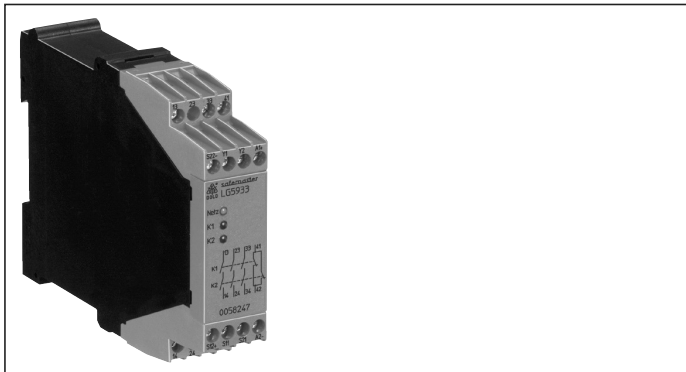


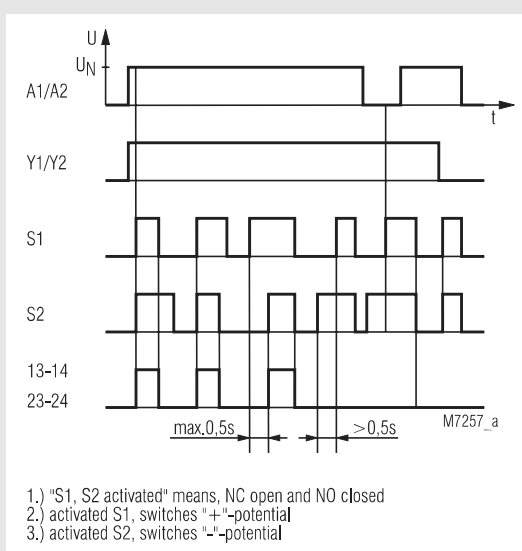
# Safety Technique

## SAFEMASTER Two-Hand Safety Relay LG 5933



- According to
  - Performance Level (PL) e and category 4 to EN ISO 13849-1: 2008
  - SIL Claimed Level (SIL CL) 3 to IEC/EN 62061
  - Safety Integrity Level (SIL) 3 to IEC/EN 61508
  - Safety level Type III-C to EN 574
- Inputs for 2 push buttons with 1 NC and 1 NO contact
- Output: 3 NO contacts, 1 NC contact
- Feedback circuit Y1 - Y2 to monitor external contactors used for reinforcement of contacts
- Overvoltage and short circuit protection
- Wire connection: also 2 x 1,5 mm<sup>2</sup> stranded ferruled, or 2 x 2,5 mm<sup>2</sup> solid DIN 46 228-1/-2/-3/-4
- as option with pluggable terminal blocks for easy exchange of devices
  - with screw terminals
  - or with cage clamp terminals
- Width 22.5 mm

### Function Diagramm



### Approvals and Marking



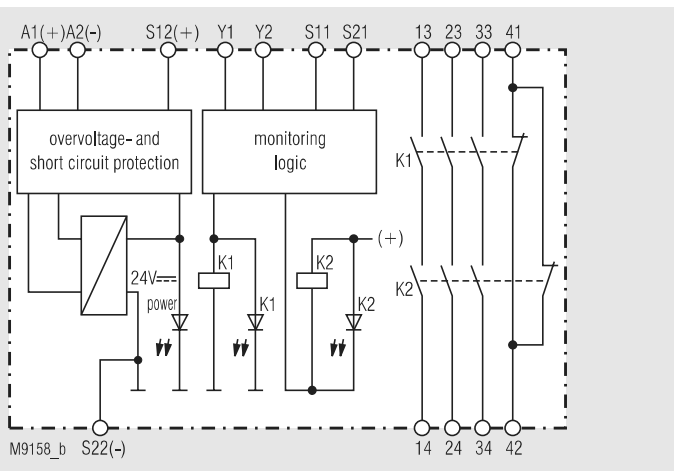
### Applications

Designed for press controls in metalworking as well as in other working machines with dangerous closing movements.

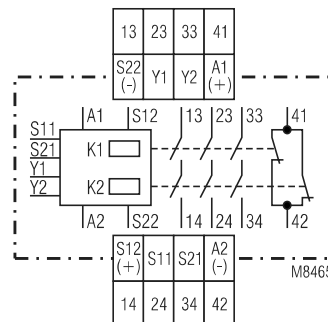
### Indication

LED power-supply: on, when operating voltage applied  
 LED K1: on, when relay K1 active  
 LED K2: on, when relay K2 active

### Block Diagram



### Circuit Diagram



Connection Terminals	
Terminal designation	Signal designation
A1 (+)	+ / L
A2 (-)	- / N
S11, S21, Y1, Y2	Inputs
S12(+), S22(-)	Outputs
13, 14, 23, 24, 33, 34	Forcibly guided NO contacts for release circuit
41, 42	Forcibly guided indicator output

### Notes

If both buttons are pressed while switching on the operating voltage (e.g. after voltage failure) the output contacts do not energize. The terminal S22 also serves as reference point for checking the control voltage. On LG 5933 there is only one terminal S12 and S22.

### Set-Up Instructions

The device has to be connected as shown in the application examples. When connecting the push-buttons in parallel or in series the safe function of the relay is disabled. Connected contactors (relays) must have forcibly guided contacts and have to be monitored in the feedback circuit.

To start a dangerous movement, 2 push buttons are used, each equipped with 1 NO and 1 NC contact. The output contacts will be switched if both push buttons are operated within  $\leq 0,5$  s. The buttons must be designed and installed in a way, that it is not possible to manipulate or to operate them without intention.

The distance between push buttons and dangerous area must be chosen in a way that it is not possible to reach the dangerous area after release of one button before the dangerous movement comes to standstill.

The safety distance "s" is calculated with the following formula:  
 $s = v \times t + C$

- a) moving speed of person  $v = 1\ 600$  mm/s
- b) stopping time of the machine  $t$  (s)
- c) Additional safety distance  $C = 250$  mm

If the risk of accessing the dangerous area is prohibited while the push buttons are pressed e.g. by covering the buttons, C can be 0. The minimum distance has to be in this case 100 mm. See also EN 574.

### Technical Data

#### Input

<b>Nominal voltage <math>U_N</math>:</b>	AC 24 V, DC 24 V
<b>Voltage range</b> at 10 % residual ripple:	AC / DC 0.9 ... 1,1 $U_N$
<b>Nominal consumption:</b>	AC approx. 4 VA DC approx. 2.3 W
<b>Nominal frequency:</b>	50 / 60 Hz
<b>Delay time for simultaneity demand:</b>	max. 0.5 s
<b>Recovery time:</b>	1 s
<b>Control contacts:</b>	2 x (1 NO, 1 NC contacts)
<b>Current via control contacts with DC 24 V:</b>	
NO contact:	typ. 50 mA
NC contact:	typ. 20 mA
<b>Fuse protection:</b>	internal with PTC
<b>Overvoltage protection:</b>	by MOV

#### Output

<b>Contacts:</b>	3 NO, 1 NC contacts
The NO contacts are safety contacts.	
<b>ATTENTION! The NC contact 41-42 can only be used for monitoring.</b>	
<b>Operate time:</b>	typ. 30 ms
<b>Release time:</b>	typ. 25 ms
<b>Contact type:</b>	forcibly guided
<b>Nominal output voltage:</b>	AC 250 V DC: see continuous current limit curve
<b>Switching of low loads:</b> (contacts with 5 $\mu$ Au)	$\geq 100$ mV $\geq 1$ mA
<b>Thermal current <math>I_{th}</math>:</b>	see continuous current limit curve
<b>Switching capacity</b> to AC 15:	
NO contacts:	AC 3 A / 230 V IEC/EN 60 947-5-1
NC contacts:	AC 2 A / 230 V IEC/EN 60 947-5-1
to DC 13	
NO contacts:	2 A / DC 24 V IEC/EN 60 947-5-1
NC contacts:	2 A / DC 24 V IEC/EN 60 947-5-1
<b>Electrical contact life</b> at 5 A, AC 230 V $\cos \varphi = 1$ :	$> 2,2 \times 10^5$ switch.cycles
<b>Permissible switching capacity:</b>	max. 1 800 switching cycles / h
<b>Short circuit strength</b> <b>max. fuse rating:</b>	10 A gL IEC/EN 60 947-5-1
<b>Line circuit breaker:</b>	B 6 A
<b>Mechanical life:</b>	$10 \times 10^6$ switching cycles

#### General Data

<b>Nominal operating mode:</b>	continuous operation
<b>Temperature range</b> operation:	- 15 ... + 55°C
storage :	- 25 ... + 85 °C
<b>altitude:</b>	< 2.000 m
<b>Clearance and creepage distances</b> rated impuls voltage / pollution degree:	4 kV / 2 (basis insulation) IEC 60 664-1
<b>EMC</b> Electrostatic discharge:	8 kV (air) IEC/EN 61 000-4-2
Fast transients:	2 kV IEC/EN 61 000-4-4
Surge voltages between wires for power supply:	1 kV IEC/EN 61 000-4-5
between wire and ground:	2 kV IEC/EN 61 000-4-5
HF-wire guided:	10 V IEC/EN 61 000-4-6
Interference suppression	Limit value class B EN 55 011
<b>Degree of protection</b> Housing:	IP 40 IEC/EN 60 529
Terminals:	IP 20 IEC/EN 60 529
<b>Housing:</b>	Thermoplast with V0 behaviour according to UL subject 94
<b>Vibration resistance:</b>	Amplitude 0.35 mm, frequency 10 ... 55 Hz IEC/EN 60 068-2-6

## Technical Data

<b>Climate resistance:</b>	15 / 055 / 04	IEC/EN 60 068-1
<b>Terminal designation:</b>		EN 50 005
<b>Wire connection</b>		DIN 46 228-1/-2/-3/-4
<b>Screw terminals (integrated):</b>	1 x 4 mm <sup>2</sup> solid or 1 x 2.5 mm <sup>2</sup> stranded ferruled (isolated) or 2 x 1.5 mm <sup>2</sup> stranded ferruled (isolated) or 2 x 2.5 mm <sup>2</sup> solid	
Insulation of wires or sleeve length:	8 mm	
<b>Plug in with screw terminals</b>		
max. cross section for connection:	1 x 2.5 mm <sup>2</sup> solid or 1 x 2.5 mm <sup>2</sup> stranded ferruled (isolated)	
Insulation of wires or sleeve length:	8 mm	
<b>Plug in with cage clamp terminals</b>		
max. cross section for connection:	1 x 4 mm <sup>2</sup> solid or 1 x 2.5 mm <sup>2</sup> stranded ferruled (isolated)	
min. cross section for connection:	0.5 mm <sup>2</sup>	
Insulation of wires or sleeve length:	12 ±0.5 mm	
<b>Wire fixing:</b>	Plus-minus terminal screws M 3.5 box terminals with wire protection or cage clamp terminals	
<b>Mounting:</b>	DIN rail	IEC/EN 60 715
<b>Weight:</b>	220 g	

## Dimensions

### Width x height x depth

LG 5933:	22.5 x 90 x 121 mm
LG 5933 PC:	22.5 x 111 x 121 mm
LG 5933 PS:	22.5 x 104 x 121 mm

## Safety Related Data

### Values according to EN ISO 13849-1:

Category:	4	
PL:	e	
MTTF <sub>cl</sub> :	30.7	a (year)
DC <sub>avg</sub> :	99.0	%
d <sub>op</sub> :	220	d/a (days/year)
h <sub>op</sub> :	12	h/d (hours/day)
t <sub>zyklus</sub> :	1.40E+02	s/Zyklus

### Values according to IEC/EN 62061 / IEC/EN 61508:

SIL CL:	3	IEC/EN 62061
SIL	3	IEC/EN 61508
HFT <sup>1)</sup> :	1	
DC <sub>avg</sub> :	99.0	%
SFF:	99.7	%
PFH <sub>D</sub> :	7.51E-09	h <sup>-1</sup>
T <sub>r</sub> :	20	a (year)

<sup>1)</sup> HFT = Hardware-Failure Tolerance



The values stated above are valid for the standard type.  
Safety data for other variants are available on request.

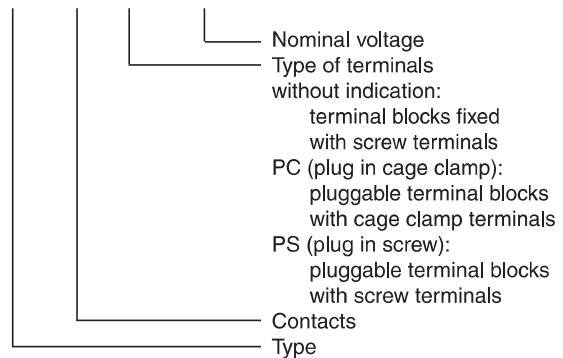
The safety relevant data of the complete system has to be determined by the manufacturer of the system.

## Standard Type

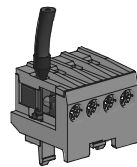
LG 5933.48 DC 24 V	
Article number:	004958247
• Output:	3 NO contacts, 1 NC contact
• Nominal voltage U <sub>N</sub> :	DC 24 V
• Width:	22.5 mm

## Ordering Example

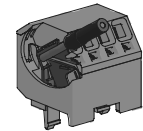
LG 5933 .48 PS DC 24 V



## Options with Pluggable Terminal Blocks



Screw terminal  
(PS/plugin screw)

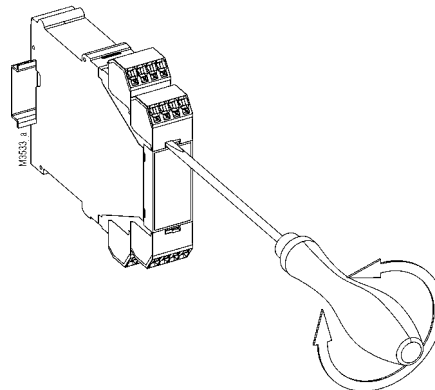


Cage clamp terminal  
(PC/plugin cage clamp)

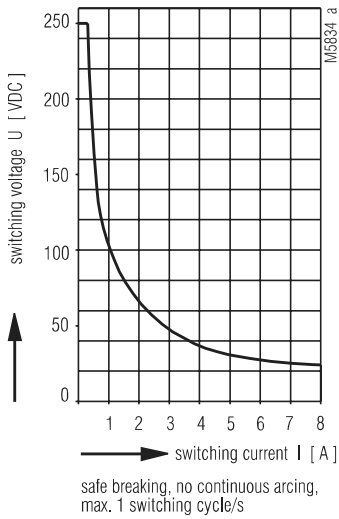
## Notes

Removing the terminal blocks with cage clamp terminals

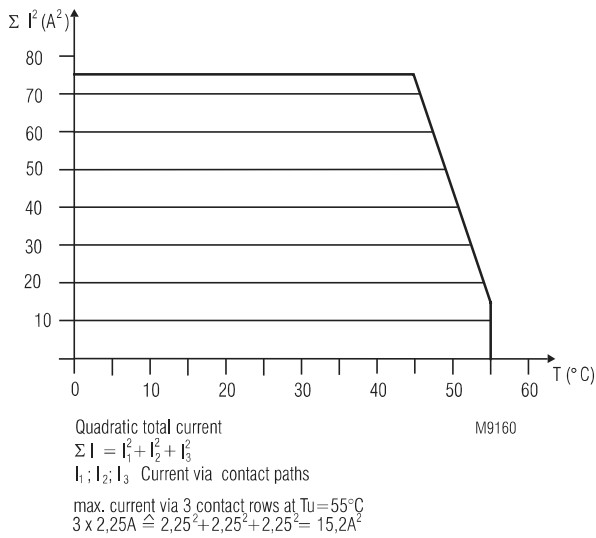
1. The unit has to be disconnected.
2. Insert a screwdriver in the side recess of the front plate.
3. Turn the screwdriver to the right and left.
4. Please note that the terminal blocks have to be mounted on the belonging plug in terminations.



## Characteristics

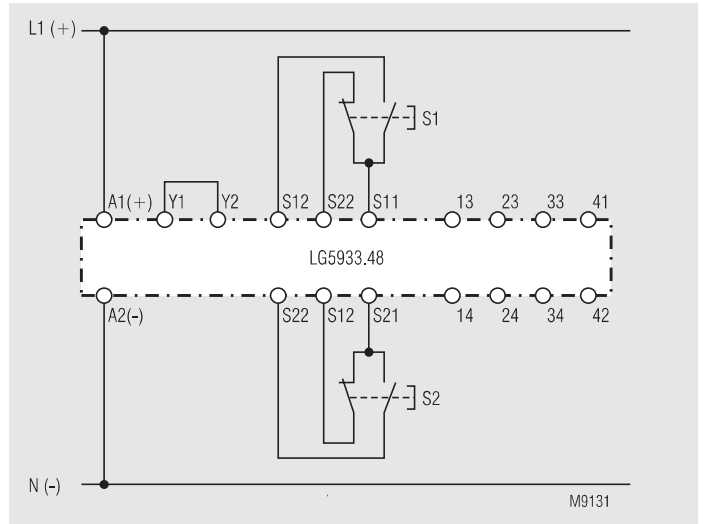


Arc limit curve under resistive load

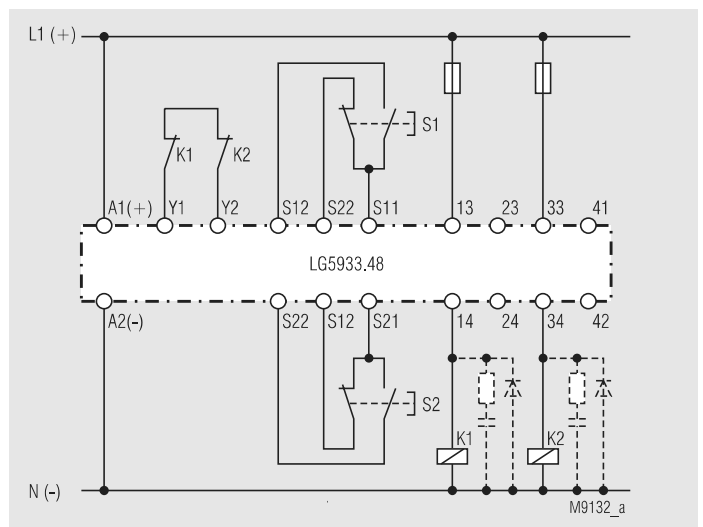


Total current limit curve

## Application Examples



Two-hand control  
Suited up to SIL3, Performance Level e, Cat. 4



Two-hand control with contact reinforcement via external forcibly guided contactors. When switching inductive loads spark absorbers are recommended.  
Suited up to SIL3, Performance Level e, Cat. 4