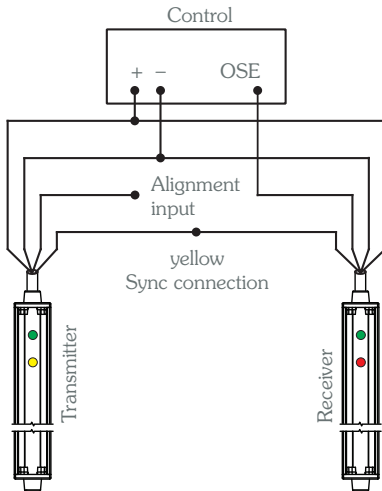


# Safety light curtain



## Connection scheme, OSE output



Transmitter	Function Setting
1 brown - 10...30VDC 3 white - 0V/GND	with blanking
1 brown - 0V/GND 3 white - 10...30VDC	without blanking

2 yellow - Sync connection → Receiver  
4 green - Alignment input

### Receiver

1 brown - 10...30VDC  
3 white - 0V/GND  
2 yellow - Sync connection → Transmitter  
4 green - OSE output 950Hz

Brown => +

White => -

Green Trans => free

Green Rece => OSE ( CS 310 contact 7 - Sig )

Yellow => Sync connection = short circuited Trans and Rece

## Order code LIGI - safety light curtain

**LIGI-01-P01-T00-A-57-2520-F00-C00-S000**

### Description

#### Housing design

01 = standard profile  
16x16mm

#### Output versions

OSE = rectangular signal  
P01 = PNP/positive switching, light-on switching (preferred configuration)  
P02 = PNP/positive switching, dark-on switching  
N01 = NPN/negative switching, light-on switching (preferred configuration)  
N02 = NPN/negative switching, dark-on switching  
R01 = light-on switching  
R02 = dark-on switching  
R03 = light-on/dark-on switching

#### Testing

T00 = without, only activates the alignment mode  
T01 = pull-down resistor, test=low or open  
T02 = pull-down resistor, test=high  
T03 = pull-up resistor, test=low  
T04 = pull-up resistor, test=high or open  
T05 = open is normal operation, test=low or high

#### Beam geometry

A = up to 500mm height → 50mm detection capability  
C = up to 500mm height → 50mm detection capability  
from 500mm height → 185mm detection capability

#### Active light beams 12...57

#### Active detection zone

in mm (light curtain is longer)

#### F = function

00 = with door function (blanking)  
01 = without door function (blanking)  
05 = switching blanking/no blanking  
07 = outdoor

#### C = cable length/connector

00 = standard version  
pig-tail connector with M8 plug, 4-pin  
03 = pig-tail connector with M8 plug, 6-pin

#### S = special version

000 = standard version  
XXX = custom design without  
functional difference,  
for example: color, logo, etc.

## Key to symbols



Recommendation for optimal procedure.



Risk of death in the case of non-observance.

---

## Safety instructions



- The safety instructions in the operating manual must be observed.
- Installation and electrical connection may only be carried out by trained personnel.
- The safety light curtain complies with the requirements of Category 2 and PL=d as per EN 13849-1 and must be integrated into the operating procedure in a fault-free manner in accordance with the applicable regulations and standards in order to achieve proper protective functioning.
- In accordance with EN 12978, the safety light curtain is suitable for all door types apart from sluice and dock gates, lift doors, vehicle doors, gates used mainly in animal husbandry, textile theatre curtains, railway level-crossing barriers, barriers that are used solely for vehicle traffic, and dangerous machines that are not doors.
- During mounting, installation and commissioning, it must be ensured that the photo switch system cannot be influenced by other photo switch systems or sources of infrared light.
- The applicable standards and regulations – particularly EN 12453 (Safety in use of power operated doors) – are to be observed during mounting, installation, commissioning, maintenance and repair.
- Strictly observe the regulations of the EN12978 when connecting safety devices on power operated doors.
- The manufacturer assumes no liability for damage caused by operation and connection errors, non-observance of the operating manual or lack of maintenance or care; the manufacturer wishes to draw attention again to the possible hazardous situations that can arise in this way.
- Notwithstanding conformity with harmonised standards, it is not possible to foresee every potential risk. For this reason, persons should only be present in the hazardous area when necessary.

## Purpose



The safety light curtain (LIGI) consists of a transmitter and receiver and is suitable for all automatic door types with a minimum door width of 1.6m. The LIGI complies with the following regulations: EN 12978, EN 12445 and EN 12453. The closing speed of the door is to be selected in such a way that the force limit values as per EN 12453 are adhered to. Only objects that are 5mm larger than the beam separation distance can be detected.

---

## Mounting, installation and commissioning



Mounting, installation and commissioning of safety light curtains may only be carried out by trained personnel in accordance with the specifications of the door manufacturer. The specifications in this operating manual are also to be adhered to. Operation under conditions other than those intended and modifications to the optics and casing are not permitted and result in loss of EC conformity.

When installing PNP/NPN versions, it must be ensured that the door control system checks the safety light curtain versions with a test input once per door cycle. To do so, the control system must trigger the test input on the transmitter for at least 100ms and monitor the reaction behaviour of the output of the receiver. If the time behaviour corresponds to the technical data, the test is successful. Testing by briefly switching off the supply voltage is not suitable.

The safety light curtains are designed in such a way that sunlight and light from halogen lamps and fluorescent tubes (see IEC 61496-2) do not lead to undesired activation.

In rare cases, other photo switches or sources of infrared light can lead to undesired activation. These sources of light interference must be dealt with in such cases by switching off, blocking or removing them.



If two light curtains (in front of and behind the door) are to be used to provide protection, the separation distance between the light curtain and door should be small enough that persons cannot be present undetected between the door and the detection zones that are created. For this application, the two transmitter of the light curtains should be mounted on opposite sides of the door.

## Mounting, installation and commissioning

Only one light curtain can be mounted in the door opening. In this case, the “door function” of the light curtain prevents detection by the door itself.

When the light curtain is being mounted, it is to be placed on a stable subsurface. Ensure that the ground is sufficiently level so that the sensor function can work at all points.

The first fixing clamp should be around 10cm above the ground and the last clamp should be 10cm from the end; between these points, fixing clamps should be used to fasten the profile at maximum intervals of 60cm. Optical components (transmitters, receivers, LEDs) must not be covered.

A risk assessment in accordance with the machinery directive is the basis for deciding on the selected safety method.

The alignment of the light curtain should be optimised after it has been mounted. If the test input of the light curtain is activated for longer than 15s, the light curtain switches into alignment mode. The signal reserve can be optimised in alignment mode by alternately rotating the LIGI transmitter and LIGI receiver.

If the signal reserve is less than 2, the green receiver LED flashes in this mode. The green LED remains on for signal reserves greater than 2 and the red receiver LED flashes with increasing flash frequency when the signal reserve increases. The signal reserve should be a factor of 2 or greater to ensure fault-free operation as well as to tolerate a certain amount of dirt.

As soon as the test input is deactivated for a short period, the light curtain returns to normal mode.



After installation and fine adjustment the light curtain should be switched off and back on again before the performance test. The transmitter is then self adjusting the optimum power.

## Electrical connection:



The connections are made depending on the version according to the supplied circuit diagram.

Important note: The sync cable (white wire, or yellow wire for OSE) is an internal connection between the transmitter and receiver which must not be connected in the controller!

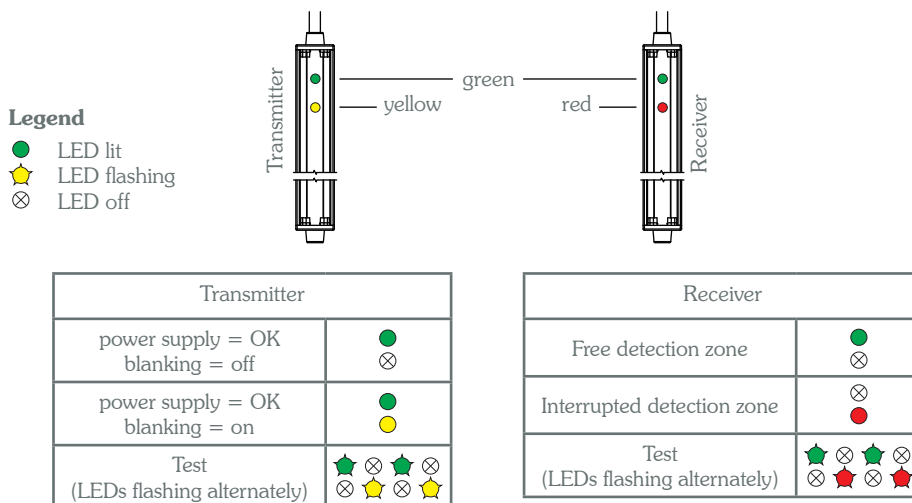
## Alignment mode:

This mode allows for optimum alignment of the LIIG based on a variable flash frequency of the LEDs on the receiver.

## Error messages:

The LIIG has an internal error diagnosis function which indicates errors by means of an LED code depending on the type of error. In the event of an error, the LIIG switches to safe mode and the door can then only be operated in "dead man" mode.

## Operating mode



## Alignment mode

### Legend

- LED lit
- ★ LED flashing
- × LED off



Transmitter	
Alignment mode (LEDs flashing alternately)	<span style="color: green;">★</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span> <span style="color: green;">★</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span> <span style="color: yellow;">★</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span> <span style="color: yellow;">★</span>

Receiver		
Excess gain less than 2	<span style="color: green;">★</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span> <span style="color: green;">★</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span>	Green LED flashing
Excess gain greater than 2	<span style="color: green;">●</span> <span style="color: green;">●</span> <span style="color: green;">●</span> <span style="color: green;">●</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span> <span style="color: red;">★</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span> <span style="color: red;">★</span>	Flash frequency of red LED increases with signal reserve

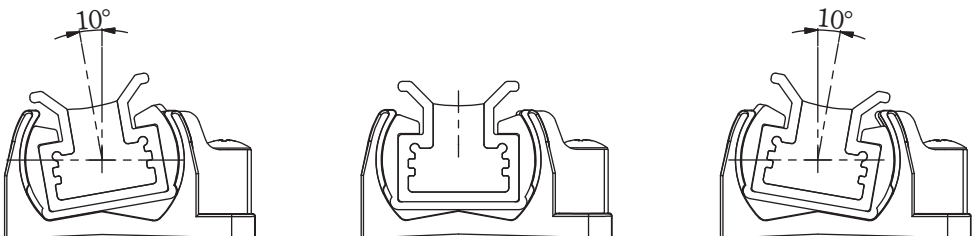
Alignment mode is accessed by activating test or alignment mode for at least 15s and for the duration of alignment. (See pages 12 and 17.)

Rotating the transmitter and receiver increases or reduces the reception level. The more the level increases, the faster the flash frequency of the red LED will be.

When the maximum flash frequency is reached, the light curtain is optimally aligned and can be fastened in place.

For PNP or NPN output versions, the test input must now be disconnected from the fixed potential again and connected to the test input of the controller.

The test input (T00 version) is only required for alignment when using the OSE output versions. Connect to 0V/GND in normal operation.





## Error mode

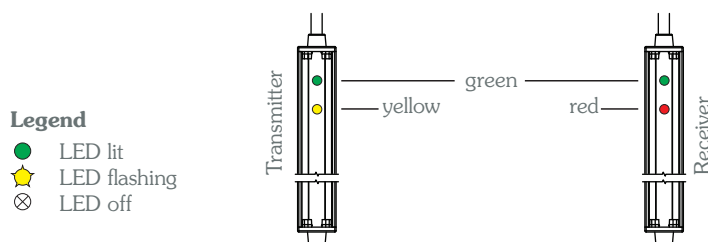
### Legend

- LED lit
- ★ LED flashing
- × LED off



	Transmitter	Error mode	Receiver	
No supply voltage	<span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span>		<span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span>	Check supply voltage
Receiver polarity reversed	<span style="color: green;">●</span> <span style="color: green;">●</span> <span style="color: green;">●</span> <span style="color: green;">●</span> <span style="color: yellow;">★</span> <span style="color: yellow;">★</span> <span style="color: yellow;">★</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span>	Yellow LED flashes 3x, long pause	<span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span>	Check receiver operating voltage
Short at output		Red LED flashes 2x, long pause	<span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span> <span style="color: red;">★</span> <span style="color: red;">★</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span>	Check output cable, overload, wrongly con- nected, cable defective, output on light curtain defective
Error in sync cable	<span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span> <span style="color: yellow;">★</span> <span style="color: yellow;">★</span> <span style="color: yellow;">★</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span>	Yellow LED flashes 3x, long pause		Check sync cable (PNP/NPN: white; OSE: yellow), may only be connected between transmitter and receiver
Internal device error	<span style="color: green;">★</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span> <span style="color: green;">★</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span> <span style="color: yellow;">★</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span> <span style="color: yellow;">★</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span>	All LEDs flashing	<span style="color: green;">★</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span> <span style="color: green;">★</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span> <span style="color: red;">★</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span> <span style="color: red;">★</span> <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">×</span>	Light curtain must be replaced

## Installation and starting up with light control



Receiver	
Area to be protected clear	● ⊗
Programming phase after connection for 1s	● ● ● ● ● ● ● ● for 10s ★ ⊗ ★ ⊗ ★ ⊗ ★ ⊗
Programming phase complete	● ⊗

### Additional information:

- If something went wrong during the programming process explained above (e.g. accidental interruption of light beam or if the adjustment was subsequently changed), the programming process can be repeated as often as required.
- If the sync connection between the transmitter and receiver is connected with 10-30 V DC for longer than 15s and less than 25s, all the saved reference values from the programming process will be actively deleted, i.e. the factory settings are restored. Once the above connection has been disconnected, the green and red LEDs on the receiver will illuminate for 2s; this confirms that the reference values have been deleted. At this setting the light curtain is typically used for uncritical ambient conditions.

Receiver	
Connect sync 15s to 25s with 10-30 V DC.	⊗ ⊗ ⊗ ⊗ ⊗ ⊗ ⊗ ⊗ ⊗ ★ ★ ★ ★ ★ ★ ★ ⊗
Connection to sync disconnected again.	● for 2s ●

## Light control

Installation options	Notes	Transmitter connection
Installation at door level (with door function)	Interruptions to the light beam in the door do not lead to detection.	<p>OSE-LIGI: brown - 10-30 V DC white - 0 V/GND</p> <p>PNP/NPN/SSR-LIGI: brown - 10-30 V DC blue - 0 V/GND</p>
Installation in front of door noncritical standard doors (without door function)	Door and floor have matt surfaces.	<p>OSE-LIGI: brown - 0 V/GND white - 10-30 V DC</p> <p>PNP/NPN/SSR-LIGI: brown - 0 V/GND blue - 10-30 V DC</p>
Installation in front of door critical doors; critical floors (without door function)	<p>Critical points: Part or all of the door has a highly reflective surface.</p> <p>Increased functional safety can be achieved by programming the signals when the door is open (see descriptions below).</p>	<p>OSE-LIGI: brown - 0 V/GND white - 10-30 V DC</p> <p>PNP/NPN/SSR-LIGI: brown - 0 V/GND blue - 10-30 V DC</p>

### Installation steps (critical doors and floors / without door function):

For increased functional security when installing in front of the door, the reception signals (reference values) must be programmed into the light curtain when the door is open and the area to be protected is clear.

- The LIGI is installed as explained in the operating instructions, i.e. the transmitter is connected as indicated in the table above (bottom row).
- **When the door is open and the area to be protected is clear, the sync connection between the transmitter and receiver is connected/hot-wired with 10-30 V DC using a short filament for a very short period of time (less than 1s). Everything else will now happen automatically.**
- If the previous step has been carried out correctly, the green LED on the receiver will be continuously on and the red LED will flash. The reference values will then be programmed. It is essential to keep the area to be protected clear during this time. This programming process will take 10s and the red LED will then go out.

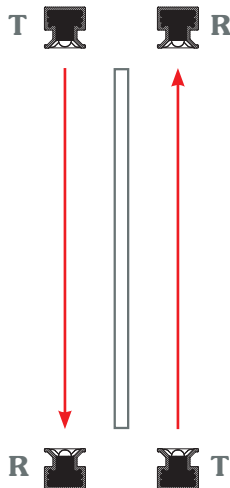
## Testing

The operation of the light curtain is to be tested as follows once it has been mounted.

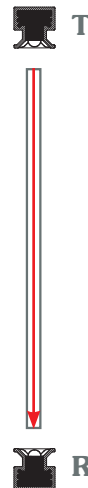
1. A test rod with a diameter of 50mm must be continuously detected over a range of 0mm to 500mm above the ground.
2. A test object with an edge length of 200mm must be continuously detected over a range of 0mm to 2500mm above the ground. The test bodies should be moved from bottom to top during these tests.

Top view:

Door and recommended light curtain layout of T=transmitter and R=receiver



**Figure 1**  
**Without door function**  
**(Blanking function)**



**Figure 2**  
**With door function**  
**(Blanking function)**

## Maintenance and repair



The safety light curtain does not have any wearing parts that need to be maintained.

The light entry and exit openings are to be cleaned regularly, depending on the dirt that occurs. Use a cloth with soapy water or a water jet for this purpose. High-pressure cleaners, abrasives and organic solvents must not be used.

Check regularly whether the light curtains are correctly aligned. Adjust the alignment if necessary. The light curtain casing, the optics areas, the plug and the connection cable are to be checked regularly for damage. Parts with significant damage must be replaced.

Furthermore please check detection ability on a regular basis as per manual page 9.



If light curtains are replaced, they must only be replaced by identical light curtains or by other safety light curtains that are intended for the relevant door by the door manufacturer.

Transmitter and receiver light curtains must only be replaced in pairs so as to ensure that the same software and hardware status is present.

Repairs must only be carried out by trained personnel.

## Versions

Number of channels: From 12 to 57 channels

Connection:

Connection cables      5m and 15m, the total length must not exceed 25m

Connection plug      Pig-tail connector with M8 plug, 4-pin, L=130mm

Connection fixed cable      Version SSR relay (receiver), 5-pin, L=5m

Door function:      Continuous interruption starting at the top light beam and going towards lower light beams does not lead to detection as this is interpreted as lowering of the door.

## Technical data

Safety parameters	ESPE type 2 as per IEC 61496-2 MTTF <sub>D</sub> > 100 years; DC <sub>AVG</sub> > 99% Category 2; PL d (PFH=7.33·10 <sup>-9</sup> 1/h) as per EN 61508-2; Category 2 for LIGI-xx-Nxx and LIGI-xx-Pxx with only one suitable external control system for testing
Door widths	1.6 to 10m
Rated voltage	24V DC -58% +25% (10 to 30V DC)
Current consumption	Transmitter: Approx. 30mA (24V DC) Receiver: Approx. 20mA (24V DC)
Power consumption	Approx. 1.2W
Detection zone height	Max. 2520mm
Channel count	Max. 57
Type of light	Modulated infrared
Type of switching:	Light switching, i.e. the following applies for free detection zones: OSE output = Alternating signal (approx. 950Hz) PNP output = High level NPN output = Low level solid state relay SSR = low resistance
Aperture angle	Approx. ±5°
Detection capability	0 to 500mm, detection object ≥ 50mm 500 to 2520mm, detection object ≥ beam separation distance + 5mm
Door function	max. door speed : (Version A; end strip min. 100 mm) if max. door speed is 1.1 m/s (Version A; end strip min. 125 mm) if max. door speed is 1.3 m/s (Version C; end strip min. 370 mm) if max. door speed is 1.3 m/s
OSE output	Approx. 950Hz, alternating signal, 4V 20mA, short proof, reverse polarity protection, max. 100nF, max. 30µA leakage current, integrated pull-down 220Ω
PNP output	100mA, short proof, reverse polarity protection, max. 220nF, max. 350µA leakage current, integrated pull-down 10kΩ
NPN output	100mA, short proof, reverse polarity protection, max. 220nF, max. 150µA leakage current, integrated pull-up 10kΩ
SSR output	100mA, short proof, max. 220nF, max. 30VDC, max. 21VAC R on < 35Ω, leakage current < 100µA

## Technical data

Ambient light safety	≥100klux
Housing material	Aluminium profile, fully filled, with 2K epoxy resin
Connection	Pig-tail M8 plug 4-pin, L=130mm
Degree of protection	IP67 as per EN 60529
Operating temperature	-20 to +60°C
Storage temperature	-30 to +70°C
Air humidity	Max. 95%
Weight	Approx. 1860g
Dimensions	2640x16x16mm (LxWxH) (length applies to max. protective field height 2520mm)

### Test input

Version	Normal operation	Test/alignment	Internal input wiring
T00	<2V	>7V	10kΩ pull-down resistor to 0V
T01	>7V	<2V	10kΩ pull-down resistor to 0V
T02	<2V	>7V	10kΩ pull-down resistor to 0V
T03	>7V	<2V	10kΩ pull-up resistor to 24V
T04	<2V	>7V	10kΩ pull-up resistor to 24V
T05	open	0V...4V or supply voltage -4V	

### Testing

Reaction of the output after activation of the test input for a free detection zone

Variant	Reaction of the output
P01	after max. 100ms switch from high to low level
N01	after max. 100ms switch from low to high level
OSE	This version is not tested.
solid state relay SSR	after max. 100ms change from low resistance (<35Ω) to high resistance

## Technical data

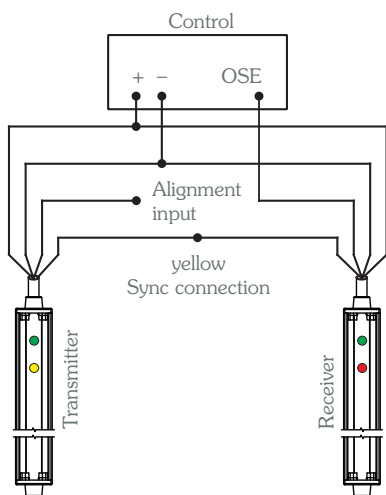
Reaction of the output after deactivation of the test input for a free detection zone

Version	Reaction of the output
P01	after max. 100ms switch from low to high level
N01	after max. 100ms switch from high to low level
OSE	This version is not tested.
solid state relay SSR	after max. 100ms change from high resistance to low resistance(<35Ω)

switching time	Definition
$t \text{ (turn on delay)} \leq 100\text{ms}$	light beam interruption
$t \text{ (turn off delay)} \leq 800\text{ms}$	uninterrupted detection zone



## Connection scheme, OSE output



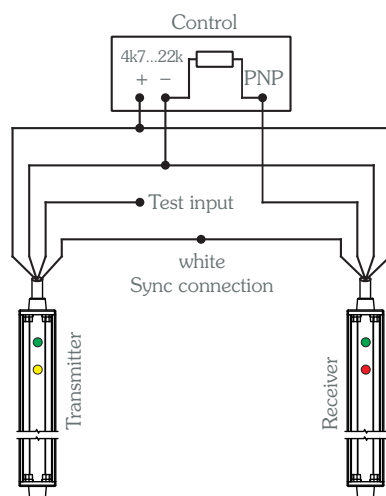
### Transmitter

Transmitter	Function Setting
1 brown - 10...30VDC	with blanking
3 white - 0V/GND	
1 brown - 0V/GND	without blanking
3 white - 10...30VDC	
2 yellow - Sync connection → Receiver	
4 green - Alignment input	

### Receiver

1 brown - 10...30VDC
3 white - 0V/GND
2 yellow - Sync connection → Transmitter
4 green - OSE output 950Hz

## Connection scheme, PNP output



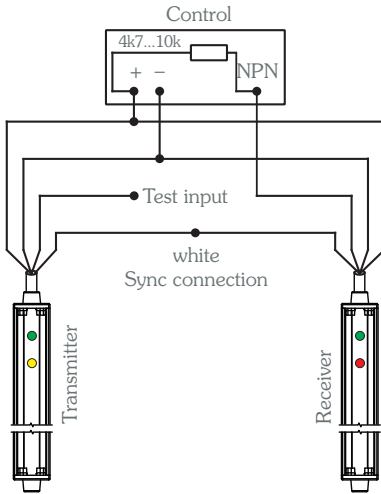
### Transmitter

Transmitter	Function Setting
1 brown - 10...30VDC	with blanking
3 blue - 0V/GND	
1 brown - 0V/GND	without blanking
3 blue - 10...30VDC	
2 white - Sync connection → Receiver	
4 black - Alignment input/test input	

### Receiver

1 brown - 10...30VDC
3 blue - 0V/GND
2 white - Sync connection → Transmitter
4 black - PNP output

## Connection scheme, NPN output



### Transmitter

1 brown - 10...30VDC

3 blue - 0V/GND

1 brown - 0V/GND

3 blue - 10...30VDC

2 white - Sync connection → Receiver

4 black - Alignment input/test input

### Function Setting

with blanking

without blanking

### Receiver

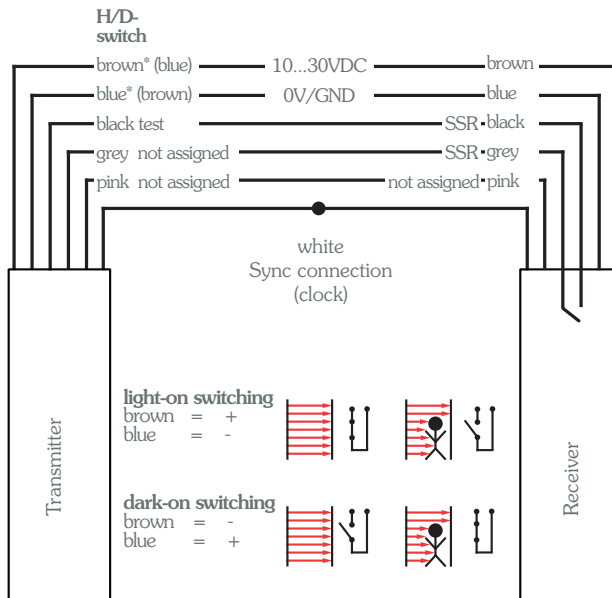
1 brown - 10...30VDC

3 blue - 0V/GND

2 white - Sync connection → Transmitter

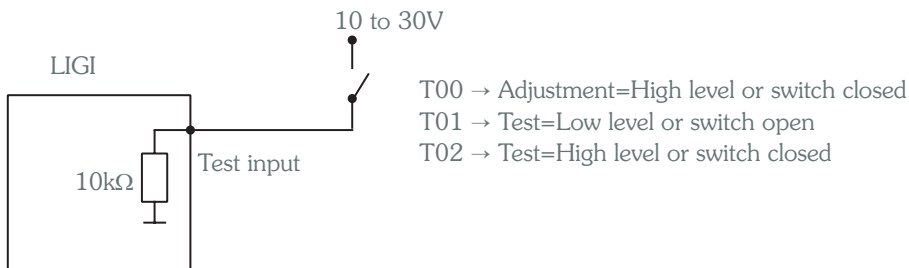
4 black - NPN output

## Connection scheme, SSR output

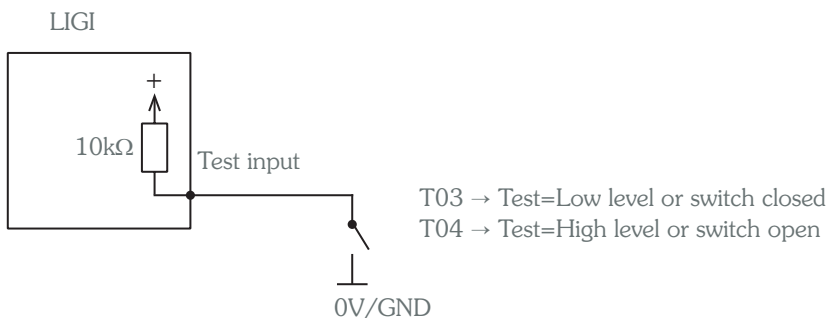


\* light-on/dark-on switching of the contact with polarity reversal of the power supply transmitter (only R03)

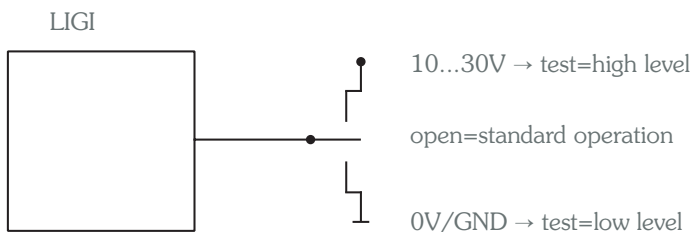
## Connection scheme, test inputs T00, T01 and T02



## Connection scheme, test inputs T03 and T04

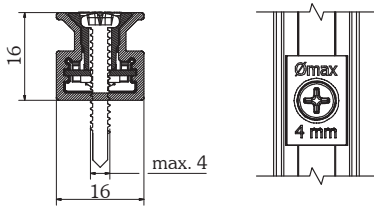


## Connection scheme, test input T05

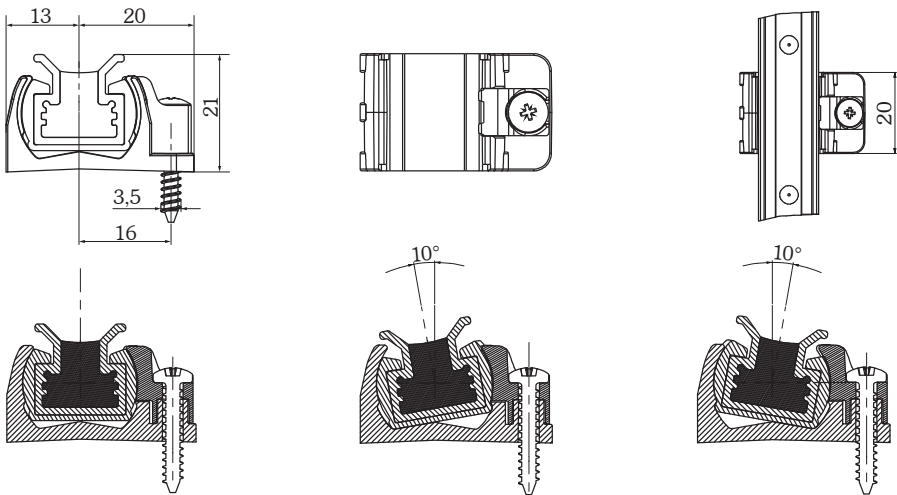


## Mounting materials

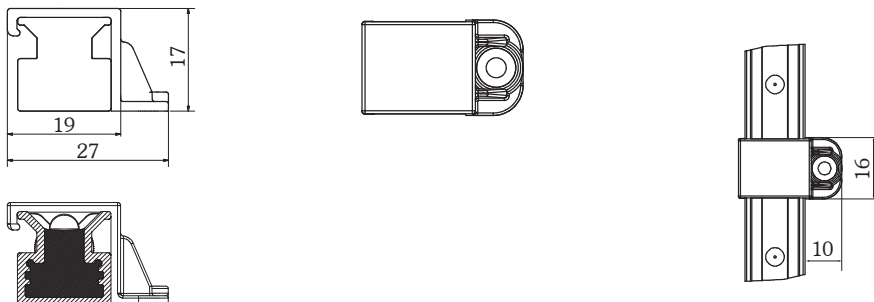
### Direct mounting



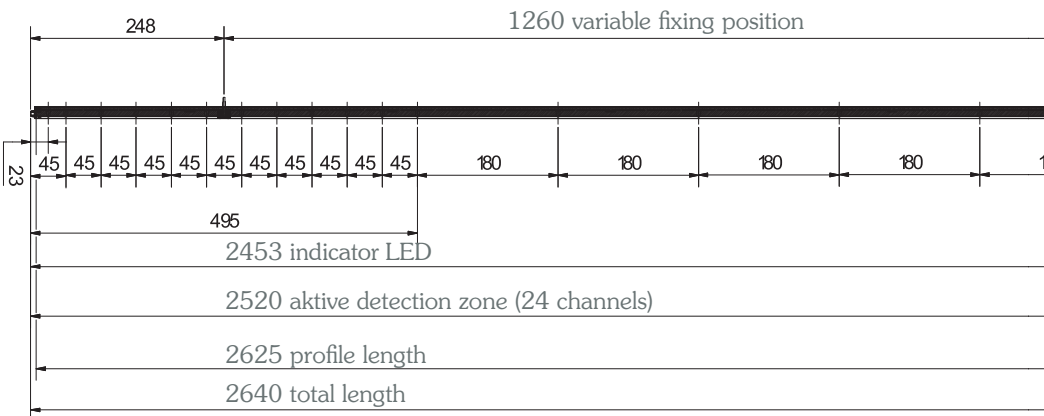
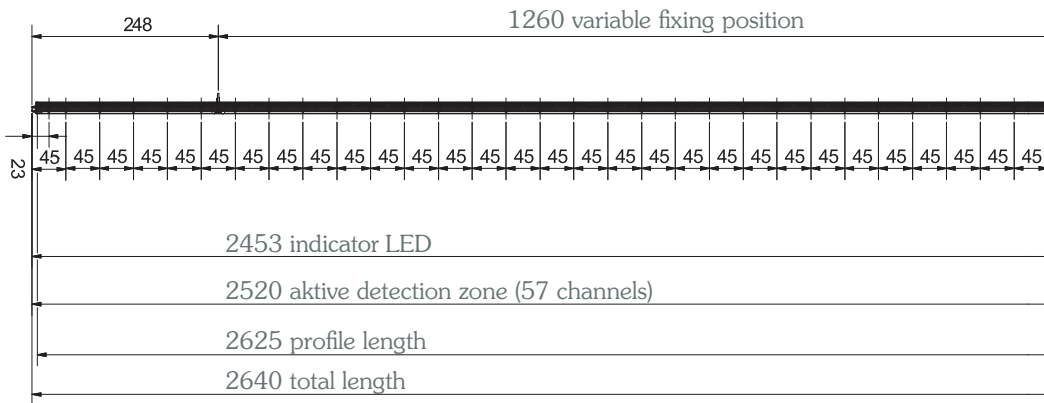
### LIGI-JK 10 alignment clamp



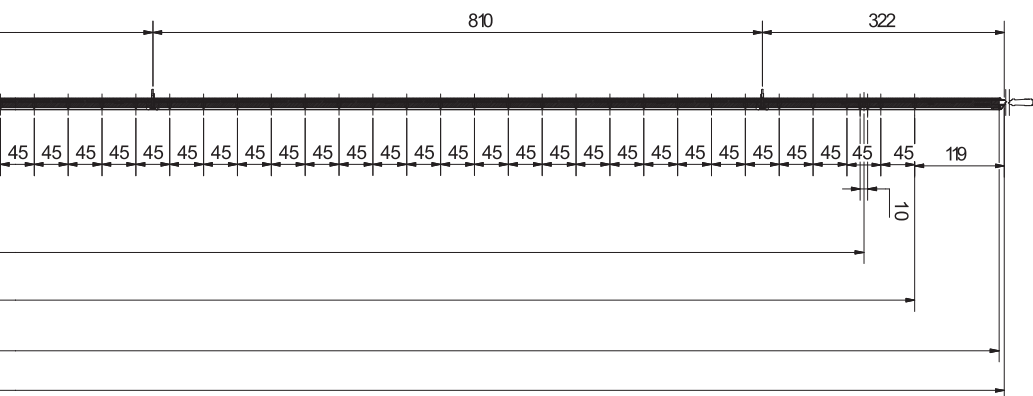
### LIGI-HK 10 fixing clamp



## Channel selection



## Version A



## Version C

