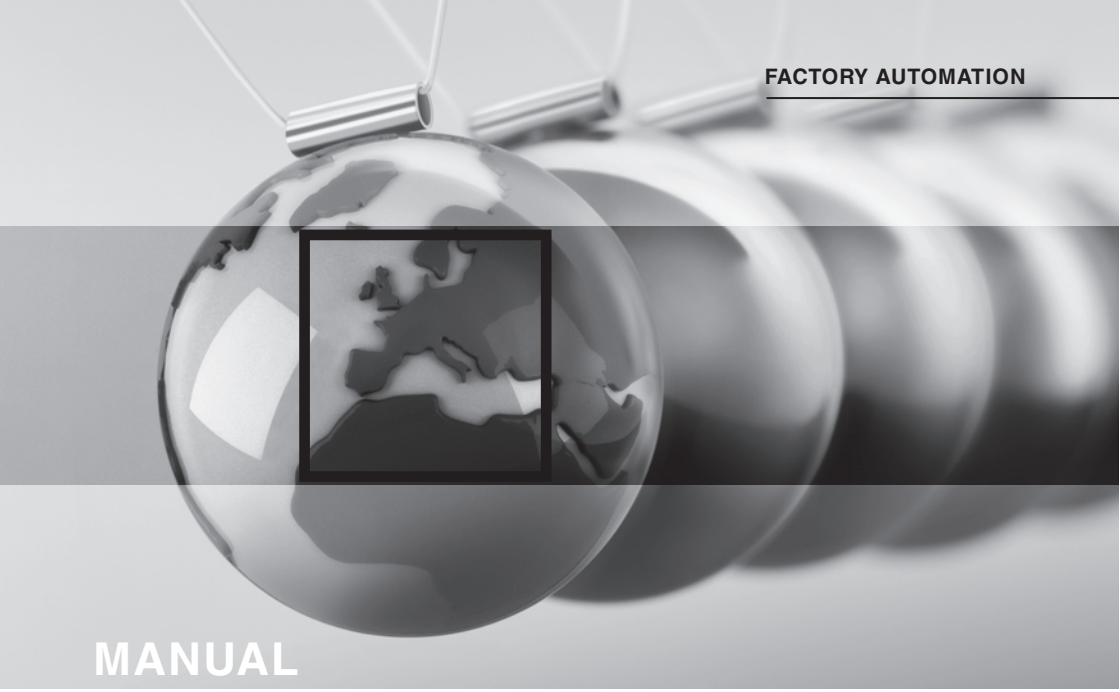
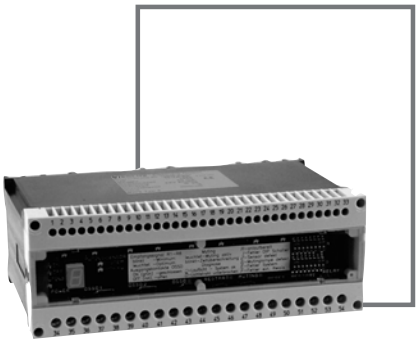


MANUAL

SLVA-8K

CONTROL UNIT



CE

PEPPERL+FUCHS
SENSING YOUR NEEDS

Part No. 119702
Date of issue 2012-03

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Date of issue 03/12/2012 Part No. 119702

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Please note!

These operating instructions contain information on the intended use of the product and serve to protect users from danger. They must be read and observed by all persons who implement, use, care for, maintain and monitor this product. This product can only fulfill the tasks for which it is intended if it is used, cared for, maintained and monitored in accordance with the instructions of Pepperl+Fuchs.

The warrantee undertaken by Pepperl+Fuchs for this product becomes null and void if it is not used, cared for, maintained and monitored in accordance with the instructions of Pepperl+Fuchs.

Before selecting and using the product, an evaluation must be performed to determine whether it is suitable for the purpose in question. The selection and range of application are not subject to the influence of Pepperl+Fuchs. Our liability is therefore limited to consistent quality of the product.

The product must be regularly monitored and maintained by professionals. The results of inspections and maintenance tasks must be kept in logs. Only original Pepperl+Fuchs parts must be used for repair jobs.

Changes to the devices or components and the use of defective or incomplete devices or components are not permitted. Repairs to devices or components may only be performed by Pepperl+Fuchs or authorized work shops. These work shops are responsible for acquiring the latest technical information about Pepperl+Fuchs devices and components.

Repair tasks made on the product that are not performed by Pepperl+Fuchs are not subject to influence on the part of Pepperl+Fuchs.
Our liability is thus limited to repair tasks that are performed by Pepperl+Fuchs.

The preceding information does not change information regarding warrantee and liability in the terms and conditions of sale and delivery of Pepperl+Fuchs.

This device contains sub-assemblies that are electrostatically sensitive. Only qualified specialists may open the device to perform maintenance and repair tasks. Touching the components without protection involves the risk of dangerous electrostatic discharge, and must be avoided. Destruction of basic components caused by an electrostatic discharge voids the warrantee!

Symbols used

This manual uses symbols to present important information on operating the SLVA-8K and working safely with it. The meaning of these symbols is as follows:

Recommendation for the user
Observing these notes will make it easier to place the system in operation and to work with the SLVA-8K.

Refers to a hazard or an immediate danger.
Failure to observe such instructions may result in damage to property, serious injury or death.

Subject to technical modifications.

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1 Intended use

The SLVA-8K is an control unit for a safety light barrier system with a maximum of 8 through-beam sensors of Category 4 (ISO 13849-1) or Type 4 (IEC 61496). The SLVA-8K control unit, through-beam sensors of the SLA series, light grids of the SLP series, muting sensors and additional appropriate safety equipment combine to form a modular protection system. This system must only be used in accordance with intended purpose as electrosensitive protection device for securing access to hazardous points and areas.

Any use not in accordance with these conditions does not comply with usage in accordance with the intended purpose. Applicable safety rules, standards and requirements must be observed during usage, and the specific requirements for the application in question must be taken into consideration.

A protective system with SLVA-8K can be used to secure access to pallet loading and unloading systems, robots, high-shelf storage units and machine systems, for example.

The following components can be added optionally to the SLVA-8K control unit:

- One to eight SLA through-beam sensors or
- SLP light grids with 2, 3 or 4 light beams and
- Up to four (and if certain system requirements are met up to 8) muting sensors for implementing muting operating modes.

2 System features

- belonging to the SLVA family
- Self-monitoring
- 1...8 protective beams
- Operating mode is easy to adjust with switches
- Up to four muting sensors
- Emergency muting for eliminating backup of material
- Can be operated with or without start/restart interlock
- Temporal monitoring of the operating behavior of an external normally closed contact (relay monitor)
- Red transmitter light for easy adjustment of light barriers
- Functional reserve display on the light barrier receivers and on the control unit
- Excessive dirt message
- Diagnostic display for easy pinpointing of faults
- as OSSD outputs alternator of monitored force-guided relays
- Control unit with rating IP20 / NEMA Type 1, assigned for mounting in a control cabinet or in an enclosure with a rating of at least IP54 / NEMA Type 3.

3 Functional principle

Every optical barrier transmitter generates a light beam that is evaluated by a corresponding receiver. A number of light beams together form a protective field. Interruptions in a light beam are determined by the SLVA-8K control unit and the OSSD outputs go into the OFF state. Depending on the type of optical barriers, the detection range of the protective beams may be up to 65 m.

Muting sensors can be used under defined conditions to bridge protective beams (muting). Bridged protective beams can be Interrupted without the OSSD outputs switching off.

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The start/restart interlock (restart) prevents the system from starting or being turned on again after the OSSD outputs have been switched off. After a potential-free normally closed contact connected to the control unit has been activated, the OSSD outputs switch back on when the protective beams are clear.

If the control unit determines the presence of an error, it assumes the secure state. The OSSD outputs are switched off and the error that was determined is displayed. This state can be exited if a normally closed contact to be connected to the reset connection is activated or if the operating voltage is turned off for 5 seconds and then turned back on again. Depending on error states, a restart can be initiated by activating the reset connection. The entire system including the OSSD outputs is tested during this restart.

Emergency muting is an operating mode that makes it possible under certain safety conditions to turn on the OSSD outputs in spite of the protective beams being interrupted. To do this, the normally closed contacts for reset and startup enable must be activated simultaneously (a switch/button).

Muting can be blocked on an additional input by clocking a potential-free contact. This blocking is not monitored. It can be used for machine protection, but is not used for protection of people.

4 Operating modes

You can set different operating modes on the SLVA-8K.

Start/restart interlock is the operating mode that is turned on when the unit leaves the factory. The user can modify the operating mode to adapt the control unit to a specific application. After the operating mode has been changed, a test must always be performed to ensure the selected setting is working properly.

The operating modes of the SLVA-8K can be adjusted using 16 DIP switches. The DIP switches are accessible by removing the see-through cover on the upper side of the analyser unit.

Two switches, one of Series A and one of Series B, must be moved to the same position.

The setting should be made in the order of Switch 1 through 8. It should be noted that Switches 4 through 8 do not have any effect unless Switch 3 is in the ON position (muting on).

If the DIP switches are switched during operation, the control unit switches into the secure state (outputs turned off) and the 7-segment display shows a P. In addition, the output flashes ready for startup (45/46).

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Switch	Position	Operating mode
1	OFF	Without start/restart interlock (restart, RI)
	ON	With start/restart interlock (restart, RI)
2	OFF	Without relay monitor (RM)
	ON	With relay monitor (RM)
3	OFF	Muting off
	ON	Muting on
4	OFF	2 muting sensors (Channels 7+8)
	ON	4 muting sensors (Channels 5 - 8)
5	OFF	Single muting
	ON	Double muting
6	OFF	Sequential muting
	ON	Parallel muting
7	OFF	Muting limited by time window
	ON	Muting limited by protective beams
8	OFF	Muting sensors external to the system
	ON	System-internal muting sensors (SLA light barriers)

Table 4.1: Selecting an operating mode

Example of setting the operating mode:

Switch A	1	2	3	4	5	6	7	8	
Switch B	1	2	3	4	5	6	7	8	Operating mode
Position	ON	OFF	ON	OFF	ON	ON	OFF	OFF	

Muting sensors external to the system
Muting limited by time window
Parallel muting
Double muting
2 muting sensors
Muting ON
No relay monitor
With start/restart interlock

Table 4.2: Example of setting the operating mode:

Table 4.3 shows the assignment of protective beam channels to muting sensors depending on what operating mode is set. As can be seen from the table, light barrier channels can be used either as a protective beam or muting sensor depending on the operating mode.

In the Double muting operating mode, fixed assignment of 2 protective beams to 2 muting sensors must be observed.The two protective beams respond independently of each other, in other words if protective beams 1 and 2 are muted by muting sensors 5 and 6, protective beams 3 and 4 are not muted.

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Operating mode	Protective beam	Muting sensor
2 muting sensors (Switch 4=OFF)	1 - 6	7, 8
4 muting sensors (Switch 4=ON)	1 - 4	5 - 8
Double muting (Switch 5=ON)	1, 2 3, 4	5, 6 7, 8

Table 4.3: Assignment of muting sensors to protective beams

5 Components of the safety light barrier system

The system is depicted in the form of a diagram in Figure 5.1. The SLVA-8K control unit generates the necessary supply voltage for the light barriers, controls the light barrier transmitters and evaluates signals transmitted by the receivers. In the Muting operating modes, up to four muting sensors (and if certain system requirements are met up to 8) are connected instead of light barriers 5 through 8.

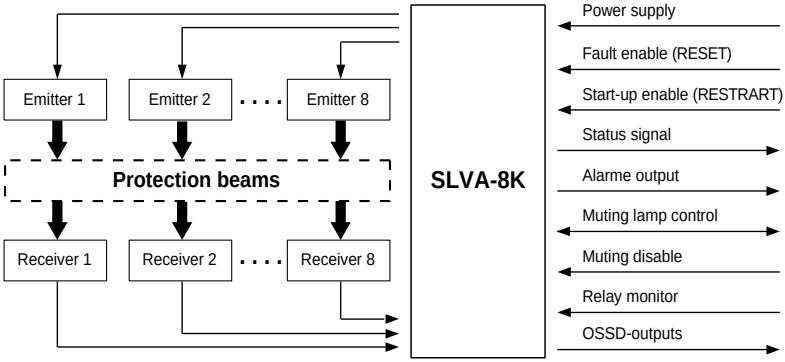

Figure 5.1: Safety light barrier system with SLVA-8K

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The connections of the SLVA-8K control unit are designed as screw terminals and are listed in Figure 5.2.

The light barriers and muting sensors are operated at a low voltage.

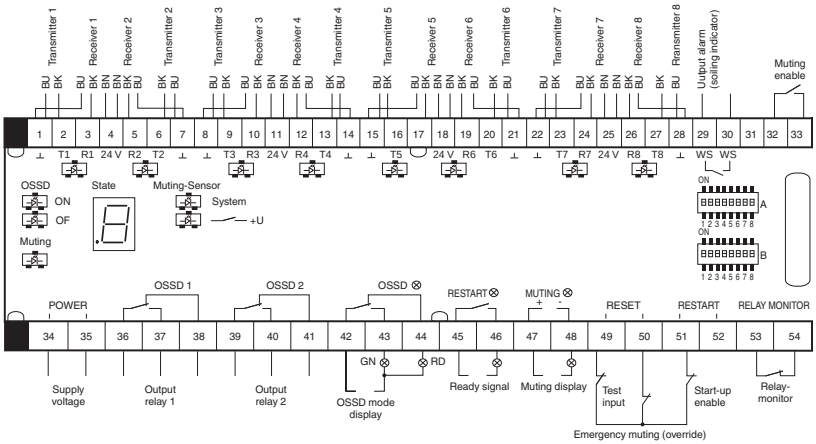

Figure 5.2: Connections of the analyzer unit

6 Setup and assembly of protective field light barriers

Light barriers that are connected to an control unit cannot affect each other mutually.

Light barriers that are connected to different control units should be positioned so that the transmitters of one light barrier group cannot transmit beams to the receivers of another light barrier group.

Light barrier types that are approved for operation on the SLVA-8K can be mixed.

Light barriers must be mounted in such a manner that it is not possible to reach the hazardous area by bypassing the protective beams.

STOP

It must not be possible:

- to crawl under the lowest beam,
- to climb over the highest beam or
- to walk between two beams

Light barriers should be mounted in such a way that they can be adjusted by moving and turning the housing.

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To calculate the minimum distance of the photoelectric sensor from the hazardous area, please refer to the applicable requirements and standards. In accordance with EN ISO 13855, the minimum distance may be calculated by the formula:

$$S = K \cdot T + C$$

Accordingly

S: the minimum safety clearance in mm, i.e. the distance from the hazardous area to the protective field
K: Constant in mm/s for the approach speed
T: Total response time in s, T=t1+t2
t1: Response time of the protective equipment (SLVA-8K = 40 ms)
t2: Response time of the machine
C: Additional distance in mm. This frequently depends on how far a person can enter into the hazardous area before the protective equipment is triggered.

The following applies for securing access:

$$S = K \cdot T + 850\ mm$$

If a risk evaluation determines that individual beams are suitable for securing an area, the following heights should be selected for individual beams parallel to the floor in accordance with EN 999:

Number of beams	Height above the reference level in mm
1	750
2	400, 900
3	300, 700, 1100
4	300, 600, 900 1200
5, 6, 7, 8	Lowest beam ≤ 300, highest beam ≥ 900

Table 6.1: Positioning of individual beams

Care should be taken that reflecting objects that could result in mirroring of an obstruction are not located within the transmitter or receiver lobe (EN IEC 61496-2).

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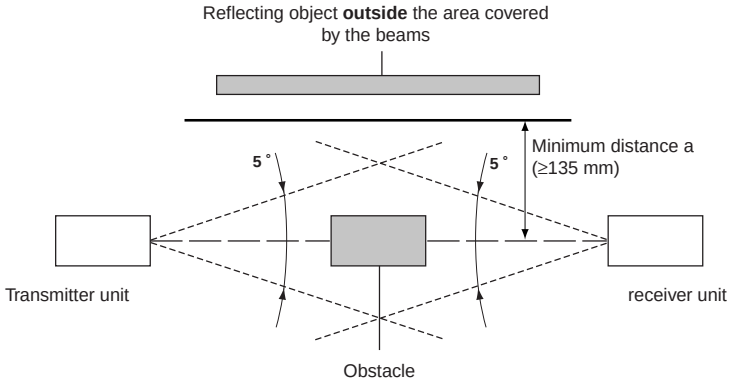

Figure 6.1: Mirroring

7 Muting

The following section should only be observed if the muting function is in use.

Muting operating modes make it possible to bridge protective beams in a manner in accordance with intended use.

The SLVA-8K permits muting of Type 4 in accordance with IEC 61496-1.

If an object needs to be moved through the protective beams without the beams responding to it, muting sensors with a sensing range that extends both before and after the object are required. The sensors must be positioned so that the object that triggers muting is detected with no gaps by at least 2 muting sensors while passing through the protective beams.

Muting requires connecting a signal lamp with a surface of at least 1 cm^2 and a brightness of at least 200 cd/m^2. This signal light is monitored by the SLVA-8K. If the lamp is not connected in a system with muting or is defective, the system assumes the secure state.

The muting state is reached approximately 115 ms after activation of the muting sensors. The system terminates muting state about 10 ms after the muting sensors are deactivated.

The physical positioning of the muting sensors must ensure that muting can only be turned on by objects directed through the area in question and not by persons. The arrangement of the muting sensors depends on the following features:

- the specific application in question
- the type of muting sensors in use
- The number of muting sensors
- The way in which objects are directed into the hazardous area
- The nature and size of the objects moving into the hazardous area
- The speed of the objects
- Safety relative to how likely the muting sensors are to make a mistake

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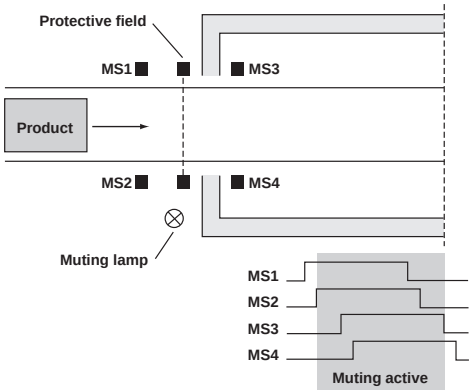
7.1 Working principle

Evaluation of muting sensors through parallel or sequential muting

Depending on the arrangement, muting sensors are activated within a short period of time or one after the other. The sequence of activation can be monitored by selecting between parallel and sequential muting.

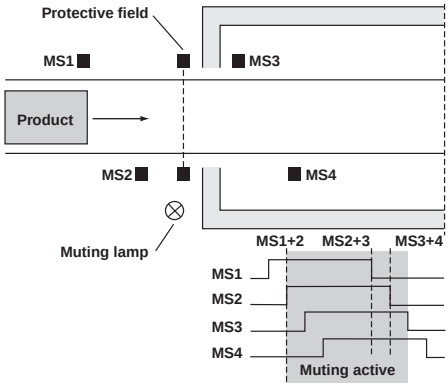
7.1.1 Parallel muting



In the Parallel muting operating mode, muting sensors that are arranged in pairs (M1 and M2 or M3 and M4) must be activated within 2 seconds. If only one of the muting sensors is activated within this time, it is blocked. Blocking prevents muting from being activated, but the protective beams remain active. This block is not released until the sensor is no longer activated.

Figure 7.1:Parallel muting

7.1.2 Sequential muting



In contrast to parallel muting, for which the activated sensors MS1 and MS2 or MS3 and MS4 fulfill the muting condition, in the case of sequential muting it is also possible for the muting condition to be satisfied by sensors MS2 and MS3. The muting sensors are activated one after the other. The way in which the sensors are positioned should be selected so that a person cannot unintentionally activate 2 sensors.

Figure 7.2: Sequential muting

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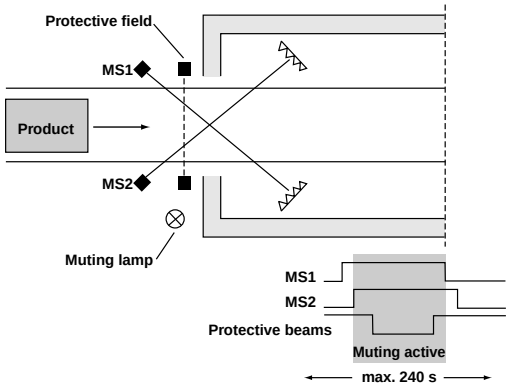
Muting monitoring with time window limiting or protective beam limited muting

To ensure that no dangerous permanent muting can occur when muting sensors fail, the operation of muting is limited either by a time window or by a protective beam. Muting limited by time window should be used if the objects that are intended to pass unimpeded through the protective beams have normally passed through the protective beams within approximately 240 s. If this time is too short, muting limited by protective beams can be used. It should be noted that muting is terminated approximately 115 ms after all protective beams are clear.

7.1.3 Time window limiting



If muting limited by time window is selected, each muting sensor is monitored by time. Each sensor can be activated for a maximum of 240 s, which means that the muting object must have passed through the sensor within this time. If this time is exceeded, the SLVA-8K blocks the sensor. Blocking the sensor means that muting can no longer be activated. The sensor cannot be released for muting again until it has been deactivated.

Figure 7.3: Muting limited by time window

7.1.4 Protective beam limiting

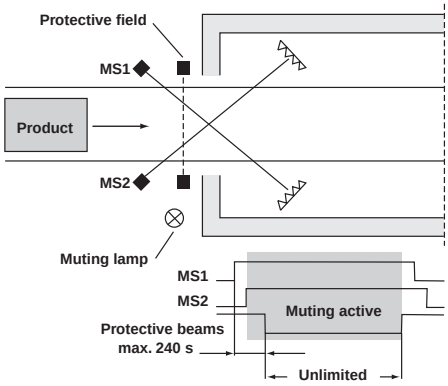


Figure 7.4: Muting limited by protective beams

When muting limited by protective beams is in effect, muting sensors are evaluated in time according to their activation. Two activated muting sensors introduce the muting process. No more than 240 seconds after activation (applies separately for each muting sensor) at least one protective beam must be interrupted. In contrast to muting limited by time window, this stops the measurement of time so that muting is possible without a temporal limit. About 115 ms after the protective field is exited (all protective beam are clear) and the way through is thus clear again, all activated muting sensors are blocked so that no more muting is possible.

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7.2 Muting sensors

Muting sensors are designed to detect muting objects. If an object is detected, the output of the muting sensor switches its supply voltage through. Sensors with relay or pnp output are suitable for this purpose. When no current is flowing, the output of the muting sensor must not be active. The sensor output should be capable of reliably switching a load current of 8 mA at 20 V.

By way of example, the following sensors can be used as muting sensors:

- Retro-reflective photoelectric sensors (light on) with reflector on the object,
- Photoelectric sensor,
- Inductive sensors,
- Mechanical switches.

7.3 Muting light

When muting is in use, an indicator lamp with a minimum lighting surface of 1 cm^2 and a minimum light intensity of 200 Cd/m^2 must be used to indicate the muting status. The SLVA-8K monitors the current of the muting indicator lamp in accordance with the standard cited above for a minimum value of 50 mA. The monitoring ensures that the muting indicator lamp performs its warning function correctly. If the muting indicator lamp is defective, the SLVA-8K assumes the interlock state and shows Error 6 on its display (muting lamp defective). The muting lamp is monitored when it is turned on, when it is executing the reset command and during the time in which muting is active.

In order to increase the availability of the system, 2 muting indicator lamps can be operated in parallel (max. current 500 mA – see Technical data). A requirement for this is that both indicator lamps are visible simultaneously and close to one another when approaching the access area.

If no muting is being used, no muting light indicators are required.

If the muting lamp is being supplied with DC power, the polarity of the muting lamp connection must be checked to ensure it is correct.

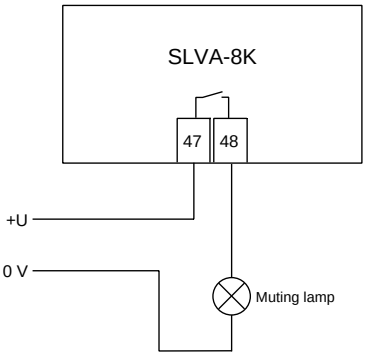

Figure 7.5: Muting lamp connection

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7.4 Emergency muting

If the system must be approached again to remove a blocking object from the area of the protective field and the muting sensors, the emergency muting function is available for this purpose. In the case of emergency muting, blocked muting sensors are re-evaluated for a period of from 3 ... 4 seconds. As a result of this, the OSSDs are turned on again for 3 ... 4 seconds. Emergency muting is initiated with the Override button. The same action can be triggered again and again in sequence, i.e., by pressing the button again within 3 seconds, the duration of the On status of the OSSDs can be lengthened again and again until the object has left the area of the muting sensors.

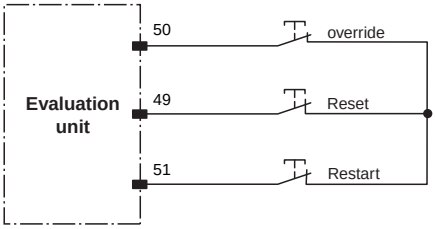

Figure 7.6: Override button connection

7.5 Muting disable

When muting sensors are activated, muting can be blocked. The muting state can be prevented during closed contact by a potential-free contact on terminals 32, 33. If the function is not used, the contacts remain free.

The purpose of this function is for protection of the system. It is not to be used for protection of persons.

8 Assembly/disassembly of the control unit

To assemble the control unit, a standard 35-mm top hat section rail in accordance with DIN EN 50 022-35 should be fastened on the underlay. A profile with a spring-loaded closing mechanism is located on the underside of the control unit in the housing material. The SLVA-8K control unit should be placed with the underside on one edge of the top hat section rail and pressed over the closing mechanism. To disassemble, pull back the closing mechanism with a screwdriver and remove the device. Enough space should be left above the screw terminals to work with a screwdriver.

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9 Installation of system components and their function

After assembling the light barriers and muting sensors as well as the SLVA-8K control unit, the system components should be connected with the control unit.

The transmitters should be connected according to the color coding to terminal pairs 1-2 (T1), 6-7 (T2), 8-9 (T3), 13-14 (T4), 15-16 (T5), 20-21 (T6), 22-23 (T7) and 27-28 (T8).

The receivers should be connected according to the color identification to terminals 1-3-4 (R1), 4-5-7 (R2), 8-10-11 (R3), 11-12-14 (R4), 15-17-18 (R5), 18-19-21 (R6), 22-24-25 (R7) and 25-26-28 (R8).

If you want to operate fewer than 8 light barrier channels, there is no need to replace non-assigned channels with a jumper wire for which a length of up to 3 m is permitted.

Light barrier channel to be replaced	Jumper wire between
1	2 - 3
2	5 - 6
3	9 - 10
4	12 - 13
5	16 - 17
6	19 - 20
7	24 - 25
8	26 - 27

Table 9.1: Jumpering non-required light barrier channels

9.1 Light barriers

Receivers are equipped with an indicator lamp for displaying the receiver status (see Table 9.2).

SLA optical barrier	SLP light grid	Status
Green	On	light beam free; functional integrity at least a factor of 1.5
Yellow	Flashing	Light beam free; functional integrity less than a factor of 1.5
Off	Off	Light beam interrupted

Table 9.2: Displays

9.2 Light grid

Receiver profiles are equipped with a red LED above the cable gland that indicates readiness for operation.

Each receiver is equipped with a red LED that indicates the receiver status (off/flashing/on).

On the meaning of the receiver display, see Table 9.2.

9.3 Muting sensors

In the case of muting sensors external to the system, there is no evaluation of function reserve by the SLVA-8K. If muting sensors external to the system will be receiving their power supply from the control unit, the maximum permissible current consumption per sensor without load is 20 mA.

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9.4 Connection cable

The connection cable between sensors and the control unit may be up to 50 m long. Cables for the light barriers should be selected so that a short-circuit between the receiver and transmitter line is not possible. The wiring of the OSSD1 and 2 connections should be designed so that the relay contacts cannot be bridged without it being noticed by line short-circuits. The voltage resistance should be designed for a secure separation.

9.5 External indicator lamps for connecting to the potential-free outputs

External indicator lamps that can be connected are not included with delivery. The signal color yellow should be used to indicate ready for startup. When selecting the indicator lamp for the muting status, the required minimum light density and surface must be observed (see Section 7.3).
If muting indicator lamps are operated with direct voltage, the polarity must be observed. The states of the OSSD outputs (OSSDs) "on" and "off" must be indicated with the colors green and red respectively.

9.6 Electrical safety

For power supply with line voltage, the control unit is designed for a secure separation between voltage supply connections 34 and 35 and all other connections.
OSSD connections 36...41 are designed for a secure separation with line voltage.
Potential-free output terminals 42...48 (connections for indicator lamps) are designed for secure separation at low voltage in reference to the other connections. The connections listed are, however, not designed for secure separation from each other.

It is therefore not permissible for one part of the connections listed here to be connected to low protective voltage and another part to be connected to low voltage or high voltage.

Terminals 29 and 30 (excessive dirt message) represent a potential-free relay output that must not be operated at low voltage.

9.7 Supply voltage

The supply voltages listed in Table 9.3 must be applied to the device.
The power supply for the device, OSSD and muting lamp may all be from a single source.

Device (terminals 34-35	Operating voltage	
	SLVA-8K 24V	24V AC/DC, for DC any polarity
	SLVA-8K 115V	115V AC
	SLVA-8K 230V	230V AC

Table 9.3: Supply voltage

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Muting lamp (terminals 47-48)	Provides power to the muting lamp; only required when using the Muting operating mode 20V...230V AC or DC, the polarity must be observed for DC: 47 an +, 48 an -

Table 9.3: Supply voltage

9.8 OSSD outputs

The potential-free alternating contacts of both force-guided relays are located on terminals 36-38 (OSSD 1) and 39-41 (OSSD 2). These should be connected to the following devices in the machine control system (for example auxiliary contactors).

With an inductive load, the output contacts must be protected against the increased load that is thus generated by RC combination or freewheeling diodes. The circuitry must be wired directly to the load.

When using freewheeling diodes, it should be noted that the pulse decay time of the connected relays or contactors is extended.

If DC loads are switched with the outputs, the permissible switching output in accordance with Section 16 must be observed.

When the control unit is integrated into the safety-related control system of the machine, the instructions in IEC/EN 61496-1 along with others must be taken into consideration (switching in electrosensitive protection device control elements downstream in the circuit).

The output contacts of the relays are not monitored for short circuits and cross circuits. This must be noted for circuitry and cable laying.

If the output relays are left turned on for a long time without interruption, the switching capacity must be tested at least once a day. To do this, either interrupt the protective field or initiate a system reset with the Reset input(See Section 9.9.1)

9.9 External control contacts

External control contacts should be designed as potential-free contacts that are switched between the respective input and a 24 V output. The current load in the closed state is about 8 mA for voltage supply with nominal voltage.

9.9.1 Error enable (reset)

The reset function can be triggered by opening a normally closed contact to the corresponding input for 0.05 ... 1 seconds and closing it again. The Reset function sets the system back to its starting condition. The amount of time until the system is ready for startup again is about 2 s. The Reset function can also be triggered by turning off the power supply for about 5 seconds. This can be used in the following situations:

- Testing the switching capacity of the output relays
- Eliminating an error state

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9.9.2 Startup enable (restart)

The startup function can be triggered by opening a normally closed contact on the corresponding input for 0.05 ... 1 seconds and closing it again. If the machine is ready for startup and there is an active start/restart interlock, it causes the OSSD outputs to be turned on. If the system is working without start/restart interlock, the input is not wired.

9.9.3 Relay monitor

This section is only of interest if the system is used for monitoring an external contact (DIP switches A+B 2=ON).

The SLVA-8K can monitor externally connected normally closed contacts if their function is connected with the switching of the OSSD outputs. Contacts of this type may originate from activated contactors or from other places in the system (for example coast-down detectors). If the external contact does not correspond to the status of the OSSD outputs, the system assumes the error status (Error **F**).

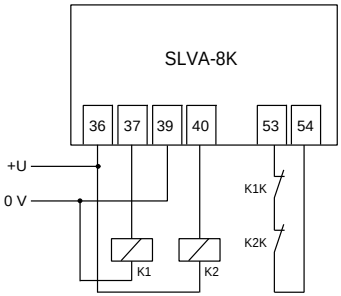

Figure 9.1: Relay monitor

An example is contactor monitoring as illustrated by Figure 9.1. In this example, two contactor contacts belonging to different contactors are wired in series.

When switching from low voltage or high voltage through the monitored switching elements, the applicable requirements for electrical safety must be observed.

10 Display LEDs on the front plate of the SLVA-8K

The front plate on the upper side of the housing as shown in Figure 5.2 is equipped with a number of LEDs for displaying various operating states, and with a 7-digit numeric display for diagnostic states. In the error state, the decimal point of the number display also flashes. In addition, the status of the Ready for startup output changes at a rate of once per second.

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LED	Red	OSSD outputs turned off
	Green	OSSD outputs turned on
	Yellow	Muting operating mode selected, flashing: Muting time error
	Yellow	Indicator lamp for Channels (1-8) on: Light beam free or muting sensor active flashing: Light beam free, level below function reserve: Light beam interrupted
7-segment display		Protective beams free, OSSD ON (running light)
		Protective beams interrupted.
		Protective beams free, OSSD off, readiness for startup
		System errors
		DIP switch position incorrect
		Receiver defective
		Transmitter connection short-circuit
		Muting lamp defective or missing
		Fault in ext. contactors (relay monitor)
		Operating mode selection via DIP switch, device in adjustment mode

Table 10.1: Front plate displays

11 Commissioning

After the supply voltage is turned on, the SLVA-8K control unit runs through the startup test and the light barriers are activated.

11.1 Adjustment

Red transmitter light is transmitted to facilitate adjusting the light barriers.

The adjustment begins on the transmitter. The red light is directed to the place where the receiver is located. To do this, the red light is observed either directly on the receiver by looking into the transmitter (which involves no danger) or it is observed by applying a retroreflector in the position of the receiver from the transmitter side. As do this, your eye should be close to the light beam axis. After the transmitter has been adjusted, the receiver should be adjusted so that the display LED is displayed with at least 1.5 times the function reserve (continuous light, green or red).

If there is a very great distance between the transmitter and receiver, the adjustment can also be facilitated with the support of a laser adjustment aid.

11.2 Test of detection capability of the installed electrosensitive protection device

The following tasks must be performed to test the detection capacity:

- Remove all objects from the beam paths.
- Interrupt the light beams one after the other. The switching device must be in the Off state when you do this.

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11.3 Test of startup/ restart lock and startup enable

- Interrupt one beam and then make all beams free.
- Output relays must remain locked for startup lock and the indicator light for startup readiness must be lit.
- Activate the startup contact for 0.05 ... 1 seconds (RESTART)
- Output relays must turn on and the annunciator light indicating ready for startup must go out.

11.4 Test of error enable connection (RESET)

- Remove all objects from the beam path.
- If there is a startup lock, activate the startup enable contact (RESTART).
- The output relays must switch on.
- Activate the error enable contact (RESET) for 0.05 ... 1 s
- The output relays must switch off.

11.5 Test of relay monitor

- Interrupt the connection line between the external contact and the control unit
- Turn on the SLVA-8K
- Read the numeric display on the SLVA-8K. If F is displayed, contact monitoring is active
- Connect the interrupted lead again.

11.6 Working principle of OSSDs

The two OSSDs are turned on under the following conditions:

- With active startup lock: The protective beams are free and startup is enabled.
- Without startup lock: The protective beams are free.

The OSSDs remain switched on under the following conditions:

- No protective beam is interrupted.
- Muting is in effect while protective beams are interrupted.

The OSSDs remain switched off under the following conditions:

- The protective beams are interrupted.
- Protective beams are interrupted while muting is active, but muting is in timeout.
- An error state is detected.
- The contact for error enable (RESET) is activated.

12 Periodic checkup

A periodic test is required if the OSSD outputs of the control unit are relays and it is not ensured that:

- A protective field interruption occurs at least once per day
- or the device is not turned on once each operating day.

The test is performed as follows:

- Make the protective field free and enable startup
- Interrupt the protective field at any beam and observe the display for the OSSD outputs as you do so.They must switch from green to red.
- If the switching device does not receive any fault status, the test is complete.

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13 Fuses

If the OSSD outputs of the control unit are relays, each relay is protected by T2A melt fuses.

Output 47-48 is protected by a T1A melt fuse.

Before replacing the fuse, it is absolutely essential to disconnect the power supply. To replace the fuses, remove the lowest terminal strip (34-54). The position of the fuses is illustrated in Figure 13.1.

Fuse	Circuit
Si1	OSSD1
Si2	OSSD2
Si3	Muting lamp contact

Table 13.1:

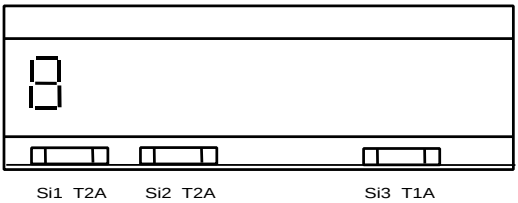

Figure 13.1 Position of the fuses

14 Troubleshooting

Errors in the system always result in the system making a transition to the secure interlock state. The outputs are then switched off. An error brings the system to a state that is identified by an error display (coded). This display can be useful in pinpointing errors.

A few errors for which the user can provide a solution are listed here:

Error figure	How to eliminate error
Displays on the switching device do not light up	Check the power supply.
The indicator lamps on the potential-free outputs do not light up	Check installation and external voltage supply, also check fuse on output 47-48
Startup enable (RESTART) is not working, Display A	Check connection between SLVA-8K control unit and external normally closed contact
One output is not switching	Remeasure the fuses when startup is enabled on terminals 36-38 (OSSD1) or 39-41 (OSSD2). If necessary, replace them and check the installation

Table 14.1: Error displays

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Error figure	How to eliminate error
No object in the protective field, but display **0**	Use the functional reserve display on the light barriers to check whether a protective field beam is interrupted. If necessary, readjust the light barriers or check the installation
Error **1** is displayed	Check the DIP switch setting
Error **5** is displayed	Check the transmitter installation
Error **6** is displayed	Connect the muting lamp or replace a defective muting lamp, check fuse Si3 in the SLVA-8K or check the installation of the muting lamp
Error **E** is displayed	Activate the error enable contact (RESET) or turn the operating voltage off and on. Check whether an external light barrier is illuminating the one of the connected receivers
Error **F** is displayed	Check monitored contact components and connection line

Table 14.1: Error displays

15 Application checklist

The application checklist serves as an aid for avoiding errors when setting up the safety light barrier system.

15.1 Before installation

- Have the applicable standards been taken into consideration (see Section 20)?
- Are the SLVA-8K control unit and the light barriers present in accordance with the specified type in the required number?
- Does the SLVA-8K have the required operating voltage (note manufacturer's rating plate)?
- Has the required overvoltage category been implemented from the output connections and voltage supply connections to other connections in accordance with EN 50178?
- If you are using monitoring of external contacts: If the necessary secure separation according to overvoltage category 4 (EN 50178) ensured between the normally closed control contact and the other contacts?
- If you are using muting: Are muting sensors present and in the required number in accordance with the specified requirements?
- If you are using muting: Is a suitable muting display present with the required brightness?
- Is there enough space for assembly and disassembly above the screw terminal of the SLVA-8K?
- Is the SLVA-8K installed in a switch cabinet or housing with a protection type of at least IP54 / NEMA 3 (requirement in accordance with IEC 61496-1)?

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15.2 After installation

- Is the startup enable contact (RESTART) connected (only for start/restart interlock)?
- Is the error enable contact (RESET) connected (if present)?
- Is there a red and green indicator lamp at a visible location to display the status of the outputs or is the required red/green indicator lamp implemented in some other manner?
- For startup/restart lock Is there a yellow indicator lamp in a clearly visible location that indicates readiness for startup?
- For muting: Is there a suitable muting display in a clearly visible location that indicates active muting?
- Are all required light barriers and muting sensors correctly connected?
- Are the light barriers and (is present) muting sensors positioned so that it is not possible to reach the source of danger by going around them?
- Are the light barriers adjusted?

15.3 Commissioning

- Was the safety equipment checked after installation on each beam for its detection capacity (for obstacle sizes see data for light barriers)?
- Has the start/restart interlock (RESTART if activated) been checked for its functionality?
- Has the monitoring of external contacts (if activated) been checked for its functionality?
- Has muting (if present) been checked for its functionality?

15.4 Periodic test

Is the protective field interrupted or is the system turned on at least once every operating day?

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16 Technical data

16.1 General specifications

Approvals	TÜV, cNRTLus
Tests	EN IEC 61496; EN ISO 13849; EN 55022 The specified standards refer on the respective current version of the normative documents
Safety type	4 (EN IEC 61496)
Performance Level	PL e (EN ISO 13849)
Safety Integrity Level (SIL)	SIL 3 (EN IEC 61508)
Category	Cat. 4 (EN ISO 13849)
Marking	CE

16.2 Electrical specifications

Supply voltage:	
230 V-design:	230 V AC (-15%, +10%), 48 Hz ... 62 Hz
115 V-design:	115 V AC (-15%, +10%), 48 Hz ... 62 Hz
24 VAC-design:	24 V AC (-10%, +10%)
24 VDC-design:	24 V DC (-25%, +25%)
Current consumption:	
230 V-design:	≤ 50 mA
115 V-design:	≤ 100 mA
24 V-design:	≤ 500 mA
Power consumption:	
230 V-designg:	13 W
115 V-design:	13 W
24 V-design:	15 W
Rating:	
230 V-design:	II (IEC 61140)
115 V-design:	II (IEC 61140)
24 V-design:	III (IEC 61140)
Response time:	40 ms
Timing:	
release time after protective beams became free:	115 ms
delay between activation of muting sensors and muting enable:	115 ms
delay between deactivation of muting sensors and muting disable:	10 ms
Activation current and voltage for potential-free control contacts:	8 mA / 24 V
Activation time for start-up enable (restart) and error enable (reset):	0.05 s .... 1 s
Outputs OSSD 1 and OSSD 2, isolated relays outputs at clamps 36 to 41:	
switch voltage AC/DC:	20 ... 230 V AC/DC
switching current AC:	0.01 A ... 2 A
switching current DC:	see limit curve
switching rate	max. 1/s
fusing	fuse T2A

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Outputs for indicator "OSSD", isolated relays outputs at clamps 42 to 44:	
switch voltage AC/DC:	20 ... 230 V AC/DC
switching current AC:	0.02 A ... 2 A
switching current DC:	see limit curve
fusing	unused
isolated relays outputs at clamps 45-46:	
switch voltage AC/DC:	20 ... 230 V AC/DC
switching current AC:	0.02 A ... 2 A
switching current DC:	see limit curve
fusing	unused
Outputs for indicator "MUTING", isolated relays outputs between clamps 47-48:	
switch voltage AC/DC:	20 ... 230 V AC/DC
switching current AC:	0,05 A ... 0,5 A
switching current DC:	see limit curve for DC-operation please check polarity (+ at clamp 47, -at clamp 48)
fusing	fuse T1A
Outputs for indicator "ALARM" or "FOULING", isolated relays outputs between clamps 29-30:	
switching current DC:	2 ... 48 V DC
switching current DC:	1 mA ... 500 mA
fusing	unused

16.3 Additional data

Muting sensors:	
max. current consumption, without load current consumption of inputs:	20 mA
current consumption of inputs:	10 mA
Wiring:	
connection:	terminal clamps with terminal screws
max. Leiterquerschnitt	litz wire with sleeve, max. 1.5 mm^2
Ambient conditions:	
operating temperature:	0 °C ... 50 °C
storage temperature:	-20 °C ... 75 °C
rel. humidity, uncondensed:	max. 95 % at temperature from 20 °C to 50 °C)
Weight:	
115 VAC or 230 VAC version	1300 g
24 VAC or 24 VDC version	750 g
Enclosure:	Polycarbonate/UL-94 V-0
Rating:	IP20 / NEMA 1 mounting in a switch cabinet or enclosure with rating IP 54/NEMA 3 or better is demanded
Length of cord sets:	max. 50 m

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Limit curve with DC current

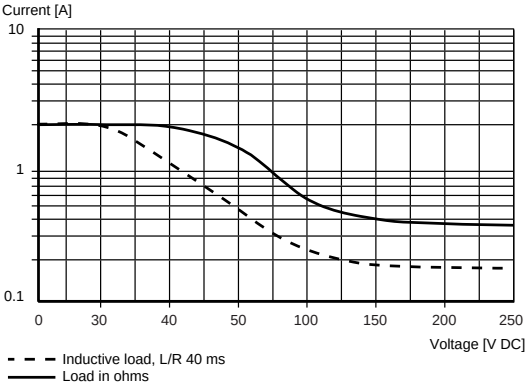

Figure 16.1:Load limit curve of relay OSSD for direct current

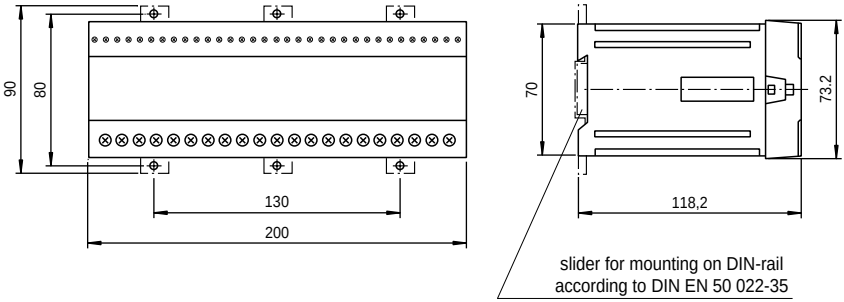

Figure 16.2:Dimensions

16.4 Light barriers

Through-beam light barriers of type SLA and SLP combine with the SLVA-8K control unit to form a electrosensitive protection device of Category 4 (in accordance with ISO 13849-1) or Type 4 (in accordance with ISO 61496-1). From 1 to 8 light barriers can be connected to an control unit.

Light barriers can be combined in any way desired, although a single light barriers must consist of a transmitter and receiver of the same type. Light barriers may only be operated with a switching device of the SLVA family.

The various light barriers that can be connected to the SLVA-8K control unit are distinguished by connection type. Either the light barriers have a fixed cable connection, a plug-in connector or there is a terminal compartment present for the cable connector.

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16.5 Light grid

The SLP 10 to SLP 65 light grids are suitable for securing access with 2 – 8 light beams (light beam clearances correspond to the standard requirements of EN ISO 13855).

16.6 Redirection mirror

Redirection mirrors are used for deflection away from protective fields and grids for securing them on multiple sides with only one transmitter/receiver pair.The detection range is reduced for each mirror by a maximum of 15%.

The mirror is set up so that light beams coming from the emitter are redirected to the receiver. For a right-angle deflection of the protective field, the mirror is at an angle of 45°.

When the layout is aligned, care must be taken that all components are standing upright at the same height. To align the mirror roughly, you should turn the mirror so that you can see the outline of the receiver in the mirror if you look out from the transmitter in the direction of the mirror.

The alignment can be facilitated by using the BA12 laser alignment aid.

Make certain that the surfaces of the mirror are clean. Use cleaning materials that will not scratch and lint-free cloths for cleaning.

17 Sample circuits

Three sample circuits are presented in the following section to demonstrate the capabilities of the SLVA-8K.

Example 1 (see Figure 17.1): The SLVA-8K is used for 3-beam protection at 2 access points. Protective beams are formed by the SLP light grid. The start/restart interlock and relay motor functions are activated.

Example 2 (see Figure 17.2): 2 access points to a hazardous area are protected by 2 beams and each entrance can be muted separately. SLA light barriers are used as muting sensors. The beams of the muting light barriers form a cross and the system works with parallel muting.

Example 3 (see Figure 17.3): 3 safety light barriers of Type SLA5/92 (plug-in connector) are used for this simple muting application. The switches that are selected as muting sensors are arranged so that one person cannot accidentally activate 2 switches simultaneously. Sequential muting is set as the muting operating type.

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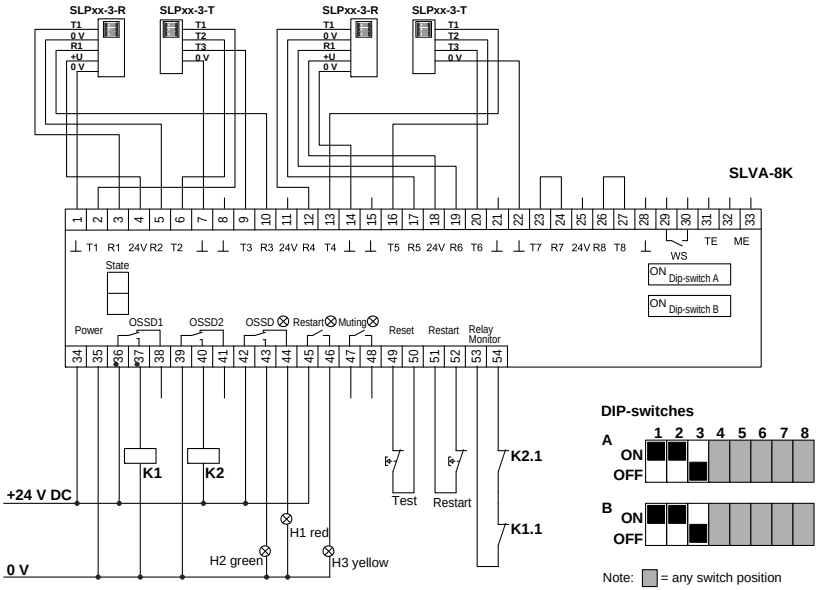

Figure 17.1:2 protective fields with 3 beams each

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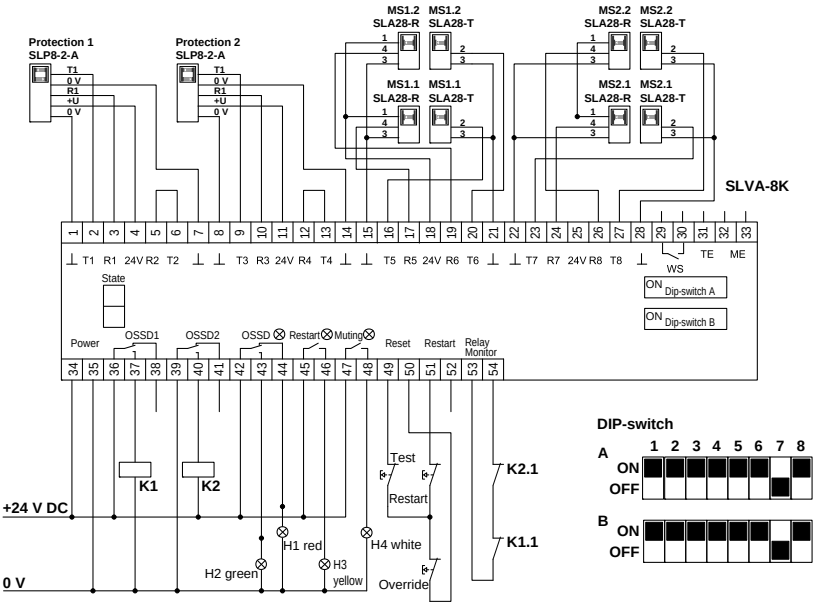

Figure 17.2:Double muting with muting sensors internal to the system

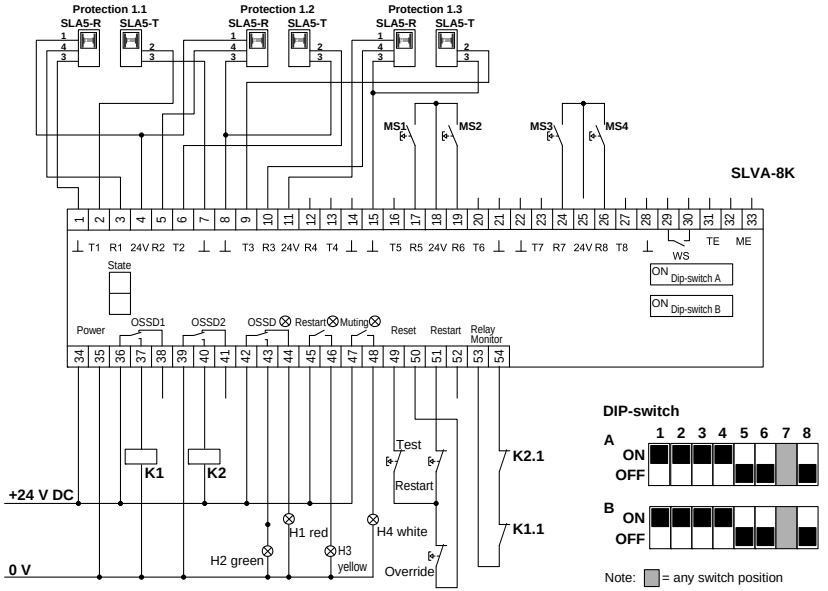

Figure 17.3:3 Protective beams with sequential muting

18 Ordering information

Power supply	Model numbers
24 V DC	SLVA-8K 24VDC
115 V AC	SLVA-8K 115VAC
230 V AC	SLVA-8K 230VAC

Table 18.1: Model numbers

19 Warrantee conditions

The warrantee period for SLVA-8K control units is 24 months in accordance with the General Terms of Delivery of ZVEI.

Repairs may only be performed by the manufacturer. Intervention into and modifications of the device are not permissible. They result in any warrantee being voided.

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20 Standards

The relevant laws and standards apply to the use of photoelectric protective devices. There are differences depending on the area of use. The following regulations are relevant within the EU and Germany.

20.1 Construction and equipping of protective equipment

IEC 61496-1	Safety of machinery. Electro-sensitive protective equipment
IEC 61508,	Functional safety of EEPE safety-related systems
DIN V VDE0801	Principles for computers in systems with safety tasks
DIN EN 62061	Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems

20.2 Use and installation of protective equipment

IEC 50178	Electronic equipment for use in power installations
DIN IEC 68	Electrical engineering; basic environmental testing procedures
DIN EN 60204-1	Safety of machinery - electrical equipment of machines
DIN EN 61140	Protection against electric shock - common aspects for installations and equipment (IEC 61140:2001 and A1:2004, modified)
DIN EN 60664-1	Coordination of the insulation of electronic equipment in low-voltage systems - Part 1: Principles, requirements and tests (IEC 60664-1:2007)
DIN EN 60068-1:1995-03	Environmental testing - Part 1: General matters and guidance
Directive 98/37/EC, from 29.12.2009 Directive 2006/42/EC	Machinery Directive
EN ISO 12100	Safety of machinery - electrical equipment of industrial machines
EN ISO 13849-1	Safety of machinery - safety relevant parts of controls- part 1: General design principles
DIN CLC/TS 62046, preliminary standard, 2005-09	Safety of machinery - Use of protective equipment to recognize the presence of people (IEC/TS 62046:2004) Safety of machinery - The positioning of protective equipment with respect to approach speeds of parts of the human body
EN999/EN ISO 13855	Safety of machinery - The positioning of protective equipment with respect to approach speeds of parts of the human body
ZH1/597	Safety rules for non-contact protective equipment on powered equipment
EN ISO 13857	Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs

In addition to the stipulations listed there may be other applicable standards for special machinery and applications that should be considered.

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21 Notes

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With regard to the supply of products, the current issue of the following document is applicable:
The General Terms of Delivery for Products and Services of the Electrical Industry, published by the Central Association of the Electrical Industry (Zentralverband Elektrotechnik und Elektroindustrie (ZVEI) e.V.)
in its most recent version as well as the supplementary clause: "Expanded reservation of proprietorship"

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