

Muting controller with Relay Outputs

SRUM/R
342153

Special characteristics:

- Intended for use with Guardscan light curtains
- Muting controller for presence sensing safeguarding devices according to EN 61496-1
- For applications up to safety category 4 according to EN 954
- Connection of an external muting light according to EN 61496-1
- Connection of different muting-sensors (NPN, PNP and relay outputs)
- Monitoring of external contactors and expansion modules
- Housing with detachable terminal strips

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WARNING

Guardscan safety systems are intended to protect operators working at or near dangerous machinery. They can only perform this function if they are correctly fitted to a suitable machine. It is essential that the full contents of this manual and all the authoritative documents referred to herein are fully understood before any attempt at installation is made. If in doubt contact your authorised Guardscan distributor.

The safety of persons and equipment cannot be guaranteed if the muting controller is not used in accordance with its intended use.

IMPORTANT

This manual must accompany the product throughout its working life. Those persons responsible for the product must ensure that all persons involved in the installation, commissioning, operation, maintenance and servicing of the product have access to all the information supplied by the manufacturers of the machine and its safety system.

PLEASE OBSERVE THE FOLLOWING:

- **The device may only be installed and commissioned in compliance with these operating instructions by suitably qualified personnel familiar with working safety and accident prevention legislation. Electrical work may only be performed by suitably qualified electricians.**
- **Repairs, in particular those involving opening the housing, may only be performed by the manufacturer or persons authorised up by the manufacturer. Any attempt to perform repairs by unauthorized persons will invalidate the warranty.**
- **Please observe the relevant valid regulations, in particular those pertaining to safety measures and the installation of muting sensors, the muting lamp and the Guardscan light curtain.**
- **It must be possible to view the danger area from the installation location of the start button and the key-operated switch.**
- **It must not be possible to start the equipment from the danger area.**

Explanation of terms

Muting	Temporary bypassing of a Light Curtain in order to transport material into or out of the danger area.
Restart inhibit	Prevention of machinery from automatically resuming operation.

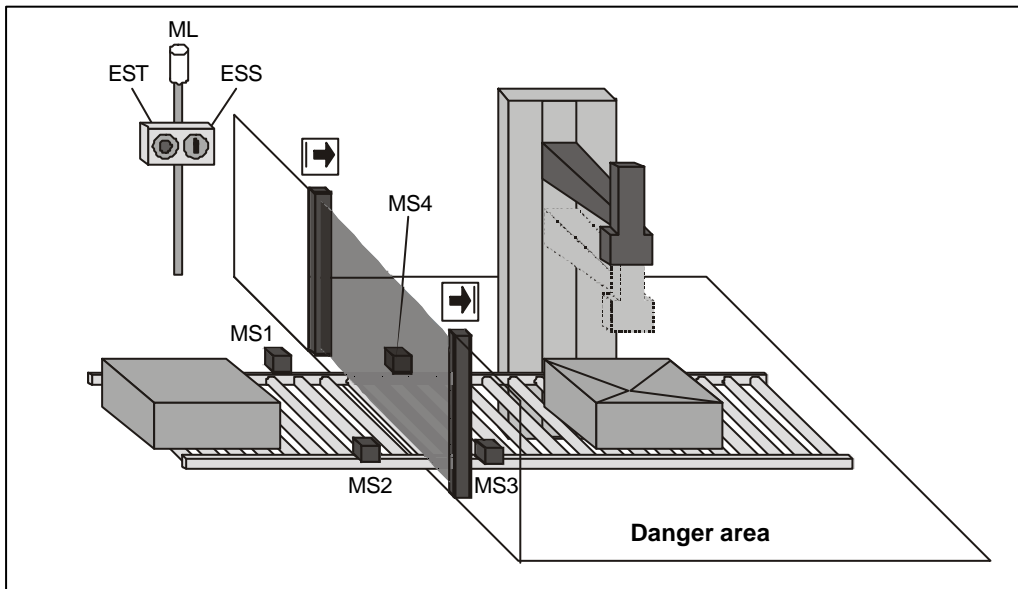
Introduction

The Guardscan SRUM/R muting controller with relay outputs is designed to be used with the new generation of Guardscan safety light curtains, to safeguard operators from dangerous machinery up to safety category 4 as described in EN 954-1. The integrated muting function, which has been designed to EN 61496, permits goods to be transported into or out of the danger area without impairment to the safety function.

The SRUM/R provides a safe method of providing a muting function, by the appropriate use of carefully positioned sensors, either two or four, at the entrance / exit of the danger area, in such a way that only the material being transported activates the sensors. Once the material has activated the muting sensors, the SRUM/R then initiates the muting cycle for the period during which the material is being transported through the protected field.

The muting sensors are arranged in such a way as only the material can correctly activate the muting sensors, and any person approaching the danger area will cause a shut down of the safety system.

A basic overview of the muting application is shown in the diagram below:



MS1, MS2, MS3, MS4
EST

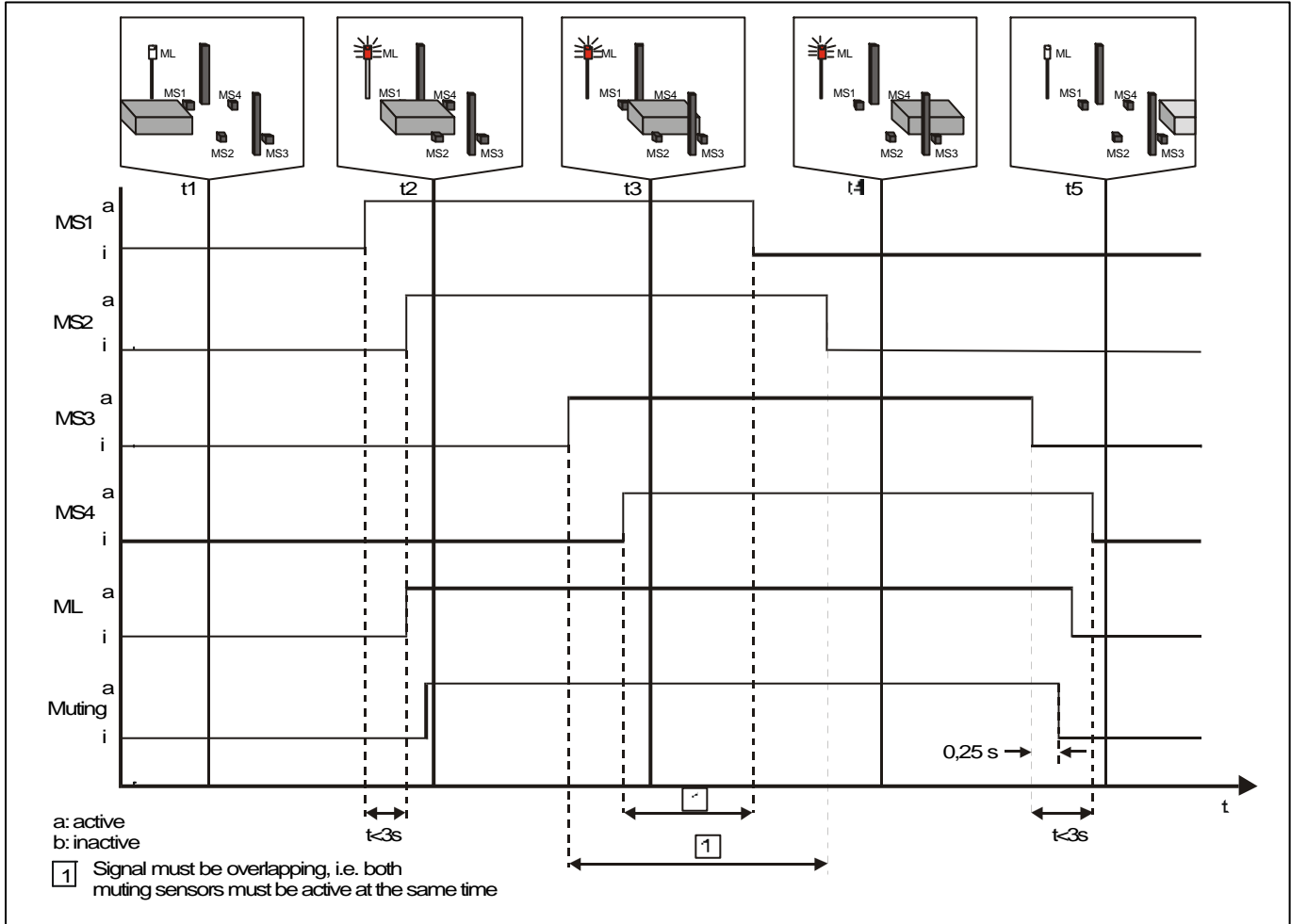
Muting sensors
Start button

ML Muting lamp
ESS Key-operated switch

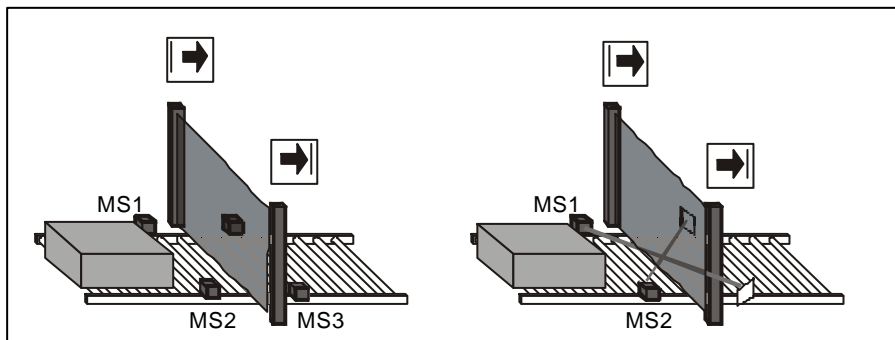
Operation

The SRUM/R functions in the following way:

To initiate a muting cycle, muting sensors MS1 and MS2 have to be activated within 3 seconds of each other. The muting lamp will turn on, and any interruption of the light curtain will not cause the outputs of the SRUM/R to de-activate. Once three of the four muting sensors have been cleared, the muting cycle will terminate after a time period of 0.25 seconds, and the light curtain will no longer be bypassed.

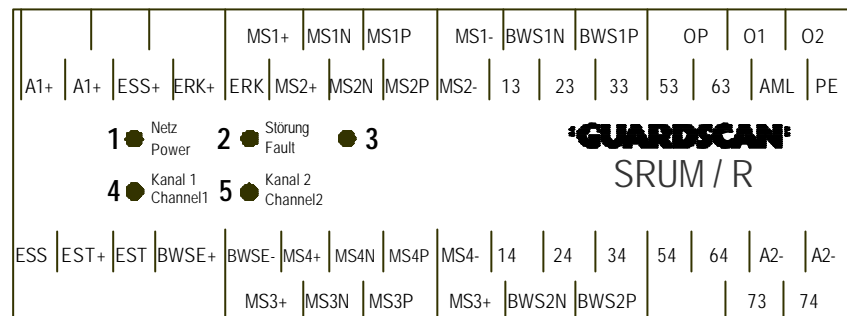


It is possible to use only two retro-reflected type mute sensors, if they are arranged diagonally across the field of the light curtain, with the cross over point on the dangerous side of the light curtain, as shown below:



Indicators

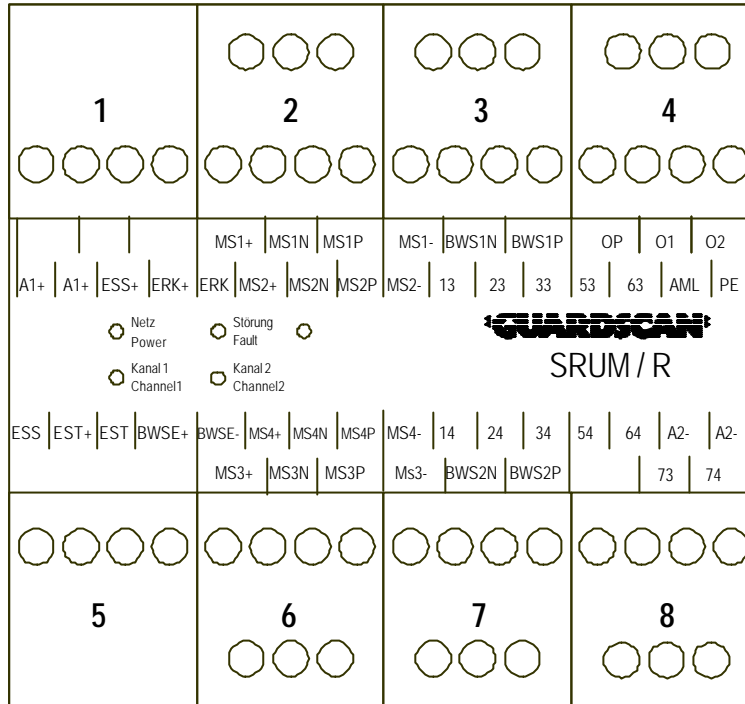
Five indicators on the front panel of the SRUM/R are used to indicate the control units status.



- 1** Power ON
- 2** Fault
- 3** Restart inhibit on, waiting for start
- 4** Operation – Channel 1 activated
- 5** Operation – Channel 2 activated
- 4+5 flashing** Error code (See Section XXX)

Connection Details

The following terminals are available on the SRUM/R muting control unit



Terminals

Description

A1+, A2-	Supply Voltage
EST+, EST	Start/Restart button
ESS+, ESS	Key-operated switch (Mute Over-ride)
ESS+, 53	Muting lamp
AML	Not used for muting operation
ERK+, ERK	Feedback circuit
MSx+	Positive voltage for muting sensor x
MSx-	Negative voltage for muting sensor x
MSxP	Input of muting sensor x -PNP
MSxN	Input of muting sensor x -NPN
BWSE+	Positive voltage for light curtain signals
BWSE-	Negative voltage for light curtain signals
BWSxP	Input of light curtain channel x - PNP
BWSxN	Input of light curtain channel x - NPN
13-14, 23-24, 33-34	Relay safety outputs
63-64	Light curtain enable output
54	Negative internal supply voltage (internally connected to EST-, ESS-, ERK-, BWSE-, MSx-)
73-74	Auxiliary mute indicator output
OP, O1, O2	Optocoupler outputs

System Components

Muting lamp

During material transport through the protected field, the muting controller switches the muting lamp (ML) on. The SRUM/R monitors the filament of the muting lamp even when the muting function has not yet been initiated. If the filament is defective, or if no lamp is connected, the control unit goes to lockout and the safety outputs are switched off.

**In accordance with EN 61496-1, the following conditions must be adhered to for the muting lamp.
The luminous surface must be at least 1cm² and have a brightness of at least 200cd/m².**

Muting sensors

Mechanical, inductive, capacitive and optoelectronic sensors are suitable as muting sensors; either solid-state outputs or relay outputs can be used.

1. The muting sensors must have a rated voltage of 24 V DC at the output.

Key-operated switch (Mute Over-ride)

A key operated switch is connected to the SRUM/R to allow the user to manually activate of the mute cycle, regardless of the status of the mute sensors, for example, when the material is already located in the area monitored by the muting sensors, and the control unit outputs are de-activated.

The muting cycle remains active as long as the key-operated switch is actuated, for a maximum time of ten minutes.

As soon as the muting sensors have been cleared, the key switch is released, and the system restarted with the Start/Restart button

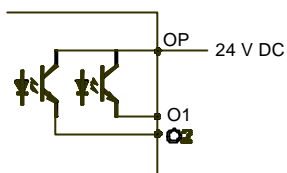
Outputs

The muting controller has the following outputs:

Three N/O safety relay outputs (13-14, 23-24, 33-34)

One N/O auxiliary mute lamp output (73-74)

Two auxiliary optocoupler outputs (OP-O1, OP-O2)



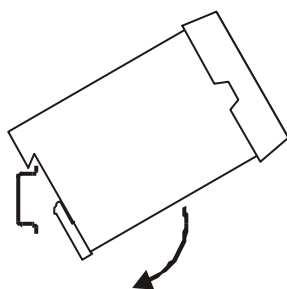
Optocoupler output O1 switches to 24V when the safety outputs are active.

Optocoupler output O2 switches to 24V when the connected light curtain is interrupted.

Mechanical Installation

Dust and moisture can lead to malfunctions. Install the device in a dust and damp-proof housing, for example in a switch cabinet or a IP54 housing.

Mount the muting controller on a universal mounting rail DIN EN 50022 as shown below:



Important Information

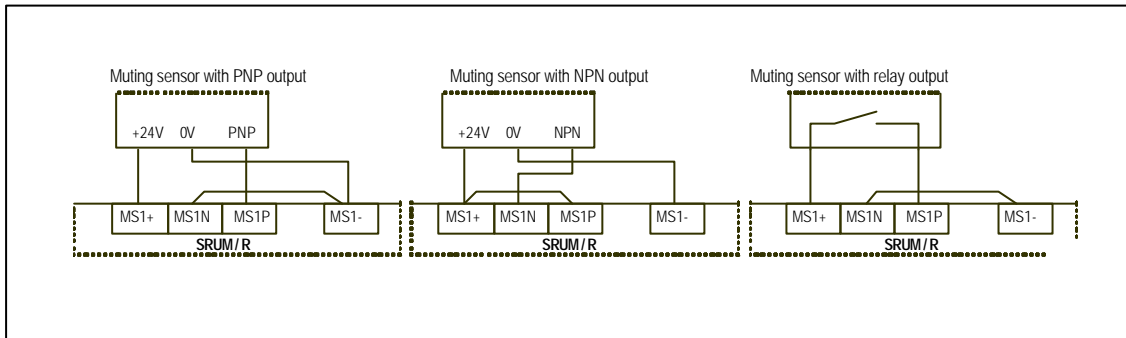
Short circuits, broken cables, power failure or voltage fluctuations in the network can impair and/or cancel the safety function and result in serious accidents.

- The safety output leads and, if they are the same polarity, also the leads of the two muting sensor groups must be laid in separate non-metallic-sheathed cables.
- The power supply to the device and all connections must be reliably isolated from the mains, by using an isolating transformer in accordance with IEC 60742 .

Muting sensors

Muting sensors are wired depending on the operating mode, type and number of sensors. Either 2 or 4 muting sensors must be connected to the muting controller. When using two muting sensors, these must be connected to terminals MS1... and MS2... .

Connect the muting sensors in accordance with the diagrams below:



MSxP and MSxN must always be connected on the SRUM/R.

The unused connections on the SRUM/R must be connected as follows:

If MSxN is not used, connect MSx- to MSxN

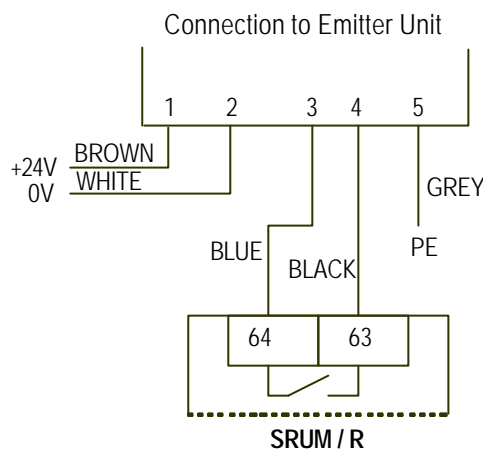
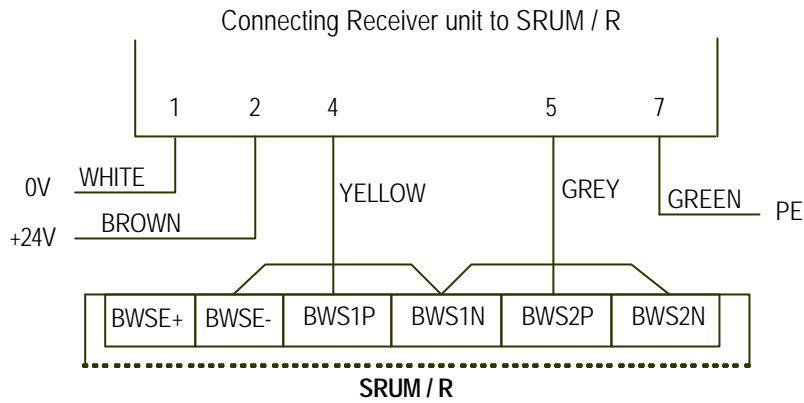
If MSxP is not used, connect MSx+ to MSxP

Please Note

1. If 4 muting sensors are connected, sensors with the same polarity must be used at the connections MS1.. and MS4.. / at MS2.. and MS3.. .
2. The wiring for MS1../MS4.. and MS2../MS3.. must be in separate cables.

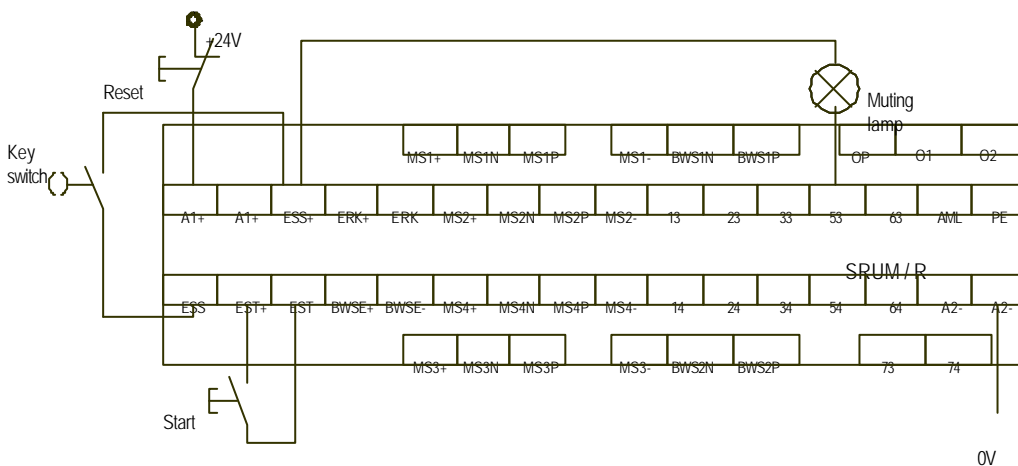
Light Curtain

The Guardscan Light curtain is to be connected to the SRUM/R as shown below:



Power supply, Mute Over-ride key switch, Muting lamp, Start button

Connection of the supply voltage, mute over-ride, mute lamp and start button is as follows:



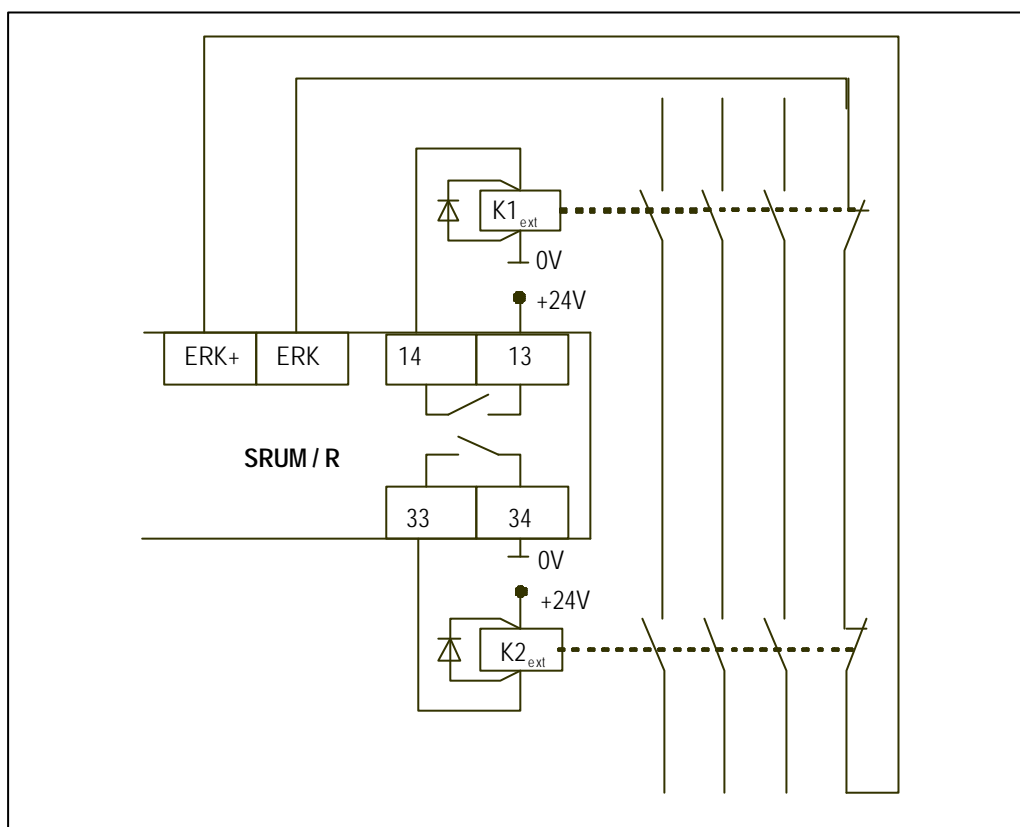
Only connect the operating voltage to terminals A1+ and A2- when the remaining wiring has been completed.

Safety Outputs

The terminals 13-14, 23-24 and 33-34 are safety relay outputs. If the muting controller is running and the light curtain is unobstructed, the outputs will be activated.

To extend the safety outputs, relays with positive guided contacts must be used

The use of external relays without spark suppressors can lead to damage to the muting controller. For this reason, always connect protection diodes, e.g. Type 1N4007, in parallel with any external relay coils.



Commissioning and Testing

After applying the supply voltage, the SRUM/R performs an internal self-test.

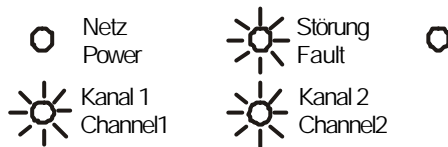
LED's 1,3,4 and 5 light up, and the SRUM/R can then be activated by pressing the start button, and the outputs should activate.

If the self-test has not been successfully executed, there could be a fault or a connection error. For details, see the following section "Troubleshooting".

Troubleshooting

The muting controller is equipped with comprehensive a diagnostics functions. If a fault is present, the fault LED will flash, together with the LEDs from channel 1 and channel 2. It is possible, under certain circumstances for both channel LEDs to indicate different errors. From the number of flashes (flashing code), it is possible to determine which fault has occurred (See following table for flash codes).

Example:



Channel 1 LED flashes 9 times (code 9), Channel 2 LED flashes once (code 1)

Channel 1 LED indicates the fault "Muting lamp interrupted"

Channel 2 LED indicates the fault "Inequality of the two channels".

Tip: If both channel LEDs flash, the code can be more easily read by covering the other LED.

If an error occurs, check the supply voltage between terminals A1+ and A2-. This voltage must not drop below 21.6 V DC.

Fault Diagnosis Chart

FC	Fault	Possible cause	What to do
1	Differences between the channels	Only one Channel detects an Error	Look at the Flash Code of the other channel
2	One of the channels activates	One channel faulty	Reset system
3	Feedback circuit open	Normally closed contacts of external relays are not connected Link not wired	Check wiring Check external relays
4	Start button constantly activated	Start button faulty Start switch is used instead of start push button	Check start button on short circuit Check start button (must be a momentary push button)
5	Key switch is activated during start up	Key switch activated Key switch defect	Reset system Check key switch
6	Light curtain active on start up	Wiring error of the light curtain	Check wiring; emitter test signal must activated with output 63-64.
7	Internal fault of the safety output	Wiring error of safety outputs Noise on the control line Output faulty	Check wiring of safety outputs.
8	Internal fault of emitter control	Wiring fault of the light curtain Noise on control line Output fault	Check wiring of output 63-64.
9	Muting lamp disconnected	Muting lamp faulty Muting lamp is missing No link on AML terminals	Check muting lamp and change if necessary Insert link between AML terminals
10	Key switch activated twice	After the clearance of the light barrier the key switch was activated a second time	Reset system
11	Light curtain disconnected during start or time out on receiver	Wiring fault for the light curtain Optical Path is broken Timeout reached	Check wiring Check optical path Check technical data of the light barrier (start time, power consumption)
12	Simultaneousness of muting sensors exceeded (3s)	Wrong position of the muting sensors Only one muting sensor was activated	Check position of muting sensors, the material must activate both sensors within 3s all muting sensors wired ?
13	Internal fault of muting lamp control	Wiring fault of the muting lamp Muting lamp defect PIN 53 is connected to GND Output fault	Check wiring at PIN 53 and ESS+ Check muting lamp
14	Mute Over-ride timeout exceeded	Manual muting timeout (10 min) reached	Reset System
15	Internal memory fault	Noise on control / Power lines Internal error	Reset; if fault occurs again: check system for noise

Technical data

Electrical data	
Supply voltage U_v	24 V DC
Voltage range	0,90 ... 1,1 U_v
Maximum ripple	$\leq 5\%$
Power consumption without peripheral devices	appr. 10 W
Conductor connection	1 x 4,0 mm ² wire 2 x 1,5 mm ² wires
Safety Outputs	3 N/O contacts
Switching voltage	24 V DC
Response time (light curtain)	< 20 ms
Input current	appr. 15 mA for each input
Simultaneousness of muting sensors	3 s
Muting time	max. 10 minutes mute over-ride, infinite during normal operation
Startup waiting time	max. 6 s
Switching current, outputs 13-14, 23-24, 33-34	6 A continuous current (one output loaded) 3,5 A continuous current (three outputs loaded)
Output 63-64 (curtain enable)	N/O Relay 2 A / 24 V DC
Output 7374 (auxiliary mute lamp)	N/O Relay 1,2 A / 24 V DC
Output OP-O1, OP-O2	Optocoupler, 20mA / 24 V DC
Power supply - muting sensors	Together max. 0,5 A (24 V DC)
Output 53 (muting lamp)	24 V DC, max. 1 A
Mechanical data	
Housing material	Self extinguishing according to UL 94 V-0
Dimensions (WxHxD)	90x84x121 mm
Mounting	Snap mounting on universal mounting rail NS35 according to DIN EN 50022
Environmental data	
Environment temperature	-25°C ... +55°C
Humidity	Operation 75% (non condensing), Storage 85% (non condensing)
Creepage and clearance	DIN VDE 0110 part 1 at pollution grade 2, basic isolation: over voltage category 3; safe breaking: over voltage category 2
Terminal type	IP 20
Housing type	IP 40
Shock resistance	< 0,7 Nm
Vibration resistance	Frequency < 33 Hz, Amplitude < 0,35 mm

