiting through the light grid/curtain. The light grid/curtain being bypassed just prior to the exit of the material.

**NOTE.** Unit MFII-L is primarily intended for material transport "out" of a working area. The standard Focus light grid/curtain delivered does not function together with the MFII-L version. They need to be ordered separately together with the MFII-L unit.

### MFII-T Reflex (Alternative 3)

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 Alternative 1. This unit, together with light beam F4-K1C-500 provides electrical connections on only one side!

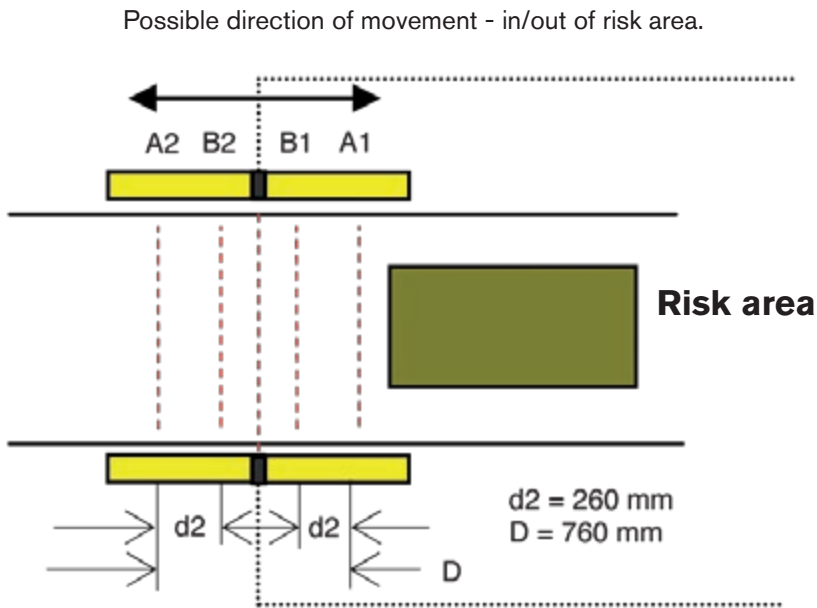
### MFII-L Reflex (Alternative 4)

Contains two 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 Alternative 2. This unit, together with light beam F4-K1C-500 provides electrical connections on only one side!



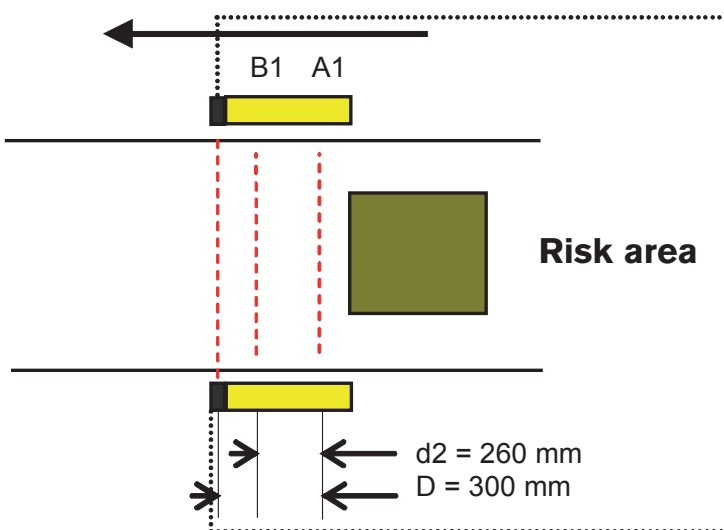
## Examples on how the muting sensors MFII-T and MFII-L can be placed

### A solution with Focus Muting unit MFII-T with integrated muting sensors.



### A solution with Focus Muting unit MFII-L with integrated muting sensors

This solution shall only be used for movement out from a risk 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 grid/curtain.  
d2: indicates the measurement between the two/four pre-assembled muting sensors within the MFII-L and MFII-T.

## Muting with FMC and FMI units

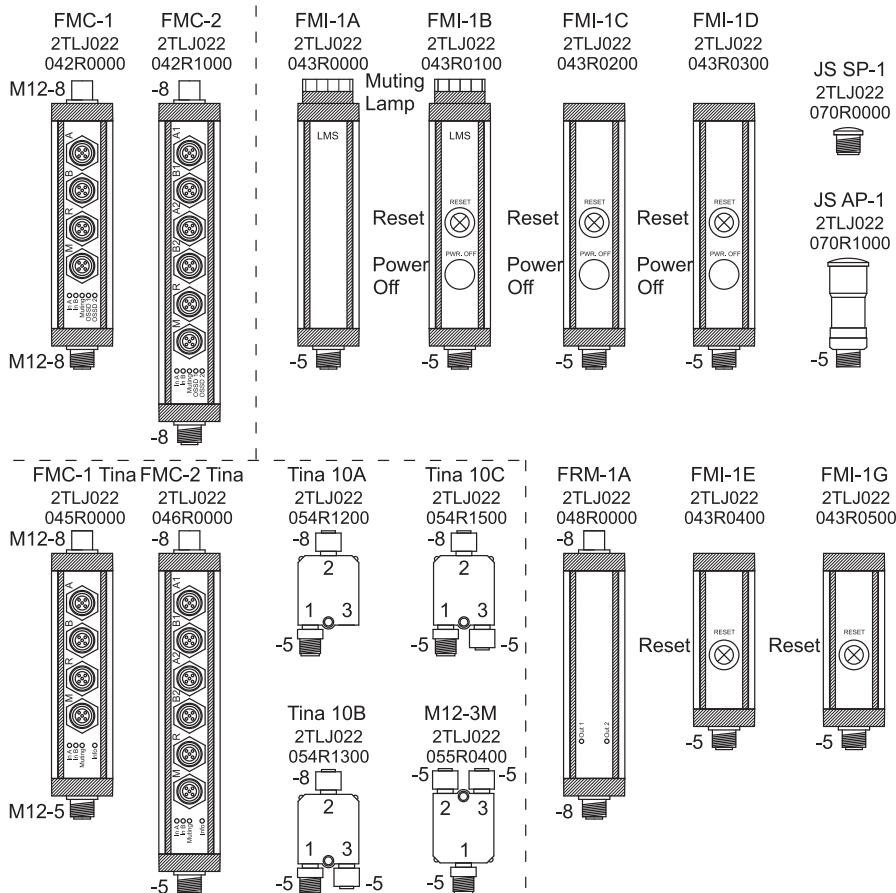


**The FMC Focus Muting Connector**, is a small, optimal unit which is used when the Focus light grid/curtain is required to be bypassed for in and out passage to and from a dangerous area. The FMC-unit is easily connected to Focus with a M12 connector.

**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

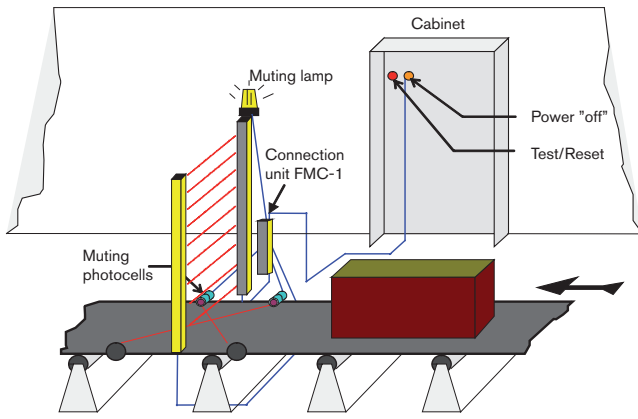
The Tina-versions have dynamic safety outputs for Vital/Pluto.



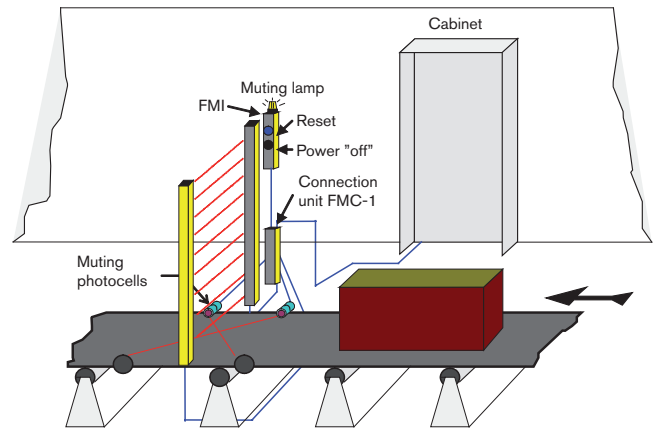
- FMC-1(2):** with connectors for muting sensors (A+B), reset, power off and muting lamp (R) and muting lamp (M).
- FMI-1A:** with muting lamp only.
- FMI-1B:** with reset, power off and muting lamp.
- FMI-1C:** with reset and power off.
- FMI-1D:** with reset, power off and internal resistor for the muting lamp.
- FMI-1E:** as pre reset connected to connector A (A2) on FMC-1(2) (Tina).
- FMI-1G:** with reset, and internal resistor for the muting lamp.
- FMC-1 (2)Tina:** same as FMC-1(2) but connected to Vital or Pluto.
- Tina 10A:** adaptor unit for connecting Focus to Vital or Pluto.
- Tina 10B:** simplified FMC-1(2) Tina including only the connector (R).
- Tina 10C:** simplified FMC-1(2) Tina including only power supply on con.no.3.
- M12-3M** bypass unit for easy connection outside the cabinet
- FRM-1A:** translates the two OSSD outputs to relay outputs (and power supply).
- JS SP-1:** protection plug for not used connectors.
- JS AP-1:** adaptor for FMC units to use instead of FMI-1B or -1D on the (R) connector including muting resistor.

## Connection of Focus and muting components with FMC-1 and FMI-1

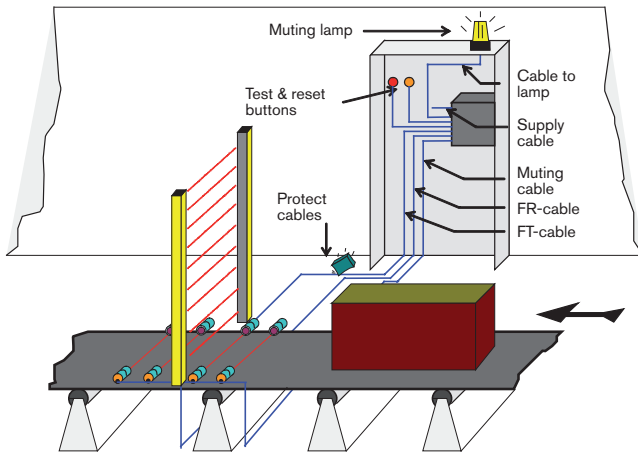
**Ex 1.** Connection of light curtain with connection block FMC-1, test/reset button and switch for supply voltage placed in (by) the control cabinet.



**Ex 2.** Connection of light curtain with connection block FMC-1. The Reset unit FMI must be placed out of reach from the risk area.



## Connection of Focus and muting components directly to the control cabinet

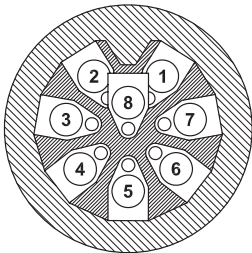


- The TEST /RESET button shall be placed so the operator can see the protected area during reset, testing, and bypassing. It should not be possible to reach the button from within the risk area.
- The LMS lamp for indication of muting and bypassing shall be placed so that it can be seen from all directions from where it is possible to access the dangerous area
- If photo cells are used as muting sensors then the sensor receivers should be assembled on the light curtain's transmitter side to minimise 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 minimised.

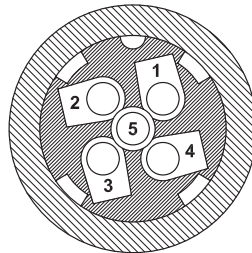
## M12-connection device with screw connectors

Female - Connector-view from cable side

M12-C03

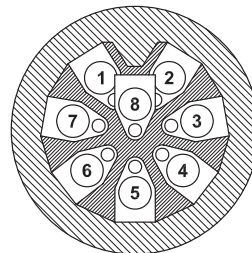


M12-C01

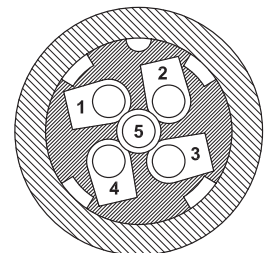


Male - Connector-view from cable side

M12-C04



M12-C02



# Muting sensors – Mute R

## Retro-reflective with polarizing filters



10...30 VDC  
PNP  
Dark-on output



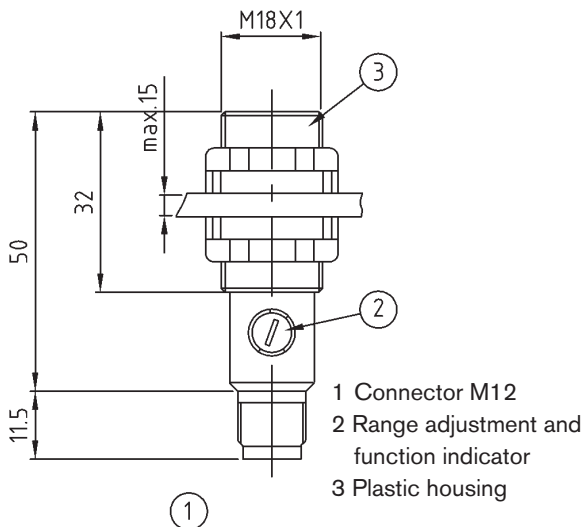
### Features:

- Range adjustable
- Light reserve warning indicator
- Transistor output, PNP
- 1000 Hz switching frequency
- Short-circuit protection, reverse polarity protection and power-up output suppression
- Connector M12
- EMC tested according to IEC 801 and EN50081-1/ EN 50082-2

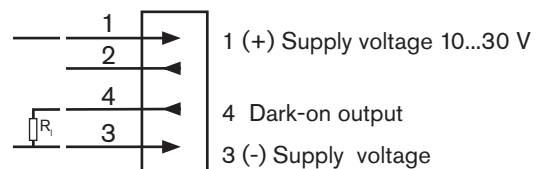
Technical data	
Manufacturer	ABB AB/Jokab Safety, Sweden
Article number/ordering data: Mute R (FSTR-1)	2TLJ022044R0000
Output	PNP, dark on
Connection	Connector M12
Range adjustment	Yes
Range	0.15... 2.5 m (with reflector FZR 1) 0.15...5m (with reflector FZR 2A)
Light source	Visible-red, 660 nm, pulsed with polarizing filter

Supply voltage	10...30 VDC
Allowable ripple	$\pm 10\%$ of $U_s$
Current consumption (without load)	< 15 mA
Max. load current	100 mA
Residual voltage	< 1,6 V
Max. switching frequency	1000 Hz
Protection class	IP67
Temperature (operating and storage)	-25 to +65° C
Weight	approx. 15 g

*All technical data at 25° C and 24V.*



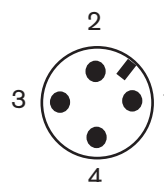
### PNP output



### Dark-on output

The output is activated when an object interrupts the light.

### Connector M12



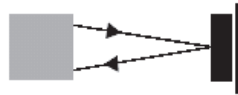


# Muting sensors – Mute D

## Diffuse-reflective with background rejection



light-on output  
dark-on output



### Features:

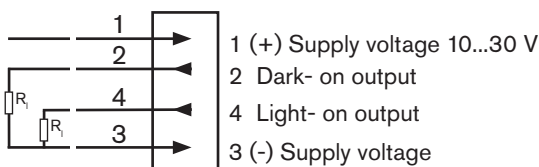
- Electronically adjustable background rejection
- Light reserve warning indicator
- Dual transistor outputs, PNP
- Short-circuit protection, reverse polarity protection and power-up output suppression
- Connector M12 rotatable
- EMC tested according to IEC 801 and EN50081-1/EN 50082-2

Technical data	
Manufacturer	ABB AB/Jokab Safety, Sweden
Article number/ordering data: Mute D (J SOGP800)	2TLJ022044R1000
Output	2 PNP (light- and dark-on)
Connection	Connector M12
Range adjustment	Yes
Range (depending on material)	0.2... 0.8 m
Light source	Infrared-LED, 880 nm, pulsed
Supply voltage	10...30 VDC

Allowable ripple	$\pm 10\%$ of $U_s$
Current consumption (without load)	<35 mA
Max. load current	200 mA
Residual voltage	<1,6 V
Max. switching frequency	200 Hz
Protection class	IP67
Operating temperature	25 to +65° C
Weight	approx. 130 g
<i>All technical data at 25° C and 24V.</i>	

- 1 Function indicator
- 2 Range adjustment
- 3 Glass covered optics
- 4 Center of the optical axis
- 5 Preferred detection direction
- 6 Bore for 5 mm self-tapping screw
- 7 Connector M12
- 8 Opening for M5 nut

### PNP output



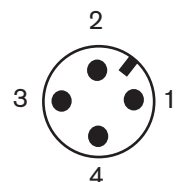
### Light-on output:

Output energized when object is present.

### Dark-on output:

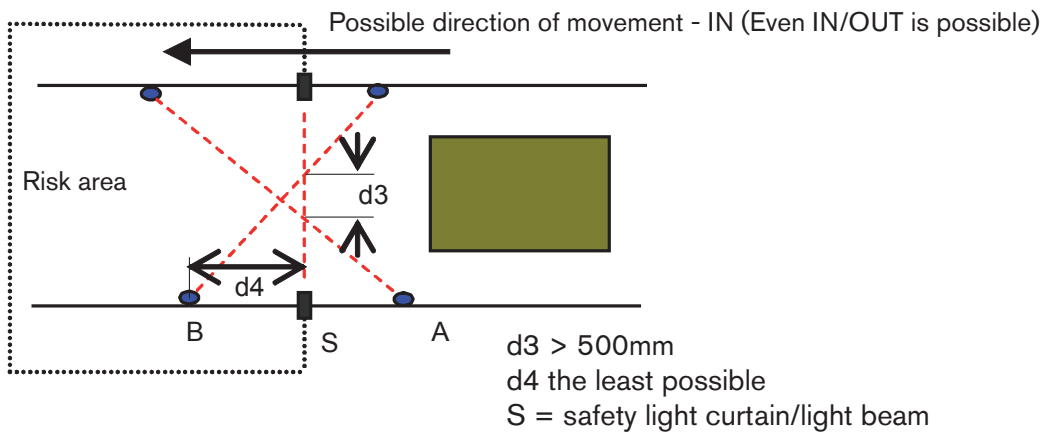
Output energized when no object is present.

### Connector M12

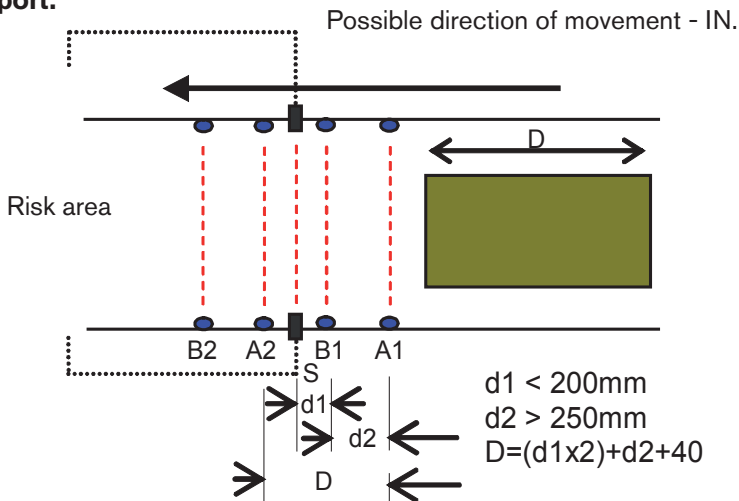


# Muting with Mute R and Mute D

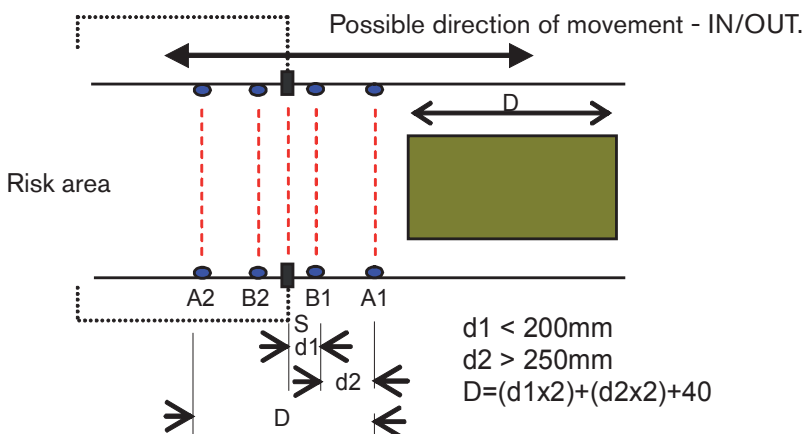
**A solution with two sensors (here photocells) and one (or two) movement directions for material transport:**



**A solution with four sensors and one movement direction for material transport:**



**A solution with four sensors and two movement directions for material transport:**



D: indicates the minimum length on the material that is to actuate the muting sensors that must be maintained during the passage through the light grid/curtain.

d1 must be as short as possible, and definitely less than 200 mm

d2: indicates the distance between A1 and B1

# Bjorn

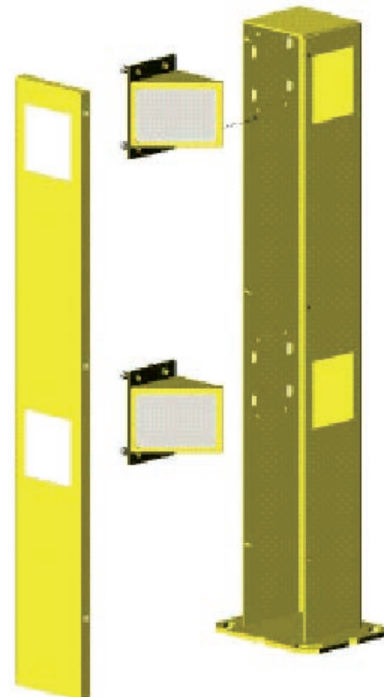
A strong support for light grids and mirrors

## Application:

Protects light curtain, light grids and mirror

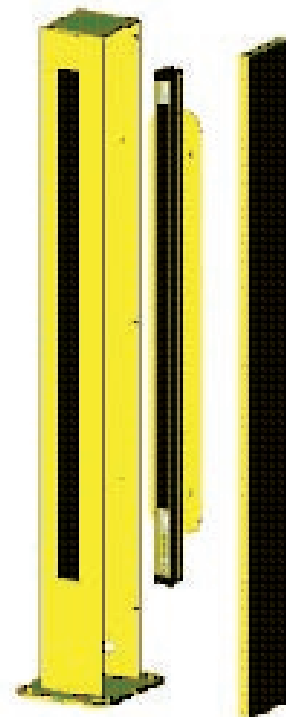
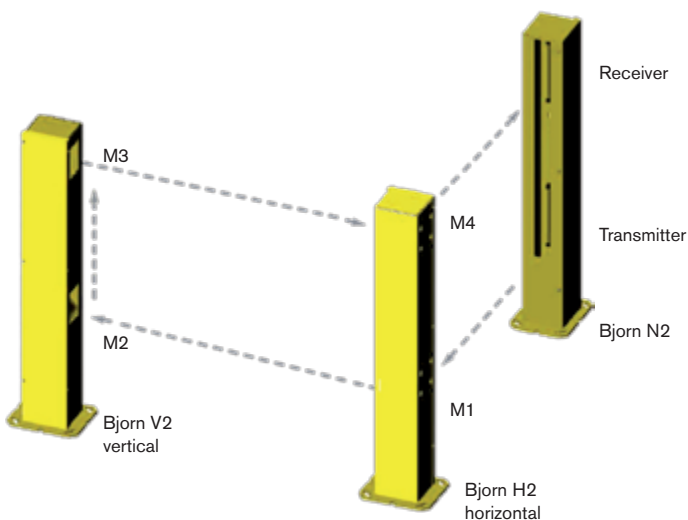
## Features:

Robust  
Adjustable



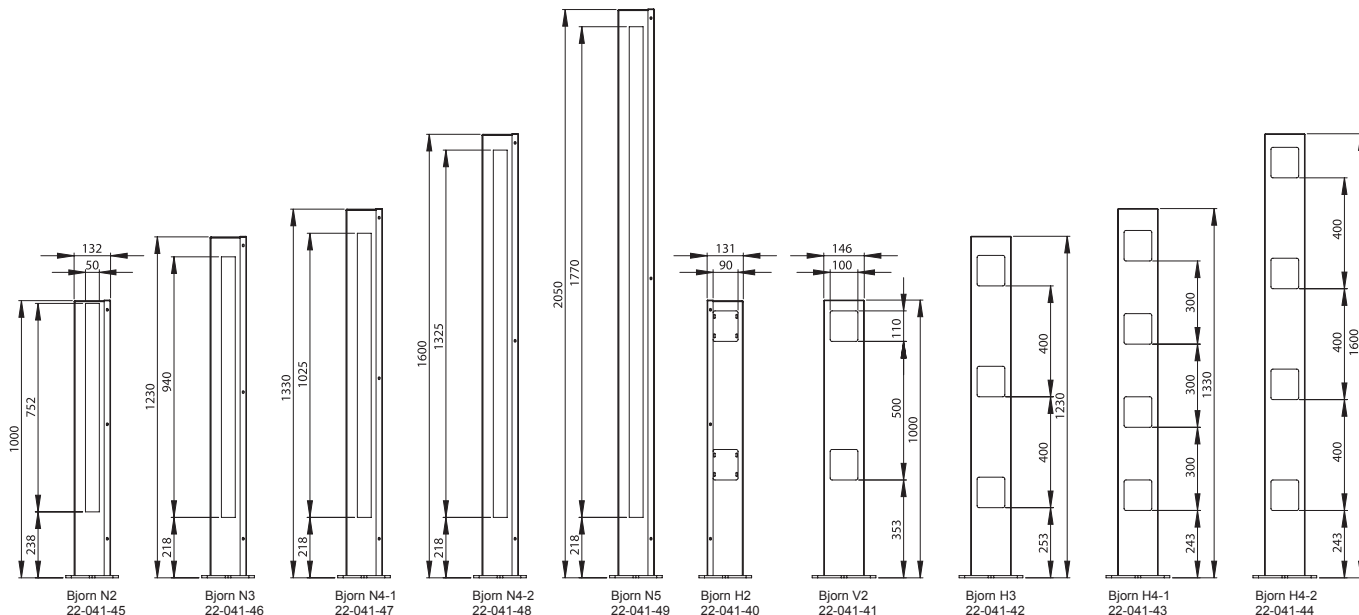
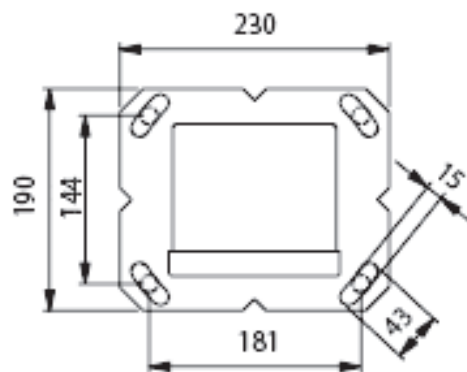
Bjorn is a very stable and flexible stand system in which Focus safety light beams and mirrors are mounted in the stand. The fixings for the mirrors in the stand can be turned to provide either vertical or horizontal angles. The robust material of the Bjorn protects Focus units from direct collisions, and thus prevents unnecessary material damage and halts in production.

Bjorn is available in stock as a standard version for dual safety light beams. Bjorn versions can also be ordered for Focus 3 and 4-beams.



## Technical data – Bjorn

<b>Manufacturer:</b>	ABB AB/Jokab Safety, Sweden
<b>Article number/ ordering data:</b>	Bjorn H2 2TLJ022041R4000 Bjorn V2 2TLJ022041R4100 Bjorn H3 2TLJ022041R4200 Bjorn H4-1 2TLJ022041R4300 Bjorn H4-2 2TLJ022041R4400 Bjorn N2 2TLJ022041R4500 Bjorn N3 2TLJ022041R4600 Bjorn N4-1 2TLJ022041R4700 Bjorn N4-2 2TLJ022041R4800 Bjorn N5 2TLJ022041R4900  H = Horizontal reflection V = Vertical reflection N = Floor stand for Focus
<b>Colour:</b>	Yellow powder-coated (RAL 1018)
<b>Material:</b>	3 mm steel
<b>Dimensions:</b>	Cross section 146 mm x 130 mm Foot 230 mm x 190 mm
<b>Weight:</b>	H2, V2 and N2 15 kg/piece H3 17 kg/piece H4-1, H4-2 20 kg/piece N5 27 kg/piece
<b>Mirror reduction:</b>	≤10 %





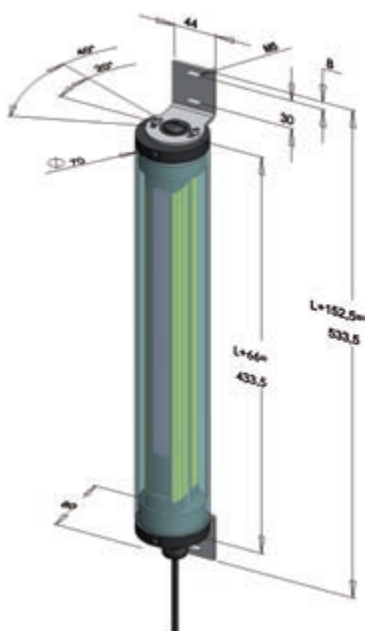
# Focus-Wet

– protection against water and dust for Focus light curtains and light beams



Wet is used for protection against water (or dust) where extreme washing conditions are encountered. The protective encapsulation rating (IP68) now enables Focus 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 light curtains or light beams, is pre-assembled complete with cabling, on request. During installation on a machine a Wet unit can be adjusted by  $\pm 20^\circ$  with the accompanying angle bracket. The plastic tube is rotatable and the outside is easy to clean.



## Application:

Protection in severe environments

## Features:

- Adjustable  $\pm 20^\circ$
- Rotatable and replaceable tube
- Capable of draining and through ventilation

## Technical data – Wet

<b>Manufacturer:</b>	ABB AB/Jokab Safety, Sweden
<b>Article number/ ordering data:</b>	
WET-150 FII	2TLJ022038R4000
WET-300 FII	2TLJ022038R4100
WET-450 FII	2TLJ022038R4200
WET-600 FII	2TLJ022038R4300
WET-750 FII	2TLJ022038R4400
WET-900 FII	2TLJ022038R4500
WET-1050 FII	2TLJ022038R4600
WET-1200 FII	2TLJ022038R4700
WET-1350 FII	2TLJ022038R4800
WET-1500 FII	2TLJ022038R4900
WET-1650 FII	2TLJ022038R5000
WET-1800 FII	2TLJ022038R5100
WET-K-500 FII	2TLJ022038R5200
WET-K-800 FII	2TLJ022038R5300
WET-K-900 FII	2TLJ022038R5400
WET-K-1200 FII	2TLJ022038R5500
WET-L FII	2TLJ022038R5600
WET-T FII	2TLJ022038R5700
<b>Colour:</b>	Transparent plastic
<b>Length including lid:</b>	light curtain/light beam + 66 mm
<b>Material:</b>	Tube Lid Angle bracket
	PC PEHD-300 Stainless steel
<b>Max. ambient temperature:</b>	+55°C
<b>Installation adjustment</b>	$\pm 20^\circ$
<b>Protection rating</b>	IP68 (IP69K)

# Blanking programmer BP1

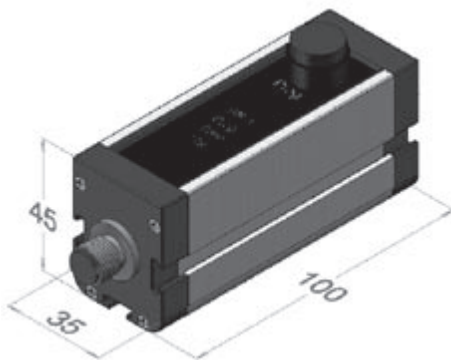
- a quick way to program  
blanking



Programming blanking is made easy by using the Blanking programmer BP1. The BP1 is easily connected between the receiver unit of the light curtain and the cable otherwise connected to the receiver. The blanking object is placed in the light curtain and the button on the BP1 is then pressed. 11 seconds later blanking is programmed for the object.

If the object needs to be changed a new programming is needed.

The unit can stay fitted during operation if required.



## Application:

Program blanking

## Features:

Easy to connect

Can stay fitted during  
operation

## Technical data – BP1

<b>Manufacturer:</b>	ABB AB/Jokab Safety, Sverige
<b>Article number/ ordering data:</b>	BP
	2TLJ022090R00
<b>Colour:</b>	yellow and black

# Laser aligner JSRL-3

## Application:

Alignment of light beams/ curtains



## Features:

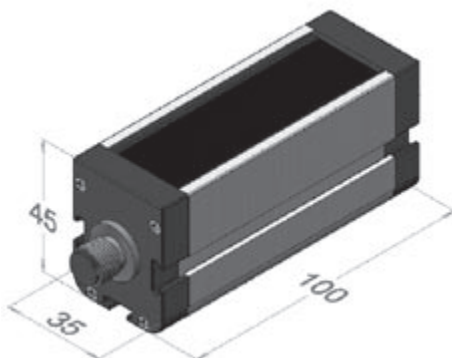
Facilitates alignment

When the solution involves one or more mirrors JSRL-3 facilitates alignment of light beams or light curtains. The JSRL-3 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.

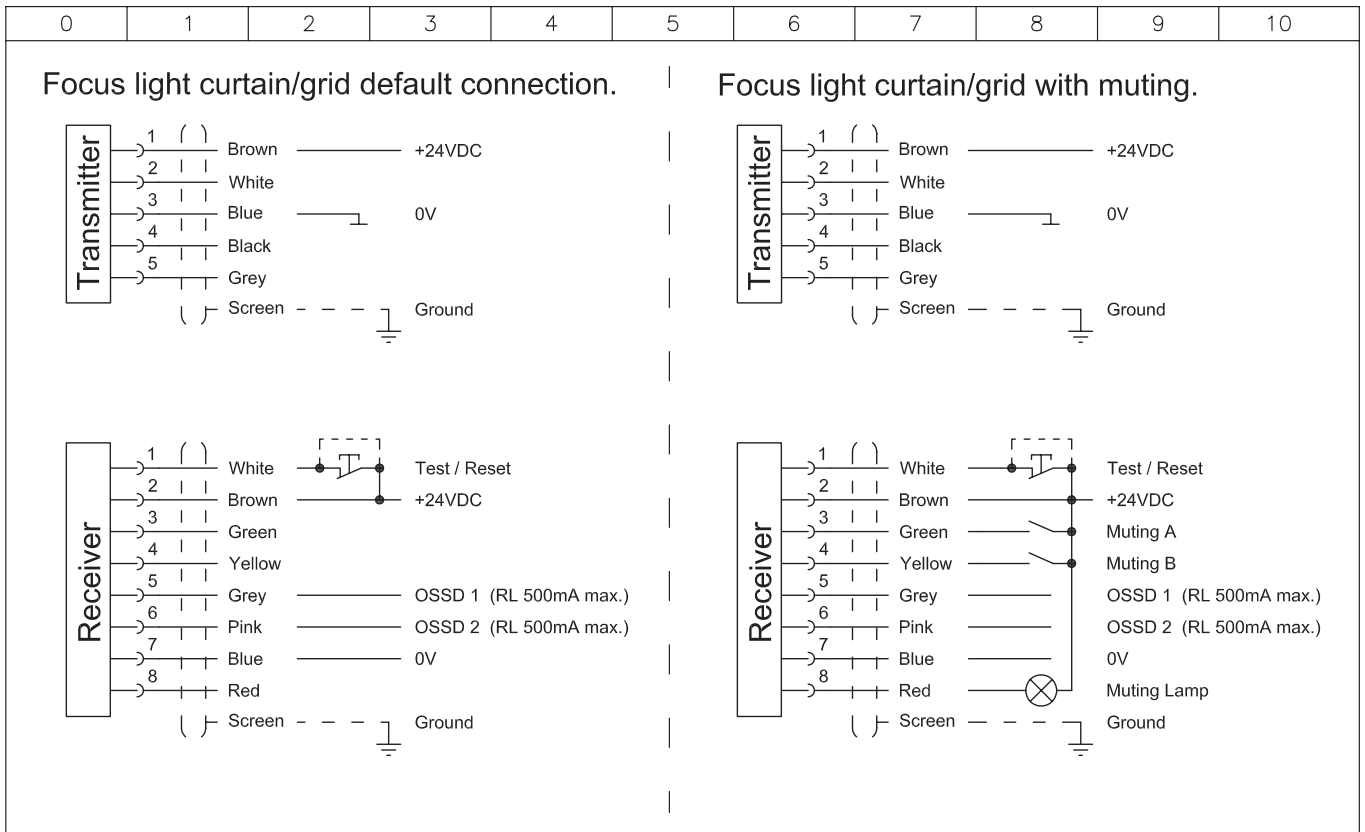
The JSRL-3 contains two type AAA batteries that are changed by unscrewing the bottom end cap.

## Technical data – JSRL-3

<b>Manufacturer:</b>	ABB AB/Jokab Safety, Sverige
<b>Article number/ ordering data:</b> JSRL-3	2TLJ020008R0200
<b>Colour:</b>	Gul och svart



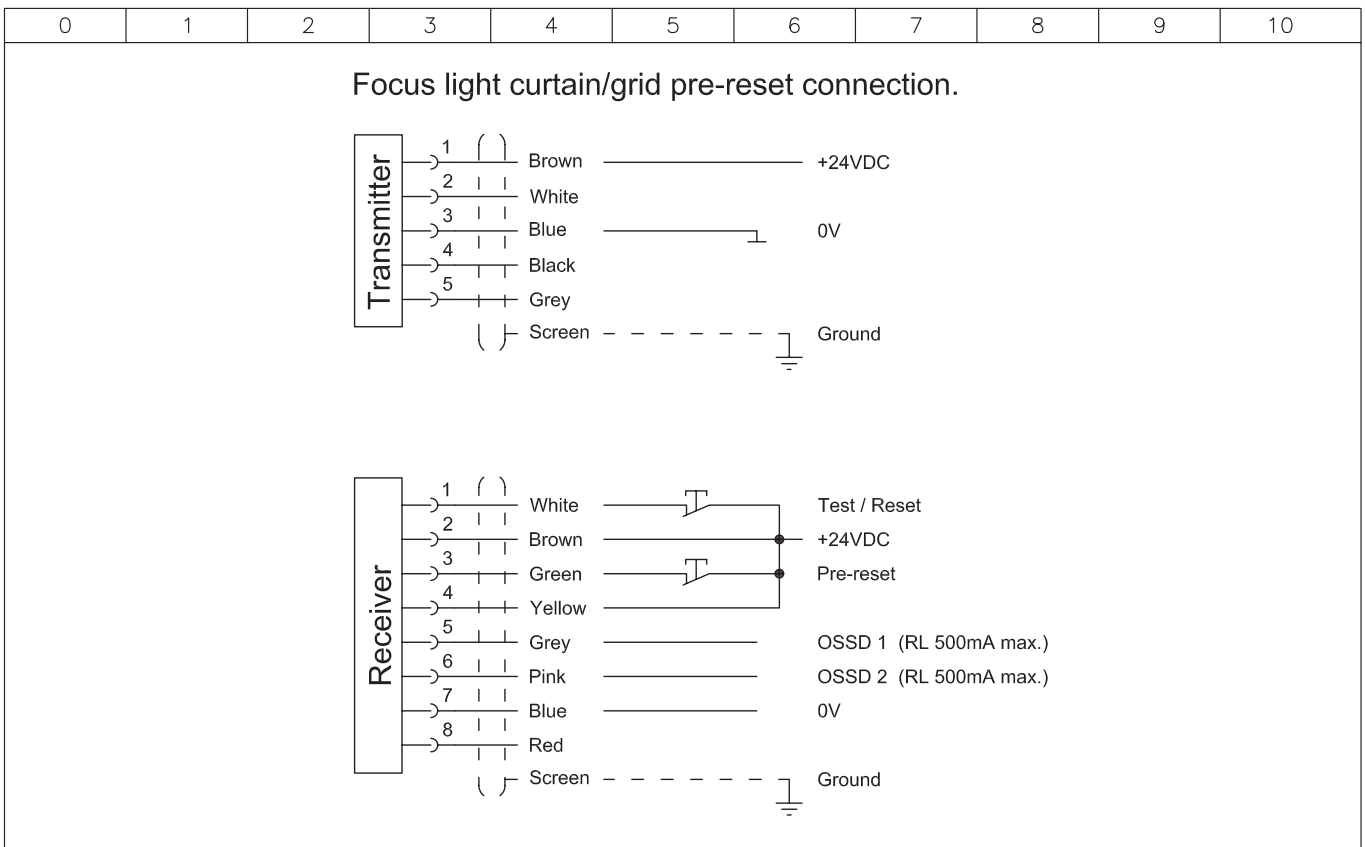
# HR7000C-01 Focus - Connection without and with muting function



Anmärkning Remark Focus Connection without and with muting function. Inkoppling utan och med muting funktion.	<b>JOKAB SAFETY</b> A MEMBER OF THE ABB GROUP	Konstr Design	Godk Appr	Datum Date	Blad Sheet
		JS		070411	
		Ritad Drawn	Sidor Pages	Ritn nr Drawing no	Forts Cont
		JS	1	HR7000C-01	

It is the user's responsibility to ensure that all control devices are correctly installed, cared for and operated to meet all applicable European, national and local codes/regulations. Specifications subject to change without notice.

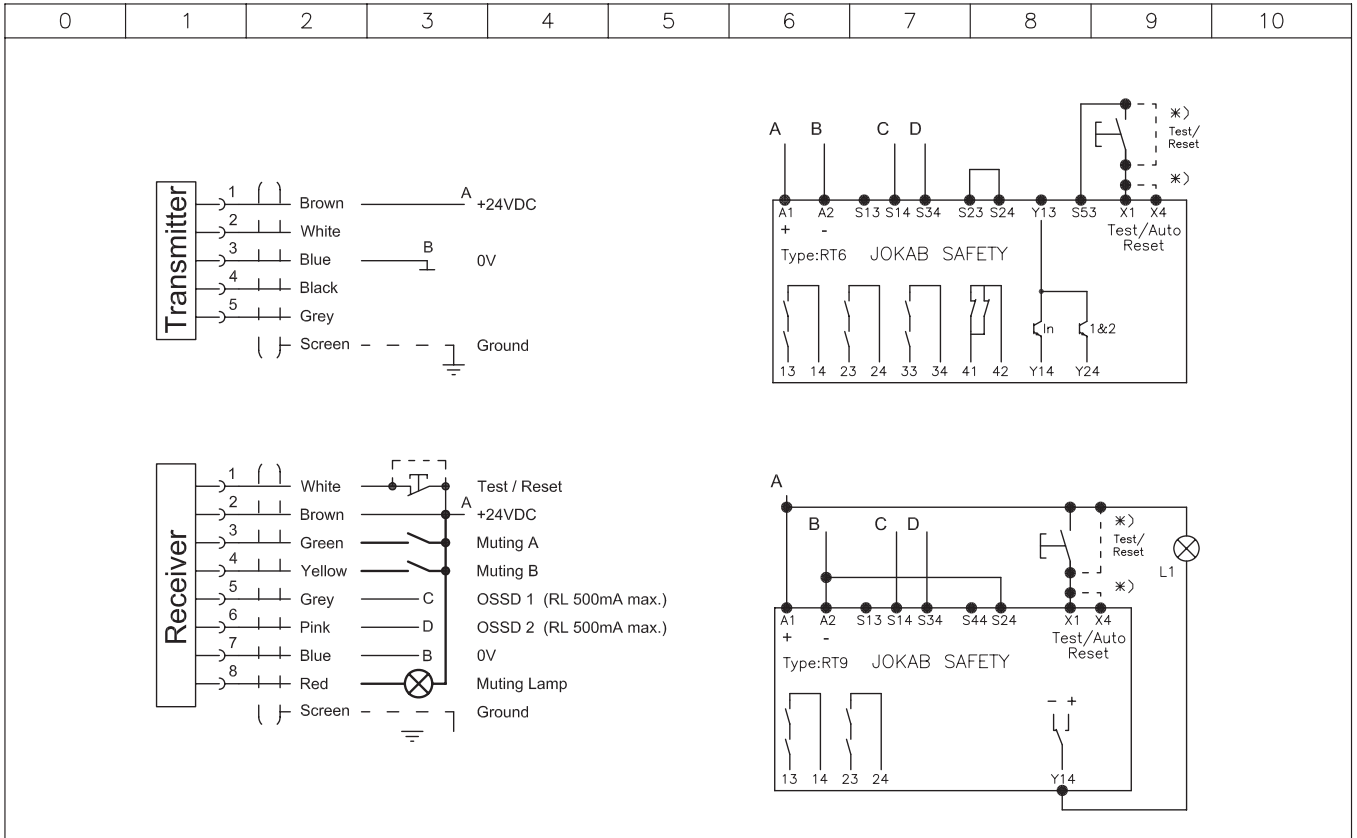
# HR7000E-01 Focus - Connection with pre-reset function



Anmärkning Remark Focus Connection with pre-reset function. Inkoppling med pre-reset funktion.	<b>JOKAB SAFETY</b> A MEMBER OF THE ABB GROUP	Konstr Design	Godk Appr	Datum Date	Blad Sheet
		JS		070411	
		Ritad Drawn	Sidor Pages	Ritn nr Drawing no	Forts Cont
		JS	1	HR7000E-01	

It is the user's responsibility to ensure that all control devices are correctly installed, cared for and operated to meet all applicable European, national and local codes/regulations. Specifications subject to change without notice.

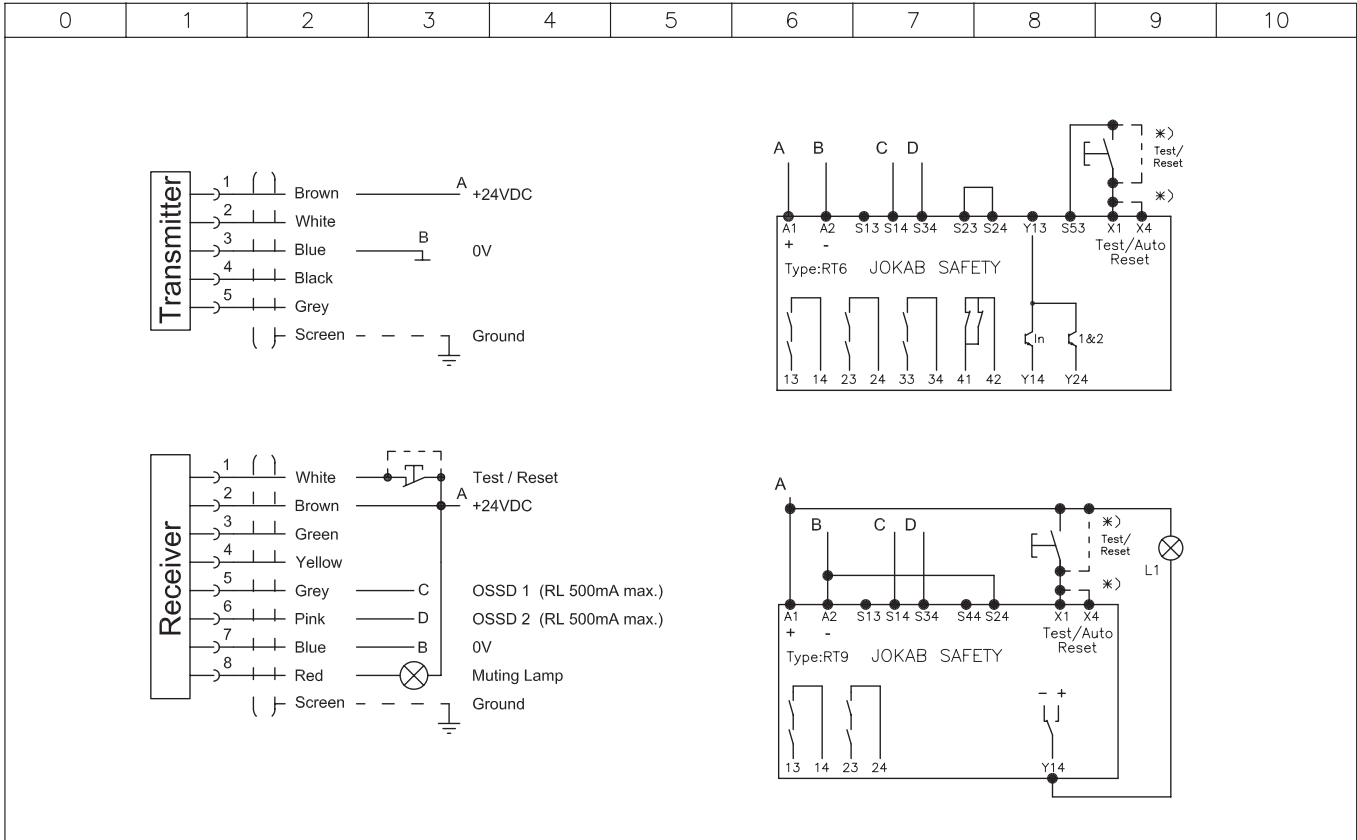
# HR7000F-01 Focus - Connection with muting to safety relay



Anmärkning Remark Focus Connection with muting to safety relay. Inkoppling med muting till säkerhetsrelä.	<b>JOKAB SAFETY</b> A MEMBER OF THE ABB GROUP	Konstr JS	Design JS	Godk JS	Appr JS	Datum 070411	Date 070411	Blad	Sheet
		Ritad JS	Drawn JS	Sidor 1	Pages 1	Ritn nr HR7000F-01	Drawing no HR7000F-01	Forts	Cont

It is the user's responsibility to ensure that all control devices are correctly installed, cared for and operated to meet all applicable European, national and local codes/regulations. Specifications subject to change without notice.

# HR7000G-01 Focus - Connection with MFII-T/MFII-L units

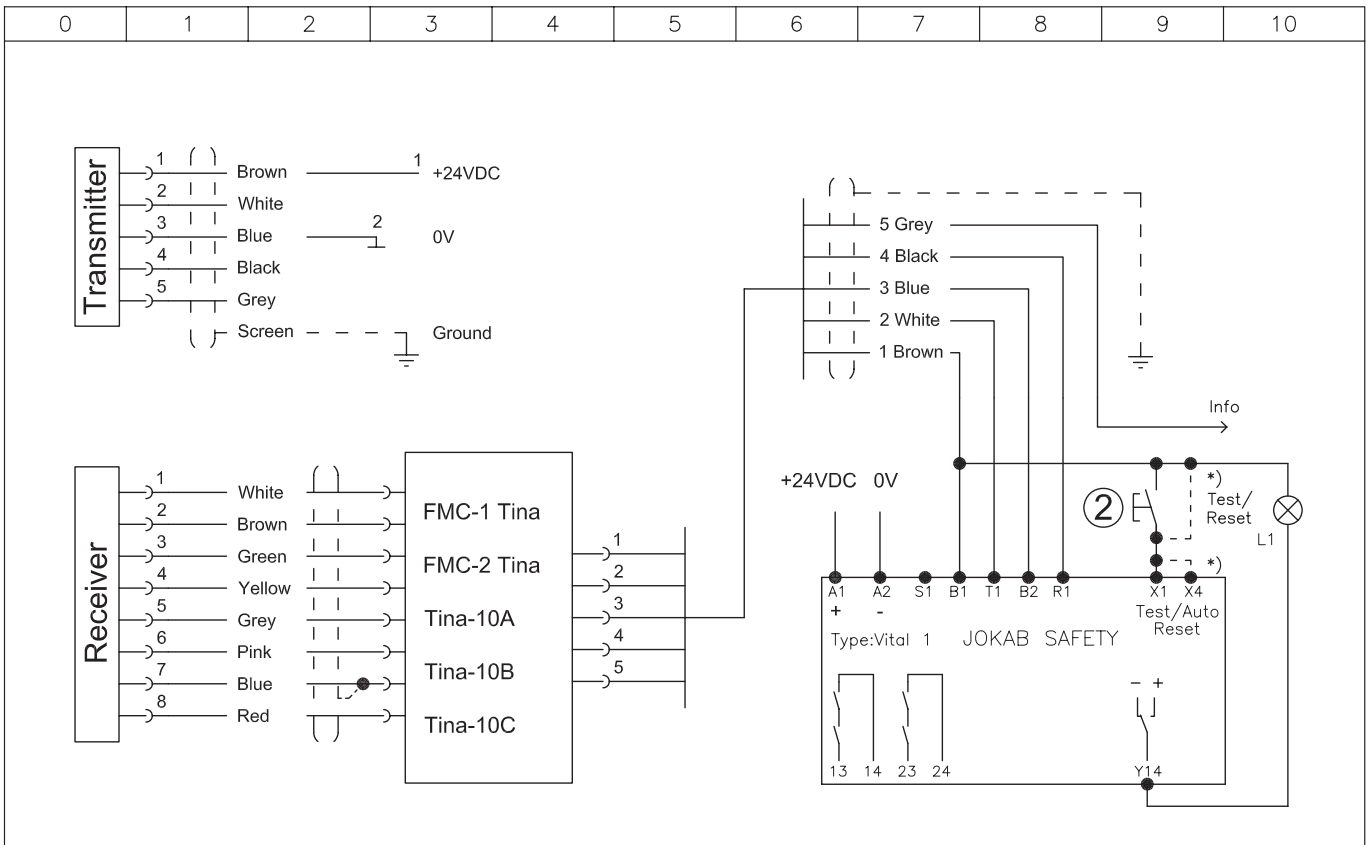


Anmärkning Remark Focus Connection with MF-T / MF-L units. Inkoppling med MF-T / MF-L enheter.	<b>JOKAB SAFETY</b> A MEMBER OF THE ABB GROUP	Konstr JS	Design JS	Godk JS	Appr JS	Datum 070411	Date 070411	Blad	Sheet
		Ritad JS	Drawn JS	Sidor 1	Pages 1	Ritn nr HR7000G-01	Drawing no HR7000G-01	Forts	Cont

It is the user's responsibility to ensure that all control devices are correctly installed, cared for and operated to meet all applicable European, national and local codes/regulations. Specifications subject to change without notice.



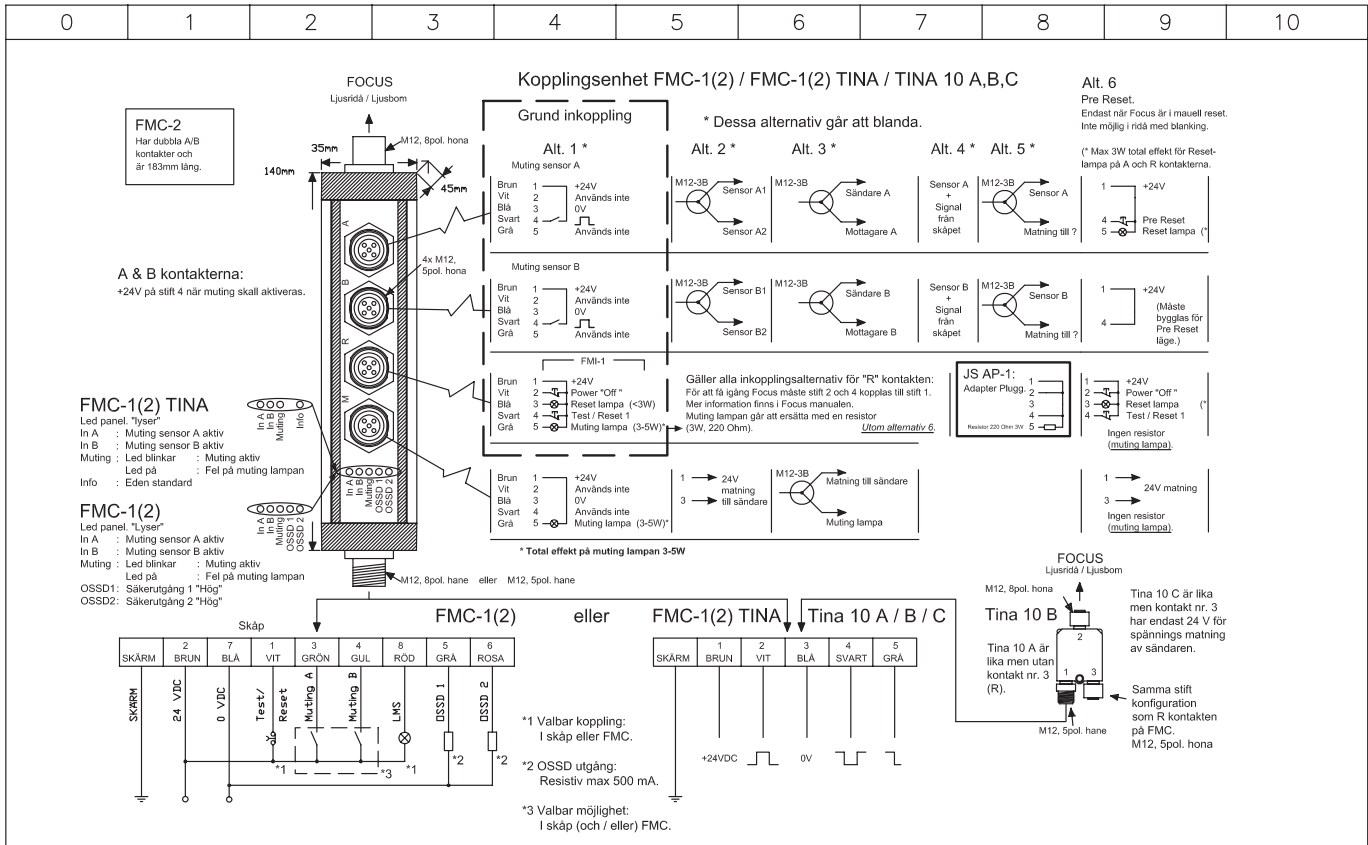
# HR7000H-01 Focus - Connection with FMC/Tina Interface



Anmärkning Remark	<b>JOKAB SAFETY</b> A MEMBER OF THE ABB GROUP	Konstr Design	Godk	Appr	Datum Date	Blad Sheet
Focus		JS			070411	
Vital connection with FMC / Tina interface.		Ritad Drawn	Sidor Pages	Ritn nr Drawing no	Forts Cont	
Vital anslutning med FMC / Tina interface.	JS	1	HR7000H-01			

It is the user's responsibility to ensure that all control devices are correctly installed, cared for and operated to meet all applicable European, national and local codes/regulations. Specifications subject to change without notice.

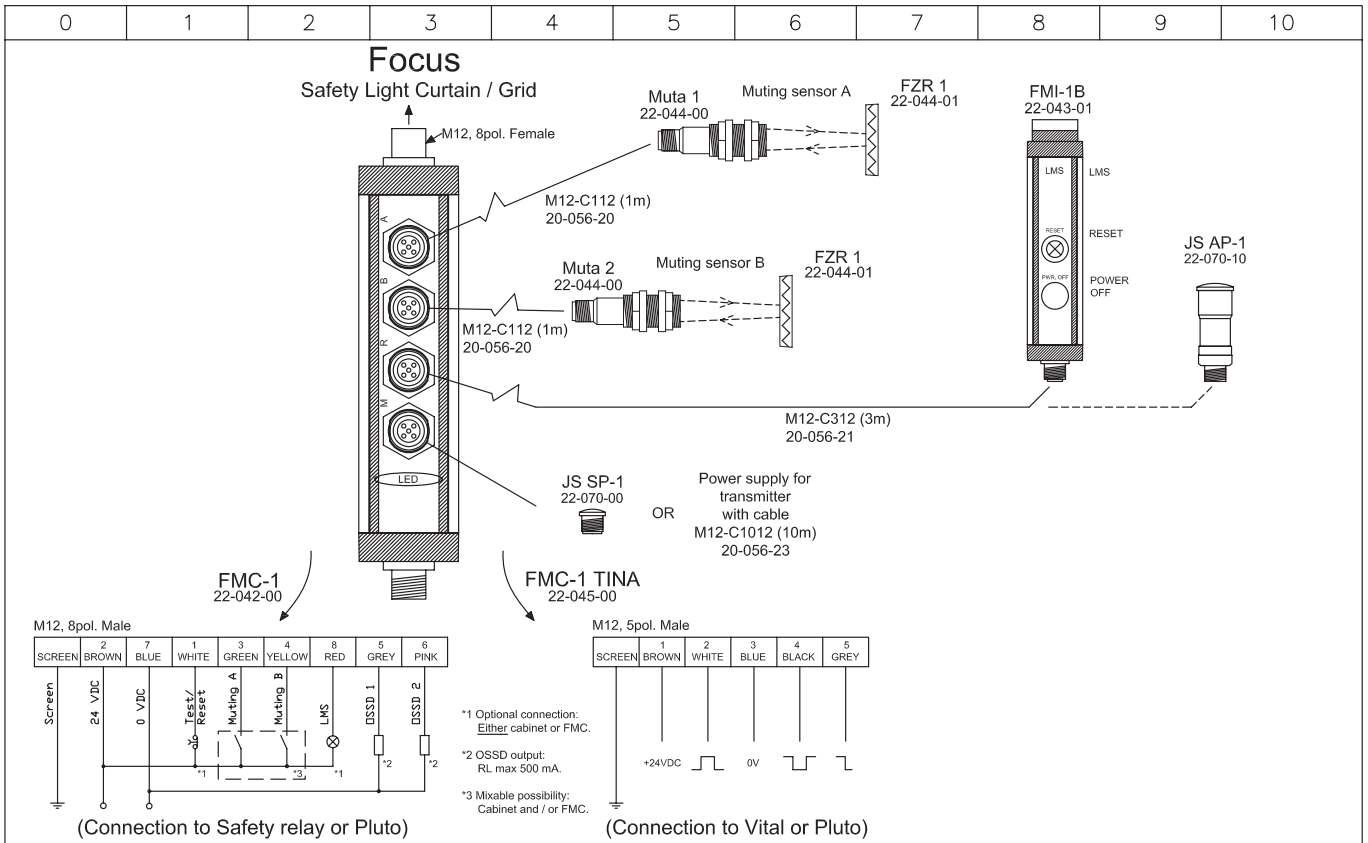
# HR7000I-01 FMC



Anmärkning Remark	<b>JOKAB SAFETY</b> A MEMBER OF THE ABB GROUP	Konstr Design	Godk	Appr	Datum Date	Blad Sheet
FMC inkopplingsmöjligheter.		JS			070827	
		Ritad Drawn	Sidor Pages	Ritn nr Drawing no	Forts Cont	
	JS	1	HR7000I-01			

It is the user's responsibility to ensure that all control devices are correctly installed, cared for and operated to meet all applicable European, national and local codes/regulations. Specifications subject to change without notice.

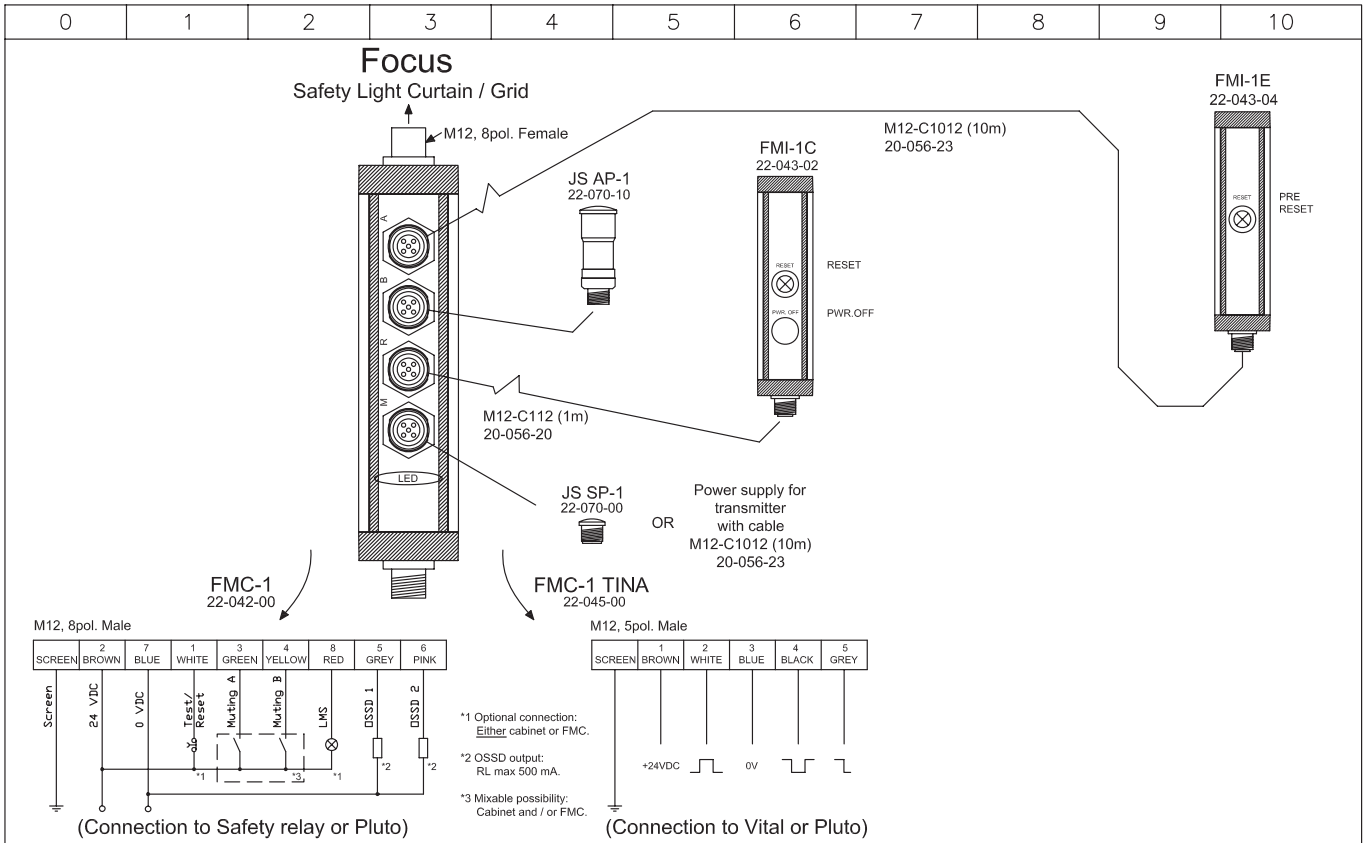
# HR7000J-01 FMC-1 or FMC-1 Tina with muting sensors and reset unit



Anmärkning Remark		<b>JOKAB SAFETY</b> A MEMBER OF THE ABB GROUP	Konstr JS	Godk JS	Appr JS	Datum 070411	Blad	Sheet
FMC-1 or FMC-1 TINA with muting sensors and reset unit. FMC-1 eller FMC-1 TINA med muting sensorer och återställningsenhet.			Ritad JS	Drawn JS	Sidor 1	Pages 1	Ritn nr HR7000J-01	Drawing no

It is the user's responsibility to ensure that all control devices are correctly installed, cared for and operated to meet all applicable European, national and local codes/regulations. Specifications subject to change without notice.

# HR7000K-01 FMC-1 or FMC-1 Tina connected with Pre Reset

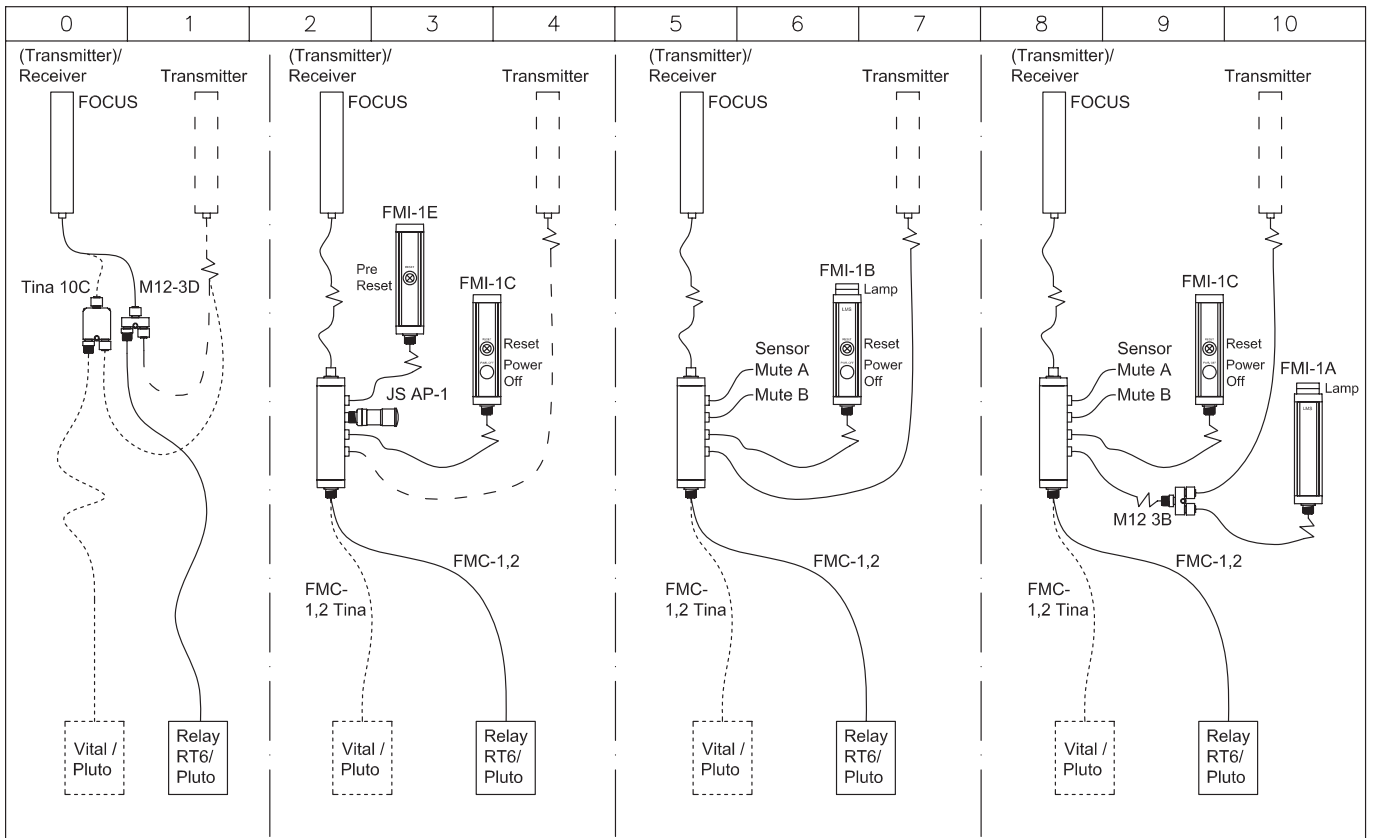


Anmärkning Remark		<b>JOKAB SAFETY</b> A MEMBER OF THE ABB GROUP	Konstr JS	Godk JS	Appr JS	Datum 070411	Blad	Sheet
FMC-1 or FMC-1 TINA connected with Pre Reset. FMC-1 eller FMC-1 TINA kopplade för tidsåterställning.			Ritad JS	Drawn JS	Sidor 1	Pages 1	Ritn nr HR7000K-01	Drawing no

It is the user's responsibility to ensure that all control devices are correctly installed, cared for and operated to meet all applicable European, national and local codes/regulations. Specifications subject to change without notice.



# HR7000-01 Connection example FMC/FMI



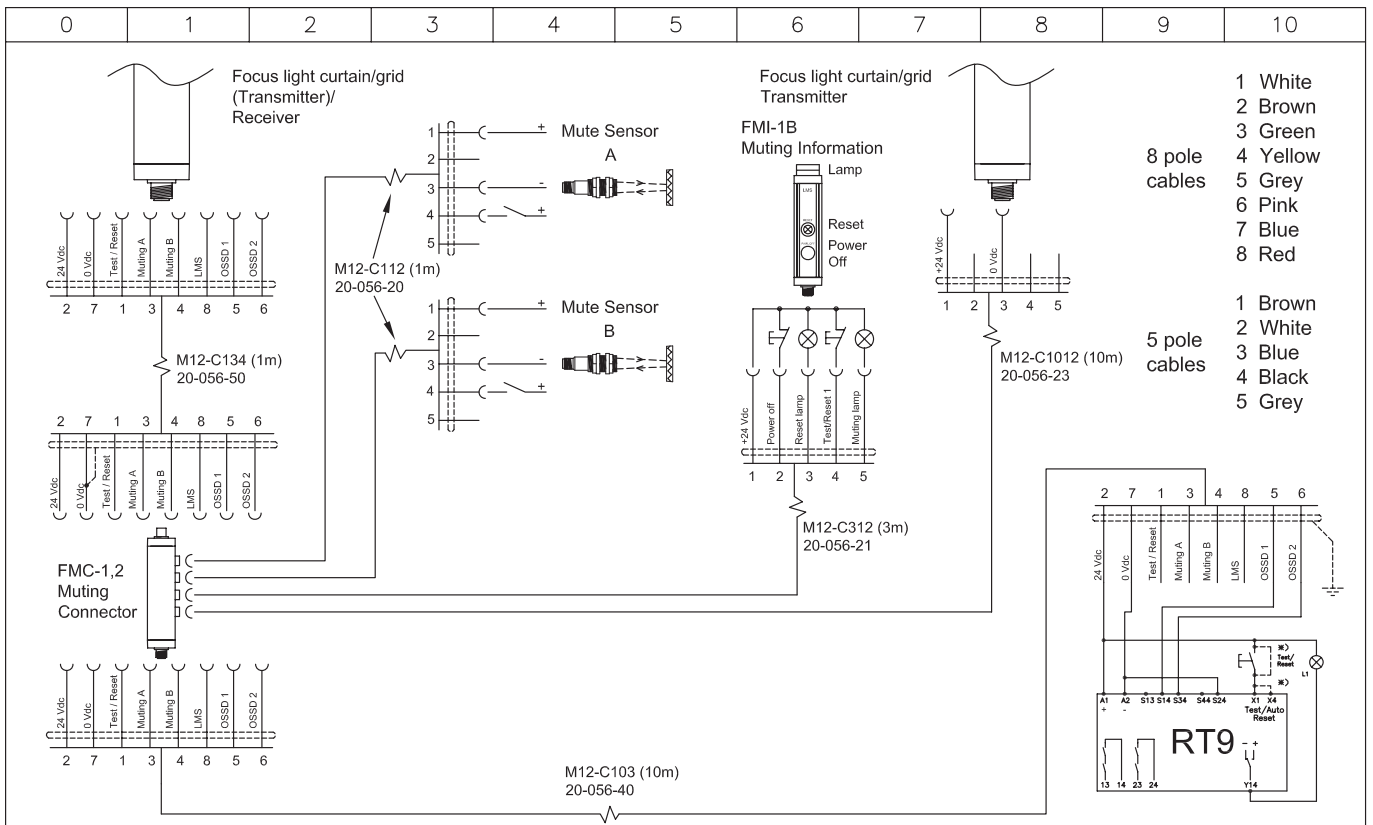
Anmärkning Remark  
 Kopplingsexempel FMC / FMI.  
 Connection example FMC / FMI.



Konstr	Design	Godk	Appr	Datum	Date	Blad	Sheet
JS				070411			
Ritad	Drawn	Sidor	Pages	Ritn nr	Drawing no	Forts	Cont
JS		1			HR7000-01		

It is the user's responsibility to ensure that all control devices are correctly installed, cared for and operated to meet all applicable European, national and local codes/regulations. Specifications subject to change without notice.

# HR7000P Cable connection example



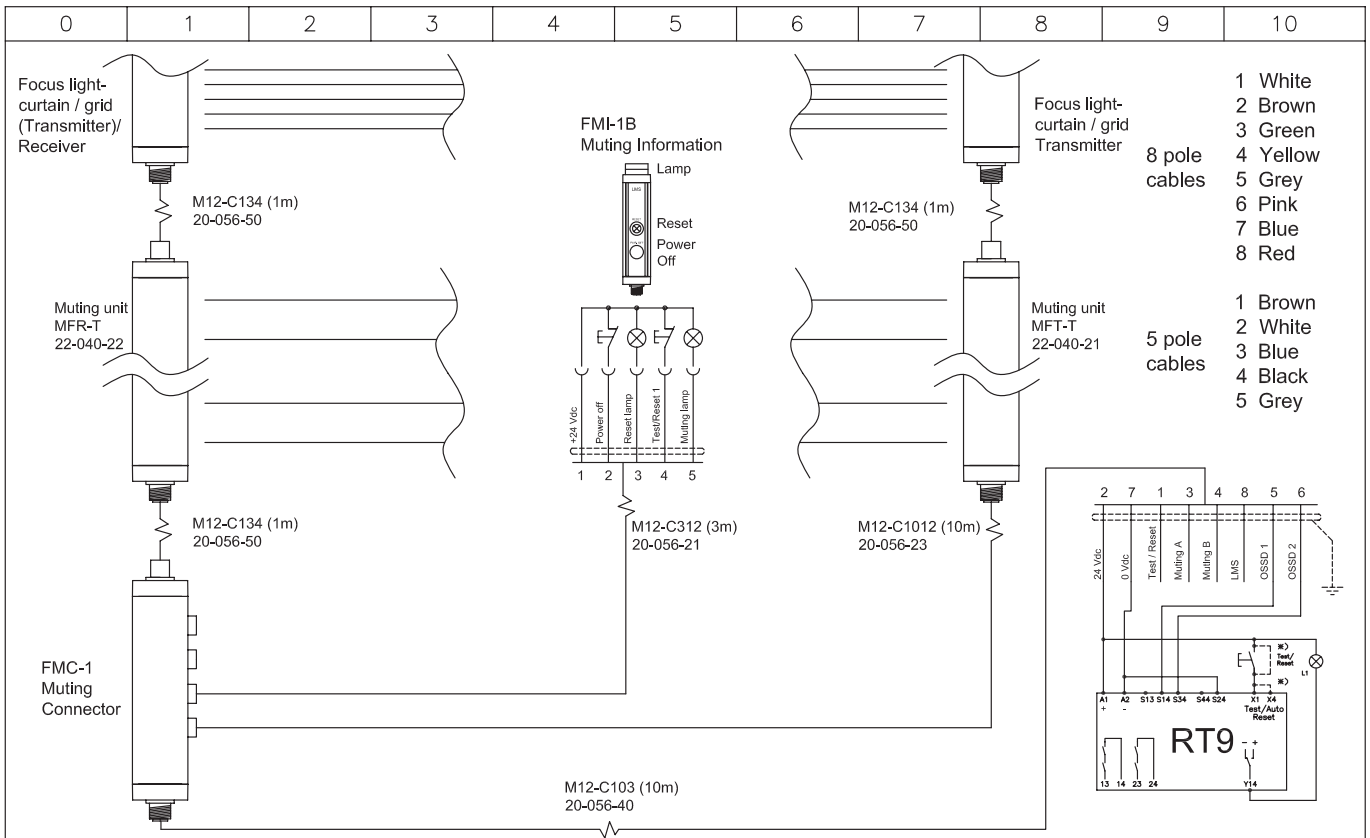
Anmärkning Remark  
 Kabel kopplingsexempel.  
 Cable connection example.



Konstr	Design	Godk	Appr	Datum	Date	Blad	Sheet
JS				050513			
Ritad	Drawn	Sidor	Pages	Ritn nr	Drawing no	Forts	Cont
JS		1			HR7000P		

It is the user's responsibility to ensure that all control devices are correctly installed, cared for and operated to meet all applicable European, national and local codes/regulations. Specifications subject to change without notice.

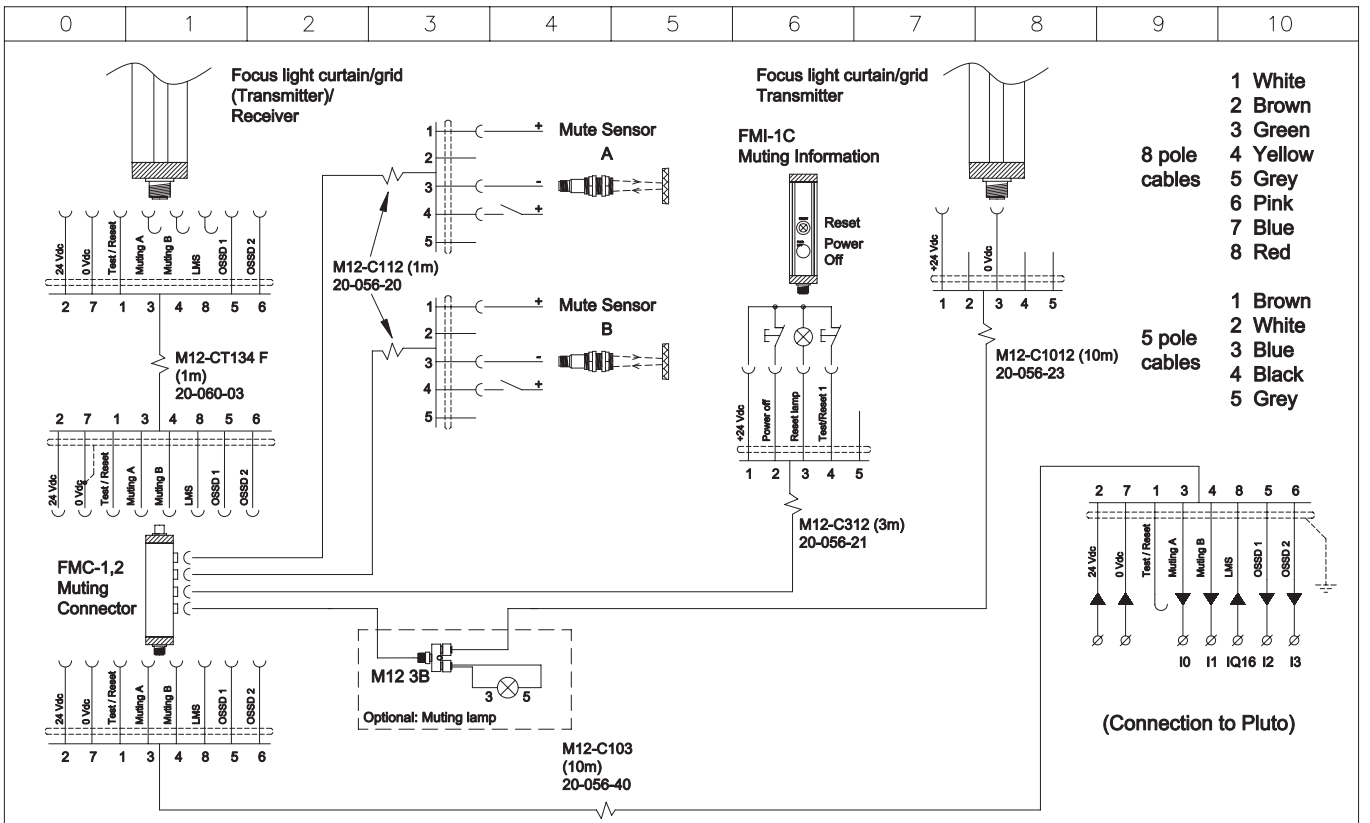
# HR7000Q Cable connection example



Anmärkning Remark	<b>JOKAB SAFETY</b> A MEMBER OF THE ABB GROUP	Konstr Design	Godk Appr	Datum Date	Blad Sheet
Kabel kopplings exempel. Cable connection example.		JS		050513	
		Ritad Drawn	Sidor Pages	Ritn nr Drawing no	Forts Cont
		JS	1	HR7000Q	

It is the user's responsibility to ensure that all control devices are correctly installed, cared for and operated to meet all applicable European, national and local codes/regulations. Specifications subject to change without notice.

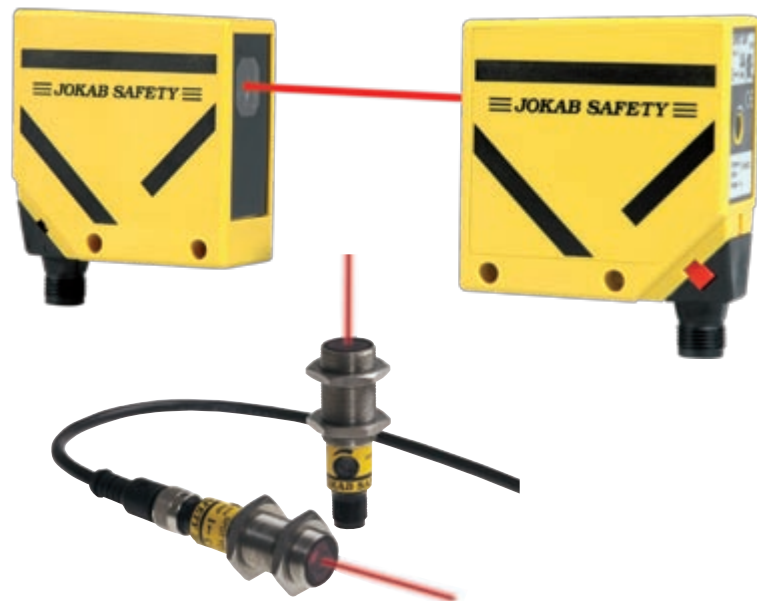
# HR7000S Focus; Muting with the aid of Pluto, FMC and a transfer cable



Anmärkning Remark	<b>JOKAB SAFETY</b> A MEMBER OF THE ABB GROUP	Konstr Design	Godk Appr	Datum Date	Blad Sheet
Kabel kopplings exempel. Cable connection example.		JS		050513	
		Ritad Drawn	Sidor Pages	Ritn nr Drawing no	Forts Cont
		JS	1	HR7000S	

It is the user's responsibility to ensure that all control devices are correctly installed, cared for and operated to meet all applicable European, national and local codes/regulations. Specifications subject to change without notice.

# Safety Light Beam Spot



## A light beam for the highest safety level

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/Pluto in combination fulfils the requirements for PL e according to 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 LED's 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 controller or by the Pluto safety-PLC. A unique coded signal is sent out from the control unit to the transmitter (Spot T). The signal which comes back from the receiver (Spot R) is then compared in the Vital/Pluto. If the correct coded signal is received the Vital/Pluto 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 means of coding, the dynamic signal can pass between up to 6 pairs of transmitters and receivers, with only one pair needing to be electrically connected to a Vital.

## Approvals:

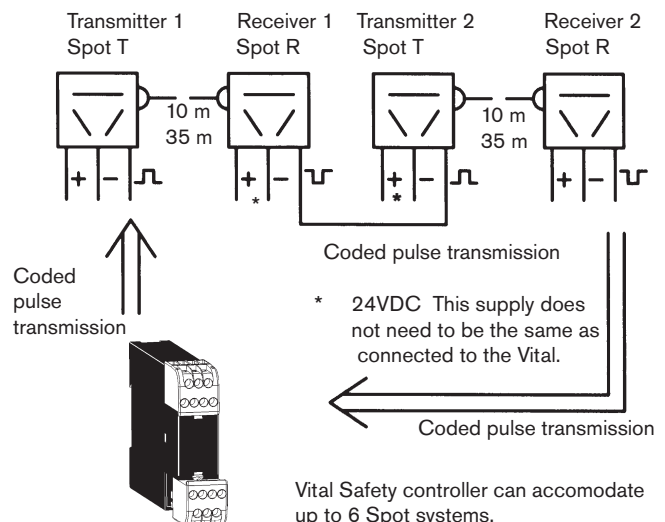


## Application:

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
- Light beam, emergency stop and Eden in the same safety circuit together with Vital/Pluto achieves PL e according to EN SO 13849-1





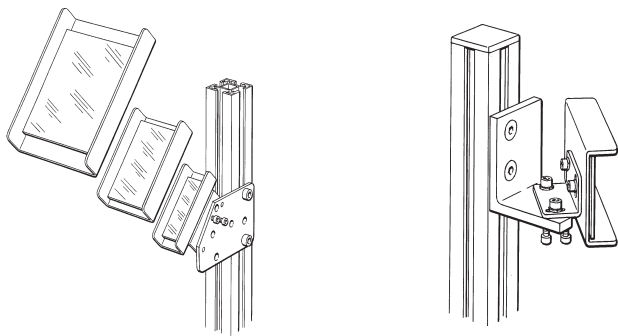
# Mounting and alignment – Spot

## 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 850 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 ISO 13855). Contact us for further information.

## Accessories and Mounting

The Spot light beam can be mounted using a variety of brackets, posts and mirrors. See ordering list for further information.



Different sizes of mirrors, mounting brackets and profiles are available. See component ordering list.

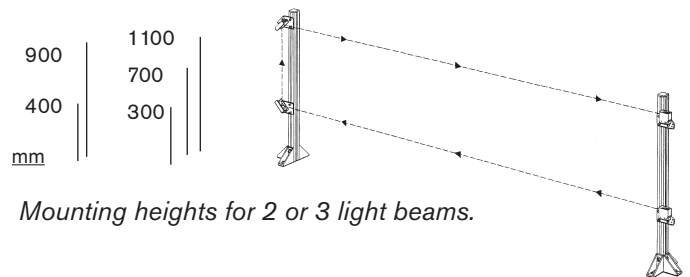
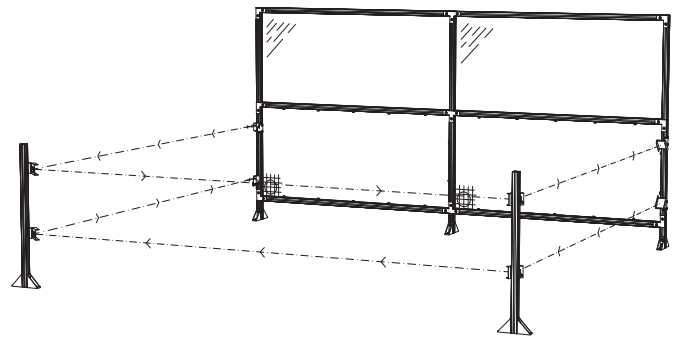
**Note.** Every mirror reduces the sensing distance of the beam by approx. 20%.

## 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 minimise 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.

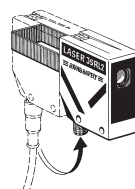
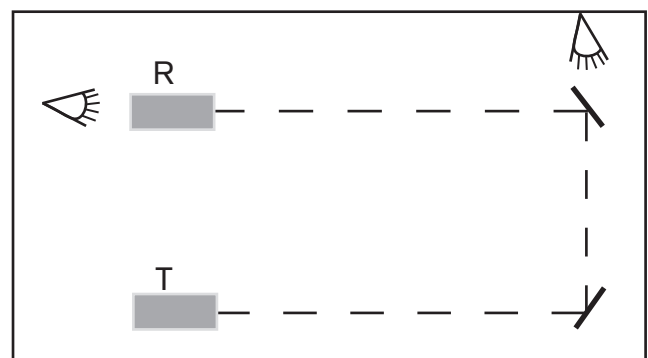
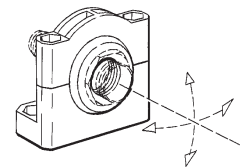
**NOTE!** When using Laser aligner **do not** look directly into the laser. Observe all necessary precautions when using laser devices, failing to do so can result in eye damage.



Mounting heights for 2 or 3 light beams.


## JSM64

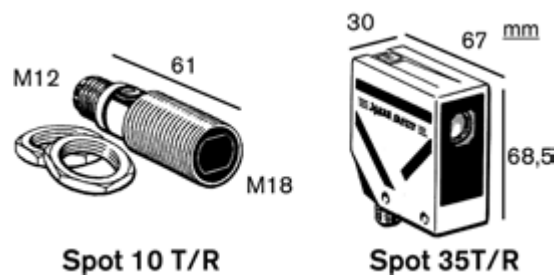
Pivot M18 bracket for Spot 10 or MUTE R (FSTR1) for example



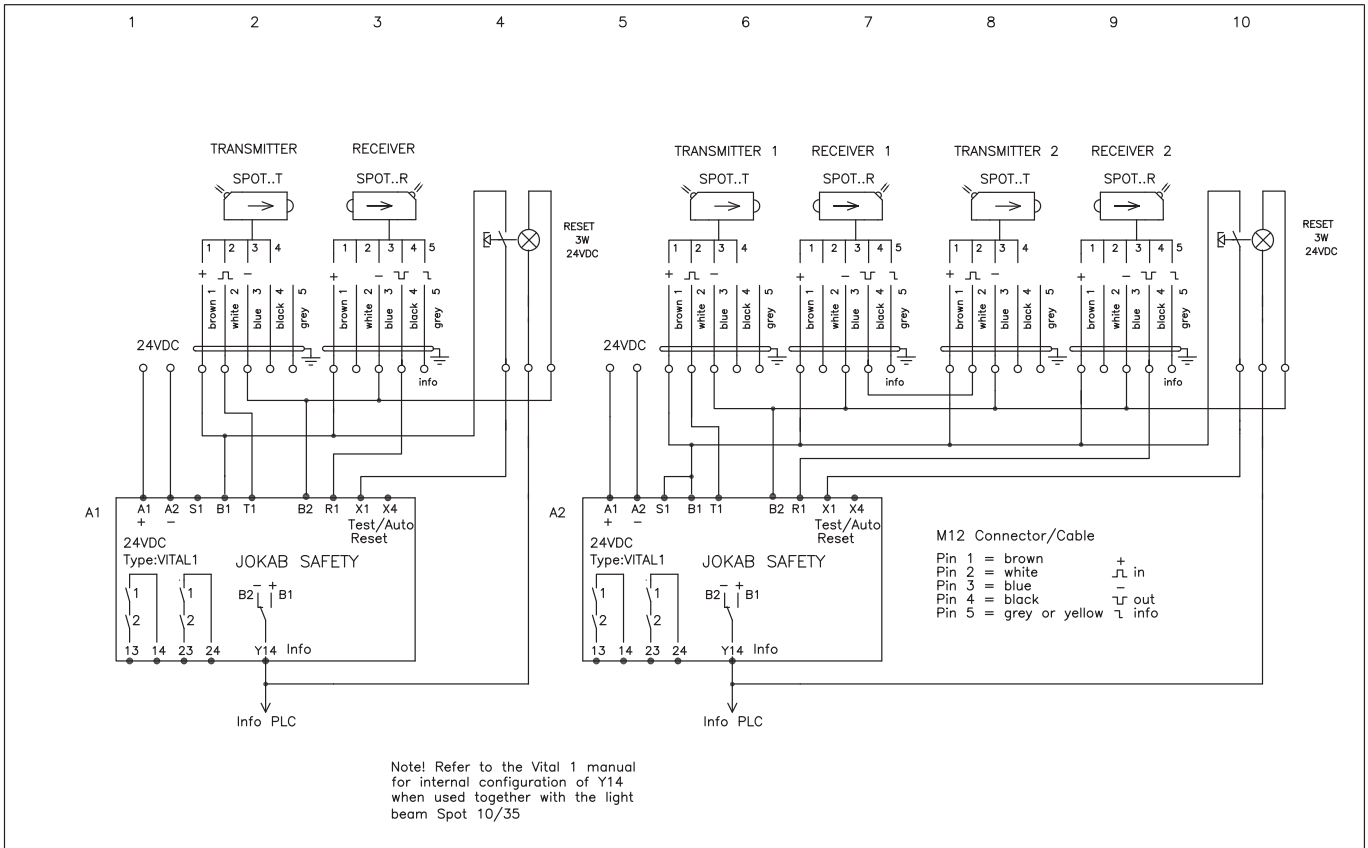
Laser aligner JSRL2 for light beam Spot T/R.

Technical data - Spot	
<b>Manufacturer</b>	ABB AB/Jokab Safety, Sweden
<b>Article number/Ordering data</b> Spot 10 T/R Spot 35 T/	2TLJ020009R0600 2TLJ020009R0500
<b>Safety level</b> EN/IEC 61496 EN 954-1 EN ISO 13849-1	Type 4 with Vital/Pluto Category 4 PL e
<b>PFH<sub>d</sub></b>	1,14x10 <sup>-8</sup>
<b>Power supply</b>	17 – 27 VDC, ripple ±10%
<b>Current consumption</b> Transmitter: Receiver:	< 25 mA < 15 mA
<b>Output currents</b> Info. output Dynamic signal out	10 mA max. 30 mA max.
<b>Light source</b>	Red visible light, 660 nm, <±2°
<b>Optical power</b> Spot10: Spot 35:	< 0,1 mW < 0,2 mW
<b>Function indication</b> Green LED on transmitter (power): Green LED on receiver status: On: Flashing: Off:	Power supply OK  Alignment OK, safety circuit closed Alignment OK, earlier safety circuit open Beam interrupted, safety circuit open
<b>Protection class</b>	IP 67
<b>Range</b> Spot 10: Spot 35:	0 - 10 m 0 - 35 m
<b>Range adjustment</b> Spot 10: Spot 35:	Trim pot. on transmitter Trim pot. on receiver
<b>Installation</b> Spot 10: Spot 35:	2xM18 nuts (provided) Either via mounting holes in the casing or with angle bracket JSM63 (provided)
<b>Operating temperature range</b>	-25°C – +65°C
<b>Cable connection</b>	M12 fixed connector
<b>Casing Material</b> Spot 10: Spot 35:	Steel housing with polyacryl lens protection. Polyamide housing with polyacryl lens protection.

<b>Colour</b> Spot 10: Spot 35:	Steel grey Yellow/black
<b>Weight</b> Spot 10: Spot 35:	2 x 21 g 2 x 100 g
<b>Connections</b> Transmitter: Brown (1) White (2) Blue (3) Receiver: Brown (1) White (2) Blue (3) Black (4) Grey (5)	+24 VDC Dynamic signal in 0 VDC +24 VDC  0 VDC Dynamic signal out Info output
	24 VDC when LED is green or flashing (tolerance -2 VDC) 0 VDC when LED is off (tolerance +2 VDC)
<b>Conformity</b>	European Machinery Directive 2006/42/EC <b>CE</b> 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
<b>Certifications</b>	TÜV Nord 

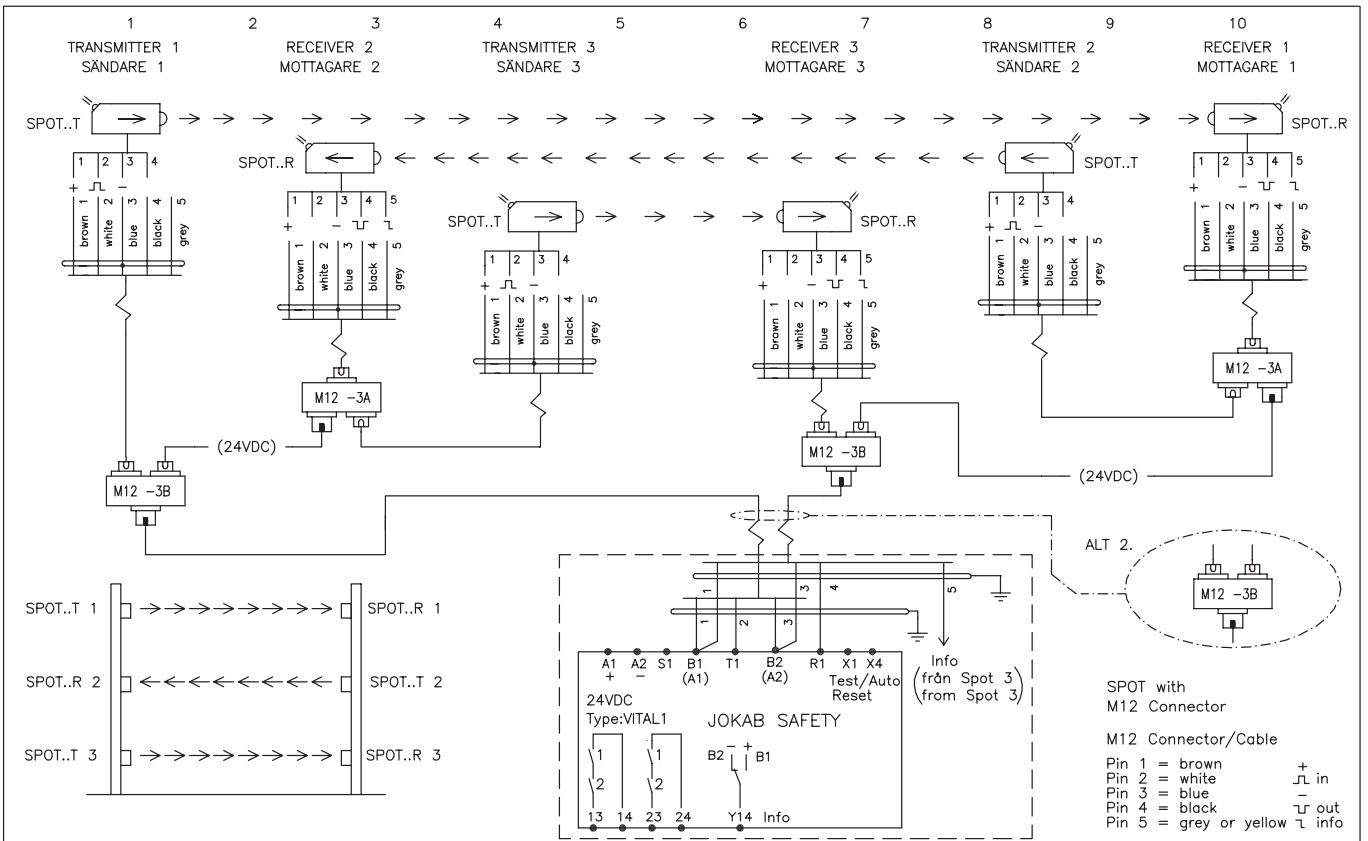


# Connection of Spot T/R to Vital1



Anmärkning Remark	VITAL1 MED LJUSBOM SPOT.. VITAL1 WITH SAFETY LIGHTBEAM SPOT	<b>JOKAB SAFETY</b> A MEMBER OF THE ABB GROUP	Konstr Design/Codk	Appr	Datum Date	Blad Sheet
Ritad Drawn	Sidor	Pages	Ritn nr Drawing no	HA3300A-01	Forts Cont	

# Vital 1 with 3 lightbeams Spot



Anmärkning Remark	VITAL1 MED 3 LJUSBOMMAR SPOT... VITAL1 WITH 3 LIGHTBEAMS SPOT...	<b>JOKAB SAFETY</b> A MEMBER OF THE ABB GROUP	Konstr Design/Codk	Appr	Datum Date	Blad Sheet
Ritad Drawn	Sidor	Pages	Ritn nr Drawing no	HA3306D	Forts Cont	

\*For more connection examples see chapters for Vital or Pluto

# Laser scanner

# Look



## Approvals:



## Application:

Photoelectric guarding of several risk areas

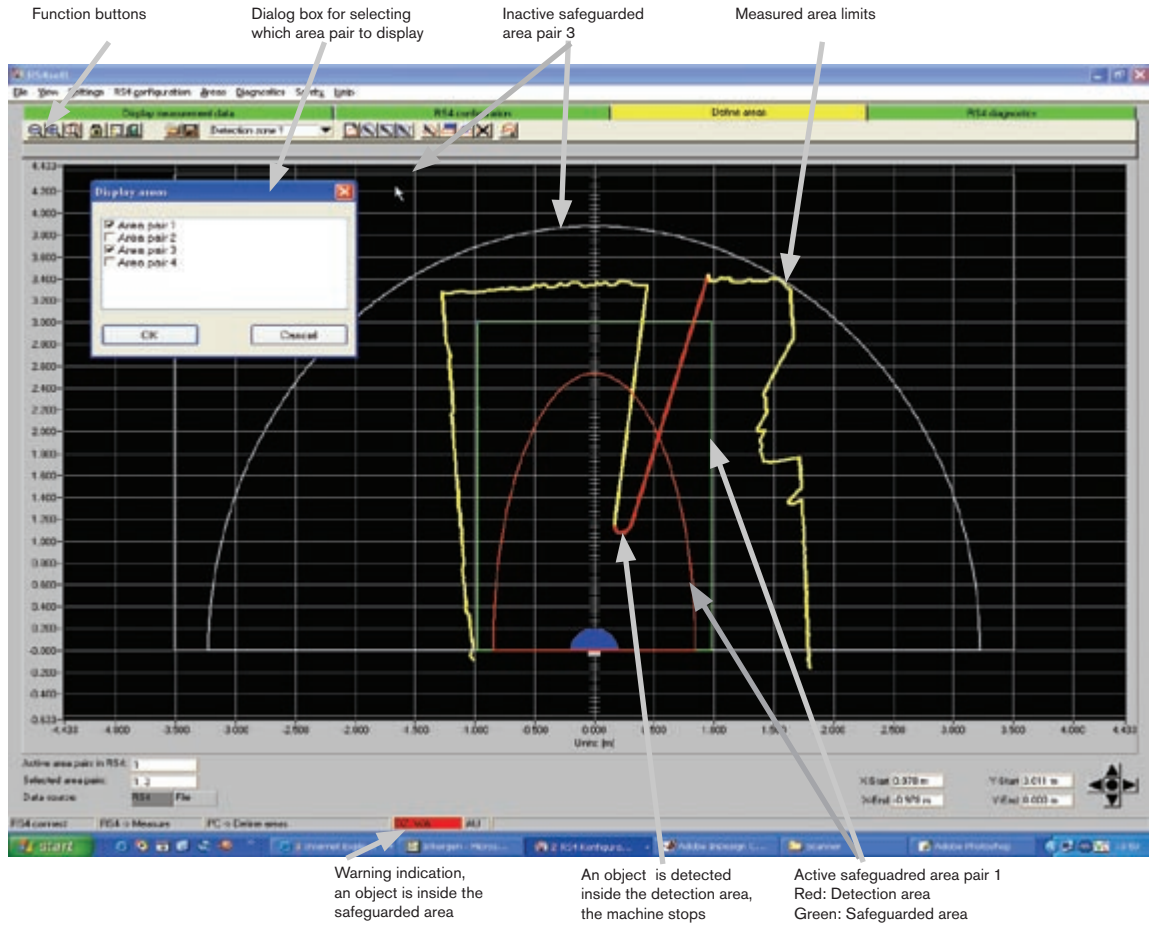
## Features:

- Type 3, IEC61496-3
- Easy to install
- Protected from welding sparks/arcs
- Easy to program
- 4 individual programmable protection areas simultaneously with Pluto

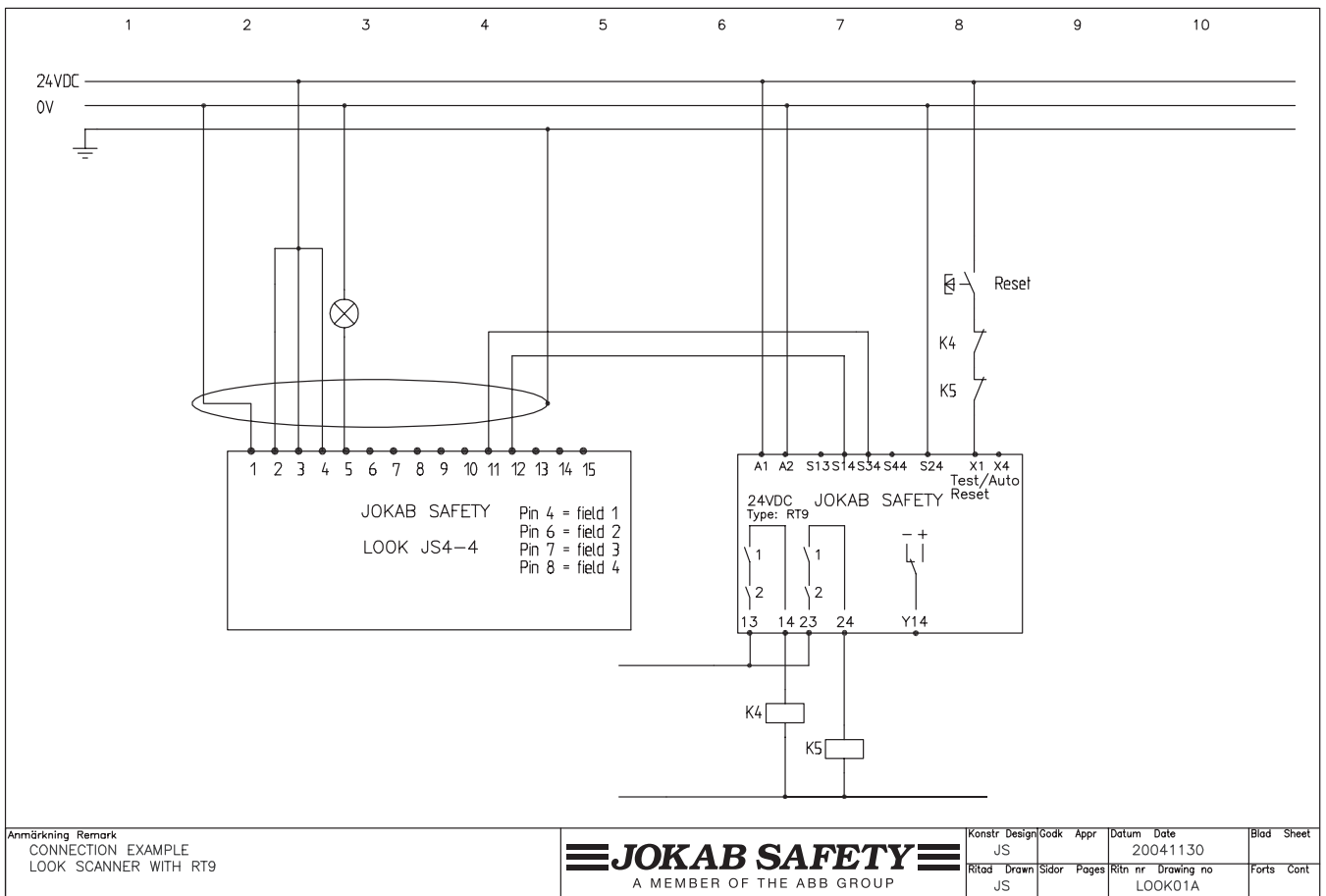
### A laser scanner that has the ability to scan four individual areas

The Laser Scanner 'Look' has the ability to scan four individual areas. Each area can be programmed individually for the specific application, making it ideal for auto-carriers that need to operate along different paths. The safety level is according to Type 3, EN 61496-3. It is approved for use as personnel protection in robot working areas, conveyor equipment etc. The small design makes it easy to install. Look is not affected by ambient light levels (sun etc) or welding arcs/sparks. The protection fields are quick and easy to create on a PC in a Windows environment. It has four individual programmable protection areas. Each area consists of one personnel protection field with maximum 4 m radius, and one warning field of maximum 15 m radius. Changing between the areas is easily achieved using additional sensors.

# Software - Look scanner



# Connection example - Look scanner with RT9



Anmärkning Remark  
 CONNECTION EXAMPLE  
 LOOK SCANNER WITH RT9

**JOKAB SAFETY**  
 A MEMBER OF THE ABB GROUP

Konstr Design JS	Godk Appr JS	Datum Date 20041130	Blad Sheet
Ritad Drawn JS	Sidor Pages 1	Ritn nr Drawing no LOOK01A	Forts Cont

Technical Data – Look	
<b>Article number/ Ordering data</b>	50034195    Look JS4-4
<b>Safety level</b> EN/IEC 61496 EN 954-1 EN ISO 13849-1	Type 3 Category 3 PL d
<b>PFH<sub>d</sub></b>	1,50E-07
<b>General data</b> Scanning rate: Scanning angle: Operating voltage: Transmitter: Current consumption: Angle resolution: Weight: Housing:	25 Scans/sec 190° 24 VDC +20%/ -30% Laserdiode; Protection class 1 approx. 300 mA 0,36° 2 kg H=155 mm, W=140 mm, D=135 mm
<b>Personnel protection field</b> Scanning distance: Area:  Output:  Resolution: Response time: Reflectance factor:	Radius 0.2 - 4 m 4 areas, switchable by 24 VDC input  2 x OSSD; 250 mA; failsafe transistor PNP outputs 24 VDC  70 mm at 4 m 80 ms min 1,8 %
<b>Warning field</b> Scanning distance: Area:  Output: Resolution: Response time: Reflectance factor:	Radius 0 - 15 m 4 areas, switchable by 24 VDC input  PNP-transistor, 24 VDC/100 mA 150 mm at 15 m, ± 20% 80 ms min 20%
<b>Contour measurement</b> Measurement range: Output: Response time: Reflectance factor: Reset: Suitable interface safety relay:	Radius 0- 50 m RS 232/422 80 ms min 20% manual or automatic RT6, RT7, RT9, JSBRT11 or Pluto
<b>Conformity:</b>	Machine directive 2006/42/EG EN ISO 12100-1/2, EN 954-1, EN ISO 13849-1, -2, EN 61496-1

